

**cloudSwXtch**

**Version 3.3.7**





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# Quick Start Guide

## Introduction

*swXtch.io* implements a software-based network switch called cloudSwXtch. cloudSwXtch consists of a software network switch and virtual NIC service called xNIC . Together, these components create an overlay network on top of a standard cloud network. This overlay network adds many valuable network features, one of which is a seamless IP multicast experience. With cloudSwXtch, existing user applications and services, that expect standards-based IP multicast, will work on any cloud without requiring any code changes. This enables performance to approach that of bare metal.

## Installing cloudSwXtch

### WHAT TO EXPECT

In this section, users will be able to learn more about installing cloudSwXtch on AWS, Azure, GCP and OCI.

Before you install cloudSwXtch, please review the [System Requirements](#).

[AWS cloudSwXtch Installation Guide](#)

[Azure cloudSwXtch Installation Guide](#)

[GCP cloudSwXtch Installation Guide](#)

[OCI cloudSwXtch Installation Guide](#)

## Installing xNIC

### WHAT TO EXPECT

In this section, users will be able to learn more about installing the xNIC for Windows, Linux, and Kubernetes. Users **must** install an xNIC on every VM that needs to send or receive cloudSwXtch multicast or broadcast traffic.

Before you install the xNIC, please review [xNIC System Requirements](#).

[xNIC Installation Guide for Windows and Linux](#)

[xNIC Installation Guide for Kubernetes](#)

## wXcked Eye for Monitoring and Orchestration

wXcked Eye is a web-based [monitoring](#) and [orchestration](#) tool for cloudSwXtch. It presents users with a high-level view of their cloudSwXtch environment with an interactive network graph detailing connections to different endpoints. With an expansive look at performance metrics, users can ensure that their data is flowing as expected.

In addition, wXcked Eye unlocks the ability to configure Mesh, High Availability, Protocol Fanout, and Precision Time Protocol (PTP) from the comfort of a user's web browser.

For more information, see [Using wXcked Eye for cloudSwXtch](#).

## Testing

The xNIC installation includes the following utilities that can be used to verify both the functionality and performance of the network:

- **swxtch-top**: This utility shows detailed cloudSwXtch statistics in the console. For more information click [here](#).
- **swxtch-perf**: This utility can be used to produce and consume multicast traffic for testing. For more information, click [here](#).
- **swxtch-tcpdump**: This utility helps capture multicast packets sent to and from the cloudSwXtch with logic to decode our own head and display the original MC payload. For more information, click [here](#).
- **swxtch-where**: This utility allows users to call for hardware information regarding their cloudSwXtch VM. For more information, click [here](#).

Each of the utilities can be run from a VM that has the xNIC software installed. Detailed usage information can be found for each by entering in the **—help** command-line argument.

## Multicast Examples

Users can find examples of the multicast by scrolling down to the Multicast Example section in the [swxtch-perf article](#).

## What is cloudSwXtch?

### WHAT TO EXPECT

In this article, users will get a deeper understanding of **cloudSwXtch** and how it can improve their networking capabilities. This article also gives users a preliminary introduction to the main features available while using cloudSwXtch.

### Meet cloudSwXtch

cloudSwXtch creates a virtual overlay network that lets users add high performance networking to their cloud or edge applications with the touch of a button, requiring no code changes!

cloudSwXtch is available on AWS, Azure, GCP and OCI. It can be instantiated via their respective Marketplaces. cloudSwXtch is also available as a BYOL software install.

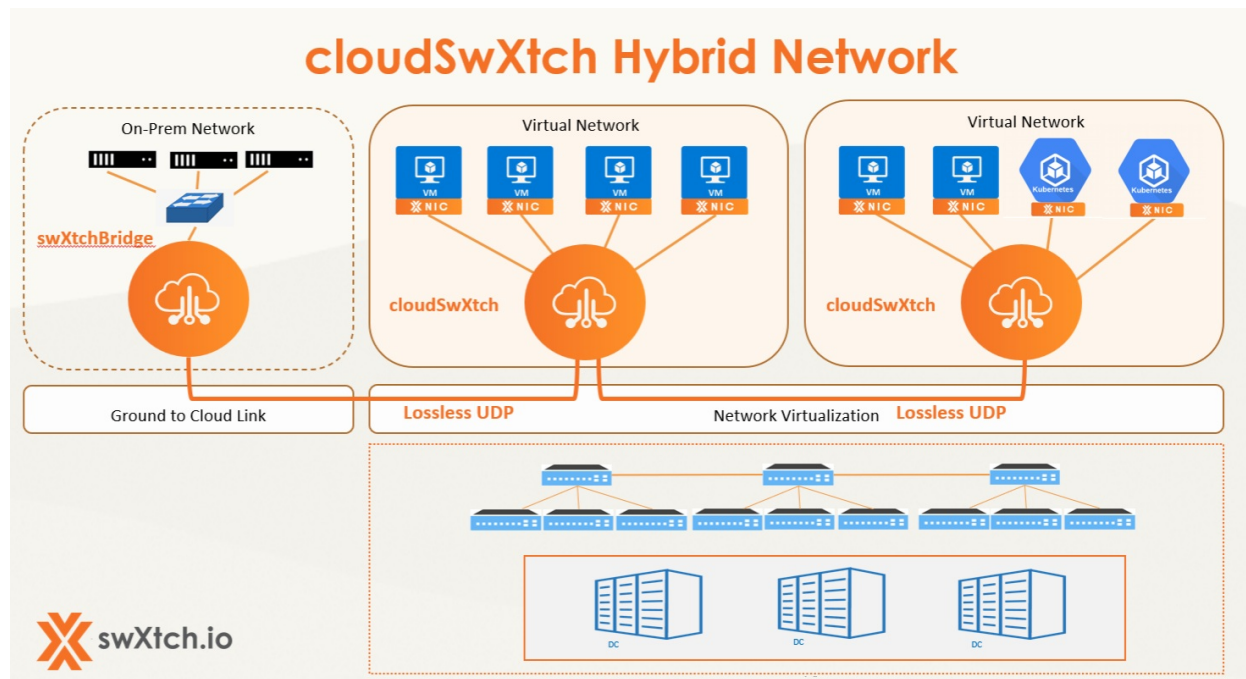
#### Supported Environments

- Microsoft's [Azure](#)
- Amazon's [AWS](#)
- Google's [GCP](#)
- Oracle's [OCI](#)
- On-Premises with [cloudSwXtch Bridge](#)

### What is a Virtual Overlay Network?

swXtch.io provides an application that implements a **Cloud Based Virtual Switch - cloudSwXtch**. It consists of a software-based network switch and a virtual NIC service (*xNIC*). Together, these components create an overlay network on top of the standard cloud network.

This overlay network adds many valuable, high-performance network features that aren't traditionally available in the cloud; one of which is a **seamless IP multicast** experience.



#### cloudSwXtch Instance

A cloudSwXtch instance running on a user's virtual machines will provide extremely low latency ( $< 3\mu s$ ), high determinism, and elastic scalability. A user can build a 1,000-port switch or create a cloudSwXtch mesh of switches to optimize network reliability.

With *cloudSwXtch*, existing user applications and services that expect standards-based IP **multicast** will work in the cloud **without requiring any code changes**. This enables performance to approach that of bare metal.

### Benefits of cloudSwXtch

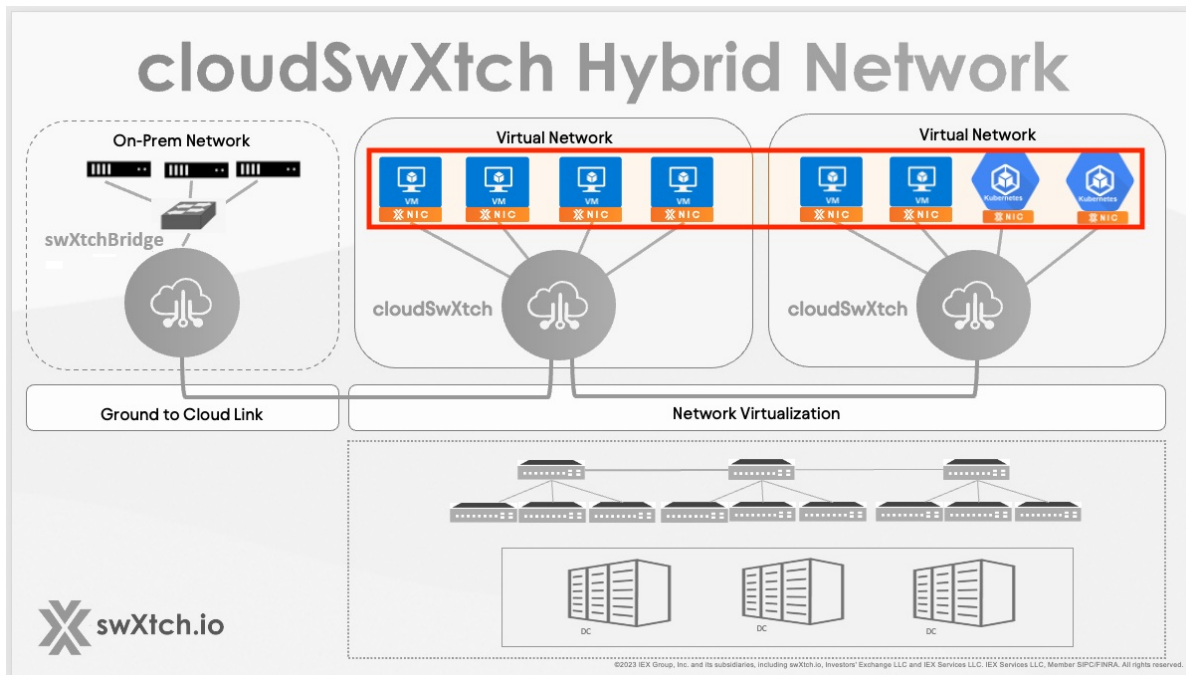
- **Unblock Cloud Migrations** – Migrate critical workloads that couldn't move to the cloud because of missing network features or performance limitations.

- **Extend On-Prem Networks to the Cloud** – Create a single data plane across private networks and the cloud, traversing virtual networks, availability zones, and regions.
- **Massive Scale** – Extended networks with unlimited endpoints share identical features and sub-millisecond performance.
- **Enhanced Packet Monitoring** – The cloudSwXtch architecture provides a unique view into low level network traffic across the entire extended network.
- **Simplified and Flexible Network Configuration** – Add and remove endpoints dynamically from global networks as conditions dictate. Eliminate the need to reconfigure individual workloads.

## What is an xNIC?

### WHAT TO EXPECT

In this article, you will learn how the xNIC, our virtual NIC, fits into the cloudSwXtch infrastructure.



## A Fully Virtualized NIC

The **xNIC** is a software service deployed by swXtch.io that creates a fully virtualized **Network Interface Controller (NIC)** within a virtual machine's (VM) operating system. In tandem with the cloudSwXtch, the xNIC provides users with wXcked fast network connectivity and enables applications running on the VM to send and receive IP multicast traffic. It is seamless and transparent to all workloads, requiring no code changes.

xNIC installation for cloudSwXtch is required for multicast to work across all major clouds — **AWS, Azure, GCP, OCI**. It is available on both **Linux** and **Windows** machines as well as **Kubernetes**. You can find a more detailed list of **xNIC system requirements**, [here](#).

In addition to multicast, the xNIC can be configured to perform high availability. At an endpoint, the xNIC compares packet reception from the multiple paths, detects dropped packets, and reconstructs the output stream in the correct order. For more information, see [Configuring xNIC for High Availability](#).

### Q: Can xNIC work on any IP within the multicast address space?

A: We recommend referring to the IANA [IPv4 Multicast Address Space Registry](#). Currently, the xNIC can't join a multicast stream if it's on 224.0.0.1.

## xNIC Type 1 vs. xNIC Type 2

**xNIC Type 2 is the default xNIC.** When running the xNIC installer script, xNIC Type 2 will automatically install. Type 2 should always be used unless kernel bypass interferes with the function of the application. In this case, use Type 1. For example, if a program requires packet captures, we would recommend using the TAP interfaces since it would expose packets earlier in the network. Another example would be a video multi-viewer as these applications typically require more information than just the video packets themselves.

**Please note:** For Windows machines, TAP/TUN interfaces are only supported in xNIC Type 1.

If a user would like to use xNIC Type 1, they will need to specify that argument during installation. For a complete list of available arguments, see [Install xNIC on Linux](#) or [Install xNIC on Windows](#).

## cloudSwXtch Liscensable Features

### WHAT TO EXPECT

The following section gives a preliminary introduction to the main features available while using a cloudSwXtch.

### Licensing cloudSwXtch Features

In addition to [Multicast](#) and [wXcked Eye](#), users can license the following features for their cloudSwXtch:

<a href="#">Protocol Fanout</a>	<a href="#">Protocol Conversion (e.g. SRT to Multicast)</a>	<a href="#">Ground to Cloud/Cloud to Ground</a>	<a href="#">SMPTE ST 2022-7 &amp; High Availability</a>
<a href="#">Precision Time Protocol (PTP)</a>	<a href="#">Tachyon LIVE!</a>	<a href="#">Increase Bandwidth Capacity (Ingress)</a>	<a href="#">Additional Endpoint Connections</a>

#### Multicast

cloudSwXtch enables true and seamless IP-multicast. Using **multicast**, instead of unicast, optimizes a user's network configuration, reducing their cloud distribution and egress costs. In addition, receivers can dynamically subscribe and unsubscribe to a user's streams as workflows dictate. cloudSwXtch alleviates the need to have to constantly reconfigure unicast streams to accommodate downstream receivers. cloudSwXtch uses the industry standard IGMPv2/v3 for its management of multicast group membership.

For more information, check out the [Multicast](#) feature article.

#### Single Source Multicast (SSM)

Traditionally, Single Source Multicast (SSM) is a method for delivering multicast packets in which the only packets that are delivered to the receiver are those originating from a specific source address requested by the receiver. This can be accomplished as either a consumer command for swxtch-perf, the cloudSwXtch-based tool for simulating traffic movement, or via an external application.

#### Protocol Conversion and Fanout

cloudSwXtch supports a unique feature called **protocol conversion and fanout**. This feature is useful when a user's multicast application needs to stream to an endpoint that does not support multicast or it is not possible to install an xNIC in the endpoint. cloudSwXtch can map a multicast group address to a unicast address. Similarly, a unicast input to cloudSwXtch can be mapped to a multicast group enabling multiple endpoints to consume the original unicast input stream. Protocol Fanout converts many packet protocols and distributes them out as if they were multicast; freely integrating multicast, unicast and Secure Reliable Transport (SRT) streams while making the network more efficient and reducing egress costs.

For more information, check out the [Protocol Conversion and Fanout](#) feature article.

#### SMPTE 2022-7 and High Availability (HA)

**High Availability (HA)** protects users against data path errors by sending the same stream through as many as eight different distributed data paths. It compares packet reception from the multiple paths, detects dropped packets and reconstructs the output stream in the correct order. This feature is compliant with SMPTE 2022-7 for media workflows.

For more information, check out the [High Availability](#) feature article.

#### Ground to Cloud <==> Cloud to Ground

A user can connect their On-Prem network to their cloudSwXtches in the Cloud via the [bridge application](#).

For more information, check out the [Installing cloudSwXtch Bridge](#) guide.

#### wXcked Eye for Monitoring and Configuration

cloudSwXtch also provides its users with visibility down to the packet level for enhanced Monitoring and Quality of Service (QoS). **wXcked Eye** is the cloudSwXtch monitoring UI tool that enables users to deeply audit the performance of their cloudSwXtch network. Each cloudSwXtch performs complete packet capture.

In addition, wXcked Eye also provides users with an additional avenue to configure their cloudSwXtch environment for mesh, high availability, protocol conversion and fanout, and precision time protocol.

A REST API is provided to help users manage and control their network in their own way.

For more information, please see the [Using wXcked Eye for cloudSwXtch](#) article.

#### Precision Time Protocol (PTP)

Precision Time Protocol (PTP) is a cloudSwXtch feature that facilitates clock synchronization between agents connected to the network. The cloudSwXtch acts as the **Master Node**, passing on the information gained from the true clock source to the **Follower Nodes** or agent end points.

For more information, please see the [Precision Time Protocol \(PTP\)](#) feature article.

#### Tachyon LIVE!



Tachyon LIVE! is a live, high-quality standards, format, and frame rate converter software stack that maximizes video quality across all conversions. It performs standards conversion including PAL/NTSC frame rate and format conversions, high-quality deinterlacing, and up/down rescaling from SD through HD, and it can process the highest-quality conversions for HD 59.97p to HD 50p, faster than real time in a VM with NVIDIA GPU-accelerated infrastructure.

This feature is an exclusive offer for cloudSwXtch from Cinnafilm and available as either an HD or UHD add-on.

For more information, please see the [Tachyon LIVE](#) feature article.

## Multicast

### Multicast

Software defined multicast (SDMC™) is a feature of the **cloudSwXtch** overlay network. With SDMC, existing applications and services that expect standards-based, IP multicast will work **without requiring any code changes** and with performance that approaches that of bare metal.

At a high level, **cloudSwXtch** implements a *software switch* that serves the same role as a hardware switch. **cloudSwXtch** receives multicast packets from producers and sends a copy of each packet to every destination VM. The **cloudSwXtch** control plane uses the industry standard IGMPv2/3 specification for the management of group membership.

The **xNIC** service handles multicast traffic between the switch and the VM operating system. The xNIC service must be installed on every VM that needs to send or receive multicast traffic.

#### SUMMARY

The **cloudSwXtch** system consists of a software switch instantiated within a virtual network and a set of virtual machines that have an xNIC virtual interface.

Applications can send and receive IP multicast by targeting the virtual network interface. IGMP control packets are generated by the local operating system and the xNIC virtual interface seamlessly picks these up and sends them to the **cloudSwXtch** instance. Local applications will work in this environment just as they would on a similar bare-metal network.

## Source Specific Multicast

### WHAT TO EXPECT

In this section, we will go into detail about Source Specific Multicast, or SSM, and how it improves security when sending/receiving multicast packets.

Source Specific Multicast, or SSM, as defined by IGMPv3, is a method for delivering multicast packets in which the only packets that are delivered to the receiver are those originating from a specific source address requested by the receiver. Not only does this improve security within the cloudSwXtch but it also alleviates strain on the network since the sender will know to only send a multicast stream from the specified single source and not via other source addresses.

This feature can be tested using swxtch-perf, a cloudSwXtch-based tool for simulating consumer and producer traffic, as well as external applications that support SSM. For more information on using it for SSM, please see the [swxtch-perf](#) article under Testing cloudSwXtch.

## Broadcast

Broadcast is a feature of the cloudSwXtch overlay network. With Broadcast, existing applications and services that expect standards-based broadcast will work without requiring any code changes and with performance that approaches that of bare metal.

At a high level, cloudSwXtch implements a software switch that serves the same role as a hardware switch. cloudSwXtch receives broadcast packets from producers and sends a copy of each packet to every destination VM.

The xNIC 2 service handles tunneling broadcast traffic between the cloudSwXtch and the VM operating system. The xNIC 2 service must be installed on every VM that needs to send or receive broadcast traffic.

### SUMMARY

The cloudSwXtch system consists of a software switch instantiated within a virtual network and a set of virtual machines that have an xNIC 2 virtual interface.

Applications can send and receive broadcast by targeting the virtual network interface. Broadcast packets are generated by the local operating system and the xNIC 2 virtual interface seamlessly picks these up and sends them to the cloudSwXtch instance. Local applications will work unchanged in this environment just as they would on a similar bare-metal network.

## High Availability

### WHAT TO EXPECT

High Availability (HA) is an implementation of data path redundancy and stream duplication. It protects users from data loss by replicating and sending packets through multiple network paths. xNIC compares packets received from those multiple paths and automatically reconstructs the original stream.

**In this section**, users will learn more about the benefits of implementing the High Availability feature in their cloudSwXtch and understand how to leverage it for their future needs.

### Creating A More Resilient Network

With High Availability, critical workloads can be configured to be more resilient, stretching across regions or availability zones in a single cloud. In addition, it can be used across multiple cloud providers. Although there can only be up to eight redundant paths, there are no limits to the number of consumers that can receive the HA stream, other than bandwidth constraints.

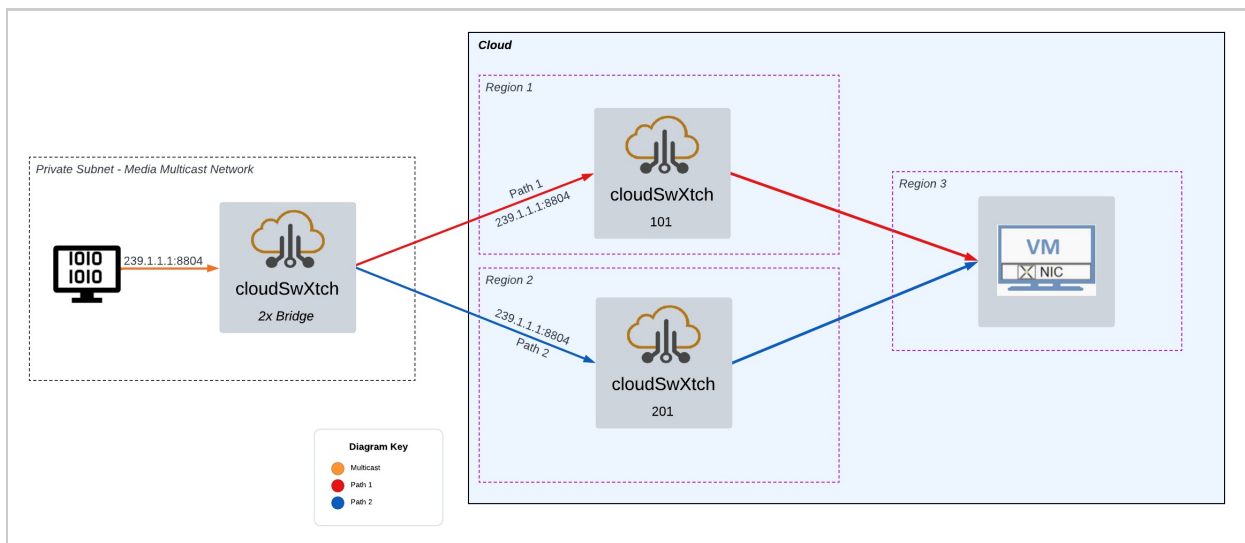
In addition, there is no limit to the number of multicast groups per data path. If one cloud, availability zone or region should go down, then the data is still sent in the other 2-8 paths, ensuring that the consumer gets the necessary data. Consumers can also be put into different clouds, availability zones or regions so that if a consumer becomes unavailable, users can still sign into a different cloud, availability zone or region and get the data desired.

The HA feature forwards packets to the receiving application from any of the configured paths as soon as the "next" expected packet is received. Redundant packets from other paths are discarded. There is no additional latency imposed by the HA feature.

### IMPORTANT

A cloudSwXtch configured in a HA path cannot be used in a cloudSwXtch mesh. They are mutually exclusive.

### High Availability Example



The simple diagram above shows high availability with one multicast group 239.1.1.1:8804 originating from an on prem source. From the bridge, two paths are created with redundant packets being sent to alternate cloudSwXtches in different regions. The number of regions and cloud providers needed for High Availability will vary depending upon the customer's environment.

Independent path redundancy ensures no packet loss if every packet arrives at the consumer from at least one path. For example:

- **In the event that cloudSwXtch101 goes offline**, the consumer will still get the multicast traffic via cloudSwXtch201 (or vice versa).
- **In the event that there are network issues in Region 1 where some of the packets are lost in path one**, the consumer can still get the multicast traffic with High Availability pulling data from Region 2 in path two.
- **In the event that there are network issues in Region 1 and 2 where some of the packets are lost in both paths**, both consumers can still get the multicast since the high availability function will take the valid packets and reconstruct the multicast stream from Region 1 and 2.

In each example, despite losing paths, multicast data was still able to get to the end point using high availability with no packet loss. Configuring more paths will ensure higher availability of the multicast group.

HA can be monitored via swxtch-top, see [swxtch-top](#) section 4-6.

To configure the system for high availability, refer to: [High Availability Configuration](#).

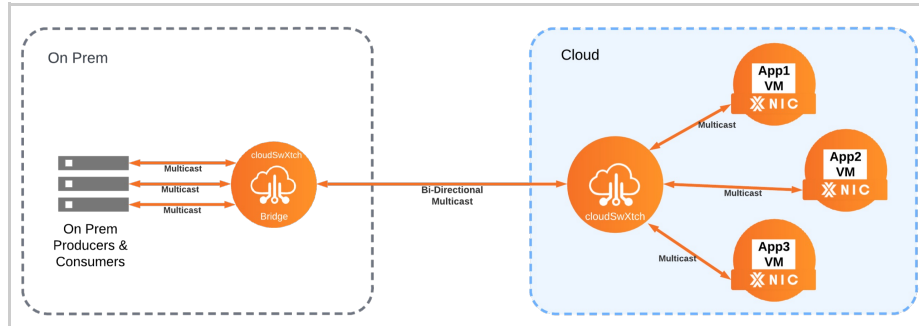
### Installing cloudSwXtch - Firewall Exceptions

When installing the cloudSwXtch, high availability requires special firewall exceptions. To learn more, see [cloudSwXtch System Requirements](#).

## Bridge

### cloudSwXtch Bridge

The **cloudSwXtch Bridge** application enables bi-directional multicast traffic between a non-cloud and cloud network. The source network can be bare-metal and on-premises. The destination network can be a cloud virtual network with a **cloudSwXtch** instance deployed. With **cloudSwXtch**, multicast traffic generated from the on-prem network can be received and processed in the cloud which then in turn can be sent back to the on-prem network.



The cloudSwXtch Bridge is bi-directional. It sends multicast traffic from the on-premises network to the cloud and from the cloud to on-premises.

From on-prem to the cloud, the bridge is dynamic. This means that users in the cloud can subscribe to a multicast group via IGMP joins. Then, the bridge will allow that traffic through. This ensures that only necessary traffic goes through the VPN or Express Route/Gateway into the cloud. It guarantees the best use of the gateway and incurs less ingress bandwidth into the cloud.

### Operation

The operation of the cloudSwXtch Bridge varies based on direction.

#### Ground-->Cloud

For Ground to Cloud, a mesh must be configured between the cloudSwXtch and the cloudSwXtch Bridge at the ground. From then on, the operation is dynamic, meaning the user does not need to map multicast addresses to go into the cloud. Instead, when a user is in an application and use an IGMP join then a message is sent to the cloudSwXtch Bridge via the cloudSwXtch through the mesh and then the Bridge allows that traffic through. When the user stops using multicast group and does an IGMP leave, then the bridge stops sending multicast data.

#### Cloud-->Ground

For Cloud to ground there is no current support to propagate IGMP joins and leaves from cloudSwXtch to on-prem. In this case, multicast groups must be explicitly configured to let the bridge know what traffic is allowed.

See [Bridge Installation](#) on how to install the Bridge and the differences between Bridge Type 1 and Type2. See our configuration pages for [Bridge Type 1](#) and [Bridge Type 2](#).

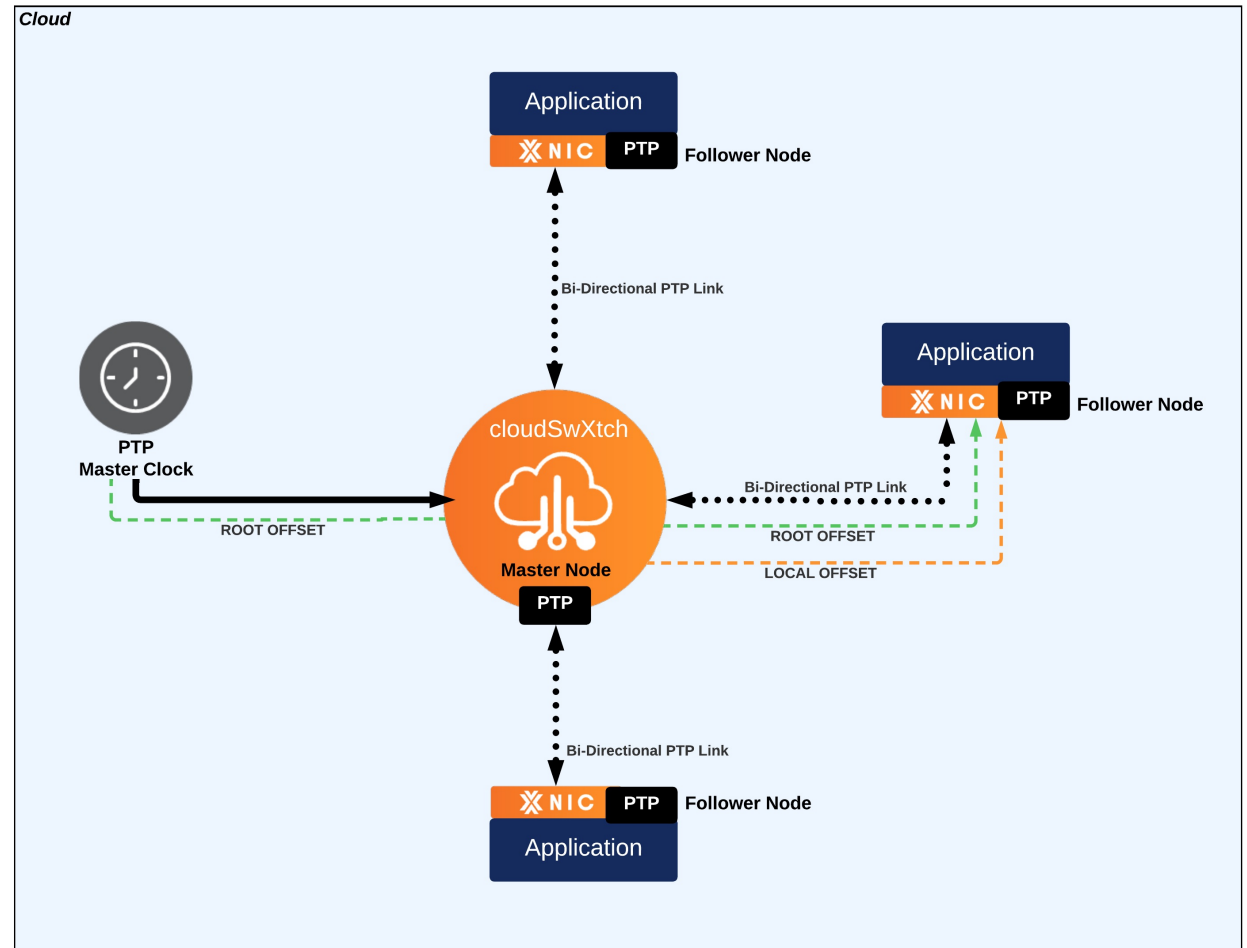
# Precision Time Protocol

WHAT TO EXPECT

In this article, users will learn how Precision Time Protocol (PTP) works in a cloudSwXtch environment when the feature is activated.

## What is Precision Time Protocol?

Precision Time Protocol (PTP) is a cloudSwXtch feature that facilitates clock synchronization between agents connected to the network. The cloudSwXtch acts as the **Master Node**, passing on the information gained from the true clock source to the **Follower Nodes** or agent end points.



Information regarding PTP will display in both [swXtch-top](#) under the PTP page and wXcked Eye under Timing Nodes. Both cloudSwXtch tools will show the local and root offset. The **local offset** denotes the offset in time from the cloudSwXtch to the xNIC. The **root offset** denotes the offset in time from the True Clock Source and the cloudSwXtch's follower nodes (xNICs). The root value will always be larger than the local since the distance between the follower node and the True Clock Source is greater than the offset between a cloudSwXtch and xNIC.



## Protocol Conversion and Fanout

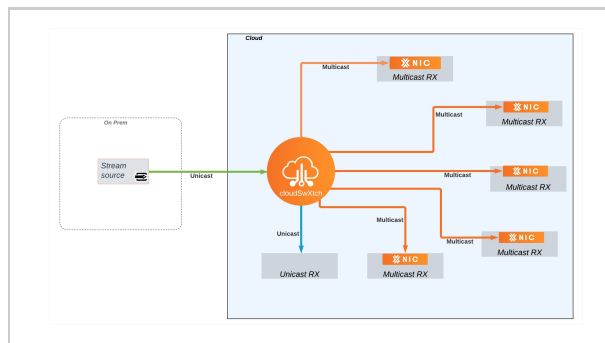
### WHAT TO EXPECT

Protocol Conversion and Fanout allows users to send copies of a single input stream in any supported protocol to multiple destinations. This gives each destination the option of being a different protocol from the input stream. An example would be a UDP input being sent to a set of multicast destination and, additionally, to one using SRT.

**In this section**, users will become more familiar with how Protocol Conversion and Fanout works in a cloudSwXtch-enabled environment.

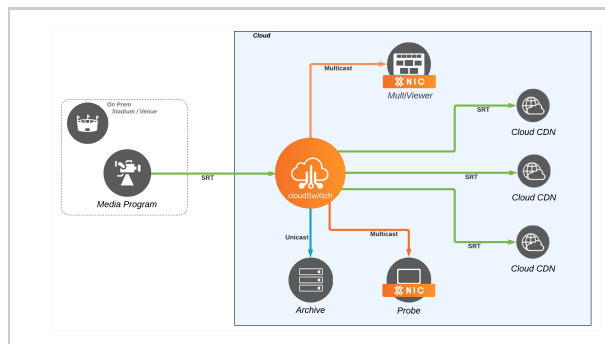
### What is Protocol Conversion and Fanout?

It is not usual for workflows to have many endpoints with each having their own protocols: SRT, Unicast and Multicast. Configuring each device can be a difficult and time consuming endeavor and up until now, impossible in the cloud. However, with cloudSwXtch, that is no longer the case. Users can convert protocols and send out multiple copies of payloads to different receivers regardless of protocol type without the need to add custom software or hardware.



This is a generic depiction of a Protocol Conversion and Fanout configuration.

In the above example, unicast data flows from the stream source into the cloudSwXtch. With Protocol Conversion and Fanout enabled, the cloudSwXtch can convert the unicast stream into multicast and fan it out to multiple receivers. In addition, the cloudSwXtch is sending out the stream to a unicast receiver. **Please note:** While it is not depicted in the above example, the cloudSwXtch can send the stream out to multiple unicast receivers.



This is a media depiction of a Protocol Fanout configuration.

In the alternative example, SRT data flows from the stream source into the cloudSwXtch. With Protocol Fanout enabled, the cloudSwXtch can convert the SRT stream into multicast and fan it out to multiple receivers. In addition, the cloudSwXtch is sending out the stream to a unicast receiver and to multiple SRT receivers. **Please note:** While it is not depicted in the above example, the cloudSwXtch can send the stream out to multiple unicast receivers.

### Understanding Endpoints

Workflows often have many endpoints: some requiring unicast, and some requiring multicast. Configuring for each device can be difficult and supporting both unicast and multicast for the same stream requires custom software or hardware. cloudSwXtch has the ability to map multicast streams to unicast streams and unicast streams to multicast streams allowing non-xNIC endpoints to participate in the cloudSwXtch network. This feature actualizes two different scenarios:

1. **Non-xNIC** producers, such as, those external to the cloud can send traffic to the cloudSwXtch, via unicast or SRT. The cloudSwXtch, then, can map that unicast or SRT stream to a multicast group for consumption within the cloudSwXtch network.
2. **Non-xNIC** consumers can receive traffic from a cloudSwXtch, as multicast streams can be mapped to unicast or SRT endpoints. This implies that non-xNIC consumers can receive packets created from a xNIC producer.

xNIC consumers and producers can consume SRT, unicast, and/or multicast based on consumer/producer workflow. For example, a VM may have 3 applications installed with each requiring a different protocol. The cloudSwXtch can send all three in the event that all three are needed.

### Configuring Protocol Conversion and Fanout for cloudSwXtch

Users can configure Protocol Conversion and Fanout using two methods:

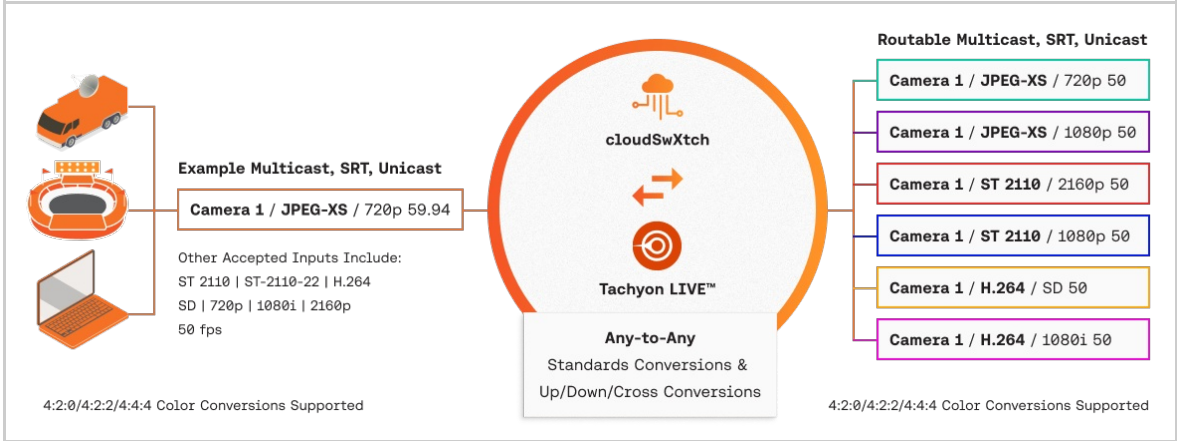
- [Via wXcked Eye](#)
- [Via API](#) - Please see the section on Protocol Fanout.

# Tachyon LIVE on cloudSwXtch

## WHAT TO EXPECT

In this article, users will learn about the various video transformations available with Tachyon LIVE on cloudSwXtch.

## What is Tachyon LIVE?



Tachyon LIVE is a live, high-quality standards, format, and frame rate converter software stack that maximizes video quality across all conversions. It performs standards conversion including PAL/NTSC frame rate and format conversions, high-quality deinterlacing, and up/down rescaling from SD through HD. It can process the highest-quality conversions for HD 59.97p to HD 50p, faster than real time in a VM with NVIDIA GPU-accelerated infrastructure.

With cloudSwXtch, this combined solution can take in LIVE multicast, RTP, UDP, NDI, SRT, and SMPTE 2110 flows for conversion and output them to multiple destinations in any of the supported network protocols. This enables simple integration into existing broadcast workflows both on public cloud or on-premises.

## Supported Media Formats and Stream Capacity

Protocol	Supported Input Codecs & Formats	Supported Output Video Codecs & Formats	Supported Output Audio Codecs & Formats
SRT	H.264 & HEVC 4:2:0/4:2:2/4:4:4 SD to UHD resolutions to 60 FPS Uncompressed & AAC Audio	H.264 SD & HD to 60fps, 4:2:0/4:2:2/4:4:4 H.264 UHD 4:2:0 to 60fps HEVC SD to UHD 4:2:0 to 60fps	AAC and Uncompressed Audio (Stereo or 5.1 – TBC)
NDI	All supported video formats SD to UHD resolutions to 60 FPS All Supported Audio Formats	All supported video formats SD to UHD resolutions to 60 FPS	All Supported Audio Formats
2110	Uncompressed or JpegXS Video SD to UHD resolutions to 60 FPS Uncompressed Audio	Uncompressed or JpegXS Video SD to UHD resolutions to 60 FPS	Uncompressed Audio

## Installing Tachyon LIVE for cloudSwXtch.

To learn more about how to install Tachyon LIVE for your cloudSwXtch, please contact [support@swxtch.io](mailto:support@swxtch.io) for more information.

## cloudSwXtch System Requirements

### WHAT TO EXPECT

In this article, users will learn about the system requirements needed to successfully deploy a cloudSwXtch. It is recommended for a user to review this page before installing a cloudSwXtch any of the four cloud platforms.

### cloudSwXtch Sizing Guidelines

#### Sizing and Feature Selection For Your cloudSwXtch

The number of endpoints and bandwidth dictate cloudSwXtch sizing requirements. It is recommended for users to **contact a swXtch.io sales representative** to discuss cloudSwXtch sizing and additional features so that the appropriate license can be distributed. **Please note:** A cloudSwXtch BYOL offering will not work without a license.

- **Sizing:** For bandwidth greater than 2 Gb/s and endpoints greater than 100, you will need different virtual CPUs/NIC sizing.
- **Adding Features:** Many additional licensable features are available for cloudSwXtch. For more information, see [cloudSwXtch Features](#).

To contact sales, please visit [swXtch.io/contact](#).

### cloudSwXtch BYOL (Marketplace)

# Endpoints	Bandwidth	Core	Memory	Hard Drive
Up to 100	2 Gb/s (max)	16+	16GB DDR	64GB SSD
Up to 200	More than 2Gb/s	64+	16GB DDR	64GB SSD

### cloudSwXtch PAYG for POCs/Trial

# Endpoints	Bandwidth	Core	Memory	Hard Drive
Unlimited	Unlimited	12+	48GB DDR	*

\*Hard Drive is dependent on the user's needs. **Note:** cloudSwXtch Pay As You Go (PAYG) is a \$30/hr offering.

### Internet Connection

Installing and upgrading cloudSwXtch **requires** internet connection. Alternatively, if a user **does not have access** to the internet, they can use the [Air-Gapped installation guide for Azure](#).

### Supported Cloud Environments

- Amazon's [AWS](#) Cloud
- Microsoft's [Azure](#) Cloud
- Google's [GCP](#) Cloud
- Oracle's [OCI](#) Cloud

### Virtual Network

A cloudSwXtch instance **must have 2 NICs**. However, both NICs can share a single subnet for control and data plane communications. This is the preferred method.

In the event that a user needs higher performance, a user can separate their subnets as described below.

- Contain a subnet for control plane traffic (referred to as the **ctrl-subnet** from here on).
- Contain a subnet for data plane traffic (referred to as the **data-subnet** from here on).

**Please note:** GCP does not allow for single subnet configuration. A user must have 2 separate subnets for their data and control NICs.

#### Subnet Selection

The subnets must be the same subnets used for the xNIC installations.

The virtual network and subnets may be shared with other services in addition to the **cloudSwXtch**. The size of each subnet should include at least 32 addresses.

### Minimum CPU and Memory

A cloudSwXtch must be a minimum of 8 cores and 16 GiB memory.

## Firewall and Security Group Rules

The xNIC software and the cloudSwXtch communicate with each other using the following protocols and ports. These firewall exceptions must be allowed in the xNIC VMs and the cloudSwXtch VM.

Subnet	Protocol	Ports	VM
ctrl-subnet	http	80	all
ctrl-subnet	udp	10800-10803	all
data-subnet	udp	9999	all

## Mesh and High Availability

Both Mesh and High Availability need special firewall exceptions in order to properly work in a user's cloudSwXtch environment. If you plan on using either features, please allow the following:

### Mesh

Subnet	Protocol	Ports	VM
ctrl-subnet	tcp+udp	37856	cloudSwXtch

### High Availability

Subnet	Protocol	Ports	VM
ctrl-subnet	tcp+udp	37856	cloudSwXtch

**Reminder:** HA Mesh are mutually exclusive and cannot be used together.

### PTP

PTP needs special firewall exceptions in order to properly work in a user's cloudSwXtch environment. If you plan on using the feature, please allow the following:

Subnet	Protocol	Ports	VM
ctrl-subnet	http	80	cloudSwXtch
ctrl-subnet	udp	10800-10803	all
data-subnet	udp	9999	all

## cloudSwXtch on AWS

### Pre-Creation Steps

Before creating an EC2 instance with cloudSwXtch installed for AWS, users must already have an AWS account *and* a VPC (Virtual Private Cloud) already created.

#### Installation Method:

1. [Review system requirements](#)
2. [Validate subnets on AWS](#)
3. [Verify security groups](#) *Optional*
4. [Create SSH key pair](#)
5. [Install cloudSwXtch on AWS](#)

#### Disclaimers

- swxtch.io does not handle any policy access rights for deployment nor does it have any special IAM roles or policies that are needed. That being said, swxtch.io suggests using a policy of least privilege for all access granted as part of the deployment. Please refer to AWS for best practices for policy rights and IAM roles and policies: [AWS Identity](#)
- swxtch.io does not require any public resources for deployment such as Amazon S3 buckets.
- swxtch.io cloudSwXtch installation does not use any AWS Secrets in Secret Manager as swxtch.io does not natively store any customer sensitive data. Customers can encrypt their traffic and the cloudSwXtch will still be able to handle the network traffic.
- swxtch.io does not encrypt data. It pass through any data sent in the multicast which may be encrypted.

## Validate Subnets on AWS

### WHAT TO EXPECT

A virtual network must be created before deploying a cloudSwXtch EC2 instance.

- It must contain at least one subnet that's used for both the control and data plane communication.
  - It is recommended that it is **private facing** and **does not auto-assign public IPs**.
  - This single subnet will be used for xNIC installation.

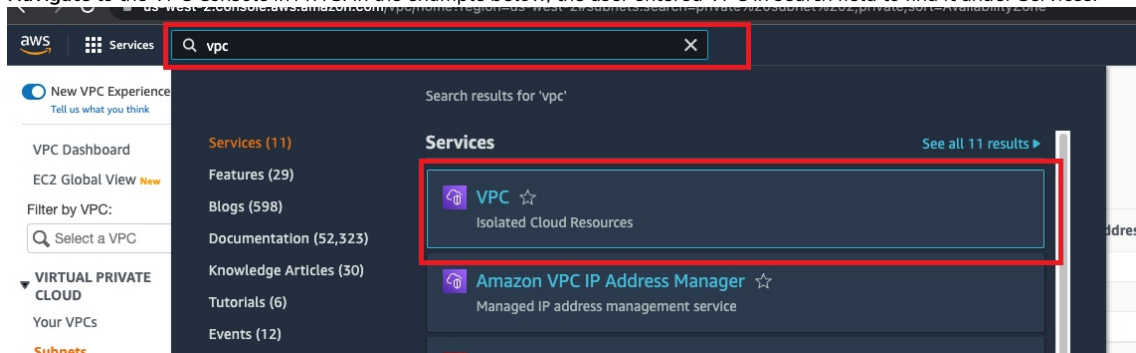
In this section, users will learn how to validate whether a subnet exists to be used as both the control and the data plane for their virtual network. This is in preparation for cloudSwXtch installation on AWS. We will also walk through an alternative method of using 2 subnets, separating the control and data plane.

### Method #1: Single-subnet

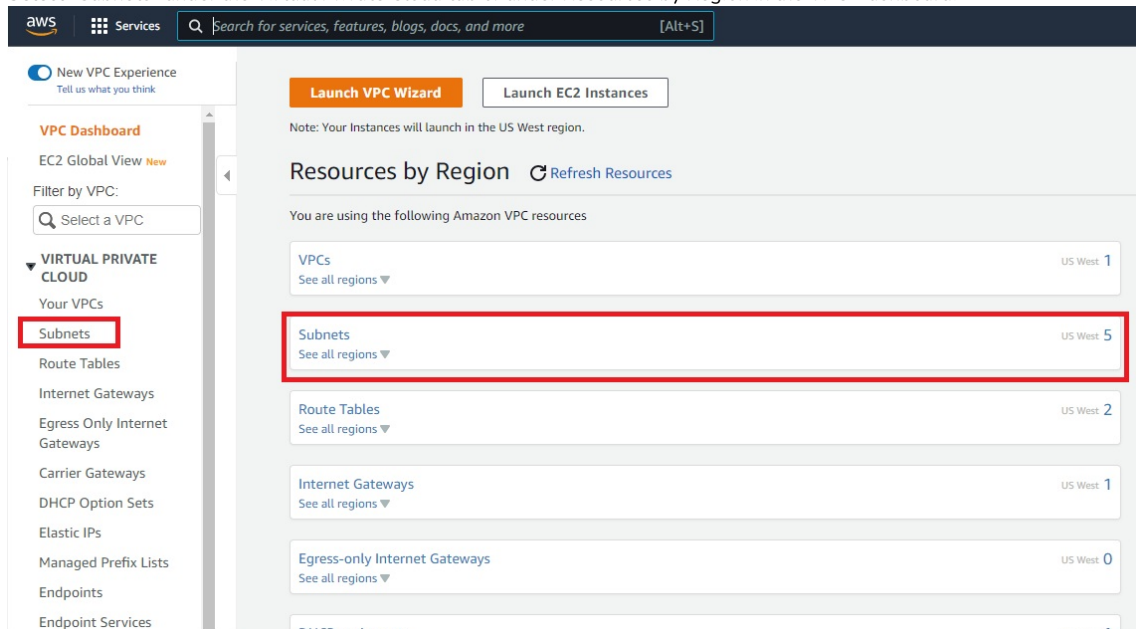
Typically, when deploying a VPC, a user will automatically create a subnet. During the main installation process, this subnet can be used for both control and data plane communications. This is the **preferred** method and will be used by a majority of users. Before installing cloudSwXtch, users should validate that the control subnet exists.

To validate:

1. **Navigate to the VPC Console in AWS.** In the example below, the user entered VPC in search field to find it under Services.



2. **Select "Subnets"** under the Virtual Private Cloud tab or under Resources by Region in the VPC Dashboard.



3. **Check that the subnet you wish to use for the cloudSwXtch is listed.** In addition to the cloudSwXtch installation, this single subnet will be used during xNIC installation.

### Method #2: Two Subnets

Alternatively, a user may decide that they want to have two separate subnets for their cloudSwXtch: one for the control plane and another for data. In addition, the same subnets must be used for the xNIC installations. This method is recommended for individuals who want higher performance.

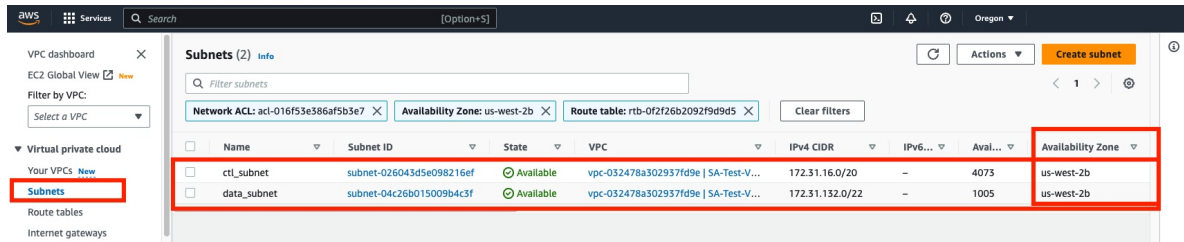
To accomplish this:

1. Navigate to the **VPC Console** in AWS.
2. Select **Subnets** under the **Virtual Private Cloud** tab or under **Resources by Region** in the **VPC Dashboard**.

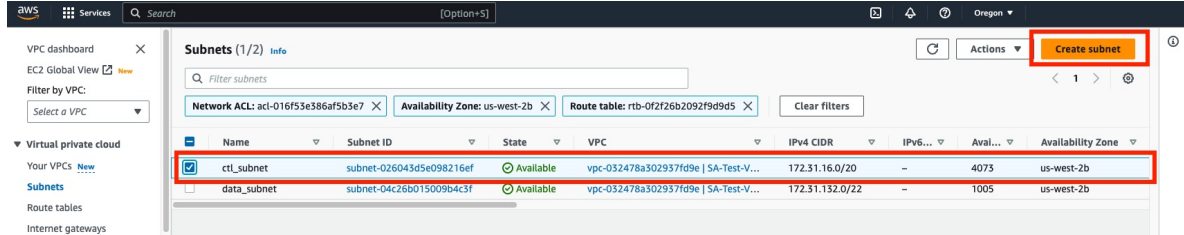
- Check that 2 subnets exist: one for the data and another for the control plane. Ensure that both subnets are in the same **Availability Zone**. This allows both NICs to be connected on the EC2 instance at the same time.

### Naming your subnets

For ease of use, name the subnets `ctl-subnet` and `data-subnet` to distinguish between them when creating an EC2 instance with `cloudSwXtch` installed.



- If a second subnet does not exist, select the orange **Create Subnet** button in the top right corner of the page.



- Fill in the **Create Subnet** form like the example shown below, ensuring that the subnet is in the same **VPC ID** and **Availability Zone** as your other subnet. In the example below, the user is creating their data subnet.

VPC > Subnets > Create subnet

## Create subnet Info

**VPC**

VPC ID  
Create subnets in this VPC.

vpc-032478a302937fd9e

Associated VPC CIDRs

IPv4 CIDRs

172.31.0.0/16

**Subnet settings**

Specify the CIDR blocks and Availability Zone for the subnet.

**Subnet 1 of 1**

Subnet name  
Create a tag with a key of 'Name' and a value that you specify.

data\_subnet

Availability Zone Info  
Choose the zone in which your subnet will reside, or let Amazon choose one for you.

US West (Oregon) / us-west-2b

IPv4 CIDR block Info

.31.133.0/22

Tags - optional

Key

Name

Value - optional

data\_subnet

Remove

Add new tag

You can add 49 more tags.

Remove

Add new subnet

Cancel **Create subnet**

- Click **"Create Subnet."** You should now have a new subnet on your list.

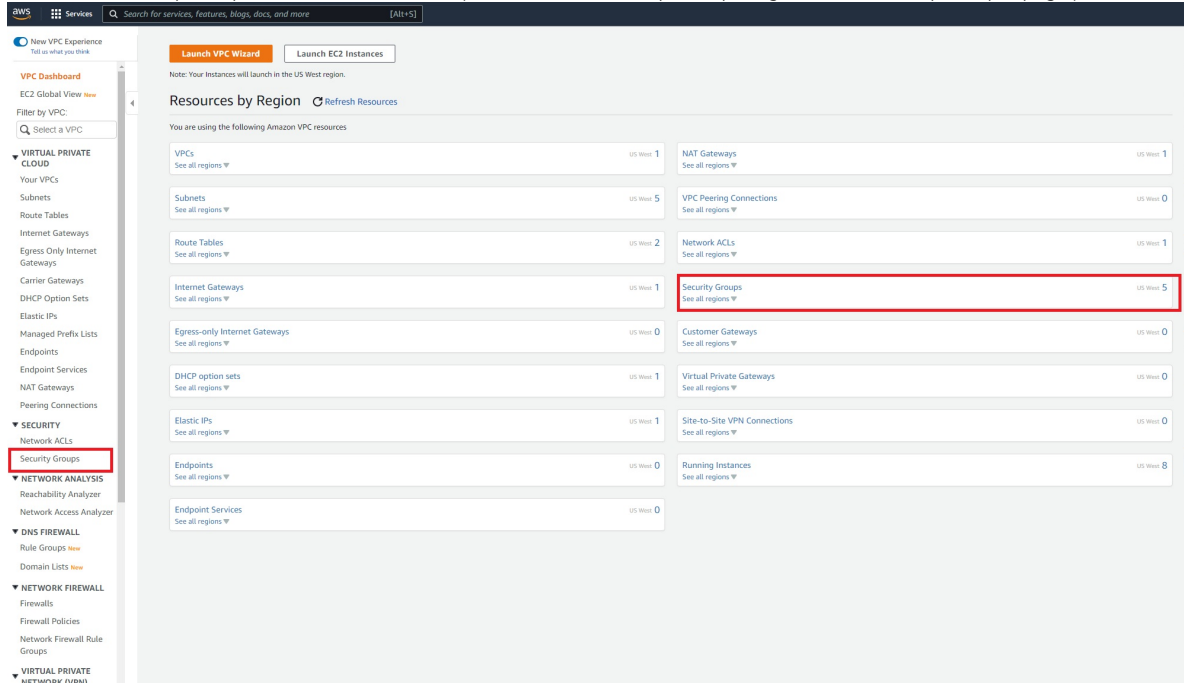


# Verify Security Groups

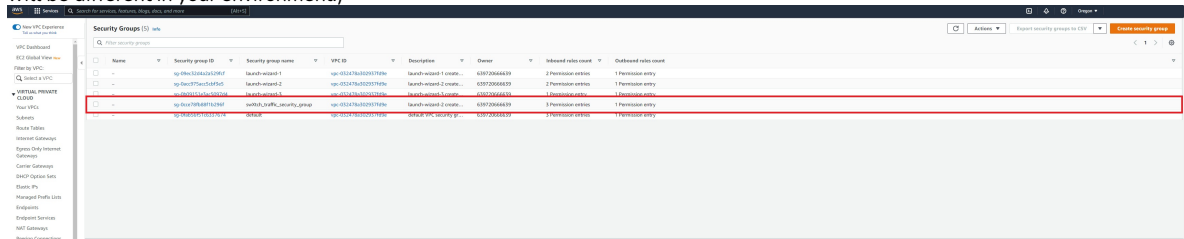
The security group contains the firewall settings for EC2 instances and interfaces (xNICs).

To ensure security groups are set up properly for cloudSwXtch:

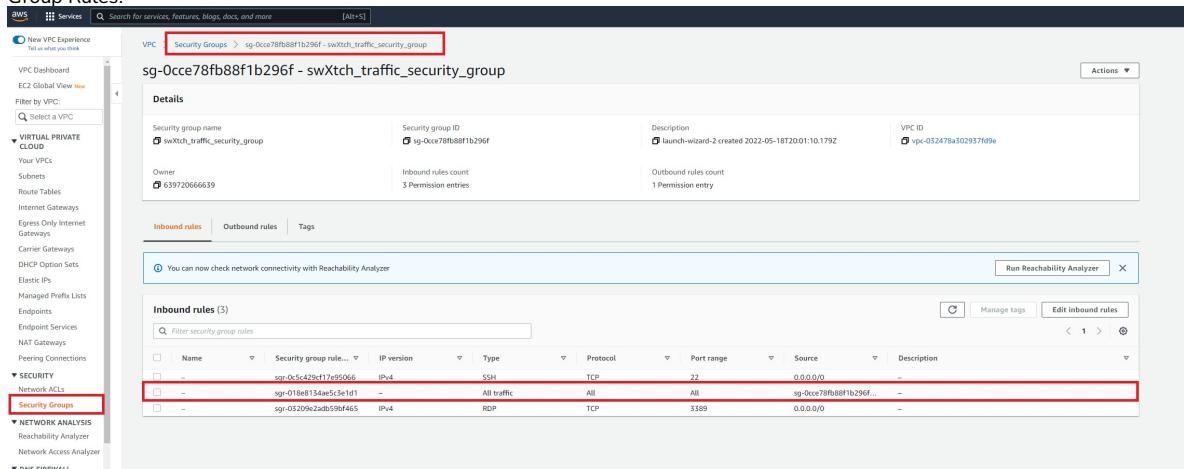
1. **Navigate** to the VPC console.
2. **Select** the "Security Groups" link as shown below. (Note: There are multiple ways to get to the "Security Groups" page.)



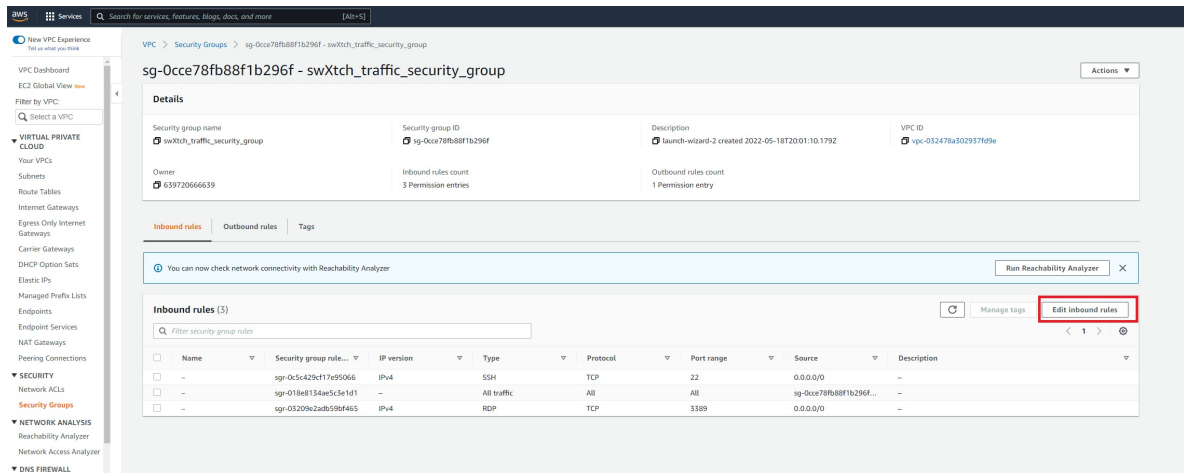
3. **Select** the Security Group that is normally used to create your EC2 instances for your application. (Note: The names in the example will be different in your environment.)



4. In order for certain features to work in your cloudSwXtch, you will need to add inbound rules to open specific ports originating from that security group. You can find the ports outlined in the [cloudSwXtch System Requirements](#) article under "Firewall and Security Group Rules."

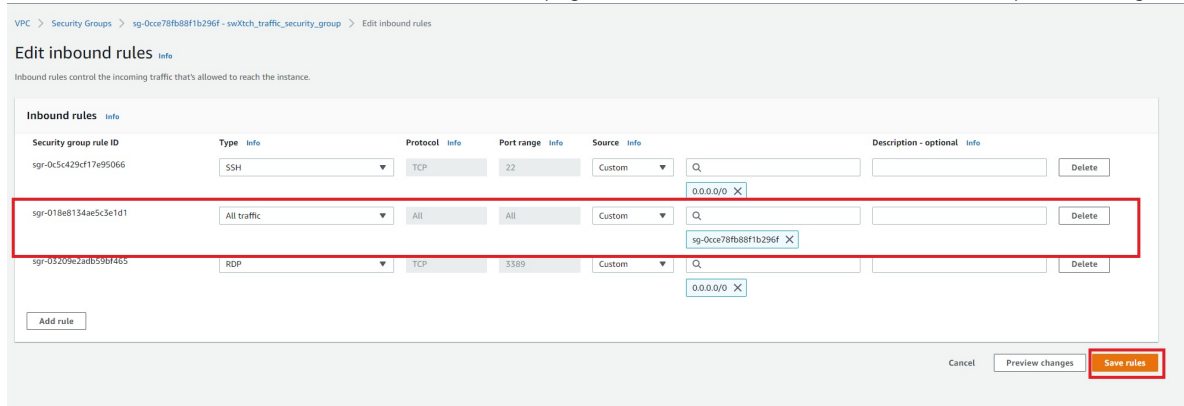


5. If an inbound rule does not exist, create it by selecting "Edit inbound rules."



6. Select "Add Rule."

7. Enter the information like the screenshot shown below verifying that the ID of the SG on Source matches the SG you are editing.



8. Save the rule.

## Additional Rules

### Mandatory Inbound Rule For Mesh

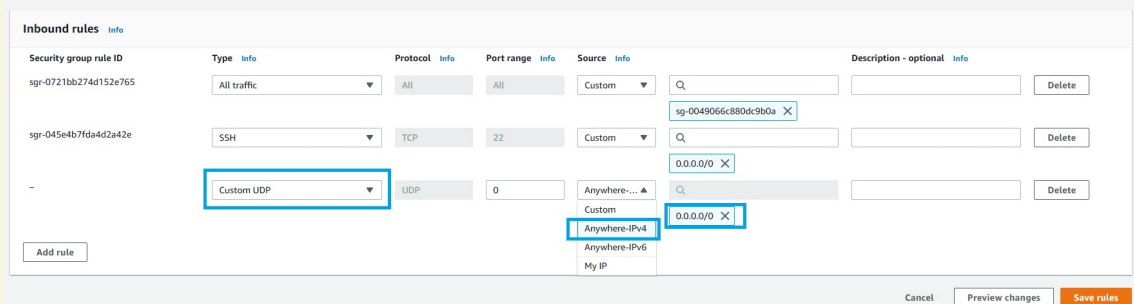
In order to use the Mesh feature bidirectionally between VPCs, users must also add the following inbound rule to each SG:

- **Type:** Custom UDP
- **Protocol:** UDP
- **Port Range:** 9999
- **Source:** Custom/Anywhere-IPv4 0.0.0.0/0

EC2 > Security Groups > sg-0049066c880d9b0a - SWLJ2L00A60-CreatedSwXtchSecurityGroup-1E57NW021UDW2 > Edit inbound rules

#### Edit inbound rules

Inbound rules control the incoming traffic that's allowed to reach the instance.



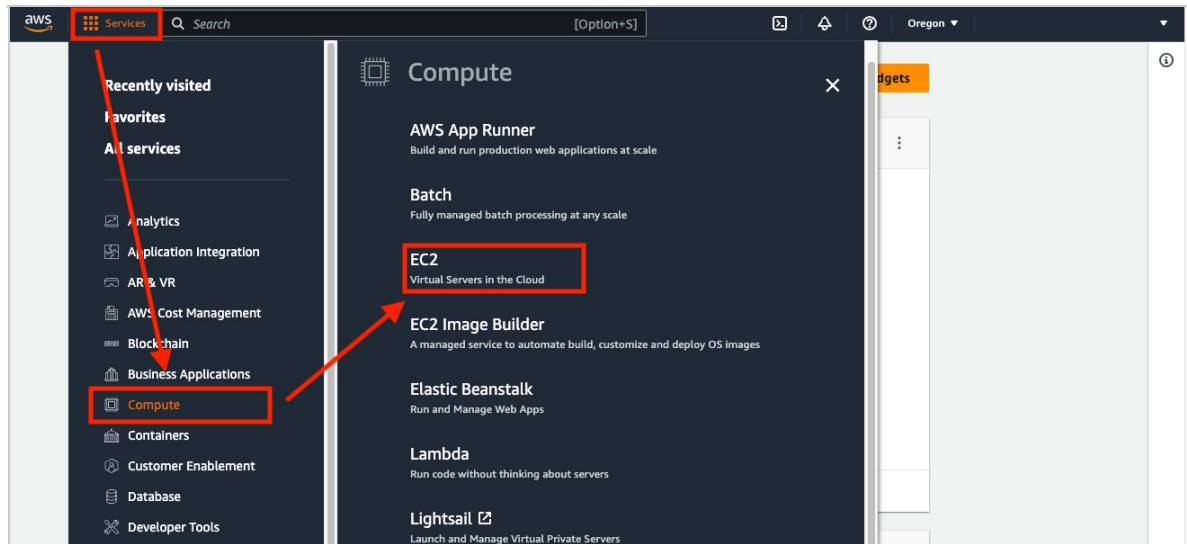
## Create SSH Key Pair

### WHAT TO EXPECT

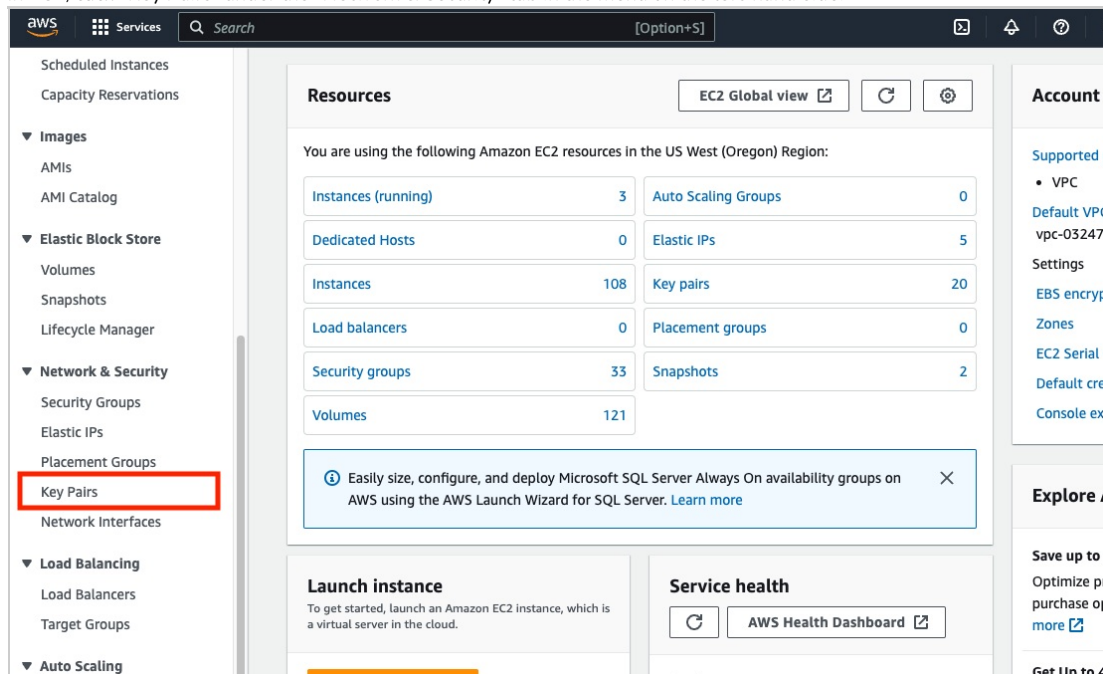
An SSH key pair is necessary when accessing a cloudSwXtch EC2 instance. If you do not already have one imported, please create an SSH key pair before beginning the cloudSwXtch on AWS creation process.

In the *AWS Management Console*, make sure you are in the region where you plan to use the cloudSwXtch instance.

1. **Navigate to EC2**
  - Select the “Services” menu in the AWS Management Console.
  - Click “Compute”
  - Select “EC2”



2. In EC2, click “Key Pairs” under the “Network & Security” tab in the menu on the left-hand side.



3. Click “Create Key Pair”. A new window should open.
4. Under **Name**, enter something meaningful and descriptive for the key.
5. Depending on your needs, you have to choose **RSA** or **ED25519**, and **.pem** or **.ppk** (OpenSSH or PuTTY access).
6. Click on **Create Key Pair**.
  - a. A file with the chosen extension will be downloaded to your computer (secret private key), and the other half of the pair will be store on AWS for later use (public key, used in conjunction with your private key to validate the access).

## Create key pair [Info](#)

### Key pair

A key pair, consisting of a private key and a public key, is a set of security credentials that you use to prove your identity when connecting to an instance.

#### Name

The name can include up to 255 ASCII characters. It can't include leading or trailing spaces.

#### Key pair type [Info](#)

☒ RSA

☐ ED25519

#### Private key file format

☒ .pem

For use with OpenSSH

☐ .ppk

For use with PuTTY

#### Tags - *optional*

No tags associated with the resource.

[Add new tag](#)

You can add up to 50 more tags.

[Cancel](#)

[Create key pair](#)

# Install cloudSwXtch on AWS

## WHAT TO EXPECT

Deployment of a cloudSwXtch consists of two parts: the creation of an EC2 instance containing cloudSwXtch and the installation of the xNIC software. The cloudSwXtch is considered "installed" once while the xNIC is installed on each agent instance that is a part of the network.

In this section, users will learn how to deploy cloudSwXtch for their AWS environment.

## NOTE:

Root privileges are not required for deployment or operation. Our CloudFormation template allows an automated mechanism to update the installed cloudSwXtch version. This will deploy the latest version of the cloudSwXtch instead of the one packaged in the AMI, which requires root privileges to trigger the update from the product side. For upgrades, please see [Upgrade cloudSwXtch on AWS](#) on how to perform an upgrade from the client side. An upgrade from the client side does not require root privileges.

## Creating a cloudSwXtch EC2 Instance

### Prerequisites

Before starting, a user must do the following:

1. Review [cloudSwXtch System Requirements](#).
2. Ensure that you already have an AWS account.
3. Create a virtual network (VPC). This **must** be created before deploying a cloudSwXtch.
4. [Validate you have at least one subnet for your virtual network](#). A single subnet can be used for the control and data plane.
5. [Verify a Security Group that allows access to all traffic inside the VPC](#). If one is not created, use default when creating a cloudSwXtch.
6. [Create an SSH Key Pair](#).

### Post-Installation

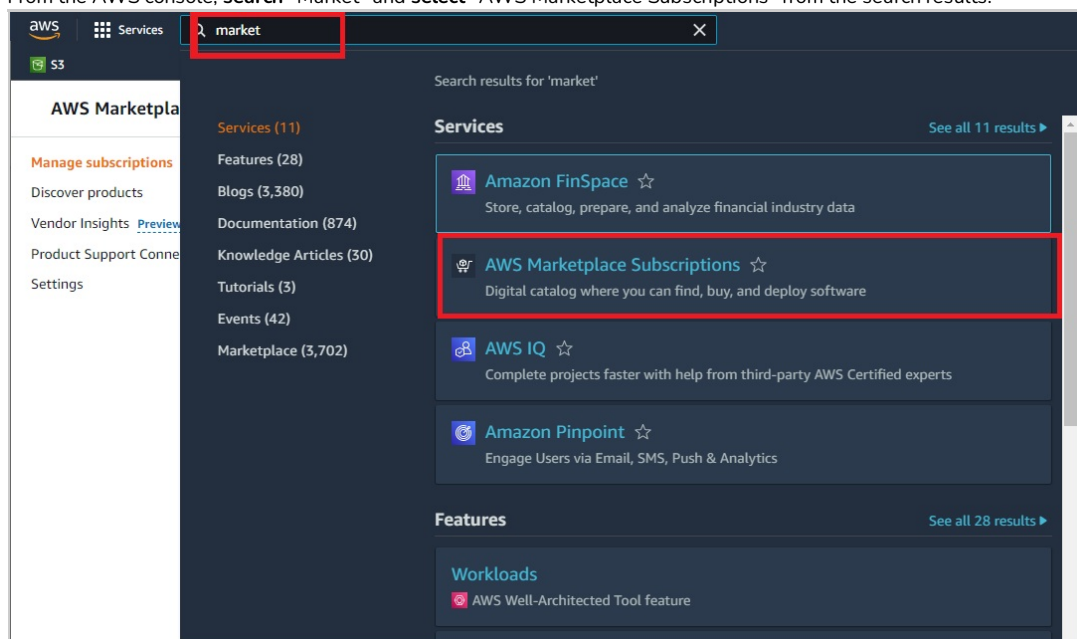
The following instructions detail how to deploy a cloudSwXtch BYOL instance. If a user decides to deploy a BYOL instance, they will need to complete [the additional step of licensing their cloudSwXtch](#).

If all prerequisites are met, a cloudSwXtch can be created via the Marketplace in any region in approximately 10 minutes. If multi-AZ or multi-region is required then see [Mesh](#) for details. The installer will create a CloudFormation Stack to include the following resources:

- ControlEni Networking Interface for control data
- DataENI Networking Interface for data such as Multicast
- EC2Instance in Linux for the cloudSwxrch to run on

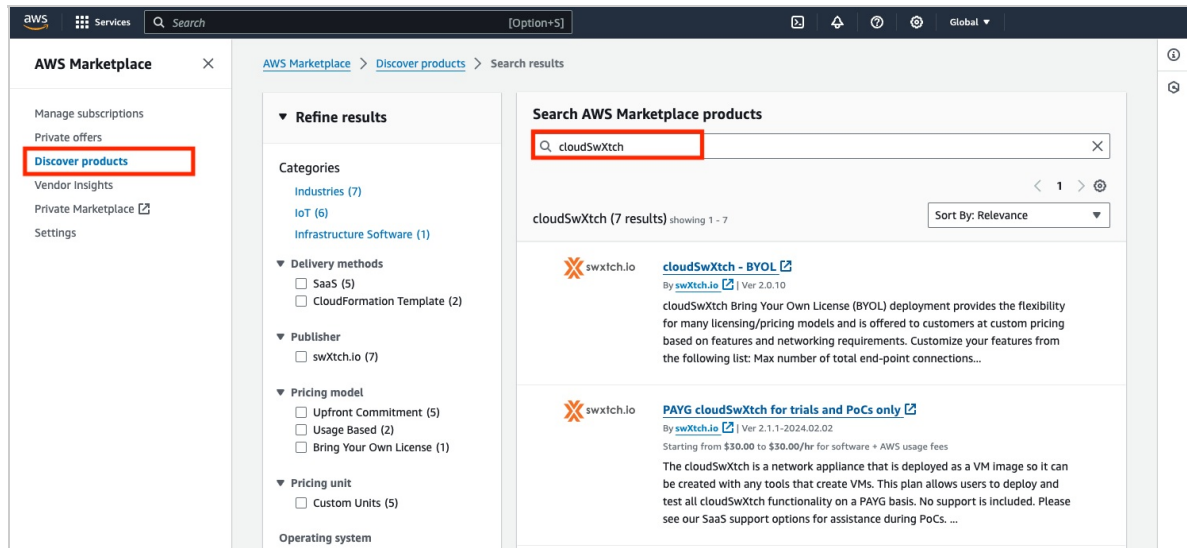
In order to create a cloudSwXtch, please do the following steps.

1. Sign into AWS.
2. From the AWS console, search "Market" and select "AWS Marketplace Subscriptions" from the search results.



3. Select "Discover Products" in the AWS Marketplace menu on the left hand side.

4. Search for "cloudSwXtch."



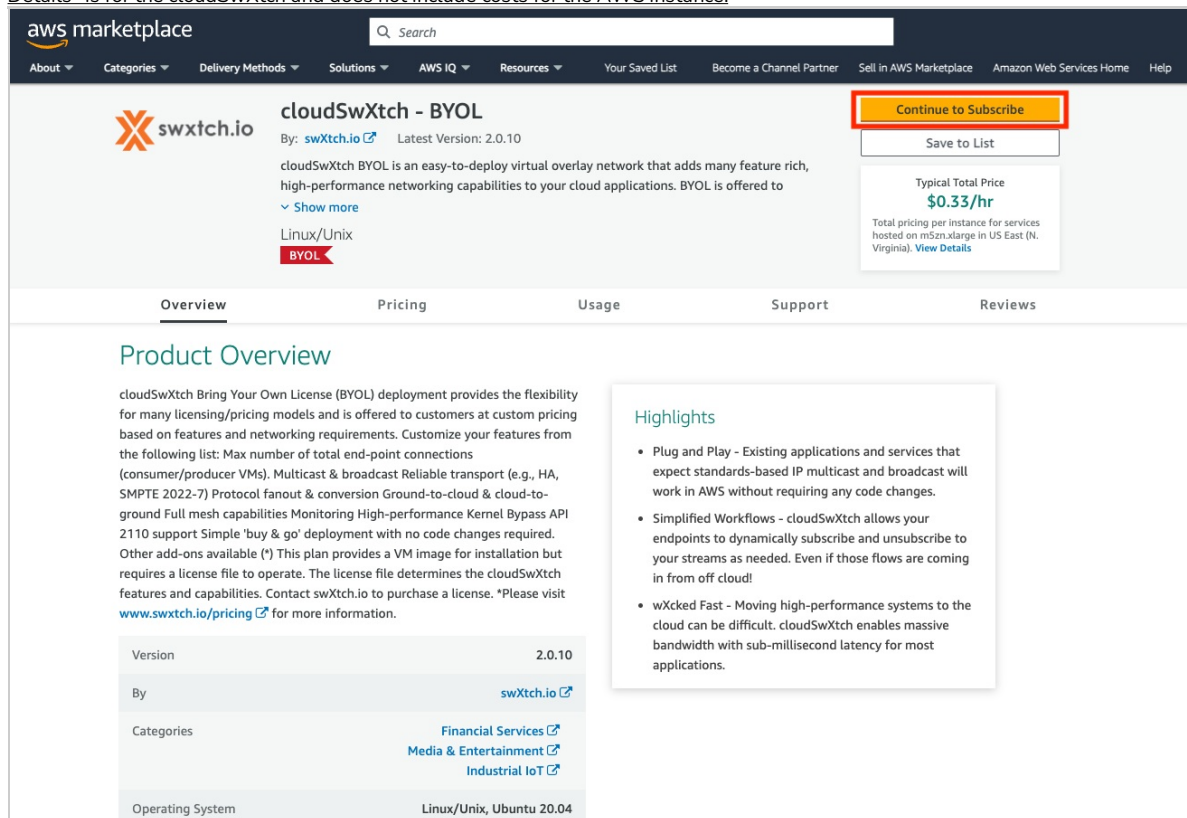
5. Select a Tier (cloudSwXtch - BYOL or cloudSwXtch - PAYG) based on your usage requirements and features needed.
- Please read the [cloudSwXtch System Requirements](#) article for more information regarding cloudSwXtch sizing.
  - For the purpose of this guide, the next screenshots will be for a **cloudSwXtch BYOL** deployment.

#### Endpoint Connections Limit

Be mindful of the number of endpoints you connect to your cloudSwXtch after creation. For cloudSwXtch BYOL, you are limited to the number of endpoints allowed in your license.

If you need to increase the number of endpoints, please view the AWS instructions [here](#). Note that if your new instance type exceeds the size of your tier, you must contact [support@swxtch.io](mailto:support@swxtch.io) to update your license.

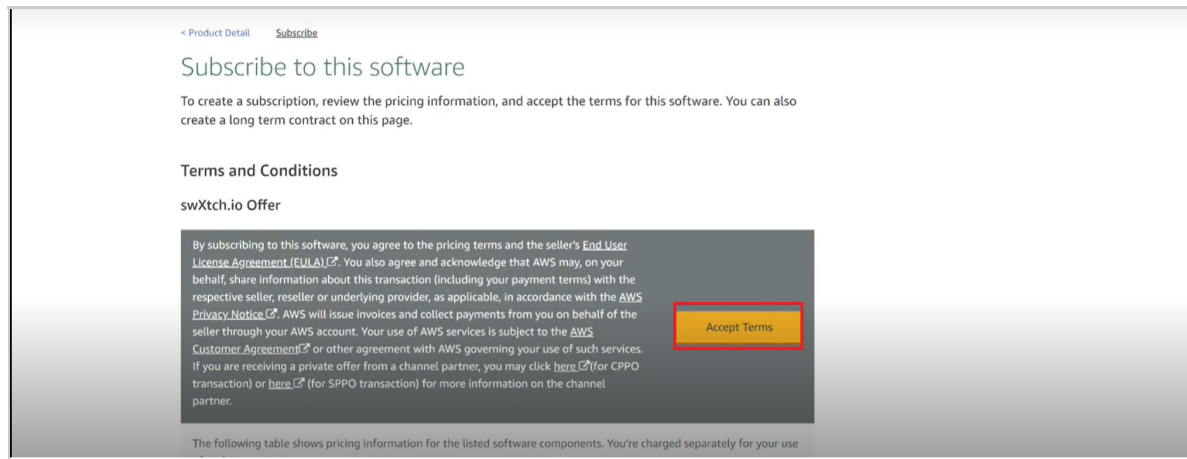
6. Select "Continue to Subscribe" after reviewing the product information. Note: The "Typical Total Price" is calculated with the recommended instance size included in the final monthly value and a utilization of 24x7. **Please note: The cost in "Software Pricing Details" is for the cloudSwXtch and does not include costs for the AWS instance.**



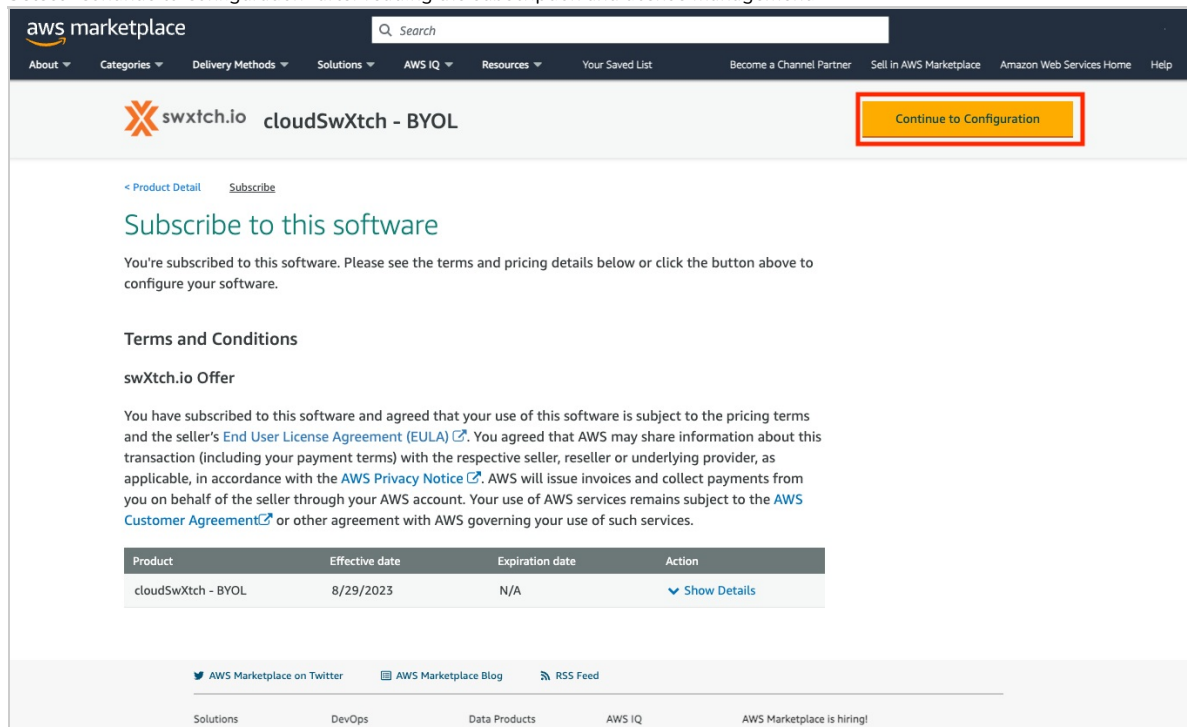
7. Review the Terms and Conditions.

8. Select "Accept Terms" if they are acceptable.





9. **Select** "Continue to Configuration" after reading the subscription and license management.



10. **Select** the desired "Region" and then **select** "Continue to Launch". (Note: If you select a region that does not match the region you began with, then it may not work even if selected here.)

aws marketplace

Search

Hello,

About Categories Delivery Methods Solutions AWS IQ Resources Your Saved List Become a Channel Partner Sell in AWS Marketplace Amazon Web Services

swxtch.io cloudSwXtch - BYOL

Continue to Launch

< Product Detail Subscribe Configure

## Configure this software

Choose a fulfillment option and software version to launch this software.

Fulfillment option  
cloudSwXtch - BYOL

Software version  
2.0.10 (Aug 28, 2023)

Whats in This Version  
cloudSwXtch - BYOL  
running on m5zn.xlarge  
[Learn more](#)

Region  
US East (N. Virginia)

Use of Local Zones or WaveLength infrastructure deployment may alter your final pricing.

Product Code: 2qr1ymkv9a1lfnwqe6gfnx1  
[Release notes \(updated August 28, 2023\)](#)

**Pricing information**

This is an estimate of typical software and infrastructure costs based on your configuration. Your actual charges for each statement period may differ from this estimate.

**Software Pricing**

cloudSwXtch - BYOL \$0 /hr  
BYOL  
running on m5zn.xlarge

### INSTANCE TYPES

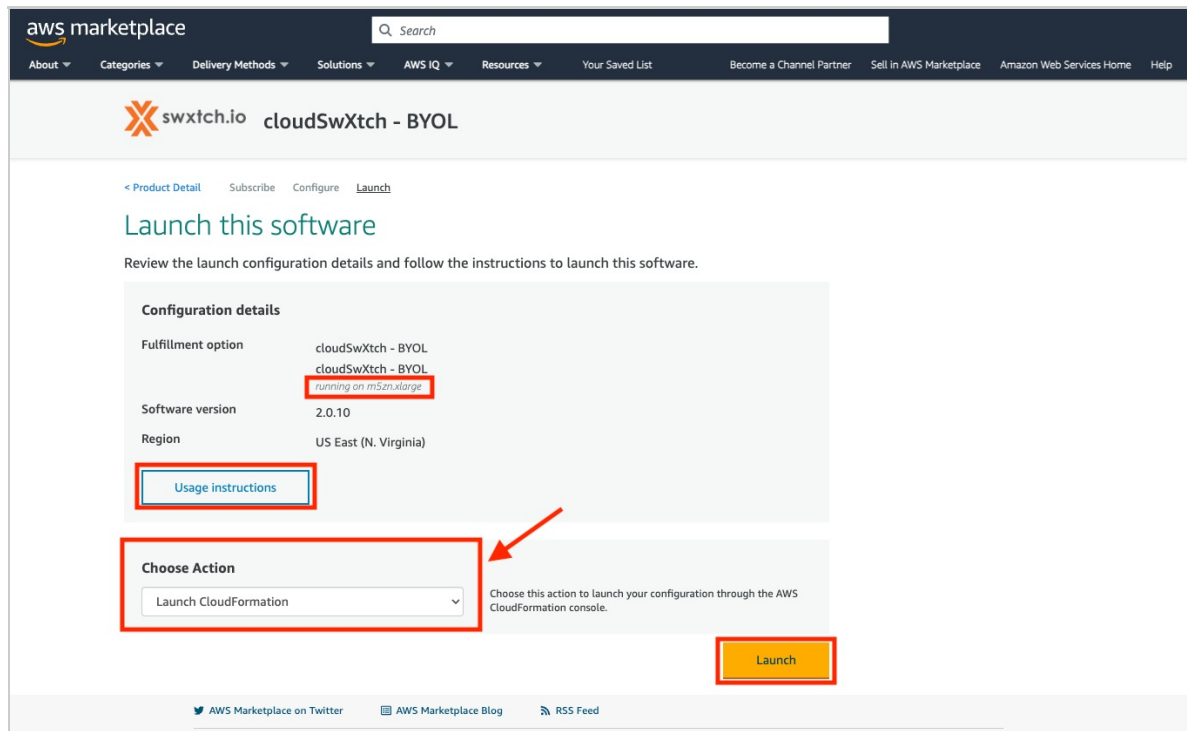
It is recommended to use an instance type in the **c6in** or **m6in** families. Remember that a cloudSwXtch requires a minimum of 8 cores. Note how the cloudSwXtch Marketplace install selects the appropriate VM size in the Fulfillment section based on the cloudSwXtch tier.

Please ensure that the instance type matches one of the options below:

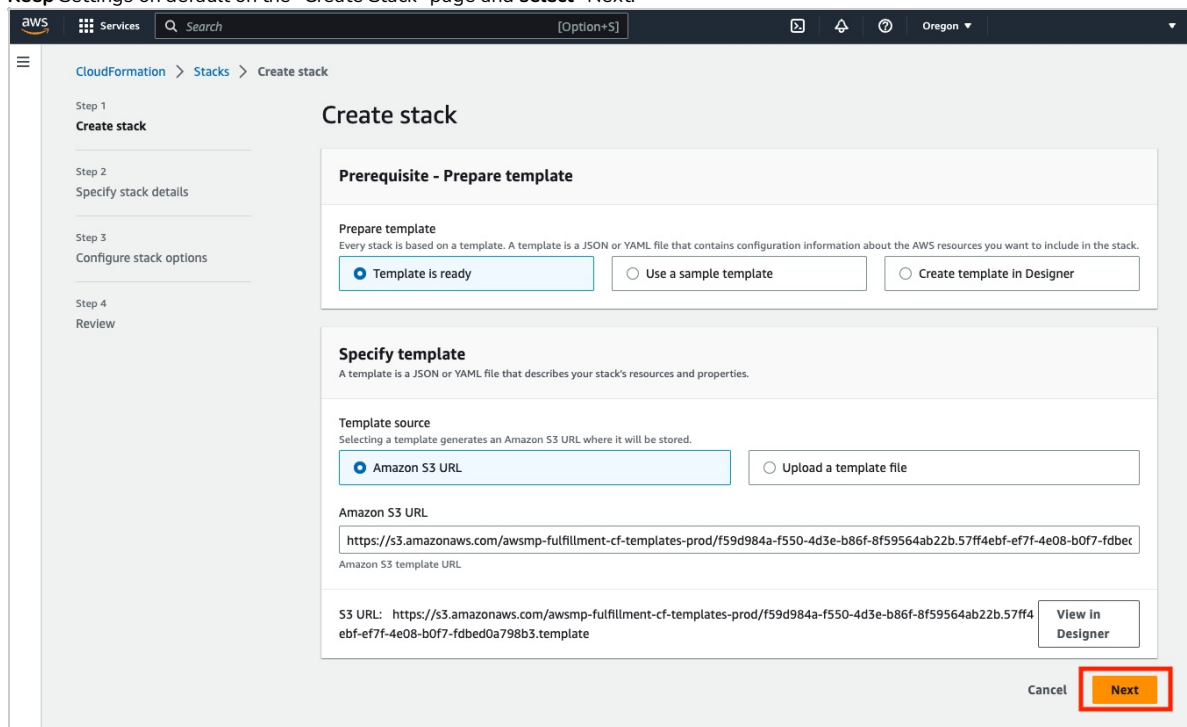
- c6in.2xlarge
- c6in.4xlarge
- c6in.8xlarge
- c6in.12xlarge
- c6in.16xlarge
- c6in.24xlarge
- c6in.32xlarge
- m6in.2xlarge
- m6in.4xlarge
- m6in.8xlarge
- m6in.12xlarge
- m6in.16xlarge
- m6in.24xlarge
- m6in.32xlarge

11. Read "Usage Instructions" if you desire.
12. Use the "Choose Action" dropdown menu and select "Launch CloudFormation".
13. Click "Launch".





14. Keep Settings on default on the "Create Stack" page and select "Next."



15. On the Specify stack details page, complete the following:

- Under "Stack name," **enter** your desired name. Keep in mind that this will be used for everything added to the stack. For example: "resource name," "security groups," "EC2 instance name," etc.
- Under "CidrIpForInboundOutboundTraffic," **use** 0.0.0.0/0 so that you can SSH to the virtual machine from any IP address. You can also pick a more restrictive range if desired.
- Under "ControlSubnet," **use** the dropdown to find the control subnet you created (recommended: *ctrl-subnet*).
- Under "DataSubnet," **use** the dropdown to find the control subnet you created. Both control and data can share the same subnet.
  - Alternatively, for better performance, a user can assign a separate subnet for their data subnet.
- For "InstanceType," there should be "Fulfillment" data from the earlier step.
- Under "KeyName," **use** the dropdown to find your previously created or imported SSH key.
- In "PassedSwxtchSecurityGroup," **use** "default" and one will be created during the installation process. Alternatively, you can enter the ID of an already created security group. It will be something similar to "sg-009273855418af38d."
- Under "VpcId," **select** from the dropdown to find the already created VPC id.
- Here is an example of how your template would look like:**

## Specify stack details

### Stack name

Stack name

Stack name can include letters (A-Z and a-z), numbers (0-9), and dashes (-).

### Parameters

Parameters are defined in your template and allow you to input custom values when you create or update a stack.

**CidrIpForSSHAcess**  
For SSH access when using default security group, please set CIDR to x.x.x.x/32 to allow one specific IP address access, 0.0.0.0/0 to allow all IP addresses access, or another CIDR range

**ControlSubnet**  
Used to create control ENI assigned to the swxtch control subnet.

**DataSubnet**  
Used to create control ENI assigned to the swxtch control subnet.

**InstanceType**  
EC2 instance type to use for swXtch creation

**KeyName**  
SSH key name for swXtch SSH access

**PassedSwxtchSecurityGroup**  
Name of the security group that should be used by swXtch and created ENIs

**VpcId**  
The VPC Id your swXtch will be placed in

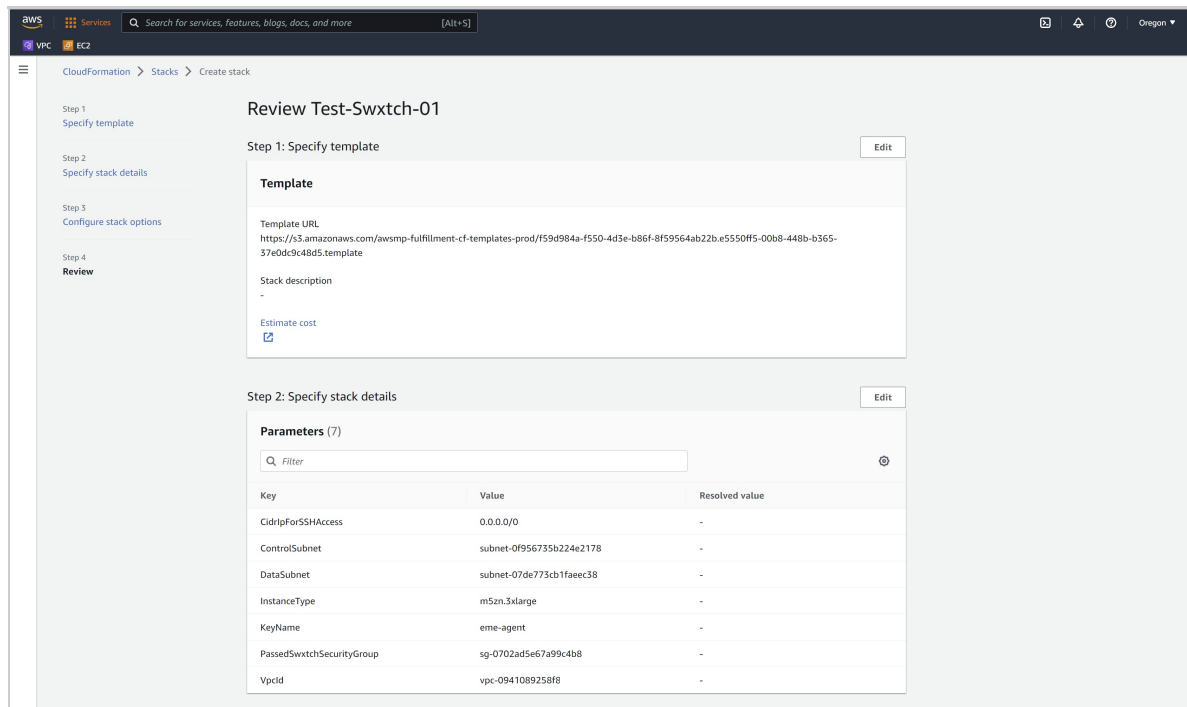
Cancel
Previous
Next

16. Click "Next."

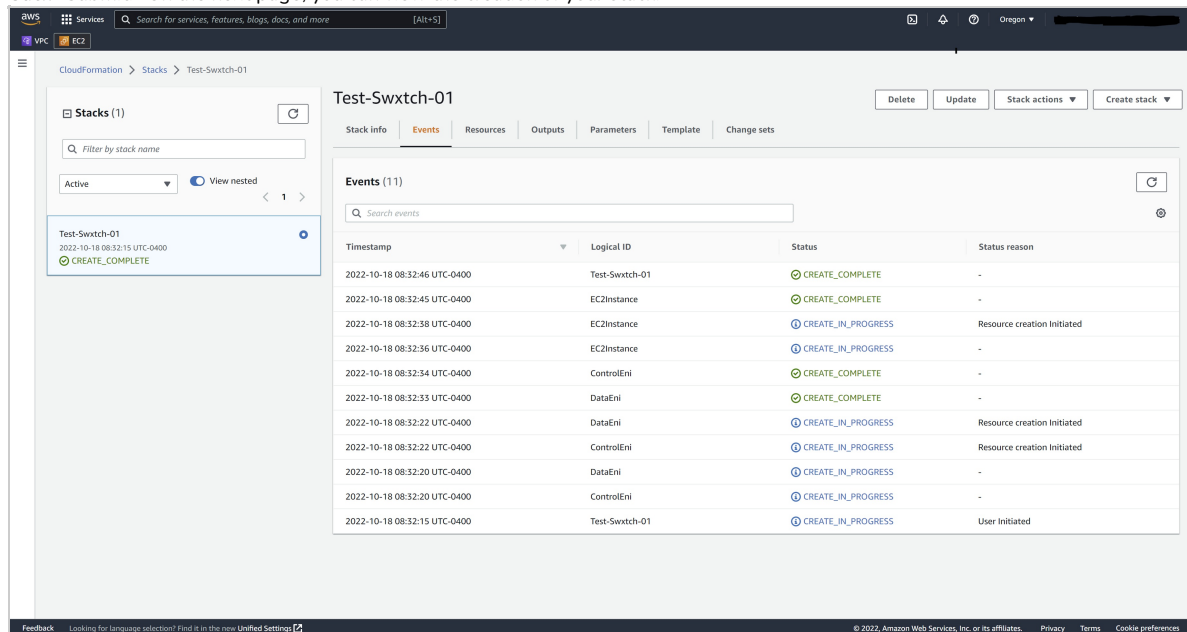
17. The "Configuring stack options" page is completely optional. You can assign tags for your stack, set additional IAM permissions, stack failure options, etc.

18. Click "Next" if you don't need to make any changes.

19. Verify that your parameters are accurate on the final "Review" page. If you need to change anything, select "Edit."

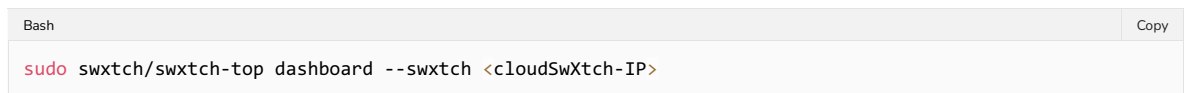


20. Click "Submit." On the next page, you can view the creation of your stack.



Your EC2 instance has now been created. You can view it on the EC2/Instances list and connect to your cloudSwXtch from there.

21. Once you have connected with SSH to your cloudSwXtch as root user (sudo su), navigate to the cloudSwXtch directory (cd /swxtch) then run the following command:



## NOTE

Use the cloudSwXtch-name in place of the IP address if DNS resolution is setup or "localhost."

This will display the cloudSwXtch's swxtch-top dashboard. In "Status," you should see "OK." **This will let you know that your cloudSwXtch has been successfully deployed.** You can review more information regarding swxtch-top in the [swxtch-top article](#).

## INSTALLING AN XNIC

If this is a new installation, then each client that is expected to receive or transmit to the cloudSwXtch will need an xNIC installed.

If this is an existing cloudSwXtch replacement, then each client with an xNIC already installed will need to be upgraded to match the current cloudSwXtch version.

You can find more information about xNIC installation, [here](#).

## Required Step for BYOL: Contact swXtch.io for a license

Users deploying a BYOL instance of cloudSwXtch will need to contact swXtch.io for a license file. For more information, see [How to License a cloudSwXtch](#).

---

## Checking the Health of Your cloudSwXtch Instance

It is important to ensure your AWS system is healthy. AWS provides AWS CloudWatch as a way to check on the health of your system. To check on the cloudSwXtch EC2 instance, read more [here](#).

## Upgrading cloudSwXtch on AWS

It is important that your cloudSwXtch instance is up to date. To learn how to upgrade your cloudSwXtch, you can read more [here](#).

## Deleting cloudSwXtch on AWS

To learn how to delete your cloudSwXtch, you can read more [here](#).

# Deploy cloudSwXtch with Terraform on AWS

## WHAT TO EXPECT

In this article, you will learn how to deploy a cloudSwXtch instance on AWS using a Terraform script.

### Prerequisites:

For this script to work, you will need to have already provisioned your VPC, Subnets, and SSH Keys. You will plug those parameter values into your [AWS/terraform/terraform.tfvars](#) file.

## Deploying a Terraform Script

1. Choose what platform you would like to run Terraform on. For this example, the user is on a Linux machine. Download instructions can be found at: [terraform.io/downloads](https://terraform.io/downloads)
2. Clone the repository using SSH. **Please note:** You will need an SSH key set up with GitHub.

```
Console Copy
$ git clone git@github.com:swxtchio/cloudSwXtch-support
```

Or, alternatively, you can clone with the HTTPS URL: ([here on GitHub](#))

```
Console Copy
$ git clone https://github.com/swxtchio/cloudSwXtch-support.git
```

Then:

```
Console Copy
$ cd cloudSwXtch-support/AWS/terraform
```

3. Update the values in the [AWS/terraform/terraform.tfvars](#) file to match your existing AWS resources such as: VPC id, Subnet IDs, and SSH Key names.
4. Run **terraform init** inside the [AWS/terraform/](#) directory.

```
ssh dev-azure  2
→ terraform git:(main) terraform init

Initializing the backend...

Initializing provider plugins...
- Reusing previous version of hashicorp/cloudinit from the dependency lock file
- Reusing previous version of hashicorp/aws from the dependency lock file
- Installing hashicorp/aws v4.67.0...
- Installed hashicorp/aws v4.67.0 (signed by HashiCorp)
- Installing hashicorp/cloudinit v2.3.2...
- Installed hashicorp/cloudinit v2.3.2 (signed by HashiCorp)

Terraform has been successfully initialized!

You may now begin working with Terraform. Try running "terraform plan" to see
any changes that are required for your infrastructure. All Terraform commands
should now work.

If you ever set or change modules or backend configuration for Terraform,
rerun this command to reinitialize your working directory. If you forget, other
commands will detect it and remind you to do so if necessary.
→ terraform git:(main) █

[ssh_tmux]0:zsh* "sdevus012" 19:00 11-Jul-23
```

5. For this step you'll need to have authenticated your AWS credentials inside the console. Or you can pass the credentials with environmental variables. One simple way to do this is using an Access Key (AK). If you don't have one, you can generate your AK in Amazon's IAM->Users->(your user), on the Security Credentials tab, Access Keys. Then, you have to export the following:

```
Console Copy
$ export AWS_ACCESS_KEY_ID="anaccesskey"
$ export AWS_SECRET_ACCESS_KEY="asecretkey"
$ export AWS_REGION="us-west-2"
```

Now that Terraform has been initialized and you're authenticated, run this command to evaluate the config and confirm the desired output which will be shown:

```
Console Copy
$ terraform plan
```

```
ssh dev-azure 2
+ tags              = {
+   + "Name" = "swxtch_traffic_swxtch-tf-example_sg"
+ }
+ tags_all          = {
+   + "Name" = "swxtch_traffic_swxtch-tf-example_sg"
+ }
+ vpc_id            = "vpc-06974b4b531c0f697"
}

Plan: 7 to add, 0 to change, 0 to destroy.

Changes to Outputs:
+ swxtches = [
+   + {
+     + ctrl_ip = (known after apply)
+     + data_ip = (known after apply)
+     + username = "ubuntu"
+   },
+   + {
+     + ctrl_ip = (known after apply)
+     + data_ip = (known after apply)
+     + username = "ubuntu"
+   },
+ ]

Note: You didn't use the -out option to save this plan, so Terraform can't guarantee to take exactly
these actions if you run "terraform apply" now.
→ terraform git:(main)
[ssh_tmux]0:zsh* "sdevus012" 19:02 11-Jul-23
```

This is the result of running **terraform plan** with 2 cloudSwXtches. The provided terraform example creates a security group for all of the deployed resources: two **aws\_network\_interface** for each of the cloudSwXtches and an **aws\_instance** for each cloudSwXtch.

6. Run the Terraform apply command (followed by "yes" when prompted) to approve the action.

```
Console Copy
terraform apply
yes
```

7. Once the resources have been applied successfully, you should see an output similar to this:

```
ssh dev-azure ㏿%2
aws_network_interface.swxtch_data[1]: Creating...
aws_network_interface.swxtch_data[0]: Creating...
aws_network_interface.swxtch_ctrl[1]: Creation complete after 1s [id=eni-099a6704b48871b65]
aws_network_interface.swxtch_data[0]: Creation complete after 1s [id=eni-05c53da54a04ea3be]
aws_network_interface.swxtch_data[1]: Creation complete after 1s [id=eni-0c364aa6898a7e2a2]
aws_network_interface.swxtch_ctrl[0]: Creation complete after 1s [id=eni-0c765fb2ad379495b]
aws_instance.swxtch[0]: Creating...
aws_instance.swxtch[1]: Creating...
aws_instance.swxtch[0]: Still creating... [10s elapsed]
aws_instance.swxtch[1]: Still creating... [10s elapsed]
aws_instance.swxtch[1]: Creation complete after 14s [id=i-06032053dbf5a744e]
aws_instance.swxtch[0]: Creation complete after 14s [id=i-08ba3f7cfa686764c]

Apply complete! Resources: 7 added, 0 changed, 0 destroyed.

Outputs:

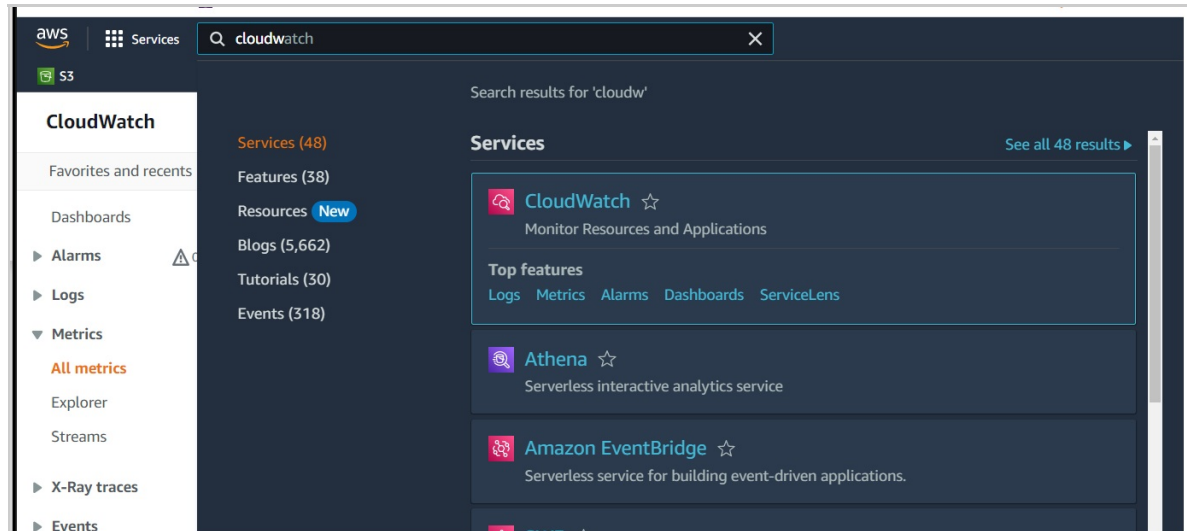
swxtches = [
  {
    "ctrl_ip" = "172.31.33.152"
    "data_ip" = "172.31.132.216"
    "username" = "ubuntu"
  },
  {
    "ctrl_ip" = "172.31.46.220"
    "data_ip" = "172.31.133.206"
    "username" = "ubuntu"
  },
]
→ terraform git:(main) [ssh_tmux]0: terraform* "sdevus012" 19:05 11-Jul-23
```

You can view the resources created from your AWS portal as confirmation of a successful deployment.

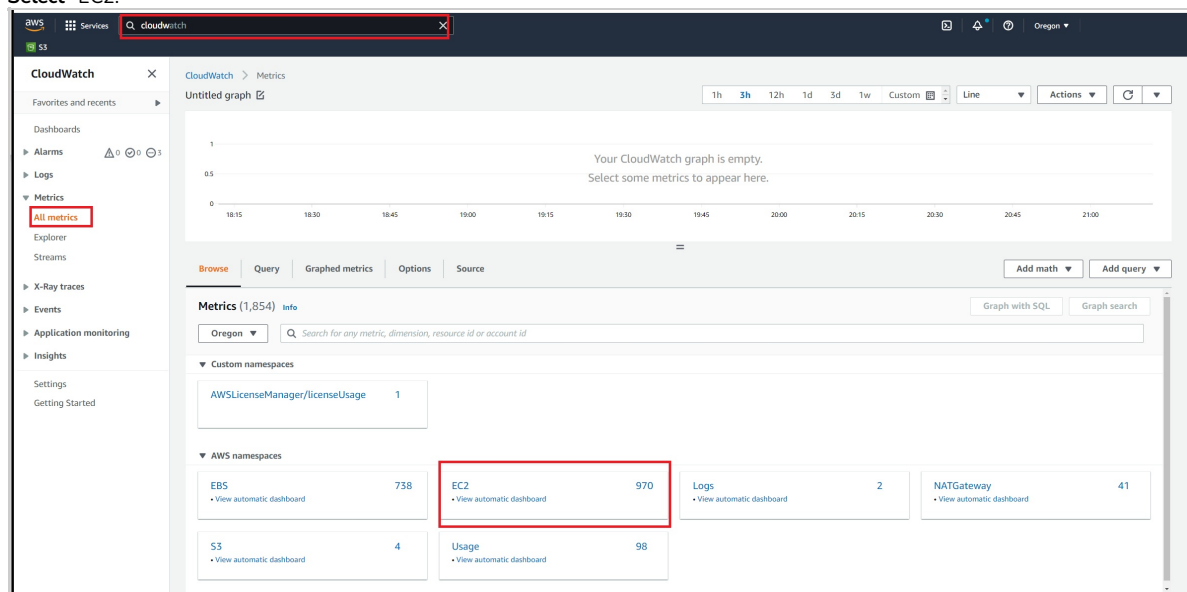
## Check Health of cloudSwXtch Instance on AWS

It is important to ensure your AWS system is healthy. AWS provides AWS CloudWatch as a way to check on the health of your system. To check on the cloudSwXtch EC2 instance:

1. Search for "CloudWatch" in the AWS Search bar.

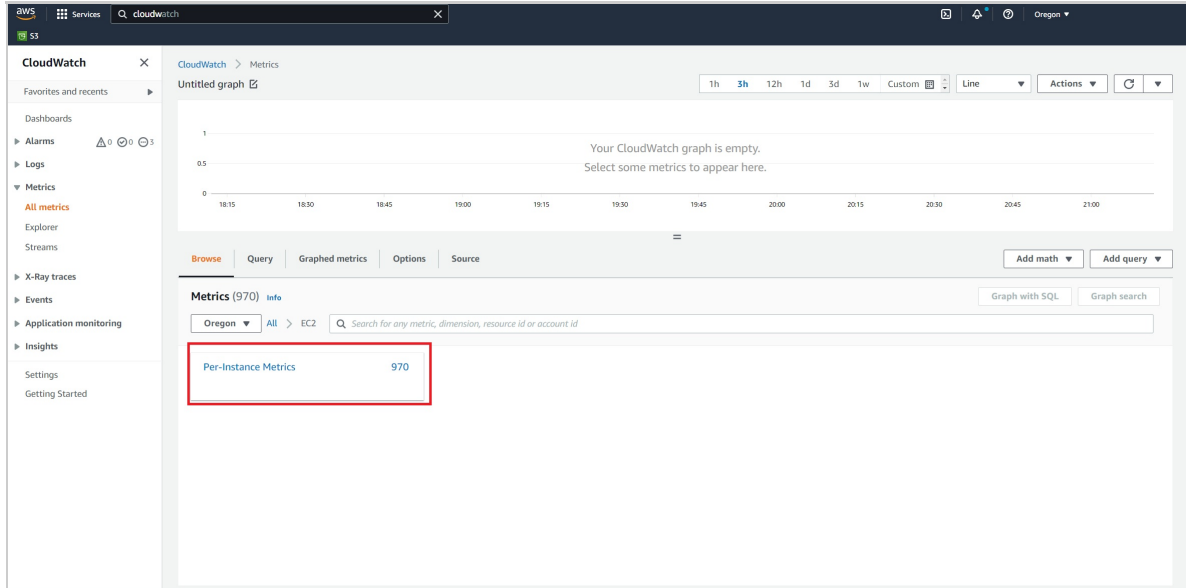


2. Select "All Metrics" on the left tree menu under "Metrics."
3. Select "EC2."

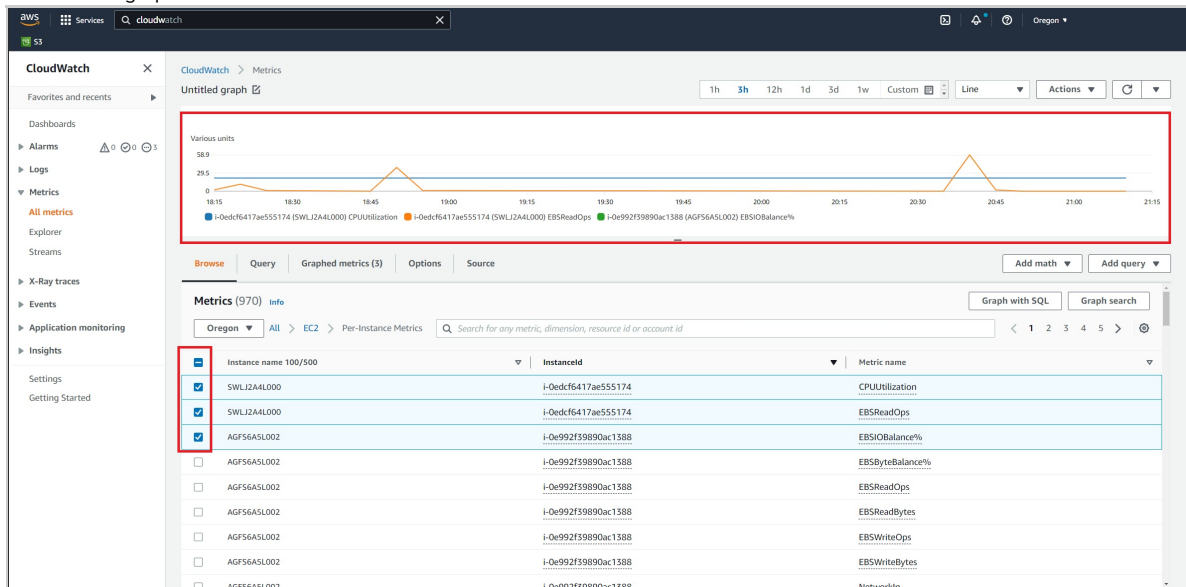




#### 4. **Select "Per-Instance Metrics."**



5. **Sort** as desired. Instance ID works well.
6. **View** data in graph.



**WARNING**

A cloudSwXtch instance will consume CPU even when the connected agents are not producing/consuming data. This is because there are several vCPUs configured to constantly watch the interfaces.

# Delete cloudSwXtch on AWS

## WHAT TO EXPECT

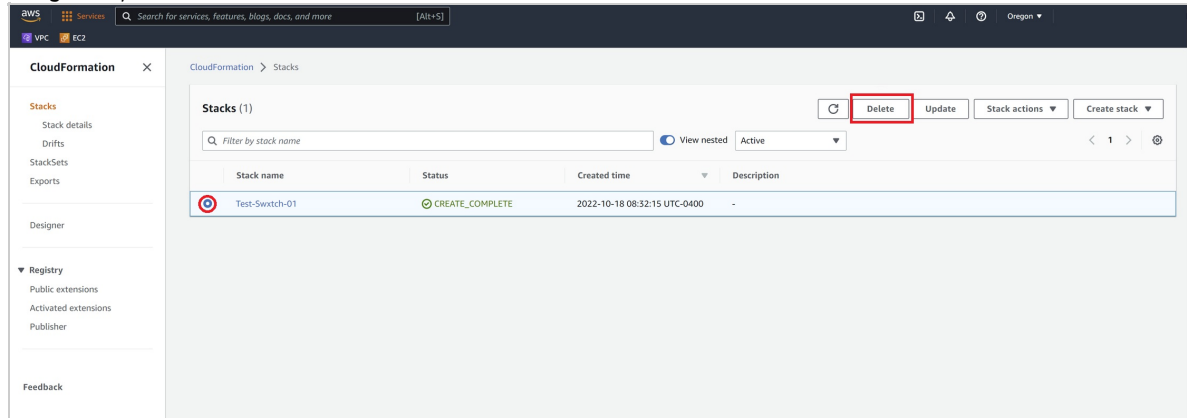
In this section, users will learn how to delete cloudSwXtch from their AWS environment.

Prior to deleting a cloudSwXtch, it is advised to uninstall any xNICs using it. See [xNIC Installation](#).

It is important to note that since your cloudSwXtch was created using a Stack, you do not want to just delete the EC2 instance by itself. Rather, you will want to delete the Stack as whole, which will also delete all associated resources as well.

To delete a cloudSwXtch:

1. **Navigate to your cloud stack: "Cloud Formation → Stacks"**



2. **Select the stack you want to delete.**
3. **Click "Delete"** and then confirm on the popup window.
4. **Refresh the page after a minute or so to confirm the stack has been deleted.**

# cloudSwXtch on Azure

## Pre-installation Steps

There are three methods that a cloudSwXtch instance can be deployed using the Azure Portal: via template, via Terraform, and via the Market Place.

Out of those three options, the **preferred method is via template** as it will create the two subnets needed for a cloudSwXtch to operate. In addition, the Network Interface will have "Accelerated Networking" enabled.

### Template Method (PREFERRED):

1. [Review system requirements](#)
2. [Validate subnets on Azure](#)
3. [Create Azure cloudSwXtch Template](#)
4. [Install cloudSwXtch on Azure](#)

The template method is also mentioned in the Market Place cloudSwXtch installation as highlighted below:

Microsoft Azure (Preview) Search resources, services, and docs (G+/)

Home > Marketplace >

### cloudSwXtch VM Image

swxtch.io LLC

**cloudSwXtch VM Image** Add to Favorites

swxtch.io LLC | Virtual Machine

Private plan Azure benefit eligible

Plan

BYOL Create Start with a pre-set configuration

Want to deploy programmatically? [Get started](#)

**Overview** Plans + Pricing Usage Information + Support Ratings + Reviews

cloudSwXtch from swxtch.io is a virtual overlay network that adds feature rich, high performance networking to your cloud or edge applications. cloudSwXtch is simple to deploy and **requires no code changes** to existing applications.

The cloudSwXtch is a network appliance that is deployed as a **VM image** so can be created with any tools that create VMs. However, to function properly the cloudSwXtch needs *two network interfaces* and the second interface needs to have Accelerated Networking enabled.

**IMPORTANT**  
Use the provided templates in the link below to **easily** deploy a cloudSwXtch. These templates ensure correct setup of the VM and network interfaces.  
*If you deploy using the Azure Portal Web UI the resulting VM may not function properly.*  
Templates for deployment: [Templates](#)  
For more installation instructions see: [docs.swxtch.io](#)

Clicking on the "Templates" hyperlink shows more information about the template creation method.



## Alternative Install Methods

### Market Place

While a user can create a cloudSwXtch via the Market Place, it will require additional work in terms of maintenance. For example, the cloudSwXtch would have to be updated to add a second NIC and then have accelerated networking manually enabled. With the template method, users can bypass all this.

If you still wish to use the Market Place method, you can find more information [here](#).

### Terraform

If you wish to deploy cloudSwXtch via Terraform, you can find more information [here](#).

### Air-Gapped

For closed environments, users can follow the Azure Air-Gapped installation instructions [here](#).

## Validate Subnets on Azure

### WHAT TO EXPECT

A virtual network must be created before deploying a cloudSwXtch EC2 instance.

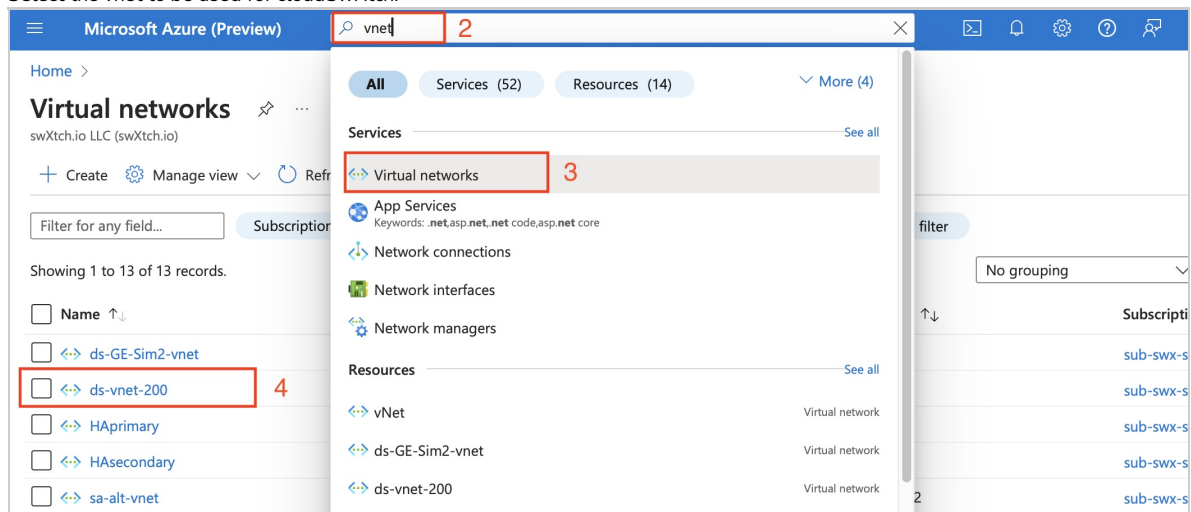
- It must contain at least one subnet that's used for both the control and data plane communication.
  - It is recommended that it is **private facing** and **does not auto-assign public IPs**.
  - This single subnet will be used for xNIC installation.

The subnets will also be used xNIC installations.

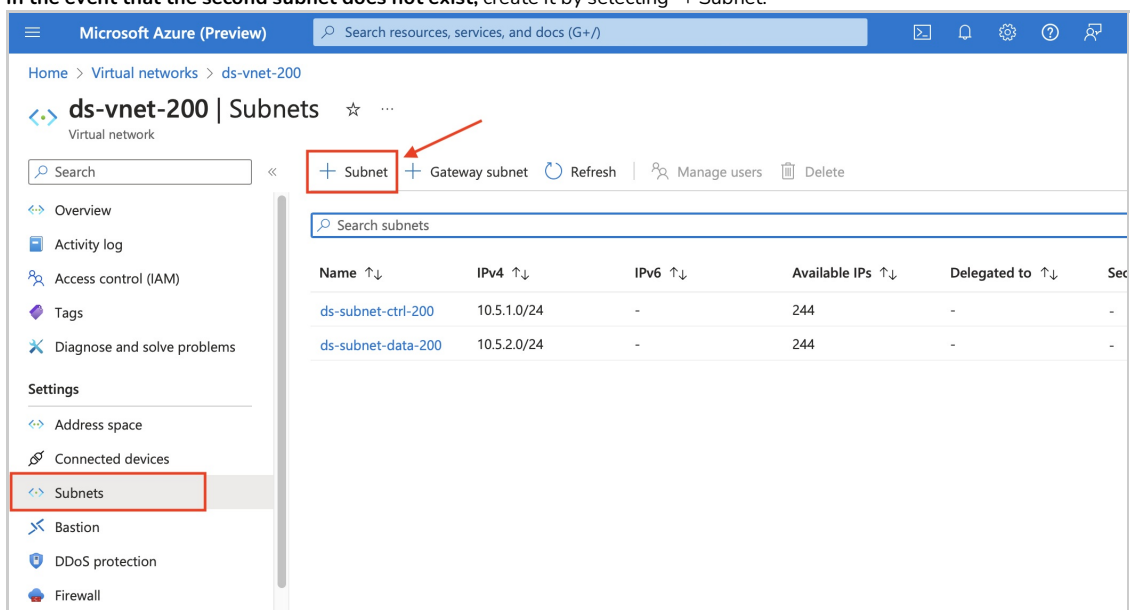
**In this section**, users will learn how to validate whether a subnet exists to be used as both the control and the data plane for their virtual network. This is in preparation for cloudSwXtch installation on Azure. We will also walk through an alternative method of using 2 subnets, separating the control and data plane.

To validate:

1. Go to the Azure Console.
2. Search for "vnet".
3. Select Virtual Networks.
4. Select the vnet to be used for cloudSwXtch.



5. If using a single-subnet, name the subnet as "ctl." If using two subnets, name the second one "data" to distinguish between them when creating an VM instance. Using two subnets will require them to be in the same Region (for example, East US). This enables a single VM instance to have two NICs connected to both subnets at the same time.
  - a. In the event that the second subnet does not exist, create it by selecting "+ Subnet."



b. Enter data as shown below making sure the subnet is in the same VNET and Availability zone as shown below:

sa-subnet-data

sa-vnet

Name

sa-subnet-data

Copy to clipboard

Subnet address range \*

.2.192.0/22

2.192.0 - 2.195.255 (1019 + 5 Azure reserved addresses)

☐ Add IPv6 address space

NAT gateway

None

Network security group

None

Route table

None

### Endpoint Connections Limit

Please be mindful of the number of endpoints (virtual machines) you are allowed to connect to your cloudSwXtch after creation. For more information about sizing, please see [cloudSwXtch System Requirements](#).

### NEXT STEP: Creating an Azure cloudSwXtch Template

After validating the subnets on Azure, continue on to the [Create an Azure cloudSwXtch Template](#) guide. This is in preparation for [installing cloudSwXtch on Azure](#).

# Create an Azure cloudSwXtch Template

## WHAT TO EXPECT

The easiest way to deploy a cloudSwXtch instance in your Azure environment is through the template method. **The following process is a one-time task per subscription.**

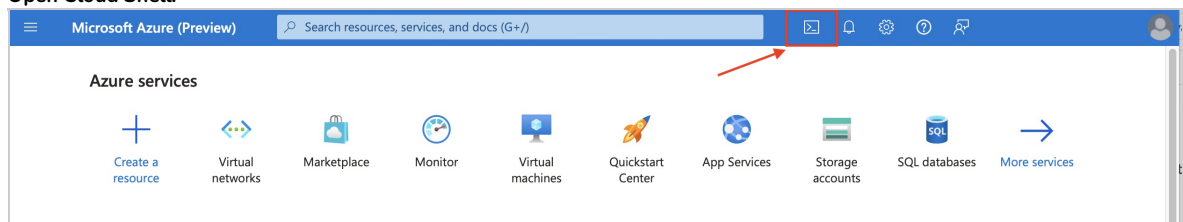
**This section** will walk you through the template creation process in preparation for Azure cloudSwXtch installation.

## Template Creation

A cloudSwXtch template can be created by using the Azure Portal. This template will be used to create a cloudSwXtch "Creating cloudSwXtch via Template method". The template is not used during creation of a cloudSwXtch via the Market Place. The creation of the Template is a one-time task per subscription

1. Log into the Azure Portal. You will need permissions to create and manage virtual machines.
  - virtual-machine-contributor

2. Open Cloud Shell.



If you need help setting up your Azure cloud-shell, use the link below for setup instructions.  
[azure cloud-shell quick start](#)

3. **Make sure** you are running your cloud shell terminal in Bash mode.
4. **Enter** in the following command to get to the proper resource group:

```
Bash Copy
rg="<your-rg-here>"
```

Example below:

```
Bash
Requesting a Cloud Shell.Succeeded.
Connecting terminal...

Welcome to Azure Cloud Shell

Type "az" to use Azure CLI
Type "help" to learn about Cloud Shell

d@Azure:~$ rg=saDevNetwork
```

5. **Enter** in the following command to clone the "cloudSwXth-AzureTemplates":

```
Bash Copy
git clone https://github.com/swxtchio/cloudSwXtch-AzureTemplates
```

Example below:

```
Bash
Requesting a Cloud Shell.Succeeded.
Connecting terminal...

Welcome to Azure Cloud Shell

Type "az" to use Azure CLI
Type "help" to learn about Cloud Shell

d@Azure:~$ rg=saDevNetwork
d@Azure:~$ git clone https://github.com/swxtchio/cloudSwXtch-AzureTemplates
Cloning into 'cloudSwXtch-AzureTemplates'...
```

6. **Change** directory (cd) to "cloudSwXtch-AzureTemplates".

```
Bash Copy
cd cloudSwXtch-AzureTemplates
```

**If desired**, use the "ls" command to see what is in the directory. Example below:



```
Bash
Requesting a Cloud Shell.Succeeded.
Connecting terminal...

fernando [ ~ ]$ cd cloudSwXtch-AzureTemplates/
fernando [ ~/cloudSwXtch-AzureTemplates ]$ ls
LICENSE  MPTemplateUI.json  MPTemplateVM.json  README.md
fernando [ ~/cloudSwXtch-AzureTemplates ]$
```

7. Create "cloudSwxtch-from-mp-image" using the following command:

```
Bash Copy
az ts create -n cloudSwxtch-from-mp-image -g $rg -v 1 -f MPTemplateVM.json --ui-form-definition
MPTemplateUI.json
```

- a. The output should look like the below screenshot:

```
Bash
{
  "validationMessage": "Enter full resource id. Must not be empty.",
  },
  "defaultValue": "",
  "label": "Proximity Placement Group Resource ID",
  "name": "ppgTextBox",
  "toolTip": "WARNING: an invalid 'Proximity Placement Group' Resource ID will cause the deployment to fail",
  "type": "Microsoft.Common.TextBox",
  "visible": "[steps('network').AdvancedSection.ppgEnable]"
  }
  ],
  "label": "Advanced Networking (optional)",
  "name": "AdvancedSection",
  "type": "Microsoft.Common.Section"
  }
  ],
  "label": "Network",
  "name": "network"
  }
  ],
  "title": "cloudSwXtch instantiation template"
  }
  }
  }
}
eme@Azure:~/cloudSwXtch-AzureTemplates$
```

#### NEXT STEP: Azure cloudSwXtch Installation

After completing template creation and [validating subnets](#), continue on to the main [Azure cloudSwXtch Installation guide](#).

## Install cloudSwXtch on Azure

### WHAT TO EXPECT

Installation of a cloudSwXtch instance consists of two parts: the cloudSwXtch and the xNIC software. The cloudSwXtch is instantiated once while the xNIC is installed on each VM that is part of the cloudSwXtch network.

In this section, users will learn how to install cloudSwXtch for their Azure environment through the template method.

**Please note:** This is the preferred method of installation. However, alternatively, you can do a manual install via the Marketplace. For more information on this method, please see the [Install cloudSwXtch via Market Place](#) guide.

### NOTE:

Access to <https://services.swxtch.io> should be enabled for marketplace installation of the cloudSwXtch. For closed environments, swXtch.io offers a BYOL model to allow installation and operation for highly secure deployments. Please contact [support@swxtch.io](mailto:support@swxtch.io) for more details.

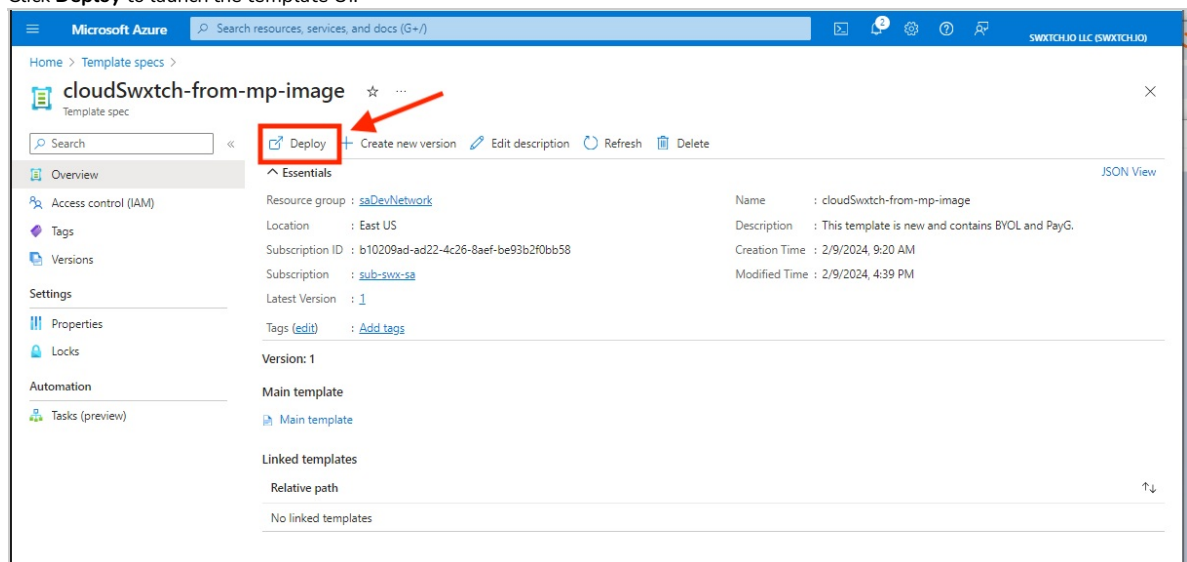
## Deploying a cloudSwXtch instance

### Prerequisites

Before starting, a user must do the following:

1. Review [cloudSwXtch System Requirements](#).
2. **Validate that there are two Subnets:** A virtual network must be created before creating a cloudSwXtch instance. This must contain two subnets, known as the ctrl- and data-subnet. In addition, the data subnet must have the "Network Acceleration" feature enabled.
3. **Create an Azure cloudSwXtch Template:** Creating a template will allow users to follow the easiest method for cloudSwXtch deployment detailed below.
4. **Make sure that your Azure subscription has the quota and access privileges to create the virtual machine instance used to run the cloudSwXtch.** Your instance will fail if you do not have the quota for the selected machine size.

1. Log into the **Azure Portal**.
2. Find the template by using the **Search resource, services, and docs (G+)** bar and enter **cloudSwxtch-from-mp-image** in the search. This will take to directly to the template.
3. Select the **template**.
4. Click **Deploy** to launch the template UI.



5. In the **cloudSwXtch commercial plan** area, click on the **Choose a cloudSwXtch plan** dropdown and **select a plan** (BYOL or PAYG). For more information on plans see: [cloudSwXtch System Requirements](#).

portal.azure.com/#create/Microsoft.Template

Home > Template specs > cloudSwXtch-from-mp-image >

## cloudSwXtch instantiation template

Template spec

New! Deployment Stacks let you manage the lifecycle of your deployments. Try it now →

Basics Network Review + create

Template

cloudSwXtch-from-mp-image (1)  
3 resources

cloudSwXtch commercial plan

cloudSwXtch plans are billed at hourly rates in addition to any Azure infrastructure (VM) fees.  
[Plan details and pricing information can be found here:](#)

Choose a cloudSwXtch plan: \*

Project details

Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription \*

Resource group \*   
[Create new](#)

Instance details

Region \*

Switch Name \*

Switch Size \*   
8 vcpus, 32 GB memory  
[Change size](#)

Admin name \*

SSH public key source

Key pair name \*

Please enter the exact version. Version names are generally of the form '1.2.3'

Manual entry of software version \*

Optional Resource Tags

Tags are name/value pairs that enable you to categorize resources and view consolidated billing by applying the same tag to multiple resources and resource groups. [Learn more about tags](#)

Note that if you create tags and then change resource settings on other tabs, your tags will be automatically updated.

Name	Value	Resource
CreatedBy	Jane Doe	2 selected

Previous Next Review + create

- In the **Project Details** area, select a **Subscription**.
- Pick (or create) an **Azure Resource Group**.
- In the **Instance details** area, notice how the **region** is filled in from the **Azure Resource Group**.
- Assign the **Virtual Machine** a name. This name must be unique in both the **resource group** and the **virtual network** in which the instance will exist. It also must meet the [requirements for a VM host name](#).
- Select the **cloudSwXtch** size.

#### cloudSwXtch Size Explained

The default size is **1x Standard D8s V4**. A minimum of 8 cores is suggested for cloudSwXtch deployment.

#### NOTE:

Please be aware that the owner of the Azure Subscription in which the cloudSwXtch instance is created is responsible for all cloud resources used by the switch. These fees are to the cloud provider and do not include any fees to swxtch.io for cloudSwXtch licensing.

- Enter in an **Admin name**. This will default to **swxtchadmin**, but can be modified.
- Enter in a **SSH public key source**. The options are:
  - Generate new key pair.**
    - If selected, enter in **Key Pair Name**. This name must be unique among other key pairs in Azure.
  - Use existing key stored in Azure.**
    - If selected, choose a **stored key** from the drop-down menu.

- **Use existing public key.**
  - If selected, paste in a **SSH public Key** from Azure. Refer to <https://learn.microsoft.com/en-us/azure/virtual-machines/ssh-keys-portal> for how to get an existing public key.

13. Select the **software version**. The most common choice is **latest**, which will use the most recent software release for this instance. For more control, a specific release version can be entered, e.g. 3.0.0.

14. In the **Optional Resource Tags** area, optionally add **Tags**. Tags can be added to all Resources

15. Select **Next - Network**.

16. In the **Configure virtual networks** area, **select** a previously created virtual network.

#### WARNING

Due to an issue with Azure templates, **do not select the Create new option** for the network because the created network will not be accessible to you. **Always** select a previously created virtual network.

#### Network

The cloudSwXtch must be associated with a virtual network and the virtual network must have at least two subnets: one for control plane and one for data plane traffic. See "System Requirements" above for details.

17. In the **Configure virtual networks** area, select a **Control Subnet Name**.

18. Select a **Data Subnet Name**.

19. **OPTIONAL:** In the **Advanced Networking (optional)** section:

- Add a static IP Address.
- Specify a Proximity Placement Group.

Home > cloudSwxtch-from-mp-image >

## cloudSwXtch instantiation template

Template spec

Configure virtual networks

Virtual network \* ⓘ

(new) pick-an-existing-vnet

Create new

Control Subnet Name \* ⓘ

(new) ControlSubnet (10.0.0.0/29)

Data Subnet Name \* ⓘ

(new) DataSubnet (10.0.1.0/29)

Advanced Networking (optional)

IP addresses are dynamic by default.
☒
Check this box to specify static IP address for network interfaces ⓘ

⚠ Static IPs are not validated here. An invalid static IP address will cause the deployment to fail.

Enter static IP for network interface on ControlSubnet \* ⓘ

Enter static IP for network interface on DataSubnet \* ⓘ

Specify a Proximity Placement Group ⓘ
☐

Review + create

< Previous

Next : Review + create >

20. Select **Review and Create**.

21. Review the **plan pricing**.

22. Read the **Terms & Conditions**.

23. Select **I agree** when ready.

The creation will take 1-3 minutes depending on Azure vagaries. When done, a cloudSwXtch instance shall exist within the selected Azure Resource Group. Your cloudSwXtch is now ready for use.

#### Post-Installation

- **IMPORTANT:** If this is a new install then each client that is expected to get traffic from the cloudSwXtch will need a xNIC installed. If this is a existing install then each client with an xNIC already installed will need to be upgraded. Please see [xNIC Installation](#).
- For Windows-related OS/servers, It's important to reboot the machine, once the installation is complete, in order to be able to execute cloudSwXtch tools properly from any client's user home directory.

#### 24/7 Operations

If the services need to be up and running 24/7 swXtch.io suggests that redundant systems exist for which will be referred to as "Main" and "Backup". During an upgrade the Backup system should be upgraded, then the traffic should be routed to the Backup while the Main is upgraded.

#### Uninstalling cloudSwXtch

Delete the cloudSwXtch instance as you would any other virtual machine.

## Install cloudSwXtch via Azure Marketplace

### Installing cloudSwXtch via Template

The best method for deploying a cloudSwXtch on Azure is via a template. For more information on this method, please review the [Install cloudSwXtch on Azure](#) guide.

### Prerequisites

Before starting, ensure that you have [validated your subnets](#) on Azure. Return to this page after completing that preliminary step.

### Creating a Virtual Machine

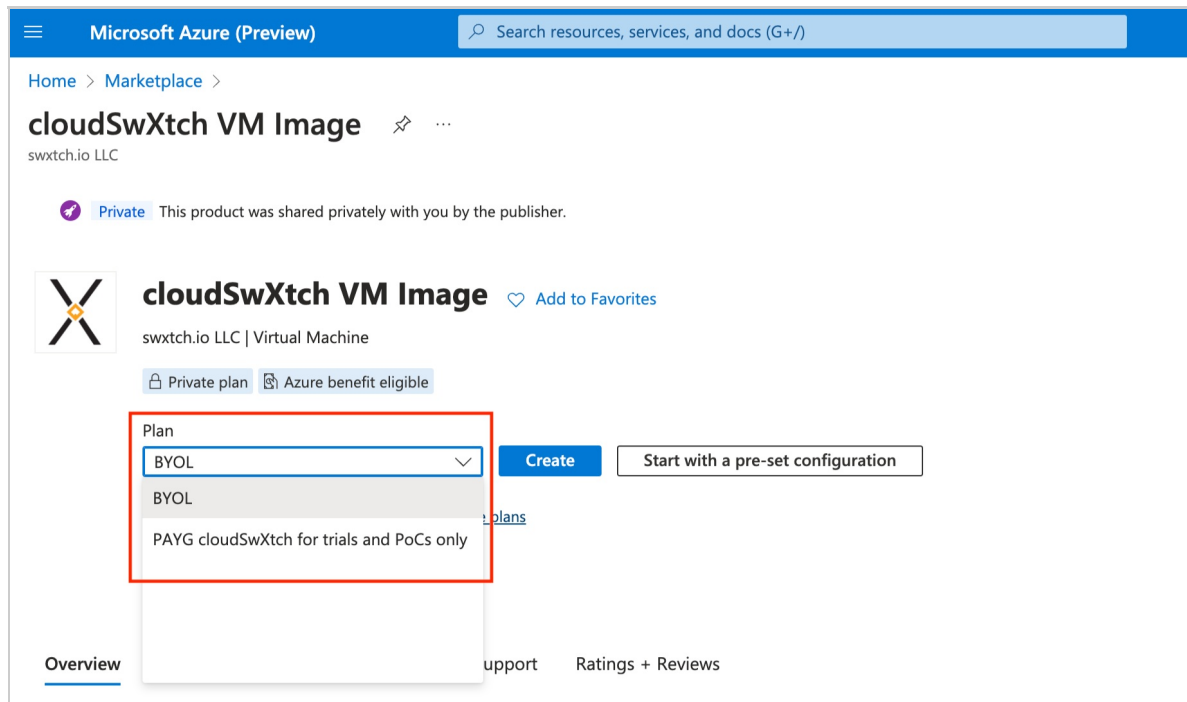
1. **Log in to the Azure Portal.** You will need the following permissions to create and manage virtual machines and to create Managed Applications.
  - **virtual-machine-contributor:** To create and manage virtual machines.
  - **managed-application-contributor-role:** To create Managed Applications.
2. Select **Marketplace**.
3. Search for **cloudswXtch**.
4. **Select** a plan. For more information, see: [cloudSwXtch System Requirements](#).
5. Click on the **cloudSwXtch VM Image** drop down menu to select a plan. **Please note:** A BYOL instance will require users to obtain a license from swXtch.io. For more information, see [here](#).

### cloudSwXtch BYOL

It is recommended that users select **cloudSwXtch BYOL**, which allows for more customizability including expanded bandwidth, increased endpoint limit and additional licensable features. Users will need to request a license from [support@swxtch.io](mailto:support@swxtch.io). For more information, please see [cloudSwXtch System Requirements](#).

The screenshot shows the Microsoft Azure Marketplace interface. The search bar contains 'cloudSwXtch'. The results show two items: 'cloudSwXtch private offers' and 'cloudSwXtch VM Image'. The 'cloudSwXtch VM Image' item has a dropdown menu open, showing 'BYOL' and 'PAYG cloudSwXtch for trials and PoCs only'. The 'BYOL' option is highlighted with a red box. The interface includes a sidebar with navigation links like 'Get Started', 'Service Providers', 'Management', 'Private Marketplace', 'Private Offer Management', 'My Marketplace', 'Favorites', 'Recently created', 'Private plans', 'Categories', 'Media (2)', 'Networking (2)', 'AI + Machine Learning (0)', 'Analytics (0)', and 'Blockchain (0)'. The top navigation bar shows 'Microsoft Azure (Preview)' and a search bar. The bottom of the page shows pagination: 'Previous', 'Page 1 of 1', and 'Next'.

The **Create a virtual machine** will open with the selected plan. If the plan was not selected in the previous screen, then the following screen will open to choose a plan.



6. Select either **Create** or **Start with a pre-set configuration**.

#### NOTE

swxtch.io is just using the standard Azure Marketplace VM from Image method, this document will not go over all the tabs and fields in the tabs as they are not cloudSwxtch specific. Some things of note in the Azure Marketplace VM image creation are as follows:

- The **Start with a pre-set configuration** vs **Create** will eventually lead to the same UI where there are many tabs to enter data. However, the **Start with a pre-set configuration** will fill in certain fields based on the user's selections. For example, in the **Basics** tab it will fill in **Boot diagnostics**, **Availability options**, and **Size**. In addition, the **Disks** tab will fill in the OS disk type.
- **REMINDER:** This Market Place method will only create one NIC. The second required NIC will need to be added after creation.

7. Follow the tabs and make appropriate selections – there are a number of fields that have to be filled in to create a cloudSwXtch instance.
8. In the **Basics** tab, select a **Subscription**.
9. Choose (or create) a **Resource Group**.
10. Assign the **Virtual Machine Name**. This name must be unique.
11. Select a **Region**.
12. Confirm the **Image** is the correct one you selected when choosing a plan: **cloudSwXtch BYOL** or **cloudSwXtch PAYG**.

Microsoft Azure (Preview) Search resources, services, and docs (G+/J) Copilot

Home > cloudSwXtch VM Image >

## Create a virtual machine

**Project details**  
Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription \* ⓘ sub-sw-x-sa

Resource group \* ⓘ (New) Resource group  
[Create new](#)

**Instance details**

Virtual machine name \* ⓘ

Region \* ⓘ (US) East US

Availability options ⓘ Availability zone

Zone options (Preview)

☒ Self-selected zone  
Choose up to 3 availability zones, one VM per zone

☐ Azure-selected zone  
Let Azure assign the best zone for your needs

**i** Using an Azure-selected zone is not supported in region 'East US'.

Availability zone \* ⓘ Zone 1

Security type ⓘ Trusted launch virtual machines  
[Configure security features](#)

Image \* ⓘ **BYOL - Gen1**  
[See all images](#)

Run with Azure Spot discount ⓘ ☐

Size \* ⓘ Standard\_D4\_v4 - 4 vcpus, 16 GiB memory (\$22,033.15/month)  
[See all sizes](#)

< Previous Next : Disks > **Review + create** [Give feedback](#)

13. Select the **Software Version**. The most common choice is **latest**, which will use the most recent software release for this instance. For more control, a specific release version can be entered.

14. Continue on the **Networking** Tab.

### Networking Tab

The cloudSwXtch instance must be associated with a virtual network and the virtual network must have at least two subnets: one for control plane and one for data plane traffic. This user interface only allows attachment of one subnet. Below steps will describe how to add a second subnet after creation. See "System Requirements" above for details.

15. Check **Delete public IP and NIC when VM is deleted**.

16. **OPTIONAL**: Change values on other tabs.

17. Select **Review and Create**.

18. Carefully review the **plan pricing**.

19. Read the **Terms & Conditions**.

20. Select **I agree** when ready. **Note**: The creation will take 2-3 minutes depending on Azure varieties.

### Creating the Second Subnet \*REQUIRED\*

1. Navigate to the newly created VM by selecting the **Go to Resource** button.
2. Click **Stop** at the top of the toolbar.
3. Select **Yes** when prompted.
4. Click **Networking** on the left hand side under settings. Alternatively, you can select **Networking** in the main Properties page.



Home > CreateVm-swxtchiolc1614108926893.cloudswxtch-vm--20220930112431 | Overview >

**vm-swxtch300**  
Virtual machine

Search << >> Connect Start Restart Stop Capture Delete Refresh Open in mobile CLI / PS

**Overview**

Activity log  
Access control (IAM)  
Tags  
Diagnose and solve problems

**Settings**

Networking  
Connect  
Disks  
Size  
Microsoft Defender for Cloud  
Advisor recommendations  
Extensions + applications  
Continuous delivery  
Availability + scaling  
Configuration  
Identity  
Properties  
Locks  
Operations  
Bastion  
Auto-shutdown  
Backup  
Disaster recovery  
Updates  
Inventory

**Essentials**

Resource group (move) : test-donna-300-rg  
Status : Stopped (deallocated)  
Location : East US  
Subscription (move) : sub-swxtch-300  
Subscription ID : b10209ad-ad22-4c26-8aef-be93b2f0b58  
Tags (edit) : CreatedBy: dsilveri@swxtch.io

Operating system : Linux  
Size : Standard D4 v4 (4 vcpus, 16 GiB memory)  
Public IP address : 40.112.52.133  
Virtual network/subnet : test-donna-300-vnet/ds-subnet-ctrl-300  
DNS name : Not configured

**Properties** Monitoring Capabilities (7) Recommendations Tutorials

**Virtual machine**

Computer name	dsd-vm-swxtch300
Health state	-
Operating system	Linux
Publisher	swxtchiolc1614108926893
Offer	cloudswxtch-vm-001-preview
Plan	swxtch-small-002
VM generation	V1
VM architecture	x64
Host group	None
Host	-
Proximity placement group	-
Colocation status	N/A
Capacity reservation group	-

**Availability + scaling**

Availability zone	-
Availability set	-
Scale Set	-

**Networking**

Public IP address	40.112.52.133
Public IP address (IPv6)	-
Private IP address	10.1.1.6
Private IP address (IPv6)	-
Virtual network/subnet	test-donna-300-vnet/ds-subnet-ctrl-300
DNS name	Configure

**Size**

Size	Standard D4 v4
vCPUs	4
RAM	16 GiB

**Disk**

OS disk	dsd-vm-swxtch300_OsDisk_1_ba053f9f18e54a10
Encryption at host	Disabled
Azure disk encryption	Not enabled
Ephemeral OS disk	N/A
Data disks	0

Auto-shutdown

5. Select **Attach network interface**.

Microsoft Azure

Search resources, services, and documentation

Home > CreateVm-swxtchiolc1614108926893.cloudswxtch-vm--20220930112431 | Overview > vm-swxtch300

**vm-swxtch300 | Networking**  
Virtual machine

Search << >> Attach network interface Detach network interface

**Overview**

Activity log  
Access control (IAM)  
Tags  
Diagnose and solve problems

**Settings**

Networking

**vm-swxtch300727**

IP configuration ⓘ

ipconfig1 (Primary) ▼

**Network Interface: vm-swxtch300727** Effective security rules Troubleshoot

Virtual network/subnet: test-donna-300-vnet/ds-subnet-ctrl-300 NIC Public IP: 40.112.52.133

**Inbound port rules** Outbound port rules Application security groups Load balancers

Network security group: dsd-vm-swxtch300-nsg (attached to network interface: vm-swxtch300727)

6. Select a **Resource Group** under **Project Details**.

7. Enter in a **Name** under **Network Interface**.

8. Select a **Subnet**. **Please note:** You can optionally change other data.

9. Select **Create**.

Microsoft Azure

Search resources, services, and docs (G+/I)

Home > vm-swxrch300 | Networking >

## Create network interface

**Project details**

Subscription ⓘ

sub-swx-sa

Resource group \* ⓘ

test-300-rg

[Create new](#)

Location ⓘ

(US) East US

**Network interface**

Name \*

vm-swxrch300-data

Virtual network ⓘ

test-300-vnet

Subnet \* ⓘ

subnet-data-300 (10.1.2.0/24)

NIC network security group ⓘ

☐ None

☒ Basic

☐ Advanced

Public inbound ports \* ⓘ

☒ None

☐ Allow selected ports

Select inbound ports

Select one or more ports

**Private IP address assignment**

☒ Dynamic ☐ Static

**Create**

ⓘ All traffic from the internet will be blocked by default. You will be able to change inbound port rules in the VM > Networking page.

10. Refresh the screen after completing the form and the second subnet should be added in a second tab.

### Enabling "Accelerated Networking" \*REQUIRED\*

The newly created Network Interface needs to be updated to enable **Accelerated Networking** to do this follow the steps below:

1. Select the **Network Interface**. In the example below, it is named **vm-swxrch-300-data**.
2. Click the blue link to the **Network Interface**.

Microsoft Azure (Preview) Search resources, services, and docs (G+/)

Home > vm-swxtch300

## vm-swxtch300 | Networking

Virtual machine

Search

Attach network interface Detach network interface

vm-swxtch300727 **vm-swxtch300-data**

IP configuration   
 ipconfig1 (Primary)

**Network Interface** **vm-swxtch300-data** [Effective security rules](#) [Troubleshoot VM connection issues](#) [Topology](#)   
 Virtual network/subnet: test-donna-300-vnet/ds-subnet-data-300 NIC Public IP: - NIC Private IP: **10.1.2.6** Accelerated networking **Disabled**

[Inbound port rules](#) [Outbound port rules](#) [Application security groups](#) [Load balancing](#)

Network security group basicNsgdsd-vm-swxtch300-data (attached to network interface: dsd-vm-swxtch300-data)   
 Impacts 0 subnets, 1 network interfaces [Add inbound port rule](#)

Priority	Name	Port	Protocol	Source	Destination	Action
65000	AllowVnetInBound	Any	Any	VirtualNetwork	VirtualNetwork	Allow
65001	AllowAzureLoadBalancerInBound	Any	Any	AzureLoadBalancer	Any	Allow
65500	DenyAllInBound	Any	Any	Any	Any	Deny

**Need help?**   
 [Understand Azure load balancing](#)   
 [Quickstart: Create a public load balancer to load balance Virtual Machines](#)   
 [Quickstart: Direct web traffic with Azure Application Gateway](#)

### 3. Click **Edit accelerated networking**.

Microsoft Azure (Preview) Search resources, services, and docs (G+/)

Home > vm-swxtch300 | Networking >

## vm-swxtch300-data

Network interface

Search

Move Delete Refresh **Edit accelerated networking**

**Overview** [View Cost](#) [JSON View](#)

**Essentials**

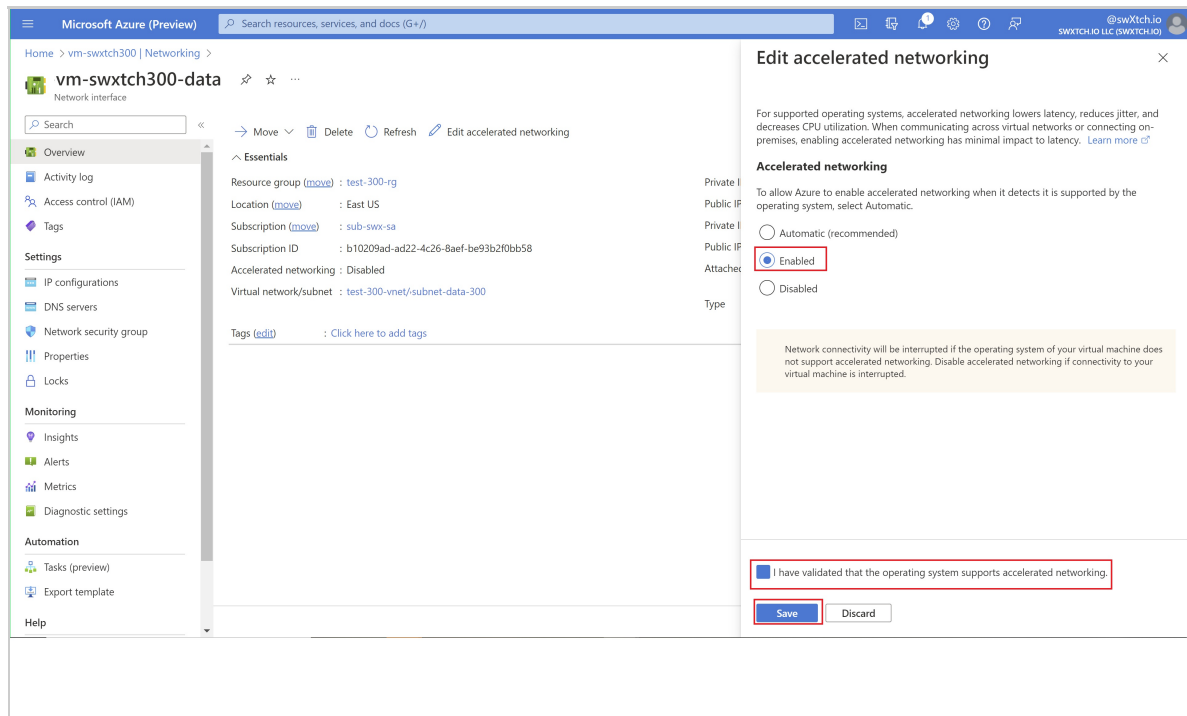
Resource group [\(move\)](#) : test-300-rg   
 Location [\(move\)](#) : East US   
 Subscription [\(move\)](#) : sub-swxtch300   
 Subscription ID : b10209ad-ad22-4c26-8aef-be93b2f0bb58   
 Accelerated networking : Disabled   
 Virtual network/subnet : test-300-vnet/subnet-data-300

Private IP address : 10.1.2.6   
 Public IP address : -   
 Private IP address (IPv6) : -   
 Public IP address (IPv6) : -   
 Attached to : vm-swxtch300 (Virtual machine)   
 basicNsgdsd-vm-swxtch300-data (Network security group)   
 Type : Regular

Tags [\(edit\)](#) : [Click here to add tags](#)

[Give feedback](#)

4. Select **Enable**.
5. Select **I have validated that the operating system supports accelerated networking**.
6. Click **Save**.



7. Start the VM for use.

#### Upgrading your cloudSwXtch Instance

After deployment, it is recommended to update your cloudSwXtch instance to latest. Please refer to the [Upgrading cloudSwXtch](#) article for more information.

#### Required Step for BYOL: Request a License from swXtch.io

Users deploying a BYOL instance of cloudSwXtch will need to contact swXtch.io for a license file. For more information, see [How to License a cloudSwXtch](#).

#### Important

If this is a new install then each client that is expected to get traffic from the cloudSwXtch or send to the cloudSwXtch will need a xNIC installed. If this is a existing install then each client with an xNIC already installed will need to be upgraded. Please see [xNIC Installation](#).

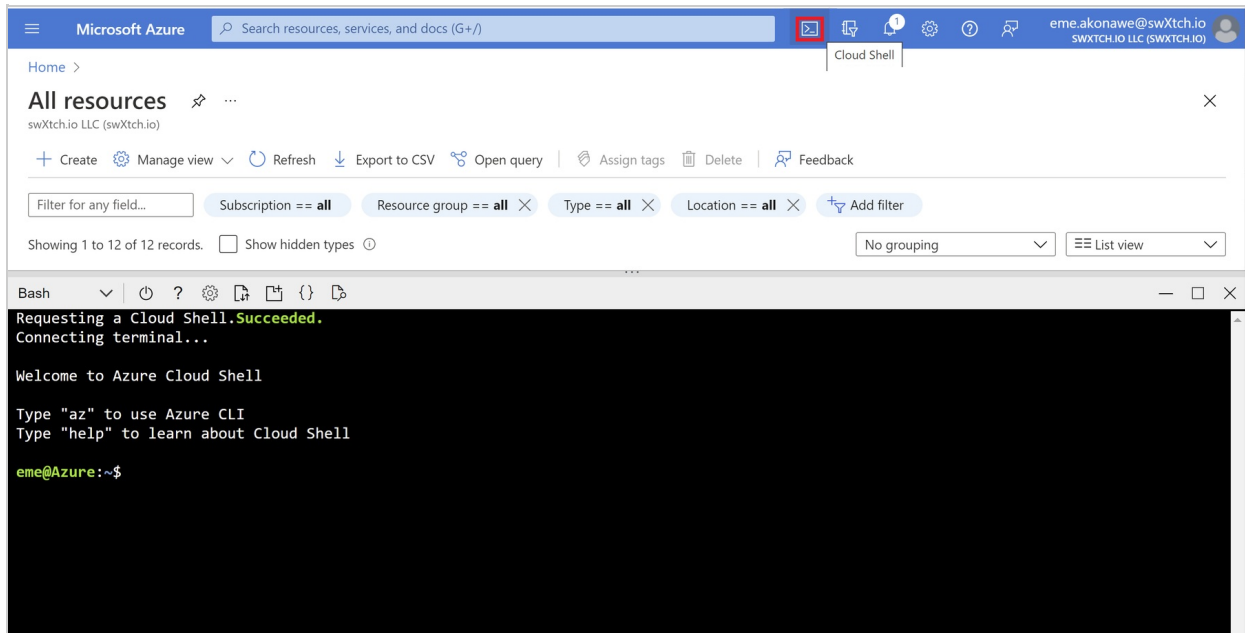
# Deploy cloudSwXtch with Terraform on Azure

## WHAT TO EXPECT

By default, the terraform script will spin up a "small" cloudSwXtch. You can make edits to the [Azure/terraform/terraform.tfvars](#) file to declare a different cloudSwXtch size. There is also an option to delegate static ip addresses on your cloudSwXtch. Further details on how to do this can be found at the end of this article.

## Deploying cloudSwXtch with Terraform on Azure

1. Sign-in to your Azure portal under the subscription where you want to deploy the cloudSwXtch.
2. Open the Azure Cloud Shell interface and select the Bash environment as shown.



3. Clone the example repository from [GitHub](#).

You can do this either **via SSH** (requires setting up your SSH authentication with GitHub ):

Bash	Copy
<pre>\$ git clone git@github.com:swxtchio/cloudSwXtch-support.git</pre>	

or **via HTTPS**:

Bash	Copy
<pre>\$ git clone https://github.com/swxtchio/cloudSwXtch-support.git</pre>	

4. Update the values in the [Azure/terraform/terraform.tfvars](#) file to match your existing azure resources such as: resource group, virtual network, subnets, etc.

The format of the key file that the scripts can process is the ssh-rsa type. The content of the file should start with "ssh-rsa AAAAB3..."

5. In the Cloud Shell terminal, cd into the [Azure/terraform](#) directory and initialize the terraform environment:

Bash	Copy
<pre>\$ cd Azure/terraform \$ terraform init</pre>	

```
Azure services

+ Create a resource
+ Storage accounts
+ Virtual machines
+ Quotas
+ Resource groups
+ Kubernetes services
+ Kubernetes fleet manager
+ Virtual networks

Bash
Initializing the backend...

Initializing provider plugins...
- Finding hashicorp/azurerm versions matching "~> 3.0"...
- Installing hashicorp/azurerm v3.64.0...
- Installed hashicorp/azurerm v3.64.0 (signed by HashiCorp)

Terraform has created a lock file .terraform.lock.hcl to record the provider
selections it made above. Include this file in your version control repository
so that Terraform can guarantee to make the same selections by default when
you run "terraform init" in the future.

Terraform has been successfully initialized!

You may now begin working with Terraform. Try running "terraform plan" to see
any changes that are required for your infrastructure. All Terraform commands
should now work.

If you ever set or change modules or backend configuration for Terraform,
rerun this command to reinitialize your working directory. If you forget, other
commands will detect it and remind you to do so if necessary.
nicholas [ ~/projects/cloudSwXtch-support/Azure/terraform ]$
```

6. Now that Terraform has been initialized, run this command to evaluate the config and confirm the desired output which will be shown:

```
Bash
$ terraform plan

# azurerm_network_interface.data_network_interface[0] will be created
+ resource "azurerm_network_interface" "data_network_interface" {
+   applied_dns_servers      = (known after apply)
+   dns_servers              = (known after apply)
+   enable_accelerated_networking = true
+   enable_ip_forwarding     = false
+   id                       = (known after apply)
+   internal_dns_name_label  = (known after apply)
+   internal_domain_name_suffix = (known after apply)
+   location                 = "eastus"
+   mac_address              = (known after apply)
+   name                     = "swxtch-example-data-nic-1"
+   private_ip_address       = (known after apply)
+   private_ip_addresses     = (known after apply)
+   resource_group_name      = "test-tf-managed-kyle"
+   virtual_machine_id       = (known after apply)

+   ip_configuration {
+     gateway_load_balancer_frontend_ip_configuration_id = (known after apply)
+     name                                               = "dinternal"
+     primary                                           = (known after apply)
+     private_ip_address                               = (known after apply)
+     private_ip_address_allocation                    = "Dynamic"
+     private_ip_address_version                       = "IPv4"
+     subnet_id                                         = "/subscriptions/91b341dd-6e01-4144-87a7-c86c27545c1a/resourceGroups/DevNetwork/providers/Microsoft.Network/virtualNetworks/dev-vnet/subnets/automation-test-data"
+   }
+ }

Plan: 3 to add, 0 to change, 0 to destroy.

Note: You didn't use the -out option to save this plan, so Terraform can't guarantee to take exactly these
actions if you run "terraform apply" now.
```

Since you are using all pre-existing resources to deploy your cloudSwXtch, there should only be 3 resources added - 1 cloudSwxtch, and 2 NICs - as can be seen at the bottom of the screenshot, "Plan: 3 to add, 0 to change, 0 to destroy."

7. Run the Terraform apply command (followed by "yes" when prompted) to approve the action.

```
Bash Copy
Terraform apply
yes
```

8. Once the resources have applied successfully you can view the resources created from your Azure portal as confirmation of a successful deployment.

## STATIC IPs

If you'd like to deploy a cloudSwXtch using Static IPs, then you just need to make some small changes to the `azure_deployswxth.tf` & `terraform.tfvars` files.

1. Un-comment the Parameter `private_ip_address` in the `azure_deployswxth.tf` code file for both your `data_network_interface` & `control_network_interface` resources.

```
source "azurerm_network_interface" "data_network_interface" {
  count          = var.counter
  name           = "${var.data_nic}-${count.index + 1}"
  location       = data.azurerm_resource_group.resource_group.location
  resource_group_name = data.azurerm_resource_group.resource_group.name
  enable_accelerated_networking = true

  ip_configuration {
    name                = "dinternal"
    subnet_id           = data.azurerm_subnet.datasubnet.id
    private_ip_address_allocation = "Static"
    private_ip_address   = var.datanic_staticip
  }
}
```

```
39 resource "azurerm_network_interface" "control_network_interface" {
40   count          = var.counter
41   name           = "${var.control_nic}-${count.index + 1}"
42   location       = data.azurerm_resource_group.resource_group.location
43   resource_group_name = data.azurerm_resource_group.resource_group.name
44
45   ip_configuration {
46     name                = "cinternal"
47     subnet_id           = data.azurerm_subnet.ctrlsubnet.id
48     private_ip_address_allocation = "Static"
49     private_ip_address = var.controlnic_staticip
50   }
51 }
```

2. Set the parameter `private_ip_address_allocation` to "Static".

Your 2 lines of code should look like below for both network interface resources:

```
Bash Copy
private_ip_address_allocation = "Static"
private_ip_address = var.datanic_staticip
```

Your `terraform.tfvars` file will have variables defined for your control and data NIC StaticIP definitions. You can update those values based on your subnet setup.

**Note:** This static IP address allocation will only work for `swxtch_count` of 1.

# Install cloudSwXtch for an Air-Gapped Environment

## WHAT TO EXPECT

In this article, you will learn how to install a cloudSwXtch in an Air-Gapped (Closed Network) environment for Azure. For standard Azure installation instructions, please see the [cloudSwXtch on Azure](#) article.

## Before You Start

Review VM Requirements for a cloudSwXtch Instance in [cloudSwXtch System Requirements](#).

## VM Image Creation

The cloudSwXtch software is delivered as a **Virtual Machine Disk Image**. This Image file can be added to an Azure **Image Gallery**. Images in an Image Gallery can be used to create Virtual Machines.

To assist with creation of VMs from images in a gallery, swXtch.io provides instructions on how to accomplish the following:

1. [Get the VM Disk Image](#)
2. [Upload the VM Image into an Azure Storage Account](#)
3. [Create a VM Image from the Disk Image](#)
4. [Create cloudSwXtch from VM Image](#)
5. [License the cloudSwXtch](#)

Complete all steps to successfully install cloudSwXtch in an Air-Gapped environment.

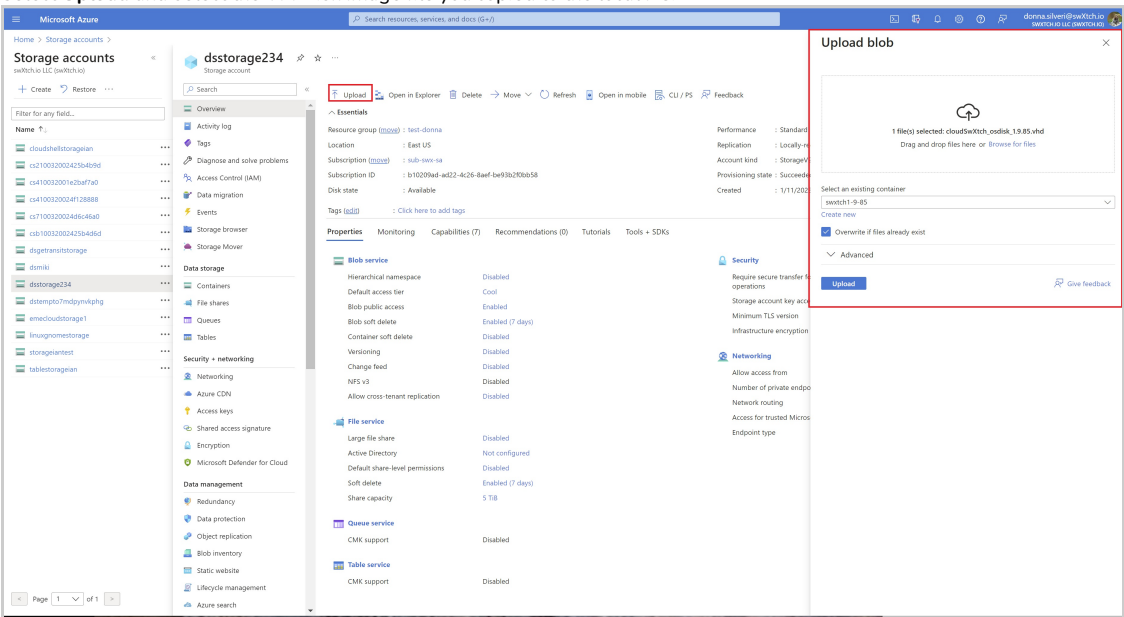
## STEP ONE: Get the VM Disk Image

Log onto an environment that has access to the internet and download the following file onto a machine with access to the Azure Air-Gapped Environment (~30GB):

Plaintext	Copy
<code>https://swxtchpublic.blob.core.windows.net/3hwgfe98hfglsrdfh4/cloudSwXtch_osdisk_3.0.0.airgap.vhd</code>	

## STEP TWO: Upload the VM Disk Image into an Azure Storage Account

1. Upload the files into an Azure storage account in the **secure** Azure Environment.
  - a. Log into the **Azure Portal**
  - b. Navigate to **Storage Accounts**.
  - c. Select the desired storage account or **create a new one**.
  - d. Select the desired Container or **create a new one**.
  - e. Select **Upload** and select the VM Disk Image file you copied to the local PC.



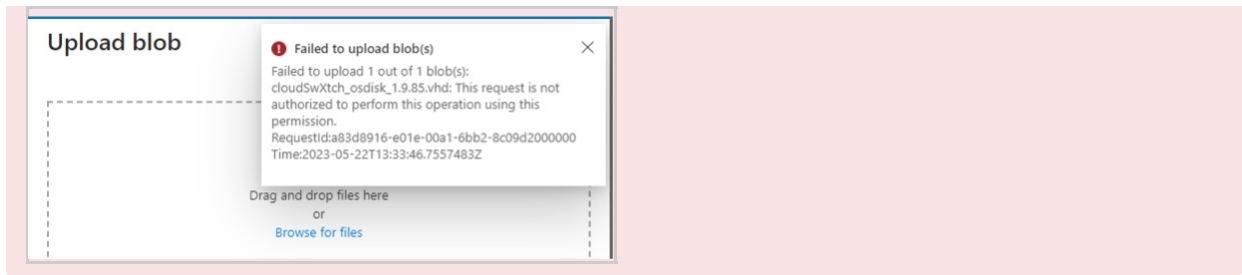
- f. Start the upload and wait for it to complete.

This may take some time to upload the file (up to an hour). When completed, the file should show with a green checkbox.

### Failed to Upload Blob(s) Message

If you receive a "Failed to Upload Blob(s)" message when uploading the file in the Storage Account, select **Configuration** and validate the **Allow storage key access** is enabled.





### STEP THREE: Create a VM Image from the Disk Image

Once we have a disk image in storage, we can use it to create a VM image. A VM image is a *snapshot* of a VM. The real VM will be created later. The VM Image only needs to be created once. Any number of VMs can be instantiated from a single VM image.

1. In the Azure Portal, **Search** for and **select Images**.
2. Select **Create**.
3. Select the appropriate **Resource Group**.
4. Give the VM Image a name. The cloudSwXtch instance will be created later with a different name. Pick a name with the cloudSwXtch software version in it as you may end up with multiple images after some time.
5. Ensure that the region is the same for the storage account holding the disk image.
6. Select **Linux** as the OS type
7. Select **Gen 1**.
8. Click **Browse** on the **Storage Blob**.
  - a. In the new panel, navigate to the storage account and container holding the disk image.
  - b. Select the file that was previously uploaded.
9. For **Account Type**, select **Standard SSD**. See the example of the screen filled out completely.

Microsoft Azure

Search resources, services, or documentation

[Home](#) > [Images](#) >

## Create an image

Create a managed image that can be used to deploy virtual machines and virtual machine scale sets. The image contains a list of managed blobs and metadata necessary for creating virtual machines. [Learn more](#)

### Project details

Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription \*

sub-swx-sa

Resource group \*

saDevNetwork

[Create new](#)

### Instance details

Name \*

cloudSwXtch\_1\_9\_85\_Image

Region \*

(US) East US

Zone resiliency

☐

### OS disk

OS type \*

☐ Windows

☒ Linux

VM generation \*

☒ Gen 1

☐ Gen 2

Storage blob \*

https://dsstorage234.blob.core.windows.net/swxtch1-9-85/cloudSwXtch\_osdis... ☒

[Browse](#)

Account type \*

Standard SSD

Host caching \*

Read/write

### Encryption

You can encrypt the OS and data disks with a platform-managed or customer-managed key. [Learn more](#)

Key management

Platform-managed key

### Data disk

+ Add data disk

Review + create

< Previous

Next : Tags >

10. If tags are desired, then select **Tags** and enter the required tags.
11. The other fields can be left as default.
12. Select **Review and create**.
13. When validation passes, select **Create**. When it is complete, click **Go to Resource** to see the image.

## STEP FOUR: Create cloudSwXtch from VM Image

Now that we have a cloudSwXtch VM Image, we can use it to instantiate a cloudSwXtch.

1. Navigate to **Images**.
2. Select the image with the cloudSwXtch version you require.
3. Select **Create VM**.

Microsoft Azure

Search resources, services, and docs (G+)

Home > Images >

Images

swXtch.io

+ Create Manage view > ...

Filter for any field...

Name ↑↓

- cloudSwXtch-v3.0.0-airgap
- cloudSwXtch-v3.0.0-airgap-sa
- cloudSwXtch\_1\_9\_85
- cloudSwXtch\_1\_9\_85\_Image
- swxtch2\_0\_60
- swxtch\_1\_9\_85
- testcloudSwXtch-1.9.85-image

cloudSwXtch-v3.0.0-airgap

Image

Search

+ Create VM Clone to a VM image Delete Refresh

Overview

- Activity log
- Access control (IAM)
- Tags
- Settings
- Automation
- Help

Essentials

Resource group (move)

FS-RG

Location (move)

Central US

Subscription (move)

sub-swX-sa

Subscription ID

b10209ad-ad22-4c26-8aef-be93b2f0bb58

Provisioning state

Succeeded

Tags (edit)

4. Fill out the **Create Virtual machine** form like below:

- a. Under **Project Details**, set the **subscription** and **Resource Group** for where you want the cloudSwXtch instance to be located.

Microsoft Azure (Preview)

Search resources, services, and docs (G+)

Copilot

Home > Images > cloudSwXtch-v3.0.0-airgap >

Create a virtual machine

Basics Disks Networking Management Monitoring Advanced Tags Review + create

Create a virtual machine that runs Linux or Windows. Select an image from Azure marketplace or use your own customized image. Complete the Basics tab then Review + create to provision a virtual machine with default parameters or review each tab for full customization. [Learn more](#)

Project details

Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription \* ⓘ sub-swX-sa

Resource group \* ⓘ FS-RG

Create new

- b. Under **Instance Details**, Name the Virtual Machine with a valid host name.
- c. Select **No infrastructure redundancy required** for Availability options.
- d. Select appropriate machine size. For recommendations based on features, endpoints, and bandwidth needs, read the [cloudSwXtch System Requirements](#).

Instance details

Virtual machine name \* ⓘ cloudSwXtch01

Region ⓘ (US) Central US

Availability options ⓘ No infrastructure redundancy required

Security type ⓘ Standard

Image \* ⓘ cloudSwXtch-v3.0.0-airgap - x64 Gen1

See all images | Configure VM generation

VM architecture ⓘ

Arm64

x64

Arm64 is not supported with the selected image.

Run with Azure Spot discount ⓘ

Size \* ⓘ Standard\_D8as\_v5 - 8 vcpus, 32 GiB memory (\$269.77/month)

See all sizes

Enable Hibernation ⓘ

Learn more

- e. Under Administrator account, use SSH for the authentication type. Enter your **SSH public key source**. Refer to [ssh-keys-portal](#) for details.

**Administrator account**

Authentication type ⓘ ☒ SSH public key ☐ Password

**i** Azure now automatically generates an SSH key pair for you and allows you to store it for future use. It is a fast, simple, and secure way to connect to your virtual machine.

Username \* ⓘ  ✓

SSH public key source  ▼

**f** Ed25519 and RSA SSH formats are supported for the selected VM image. Ed25519 offers better performance and security with a smaller key size, while RSA is still widely used particularly for legacy systems and applications.

Stored Keys  ▼

- f. Select your preference in **Inbound port rules**.

**Inbound port rules**

Select which virtual machine network ports are accessible from the public internet. You can specify more limited or granular network access on the Networking tab.

Public inbound ports \* ⓘ ☒ None ☐ Allow selected ports

Select inbound ports  ▼

**i** All traffic from the internet will be blocked by default. You will be able to change inbound port rules in the VM > Networking page.

- g. Set the **Licensing Type** to **Other**.

**Licensing**

License type \*  ▼

If you are using a RedHat or SLES image, you may be eligible for the Azure Hybrid Benefit and can save money on the license costs. [Learn more about Azure Hybrid Benefit](#) and how to enable it using Azure CLI for custom images from snapshots and Azure compute gallery.

[< Previous](#) [Next : Disks >](#) [Review + create](#)

[Give feedback](#)

- h. Navigate to the **Networking** tab and fill out the form like below:

Microsoft Azure

Search resources, services, and docs (G+)

[Home](#) >
[Microsoft.Image-20230603122553 | Overview](#) >
[cloudSwXtch\\_1\\_9\\_85\\_Image](#) >

## Create a virtual machine

[Basics](#)
[Disks](#)
[Networking](#)
[Management](#)
[Monitoring](#)
[Advanced](#)
[Tags](#)
[Review + create](#)

Define network connectivity for your virtual machine by configuring network interface card (NIC) settings. You can control ports, inbound and outbound connectivity with security group rules, or place behind an existing load balancing solution. [Learn more](#)

### Network interface

When creating a virtual machine, a network interface will be created for you.

Virtual network \*

sa-vnet

Create new

Subnet \*

sa-subnet-ctrl (10.2.128.0/22)

Manage subnet configuration

Public IP

(new) CloudSwXtch01-ip

Create new

NIC network security group

☒ None
☐ Basic
☐ Advanced

The selected subnet 'sa-subnet-ctrl (10.2.128.0/22)' is already associated to a network security group 'Sa-NSG'. We recommend managing connectivity to this virtual machine via the existing network security group instead of creating a new one here.

Delete public IP and NIC when VM is deleted

☐

Enable accelerated networking

☐

The selected image does not support accelerated networking.

### Load balancing

You can place this virtual machine in the backend pool of an existing Azure load balancing solution. [Learn more](#)

Place this virtual machine behind an existing load balancing solution?

☐

Review + create

< Previous

Next : Management >

- i. Select the appropriate **Virtual Network**.
  - ii. Select the appropriate control subnet.
  - i. Navigate to other tabs as desired and enter in information as preferred. For example, some installations expect **Tags** to be entered.
  - j. Select **Review + Create**.
  - k. When validation passes, select **Create**.
5. When the deployment is complete, select **Go to Resource**.

Microsoft Azure Search resources, services, and docs (G+/) Copilot

Home > CreateVm-cloudSwXtch-v3.0.0-airgap-20240919175527 | Overview

Deployment

Search x « Delete Cancel Redeploy Download Refresh

**Overview**

Inputs

Outputs

Template

**Your deployment is complete**

Deployment name : CreateVm-cloudSwXtch-v3.0.0-airgap-20240919175527  
Subscription : sub-sw-x-sa  
Resource group : saDevNetwork  
Start time : 9/19/2024, 6:14:24 PM  
Correlation ID : 648ff6aa-e6c7-4085-8897-ba5a9c6705cf

**Deployment details**

Resource	Type	Status	Operation details
cloudSwXtch01	Virtual machine	OK	<a href="#">Operation details</a>
cloudswxtch01634	Microsoft.Network/networkInter	Created	<a href="#">Operation details</a>

**Next steps**

[Go to resource](#)

6. Select **Stop** to stop the VM.
7. Navigate to **Network Settings** under **Networking**.

Microsoft Azure Search resources, services, and docs (G+/) Copilot

Home > CreateVm-cloudSwXtch-v3.0.0-airgap-20240919175527 | Overview >

**cloudSwXtch01** Virtual machine

Search « Connect Start Restart Stop Hibernate Capture Delete Refresh

**Overview**

Activity log

Access control (IAM)

Tags

Diagnose and solve problems

Connect

**Networking**

**Network settings**

Load balancing

Application security groups

Network manager

Settings

Disks

Extensions + applications

Operating system

Configuration

Advisor recommendations

Properties

Locks

Availability + scale

Size

Availability + scaling

Security

**Essentials** JSON View

Resource group [\(move\)](#) saDevNetwork

Status Stopped (deallocated)

Location Central US

Subscription [\(move\)](#) sub-sw-x-sa

Subscription ID b10209ad-ad22-4c26-8aef-be93b2f0bb58

Tags [\(edit\)](#) [Add tags](#)

Operating system Linux

Size Standard D8as v5 (8 vcpus, 32 GiB memory)

Public IP address -

Virtual network/subnet FS-agnet/FS-ag-control

DNS name -

Health state -

Time created 9/19/2024, 4:14 PM UTC

**Properties** Monitoring Capabilities (7) Recommendations Tutorials

**Virtual machine**

Computer name cloudSwXtch01

Operating system Linux

VM generation V1

VM architecture x64

Hibernation Disabled

Host group -

Host -

Proximity placement - group

Colocation status N/A

8. Select **Attach network Interface**.

The screenshot shows the Azure portal interface for a virtual machine named 'cloudSwXtch01'. The left sidebar contains navigation options like Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Connect, and Networking. The 'Networking' section is expanded, showing 'Network settings' as the active tab. In the main content area, the 'Attach network interface' button is highlighted with a red box and an arrow. Below this, a dropdown menu shows the selected network interface: 'cloudswxtch01634 (primary) / ipconfig1 (primary)'. The 'Essentials' section lists various network-related settings such as Network interface, Virtual network / subnet, Public IP address, Private IP address, Admin security rules, Load balancers, Application security groups, Network security group, Accelerated networking, and Effective security rules. At the bottom, a message states 'No port rules to display' and provides a link to 'Add network security group'.

9. Select **Create and attach Network**. A new form will open.
10. Enter your information into the form to add a new NIC like shown. It is good practice to include the word, "data", in the name to distinguish between the two.

Microsoft Azure

Search resources, services, and docs (G+/)

Home > CloudSwXtch01 | Networking >

Create network interface ...

Project details

Subscription ⓘ

sub-swx-sa

Resource group \* ⓘ

saDevNetwork

Create new

Location ⓘ

(US) East US

Network interface

Name \*

cloudswxtch01-data

Virtual network ⓘ

sa-vnet

Subnet \* ⓘ

sa-subnet-data (10.2.192.0/22)

NIC network security group ⓘ

☐ None
☒ Basic
☐ Advanced

Public inbound ports \* ⓘ

☒ None
☐ Allow selected ports

Select inbound ports

Select one or more ports

All traffic from the internet will be blocked by default. You will be able to change inbound port rules in the VM > Networking page.

Private IP address assignment

Dynamic

Static

☐ Private IP address (IPv6)

Create

- a. **Note:** For Public inbound ports, it is up to the user to decide.
11. Select **Create**.
12. When it is done, the screen will automatically refresh with the new "data" interface listed as the top network interface. **There should now be a control and data interface** in the dropdown.



Microsoft Azure

Home > CreateVm-cloudSwXtch-v3.0.0-airgap-20240919175527 | Overview > cloudSwXtch01

## cloudSwXtch01 | Network settings

Virtual machine

Search

- Overview
- Activity log
- Access control (IAM)
- Tags
- Diagnose and solve problems
- Connect
- Networking
  - Network settings**
  - Load balancing
  - Application security groups
  - Network manager
- Settings
  - Disks
  - Extensions + applications
  - Operating system
  - Configuration
  - Advisor recommendations
  - Properties
  - Locks
- Availability + scale
  - Size
  - Availability + scaling
- Security

This is a new experience. [Please provide feedback](#)

Attach network interface Detach network interface View topology Troubleshoot Refresh

Network interface / IP configuration

**cloudSwXtch-data / ipconfig1 (primary)**

cloudswxtch01634 (primary) / ipconfig1 (primary)

cloudSwXtch-data / ipconfig1 (primary)

cloudSwXtch-data	0 (Configure)
Virtual network / subnet	Application security groups
FS-agnet / FS-ag-control	0 (Configure)
Public IP address	Network security group
- (Configure)	-
Private IP address	Accelerated networking
10.0.0.7	Disabled
Admin security rules	Effective security rules
0 (Configure)	0

**No port rules to display**

Network security group is an essential component of Azure's network security architecture, providing inbound and outbound traffic filtering for network resources. Customers can connect to their virtual machines securely by adding the appropriate port rules, allowing granular control over inbound traffic and ensuring authorized access to specific ports and protocols.

[Add network security group](#)

13. Click the **Data Network Interface**.

Microsoft Azure

Home > CreateVm-cloudSwXtch-v3.0.0-airgap-20240919175527 | Overview > cloudSwXtch01

## cloudSwXtch01 | Network settings

Virtual machine

Search

- Overview
- Activity log
- Access control (IAM)
- Tags
- Diagnose and solve problems
- Connect
- Networking
  - Network settings**
  - Load balancing
  - Application security groups
  - Network manager
- Settings
  - Disks
  - Extensions + applications
  - Operating system
  - Configuration
  - Advisor recommendations
  - Properties
  - Locks
- Availability + scale
  - Size
  - Availability + scaling
- Security

Attach network interface Detach network interface View topology Troubleshoot Refresh

Network interface / IP configuration

**cloudSwXtch-data / ipconfig1 (primary)**

cloudswxtch01634 (primary) / ipconfig1 (primary)

cloudSwXtch-data / ipconfig1 (primary)

cloudSwXtch-data 0 (Configure)

Virtual network / subnet FS-agnet / FS-ag-control Application security groups 0 (Configure)

Public IP address - (Configure) Network security group -

Private IP address 10.0.0.7 Accelerated networking Disabled

Admin security rules 0 (Configure) Effective security rules 0

No port rules to display

Network security group is an essential component of Azure's network security architecture, providing inbound and outbound traffic filtering for network resources. Customers can connect to their virtual machines securely by adding the appropriate port rules, allowing granular control over inbound traffic and ensuring authorized access to specific ports and protocols.

Add network security group

a. Select **Overview** in the side menu.

Microsoft Azure

Home > CreateVm-cloudSwXtch-v3.0.0-airgap-20240919175527 | Overview > cloudSwXtch01 | Network settings > cloudSwXtch-data

## cloudSwXtch-data | IP configurations

Network Interface

Search

- Overview**
- Activity log
- Access control (IAM)
- Tags
- Settings
  - IP configurations**
  - DNS servers
  - Network security group
  - Properties
  - Locks
- Monitoring
- Automation
- Help

Refresh

### IP Settings

Enable IP forwarding ☐

Virtual network FS-agnet

Subnet \* FS-ag-control (10.0.0.0/24) 247 free IP addresses

Private and public IP addresses can be assigned to a virtual machine's network interface controller. You can add as many private and public IPv4 addresses as necessary to a network interface, within the limits listed in the Azure limits article. [Learn more](#)

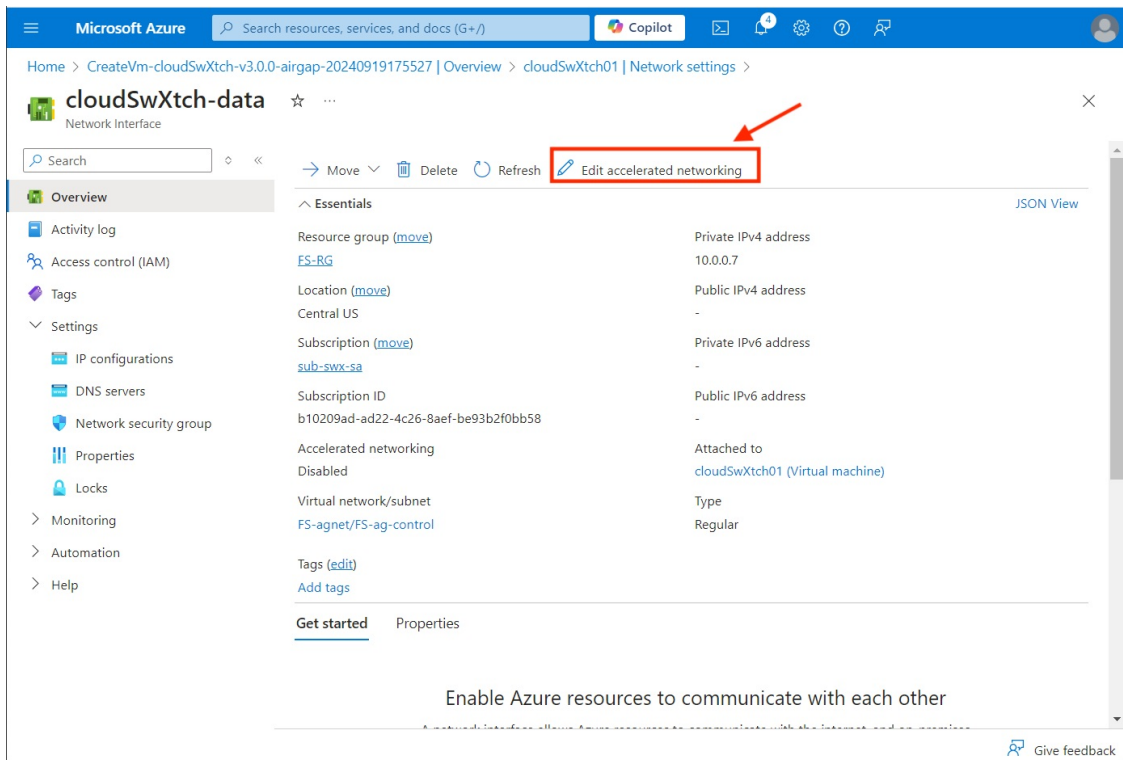
+ Add Make primary Delete

Name	IP Version	Type	Private IP Address	Public IP Address
ipconfig1	IPv4	Primary	10.0.0.7 (Dynamic)	-

Apply Discard changes

Give feedback

b. Select **Edit accelerated Networking**. A new window will display.



- c. Select **Enabled**.
- d. Check the agreement.
- e. Select **Save**.

## Edit accelerated networking



For supported operating systems, accelerated networking lowers latency, reduces jitter, and decreases CPU utilization. When communicating across virtual networks or connecting on-premises, enabling accelerated networking has minimal impact to latency. [Learn more](#)

### Accelerated networking

To allow Azure to enable accelerated networking when it detects it is supported by the operating system, select Automatic.

☐ Automatic (recommended)

☒ Enabled

☐ Disabled

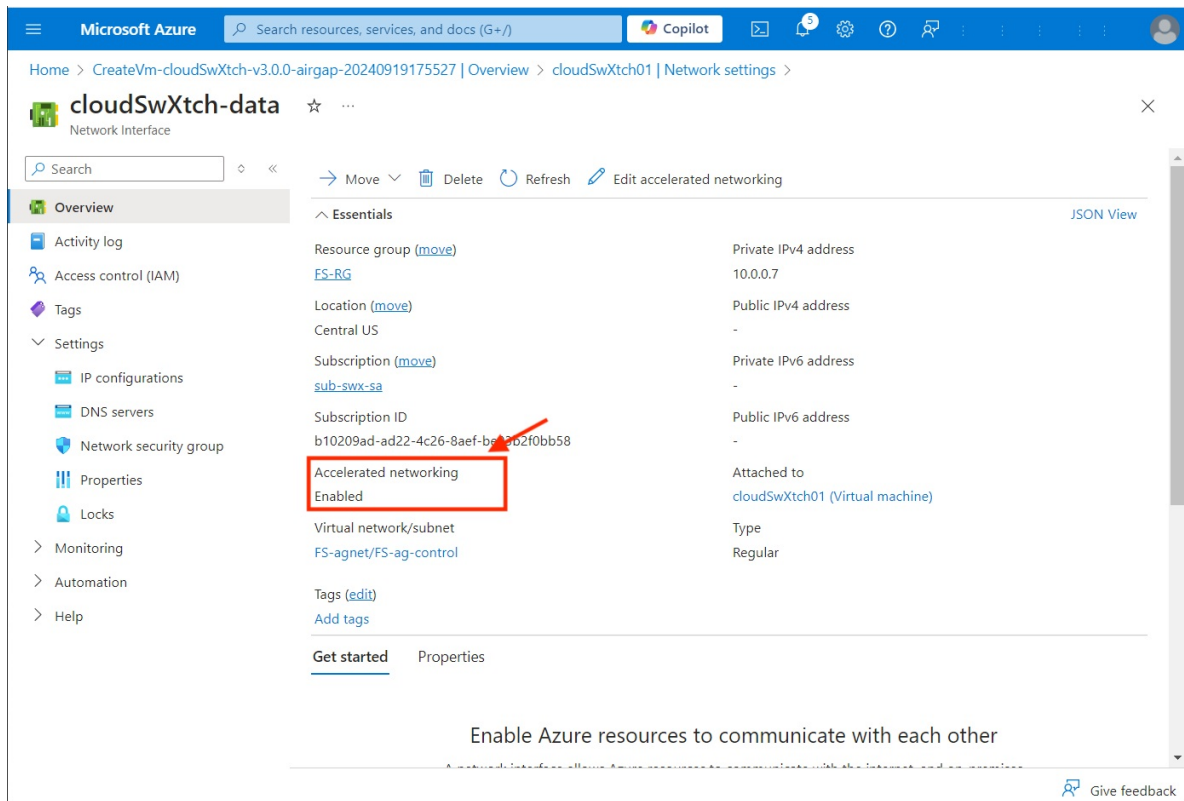
Network connectivity will be interrupted if the operating system of your virtual machine does not support accelerated networking. Disable accelerated networking if connectivity to your virtual machine is interrupted.

☒ I have validated that the operating system supports accelerated networking.

Save

Discard

14. The page will automatically refresh and navigate back to Overview page. Validate that **Accelerated networking is Enabled**.



15. Start the newly created cloudSwXtch VM.

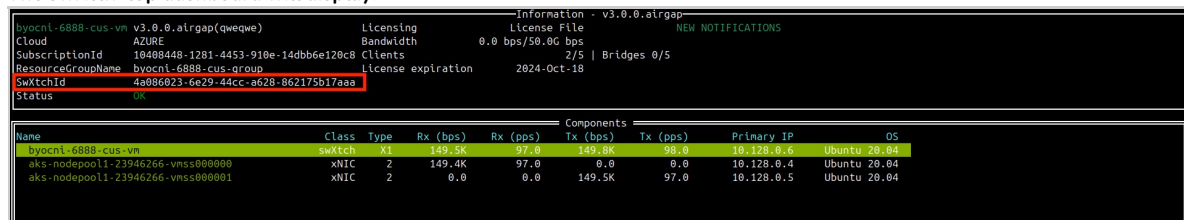
## STEP FIVE: License the cloudSwXtch

1. Log onto the newly created VM.
2. Run this command:

Text

```
Bash
swxtch-top
```

3. The swXtch-top dashboard will display.



4. Copy the "SwxtchId" and email it to [support@swxtch.io](mailto:support@swxtch.io) requesting a license.
5. When you receive the license file, **upload** it onto the cloudSwXtch VM.
6. Move the license.json file to the /swxtch directory using the following command replacing user with the appropriate value:

Text

```
Bash
sudo mv /home/<user>/license.json /swxtch
```

7. Reboot the cloudSwXtch and run swxtch-top again or journal to check the license took place:

Text

```
Bash
sudo journalctl -u swxtch-ctrl.service -f -n 500
```

byocnl-6888-cus-vm

v3.0.0.airgap(qweqwe)

Cloud

AZURE

SubscriptionId

10408448-1281-4453-910e-14dbb6e120c8

ResourceGroupName

byocnl-6888-cus-group

SwXtchId

4a086023-6e29-44cc-a628-862175b17aaa

Status

OK

Licensing

License File

Bandwidth

0.0 bps/50.0G bps

Clients

2/5 | Bridges 0/5

License expiration

2024-Oct-18

NEW NOTIFICATIONS

Name	Class	Type	Rx (bps)	Rx (pps)	Tx (bps)	Tx (pps)	Primary IP	OS
byocnl-6888-cus-vm	swXtch	X1	149.5K	97.0	149.8K	98.0	10.128.0.6	Ubuntu 20.04
aks-nodpool1-23946266-vmss000000	xNIC	2	149.4K	97.0	0.0	0.0	10.128.0.4	Ubuntu 20.04
aks-nodpool1-23946266-vmss000001	xNIC	2	0.0	0.0	149.5K	97.0	10.128.0.5	Ubuntu 20.04

The cloudSwXtch is ready for use. IMPORTANT: Each client that is expected to get traffic from the cloudSwXtch will need an xNIC installed. See [Installing xNIC](#) for next steps in preparing clients (producers and consumers of Multicast).

#### Prerequisite: Installing Dependencies for Air-Gapped Clients

Before installing the xNIC, users will need to install the necessary packages on their air-gapped clients. Failure to complete this prerequisite will result in an unsuccessful xNIC deployment. To learn more, see [How to Install xNIC Dependencies in an Air-Gapped Environment](#).

## cloudSwXtch on GCP

### WHAT TO EXPECT

In this article, users will find links to articles on deploying a cloudSwXtch on Google Cloud Platform (GCP).

Currently, there is two ways of deploying a cloudSwXtch on GCP:

- [From the Google Cloud Marketplace](#)
  - **Note:** This method will require users to contact [swXtch.io](#) for a license.
- [Cloud agnostic cloudSwXtch VM Install](#)
  - **Note:** This method will require the user to already have a Virtual Machine installed with Ubuntu 20.04 that adheres to all the [cloudSwXtch System Requirements](#).

## Install cloudSwXtch via GCP Marketplace

### WHAT TO EXPECT

In this article, users will learn how to deploy a cloudSwXtch instance via the Google Cloud Platform (GCP) Marketplace.

- [Prerequisites](#)
- [Step One: Navigate to cloudSwXtch in the GCP Marketplace](#)
- [Step Two: Configure cloudSwXtch deployment](#)
- [Step Three: Add SSH Key\(s\)](#)
- [Required Step for BYOL: Contact swXtch.io for a License](#)

### Prerequisites

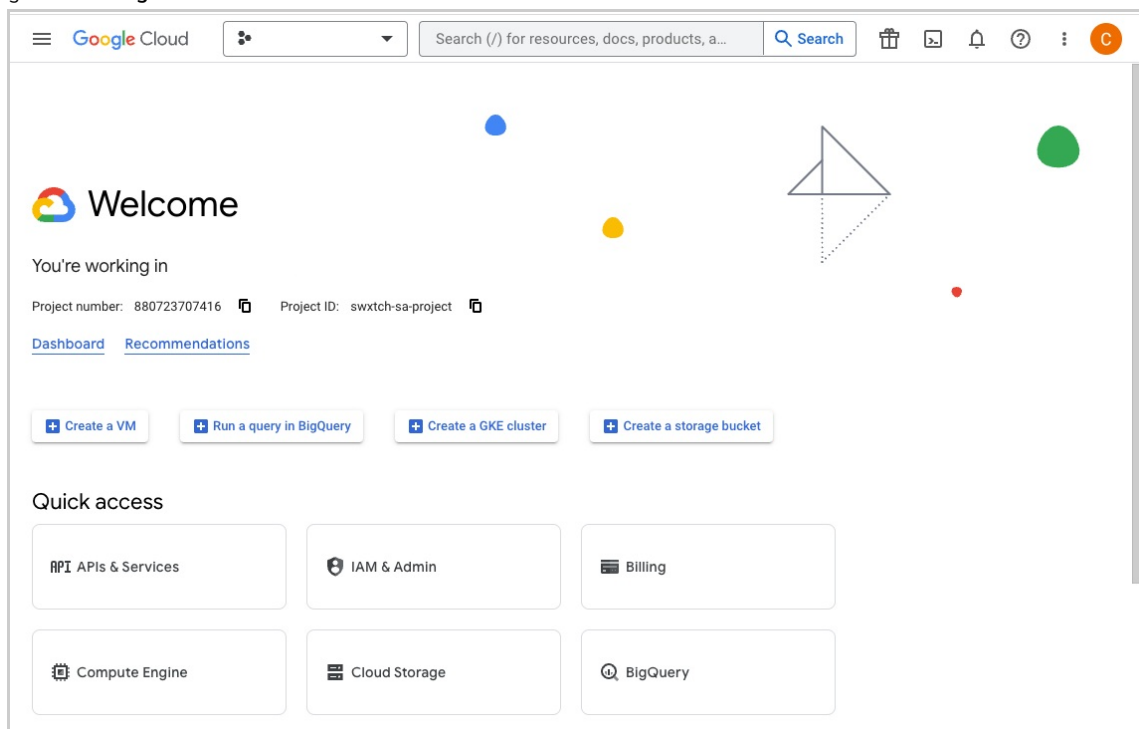
A user needs the following to deploy a cloudSwXtch via the GCP Marketplace:

- An existing **Deployment Service Account** established in their Google Cloud Console project. Creating a new account is further detailed in Step Two.
- **Two (2) VPCs available** -- one for the Control NIC and another for Data. All cloudSwXtch installations require 2 NICs. Please review GCP documentation on [how to create and modify VPCs](#).
  - **Note:** GCP does not allow you to have 2 NICs on the same VPC. It will return an error message. The Control and Data NIC must be assigned their own VPC.

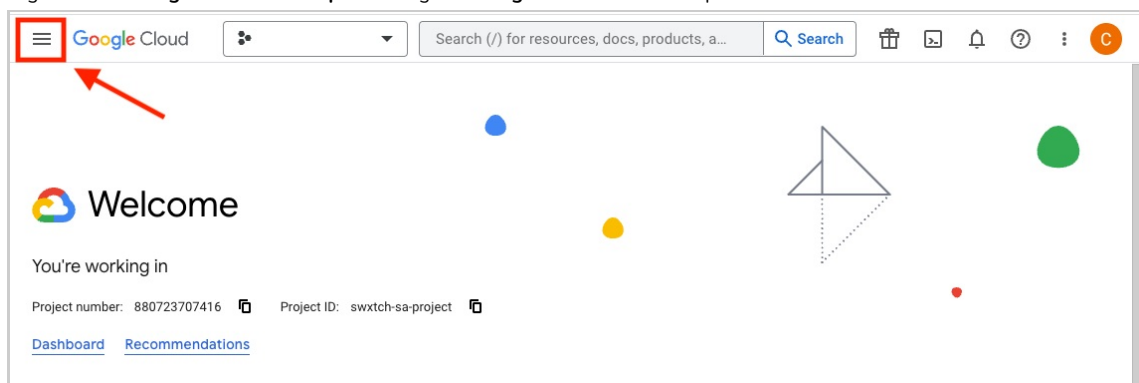
Please review [cloudSwXtch System Requirements](#) for additional prerequisites.

### Step One: Navigate to cloudSwXtch in the GCP Marketplace

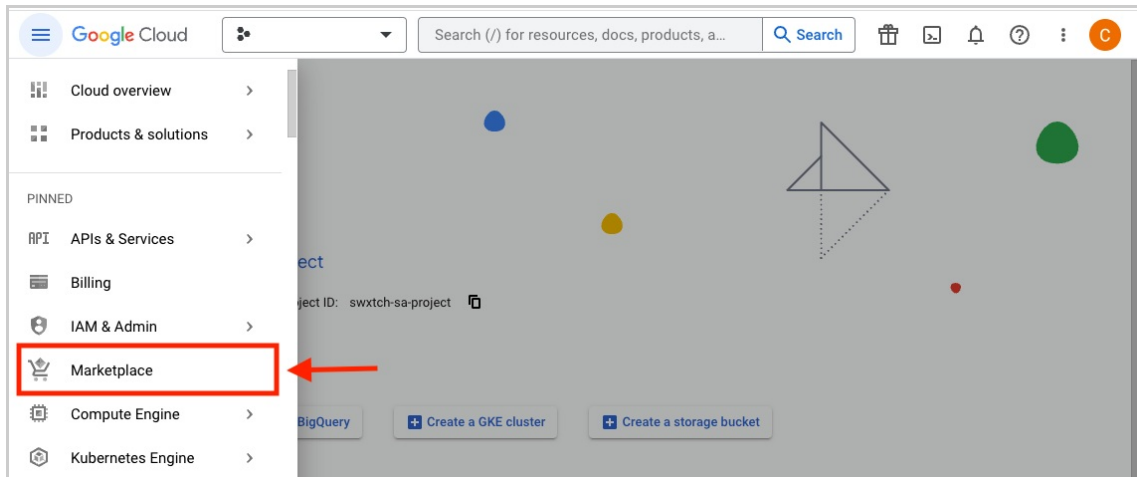
1. Log into the **Google Cloud Console**.



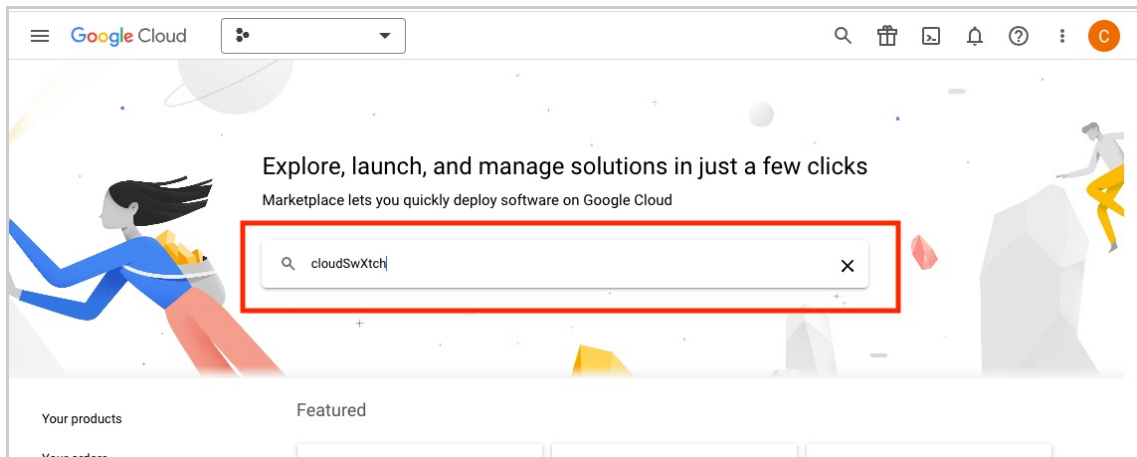
2. Navigate to the **Google Cloud Marketplace** using the **Navigation** menu at the top left corner.



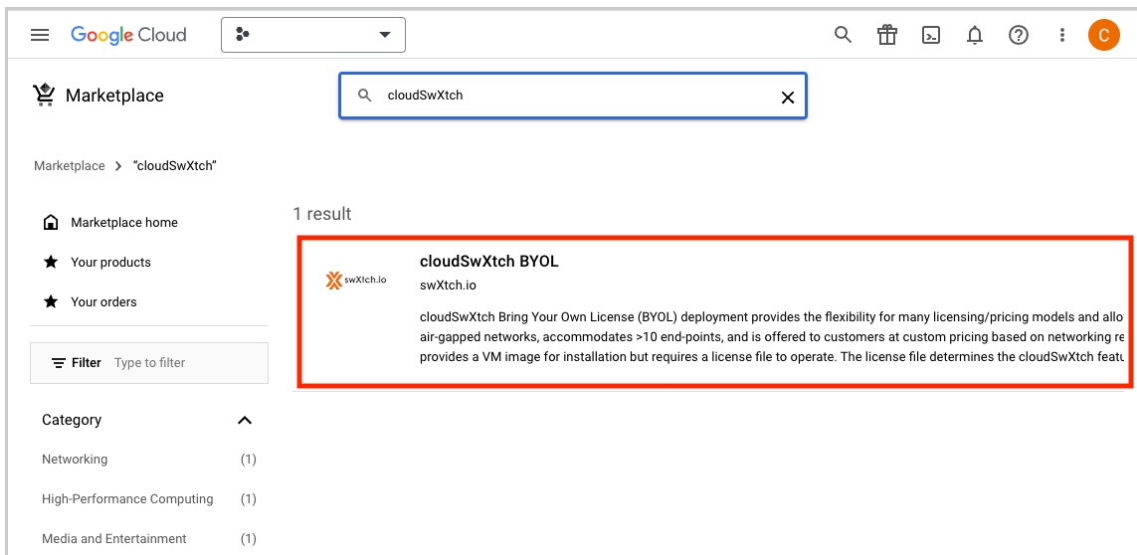
3. Select **Marketplace**.



4. Search for **cloudSwXtch**.

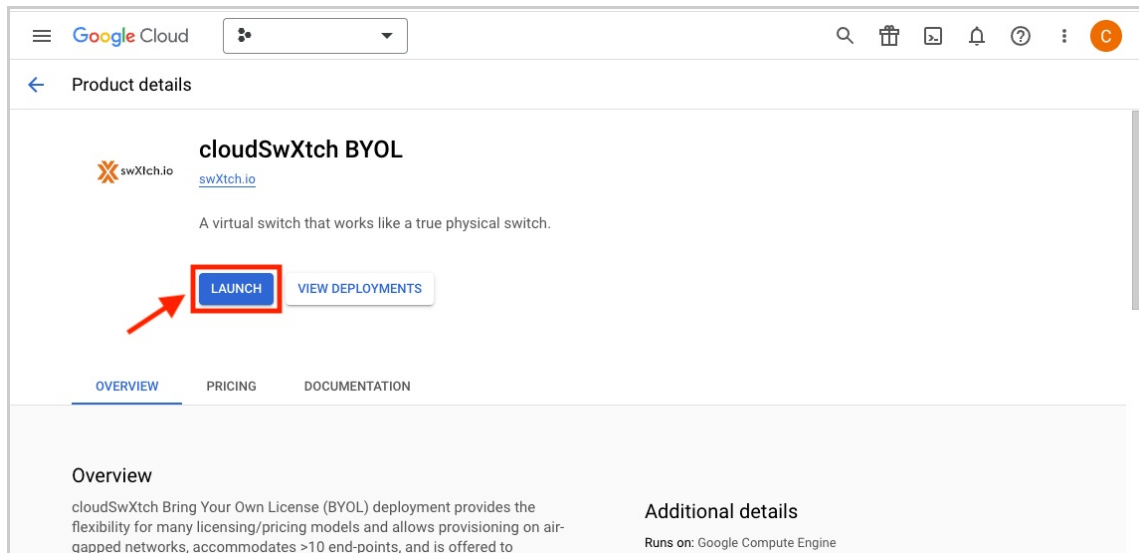


5. Select the product, **cloudSwXtch BYOL**.



6. Click **Launch** to open the deployment configuration page.





#### Enabling APIs

After hitting launch, a new window might open asking you to enable Google APIs. You must enable the suggested APIs to continue.

### Step Two: Configure cloudSwXtch Deployment

1. Enter a **Deployment name** for your cloudSwXtch.
2. Select an **Existing account** under Deployment Service Account.

- a. If you do not have a **Deployment Service Account**, select **New Account**. You will need permissions from your Project IAM Admin (or someone with the resourcemanager.projects.setiampolicy permissions) to allow you to create a new Deployment Service Account.
- b. Enter the same name used for your cloudSwXtch Deployment for your New Account Name and ID. The names must match and only use lowercase letters and numbers.
- c. **The account will be created after you deploy your cloudSwXtch.** Once an account is created, users without permissions can use it as an Existing account option.

Google Cloud swxtch-sa-project

### New cloudSwXtch BYOL deployment

Prices don't include private offer discounts

Deployment name \*  
cloudswxtch-2

Deployment Service Account ?

☐ Existing account

☒ New account

Create a new Service Account

This will create a new Service Account with the following roles:

- roles/config.agent
- roles/compute.admin

Name \*  
cloudswxtch-2

ID \*  
cloudswxtch-2

Description

Swxtch Machine Type

☒ General purpose ☐ Compute optimized ☐ Memory optimized

Additional information

cloudSwXtch BYOL overview  
Product provided by swXtch.io

Launching a BYOL product

cloudSwXtch BYOL is a BYOL (Bring Your Own License) product. Marketplace will deploy this product, but you are responsible for purchasing and managing the license directly from the provider

License for Cloud Marketplace virtual machine image solution with billing service cloudswxtch-byol endpoints.swxtchio-public.cloud.google.com: default usage fee (BYOL) ?  
Google does not collect this license fee.

Price estimates based on 30-day, 24hrs per day usage of the listed resources in the selected region. The Monthly Infrastructure Fee is not included in the estimates and varies depending on all Google Cloud IaaS resources actually created or consumed by this product (or the fees charged for such consumption). The provider of this product may be able to provide a more accurate estimate of monthly GCP IaaS consumption.

- Under **SwXtch Machine Type**, confirm that **N2** is selected under **Series**.
- Confirm your sizing under **Machine Type**. The **default** is set to **n2-standard-16**, which is 16 core. A **cloudSwXtch** must have a **minimum of 8 cores**. For cloudSwXtch Sizing guidelines, see [cloudSwXtch System Requirements](#).
- Confirm your desired **Zone**.

Google Cloud swxtch-sa-project

### New cloudSwXtch BYOL deployment

Swxtch Machine Type

☒ General purpose ☐ Compute optimized ☐ Memory optimized

Machine types for common workloads, optimized for cost and flexibility

Series  
N2

Powered by Intel Cascade Lake and Ice Lake CPU platforms

Machine type  
n2-standard-16 (16 vCPU, 8 core, 64 GB memory)

vCPU  
16

Memory  
64 GB

Zone  
us-central1-a

Price estimates based on 30-day, 24hrs per day usage of the listed resources in the selected region. The Monthly Infrastructure Fee is not included in the estimates and varies depending on all Google Cloud IaaS resources actually created or consumed by this product (or the fees charged for such consumption). The provider of this product may be able to provide a more accurate estimate of monthly GCP IaaS consumption.

- Use the dropdown arrow under **Control network interface** to open the configuration panel. If your default subnet is already selected and you do not wish to set a public IP, continue you on Step 10.

Control network interface

Definitions for the control network interface.

Network interfaces

default default (10.128.0.0/20)	⌵
---------------------------------	---

ADD A NETWORK INTERFACE

- Select a **Network** and **Subnetwork**. This subnet will be used for your control plane communications.
  - Optional:** Users can select Ephemeral under External IP if they wish for their Control NIC to be assigned a randomized public IP address.

**Control network interface**  
Definitions for the control network interface.

**Network interfaces**

Edit network interface

Network: default

Subnetwork: default

External IP: None (selected), Ephemeral

DONE

8. Click **Done** when you are happy with your selections.
9. Use the dropdown arrow under **Data network interface** to open the configuration panel.

**Data network interface**  
Definitions for the data network interface.

**Network interfaces**

vpc02 dpdk-uscentral1 (10.28.0.0/20)

ADD A NETWORK INTERFACE

10. Select a **Network** and **Subnetwork**. This 2nd subnet will be used for your data plane communications and should've been created before starting the deployment process.
  - a. **Please note:** The control and data NICs cannot share a subnet. They must have separate subnets.
  - b. **Optional:** Users can select Ephemeral under External IP if they wish for their Data NIC to be assigned a randomized public IP address.

**Data network interface**  
Definitions for the data network interface.

**Network interfaces**

Edit network interface

Network: vpc02

Subnetwork: dpdk-uscentral1

External IP: None (selected), Ephemeral

DONE

11. Click **Done** when you are happy with your selections.
12. Click **Deploy**.

default default (10.128.0.0/20)

ADD A NETWORK INTERFACE

**Data network interface**  
Definitions for the data network interface.

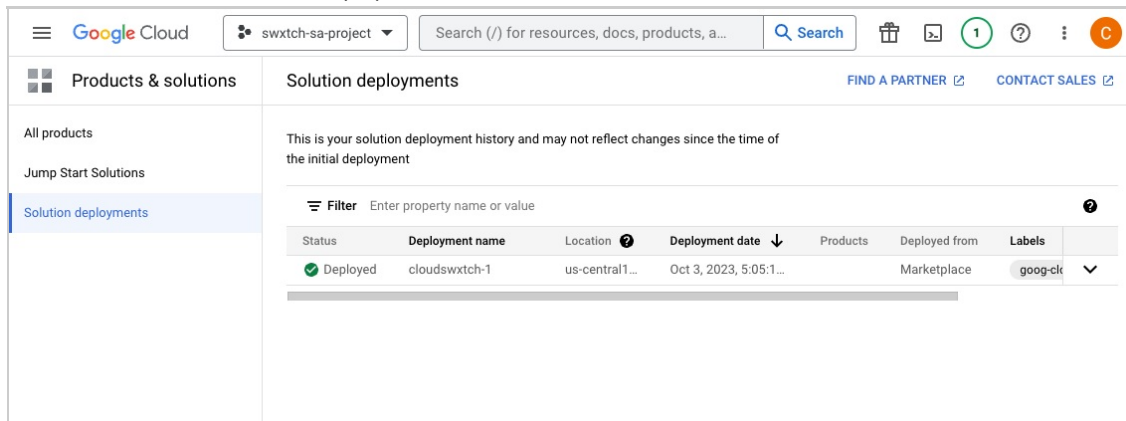
**Network interfaces**

vpc02 dpdk-uscentral1 (10.28.0.0/20)

ADD A NETWORK INTERFACE

DEPLOY

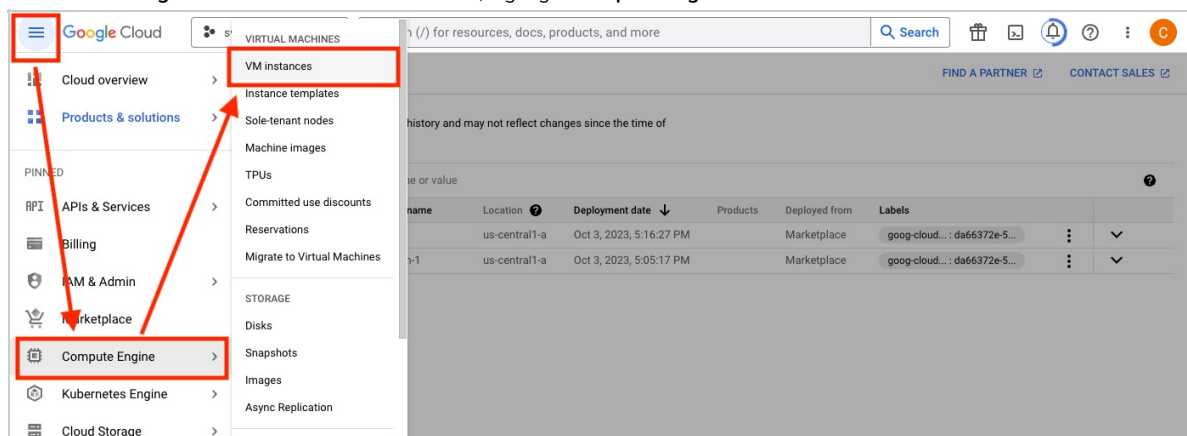
Your cloudSwXtch instance will now be deployed.



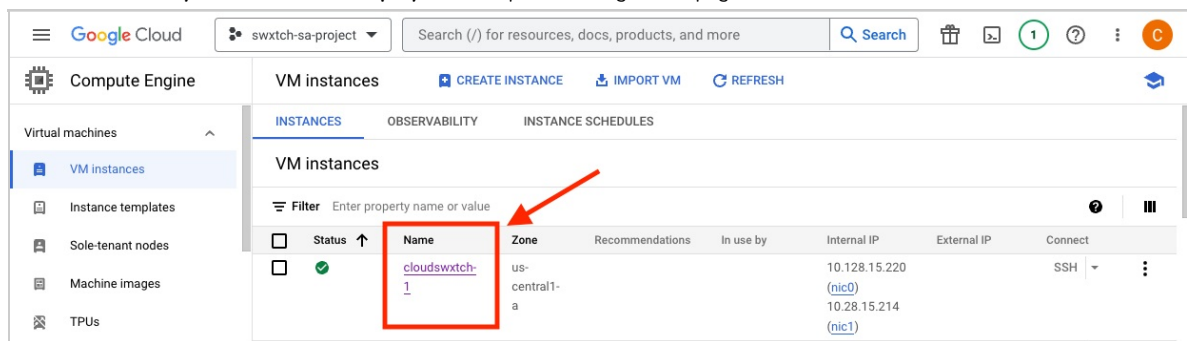
### Step Three: Add SSH Key(s)

In order to access your Google Cloud VM instance, you will need to add an SSH key to your cloudSwXtch deployment.

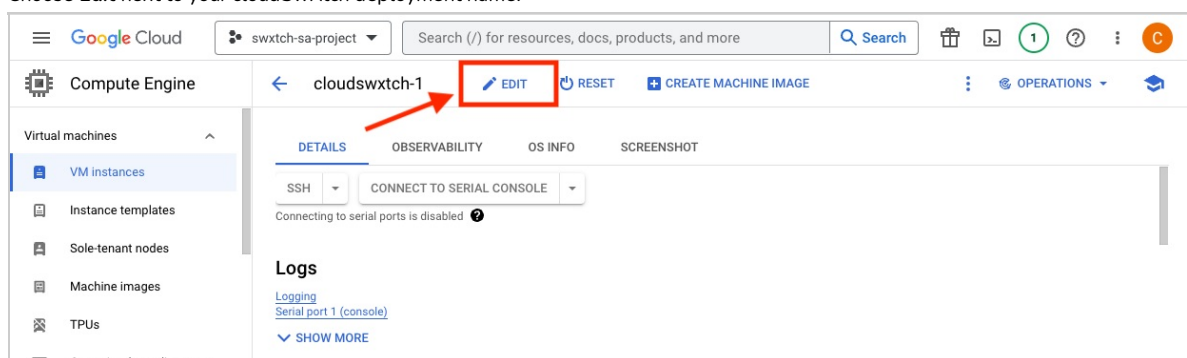
1. Click on the **Navigation** menu on the left hand corner, highlight **Compute Engine** and select **VM instances**.



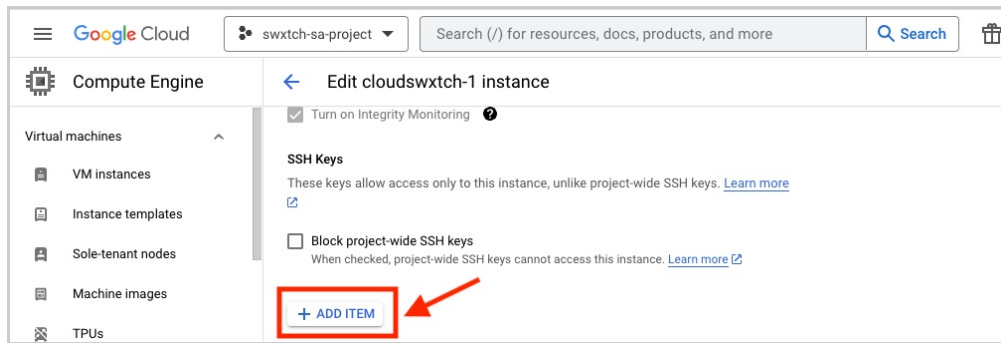
2. Select the **name of your cloudSwXtch deployment** to open its configuration page.



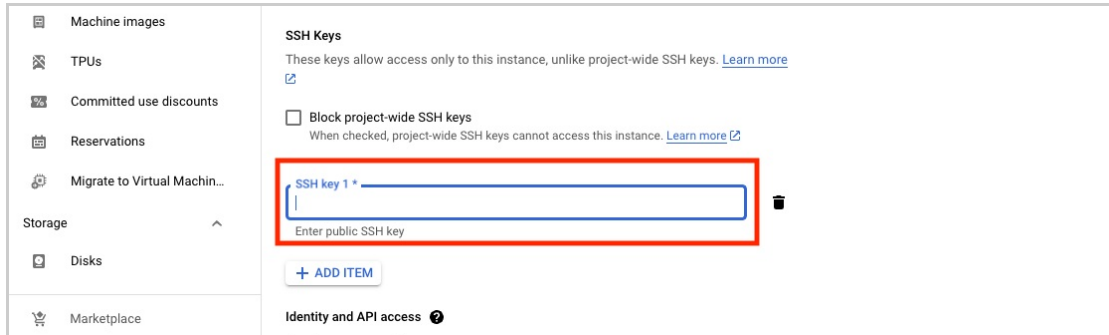
3. Choose **Edit** next to your cloudSwXtch deployment name.



4. Scroll down to **SSH Keys** under **Security and Access**.
5. Click **+Add Item**.



6. Enter your **SSH key**. You can add multiple.



7. Hit **Save** at the bottom of the page.

#### Upgrading your cloudSwXtch Instance

After deployment, it is recommended to update your cloudSwXtch instance to latest. Please refer to the [Upgrading cloudSwXtch](#) article for more information.

#### Required Step for BYOL: Contact swXtch.io for a license

Users deploying a BYOL instance of cloudSwXtch will need to contact swXtch.io for a license file. For more information, see [How to License a cloudSwXtch](#).

## cloudSwXtch on OCI

### WHAT TO EXPECT

In this article, users will find links to articles on deploying a cloudSwXtch in Oracle Cloud Infrastructure (OCI).

Currently, there are only two ways of deploying a cloudSwXtch on OCI:

- [From the Oracle Cloud Marketplace](#)
  - **Note:** This method will require users to contact swXtch.io for a license.
- [Cloud agnostic cloudSwXtch VM Install](#)
  - **Note:** This method will require the user to already have a Virtual Machine installed with Ubuntu 20.04 that adheres to all the [cloudSwXtch System Requirements](#).

Please stay tuned for more information about alternative methods of installation.

## Install cloudSwXtch via OCI Marketplace

### WHAT TO EXPECT

In this article, users will learn how to deploy a cloudSwXtch instance via the Oracle Cloud Marketplace.

- [Step One: Navigate to cloudSwXtch in the Oracle Marketplace](#)
- [Step Two: Create Compute Instance](#)
- [Step Three: Attach Secondary VNIC](#)
- [Optional Step for BYOL: Contact swXtch.io for License](#)

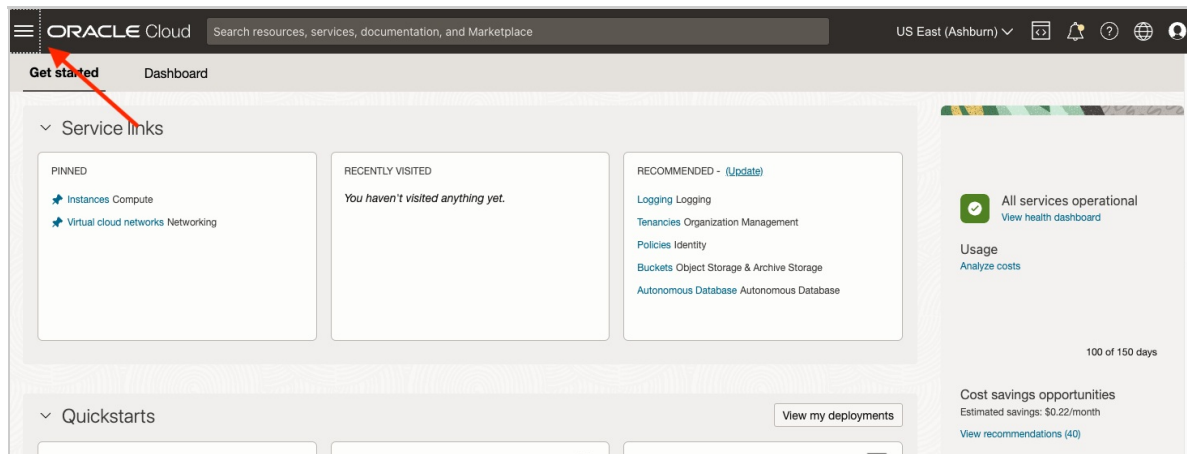
**Please note:** At this time, our only product offering in OCI is a BYOL instance of cloudSwXtch. This requires a user to contact swXtch.io for a license.

### Prerequisites

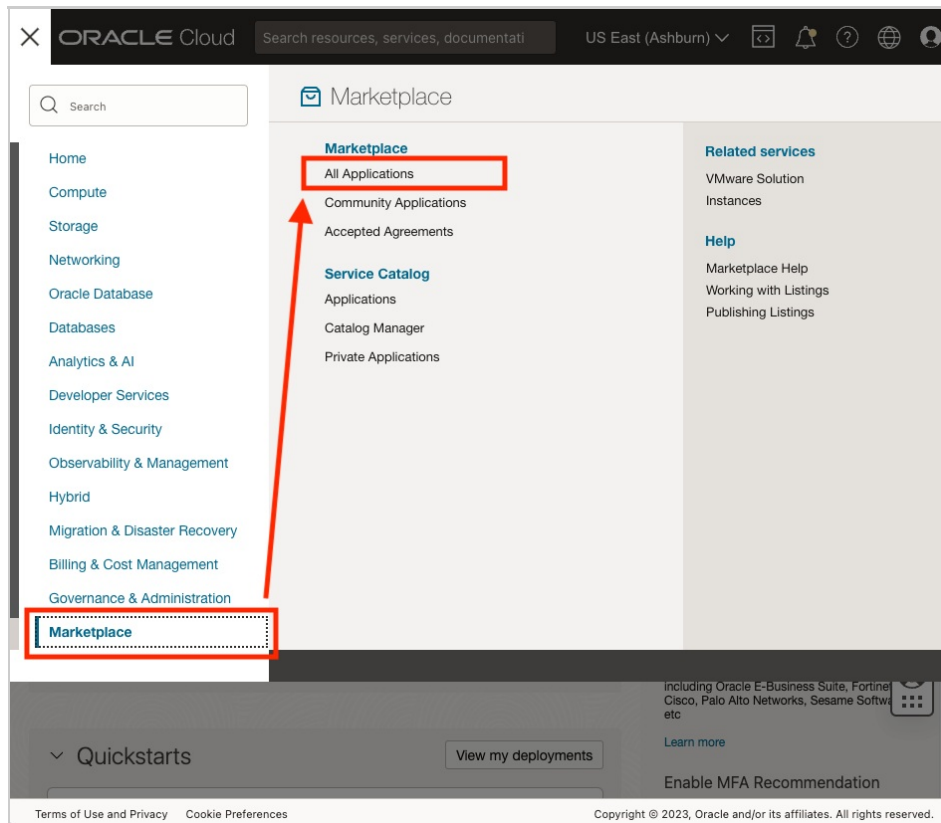
A user should have a **Compartment** established in their Oracle Cloud console before they start to deploy a cloudSwXtch. For more information about compartments, please see the [Managing Compartments](#) page under Oracle Cloud Infrastructure Documentation.

### Step One: Navigate to cloudSwXtch in the Oracle Marketplace

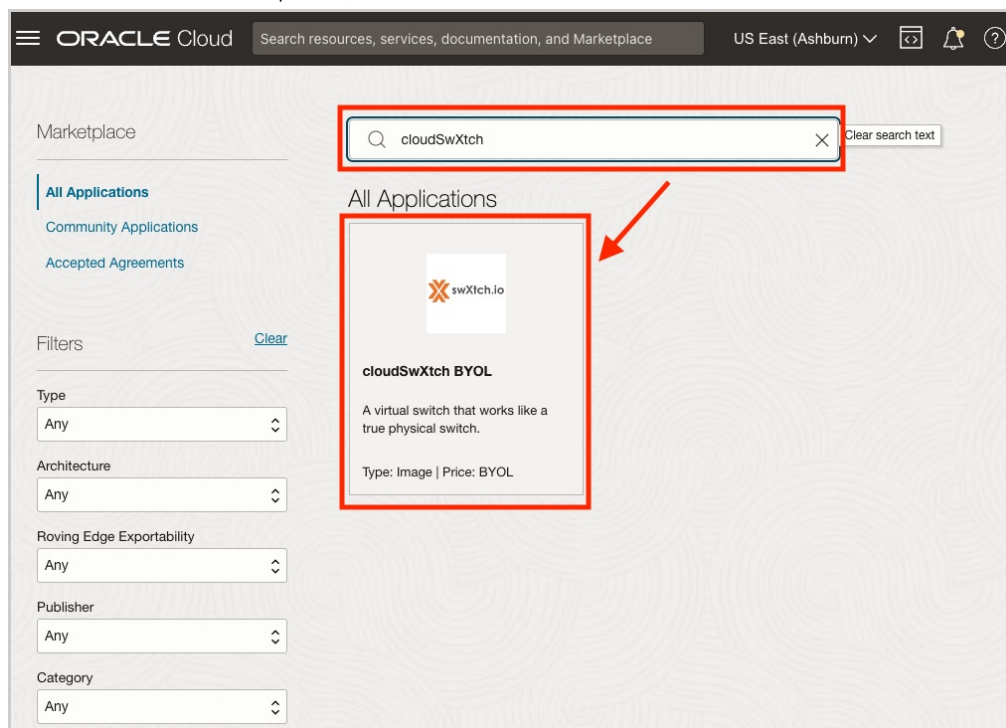
1. Log into **Oracle Cloud**.
2. Navigate to the **Oracle Cloud Marketplace** using the **Navigation** menu at the top left corner.



3. Select **Marketplace** and **All Applications**.



4. Search for **cloudSwXtch** and select the product, **cloudSwXtch BYOL**.



5. Select the **Version** and the **Compartment** that you will like to use. It is best to use the default since it will be the most recent version.
6. Click **Launch Instance** when you're happy with your selections.



**cloudSwXtch BYOL**

A virtual switch that works like a true physical switch.

cloudSwXtch BYOL can be provisioned on cloud deployments, including air-gapped networks. BYOL is offered to customers at custom pricing based on features and networking requirements. This plan provides a VM image for installation and requires a license file to operate.

Categories: Cloud Management, Migration, Networking

**Type**  
Image

**Version**  
2.0.15 (8/2/2023) - de...

**Compartment**  
SA

**Software price per OCPU**  
BYOL  
(Bring your own license)

There are additional fees for the infrastructure usage.

☒ I have reviewed and accept the [Oracle terms of use](#) and the [Partner terms and conditions](#).

**Launch Instance**

Reminder: Patch the instance once installed.

**Overview** | Provider | More apps | Usage instructions

**App by swxtch**

cloudSwXtch **Bring Your Own License (BYOL)** deployment provides the flexibility for many licensing/pricing models and allows provisioning on air-gapped networks, accommodates >10 end-points, and is offered to customers at custom pricing based

**Support**

**Contacts:**  
**Links:**  
[cloudSwXtch Support](#)

## Step Two: Create Compute Instance

1. Give your **Compute Instance** a unique name.
2. Confirm that your desired **Compartment** is populated.
3. **Optional:** Edit selections for **Placement** and **Security**. This is dependent on a user's specific needs.

**Create compute instance**

Create an instance to deploy and run applications, or save as a reusable Terraform stack for creating an instance with Resource Manager.

**Name**  
docs-test-instance

**Create in compartment**  
SA

swxtchocipoc (root)/SA

**Placement** [Edit](#)

**Availability domain:** AD-2 Always Free-eligible **Capacity type:** On-demand capacity

**Fault domain:** Let Oracle choose the best fault domain

**Security** [Edit](#)

**Shielded instance:** Disabled

**Confidential computing:** Disabled

**Summary** [i](#)  
Compute instance

4. Select the **Edit** button for **Image and Shape**.

**Image and shape**

**Image:** cloudSwXtch BYOL

**Shape:** VM.Standard.E2.1.Micro Always Free-eligible

**OCPU count:** 1

**Memory (GB):** 1

**Network bandwidth (Gbps):** 0.48

**Edit**

- a. Confirm that **cloudSwXtch BYOL** is selected for **Image**.

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Search resources, services, documentation, and Marketplace

US East (Ashburn)

Create compute instance

Image and shape

swXtch.io

cloudSwXtch BYOL

A virtual switch that works like a true physical switch.

Return to Marketplace

Shape

VM.Standard.E2.1.Micro

Always Free-eligible

Virtual machine, 1 core OCPU, 1 GB memory, 0.48 Gbps network bandwidth

Change shape

b. Click **Change Shape**.

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Search resources, services, documentation, and Marketplace

US East (Ashburn)

Create compute instance

Image and shape

swXtch.io

cloudSwXtch BYOL

A virtual switch that works like a true physical switch.

Return to Marketplace

Shape

VM.Standard.E2.1.Micro

Always Free-eligible

Virtual machine, 1 core OCPU, 1 GB memory, 0.48 Gbps network bandwidth

Change shape

c. Choose **Intel** and **VM.Standard3.Flex**.

### Browse all shapes

prepayments. Upgrade

Instance type

**Virtual machine** Always Free-eligible

A virtual machine is an independent computing environment that runs on top of physical bare metal hardware. ✓

**Bare metal machine**

A bare metal compute instance gives you dedicated physical server access for highest performance and strong isolation.

Shape series

**AMD**

Flexible OCPU count. Current generation AMD processors.

**Intel**

Flexible OCPU count. Current generation Intel processors. ✓

**Ampere**

Arm-based processor.

**Specialty and previous generation**

Always Free, Dense I/O, GPU, HPC, Generic, and earlier generation AMD and Intel standard shapes.

Image: Canonical Ubuntu 20.04

Shape name	OCPU ⓘ	Memory (GB)	Security
<input checked="" type="checkbox"/> VM.Standard3.Flex	4 (56 max)	64 (896 max)	🛡️ ⬆️

Network bandwidth (Gbps): 4

Maximum VNICS: 4 ⓘ

You can customize the number of OCPUs and the amount of memory allocated to a flexible shape.

Select shape Cancel

- d. Configure the **Number of OCPUs** and **Amount of memory (GB)**. Please note: It is recommended to have **at least eight (8) cores** for your cloudSwXtch instance. For more information on recommended sizing, please see [cloudSwXtch System Requirements](#).

### Browse all shapes

Shape name	OCPU ⓘ	Memory (GB)	Security
<input checked="" type="checkbox"/> VM.Standard3.Flex	8 (56 max)	32 (896 max)	🛡️ ⬆️

Network bandwidth (Gbps): 8

Maximum VNICS: 8 ⓘ

You can customize the number of OCPUs and the amount of memory allocated to a flexible shape. The other resources scale proportionately. [Learn more about flexible shapes](#).

Number of OCPUs

8 1 8 16 24 32 56 Extended OCPU ⓘ

Amount of memory (GB)

32 1 32 128 256 384 512 896 Extended memory ⓘ

**Burstable**

☐ Burstable instances are virtual machine (VM) instances that provide a baseline level of CPU performance with the ability to burst to a higher level to support occasional increases in usage.

<input type="checkbox"/> VM.Optimized3.Flex	4 (18 max)	56 (256 max)	🛡️ ⬆️
---	------------	--------------	-------

1 selected Showing 2 items

Select shape Cancel

- e. Click **Select Shape** when you're happy with your selection.
5. Select the **Edit** button for **Primary VNIC** information.

Primary VNIC information

Virtual cloud network: vcn-sa

Subnet: subnet-sa-jh

Launch options: -

Use network security groups to control traffic: No

Assign a public IPv4 address: Yes

DNS record: Yes

Edit

- Optional:** Add a name to your VNIC. If left blank, Oracle will assign it the name of your instance with a note that it is the Primary VNIC.
- Assign a **VCN** to your **Primary VNIC**.
- Select a **subnet**. **Please note:** This ctrl subnet will also be used for your secondary VNIC.

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## Create compute instance

Primary VNIC information [Collapse](#)

A [virtual network interface card \(VNIC\)](#) connects your instance to a [virtual cloud network \(VCN\)](#) and endpoints in and outside the VCN. Having a public IP address is required to make this instance accessible from the internet.

VNIC name *Optional*

Primary network

☒ Select existing virtual cloud network ☐ Create new virtual cloud network ☐ Enter subnet OCID

VCN in SA [\(Change compartment\)](#)

vcn-sa

Subnet

An IP address from a public subnet and an [internet gateway](#) on the VCN are required to make this instance accessible from the internet.

☒ Select existing subnet ☐ Create new public subnet

Subnet in SA [\(Change compartment\)](#)

subnet-sa-ctrl (regional)

- Click on **Show advanced options**.

Primary VNIC IP addresses

Private IPv4 address

☒ Automatically assign private IPv4 address ☐ Manually assign private IPv4 address

Public IPv4 address

☒ Automatically assign public IPv4 address

If you're not sure whether you need a public IP address, you can always assign one later.

IPv6 addresses

☐ Assign IPv6 addresses from subnet prefixes

You can only assign one IPv6 address per subnet prefix at first instance creation. Subnets can have more than one IPv6 prefix.

[Show advanced options](#)

The selected VCN and subnet combination does not support IPv6 addresses. You must enable IPv6 addressing on the VCN and subnet before you can assign IPv6 addresses to this instance.

- Select **Hardware-assisted (SR-IOV) networking** under **Launch options**.

[Hide advanced options](#)

**Advanced options**   VCN tags   Subnet tags

☐ Use network security groups to control traffic ⓘ

DNS record  
☒ Assign a private DNS record   ☐ Do not assign a private DNS record

Hostname *Optional*

No spaces. Only letters, numbers, and hyphens. 63 characters max.

**Fully qualified domain name:** <hostname>.sactrl.vcn07241005.oraclevcn.com

Launch options  
☐ Let Oracle Cloud Infrastructure choose the best networking type  
Allow Oracle Cloud Infrastructure to choose the [networking type](#), depending on the instance shape and operating system image.  
☐ Paravirtualized networking  
For general purpose workloads such as enterprise applications, microservices, and small databases.  
☒ **Hardware-assisted (SR-IOV) networking**  
For low-latency workloads such as video streaming, real-time applications, and large or clustered databases. Does not support live migration.

6. Add an SSH key.

**Add SSH keys**

Generate an [SSH key pair](#) to connect to the instance using a Secure Shell (SSH) connection, or upload a public key that you already have.

☒ Generate a key pair for me   ☐ Upload public key files (.pub)   ☐ Paste public keys   ☐ No SSH keys

**i** Download the private key so that you can connect to the instance using SSH. It will not be shown again.

[↓ Save private key](#)   [↓ Save public key](#)

7. Hit **Create** button when you're happy with all of your selections.

### Step Three: Attach a Secondary VNIC

When deploying a cloudSwXtch, you will need two VNICs. Both can share a single subnet for control and data plane communications. In this step, we will walkthrough how to attach your secondary VNIC and how to manually add its IP to your cloudSwXtch instance.

1. Make sure that your **Instance with cloudSwXtch installed is running**. You **cannot** attach a secondary VNIC if the machine is off.
2. Select **Attached VNICs** under **Resources**.

**Resources**

[Metrics](#)  
[Quick actions](#)  
[Attached block volumes](#)  
[Attached VNICs](#)  
[Boot volume](#)  
[Console connection](#)  
[Run command](#)

**Attached VNICs**

A [virtual network interface card \(VNIC\)](#) attaches an instance to a subnet within a VCN and is required for connectivity with other endpoints.

[Create VNIC](#)

Name	Subnet or VLAN ⓘ	State	FQDN ⓘ	VLAN tag	MAC address
<a href="#">docs-test-instance</a> (Primary VNIC)	Subnet - <a href="#">subnet-sa-jh</a>	● Attached	docs-test-... <a href="#">Show</a> <a href="#">Copy</a>	2726	02:00:17:14:06:D6

Showing 1 item < 1 of 1 >

3. Click **Create VNIC**.
  - a. **Pro-Tip:** Assign your secondary VNIC a user-friendly name. Otherwise, Oracle will assign a randomized ID.
  - b. Choose the same **Virtual cloud network** and ctrl **Subnet** as your Primary VNIC.
  - c. Select **Save Changes**.

### Create VNIC

VNIC name *Optional*

Virtual cloud network in SA [\(Change compartment\)](#)

vcn-sa

Network

**Normal setup: subnet**

The typical choice when adding a VNIC to an instance. ✓

**Advanced setup: VLAN**

Only for experienced users who have purchased the Oracle Cloud VMware Solution.

Subnet in SA [\(Change compartment\)](#)

subnet-sa-ctrl (regional)

☐ Use network security groups to control traffic (optional) ⓘ

☐ Skip source/destination check ⓘ

VNIC IP addresses

Private IPv4 address

**Save changes** [Cancel](#)

4. Click on the freshly created VNIC's name after it finishes attaching.

Resources

Metrics

Quick actions

Attached block volumes

**Attached VNICs**

Boot volume

Console connection

Run command

Work requests

OS Management

### Attached VNICs

A [virtual network interface card \(VNIC\)](#) attaches an instance to a subnet within a VCN and is required for connectivity with other endpoints.

[Create VNIC](#)

Name	Subnet or VLAN ⓘ	State	FQDN ⓘ	VLAN tag	MAC address
<a href="#">docs-test-instance</a> (Primary VNIC)	Subnet - <a href="#">subnet-sa-lh</a>	Attached	docs-test-... <a href="#">Show</a> <a href="#">Copy</a>	2726	02:00:17:14:06:D6
<a href="#">vnic20230912182454</a>	Subnet - <a href="#">subnet-sa-ctrl</a>	Attached	-	3514	00:00:17:02:A8:85

Showing 2 items < 1 of 1

5. Record the **Private IP address**. **You will need it later.**

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Compute > Instances > Instance Details > Attached VNICs > VNIC Details

## vnic20230912182454

[Delete](#) [Add tags](#)

AVAILABLE

VNIC Information

Tags

### VNIC Information

OCID: ...ulzvyq [Show](#) [Copy](#)

Created: Tue, Sep 12, 2023, 18:24:54 UTC

Compartment: swxtchocipoc (root)/SA

Subnet: [subnet-sa-ctrl](#)

Skip Source/Destination Check: No

MAC Address: 00:00:17:02:A8:85

VLAN Tag: 3514

### Primary IP Information

**Private IP Address: 10.0.21.174**

Private IP OCID: ...4lphma [Show](#) [Copy](#)

Assigned: Tue, Sep 12, 2023, 18:24:52 UTC

Network Security Groups: - [Edit](#)

Fully Qualified Domain Name: -

Public IP Address: (Not Assigned)

6. Log into your Instance with cloudSwXtch installed.
7. Create the following file in the `/etc/netplan` folder and name it `02-datanic-static-config.yaml`. Please note: You will need to add the Private IP Address of the secondary VNIC into the file below.

Bash	Copy
<pre>network:     version: 2     ethernet:         ens4:             match:                 macaddress: 02:00:17:09:c2:cf             dhcp4: false             addresses:                 - &lt;ADD IP ADDRESS OF 2ND VNIC&gt;/&lt;XX&gt;</pre>	

Where the <XX> is the net mask (or network mask) of ctrl-plane CIDR (in single-subnet configuration).

8. Apply the new config (**sudo netplan apply**).
9. Find the file **/etc/iptables/rules.v4** and open it in your editor.
10. Search for the following lines:

Bash	Copy
<pre>-A INPUT -p all -s 10.0.128.0/24 -j ACCEPT -A INPUT -p all -s 10.0.192.0/24 -j ACCEPT</pre>	

11. Replace the **CIDRs** with your own **CIDRs**, corresponding to the ctrl and data subnets. These numbers can be the same if using a single-subnet configuration for both your VNICs.
12. Save file and reboot instance.

**The secondary VNIC should now be successfully attached.**

#### Upgrading your cloudSwXtch

After deployment, it is recommended to update your cloudSwXtch instance to latest. Please refer to the [Upgrading cloudSwXtch](#) article for more information.

### Optional Step for BYOL: Contact swXtch.io for a license

Users deploying a BYOL instance of cloudSwXtch will need to contact swXtch.io for a license file. For more information, see [How to License a cloudSwXtch](#).

#### NEXT STEPS

**The cloudSwXtch is ready to use.** The next step is to install the xNIC on each client expected to get traffic from the cloudSwXtch. See [Installing xNIC](#) for more information on preparing clients. [How to License a cloudSwXtch](#)



# Cloud agnostic cloudSwXtch VM Install

## WHAT TO EXPECT

In this article, you will learn how to install a cloudSwXtch instance on an existing Linux Ubuntu 20.04 virtual machine. This install process can be used on any cloud but requires a license file from swXtch.io. For more information about VM prerequisites, please see the [cloudSwXtch System Requirements](#).

## Pre-Installation Step: Create VM

Before installing cloudSwXtch, you will need to create an **Ubuntu 20.04 virtual machine** on your desired cloud **with connection to the internet**. In addition, it should encompass all the prerequisites outlined in the [cloudSwXtch System Requirements](#)

## Step One: Install cloudSwXtch

In this step, users will execute commands in their VMs to manually install a cloudSwXtch instance.

1. Run your freshly created virtual machine using your desired tool.
2. Enter the following command to download the **cloudSwXtch installer script**:

Shell



```
Bash Copy
token="si=RDONLY&spr=https&sv=2021-06-08&sr=c&sig=xyPF7SyI1cagUAEIZViqCHz7RroFTy2Fk1tn2wwwMzc%3D"
curl -X GET -H "x-ms-date: $(date -u)"
"https://sdmcddevstorage.blob.core.windows.net/imagebuilder/image_install.sh?${token}" -o image_install.sh
chmod +x image_install.sh
```

3. Use the following command to get the latest version of cloudSwXtch. **The latest release is 3.2.0.**

Shell



```
Bash Copy
ver="v3.2.0"
```

4. Enter the following to download that version.

Shell



```
Bash Copy
curl -X GET -H "x-ms-date: $(date -u)"
"https://sdmcddevstorage.blob.core.windows.net/imagebuilder/install-${ver}.tar.gz?${token}" -o install-
${ver}.tar.gz
```

5. Execute the installer.

Shell



```
Bash Copy
sudo ./image_install.sh ${ver}
```

- a. **Precision Time Protocol (PTP)** is not installed at default. Users can install with the argument `--ptp true` with the installer script. This should only be done if they plan to deploy a PTP configuration with their endpoints. For guidance on how to enable PTP for the xNIC, see [Windows](#) and [Linux](#) installation guides.

With both files on the VM (and in the same directory), run the installer as follows:

```
Bash Copy
sudo ./image_install.sh ${ver} --ptp true
sudo reboot now
```

This will automatically reboot the machine.

## Step Two: Contact swXtch.io for a license

Users will need to contact swXtch.io for a license file. For more information, see [How to License a cloudSwXtch](#).



## NEXT STEPS

The cloudSwXtch is ready to use. The next step is to install the xNIC on each client expected to get traffic from the cloudSwXtch. See [Installing xNIC](#) for more information on preparing clients.

# Licensing cloudSwXtch

## WHAT TO EXPECT

In this article, users will learn about the different license options available for deploying a cloudSwXtch with links to each article. A licensing method is required in order to use a cloudSwXtch.

## Licensing Options

There are two ways to license a cloudSwXtch:

1. **Marketplace (Private Offer or PAYG for Trials):** In this case, you are charged through your cloud provider for the cloudSwXtch and you pay based on usage.
2. **Bring Your Own License (BYOL):** With BYOL, there are two options - either through a individual license file or a cloudSwXtch licensing server.
  - a. **License File:** A license file must be negotiated and requested on a per cloudSwXtch basis.
  - b. **cloudSwXtch Licensing Server:** A licensing server must be negotiated and can handle multiple cloudSwXtches with varying entitlements.To negotiate a license file or server, please contact support@swxtch.io.

### How Does cloudSwXtch Prioritize License Types?

The cloudSwXtch takes an intuitive approach to licensing by looking for each type during initialization. It prioritizes the license type as follows:

1. License File
2. Licensing Server
3. Marketplace License

For example, if a license file, or license.json, is in place, the cloudSwXtch will prioritize that file over the licensing server. By removing or renaming the license.json, the cloudSwXtch will then look for the licensing server file, or remote-licensing.json. If there is no licensing server, the cloudSwXtch will look for a marketplace license.

Once the cloudSwXtch has exhausted all three methods, it will be marked as **Not Authorized** and will not work.

## License File

### WHAT TO EXPECT

In this article, users will learn the appropriate steps for licensing their cloudSwXtch instance via a License File provided by swXtch.io. First, they will need to open swXtch-top on their cloudSwXtch VM and copy the swXtchID. They will then provide the cloudSwXtch ID number to swXtch.io, requesting a license. Finally, they will move the new license.json file into the cloudSwXtch directory and check swXtch-top to see if the license has taken hold.

This is one of the methods for licensing a cloudSwXtch. To license via a licensing server, see [here](#).

### Locating the SwXtchID and Requesting a License

In order to receive a license file from swXtch.io Support, users will need to provide them with a cloudSwXtch ID number. This is something that can be found in swXtch-top or through a command.

1. Log into the newly created cloudSwXtch VM.
2. Run the command:

Bash	Copy
<pre>sudo /swxtch/swxtch-top dashboard --swxtch localhost</pre>	

3. The swxtch-top dashboard will display.
  - a. Alternatively, if you do not want to open swxtch-top, you can use the following commands to get the swXtchID:

Bash	Copy
<pre>curl -s http://127.0.0.1/top/dashboard   grep -m 2 -Eo '"fingerprint"[^,]*'   head -1</pre>	

4. Copy the **SwXtchID** and email it to support@swxtch.io, requesting a license file.

### Adding the License File to the cloudSwXtch VM

After receiving a license file from swXtch.io, users will now need to upload onto their cloudSwXtch VM.

1. Upload the license.json file onto the cloudSwXtch VM.
2. Move the license.json file to the /swxtch directory using the following command replacing user with the appropriate value:

Bash	Copy
<pre>sudo mv /home/&lt;user&gt;/license.json /swxtch</pre>	

3. Return to the swxtch-top dashboard and check if the license has taken hold.

# Licensing Server

## WHAT TO EXPECT

In this article, users will learn about licensing cloudSwXtches via a Licensing Server. This process is comprised of two main steps:

1. Creating a Licensing Server VM
2. Licensing a cloudSwXtch with the Licensing Server

This article will also explain how to add multiple license bundles to an existing licensing server and how to add license bundles with different entitlements.

## Creating a Licensing Server

Before creating a licensing server, users will need to deploy a virtual machine that adheres to the following requirements.

### Licensing Server VM Requirements

The Licensing Server is supported on Ubuntu 20.04 and 22.04. Since it is a lightweight service, it does not require many resources. For most clouds, it will work on a single core machine with at least 1GBs of memory. Here are some instance recommendations:

- AWS: t2.small (1 core / 2GB RAM)
- Azure: Standard\_B1ms (1 core / 2GB RAM)
- GCP: e2-small (2 cores / 2GB RAM)

The Licensing Server uses an HTTP connection. Port 8081 should be open for both the licensing server VM and the cloudSwXtch. Licensing server if not in the same VPC will require a public IP or peering to ensure connectivity to the cloudSwXtch(s).

**Docker must be installed on the virtual machine.** For quick instructions, see [How to Install Docker on RHEL and Ubuntu](#). For more detailed steps, see [Install Docker Engine](#) on Ubuntu's documentation site.

With these requirements, you may continue onto the creation process.

1. Create the VM that will be your Licensing Server based on the prerequisites listed above. **Note:** This must be on a separate VM from the cloudSwXtch and must run continuously.
2. Create a `/swxtch/bundles` directory on your licensing server VM.

### What is a license bundle?

A bundle contains multiple licenses that share the same entitlements. For example, a user can have a license bundle that contains 3 cloudSwXtch licenses with similar max bandwidths, number of endpoints allowed, and features enabled.

3. Run the following docker command to install the Licensing Server on the VM:

```
Bash Copy
docker run -d --restart=unless-stopped --name swx-license-server -p 8081:8081 -v
/swxtch/bundles:/swxtch/bundles swxtchio/swx-license-server:latest
```

4. Run the show command to get the Licensing Server VM's UUID:

```
Bash Copy
curl http://localhost:8081/swxtch/licenses/v1/show
```

5. Record the fingerprint. Below is an example output of the show command:

```
Bash Copy
$ curl http://localhost:8081/swxtch/licenses/v1/show
{
  "fingerprint": "72ddcaf0-923c-bc4b-941b-a3b73b9290d1",
  "Licenses": []
}
```

6. Send the fingerprint to support@swxtch.io, requesting the `*.dat`. This will contain your licenses with the agreed entitlements.
  - a. **Note:** The naming of the `*.dat` file can vary based on entitlements. In this walkthrough, we used the file, `license_10_1_30000_bridge_ha_adapt.dat`, as our bundle.
7. Copy the `*.dat` file into the `/bundles` folder located under `/swxtch/bundles` using the following command:

```
Bash Copy
sudo cp *.dat /swxtch/bundles
```

Example:

```
Bash Copy
sudo cp license_10_1_30000_bridge_ha_adapt.dat /swxtch/bundles
```

8. Run the following command on your licensing server VM to view the license bundle:

```
Bash Copy
curl http://localhost:8081/swxtch/licenses/v1/show
```

Below is an example output with the license in place.

```
Bash Copy
{
  "fingerprint": "ec256b6f-ea1b-f3eb-f791-e10c747a1c8e",
  "Licenses": [
    {
      "name": "license_test-sa1",
      "allowedSwxtchCount": 5,
      "consumedCount": 0,
      "evictableCount": 0,
      "assignableCount": 5,
      "consumers": [
      ],
      "Bundles": [
        {
          "bundleName": "license_10_1_30000_bridge_ha_adapt",
          "expirationDate": "2025-12-30T00:00:00Z",
          "allowedSwxtchCount": 5,
          "consumedCount": 0,
          "evictableCount": 0,
          "assignableCount": 5,
          "consumers": [
          ]
        }
      ],
      "entitlements": {
        "maxClientCount": 10,
        "maxBridgeCount": 1,
        "bandwidthMbps": 30000,
        "enableMesh": false,
        "enableUnicast": true,
        "enableHA": true,
        "enableClockSync": false,
        "enableBridge": true,
        "enableWxckedEye": true,
        "enableAllowsMajorVersionUpdate": true,
        "enableTachyonLive": null
      }
    }
  ]
}
```

#### What does each value mean?

1. **name:** Name of the License. All licenses in a bundle will share this name. When Licensing a cloudSwXtch via the Licensing Server, users will need to add this name to the remote-licensing.json file for the "License Name" field. This will consume one license from the bundle.
2. **allowedSwXtchCount:** The number of licenses allotted to a user via the Licensing Server. In this example, the user has been given 2 licenses to use interchangeably between their cloudSwXtches.
3. **consumedCount:** the number of cloudSwXtches currently licensed through the bundle, listing them under authorized. Since no licenses are being used, the consumedCount is 0.
4. **evictableCount:**
5. **assignableCount:** The number of cloudSwXtch licensing spots remaining
6. **entitlements:** This shows the entitlements for each of the licenses in a bundle.
  - a. **maxClientCount:** Max number of endpoints

You should now be ready to license the cloudSwXtch.

#### Viewing License Server Logs

To view Licensing Server logs, use the following command on the VM:

Bash	Copy
docker logs swx-license-server -f	

Below is an example output:

Bash	Copy
<pre>ubuntu@ip-10-64-29-105:~\$ docker logs swx-license-server -f info: 2024/12/23 14:48:35 /home/maxiz/swxtch-core/go/license-server/cmd/swxtch-license-svr/cmd/run_cmd.go:45: {"Version":"dev","Commit":"unknown","Date":"unknown"} info: 2024/12/23 14:48:35 /home/maxiz/swxtch-core/go/toolkit/fingerprint/fingerprint.go:20: HOLAAAAAAAAA info: 2024/12/23 14:48:35 /home/maxiz/swxtch-core/go/license-server/cmd/swxtch-license-svr/cmd/run_cmd.go:53: fingerprint: ec256b6f- ea1b-f3eb-f791-e10c747a1c8e info: 2024/12/23 14:48:35 /home/maxiz/swxtch-core/go/license-server/services/bundles.go:403: Bundle folder /swxtch/bundles info: 2024/12/23 14:48:35 /home/maxiz/swxtch-core/go/license-server/services/bundles.go:404: Server license location /swxtch info: 2024/12/23 14:48:35 /home/maxiz/swxtch-core/go/license-server/services/bundles.go:189: Loading new bundle detected: license_10_1_30000_bridge_ha_adapt. info: 2024/12/23 14:48:35 /home/maxiz/swxtch-core/go/license-server/services/bundles.go:189: Loading new bundle detected: license_10_1_30000_bridge_ha_adapt2. info: 2024/12/23 14:48:35 /home/maxiz/swxtch-core/go/license-server/services/bundles.go:189: Loading new bundle detected: license_20_1_30000_all. info: 2024/12/23 14:48:35 /home/maxiz/swxtch-core/go/license-server/cmd/swxtch-license-svr/cmd/run_cmd.go:55: keep Alive Expiry: 10 in minutes info: 2024/12/23 14:48:35 /home/maxiz/swxtch-core/go/license-server/cmd/swxtch-license-svr/cmd/run_cmd.go:57: Starting http server at :8081</pre>	

### Starting and Stopping the Licensing Server

When creating the Licensing Server, the docker command used during deployment tells the service to restart every time the VM is initialized. In the event that a user would like to stop or start the licensing server manually, they should use the following commands:

#### START

Bash	Copy
docker start swx-license-server	

#### STOP

Bash	Copy
docker stop swx-license-server	

## Licensing a cloudSwXtch via the Licensing Server

### Required: Installing a cloudSwXtch

In order to license a cloudSwXtch, you must first install a cloudSwXtch via BYOL or manual method. For instructions on how install a cloudSwXtch, see [here](#).

With a cloudSwXtch installed and ready to go, you may now continue onto the licensing process:

1. The Licensing server uses HTTP as well as port 8081 open them up on the cloudSwXtch(s) and the Licensing Server.
2. Check to see if your cloudSwXtch is currently licensed by opening swxtch-top on the cloudSwXtch VM. Use the following command:

Bash	Copy
swxtch-top	

#### For Existing cloudSwXtches

If you see "License File" under Licensing, go to the /swxtch directory and **remove** the **license.json** file. Alternatively, if you like to keep the file, you can rename it as a backup.

#### How cloudSwXtch Looks for Licenses

1. When a license.json file exists, the cloudSwXtch will prioritize that file over the licensing server.
2. By removing or renaming the license.json file, the cloudSwXtch then will look for the licensing server file, or remote-licensing.json.
3. If there is no licensing server, the cloudSwXtch will look for a marketplace license.
4. Once the cloudSwXtch has exhausted all three methods, it will be marked as Not Authorized and will not work.

For new cloudSwXtches installed via BYOL or manually, there will no license file in place.

swxtch-top should display the following **Not Authorized** message at the top panel.

ip:172-41-128-25 dev:809359 Licensing Marketplace NEW NOTIFICATIONS Information - dev:809359 ( - )	
Cloud	AWS
AccountId	63972066639
Region	us-west-2
SwxtchId	1-0005b067da040f7e4
Status	Not Authorized

3. Validate communication to the Licensing Server by running the following commands on the cloudSwXtch VM:

Bash	Copy
<pre>curl http://&lt;Licensing Server IP&gt;:&lt;Licensing Server Port&gt;/swxtch/bundles</pre>	

**Example Command:**

Bash	Copy
<pre>curl http://10.64.29.105:8081/swxtch/bundles</pre>	

**Example Output:**

```
root@ip-172-41-128-25:/home/ubuntu# curl http://35.174.125.39:8081/swxtch/bundles
404 page not found
root@ip-172-41-128-25:/home/ubuntu#
```

Bash	Copy
<pre>nc -vz &lt;Licensing Server IP&gt; &lt;Licensing Server Port&gt;</pre>	

**Example Command:**

Bash	Copy
<pre>nc -vz 35.174.125.39 8081</pre>	

**Example Output:**

```
root@ip-172-41-128-25:/home/ubuntu# nc -vz 35.174.125.39 8081
Connection to 35.174.125.39 8081 port [tcp/tproxy] succeeded!
root@ip-172-41-128-25:/home/ubuntu#
```

#### Error: No Response

If you do not get a response, check to see if Port 8081 is open for both the Licensing Server VM and the cloudSwXtch.

4. Create a **remote-licensing.json** file in your cloudSwXtch directory. **Note:** It MUST have the name, **remote-licensing.json**
5. Enter the following information in the remote-licensing.json file, replacing <IP-license-server> with the IP address of the Licensing Server virtual machine, and the LicenseName.

Bash	Copy
<pre>{   "Url": "http://&lt;IP-license-server&gt;:8081/swxtch/licenses/v1",   "LicenseName": "&lt;License Name&gt;" }</pre>	

- a. In **Step 6 and 8 of Creating a Licensing Server**, the user received a license.dat file after providing the fingerprint to the [swxtch.io](https://swxtch.io) Team. In that file, there is a field for the name of the license. In this example, the Name is **license\_from\_swxtch**. Therefore, that is the name they would put in the remote-licensing.json file as shown below.

Bash	Copy
<pre>{   "Url": "http://&lt;IP-license-server&gt;:8081/swxtch/licenses/v1",   "LicenseName": "license_from_swxtch" }</pre>	

- b. If a user changed the name in the license.dat file on their Licensing Server VM or would like to use a different license, they would need to change the LicenseName in the remote-licensing.json file on the cloudSwXtch VM as well. This tells the cloudSwXtch where to point.
6. Save and close the file.
  7. Restart the cloudSwXtch, specifically the swxtch-ctrl.service. The cloudSwXtch is now ready and pointing to the license server.

These steps can be repeated for every additional cloudSwXtch allotted in the license bundle.

#### Viewing License Bundles on the cloudSwXtch

A user can view their license bundles by running the following command on their cloudSwXtch:

Bash	Copy
<code>./swx licenses show -s &lt;License Server IP&gt;:&lt;License Server Port&gt;</code>	

#### Example:

Bash	Copy
<code>./swx licenses show -s 10.64.29.105:8081</code>	

The example below shows what the output will look like:

Bash	Copy
<pre> root@ip-10-64-20-179:/swxtch# ./swx licenses show -s 10.64.29.105:8081 {   "fingerprint": "ec256b6f-ea1b-f3eb-f791-e10c747a1c8e",   "Licenses": [     {       "name": "license_test-sa1",       "allowedSwxtchCount": 5,       "consumedCount": 1,       "evictableCount": 0,       "assignableCount": 4,       "consumers": [         {           "fingerprint": "213de388-ccb5-4d93-9159-3fa9ad5585ea",           "hostAddress": "10.2.128.10",           "hostName": "dsd-core-100",           "lastUpdateTime": "2025-02-11T20:46:09.756723888Z",           "evictable": false         }       ],       "Bundles": [         {           "bundleName": "license_10_1_30000_bridge_ha_adapt",           "expirationDate": "2025-12-30T00:00:00Z",           "allowedSwxtchCount": 5,           "consumedCount": 1,           "evictableCount": 0,           "assignableCount": 4,           "consumers": [             {               "fingerprint": "213de388-ccb5-4d93-9159-3fa9ad5585ea",               "hostAddress": "10.2.128.10",               "hostName": "dsd-core-100",               "lastUpdateTime": "2025-02-11T20:46:09.756723888Z",               "evictable": false             }           ]         }       ],       "entitlements": {         "maxClientCount": 10,         "maxBridgeCount": 1,         "bandwidthMbps": 30000,         "enableMesh": false,         "enableUnicast": true,         "enableHA": true,         "enableClockSync": false,         "enableBridge": true,         "enableWxckedEye": true,         "enableAllowsMajorVersionUpdate": true,         "enableTachyonLive": null       }     }   ],   "entitlements": {     "maxClientCount": 10,     "maxBridgeCount": 1,     "bandwidthMbps": 30000,     "enableMesh": false,     "enableUnicast": true,     "enableHA": true,     "enableClockSync": false,     "enableBridge": true,     "enableWxckedEye": true,     "enableAllowsMajorVersionUpdate": true,     "enableTachyonLive": null   } } </pre>	

#### Releasing a Licensed cloudSwXtch from Licensing Server

License bundles contain a finite amount of licenses available to use. Unless they receive an additional bundle with the same licenses, they are limited by the amount allotted to them in their original bundle. Luckily, the licensing server has a release function that allows users to swap licenses between cloudSwXtches. For example, if a user has licensed 5 cloudSwXtches, consuming all the licenses in the singular bundle they have, they would need to release at least one of their cloudSwXtches from the licensing server to have an available license to use.

To release a cloudSwXtch from the licensing server, run the following command on the VM, replacing the values:



```
Bash Copy

~$ sudo /swxtch/swx licenses release -p "<cloudSwXtch fingerprint>" -n "<License Name>" -s <Licensing Server IP>:<Licensing Server Port>
```

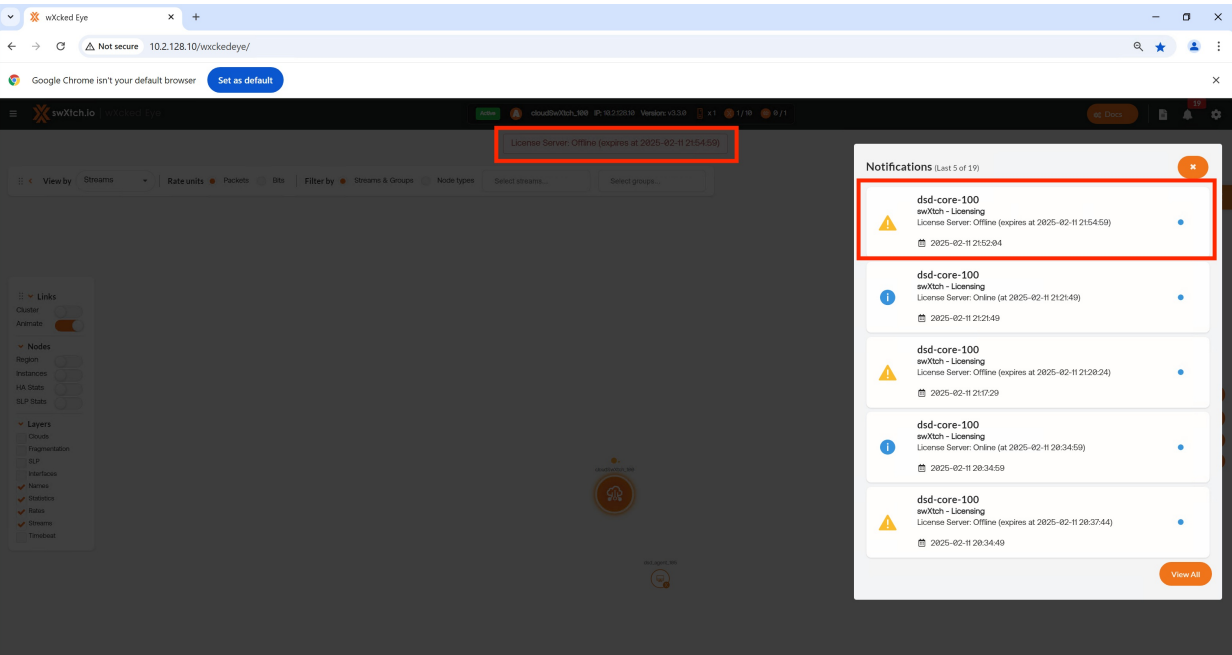
Example:

```
Bash Copy

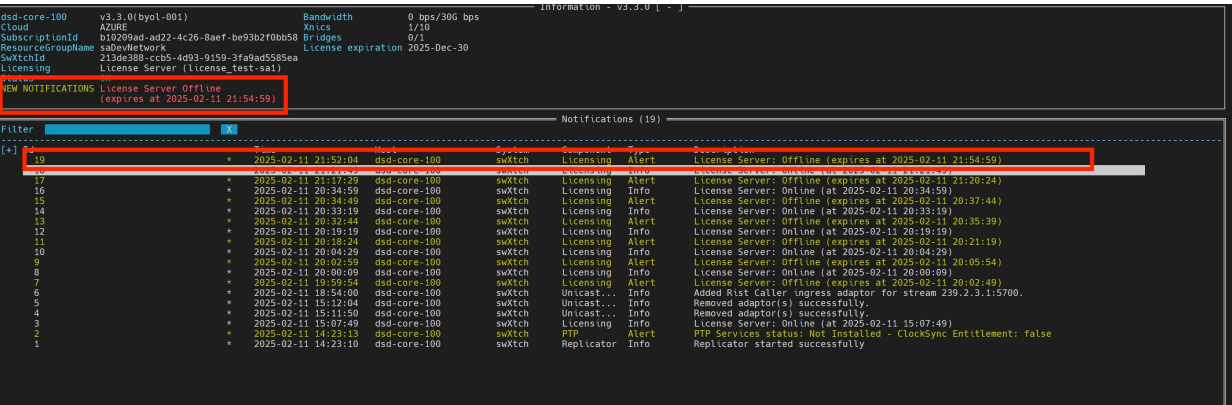
~$ sudo /swxtch/swx licenses release -p "67ae4938-70c4-4f96-9dfb-bea3d836e672" -n "license_from_swxtch" -s 10.1.212.164:8081
```

Users can verify if the cloudSwXtch was released from the licensing server by checking either wXcked Eye or swXtch-top.

wXcked Eye



swXtch-top



Increasing Number of Licenses by Adding Bundles

Users can increase the number of licenses in an existing bundle by requesting an additional bundle file, or \*.dat, from the swXtch.io Support Team. This is only for situations where the additional licenses will have the same entitlements allotted in licenses within the original .dat file.

1. Contact support@swxtch.io, requesting additional licenses with the same entitlements as the original license bundle file.
2. Move the new .dat file into the /swxtch/bundles folder on the licensing server VM. You do not have to remove the previous license bundle.
  - a. In this example, the user requested an additional license bundle, containing 5 copies of the same license with the same entitlements. swXtch.io Support sent a new bundle file, license\_10\_1\_30000\_bridge\_ha\_adapt2.dat. The screenshot illustrates the new license bundle in place with the the old one.

```
ubuntu@ip-10-64-29-105:/swxtch/bundles$ ls
license 10 1 30000 bridge ha adapt.dat  license 10 1 30000 bridge ha adapt2.dat
```

3. Use the following curl show command on the licensing server to see the licenses.

Bash

Copy

```
curl http://localhost:8081/swxtch/licenses/v1/show
```

a. **Example Output:**

```
ubuntu@ip-10-64-29-105:~$ curl http://localhost:8081/swxtch/licenses/v1/show
{
  "fingerprint": "ec256b6f-ea1b-f3eb-f791-e10c747a1c8e",
  "licenses": [
    {
      "name": "license_test-sa1",
      "allowedSwxtchCount": 10,
      "consumedCount": 1,
      "evictableCount": 0,
      "assignableCount": 9,
      "consumers": [
        {
          "fingerprint": "213de388-ccb5-4d93-9159-3fa9ad5585ea",
          "hostAddress": "10.2.128.10",
          "hostName": "dsd-core-100",
          "lastUpdateTime": "2025-02-11T20:46:09.756723888Z",
          "evictable": false
        }
      ]
    },
    {
      "bundleName": "license_10_1_30000_bridge_ha_adapt",
      "expirationDate": "2025-12-30T00:00:00Z",
      "allowedSwxtchCount": 5,
      "consumedCount": 1,
      "evictableCount": 0,
      "assignableCount": 4,
      "consumers": [
        {
          "fingerprint": "213de388-ccb5-4d93-9159-3fa9ad5585ea",
          "hostAddress": "10.2.128.10",
          "hostName": "dsd-core-100",
          "lastUpdateTime": "2025-02-11T20:46:09.756723888Z",
          "evictable": false
        }
      ]
    },
    {
      "bundleName": "license_10_1_30000_bridge_ha_adapt2",
      "expirationDate": "2025-12-30T00:00:00Z",
      "allowedSwxtchCount": 5,
      "consumedCount": 0,
      "evictableCount": 0,
      "assignableCount": 5,
      "consumers": []
    }
  ],
  "entitlements": {
    "maxClientCount": 10,
    "maxBridgeCount": 1,
    "bandwidthMbps": 30000,
    "enableMesh": false,
    "enableUnicast": true,
    "enableHA": true,
    "enableClockSync": false,
    "enableBridge": true,
    "enableMockedEye": true,
    "enableAllowsMajorVersionUpdate": true,
    "enableTachyonLive": null
  }
}
```

The license name is **license\_test-sa1**. Since the user added an additional license bundle containing 5 licenses, the **allowedSwxtchCount** went from 5 to 10.

Currently, **one (1) cloudSwxtch** is consuming a "license\_test-sa1" license and are listed under **consumers**. The **consumedCount** is also 1, with 9 still available.

Under **Bundles**, users will find the information for the .dat files containing copies of **license\_test-sa1**.

This section illustrates how 1 license from the original bundle is being used by 1 cloudSwxtch, mirroring the section above.

**Here is the freshly added bundle.** It contains the same licenses with the same entitlements as the original bundle but by adding it here, increases the total **assignableCount**. Currently, no licenses from this bundle are being used.

This section details the **entitlements** allotted to each license within a bundle. Since they all come from the same bundle, they will all be the same.

4. Users can now license their cloudSwxtches. For information, see [Licensing a cloudSwxtch via the Licensing Server](#).

## Adding A New License Bundle

The Licensing Server can host multiple different licenses with different entitlements. Similar to adding a bundle to increase the number of identical licenses, users can add a new bundle, or \*.dat, file to their swxtch/bundles folder if they have cloudSwxtches that need a different feature set.

1. Contact support@swxtch.io, requesting a new license bundle.
2. Move the new .dat file into the /swxtch/bundles folder on the licensing server VM. You do not have to remove any existing license bundles. Since they contain different licenses, they are independent of one another.
3. Use the following curl show command on the licensing server to see the licenses.

Bash

Copy

```
curl http://localhost:8081/swxtch/licenses/v1/show
```

- a. **Example Output:** In this example, the user has two existing license bundles, **license\_10\_1\_30000\_bridge\_ha\_adapt** and **license\_10\_1\_30000\_bridge\_ha\_adapt2**, containing identical copies of the license, **license\_test-sa1**. They are both listed under the license\_test-sa1 license in the output above. There is a second license listed named license\_test-sa2. Under that license is a freshly added bundle file, license\_20\_1\_30000\_all, containing licenses with different entitlements than license\_test-sa1.

```
Bash
{
  "fingerprint": "ec256b6f-ea1b-f3eb-f791-e10c747a1c8e",
  "licenses": [
    {
      "name": "license_test-sa1",
      "allowedSwxtchCount": 10,
      "consumedCount": 1,
      "evictableCount": 0,
      "assignableCount": 9,
```

```

    "consumers": [
      {
        "fingerprint": "213de388-ccb5-4d93-9159-3fa9ad5585ea",
        "hostAddress": "10.2.128.10",
        "hostName": "dsd-core-100",
        "lastUpdateTime": "2025-02-11T20:46:09.756723888Z",
        "evictable": false
      }
    ],
    "Bundles": [
      {
        "bundleName": "license_10_1_30000_bridge_ha_adapt",
        "expirationDate": "2025-12-30T00:00:00Z",
        "allowedSwxtchCount": 5,
        "consumedCount": 1,
        "evictableCount": 0,
        "assignableCount": 4,
        "consumers": [
          {
            "fingerprint": "213de388-ccb5-4d93-9159-3fa9ad5585ea",
            "hostAddress": "10.2.128.10",
            "hostName": "dsd-core-100",
            "lastUpdateTime": "2025-02-11T20:46:09.756723888Z",
            "evictable": false
          }
        ]
      },
      {
        "bundleName": "license_10_1_30000_bridge_ha_adapt2",
        "expirationDate": "2025-12-30T00:00:00Z",
        "allowedSwxtchCount": 5,
        "consumedCount": 0,
        "evictableCount": 0,
        "assignableCount": 5,
        "consumers": []
      }
    ],
    "entitlements": {
      "maxClientCount": 10,
      "maxBridgeCount": 1,
      "bandwidthMbps": 30000,
      "enableMesh": false,
      "enableUnicast": true,
      "enableHA": true,
      "enableClockSync": false,
      "enableBridge": true,
      "enableWxckedEye": true,
      "enableAllowsMajorVersionUpdate": true,
      "enableTachyonLive": null
    }
  },
  {
    "name": "license_test-sa2",
    "allowedSwxtchCount": 6,
    "consumedCount": 0,
    "evictableCount": 0,
    "assignableCount": 6,
    "consumers": [],
    "Bundles": [
      {
        "bundleName": "license_20_1_30000_all",
        "expirationDate": "2025-12-30T00:00:00Z",
        "allowedSwxtchCount": 6,
        "consumedCount": 0,
        "evictableCount": 0,
        "assignableCount": 6,

```

```

        "consumers": []
    },
    "entitlements": {
        "maxClientCount": 20,
        "maxBridgeCount": 1,
        "bandwidthMbps": 30000,
        "enableMesh": true,
        "enableUnicast": true,
        "enableHA": true,
        "enableClockSync": true,
        "enableBridge": true,
        "enableWxckedEye": true,
        "enableAllowsMajorVersionUpdate": true,
        "enableTachyonLive": true
    }
}
]
}

```

4. The user should now have two different licenses available for them to license their cloudSwXtches. For information, see [Licensing a cloudSwXtch via the Licensing Server](#).

## Upgrading the Licensing Server

To upgrade the licensing server, users will need to follow these steps:

1. Get the licensing server container ID.
2. Stop the docker service.
3. Remove the container from the machine.
4. Reinstall the licensing server using the command in [Step 3 of Creating a Licensing Server](#).

For a complete list, see [Helpful Docker Service Commands](#) under cloudSwXtch How To's.

# Upgrading cloudSwXtch

## WHAT TO EXPECT

In this article, users will learn how to update their cloudSwXtch when new versions are available. The following commands are cloud agnostic so they should work regardless of what cloud they're using.

### Prerequisites

For major upgrades, it is important to remove your high availability and protocol fanout configurations before upgrading your cloudSwXtch. This will ensure that you have the latest and greatest version of both features. Users have two ways of doing this: via the UI and via the cloudSwXtch.

- **via the wXcked Eye UI**
  1. Go to the Settings page in wXcked Eye and navigate to either the high availability or protocol fanout tabs.
  2. Delete all your configurations.
- **via the cloudSwXtch**
  1. `cd` into the `/swXtch/` folder on the cloudSwXtch VM.
  2. `ls` all of the files.
  3. Copy the `config.json` as a backup.
  4. Delete the original `config.json`.
  5. Delete any old "install-x.x.x" files. *This is optional for users lacking space.*

You may now proceed with the upgrade.

There are two ways of ensuring your cloudSwXtch is up-to-date: via the cloudSwXtch or via the xNIC.

## Upgrading cloudSwXtch via the cloudSwXtch

1. Sign onto the VM where the cloudSwXtch is running.
2. Run the following command:

Shell  
 

Bash

Copy

```
sudo /swxtch/swx update -i localhost -v v<desired version>
```

Example:

Shell



Bash

Copy

```
sudo /swxtch/swx update -i localhost -v v3.0.0
```

## Upgrading cloudSwXtch via the xNIC

1. Connect to any VM where an xNIC is running.
2. Run the following command:

Shell  
 

Bash

Copy

```
swx update -v <desired version> --ip <ip of cloudSwXtch>
```

Example:

Bash

Copy

```
swx update -v v3.0.0 --ip 10.5.1.6
```

**Note:** The `<desired version>` includes a "v" before the version number (e.g. v3.0.0).

### Upgrading cloudSwXtch and xNICs

Make sure you upgrade all cloudSwXtches and xNICs in the environment to have the best functionality.

## Installing swXtchBridge

### WHAT TO EXPECT

In this introduction, users will learn about the swXtchBridge including the benefits of implementing one in their cloudSwXtch network. For installation steps, please complete the following:

1. Review the [swXtchBridge System Requirements](#).
2. Review [Install swXtchBridge](#) guide.

### What is a swXtchBridge?

A swXtchBridge enables bi-directional multicast traffic between an on-premises network and a cloudSwXtch. As a DPDK-based solution, the swXtchBridge unlocks the following benefits:

- **High throughput with support for any NIC**
- **swXtch Lossless UDP for Ground to Cloud/Cloud to Ground traffic**
- **IGMPv3 for Source Specific Multicast**
- **Protocol Fanout for all protocols**
- **Dynamic IGMP joins and leaves.** When an application in the cloud sends an IGMP join, then the cloudSwXtch in the cloud sends the information to the ground cloudSwXtch as a bridge, allowing the traffic to go through. Dynamic bridge is only supported from ground to cloud, not from cloud to ground.

**To install a swXtchBridge**, please review the swXtchBridge System Requirements and then continue onto the Install swXtchBridge article.

# swXtchBridge System Requirements

## WHAT TO EXPECT

In this article, users will learn about the prerequisites before deploying a SwXtchBridge. It is recommended for a users to review this page before installing the swXtchBridge.

## Network and cloudSwXtch Connectivity

- Before deploying a swXtchBridge, a user must already have a cloudSwXtch instance running in any cloud.
- A user should have network connectivity from on-premises to the Virtual Network hosting the cloudSwXtch instance. A user should be able to ping the cloudSwXtch instance from the on-premises network.

### Testing On-Premises and Cloud Link

Use one of the following UDP testing tools to measure point from on-prem and into the cloud and to profile your link. This will ensure the link between on-premises and the cloud used by both the SwXtchBridge and the cloudSwXtch is optimal.

- iPerf: <https://iperf.fr/iperf-doc.php>
- Sockperf: <https://docs.nvidia.com/networking/display/vmav9851/appendix+sockperf+%E2%80%93+udp/tcp+latency+and+throughput+benchmarking+tool>

## NIC Requirements

The SwXtchBridge requires 2 NICs with the non-primary NIC as a Mellanox or Intel card.

- **Mellanox:** ConnectX-5 cards are preferred for the non-primary NIC. For a list of recommendations, please visit the following link: [https://www.cisco.com/c/en/us/products/servers-unified-computing/third-party-adapters-listing.html?flt2\\_general-table0=Nvidia%2FMellanox](https://www.cisco.com/c/en/us/products/servers-unified-computing/third-party-adapters-listing.html?flt2_general-table0=Nvidia%2FMellanox)
- **Intel:** For a list of recommendations (drivers and NIC names), please visit the following link: <https://core.dpdk.org/supported/nics/intel/>

## Operating System

A VM or BareMetal bridge host machine running one of the following operating systems with a **minimum 8 cores, 16GB RAM**, a recommended **hard drive of 40GB (20GB min)** and **Kernel 5.11 or greater**:

- Ubuntu 20.04
- RHEL9

## CPUs

CPUs must be at least 2nd generation Intel Core processors, supporting AVX.

## Firewall Exceptions

The swXtchBridge installer script will automatically open the following ports:

Bash

Copy

```
firewall-cmd --add-port=80/tcp --permanent
firewall-cmd --add-port=9999/udp --permanent
firewall-cmd --add-protocol=igmp --permanent
```

## Install Specific Requirements

There are currently two methods to installing the SwXtchBridge - containerized and non-containerized.

### Required Dependencies for Containerized Install

For RHEL 9 and Ubuntu 20.04, users will need the following dependencies on their SwXtchBridge machine:

- **pciutils**
- **docker**

For RHEL 9, you would also need **kernel-extra-modules** if you are running a high-performance driver.

### How to Install Docker Engine

For swXtchBridge, users should install the latest version of Docker Engine for your VM. For quick installation guides, see our [How to Install Docker on RHEL/Ubuntu](#).

### Required Third-Party Packages for Non-Containerized Install

This is a list of required 3rd party packages for the SwXtchBridge VM. Installation with internet will automatically install the required packages.

Non-internet installation, or air-gapped, will require the packages to be downloaded and installed manually. After installing the packages, it is good practice to reboot the virtual before continuing with SwXtchBridge Installation.

RHEL	Ubuntu
dialog	dialog
kernel-modules-extra*	iproute2
libatomic	libdw-dev
librdmacm	libssl-dev
wget	libstdc++6
jq	build-essential
glibc-langpack-en	librdmacm-dev
libpcap	libnuma-dev
	libmnl-dev
	meson
	jq

For DPDK driver install script, the following packages are also required for both RHEL and Ubuntu:

- dkms
- gcc
- git
- make
- pciutils
- net-tools
- python3

\*Only necessary if running a high-performance driver

#### How to Install Third Party Packages onto your SwXtchBridge VM

1. Run these commands to enable the following repositories to download the above packages.

##### a. RHEL9

Bash	Copy
<pre>dnf config-manager --enable crb</pre> <pre>dnf -y install https://dl.fedoraproject.org/pub/epel/epel-release-latest-9.noarch.rpm</pre>	

- i. Depending on the image, the repo name could be different. A command that could help you verify the name of the CodeReady Builder repository is `dnf repolist all`. Once you have the correct name, you can use the first command as follows, replacing {reponame}: `dnf config-manager --enable {reponame}`

##### b. Ubuntu

Bash	Copy
<pre>add-apt-repository ppa:ubuntu-toolchain-r/test</pre> <pre>add-apt-repository ppa:canonical-server/server-backports</pre>	

2. Depending on the virtual machine's operating system, run the following command to download the necessary packages:

##### a. RHEL

Bash	Copy
<pre>sudo dnf install dialog kernel-modules-extra libatomic librdmacm wget jq glibc-langpack-en libpcap</pre>	

##### b. Ubuntu

Bash	Copy
<pre>sudo apt install dialog iproute2 libdw-dev libssl-dev libstdc++6 build-essential librdmacm-dev libnuma-dev libmnl-dev meson dkms gcc git make pciutils net-tools python3 jq</pre>	



# Install swXtchBridge

## WHAT TO EXPECT

In this article, users will learn how to install SwXtchBridge. There are two methods for installation: non-containerized and containerized via Docker.

## Before You Start

Review the [SwXtchBridge System Requirements](#) to understand the prerequisites to installing swXtchbridge on your virtual machine.

## Pre-Installation

The following steps must be down for both installation options: containerized and non-containerized.

### STEP ONE: Update Currently Installed OS Packages

1. Please update all of your currently installed OS packages
  - a. RHEL

Bash	Copy
<code>dnf upgrade</code>	

- b. Ubuntu

Bash	Copy
<code>apt update &amp;&amp; apt upgrade</code>	

2. Reboot VM.

### STEP TWO: Update Ubuntu 20.04 to Kernel 5.15 (Ubuntu ONLY)

If the SwXtchBridge VM is on Ubuntu 20.04, please update to Kernel 5.15. To do this:

1. Use the following commands:

Bash	Copy
<code>sudo apt-get install linux-generic-hwe-20.04</code> <code>sudo apt update &amp;&amp; sudo apt full-upgrade</code>	

2. Reboot your machine. If a user is running an Air-Gapped install, they will need to download and Install the package manually: <https://vitux.com/how-to-install-latest-linux-kernel-5-15-on-ubuntu-20-04>
3. Use the following to verify the kernel version is at 5:15:

Bash	Copy
<code>uname -r</code>	

The output will read:

Bash	Copy
<code>5.15.0-1023</code>	

### STEP THREE: Gather Information from the swXtchBridge Data NIC (RHEL ONLY)

This step is only required for users running on a RHEL machine.

1. Run the following command on the VM or the on-premises machine of your Data NIC:

Bash	Copy
<code>ip a</code>	

2. Make note of the PCI Address, IP Address, subnetMask, and mac for your swXtchBridge data NIC. This information is required for configuration after installation.

### STEP FOUR: Review Firewall Exceptions for RHEL [Optional]

The swXtchBridge installer script will automatically open the following ports:

Bash	Copy
<pre>sudo firewall-cmd --add-port=80/tcp --permanent sudo firewall-cmd --add-port=9999/udp --permanent sudo firewall-cmd --add-protocol=igmp --permanent</pre>	

To open up additional ports for producing/consuming multicast traffic, use the following command:

Bash	Copy
<pre>sudo firewall-cmd --add-port=&lt;port&gt;/udp --permanent sudo systemctl restart firewalld</pre>	

**Note:** In some rare cases, it might be helpful to disable the firewall, if swXtchBridge installation fails, for troubleshooting purposes.

## Option#1: Non-Containerized Installation

This non-containerized method can be used to install the bridge application onto the bridge host machine. It will only work if the cloudSwXtch instance is up and running and the bridge host has network connectivity to the cloudSwXtch instance.

1. **Open** a bash console on any VM that is on the same control plane network as the cloudSwXtch that you intend to use as the bridge host.
2. **Ping** the cloudSwXtch using your instance name or IP.

Bash	Copy
<pre>ping &lt;cloudSwXtch-instance-IP or instance-name&gt;</pre>	

- a. If the ping fails to find the cloudSwXtch instance by name, try pinging the IP address of the cloudSwXtch instance. If the IP works, they use the IP address in place of the name in all future commands. This can happen if the default DNS settings are changed for the Virtual Network.

3. Run the swXtchBridge installer script:

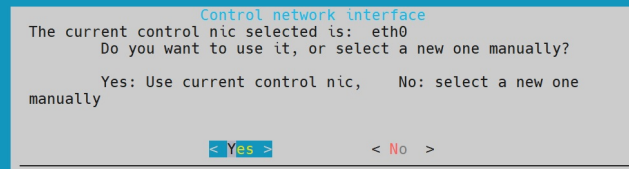
Bash	Copy
<pre>sudo sh -c "curl -s http://&lt;swxtch-ip&gt;/services/install/swxtch-bridge-install.sh   bash -s"</pre>	

- a. If running an air-gapped, or no internet, installation, add `--ag` parameter after the installer script:

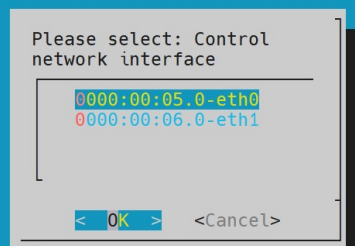
Bash	Copy
<pre>sudo sh -c "curl -s http://&lt;swxtch-ip&gt;/services/install/swxtch-bridge-install.sh   bash -s -- --ag"</pre>	

**Note:** Please ensure that you have completed all prerequisites for an air-gapped installation, including the installation of 3rd party packages as detailed in the swXtchBridge System Requirements page.

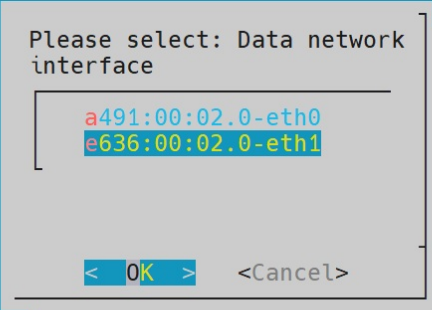
4. Confirm that the selected control NIC is the one you would like to use. **Please note:** There are different cloudSwXtch topologies users can deploy depending on the number of NICs they have. For more information on single-, 2-, 3-NIC configurations, see [SwXtchBridge Topologies](#).



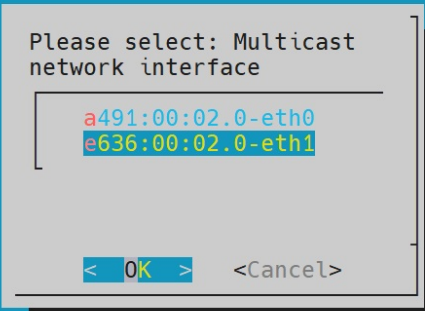
a. If not, click No to manually select one.



5. When prompted, select the network interface that will be used as the data interface (this is the interface for data from the swXtchBridge to the cloud):



6. When prompted, select the network interface that will be used to receive and send multicast traffic (i.e. interface to/from on prem):



**Note:** The swXtchBridge config JSON file will use the PCI Address for the data and user interface names.  
The service will automatically initialize.

**Additional Arguments for swXtchBridge Installer**

```
Bash Copy
$ sudo ./swxtch-bridge-install.sh --help
===== swXtch.io Bridge Installer =====
2025-01-02 11:56:19.230 *** Logging to: 'bridge-install.log' ***
2025-01-02 11:56:19.265 Linux Distribution: almalinux (version: '9.5'; major version: '9').
2025-01-02 11:56:19.279 Arguments (1): --help
Usage: ./swxtch-bridge-install.sh [OPTIONS]
-u just uninstall the swXtch.io bridge (default:no)
-c <nic> manually select nic for control interface
-d <nic> manually select nic for data interface
-i <nic> manually select nic for user interface
--airgap airgap mode: do not try to update nor install dependencies from the internet
(update your system and install the required OS packages manually, before installing)
--route_control_to_data tunnel control data through the data interface (default: false)
--override_src_ip override the source IP of incoming packets (default: false)
--high_perf_driver high-performance drivers will be installed (if required) as part of the swXtch.io bridge
installation
--force_swx_ctrl_to_public_ip use swxtch control interface public ip (if available) instead of default. (avoiding user
interaction)
--force_swx_data_to_public_ip use swxtch data interface public ip (if available) instead of default. (avoiding user interaction)
--docker Runs swXtch.io bridge in a docker container
-h | --help shows this help
```

## Switching to High Performance Mode

Certain NICs can handle a high performance version of the swXtchBridge. This should only be used if a user requires higher throughput for 10+ GB of traffic. For a complete list of recommended NICs, see NIC Requirements under swXtchBridge System Requirements.

To install the high performance drivers for a user's bare metal NICs, it is recommended that users first install the swXtchBridge following the [Installation](#) instructions above. Then, a user should re-install the swXtchBridge on their VM with the additional `high-perf-driver` argument.

## Using a Specific Gateway Address for swXtchBridge

Since the `dataGatewayIP` is set to `null` in its JSON file, the swXtchBridge will resolve the data gateway MAC address by choosing the first IP address of the subnet for the data interface.

```
"bridgeConfig": {
  "ctrlInterfaceName": "eth0",
  "dataInterfaceName": "eth1",
  "userInterfaceName": "eth1",
  "nicsConfig": null,
  "swxtchCtrlIp": "10.2.128.10",
  "swxtchCtrlPort": 80,
  "swxtchDataIp": "10.2.192.116",
  "swxtchDataPort": 9999,
  "overwriteSenderIp": null,
  "dataGatewayIp": null,
  "groundToCloudSubscriptions": null,
  "cloudToGroundSubscriptions": [],
  "pollingIntervalMilliseconds": 1000,
  "subscriptionsPollingIntervalMilliseconds": 100,
  "mtuSize": 1500,
  "adaptorsConfig": {},
  "overrideSrcIp": false,
  "slp": {
```

However, if the assigned data interface necessitates a specific IP address to act as the gateway, the swXtchBridge installation will fail. To remedy this, users will need to manually change the dataGatewayIP address in the JSON to match the one assigned for the data interface.

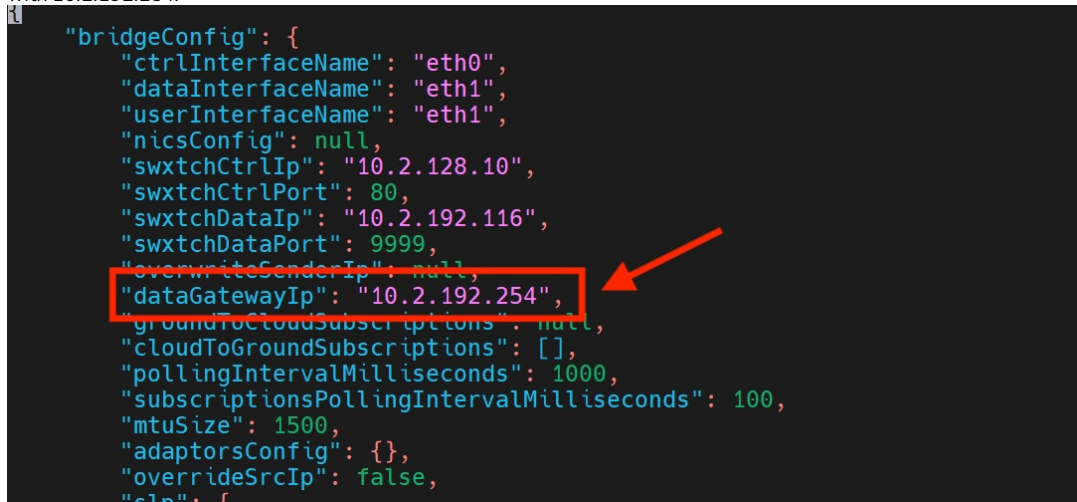
1. Use the `ip route` command in the swXtchBridge VM to get a list of the interfaces and their IP address.
2. Record the IP address of the data interface. In this example, since eth1 is the dataInterfaceName, the user will record 10.2.192.254 as the dataGatewayIP.

```
Last login: Thu Nov 21 13:53:17 2024 from 10.2.128.4
testadmin@DSd-bridge-100:~$ ip route
default via 10.2.128.254 dev eth0 proto dhcp metric 20100
default via 10.2.192.254 dev eth1 proto dhcp metric 20101
10.2.128.0/22 dev eth0 proto kernel scope link src 10.2.128.98 metric 100
10.2.192.0/22 dev eth1 proto kernel scope link src 10.2.192.90 metric 200
168.63.129.16 via 10.2.128.1 dev eth0 proto dhcp src 10.2.128.98 metric 100
169.254.169.254 via 10.2.128.1 dev eth0 proto dhcp src 10.2.128.98 metric 100
172.10.1.0/24 dev swxtch-tun-igmp proto kernel scope link src 172.10.1.10
testadmin@DSd-bridge-100:~$
```

3. Open the swXtchBridge JSON file by running the following command. The location of the swXtchBridge JSON file is **/var/opt/swxtch/swxtch-bridge-cfg.json**.

Bash	Copy
<pre>sudo nano /var/opt/swxtch/swxtch-bridge-cfg.json</pre>	

4. Replace **null** in the dataGatewayIP field with the data interface IP address found in Step 2. In this example, the replaced null with 10.2.192.254.



```
"bridgeConfig": {
  "ctrlInterfaceName": "eth0",
  "dataInterfaceName": "eth1",
  "userInterfaceName": "eth1",
  "nicsConfig": null,
  "swxtchCtrlIp": "10.2.128.10",
  "swxtchCtrlPort": 80,
  "swxtchDataIp": "10.2.192.116",
  "swxtchDataPort": 9999,
  "overwriteSenderIp": null,
  "dataGatewayIp": "10.2.192.254",
  "groundToCloudSubscriptions": null,
  "cloudToGroundSubscriptions": [],
  "pollingIntervalMilliseconds": 1000,
  "subscriptionsPollingIntervalMilliseconds": 100,
  "mtuSize": 1500,
  "adaptorsConfig": {},
  "overrideSrcIp": false,
  "ctrl": {
```

5. Save the file.
6. Run the installation again using the following command:

Bash	Copy
<pre>sudo sh -c "curl -s http://&lt;swxtch-ip&gt;/services/install/swxtch-bridge-install.sh   bash -s"</pre>	

Completing these steps will force the Bridge to resolve the gateway MAC address by using the IP address specified.

## Option #2: Containerized Installation via Docker

By installing the containerized version of the swXtchBridge installer via Docker, users can forgo the traditional steps of downloading dependencies since they will be packaged together. Containers allow users to support any system that meets the basic system requirements. It will only work if the cloudSwXtch instance is up and running and the bridge host has network connectivity to the cloudSwXtch instance.

### Reminder

Before you start, review the [swXtchBridge System Requirements](#) for Docker-specific RHEL and Ubuntu system requirements.

## Prerequisites

Users must install Docker on their RHEL or Ubuntu. Please use the following commands below to properly install Docker for swXtchBridge.

### RHEL

1. Ensure the operating system is RHEL9.
2. Run the following command to prepare the repositories for the docker install:

Bash	Copy
<pre>sudo dnf config-manager --add-repo https://download.docker.com/linux/rhel/docker-ce.repo cat /etc/yum.repos.d/docker-ce.repo sudo sed -i 's/\$releasever/9/g' /etc/yum.repos.d/docker-ce.repo cat /etc/yum.repos.d/docker-ce.repo sudo dnf -y install dnf-plugins-core</pre>	

3. Install Docker:

Bash	Copy
<pre>sudo dnf install docker-ce docker-ce-cli containerd.io docker-buildx-plugin docker-compose-plugin</pre>	

4. Run the following commands to enable Docker on your machine:

Bash	Copy
<pre>sudo usermod -aG docker \$USER sudo systemctl enable docker sudo systemctl start docker</pre>	

## Ubuntu

1. Ensure the operating system is Ubuntu 20.04.
2. Install Docker:

Bash	Copy
<pre>curl https://get.docker.com/ &gt; dockerinstall &amp;&amp; chmod 777 dockerinstall &amp;&amp; sudo ./dockerinstall</pre>	

3. Run the following commands to enable Docker on your machine:

Bash	Copy
<pre>sudo usermod -aG docker \$USER sudo systemctl enable docker sudo systemctl start docker</pre>	

## Running Containerized Install

To run a containerized install via Docker, do the following:

1. **Open** a bash console on any machine that is on the same control plane network as the cloudSwXtch that you intend to use as the bridge host.
2. **Ping** the cloudSwXtch using your instance name or IP.

Bash	Copy
<pre>ping &lt;cloudSwXtch-instance-IP or instance-name&gt;</pre>	

a. If the ping fails to find the cloudSwXtch instance by name, try pinging the IP address of the cloudSwXtch instance. If the IP works, they use the IP address in place of the name in all future commands. This can happen if the default DNS settings are changed for the Virtual Network.

3. Run the following command with the `--docker` argument, replacing `<cloudSwXtch-IP>` with the cloudSwXtch's IP address, the `<Data-NIC>` with the Data Interface IP and the `<User-NIC>` with the Multicast Interface IP.

Bash	Copy
<pre>sudo sh -c "curl -s http://&lt;cloudSwXtch-IP&gt;/services/install/swxtch-bridge-install.sh   bash -s -- -d &lt;Data-NIC&gt; -i &lt;User-NIC&gt; --docker"</pre>	

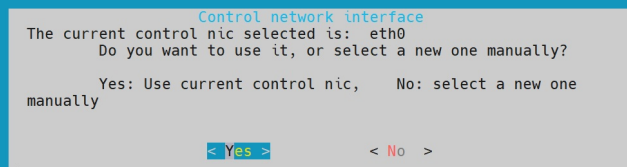
### Example:

Bash	Copy
<pre>sudo sh -c "curl -s http://172.41.128.25/services/install/swxtch-bridge-install.sh   bash -s -- -d eth1 -i eth1 --docker"</pre>	

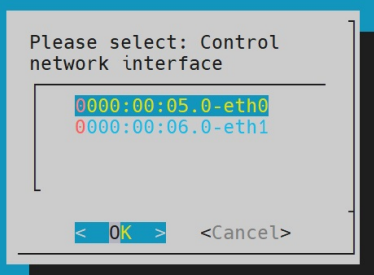
### swXtchBridge Topologies

There are different cloudSwXtch topologies users can deploy depending on the number of NICs they have. For more information on single-, 2-, 3-NIC configurations, see [swXtchBridge Topologies](#).

4. Confirm that the selected control NIC is the one you would like to us.



5. If not, click No to manually select one.



Installation is now complete. You can continue onto [Verify swXtchBridge Installation in swXtch-top](#).

#### Viewing swXtchBridge Container Logs

To view swXtchBridge Container logs, users will need to get the swXtchBridge container ID and run the docker logs command. For a complete list, see [Helpful Docker Service Commands](#).



## Upgrading your swXtchBridge via Docker

### Before You Start - Save Adaptors and Connections Information

1. Go to wXcked Eye Topology Graph.
2. Select the swXtchBridge component.
3. Record the information under the Adaptors and Connections sections. These configurations will not save when updating and will need to be re-added after reinstall.

To upgrade the swXtchBridge via Docker, users will need to follow these steps:

1. **Get** the swXtchBridge docker container ID for both the control and data.
2. **Stop** the docker service.
3. **Remove** both containers from the machine.
4. **Reinstall** the cloudSwXtch using the command in [Step 3 of Containerized Installation via Docker](#).

For a complete list, see [Helpful Docker Service Commands](#) under cloudSwXtch How To's.

### Additional Arguments for swXtchBridge Installer

Bash	Copy
<pre>\$ sudo ./swxtch-bridge-install.sh --help ===== swXtch.io Bridge Installer ===== 2025-01-02 11:56:19.230 *** Logging to: 'bridge-install.log' *** 2025-01-02 11:56:19.265 Linux Distribution: almalinux (version: '9.5'; major version: '9'). 2025-01-02 11:56:19.279 Arguments (1): --help Usage: ./swxtch-bridge-install.sh [OPTIONS]  -u                               just uninstall the swXtch.io bridge (default:no) -c &lt;nic&gt;                         manually select nic for control interface -d &lt;nic&gt;                         manually select nic for data interface -i &lt;nic&gt;                         manually select nic for user interface --airgap                         airgap mode: do not try to update nor install dependencies from the internet                                 (update your system and install the required OS packages manually, before installing) --route_control_to_data          tunnel control data through the data interface (default: false) --override_src_ip               override the source IP of incoming packets (default: false) --high_perf_driver              high-performance drivers will be installed (if required) as part of the swXtch.io bridge installation --force_swx_ctrl_to_public_ip   use swxtch control interface public ip (if available) instead of default. (avoiding user interaction) --force_swx_data_to_public_ip   use swxtch data interface public ip (if available) instead of default. (avoiding user interaction) --docker                       Runs swXtch.io bridge in a docker container -h   --help                     shows this help</pre>	

### Switching to High Performance Mode

Certain NICs can handle a high performance version of the swXtchBridge. This should only be used if a user requires higher throughput for 10+ GB of traffic. For a complete list of recommended NICs, see NIC Requirements under swXtchBridge System Requirements.

To install the high performance drivers for a user's bare metal NICs, it is recommended that users first install the swXtchBridge following the [Installation](#) instructions above. Then, a user should re-install the swXtchBridge on their VM with the additional `high-perf-driver` argument. Verify swXtchBridge installation in swXtch-top

Verify swXtchBridge installation was a success by navigating to swXtch-top on your cloudSwXtch instance. There, you should see the new Bridge virtual machine listed under the Components view.

Administrator: Windows PowerShell

Information - dev

ip-10-64-20-179 dev.20240924E(donna-samc-east-cloudswtch-02-swtch-all)

Cloud

AccountId

Region

SwXtchId

Status

Aws

639720666639

us-east-1

i-0621fe002d73761f0

OK

Licensing

License File

Bandwidth

Clients

License expiration

0.0 bps/50.06 bps

2/30

2033-Dec-15

Bridges 1/1

NEW NOTIFICATIONS

Components

Name	Class	Type	Rx (bps)	Rx (pps)	Tx (bps)	Tx (pps)	Primary IP	OS	Version	Hostname
ip-10-64-20-179	swXtch	X1	0.0	0.0	0.0	0.0	10.64.20.179	Ubuntu 20.04	dev.20240924E	ip-10-64-20-179
metal-r13	Bridge	3	0.0	0.0	0.0	0.0	10.85.0.13	AlmaLinux 9.4	dev.20240924E	metal-r13
EC2AMAZ-7EB22UP	XNIC	2	0.0	0.0	0.0	0.0	10.64.29.51	Windows Serv...	dev.20240924E	EC2AMAZ-7EB22UP
samc-aws-agent-002	XNIC	2	0.0	0.0	0.0	0.0	10.64.23.154	Ubuntu 20.04	dev.20240924E	samc-aws-agent-002

Interfaces metal-r13

Name	Index	Ip	SubnetPrefix	Public Ip	MTU	Driver	PciAddress
dpdk-0	0	10.85.4.130	10.85.4.0/24	--	--	igb_uio	0000:65:00:3
eno1	2	10.85.0.13	10.85.0.0/24	--	1500	igb	0000:18:00:0
swtch-tun-igmp	25	172.10.1.10	172.10.1.0/24	--	4096		

Components

Streams

StreamLinks

Adaptors

HA

Lossless

Settings

PTP

Subscriptions

Notifications

Configurations

Setup

## Accessing logs for swXtchBridge

### Non-containered Install

The logs for control service can be seen with the following command:

Bash

```
sudo journalctl -u swxtch-bridge-ctrl -f -n 100
```

Copy

### Containerized Install

1. Use the `docker ps` command to list all the docker containers currently running on your machine.
2. Record the docker name of the swXtchBridge service you would like to see logs for.
3. Use the `docker logs` command with the container service name.
  - a. **control**

Bash

```
docker logs swxtch-bridge-ctrl -f -n 100
```

Copy

For additional arguments related to the swXtchBridge logs, see [How to View swXtchBridge Logs](#).

## Accessing the bridge-install log

If there are any problems with installation, we recommend users export the **bridge-install.log** from your virtual machine's home directory and email it to [support@swxtch.io](mailto:support@swxtch.io) for additional troubleshooting.

### Troubleshoot: Configuring swXtchBridge Interfaces for Gateway

In the event that your swXtchBridge is not sending data to the cloudSwXtch, then it is recommended to review the swXtchBridge configuration json file to verify the correct interfaces have been selected. For more information on how to do this, please see the [Configuring swXtchBridge Instances](#) section.

Alternatively, there can be an issue with the gateway address. For more information, see [Using a Specific Gateway Address for swXtchBridge](#).

## Configuring swXtchBridge

There may be some scenarios that require special configuration for the swXtchBridge. For more information, see [swXtchBridge](#) under Configuring cloudSwXtch.

## swXtchBridge Commands

After deploying your swXtchBridge, a user can execute commands to stop, start, and restart their instance. They can execute these commands in the command window of their swXtchBridge.

### STOP

Bash	Copy
<pre>sudo systemctl stop swxtch-bridge-ctrl</pre>	

## START

Bash	Copy
<pre>sudo systemctl start swxtch-bridge-ctrl</pre>	

## RESTART

Bash	Copy
<pre>sudo systemctl restart swxtch-bridge-data swxtch-bridge-ctrl</pre>	

**Note:** This example shows how to restart multiple services. Typically, for configuration changes, only ctrl needs to be restarted. However, if the interfaces are altered in the configuration file, the data service should also be restarted.

## Uninstalling swXtchBridge

To uninstall your swXtchBridge application from your bridge host machine:

1. Execute the following command on the Bridge VM on-prem:

Bash	Copy
<pre>sudo sh -c "curl -s http://&lt;swxtch-ip&gt;/services/install/swxtch-bridge-install.sh   bash -s -- -u"</pre>	

Your swXtchBridge instance should now be uninstalled.

# swXtchBridge Topologies

## WHAT TO EXPECT

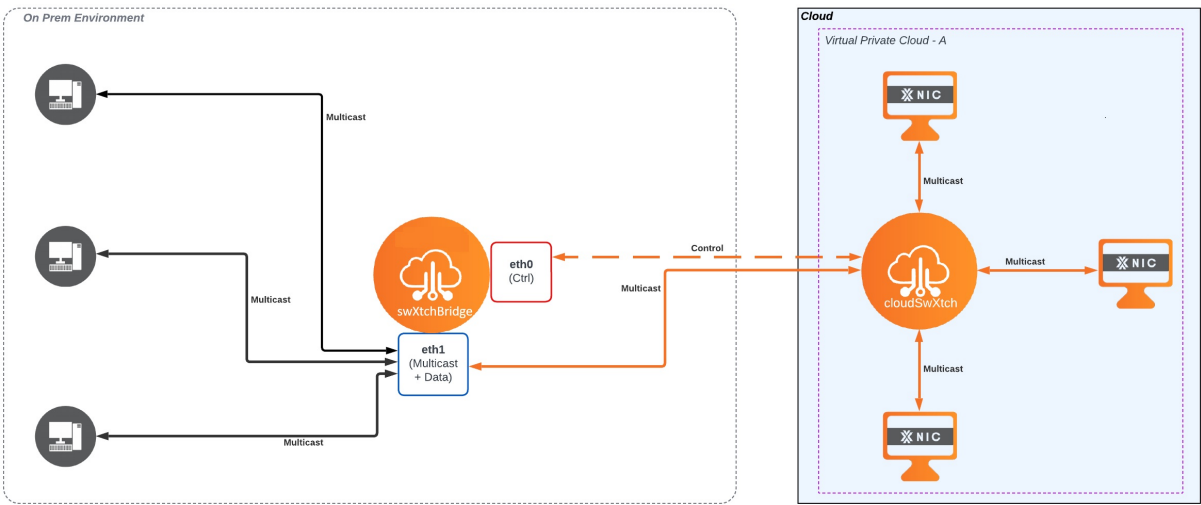
In this article, we will review the different swXtchBridge topologies available for users in order to understand what makes sense for your environment.

## A Flexible Way to Bridge

One benefit of the swXtchBridge is how flexible it is with a user’s on-premises configuration. Depending on their performance or security needs, a user can designate a NIC for their multicast, data, and control plane traffic. This selection occurs when prompted by the swXtchBridge installer. Users can set their interfaces to share a NIC or have their own.

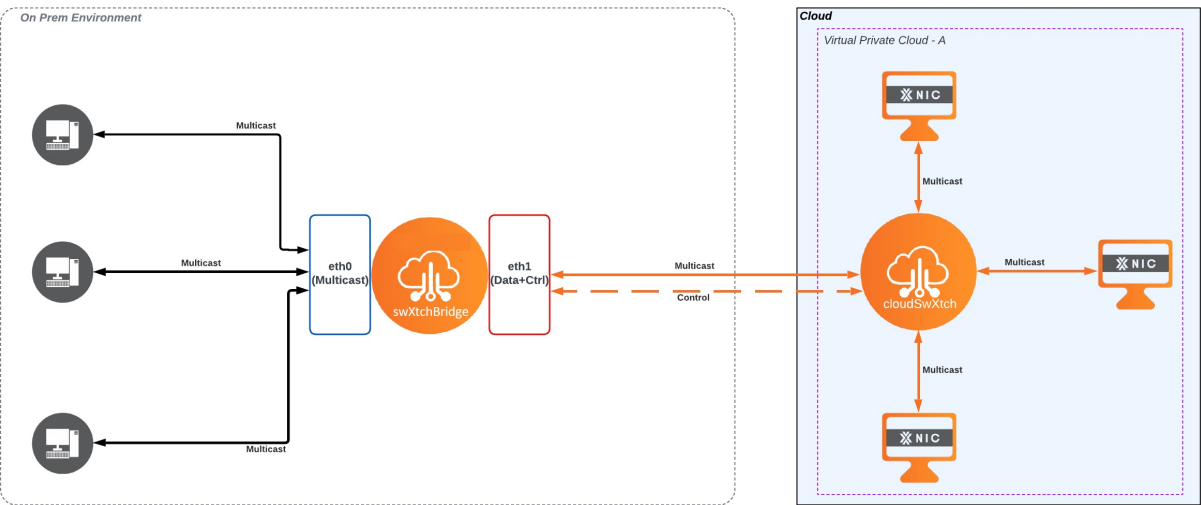
We will review these different configurations, their drawbacks, and their benefits.

## swXtchBridge with 2 NICs



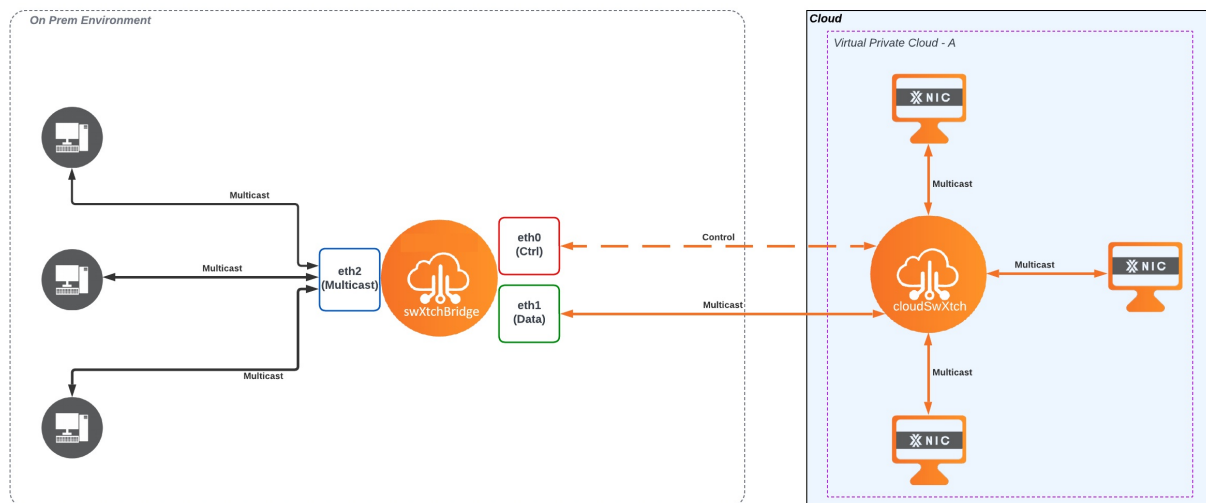
In this configuration, users have two NICs for their swXtchBridge. One NIC (**eth1**) is used for multicast and data plane traffic while the other (**eth0**) is used strictly for control. We recommend this setup because it requires the least amount of configuration and only requires two NICs. It is also deployed by a majority of our users.

## Alternative 2 NIC Bridge Configuration



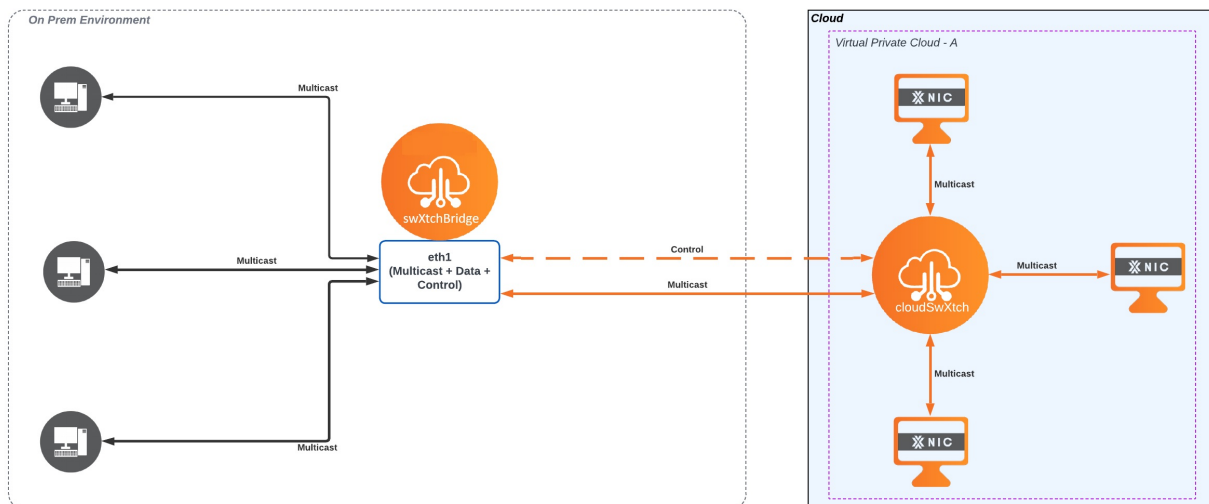
Alternatively, you can have data and control plane traffic share a single NIC. This would require users to configure their control traffic to tunnel through the data interface. Having the data and control plane share the same interface can introduce a few unknowns. It is recommended that you contact [support@swXtch.io](mailto:support@swXtch.io) if you require this configuration.

## swXtchBridge with 3 NICs



In this configuration, users will have three NICs for their SwXtchBridge. Each NIC will be assigned a different interface. While this also requires minimal setup, users may not have the infrastructure and resources to allot an individual hardware NIC for each interface. Users who require more control over their network and the ability to segregate network traffic efficiently without saturating their individual hardware NICs will benefit from this setup.

## swXtchBridge with Single NIC



In this configuration, users will only have a single NIC for their swXtchBridge. This means that the multicast, data, and control plane will all share a single NIC for their respective traffic. While this requires the least amount of physical infrastructure, users will need to configure their control plane traffic to tunnel using data plane. In addition, high performance mode will not be available.

# Installing xNIC

## SUMMARY

- The following article will explain how to install the xNIC component on your Windows and Linux system.
- **xNIC** is the software that runs on your VM to create a virtual NIC. The **xNIC** connects your VM to a cloudSwXtch instance.

## xNIC System Requirements

There are some major feature considerations to make when deciding what xNIC version to use. These prerequisites are further detailed in the [xNIC System Requirements](#) article.

## Linux Installation Guide

### [xNIC Linux Installation](#)

The installer script will install the xNIC as a service as well as the utility applications used to verify the operation of the xNIC and cloudSwXtch instance network for a Linux system. See [Testing](#).

## Windows Installation Guide

### [xNIC Windows Installation](#)

The installer script will install the xNIC as a service as well as the utility applications used to verify the operation of the xNIC and the cloudSwXtch instance network for a Windows system.

# xNIC System Requirements

A cloudSwxtch must exist to create a xNIC. See [cloudSwXtch System Requirements](#) for more information.

## xNIC software

The xNIC software must be run on each virtual machine that is to be part of the IP multicast network and not a cloudSwXtch or a cloudSwXtch Bridge. This software can be installed on hosts which meet the following requirements:

### Available Operating Systems

Linux	Windows
<ul style="list-style-type: none"><li>AlmaLinux 8.8</li><li>Amazon Linux 2023</li><li>Centos 8 Minimum</li><li>Oracle Linux 8</li><li>RHEL 8.8</li><li>RHEL 9.2</li><li>Rocky Linux 8</li><li>Rocky Linux 9</li><li>Ubuntu 20.04</li><li>Ubuntu 22.04</li><li>Ubuntu 24.04</li></ul> <p>Minimum Kernel Version 4.18</p>	<ul style="list-style-type: none"><li>Windows Server 2022</li><li>Windows Server 2019</li><li>Windows Server 2016</li><li>Windows 11 Pro/Enterprise</li><li>Windows 10 Pro/Enterprise</li></ul>

### Required Dependencies for xNIC

Certain versions of the available operating systems require additional dependencies for xNIC installation. These **must** be installed onto the VM before installing the xNIC.

Ubuntu 20.04.6 LTS (Focal Fossa)

Plaintext

Copy

```
libcrypt-dev_1%3a4.4.10-10ubuntu4_amd64.deb
libpcap-dev_1.9.1-3ubuntu1.20.04.1_amd64.deb
manpages-dev_5.05-1_all.deb
libonig5_6.9.4-1_amd64.deb
libctf-nobfd0_2.34-6ubuntu1.9_amd64.deb
libc6-dev_2.31-0ubuntu9.16_amd64.deb
libc-dev-bin_2.31-0ubuntu9.16_amd64.deb
linux-tools-5.4.0-200_5.4.0-200.220_amd64.deb
libpcap0.8-dev_1.9.1-3ubuntu1.20.04.1_amd64.deb
libctf0_2.34-6ubuntu1.9_amd64.deb
libbinutils_2.34-6ubuntu1.9_amd64.deb
libjq1_1.6-1ubuntu0.20.04.1_amd64.deb
binutils-x86-64-linux-gnu_2.34-6ubuntu1.9_amd64.deb
linux-tools-generic_5.4.0.200.196_amd64.deb
linux-libc-dev_5.4.0-200.220_amd64.deb
linux-tools-5.4.0-200-generic_5.4.0-200.220_amd64.deb
binutils_2.34-6ubuntu1.9_amd64.deb
jq_1.6-1ubuntu0.20.04.1_amd64.deb
binutils-common_2.34-6ubuntu1.9_amd64.deb
```

Ubuntu 22.04.5 LTS (Jammy Jellyfish)

Plaintext

Copy

```
libjpeg8_8c-2ubuntu10_amd64.deb
libfile-fcntllock-perl_0.22-3build7_amd64.deb
libwebp7_1.2.2-2ubuntu0.22.04.2_amd64.deb
linux-tools-5.15.0-126-generic_5.15.0-126.136_amd64.deb
manpages-dev_5.10-1ubuntu1_all.deb
libc-devtools_2.35-0ubuntu3.8_amd64.deb
libpcap-dev_1.10.1-4ubuntu1.22.04.1_amd64.deb
libdpkg-perl_1.21.1ubuntu2.3_all.deb
pkg-config_0.29.2-1ubuntu3_amd64.deb
libjpeg-turbo8_2.1.2-0ubuntu1_amd64.deb
libc-dev-bin_2.35-0ubuntu3.8_amd64.deb
linux-tools-5.15.0-126_5.15.0-126.136_amd64.deb
libtiff5_4.3.0-6ubuntu0.10_amd64.deb
libjq1_1.6-2.1ubuntu3_amd64.deb
libdbus-1-dev_1.12.20-2ubuntu4.1_amd64.deb
fontconfig-config_2.13.1-4.2ubuntu5_all.deb
linux-libc-dev_5.15.0-126.136_amd64.deb
rpcsvc-proto_1.4.2-0ubuntu6_amd64.deb
libcrypt-dev_1%3a4.4.27-1_amd64.deb
libgd3_2.3.0-2ubuntu2.3_amd64.deb
libjbig0_2.1-3.1ubuntu0.22.04.1_amd64.deb
libfontconfig1_2.13.1-4.2ubuntu5_amd64.deb
libpcap0.8-dev_1.10.1-4ubuntu1.22.04.1_amd64.deb
jq_1.6-2.1ubuntu3_amd64.deb
libtirpc-dev_1.3.2-2ubuntu0.1_amd64.deb
linux-tools-generic_5.15.0.126.125_amd64.deb
bzip2_1.0.8-5build1_amd64.deb
libxpm4_1%3a3.5.12-1ubuntu0.22.04.2_amd64.deb
libns1-dev_1.3.0-2build2_amd64.deb
libc6-dev_2.35-0ubuntu3.8_amd64.deb
libonig5_6.9.7.1-2build1_amd64.deb
fonts-dejavu-core_2.37-2build1_all.deb
libdeflate0_1.10-2_amd64.deb
```

## Red Hat Enterprise Linux 9.2 (Plow)





Plaintext

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```

libnl3-3.7.0-1.el9.x86_64.rpm
libibverbs-44.0-2.el9.i686.rpm
libibverbs-44.0-2.el9.x86_64.rpm
glibc-2.34-60.el9_2.14.x86_64.rpm
glibc-2.34-60.el9_2.14.i686.rpm
libpcap-1.10.0-4.el9.i686.rpm
glibc-common-2.34-60.el9_2.14.x86_64.rpm
glibc-gconv-extra-2.34-60.el9_2.14.i686.rpm
glibc-gconv-extra-2.34-60.el9_2.14.x86_64.rpm
iproute-6.1.0-1.el9.x86_64.rpm
bash-5.1.8-6.el9_1.x86_64.rpm
libnetfilter_conntrack-1.0.9-1.el9.x86_64.rpm
pcr2-syntax-10.40-2.el9.noarch.rpm
zlib-1.2.11-39.el9.x86_64.rpm
libdb-5.3.28-53.el9.x86_64.rpm
oniguruma-6.9.6-1.el9.5.x86_64.rpm
libsepol-3.5-1.el9.x86_64.rpm
libnfnetlink-1.0.1-21.el9.x86_64.rpm
libnl3-3.7.0-1.el9.i686.rpm
ncurses-base-6.2-8.20210508.el9_2.1.noarch.rpm
ncurses-libs-6.2-8.20210508.el9_2.1.x86_64.rpm
oniguruma-6.9.6-1.el9.5.i686.rpm
libpcap-1.10.0-4.el9.x86_64.rpm
iproute-tc-6.1.0-1.el9.x86_64.rpm
setup-2.13.7-9.el9.noarch.rpm
tzdata-2024b-2.el9.noarch.rpm
bpf2tool-7.0.0-284.92.1.el9_2.x86_64.rpm
iptables-libs-1.8.8-6.el9_1.x86_64.rpm
libmnl-1.0.4-15.el9.x86_64.rpm
libselinux-3.5-1.el9.x86_64.rpm
elfutils-libelf-0.188-3.el9.x86_64.rpm
glibc-minimal-langpack-2.34-60.el9_2.14.x86_64.rpm
jq-1.6-14.el9.i686.rpm
redhat-release-9.2-0.15.el9.x86_64.rpm
redhat-release-eula-9.2-0.15.el9.x86_64.rpm
libbpf-1.0.0-2.el9.x86_64.rpm
libcap-2.48-9.el9_2.x86_64.rpm
pcr2-10.40-2.el9.x86_64.rpm
jq-1.6-14.el9.x86_64.rpm
psmisc-23.4-3.el9.x86_64.rpm
basesystem-11-13.el9.noarch.rpm
filesystem-3.16-2.el9.x86_64.rpm
libgcc-11.3.1-4.3.el9.x86_64.rpm
libgcc-11.3.1-4.3.el9.i686.rpm

```

## CPU Architecture

x86\_x64

## Network Connectivity

1 NIC or 2 NICs for higher performance (one for each sub-net: ctrl-subnet and data-subnet)

### 1 NIC vs. 2 NICs

An xNIC instance may have 1 or 2 NICs depending on the subnet configuration of the cloudSwXtch.

- **If a cloudSwXtch has 2 NICs sharing a single subnet**, an xNIC needs only 1 NIC (control). This NIC will share the same single subnet for control and data plane communications as the cloudSwXtch.
- **For high performance, a cloudSwXtch should have 2 NICs using 2 different subnets**, an xNIC will need 2 NICs connected to separate subnets:
  - A subnet for control plane traffic (referred to as the **ctrl-subnet** from here on).
  - A subnet for data plane traffic (referred to as the **data-subnet** from here on).

### Subnet Selection

The subnets must be the same subnets used for the cloudSwXtch.

The install requires a simple command that installs the xNIC from the cloudSwXtch. The install typically takes less than one minute per host. See the installation sections for more details.

## Tunnel network for xNIC Type 1

The xNIC software must be installed on each virtual machine that is to send or receive multicast traffic. For xNIC Type 1, the software will create a tunnel network interface (called **swxtch-tun0** for Linux and **swxtch-tun** for Windows) that presents to the application a network subnet of 172.30.X.Y. Each virtual machine running the xNIC software will be assigned an IP address in this range.

**Please note:** In almost all scenarios, it is recommended that users install xNIC Type 2 as this will bypass this requirement.

**NOTE:**

The swxtch tunnel interface should only be used for multicast traffic. Any other network traffic should target other network interfaces.

## Install xNIC on Linux

### WHAT TO EXPECT

The xNIC is a lightweight service that must be installed on every VM sending or receiving multicast traffic to and from a cloudSwXtch. An xNIC should not be installed on a cloudSwXtch or cloudSwXtch Bridge VM.

In this article, users will learn how to install the xNIC software in the Linux systems.

## Installing xNIC for Linux

### BEFORE YOU START

Review [xNIC System requirements](#).  
**Network Acceleration**

If using Azure, the data-subnet must have the "Network Acceleration" feature enabled.

## Running the Install Script

To make installation easy, the xNIC is installed from the cloudSwXtch instance via a one-time shell command. The xNIC is matched to the attached cloudSwXtch instance and should be reinstalled if the cloudSwXtch version changes.

To run the install:

1. **Open** a terminal on the VM you wish to install the xNIC software on.
2. **Verify** network connectivity to the cloudSwXtch instance by "pinging" the switch.

Bash	Copy
<pre>ping &lt;cloudSwXtch-instance-name&gt;</pre>	

- a. If the ping fails to find the cloudSwXtch instance by name, try pinging the IP address of the cloudSwXtch instance. If the IP works, then use the IP address in place of the <switch-instance-name> in all further commands. This can happen if the DNS settings are not configured for the virtual network.

### Review Firewall Exceptions

The installer script will automatically open ports 10800 and 9999.

To open up additional ports for producing/consuming multicast traffic, use the following command:

Bash	Copy
<pre>sudo firewall-cmd --add-port=&lt;port&gt;/udp --permanent sudo systemctl restart firewalld</pre>	

3. **Run** the following installer script:

Bash	Copy
<pre>curl http://&lt;cloudSwXtch-instance-name&gt;/services/install/swxtch-xnic-install.sh   bash</pre>	

Alternatively, you can run the install script after downloading it using the **wget** command:

Bash	Copy
<pre>wget http://&lt;cloudSwXtch-ip&gt;/services/install/swxtch-xnic-install.sh chmod +x swxtch-xnic-install.sh ./swxtch-xnic-install.sh</pre>	

The installer script will install the xNIC as a service and a set of utility applications that can be used to verify the operation of your cloudSwXtch network. Refer to [Testing](#) for more details.

A successful install is shown below:

```
testadmin@agent-101:~$ curl http://10.2.128.10/services/install/swxtch-xnic-install.sh | bash
% Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
           Dload  Upload    Total   Spent    Left   Speed
100 21432  0 21432    0     0  5232k  0 --:--:-- --:--:-- --:--:-- 5232k
xNIC installer detected ubuntu 20.04. Installing xNIC version 1.
% Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
           Dload  Upload    Total   Spent    Left   Speed
100 7308k 100 7308k    0     0 113M    0 --:--:-- --:--:-- --:--:-- 113M
Selecting previously unselected package swxtch-xnic.
(Reading database ... 141654 files and directories currently installed.)
Preparing to unpack swxtch-xnic_1.0.0_ubuntu20.04_amd64.deb ...
Unpacking swxtch-xnic (1.0.0) ...
Setting up swxtch-xnic (1.0.0) ...
/var/opt/swxtch/swxtch-xnic.conf has been updated.
Service swxtch-xnic.service started
testadmin@DSd-agent-101:~$
```

#### IF THE INSTALL FAILS:

Validate that the VM has at least two NICs and the NICs are on the same subnets for control and data as the cloudSwXtch. The ctrl-subnet should be assigned to the primary NIC.

If you are using Azure, validate that the data-subnet has "Network Acceleration" feature enabled.

#### Setting the rp\_filter on Linux

During xNIC installation, the Linux `rp_filter` is set to loose mode by default at runtime. This allows for the xNIC to work on asymmetric networks, meaning that it can receive packets from machines outside of its subnet if the source is routable.

To **opt out** of this configuration, navigate to the `xnic.json` file after completing the xNIC installation process. This file can be found in `/var/opt/swxtch/xnic.json`. To edit the file, one option is to use `nano` as shown below:

```
Bash                                                                    Copy
sudo nano /var/opt/swxtch/xnic.json
```

Next to "overrideSourceIP" in the json file, change the parameter to **true**. **Save the file** and **restart** the xNIC VM. This will set the `rp_filter` back to the original mode and will remain like that for future reboots. Note that this means our software will do source network address translation on incoming packets.

#### Additional Arguments

There are additional arguments when installing the xNIC.

Note that the **ctrl-** and **data-** interfaces are from the VM the xNIC is installed. These will be set automatically by the installer. There may be some instances where you will need to specify them. For example, if you have three network interfaces and you want to specify what you want to use for ctrl or data, you can manually select them using the `-ctrl_interface <interface index>` or `-data_interface <interface index>` arguments. Also, these argument help in complex contexts where the agent is in a different vNet/VPC from the cloudSwXtch.

A full list of arguments is detailed below:

```
Bash                                                                    Copy
$ ./swxtch-xnic-install.sh -h
Usage: ./swxtch-xnic-install.sh [OPTIONS]
  -t <1|2>                xNIC type to install (default: 2 if supported in this OS, 1 otherwise)
  -u                      uninstall xNIC instances
  --ctrl_interface <interface name>  manual selection of the Control interface
  --data_interface <interface name>  manual selection of the Data interface
  --ptp                   installing of Precision Time Protocol (default: false)
  --verify               Verify install package with respective signature file (sig_public.pem if public_key is not
  setted).
  --public_key <public key file>    Public key file to use for signature verification (used with verify parameter).
  -h | --help             shows this help
```

**Note:** There is an option for users to switch between xNIC Type 1 and Type 2, latter being the default. All installation instructions and system requirements are solely for Type 2. It is not recommended to use Type 1 unless otherwise suggested by swXtch.io Support.

#### Precision Time Protocol Installation

By default, precision time protocol is not enabled during xNIC installation. To install the Precision Time Protocol feature, please run the following command:

```
PowerShell                                                                Copy
wget http://<swxtch-ip>/services/install/swxtch-xnic-install.sh
chmod +x swxtch-xnic-install.sh
./swxtch-xnic-install.sh --ptp
```

#### Verifying Installer Files [Optional]

Prior to installing the xNIC, the user may need to verify the authenticity of swXtch.io's installer files. While it is not a necessary step in the installation process, it is still an available option to users with security protocols that require files to be validated. **Please note:** This option is only available in cloudSwXtch versions 2.2 or greater.

After downloading the **swxtch-xnic-install.sh** file on your VM, run the following steps:

1. Download the public key from swXtch.io using the following command on your VM:

Shell  
 

Bash	Copy
<pre>curl https://services/swxtch.io/assets/sig_public.pem</pre>	

2. Move the public key into the same directory as the swxtch-xnic-install.sh file.
3. Run the install command with the **--verify** argument:

Shell  
 

Bash	Copy
<pre>./swxtch-xnic-install.sh --verify</pre>	

The **--verify** argument will download the .sig file associated with the xNIC installer file based on the VM's operating system, verify with the public key, and proceed to install the xNIC onto the VM as a service.

## Testing

xNIC installation includes a set of utility applications that you can use to verify the operation of your cloudSwXtch network. Refer to [Testing](#) for details.

- **swxtch-top**: An application to display real-time statistics of the cloudSwXtch instance.
- **swxtch-perf**: An application to produce and consume unicast and multicast traffic for testing purposes.

### Running swxtch-top on Linux

<swxtch-hostname>: name of your existing swxtch or "host" swxtch

Bash

Copy

```
swxtch-top dashboard --swxtch <swxtch-hostname>
```

## Increasing the Number of Groups Being Consumed by the xNIC

Linux environments limit the amount of groups that can be consumed by the xNIC. By default, the value is set to 20. If a user needs to consume more than 20 groups through a single xNIC, they need to make a change to the kernel parameter, **net.ipv4.igmp\_max\_memberships**, in the **sysctl.conf** file.

To do this:

1. Open the **/etc/sysctl.conf** to begin editing.
2. Add the following line:

Bash

Copy

```
net.ipv4.igmp_max_memberships=4096
```

3. Save the file and apply the changes immediately:

Bash

Copy

```
sysctl -p
```

4. Verify the change:

Bash

Copy

```
sysctl net.ipv4.igmp_max_memberships
```

The xNIC should now be able to consume more groups.

## Uninstalling xNIC on Linux

To uninstall xNIC on Linux, users can follow the steps in the [xNIC Linux Uninstall Guide](#).

## Upgrading xNIC on Linux

To upgrade xNIC on Linux, users can follow the steps in the [xNIC Linux Upgrade Guide](#).

# xNIC Linux Uninstall

WHAT TO EXPECT

In this article, users will learn how to remove the xNIC from their Linux system for both Ubuntu and Redhat.

## Uninstalling xNIC on Linux

- 1. **Open** a shell on the host VM. The host VM is the VM where you wish to uninstall the xNIC software.
- 2. **Run** the following command depending the xNIC version:

None	Copy
<pre>curl http://&lt;swxtch-instance-name&gt;/services/install/swxtch-xnic-install.sh   bash -s -- -u</pre>	

- 3. **The uninstall script will remove Linux xNIC.**

# xNIC Linux Upgrade

BEFORE YOU START

When a cloudSwXtch has been updated, it's recommended to update connected xNICs as well.

In this article, users will be able to use the appropriate script to upgrade their xNIC.

## Upgrading Linux xNIC

24/7 Operations

If the services need to be up and running 24/7, swXtch.io suggests that redundant systems exist for which will be referred to as "Main" and "Backup". During an upgrade the Backup system should be upgraded, then the traffic should be routed to the Backup while the Main is upgraded.

You can use the following command to uninstall the existing xNIC and upgrade it.

1. Run the installer script:

Shell



Bash	Copy
<pre>curl http://&lt;swxtch-instance-name&gt;/services/install/swxtch-xnic-install.sh   bash</pre>	

### Additional Arguments

There are additional options when installing the xNIC.

Note that the **ctrl-** and **data-** interfaces are from the VM the xNIC is installed. These will be set automatically by the installer. There may be some instances where you will need to specify them. For example, if you have three network interfaces and you want to specify what you want to use for ctrl or data, you can manually select them using the `-ctrl_interface` or `-data_interface` arguments. Also, these argument help in complex contexts where the agent is in a different vNet/VPC from the cloudSwXtch.

For xNIC 1 on Linux, multiple xNICs can be installed on one VM by using the `-i` and the `--tun-subnet` arguments. In this case, the control interface will be the same while the data interface will differ for each xNIC on the Linux VM.

A full list of arguments is detailed below:

Bash	Copy
<pre>\$ ./swxtch-xnic-install.sh -h Usage: ./swxtch-xnic-install.sh [OPTIONS] -t &lt;1 2&gt;                xNIC type to install (default: 2 if supported in this OS, 1 otherwise) -u                      uninstall xNIC instances --ctrl_interface &lt;interface name&gt; manual selection of the Control interface --data_interface &lt;interface name&gt; manual selection of the Data interface --ptp &lt;true false&gt;      installing of Precision Time Protocol (default: true) -h   --help             shows this help</pre>	

# Install xNIC on Windows

## WHAT TO EXPECT

The xNIC is a lightweight service that must be installed on every VM sending or receiving multicast traffic to and from a cloudSwXtch. An xNIC should not be installed on a cloudSwXtch or a cloudSwXtch Bridge VM.

In this article, users will learn how to install the xNIC software on Windows systems.

## Installing xNIC for Windows

### BEFORE YOU START

Review [xNIC System Requirements](#).

#### Firewall Restrictions

The Windows installation process adds rules to Windows Defender Firewall, which allow for traffic through the UDP ports 10800 and 9999. The rule names are SwXtchControl, SwXtchData, and SwXtchTun.

#### Network Acceleration

If using Azure, the data-subnet must have the "Network Acceleration" feature enabled.

## Running the Install script

To make installation easy, the xNIC is installed from the cloudSwXtch instance via a one-line shell command. The xNIC is matched to the attached cloudSwXtch instance and should be reinstalled if the cloudSwXtch version changes.

The xNIC takes less than a minute to install on an existing VM.

To run the install:

1. **Open** a PowerShell terminal on the Windows VM that you aspire to install the xNIC software on. **If you are working on Windows 11**, please use Windows Terminal instead for installation.
2. **Verify** network connectivity to the cloudSwXtch instance by "pinging" the switch.

Bash

Copy

```
ping <cloudSwXtch-instance-name>
```

### Ping Fails

If the ping fails to find the cloudSwXtch instance by name, try pinging the IP address of the cloudSwXtch instance. If the IP works, then use the IP address in place of the `<switch-instance-name>` in all further commands.

This can happen if the default DNS settings are changed for the virtual network.

3. **The installer script will automatically remove any firewall restrictions to UDP ports 10800 and 9999.** The cloudSwXtch sends UDP packets to these ports as part of normal operation.

### Special Rules for Windows Defender Firewall

**It is recommended to simply turn off the firewall.** Additionally, users can open up additional ports for producing/consuming multicast traffic by using the following command in PowerShell:

Bash

Copy

```
New-NetFirewallRule -Name 'rule_name' -DisplayName 'rule_name' -Enabled True -Direction Inbound -Protocol UDP -Action Allow -LocalPort 1234
```

5. **Download and run** the installer script in Powershell as an administrator:

Bash

Copy

```
Invoke-WebRequest -Uri 'http://<cloudSwXtch-instance-name>/services/install/swxtch-xnic-win-install.ps1' -Outfile swxtch-xnic-win-install.ps1
```

## Additional Arguments

There are additional options when installing the xNIC. To see these options, use the **-h** argument.

The **ctrl-** and **data-** interfaces are from the VM the xNIC is installed. These will be set automatically by the installer. There may be some instances where you will need to specify them. For example, if you have three network interfaces and you want to specify what you want to use for ctrl or data, you can manually select them using the **-ctrl\_interface <interface index>** or **-data\_interface <interface index>** arguments detailed below.



**Note:** There is an option (-t) for users to switch between xNIC Type 1 and xNIC Type 2 (default). All installation instructions and system requirements are solely for Type 2. It is not recommended to use Type 1 unless otherwise suggested by swXtch.io Support.

BashCopy

```
PS C:\Users\testadmin> .\swxtch-xnic-win-install.ps1 -h
Running on Microsoft Windows Server 2022 Datacenter
Usage: C:\Users\testadmin\swxtch-xnic-win-install.ps1 [OPTIONS]
  -t <1|2>                xNIC type to install (default: 2 if supported in this OS, 1 otherwise)
  -u                      uninstall xcd xNIC only (no other options allowed)
  -unattended             unattended installation (in case of reboot, the user will not be prompted)
  -ctrl_interface <interface index> manual selection of the Control interface
  -data_interface <interface index> manual selection of the Data interface
  -ptp                   installing of Precision Time Protocol (default: false)
  -verify                verify install package with respective signature file (sig_public.pem if public_key is not
  -public_key <public key file> public key file to use for signature verification (used with verify parameter).
  -h                     shows this help
```

**Please note:** The `ctrl_interface` and `data_interface` commands should only be used in complex configurations where the installer cannot locate them. Contact [support@swXtch.io](mailto:support@swXtch.io) for more information.

### Precision Time Protocol Installation

By default, precision time protocol is not enabled during xNIC installation. To install the Precision Time Protocol feature, please run the following command:

PowerShellCopy

```
.\swxtch-xnic-win-install.ps1 --ptp
```

### Getting the interface index for ctrl\_interface and data\_interface

To get the interface index, you can run the following command:

BashCopy

```
get-netipconfiguration
```

A sample of the response will be returned with the InterfaceIndex (\*\*\*) listed for both:

BashCopy

```
PS C:\Users\testadmin> get-netipconfiguration

InterfaceAlias      : Ethernet
InterfaceIndex       : 36 ***
InterfaceDescription : Microsoft Hyper-V Network Adapter
NetProfile.Name      : Network
IPv4Address          : 10.2.128.75
IPv6DefaultGateway   :
IPv4DefaultGateway   : 10.2.128.1
DNSServer            : 168.63.129.16

InterfaceAlias      : Ethernet 2
InterfaceIndex       : 60 ***
InterfaceDescription : Microsoft Hyper-V Network Adapter #2
NetProfile.Name      : Unidentified network
IPv4Address          : 10.2.192.82
IPv6DefaultGateway   :
IPv4DefaultGateway   :
DNSServer            : 168.63.129.16
```

7. The installer script will install a **Windows service** called **swXtchNIC**:

```
Administrator: Windows PowerShell
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

PS C:\Users\testadmin> ./swxtch-xnic-win-install.ps1 -k
This PowerShell script manages the xNIC installation for Windows
Version to install is 1
Running on Windows Server 2019 Datacenter
- Getting Swxtch-xNIC installer for Windows
Saving swxtch-xnic.conf file backup named swxtch-xnic-bup.conf
- Removing installed swXtch xNIC
- Installing Swxtch-xNIC (swxtch-xnic-1.0.0-x86_64.msi)
- Installing Microsoft Visual C++ Redistributable
- Adding xNIC tools folder to the User PATH
- Configuring xNIC
Loading swxtch-xnic.conf backup
...Control Subnet = 10.2.128.0, Prefix = 22
...Data Subnet = 10.2.192.0, Prefix = 22
...Control Interface index = 134
...Data Interface index = 47
- Checking if XDP driver is installed
- Starting the xNIC 1 service...
Installation finished
PS C:\Users\testadmin>
```

8. **Reboot** your machine once the installation is complete. This will enable you to execute cloudSwXtch tools properly from your user home directory such as **swxtch-top**.

### Errors

The control and data interfaces should have proper numbers. A 0, or negative number, indicates an error in the configuration of the control or data subnets for the xNIC. The control and data subnets of the cloudSwXtch and the xNICs should be the same.

If you are using Azure, validate that the data-subnet has "Network Acceleration" featured enabled.

### Testing

The installation includes a set of utility applications that you can use to verify the operation of your cloudSwXtch network. Refer to [Testing](#) for details.

- **swxtch-top.exe** : An application to display real-time statistics of the cloudSwXtch instance.
- **swxtch-perf.exe** : An application to produce and consume multicast traffic for testing purposes.

#### Running swxtch-top on Windows

```
Bash
swxtch-top --swxtch <cloudSwXtch-hostname>
```

- **<cloudSwXtch-hostname>**: the name of your existing or "host" cloudSwXtch

### Uninstalling xNIC on Windows

To uninstall xNIC on Windows, users can follow the steps in the [Uninstall xNIC on Windows](#) guide.

### Upgrading xNIC on Windows

To upgrade xNIC on Windows, users can follow the steps in the [Upgrade xNIC on Windows](#) guide.

# Uninstall xNIC on Windows

WHAT TO EXPECT

In this article, users will learn how to remove the xNIC from their Windows system.

## Uninstalling xNIC on Windows

When uninstalling xNIC on Windows, please **do not** uninstall using the Add/Remove Programs feature. It is important to use the command below instead for uninstall.

- 1. **Open** Powershell on your Windows system (command window if Windows 11).
- 2. Run the following command:

Text



None	Copy
<pre>.\swxtch-xnic-win-install.ps1 -u</pre>	

# Upgrade xNIC on Windows

## WHAT TO EXPECT

When a cloudSwXtch has been updated, their xNIC should be upgraded as well. This is very simple since you will only need to reinstall the script. The installer will automatically remove the older version of xNIC.

In this article, users will learn to use the appropriate script to upgrade their xNIC.

Make sure that you have the latest version of cloudSwXtch installed. You can find information about how to upgrade your cloudSwXtch by clicking here: [Upgrading cloudSwXtch](#). You can also upgrade your cloudSwXtch by deleting and recreating the instance.

## Upgrading xNIC on Windows

1. **Open** PowerShell. If you are using Windows 11, please use Windows Terminal.
2. **Download** the installer script:

PowerShell	Copy
<pre>Invoke-WebRequest -Uri 'http://&lt;swxtch-instance-name&gt;/services/install/swxtch-xnic-win-install.ps1' - Outfile swxtch-xnic-win-install.ps1</pre>	

3. **Run** the script. Please use the appropriate command for your version. **Note:** xNIC Type 2 is the default.

PowerShell	Copy
<pre>./swxtch-xnic-win-install.ps1</pre>	

4. The latest version of the Windows xNIC will be installed.

## Remember to Reboot

Reboot the machine after the upgrade is complete. You must do this to be able to execute the cloudSwXtch tools properly from your user home directory.

## Additional Arguments

To see all the options available for the xNIC installation/update script, use the **-h** argument.

Note that the **ctrl-** and **data-** interfaces are from the VM the xNIC is installed. These will be set automatically by the installer. There may be some instances where you will need to specify them. For example, if you have three network interfaces and you want to specify ctrl or data interfaces, you can manually select them using the **-ctrl\_interface <interface index>** or **-data\_interface <interface index>** arguments detailed below.

Bash	Copy
<pre>PS C:\Users\testadmin&gt; .\swxtch-xnic-win-install.ps1 -h Usage: C:\Users\testadmin\swxtch-xnic-win-install.ps1 [OPTIONS] -t &lt;1 2&gt;                xNIC type to install (default: 2 if supported in this OS, 1 otherwise) -u                      uninstall xcd xNIC only (no other options allowed) -unattended             unattended installation (in case of reboot, the user will not be prompted) -ctrl_interface &lt;interface index&gt; manual selection of the Control interface -data_interface &lt;interface index&gt; manual selection of the Data interface -ptp &lt;true false&gt;       installing of Precision Time Protocol (default: true) -h                      shows this help</pre>	

## Install xNIC on Kubernetes

### WHAT TO EXPECT

For Kubernetes, the xNIC is a lightweight daemonset that must be installed on every node with pods sending or receiving cloudSwXtch traffic. This creates a virtual network interface within the node in a Kubernetes Cluster. Applications that use IP multicast should target this virtual network interface.

In this article, you will learn how to install xNIC on K8s.

### Supported Types

Below is a list of supported K8s Clusters. The \* denotes default.

- AKS: Kubenet CNI\*, Cilium CNI, or Calico CNI
- EKS: Amazon VPC CNI\* and Cilium CNI
- GKE: Traditional CNI\*, Calico CNI and Dataplane V2 (Cillium)

The following operating systems in a pod are supported for the xNIC on K8s: **RHEL 8, RHEL 9, CentOS 8, Ubuntu 20.04, or Ubuntu 22.04.**

### Installation

The installation process can be split into three steps:

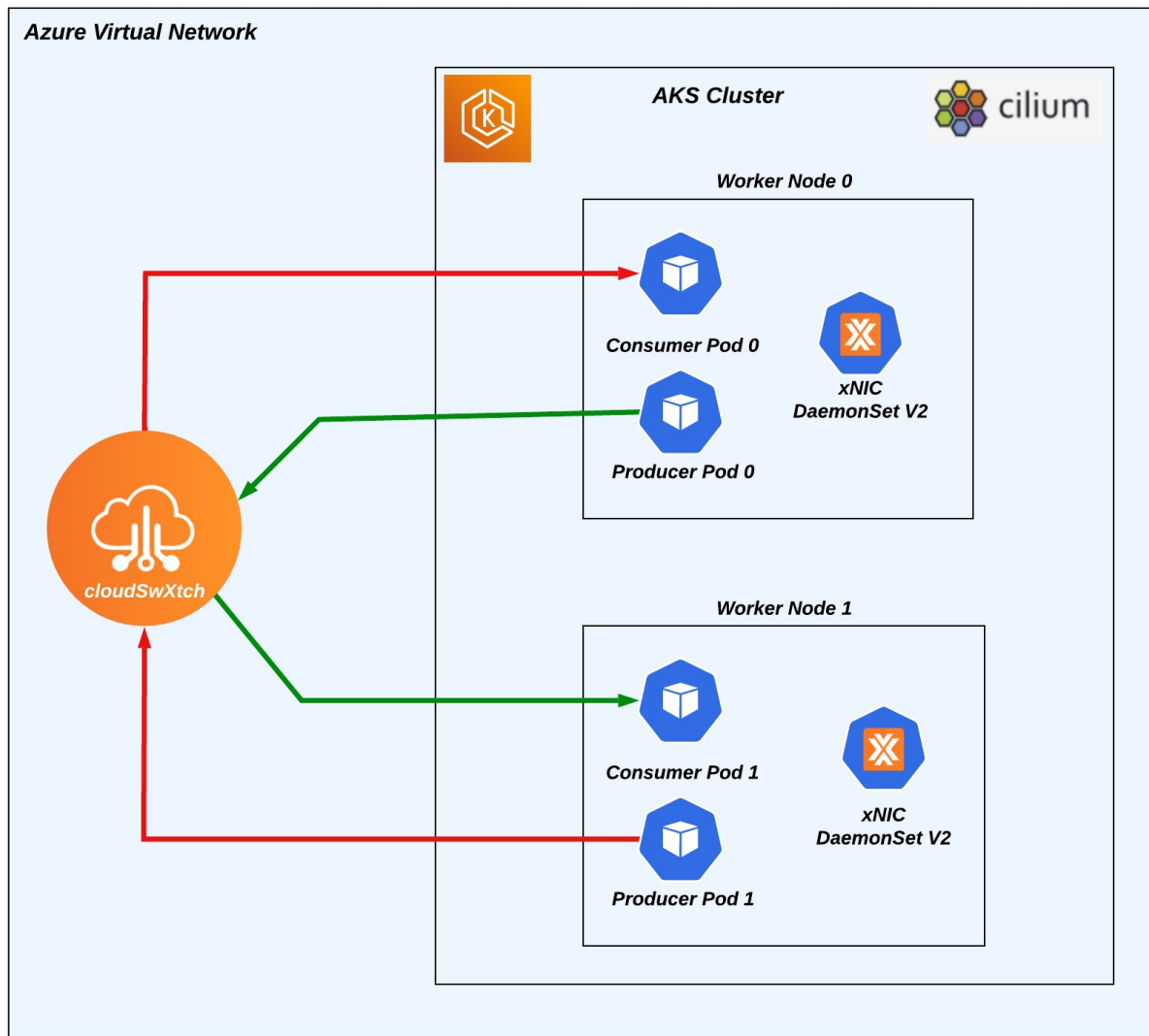
1. Create a Kubernetes Cluster (AKS, EKS, or GKE)
2. [Install xNIC on K8s Cluster](#)
3. [Test xNIC on K8s](#)

### Post-Installation

You can learn how to upgrade your xNIC nodes on K8s, [here](#).

### xNIC Architecture Diagram

Below is an example architecture for an xNIC installed on AKS with Cilium with communication to and from a cloudSwXtch. Other Virtual Machines (not AKS) with xNICs installed could also communicate with the AKS worker nodes via cloudSwXtch and xNIC v2.



**Please note:** The producer pod and consumer pod of the same stream must be in different nodes. For example, Consumer Pod 0 is consuming a stream from Producer Pod 1 from a different node. Consumer Pod 0 cannot consume what Producer Pod 0 is creating since they are in the same node.

## Install xNIC on K8s Cluster

### WHAT TO EXPECT

For Kubernetes, the xNIC is a lightweight daemonset that must be installed on every node with pods sending or receiving cloudSwXtch traffic. This creates a virtual network interface within the node in a Kubernetes Cluster. Applications that use IP multicast should target this virtual network interface.

In this article, users will learn how to install xNIC Daemonset for Kubernetes on one of the supported clouds (AKS, EKS, or GKE).

### Overview

Unicast traffic will not be affected by this feature since it will work as it did before. The xNIC will only be used for Multicast traffic. The default interface xNIC will use is **eth0**. It can be installed via your preferred cloud's CloudShell or you can assign a VM as a manager to control your cluster. Either way, it is required to have access to the cloudSwXtch and the cluster.

In this document, we will discuss how to do it via the CloudShell. However, the commands below will work in either the CloudShell or on the VM managing the K8s cluster.

### Running the xNIC Daemonset Install Script

#### BEFORE YOU START

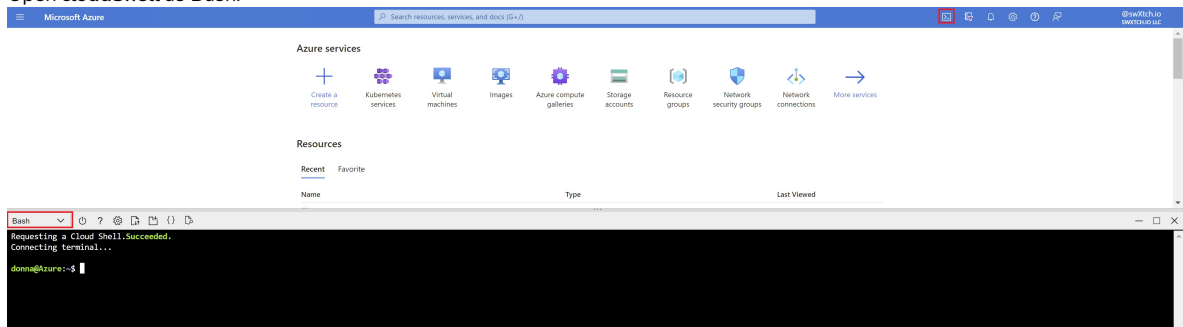
If you haven't already, please create a Kubernetes Cluster. This is a prerequisite before installing the xNIC.

To make installation easy, the xNIC is installed from the cloudSwXtch instance via a one-line shell command. The xNIC is matched to the attached cloudSwXtch and should be upgraded if the cloudSwXtch version changes.

This process takes less than a minute to install on an existing K8s cluster.

To run the install:

1. Ensure your cloudSwXtch is version **2.0.89 or greater**. If it is not upgraded, see [Upgrading cloudSwXtch](#).
2. Sign into **your desired cloud provider**.
3. Open **cloudShell** as Bash.



4. Paste in the following commands, replacing the <cloudSwXtch\_IP> with your cloudSwXtch's Ctrl IP address.

Bash	Copy
<pre>kubectl run installer --image=busybox -- sh -c "wget http://&lt;cloudSwXtch_IP&gt;/services/install/xnic_ds_installer.sh; sleep 3650" kubectl cp default/installer:/xnic_ds_installer.sh xnic_ds_installer.sh kubectl delete po/installer --grace-period 1 chmod +x xnic_ds_installer.sh</pre>	

5. Run one of the following scripts:  
**cloudSwXtch with Internet Access:**

Bash	Copy
<pre>./xnic_ds_installer.sh</pre>	

**cloudSwXtch without Internet Access (Air-Gapped):**

Bash	Copy
<pre>./xnic_ds_installer.sh -ag</pre>	

An example of a successful install without INTERNET access is shown below:

```
Bash Copy
$ ./xnic_ds_installer.sh -ag

[i] Detected Cloud: AZURE
[i] Cilium Installation detected
[i] Setting CNI to CILIUM...

#####
      This script modifies the underlying configuration of Cilium CNI to make it compatible
      with Multicast Networks.
      It also installs xNIC DaemonSet on the existing cluster.
#####

- RUNNING INSTALLER: Airgap

- IMAGE: 10.144.0.115:443/xnicv2:airgap

- CNI PLUGIN: CILIUM

- SWTCH IP ADDRESS: 10.144.0.115

- AGENT TYPE: XNIC XCD

=====
      Adjusting BPF filter priority on Cilium
=====
Setting flag "bpf-filter-priority" to "50000"
configmap/cilium-config patched
Done!

=====
      Restarting Cilium Agents
=====
daemonset.apps/cilium restarted
daemonset.apps/cilium-node-init restarted
Waiting for Cilium Agents to be fully UP and Running.....OK
Done!
Proceeding with xNIC Installation

=====
      Creating xNIC ConfigMap
=====
configmap/xnic-config created

=====
      Installing xNIC
=====
daemonset.apps/swtch-xnic created
Done!

===== Completed! =====

Please allow a minute for the xNIC DaemonSet to fully spin up before starting to use it.
Feel free to follow up on the xNIC Agents installation by running

kubect1 logs -n kube-system daemonsets/swtch-xnic -f
```

6. Run the following command to view the xNIC DaemonSet logs in the Bash window:

```
Bash Copy
kubect1 logs -n kube-system daemonsets/swtch-xnic -f
```

7. Use the command below to follow the xNIC DaemonSet status in the Bash window and check if they have started (i.e "Running"):



Plaintext	Copy
<pre>kubectl get pods -l app=swxtch-xnic -n kube-system</pre>	

Example:

Bash	Copy
<pre>user@Azure:~\$ kubectl get pods -l app=swxtch-xnic -n kube-system NAME                READY   STATUS    RESTARTS   AGE swxtch-xnic-fc58t    1/1     Running   0           11d swxtch-xnic-kn9hg    1/1     Running   0           11d</pre>	

8. Sign into your cloudSwXtch and enter in the following command to see the new instances in swXtch-top.

Bash	Copy
<pre>swxtch-top</pre>	

## Restarting xNIC DaemonSet

To restart xNIC DaemonSet for K8s, run the following command:

Bash	Copy
<pre>kubectl rollout restart ds/swxtch-xnic -n kube-system</pre>	

## \*Managing Multicast Traffic

Following are some `tc` commands that can be useful when it comes to allowing/denying either incoming or outgoing multicast traffic on producer and consumer pods. You **must** run these commands **inside** the target producer/consumer pods so that the correct interface name (eth0 in the examples) is picked up.

By default, **ALL** multicast traffic is **allowed** on every pod.

### For Outgoing (Traffic leaving the Pod)

#### Deny ALL outgoing multicast

To deny all outgoing multicast, use the following commands:

##### Specific syntax:

Bash	Copy
<pre># DENY ALL OUTGOING tc qdisc add dev eth0 root handle 1: prio tc filter add dev eth0 parent 1: protocol ip u32 match ip dst 224.0.0.0/4 action drop</pre>	

Alternatively, users can deny outgoing multicast to specific groups:

##### General Syntax:

Bash	Copy
<pre># DENY OUTGOING TO SPECIFIC GROUP(S) tc qdisc add dev eth0 root handle 1: prio tc filter add dev eth0 parent 1: protocol ip u32 match ip dst &lt;multicast_group_0&gt; action drop ... tc filter add dev eth0 parent 1: protocol ip u32 match ip dst &lt;multicast_group_n&gt; action drop</pre>	

Example: denying outgoing traffic to multicast group `239.0.0.1` :

Bash	Copy
<pre>tc qdisc add dev eth0 root handle 1: prio tc filter add dev eth0 parent 1: protocol ip u32 match ip dst 239.0.0.1/32 action drop</pre>	

#### Allow outgoing multicast to a specific group(s) - Deny any other

Bash	Copy
<pre># DENY ALL OUTGOING tc qdisc add dev eth0 root handle 1: prio tc filter add dev eth0 parent 1: protocol ip u32 match ip dst 224.0.0.0/4 action drop  # ALLOW SPECIFIC GROUP(S) tc filter add dev eth0 parent 1: protocol ip u32 match ip dst &lt;multicast_group_0&gt; action ok ... tc filter add dev eth0 parent 1: protocol ip u32 match ip dst &lt;multicast_group_n&gt; action ok</pre>	

**Example:** allowing outgoing traffic **ONLY** to multicast group **239.0.0.1** :

Bash	Copy
<pre>tc qdisc add dev eth0 root handle 1: prio tc filter add dev eth0 parent 1: protocol ip u32 match ip dst 224.0.0.0/4 action drop tc filter add dev eth0 parent 1: protocol ip u32 match ip dst 239.0.0.1/32 action ok</pre>	

## Incoming (Traffic entering the Pod)

To deny **ALL** incoming multicast, use the following command:

Specific syntax:

Bash	Copy
<pre># DENY ALL INCOMING tc qdisc add dev eth0 ingress tc qdisc add dev eth0 parent ffff: protocol ip u32 match ip dst 224.0.0.0/4 action drop</pre>	

Alternatively, users can deny incoming multicast for a specific group(s)

General syntax:

Bash	Copy
<pre># DENY INCOMING TO SPECIFIC GROUP(S) tc qdisc add dev eth0 ingress tc filter add dev eth0 parent ffff: protocol ip u32 match ip dst &lt;multicast_group_0&gt; action drop ... tc filter add dev eth0 parent ffff: protocol ip u32 match ip dst &lt;multicast_group_n&gt; action drop</pre>	

**Example:** denying incoming multicast traffic to multicast group **239.0.0.1** :

Bash	Copy
<pre>tc qdisc add dev eth0 ingress tc filter add dev eth0 parent ffff: protocol ip u32 match ip dst 239.0.0.1/32 action drop</pre>	

In addition, users can specify allowing incoming multicast by a specific group(s) while denying any other:

General syntax:

Bash	Copy
<pre># DENY ALL INCOMING tc qdisc add dev eth0 ingress tc qdisc add dev eth0 parent ffff: protocol ip u32 match ip dst 224.0.0.0/4 action drop  # ALLOW SPECIFIC GROUP(S) tc filter add dev eth0 parent ffff: protocol ip u32 match ip dst &lt;multicast_group_0&gt; action ok ... tc filter add dev eth0 parent ffff: protocol ip u32 match ip dst &lt;multicast_group_n&gt; action ok</pre>	

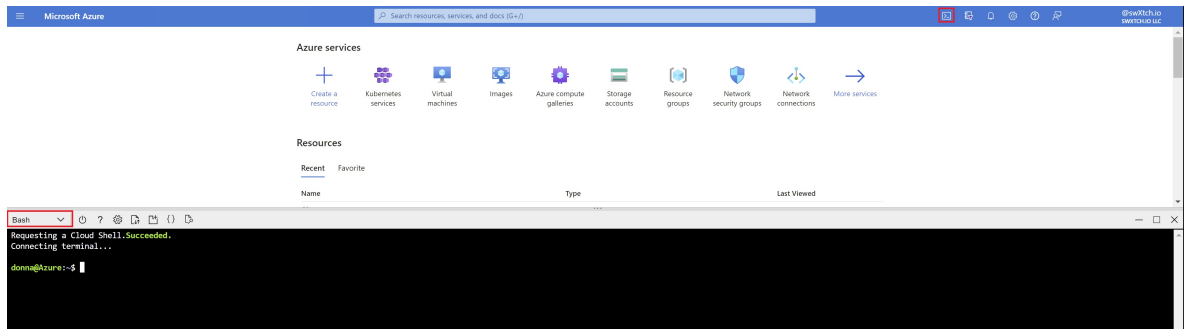
**Example:** allowing incoming traffic **ONLY** to multicast group **239.0.0.1** :

Bash	Copy
<pre>tc qdisc add dev eth0 ingress tc qdisc add dev eth0 parent ffff: protocol ip u32 match ip dst 224.0.0.0/4 action drop tc filter add dev eth0 parent ffff: protocol ip u32 match ip dst 239.0.0.1/32 action ok</pre>	

## Getting a shell to an xNIC DaemonSet pod

At times, it is nice to be able to get into the pod and be able to run commands such as `swtch-tcpdump`. To accomplish this, follow these steps:

1. Sign into **your desired cloud**.
2. Open **cloudShell** as Bash. In this example, the user is using Azure.



3. Enter in the following command to get the pod name:

```
Bash
kubect1 get pods -l app=swxtch-xnic -n kube-system
```

Example:

```
Bash
user@Azure:~$ kubect1 get pods -l app=swxtch-xnic -n kube-system
NAME                READY   STATUS    RESTARTS   AGE
swxtch-xnic-fc58t    1/1     Running   0           11d
swxtch-xnic-kn9hg    1/1     Running   0           11d
```

4. Enter in the following command, replacing **Pod** with the pod name:

```
Bash
kubect1 exec -it pod/swxtch-xnic-name -n kube-system -- bash
```

Example:

```
Bash
user@Azure:~$ kubect1 exec -it pod/swxtch-xnic-kn9hg -n kube-system -- bash
root@aks-nodepool11-23164585-vmss00000A:~$
```

You can now enter in commands similar to any VM, such as **ip a** or **sudo swxtch-tcpdump -i eth0**. Note that the pods created in this example do not have tools such as the standard tcpdump. However, **swxtch-tcpdump** will work. For testing, see [swxtch-perf](#) under [Testing cloudSwXtch](#).

**Switching Contexts**  
If you have more than one AKS Kubernetes cluster, then you may need to change the context to work on the desired instance. For more information, please review the [Changing K8s Context in Your Preferred Cloud](#) section.

## Accessing xNIC Logs

You can get xNIC logs once signed in to the pod. See [How to Find xNIC Logs](#) and follow directions for xNIC.

## Using xNIC config

Getting to the xNIC config is available once you're signed into the Pod. To get to the xNIC config, use the command below:

```
Bash
cat /var/opt/swxtch/swxtch-xnic.conf
```

## Exiting the Pod

To exit the pod, enter in the following command:

```
Bash
exit
```

## To Change K8s Context in Your Preferred Cloud

If there are more than one K8s clusters in your preferred cloud, then you may need to switch between them to run commands in the CloudShell Bash. Below are steps to switch between K8s clusters.

1. Get a list of all K8s Contexts by using the following command:

Bash	Copy
<code>kubectl config get-contexts</code>	

Example in Azure:

Bash

Copy

user@Azure:~\$ kubectl config get-contexts

CURRENT	NAME	CLUSTER	AUTHINFO
	cilium-sample	cilium-sample	clusterUser_saDevNetwork_cilium-sample
	cilium-sample-200	cilium-sample-200	clusterUser_test-donna-200-rg_cilium-sample-200
	cilium-sample2	cilium-sample2	clusterUser_saDevNetwork_cilium-sample2
*	cilium-sample300	cilium-sample300	clusterUser_test-donna-300-rg_cilium-sample300
	dsd-k8-cluster-100	dsd-k8-cluster-100	clusterUser_saDevNetwork_dsd-k8-cluster-100

Notice in the above list there are multiple context but only one has the asterisks (\*). The asterisks marks what is the default context.

- To change context, run the following command. The example is changing to cilium-sample2.

Bash	Copy
<code>kubectl config use-context cilium-sample2</code>	

- Re-run the **get-context** command:

Bash	Copy
<code>kubectl config get-contexts</code>	

Example in Azure:

Bash

Copy

user@Azure:~\$ kubectl config get-contexts

CURRENT	NAME	CLUSTER	AUTHINFO
	cilium-sample	cilium-sample	clusterUser_saDevNetwork_cilium-sample
	cilium-sample-200	cilium-sample-200	clusterUser_test-donna-200-rg_cilium-sample-200
*	cilium-sample2	cilium-sample2	clusterUser_saDevNetwork_cilium-sample2
	cilium-sample300	cilium-sample300	clusterUser_test-donna-300-rg_cilium-sample300
	dsd-k8-cluster-100	dsd-k8-cluster-100	clusterUser_saDevNetwork_dsd-k8-cluster-100

As you can see above, the asterisk (\*) has changed positions to the desired context, cilium-sample2.

# Uninstall xNIC DaemonSet on K8s

## WHAT TO EXPECT

In this article, users will learn how to uninstall xNIC DaemonSet on Kubernetes (K8s).

To uninstall xNIC DaemonSet on K8s, please follow these steps:

- 1. Sign into **Cloud**.
- 2. Open **cloudShell** as Bash.
- 3. Run the following command in the terminal:

Shell



Bash	Copy
<pre>./xnic_ds_installer.sh -u</pre>	

- 4. xNIC DaemonSet on K8s should now be uninstalled.

## Test xNIC with K8s

### WHAT TO EXPECT

Before running your application in your preferred cloud, it is a good idea to test with swXtch.io's provided tools/examples.

In this article, you will learn how to test xNIC with K8s. Please complete the installation process outlined in [Install xNIC on K8s](#) before you begin testing.

### Prerequisites

For this test to work, a user should have at least two nodes.

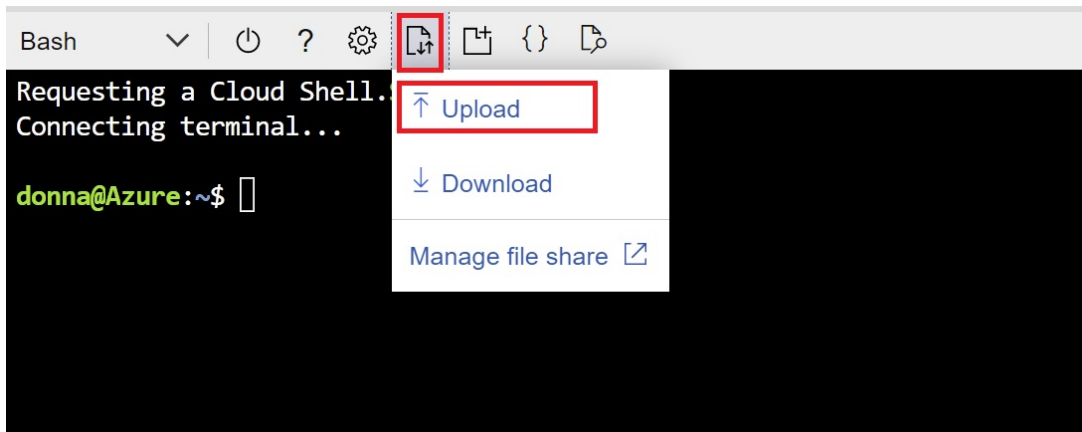
### STEP ONE: Create A Consumer

1. Create a `TestConsumer.yaml` file using the example below.  
Replace the `XNIC_SWXTCH_ADDR` with the cloudSwXtch control address.


BashCopy

```
apiVersion: v1
kind: Pod
metadata:
  name: consumer-a
  labels:
    app: consumer-a
spec:
  affinity:
    podAntiAffinity:
      requiredDuringSchedulingIgnoredDuringExecution:
        - labelSelector:
            matchExpressions:
              - key: app
                operator: In
                values:
                  - producer-a
                  - consumer-b
          topologyKey: kubernetes.io/hostname
  containers:
    - name: consumer-a
      image: ubuntu:20.04
      securityContext:
        privileged: true
      env:
        - name: IS_DAEMON
          value: "false"
        - name: PERF_TYPE
          value: "consumer"
        - name: PERF_NIC
          value: "eth0"
        - name: PERF_MCGIP
          value: "239.0.0.10"
        - name: PERF_MCGPORT
          value: "8410"
        - name: XNIC_SWXTCH_ADDR
          value: "10.224.0.115"
      command: ["/bin/bash"]
      args: ["-c", "apt update && apt install curl -y;
        curl http://$(XNIC_SWXTCH_ADDR)/services/install/swxtch-xnic-k8s-install.sh --output
        swxtch-xnic-k8s-install.sh;
        chmod +x swxtch-xnic-k8s-install.sh;
        ./swxtch-xnic-k8s-install.sh -v 2;
        sleep infinity"]
```

2. Upload the file into the Azure CloudShell.

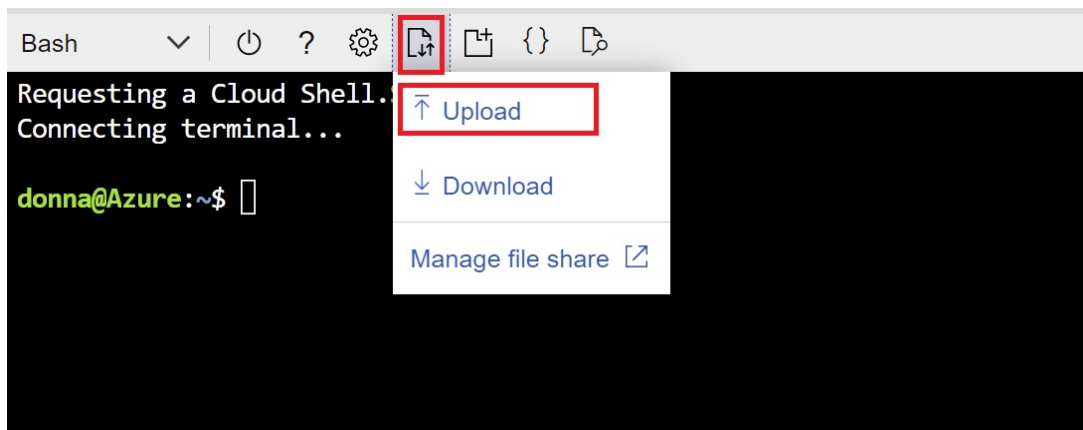


#### STEP TWO: Create a Producer

1. Create a **TestProducer.yaml** file using the example below.  
Replace **XNIC\_SWXTCH\_ADDR** with the cloudSwXtch control address.  
Shell  


```
Bash Copy
apiVersion: v1
kind: Pod
metadata:
  name: producer-a
  labels:
    app: producer-a
spec:
  affinity:
    podAntiAffinity:
      requiredDuringSchedulingIgnoredDuringExecution:
        - labelSelector:
            matchExpressions:
              - key: app
                operator: In
                values:
                  - consumer-a
                  - producer-b
          topologyKey: kubernetes.io/hostname
  containers:
    - name: producer-a
      image: ubuntu:20.04
      securityContext:
        privileged: true
      env:
        - name: IS_DAEMON
          value: "false"
        - name: PERF_TYPE
          value: "producer"
        - name: PERF_NIC
          value: "eth0"
        - name: PERF_MCGIP
          value: "239.0.0.10"
        - name: PERF_MCGPORT
          value: "8410"
        - name: PERF_PPS
          value: "100"
        - name: XNIC_SWXTCH_ADDR
          value: "10.224.0.115"
      command: ["/bin/bash"]
      args: ["-c", "apt update && apt install curl -y;
        curl http://$(XNIC_SWXTCH_ADDR)/services/install/swxtch-xnic-k8s-install.sh --output
        swxtch-xnic-k8s-install.sh;
        chmod +x swxtch-xnic-k8s-install.sh;
        ./swxtch-xnic-k8s-install.sh -v 2;
        sleep infinity"]
```

2. Upload the file into the Azure CloudShell.



### STEP THREE: Run Test



- Run the producer by running this command in your preferred cloud's cloudShell Bash window. Wait for the cursor to return to know it is fully created.

Shell  


Bash	Copy
kubect1 create -f TestProducer.yaml	

- Run the consumer by running this command in your preferred cloud's cloudShell bash window. Wait for the cursor to return to know it is fully created.

Bash	Copy
kubect1 create -f TestConsumer.yaml	

Validate they are running using this command:

Bash	Copy
kubect1 get pods -o wide -A	

Below is an example in Azure showing the consumer-a and producer-a running:

Bash							Copy
<pre>donna@Azure:~\$ kubectl get pods -o wide -A</pre>							
NAMESPACE	NAME	READY	STATUS	RESTARTS	AGE	IP	NODE
NOMINATED	NODE	READINESS	GATES				
kube-system	consumer-a	1/1	Running	0	15m	10.0.1.91	aks-nodepool1-23351669-vmss000006
<none>	<none>						
kube-system	producer-a	1/1	Running	0	15m	10.0.1.90	aks-nodepool1-23351669-vmss000005
<none>	<none>						
kube-system	cilium-node-init-kbql4	1/1	Running	0	27h	10.2.128.101	aks-nodepool1-23164585-vmss00000j
<none>	<none>						
kube-system	cilium-node-init-sg4vc	1/1	Running	0	27h	10.2.128.100	aks-nodepool1-23164585-vmss00000i
<none>	<none>						
kube-system	cilium-nx7v1	1/1	Running	0	27h	10.2.128.100	aks-nodepool1-23164585-vmss00000i
<none>	<none>						
kube-system	cilium-operator-6485c89c66-748tz	1/1	Running	0	27h	10.2.128.101	aks-nodepool1-23164585-vmss00000j
<none>	<none>						
kube-system	cilium-vv4qs	1/1	Running	0	27h	10.2.128.101	aks-nodepool1-23164585-vmss00000j
<none>	<none>						
kube-system	cloud-node-manager-mncgk	1/1	Running	0	27h	10.2.128.100	aks-nodepool1-23164585-vmss00000i
<none>	<none>						
kube-system	cloud-node-manager-qg5wf	1/1	Running	0	27h	10.2.128.101	aks-nodepool1-23164585-vmss00000j
<none>	<none>						
kube-system	coredns-autoscaler-569f6ff56-qtqpr	1/1	Running	0	28h	10.0.0.121	aks-nodepool1-23164585-vmss00000i
<none>	<none>						
kube-system	coredns-fb6b9d95f-blk6j	1/1	Running	0	28h	10.0.0.236	aks-nodepool1-23164585-vmss00000i
<none>	<none>						
kube-system	coredns-fb6b9d95f-pxzh2	1/1	Running	0	28h	10.0.0.131	aks-nodepool1-23164585-vmss00000i
<none>	<none>						

#### Step Four: Validate The Test Is Running

You can validate it is working by viewing logs with this command:

Bash	Copy
kubect1 logs pods/producer-a -f	

#### 2nd screen

Alternatively, you can log into your cloudSwXtch and run this command to see data flowing between nodes:

Bash	Copy
swxtch-top	

swXtch-top should show the traffic coming in and out of the nodes with either the producer or the consumer.

Information - dev.3645.v2-					
dsd-core-100	dev.3645.v2(dsd-100-core-azure-April-5-2033)	Auth. Type	License	File	Marketplace
SubscriptionId	b10209ad-ad22-4c26-8aef-be93b2f0bb58	Max Bandwidth	2000 Mbps		
ResourceGroupName	TEST-DONNA	Max Clients	10		
SwxtchId	2369a922-410a-40bf-8e6e-630efe0ee70a				
Status	OK				

Totals-					
Producers	99 pps	(136.7K bps)	Consumers	99 pps	(137.6K bps)
Bridge RX	0 pps	(0 bps)	Bridge TX	0 pps	(0 bps)
Mesh RX	0 pps	(0 bps)	Mesh TX	0 pps	(0 bps)
Switch RX	100 pps	(139.1K bps)	Switch TX	99 pps	(137.7K bps)

xNIC clients-					
Name	ip	Version (XNIC)	RX pps	RX bps	TX pps
aks-nodepool1-23351669-vmss000004	10.2.128.95	dev.3645.v2 (v2)	99	137.6K	0
aks-nodepool1-23351669-vmss000005	10.2.128.96	dev.3645.v2 (v2)	0	0	99

## Step Five: Cleaning the Pods

- Stop the test consumer by running this command back in your preferred cloud's CloudShell bash window.
  - Wait for the cursor to return to know it is deleted fully.

Bash	Copy
<pre>kubectl delete -f TestConsumer.yaml</pre>	

- swXtch-top should no longer show the consumer. Additionally, running **kubectl get pods -o wide** should now show just the test consumer as shown below:

Bash

Copy

```
donna@Azure:~$ kubectl get pods -o wide -A
```

NAME	READY	STATUS	RESTARTS	AGE	IP	NODE
NOMINATED NODE	READINESS	GATES				
consumer-a	1/1	Terminating	0	15m	10.0.1.91	aks-nodepool1-23351669-vmss000006
	<none>	<none>				
producer-a	1/1	Running	0	15m	10.0.1.90	aks-nodepool1-23351669-vmss000005
	<none>	<none>				
swxtch-xnic-46qgg	1/1	Running	0	39m	10.2.128.96	aks-nodepool1-23351669-vmss000005
	<none>	<none>				
swxtch-xnic-szdk7	1/1	Running	0	40m	10.2.128.95	aks-nodepool1-23351669-vmss000004
	<none>	<none>				

- Stop the test producer by running this command in your preferred cloud's CloudShell bash window.
  - Wait for the cursor to return to know its fully deleted.

Bash	Copy
<pre>kubectl delete -f TestProducer.yaml</pre>	

- swXtch-top should no longer show the producer. This may take a minute to display. Additionally, running **kubectl get pods -o wide** should now show just the test producer as shown below:

Bash

Copy

donna@Azure:~\$ kubectl get pods -o wide -A

NAME	READY	STATUS	RESTARTS	AGE	IP	NODE
NOMINATED NODE	READINESS	GATES				
producer-a	1/1	Terminating	0	15m	10.0.1.90	aks-nodepool1-23351669-vmss000005
	<none>	<none>				
swxtch-xnic-46qgg	1/1	Running	0	42m	10.2.128.96	aks-nodepool1-23351669-vmss000005
	<none>	<none>				
swxtch-xnic-szdk7	1/1	Running	0	42m	10.2.128.95	aks-nodepool1-23351669-vmss000004
	<none>	<none>				

Now that the system is validated using swXtch.io, you can test with your K8s application.

# Upgrade xNIC nodes on K8s

## WHAT TO EXPECT

The nodes upgrade is automatic based on the restart of the nodes containing the xNIC.

In this article, you will learn how you can use this method to upgrade your xNIC nodes on K8s to match the version of your cloudSwXtch.

Before you upgrade the xNIC nodes on K8s, you need to upgrade the cloudSwXtch to the latest version. See [Upgrading cloudSwXtch](#) for more information

## Restarting the xNIC DaemonSet

- 1. Sign into your preferred cloud's portal.
- 2. Open cloudShell as Bash.
- 3. Run the following command:

Bash	Copy
<code>kubectl rollout restart ds swxtch-xnic -n kube-system</code>	

- a. This will restart the Kubernetes swxtch-xnic DaemonSet and update the version of the xNIC to match that of the cloudSwXtch.

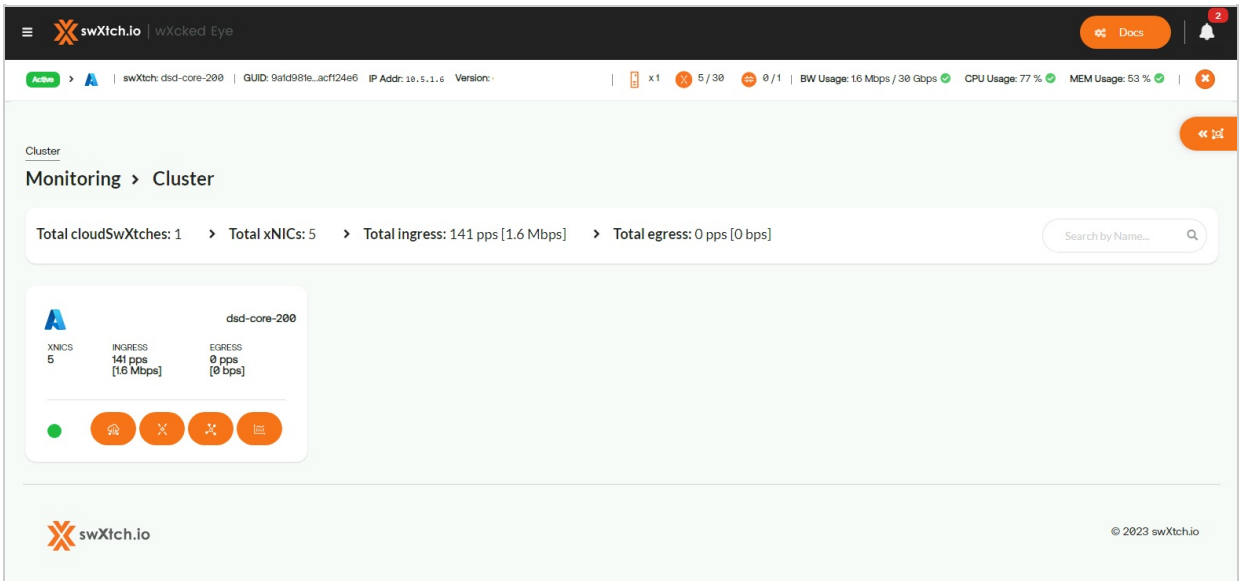
# Using wXcked Eye for cloudSwXtch

## WHAT TO EXPECT

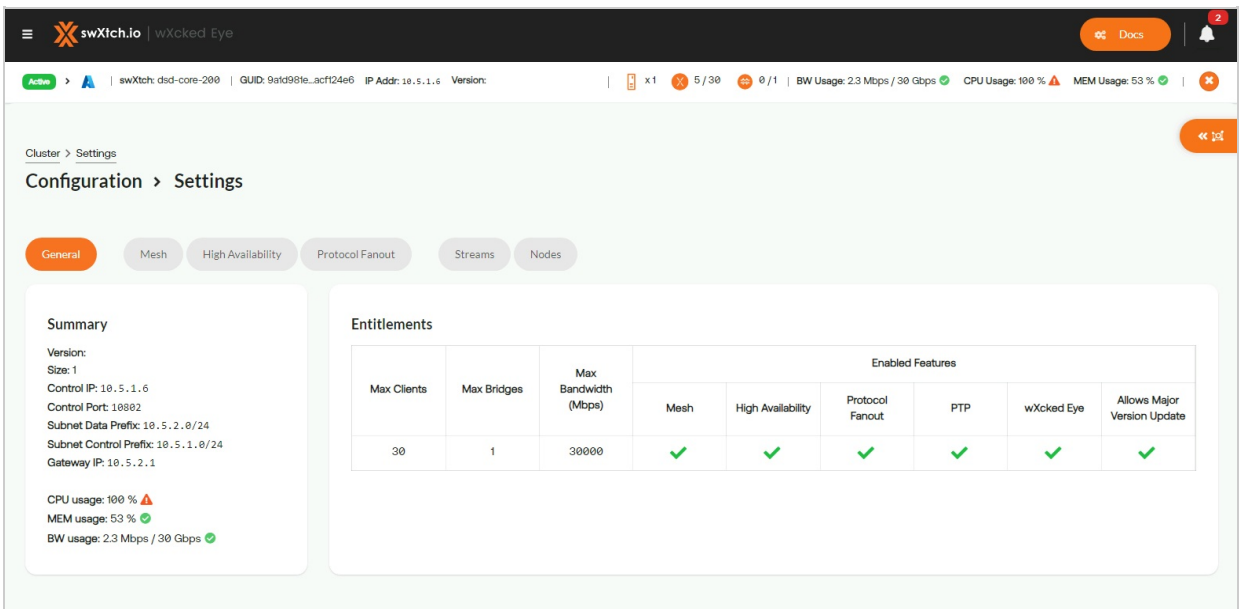
In this article, you will learn more about wXcked Eye and the benefits of using it to configure and monitor your cloudSwXtch environment.

## What is wXcked Eye?

wXcked Eye is a web-based monitoring and configuration tool for cloudSwXtch. It presents users with a high-level view of their cloudSwXtch environment with an interactive graph detailing connections to different endpoints. With an expansive look at performance metrics, users can ensure that their data is flowing as expected.



In addition, wXcked Eye unlocks the ability to configure Mesh, High Availability, Protocol Fanout and Conversion, and Precision Time Protocol (PTP) from the comfort of a web browser.



## How to Access wXcked Eye

To access the wXcked Eye UI, users will need to enter the following URL into a web browser of a VM in the cloudswXtch environment. They should use the IP address of their cloudSwXtch to prefix the URL.

```
Bash
<swxtch-ip-address>/wxckedeye/
```

## Monitor cloudSwXtch with wXcked Eye

To learn more about the monitoring capabilities of wXcked Eye such as the Network Graph or the cloudSwXtch and xNIC metrics views, see [Monitor cloudSwXtch with wXcked Eye](#).

## Configure cloudSwXtch with wXcked Eye

To learn more about the configuration capabilities of wXcked Eye such as Mesh, High Availability, Protocol Fanout and Precision Time Protocol, see [Configure cloudSwXtch with wXcked Eye](#).

# Monitor cloudSwXtch with wXcked Eye

## WHAT TO EXPECT

The **wXcked Eye** UI provides users with an additional way to monitor the performance of their cloudSwXtch network.

To learn more about how to configure your cloudSwXtch for high availability and protocol fanout with wXcked eye, please read the "[Configure cloudSwXtch with wXcked Eye](#)" article.

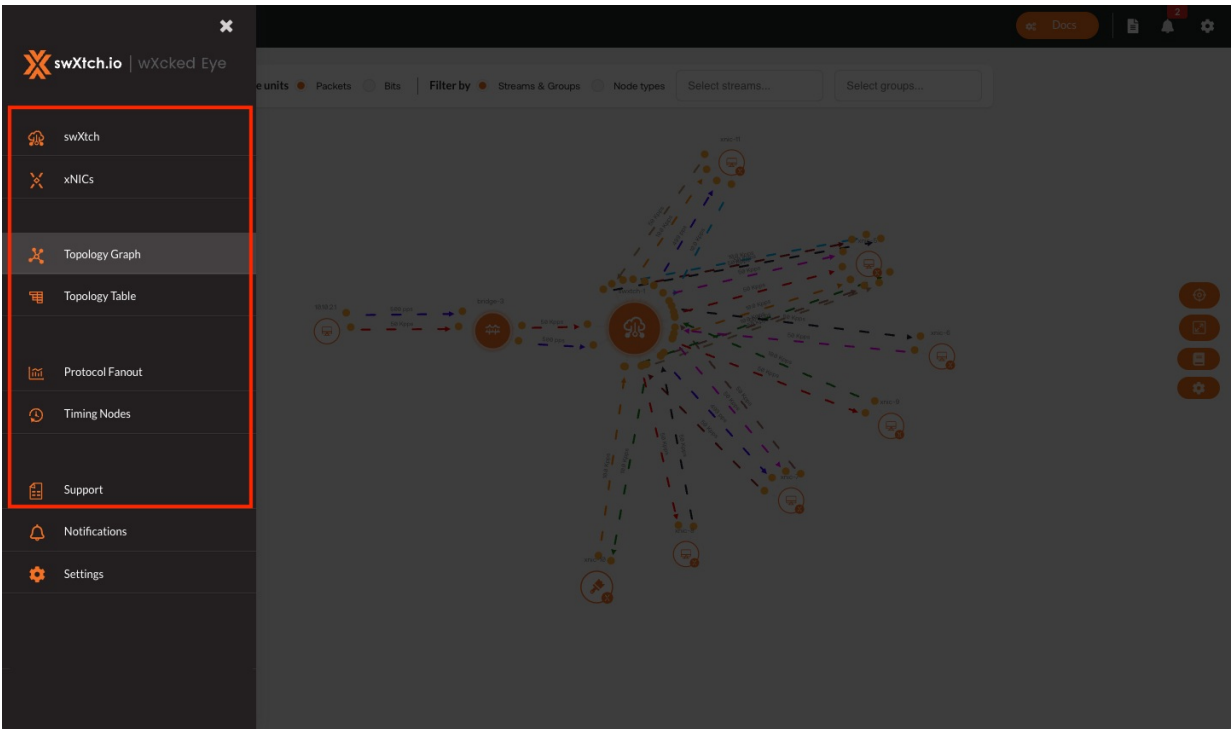
**In this section**, we will walk through the user interface, explaining overall functionality and how it provides users with additional control over their cloudSwXtch network.

## Accessing the wXcked Eye UI

To access the wXcked Eye UI, users will need to enter the following URL into a web browser of a VM in their cloudswxtch environment. They should use the IP address of their cloudSwXtch to prefix the URL.

Plaintext	Copy
<cloudSwXtch-ip-address>/wxckedeye/	

## Navigating the Monitoring pages



The wXcked Eye's monitoring capabilities are organized into six pages. For more information on a page's contents, please view their respective articles.

- [cloudSwXtch Stats](#)
- [xNICs Stats](#)
- [Topology](#)
- [Protocol Fanout Stats](#)
- [Timing Nodes](#)
- [Support](#)

## wXcked Eye Network Page

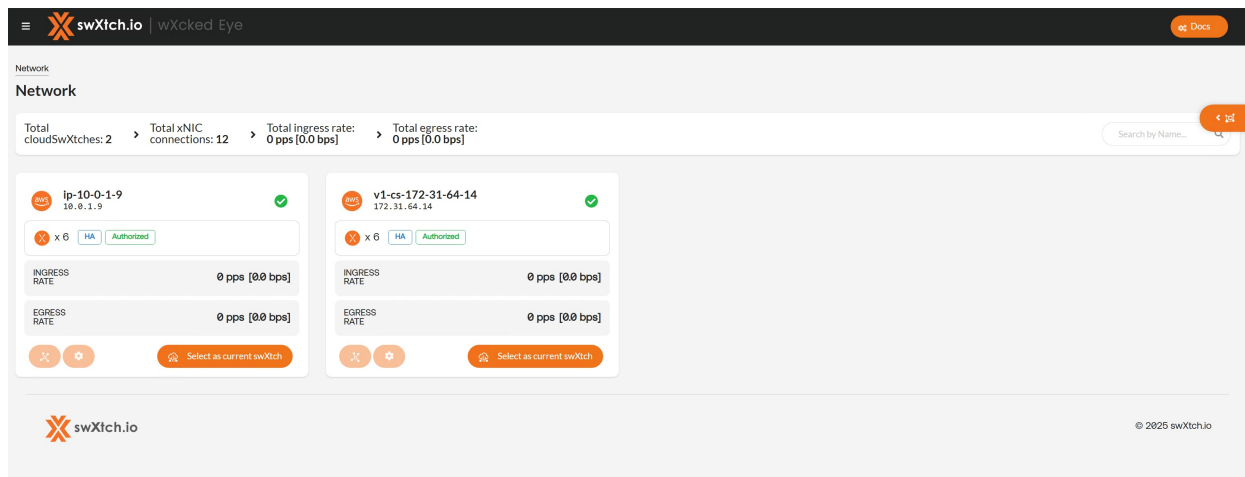
### WHAT TO EXPECT

The Network page in wXcked Eye provides user with a high-level view of all their connected cloudSwXtches. Users can easily go between different cloudSwXtches and view their stats and the stats of associated xNICs. In addition, a new generalized side panel allows users to jump between cloudSwXtches.

In this section, we will walk you through the Network page and how it improves navigation between cloudSwXtches.

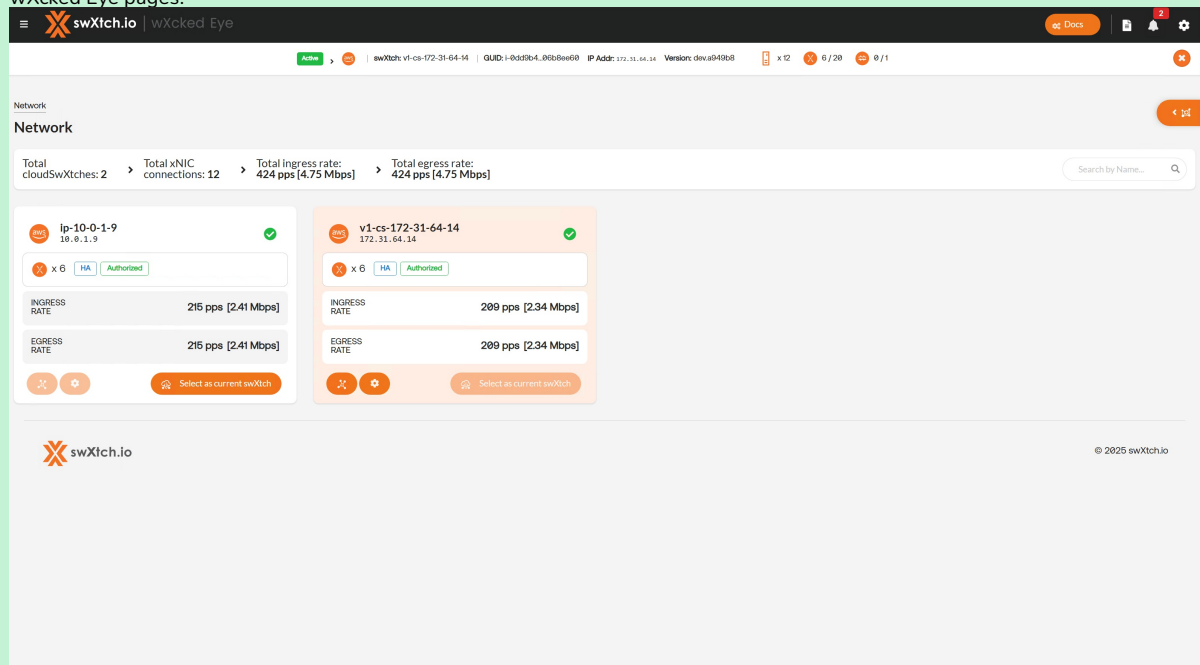
### Introduction

The **Network** page is the landing page of wXcked Eye. It segments cloudSwXtches into byte sized cards with some top level information, such as the name, the cloud provider, the status, the number of attached xNICs, and the flow of data for both Ingress and Egress in packets per seconds (pps). The **Network Information panel** shows the total number of cloudSwXtches and xNICs with the cumulative total in pps for both Ingress and Egress.



## Selecting a cloudSwXtch

At start-up, users will need to select what they would like to be their “Current swXtch” in order to populate the rest of the wXcked Eye UI. Otherwise, the navigation menu will be empty. Selecting a cloudSwXtch will highlight it in orange and will create a cloudSwXtch information ribbon at the top of wXcked Eye. In addition, the navigation menu will now link out to other wXcked Eye pages.



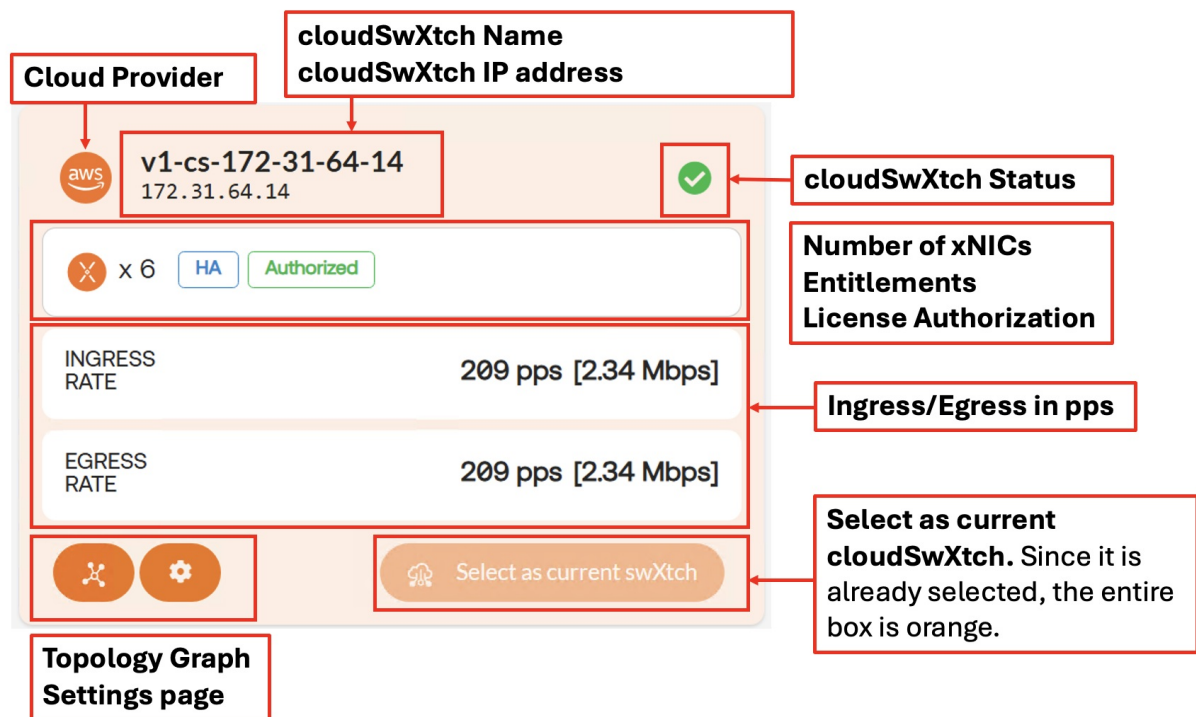
At the top of each page in wXcked Eye, the **Current cloudSwXtch ribbon** will display relevant information regarding the cloudSwXtch a user is currently on.



A cloudSwXtch's membership in a Network is dependent on whether or not it is involved in a high availability configuration. For more information on how to set up [high availability](#) in wXcked Eye, please visit their respective articles under Configure cloudSwXtch in wXcked Eye.

## Navigating using cloudSwXtch Information Card





In each cloudSwXtch Information card, users will find two buttons linking you to additional information and metrics within wXcked Eye. This includes:

- [Topology Graph](#)
- [wXcked Eye Settings page](#)

## wXcked Eye Topology Graph

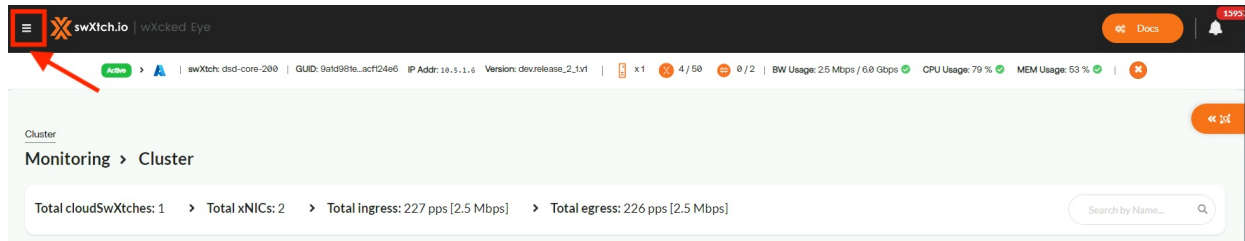
### WHAT TO EXPECT

The wXcked Eye Topology Graph gives users a visualization of their cloudSwXtch network, highlighting the data flowing between the various components. This includes cloudSwXtches, cloudSwXtch Bridges, and the endpoints (with and without xNICs). With a wealth of different filtering tools, users have complete flexibility on how they monitor and configure their data.

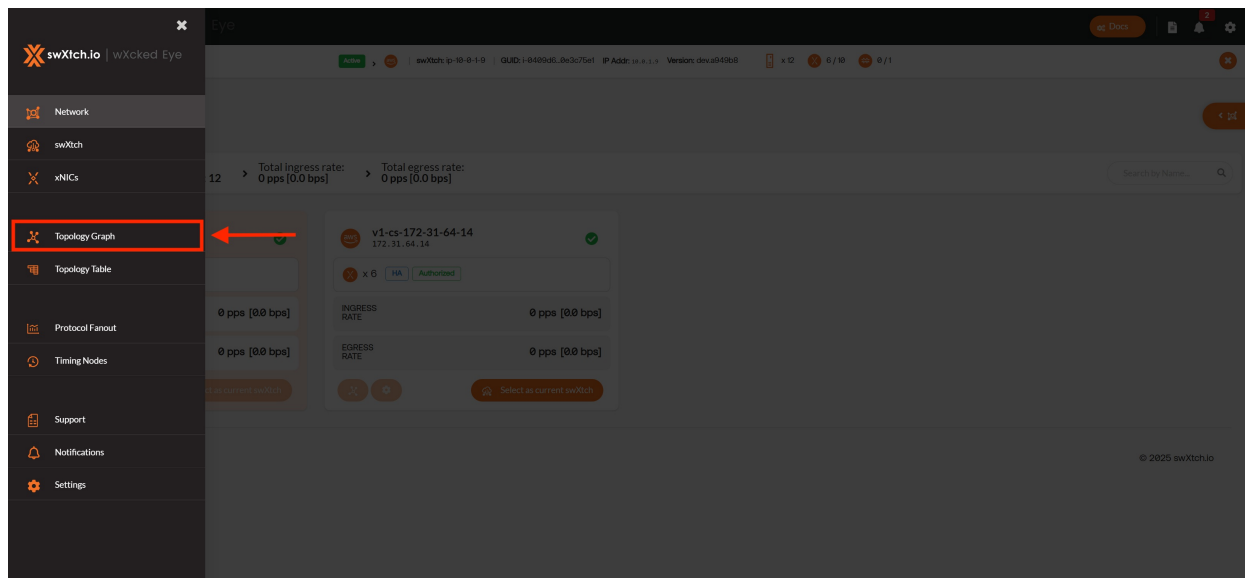
In this article, we will discuss how to navigate to the topology graph in wXcked Eye and also provide a intro on the various panels.

### How to get to the Topology Graph

To navigate to the wXcked Eye Topology Graph page, users will need to click on the menu ( $\equiv$ ) option at the top right hand corner by the swXtch.io logo.

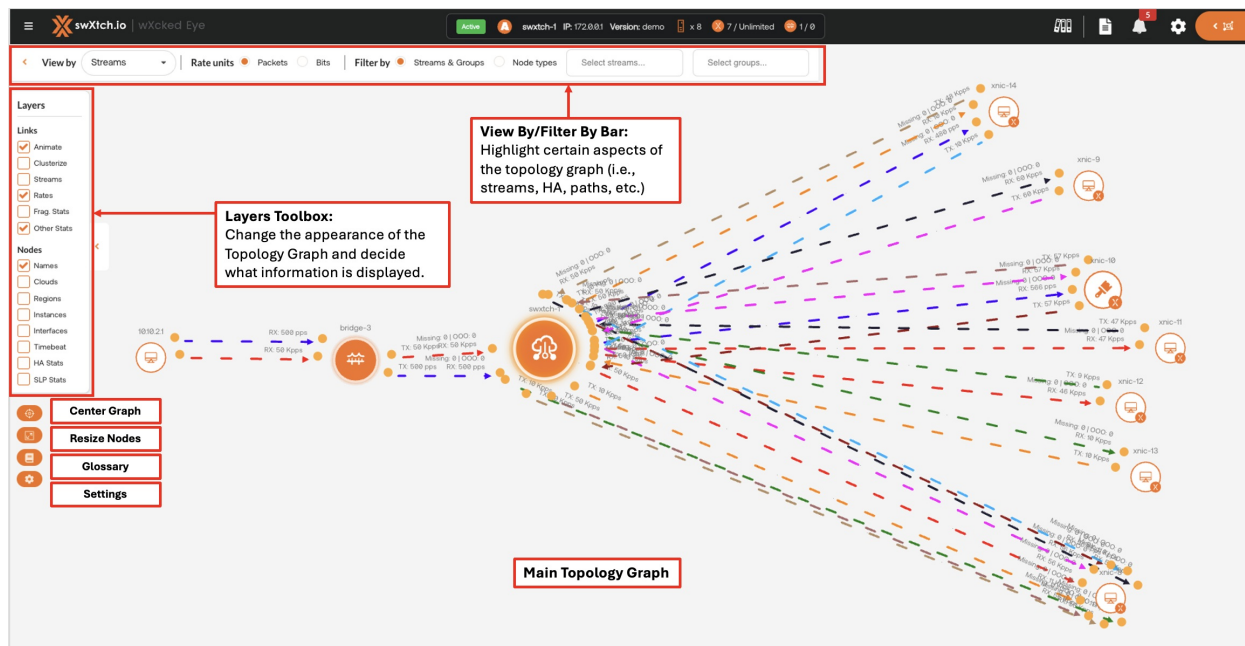


From there, select **Topology Graph**.

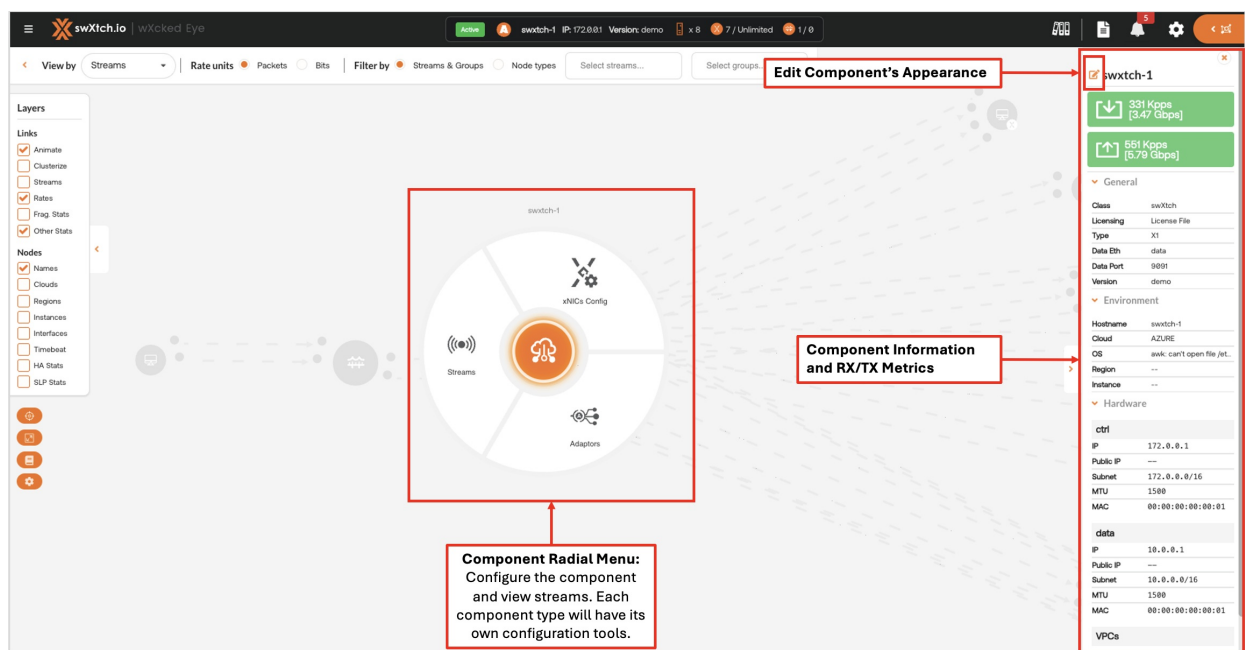


### Topology Graph Layout

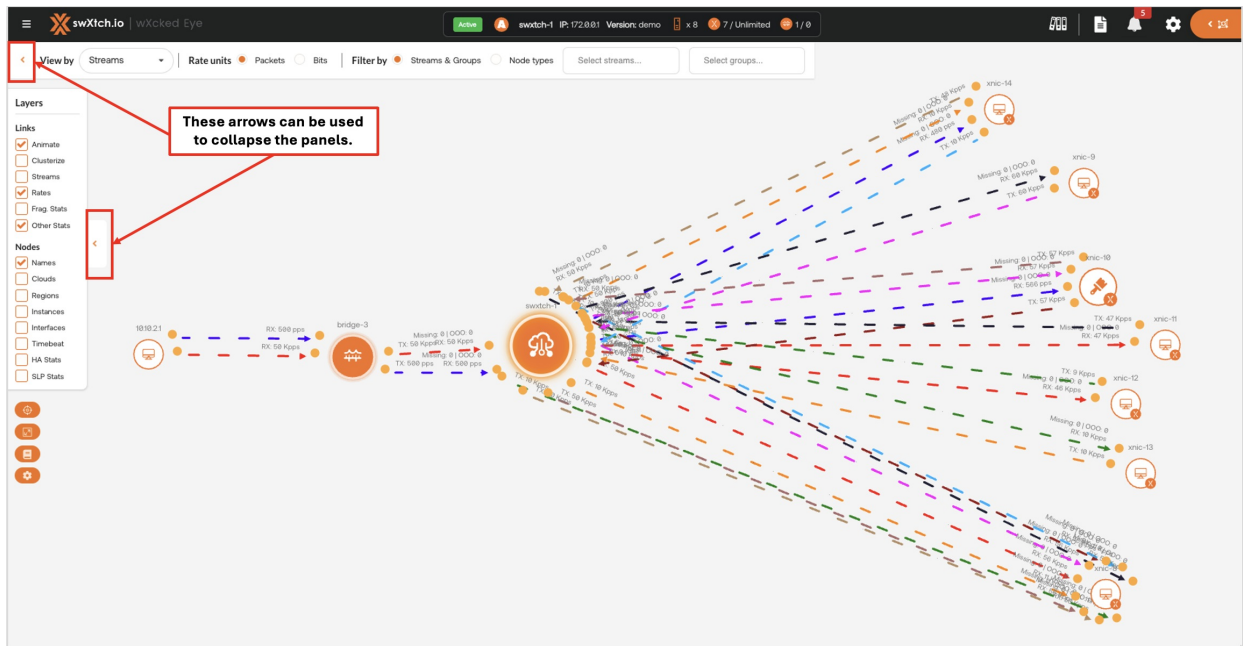
The Topology Graph can be organized into four points of interest. To start, you have the **main network graph** at the center, displaying traffic traveling to and from the cloudSwXtch. Then, you have the two configuration panels: **The View By/Filter Bar** and the **Topology Toolbox**. Both are collapsible and moveable across the topology graph. Finally, at the left of the page, there are some additional tools, such as **Center Graph**, **Resize Nodes**, **Glossary**, and **Settings**.



In addition to these four main areas, selecting a component node in the topology graph will open its **Component Information Panel** and **Radial Menu**. Here, users will find metrics specific to that component and additional configuration options. Depending on the component class (cloudSwXtch, bridge or xNIC), this could include adding adaptors for protocol fanout via the cloudSwXtch component node, configuring HA for multiple multicast groups at the xNIC, and toggling deduplication on or off for the endpoints.



The **View By/Filter By** bar and **Layers Toolbox** are movable across the Topology Graph and collapsible.

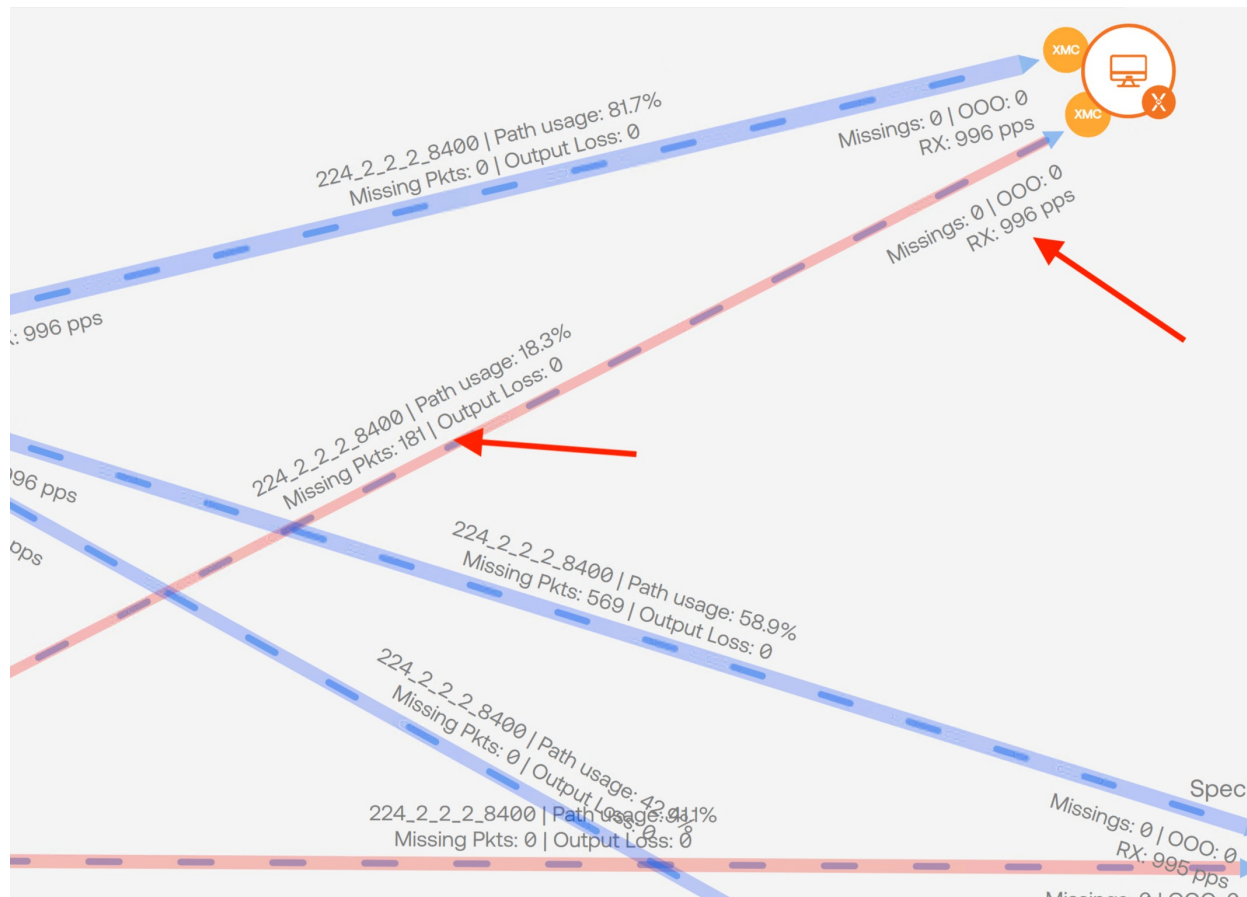


## Statistics Explained

Each cloudSwXtch component (cloudSwXtch, cloudSwXtch Bridge and xNIC) acts as a probe point, illustrating the following metrics:

- TX
- RX
- Out of Order (OoO)
- Missing Packets

These values will display when the Statistics layer is toggled on.



## Deeper Dive into wXcked Eye

For more information about a specific area in the Topology Graph, read their respective articles below.

[View By/Filter By Bar](#)

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## Topology Toolbox

### Viewing Metrics in the Component Information Panel

### Configuring in the Component Information Panel

- [Adding Adaptors via a cloudSwXtch or Bridge Component Node](#)
- [Adding Cloud To Ground \(C2G\) Subscriptions via a Bridge Component Node](#)
- [Configuring High Availability via the xNIC Component Node](#)
- [Toggling xNIC Deduplication Off via the xNIC Component](#)
- [Disabling HA via the xNIC Component](#)

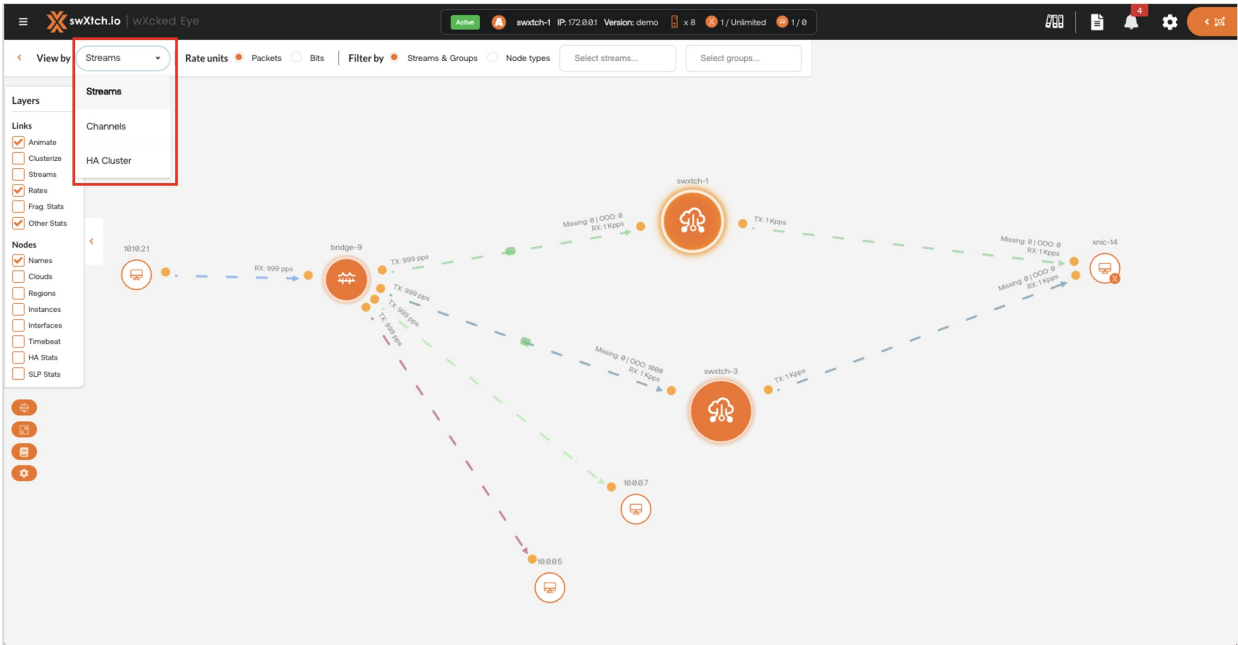
# View By/Filter By Bar

## WHAT TO EXPECT

In this article, users will learn more about the functionality of the View By/Filter Bar in the wXcked Eye Topology Graph.

## View By

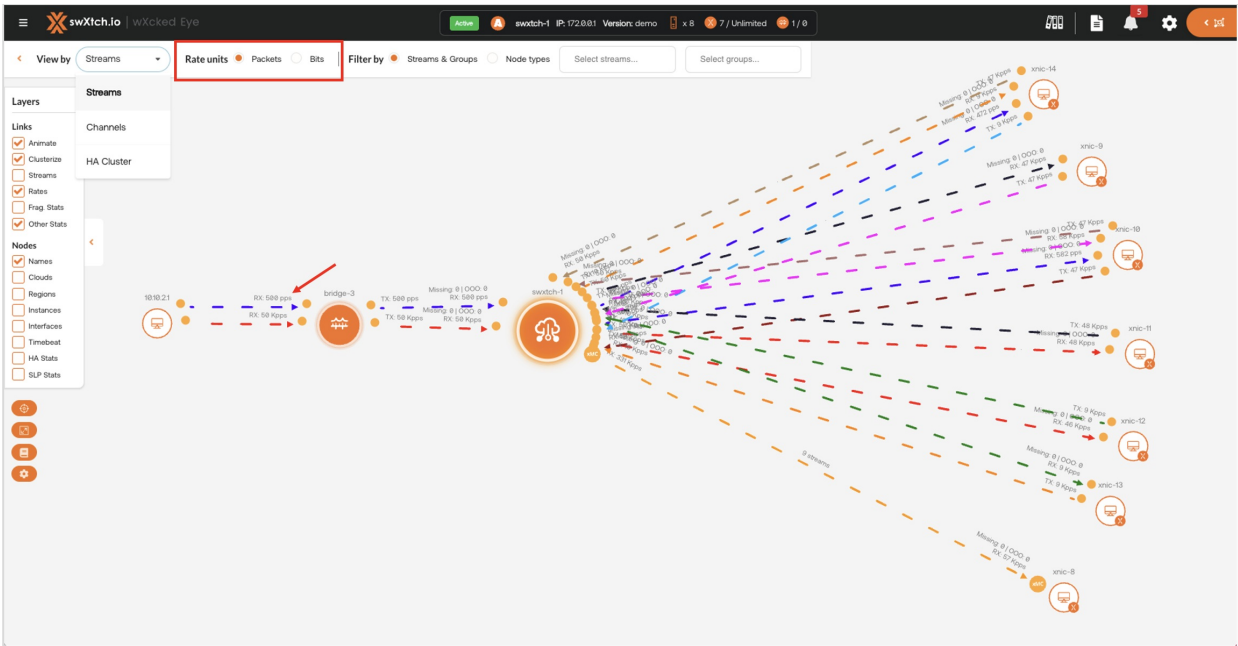
There are three views available for users: **Streams**, **Channels**, and **HA Clusters**. Selecting one of these views will alter the Filter By options available to the user. For example, with HA Clusters selected, users will be able to filter by HA Paths in the Topology Graph.



Streams, Channels, and HA Clusters are all configurable in the wXcked Eye [Settings](#) page.

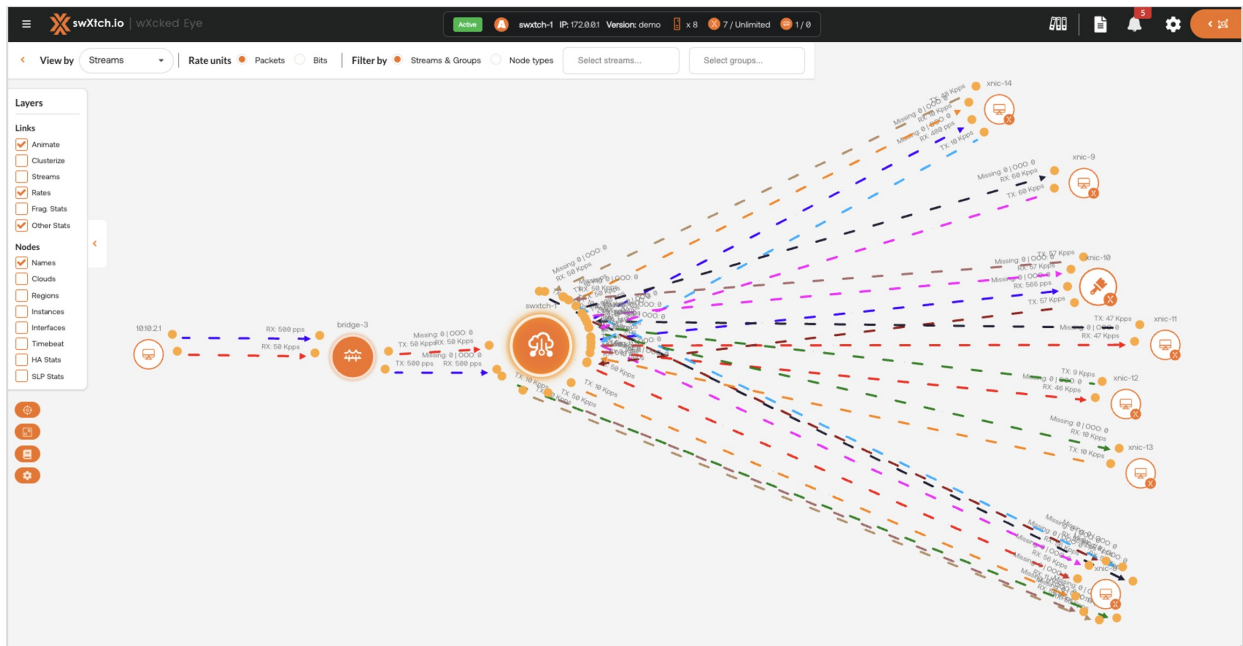
## Rate units

Across all views, users can set the displayed Rate units to be either in **Packets Per Second (pps)** or **Bits Per Second (bps)**.



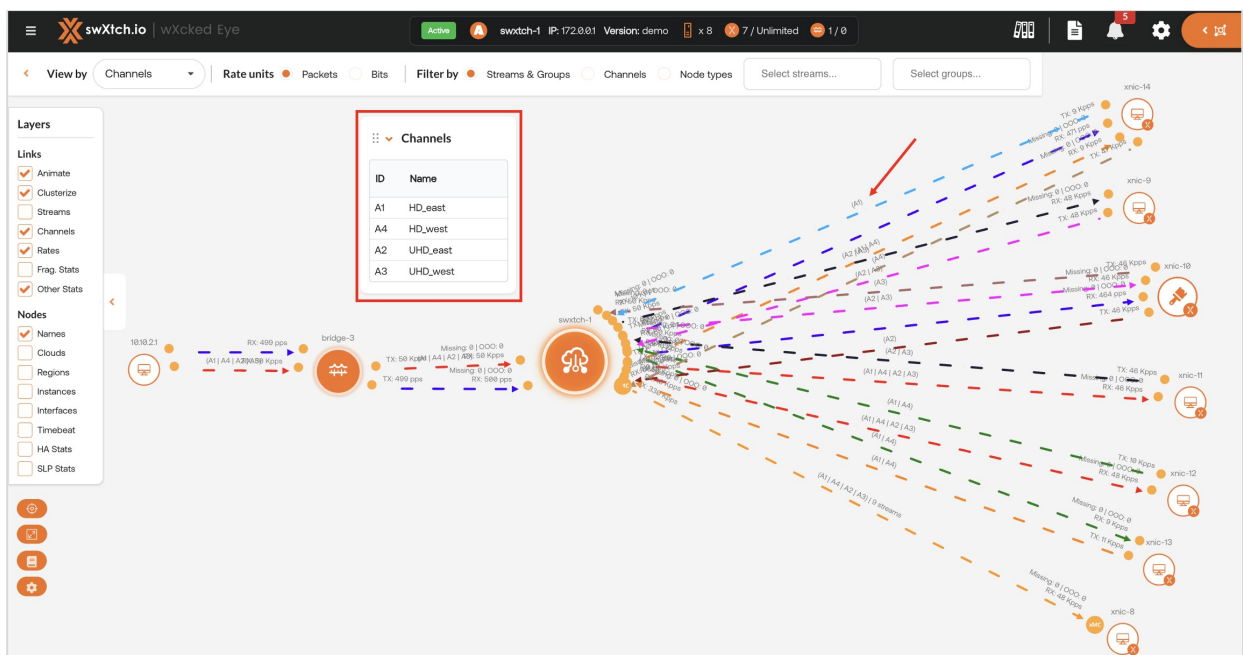
## View by Streams

The **Streams** view provides users with a high level view of all the streams associated with the cloudSwXtch. When selected, the streams will be highlighted in the Topology Graph by the assigned color. In the example below, each color presents a different stream.



## View By Channels

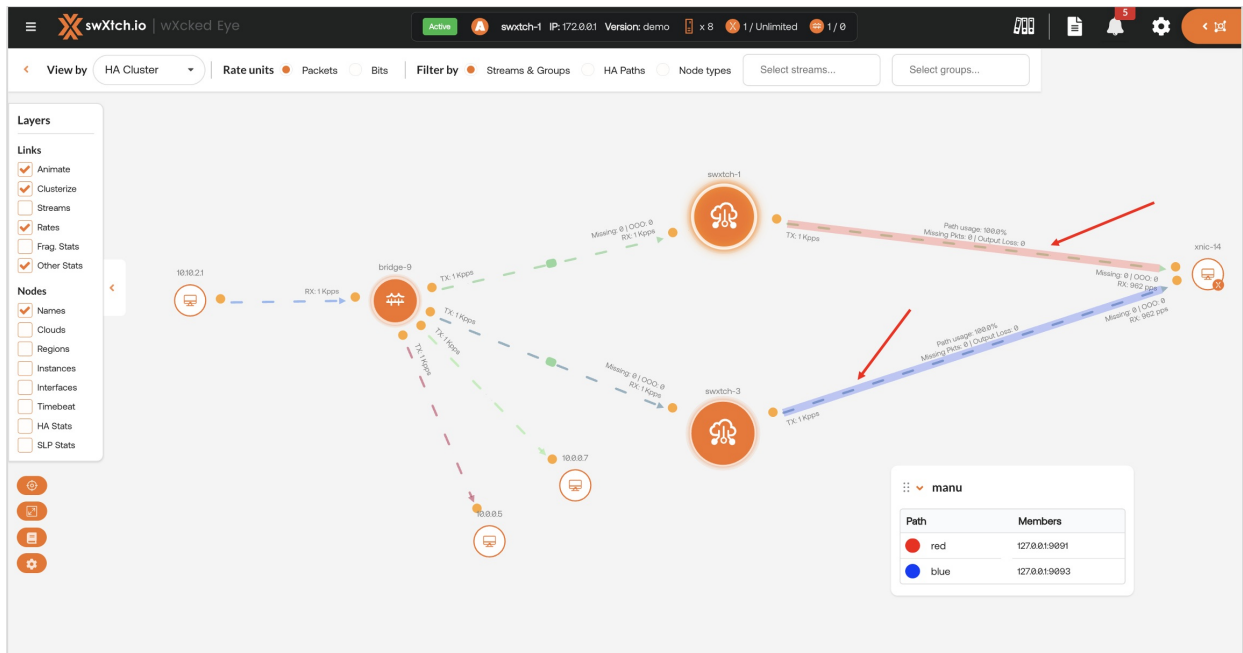
The Channels view highlights streams associated with a specific channel distinction. Each relevant line will have a Channel ID attached to it. A Channels key will also appear.



## View by HA Cluster

The HA Clusters view highlights the multiple paths in a high availability configuration. The thickness of the shadows surrounding each paths illustrate the path's usage by the receiver to reconstruct the stream. In the example below, Path 1 sees 83.5% usage while Path 2 shows 16.5%. Since Path 1 is being used more, the red line is thicker.



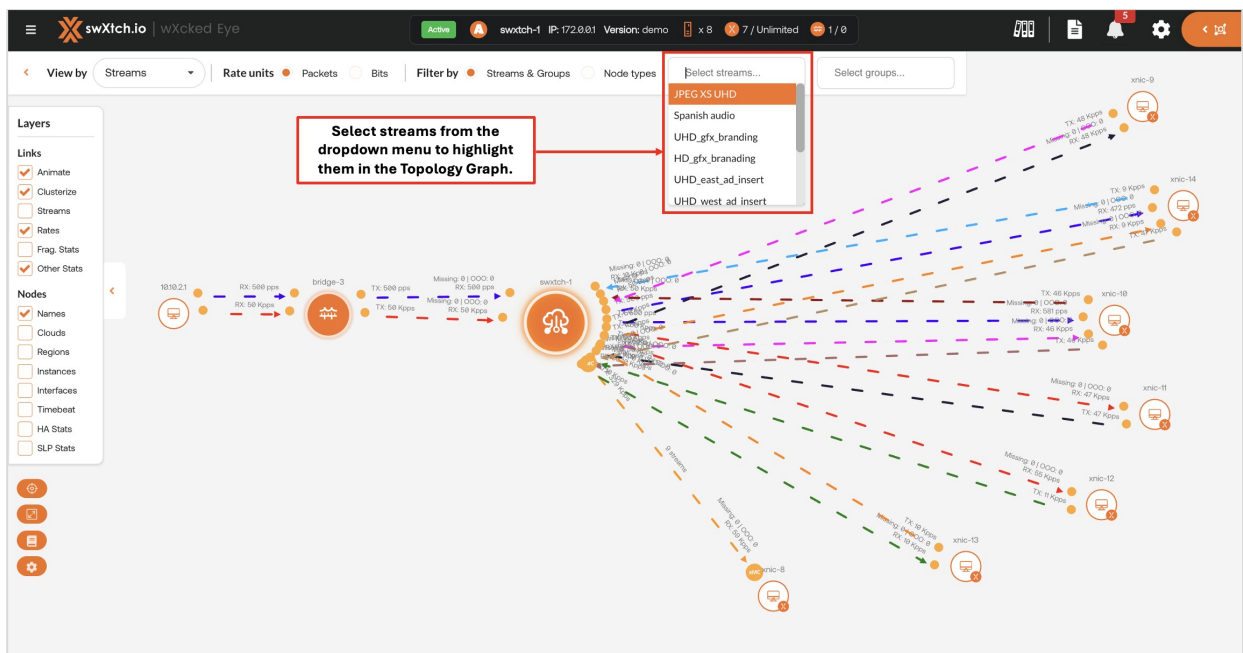


## Filter By

Depending on the View selected (Streams, Channels, and HA), the Filter By options will change, reflecting that choice. The two main options, Streams & Groups and Node Types, will appear for all view types. Choosing either category will alter the subsequent "Select" prompts. Here, users can specify the streams, groups, channels, or node types they wish to see in the graph.

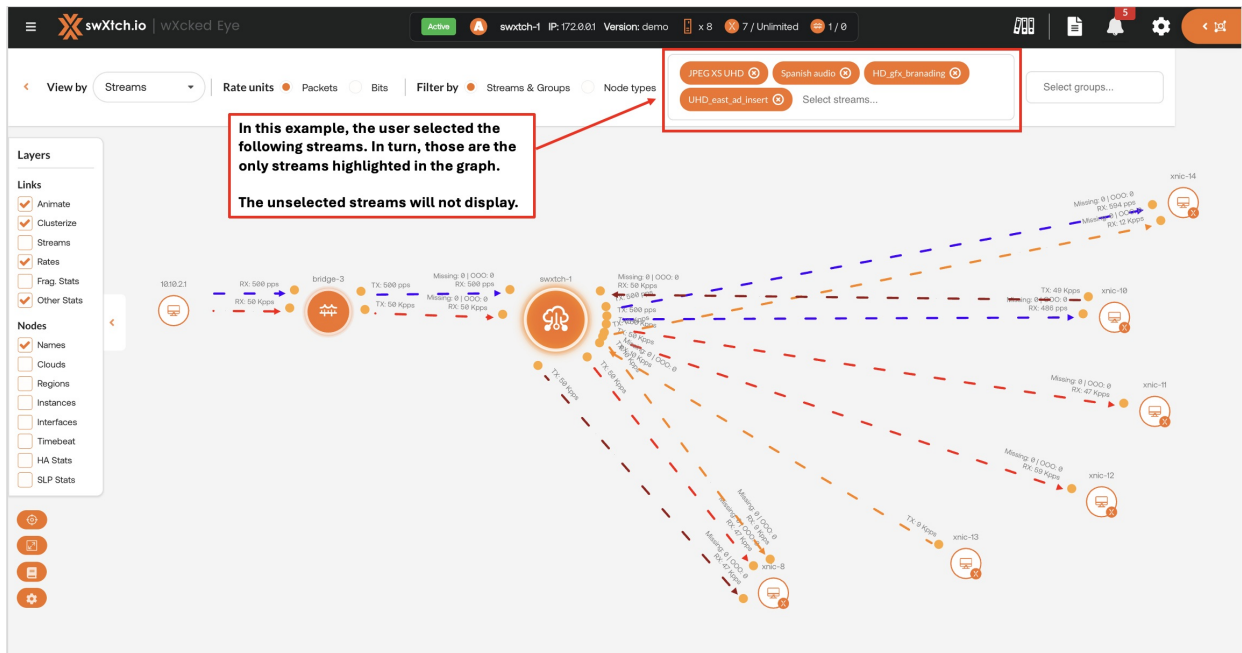
## Filter By Streams and Groups

Filtering by Streams and Groups will allow users to specify streams or stream groups they would like to see highlighted in the Topology Graph.

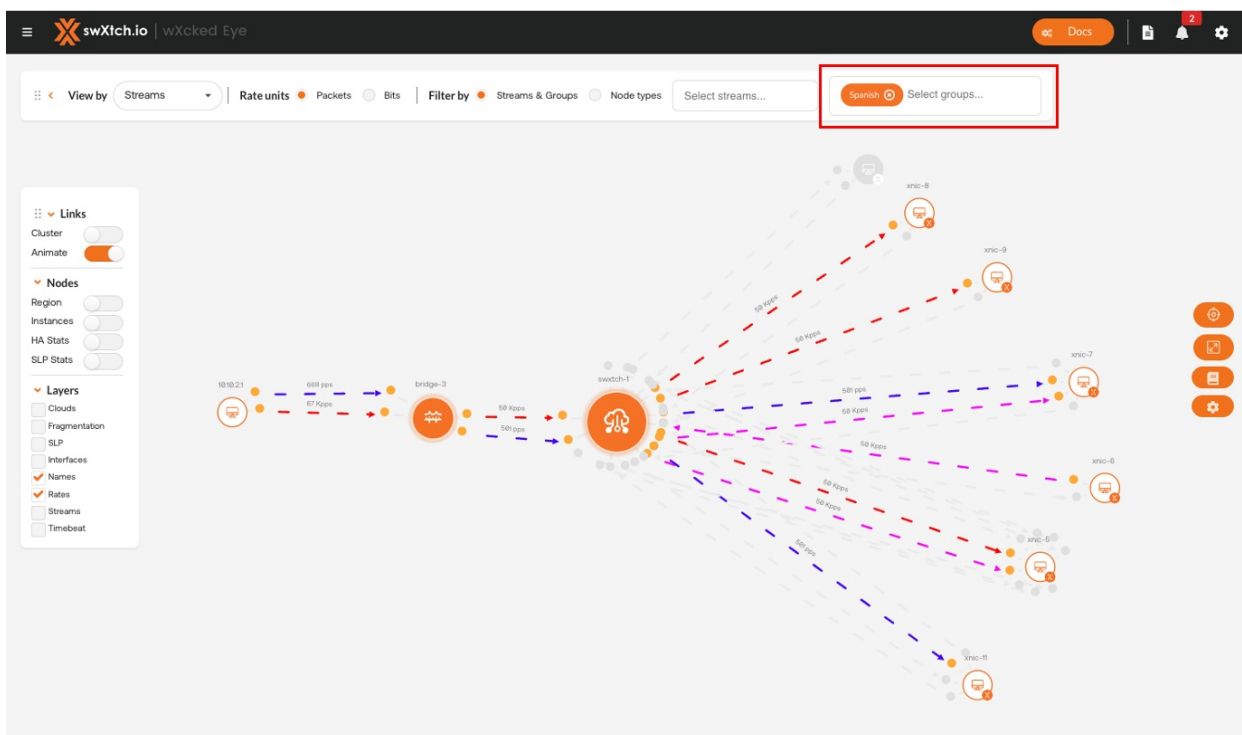


In the example, the user selected the following streams: **Spanish audio**, **UHD\_east\_ad\_insert**, **HD\_gfx\_branding**, and **JPEG XS UHD**. They are now highlighted by their color in the main graph. Users can assign names and colors to their streams in the wXcked Eye [Settings](#) page.





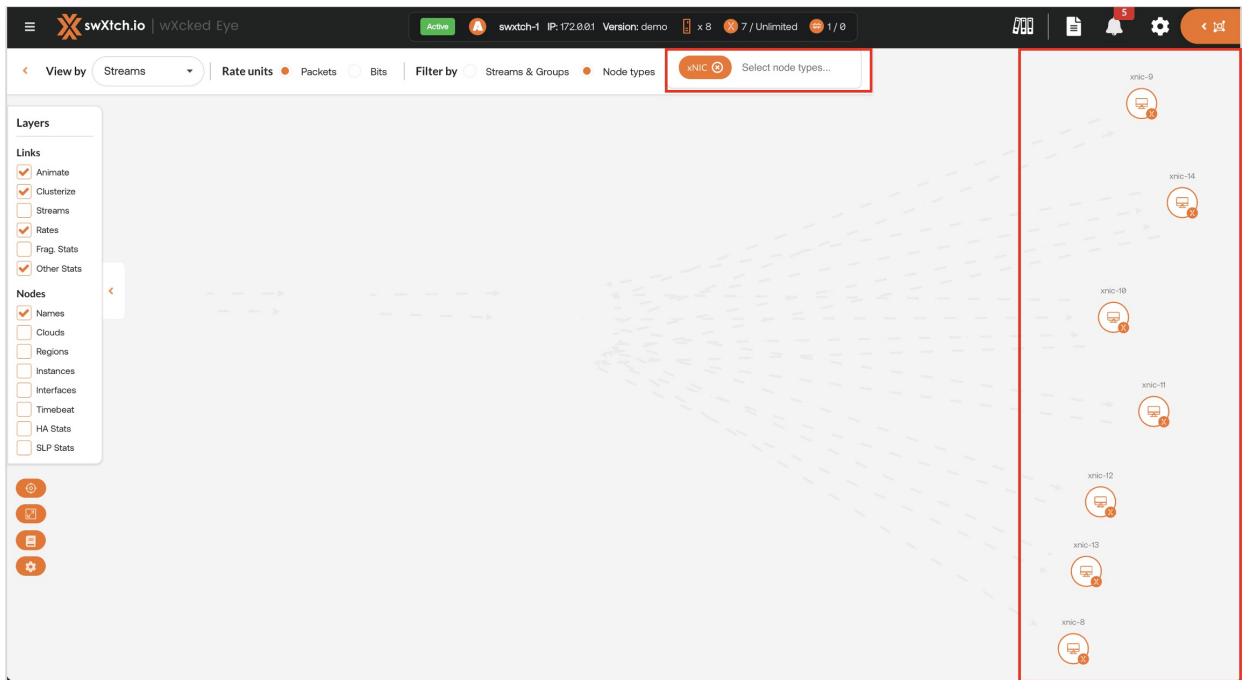
In addition to selecting streams individually, users can also select a group of streams all at once. Groups are created in the wXcked Eye [Settings](#) page. When selecting a group, users will see the streams assigned to that group highlighted in the topology graph. In this example, the user created a group called **Spanish** for all their Spanish-language related streams in the wXcked Eye Settings page. By selecting the group, all the streams assigned to it are highlighted below by their stream color.



## Filter By Node Types

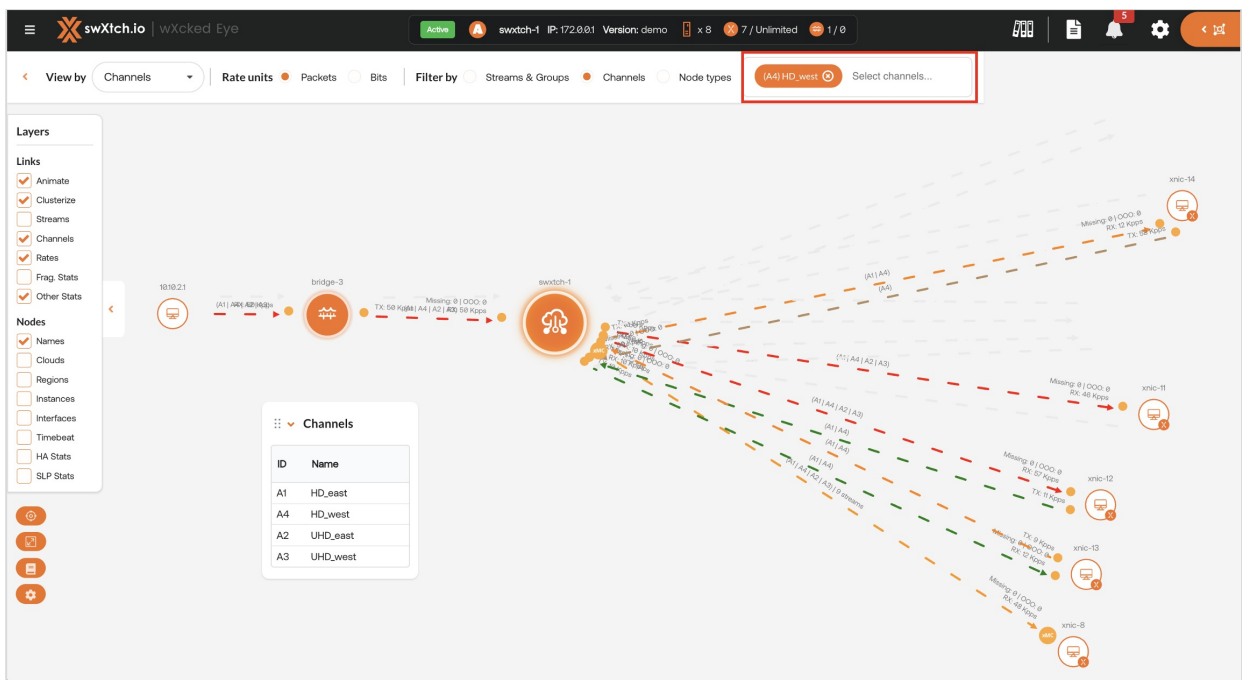
With Node Types selected, users can highlight specific nodes in the graph based on their type: cloudSwXtches, cloudSwXtch Bridges, VMs with xNICs, non-xNIC VMs, interfaces, and protocols.

In the example below, the user has chosen xNIC VM nodes to be highlighted in the Topology Graph. User can distinguish between xNIC VMs and non-xNIC VMs by the xNIC symbol on the node.



## Filter by Channels

When the View is set to Channels, an additional Filter By Channel option will activate, allowing users to highlight streams related to a specific channel. In the example below, the user filtered on the channel "(A1) HD\_east." All related streams are highlighted in the graph.



## Filter By HA Paths

When the HA view is selected, users can filter by HA Paths, highlighting specific paths by the name assigned during high availability configuration. In this example, the user has selected red path to highlight in the topology graph.

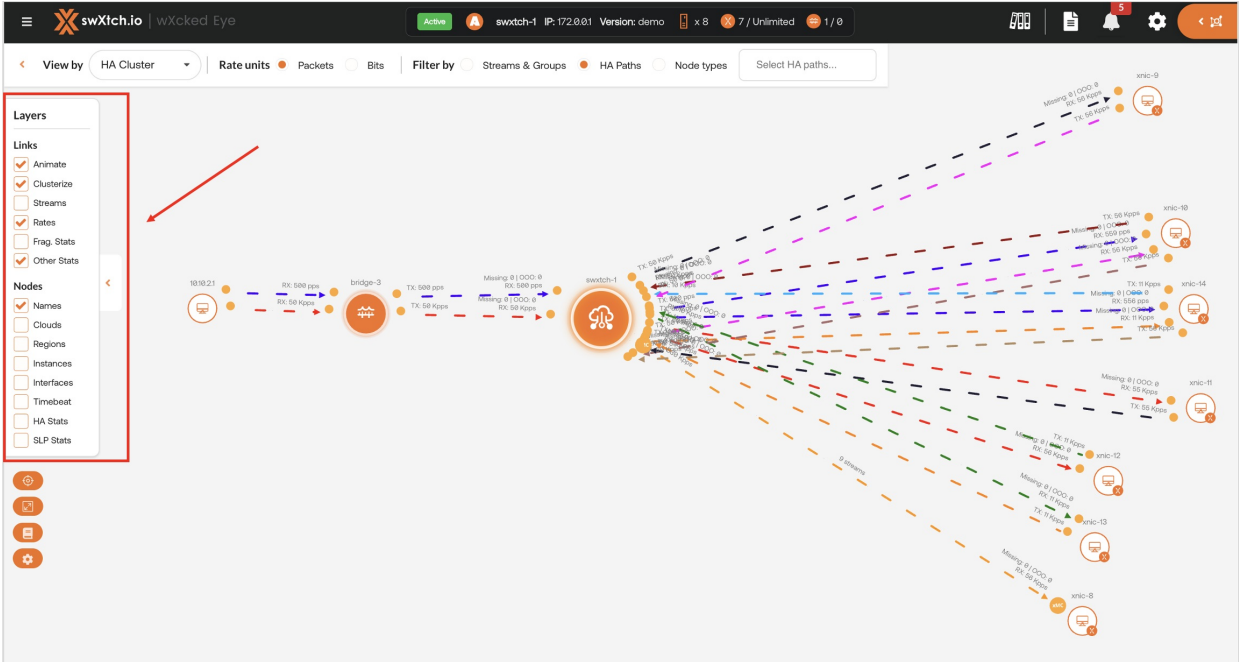


# Layers Toolbox

## WHAT TO EXPECT

In this article, users will learn about the various options in the Layers Toolbox and how it alters the appearance of the topology graph.

## Links and Nodes



The Topology Toolbox enables users to change the appearance of their topology graph and display information important to them. The toolbox is organized into three categories: links, nodes, and layers.

### Links

Links are the lines that connect component nodes in the topology graph, representing the traffic that is flowing between them. This section of the Layers Toolbox will edit the appearance of those links or the information displayed.

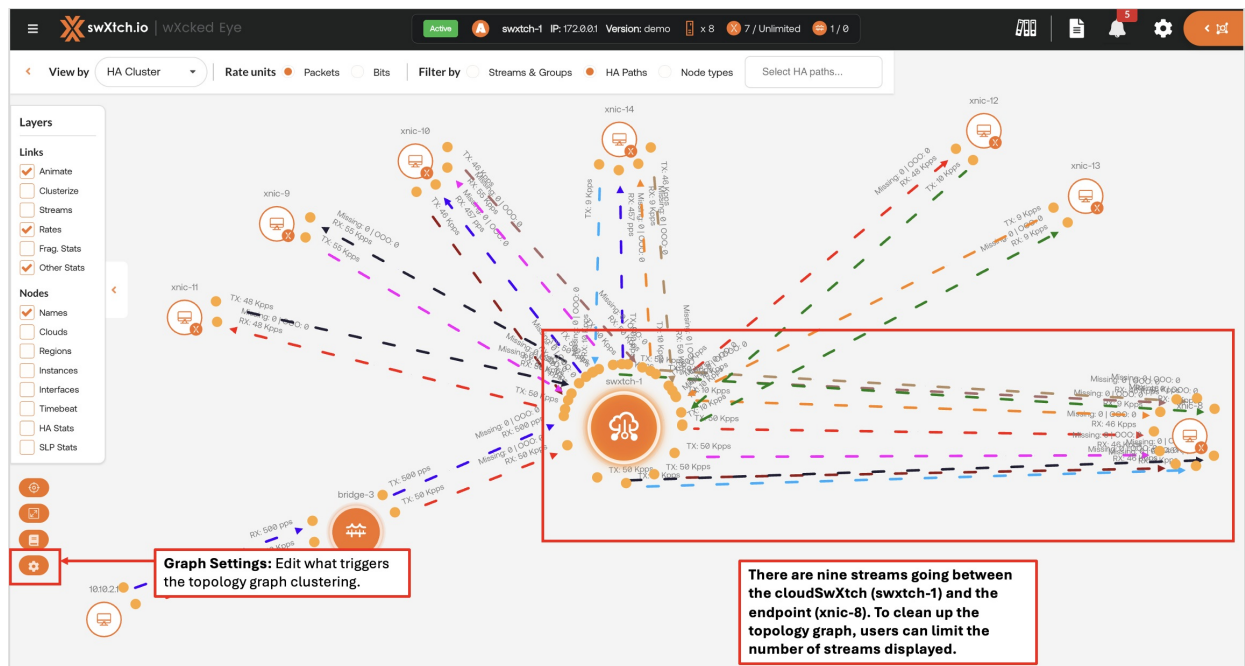
#### Animate

By default, the links are animated to illustrate the direction of the stream.

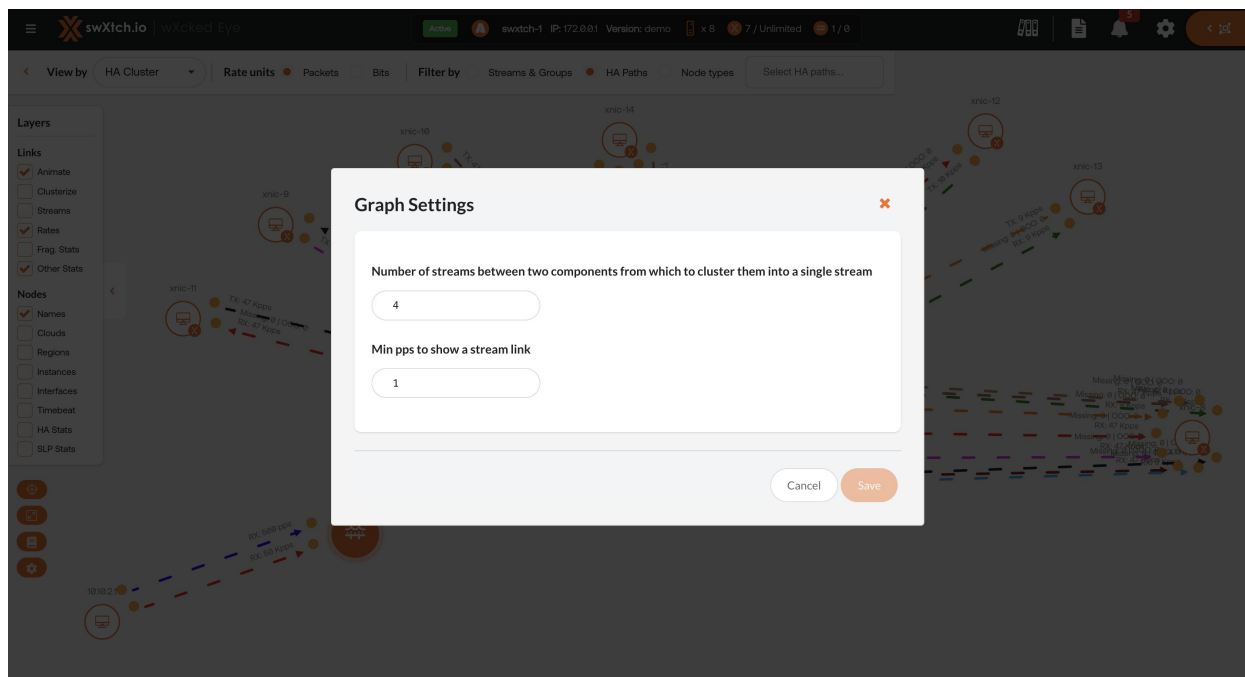
#### Cluster

When activated, links between nodes will cluster depending on the number set in the topology graph settings. For example, if the maximum number of streams between two component nodes is set to 4, all streams will be condensed into a single link when they go over 4.

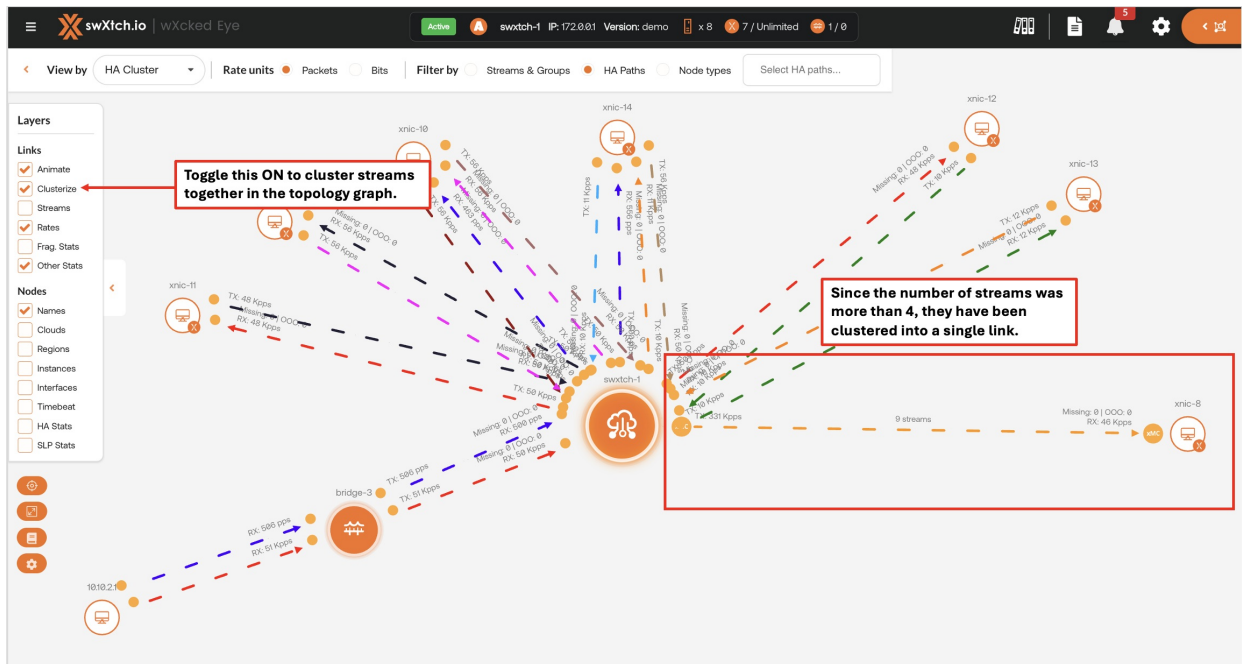
In this example, there are eight streams between swXtch-1 and xnic-5. A user may want to consolidate these into a single link, in order to tidy up the way their topology graph looks. To do this, users will select the Graph Settings button on the righthand side of the graph. This will cause a new window will open.



Users will then enter the amount of streams that would trigger a cluster. In the below example, the user selected 4 as the number of streams. This means that whenever the number of streams exceeds 4, wXcked Eye will combine those into a single link.



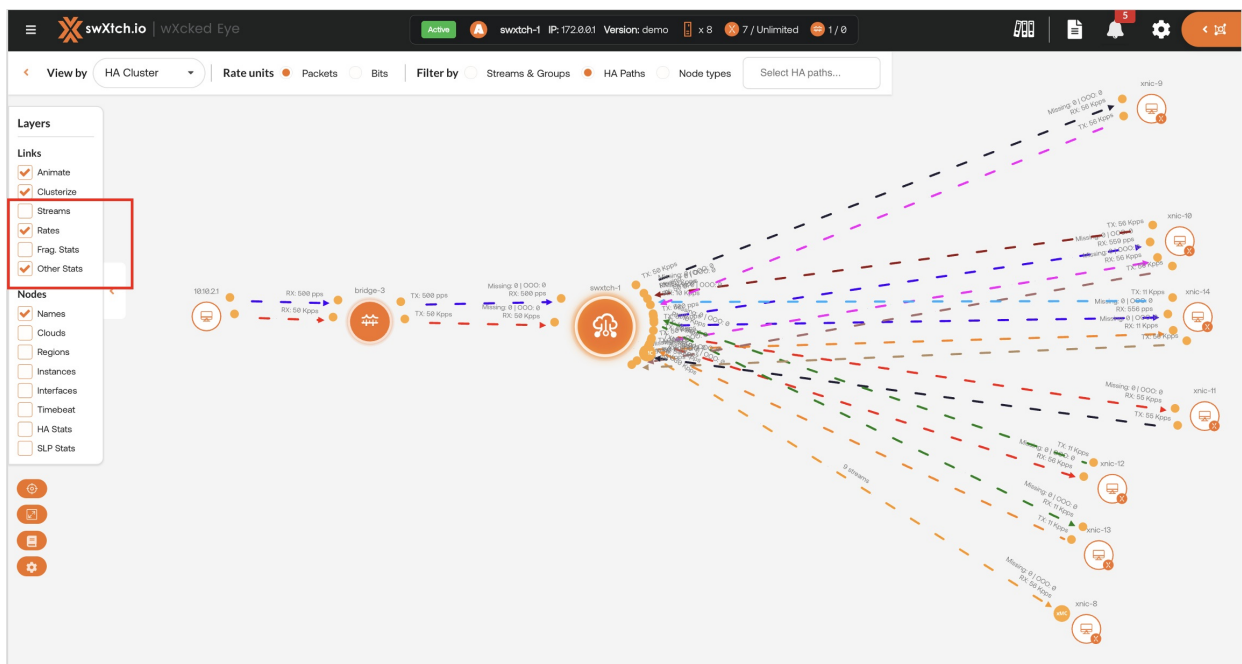
Now, when a user toggles Cluster under the Links section of the Topology Toolbox, the stream cluster setting they configured will be applied to the graph.



## Link Statistics

The four remaining toggles allow users to see information related to a stream link.

- **Streams:** This will display the stream names at the center of the link.
- **Rates:** This will display packet metrics. Rates must be selected in order to view Missing and OoO Stats under Other Stats.
- **Frag. Stats:** This will display how many packets were fragmented in the stream.
- **Other Stats:** This will display Missing and Out-of-Order (OoO) packet statistics.



## Nodes

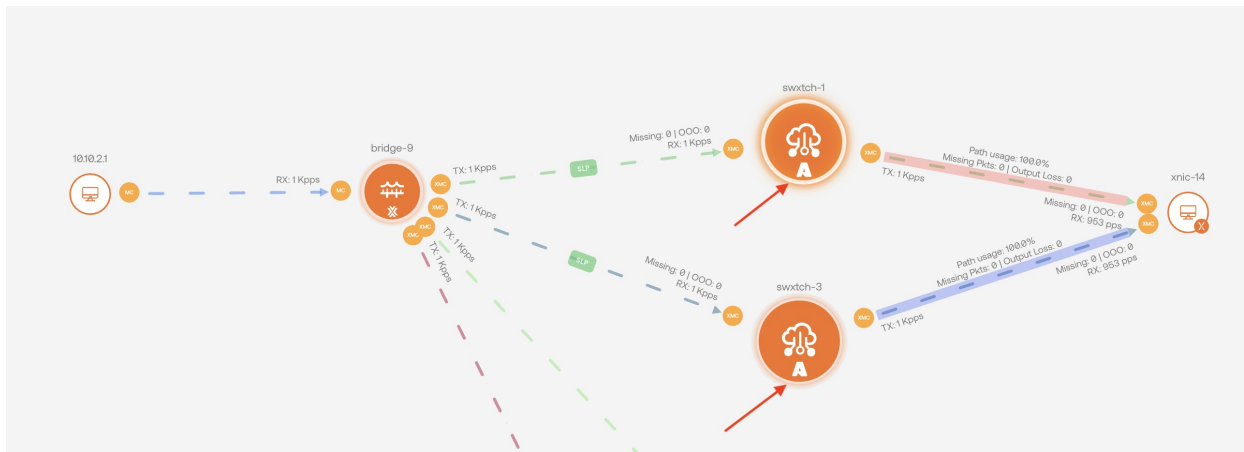
Nodes are the circle icons in the topology graph. They can represent cloudSwXtches, cloudSwXtch Bridges, and endpoints (with or without xNICs).

### Names

Selecting this option will display the names of the nodes.

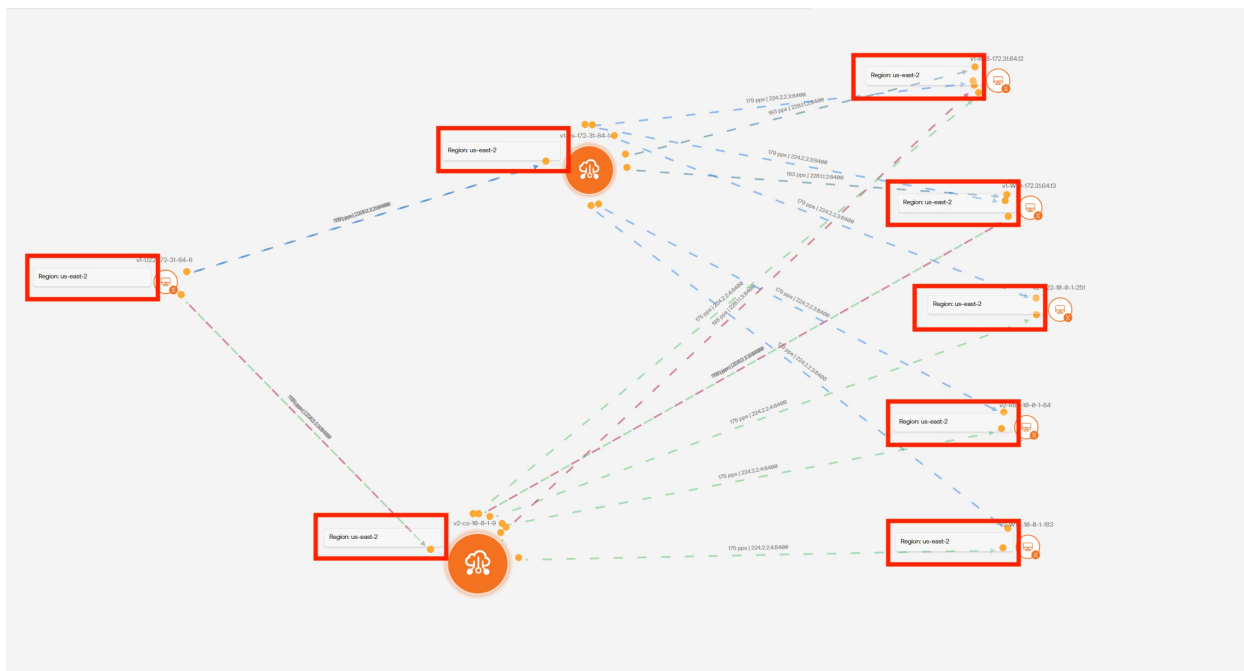
### Clouds

Toggling this one will display the cloud provider for the cloudSwXtch and cloudSwXtch Bridge components.



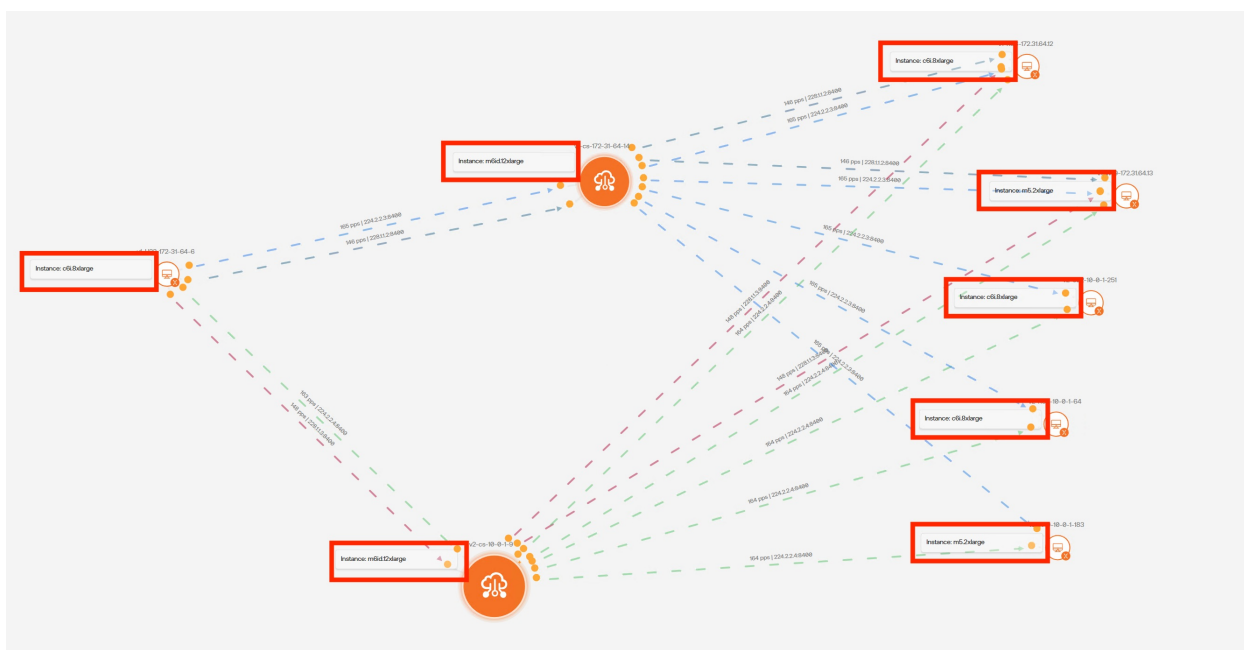
## Regions

This will display where the node is located.



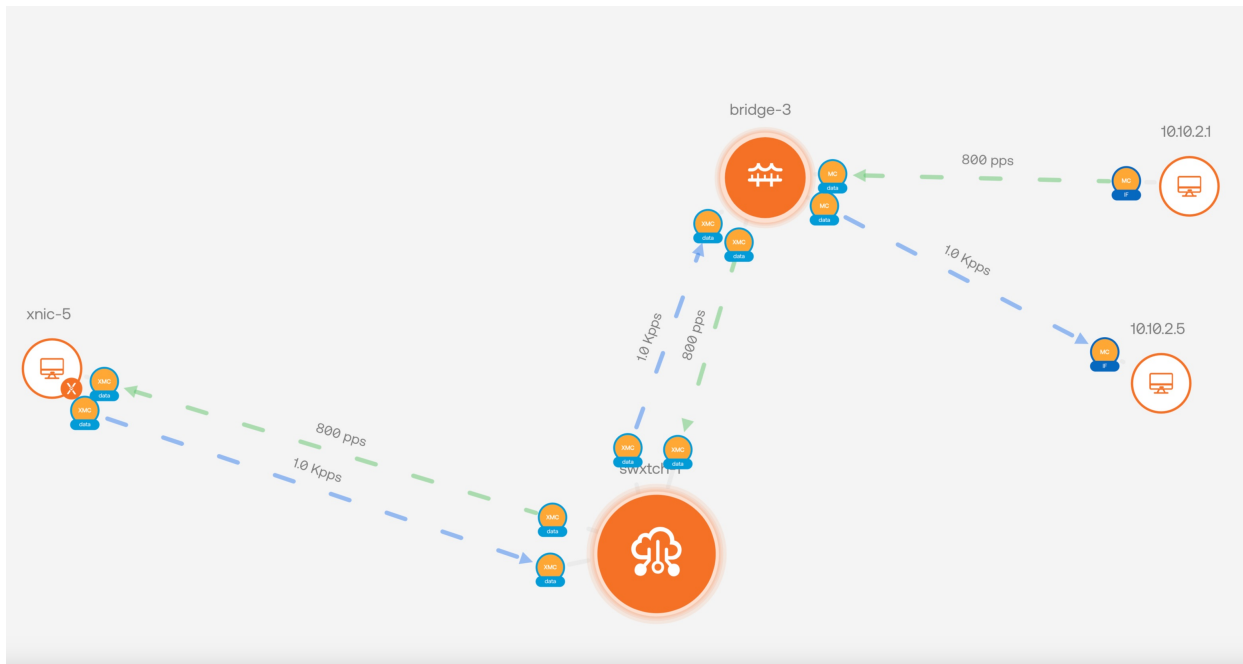
## Instances

When activated, this will display information about a virtual machine's instance.

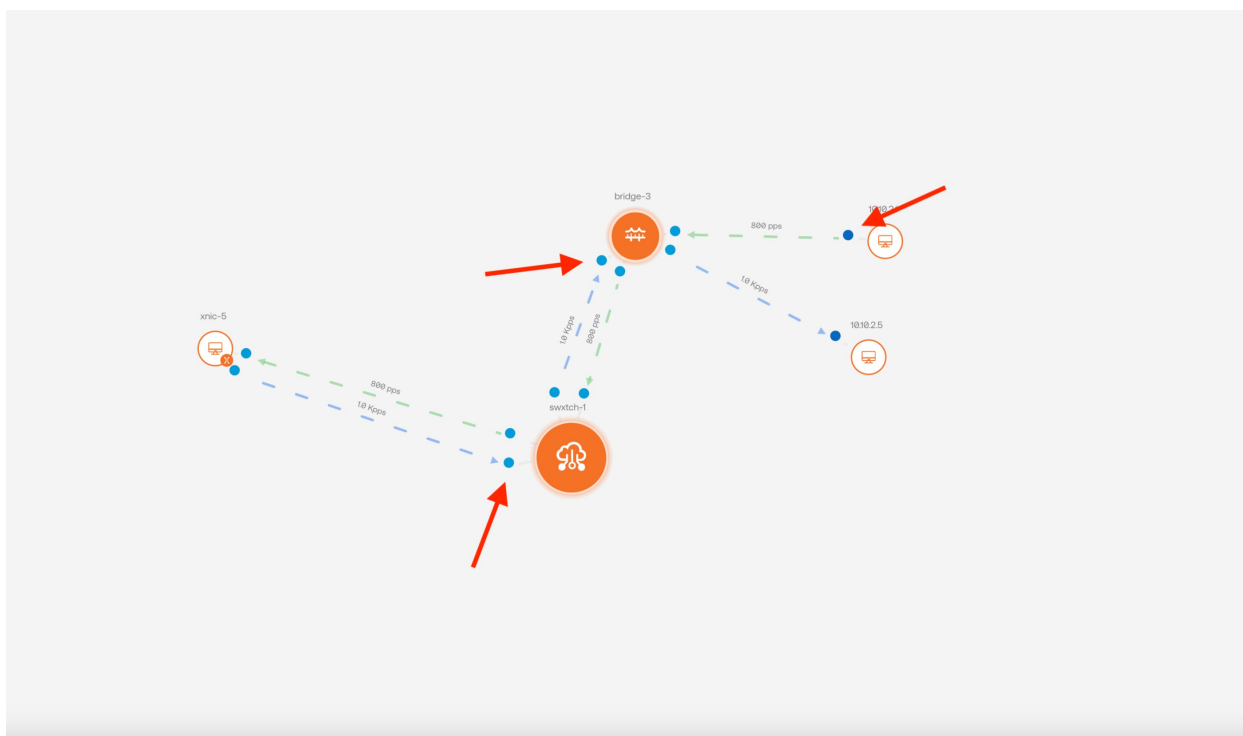


## Interfaces

Toggle this on will display the interfaces the components are using to send or receive traffic.



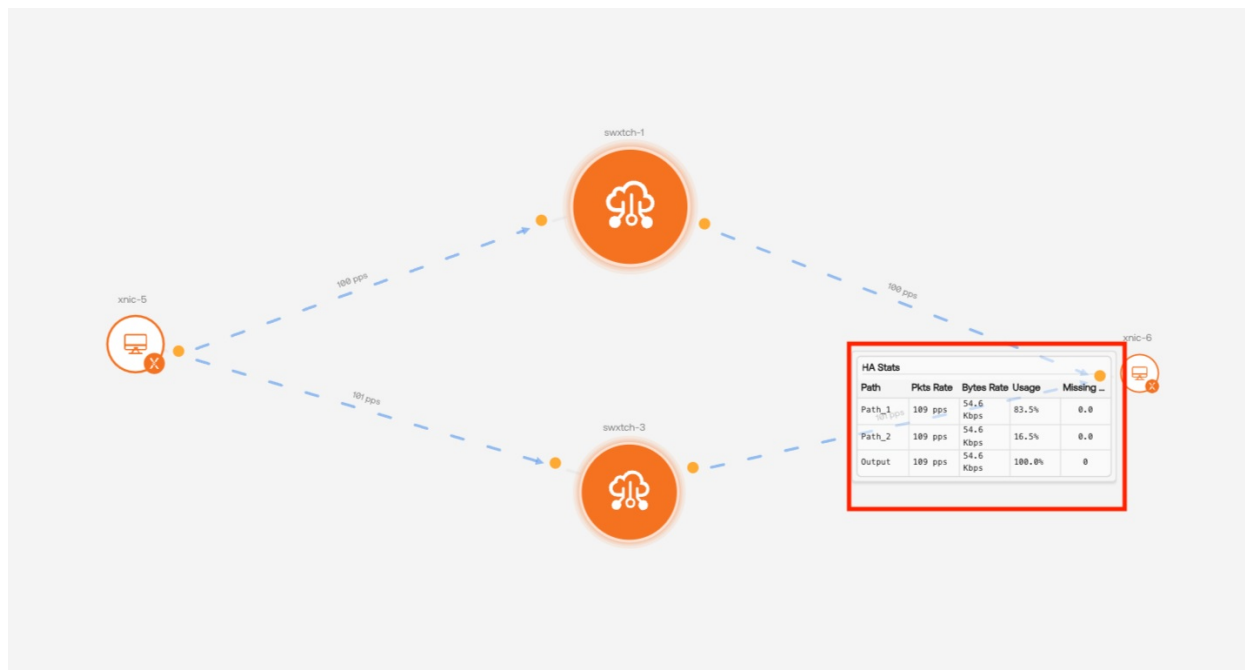
Zooming in and out of the graph will minimize the interfaces.



## HA Stats

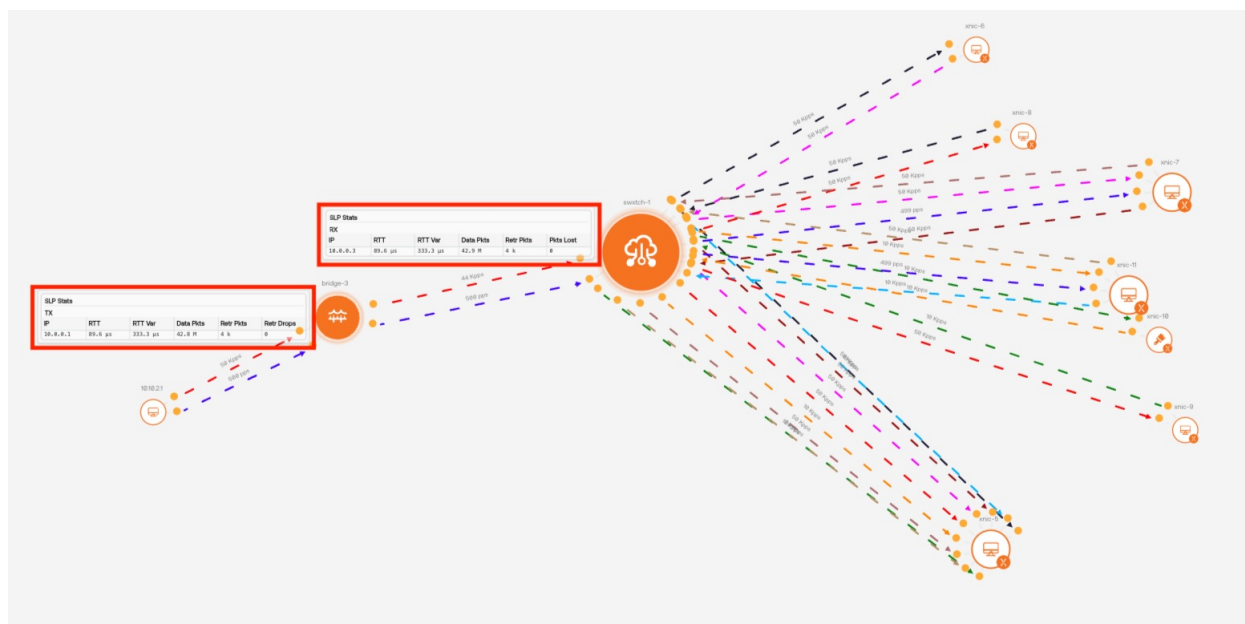
When activated, information about data flow in an HA configuration at the node will be displayed.





## SLP Stats

When activated, information about lossless data flow at the node will be displayed.



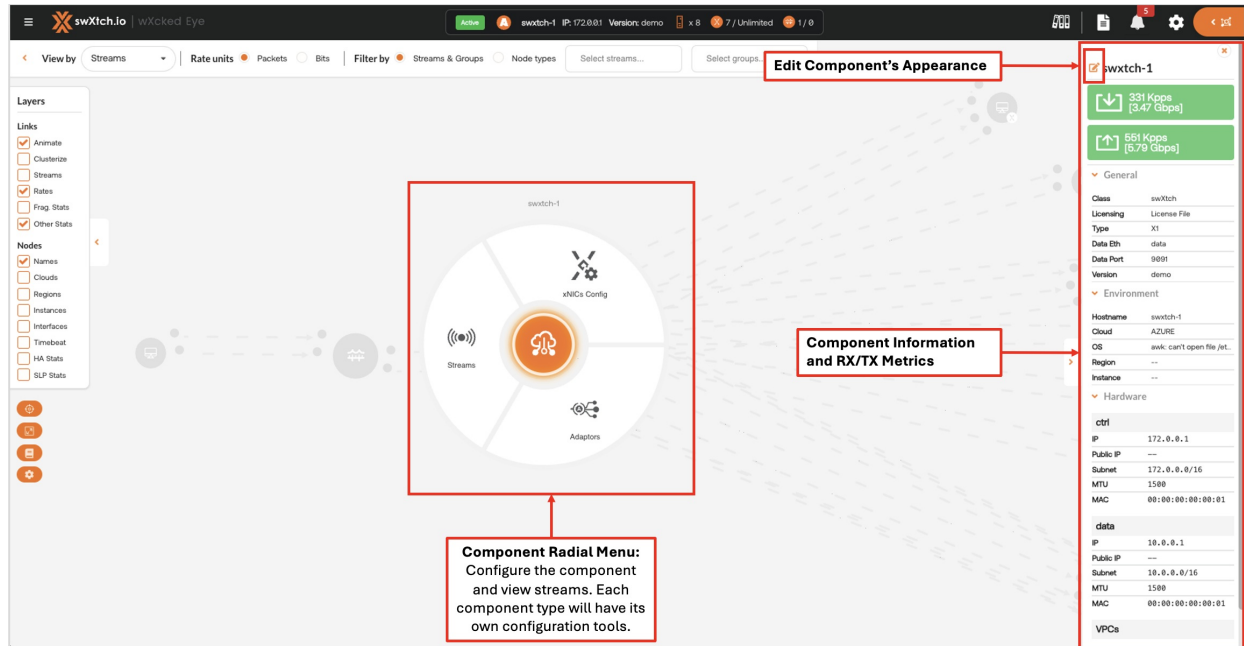
## Viewing Metrics in the Component Information Panel

### WHAT TO EXPECT

The Component Information Panel serves two purposes: allowing users to see metrics for a specific node in the topology graph and configuration at that node.

In this article, users learn about the different metrics they can view in the Component Information Panel. For information on how to use the configuration options, see [Configuring in the Component Information Panel](#).

### General Metrics



The Component Information Panel will display metrics pertaining to a selected component in the Topology Graph. Depending on the Component type, the information displayed may vary. Across all types, the following four categories will be listed: Statistics, General, Environment, and Hardware.

At the top of the component sidebar, users will see a high level view of Total Rx and Total Tx **statistics** from the perspective of the selected component. In the example above, the user has the cloudSwXtch in the center selected and can see the data being received and transmitted.

The **General** section details the type of component (cloudSwXtch, xNIC, cloudSwXtch Bridge, etc.), the data eth, data port and the version. The **Environment** provides information regarding the cloud provider, including the host name, cloud, OS, Region, and Instance type. The **Hardware** section goes deeper into the information regarding the virtual machine, specifically the NICs.

### Component Radial Menu

In addition to displaying component information and performance metrics, selecting a node in the Topology Graph will reveal a radial menu. Here, users can find statistics specific to that component type and additional configuration options. In this section, we will look into the different metrics for each component type.

For more information on configuring a component via the radial menu, see [here](#).

### Streams

The **Streams** section provide users with a detailed list of all the streams going through the component and the direction of data flow. Users can view streams for every component node.

**Selecting Streams from the Component radial menu will open a Streams tab, displaying all the streams associated with the component.**

**Egress and ingress directions are from the perspective of the component.**

## Timing Nodes

The **Timing Nodes** section will populate with information if any are configured in the cloudSwXtch network for Precision Time Protocol. Users can view timing node information when PTP has been established. This will only be visible in for cloudSwXtch and xNIC components.

## cloudSwXtch and Bridge Metrics

cloudSwXtch and cloudSwXtch Bridge component nodes share one category that is not listed in the xNIC component node. These are Lossless Stats.

### Lossless Stats

**Lossless stats** display SLP TX or SLP RX stats, depending on whether or not the component is transmitting lossless data or receiving. The default statistics listed here will match those found when turning the SLP Stats toggle on in the Topology Toolbox. In addition, it will match what is found in the Lossless view in swtXtch-top.

**Lossless**

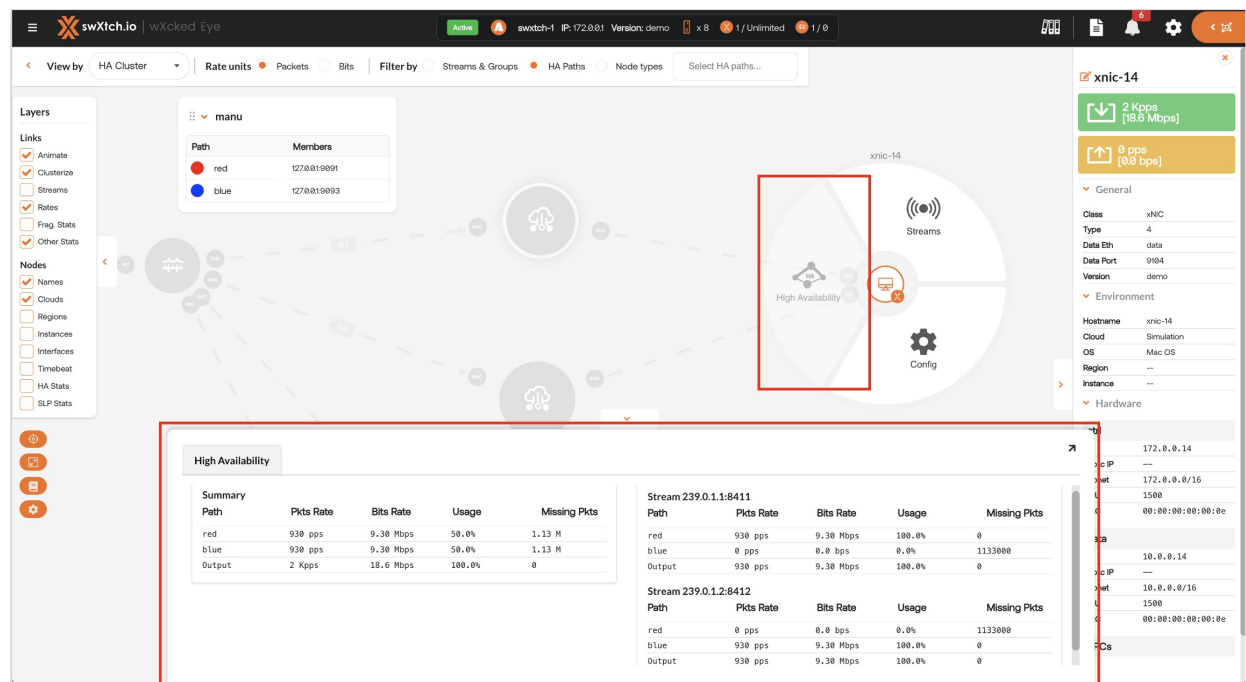
TX					
IP	RTT	RTT Var	Data Pkts	Retr Pkts	Retr Drops
10.0.0.3	98.2 µs	333.3 µs	179.0 k	17	0

## xNIC Metrics

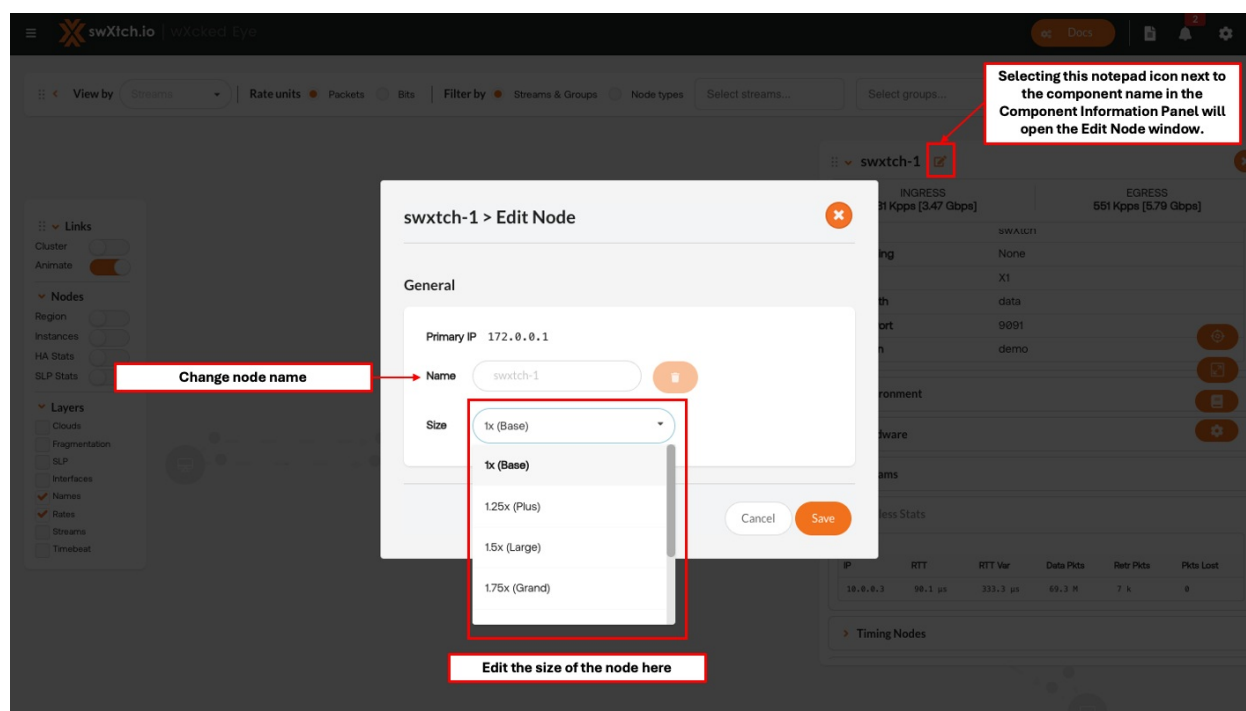
High availability stats is the only category not found in either the cloudSwXtch or the cloudSwXtch Bridge. It is only listed in the xNIC component information panel.

### High Availability

When selecting a node configured for **high availability**, a user can see information regarding data flow between the two paths. High Availability stats display the amount of data the xNIC is using from HA paths in order to reconstruct a stream. This is organized into two subsections: Summary and Counters. Summary takes a holistic look at the two paths while Counters displays information at the stream-level.

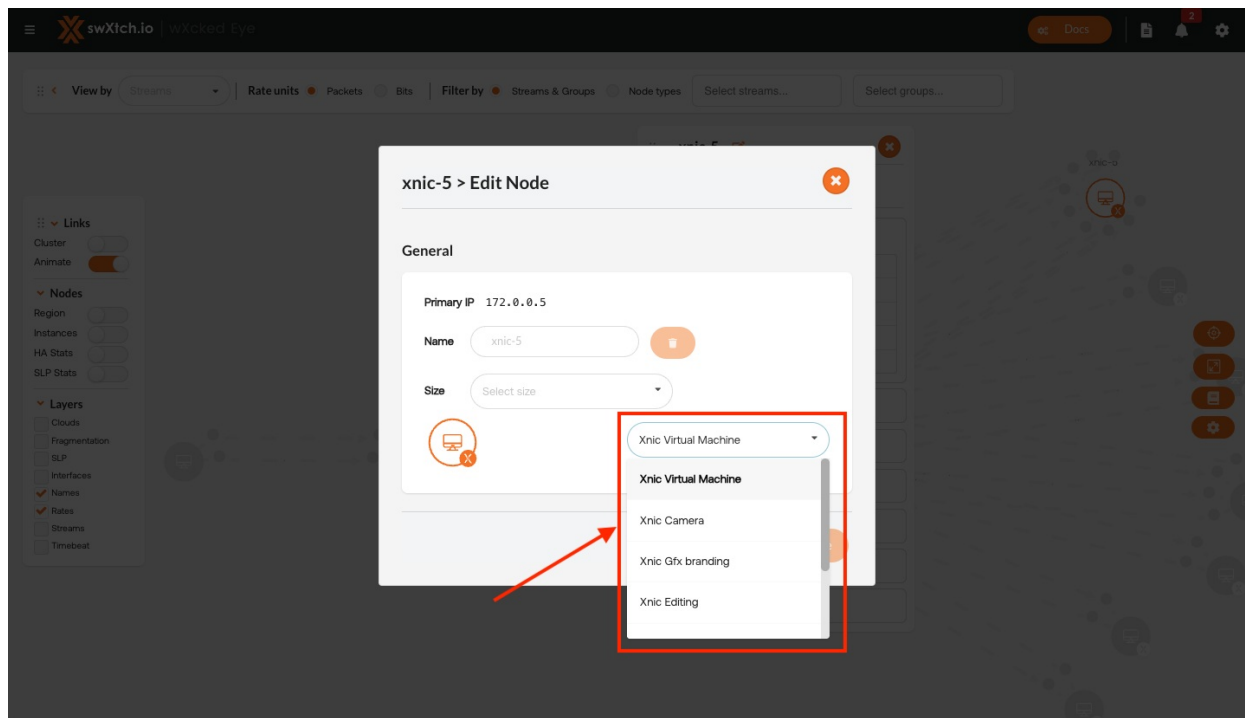


## Editing Node's Appearance



Users can change the appearance of each node or component in the Topology Graph. By selecting the Edit Pad next to the component's name in the Information Sidebar, a user can edit the size and the name.

For xNIC endpoints, users can also edit the icon to reflect the role of the endpoint in the cloudSwXtch network.



## Configuration Options

In addition to viewing metrics, users can also configure the cloudSwXtch, cloudSwXtch Bridge, or xNIC within the Component radial menu. For a detailed walkthrough of each configuration option, see [Configuring in the Component Information Panel](#) under wXcked Eye Topology Graph.

## Configuring in the Component Radial Menu

### WHAT TO EXPECT

In this article, users learn about the different configuration options they can use in the Component radial menu. For information on metrics options, see [Viewing Metrics in the Component Information Panel](#).

### Opening the Component Node's Radial Menu

When selecting a component node, two things occur: a side panel opens with component-specific information, known as the Component Information panel, and a radial menu encircles the node.



Depending on the component type, the radial menu provides users with additional information about associated streams, lossless stats, and high availability stats, depending on the node type. In addition, the menu also provides tools to configure the component.

### Configuring cloudSwXtch via Topology Graph

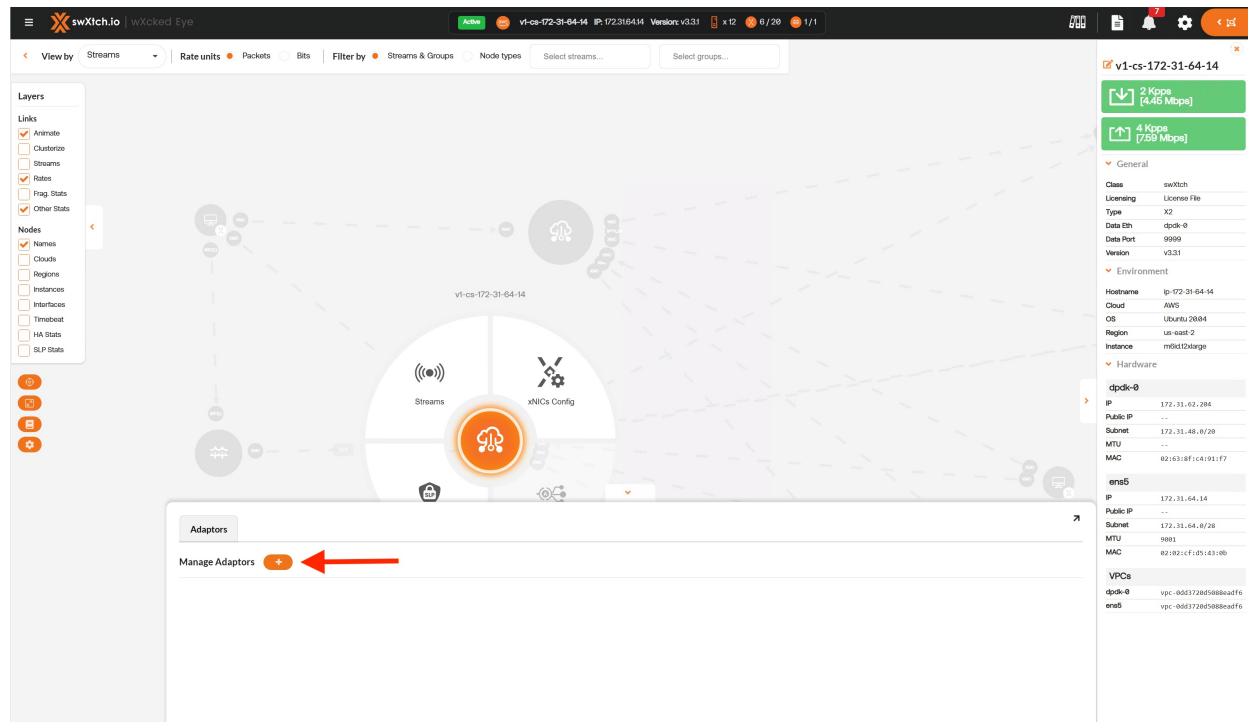
In addition to monitoring metrics, users can configure certain attributes about component. For example, users can add adaptors to a cloudSwXtch component directly through the wXcked Eye Topology graph as opposed to navigating the Settings page.

### Adding Adaptors via a cloudSwXtch or Bridge Component Node

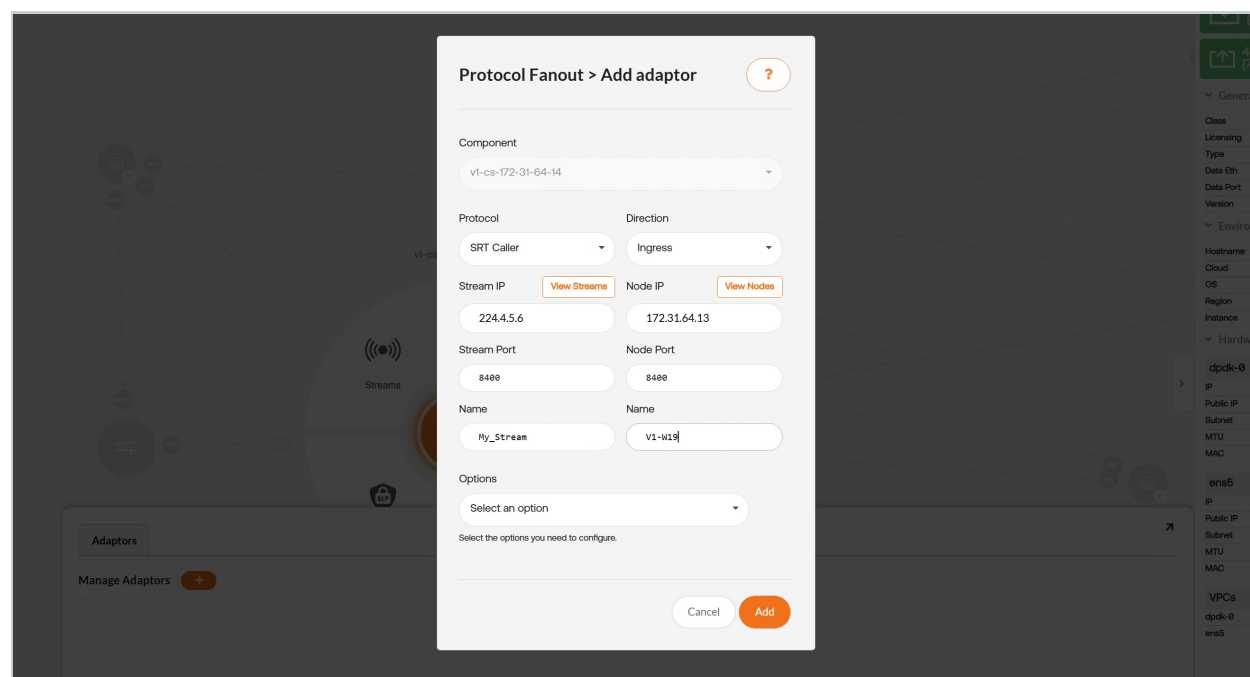
Under **Adaptors**, users can view adaptor details, add, edit, remove, and link to adaptor stats.

A screenshot of the swXtch.io wXcked Eye interface. The top bar shows the application name, a status indicator, and a node identifier 'v1-cs-172-31-64-14'. Below this is a navigation bar with tabs for 'View by' (Streams, Rate units, Packets, Bits) and 'Filter by' (Streams &amp; Groups, Node types). The main area displays a network topology graph with a central node 'v1-cs-172-31-64-14' and its radial menu. The right sidebar shows the 'Component Information' panel for the selected node, including general information (Class, Licensing, Type, Data Bn, Data Port, Version) and hardware details (Hostname, Cloud, OS, Region, Instance). The bottom of the sidebar lists VPCs associated with the node.

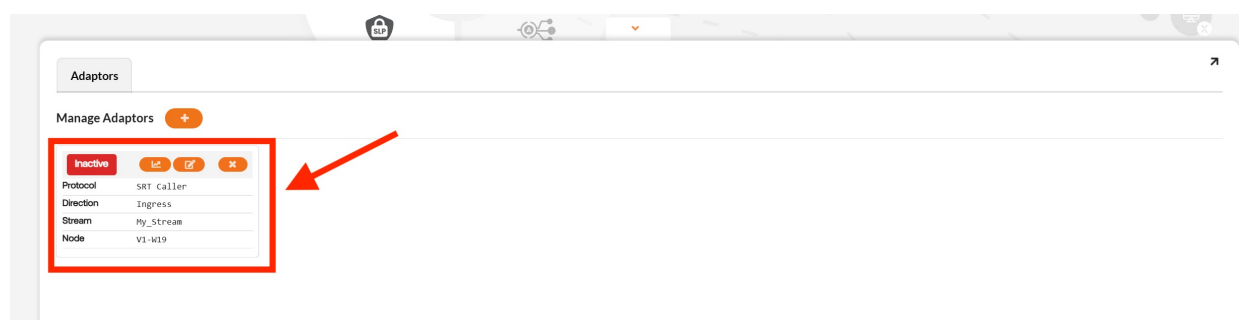
Selecting the Adaptors option in the component radial menu will open a panel directly in the Topology Graph. Here, users can see existing adaptors and add or delete them. **To add an adaptor**, select the “+” sign next to Manage Adaptors.



The pop-up window is similar to what can be found under the [Protocol Fanout tab on the Settings page](#). Users can specify the protocol, direction, and stream information necessary to add an adaptor.



After selecting “Add,” the new adaptor should appear in the Adaptors panel. The adaptor card will have options to view Adaptor stats, edit, and remove. **Please note:** Adding an adaptor can take a few minutes. A status message will appear.

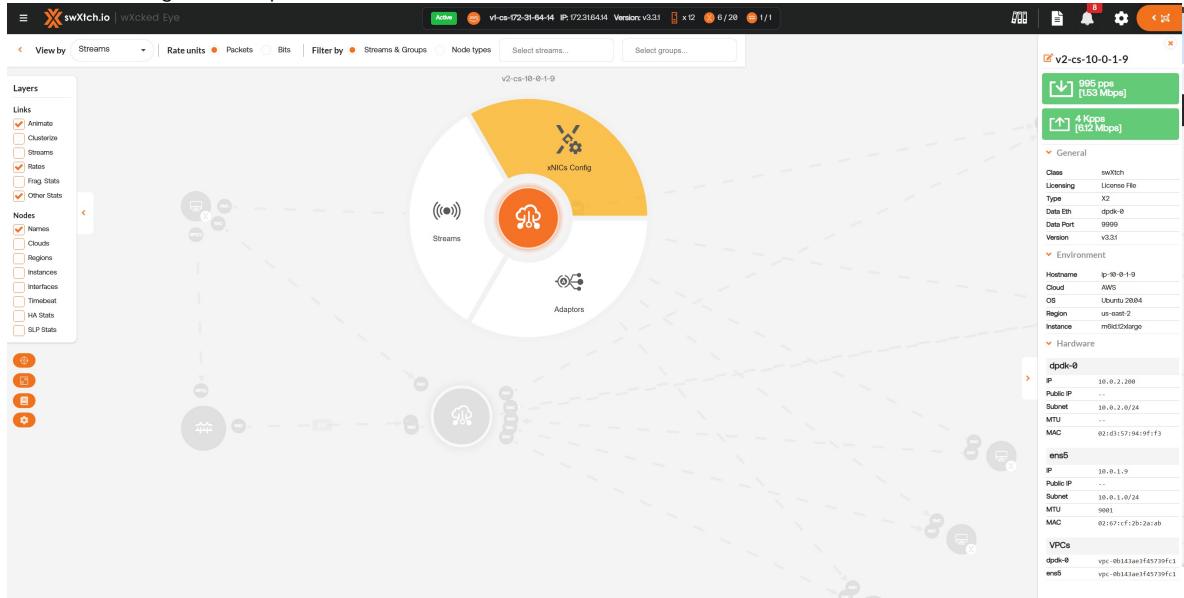


## Editing Multiple xNICs Config via the cloudSwXtch Node

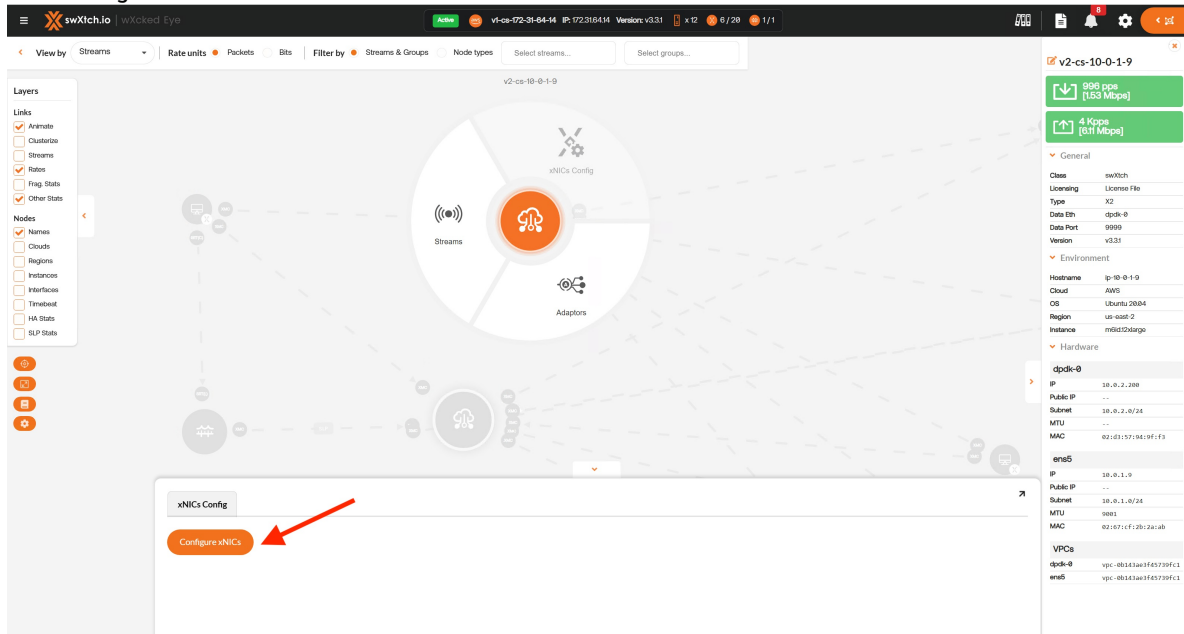
When selecting a cloudSwXtch component in the Topology Graph, an **xNIC Config** section will be listed. Here, users can configure multiple xNICs related to the cloudSwXtch concurrently. This is specifically for xNICs that have been deployed against the highlighted cloudSwXtch. Users can toggle High Availability on/off and select the desired protocol. In addition, users can toggle xNIC Deduplication and specify the Buffer Size and Timeout speed. When confirmed, all these changes will be applied to every selected xNIC.

To do this:

1. Navigate to the **Topology Graph**.
2. Click on one of your cloudSwXtches.
3. Select xNIC Config in the component radial menu.



4. Select **Configure xNICs**.



5. Select the checkboxes of the xNICs you would like to configure together.
  - a. **Please note:** Only xNICs installed against the cloudSwXtch will be listed. If you do not see an xNIC listed, it may have been installed via another cloudSwXtch.



6. Click **Next**.

v2-cs-10-0-1-9 > Configure xNICs

1 Select xNICs 2 Update config

Please select the xNICs that you want to broadcast the config to

<input checked="" type="checkbox"/>	IP	Name
<input checked="" type="checkbox"/>	10.0.1.164	v2-R88-10-0-1-64
<input checked="" type="checkbox"/>	10.0.1.183	v2-W19-10-0-1-183
<input checked="" type="checkbox"/>	10.0.1.251	v2-U22-10-0-1-251

Previous Next

7. Configure your settings as you see fit. **To activate the dropdown menus**, you have to toggle each section ON.

v2-cs-10-0-1-9 > Configure xNICs

✓ Select xNICs 2 Update config

High Availability ☒

Protocol RTP

xNIC Deduplication ☒

Buffer Size (pkts) 131072 Timeout (ms) 50

Previous Confirm

8. Select **Confirm** when you are happy with your selections.

xNICs Config

Configure xNICs

xNICs config broadcasted successfully. This may take a few seconds to update.

To confirm that your changes have taken hold, click on one of the xNICs attached to the cloudSwXtch and expand the Config dropdown in the Component Information pop-up.

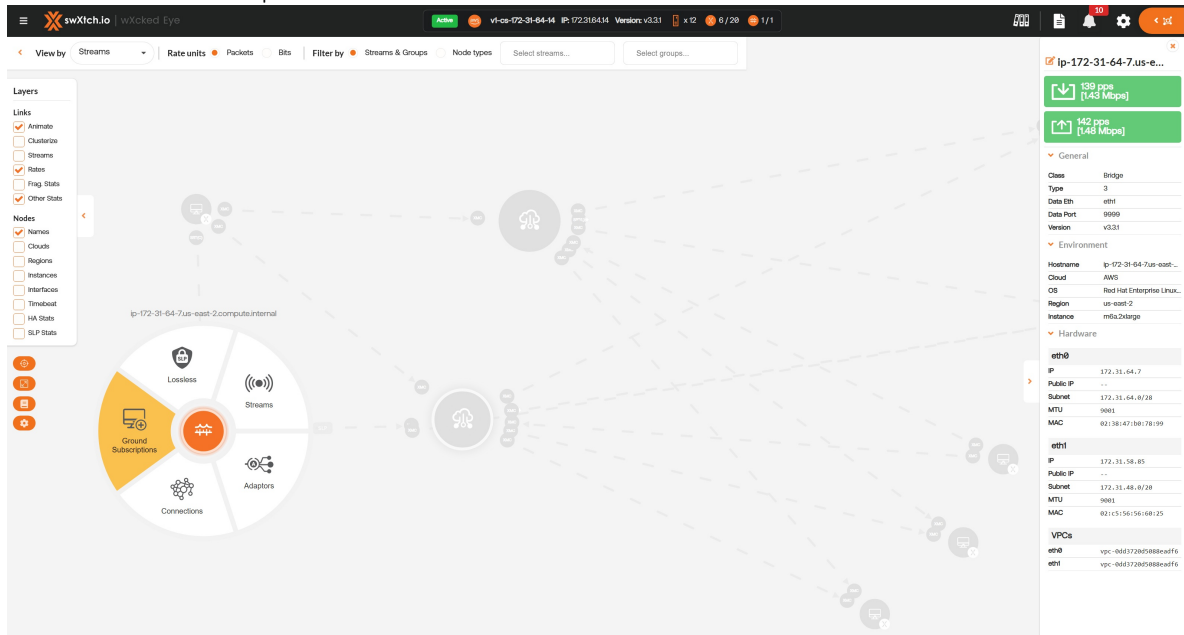
## Adding Ground Subscriptions via a Bridge Component Node

When selecting a cloudSwXtch Bridge component in the Topology Graph, a Ground Subscriptions option will display. Formally known as Cloud to Ground (C2G) subscriptions, ground subscriptions are when the bridge found on-premises requests for multicast data from the cloud (i.e. subscribing).

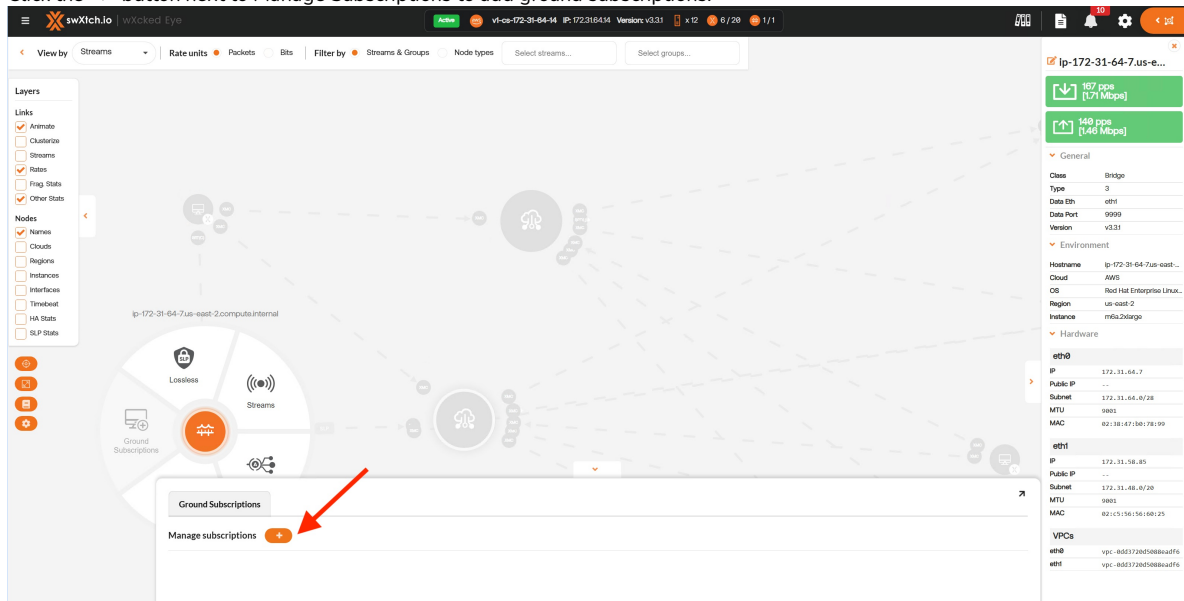
Here, users can add ground subscriptions directly in the UI and apply them to the bridge configuration JSON.

To do this:

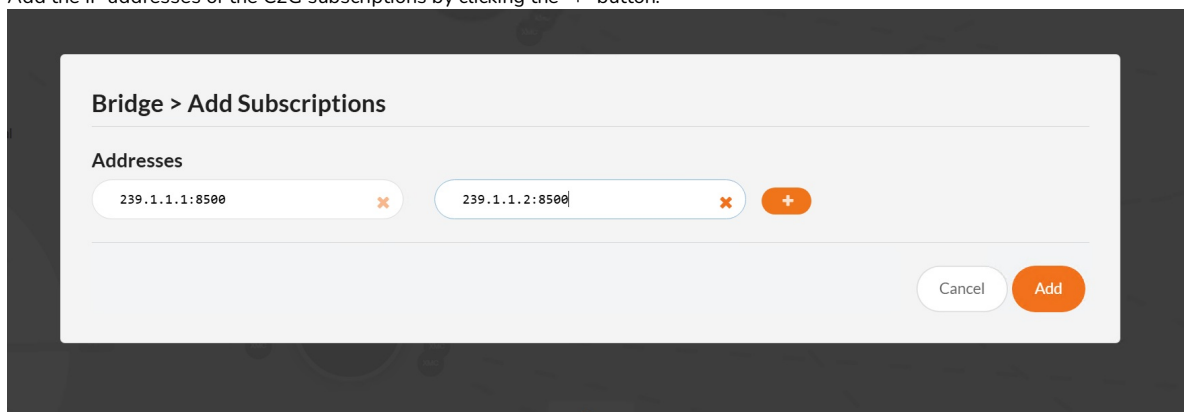
1. Click the cloudSwXtch Bridge component in the Topology Graph to open the Component Information panel.
2. Select to the Ground Subscriptions section.



3. Click the "+" button next to Manage Subscriptions to add ground subscriptions.

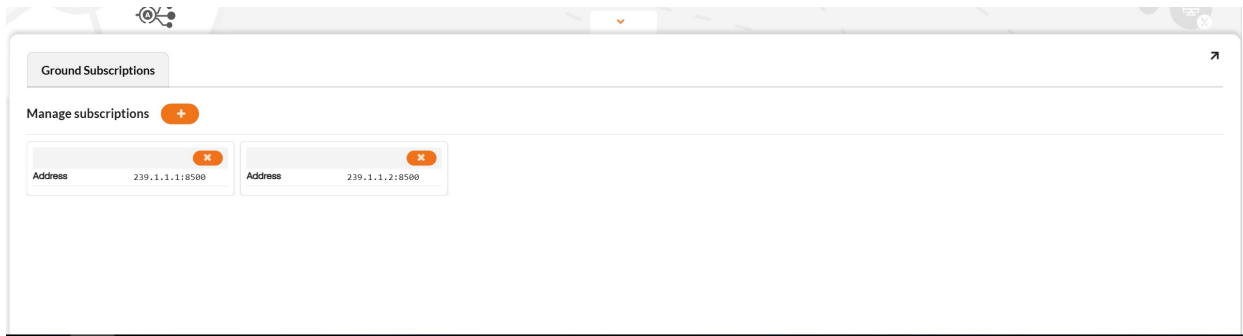


4. Add the IP addresses of the C2G subscriptions by clicking the "+" button.



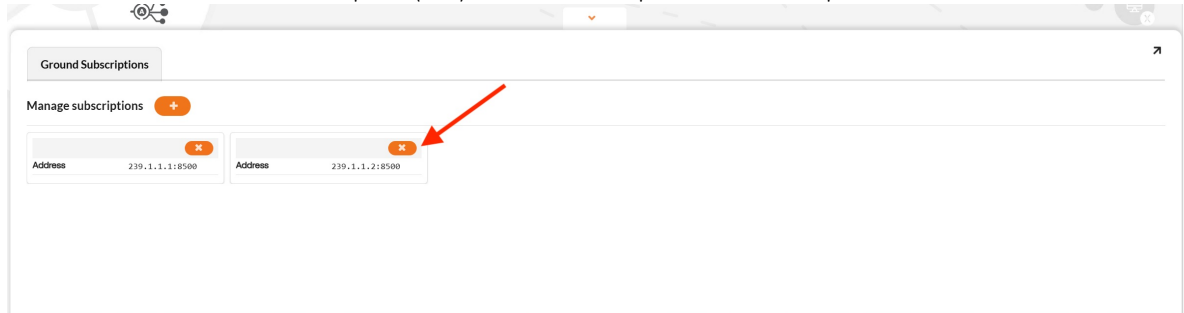
5. Click Add to confirm.

The new subscriptions should now list in the Component Information panel.

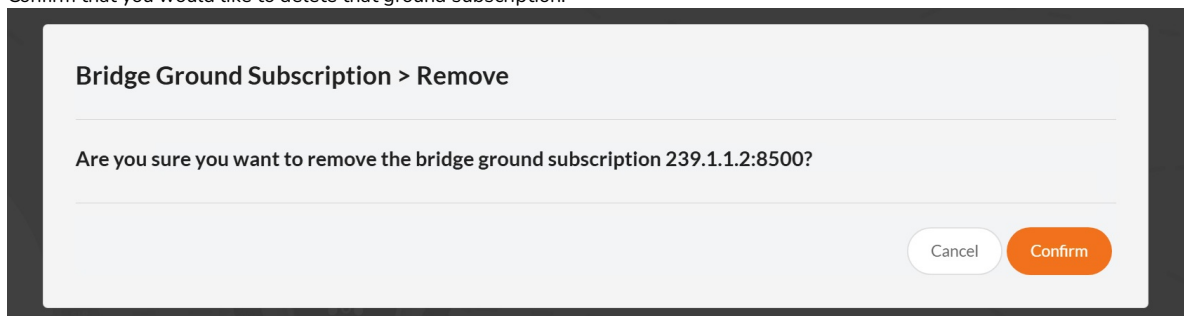


To remove:

1. Click the "X" button next to the Subscriptions (C2G). A Remove Subscriptions window will open.



2. Confirm that you would like to delete that ground subscription.



3. The ground subscription should now be removed.

## Configuring for Multi-cloudSwXtch via the Bridge Component Node

Users can configure their cloudSwXtch Bridge to send and receive data to and from multiple cloudSwXtches. Prior to 3.3.0 release, users were only able to connect a single cloudSwXtch Bridge to a single cloudSwXtch. By expanding the number of cloudSwXtches, users can better utilize their on-premises hardware.

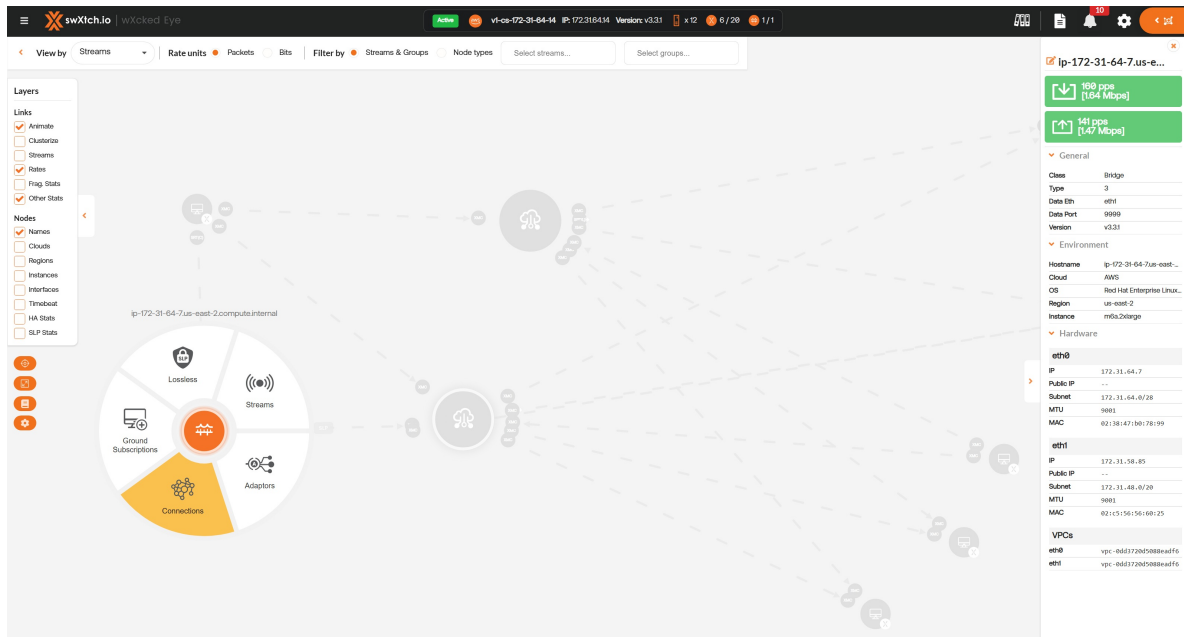
**Please note:** It is recommended for users to only connect up to 5 cloudSwXtches per cloudSwXtch Bridge via the steps below. If they would like to add more, please contact [support@swxtch.io](mailto:support@swxtch.io).

### Before You Start

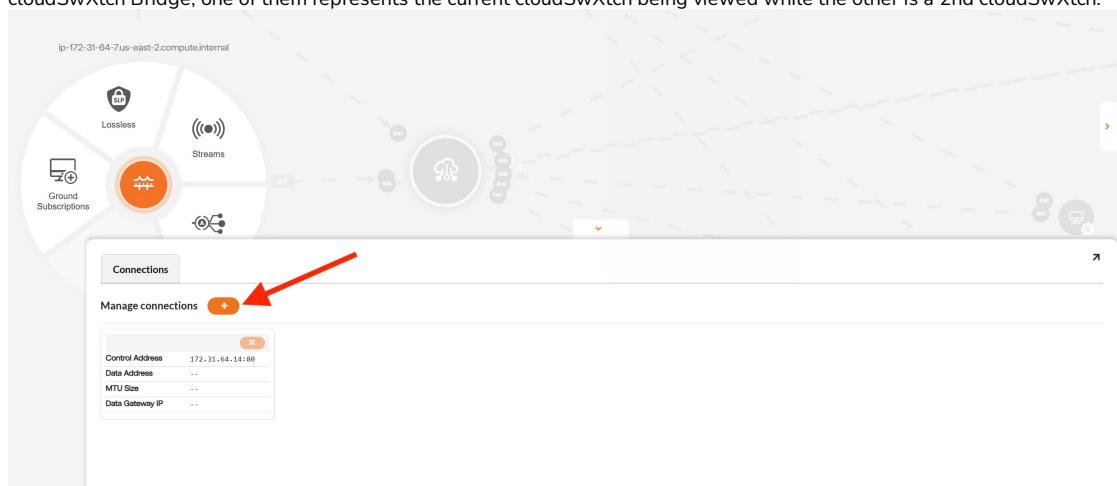
You must install a cloudSwXtch Bridge first and connect it to a primary cloudSwXtch. For installation steps, see [Installing cloudSwXtch Bridge](#).

To connect multiple cloudSwXtches to a single bridge, please run the following steps:

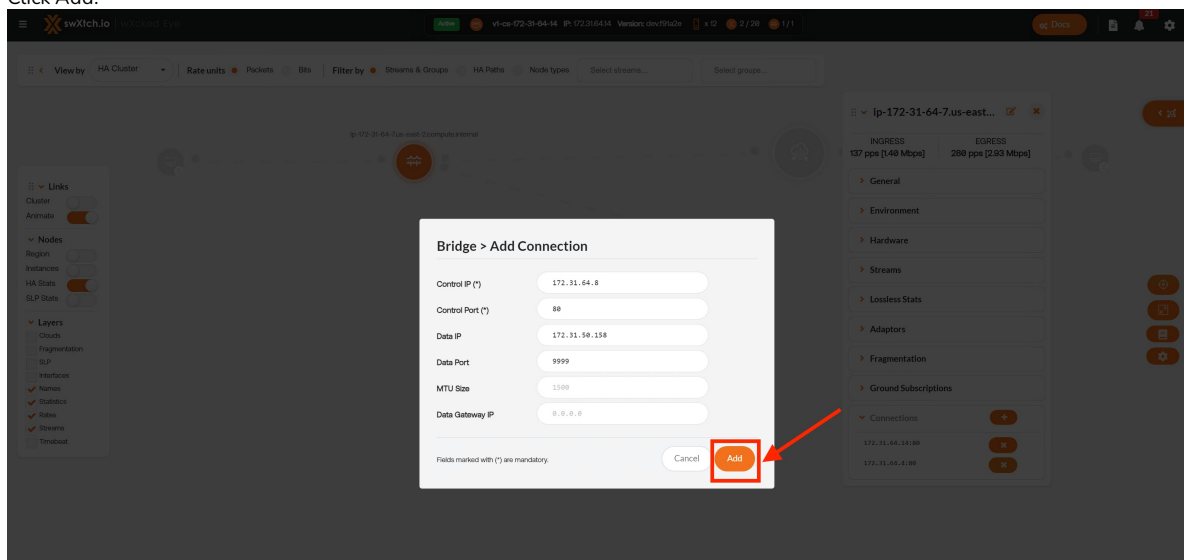
1. Navigate to the Topology Graph in wXcked Eye.
2. Select the cloudSwXtch Bridge component.
  - a. This will open the component radial menu.
3. Select Connections.



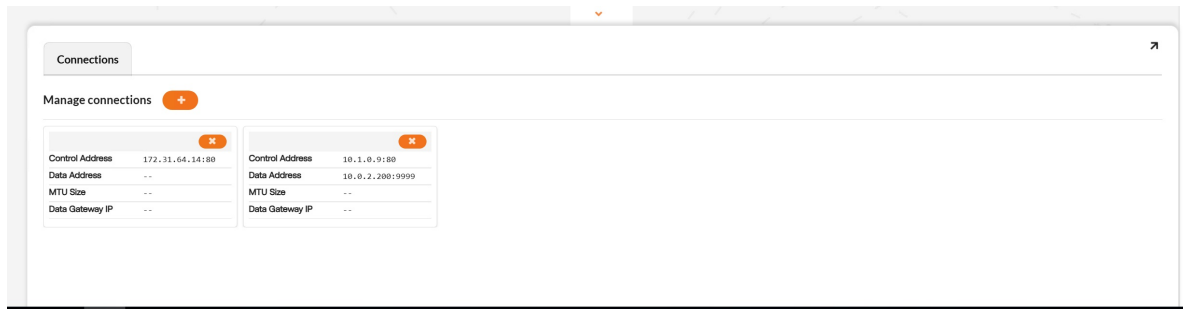
4. Click the + button next to **Manage connections** to add a new cloudSwXtch connection.
  - a. Note how there are already a connection listed. Since this is from the information panel is from the perspective of the cloudSwXtch Bridge, one of them represents the current cloudSwXtch being viewed while the other is a 2nd cloudSwXtch.



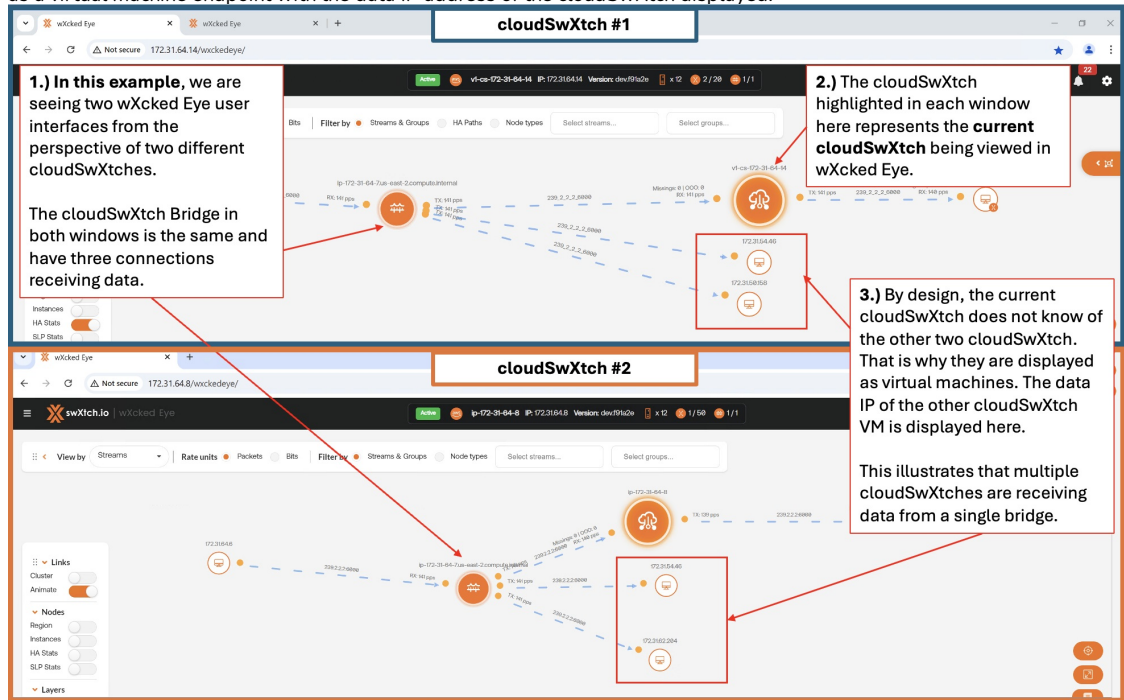
5. Enter the Data and Control information for the cloudSwXtch VM.
6. Click Add.



7. The cloudSwXtch should now appear as a virtual machine in the current cloudSwXtch's Topology Graph.



- a. In the example below, a third cloudSwXtch was added to an existing cloudSwXtch Bridge. cloudSwXtch #1 and cloudSwXtch #2 represent two separate wXcked Eye user interfaces, illustrating how multiple cloudSwXtches to a single bridge would appear to a user. When a new cloudSwXtch gets added to a cloudSwXtch bridge, that connection will appear as a virtual machine endpoint with the data IP address of the cloudSwXtch displayed.



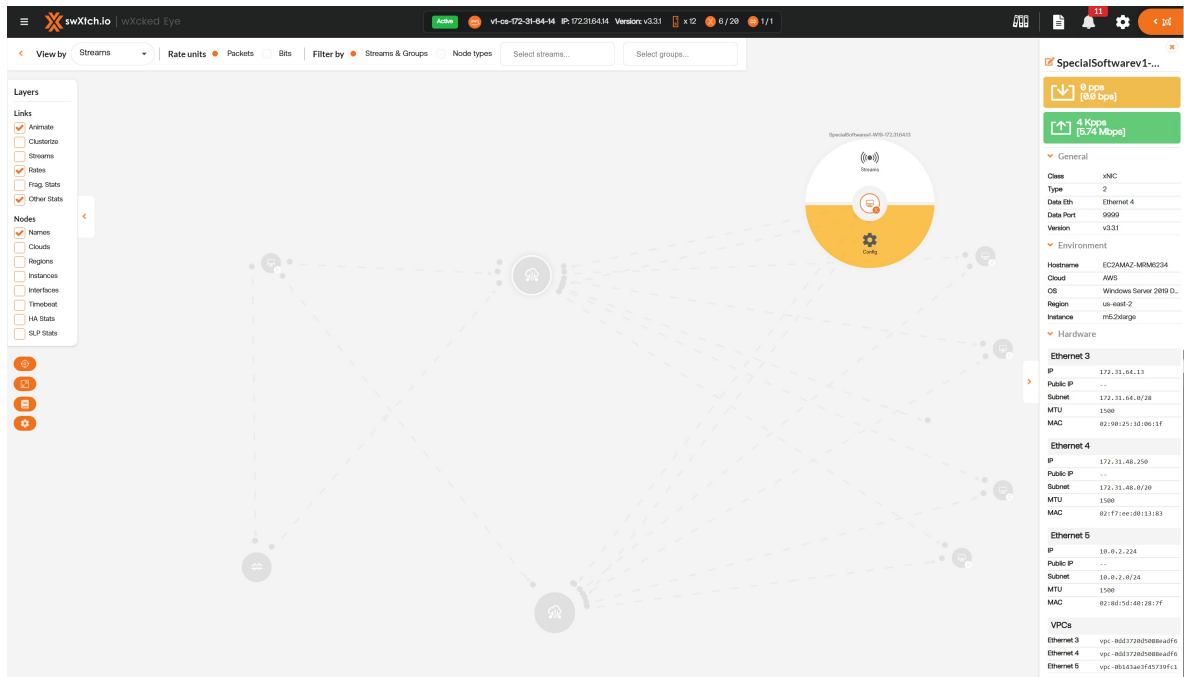
### WARNING

When doing an upgrade, subscriptions and connections are not saved. This is a known issue and will be resolved in a future version.

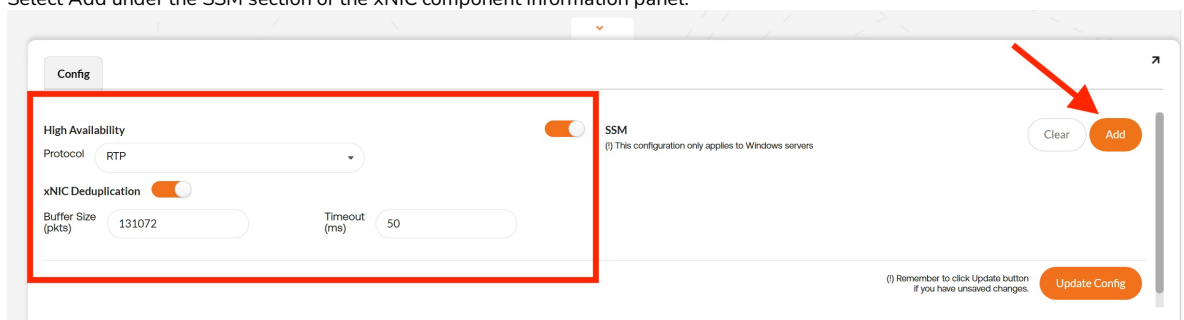
## Configuring HA for SSM via the xNIC Component Node

Users can configure high availability for Source Specific Multicast (SSM) via the xNIC component within the topology graph. **This is only for Windows consumer machines.**

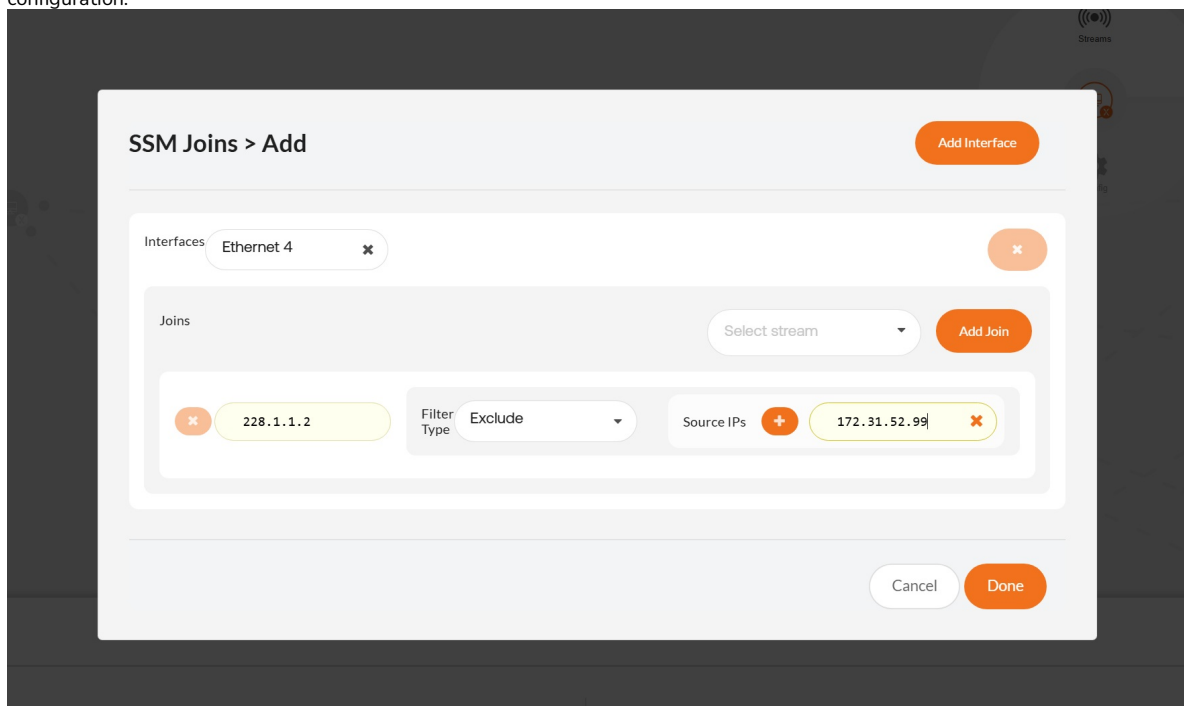
1. Navigate to the Topology Graph.
2. Select an xNIC that you wish to configure for SSM as a consumer.
3. Select Config from the component radial menu.



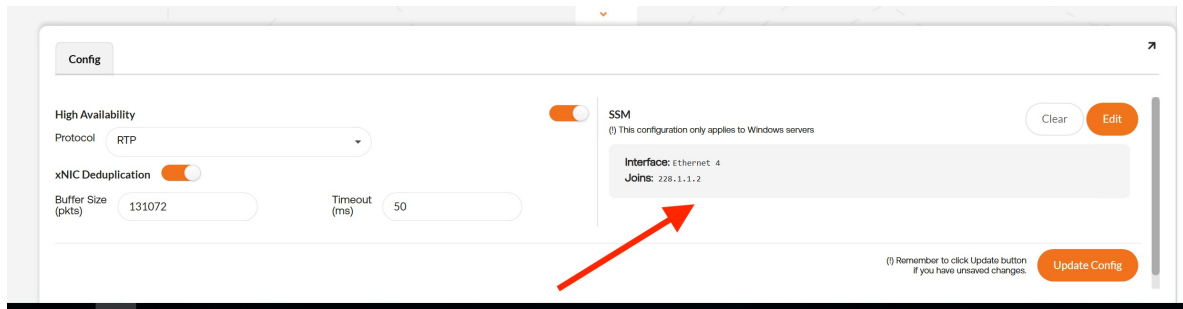
4. Toggle High Availability and xNIC Deduplication on.
5. Select RTP under the Protocol dropdown menu.
6. Select Add under the SSM section of the xNIC component information panel.



7. Add the **Interfaces** for the SSM Joins, specifying the IP Addresses of the Path Streams assigned during MMC Producer configuration.



8. Select **Done**.
9. Verify the **Interfaces** are listed in the **Component Information Panel** under **SSM**.



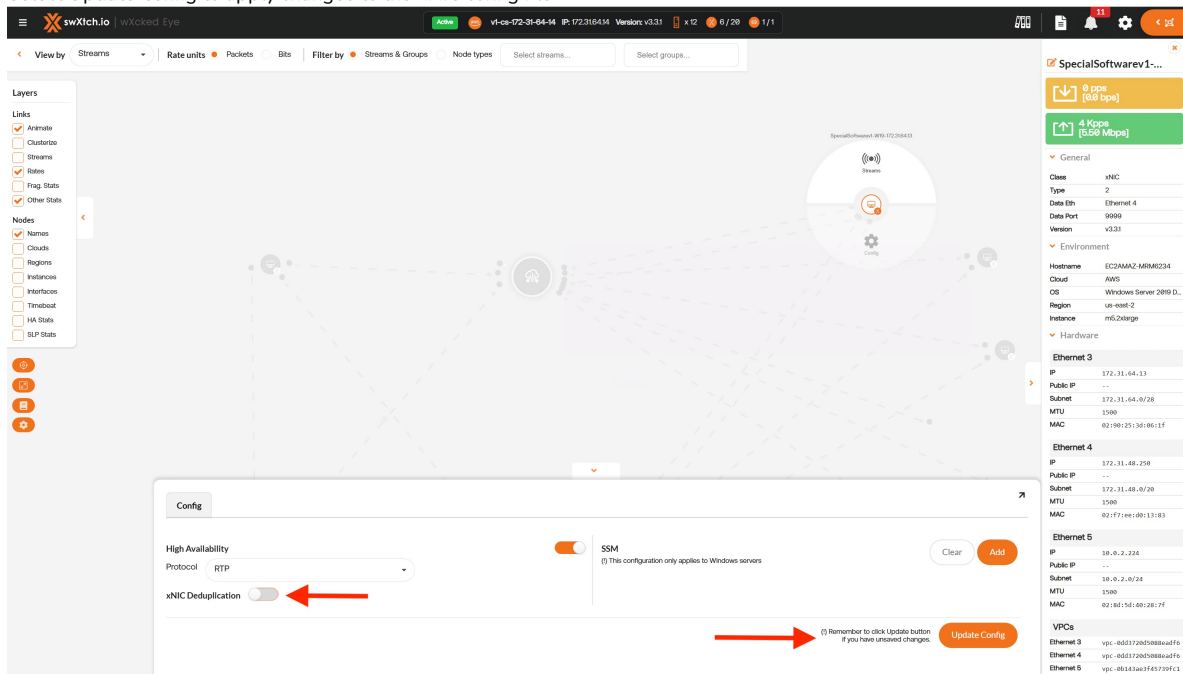
- Click **Update Config** in the Component Information window to apply changes to the xNIC config file.



## Toggling xNIC Deduplication Off via the xNIC Component

There are some instances where a user may want their own application at the endpoint to deduplicate HA paths instead of the xNIC. Users can toggle xNIC Deduplication on and off in an xNIC's component information panel.

- Navigate to the Topology Graph.
- Select an xNIC consumer component.
  - The xNIC component information panel will open.
- Scroll down to the Config section and expand it.
- Toggle xNIC Deduplication off.
- Select **Update Config** to apply changes to the xNIC config file.



## Disabling HA via the xNIC Component

Users can disable high availability via the xNIC Component node in the event that do no wish for endpoint to do HA.

- Navigate to the Topology Graph.
- Select an xNIC consumer component.
  - The xNIC component information panel will open.
- Scroll down to the Config section and expand it.

- Toggle High Availability off.
- Select Update Config to apply changes to the xNIC config file.

The screenshot shows the swXtch.io interface with the 'Config' panel open for 'SpecialSoftware1'. The 'High Availability' toggle is set to 'Off', and the 'xNIC Deduplication' toggle is set to 'On'. A red arrow points to the 'High Availability' toggle. Another red arrow points to the 'Update Config' button. The right sidebar shows details for Ethernet 3, 4, and 5.

**Config Panel:**

- High Availability: ☐ (Off)
- Protocol: RTP
- xNIC Deduplication: ☒ (On)
- Buffer Size (pkts): 131072
- Timeout (ms): 50
- SSM: (i) This configuration only applies to Windows servers

**Update Config Button:** (i) Remember to click Update button if you have unsaved changes.

**Right Sidebar:**

- Ethernet 3:** IP: 172.31.64.13, Public IP: --, Subnet: 172.31.64.0/20, MTU: 1500, MAC: 02:19:01:25:1d:0c:1f
- Ethernet 4:** IP: 172.31.48.250, Public IP: --, Subnet: 172.31.48.0/20, MTU: 1500, MAC: 02:17:10:01:00:13:18:3
- Ethernet 5:** IP: 10.0.0.2, Public IP: --, Subnet: 10.0.0.0/24, MTU: 1500, MAC: 02:19:01:25:1d:0c:1f

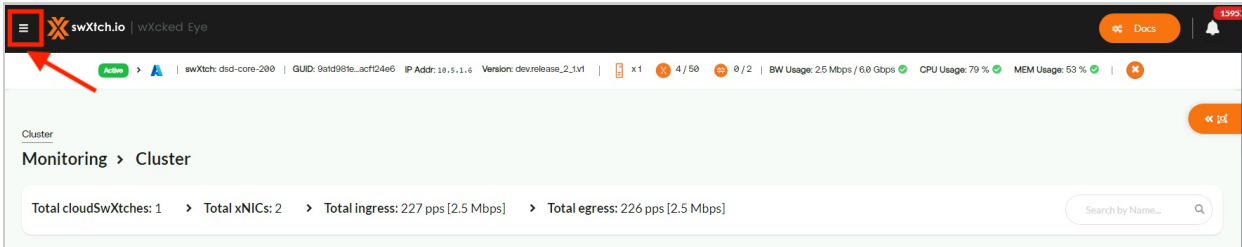


# wXcked Eye cloudSwXtch Page

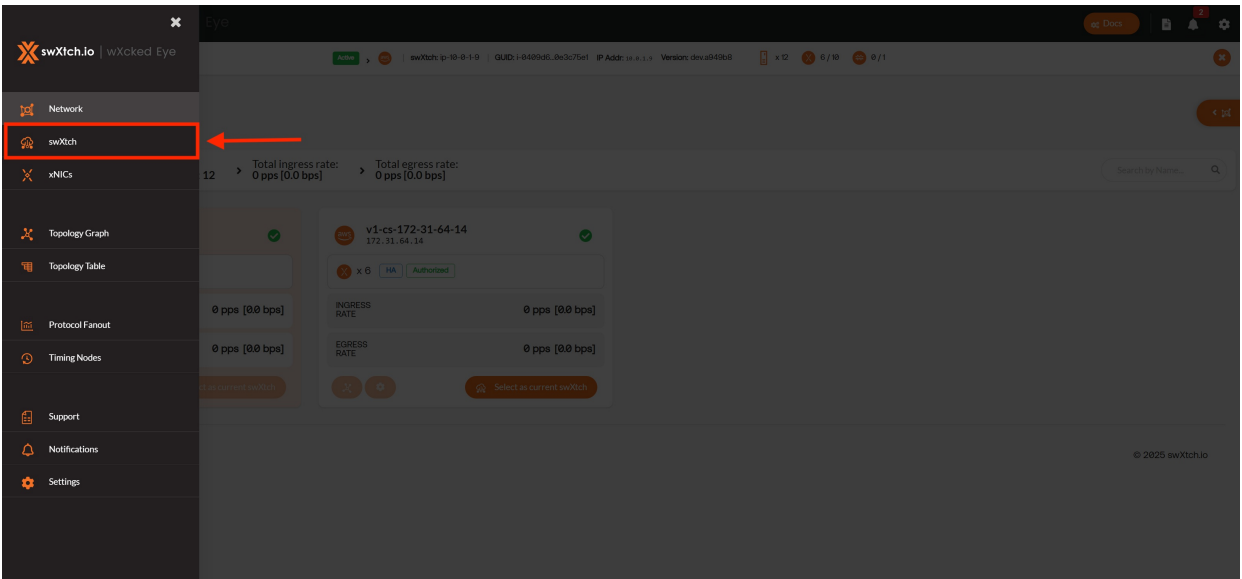
**WHAT TO EXPECT**  
In this article, you will learn how to view the performance metrics for your cloudSwXtch and the xNICs associated with it.

## Locating the wXcked Eye cloudSwXtch Page

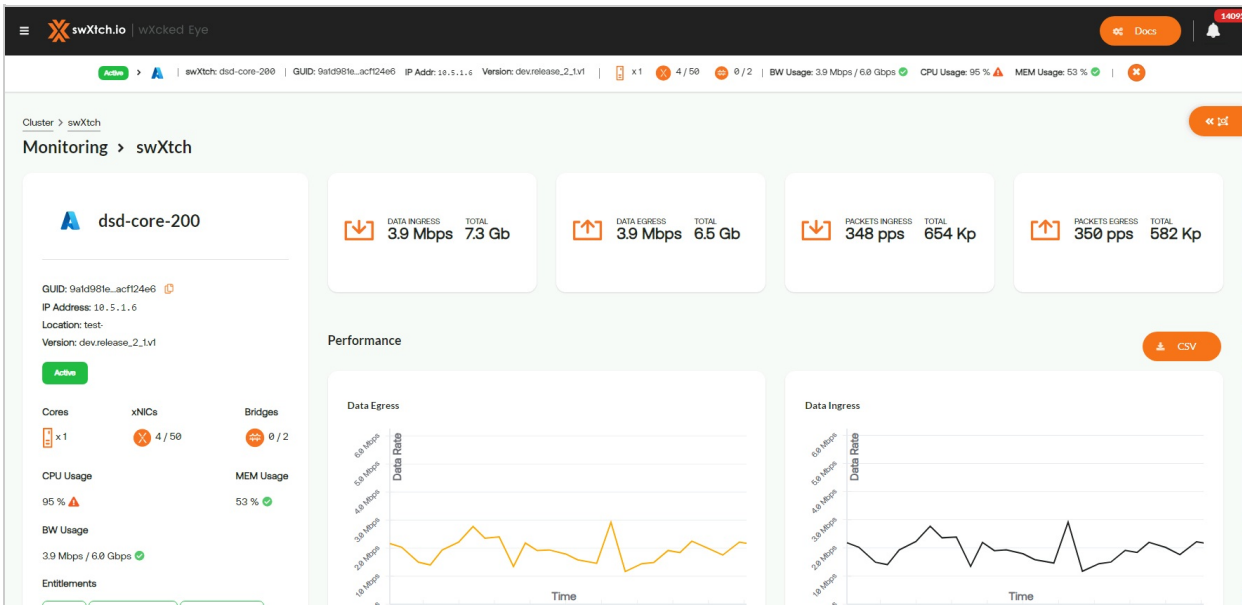
To navigate to the cloudSwXtch page, users will need to click on the menu (≡) option at the top left hand corner by the swXtch.io logo.



From there, select swXtch.



## Navigating the wXcked Eye cloudSwXtch Page

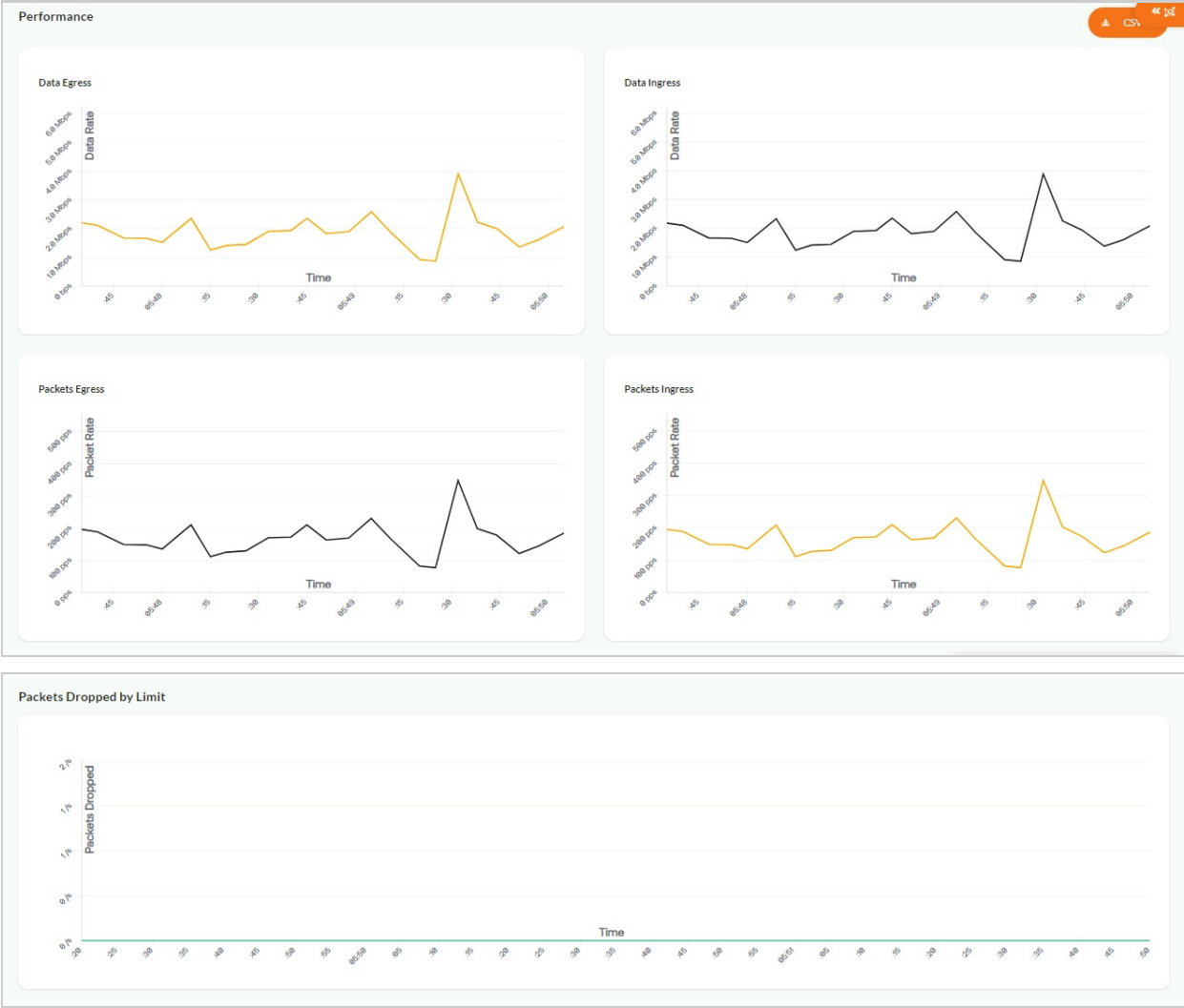


### cloudSwXtch Key Performance Metrics

Once the page loads, users will be presented a high-level view of their selected cloudSwXtch's data flow. This page provides detailed information regarding the cloudSwXtch and illustrates 4 key performance metrics:

- Data Egress
- Data Ingress
- Packets Egress
- Packets Ingress

Data egress/ingress are displayed in bits per second (bps) while packets egress/ingress are displayed in packets per second (pps). In addition to the rate, the total number of bits and packets are displayed for the user. These metrics are further explored in the **Performance** section with four related graphs and an additional Packets Dropped graph.



cloudSwXtch Information Panel

## ip-172-52-137-127

GUID: i-03a389...26cbf76e 

IP Address: 172.52.137.127

Location: 639720666639/us-west-2

Version: dev.44af38

Active

Cores



x 4

xNICs



5 / 50

Bridges



0 / 1

BW Usage

1.9 Mbps / 50 Gbps 

Entitlements

MESH

PROTOCOL FANOUT

HIGH AVAILABILITY

PTP

BRIDGE

WXCKED EYE

MAJOR VERSION UPDATE

TACHYON LIVE

Important network information of the cloudSwXtch such as the **GUID**, **IP address**, **location (resource groups)**, **cloud provider**, **version**, & **replicator status** is shown in the top left card along with its name, which in this case is core-200. In addition, the **number of cores** and **number of associated xNICs** to the cloudSwXtch will also be displayed. **Bandwidth usage** is also listed. In the event that a cloudSwXtch exceeds its allotted bandwidth, a warning symbol will appear.

## xNICs Panel

xNICs (4)				
Search by Name...				
Name	Version	Ingress 172 Gb [17 Mp]	Egress 47 Gb [4.2 Mp]	Drops 0
▼ 172.41.128.113		5.1 Mbps [451 pps]	0 bps [0 pps]	0 /s
Multicast Groups				
IP: 224.2.2.2		Ingress: 0 bps [0 pps]	Egress: 0 bps [0 pps]	
IP: 239.255.255.250		Ingress: 0 bps [0 pps]	Egress: 0 bps [0 pps]	
▶ 172.41.129.42		1.6 Mbps [1.1 Kpps]	4.9 Mbps [440 pps]	0 /s
▼ 172.52.132.19		4.8 Mbps [430 pps]	0 bps [0 pps]	0 /s

At the bottom of the cloudSwXtch Stats page, users will be able to see the **xNICs** panel. This panel lists the agents that are connected to the cloudSwXtch. Each listed xNIC is accompanied with its version, ingress/egress rates, and packet drops. When using the dropdown feature for an agent, a user can see the multicast groups associated with the xNIC and its ingress/egress rates.

# wXcked Eye xNICs Page

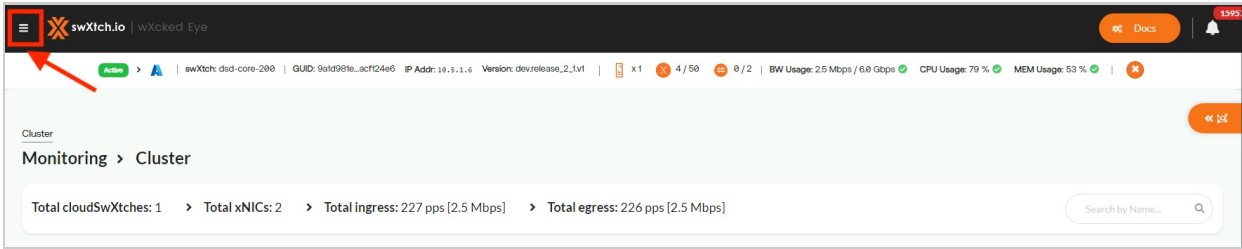
## WHAT TO EXPECT

In this article, users will learn how to view performance metrics from the xNICs perspective.

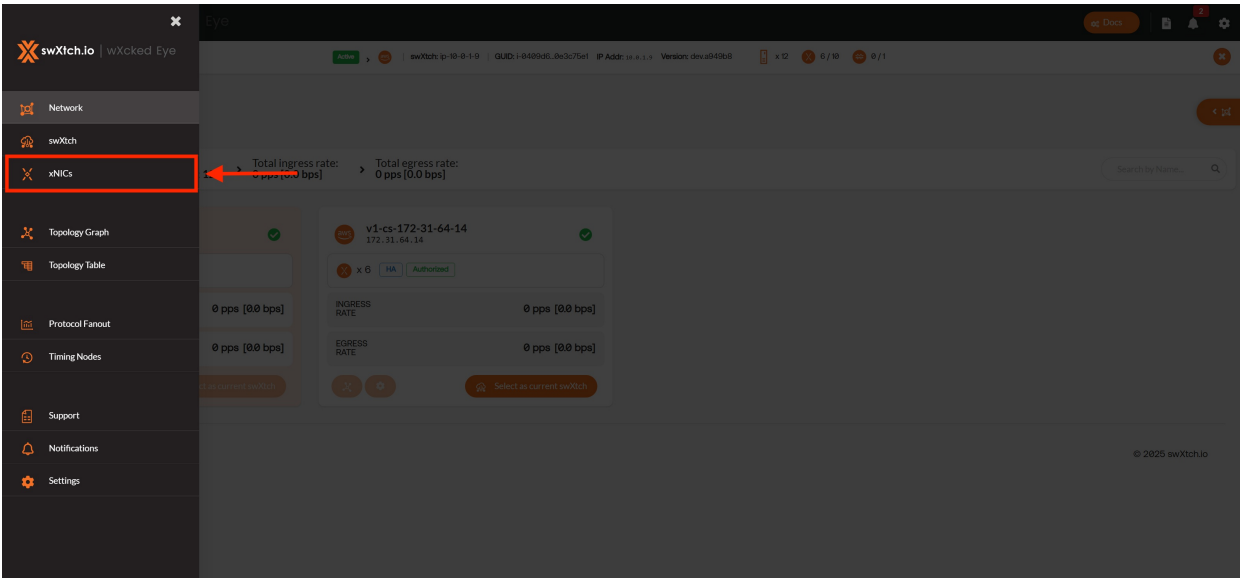
## Locating the xNIC View Page

The xNIC page provides users with a look of their cloudSwXtch environment from the xNICs' perspective, breaking down performance at an agent's level.

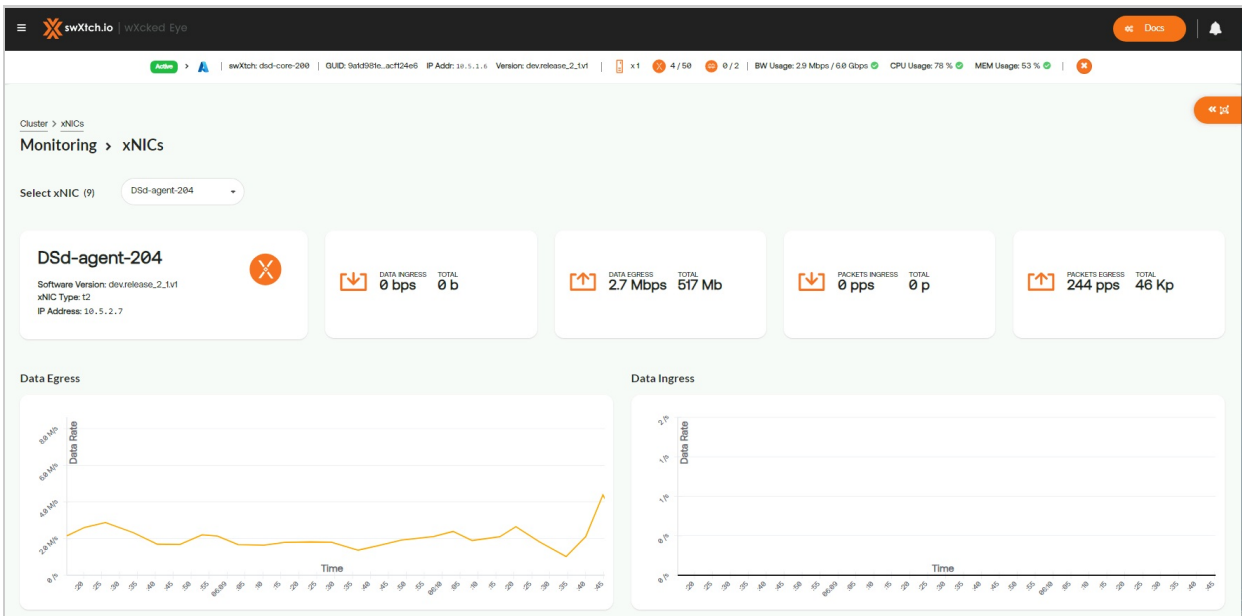
To navigate to the xNIC page, users will need to click on the menu option at the top left hand corner by the swXtch.io logo.



The navigation menu will open, revealing the other wXcked Eye pages. Select xNICs to view the xNIC page.



## Navigating the xNIC page



At first glance, the xNIC page looks very similar to the [cloudSwXtch view](#). However, instead of focusing on the cloudSwXtch, users are given key information and performance metrics for a single xNIC.

- **Data Ingress (bps)** - Data being consumed by the xNIC
- **Data Egress (bps)** - Data being sent from the xNIC
- **Packets Ingress (pps)** - Packets being consumed by the xNIC
- **Packets Egress (pps)** - Packets being sent from the xNIC

In the example above, one noticeable difference is the inclusion of the Select an xNIC dropdown menu next to "Select xNIC." Here, a user can select an agent they wish to monitor (DSd-agent-204).

After selecting an xNIC, the agent's information will display in the same area as the cloudSwXtch on the main page. The information includes the software version, xNIC version and the IP address.

Just like the xNIC panel in the wXcked Eye main page, users are able to see the Multicast Groups associated with the xNIC and their ingress/egress rates.

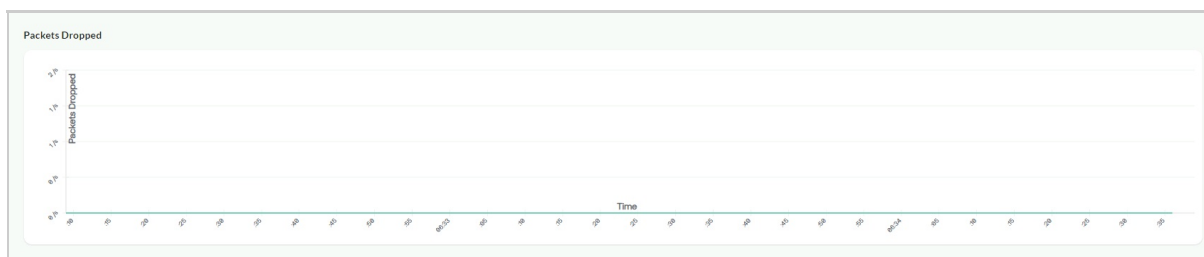
## Performance

The xNIC view provides users with another way to visualize data flow. Towards the bottom of the page, users will be able to see the 5 key performance metrics displayed as active histograms. The first four deal with data and packet egress/ingress over 15 second increments.



Performance: Data Egress/Ingress and Packets Egress/Ingress

The bottom graph displays the number of packets dropped over time. A successful stream would show no packets dropping like the example below. The X-Axis is organized into 5 second increments.



Packets Dropped by Limit (:05 second increments)


## Multicast Groups

The Multicast Groups panel lists the IP addresses of different data streams related to the cloudSwXtch with the ingress/egress rates displayed.

Multicast Groups (3)

Search by IP...

IP Address	Ingress 149 Kb (76 p)	Egress 40 Gb (3.4 Mp)
10.2.131.255	0 bps (0 pps)	0 bps (0 pps)
224.0.0.251	0 bps (0 pps)	0 bps (0 pps)
10.2.135.255	0 bps (0 pps)	0 bps (0 pps)
239.255.255.250	0 bps (0 pps)	0 bps (0 pps)
239.1.1.4	0 bps (0 pps)	66 Gbps (574 Kpps)

swXtch.io

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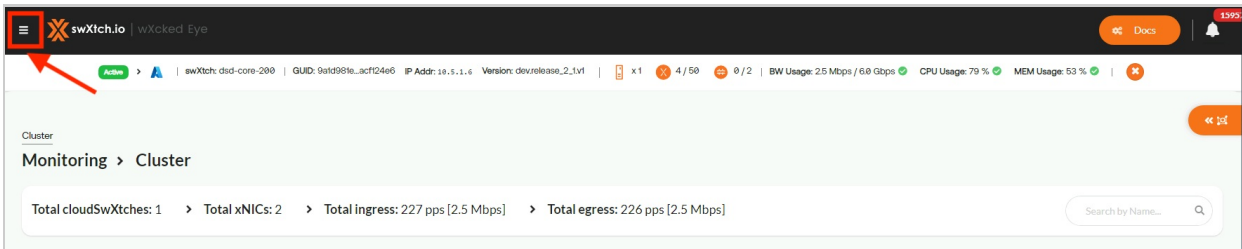
# wXcked Eye Topology Table

## WHAT TO EXPECT

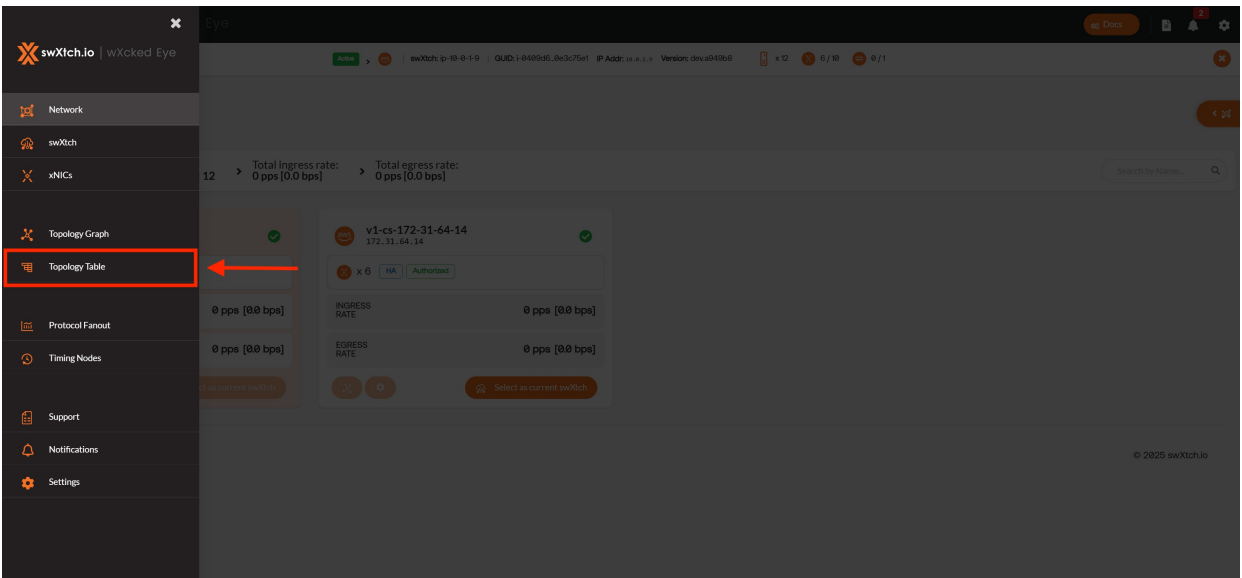
In this section, users will learn how to navigate the wXcked Eye Topology Table. Similar to the Topology Graph, the table organizes statistics by either Streams or Channels in a tree view.

## Locating the wXcked Eye Topology Table

To navigate to the wXcked Eye Topology Table page, users will need to click on the menu (≡) option at the top right hand corner by the swXtch.io logo.



From there, select **Topology Table**.



## Using the wXcked Eye Topology Table

The wXcked Eye Topology Table provides users with an alternative way of viewing how data flows in and out of their cloudSwXtch. Instead of a Topology view with nodes and steam links, the table organizes streams and channels in tree view where they can easily see the origin of the data flow and how it moves through different components. This gives users a more focused look into a single stream or channel.

### Streams

In the example below, the user is viewing a list of streams. Similar to the Topology Graph, a user can filter specific streams, consumers, and producers. The list will adapt to those selections. This can be helpful when dealing with a large amount of line items.



The screenshot shows the 'Topology Table' view in the swXtch.io interface. The 'View' tab is selected, showing a list of 12 streams. The streams are listed in a table with columns for Name, Producers, Consumers, and various metrics (Rx Pkts, Rx Bits, Tx Pkts, Tx Bits). The streams include JPEG XS UHD, Spanish audio, UHD\_gfx\_branding, HD\_gfx\_branding, UHD\_east\_ad\_insert, UHD\_west\_ad\_insert, HD\_east\_ad\_insert, HD\_west\_ad\_insert, UHD\_FR\_58to68, and HD\_FR\_58to68.

Stream Name	Producers	Consumers	Rx Pkts	Rx Bits	Tx Pkts	Tx Bits
JPEG XS UHD	1	1	0	0	0	0
JPEG XS UHD:1009	1	1	0	0	0	0
Spanish audio	1	1	0	0	0	0
Spanish audio:10010	1	1	0	0	0	0
UHD_gfx_branding:1001	1	2	1	0	0	3
HD_gfx_branding:1006	1	2	1	0	0	3
UHD_east_ad_insert:1002	1	1	0	0	0	2
UHD_west_ad_insert:1003	1	1	0	0	0	2
HD_east_ad_insert:1007	1	1	0	0	0	2
HD_west_ad_insert:1008	1	1	0	0	0	2
UHD_FR_58to68:1004	1	2	1	0	0	3
HD_FR_58to68:1005	1	2	1	0	0	3

Each item in the stream list can be expanded to reveal a tree level view of the data flowing through the various components. The JPEG XS UHD stream is expanded to show how data flows through the various cloudSwXtch components. Starting from the producer, the stream moves through the cloudSwXtch Bridge up into the cloudSwXtch, where it feeds the stream into a multiviewer and Tachyon Live endpoints.

Selecting the Topology button next to the component name will reveal a visualization similar to the Topology graph up until that point.

The screenshot shows the 'Topology Table' view with the 'Streams' tab selected. The 'JPEG XS UHD' stream is expanded, showing a tree view of the data flow. The tree structure is as follows:

- Producer
  - cloudSwitch
    - MultiViewer
      - Tl\_2180p58\_1000p60
        - Tl\_2180p58\_1000p60

The diagram below illustrates the data flow from the Producer to the cloudSwitch, then to the MultiViewer, and finally to the Tl\_2180p58\_1000p60 endpoint.

```

graph LR
    Producer((Producer)) -- 50 Kbps --> bridge1((bridge-1))
    bridge1 -- 50 Kbps --> cloudSwXtch((cloudSwXtch))
    cloudSwXtch -- 50 Kbps --> Tl_2180p58_1000p60((Tl_2180p58_1000p60))
  
```

## Channels

The Channels view organizes channels into a similar list for the Topology table. However, one big difference is that the number of streams associated with a single channel is also displayed. The table will list those streams in a tree view, displaying how they progress through the various cloudSwXtch components. In the example below, the UHD\_west channel has been expanded, revealing the JPEG XS UHD stream with a topology graph view of data flow.



# wXcked Eye Protocol Fanout Stats

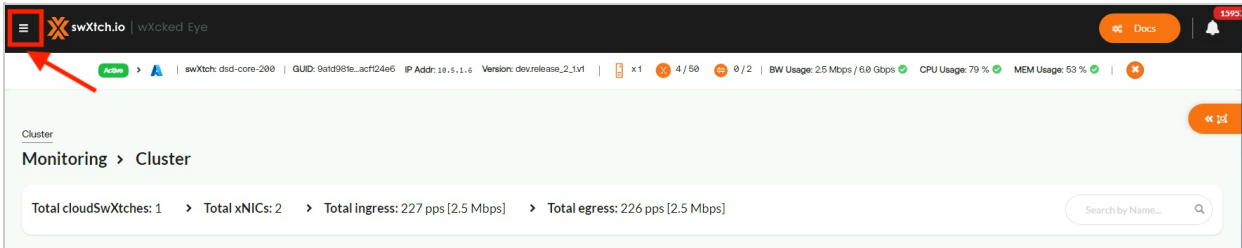
## WHAT TO EXPECT

The **Protocol Fanout Stats** page allows users to see metrics for non-Multicast and non-Broadcast data flows. This includes protocols, such as **SRT Caller**, **SRT Listener**, **RIST Caller** and **RIST Listener**.

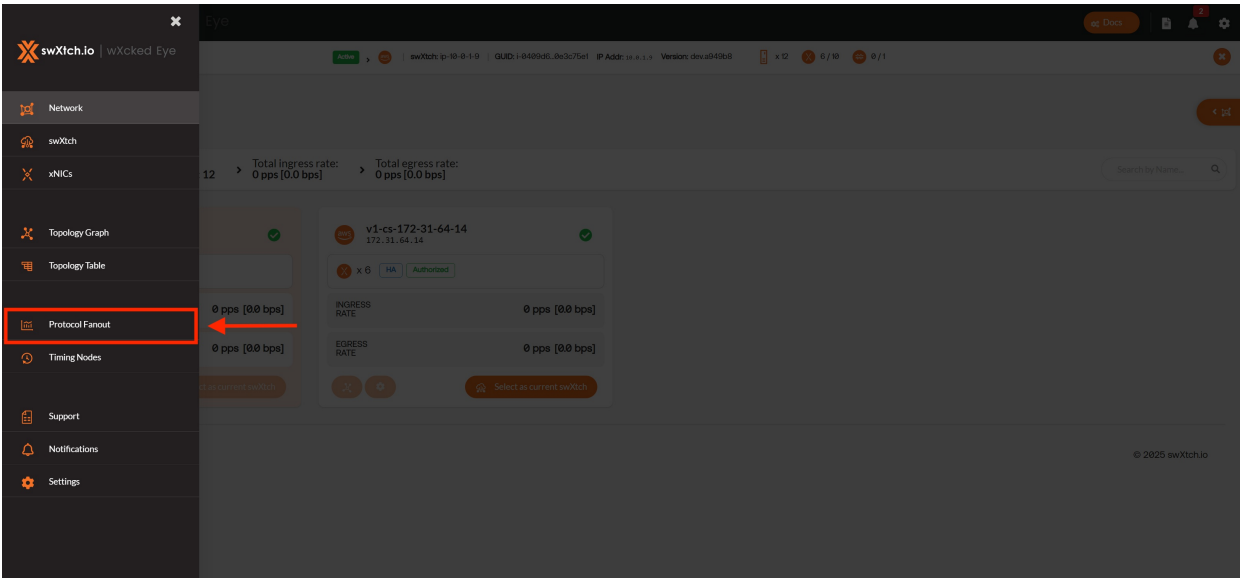
In this section, users will learn how to navigate between different protocols and their adaptors in order to better visualize their packets' movements. **Please note:** This page only shows the stats for protocol fanout configurations. To learn how to configure your cloudSwXtch for Protocol Fanout and Conversion in the wXcked Eye UI, please read [this article](#).

## Locating the Protocol Fanout Stats Page

To navigate to the **Protocol Fanout Stats** page, users will need to click on the menu option at the top right corner by the swXtch.io logo.



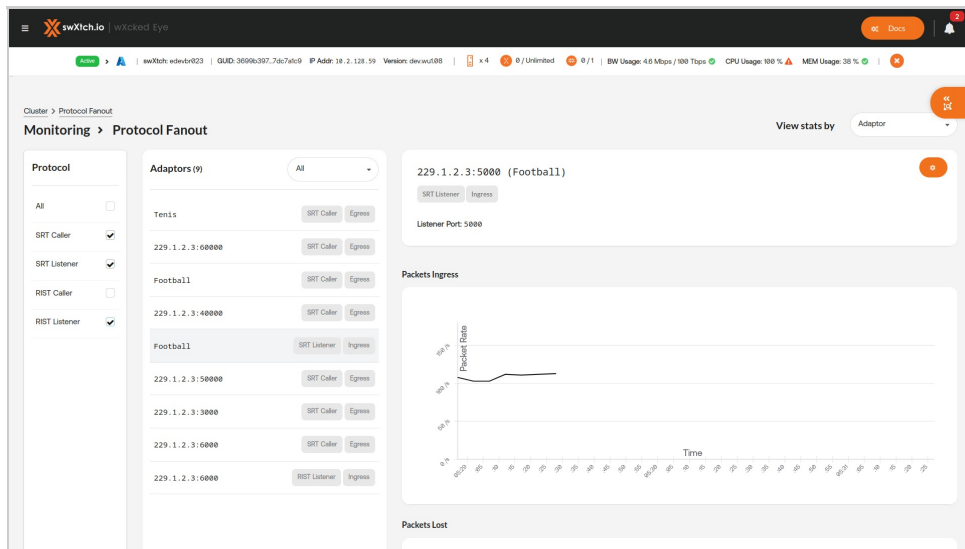
From there, select **Protocol Fanout**.



## Navigating the Protocol Fanout Stats page

Statistics displayed through the wXcked Eye UI focus primarily on multicast and broadcast data flow. The **Protocol Fanout Stats** page provides users with a dedicated area to see data flow for alternative protocols like SRT and RIST.

## Adaptor View



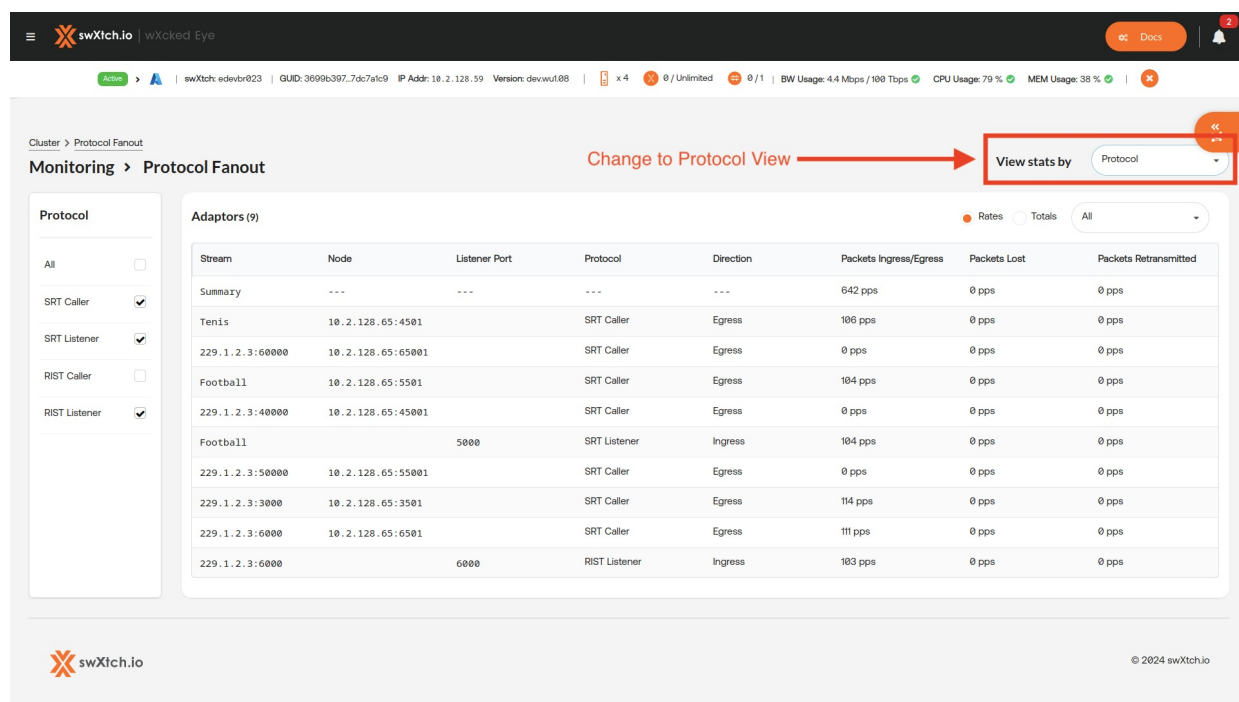
### Adaptor View

At start-up, the page will be in **Adaptors** view and display 3 graphs:

1. Packets Egress
2. Packets Lost
3. Packets Retransmitted

A user can select the **Protocols** they want listed in the left hand side to filter Adaptors or return to "All" to see them all listed. At the top of the Adaptors panel, users can filter the list further by direction -- either Ingress or Egress.

### Protocol View



A user can select to **View Stats by Protocol** by clicking the dropdown menu in the upper right hand corner. This will provide users with a table view, listing adaptors by protocol. This allows for closer comparison between adaptors. The table can be configured to display in both **Rates (pps)** or **Total Packets**.

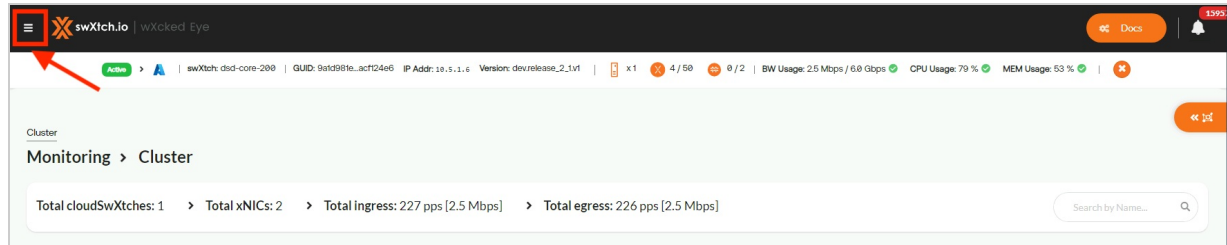
Similar to the Adaptors view, users can group adaptors by protocol. The Protocol panel on the left hand side enables users to filter out certain protocols so that they list in the center table. In addition, users can also group protocols by direction -- either Ingress or Egress.

# wXcked Eye Timing Nodes

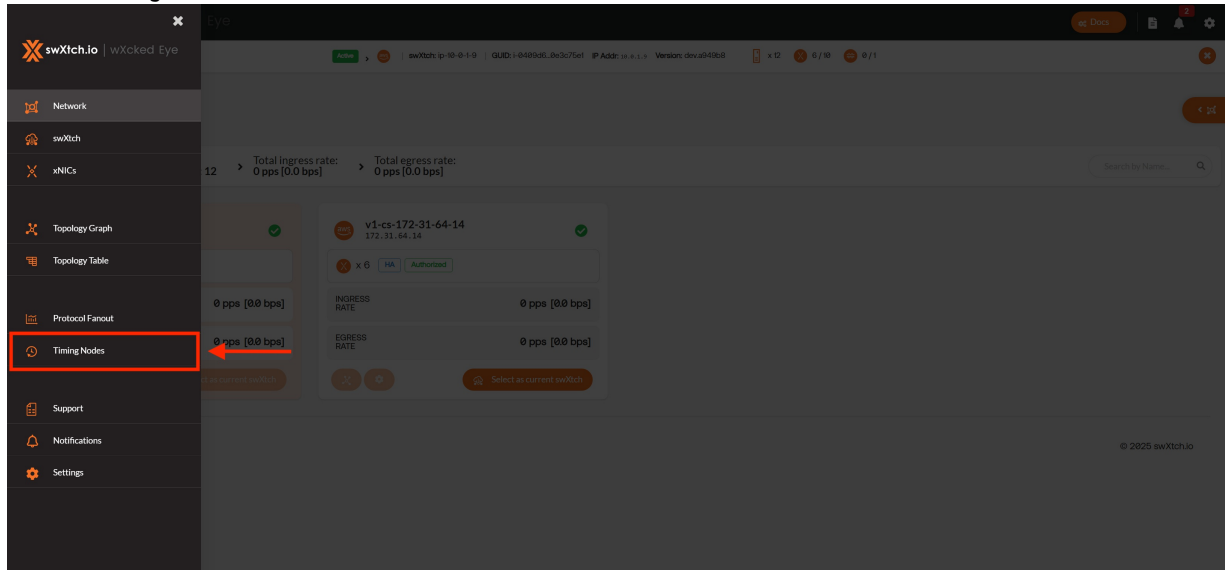
## Finding the Timing Nodes page

To find the Timing Nodes page in the wXcked Eye UI:

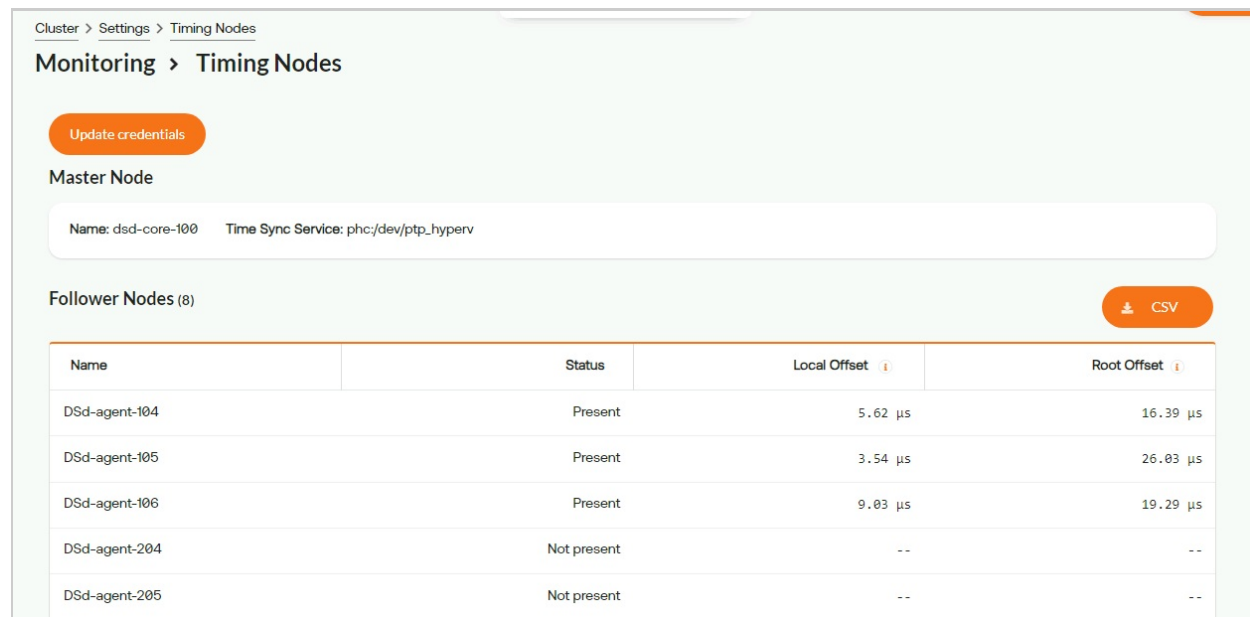
- 1. Click the menu icon (≡) next to the swXtch.io logo.



- 2. Select Timing Nodes.



## Understanding the Timing Nodes page



The Timing Nodes page displays information regarding clock sync configuration for the cloudSwXtch. This page in wXcked Eye will only populate with information if the user has the PTP feature enabled.

In the example above, the cloudSwXtch (DSd-core-100) is acting as the Master Node.

- **Master Node**- The Master Node is what the PTP configuration sets as the most reliable time source. This will send the true time it receives from the source clock to the Follower Nodes.
  - **Name** - The name of the cloudSwXtch
  - **Time Sync Service** - The source clock
- **Follower Nodes**- The Follower Nodes lists the agents/VMs that subscribe to the Master Node for accurate timing.
  - **Name** - The name of the endpoints
  - **Status** - The status of the endpoints, noting if the node is active in the PTP configuration
  - **Local Offset** - The local offset denotes the offset in time from the cloudSwXtch to the xNIC.
  - **Root Offset** - The root offset denotes the offset in time from the GrandMaster clock to the cloudSwXtch and its follower nodes (xNIC). Note how the root offset is larger than the local offset. This is normal behavior since the distance between the follower node and the Grandmaster clock is greater than the offset between a cloudSwXtch and xNIC.

### Timing Nodes Stabilization

After upgrading or rebooting your cloudSwXtch system, you may notice that the local and root offset values are much larger than they actually are. It can take up to 30 minutes for the values to stabilize and return back to normal levels.

### Exporting your Timing Nodes

You can export your timing nodes by hitting the **CSV button** next to **Follower Nodes**.

#### Formatting CSV Timing Nodes file in Excel

To prevent incorrect formatting in your CSV Timing Nodes file in Excel, complete the following steps:

1. **Make sure** your Timing Nodes CSV file is already downloaded from wXcked Eye.
2. **Select** "Data" from the top ribbon of a new Excel spreadsheet.
3. **Click** "Get Data (Power Query)."
4. **Select** "Text/CSV" from the "Choose data source" options.
5. **Browse** for your file and click "Get Data."
6. **Click** "Next."
7. **Select** "Unicode (UTF-8)" from the File Origin dropdown menu. This ensure your data displays as it was intended.
8. **Click** "Load."

# wXcked Eye Support Page

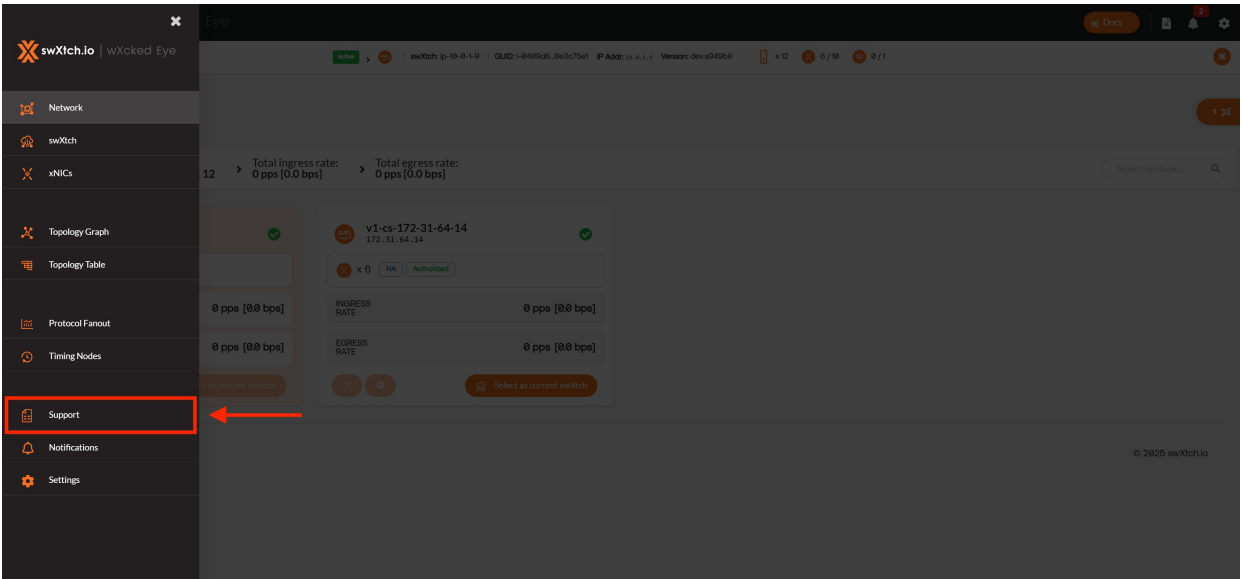
## WHAT TO EXPECT

The wXcked Eye Support Page allows users to export a report detailing the statistical data stored within the cloudSwXtch over a set period of time. This report includes JSON files containing cloudSwXtch information, Max Highmarks, List Highmarks, Repl and Control logs, and xNIC Logs -- all in a compressed file. This report should be provided to swXtch.io Support when troubleshooting an issue.

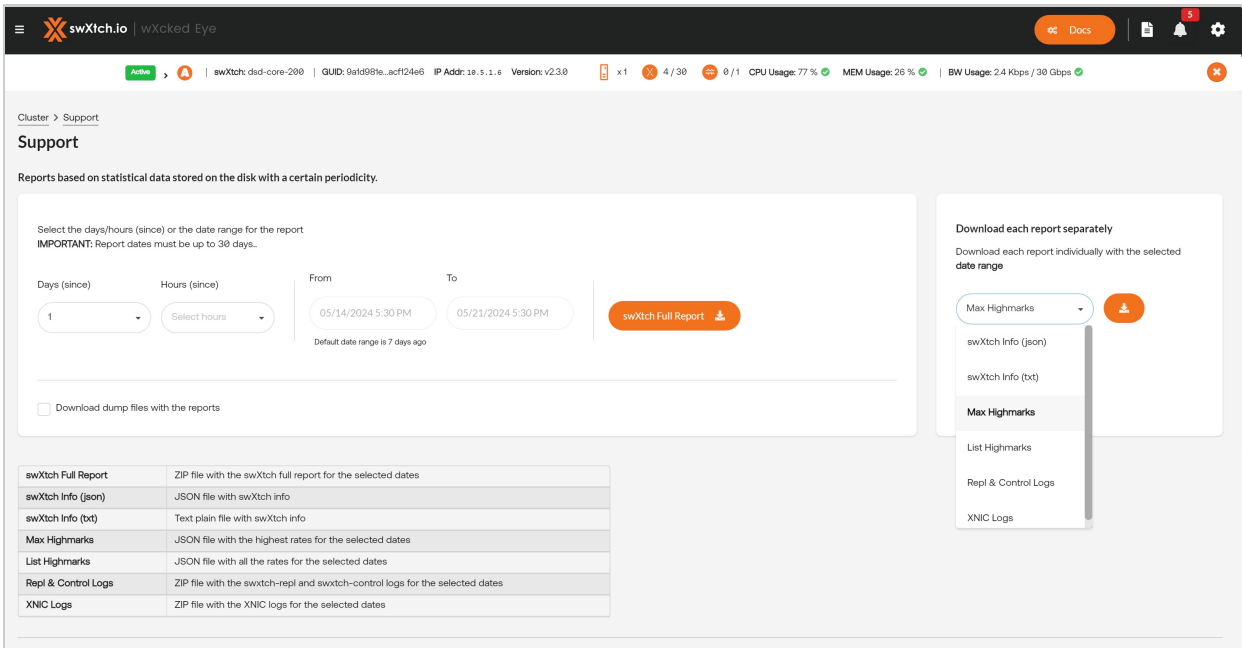
In this section, we will walkthrough exporting both a full report and also individual files. Alternatively, you can use the swx support command in the cloudSwXtch VM to export a report. For more information, see [How to View cloudSwXtch Logs for Troubleshooting](#).

## Navigating the wXcked Eye Support Page

The wXcked Eye **Support** page can be located in the wXcked Eye navigation menu.



The page has two functionalities: **exporting a full report** or **selecting individual JSON files to download separately**. When troubleshooting, it is **recommended** for users to send the complete report so that swXtch.io Support can fully understand the situation.



To do this, simply set a **start** and **end time** for the report and select the download button, **SwXtch full report**. User should set the duration to **at least 24 hours of time**, spanning from a little before the issue began to up until now. The output file will be named **swxtch-report-date\_from.tar.gz**.

In the event that a user only wants a specific section of the report, they can use the dropdown menu after **Download each report separately** and download their desired JSON file. The wXcked Eye UI will then export using the time period set.

#### Contacting swXtch.io Support

For all troubleshooting requests, email the compressed file to [support@swxtch.io](mailto:support@swxtch.io) for further instructions.



## Configure cloudSwXtch with wXcked Eye

### WHAT TO EXPECT

wXcked Eye allows users to configure their cloudSwXtch directly from a graphical user interface (GUI).

To learn how to use wXcked Eye to monitor your cloudSwXtch, please see the ["Monitor cloudSwXtch with wXcked Eye"](#) article.

In this article, users will learn how to navigate the "Settings" option in the wXcked Eye UI and to configure their cloudSwXtch for mesh, high availability and protocol fanout. To learn how to access the wXcked Eye UI, please review the following article.

### Accessing wXcked Eye

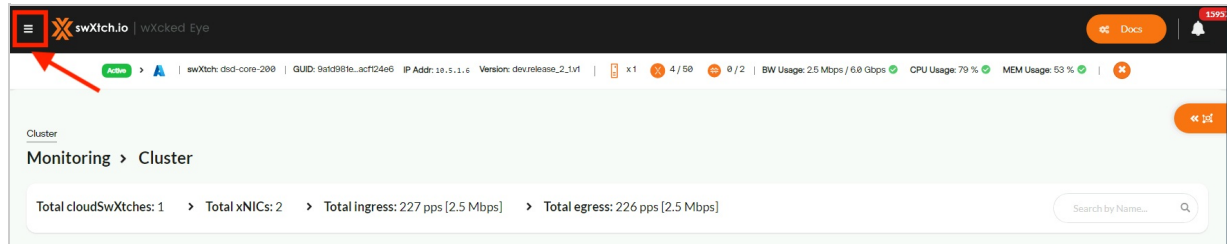
To access the wXcked Eye UI, users will need to enter the following URL into a web browser of a VM in their cloudswxtch environment. They should use the IP address of their cloudSwXtch to prefix the URL.

Browser	Copy
<swxtch-ip-address>/wxckedeye/	

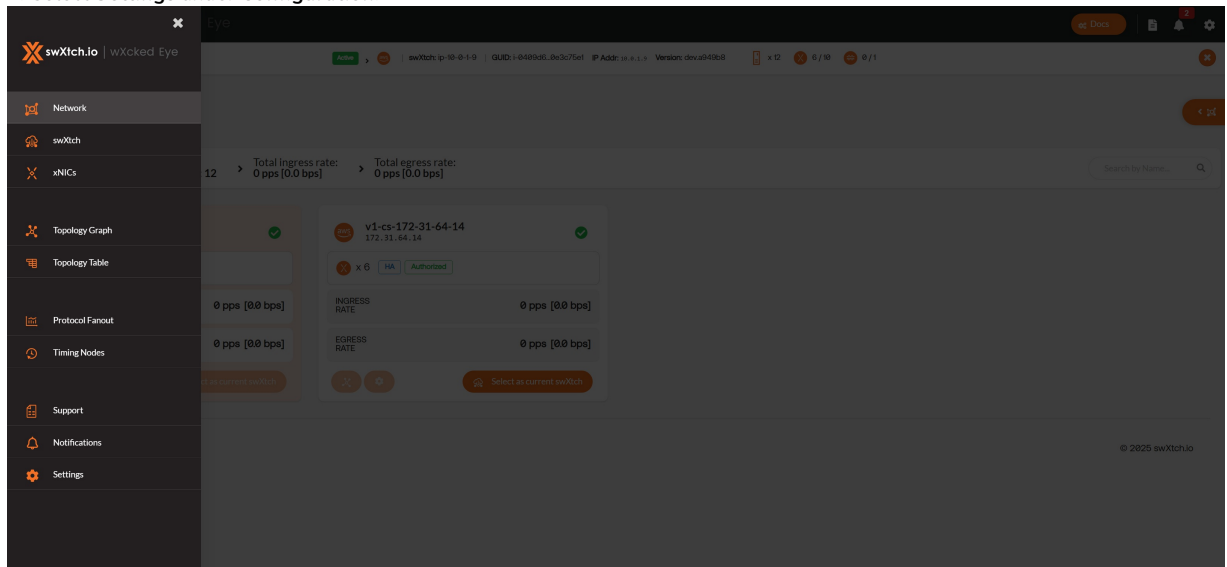
### Finding the Settings page

To find the Settings page in the wXcked Eye UI:

1. Click the menu icon ( $\equiv$ ) next to the swXtch.io logo.



2. Select **Settings** under **Configuration**.



3. You should now be on the **Settings** page.

### Navigating Settings

The Settings page is organized into five tabs with varying functionalities:

- [General](#)
- [High Availability](#)
- [Protocol Conversion and Fanout](#)
- [Aliases](#)

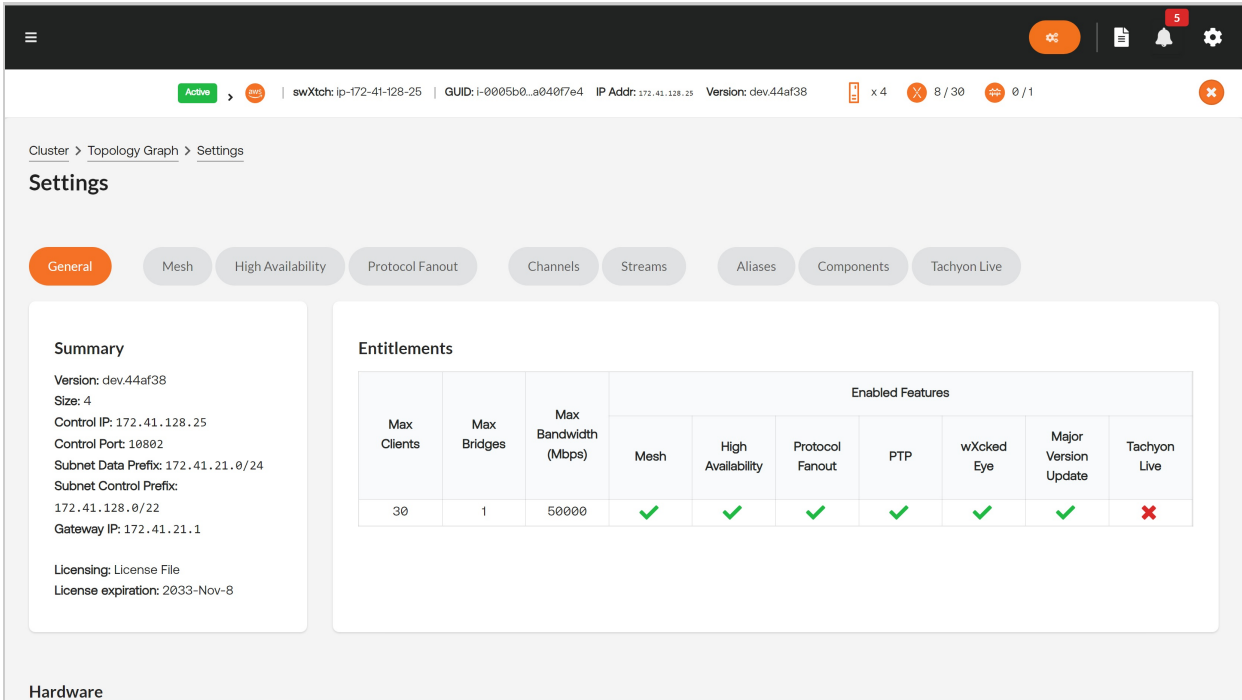
In this section, we will discuss each tab and how it offers the user additional control over their cloudSwXtch network.

# General

## How to Navigate to the General tab

To learn how to navigate to Settings from the wXcked Eye main page, please review the [Configure cloudSwXtch with wXcked Eye](#) article.

## Navigating the General Tab



The General tab is organized into four sections:

- [cloudSwXtch Summary](#)
- [Entitlements](#)
- [Hardware](#)
- [Actions](#)

### cloudSwXtch Summary

The Summary panel details basic information regarding the cloudSwXtch, specifically on the data and control subnets configured during installation. The panel also tells the user the Licensing type and the expiration date.

### Entitlements

The **General** tab is designed to give users a detailed look into the entitlements associated with their network. In the example, the user has a license that enables mesh, high availability, protocol fanout, PTP, and wXcked Eye with a max of 30 clients, 1 cloudSwXtch bridges, and 50000 Gbps max bandwidth. For Tachyon Live, the user does not have the entitlement unlocked.

Entitlements									
Max Clients	Max Bridges	Max Bandwidth (Mbps)	Enabled Features						
			Mesh	High Availability	Protocol Fanout	PTP	wXcked Eye	Major Version Update	Tachyon Live
30	1	50000	✓	✓	✓	✓	✓	✓	✗

## Hardware

The Hardware section of the General tab gives an extensive look at the Data and Control planes with each split into Meta and Operating System (OS) data.

Hardware			
Control		Data	
Meta	Os	Meta	Os
IP Address	10.2.128.10	IP Address	10.2.192.23
IP Broadcast	10.2.131.255	IP Broadcast	10.2.195.255
IP Subnet	10.2.128.0	IP Subnet	10.2.192.0
MAC Address	60:45:bd:a8:a6:ab	MAC Address	60:45:bd:a8:af:c5
Subnet Mask	60:45:bd:a8:a6:ab	Subnet Mask	60:45:bd:a8:af:c5
	Driver	Driver	hv_netvsc
	Master of	Master of	
	MTU	MTU	1500
	Name	Name	eth0
	PCI Address	PCI Address	eth1

## Actions

The General tab also allows users to adjust the Data Refresh period for all Monitoring pages in wXcked Eye. This gives users control on how often the data is updating with the default value set to the minimum of 5 seconds.

Actions

Update swXtch

Data refresh period

This slider allows you to change how often the data is updated across all monitoring pages.

5 secs

## High Availability with wXcked Eye

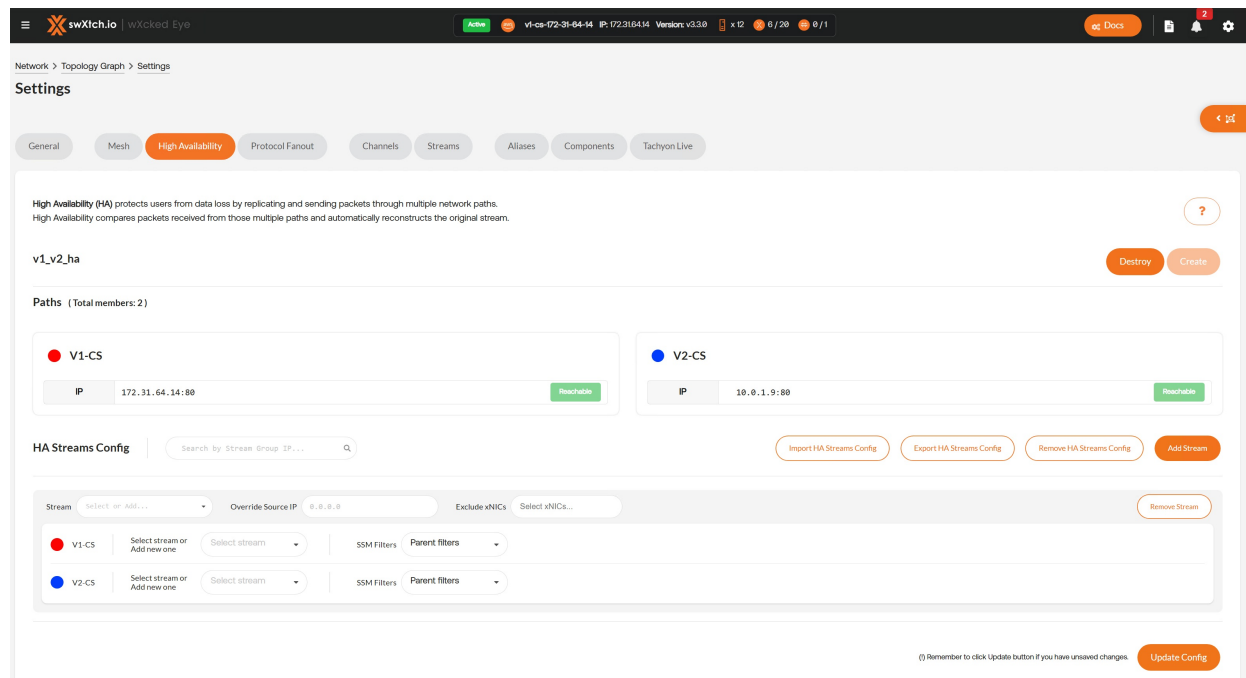
### Navigating to the High Availability tab

The High Availability tab is located in the Settings page on wXcked Eye. To learn how to navigate there, please review the [Configure cloudSwXtch with wXcked Eye](#) article.

The High Availability tab is organized into 3 functions:

- [Create HA](#)
- [Destroy HA](#)
- [Configure HA Streams for Multiple Multicast and Source Specific Multicast](#)

In this article, we will discuss each tab and how it offers a user additional control over their cloudSwXtch network.

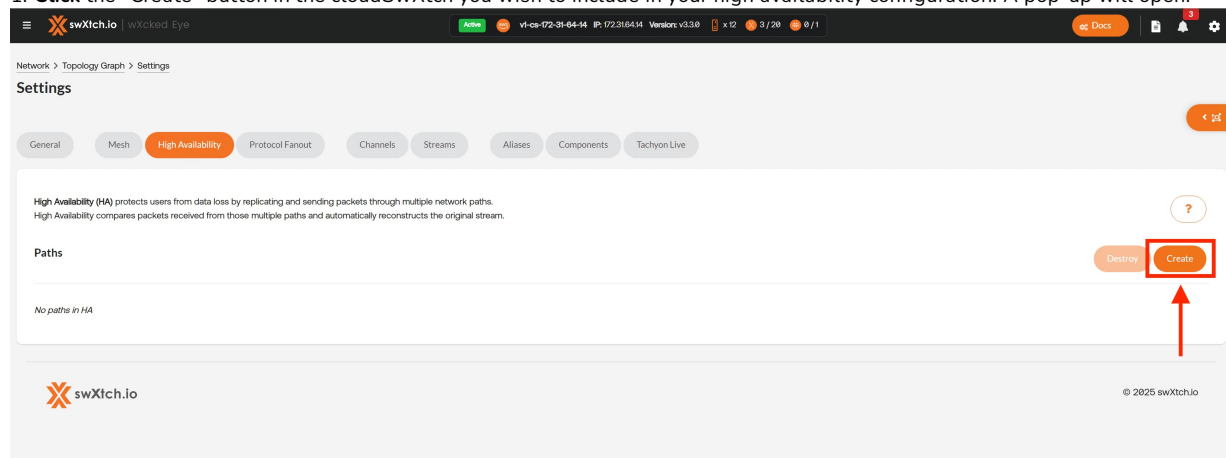


### High Availability Command-Line Alternatives

In addition to configuring your high availability through the wXcked Eye UI, users can also use swXtch specific commands in their terminal. To learn more, please visit the [High Availability](#) article under Configuring cloudSwXtch.

## Create HA

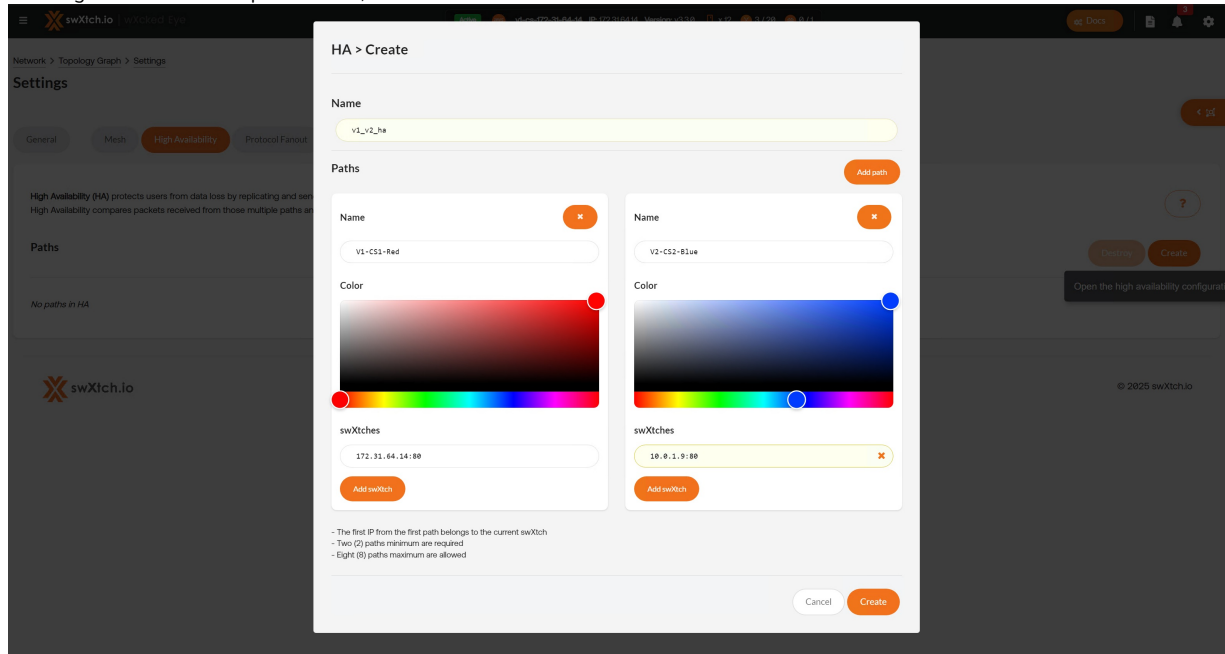
1. Click the "Create" button in the cloudSwXtch you wish to include in your high availability configuration. A pop-up will open.



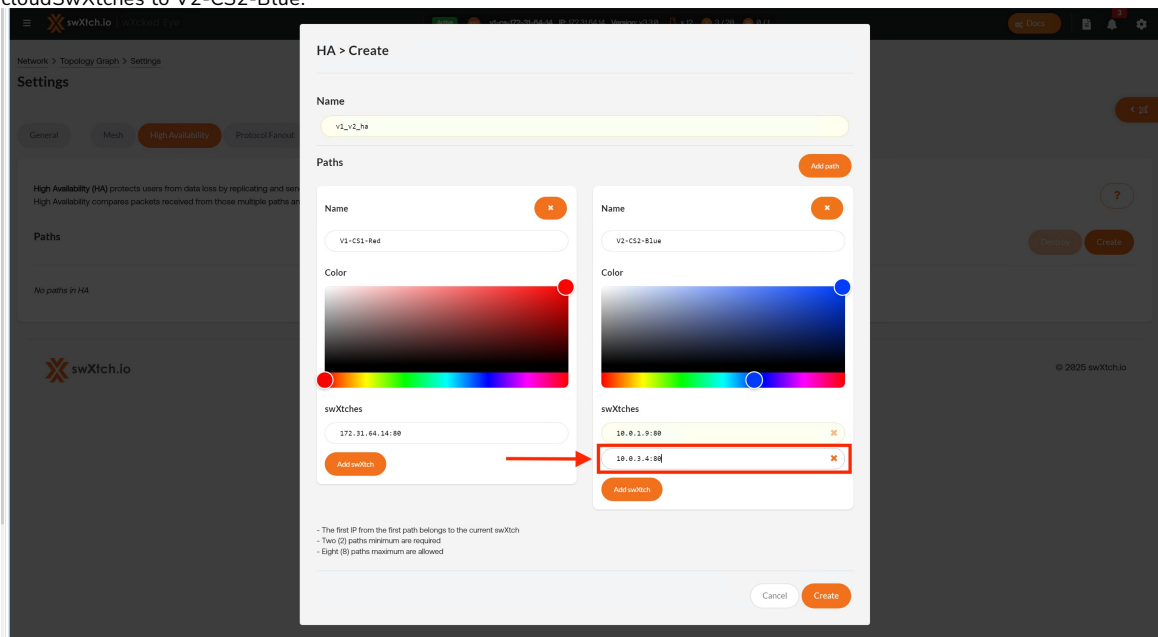
2. **Name** your HA configuration. In this example, the HA is named **v1\_v2\_ha**.

3. **Name** the first path. The IP address of the cloudSwXtch you are currently on will populate. Enter **IP addresses** for any additional relevant cloudSwXtches.

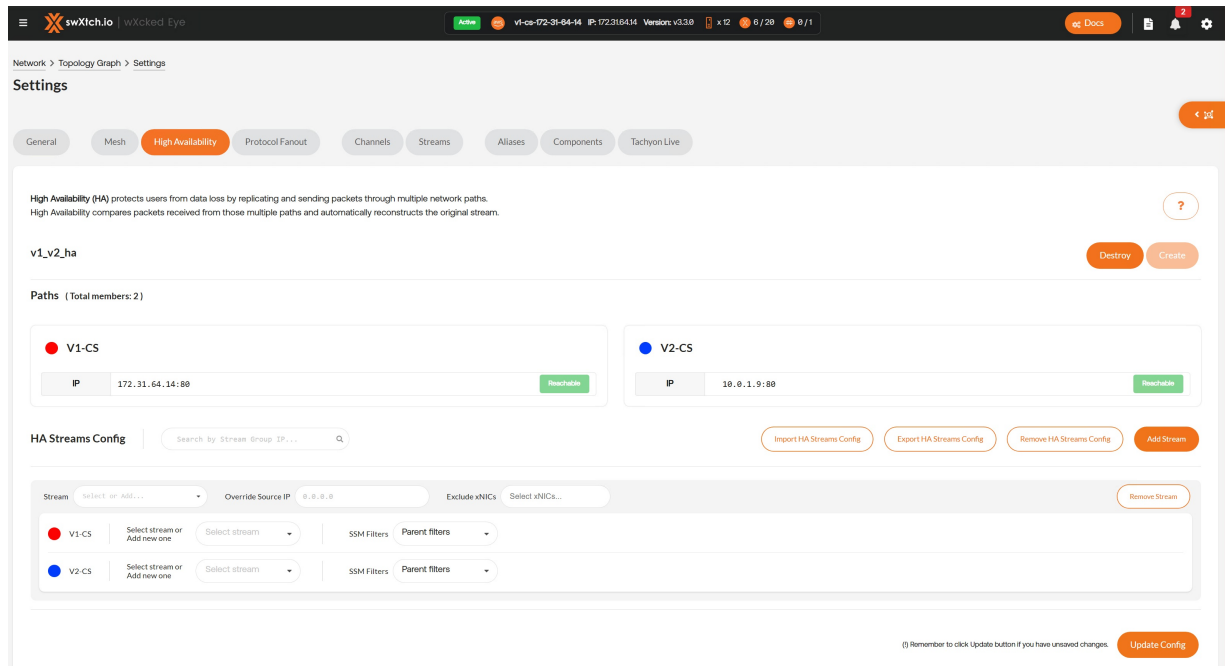
4. **Name** the second path and enter the **IP addresses** for the relevant cloudSwXtches. **Note:** You must have *more than 1 path* in order to have a working HA flow.
5. Assign a color for both paths. Here, the user selected Red for V1-CS1-Red and Blue for V2-CS2-Blue.



- a. **OPTIONAL:** Add an additional cloudSwXtch to a Path by clicking "Add SwXtch." In this example, the user assigned 2 cloudSwXtches to V2-CS2-Blue.



6. Click "Create." A new High Availability flow has been created.



With High Availability now configured, users can switch between different cloudSwXtches in their HA, refresh the HA page and see the members listed with their associated paths. For example, if a user were to look at the wXcked Eye for cloudSwXtch 10.0.1.9 instead of the above 172.31.64.14, they will see the same My High Availability member list.

From any of the connected cloudSwXtches, users can destroy their HA configuration.

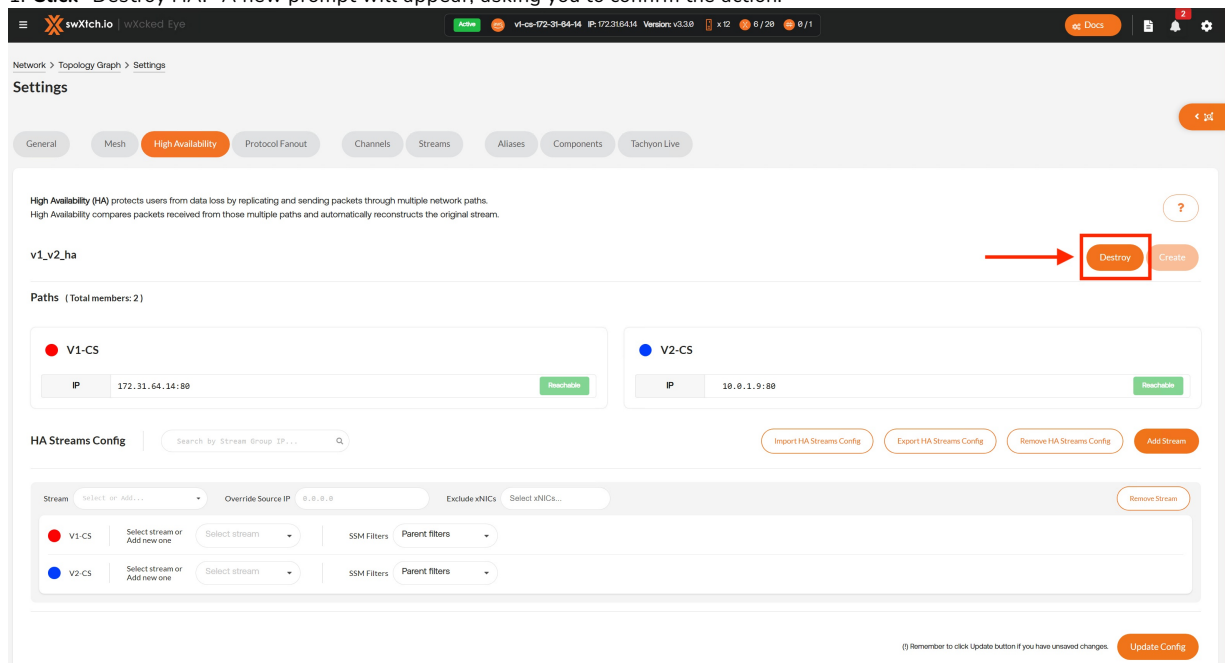
## Renaming High Availability and Path Names

To rename the high availability configuration or paths, users will need to destroy the HA and reconfigure.

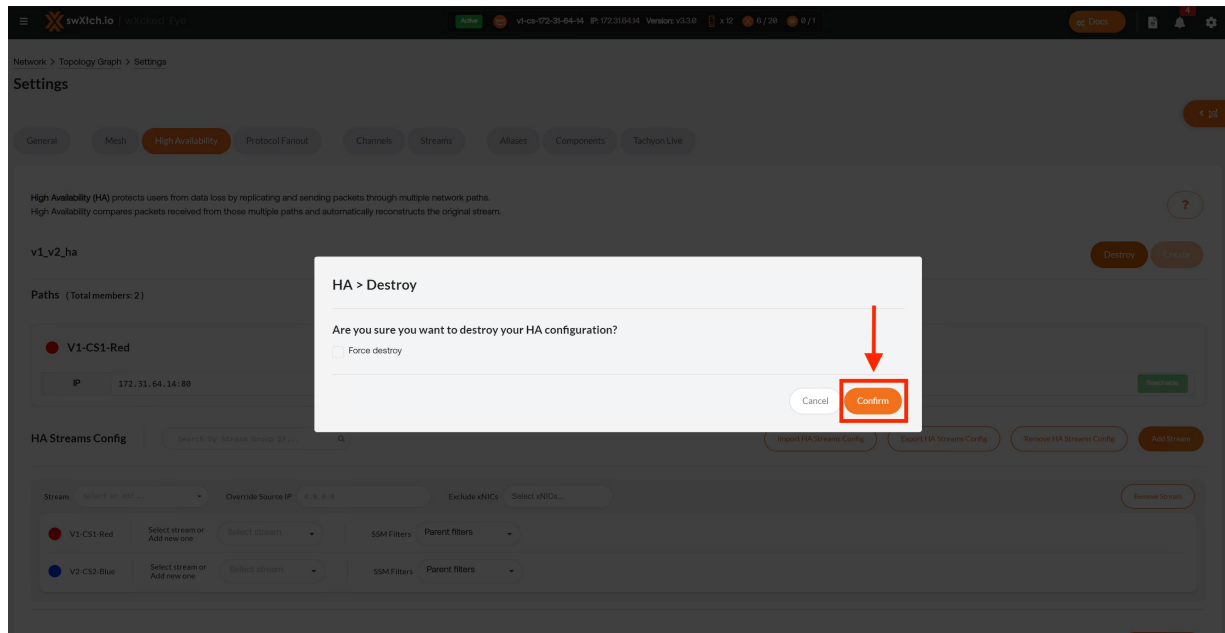
## Destroy HA

To destroy an HA configuration, a user will need to go to the HA page of any associated cloudSwXtches.

1. Click "Destroy HA." A new prompt will appear, asking you to confirm the action.



2. Select "Confirm."



Your HA is now destroyed. All associated cloudSwXtches will show a blank list for HA and your Cluster page will be empty.

### Removing a cloudSwXtch from an HA configuration

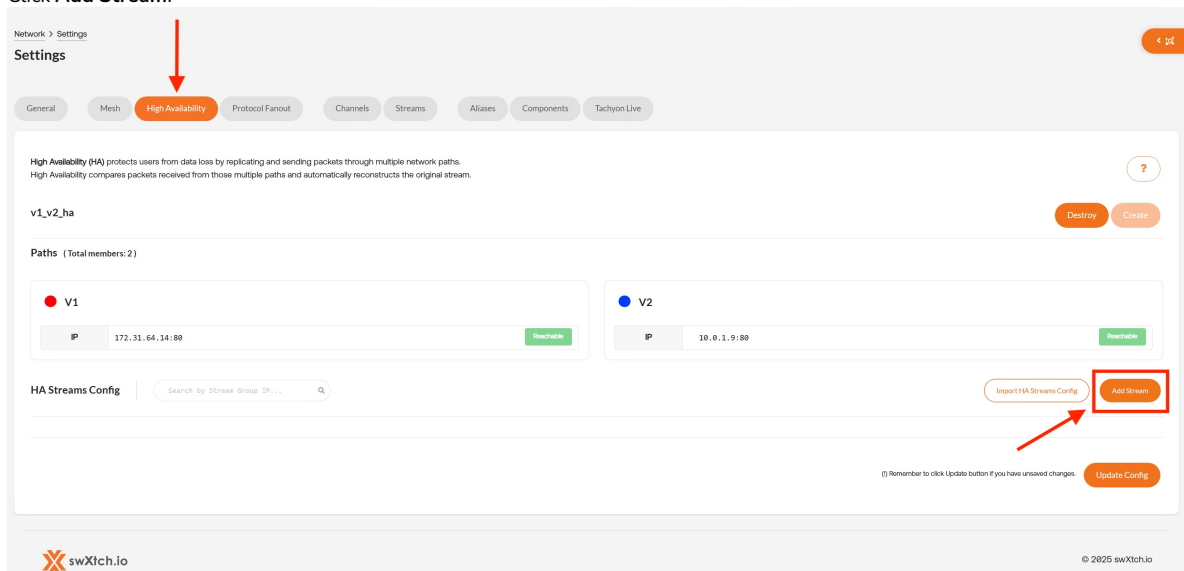
To remove a cloudSwXtch from a user's HA configuration, they will need to delete and recreate their HA cluster without that cloudSwXtch.

## Configuring HA for Multiple Multicast (MMc) and Source Specific Multicast (SSM)

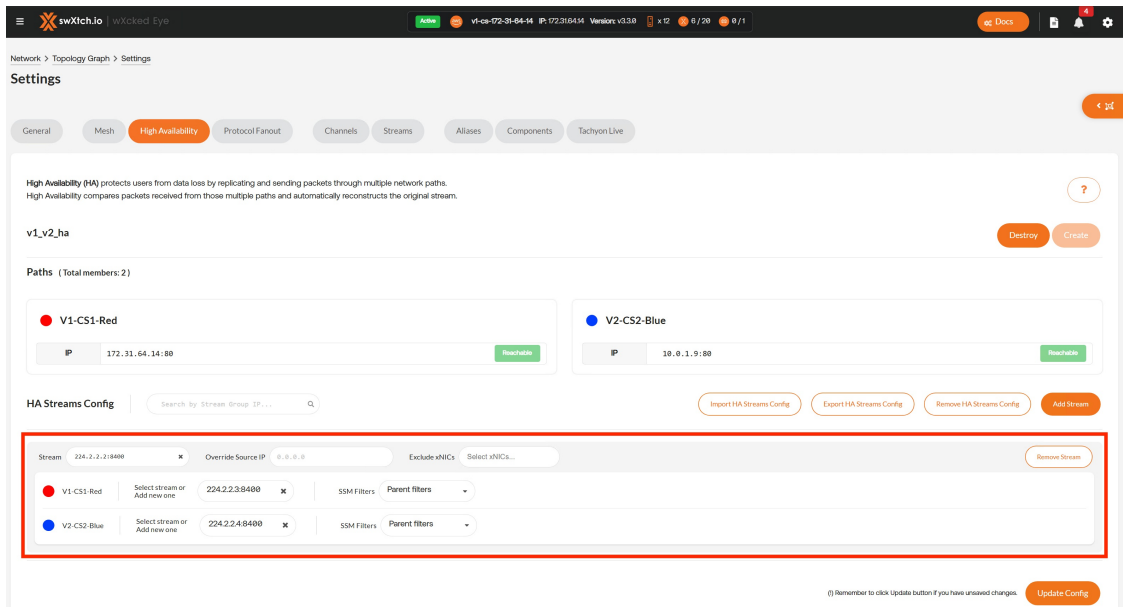
wXcked Eye enables users to group multiple multicast IP addresses with the same traffic under a singular multicast group IP. The xNIC, or application at the end point, is then tasked with listening for the multicast group IP and deduplicating the data from the two paths. This is what we call a **multiple multicast**, or **MMc**, high availability configuration.

In addition, users can also configure their path streams for **source specific multicast (SSM)**. This is a method for delivering multicast packets in which the only packets that are delivered to the receiver are those originating from a specific source IP address.

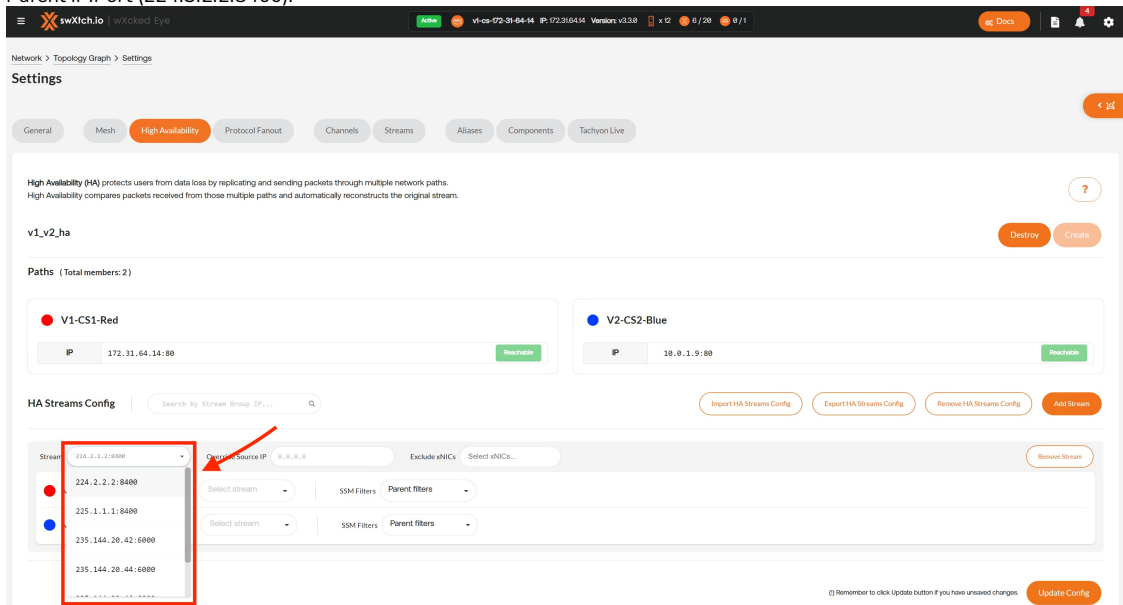
1. Go to the **High Availability** tab on the **wXcked Eye Settings** page.
2. Click **Add Stream**.



3. Enter the **Stream (Parent IP address and Port)**, followed by the **Path Streams**.
  - a. In the example below, the user assigns the parent and port as **224.2.2.2:8400** with the two path streams as **224.2.2.3:8400** for **V1-CS1-Red** and **224.2.2.4:8400** for **V2-CS2-Blue**.



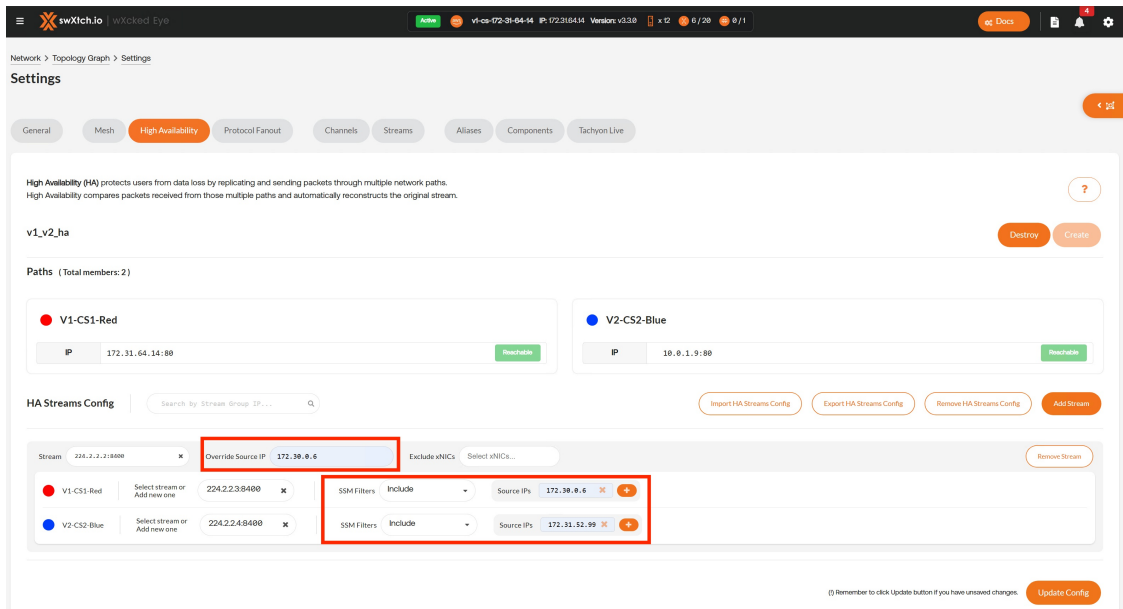
- b. Alternatively, users can also select an existing parent from the dropdown menu. Considered a Group in the wXcked Eye Settings page, choosing a parent will automatically populate the path streams. For this to work, the group name must be the Parent IP:Port (224.3.2.2:8400).



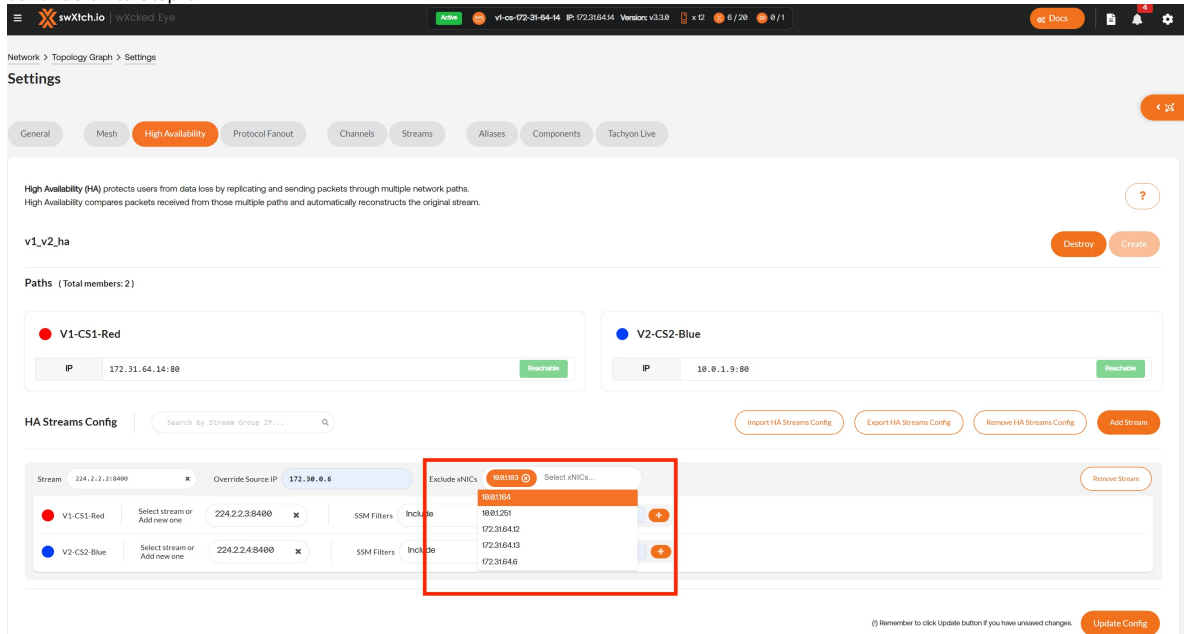
Adding a new Parent IP address and its path streams will create a new Group.

4. If you require **Source Specific Multicast**, you may follow the next steps. If not, you can leave them blank and continue to Step 5.
  - a. For each stream path, select Include in the SSM Filters dropdown menu.
  - b. Enter the Override Source IP address into one of the Source IP fields.
  - c. Enter the second Source IP for the second path.





5. If you would like to exclude xNICs from your HA Streams configuration, enter the IP addresses in the Exclude xNICs field. If not, continue on to Step 6.



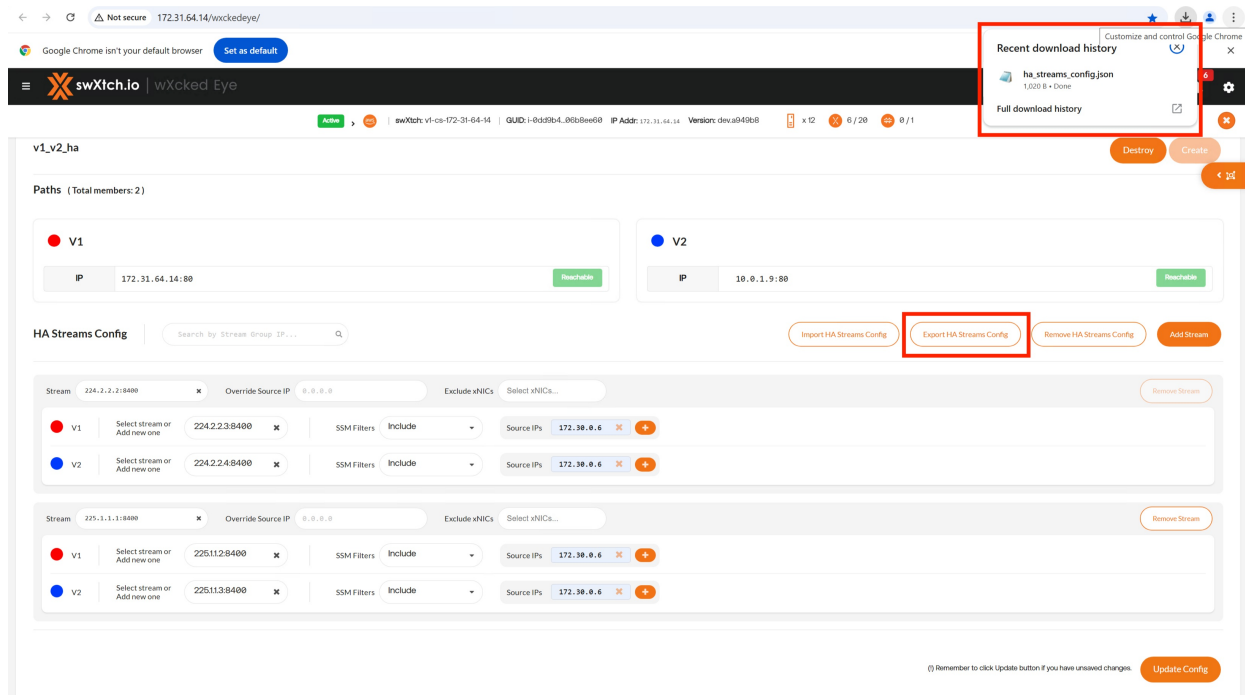
6. Select **Update Config** to apply your changes.

## Exporting HA Streams Config

Users can export their HA streams configuration as a JSON file from the wXcked Eye UI. This allows for easy setup in future configurations.

To accomplish this:

1. Navigate to the **High Availability Tab** in the wXcked Eye Settings page.
2. Select **Export HA Streams Config**.
  - a. **Note:** This will only work if you have an existing HA Streams config populated as shown below.
3. An **ha\_streams\_config.json** should automatically download onto your machine.

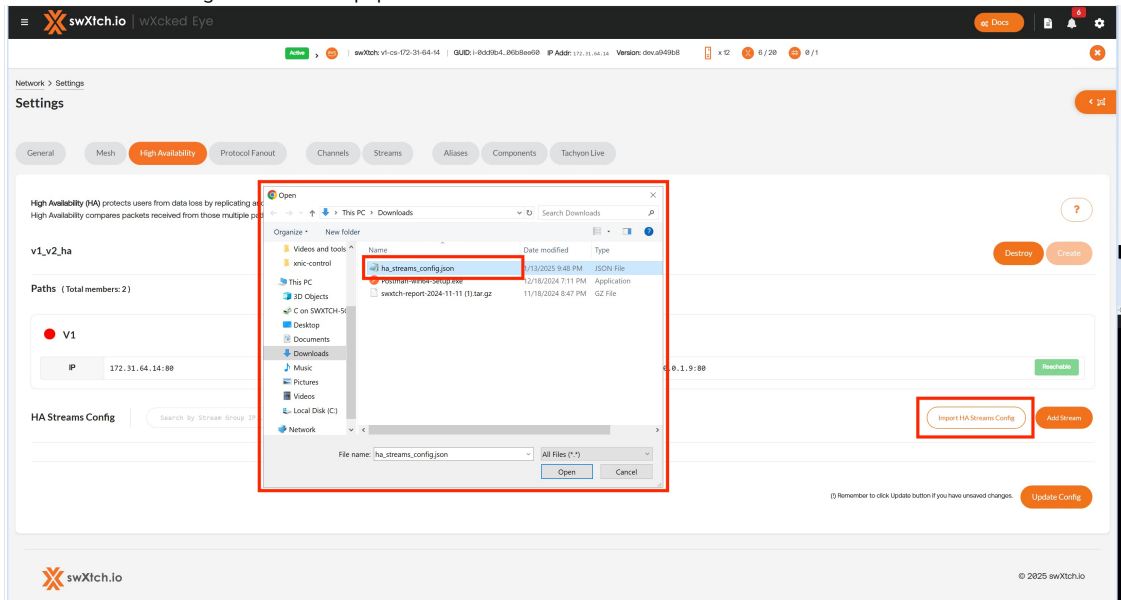


## Importing HA Streams Config

Users can import their HA Streams configuration JSON file into wXcked Eye to automatically populate their high availability settings page.

To accomplish this:

1. Navigate to the High Availability Tab in the wXcked Eye Settings page.
2. Select **Import HA Streams Config**.
  - a. The File Explorer will open.
3. Select and open the **ha\_streams\_config.json** file you would like to use. **Note:** The file name may be different if the user reassigned it during export.
  - a. The HA Streams Config section should populate with the contents of the JSON file.



4. Click **Update Config** to apply your changes.

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eg Docs

Active

swXtch: v1-cs-172-31-64-14 | GUID: 1-6cd9b4-00b1ee68 | IP Addr: 172.31.64.14 | Version: dev.a940b8

x 12

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0 / 1

High Availability (HA) protects users from data loss by replicating and sending packets through multiple network paths. High Availability compares packets received from those multiple paths and automatically reconstructs the original stream.

v1\_v2\_ha

Destroy

Create

Paths (Total members: 2)

V1

IP172.31.64.14:80

Reachable

V2

IP10.0.1.9:80

Reachable

HA Streams Config

Search by Stream Group IP...

Import HA Streams Config

Export HA Streams Config

Remove HA Streams Config

Add Stream

Stream224.2.2.2:8400

Override Source IP0.0.0.0

Exclude xNICs

Select xNICs...

Remove Stream

V1

Select stream or Add new one

224.2.2.3:8400

SSM FiltersInclude

Source IPs172.30.0.6

V2

Select stream or Add new one

224.2.2.4:8400

SSM FiltersInclude

Source IPs172.30.0.6

Config updated successfully!

(!) Remember to click Update button if you have unsaved changes

Update Config

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# Protocol Conversion and Fanout with wXcked Eye

## WHAT TO EXPECT

The Protocol Fanout feature allows users to configure unicast (UDP, SRT, RIST) for the cloudSwXtch and the cloudSwXtch Bridge and fan it out to multiple instances as UDP, SRT, RIST or multicast.

Configuration for Protocol Fanout for cloudSwXtch and cloudSwXtch Bridge can be done in wXcked Eye from the Settings page and from [the Topology Graph](#). To learn more about how to navigate there, please review the [Configure cloudSwXtch with wXcked Eye](#) article.

In this article, users will learn how to establish UDP, SRT and RIST connections via the Protocol Conversion and Fanout feature on wXcked Eye. It can also be used to convert multicast into one or more of these protocols. For example, imagine you have an SRT stream coming into the cloudSwXtch with five different clients requiring different protocols (one needing SRT, another RIST, another UDP and the last two for multicast). This can be accomplished by using this tool. For a walkthrough on configuring Protocol Conversion and Fanout in wXcked Eye, see the [Protocol Conversion and Fanout Example](#) article.

## Setting Up Aliases

The Protocol Fanout tab utilizes Stream and Node names set up in the Aliases tab. For more information on how to do this, please see the [Aliases](#) article.

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swXtch: ip-172-41-128-25 | GUID: 1-00006b0-aa407e4 | IP Addr: 172.41.128.25 | Version: dev-ac84d0

4

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Cluster > Settings

Settings

GeneralMeshHigh AvailabilityProtocol FanoutChannelsStreamsAliasesComponentsTachyon Live

Protocol Fanout enables users to configure unicast adaptors to send and receive traffic through the swXtch using different protocols (UDP, SRT and RIST).  
Ingress direction describes receiving unicast traffic in any supported protocol and converting it into a multicast stream on the swXtch.  
Egress describes sending copies of a single input stream in any supported protocol to multiple destinations.  
This gives each destination the option of being a different protocol from the input stream (for instance, an UDP input being sent to a set of multicast destinations and, additionally, to one using SRT).

Adaptors (8)

Filter byProtocolDirection

Add Adaptor

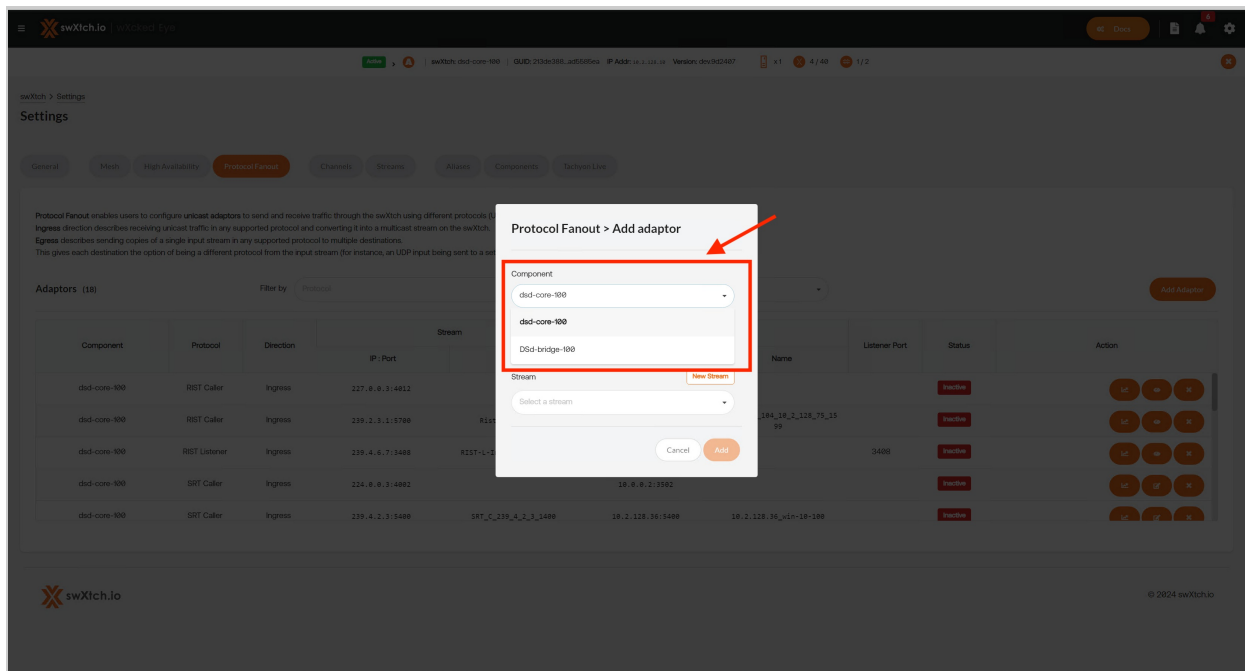
Component	Protocol	Direction	Stream		Node		Listener Port	Status	Action
			IP: Port	Name	IP: Port	Name			
ip-172-41-128-25	SRT Listener	Egress	225.1.1.1:5500	SRTListenerIngress			5888	Active	IdOffX
ip-172-41-128-25	SRT Listener	Ingress	225.1.1.1:5500	SRTListenerIngress			1509	Active	IdOffX
ip-172-41-128-25	SRT Caller	Egress	225.1.2.2:5000	SRT_caller	172.41.128.113:2222	drs2-one-win2019_1		Inactive	IdOffX
ip-172-41-128-25	RIST Listener	Egress	225.1.2.3:5000	RistIngress			5643	Inactive	IdOffX
ip-172-41-128-25	RIST Caller	Egress	225.1.2.4:5000	RistCaller	172.41.129.63:1598	drs2-one-win2019_2 Egress Rist Cal		Inactive	IdOffX

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**Protocol Fanout and Conversion** is a cloudSwXtch feature that allows users to send copies of a single input stream in any supported protocol to multiple destinations. In wXcked Eye, users can send/receive UDP traffic or establish SRT/RIST caller/listener connection methods.

To add an adaptor, select "Add Adaptor." Here, a user can select either a cloudSwXtch or a cloudSwXtch Bridge (only if it is installed) as the component.



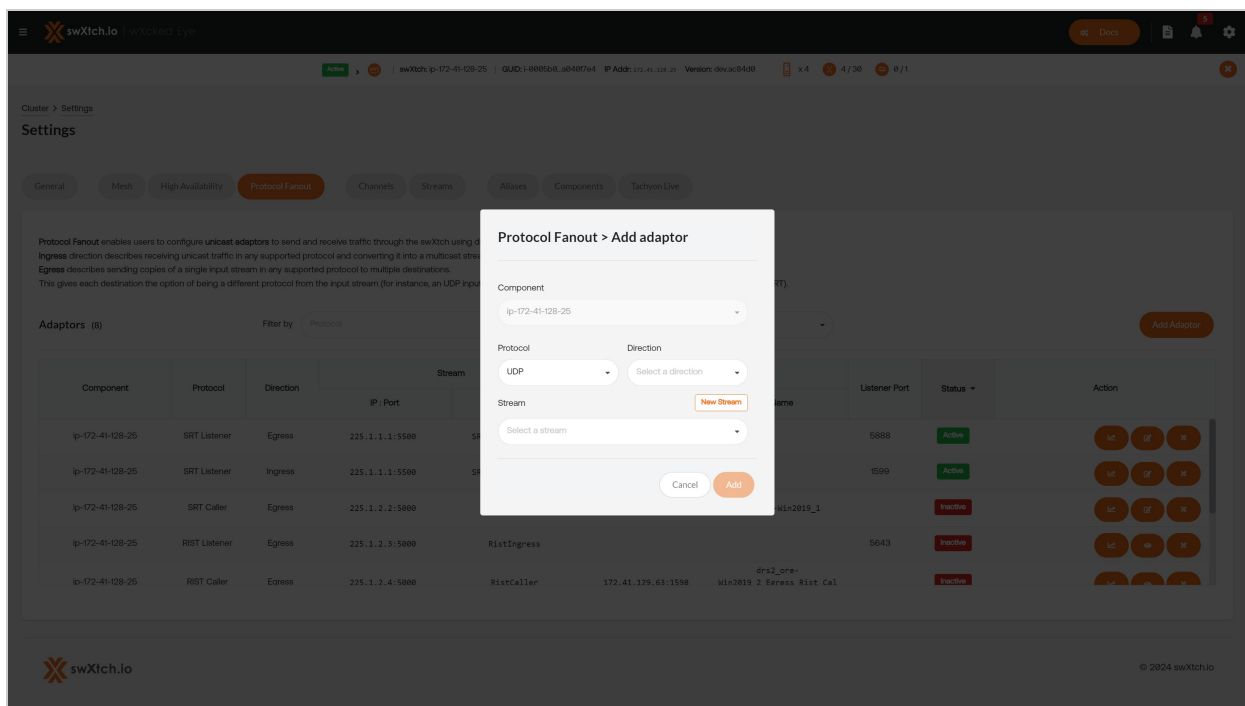
Then, users can select between three different protocols for their adaptor: UDP, SRT, and RIST.

## UDP

### Ingress vs. Egress

Differentiating between ingress and egress can be difficult. It is important to imagine it in **relation to the cloudSwXtch**.

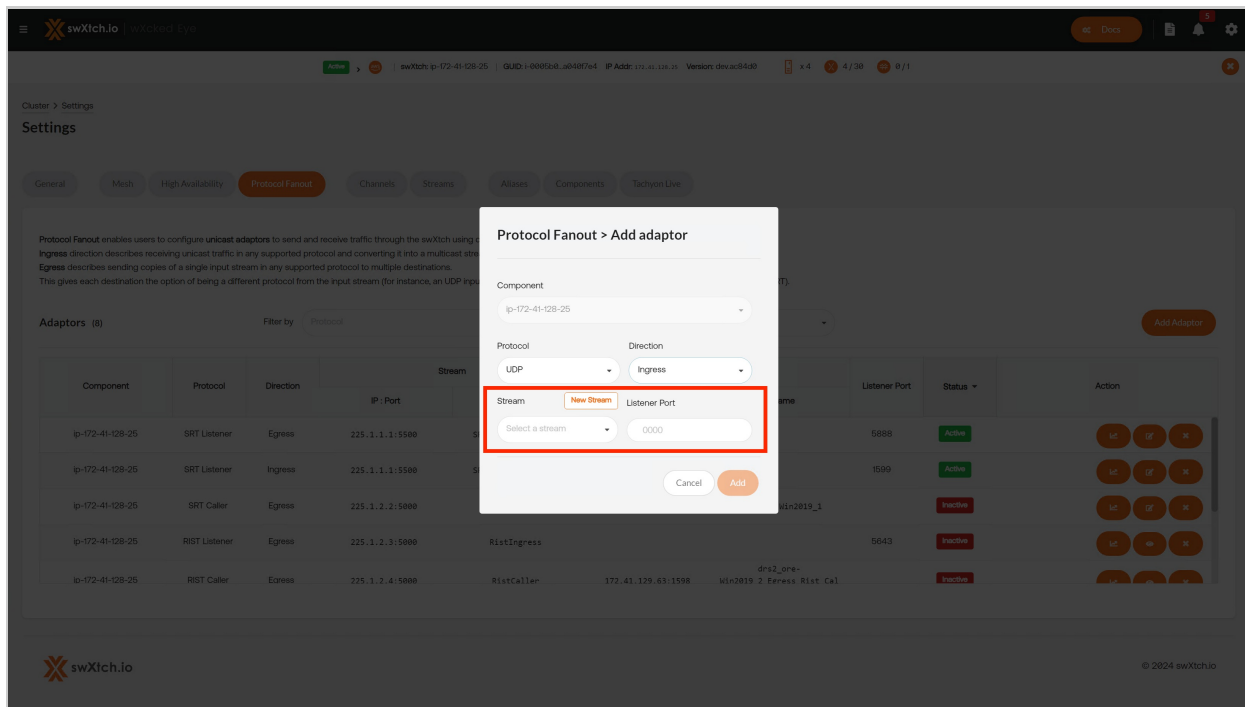
- **Ingress:** Data is coming into the cloudSwXtch.
- **Egress:** Data is leaving the cloudSwXtch.



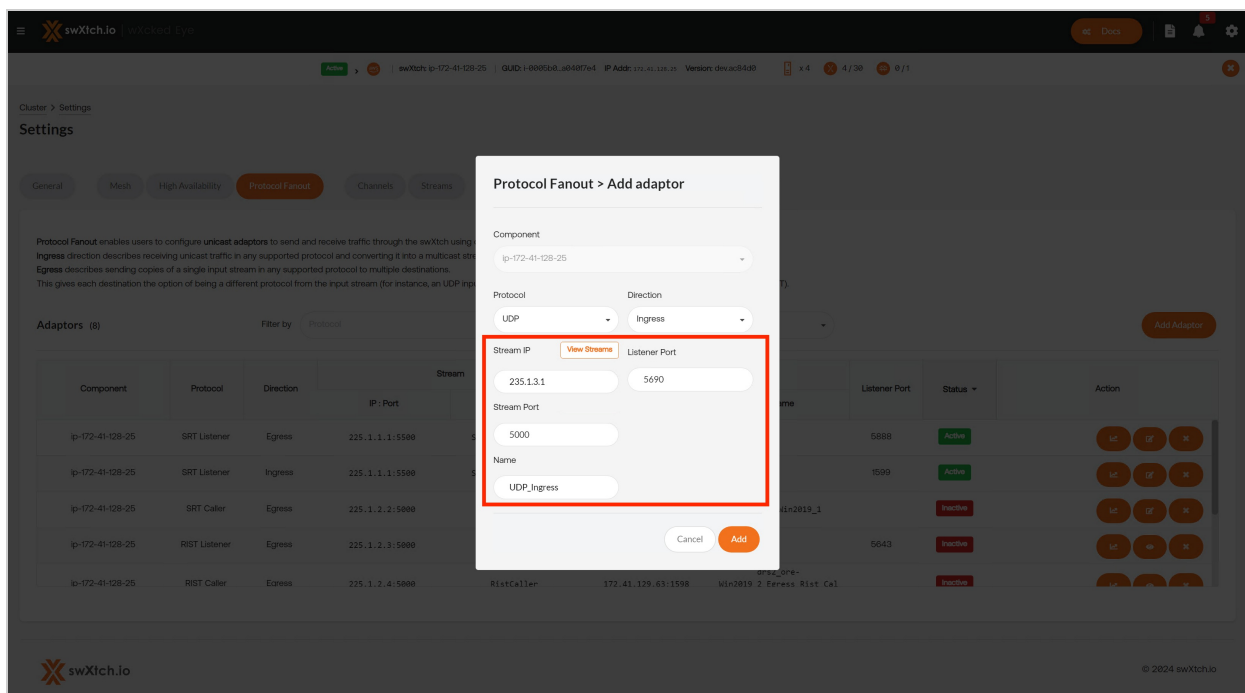
Selecting UDP under Protocol allows users to add mapping for UDP traffic entering and leaving the cloudSwXtch. Depending on the direction of the data, a user will have to add additional information to set up a successful connection.

### UDP Ingress

For Ingress, a user will select one of the **Streams** created in the **Streams** tab from the dropdown and designate a **Listener Port**.



Alternatively, if a user does not have an alias set up for their desired stream, they can manually specify a **Stream IP**, **Listener Port**, a **Stream Port** and an **alias name** to add one. To do this, they would have to select the **New Stream** option in the panel.



By clicking Add, the new adaptor will appear in the list on the Protocol Fanout tab.

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Docs

4

⚙️

Active

swXtch ip-172-41-128-25 | GUID: 1-8081b8-ab487e4 IP Addr: 172.41.128.25 Version: drw.ac84b8

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Cluster > Settings

Settings

General

Mesh

High Availability

Protocol Fanout

Channels

Streams

Aliases

Components

Tachyon Live

Protocol Fanout enables users to configure **unicast adaptors** to send and receive traffic through the swXtch using different protocols (UDP, SRT and RIST).

**Ingress** direction describes receiving unicast traffic in any supported protocol and converting it into a multicast stream on the swXtch.

**Egress** describes sending copies of a single input stream in any supported protocol to multiple destinations.

This gives each destination the option of being a different protocol from the input stream (for instance, an UDP input being sent to a set of multicast destinations and, additionally, to one using SRT).

Adaptors (9)

Filter by: All

Direction

Add Adaptor

Component	Protocol	Direction	Stream		Node		Listener Port	Status	Action
			IP: Port	Name	IP: Port	Name			
ip-172-41-128-25	RIST Listener	Egress	225.1.2.3:5000	RistIngress			5043	Inactive	id ← → ↻
ip-172-41-128-25	RIST Caller	Egress	225.1.2.4:5000	RistCaller	172.41.129.63:1588	drst2_one- Win2019_2_Egress_Rist_Cal		Inactive	id ← → ↻
ip-172-41-128-25	UDP	Ingress	235.1.3.1:5000	UDP_Ingress			5000	Inactive	id ← → ↻
ip-172-41-128-25	SRT Caller	Ingress	225.1.2.2:5000	SRT_caller	172.41.129.63:1588	drst2_win2019_2		Inactive	id ⏏ ↻

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Both methods will allow endpoints to send unicast data. Once that connection has been established, the cloudSwXtch will be able to ingest the unicast data as multicast.

## UDP Egress

For Egress, a user will set the parameters for fanning out a multicast stream as unicast. To do this, the cloudSwXtch would need to select a **Stream** and **Target Node** from their respective **Alias** dropdown.

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Docs

4

⚙️

Active

swXtch ip-172-41-128-25 | GUID: 1-8081b8-ab487e4 IP Addr: 172.41.128.25 Version: drw.ac84b8

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0 / 1

Cluster > Settings

Settings

General

Mesh

High Availability

Protocol Fanout

Channels

Streams

Aliases

Components

Tachyon Live

Protocol Fanout enables users to configure **unicast adaptors** to send and receive traffic through the swXtch using different protocols (UDP, SRT and RIST).

**Ingress** direction describes receiving unicast traffic in any supported protocol and converting it into a multicast stream on the swXtch.

**Egress** describes sending copies of a single input stream in any supported protocol to multiple destinations.

This gives each destination the option of being a different protocol from the input stream (for instance, an UDP input being sent to a set of multicast destinations and, additionally, to one using SRT).

Adaptors (9)

Filter by: All

Direction

Add Adaptor

Component	Protocol	Direction	Stream		Node		Listener Port	Status	Action
			IP: Port	Name	IP: Port	Name			
ip-172-41-128-25	RIST Listener	Egress	225.1.2.3:5000	RistIngress			5043	Inactive	id ← → ↻
ip-172-41-128-25	RIST Caller	Egress	225.1.2.4:5000	RistCaller	172.41.129.63:1588	drst2_one- Win2019_2_Egress_Rist_Cal		Inactive	id ← → ↻
ip-172-41-128-25	UDP	Ingress	235.1.3.1:5000	UDP_Ingress			5000	Inactive	id ← → ↻
ip-172-41-128-25	SRT Caller	Ingress	225.1.2.2:5000	SRT_caller	172.41.129.63:1588	drst2_win2019_2		Inactive	id ⏏ ↻

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Protocol Fanout > Add adaptor

Component

ip-172-41-128-25

Protocol

UDP

Direction

Egress

Stream

New Stream

Select a stream

Node

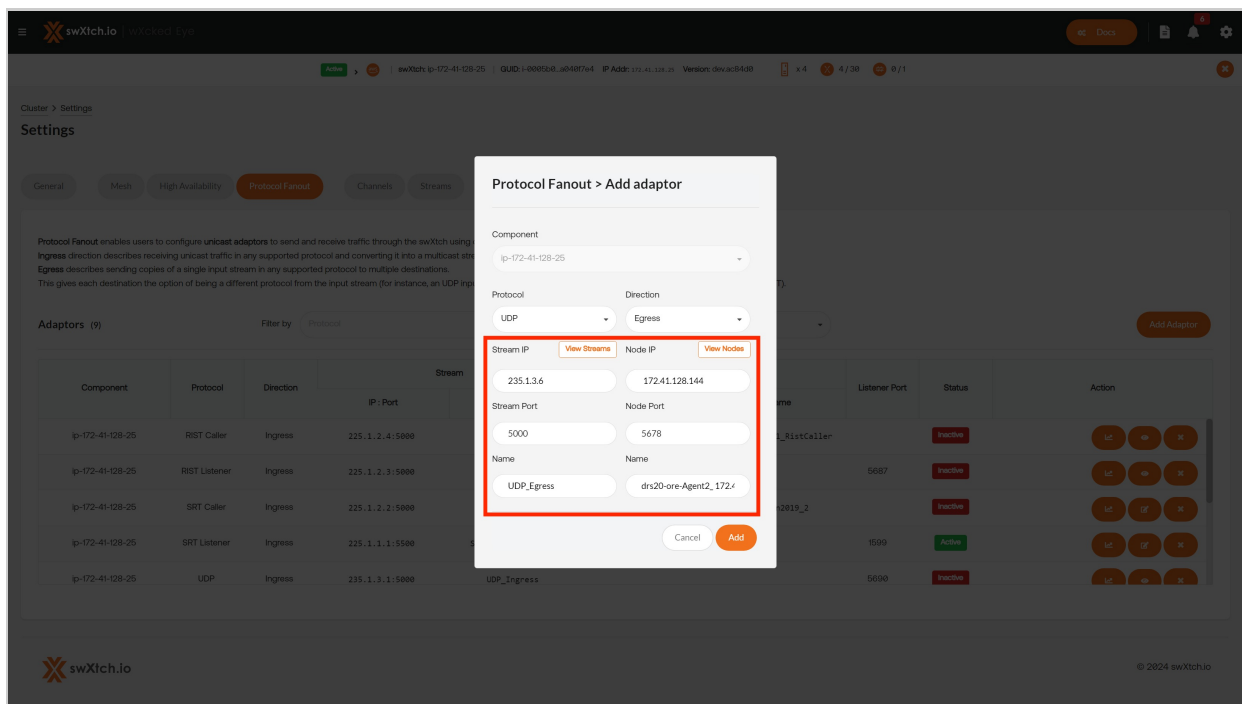
New Node

Select a node

Cancel

Add

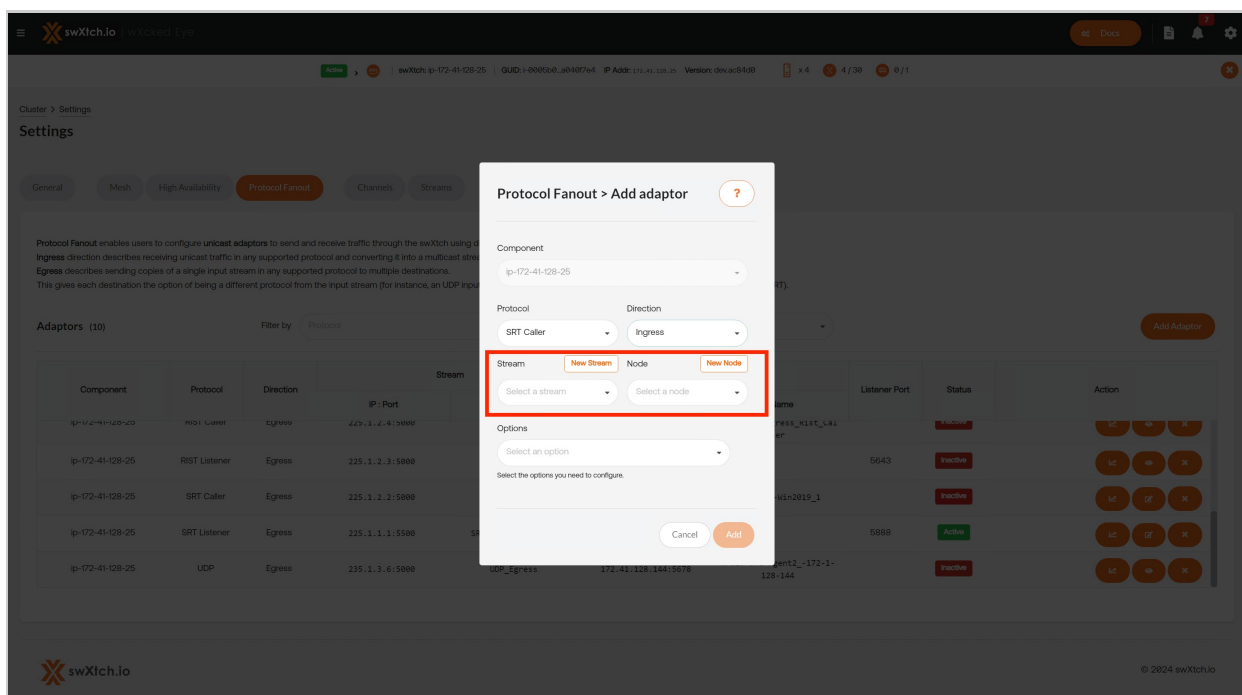
If an **Alias** was not created prior, they can manually add a **New Stream** and **New Node** by entering the appropriate information for both. To create a **New Stream**, a user will need the **Stream IP**, **Stream Port** and **Alias name**. Similarly, a **New Node** would require a **Node IP**, **Node Port** and **Alias name**.



Whether it is from existing Aliases or ones manually created, this will allow the cloudSwXtch to transmit a multicast stream as unicast to a desired endpoint.

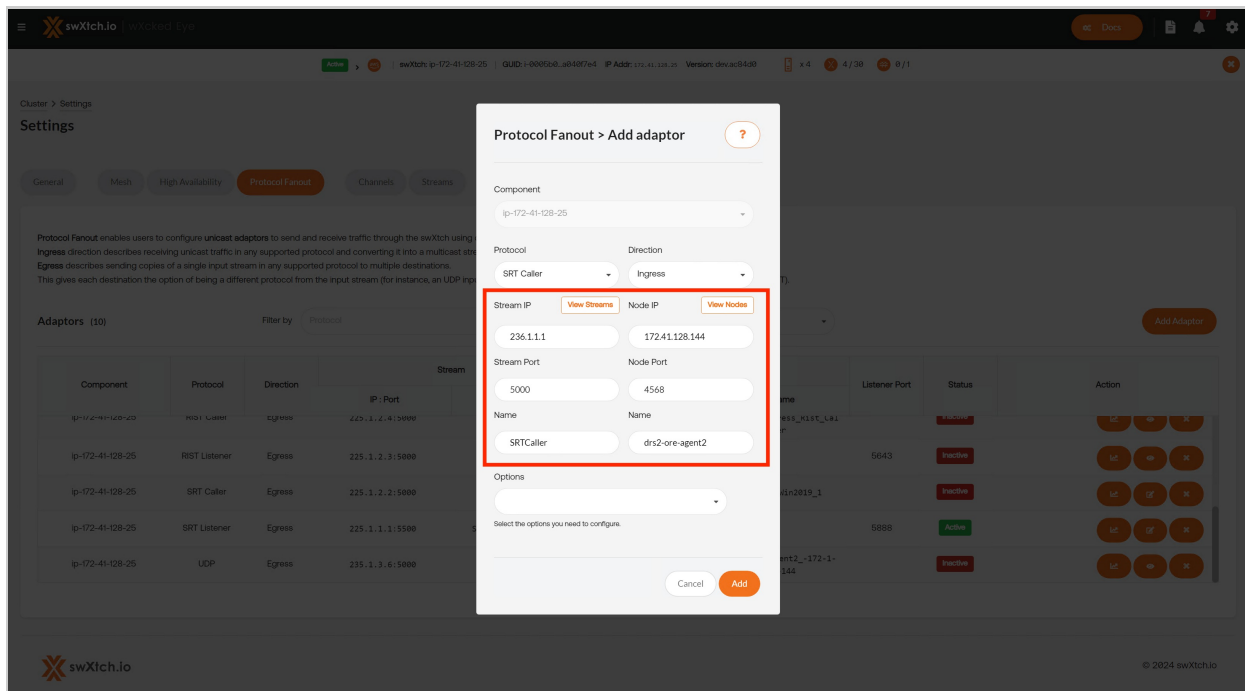
## SRT and RIST Caller

To set up SRT or RIST Caller, a user will need to choose what direction they will like their data to flow: Ingress or Egress. Regardless of their choice, both Ingress and Egress requires a selection for Stream and Node. These can either be selected from the Alias dropdown (assigned in the Alias tab under Settings) or manually created in the panel.



If a user wants to manually create a stream and node, they will need to select the "New Stream" and "New Node" buttons. This will reveal additional fields necessary for both. For Stream, a user will need to enter a Stream IP, Stream Port and Alias name. For Node, they will need a Node IP, Node Port and Alias. This will act as a Target Node. It is the source of where the traffic will be coming from outside the cloudSwXtch. This information is crucial since it will dictate where the cloudSwXtch sends the caller message.





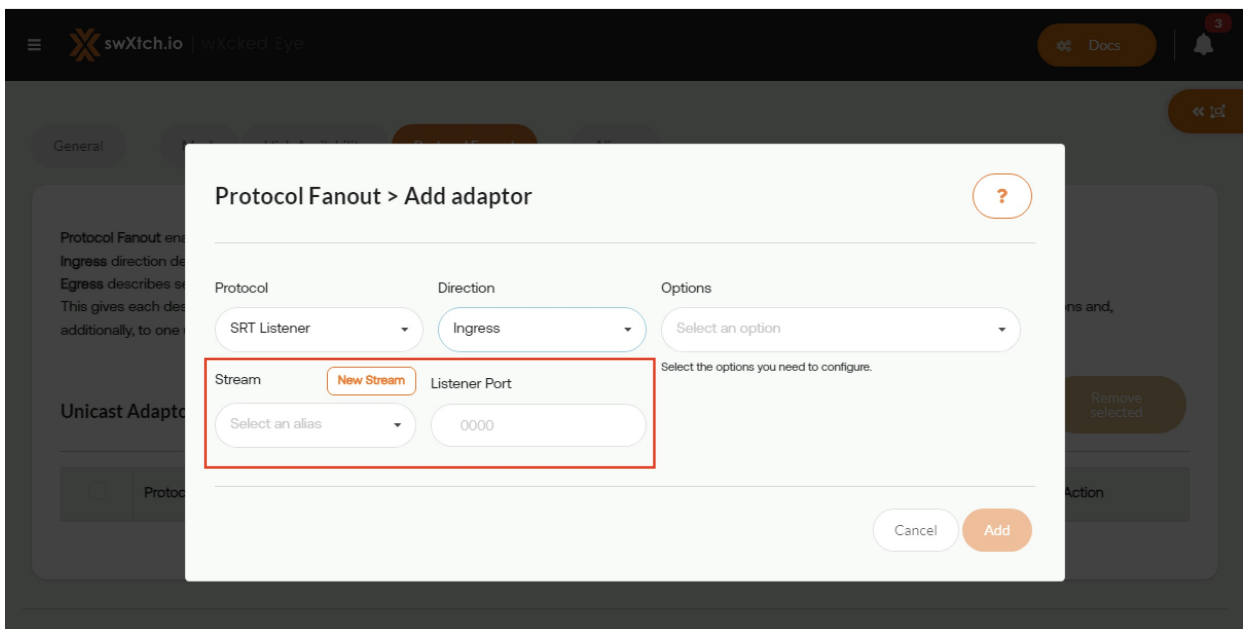
The **Options** dropdown allows for additional fine tuning based on standards of the protocol. Selection of an option will open another field.

After filling out all the required fields, select "Add." The cloudSwXtch will then call out to the target source and receive multicast traffic through the designated node.

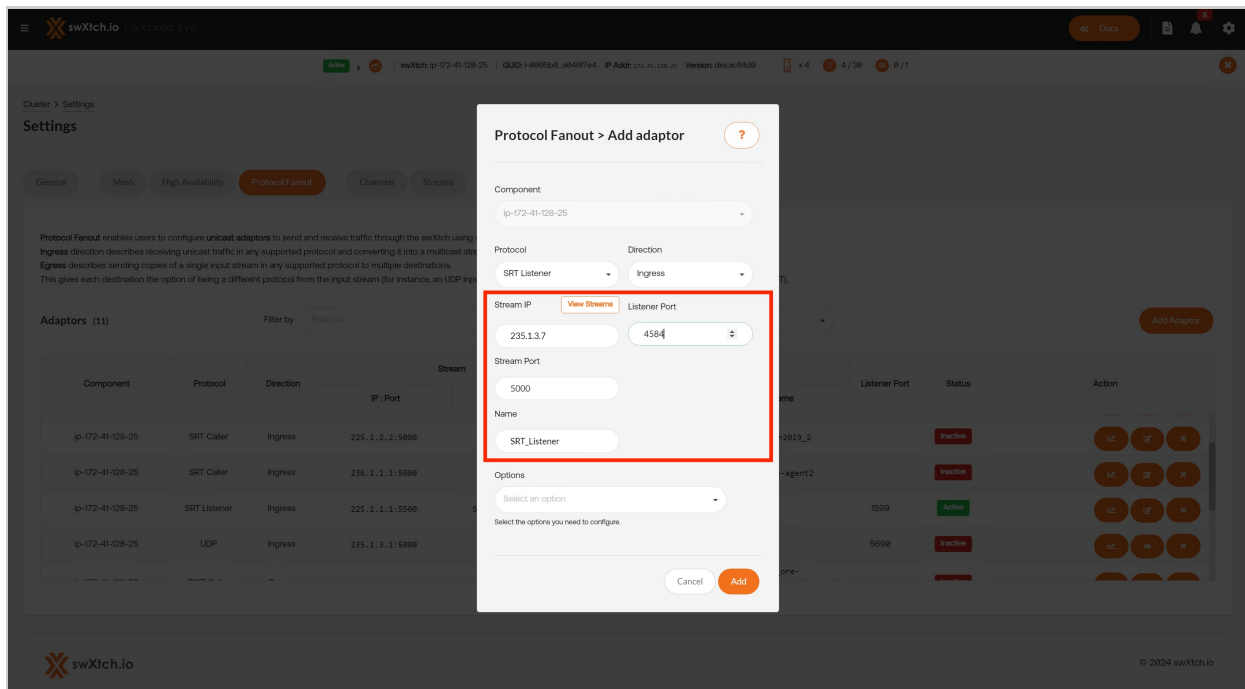
For **Egress**, the user will be specifying the Target Node for an endpoint to receive an SRT or RIST stream from the cloudSwXtch. The cloudSwXtch will then call to the Destination or Target Node to establish a connection before transmitting the stream.

## SRT and RIST Listener

Similar to the SRT or RIST Caller panel, Listener requires the user to specify the direction of their data flow: Ingress or Egress. However, what differs is that the SRT or RIST Listener is essentially "listening" for any incoming messages from endpoints ready to send/receive SRT or RIST data. This method of transmission is considered to be more user-friendly since a user will not have to worry about pointing to a specific IP address. It places the burden of targeting the endpoint instead.



Both Ingress and Egress will require a user to select a multicast Stream from the Alias dropdown. Stream Aliases are assigned in the Alias tab under Settings. Alternatively, users can enter a new Stream by selecting the New Stream button and entering the following information: Stream IP, Stream Port and Alias Name. In addition to the Stream, a user will also need to specify a Listener Port where an endpoint can send data through.



The **Options** dropdown allows for additional fine tuning based on standards of the protocol. Selection of an option will open another field.

For Ingress, once the configuration is complete, the cloudSwXtch will now listen for producers of SRT or RIST traffic who connect to the port. When a connection has been established, the cloudSwXtch will begin ingesting data.

Likewise for Egress, the cloudSwXtch is listening for endpoints that are trying to receive SRT or RIST data. From there, depending on the user's bandwidth, they can create up to 32 Listener ports from which an endpoint can connect to the the steam. By setting the necessary parameters, a consumer will then be able locate a target port and begin streaming data from the cloudSwXtch.

## Protocol Conversion and Fanout Example

# Protocol Conversion and Fanout Example

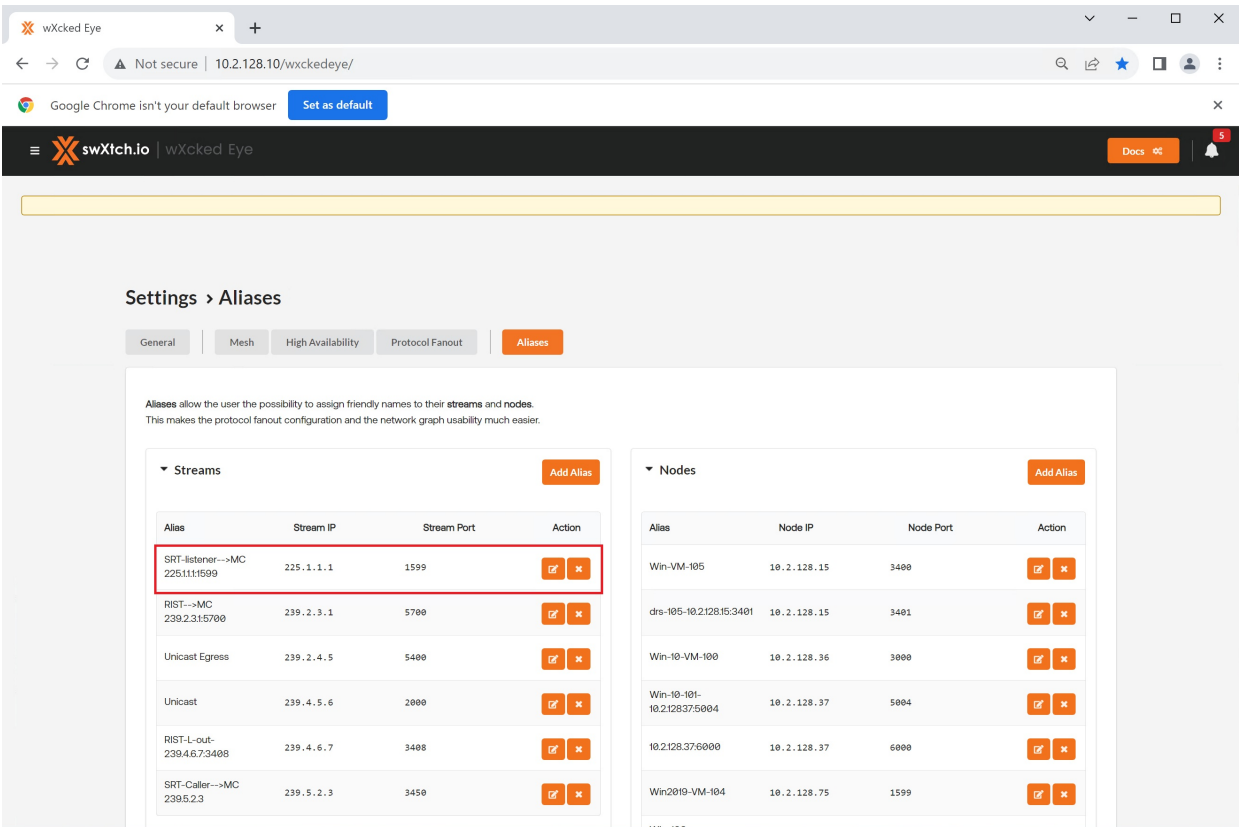
WHAT TO EXPECT

Navigating the Protocol Fanout and Conversion tab in wXcked Eye can be a little confusing when first starting out.

In this article, we will walk you through a typical SRT Listener configuration workflow to explain the various pieces that go into setting it up. We will look at the differences between ingress and egress and what that means in relation to the cloudSwXtch.

## Step One: Setting up Your Aliases

The Aliases tab allows users to set friendly names or "aliases" for their streams and nodes so that it is easier to organize them in the Protocol Fanout tab. In this example, the user has named their stream **SRT-listener -> MC 225.1.1.1:1599**, inputting a stream IP of 225.1.1.1 and a Stream Port of 1599. This name is helpful for the user because it illustrates what they hope to do when setting up for Protocol Fanout. They are going to set up for an SRT to MC conversion using the stream IP and Stream Port assigned to the name.



For more information about how aliases work, see the [Aliases](#) article under Configure cloudSwXtch with wXcked Eye.

## Step Two: Adding Adaptors

In the Protocol Fanout Settings page, the user has set up two SRT Listeners. An SRT Listener configuration is telling the cloudSwXtch to listen for any incoming messages from endpoints ready to send/receive SRT data. This method of transmission is considered to be more user-friendly since a user will not have to worry about pointing to a specific IP address. It places the burden of targeting on the endpoint instead.

Settings > Protocol Fanout

General | Mesh | High Availability | **Protocol Fanout** | Aliases

Protocol Fanout enables users to configure unicast adaptors to send and receive traffic through the swXtch using different protocols (UDP, SRT and RIST).

Ingress direction describes receiving unicast traffic in any supported protocol and converting it into a multicast stream on the swXtch.

Egress describes sending copies of a single input stream in any supported protocol to multiple destinations.

This gives each destination the option of being a different protocol from the input stream (for instance, an UDP input being sent to a set of multicast destinations and, additionally, to one using SRT).

Unicast Adaptors

Filter by: Protocol Direction Add Adaptor

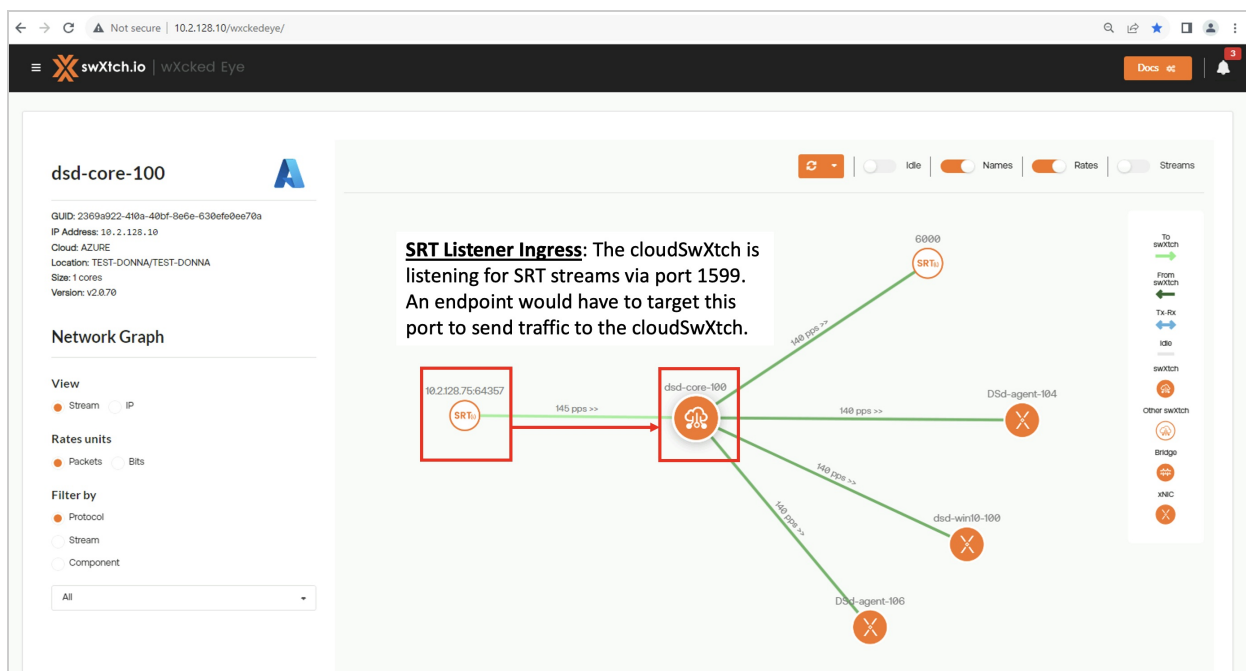
Protocol	Direction	Stream	Node	Listener Port	Action
UDP	Egress	SRT-Caller-->HC 239.5.2.3	10.2.128.44:5003		
RIST Caller	Egress	RIST-->HC 239.2.3.1:5700	win-VH-105		
SRT Listener	Egress	SRT-Listener-->HC 225.1.1.1:1599		6000	
SRT Listener	Ingress	SRT-Listener-->HC 225.1.1.1:1599		1599	
SRT Caller	Ingress	SRT-Caller-->HC 239.5.2.3	win-10-VH-100		
RIST Caller	Ingress	RIST-->HC 239.2.3.1:5700	win2019-VH-104		

The user has set up SRT Listener for both Egress and Ingress using the Alias assigned earlier: **SRT-Listener -> Multicast 225.1.1.1:1599**. When differentiating between Egress and Ingress, always imagine it from the perspective of the cloudSwXtch:

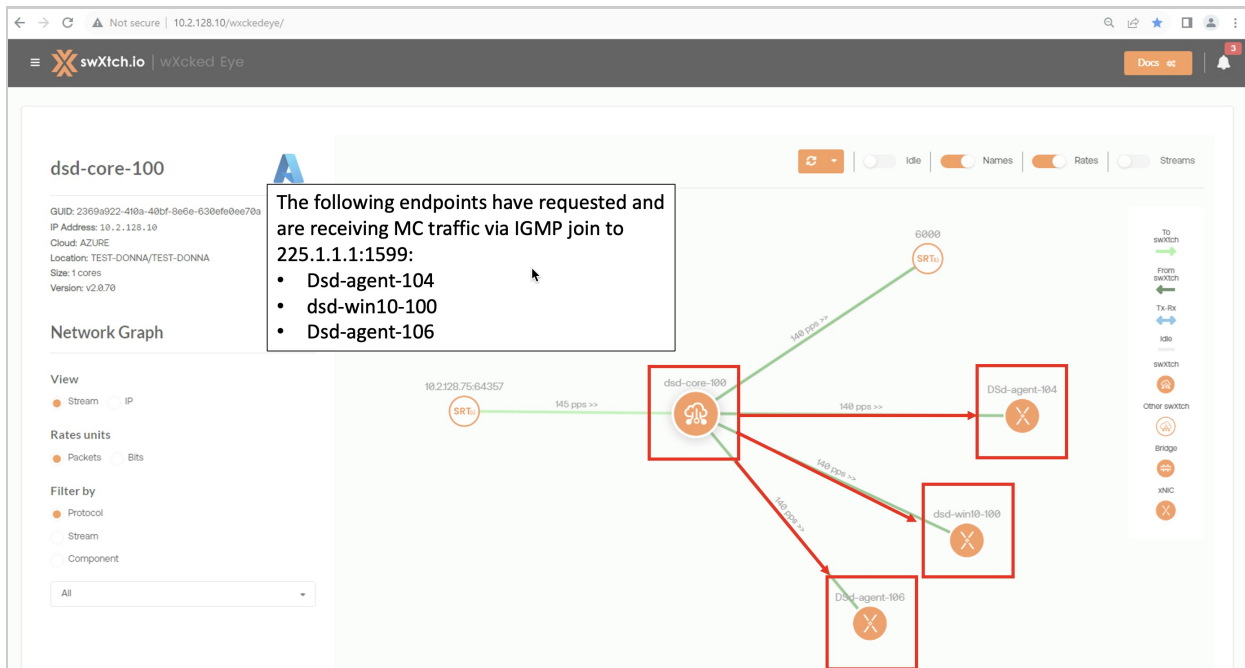
### SRT Listener Ingress

For **Ingress**, think about the cloudSwXtch **Ingesting** a stream. The user has set up an SRT Listener Ingress using the **SRT-Listener -> Multicast 225.1.1.1:1599** stream with **Listener Port 1599**. That means that an endpoint will have to target port 1599 to send SRT traffic to the cloudSwXtch. Since it is ingress, the cloudSwXtch will automatically convert the SRT stream it receives into multicast.

Using the [Topology](#) in wXcked Eye, you can see how SRT Listener Ingress is set up in relation to the cloudSwXtch below.

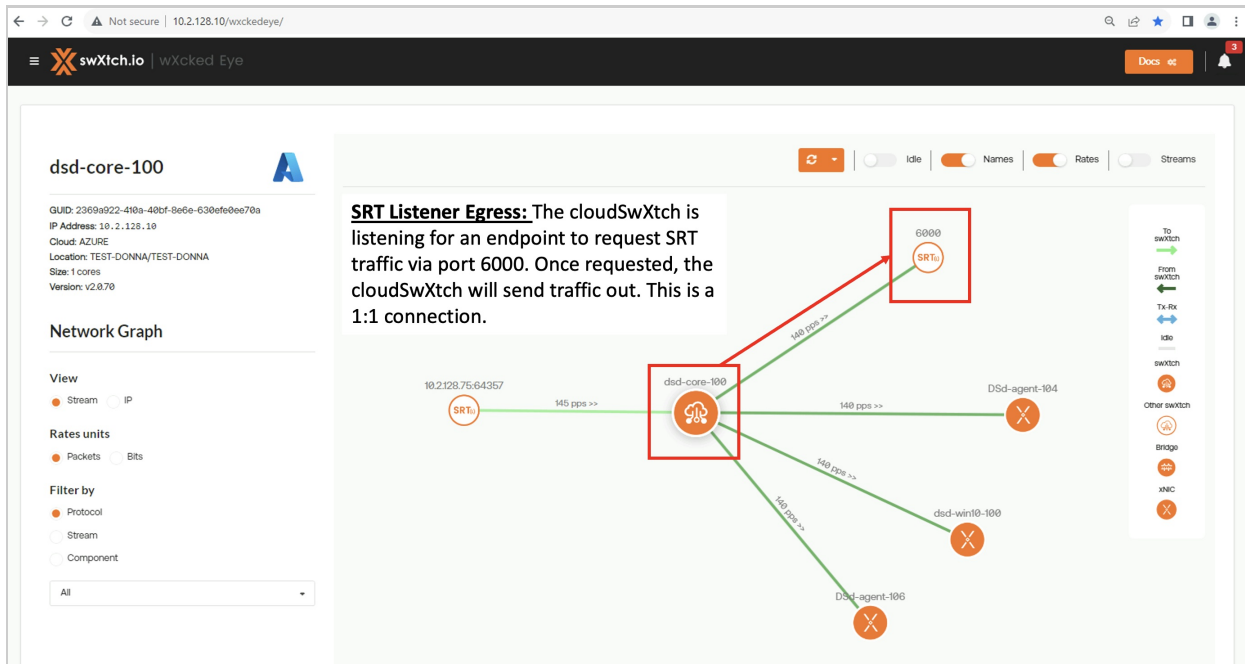


The endpoints highlighted will then request and receive multicast traffic via IGMP join to 225.1.1.1:1599.



### SRT Listener Egress

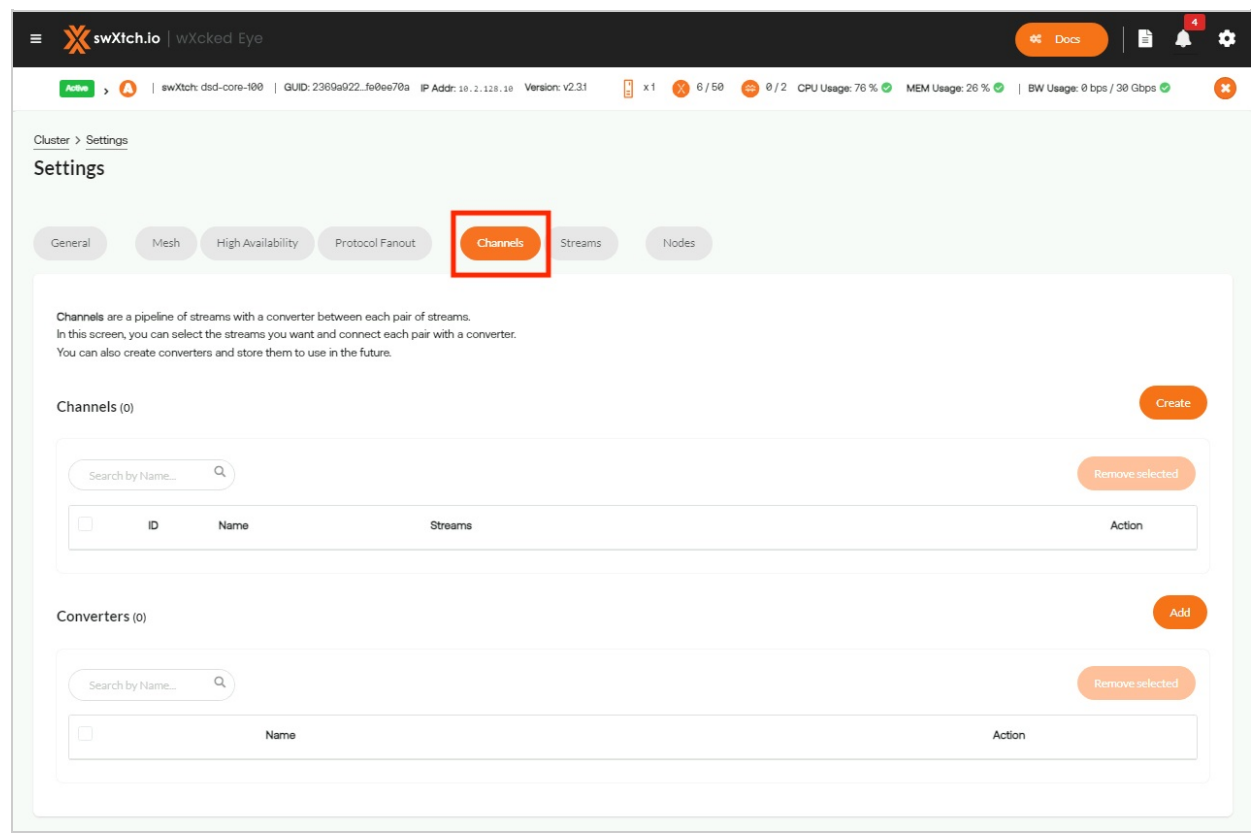
For Egress, imagine the stream **EXITING** the cloudSwXtch (->). In this example, the user has set up SRT Listener Egress using the **SRT-Listener -> Multicast 225.1.1.1:1599** stream and opening Listener Port 6000. That means that an endpoint will have to target port 6000 and let the cloudSwXtch know that it would like to receive SRT traffic. Note that **this is a 1:1 connection**, meaning only one SRT endpoint can use the listener port. In the example below, an endpoint has requested the SRT traffic and the cloudSwXtch is sending it out 140pps via port 6000.



# Channels

## WHAT TO EXPECT

The Channels tab on the Settings page allows users to create and remove channels from wXcked Eye. In addition, users can add and remove converters, which connect streams together to form a Channel.

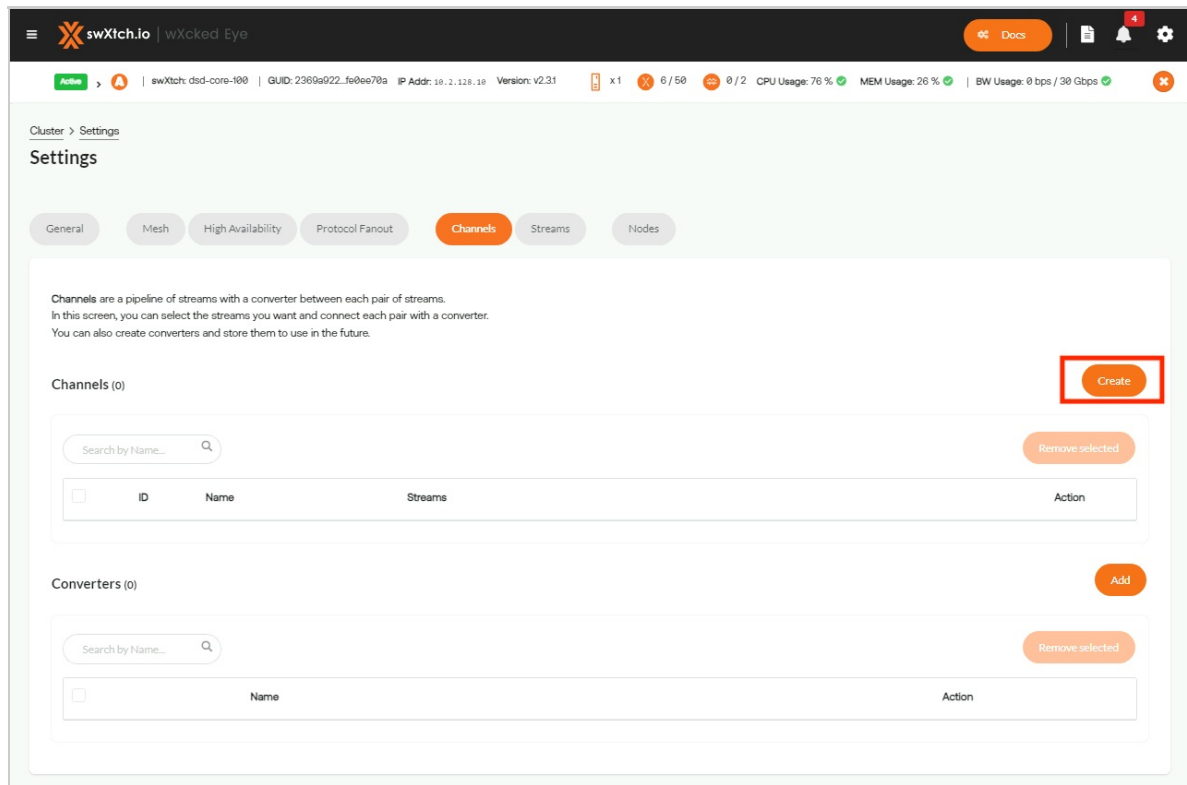


## Channels

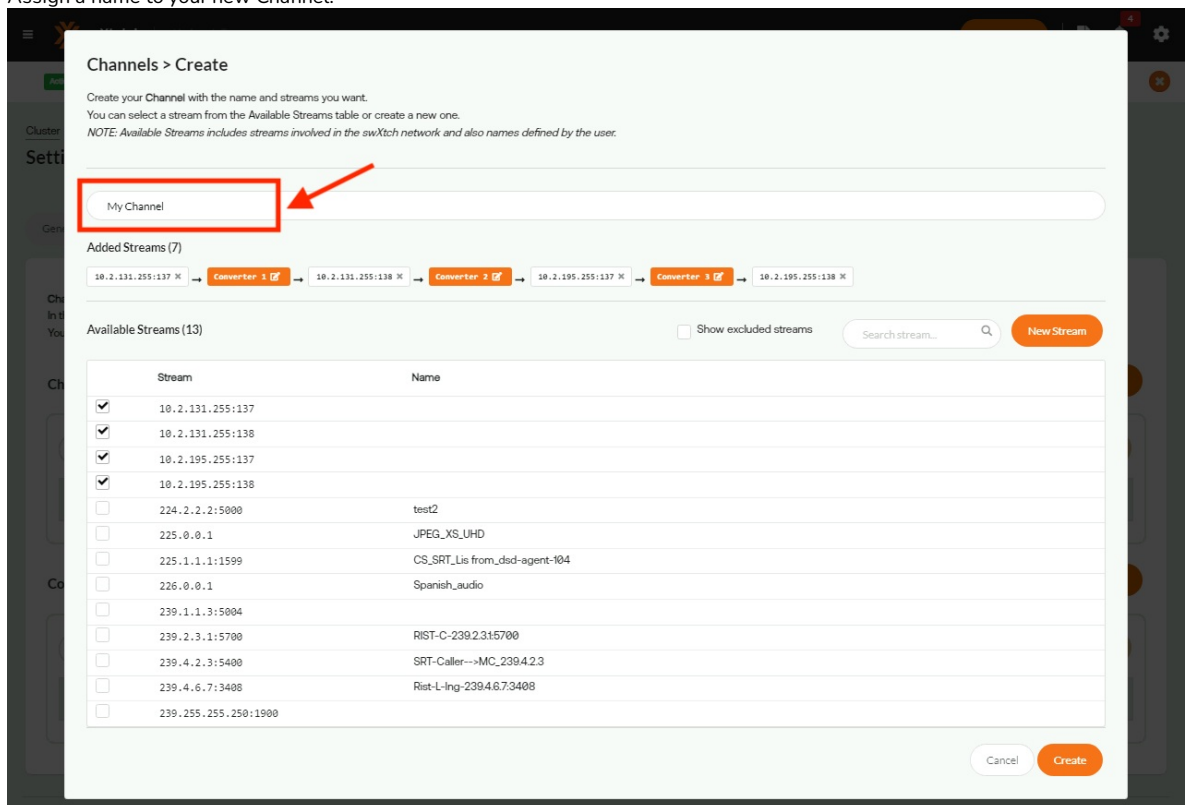
Channels are a pipeline of streams with a converter between each of them. On this page, a user will be able to Create Channels from a list of available streams and note the converters that connect them.

### Creating Channels

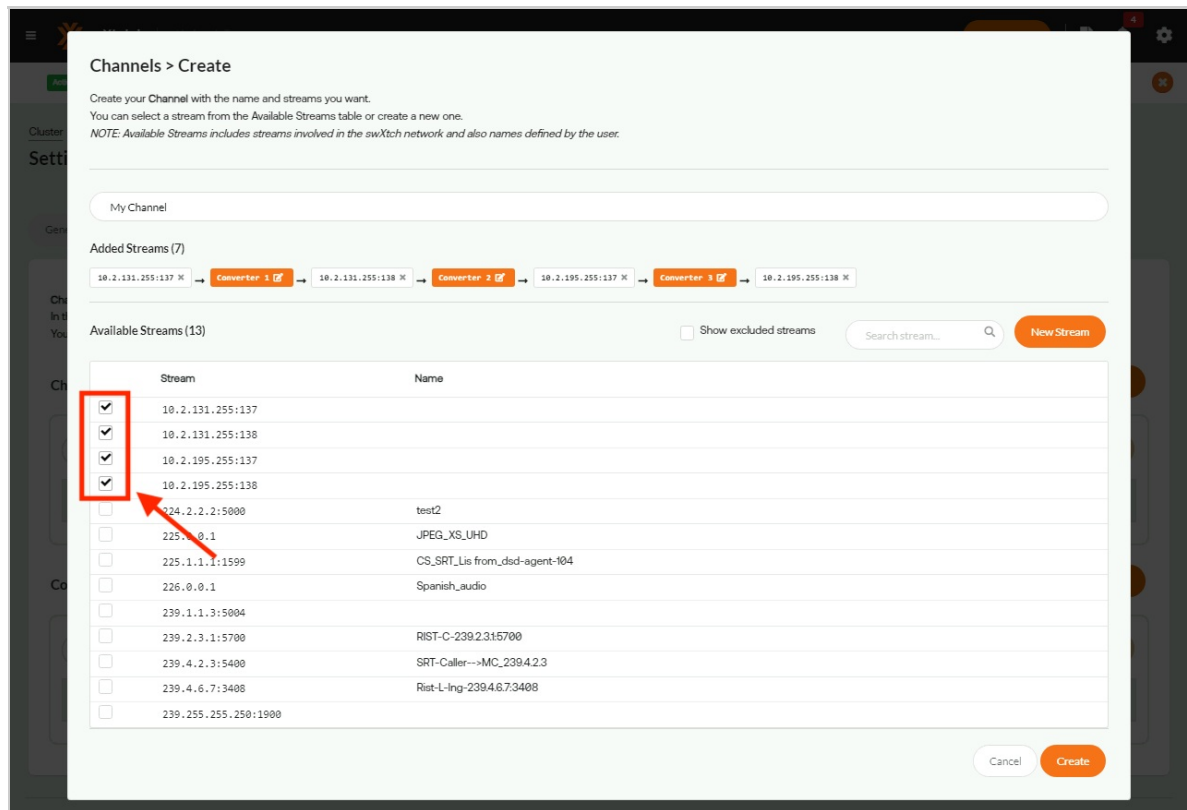
1. Click **Create** above the Channels section. A new window will open.



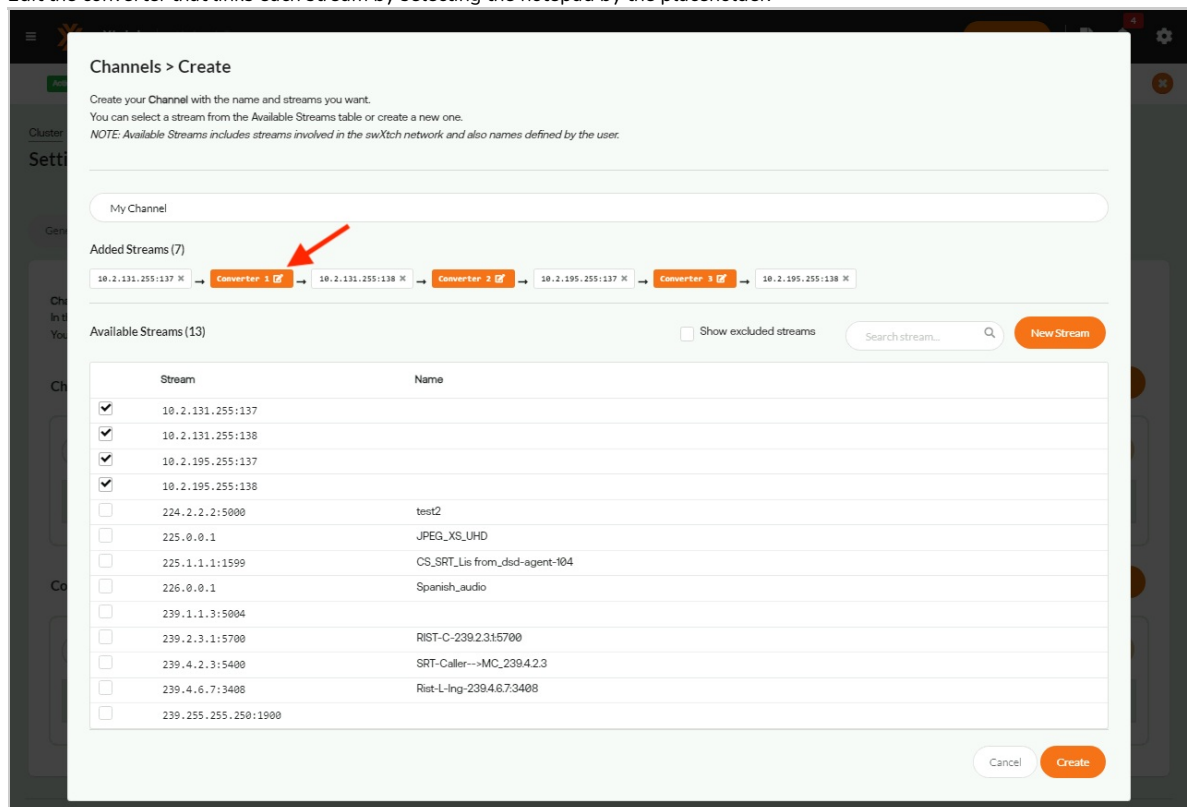
2. Assign a name to your new Channel.



3. Select the streams that you wish to add to the Channel configuration from the Available streams list.

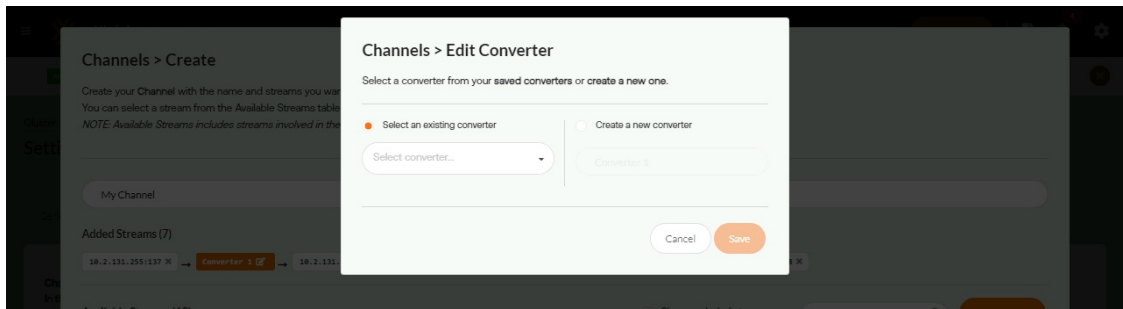


- a. Alternatively, select New Stream to add a new stream to the list. This will open a new window where you can name and assign a color to a Stream IP.
4. Edit the converter that links each stream by selecting the notepad by the placeholder.



5. Select an existing converter from the dropdown menu.
  - a. Alternatively, select **Create a new converter** and name it.





- b. **Please note:** wXcked Eye does not create these converters. This feature only allows users to name the existing converters in their network that will connect these streams.

6. Click **Create**. A new Channel will appear.

wXcked Eye will automatically assign an ID to the Channel. These channel configurations will carry throughout the UI. Users can edit or remove the channel using the action buttons on the right hand side.

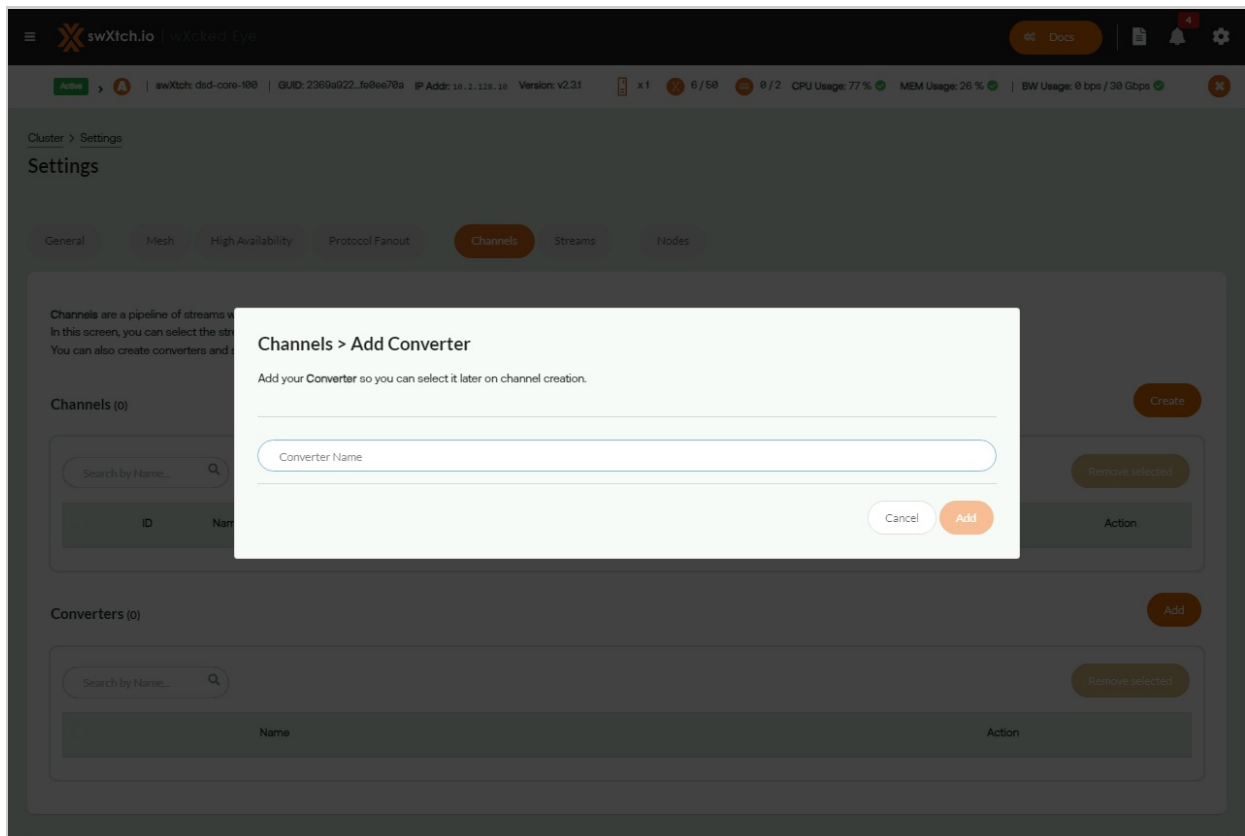
**Channels (4)**

ID	Name	Streams	Action
A3	HD_east	JPEG XS UHD → HD_FR_50to60 → HD_gfx_branding → HD_east_ad_insert	[Edit] [X]
A4	HD_west	JPEG XS UHD → HD_FR_50to60 → HD_gfx_branding → HD_east_ad_insert	[Edit] [X]
A1	UHD_east	JPEG XS UHD → UHD_FR_50to60 → UHD_gfx_branding → UHD_east_ad_insert	[Edit] [X]
A2	UHD_west	JPEG XS UHD → UHD_FR_50to60 → UHD_gfx_branding → UHD_west_ad_insert	[Edit] [X]

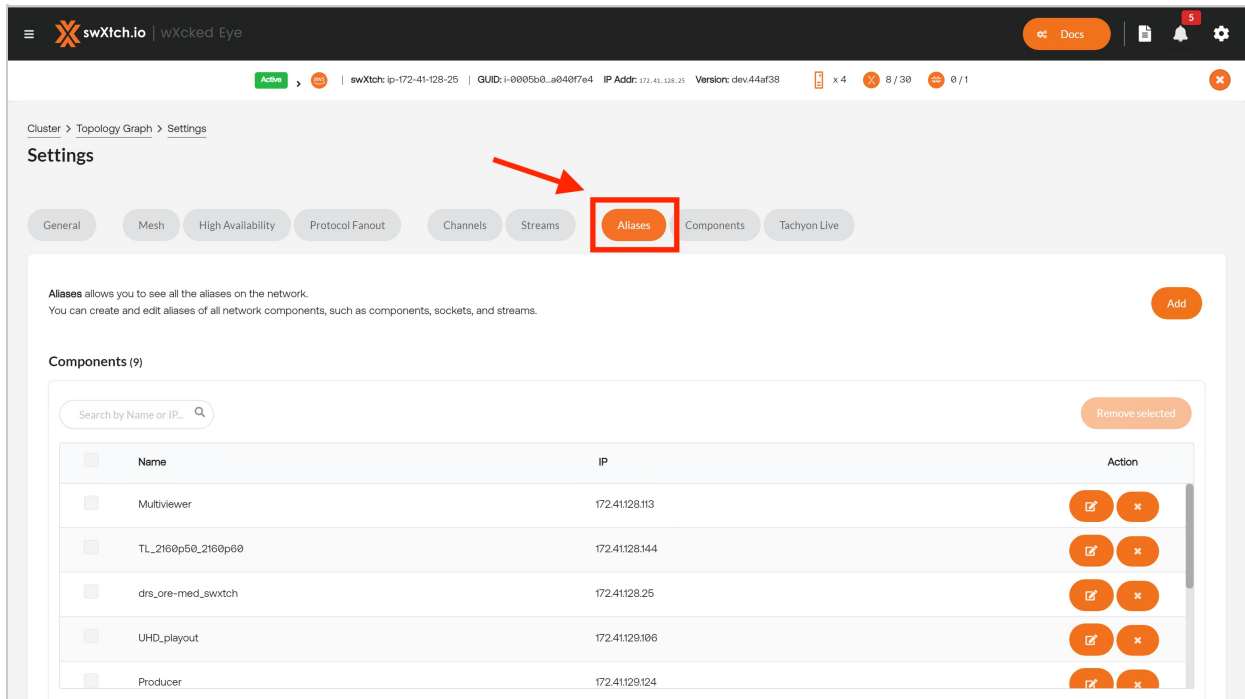
**Converters (0)**

## Adding Converters

Users can add a converter by clicking the Add button in the Converter section. A new window will open where users can name existing converters in their network. These can be a range of different transformations, such as Tachyon LIVE. **Please note:** wXcked Eye does not create converters. This feature only allows users to name a placeholder to connect streams visually in the UI.



# Aliases



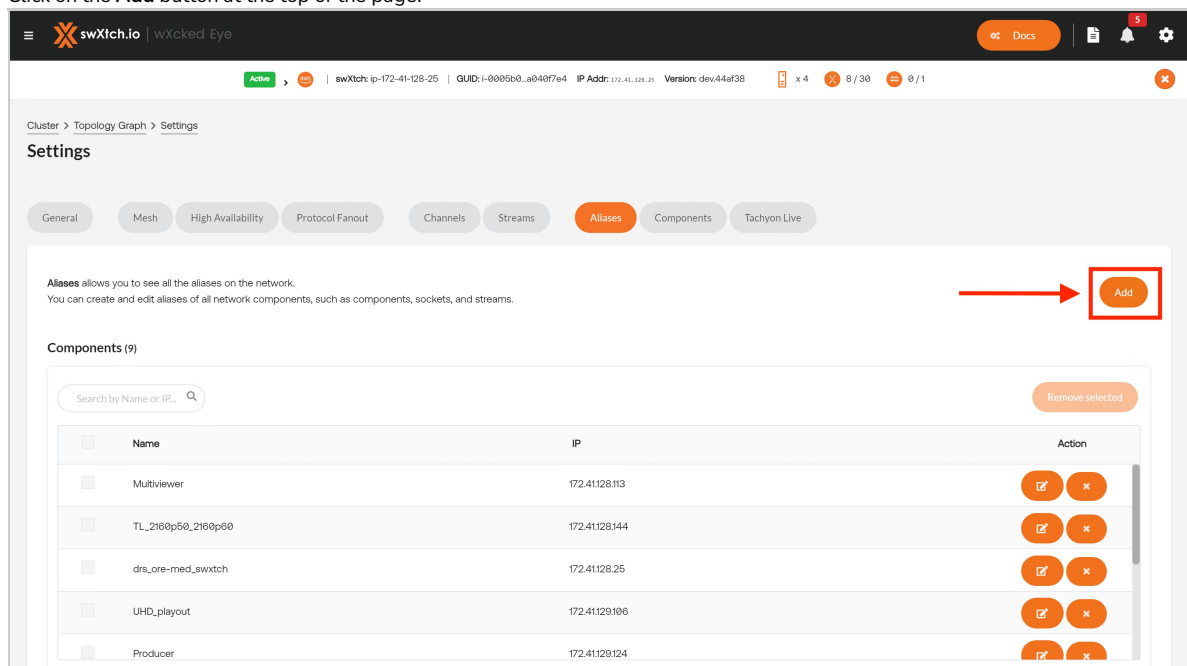
## Assigning an Alias

Aliases are assigned user-friendly names for a component, stream, or socket that will be displayed throughout the wXcked Eye UI. While Components (cloudSwXtches, xNICs and cloudSwXtch Bridges) already display a name assigned for the VM during installation, a user can assign an alias for that component. This new name will appear in the Aliases tab.

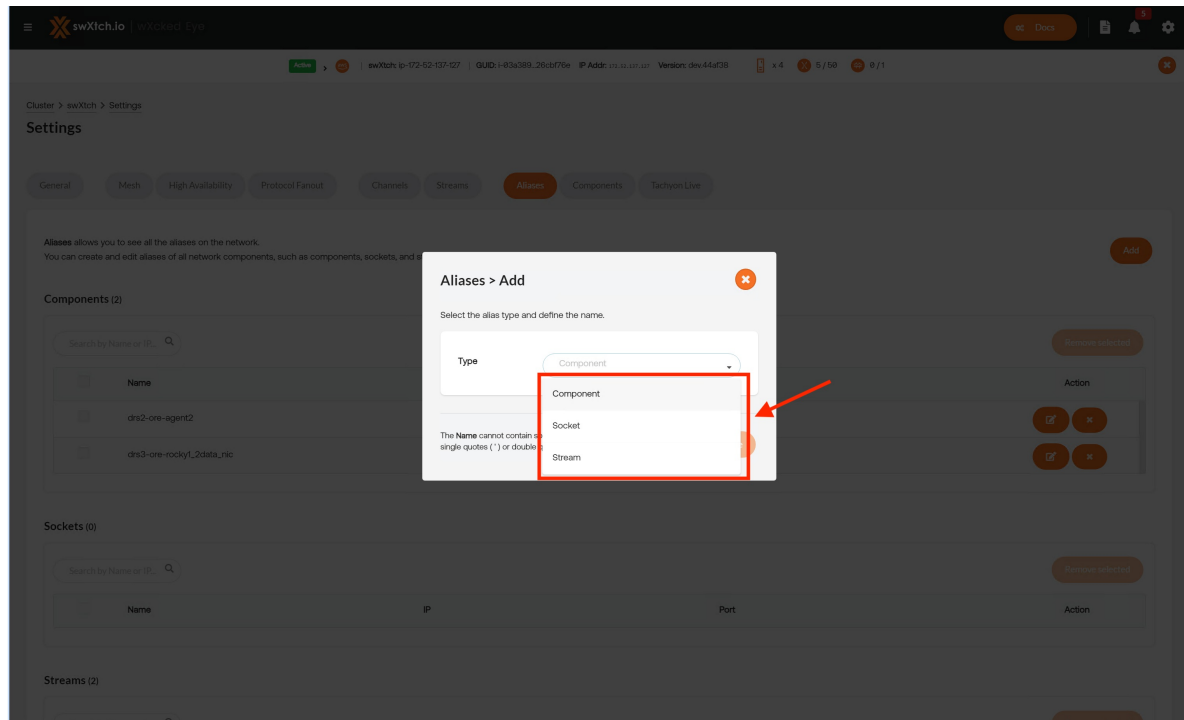
The same goes for Streams and Sockets. If a user changes the name of either, the new name will populate in their respective section in the Aliases tab.

### Assigning an Alias to a Component, Socket, or Stream

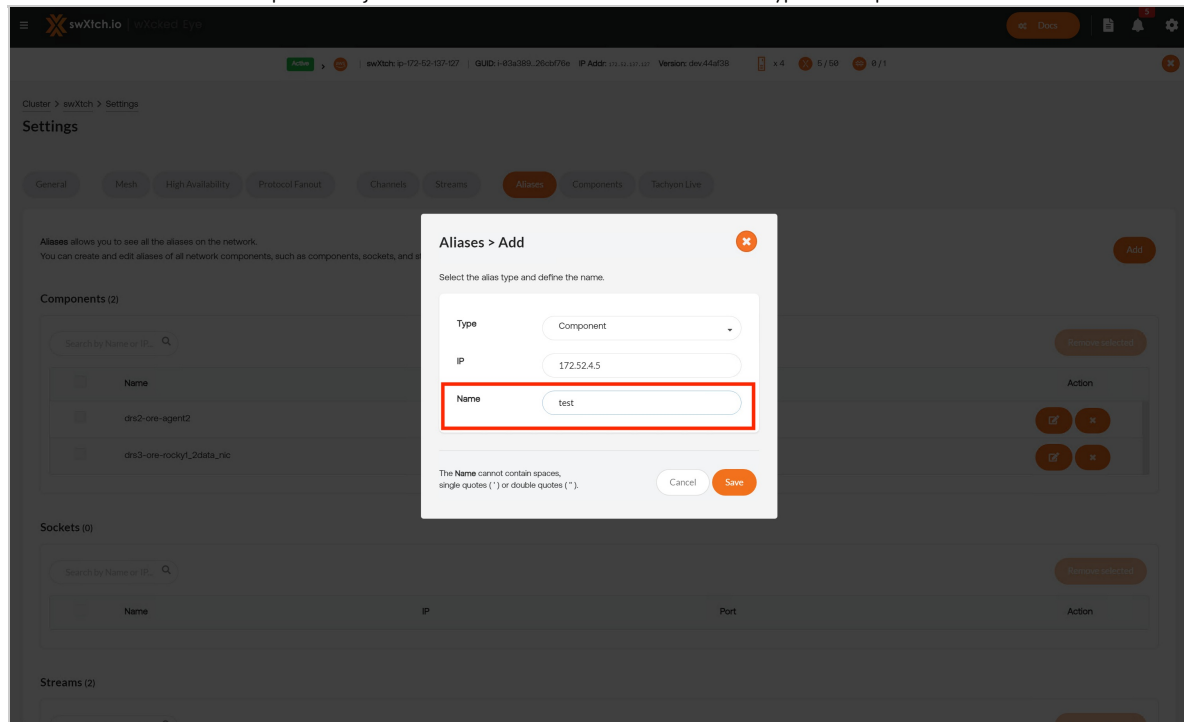
1. Go to the **Aliases** tab on the wXcked Eye Settings page.
2. Click on the **Add** button at the top of the page.



3. Select either **Component**, **Socket**, or **Stream** from the dropdown menu.



4. Enter a new **Alias** into the respective object's **Name** field. Be mindful that each Alias type will require different information.

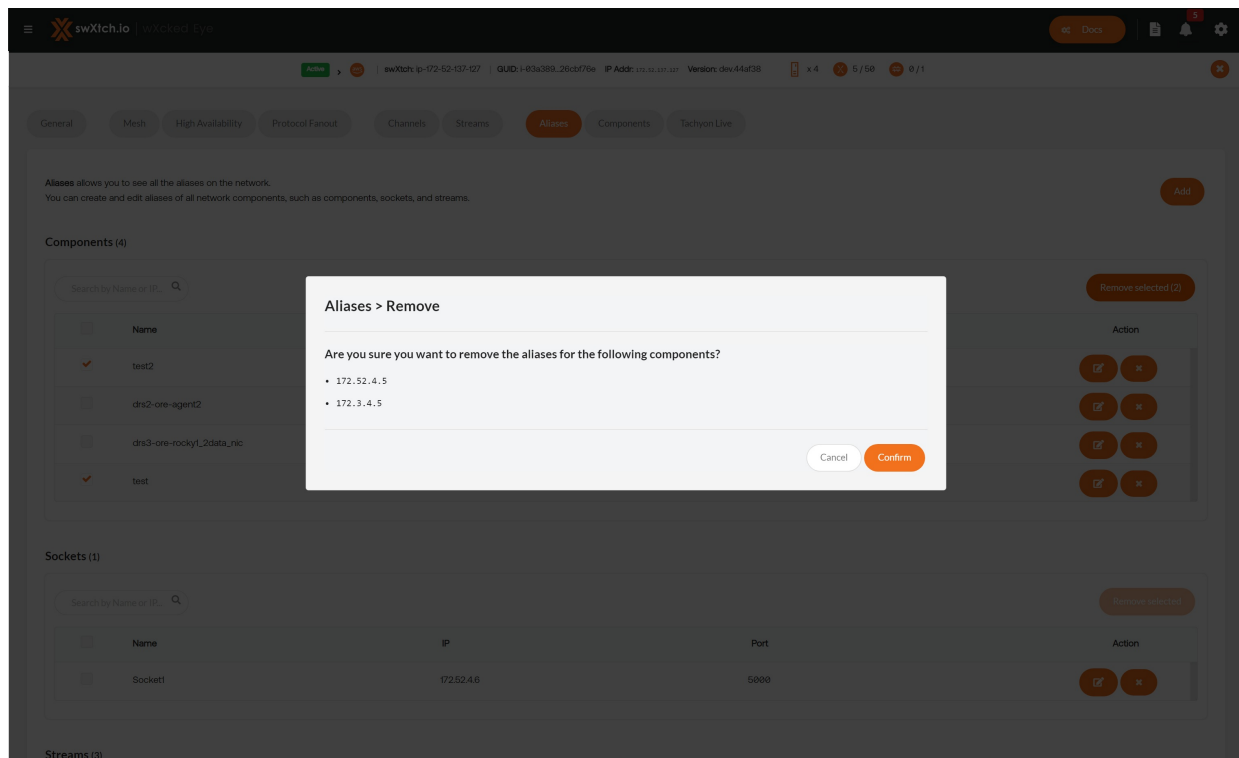


5. Select **Save** at the bottom of the window.

A new Alias should appear in the type's matching section. **Please note:** When assigning an alias to a component or a stream, the object will appear in their respective Settings tab.

### Deleting an Alias

Deleting an Alias will not remove the component, socket or stream from the wXcked Eye UI. It will only remove the assigned name and the listing on the Aliases tab. **To delete**, select the X button next to the item or use the checkbox to select multiple. A prompt will appear, confirming deletion.



## Alternate Ways to Assign an Alias to a Component

In addition to the Aliases tab, there are two additional ways a user can assign an alias for a Component: the **Topology Graph** and the **Settings' Component tab**. Altering the name in either of these pages will result in the addition of the component in the Aliases tab.

### Alternative #1: Topology Graph

To assign an alias to a component in the Topology Graph:

1. Go to the Topology Graph.
2. Select one of the nodes in the Topology Graph. This will open the Component Information panel for that node.
3. Click the notepad button by the Component's current name. A new window will open.
4. Enter an Alias in the Name field.
5. Click Save.

The new name will appear in the Topology Graph for that node. It will also now list under Components in the Aliases tab in the wXcked Eye Settings page.

For more information, see the [wXcked Eye Topology Graph](#) article.

### Alternative #2: Components Tab

In the Components tab under wXcked Eye's Settings page, swXtch.io related products (cloudSwXtches, xNICs, and cloudSwXtch Bridges) connected to the primary cloudSwXtch you're viewing will automatically populate the Components list. This forms the cloudSwXtch network displayed in the Topology Graph. Each of these existing components will have names assigned during VM creation.

Next to each component in the Components tab, **there is an edit button**. Selecting it will open a new window where a user can assign an Alias for their component. This will change the name of the component in the Topology Graph and add the name in the Aliases tab.

For more information, see [Components](#) under Configure cloudSwXtch with wXcked Eye.

## Alternate Ways to Assign an Alias to a Stream

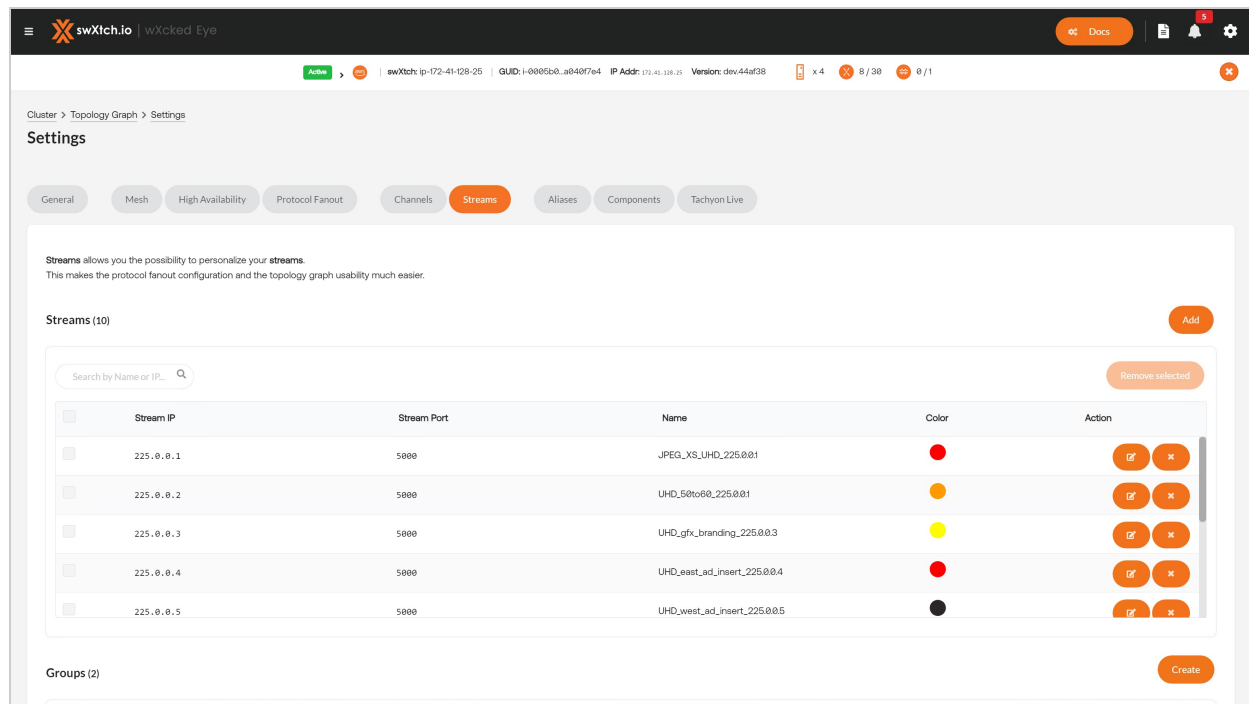
In addition to the Aliases tab, a user can also edit a stream's name in the Streams tab on the wXcked Eye Settings page. Any changes to a stream's name or the creation of a stream name in the Streams tab will result in its appearance in the Aliases tab.

# Streams

## WHAT TO EXPECT

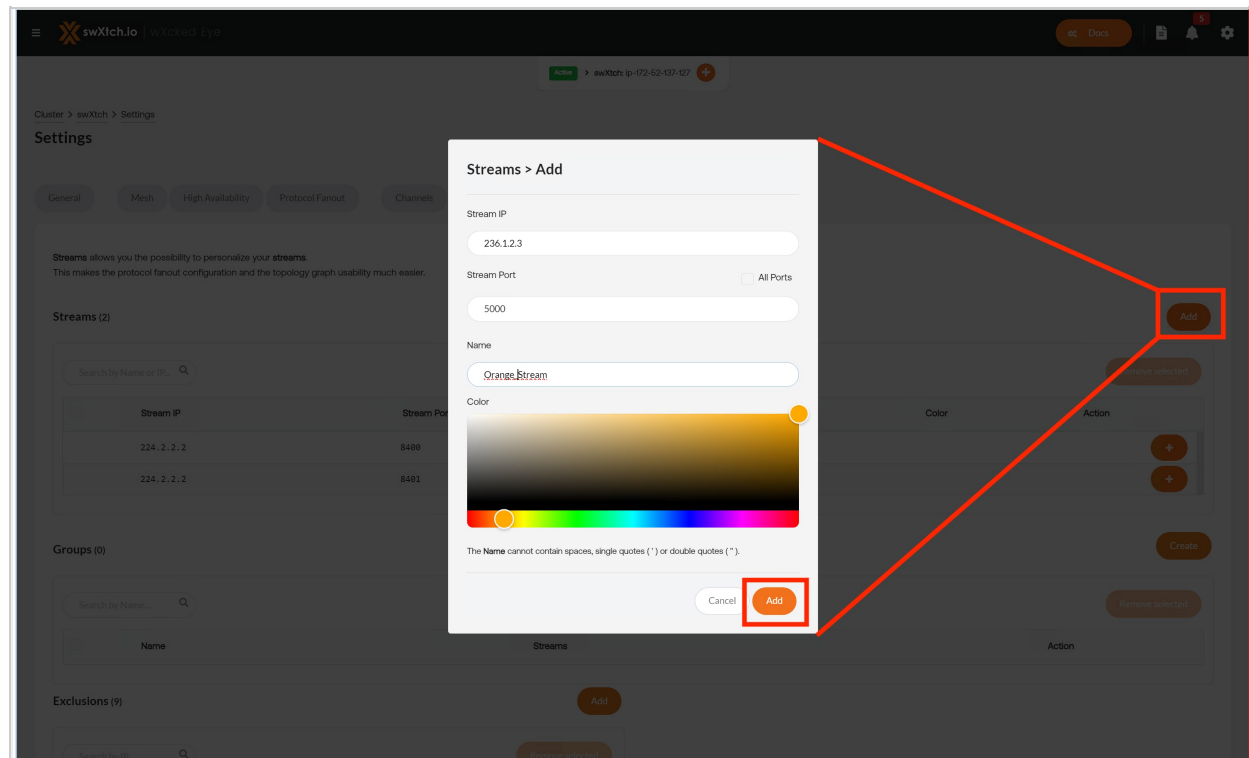
In this article, users will learn how to use the Streams tab under Settings to configure and personalize streams in the wXcked Eye UI.

## Navigating the Streams Tab



The Streams tab allows users to name their Multicast IP addresses and assign them a color. This enables users to readily distinguish between different streams in the Topology Graph. In addition, this creates a shortcut for users in dropdown menus throughout the Protocol Fanout tab, allowing them to easily differentiate between multiple streams.

## Adding a Stream



## To add a stream:

1. Click the Add button at the top of the Streams section. A new window will open.

2. Enter the Stream IP and Stream Port.
3. Assign the stream a name and color.
4. Select Save.

A new stream will now be listed.

Cluster > swXtch > Settings

Settings

General Mesh High Availability Protocol Fanout Channels **Streams** Aliases Components Tachyon Live

Streams allows you the possibility to personalize your streams.  
This makes the protocol fanout configuration and the topology graph usability much easier.

Streams (3) Add

Search by Name or IP...

Stream IP	Stream Port	Name	Color	Action
224.2.2.2	8400			<span>+</span>
224.2.2.2	8401			<span>+</span>
236.1.2.3	5000	Orange_Stream	Yellow	<span>✎</span> <span>✖</span>

Groups (0) Create

Search by Name...

Name	Streams	Action
------	---------	--------

Exclusions (9) Add

**Please note:** While the new stream is listed, it **will not appear** in the Topology Graph unless the cloudSwXtch detects it. However, once the cloudSwXtch connects with the stream, wXcked Eye will assign it the user-designated name and color and display it in the Topology Graph. For example, in the image above, streams 224.2.2.2:5400 and 224.2.2.2:5401 were detected by the cloudSwXtch but are not yet assigned a name or color.

### Editing and Deleting A Stream Name

Under the Action column, users can **edit** or **delete** their stream's name from their Streams list.

Cluster > swXtch > Settings

Settings

General Mesh High Availability Protocol Fanout Channels **Streams** Aliases Components Tachyon Live

Streams allows you the possibility to personalize your streams.  
This makes the protocol fanout configuration and the topology graph usability much easier.

Streams (3) Add

Search by Name or IP...

Stream IP	Stream Port	Name	Color	Action
224.2.2.2	8400			<span>+</span>
224.2.2.2	8401			<span>+</span>
236.1.2.3	5000	Orange_Stream	Yellow	<span>✎</span> <span>✖</span>

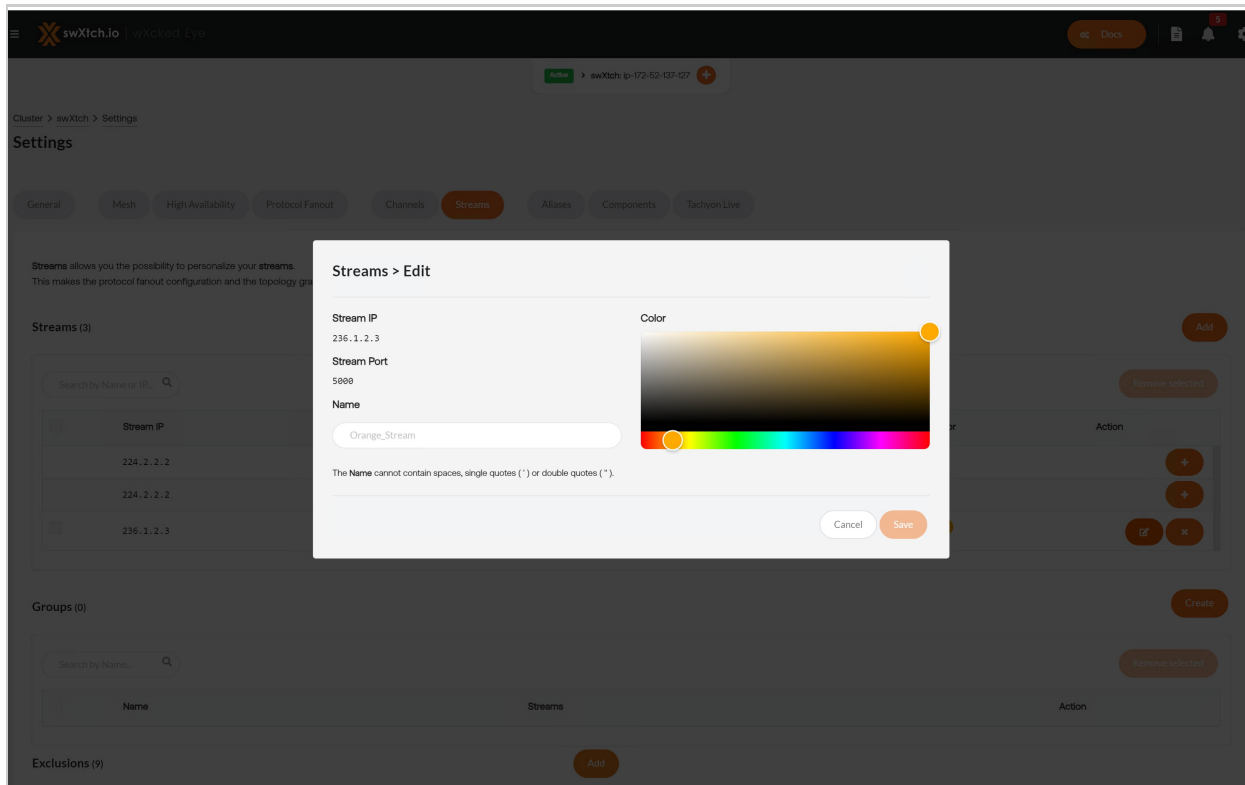
Groups (0) Create

Search by Name...

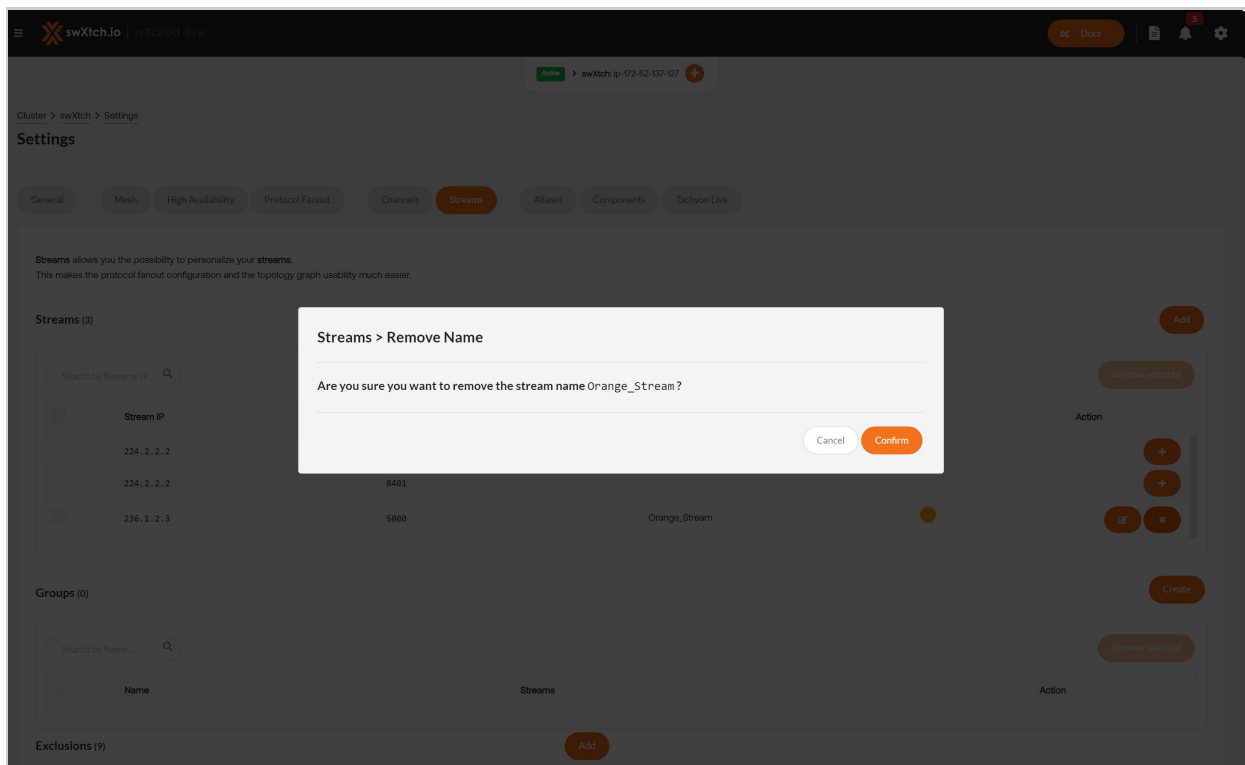
Name	Streams	Action
------	---------	--------

Exclusions (9) Add

**Editing the stream** will open a new window where the stream's name and color can be altered. You cannot edit Stream IP or Stream Port.



he **Delete** button will open a prompt, confirming the stream's name deletion.



**Please note:** This will only delete the Stream's name and color designation from the wXcked Eye UI. If the cloudSwXtch still detects the stream, it will still be listed under Streams.

## Groups

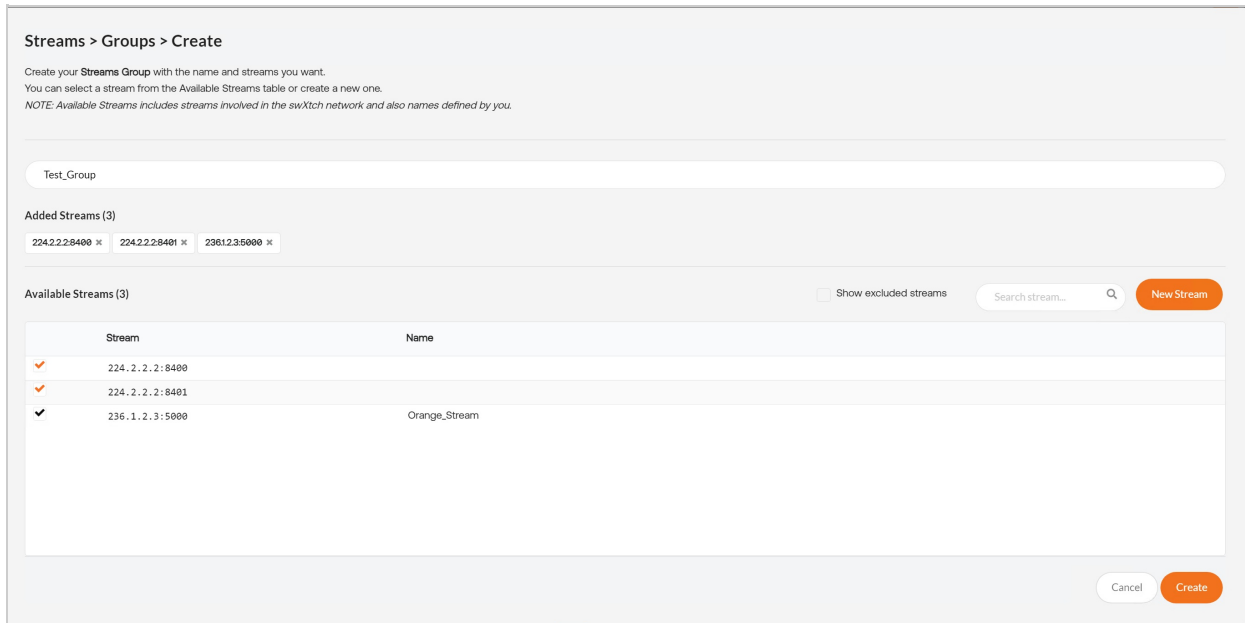
Further down the page under Groups, users can assign a number of streams a group designation so that they appear highlighted together in the Topology Graph. In the example below, the user created two groups, UHD and HD.





This would help them distinguish between different “types” of streams in the Topology Graph, highlighting ones only belonging to their assigned group.

### Creating a Group



#### To create a Group:

1. Click the **Create** button at the top of the **Groups** section on the page. A new window will open.
2. Assign the streams group a name.
3. Select the streams you will like to add to the Group.
  - a. You can also add a New Stream to the Available Streams list directly in the window. You will follow the same prompts as the Streams tab.
4. Click Create.

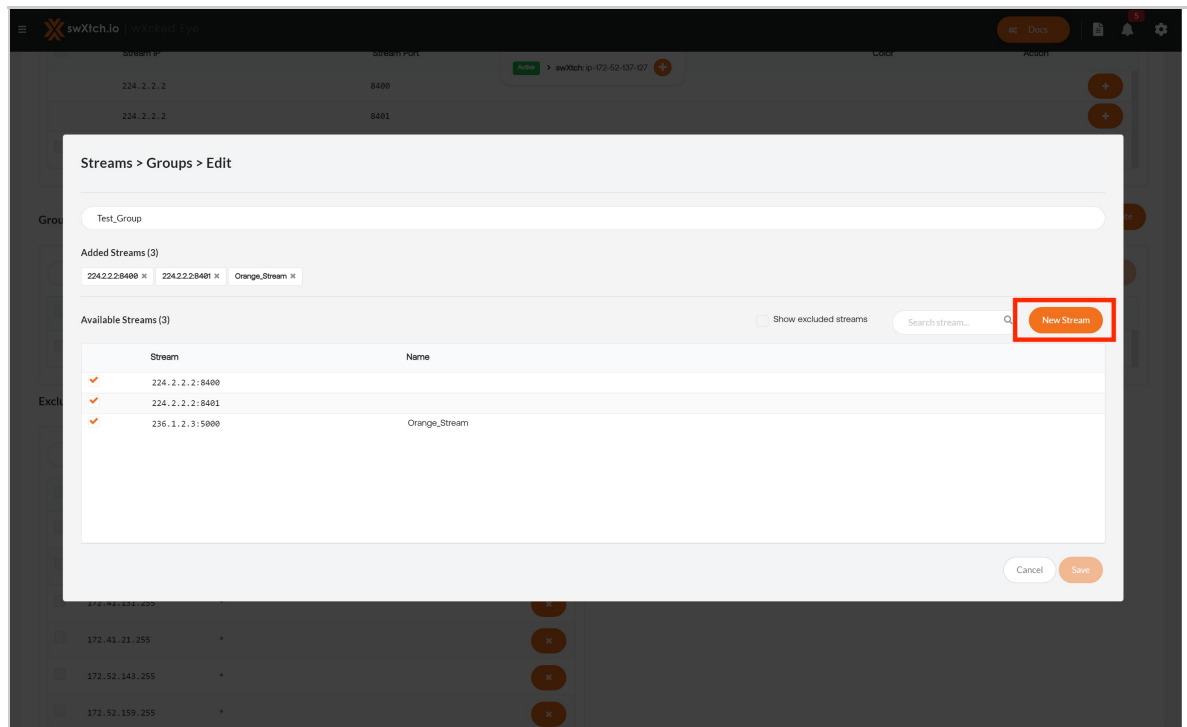
A new group will appear in your Groups list.

### Editing and Deleting a Group

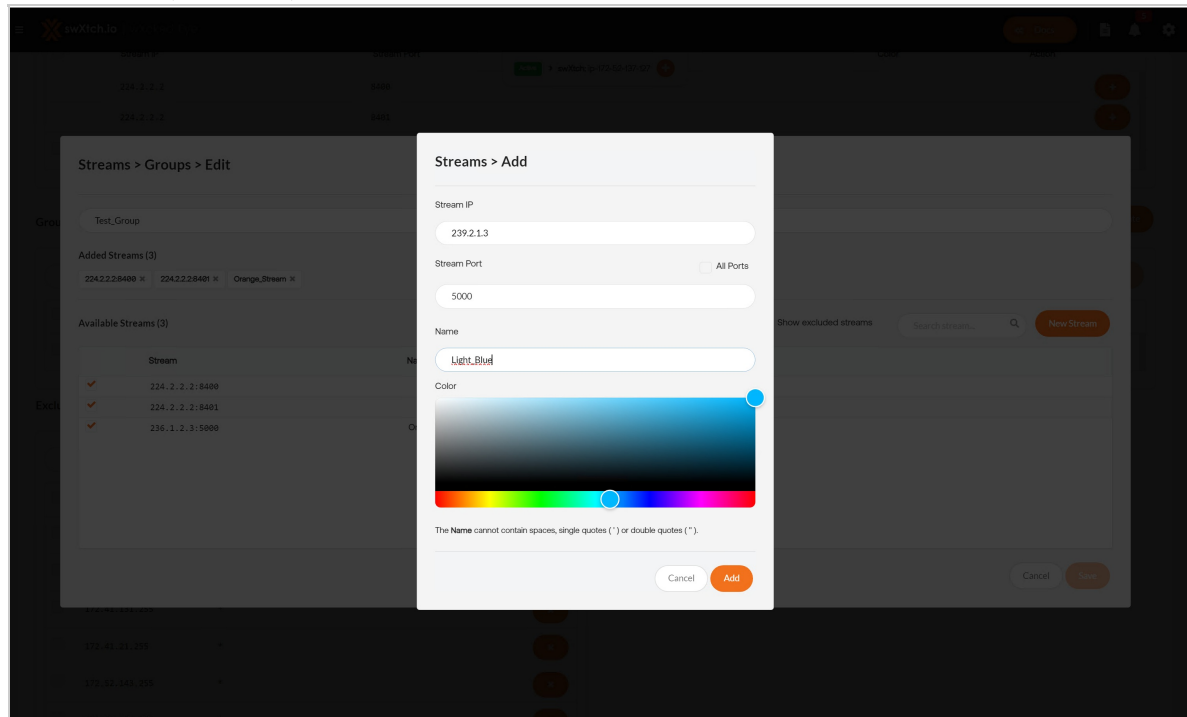
Under the Action column, users can edit or delete their groups from their Groups list. Editing a group will open a new window where they can add and remove streams or rename the Streams Group.

If a stream is now in the Available Streams list, the user can do the following to add a New Stream:

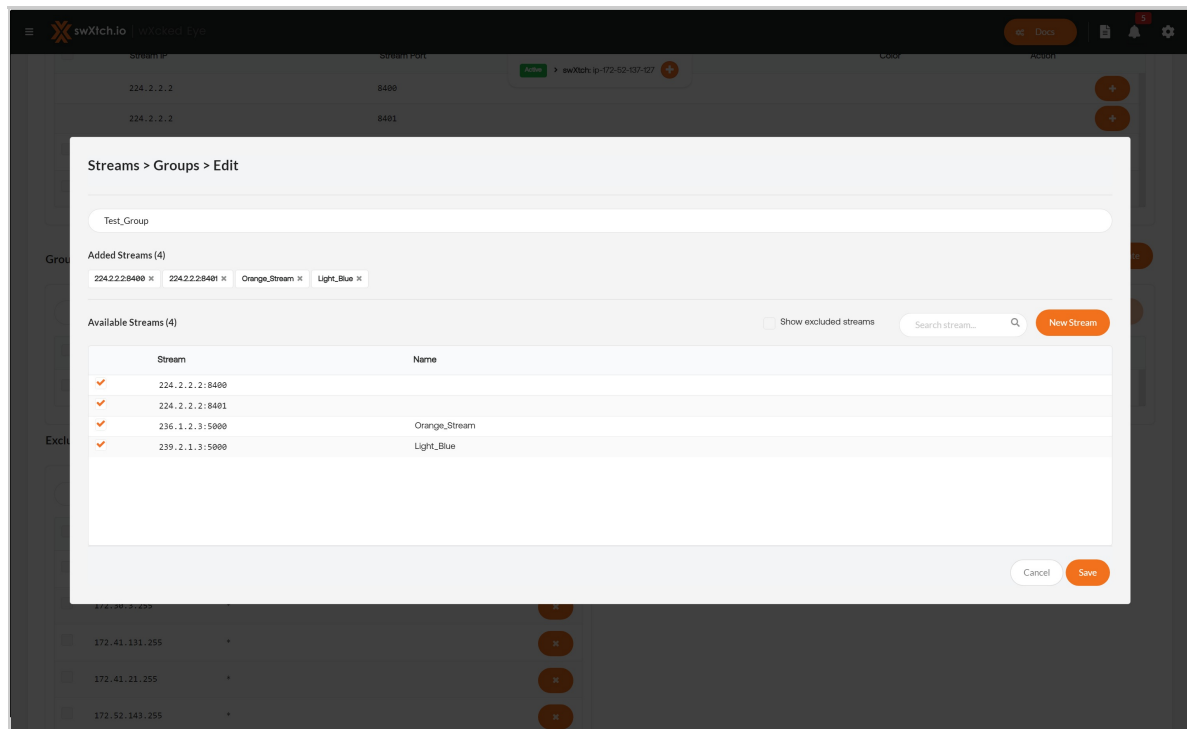
1. Select New Stream in the Create or Edit Group window. A new window will open, requesting information.



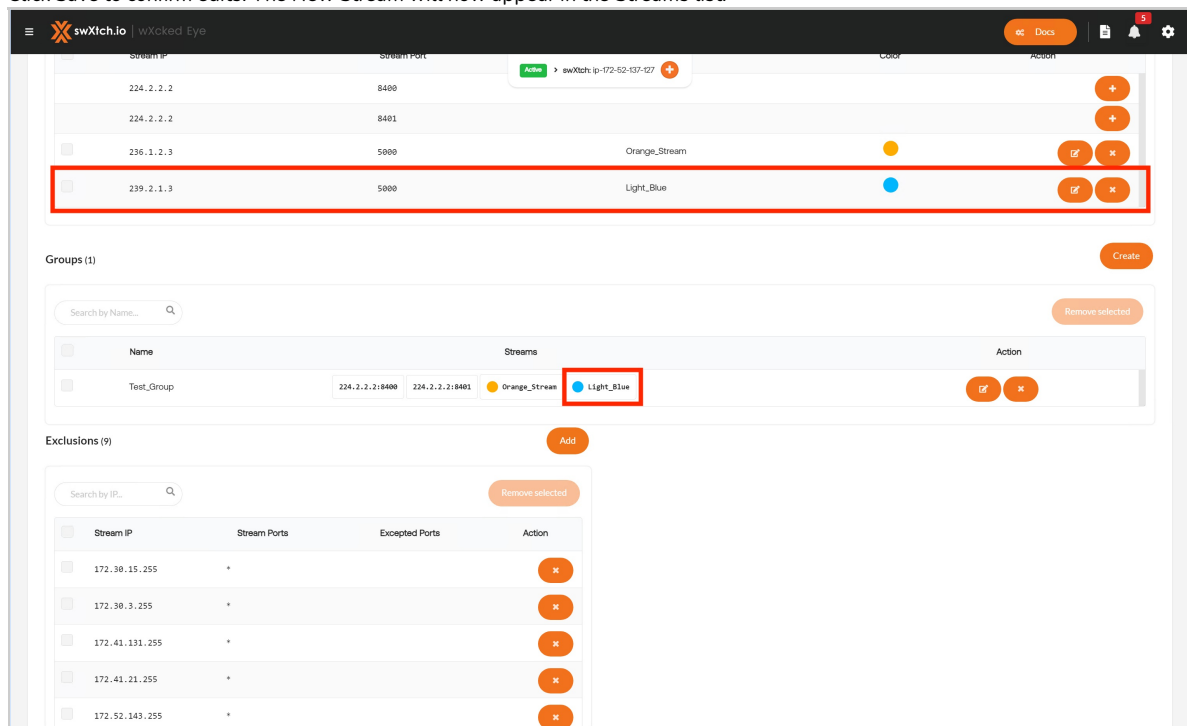
2. Add the Stream IP, Stream Port, Name and Color of the stream.



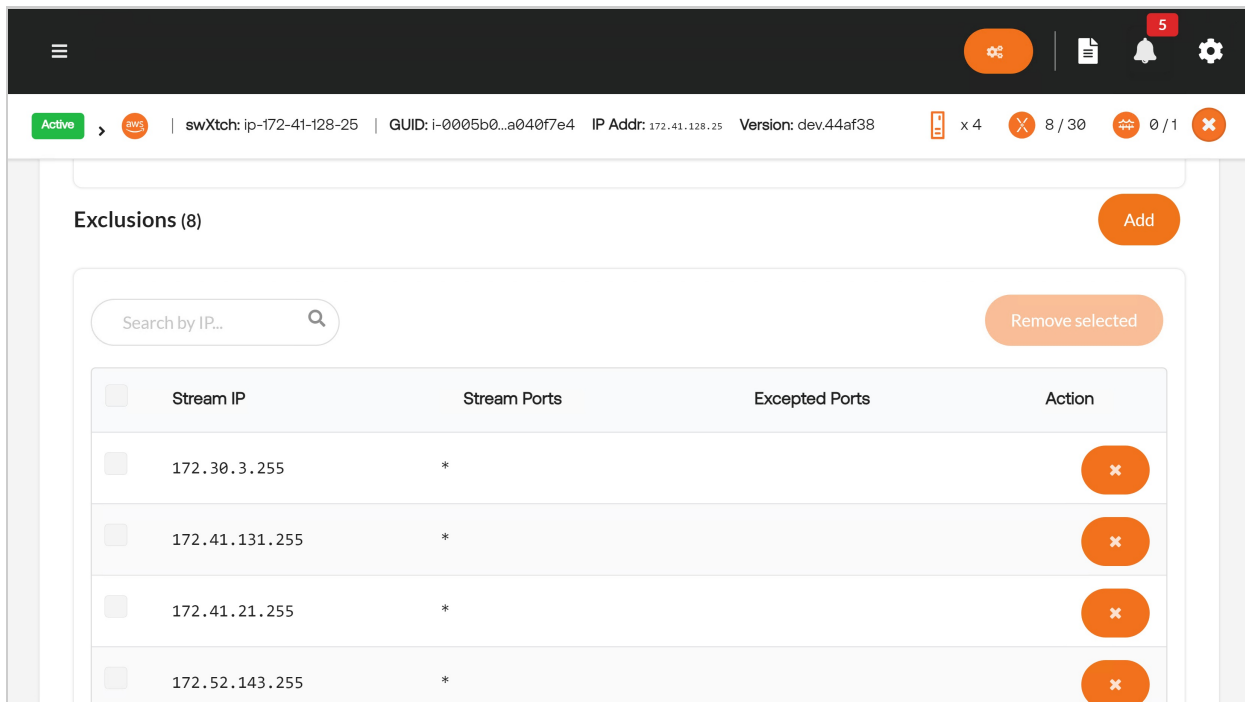
3. Click Add. A new stream will be available to add to the Streams Group.



4. Click Save to confirm edits. The New Stream will now appear in the Streams list.

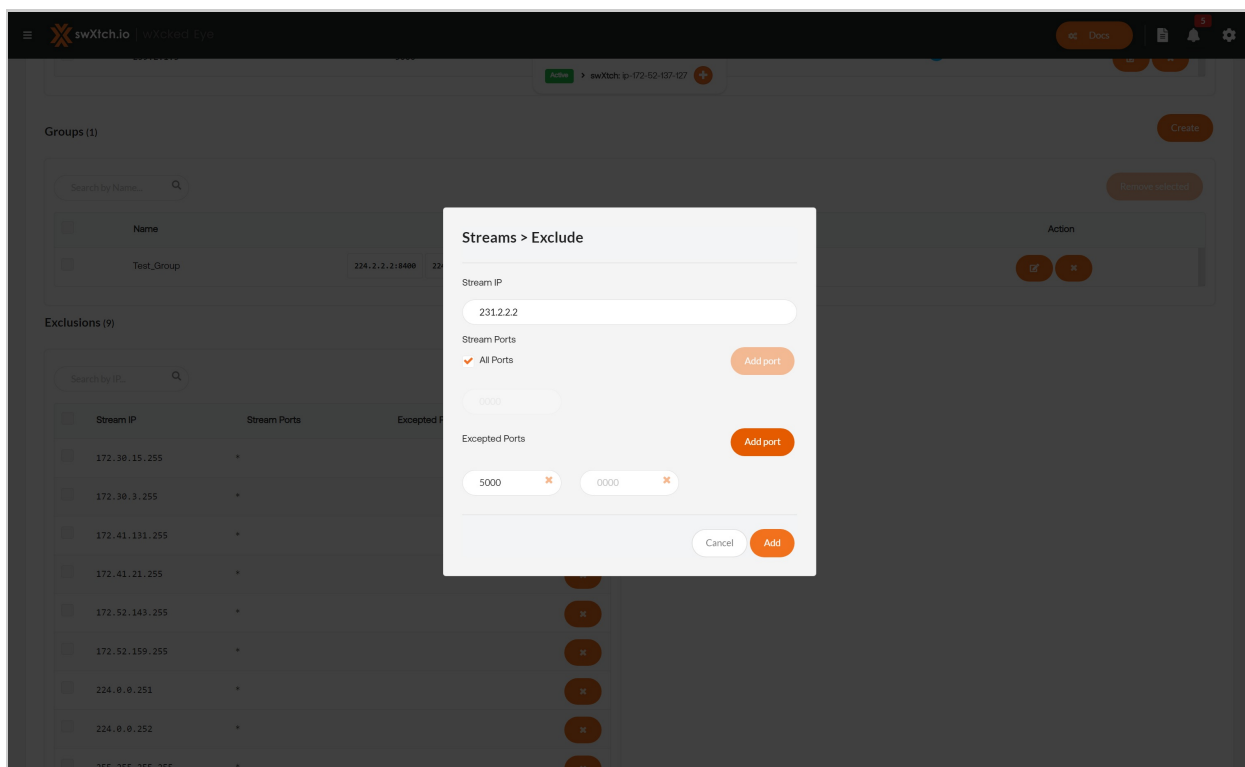


## Exclusions



The Streams tab includes the functionality to exclude streams from all monitoring related activities in wXcked Eye and swXtch-top. This is especially beneficial for users who use external software to generate additional streams that don't want them included when monitoring packet and data flow through the cloudSwXtch.

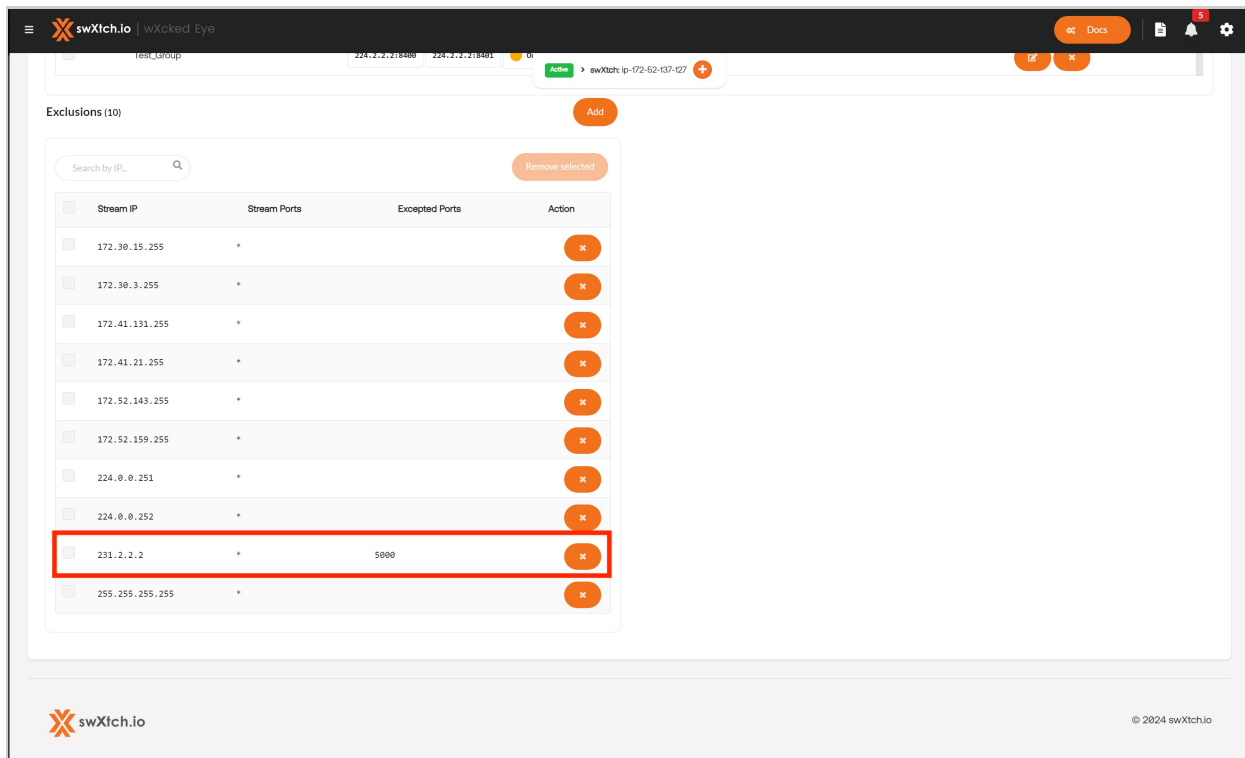
#### Adding an Exclusion



#### To add an exclusion:

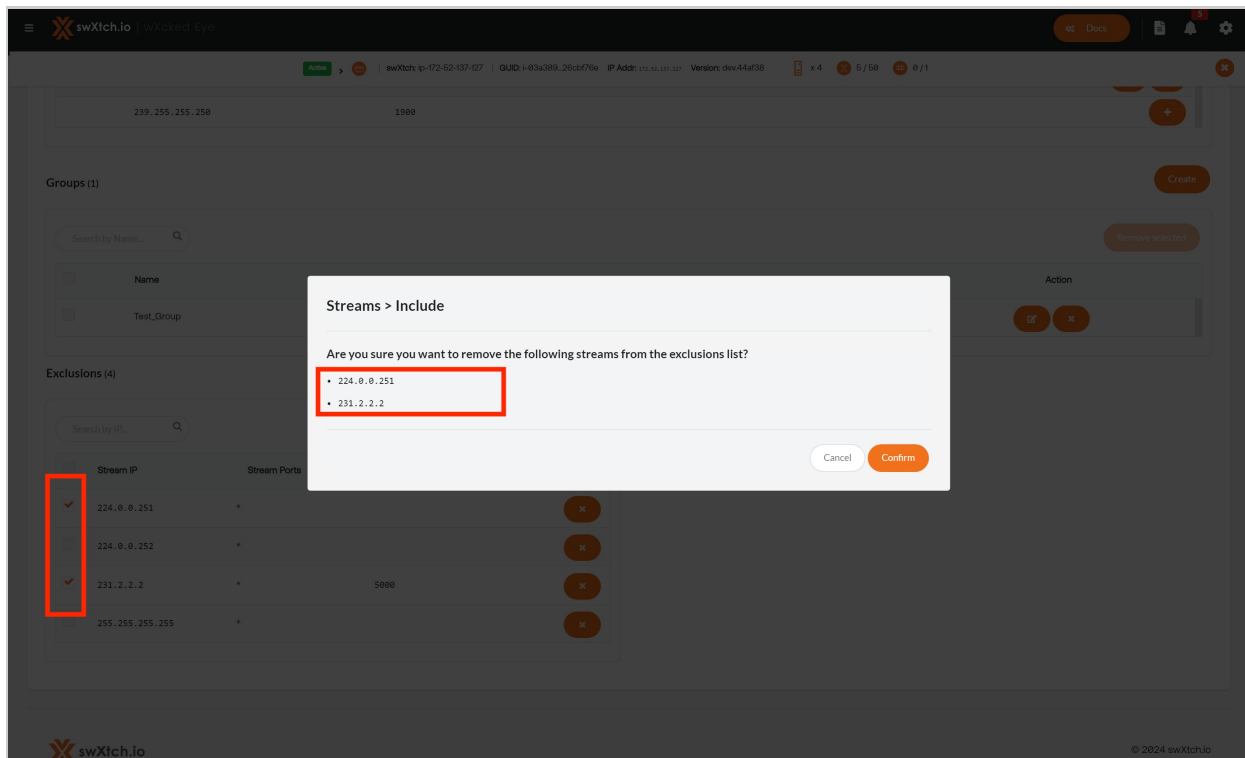
1. Click the Add button at the top of the Exclusions section of the Streams page. A new window will open.
2. Enter the Stream IP. You can also specify all or some ports.
  - a. You can also specify Excepted Ports where streams coming in from those ports are allowed.
3. Click Add.

A new stream should appear in the Exclusions list.



### Deleting an Exclusion

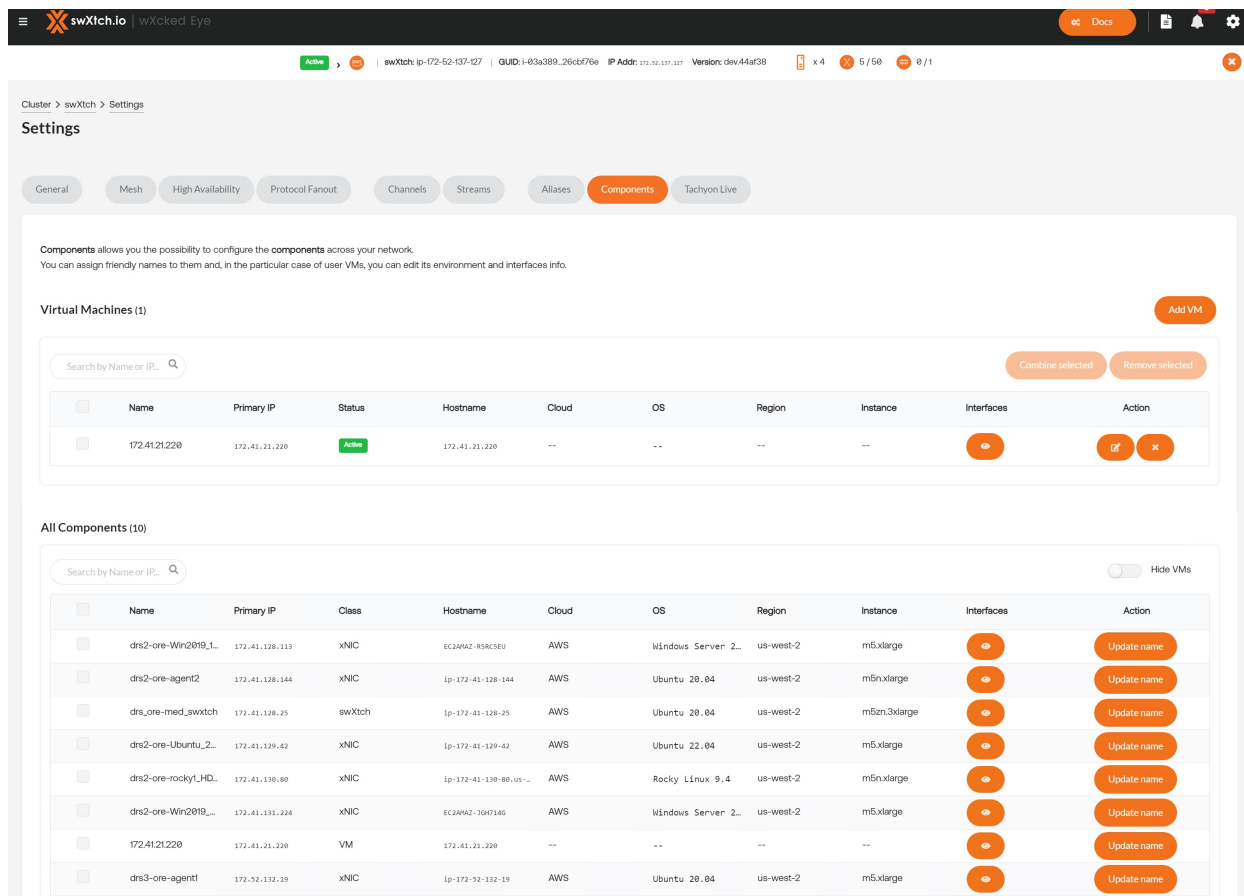
To delete an exclusion, click the X action button to the right of the listed stream OR select multiple streams. A prompt will appear, confirming your request.



# Components

## WHAT TO EXPECT

In this article, users will learn how the Components tab under Settings allows them to edit the description of nodes in the Topology graph. In addition, users will learn how to merge two VM components, or interfaces, as a single VM.



## Introduction

The Components tab under the Settings page in wXcked Eye lists all of the virtual machines displayed in the Topology graph. It is separated into two sections: Virtual Machines and Components.

### Virtual Machines

The Virtual Machines section is designated for VMs without an xNIC installed. Here, users can manually populate information for these non-xNIC VMs, such as the name, Primary IP, hostname, cloud provider, the operating system, the region, and the instance type.

### Components

The Components section is an inclusive list of all VMs associated with the cloudSwXtch (cloudSwXtches, xNICs and cloudSwXtch Bridges). In addition, active VMs without an xNIC are also listed.

Here, users can manually populate information for virtual machines without an xNIC installed and update the name of components in a cloudSwXtch network (cloudSwXtches, xNICs and cloudSwXtch Bridges.)

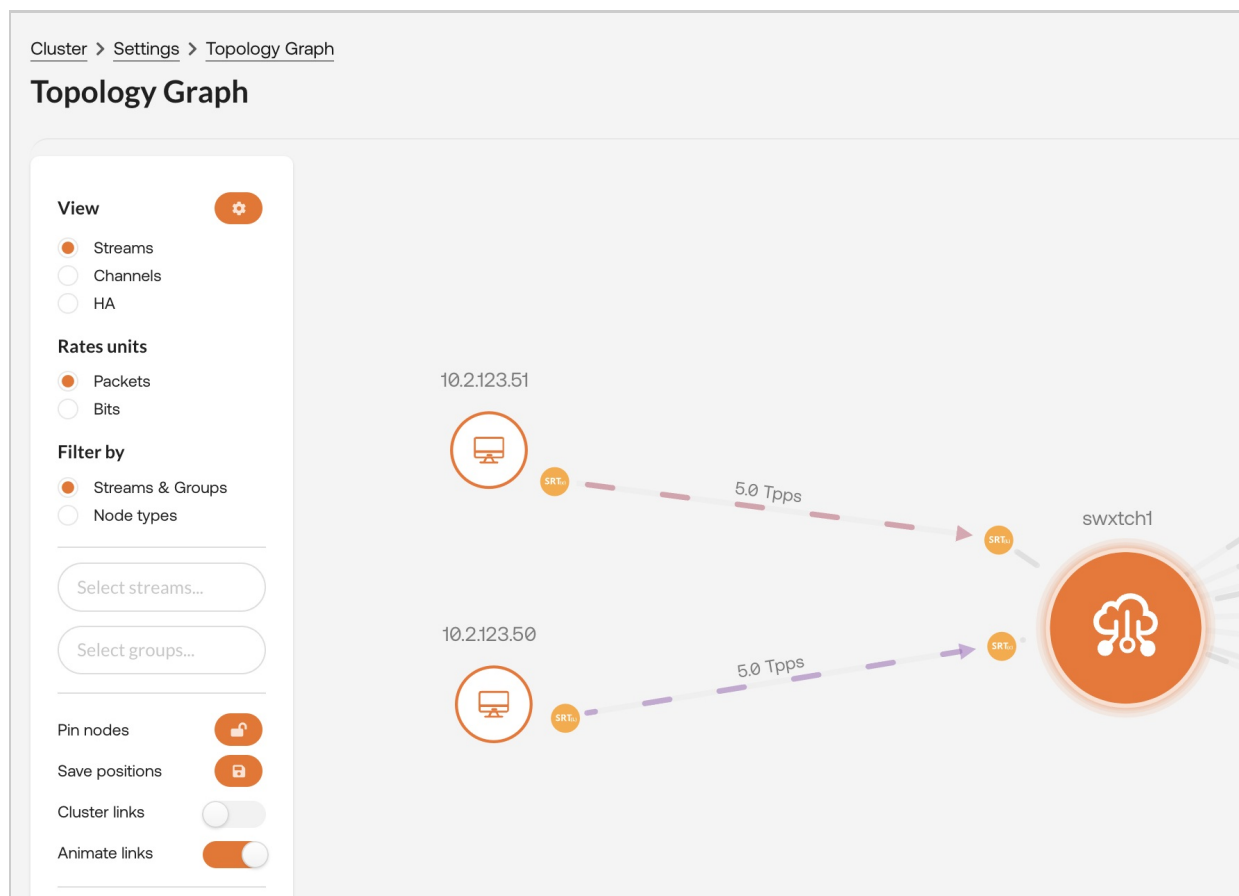
### Updating Component Information

To update a component's information, select Update Name underneath the **Action** column. This will open a new page where users can enter information pertaining to the VM's environment. These fields do not automatically populate when adding a VM to a cloudSwXtch network and will need to be filled manually.

**Please note:** You can also edit the component's information directly in the Topology Graph.

### Merging Interfaces into a Single VM

Since wXcked Eye cannot distinguish between interfaces from a single VM, it ends up duplicating the virtual machine in the topology graph. The Component page allows user to select these duplicated VMs and merge them into a single node. This will display traffic as going to and from the VM.



In this example, there are two different virtual machines displayed as separate nodes in the Topology Graph (10.2.123.50 and 10.2.123.51). However, they are actually the same virtual machine, just different interfaces with separate IPs. This is something that only a user will know.

To merge the interfaces into a single VM, users can follow these next steps:

1. Go to the **Components** tab under the **wXcked Eye Settings** page.
2. Search for the IP addresses of the interfaces that you would like to merge.

Cluster > Settings

### Settings

General Mesh High Availability Protocol Fanout Channels Streams **Components**

Components allows you the possibility to configure the **components** across your network.  
You can assign friendly names to them and, in the particular case of user VMs, you can edit its environment and interfaces info.

Virtual Machines (10) Add VM

10.2.123.5 🔍

<input type="checkbox"/>	Name	Primary IP	Status	Hostname	Cloud	OS	Region	Instance	Interfaces	Action
<input type="checkbox"/>	10.2.123.50	10.2.123.50	Active	10.2.123.50	--	---	--	--		
<input type="checkbox"/>	10.2.123.51	10.2.123.51	Active	10.2.123.51	--	---	--	--		

Combine selected Remove selected

3. Select the two interfaces and click **Combine selected**.
  - a. This will open a new page where you can set the information for the combined VM.

Cluster > Settings

## Settings

General Mesh High Availability Protocol Fanout Channels Streams **Components** Apps

Components allows you the possibility to configure the **components** across your network.  
You can assign friendly names to them and, in the particular case of user VMs, you can edit its environment and interfaces info.

Virtual Machines (10) Add VM

10.2.123.5 Q Combine selected (2) Remove selected (2)

<input type="checkbox"/>	Name	Primary IP	Status	Hostname	Cloud	OS	Region	Instance	Interfaces	Action
<input checked="" type="checkbox"/>	10.2.123.50	10.2.123.50	Active	10.2.123.50	---	---	---	---	<span>+</span>	<span>🔍</span> <span>✖</span>
<input checked="" type="checkbox"/>	10.2.123.51	10.2.123.51	Active	10.2.123.51	---	---	---	---	<span>+</span>	<span>🔍</span> <span>✖</span>

4. Under **General**, set the combined VM's **Primary IP address** and assign the VM a name. This will be used in the Topology graph. It is recommended to select a name that explicitly indicates that this VM has two separate interface.
5. Add information regarding the VM's **environment**.
6. Under **Interfaces**, assign a **name** to each of the two selected interfaces.
7. Click **Save**.
  - a. The two VMs should now be merged into one with the primary interface IP set.

### Components > Combine VMs

#### General

Primary IP

Name

#### Environment

Hostname

Cloud

OS

Region

Instance

#### Interfaces

Add NIC

Name

Primary IP

Name

IP

8. Confirm the merge by selecting the **eye icon under Interfaces**.



Cluster > Settings

## Settings




General Mesh High Availability Protocol Fanout Channels Streams **Components** Apps

Components allows you the possibility to configure the components across your network.  
You can assign friendly names to them and, in the particular case of user VMs, you can edit its environment and interfaces info.

Virtual Machines (9) Add VM

10.2.123.5

Combine selected Remove selected

<input type="checkbox"/>	Name	Primary IP	Status	Hostname	Cloud	OS	Region	Instance	Interfaces	Action
<input type="checkbox"/>	Combined_VM	10.2.123.50	Active	10.2.123.50	AWS	Linux	US East	--		 

a. This will open a new window, listing the VM's interfaces.

Cluster > Settings

## Settings

General Mesh High Availability Protocol Fanout Channels

Components allows you the possibility to configure the components across your network.  
You can assign friendly names to them and, in the particular case of user VMs, you can edit its environment and interfaces info.

Virtual Machines (9)

10.2.123.5

Combine selected Remove selected

**Combined\_VM** ✕

Primary IP 10.2.123.50

Interfaces


Name	eth0
IP	10.2.123.50
Name	eth1
IP	10.2.123.51

Close

9. Verify that the new combined node is visible in the Topology Graph.

Cluster > Settings > Topology Graph

## Topology Graph

**View** 

☒ Streams  
☐ Channels  
☐ HA

**Rates units**


☒ Packets  
☐ Bits


**Filter by**

☒ Streams & Groups  
☐ Node types

Select streams...

Select groups...

Pin nodes 

Save positions 

Cluster links ☐

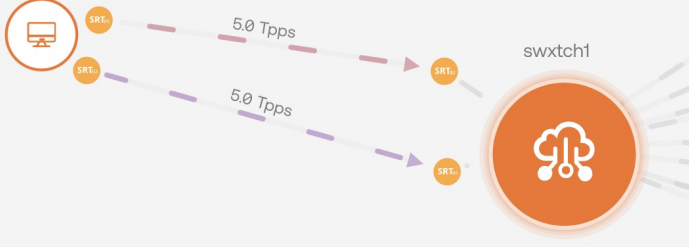
Animate links ☒

Combined\_VM

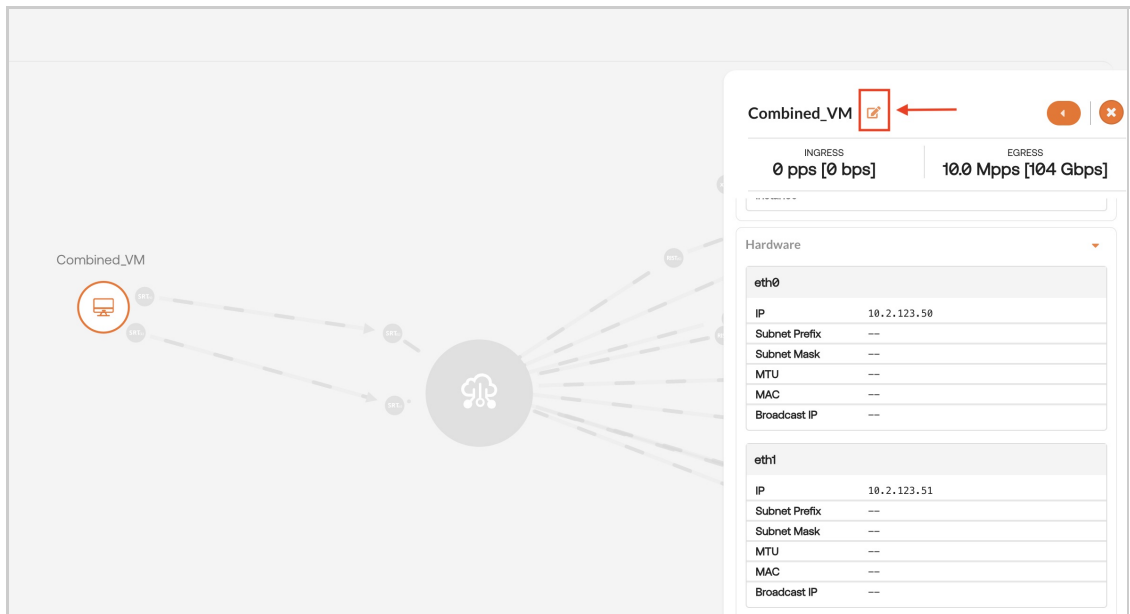
swxtch1

5.0 Tpps

5.0 Tpps



a. You can also see the component's information by highlighting the node. Editing is also available and will update the node's information across the wXcked Eye UI.



## Configuring cloudSwXtch for HA

### WHAT TO EXPECT

In this article, users will learn about the specific commands they can use to configure the cloudSwXtch for high availability. However, it is the **preferred** method for users to configure the cloudSwXtch for high availability via wXcked Eye.

For more information, see [High Availability with wXcked Eye](#).

## Configuring cloudSwXtch for High Availability

For High Availability to work, the cloudSwXtch must be configured. This allows for the system to know the paths through user naming and ultimately enables HA views in swXtch-top. In this section, we will review the various HA commands available to the user for a successful high availability configuration.

Users can also configure High Availability for the cloudSwXtch in wXcked Eye. That is the preferred method. For more information, see [High Availability with wXcked Eye](#).

### HA Help

To get a list of the HA commands, use -h or --help as shown below.

Bash	Copy
<pre>PS C:\Users\testadmin&gt; swx ha -h High Availability cluster management tool (create, show, and destroy the HA cluster)  Usage:   swx ha [command]  Available Commands:   create      Create or Update the HA cluster of swxtches using a config file   destroy     Destroy the HA cluster   show        Show information about the HA cluster  Flags:   -h, --help                help for ha   -s, --service-host-address string  Host swxtch address in the form &lt;host&gt;[:port]   -d, --show-error          show-error - display additional information for error messages.  Use "swx ha [command] --help" for more information about a command.</pre>	

### NOTE

The default port in which the cloudSwXtch listens for these swx configuration commands is port 80. You can safely omit the port in the "-s" parameter since 80 will be used. Do not use port 10802 (the one used in the config file), as it is intended for xNIC communications only. It will not work for swx commands.

### HA Create

To create or update an HA cluster, a **HAconfig.json** file must exist. Note that the IP is for the control plane. The following shows the format:

Bash	Copy
<pre>{   "name": "MY High Availability",   "paths": [     {       "name": "Path 1",       "swxtches": [         "10.2.128.10"       ]     },     {       "name": "Path 2",       "swxtches": [         "10.5.1.6"       ]     }   ] }</pre>	

If there are multiple cloudSwXtches in a path then the last cloudSwXtch added will have the IP address in the configuration. The rest of the cloudSwXtches do not need to be listed.

The -h and --help commands will show the syntax for the "swx ha create" command.

Bash	Copy
<pre> PS C:\Users\testadmin&gt; swx ha create -h Create or Update the HA cluster of swxtches using a config file  Usage:   swx ha create [flags]  Flags:   -h, --help           help for create   -i, --input string    JSON input file  Global Flags:   -s, --service-host-address string  Host swxtch address in the form &lt;host&gt;[:port]   -d, --show-error                  show-error - display additional information for error messages. </pre>	

Below is the command:

Bash	Copy
<pre> swx ha create -i &lt;path_to_config&gt; -s &lt;cloudSwXtch_IP&gt; </pre>	

## HA Destroy

To remove a cloudSwXtch from the High Availability flow, the "ha destroy" command can be used. The -h and --help commands will show the syntax for the "swx ha destroy" command.

Bash	Copy
<pre> PS C:\Users\testadmin&gt; swx ha destroy -h Destroy the HA cluster  Usage:   swx ha destroy [flags]  Flags:   -h, --help           help for destroy  Global Flags:   -s, --service-host-address string  Host swxtch address in the form &lt;host&gt;[:port]   -d, --show-error                  show-error - display additional information for error messages. </pre>	

Below is the command to leave:

Bash	Copy
<pre> PS C:\Users\testadmin&gt; swx ha destroy -s &lt;swxtch name or control data ip of a cloudSwXtch in the HA configuration&gt; </pre>	

Example:

Bash	Copy
<pre> PS C:\Users\testadmin&gt; swx ha destroy -s cloudswxtch101 Validating cluster deletion. Successfully deleted the cluster. </pre>	

## Removing a cloudSwXtch from an HA configuration

To remove a cloudSwXtch from a user's HA configuration, they will need to delete and recreate their HA cluster without that cloudSwXtch.

## HA Show

To get a list of cloudSwXtches part of the HA flow, the "ha show" command can be used. The -h and --help commands will show the syntax for the "swx ha show" command.

Bash	Copy
<pre> PS C:\Users\testadmin&gt; swx ha show -h Show information about the HA cluster  Usage:   swx ha show [flags]  Flags:   -h, --help           help for show  Global Flags:   -s, --service-host-address string  Host swxtch address in the form &lt;host&gt;[:port]   -d, --show-error                  show-error - display additional information for error messages. </pre>	

Below is the command to list:

Bash

Copy

```
swx ha show -s <swtch name or control data IP of a cloudSwXtch in the HA configuration>
```

Example below:

Bash

Copy

```
PS C:\Users\testadmin> swx ha show -s cloudswxtch101
{
  "clusterConfig": {
    "uid": "D20E820C-91DE-A571-4C7C-B60C1695973D",
    "name": "dsd-100-200-HA",
    "paths": [
      {
        "name": "Path1",
        "swxtches": [
          "10.2.128.10"
        ]
      },
      {
        "name": "Path2",
        "swxtches": [
          "10.5.1.6"
        ]
      }
    ]
  }
}
```

swxtch-top has options for HighAvailability. For more information, see the [swxtch-top](#) article.

## Configuring xNIC on Endpoints for HA

### WHAT TO EXPECT

In this article, users will learn the various ways xNICs at their endpoints can be configured for high availability. While they can do it manually below, it is **recommended** to configure High Availability via the [wXcked Eye Topology Graph](#).

- [Single Multicast Group](#)
- [Multiple Multicast Group](#)
- [Source Specific Multiple Multicast](#)
- [Multi-VPC/Data NIC Support](#)

**Note:** Reinstalling the xNIC will re-write configuration files to their original state, undoing any of the above configurations.

### Configuring xNIC for High Availability

After a user sets up their cloudSwXtch for High Availability, the xNIC will automatically configure itself to receive and/or send HA traffic for a single multicast group. Users can confirm high availability has been configured by viewing the JSON file in the VM where their xNIC resides.

#### Where to Find the Bridge JSON File

To configure the cloudSwXtch Bridge for high availability streams, the swxtch-bridge.json file needs to be updated. See where to locate them below:

#### For Linux:

The file can be found in `/var/opt/swxtch/xnic.json`. Currently, only V1 is supported for Linux.

To edit the file, one option is to use nano as shown below:

Bash

Copy

```
sudo nano /var/opt/swxtch/xnic.json
```

#### For Windows:

The file can be found in `C:\Program Files\SwXtch.io\Swxtch-xNIC\xnic.json`

### Single Multicast Group

An example of the `xnic.json` file is shown below. Note the **ha** section has been added.

Bash

Copy

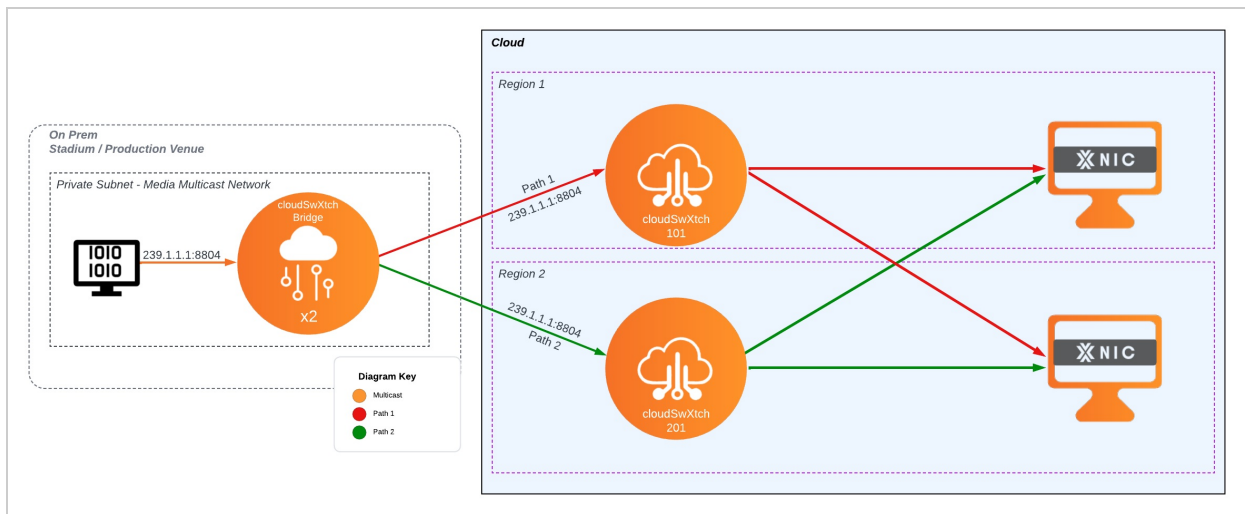
```
{
  "swxtch": "10.2.128.10",
  "controlInterface": "Ethernet 2",
  "dataInterface": "Ethernet",
  "dataPort": 9999,
  "xnicType": 2,
  "dataPlaneSpecs": {
    "verbosity": 0,
    "virtualInterface": {
      "name": "swxtch-tun0",
      "ip": "172.30.0.0",
      "subnet": "255.255.0.0",
      "mtu": 4096
    },
    "bpfPrograms": [
    ]
  },
  "ha": {
    "enable": true,
    "protocol": "rtp",
    "deduplication": {
      "maxTimeToBufferPacketsMs": 50,
      "bufferSizeInPackets": 131072
    }
  },
  "overrideSrcIp": false,
  "statsReportWait": 60,
  "subscriptionsPollingIntervalMs": 100
}
```

### ha Section Explained

The ha section exposes variables that can alter the behavior of the hitless switching code. The values for `MaxTimeToBufferPackets_ms` and `BufferSizeInPackets` in the example are good, suggested values; however, they can be tweaked to meet desired high availability requirements.

- **enable**: If set to true, the xNIC will join the HA cluster when configured. The data and control traffic will start flowing to/from `cloudSwXtches` in the HA cluster. If set to false, the xNIC will ignore the HA cluster and continue operating only with its primary `cloudSwXtch`. The default is true as it is the most common use case.
- **Protocol**- how to parse the packet. The available options are **swxtch** or **rtp**.
  - **swxtch** = This can be used when the xNIC is duplicating or deduplicating the multicast. The xNIC will reconstruct based on the sequence count inside the `cloudSwXtch` packet header.
  - **rtp** = This should be used when processing RTP packets sent from a non-xNIC source. The xNIC will reconstruct based on the RTP timestamp information for Real-time Transport Protocol.
- **deduplication**: This is only valid if "enable" is set to true. When this field is populated with the following values, the data plane will turn on HA and de-duplicate traffic from the HA cluster. If set to null or non-existent, it will receive all traffic from the HA cluster, allowing users to deduplicate using their own application.
  - **MaxTimeToBufferPackets\_ms** - how long to buffer packets before declaring it as lost.
  - **BufferSizeInPackets** - the max number of packets that can be buffered.
- **subscriptionsPollingIntervalMs**: Time in milliseconds to buffer and wait for reordered/delayed packets. *Default: ~100ms*

Below is an example of what a single multicast group configuration might look like. In this example, a user is sending the same multicast traffic (239.1.1.1:8804) via two paths with the xNIC consuming both and deduplicating at the end point.

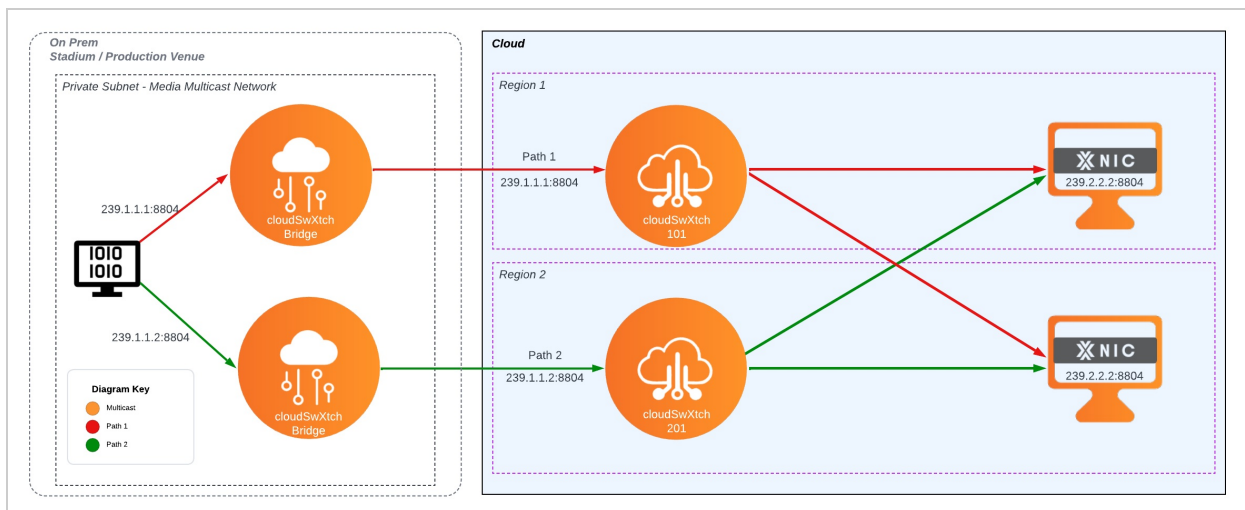


### Multiple Multicast for xNIC

#### Important Rules

- Protocol for Multiple Multicast (MMC) must be set to rtp.
- For MMC on a producer, the xNIC must be Type 1.
- If the producer is set to true, then it must be set to Type 1 even if you're just consuming.
- Multiple NICs are currently not supported for Ingress Windows Type 2.

If a user wants to set up for Multiple Multicast groups, they will need to manually configure the `xnic.json` file. Below is an example of what a multiple multicast group configuration might look like:



In this example, you have two paths with the same multicast traffic with different IP addresses. Path 1 is 239.1.1.1 while Path 2 is 239.1.1.2. The application at the end point is listening to 239.2.2.2, which is grouping together Path 1 and Path 2. The xNIC at the end point is tasked with deduplication.

A sample `xnic.json` file of the diagram is shown below with a "streamSpecs" section added.

**Note that the following rules apply to this json file:**

- The `xnicType` is set to 2 but could also be 1. It has to be set to 1 if the VM is for a producer.
- In the HA section, the protocol is set to `rtp`.

Bash

Copy

```
{
  "swtch": "10.2.128.10",
  "controlInterface": "Ethernet 2",
  "dataInterface": "Ethernet",
  "dataPort": 9999,
  "xnicType": 2,
  "dataPlaneSpecs": {
    "verbosity": 0,
    "virtualInterface": {
      "name": "swtch-tun0",
      "ip": "172.30.0.0",
      "subnet": "255.255.0.0",
      "mtu": 4096
    },
    "bpfPrograms": [
    ]
  },
  "ha": {
    "enable": true,
    "protocol": "rtp",
    "deduplication": {
      "maxTimeToBufferPacketsMs": 50,
      "bufferSizeInPackets": 131072
    }
  },
  "streamSpecs": {
    "mmcProducerEnable": false,
    "multipleMulticastGroups": {
      "239.2.2.8804": {
        "pathStreams": [
          {
            "stream": "239.1.1.1:8804"
          },
          {
            "stream": "239.1.1.2:8804"
          }
        ]
      }
    }
  },
  "overrideSrcIp": false,
  "statsReportWait": 60,
  "subscriptionsPollingIntervalMs": 100
}
```

Here, the user is grouping together 2 multicast IPs (239.1.1.1 and 239.1.1.2) and assigning it a multicast group IP address (239.2.2.2). The application at the endpoint is listening for 239.2.2.2, which the xNIC will deduplicate into a stream from 239.1.1.1 and 239.1.1.2. This was illustrated in the diagram above.

**Please note:** At this time, the ports for the multicast group and the path streams must be the same.

### How to update `xnic.json` file for Multiple Multicast Groups

The user will have to make the following changes to their `xnic.json` file found in the [single multicast group configuration](#) to match the example above. These alterations to the `xnic.json` file should happen after [Configuring the cloudSwXtch for High Availability](#).

1. The default xNIC Type is set to 2. Change the xNIC type to 1 if following conditions are true:
  - a. if the VM is a producer
  - b. OR if the VM is a Windows machine with multiple data NICs. For more information about multiple data NICs, see [here](#).
2. Change the protocol under `ha` from "`swtch`" to "`rtp`" including the quotation marks.
3. **For each multicast group**, add the following "`streamSpecs`" section as shown below with your stream data. If the VM is a producer, set `mmcProducerEnable` to true. **Note:** A user can enter multiple multicast groups.



```

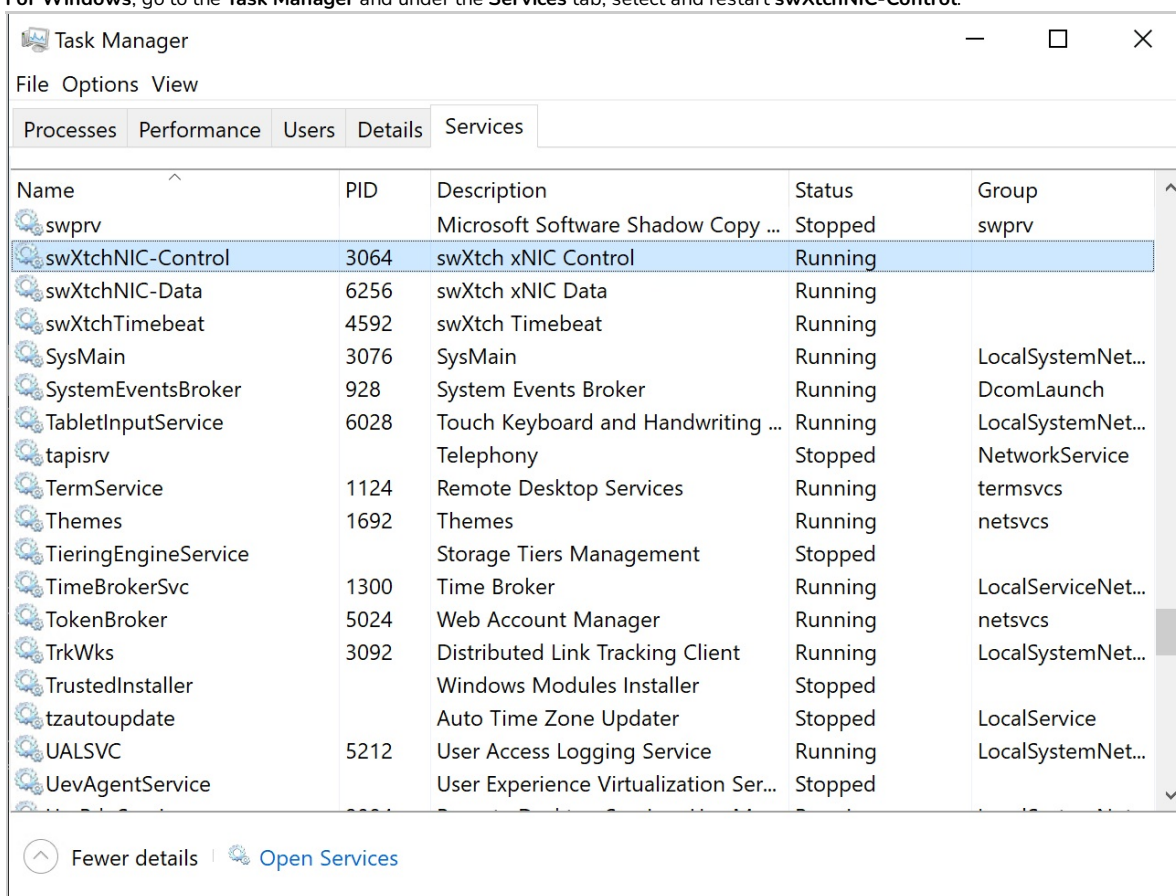
Bash Copy
},
  "streamSpecs": {
    "mmcProducerEnable": false,
    "multipleMulticastGroups": {
      "239.2.2.2:8804": {
        "pathStreams": [
          {
            "stream": "239.1.1.1:8804"
          },
          {
            "stream": "239.1.1.2:8804"
          }
        ]
      }
    }
  }
},
}

```

3. Save the **xnic.json** file.

4. Restart the **swXtch-NIC Control** service.

- For Windows, go to the **Task Manager** and under the **Services** tab, select and restart **swXtchNIC-Control**.



- For Linux, use the following command:

```

Bash Copy
sudo systemctl restart swxtch-xnic-control

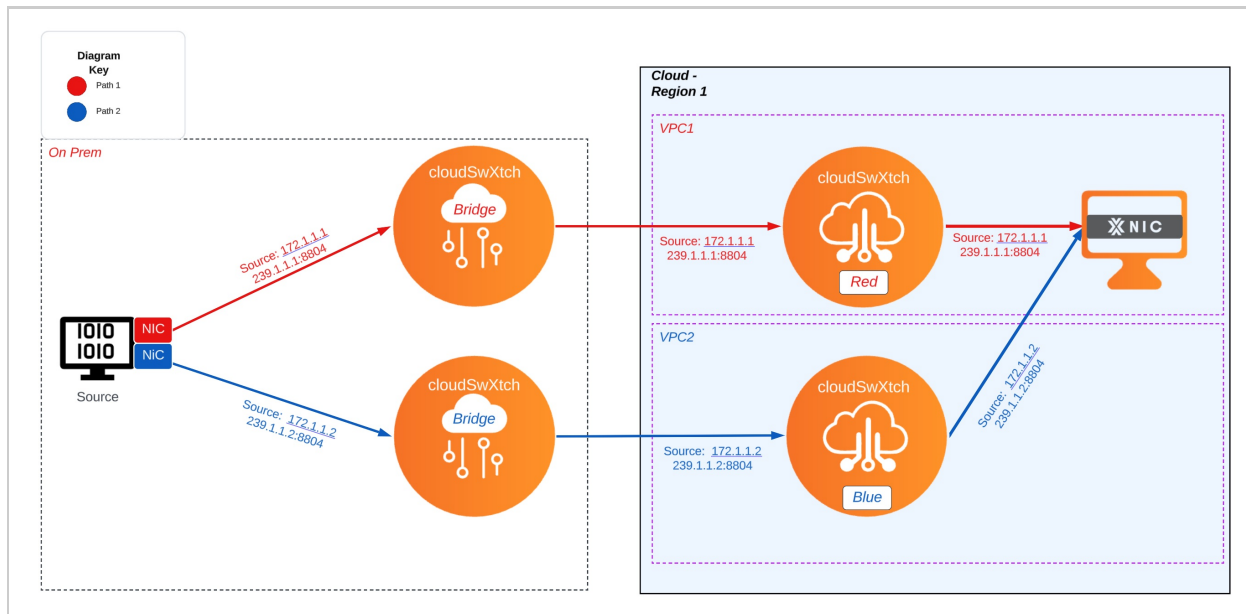
```

## Source Specific Multiple Multicast

### Important Rules

- Protocol for Source Specific Multiple Multicast must be set to **rtp**.
- For Source Specific Multiple Multicast on a producer, the xNIC must be Type 1.
- If the producer is set to true, then it must be set to Type 1 even if you're just consuming.

If a user wants to set up Source Specific Multiple Multicast groups, they will need to manually configure the **xnic.json** file. Below is an example of what a source specific multiple multicast group configuration might look like:



In this example, you have two paths with the same multicast traffic with different multicast IP addresses along with their sources. Path 1 is 239.1.1.1 with a source of 172.1.1.1 while Path 2 is 239.1.1.2 with a source of 172.1.1.2. The application at the end point is listening to 239.2.2.2, which is grouping together Path 1 and Path 2. The xNIC at the end point is tasked with deduplication.

### Producer

A sample `producer xnic.json` file of the diagram is shown below with a "streamSpecs" section added. **Note that the following rules apply to this producer json file:**

- The `xnicType` is set to 1.
- In the HA section, the `protocol` is set to `rtp`.
- In the streamSpecs section, there is no source specified since it is a producer.

```
{
  "swxtch": "172.41.128.25",
  "controlInterface": "ens5",
  "dataInterface": "ens6",
  "dataPort": 9999,
  "xnicType": 1,
  "xnicRpcPort": 10002,
  "dataPlaneSpecs": {
    "verbosity": 0,
    "virtualInterface": {
      "type": "tun",
      "name": "swxtch-tun0",
      "ip": "172.30.0.0",
      "subnet": "255.255.0.0",
      "mtu": 4096
    },
    "bpfPrograms": [
      {
        "name": "tc-ingress",
        "interface": "ens6",
        "attachPoint": "BPF_TC_INGRESS"
      },
      {
        "name": "tc-egress",
        "interface": "ens6",
        "attachPoint": "BPF_TC_EGRESS"
      },
      {
        "name": "tc-forwarder",
        "interface": "ens5",
        "attachPoint": "BPF_TC_EGRESS"
      },
      {
        "name": "tc-forwarder",
        "interface": "ens7",
        "attachPoint": "BPF_TC_EGRESS"
      }
    ]
  },
  "ha": {
    "enable": true,
    "protocol": "rtp",
    "deduplication": {
      "maxTimeToBufferPacketsMs": 50,
      "bufferSizeInPackets": 131072
    }
  },
  "streamSpecs": {
    "mmcProducerEnable": true,
    "multipleMulticastGroups": {
      "224.2.2.2:8400": {
        "pathStreams": [
          {
            "stream": "224.2.2.3:8400"
          },
          {
            "stream": "224.2.2.4:8400"
          }
        ]
      }
    }
  },
  "overrideSrcIp": false,
  "statsReportWait": 60,
  "subscriptionsPollingIntervalMs": 100
}
```

## Consumer

A sample consumer `xnic.json` file of the diagram is shown below with a "streamSpecs" section added.

**Note that the following rules apply to this consumer json file:**

- The `xnicType` is set to 2 but should be 1 if the VM is a Windows machine with multiple data NICs. For more information about multiple data NICs, see [here](#).
- In the HA section, the protocol is set to `rtp`.
- In the `streamSpecs` section, there is a source specified since it is a consumer.

```
{
  "swxtch": "172.41.128.25",
  "controlInterface": "Ethernet 3",
  "dataInterface": "Ethernet 4",
  "dataPort": 9999,
  "xnicType": 2,
  "xnicRpcPort": 10002,
  "dataPlaneSpecs": {
    "verbosity": 0,
    "virtualInterface": {
      "type": "tun",
      "name": "swxtch-tun0",
      "ip": "172.30.0.0",
      "subnet": "255.255.0.0",
      "mtu": 4096
    }
  },
  "ha": {
    "enable": true,
    "protocol": "rtp",
    "deduplication": {
      "maxTimeToBufferPacketsMs": 50,
      "bufferSizeInPackets": 131072
    }
  },
  "streamSpecs": {
    "mmcProducerEnable": false,
    "multipleMulticastGroups": {
      "239.2.2.2:8400": {
        "overrideSourceIp": "172.1.1.1",
        "pathStreams": [
          {
            "stream": "239.1.1.1:8400",
            "ssm": {
              "filter": "include",
              "srcList": [
                "172.1.1.1"
              ]
            }
          },
          {
            "stream": "239.1.1.2:8400",
            "ssm": {
              "filter": "include",
              "srcList": [
                "172.1.1.2"
              ]
            }
          }
        ]
      }
    }
  },
  "overrideSrcIp": false,
  "statsReportWait": 60,
  "subscriptionsPollingIntervalMs": 100
}
```

Here, you have two paths with the same multicast traffic with different multicast IP addresses along with their sources. Path 1 is 239.1.1.1 with a source of 172.1.1.1 while Path 2 is 239.1.1.2 with a source of 172.1.1.2. The application at the end point is listening to 239.2.2.2, which is grouping together Path 1 and Path 2. The xNIC at the end point is tasked with deduplication.

**Please note:** At this time, the ports for the multicast group and the path streams must be the same.

#### How to update xnic.json file for Source Specific Multiple Multicast Groups

The user will have to make the following changes to their **xnic.json** file found in the [single multicast group configuration](#) to match the example above. These alterations to the xnic.json file should happen after [Configuring the cloudSwXtch for High Availability](#).

1. Change the xNIC type to 1 if the VM is a producer OR if is a Windows machine with multiple data NICs. For more information about multiple data NICs, see [here](#).
2. Change the protocol under ha from "swxtch" to "rtp" including the quotation marks.
3. **Insert the following after the HA section.** Then, for each additional multiple multicast group, add a new multiple multicast set. If the VM is a producer, set mmcProducerEnable to true.

```

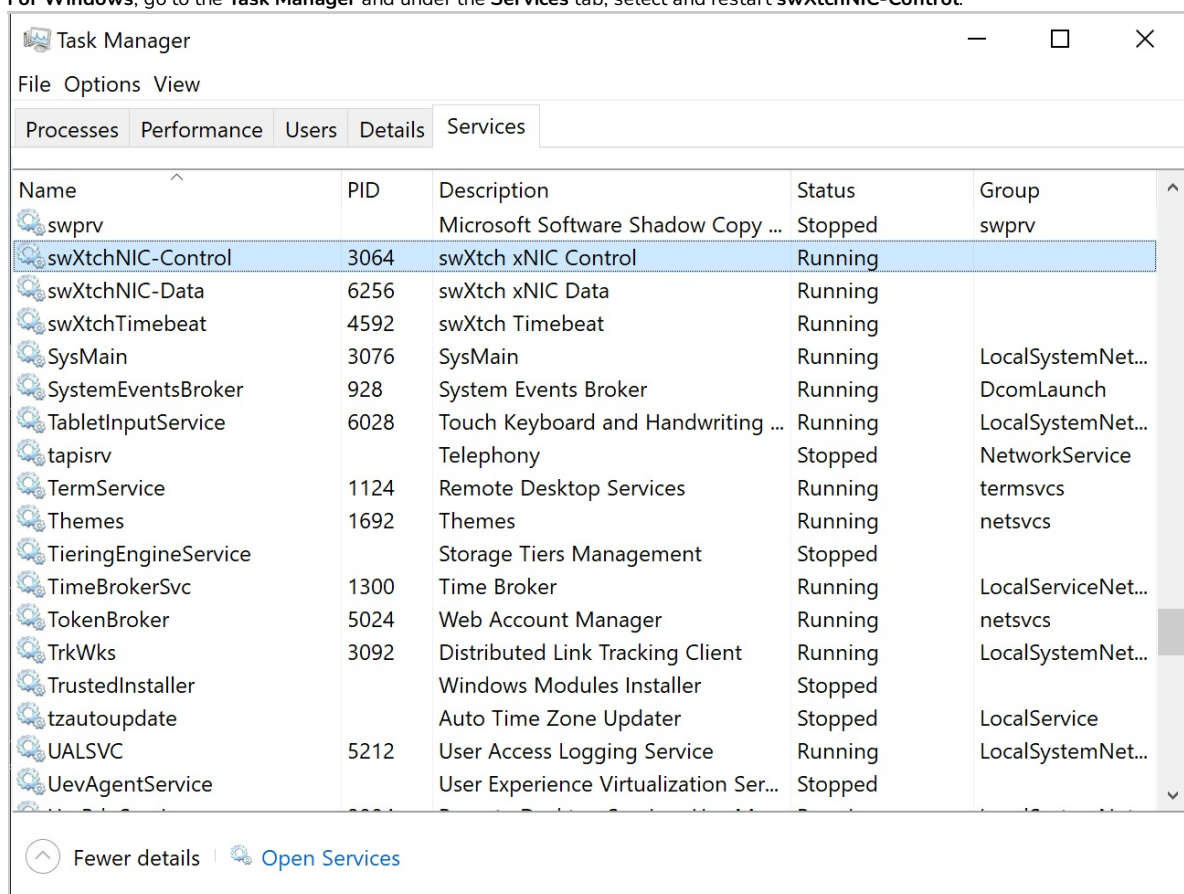
Bash Copy
"streamSpecs": {
  "mmcProducerEnable": false,
  "multipleMulticastGroups": {
    "239.2.2:8400": {
      "overrideSourceIp": "172.1.1.1",
      "pathStreams": [
        {
          "stream": "239.1.1.1:8400",
          "ssm": {
            "filter": "include",
            "srcList": [
              "172.1.1.1"
            ]
          }
        },
        {
          "stream": "239.1.1.2:8400",
          "ssm": {
            "filter": "include",
            "srcList": [
              "172.1.1.2"
            ]
          }
        }
      ]
    }
  }
},
}

```

3. Save the **xnic.json** file.

4. Restart the **swXtch-NIC Control** service.

- For Windows, go to the **Task Manager** and under the **Services** tab, select and restart **swXtchNIC-Control**.



- For Linux, use the following command:

```

Bash Copy
sudo systemctl restart swxtch-xnic-control

```

## How to update xnic.json file to Disable Deduplication at the Consumer

Some users may want to disable deduplication by the xNIC in favor of their own application. To do this, navigate to the xnic.json file and add "null" after the deduplication flag, removing the bracketed maxTimeToBufferPacketsMs and bufferSizeInPackets, as seen in the example below:

PowerShell

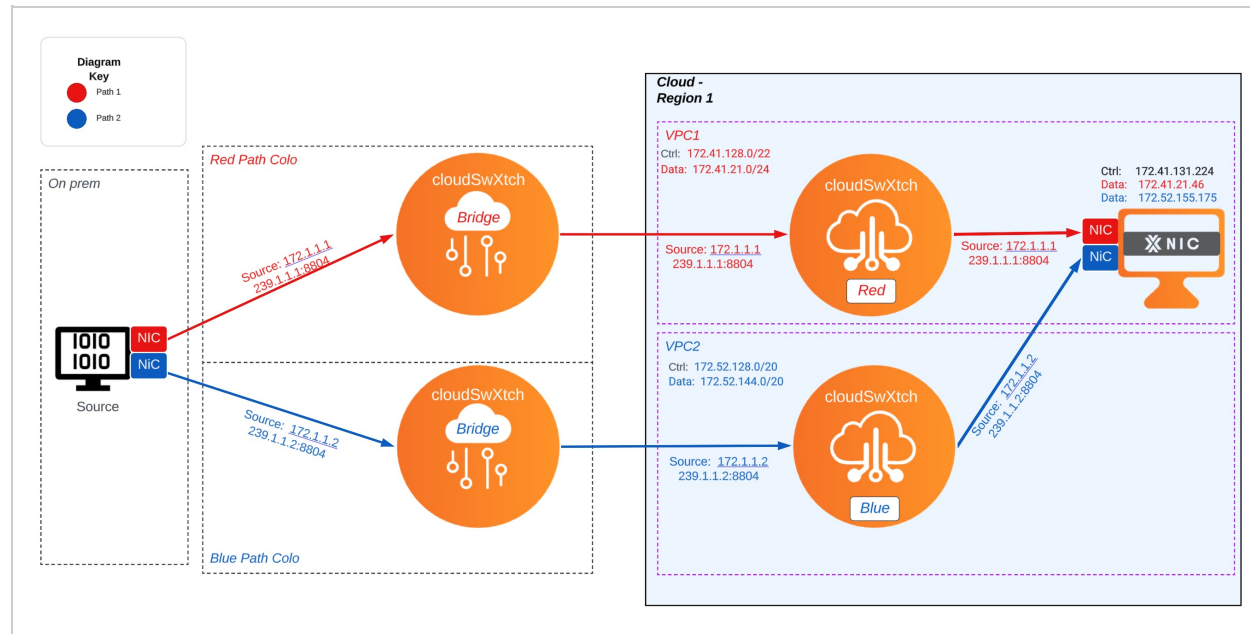
Copy

```
"ha": {
  "enable": true,
  "protocol": "rtp",
  "deduplication": null
},
```

This will inform the xNIC at the consumer VM, receiving traffic from the HA cluster, to not deduplicate the streams. The user can now apply their own application to deduplicate the traffic if they so wish.

## Multiple VPC/Data NIC Support

swXtch.io supports multiple VPC/Data NICs for network isolation across two or more paths. In the example below, you have two data NICs for red and blue paths.



The NICs can belong to either the same VPC or entirely different ones. For better data isolation, it is recommended to have each path flow through different VPCs so that if one complete VPC goes down, traffic will still flow via the other. Another benefit is that since the NIC is part of path/region, no peering is required between VPCs.

### AWS Multi-VPC ENI Attachments Explained

For a detailed description of multi-VPC ENI attachments on AWS, see their documentation here: <https://aws.amazon.com/about-aws/whats-new/2023/10/multi-vpc-eni-attachments/>

## Multiple VPC/Data NIC Rules

The following rules apply for Multiple VPC/Data NIC on xNIC:

1. For Multiple VPC/Data NICs on a producer, the xNIC must be Type 1.
2. If the xNIC is the producer, then single multicast group is supported.
3. Windows consumer must be set to Type 1.

For rules regarding a specific high availability configuration, see the corresponding section:

- [Multiple Multicast](#)
- [Source Specific Multiple Multicast](#)

# Configuring cloudSwXtch Bridge for HA

## WHAT TO EXPECT

In this article, users will learn how to configure Bridge 2 and 3 for High Availability.

## Configuring cloudSwXtch Bridge Type 2 and 3 for High Availability

After a user sets up their cloudSwXtch for High Availability, the cloudSwXtch Bridge will automatically configure itself to receive and/or send HA traffic for a single multicast group. Users can confirm high availability has been configured by viewing the swxtch-bridge.json file in the VM where their cloudSwXtch Bridge resides.

**Reminder:** A cloudSwXtch Bridge can only exist on a Linux machine.

### Where to Find the Bridge JSON File

To configure the cloudSwXtch Bridge for high availability streams, the swxtch-bridge.json file needs to be updated. See where to locate them below:

#### Linux:

The file can be found in /var/opt/swxtch/swxtch-bridge.json. To edit the file, use nano as shown below:

```
Bash
Copy
sudo nano /var/opt/swxtch/swxtch-bridge.json
```

## Single Multicast Group

An example of the swxtch-bridge.json file is shown below. Note the ha section has been added. While it may look similar to the xnic.json file, there are a number of differences. One noteworthy addition is the "producer" and "consumer" fields in the ha section.

```
Bash
Copy
{
  "swxtch": "10.2.128.10",
  "controlInterface": "Ethernet 2",
  "dataInterface": "Ethernet",
  "dataPort": 9999,
  "xnicType": 2,
  "dataPlaneSpecs": {
    "verbosity": 0,
    "virtualInterface": {
      "name": "swxtch-tun0",
      "ip": "172.30.0.0",
      "subnet": "255.255.0.0",
      "mtu": 4096
    }
  },
  "ha": {
    "producer": false,
    "consumer": false,
    "maxTimeToBufferPacketsMs": 50,
    "bufferSizeInPackets": 131072,
    "protocol": "swxtch"
  },
  "statsReportWait": 60
}
```

It is important to imagine configuration from the perspective of the cloudSwXtch Bridge. At default, both the producer and consumer is set to false. Switching either to true will change the direction of the high availability.

- **If the producer is set to true**, the cloudSwXtch Bridge is producing duplicate streams taken from on-prem applications and sending to cloudSwXtches in the cloud.
- **If the consumer is set to true**, the cloudSwXtch Bridge is receiving duplicate streams from the cloud. However, unlike the xNIC, it does not do the deduplication and will send both streams to the on-prem applications.

Whether it is producer or consumer, one of them has to be set to true in order to activate high availability via the cloudSwXtch Bridge.

Once a selection has been made, a user **must restart the cloudSwXtch Bridge control service** by running the following command:

### Bridge Type 3:

```
Bash
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sudo systemctl restart swxtch-bridge3-ctrl
```

### Bridge Type 2:

Bash	Copy
<pre>sudo systemctl restart swxtch-bridge2.service</pre>	

Multiple Multicast for cloudSwXtch Bridge

If a user wants to set up Multiple Multicast groups for cloudSwXtch Bridge, they will need to manually configure the **swxtch-bridge.json** file by changing the protocol under ha to "rtp" and adding the "streamSpecs" section. This process is similar to configuring the [xNIC for multiple multicast groups](#).

How to update swxtch-bridge.json file for Multiple Multicast Groups:

The user will have to make the following changes to their **swxtch-bridge.json** file found in the [single multicast group configuration](#) to match the example above. These alterations to the swxtch-bridge.json file should happen after [Configuring the cloudSwXtch for High Availability](#).

- 1. Change the protocol under ha from "swxtch" to "rtp" including the quotation marks.
  - 2. **For each multicast group**, add the following "streamSpecs" section as shown below with your **parent** and **children** groups listed.
- Note:** A user can enter multiple multicast groups.

Bash	Copy
<pre>},   "streamSpecs": {     "mmcProducerEnable": false,     "multipleMulticastGroups": [       {         "parent": "239.2.2.2:8804",         "children": [           "239.1.1.1:8804",           "239.1.1.2:8804"         ]       },       {         "parent": "239.3.3.3:8804",         "children": [           "239.1.1.3:8804",           "239.1.1.4:8804"         ]       }     ]   }, }</pre>	

- 3. Save the **swxtch-bridge.json** file.
- 4. Restart the cloudSwXtch Bridge control service by running the following command in Linux:

Bridge 3

Bash	Copy
<pre>sudo systemctl restart swxtch-bridge3-ctrl</pre>	

Bridge 2

Bash	Copy
<pre>sudo systemctl restart swxtch-bridge2.service</pre>	



## swXtchBridge

### Configuring swXtchBridge Interfaces

By default, swXtchBridge installation will attempt to resolve the interface that is routable to the cloudSwXtch. However, if a user would like to do this manually, the swXtchBridge can be configured in one of two ways:

- For hairpin forwarding on a **single** interface
- For bridge in the middle redirection between **two** interfaces

This section will go into the changes a user would have to make to the swXtchBridge JSON configuration file to apply the above methods.

### Where to Find swXtchBridge Configuration Files

The location of the swXtchBridge JSON file is `/var/opt/swxtch/swxtch-bridge-cfg.json`.

### swXtchBridge Configuration JSON Example

```
PowerShell Copy
{
  "bridgeConfig": {
    "ctrlInterfaceName": "eth0",
    "dataInterfaceName": "e636:00:02.0",
    "userInterfaceName": "e636:00:02.0",
    "nicsConfig": null,
    "swxtchCtrlIp": "10.2.128.10",
    "swxtchCtrlPort": 80,
    "swxtchDataIp": "10.2.192.116",
    "swxtchDataPort": 9999,
    "overwriteSenderId": null,
    "dataGatewayIp": null,
    "groundToCloudSubscriptions": null,
    "cloudToGroundSubscriptions": [],
    "pollingIntervalMilliseconds": 1000,
    "subscriptionsPollingIntervalMilliseconds": 100,
    "mtuSize": 1500,
    "adaptorsConfig": {},
    "overrideSrcIp": false,
  },
  "xdpModeData": null,
  "xdpModeUser": null,
  "cloudTunIp": null,
  "rpcPort": 10002
},
"ha": {
  "producer": false,
  "consumer": false,
  "bufferSizeInPackets": 131072,
  "maxTimeToBufferPacketsMs": 50,
  "protocol": "swxtch"
},
"streamSpecs": null
}
```

#### Fields in Common Explained

Below are deeper explanations for certain fields in the cloudSwXtch config file:

- **"ctrlInterfaceName"**: NIC used for control-plane communication with cloudSwXtch
- **"dataInterfaceName"**: NIC used for the data-plane communication with cloudSwXtch. For Bridge 2, the config file uses the ethernet name. For Bridge 3, the config file uses the PCI address.
- **"userInterfaceName"**: NIC used for multicast ground traffic. For Bridge 2, the config file uses the ethernet name. For Bridge 3, the config file uses the PCI address.
- **"pathId"**: Please set this to zero.
- **"groundToCloudSubscriptions"**: Please leave blank as it is no longer necessary since ground to cloud is done dynamically via IGMP joins from the cloud client.
- **"cloudToGroundSubscriptions"**: Traffic coming into the cloudSwXtch with these addresses will be forwarded to bridge and then to the userInterface.
- **"pollingIntervalMilliseconds"**: Polling consists on a sync with the cloudSwXtch to exchange MC groups information.

#### Using the status API call to get swxtch-bridge JSON file

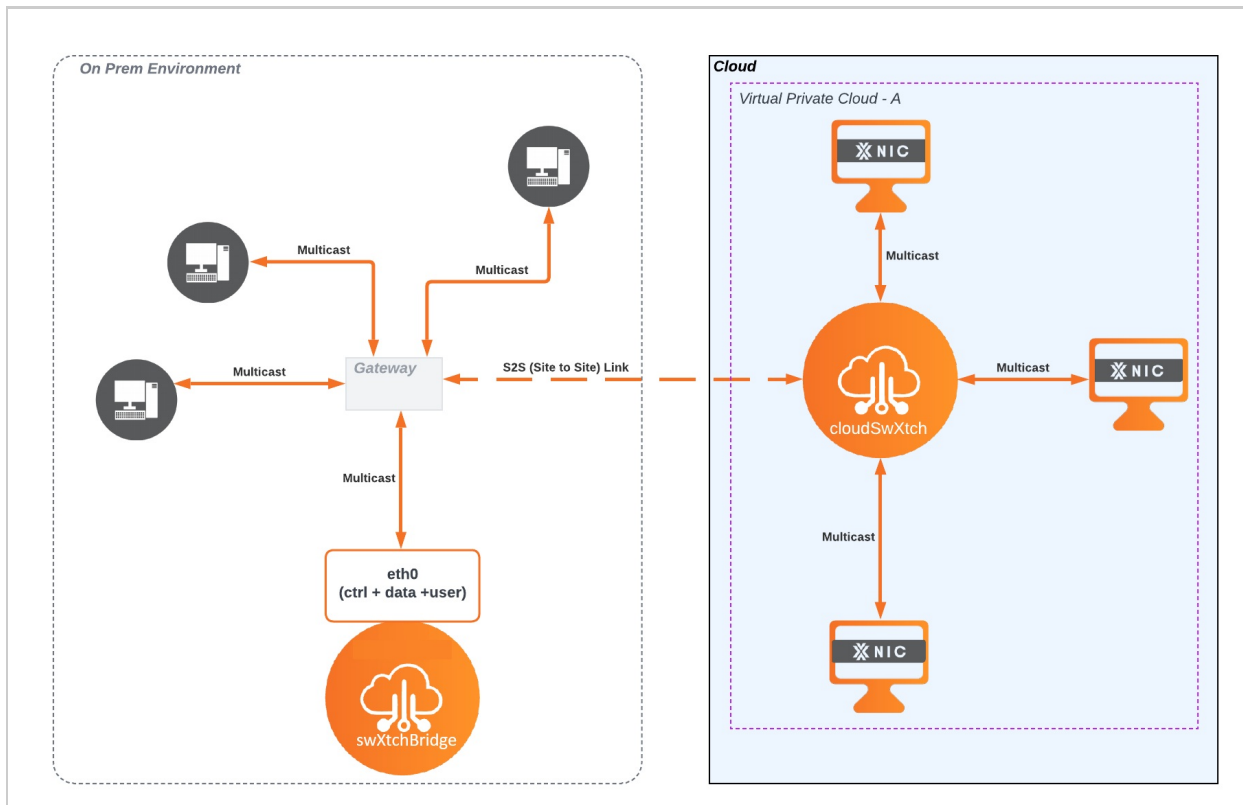
Alternatively, users can use a `/status` API call to get the swxtch-bridge.json file. To do this, use the following command replacing the `<bridge-ctrl-IP>` with the IP address of the bridge:

Bash

Copy

```
curl -x GET http://<bridge-ctrl-ip>/status
```

### For a single interface



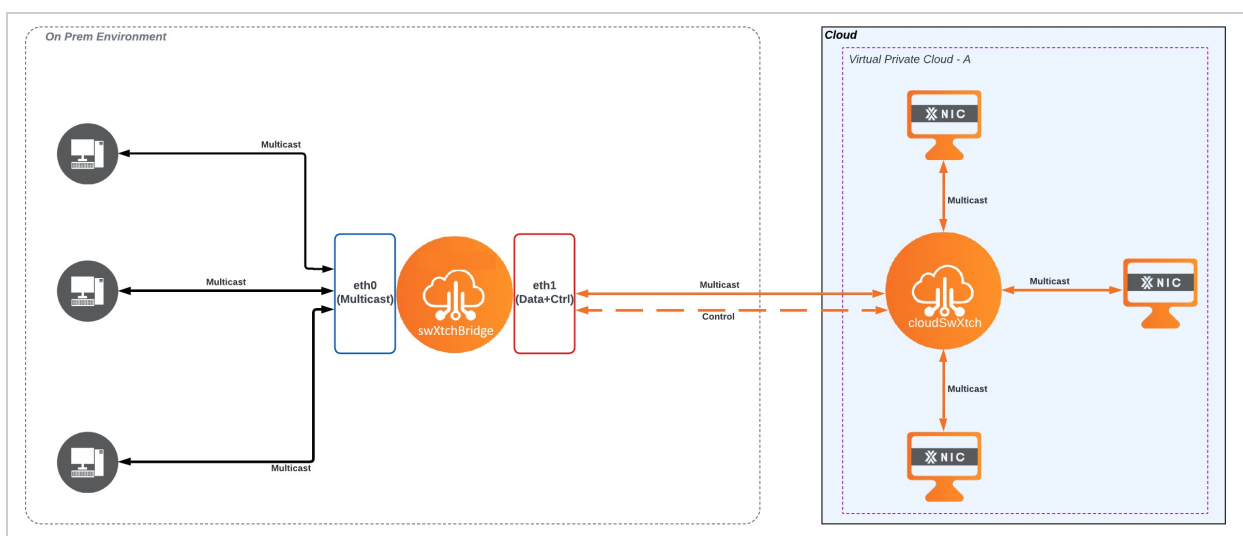
To accomplish a single interface configuration for your `swXtchBridge`, users will need to specify the same `InterfaceName` for `Ctrl`, `Data` and `User` in the `swxtch-bridge.json` file. In the example, each are assigned to `eth0`.

Bash

Copy

```
"ctrlInterfaceName": "eth0",
"dataInterfaceName": "eth0",
"userInterfaceName": "eth0",
```

### For bridge in the middle of two interfaces



Alternatively to the single interface approach, a user can decide to place the `swXtchBridge` between two interfaces in order to redirect traffic from the user interface to the data interface. In the example below, the `ctrlInterfaceName` and the `dataInterfaceName` are the same (`eth1`) while the `userInterfaceName` differs (`eth0`).

Bash	Copy
<pre>"ctrlInterfaceName": "eth1", "dataInterfaceName": "eth1", "userInterfaceName": "eth0",</pre>	

## Using swXtchBridge cloud to ground API to Join/Leave

swXtchBridge has the capability to do join and leaves from ground to cloud via an HTTP endpoint on the bridge. This will enable the forwarding of multicast traffic from cloud to ground.

### To Join:

Bash	Copy
<pre>curl -X POST http://&lt;BRIDGE_CTRL_IP&gt;/addCloudToGround -d '{"MulticastGroups":["239.239.239.99:9000"],"UpdateConfigFile":false}'</pre>	

### To Leave:

Bash	Copy
<pre>curl -X POST http://&lt;BRIDGE_CTRL_IP&gt;/removeCloudToGround -d '{"MulticastGroups":["239.239.239.99:9000"],"UpdateConfigFile":false}'</pre>	

**Note:** A user can set the UpdateConfigFile to **"true"** in order to make their configuration permanent. This means that the changes to swXtchBridge will persist between restarts.

## Configuring swXtchBridge Static Subscriptions

The cloud to ground and ground to cloud flows are static based on entry into a json file. In order to do this, modify the bridge JSON configuration file and add the static multicast groups for either groundToCloudSubscriptions or cloudToGroundSubscriptions

Modify the JSON array attribute for **"cloudToGroundSubscriptions"** or **"groundToCloudSubscriptions"** and add the appropriate multicast groups from either option.

Bash	Copy
<pre>{   "bridgeConfig": {     "ctrlInterfaceName": "eth0",     "dataInterfaceName": "eth1",     "userInterfaceName": "eth0",     "swxtchCtrlIp": "10.0.0.1",     "swxtchCtrlPort": 80,     "swxtchDataIp": "10.0.1.1",     "swxtchDataPort": 9999,     "pathId": 0,     "groundToCloudSubscriptions": [       "226.0.23.182:13000",       "226.0.23.183:13000",       "226.0.23.184:13000",       "226.0.23.185:13000"],     "cloudToGroundSubscriptions": [       "225.0.23.182:12000",       "225.0.23.183:12000",       "225.0.23.184:12000",       "225.0.23.185:12000"],     "pollingIntervalMilliseconds": 1000   } }</pre>	

After modifying the configuration file, restart the swXtchBridge service with the following command:

Bash	Copy
<pre>sudo systemctl restart swxtch-bridge-ctrl</pre>	

In the example above, these multicast groups will now be sent from both cloud to ground and ground to cloud at startup for bridge.

## Using a specific gateway address for swXtchBridge

By default, swXtchBridge will resolve the data gateway MAC address by arping the first IP address of the subnet for the data interface. However, if the gateway IP address is not there, then the dataGatewayIP field can be added into the configuration file. This will force the Bridge to resolve the gateway MAC address by using the IP address specified. In the example below, the user inserted their own data gateway IP address.

Bash	Copy
<pre>"dataGatewayIp": "192.168.1.2",</pre>	

## Protocol Conversion and Fanout

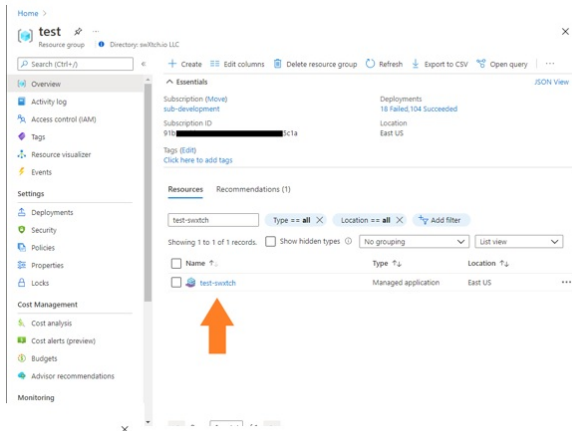
### Configuring Protocol Conversion and Fanout

There are two options for configuring Protocol Conversion and Fanout: via wXcked Eye or via the API. For more information, please see the following articles:

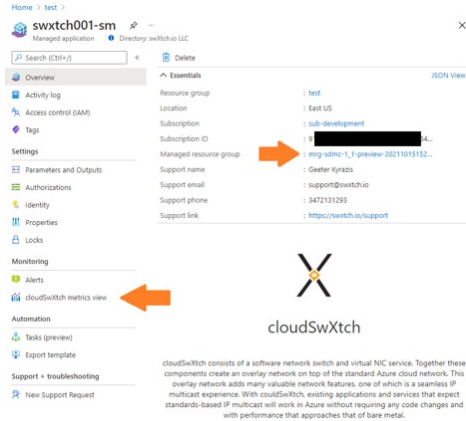
- [Protocol Conversion and Fanout with wXcked Eye](#)
- [Configuration API](#)

## Azure Monitoring

cloudSwXtch instances will show up in your Azure Resource Groups as “Managed applications” with the name given during creation. For example, the below image shows a cloudSwXtch instance with the name “test-switch” in the resource group “test”. When you click on a cloudSwXtch instance in a resource group, you are taken to the cloudSwXtch information page for that instance. From this page you can view properties and other standard Azure component screens.



In addition to the standard Azure component sections, this screen has two sections that are unique to the cloudSwXtch managed application: metrics view and managed application resource group.

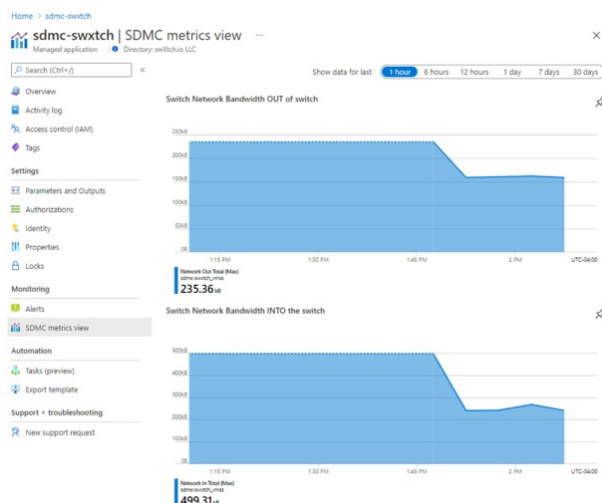


### cloudSwXtch metrics view

The metrics view shows two simple graphs of the network activity of the cloudSwXtch instance. The metrics available are the total bandwidth into and out of the instance. The bandwidth units change based on the timescale chosen.

#### NOTE:

due to Azure idiosyncrasies, the metrics view will first show up around 15 minutes or so after a cloudSwXtch instance is first created. The swxtch-top application can be used immediately.



## Managed resource group

The cloudSwXtch product is delivered as a “managed application”. This means that a cloudSwXtch instance lives within the customer’s subscription and is made up of Azure resources (VMs, etc.) that are instantiated within the same subscription. These resources are directly billed to the subscription owner.

### PRO TIP:

When a cloudSwXtch instance is created, it is assigned to the resource group selected by the creator and to an auto-generated resource group that holds the low-level components needed to compose the managed application. The creator of the instance has full access to the resource group that holds the instance and partial access to the auto-generated managed application resource group. The partial access allows the creator to see the various components and view their properties and metrics. It does not, however, allow the creator access to the internal VM instances that make up the managed application. The creator cannot directly control these resources from the portal, except to start/stop the VM. For more details see: [Azure managed applications overview](#)

Figure 2 - SDMC metrics view

## Changing xNIC configuration settings

All xNIC configuration values are normally set by the xNIC installation script. If manual changes are made to the configuration values, the xNIC service must be restarted:

```
sudo systemctl restart swxtch-xnic
```

The configuration settings for the xNIC are located at:

- Linux: `/var/opt/swxtch/swxtch-xnic.conf`
- Windows: `<tdb>`

The configuration file is a simple text file in `*.ini` format. The following values are available:

Key Name	Default value	Description and notes
SvcAddr	<ip-of-instance>	IPv4 address of the cloudSwXtch instance.
SvcPort	10802	Control port on cloudSwXtch instance.
VirtualInterfaceName	“swxtch-tun”	Base name of the virtual network interface. Must be < 15 characters.
VirtualInterfaceIpAddr	“172.30.0.0”	IPv4 subnet of the virtual network interface as seen from the host applications
VirtualInterfaceSubnet	“255.255.0.0”	IPv4 subnet mask
CtrlInterface	“eth0”	Network interface to use for control plane traffic.
DataInterface	“eth1”	Network interface to use for data plane traffic.
CtrlPort	10800	Local port used for control traffic <i>from</i> the SDMC switch
DataPort	9999	Local port used for data traffic <i>from</i> the SDMC switch

# Prometheus Monitoring

WHAT TO EXPECT

In this article, users will learn how to integrate Prometheus and Grafana as an additional way to monitor their cloudSwXtch environment.

PREREQUISITES

The following process assumes that you already have Prometheus and Grafana installed in a docker container.

## STEP ONE: Validate cloudSwXtch can create Prometheus data

On the cloudSwXtch VM, run the following command:

Plaintext

Copy

curl http://localhost/prometheus/metrics

The output will list information about each metric with example output data. Metrics starting with **swx\_core** are from the cloudSwXtch while metrics starting with **swx\_xnic** are from xNICs. Since this example has only one cloudSwXtch but many VMs with xNICs, the xNIC data has multiple sample rows. Note that for brevity some of the xNIC rows returned have been deleted.

PowerShell

Copy

swxtchadmin@dspd-core-100:~\$ curl http://localhost/prometheus/metrics
# HELP swx\_core\_droppedPacketCountByByteLimit Bytes dropped in the swXtch
# TYPE swx\_core\_droppedPacketCountByByteLimit counter
swx\_core\_droppedPacketCountByByteLimit{category="swxtch\_repl",host="10.1.216.23"} 0
# HELP swx\_core\_droppedPacketCountByPacketLimit Packets dropped in the swXtch
# TYPE swx\_core\_droppedPacketCountByPacketLimit counter
swx\_core\_droppedPacketCountByPacketLimit{category="swxtch\_repl",host="10.1.216.23"} 0
# HELP swx\_core\_rxBridgeByteCount Bridge bytes received into the swXtch
# TYPE swx\_core\_rxBridgeByteCount counter
swx\_core\_rxBridgeByteCount{category="swxtch\_repl",host="10.1.216.23"} 0
# HELP swx\_core\_rxBridgePacketCount Bridge packets received into the swXtch
# TYPE swx\_core\_rxBridgePacketCount counter
swx\_core\_rxBridgePacketCount{category="swxtch\_repl",host="10.1.216.23"} 0
# HELP swx\_core\_rxByteCount Bytes received into the swXtch
# TYPE swx\_core\_rxByteCount counter
swx\_core\_rxByteCount{category="swxtch\_repl",host="10.1.216.23"} 1.10391744e+08
# HELP swx\_core\_rxMeshByteCount Mesh bytes received into the swXtch
# TYPE swx\_core\_rxMeshByteCount counter
swx\_core\_rxMeshByteCount{category="swxtch\_repl",host="10.1.216.23"} 0
# HELP swx\_core\_rxMeshPacketCount Mesh packets received into the swXtch
# TYPE swx\_core\_rxMeshPacketCount counter
swx\_core\_rxMeshPacketCount{category="swxtch\_repl",host="10.1.216.23"} 0
# HELP swx\_core\_rxPacketCount Packets received into the swXtch
# TYPE swx\_core\_rxPacketCount counter
swx\_core\_rxPacketCount{category="swxtch\_repl",host="10.1.216.23"} 574957
# HELP swx\_core\_rxUnicastByteCount Unicast bytes received into the swXtch
# TYPE swx\_core\_rxUnicastByteCount counter
swx\_core\_rxUnicastByteCount{category="swxtch\_repl",host="10.1.216.23"} 0
# HELP swx\_core\_rxUnicastPacketCount Unicast packets received into the swXtch
# TYPE swx\_core\_rxUnicastPacketCount counter
swx\_core\_rxUnicastPacketCount{category="swxtch\_repl",host="10.1.216.23"} 0
# HELP swx\_core\_sequence swXtch sequence number
# TYPE swx\_core\_sequence counter
swx\_core\_sequence{category="swxtch\_repl",host="10.1.216.23"} 3022
# HELP swx\_core\_txBridgeByteCount Bridge bytes sent from the swXtch
# TYPE swx\_core\_txBridgeByteCount counter
swx\_core\_txBridgeByteCount{category="swxtch\_repl",host="10.1.216.23"} 0
# HELP swx\_core\_txBridgePacketCount Bridge packets sent from the swXtch
# TYPE swx\_core\_txBridgePacketCount counter
swx\_core\_txBridgePacketCount{category="swxtch\_repl",host="10.1.216.23"} 0
# HELP swx\_core\_txByteCount Bytes sent from the swXtch
# TYPE swx\_core\_txByteCount counter
swx\_core\_txByteCount{category="swxtch\_repl",host="10.1.216.23"} 1.09192128e+08
# HELP swx\_core\_txMeshByteCount Mesh bytes sent from the swXtch
# TYPE swx\_core\_txMeshByteCount counter
swx\_core\_txMeshByteCount{category="swxtch\_repl",host="10.1.216.23"} 0
# HELP swx\_core\_txMeshPacketCount Mesh packets sent from the swXtch
# TYPE swx\_core\_txMeshPacketCount counter
swx\_core\_txMeshPacketCount{category="swxtch\_repl",host="10.1.216.23"} 0
# HELP swx\_core\_txPacketCount Packets sent from the swXtch
# TYPE swx\_core\_txPacketCount counter
swx\_core\_txPacketCount{category="swxtch\_repl",host="10.1.216.23"} 568709
# HELP swx\_core\_txUnicastByteCount Unicast bytes sent from the swXtch
# TYPE swx\_core\_txUnicastByteCount counter
swx\_core\_txUnicastByteCount{category="swxtch\_repl",host="10.1.216.23"} 0
# HELP swx\_core\_txUnicastPacketCount Unicast packets sent from the swXtch
# TYPE swx\_core\_txUnicastPacketCount counter

```

swx_core_txUnicastPacketCount{category="swxtch_rep1",host="10.1.216.23"} 0
# HELP swx_maxClientCount Maximum number of clients by license
# TYPE swx_maxClientCount gauge
swx_maxClientCount{category="swxtch"} 10
# HELP swx_numClientsConnected Number of client currently connected
# TYPE swx_numClientsConnected gauge
swx_numClientsConnected{category="swxtch"} 2
# HELP swx_xnic_byteCounters_rxTotalCount Total bytes received from the swXtch into the component
# TYPE swx_xnic_byteCounters_rxTotalCount counter
swx_xnic_byteCounters_rxTotalCount{category="swxtch_xnic",host="10.1.213.120"} 0
swx_xnic_byteCounters_rxTotalCount{category="swxtch_xnic",host="10.1.213.121"} 914880
# HELP swx_xnic_byteCounters_txTotalCount Total bytes sent from the component into the swXtch
# TYPE swx_xnic_byteCounters_txTotalCount counter
swx_xnic_byteCounters_txTotalCount{category="swxtch_xnic",host="10.1.213.120"} 1.080768e+06
swx_xnic_byteCounters_txTotalCount{category="swxtch_xnic",host="10.1.213.121"} 0
# HELP swx_xnic_packetCounters_rxDroppedCount Lost packets received from the swXtch into the component
# TYPE swx_xnic_packetCounters_rxDroppedCount counter
swx_xnic_packetCounters_rxDroppedCount{category="swxtch_xnic",host="10.1.213.120"} 0
swx_xnic_packetCounters_rxDroppedCount{category="swxtch_xnic",host="10.1.213.121"} 0
# HELP swx_xnic_packetCounters_rxTotalCount Total packets received from the swXtch into the component
# TYPE swx_xnic_packetCounters_rxTotalCount counter
swx_xnic_packetCounters_rxTotalCount{category="swxtch_xnic",host="10.1.213.120"} 0
swx_xnic_packetCounters_rxTotalCount{category="swxtch_xnic",host="10.1.213.121"} 4765
# HELP swx_xnic_packetCounters_txDroppedCount Lost packets sent from the component into the swXtch
# TYPE swx_xnic_packetCounters_txDroppedCount counter
swx_xnic_packetCounters_txDroppedCount{category="swxtch_xnic",host="10.1.213.120"} 9606
swx_xnic_packetCounters_txDroppedCount{category="swxtch_xnic",host="10.1.213.121"} 0
# HELP swx_xnic_packetCounters_txTotalCount Total packets sent from the component into the swXtch
# TYPE swx_xnic_packetCounters_txTotalCount counter
swx_xnic_packetCounters_txTotalCount{category="swxtch_xnic",host="10.1.213.120"} 5629
swx_xnic_packetCounters_txTotalCount{category="swxtch_xnic",host="10.1.213.121"} 0
# HELP swx_xnic_rxMulticastGroups_byteCount Multicast group traffic sent from the Swxtch into the xNIC - Multicast group byte count
# TYPE swx_xnic_rxMulticastGroups_byteCount counter
swx_xnic_rxMulticastGroups_byteCount{category="swxtch_xnic",cloudSwxtchVersion="dev.f91a2e",groupId="239.4.0.1",host="10.1.213.121",hostAddress="10.1.213.121",index="0",osDistribution="Ubuntu 20.04",swx_xnic_rxMulticastGroups_index="0",xNicType="t2"} 914880
# HELP swx_xnic_rxMulticastGroups_packetCount Multicast group traffic sent from the Swxtch into the xNIC - Multicast group packet count
# TYPE swx_xnic_rxMulticastGroups_packetCount counter
swx_xnic_rxMulticastGroups_packetCount{category="swxtch_xnic",cloudSwxtchVersion="dev.f91a2e",groupId="239.4.0.1",host="10.1.213.121",hostAddress="10.1.213.121",index="0",osDistribution="Ubuntu 20.04",swx_xnic_rxMulticastGroups_index="0",xNicType="t2"} 4765
# HELP swx_xnic_txMulticastGroups_byteCount Multicast group traffic sent from the xNIC into the Swxtch - Multicast group byte count
# TYPE swx_xnic_txMulticastGroups_byteCount counter
swx_xnic_txMulticastGroups_byteCount{category="swxtch_xnic",cloudSwxtchVersion="dev.f91a2e",groupId="239.4.0.1",host="10.1.213.120",hostAddress="10.1.213.120",index="0",osDistribution="Ubuntu 20.04",swx_xnic_txMulticastGroups_index="0",xNicType="t2"} 1.080768e+06
# HELP swx_xnic_txMulticastGroups_packetCount Multicast group traffic sent from the xNIC into the Swxtch - Multicast group packet count
# TYPE swx_xnic_txMulticastGroups_packetCount counter
swx_xnic_txMulticastGroups_packetCount{category="swxtch_xnic",cloudSwxtchVersion="dev.f91a2e",groupId="239.4.0.1",host="10.1.213.120",hostAddress="10.1.213.120",index="0",osDistribution="Ubuntu 20.04",swx_xnic_txMulticastGroups_index="0",xNicType="t2"} 5629

```

If successful (there is an output), continue on to updating your Prometheus Directory for cloudSwXtch.

## STEP TWO: Update Prometheus Directory for cloudSwXtch

Attached is an example prometheus.yml file with an cloudSwXtch job name configuration.

 prometheus 732 Byte 

1. Open the example **prometheus.yml** file and copy lines 26-36.
2. Paste those lines into your existing **prometheus.yml** file.
3. Update the cloudSwXtch **targets** line that has " 127.0.0.1:80" and put in the IP address of the cloudSwXtch in place of the localhost IP.
  - a. **Please note:** If Prometheus and cloudSwXtch are on the same VM, then the localhost IP (127.0.0.1) will still work.

```

26 - job_name: swxtch
27   honor_timestamps: true
28   scrape_interval: 5s
29   scrape_timeout: 2s
30   metrics_path: /prometheus/metrics
31   scheme: http
32   follow_redirects: true
33   enable_http2: true
34   static_configs:
35     - targets:
36       - 127.0.0.1:80
37

```

4. Run the following docker command to run it in VM. If you decide to run it this way, you will need to run it after every reboot or when you close your window. Please use this method when testing in order to limit the amount of records added to the Prometheus database.



Plaintext	Copy
<code>docker run --network host -v ~/prometheus:/etc/prometheus prom/prometheus</code>	

5. Use this command to run Prometheus automatically upon reboot. (Preferred method for a production environment.)

Plaintext	Copy
<code>docker run --network host --restart always -v ~/prometheus:/etc/prometheus prom/prometheus</code>	

## STEP THREE: Access Prometheus UI

In order to access the Prometheus UI, users should open a browser on their Windows machine in the same VNET and enter the following URL:

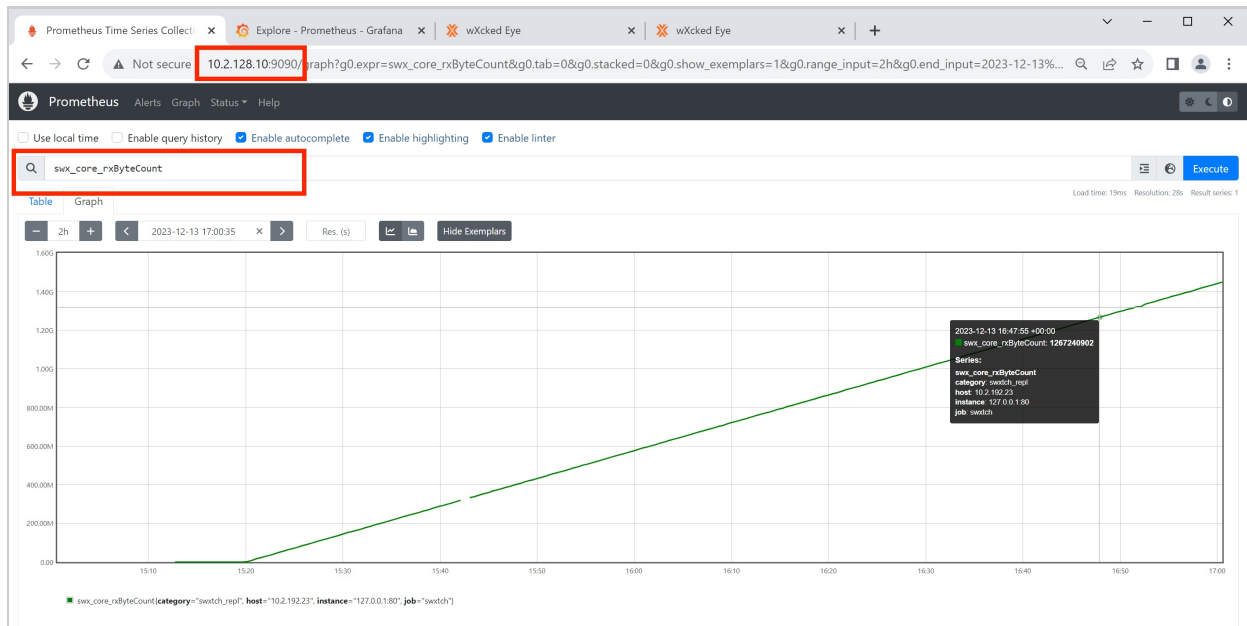
Plaintext	Copy
<code>http://&lt;prometheus-IP&gt;:9090/</code>	

**Note:** Replace the <prometheus-IP> with the IP address of your Prometheus instance.

Users can enter the prefix “swx” into the search field to see a list of data fields related to the cloudSwXtch (swx\_core) and its xNICs (swx\_xnic).

The screenshot shows the Prometheus web interface. The browser address bar displays the URL `10.2.128.10:9090/graph?g0.expr=swx_core_rxByteCount&g0.tab=0&`. The interface includes a navigation bar with 'Prometheus', 'Alerts', 'Graph', 'Status', and 'Help'. Below the navigation bar, there are checkboxes for 'Use local time', 'Enable query history', 'Enable autocomplete', 'Enable highlighting', and 'Enable linter'. A search bar on the left contains the text 'swx\_core\_'. A dropdown menu is open, showing a list of metrics: 'swx\_core\_droppedPacketCountByByteLimit', 'swx\_core\_droppedPacketCountByPacketLimit', 'swx\_core\_rxBridgeByteCount', 'swx\_core\_rxBridgePacketCount', 'swx\_core\_rxByteCount', 'swx\_core\_rxMeshByteCount', 'swx\_core\_rxMeshPacketCount', 'swx\_core\_rxPacketCount', 'swx\_core\_rxUnicastByteCount', 'swx\_core\_rxUnicastPacketCount', 'swx\_core\_sequence', 'swx\_core\_txBridgeByteCount', 'swx\_core\_txBridgePacketCount', 'swx\_core\_txByteCount', 'swx\_core\_txMeshByteCount', and 'swx\_core\_txMeshPacketCount'. The 'swx\_core\_rxByteCount' metric is highlighted. To the right of the list, a tooltip for 'swx\_core\_rxByteCount' is visible, stating 'Bytes dropped in the swXtch'.

In the example below, the user has chosen `swx_core_rxByteCount` as their data field.



By selecting Execute, users will be able to populate the table with the desired data. **Note:** Producers and consumers must be running in order to see data. In the example above, a user can select Execute multiple times and notice that the number in the orange box grow in size.

For a list of available data fields, view the dropdown section here:

prometheus/metrics

URL

Plaintext

Copy

http://<core>/prometheus/metrics

Parameters

None

Request

None

Response

200 - Success

Data Fields

Metric	Description	Type
swx_core_droppedPacketCountByByteLimit	Bytes dropped in the swXtch	counter
swx_core_droppedPacketCountByPacketLimit	Packets dropped in the swXtch	counter
swx_core_rxBridgeByteCount	Bridge bytes received into the swXtch	counter
swx_core_rxBridgePacketCount	Bridge packets received into the swXtch	counter
swx_core_rxByteCount	Bytes received into the swXtch	counter
swx_core_rxMeshByteCount	Mesh bytes received into the swXtch	counter
swx_core_rxMeshPacketCount	Mesh packets received into the swXtch	counter
swx_core_rxPacketCount	Packets received into the swXtch	counter
swx_core_rxUnicastByteCount	Unicast bytes received into the swXtch	counter
swx_core_rxUnicastPacketCount	Unicast packets received into the swXtch	counter
swx_core_sequence	swXtch sequence number	counter

swx_core_txBridgeByteCount	Bridge bytes sent from the swXtch	counter
swx_core_txBridgePacketCount	Bridge packets sent from the swXtch	counter
swx_core_txByteCount	Bytes sent from the swXtch	counter
swx_core_txMeshByteCount	Mesh bytes sent from the swXtch	counter
swx_core_txMeshPacketCount	Mesh packets sent from the swXtch	counter
swx_core_txPacketCount	Packets sent from the swXtch	counter
swx_core_txUnicastByteCount	Unicast bytes sent from the swXtch	counter
swx_core_txUnicastPacketCount	Unicast packets sent from the swXtch	counter
swx_xnic_activeConnectionCount	xNIC active connections	gauge
swx_xnic_byteCount		
swx_xnic_byteCounters_rxMulticastCount	Multicast bytes received from the swXtch into the xNIC	counter
swx_xnic_byteCounters_rxTotalCount	Total bytes received from the swXtch into the xNIC	counter
swx_xnic_byteCounters_txMulticastCount	Multicast bytes sent from the xNIC into the swXtch	counter
swx_xnic_byteCounters_txTotalCount	Total bytes sent from the xNIC into the swXtch	counter
swx_xnic_latencies_count	xNIC latency count	gauge
swx_xnic_latencies_sum	xNIC latency sum	gauge
swx_xnic_maxActiveConnections	xNIC max number of active connections	gauge
swx_xnic_packetCounters_rxDroppedCount	Lost packets received from the swXtch into the xNIC	counter
swx_xnic_packetCounters_rxMulticastCount	Multicast packets received from the swXtch into the xNIC	counter
swx_xnic_packetCounters_rxTotalCount	Total packets received from the swXtch into the xNIC	counter
swx_xnic_packetCounters_txDroppedCount	Lost packets sent from the xNIC into the swXtch	counter
swx_xnic_packetCounters_txIcmpCount	IGMP packets sent from the xNIC into the swXtch	counter
swx_xnic_packetCounters_txMulticastCount	Multicast packets sent from the xNIC into the swXtch	counter
swx_xnic_packetCounters_txTotalCount	Total packets sent from the xNIC into the swXtch	counter
swx_xnic_rxHaCounters_egressByteCount	HA bytes sent	counter
swx_xnic_rxHaCounters_egressPacketCount	HA packets sent	counter
swx_xnic_rxHaCounters_enqueueFailureCount	HA enqueue failure count	counter
swx_xnic_rxHaCounters_outputStreamLossCount	HA output stream lose packets	counter
swx_xnic_rxHaCounters_paths_ingressByteCount	HA Bytes received	counter
swx_xnic_rxHaCounters_paths_ingressPacketCount	HA Packets received	counter
swx_xnic_rxHaCounters_paths_missingPacketCount	HA Packets missing	counter
swx_xnic_rxHaCounters_paths_usedPacketCount	HA Packets used	counter
swx_xnic_rxMulticastGroups_byteCount	Multicast Groups bytes sent from the SwXtch into the xNIC	counter
swx_xnic_rxMulticastGroups_packetCount	Multicast Groups packets sent from the SwXtch into the xNIC	counter
swx_xnic_timestamp	timestamp	counter
swx_xnic_txMulticastGroups_byteCount	Multicast Groups bytes sent from the xNIC into the SwXtch	counter
swx_xnic_txMulticastGroups_packetCount	Multicast Groups packets sent from the xNIC into the SwXtch	counter
swx_xnic_usedPacketCount	Packets	counter

## STEP FOUR: Access Grafana UI

Alternatively, users can also use Grafana as another method for viewing cloudSwXtch metrics.

1. In a Windows machine on the same VNET, open a browser and enter the following URL:

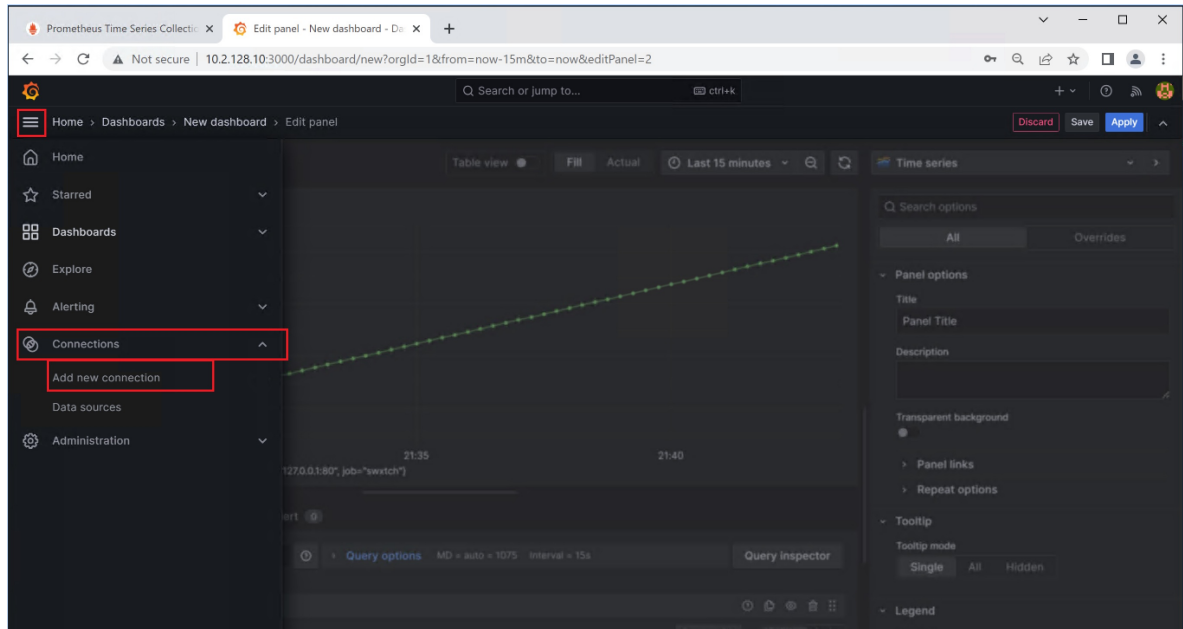
Plaintext

Copy

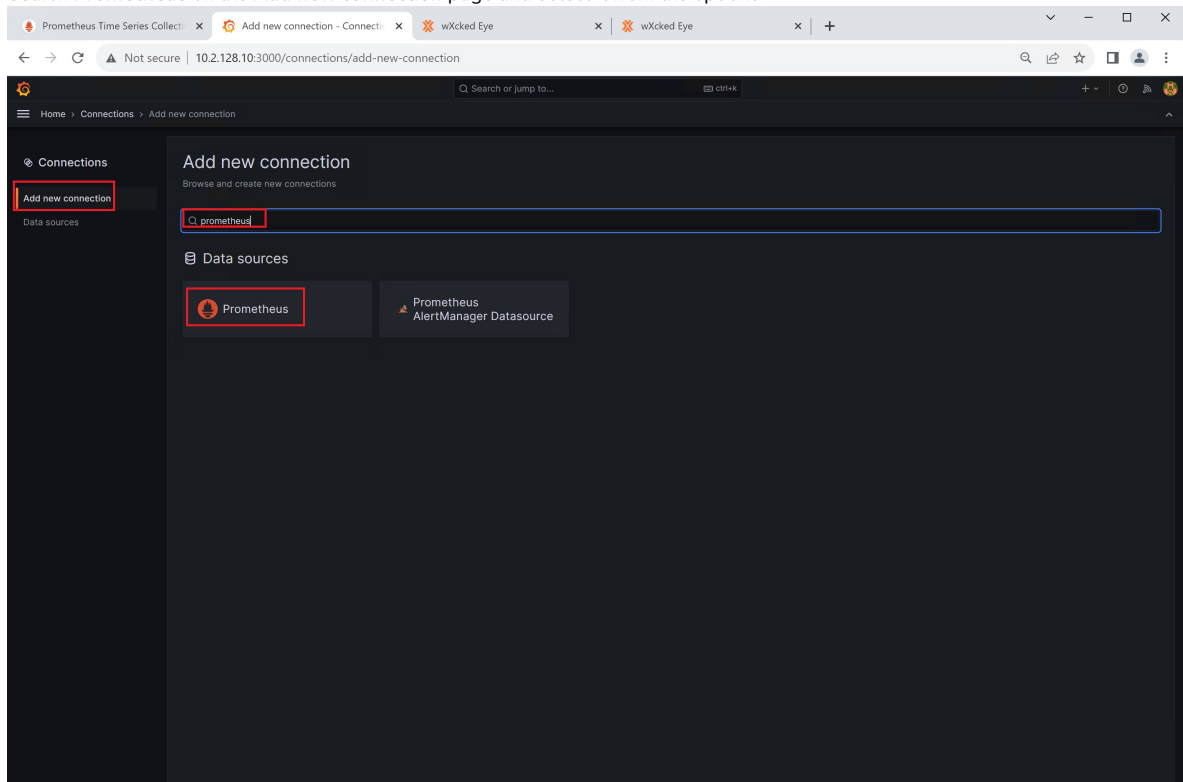
<http://<Grafana-IP>:3000/>

**Note:** Replace the <Grafana-IP> with the IP address of your Grafana instance.

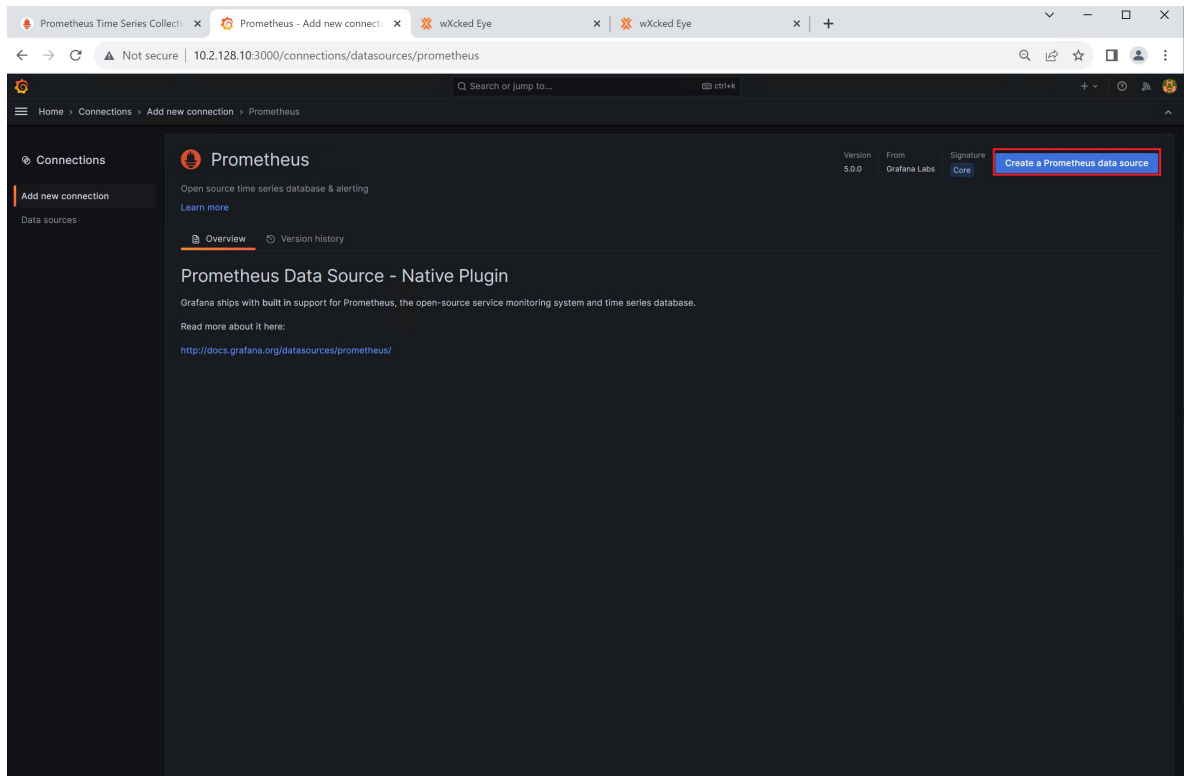
2. Sign in as a user **admin** and the password **admin**.
3. Click on the three horizontal lines next to **Home** to get additional options.
4. Select **Connection**.
5. Click **Add new connection**.



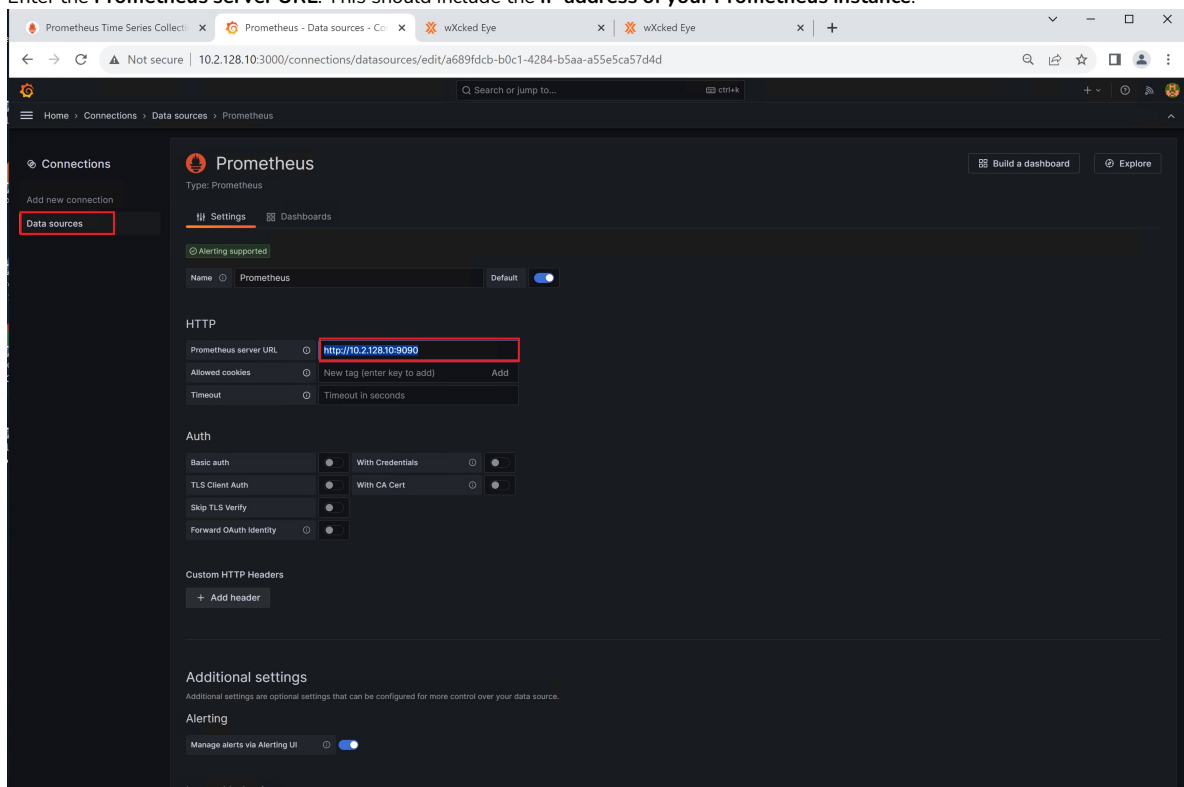
6. Search **Prometheus** on the **Add new connection** page and select it from the options.



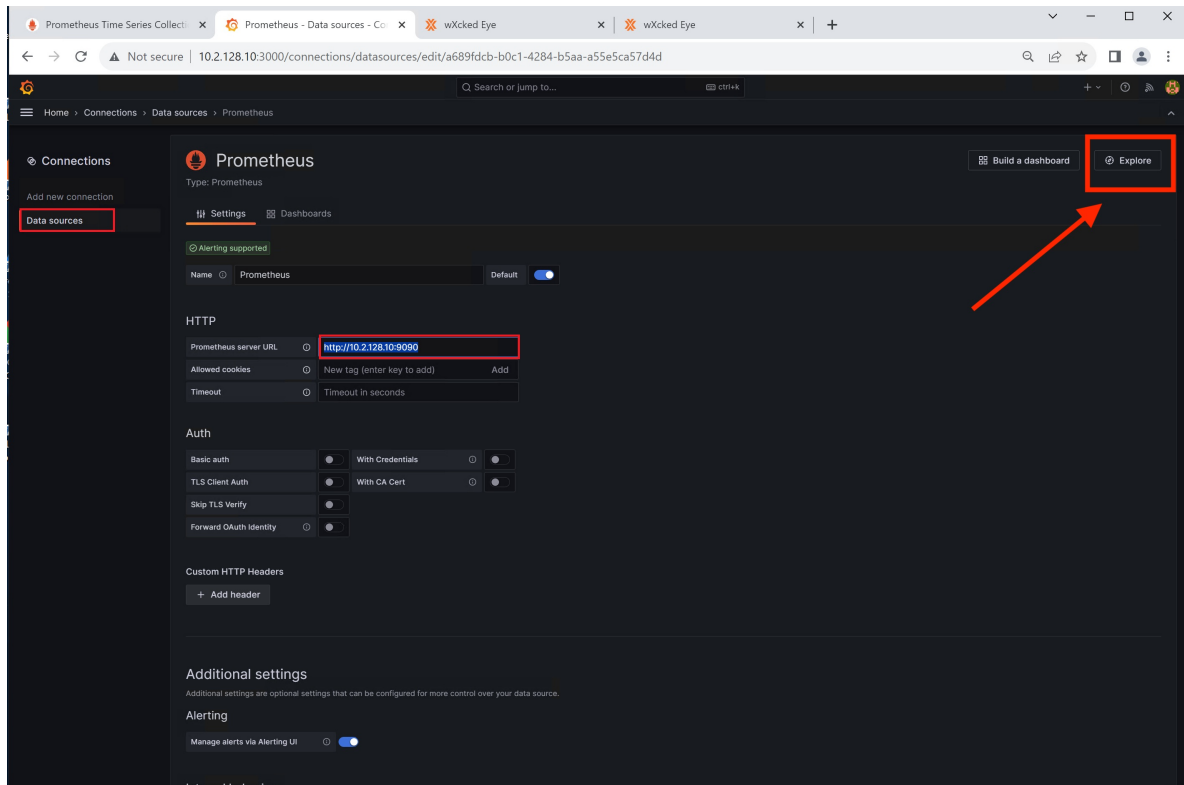
7. Click **Create a Prometheus data source**.



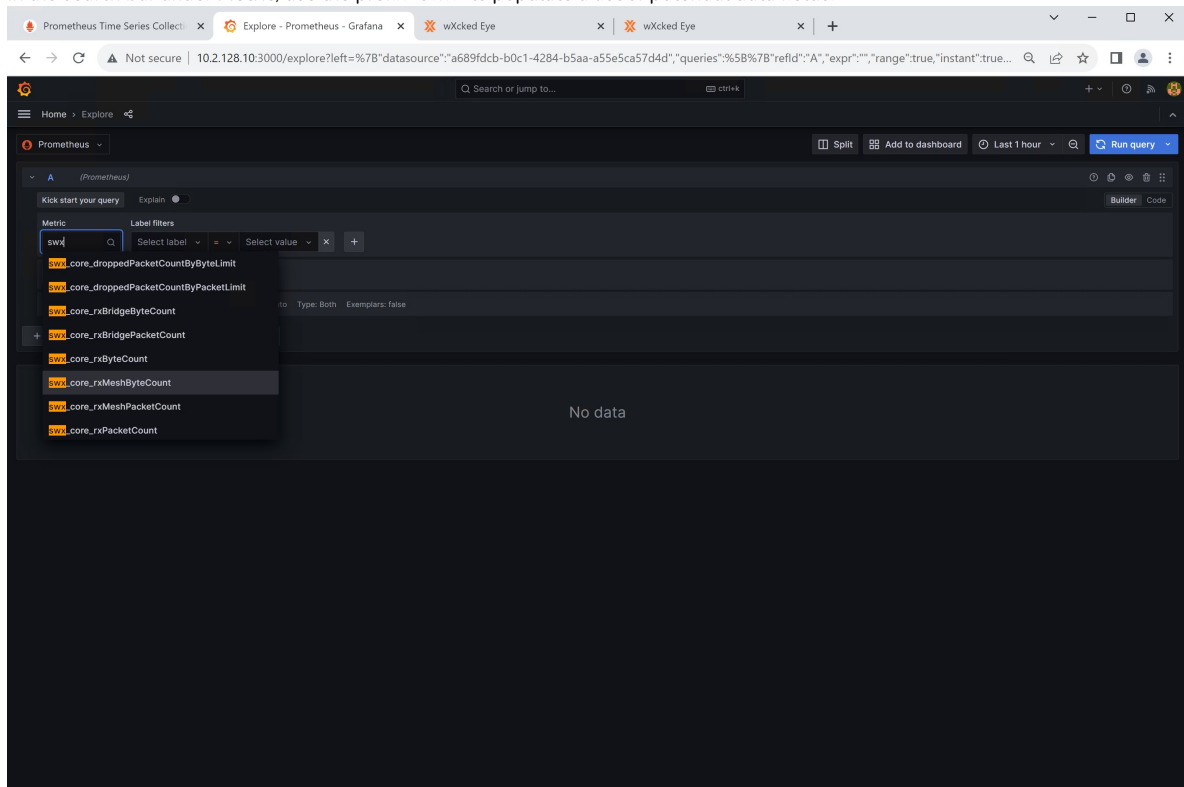
8. Go to **Data Sources** and select the **Prometheus** data source created.
9. Enter the **Prometheus server URL**. This should include the **IP address of your Prometheus instance**.



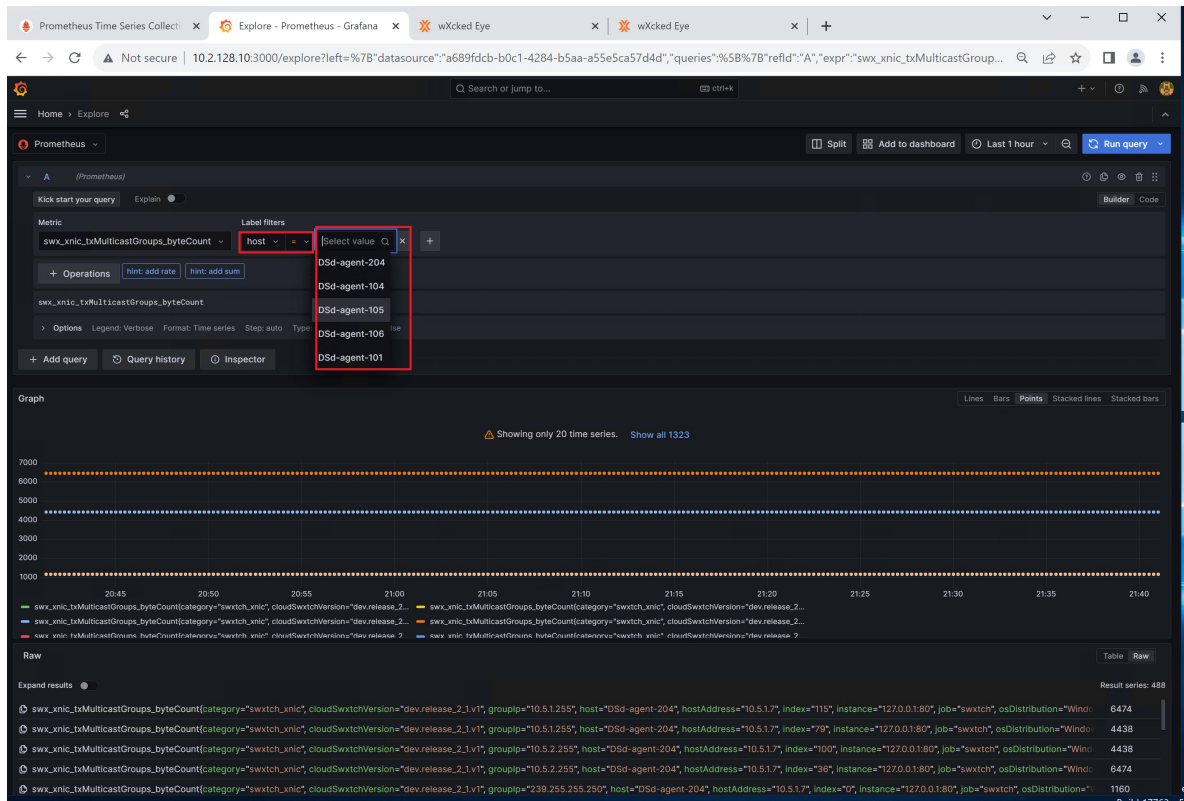
10. Click **Explore**.



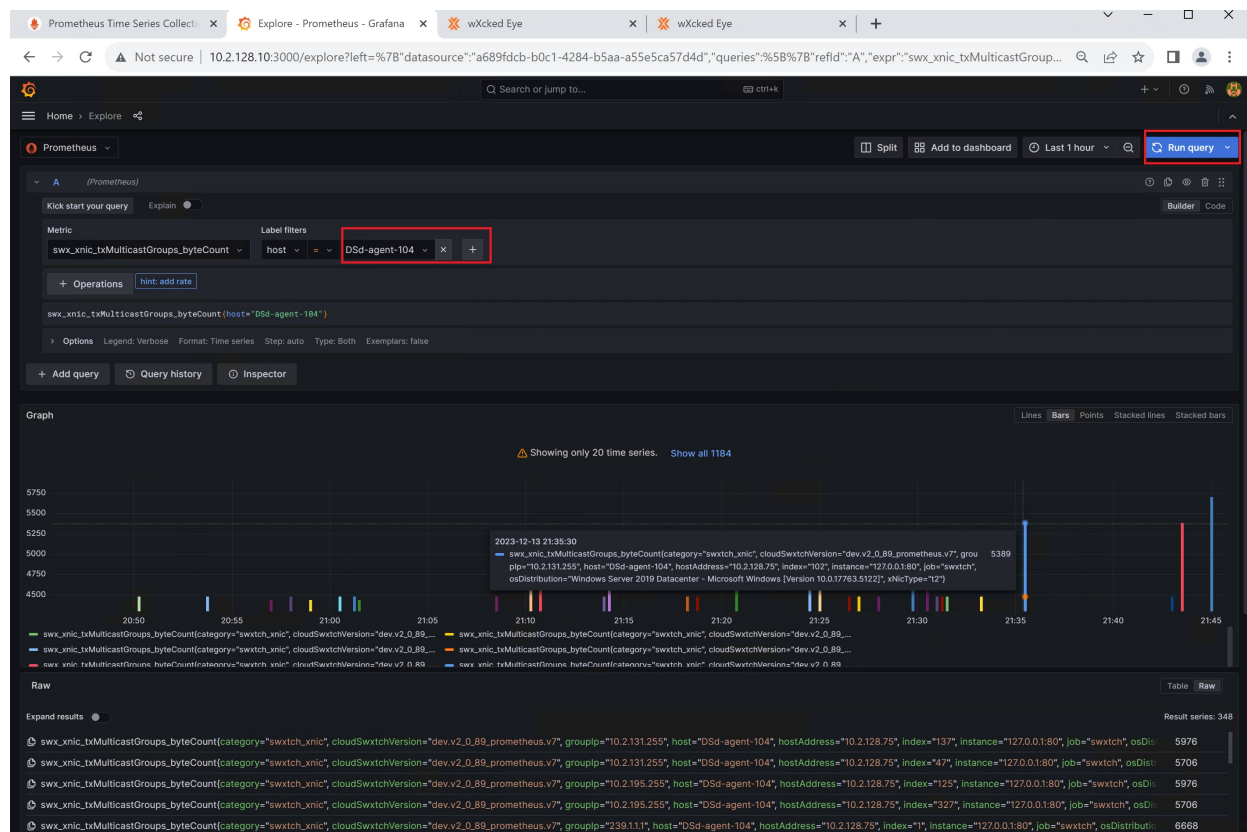
11. In the search bar under **Metric**, use the prefix "swx" to populate a list of potential data fields.



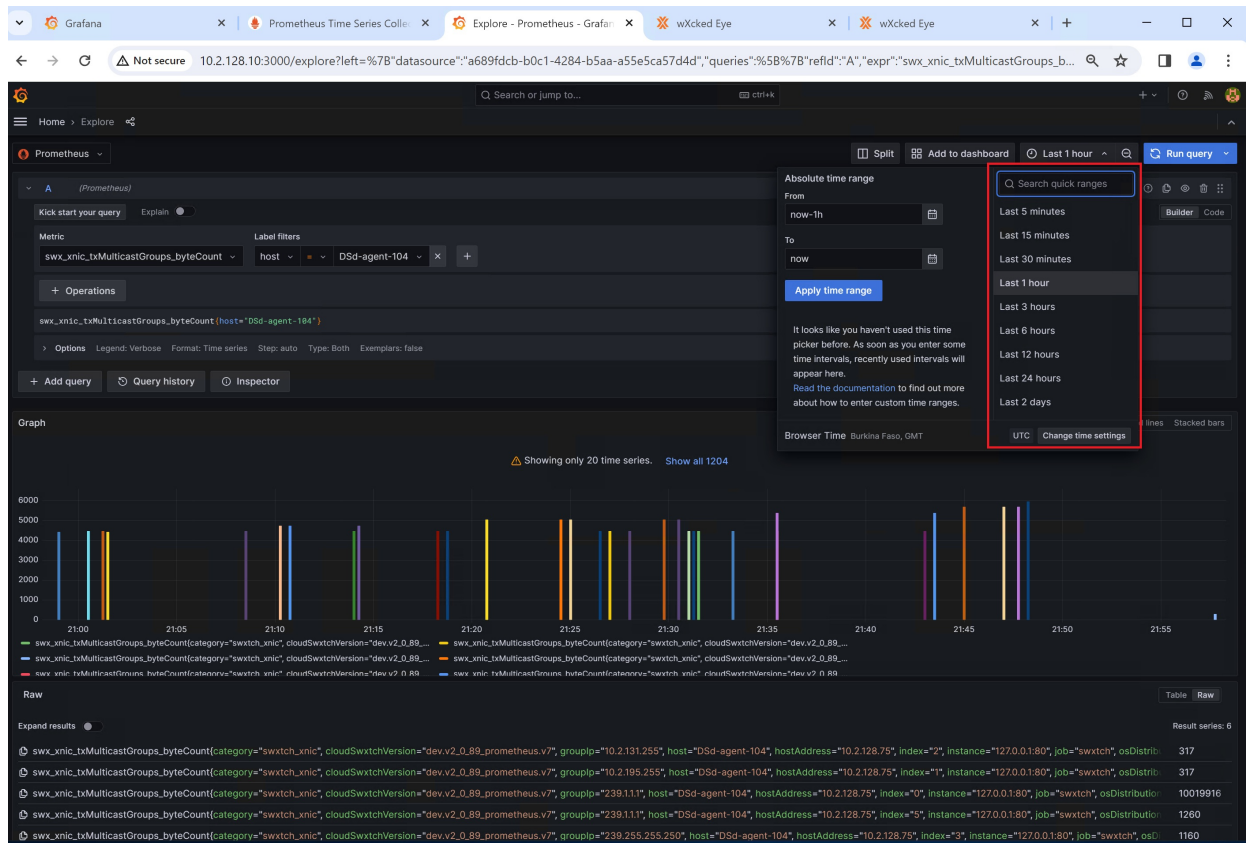
12. Scroll through the list and select what is desired.
13. **Run the query.** The results will appear below.



For xNIC-related metrics, users can specify a host under Label Filters and select an agent. After selecting an agent, a user will need to run the query again to populate the graph as shown above.



If desired, a user can also change the amount of time in the top of the window.





## Testing cloudSwXtch

### WHAT TO EXPECT

In this article, users will learn about the various tools that are available to them test their cloudSwXtch multicast network.

### cloudSwXtch Testing Tools

Included within the xNIC installation are four utilities that can be used to verify both the functionality and performance of their cloudSwXtch network.

- **swxtch-perf**: Simulates traffic movement throughout the cloudSwXtch network assigning machines with the xNIC installed as producers and consumers
- **swxtch-top**: Displays detailed system statistics from the console of any VM that has the xNIC software installed. This includes data regarding the xNIC, the cloudSwXtch Bridge, streams, mesh, and high availability.
- **swxtch-tcpdump**: As our version of tcpdump, this tool helps capture multicast packets sent to and from the cloudSwXtch with logic to decode our own head and display the original MC payload.
- **swxtch-where**: Allows users to call for hardware information regarding their cloudSwXtch VM

Each of the utilities above can be run from a VM which has the xNIC software installed. Detailed information can be found for each by entering in the `--help` command-line argument.

### wXcked Eye for Monitoring

In addition to viewing cloudSwXtch statistics in swxtch-top, users can also use wXcked Eye from the web browser of a VM in the cloudSwXtch network. For more information, see [Using wXcked Eye for cloudSwXtch](#).

### Universal Third-Party Test Tools

There are a number of universal third-party tools available to test the fidelity of your cloudSwXtch network. For more information on these alternative tools, see our [Universal Third-Party Test Tools](#) article.

# swxtch-perf

## Overview

To simulate traffic movement throughout the cloudswxtch overlay network you can use swxtch-perf to create producer and consumers on machines with the xNIC installed.

**swxtch-perf producer** has multiple parameters that can be configured to generate different traffic flows. There can be multiple instances of swxtch-perf generating traffic on a single machine.

None	Copy
swxtch-perf producer --sendto <MC_ADDRESS:DEST_PORT> --nic <NETWORK_INTERFACE>	

**swxtch-perf consumer** will pick up the traffic generated by the producer(s) in the network.

None	Copy
swxtch-perf consumer --recvfrom <MC_ADDRESS:DEST_PORT> --nic <NETWORK_INTERFACE>	

### NOTE

<MC\_ADDRESS> = Multicast Address  
<DEST\_PORT> = Destination Port  
<NETWORK\_INTERFACE> = Network Interface where xNIC conncted to. The network interface does not have to be specified in xNic V1, but must be specified in xNic V2. (See [xNIC Linux Installation](#) for V1 and V2 differences.

## swxtch-perf

For a quick view at the functionality and usage of **swxtch-perf** use **-h** or **-help** .

None	Copy
swxtch-perf -h Usage: swxtch-perf [options] command	
Positional arguments: command [producer consumer] suported commands	
Optional arguments: -h --help shows help message and exits [default: false] -v --version prints version information and exits [default: false] --nic name of NIC to use this is Mandatory for swxtch-perf to work. --recvfrom IP:Port The IP and Port where packets come from [default: "239.5.69.2:10000"] --sendto IP:Port The IP and Port where packets are sent to [default: "239.5.69.2:10000"] --ssm_include (consumer command only) List of SSM addresses to include (i.e. 192.168.2.1 193.168.2.4) [nargs: 1 or more] --ssm_exclude (consumer command only) List of SSM addresses to exclude (i.e. 192.168.2.1 193.168.2.4) [nargs: 1 or more] --payload_length (producer command only) number of bytes for the multicast udp payload [default: 100] --total_pkts Total packets to send/receive. To run without this limit use 0 [default: 0] --pps (producer command only) packet-rate or packet per seconds [default: 1] --seconds Number of seconds to run the application. To run without this limit use 0 [default: 0] --loopback Receives packets from --recvfrom and sends packets to --sendto [default: false] --generic (consumer command only) to consume generic packets [default: false] --latency Enables timestamp propagation and measurement of latency [default: false] --broadcast Enables broadcast packets in NIC, this overrides IP argument [default: false] --generic-broadcast Sends broadcast packets to 255.255.255.255, valid only with --broadcast argument [default: false] --broadcast-port Port for broadcast traffic, valid only with --broadcast argument [default: 10000] --rtt-latency Enables timestamp propagation and measurement of RTT/2 where RTT = round trip time [default: false] --one-way-latency Enables timestamp propagation and measurement of one way latency [default: false] --latency-buckets Enables histogram of latency. Use with --latency [default: false] --dbg Enables more information in the logs [default: false] --show-full-packet-bps Shows the bps with all headers included	

## Parameters

Argument	Description	Default Value	Valid Range	Machine Type	Operating System
<code>h</code>	Shows commands that are available.				All
<code>v</code>	Shows version.			Both	All
<code>nic</code>	Specify which network interface xNIC will listen to this command is Mandatory.		--	Both	All
<code>recvfrom</code>	Specify the multicast group and port to listen for packets IPv4 addresses are valid; Ports: 1024 <= x <= 65535. Mandatory for Consumer Mode and Multicast.			Consumer	All
<code>sendto</code>	Specify the multicast group and port to send packets, mandatory for producer if using multicast.	All	IPv4 addresses are valid; Ports: 1024 <= x <= 65535 Mandatory for Producer Mode and Multicast.	Producer	All
<code>ssm_include</code>	List of SSM addresses to include (i.e. 192.168.2.1 193.168.2.4)		1 or more	Consumer	All
<code>ssm_exclude</code>	List of SSM addresses to exclude (i.e. 192.168.2.1 193.168.2.4)		1 or more	Consumer	All
<code>payload_length</code>	Number of bytes per packet.	100	8 and 65475	Producer	All
<code>total_pkts</code>	Number packets to receive or send before exiting iperf.	0	8 and 3750	Producer	Windows
<code>pps</code>	packet-rate or packets per second.	1	100000	Producer	All
<code>seconds</code>	Number of seconds to run the application, use 0 to run without a limit.	0		Both	Windows
<code>loopback</code>	Receives packets from recvfrom and sends packets to sendto.	false	true:false	Both	All
<code>generic</code>	Consume generic packets.	false	true:false	Consumer	All
<code>latency</code>	Enables timestamp propagation and measurement of latency.	false	true:false	Both	Linux
<code>broadcast</code>	Sets swtch-perf to use normal broadcast mode, when sending it will use the IP of the --nic argument.	false	true:false	Both	All
<code>generic-broadcast</code>	Sets iperf to use broadcast mode using the IP of 255.255.255.255.	false	true:false	Both	All
<code>broadcast-port</code>	Sets port to be used for broadcast, and is only valid with --broadcast and --generic-broadcast argument and is Mandatory for --broadcast --generic-broadcast .		Ports: 1024 <= x <= 65535	Both	All
<code>rtt-latency</code>	Enables timestamp propagation and measurement of RTT/2 where RTT = round trip time	false			Windows
<code>one-way-latency</code>	Enables timestamp propagation and measure of one way latency	false			Windows
<code>latency-buckets</code>	Enables histogram of latency. Use with --latency	false			Windows
<code>dbg</code>	Enables more information in the logs	false			All
<code>show-full-packet-bps</code>	Shows the bps with all headers included			Both	All

## Multicast - Example

These examples can be run from one machine or across multiple machines. Parameters for NIC names assume default installation options.

### EXAMPLE

Single Producer, Single Consumer, and one multicast group

Run this command on a VM to create a multicast group on the address `230.1.1.1` and port `3490` :

None	Copy
Linux: swtch-perf producer --sendto 239.1.1.1:3490 --pps 1000 --nic swtch-tun0 Windows: swtch-perf producer --sendto 239.1.1.1:3490 --pps 1000 --nic swtch-tun	

Example with results:

NoneCopy

```
swtch-perf producer --sendto 239.1.1.1:3490 --pps 1000 --nic swtch-tun0
Trying to reach a packet-rate of 1000 pps
swtch-perf producer threads started... Ctrl+C to exit.
|-----|-----|
|          TOTALS          |          THIS PERIOD          |
| TX PKTS | TX BYTES | TX DROPS | TX-PPS | TX-bps | TX-DPS |
|-----|-----|-----|-----|-----|-----|
|    1,283 |   128KB |      0 |   1.28K | 1.0Mbps |      0 |
|    2,274 |   227KB |      0 |    991 | 792Kbps |      0 |
|    3,267 |   326KB |      0 |    993 | 794Kbps |      0 |
|    4,262 |   426KB |      0 |    995 | 796Kbps |      0 |
```

Run this command on one of the VMs to listen to traffic on the Multicast Address **230.1.1.1** port **13490** :

NoneCopy

```
Linux:
swtch-perf consumer --recvfrom 239.1.1.1:3490 --nic swtch-tun0
Windows:
swtch-perf consumer --recvfrom 239.1.1.1:3490 --nic swtch-tun
```

Example with results:

NoneCopy

```
testadmin@D5d-agent-102:~$ swtch-perf consumer --recvfrom 239.1.1.1:3490 --nic swtch-tun0
swtch-perf consumer threads started... Ctrl+C to exit.
|-----|-----|
|          TOTALS          |          THIS PERIOD          |
| RX PKTS | RX BYTES | RX DROPS | RX-PPS | RX-bps | RX-DPS |
|-----|-----|-----|-----|-----|-----|
|         0 |        0B |      0 |      0 |    0bps |      0 |
|         0 |        0B |      0 |      0 |    0bps |      0 |
|         0 |        0B |      0 |      0 |    0bps |      0 |
|        330 |   33.00KB |      0 |      330 | 264Kbps |      0 |
|       1,326 |   132KB |      0 |      996 | 796Kbps |      0 |
|       2,328 |   232KB |      0 |     1.00K | 801Kbps |      0 |
|       3,330 |   333KB |      0 |     1.00K | 801Kbps |      0 |
|       4,332 |   433KB |      0 |     1.00K | 801Kbps |      0 |
|       5,328 |   532KB |      0 |      996 | 796Kbps |      0 |
|       6,330 |   633KB |      0 |     1.00K | 801Kbps |      0 |
```

- To add more consumers you simply run the same swtch-perf command on new VMs.

## Broadcast - Example

These examples can be run from one machine or across multiple machines. Parameters for NIC names assume default installation options.

### EXAMPLE

Single Producer, Single Consumer, and broadcast

Run this command on a VM to create a broadcast

NoneCopy

```
Linux:
swtch-perf producer --broadcast --nic eth1 --pps 1000 --broadcast-port 1234
Windows:
swtch-perf producer --broadcast --nic 'Ethernet 2' --pps 1000 --broadcast-port 1234
```

Example with results:

None	Copy
<pre> PS C:\Users\testadmin&gt; swxtch-perf producer --broadcast --nic 'Ethernet 2' --pps 1000 --broadcast-port 1234 Config:     Sending traffic to broadcast address.     Ip Address: 10.2.195.255     Port      : 10000     Interface IP Address: 45     Running without a total packet counter limit     Running the application without a timing limit Sent 972 total packets, throughput: 890.383 pkts/sec Sent 2047 total packets, throughput: 993.128 pkts/sec Sent 3123 total packets, throughput: 991.82 pkts/sec Sent 4198 total packets, throughput: 990.419 pkts/sec </pre>	

Run this command on one of the VMs to listen for broadcast

None	Copy
<pre> Linux: swxtch-perf consumer --broadcast --nic eth1--pps 1000 Windows: swxtch-perf consumer --broadcast --nic 'Ethernet 3' --pps 1000 </pre>	

# swxtch-top

## WHAT TO EXPECT

swxtch-top is one of the utility applications included in xNIC installation. It can be run from the console of any VM that has the **xNIC** software installed, displaying real-time statistics of an attached cloudSwXtch instance. This includes data regarding mesh, high availability, multicast and PTP.

In this article, you will learn how to navigate through the different pages in swxtch-top and get better visibility on how data flows in your cloudSwXtch instance.

## Running swxtch-top

Depending on your operating system, you can use certain commands to run swxtch-top on your VM.

For both Windows and Linux agents (xNICs), users can enter the following into the terminal:

BashCopy

```
swxtch-top --swxtch <cloudSwXtch-IP>
```

Example:

BashCopy

```
swxtch-top --swxtch 10.5.1.6
```

From the cloudSwXtch, users can enter the following command:

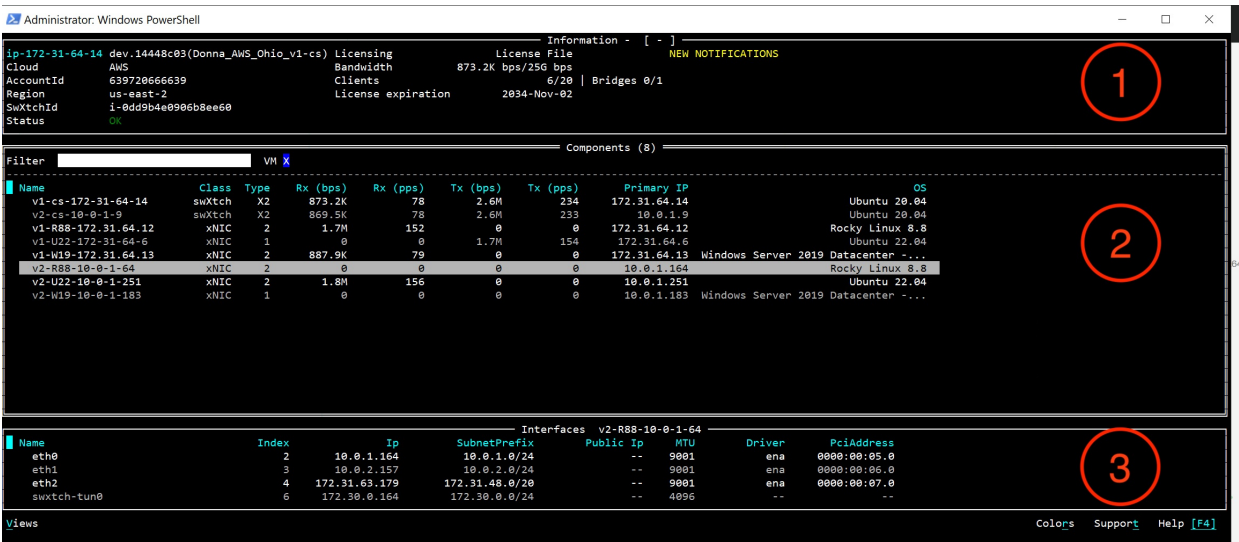
BashCopy

```
swxtch-top
```

## Updating cloudSwXtch for swXtch-top

The following screenshots have been taken on the latest version of cloudSwXtch. To learn how to upgrade your cloudSwXtch, please see the article, [Upgrading cloudSwXtch](#).

## Navigating swxtch-top Dashboard



The swxtch-top dashboard is organized into 3 panels as shown in the screenshot above. While the top panel will remain static, displaying information regarding the cloudSwXtch, the bottom 2 panels will change depending on the selected view. The swxtch-top dashboard has 12 different views:

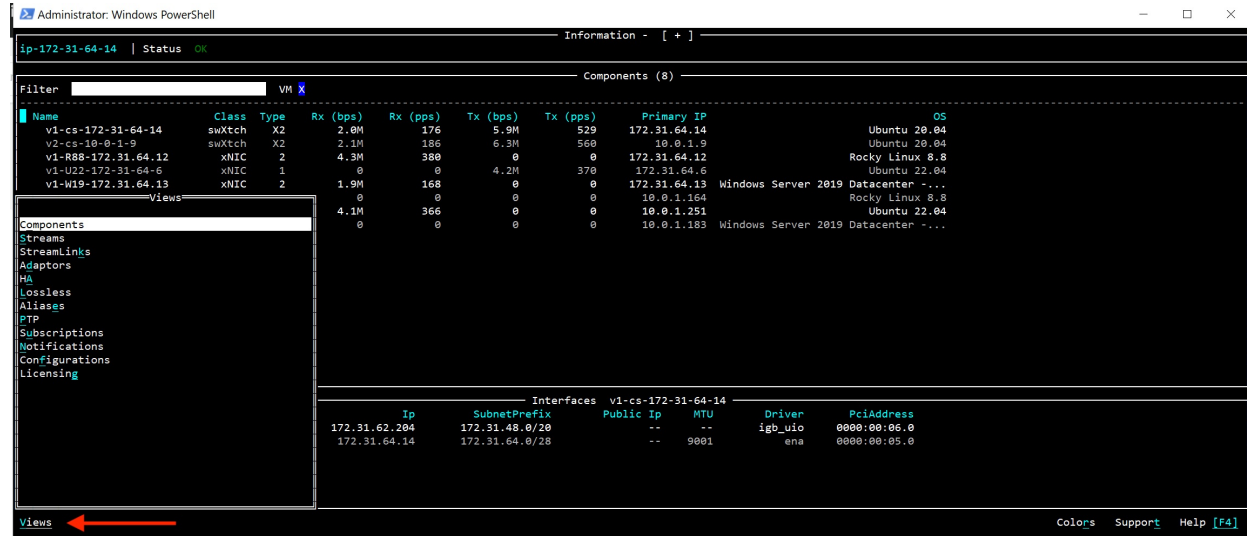
- 1. Components (Default)
- 2. Streams
- 3. StreamLinks
- 4. Adaptors
- 5. HA
- 6. Lossless
- 7. Aliases
- 8. PTP
- 9. Subscriptions
- 10. Notifications

11. Configuration
12. Licensing

## Switching Between swXtch-top Views

To switch between views, click on the Views option in the lefthand corner of swXtch-top and select the desired view from the menu. Alternatively, users can press CTRL + V to open the menu and then CTRL + the highlighted letter to switch to that view. For example, to toggle to "StreamLinks", enter CTRL + V and CTRL + K.

**Note:** Opening the menu with the CTRL key is not necessary if you know the highlighted letter for your desired view. Simply entering CTRL + the highlighted letter will open the view.

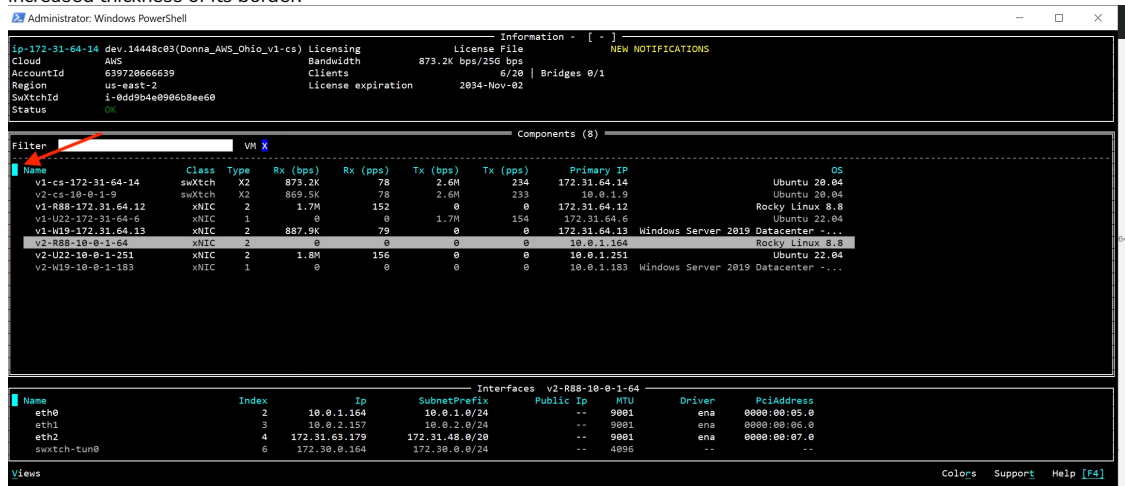


## Using the Setup Function

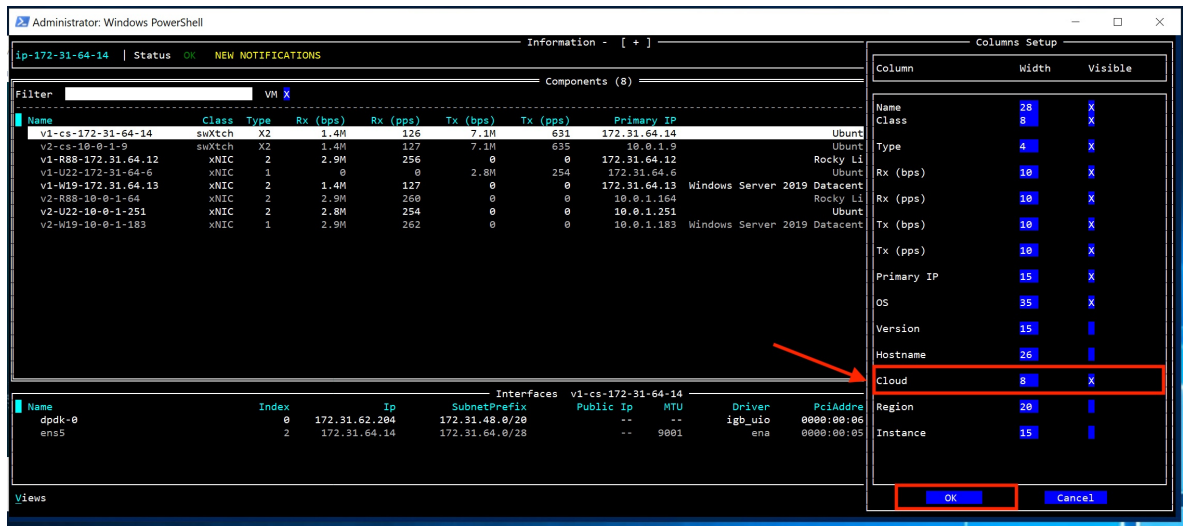
Users can modify what columns are visible in each of the views and the width of those columns. **Please note:** These changes will persist between swxtch-top sessions.

To do this:

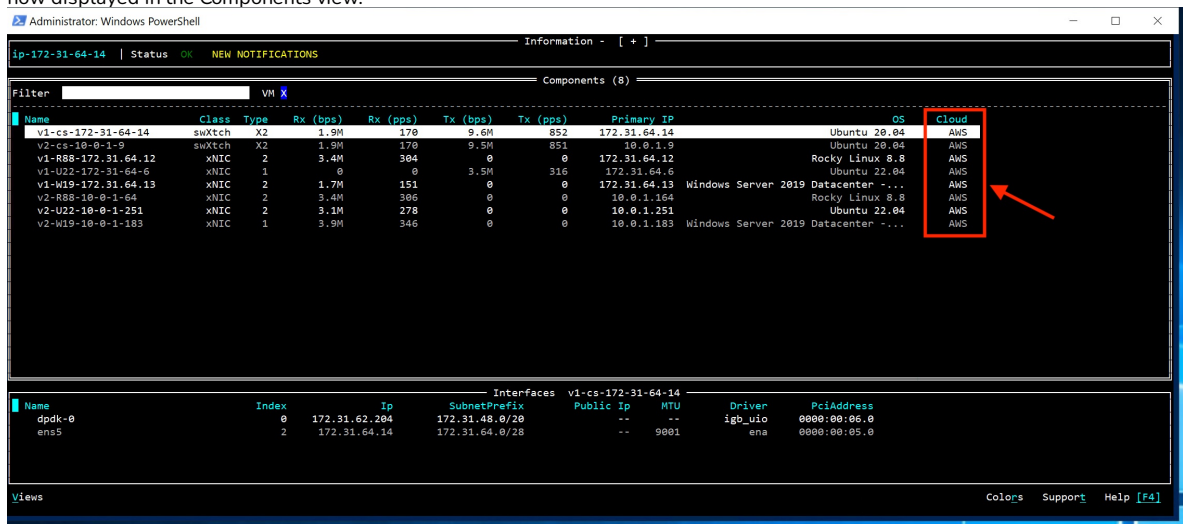
1. Select the [+] next to the first column. This will open the Setup menu for that specific panel.
  - a. Alternatively, you can click a panel to select it and press F3 to open the Setup menu. You can tell you selected panel by the increased thickness of its border.



2. Click one of the blue checkboxes under **Visible** to highlight the column you wish to add. An X will appear.
  - a. You can also change the width of the columns in swXtch-top in this panel.
3. Hit **OK** to confirm your selection.

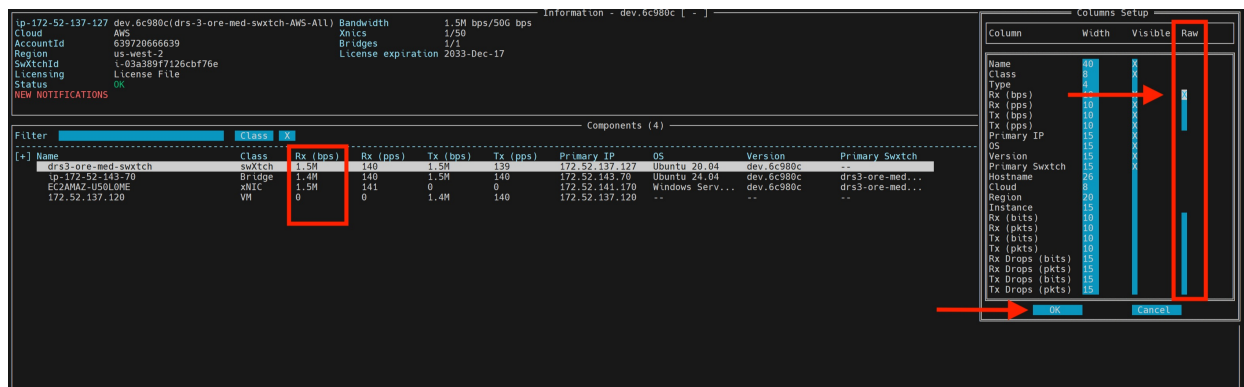


The new column should now appear in the swtch-top view. In this example, the Cloud column was added by the user and is now displayed in the Components view.



### Using Setup to Toggle Raw Totals On/Off

By default, swtch-top will round the total of bits and packets into a simplified number. For example, instead of 1496892, swtch-top will write 1.5 M (million). To toggle this on/off, go to the Setup menu and check the column that you would like the raw totals for and select OK.



The raw total should appear in a few seconds for the entire column.



ip-172-52-137-127

dev.6c980c(drs-3-ore-med-swxtch-AWS-ALL)

Bandwidth

1.5M bps/50G bps

Cloud

AWS

Xnics

1/50

Accountid

639720666639

Bridges

1/1

Region

us-west-2

License expiration

2033-Dec-17

SwxtchId

l-03a389f7126cbf76e

License File

Licensing

Status

OK

NEW NOTIFICATIONS

Filter

Class

X

Components (4)

Name	Class	Rx (bps)	Rx (pps)	Tx (bps)	Tx (pps)	Primary IP	OS	Version	Primary Swxtch
dr3-3-ore-med-swxtch	swxtch	1439984	140	1.4M	139	172.52.143.70	Ubuntu 20.04	dev.6c980c	--
ip-172-52-143-70	Bridge	1437712	139	1.5M	139	172.52.143.70	Ubuntu 20.04	dev.6c980c	dr3-3-ore-med...
EC2AMAZ-USOLONE	xNIC	1437984	138	0	0	172.52.141.170	Windows Serv...	dev.6c980c	dr3-3-ore-med...
172.52.137.120	VM	0	0	1.4M	139	172.52.137.120	--	--	--

## Changing swXtch-top Colors

Users can change the colors displayed in swxtch-top by keying in different hex codes in the Colors Set-Up menu.

To do this:

- Click **Colors** at the bottom of swxtch-top or enter **CTRL + R**.

ip-172-31-64-14

dev.f91a2e(Donna\_AMS\_Ohio\_v1-cs)

Bandwidth

1.5M bps/25G bps

Cloud

AWS

Xnics

2/20

Accountid

639720666639

Bridges

1/1

Region

us-east-2

License expiration

2034-Nov-02

SwxtchId

i-0dd9b4e9906b8ee60

License File

Licensing

Status

OK

NEW NOTIFICATIONS

Filter

Class

X

Components (6)

Name	Class	Type	Rx (bps)	Rx (pps)	Tx (bps)	Tx (pps)	Primary IP	OS	Version	Primary Swxtch
v1-cs-172-31-64-14	swxtch	X2	1.5M	141	1.5M	141	172.31.64.14	Ubuntu 20.04	dev.f91a2e	--
ip-172-31-64-7.us...	Bridge	3	1.7M	165	4.4M	422	172.31.64.7	Red Hat Ente...	dev.f91a2e	v1-cs-172-31...
v1-R88-172.31.64.12	xNIC	2	1.5M	140	0	0	172.31.64.12	Rocky Linux 8.8	dev.f91a2e	v1-cs-172-31...
v1-U02-172-31-64-6	xNIC	1	0	0	1.7M	165	172.31.64.6	Ubuntu 22.04	dev.f91a2e	v1-cs-172-31...
172.31.50.158	VM	--	0	0	0	0	172.31.50.158	--	--	--
172.31.54.46	VM	--	0	0	0	0	172.31.54.46	--	--	--

Interfaces v1-cs-172-31-64-14

Name	Index	IP	SubnetPrefix	Public IP	MTU	Driver	PciAddress
dpdk-0	0	172.31.62.204	172.31.64.0/28	--	--	igb_uio	0000:00:06:0
ens5	2	172.31.64.14	172.31.64.0/28	--	9001	ena	0000:00:05:0

Views

Colors

Support

Help

- Select Custom from the Scheme dropdown menu.
- Enter the desired hex codes into one of the fields.
- Click **Confirm** when you are happy with your color selections.

ip-172-31-64-14

dev.f91a2e(Donna\_AMS\_Ohio\_v1-cs)

Bandwidth

1.5M bps/25G bps

Cloud

AWS

Xnics

2/20

Accountid

639720666639

Bridges

1/1

Region

us-east-2

License expiration

2034-Nov-02

SwxtchId

i-0dd9b4e9906b8ee60

License File

Licensing

Status

OK

NEW NOTIFICATIONS

Filter

Class

X

Components (6)

Name	Class	Type	Rx (bps)	Rx (pps)	Tx (bps)	Tx (pps)	Primary IP	OS	Version	Primary Swxtch
v1-cs-172-31-64-14	swxtch	X2	1.5M	142	1.5M	142	172.31.64.14	Ubuntu 20.04	dev.f91a2e	--
ip-172-31-64-7.us...	Bridge	3	1.3M	125	4.4M	424	172.31.64.7	Red Hat Ente...	dev.f91a2e	v1-cs-172-31...
v1-R88-172.31.64.12	xNIC	2	1.5M	141	0	0	172.31.64.12	Rocky Linux 8.8	dev.f91a2e	v1-cs-172-31...
v1-U02-172-31-64-6	xNIC	1	0	0	1.3M	125	172.31.64.6	Ubuntu 22.04	dev.f91a2e	v1-cs-172-31...
172.31.50.158	VM	--	0	0	0	0	172.31.50.158	--	--	--
172.31.54.46	VM	--	0	0	0	0	172.31.54.46	--	--	--

Interfaces v1-cs-172-31-64-14

Name	Index	IP	SubnetPrefix	Public IP	MTU	Driver	PciAddress
dpdk-0	0	172.31.62.204	172.31.64.0/28	--	--	igb_uio	0000:00:06:0
ens5	2	172.31.64.14	172.31.64.0/28	--	9001	ena	0000:00:05:0

Views

Colors

Support

Help

Colors Setup

Scheme:

Custom

Header/Label:

#00FFFF

Row Text (odd):

#FF7126

Row Text (even):

#000000

Primary Text:

#FFFFFF

Screen Background:

#000000

Buttons/Fields Background:

#0000FF

Border/Title:

#FFFFFF

Status OK:

#008000

Status Warning:

#FFD700

Status Fail:

#FF0000

Confirm

Cancel

- swxtch-top should now display the assigned colors.

Administrator: Windows PowerShell

ip-172-31-64-14 | Status OK NEW NOTIFICATIONS

Information - [ + ]

Filter  Class X

Components (6)

Name	Class	Type	Rx (bps)	Rx (pps)	Tx (bps)	Tx (pps)	Primary IP	OS	Version	Primary Switch
v1-cs-172-31-64-14	swXtch	X2	1.5M	141	1.5M	141	172.31.64.14	Ubuntu 20.04	dev.f91a2e	--
ip-172-31-64-7.us...	Bridge	3	1.4M	141	4.4M	423	172.31.64.7	Red Hat Ente...	dev.f91a2e	v1-cs-172-31...
v1-R88-172.31.64.12	xNIC	2	1.5M	143	0	0	172.31.64.12	Rocky Linux 8.8	dev.f91a2e	v1-cs-172-31...
v1-U22-172-31-64-6	xNIC	1	0	0	1.4M	141	172.31.64.6	Ubuntu 22.04	dev.f91a2e	v1-cs-172-31...
172.31.50.158	VM	--	0	0	0	0	172.31.50.158	--	--	--
172.31.54.46	VM	--	0	0	0	0	172.31.54.46	--	--	--

Interfaces v1-cs-172-31-64-14

Name	Index	Ip	SubnetPrefix	Public Ip	MTU	Driver	PciAddress
dpdk-0	0	172.31.62.204	172.31.48.0/20	--	--	igb_uio	0000:00:06:0
ens5	2	172.31.64.14	172.31.64.0/28	--	9001	ena	0000:00:05:0

Views Colors Support Help

## Exporting Support Logs

Administrator: Windows PowerShell

ip-10-0-1-9 | Status OK

Information - [ + ]

Filter

Support

Command: Switch info

Output File Location:

Execute Cancel

Options: Max high marks, List high marks, Report, Entitlements

Views Colors Support Help [F4]

The swXtch-top Support menu allows users to export cloudSwXtch logs, similar to the functionality found in the wXcked Eye [Support](#) page.

To navigate to this menu, you can enter CTRL + T or select Support in the bottom navigation bar.

Selecting one of the report options will prompt users to enter parameters as shown in the example below. The report will save on the VM's user directory.

Administrator: Windows PowerShell

ip-10-0-1-9 | Status OK

Information - [ + ]

Filter

Support

Command: Switch info (Plain text)

Output File Location:

Execute Cancel

Views Colors Support Help [F4]

## Panel 1: Information

Information - dev				NEW NOTIFICATIONS
ip-172-41-128-25	dev-fbd4bf(AWS-drs2-ore-med-swxtch2-swxtch-all)	Licensing	License File	
Cloud	AWS	Bandwidth	1.7M bps/50.0G bps	Bridges 0/1
AccountId	639720666639	Clients	7/30	
Region	us-west-2	License expiration	2033-Nov-08	
SwXtchId	i-0005b067da040f7e4			
Status	OK			

The first panel of the swxtch-top dashboard provides users with information regarding their cloudSwXtch as well as their subscription plan. Each cloud provider will have alternative titles for some of the listed items but for the most part, the information is the same.

On the left side of the section:

- cloudSwXtch name
- Cloud (Azure, AWS, GCP, OCI)
- SubscriptionID (Azure), Account ID (AWS), or ID (GCP)
- ResourceGroupName (Azure) or Region (AWS and GCP)
- SwXtchID
- Status

On the right side of the section:

- Licensing Type
- Bandwidth Allotment
- Number of Clients and Bridges
- License Expiration Date

The Information panel is fully collapsible by either selecting the (+) or (-) buttons. Users can also open and close the panel using the F2 key on their keyboard. The collapsed view will only display the cloudSwXtch name, the status, the licensing type, and new notifications.

When there are new notifications under the Notifications view, a “NEW NOTIFICATIONS” message will also display in this box.

For more information regarding licensing, please read the [cloudSwXtch System Requirements](#) article.

## Panel 2 and 3: Views

Panel 2 and 3 defaults to the Components view and is shown in the picture above. However, the display changes based on view selection. To change views, key in CTRL + the associated letter for that view.

Please note: Not all views have a 3rd panel.

## Filter Bar

At the top of each view's main panel, there is a white search “Filter” bar. This allows users to filter through the contents in the current view. Simply type the information you would like to filter the list by, followed by an asterisk (\*), and hit Enter. For example, **v1\*** to see all the fields that have “v1” in in.

The screenshot shows the swxtch-top dashboard in a Windows PowerShell window. The top panel displays information for a specific cloudSwXtch instance. The middle panel shows a list of components with a filter bar at the top. The bottom panel shows network interfaces.

Name	Class	Type	Rx (bps)	Rx (pps)	Tx (bps)	Tx (pps)	Primary IP	OS
v1-cs-172-31-64-14	swXtch	X2	873.2K	78	2.6M	234	172.31.64.14	Ubuntu 20.04
v2-cs-10-0-1-9	swXtch	X2	869.5K	78	2.6M	233	10.0.1.9	Ubuntu 20.04
v1-R88-172.31.64.12	xNIC	2	1.7M	152	0	0	172.31.64.12	Rocky Linux 8.8
v1-U22-172-31-64-6	xNIC	1	0	0	1.7M	154	172.31.64.6	Ubuntu 22.04
v1-W19-172.31.64.13	xNIC	2	887.9K	79	0	0	172.31.64.13	Windows Server 2019 Datacenter -...
v2-R88-10-0-1-64	xNIC	2	0	0	0	0	10.0.1.164	Rocky Linux 8.8
v2-U22-10-0-1-251	xNIC	2	1.8M	156	0	0	10.0.1.251	Ubuntu 22.04
v2-W19-10-0-1-183	xNIC	1	0	0	0	0	10.0.1.183	Windows Server 2019 Datacenter -...

Name	Index	Ip	SubnetPrefix	Public Ip	MTU	Driver	PciAddress
eth0	2	10.0.1.164	10.0.1.0/24	--	9001	ena	0000:00:05.0
eth1	3	10.0.2.157	10.0.2.0/24	--	9001	ena	0000:00:06.0
eth2	4	172.31.63.179	172.31.48.0/20	--	9001	ena	0000:00:07.0
swxtch-tun0	6	172.30.0.164	172.30.0.0/24	--	4096	--	--

## Components

Name	Class	Type	Rx (bps)	Rx (pps)	Tx (bps)	Tx (pps)	Primary IP	OS	Version	Primary Swtch
v1-cs-172-31-64-14	swtch	X2	0	0	0	0	172.31.64.14	Ubuntu 20.04	dev.a949b8	--
v2-cs-10-0-1-9	swtch	X2	0	0	0	0	10.0.1.9	Ubuntu 20.04	dev.a949b8	--
v1-R88-172.31.64.12	xNIC	2	0	0	0	0	172.31.64.12	Rocky Linux 8.8	dev.a949b8	v1-cs-172-31-64-14
v1-U22-172.31.64-6	xNIC	2	0	0	0	0	172.31.64-6	Ubuntu 22.04	dev.a949b8	v1-cs-172-31-64-14
v1-W19-172.31.64.13	xNIC	1	0	0	0	0	172.31.64.13	Windows Server 2019 Datacenter - Microsoft...	dev.a949b8	v1-cs-172-31-64-14
v2-R88-10-0-1-64	xNIC	2	0	0	0	0	10.0.1.164	Rocky Linux 8.8	dev.a949b8	v2-cs-10-0-1-9
v2-U22-10-0-1-251	xNIC	2	0	0	0	0	10.0.1.251	Ubuntu 22.04	dev.a949b8	v2-cs-10-0-1-9
v2-W19-10-0-1-183	xNIC	2	0	0	0	0	10.0.1.183	Windows Server 2019 Datacenter - Microsoft...	dev.a949b8	v2-cs-10-0-1-9

Name	Index	Ip	SubnetPrefix	Public Ip	MTU	Driver	PciAddress
dpdk-0	0	172.31.62.204	172.31.48.0/28	--	--	igb_uio	0000:00:06:0
ens5	2	172.31.64.14	172.31.64.0/28	--	9001	ena	0000:00:05:0

The Components view gives a detailed list of all the connected nodes in a cloudSwXtch's network. To navigate to this view, press CTRL+E or click on the view's name. To switch between components, use the up and down directional keys on your keyboard.

This view includes:

- **Name** - The name of the component
- **Class** - Either cloudSwXtch, xNIC, or VM (non-xNIC)
- **Type** - X1 or X2 for cloudSwXtch or Type 1 or 2 for xNIC
- **RX bps** - The total ingress bits per second that the component is receiving.
- **RX pps** - The total ingress packets per second that the component is receiving.
- **TX bps** - The total egress bits per second that the component is transmitting.
- **TX pps** - The total egress packets per second that the xNIC is transmitting.
- **Primary IP** - The primary interface IP address
- **OS** - Operating System
- **Primary Swtch** - This lists the cloudSwXtch the xNIC was installed against

There are additional column options in the Setup menu:

Column	Width	Visible
Name	40	X
Class	8	X
Type	4	X
Rx (bps)	10	X
Rx (pps)	10	X
Tx (bps)	10	X
Tx (pps)	10	X
Primary IP	15	X
OS	45	X
Version	15	X
Primary Swtch	25	X
Hostname	35	X
Cloud	8	X
Region	20	X
Instance	15	X
Rx (bits)	10	X
Rx (pkts)	10	X
Tx (bits)	10	X
Tx (pkts)	10	X
Rx Drops (bits)	15	X
Rx Drops (pkts)	15	X
Tx Drops (bits)	15	X
Tx Drops (pkts)	15	X

An **Interfaces** panel displays when in the Component view, detailing the interfaces of a selected component. This panel includes the following information for each interface:

Name	Index	Ip	SubnetPrefix	Public Ip	MTU	Driver	PciAddress
Ethernet 3	4	10.0.1.183	10.0.1.0/24	--	1500	ena.sys	0000:00:06:0
Ethernet 4	5	10.0.2.183	10.0.2.0/24	--	1500	ena.sys	0000:00:06:0
Ethernet 5	12	172.31.34.87	172.31.48.0/28	--	1500	ena.sys	0000:00:07:0

## Filtering Out Virtual Machines

Next to the Filter search bar, there is a checkbox with virtual machines (VMs) selected. This means that non-xNIC virtual machines will display in the components list. If a user wishes to hide these virtual machines and just focus on swXtch.io-based components, they can deselect this VM filter.

Administrator: Windows PowerShell

Information - [ - ]

ip-172-31-64-14 dev.14448c03(Donna\_AWS\_Ohio\_v1-cs) Licensing License File NEW NOTIFICATIONS


Cloud AWS Bandwidth 873.2K bps/250 bps

AccountId 639720666639 Clients 6/20 Bridges 0/1

Region us-east-2 License expiration 2034-Nov-02

SwXtchId i-0dd9b4e0906b8ee60

Status OK

Filter  VM 

Components (8)

Name	Class	Type	Rx (bps)	Rx (pps)	Tx (bps)	Tx (pps)	Primary IP	OS
v1-cs-172-31-64-14	swXtch	X2	873.2K	78	2.6M	234	172.31.64.14	Ubuntu 20.04
v2-cs-10-0-1-9	swXtch	X2	869.5K	78	2.6M	233	10.0.1.9	Ubuntu 20.04
v1-R88-172.31.64.12	xNIC	2	1.7M	152	0	0	172.31.64.12	Rocky Linux 8.8
v1-U22-172.31.64.6	xNIC	1	0	0	1.7M	154	172.31.64.6	Ubuntu 22.04
v1-W19-172.31.64.13	xNIC	2	887.9K	79	0	0	172.31.64.13	Windows Server 2019 Datacenter - ...
v2-R88-10-0-1-64	xNIC	2	0	0	0	0	10.0.1.164	Rocky Linux 8.8
v2-U22-10-0-1-251	xNIC	2	1.8M	156	0	0	10.0.1.251	Ubuntu 22.04
v2-W19-10-0-1-183	xNIC	1	0	0	0	0	10.0.1.183	Windows Server 2019 Datacenter - ...

Interfaces v2-R88-10-0-1-64

Name	Index	Ip	SubnetPrefix	Public Ip	MTU	Driver	PciAddress
eth0	2	10.0.1.164	10.0.1.0/24	--	9001	ena	0000:00:05.0
eth1	3	10.0.2.157	10.0.2.0/24	--	9001	ena	0000:00:06.0
eth2	4	172.31.63.179	172.31.48.0/20	--	9001	ena	0000:00:07.0
swXtch-tun0	6	172.30.0.164	172.30.0.0/24	--	4896	--	--

Views Colors Support Help [F4]

## Streams

Streams (2)

Filter

Streams

Streams	Component	Protocol	Rx Pkts (pps)	Rx Bits (bps)	Tx Pkts (pps)	Tx Bits (bps)
(-) 224.2.2.3:8400						
(-) v1-U22-172-31-64-6	xNIC	xMC	0	0	171	1.9M
(-) v1-cs-172-31-64-14	swXtch	xMC	171	1.9M	513	5.8M
v1-R88-172.31.64.12	xNIC	xMC	171	1.9M	0	0
v1-W19-172.31.64.13	xNIC	xMC	171	1.9M	0	0
v2-U22-10-0-1-251	xNIC	xMC	171	1.9M	0	0
(-) 224.2.2.4:8400						
(-) v1-U22-172-31-64-6	xNIC	xMC	0	0	172	1.9M
(-) v2-cs-10-0-1-9	swXtch	xMC	172	1.9M	516	5.8M
v1-R88-172.31.64.12	xNIC	xMC	172	1.9M	0	0
v1-W19-172.31.64.13	xNIC	xMC	172	1.9M	0	0
v2-U22-10-0-1-251	xNIC	xMC	172	1.9M	0	0

This tree view shows all the multicast groups that are being received and/or transmitted by the cloudSwXtch and how it interacts with the various endpoints. **To navigate to this view**, enter CTRL + S or click on the view's name.

This view includes:

- **Stream** - The name of the stream IP and Port. This could also be an [Alias](#) set in wXcked Eye. For example, BaseballCamera1 and BaseballCamera2 were Aliases assigned in wXcked Eye.
- **Components**: swXtch, xNIC or VM (Virtual Machine w/o xNIC)
- **Protocol**: Multicast or Broadcast
- **RX Pkts**: The total ingress packets per second being received by the component.
- **RX Bits**: The total ingress bits per second that is received by the component.
- **TX Pkts**: The total egress packets per second that is transmitted by the component.
- **TX Bits**: The total egress bits per second that is transmitted by the component.

In the example above, stream 224.2.2.3:8400 is listed. It is being transmitted by an **endpoint (v1-u22-172-31-64-6)** to the **cloudSwXtch (v1-c2-172-31-64-14)**, which is then sent to the other endpoints. That is why there are three additional endpoints listed under the cloudSwXtch.

## Stream Links

Stream Links (6)									
Components	Direction	Protocol	Bits (bps)	Pkts (pps)	Frag-Pkts (fpps)	Frag-Pkts	Missing Pkts	OOO Pkts	
(-) v1-cs-172.31.64-14 (2)									
v1-R88-172.31.64.12 (xNIC)	Egress	xMC	216	0	--	--	0	0	
v1-U22-172.31.64-6 (xNIC)	Ingress	xMC	216	0	--	--	0	0	
v1-W19-172.31.64.13 (xNIC)	Egress	xMC	216	0	--	--	0	0	
v2-U22-10-0-1-251 (xNIC)	Egress	xMC	216	0	--	--	0	0	
(-) 224.2.2.3:8400									
v1-R88-172.31.64.12 (xNIC)	Egress	xMC	2.9M	257	--	--	0	0	
v1-U22-172.31.64-6 (xNIC)	Ingress	xMC	2.9M	257	--	--	0	0	
v1-W19-172.31.64.13 (xNIC)	Egress	xMC	2.9M	257	--	--	0	0	
v2-U22-10-0-1-251 (xNIC)	Egress	xMC	2.9M	257	--	--	0	0	
(-) v2-cs-10-0-1-9 (2)									
v1-R88-172.31.64.12 (xNIC)	Egress	xMC	216	0	--	--	0	0	
v1-U22-172.31.64-6 (xNIC)	Ingress	xMC	216	0	--	--	0	0	
v1-W19-172.31.64.13 (xNIC)	Egress	xMC	216	0	--	--	0	0	
v2-U22-10-0-1-251 (xNIC)	Egress	xMC	216	0	--	--	0	0	
(-) 224.2.2.4:8400									
v1-R88-172.31.64.12 (xNIC)	Egress	xMC	2.8M	247	--	--	0	0	

The Stream Links view displays all the cloudSwXtch network components (cloudSwXtch or xNIC) and the streams they are linked to. **To select this view**, press CTRL + K or click on the view's name. To expand a component, simply use the up and down keys on the keyboard and hit ENTER to select.

In this example, the cloudSwXtch (dsd-core-200) is selected with the singular stream 239.1.1.1:3490 expanded. Here, a user can see a list of endpoints receiving/transmitting the stream to/from the cloudSwXtch, dsd-core-200.

- **Components:** cloudSwXtch or endpoints (xNICs)
- **Direction:** Either Ingress or Egress, depending on whether data is being ingested or transmitted by the component
- **Protocol:** Multicast or Broadcast
- **Bits (bps):** Bits per second
- **Pkts (pps):** Packets per second
- **Frag-Pkts (fpps):** Fragmented packets per second
- **Frag-Pkts:** Total # of Fragmented Packets
- **Missing Packets:** Packets that did not make their destination
- **OOO Pkts:** Out of order packets

## Adaptors

Adaptors (2)						
Components	Class	Active	Direction	Stream	Node	Listener Port
(-) drs_ore-med_swxtch (12)	swXtch					
rist-caller	false	egress	RistCaller	172.41.129.63...	--	--
rist-caller	false	ingress	RistCaller	172.41.128.11...	--	--
rist-listener	false	egress	RistIngress	--	--	5643
rist-listener	false	ingress	RistIngress	--	--	5687
srt-caller	false	egress	SRT_Caller	172.41.128.11...	--	--
srt-caller	false	ingress	SRT_Caller	172.41.129.63...	--	--
srt-caller	false	ingress	SRT_Ingress_T...	172.31.63.9:5786	--	--
srt-caller	false	ingress	SRTCcaller	172.41.128.14...	--	--
srt-listener	true	egress	SRTListenerIn...	--	--	5888
srt-listener	false	ingress	SRTListenerIn...	--	--	1599
udp	false	egress	UDP_Egress	172.41.128.14...	--	--
udp	false	ingress	UDP_Ingress	--	--	5690
drs3-ore-med-swxtch (0)	swXtch					

The Adaptors view displays information regarding Protocol Conversion and Fanout. It includes a detailed list of configured protocols (UDP, SRT Caller/Listener, or RIST Caller/Listener), their direction (ingress/egress), the stream IP or stream name, the node, and Listener Port. Users can also add and delete adaptors. For more information, see the [Configuring Adaptors for Protocol Fanout](#) section.

To navigate to this view, enter CTRL + A or click on the view's name.

## HA (High Availability)

Filter						HA (6)	
Components (xNIC)							
		Path Ingress (pps)	Path Ingress (bps)	Path Usage (%)	Missing Packets		
(-) 224.2.2.2:8400	Reconstructed Path	149	1.7M	-	0		
	Path 1	149	1.7M	8.05	0		
	Path 2	149	1.7M	91.95	22		
(-) 224.2.2.2:8401	Reconstructed Path	149	1.7M	-	0		
	Path 1	149	1.7M	8.05	0		
	Path 2	149	1.7M	91.95	22		
(+/-) v1=V23-172.31.64.6	Reconstructed Path	0	0	-	0		
	Path 1	0	0	0.00	0		
	Path 2	0	0	0.00	0		
(+/-) v1=V19-172.31.64.13							
						Cluster	
Name						Swxtch/es	
(-) MyHA							
Path 1						172.31.64.14:80	
Path 2						10.0.1.9:80	
Views						DESTROY (F7)	
						Colors Support Help [F4]	

The HA view shows additional details for high availability from the perspective of the consumer. It will only show data if High Availability has been configured.

To navigate to this view, enter CTRL + H or click on the view's name. Go to [High Availability](#) for configuration details.

This view is organized into two sections: **HA** and **Cluster**.

- **HA:** This section lists the xNIC components in the cloudSwXtch network that are consuming or producing HA paths. Expanding the consumer details will show the stream IP split into two paths (red and blue) and a reconstructed path.
- **Cluster:** This section displays the high availability clusters and the associated cloudSwXtches for each path.

The statistics by each line item is further explained below:

- **Path Ingress pps** - The total ingress packets per second that is received in the path for the multicast group.
- **Path Ingress bps** - The total ingress bits per second that is received in the path for the multicast group.
- **Path Usage %** - The percentage that the path is used in the highly available multicast group.
- **Missing packets** - The total number of missing packets for the path since the inception of the stream. If you stop the stream or cloudSwXtches, the number will stop increasing but will not reset.

Users can also create and destroy HA clusters in this view. For more information, see [Configuring HA in swXtch-top](#).

Lossless



SLP Rx (2)					
Filter					
Components	RTT	RTT Var	Data Pkts	Retr Pkts	Pkts Lost
(-) ip-10-64-20-179					
└ 10.85.4.13	27.0ms	1.9ms	5.4M	19.1k	0
(-) r13.data0.mellanox					
└ 10.85.4.10	27.9ms	1.3ms	0	0	0

SLP Tx (2)					
Filter					
Components	RTT	RTT Var	Data Pkts	Retr Pkts	
(-) ip-10-64-20-179					
└ 10.85.4.13	26.8ms	1.5ms	0	0	
(-) r13.data0.mellanox					
└ 10.64.46.245	27.7ms	1.5ms	5.4M	19.1k	

The Lossless view shows statistics for data flow using swXtch Lossless UDP, or SLP, from ground to cloud through the cloudSwXtch Bridge.

To navigate to this view, enter CTRL + L or click on the view's name.

By default, the view is organized into two sections: **SLP Rx** and **SLP Tx**. Both sections will populate with information, illustrating traffic between the cloudSwXtch Bridge and the cloudSwXtch.

By default, the following columns are displayed for **SLP Rx**:

- **RTT (ns)**: Round trip time in nanoseconds it takes for our connection to send a ping and receive a response. One way latency can be estimated by dividing this value in half.
- **RTT Variance**: The variance of the RTT measurement. A high variance is indicative of an unstable connection.
- **Data Pkts**: The total number of packets received (original and retransmitted)
- **Retr Pkts**: The number of packets received as a retransmitted packet.
- **Packets Lost**: The total number of packets that were not recovered by the connection and are lost.

By default, the following columns are displayed for **SLP Tx**:

- **RTT (ns)**: The round trip time in nanoseconds it takes for our connection to send a ping and receive a response. One way latency can be estimated by dividing this value in half.
- **RTT Variance**: The variance of the RTT measurement. A high variance is indicative of an unstable connection.
- **Data Pkts**: The total number of packets transmitted (original and retransmitted)
- **Retr Pkts**: The total number of retransmitted packets

**Please note:** Although the Setup feature has additional SLP-related statistics, they are mostly use for troubleshooting purposes by the swXtch.io. We recommend using the default columns above to monitor your SLP connection.

## Aliases

Aliases					
Filter					
Alias	Stream	Primary IP	Hostname	Class	
v1-cs-172-31-64-14	--	172.31.64.14	ip-172-31-64-14	swXtch	
Stream1_Blue	235.1.132.11:6000	--	--	--	
Stream1_Red	235.1.131.11:6000	--	--	--	
Stream2_Blue	235.1.132.13:6000	--	--	--	
Stream2_Red	235.1.131.13:6000	--	--	--	
Stream3_Blue	235.1.132.15:6000	--	--	--	
Stream3_Red	235.1.131.15:6000	--	--	--	
v2-cs-10-0-1-9	--	10.0.1.9	ip-10-0-1-9	swXtch	
v1-R88-172.31.64.12	--	172.31.64.12	ip-172-31-64-12.us-east-2.c...	xNIC	
v1-U22-172-31-64-6	--	172.31.64.6	ip-172-31-64-6	xNIC	
v1-W19-172.31.64.13	--	172.31.64.13	EC2AMAZ-MRM6234	xNIC	
v2-R88-10-0-1-64	--	10.0.1.164	ip-10-0-1-164.us-east-2.com...	xNIC	
v2-U22-10-0-1-251	--	10.0.1.251	ip-10-0-1-251	xNIC	
v2-W19-10-0-1-183	--	10.0.1.183	EC2AMAZ-Q83Q25K	xNIC	
224.2.2.3:8400	224.2.2.3:8400	--	--	--	
224.2.2.4:8400	224.2.2.4:8400	--	--	--	
225.1.1.2:8400	225.1.1.2:8400	--	--	--	
225.1.1.3:8400	225.1.1.3:8400	--	--	--	
226.1.1.2:8400	226.1.1.2:8400	--	--	--	

The Aliases section provides users with a detailed list of user-assigned names for components and streams. It is split into two sections: **Component Aliases** and **Stream Aliases**.

For **Component Aliases**, the following columns will display:

- **Alias**
- **Primary IP**
- **Hostname**
- **Class**

For **Stream Aliases**, there are only two columns: **Alias** and **Stream**.

To navigate to this view, enter CTRL + E or click on the view's name.

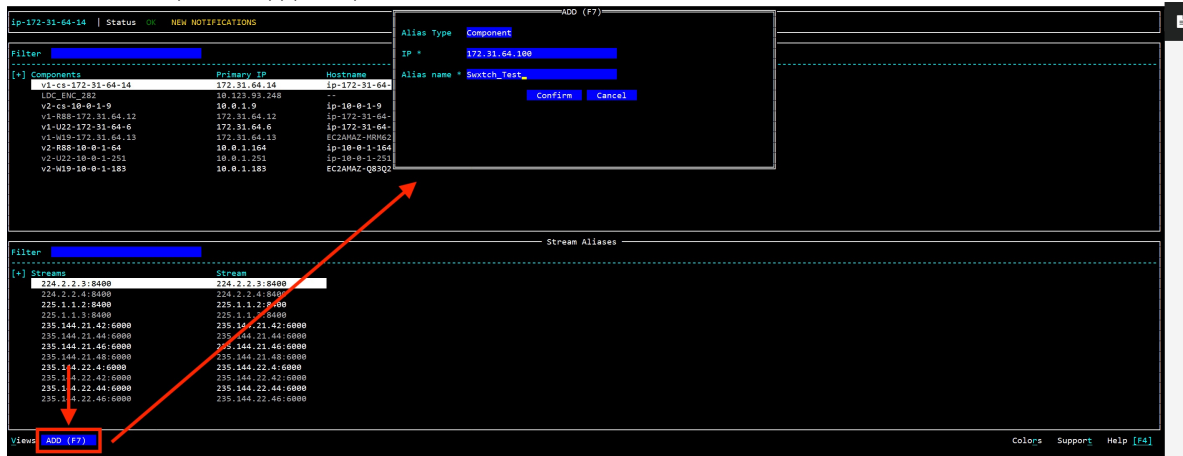
### Adding and Deleting Aliases



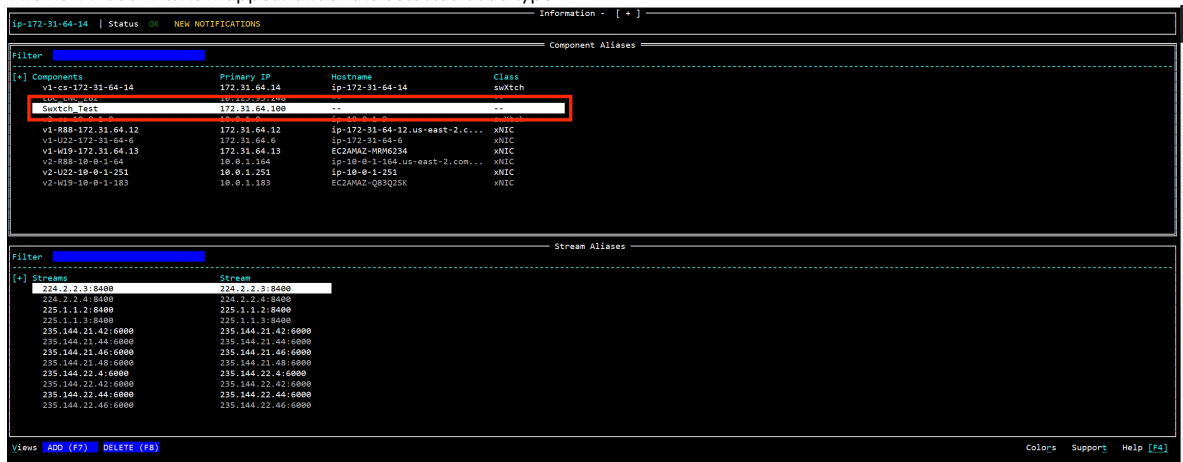
Users can add and delete aliases in swtch-top. This can also be done in the Aliases tab on the wXcked Eye Settings page.

#### To add an alias:

1. Click the Add button at the bottom of swtch-top or hit F7 on your keyboard.
  - a. A new window will open.
2. Select the Alias type: **Component** or **Stream**.
  - a. For Component, add an IP address and the assign an Alias name.
  - b. For Stream, add a Stream IP address, Port and assign an Alias.
3. Click Confirm once you are happy with your selections.

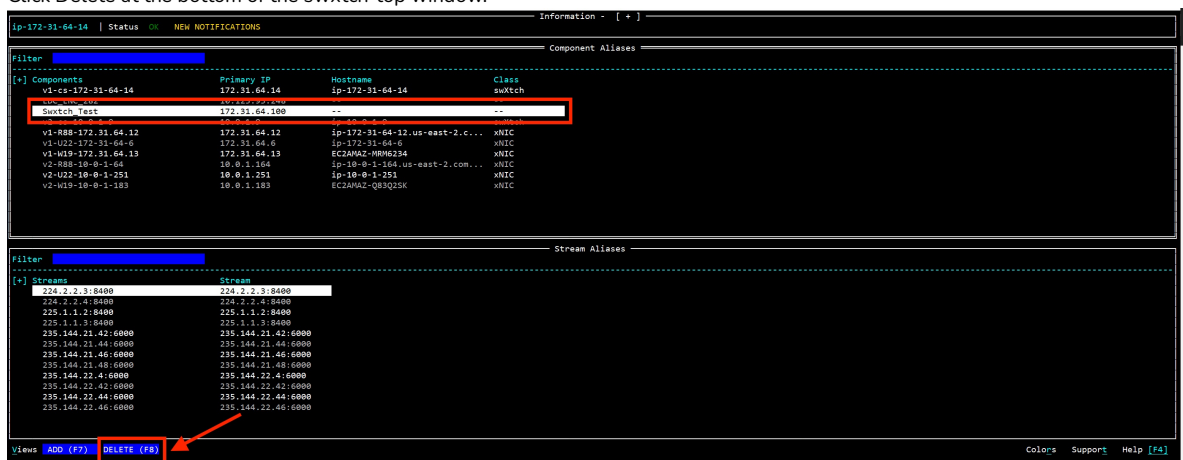


4. The new Alias will now appear under the selected alias type.



#### To delete an alias:

1. Highlight an Alias from either the Component or Stream Aliases list.
2. Click Delete at the bottom of the swtch-top window.



3. Click Confirm.
4. The Alias will disappear from list.

#### PTP

PTP Info							
Filter	Components	Name	Time Sync Service	Type	Status	Local Offset	Root Offset
	testjosebridge31az-0-core-000	testjosebridge31az-0-core-000	phc:/dev/ptp_hyperv	primary	No present		
	testjosebridge31az-0-agent-000	testjosebridge31az-0-agent-000	phc:/dev/ptp_hyperv	primary	Present	3.70 ms	200.05 ms
	testjosebridge31az-0-agent-001	testjosebridge31az-0-agent-001	phc:/dev/ptp_hyperv	primary	Present	5.01 ms	143.97 ms

The PTP view displays information regarding the clock sync configuration for the cloudSwXtch. The page in swxtch-top will only populate with information if the user has the PTP feature enabled.

To navigate to this view, enter CTRL + P or click on the view's name.

In the example above, the cloudSwXtch is acting as the Master Node and is the first line item listed. Below the cloudSwXtch are the follower nodes.

- **Master Node**- The Master Node is what the PTP configuration sets as the most reliable time source. This will send the true time it receives from the source clock to the Follower Nodes.
  - **Name** - The name of the cloudSwXtch
  - **Time Sync Service** - The source clock
- **Follower Nodes**- The Follower Nodes lists the agents/VMs that subscribe to the Master Node for accurate timing.
  - **Name** - The name of the endpoints
  - **Status** - The status of the endpoints, noting if the node is active in the PTP configuration
  - **Local Offset** - The local offset denotes the offset in time from the cloudSwXtch to the xNIC.
  - **Root Offset** - The root offset denotes the offset in time from the GrandMaster clock to the cloudSwXtch and its follower nodes (xNIC). Note how the root is larger than the local. This is normal behavior since the distance between the follower node and the Grandmaster clock is greater than the offset between a cloudSwXtch and xNIC.

### PTP Stabilization

After upgrading your cloudSwXtch system, you may notice that the local and root offset values are much larger than they actually are. It can take up to 30 minutes for the values to stabilize and return back to normal levels.

## Subscriptions

Subscriptions (7)						
Filter	Component	Filter	Sources			
	(-) EC2AMAZ-NVOHDS3					
	(-) Ethernet 3					
	224.0.0.251	exclude				--
	224.0.0.252	exclude				--
	224.0.1.129	exclude				--
	(-) dms2-one-Win2019_1_Multiviewer					
	(-) Ethernet 4					
	224.0.0.251	exclude				--
	224.0.0.252	exclude				--
	224.0.1.129	exclude				--
	(-) dms2-one-Win2019_2data_nic_2					
	(-) Ethernet 4					

Subscribers (2)						
Filter	Component	Class	Group IP:PORT	Target IP:PORT	Target Subnet	Listener Port
	(-) dms2-one-med_swxtch					
	(-) 172.30.3.255					
	dms2-one-Ubuntu_22.04_2...	Xnic	172.30.3.255	172.41.21.187:9999	172.41.21.0/24	--
	dms2-one-Win2019_2data...	Xnic	172.30.3.255	172.41.21.46:9999	172.41.21.0/24	--
	dms2-one-agent2_TL_2160...	Xnic	172.30.3.255	172.41.21.26:9999	172.41.21.0/24	--
	(-) 172.30.15.255					
	dms3-one-agent1	Xnic	172.30.15.255	172.52.144.141:9999	172.52.144.0/20	--
	dms3-one-rocky1_2data_nic	Xnic	172.30.15.255	172.41.21.135:9999	172.41.21.0/24	--
	(-) 172.41.21.255					
	dms2-one-Ubuntu_22.04_2...	Xnic	172.41.21.255	172.41.21.187:9999	172.41.21.0/24	--
	dms2-one-Win2019_1_Mult...	Xnic	172.41.21.255	172.41.21.183:9999	172.41.21.0/24	--
	dms2-one-Win2019_2data...	Xnic	172.41.21.255	172.41.21.46:9999	172.41.21.0/24	--
	dms2-one-agent2_TL_2160...	Xnic	172.41.21.255	172.41.21.26:9999	172.41.21.0/24	--

The Subscriptions page details the different source list configurations for single source multicast and multiple multicast groups. Here, users will get a detailed lists of included and excluded streams and the source they originate from.

To navigate to this view, enter CTRL + U or or click on the view's name.

## Notifications

Filter						Notifications (2)	
Id	Time	Host	System	Component	Type	Description	
2	2024-12-09 14:23:20	ip-10-0-1-9	swtch	Replicator	Info	Replicator started successfully	
1	2024-12-09 14:23:09	ip-10-0-1-9	swtch	PTP	Alert	PTP Services status: Not Installed - ClockSync Entitlement: true	

The Notifications view compiles a list of cloudSwXtch-related notifications.

To navigate to this view, enter CTRL + N or click on the view's name.

A **New Notifications** alert will appear in the Information panel in swXtch-top as shown below. Visiting the Notifications view will remove this alert.

Filter		Information - dev			
ip-172-41-128-25	dev.fbd4bf(AWS-drs2-ore-med-swxtch2-swxtch-all)	Licensing	License File	<div>NEW NOTIFICATIONS</div>	
Cloud	AWS	Bandwidth	1.7M bps/50.0G bps		
AccountId	639720666639	Clients	7/30	Bridges 0/1	
Region	us-west-2	License expiration	2033-Nov-08		
SwXtchId	i-0005b067da040f7e4				
Status	OK				

## Configurations

Filter						Configurations	
Components						Value	
(-) v1-r88-172.31.64.12							
Control Interface						eth0	
Data Interface						eth1	
(-) Data Plane Specs							
(-) Bpf Programs							
(-) [0]							
Attach Point						BPF_TC_INGRESS	
Interface						eth1	
Name						tc-ingress	
(-) [1]							
Attach Point						BPF_TC_EGRESS	
Interface						eth1	
Name						tc-egress	
(-) [2]							
Attach Point						BPF_TC_EGRESS	
Interface						eth0	
Name						tc-forwarder	
(-) [3]							
Attach Point						BPF_TC_EGRESS	
Interface						eth2	
Name						tc-forwarder	
Verbosity						0	
(-) Virtual Interface							
Ip						172.30.0.12	

The Configurations view gives users a visualization of the xNICs' configuration JSON files.

To navigate to this view, enter CTRL + F or click on the view's name.

## Licensing

Filter

Licensing

[+]

Component	Class	Type	Entitlements
(-) v1-cs-172-31-64-14	swtch	X2	
BandwidthMbps			250 bps
ClockSync			true
Fanout			true
HA			true
MajorVersionUpdate			true
Max Bridges			1
Max Clients			20
Mesh			true
TachyonLive			true
wXckedEye			true
(+) v2-cs-10-0-1-9	swtch	X2	

Details v1-cs-172-31-64-14

[+]

Key	Value
Created At	2024-10-03 18:52:04.316 +0000 UTC
Expires At	2034-11-02 18:50:00 +0000 UTC
Licensing Type	License File
Plan Name	AWS_Ohio_v1-cs

views

ColorsSupportHelp [F4]

The Licensing view gives a breakdown of the entitlements allotted to each of the cloudSwXtches included in the network.

Depending on their license, users will have a set number for their Max Bandwidth, Max Clients and Max bridges. In the example above, the user has a max bandwidthMbps of 236bps with 20 clients max and 1 bridges max. This section will also show if a user has the following features enabled: HA, Fanout, Clock Sync (PTP), wXckedEye, TachyonLive, and Major Version Update.

In addition to the Licensing details, the Details panel lists the expiration date of the license and the license type for a selected cloudSwXtch.

To navigate to this view, enter CTRL + G or click on the view's name.

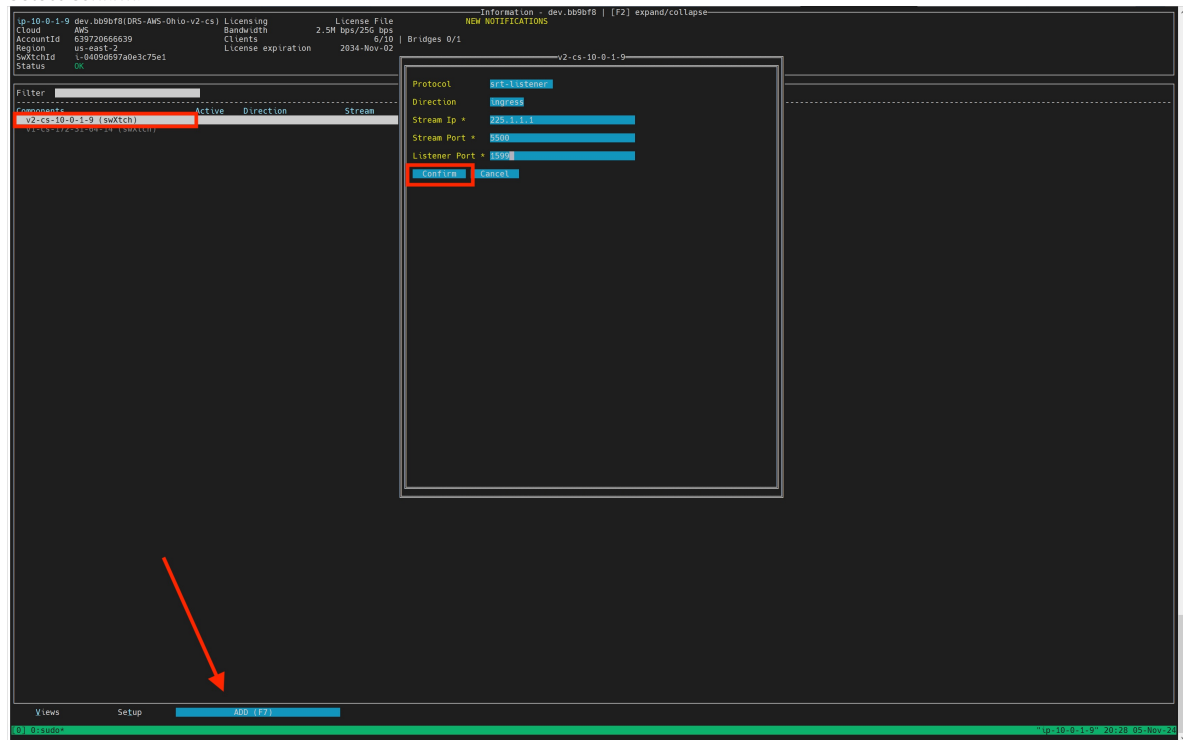
## Configuring Adaptors for Protocol Fanout

In the Adaptors view, users can configure adaptors for protocol fanout, a functionality that is also available in [wXcked Eye](#). swXtch.io's protocol fanout feature allows users to configure unicast (UDP, SRT, RIST) for the cloudSwXtch and the cloudSwXtch Bridge and fan it out to multiple instances as UDP, SRT, RIST, or multicast. For swXtch-top, users have the ability to both add and delete an adaptor.

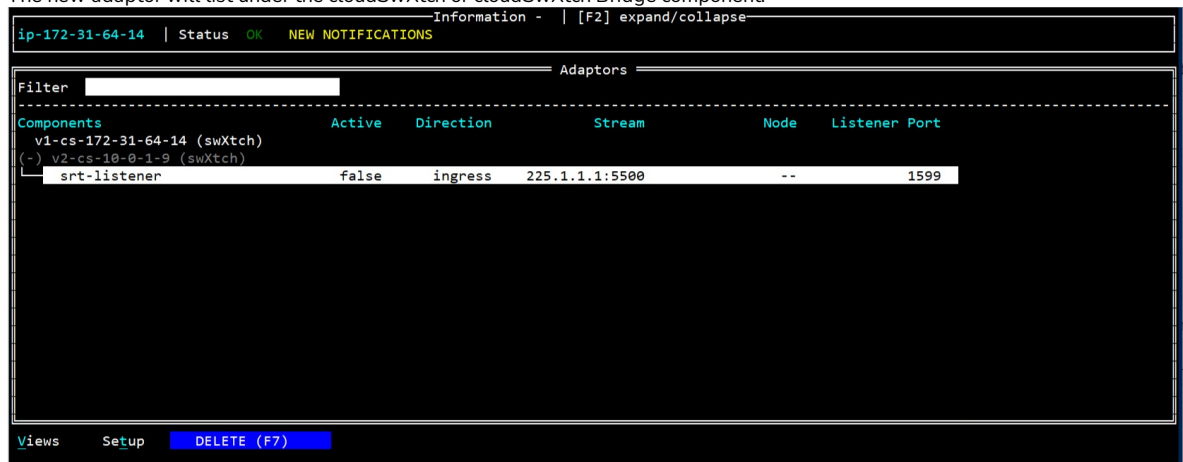
### Adding an Adaptor

1. Navigate to the Adaptors view in swXtch-top.

- Highlight a component (cloudSwXtch or cloudSwXtch Bridge) that you would like to add an adaptor. You can do this either by clicking on a listed component or using the navigation up and down navigation keys.
- Press F7 or click the Add button at the bottom of swXtch-top.
  - A new window will open.
- Enter the information for your adaptor. For an explainer on what each field means, see [Protocol Conversion and Fanout with wXcked Eye](#).
- Select Confirm.

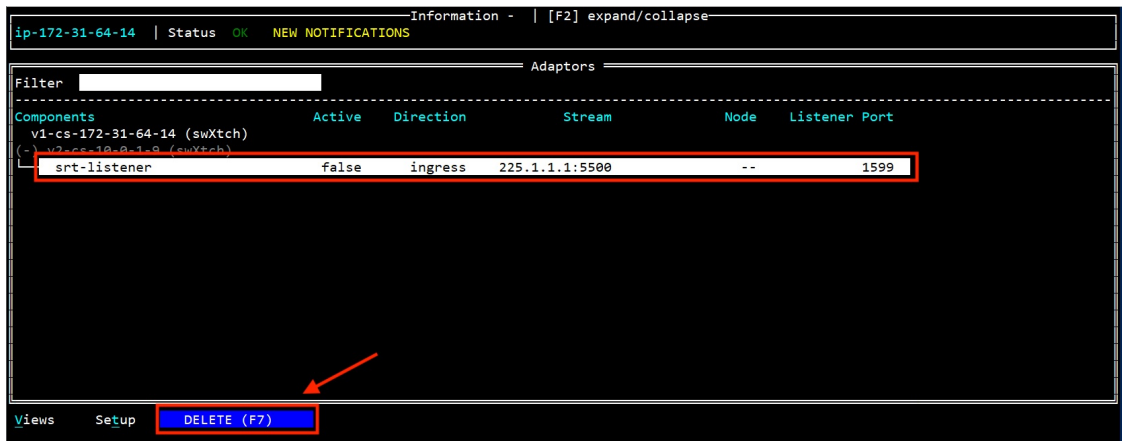


- The new adaptor will list under the cloudSwXtch or cloudSwXtch Bridge component.

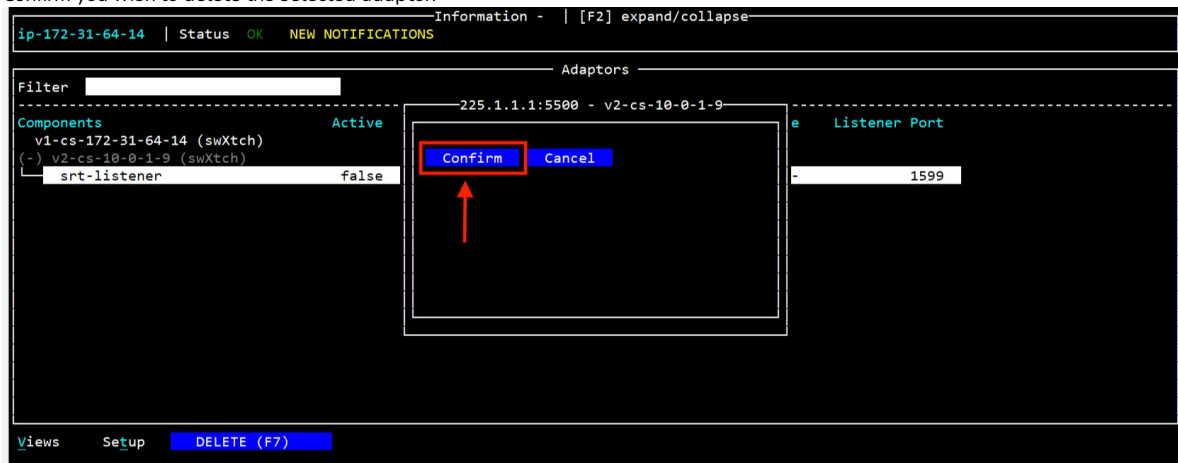


## Deleting an Adaptor

- Navigate to the Adaptors view in swXtch-top.
- Select an adaptor under a cloudSwXtch or cloudSwXtch Bridge component that you would like to delete. You can do this either by clicking on a listed component or using the navigation up and down navigation keys.
- Press F7 or click the delete button at the bottom of swXtch-top.
  - A new window will open.



- Confirm you wish to delete the selected adaptor.



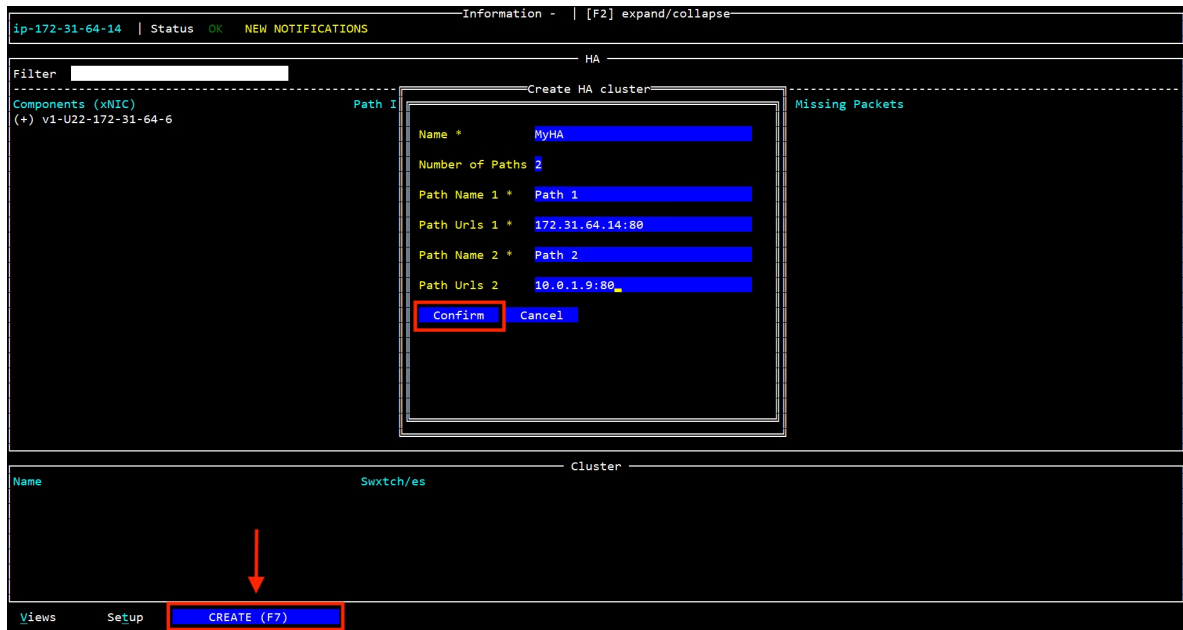
- The new adaptor will be removed from under the cloudSwXtch or cloudSwXtch Bridge component.

## Configuring HA in swXtch-top

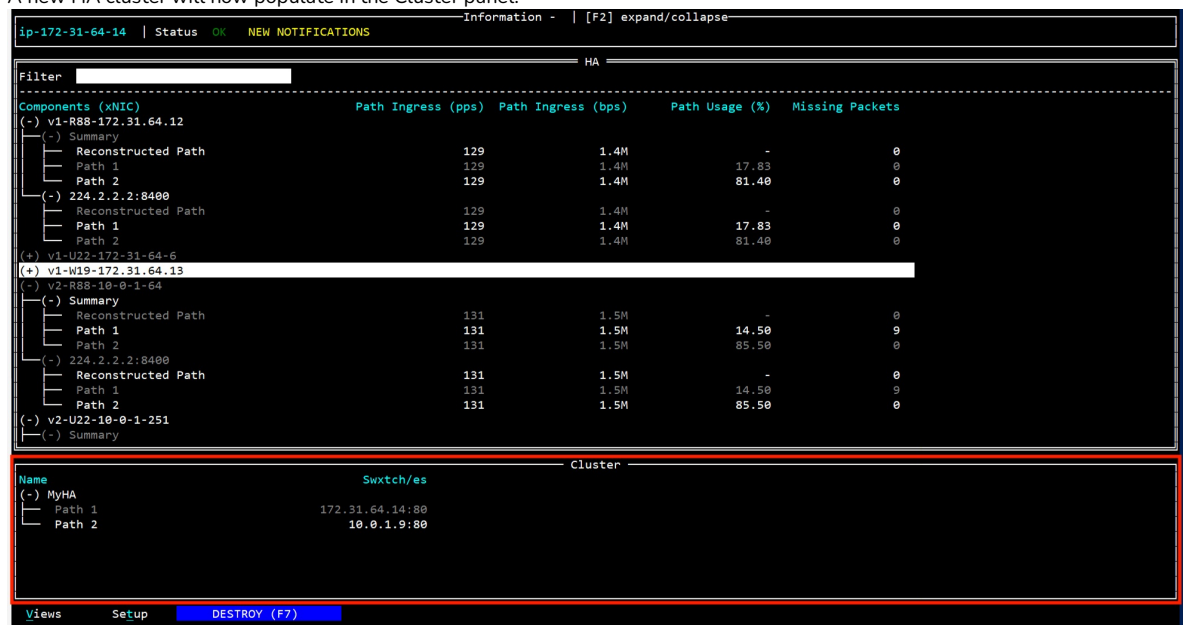
In the HA view, users can configure an HA cluster, a functionality that is also [available in wXcked Eye](#). This includes creating or deleting an HA cluster. **Note:** You cannot reconfigure an HA cluster after creating one. You must delete it to start again.

### Creating an HA cluster

- Navigate to the HA view in swXtch-top.
- Press F7 or click the Create button at the bottom of swXtch-top.
  - A Create HA cluster form will open.
- Name your HA cluster.
- Set the number of Paths.
  - For each path, assign a Path Name and a cloudSwXtch Control IP address.
- Confirm when you are happy with your selections.



6. A new HA cluster will now populate in the Cluster panel.



After a cluster is added for this cloudSwXtch, the information will propagate to all relevant cloudSwXtches.

## Deleting an HA cluster

1. Navigate to the HA view in swXtch-top.
2. Press F7 or click the Delete button at the bottom of swXtch-top.
  - a. A Delete HA cluster form will open.
3. Confirm that you wish to Destroy the HA cluster.



- The HA cluster and the displayed HA stats will be removed.

## Troubleshooting swxtch-top

- If the swxtch-top "Status" is showing that there is a "Connection error:"
  - Check that the cloudSwXtch is started.
  - Check that you entered in the proper cloudswxtch name or IP when running the swxtch-top command.
  - If name does not work when running the swxtch-top command then the DNS is not set-up correctly, use the IP address instead.
- If an xNIC was installed but is not showing up in swxtch-top:
  - Navigate to the swxtch-nic.conf file and validate that the "SwxtchSvcAddr" is correct.
    - Windows can be found at "C:\Program Files\SwXtch.io\Swxtch-xNIC"
    - Linux can be found at "/var/opt/swxtch/swxtch-xnic.conf"
  - Check that the firewall is open for the following ports:

subnet	protocol	ports	vm
ctrl-subnet	tcp	80	cloudSwXtch
ctrl-subnet	udp	10800-10803	all
data-subnet	udp	9999	all

- If a multicast group is not showing up then check that they have registered.

- In Linux, run this command:  
Text

Plaintext	Copy
ip maddress show	

- In Windows, run this command in PowerShell:  
Text

Plaintext	Copy
netsh.exe interface ipv4 show joins	

- If the joins are not showing here then the application is not joining the multi-cast group. In this case run swxtch-perf for the same IP:Port combination and then re-try in the program.
- If the joins are not showing here then the application is not joining the multi-cast group. In this case run swxtch-perf for the same IP:Port combination and then re-try in the program.
- If using Windows make use of Task Manager and view Performance to know where data is being sent/received.
- Validate using TCPdump or Wireshark to identify where traffic is going as it could be going to the wrong network interface, it should be going to the Data Interface if xNIC2 and Swxtch-tun0 if xNIC1. An example is below:

Plaintext	Copy
\$ sudo tcpdump udp -X -i <interface>	

#### NOTE

xNIC1 interface: `swxtch-tun0`

xNIC2 interface: data nic (usually `eth1` for Linux, and "Ethernet 2" for Windows )

- Validate that a firewall is not stopping the multicast and open up the firewall to include port exceptions.

#### swxtch-top on a cloudSwXtch

swxtch-top should be run from a virtual machine with an xNIC installed, it should be avoided to run it or anything else directly on a cloudSwXtch. That being said it can be done, but you must run it with sudo. Only run it on the cloudSwXtch if doing advanced troubleshooting.

`sudo /swxtch/swxtch-top dashboard --swxtch localhost`

Alternatively use 127.0.0.1 or swxtch-hostname or swxtch-IP in place of localhost



# swxtch-tcpdump

### WHAT TO EXPECT

Users can use a cloudSwXtch specific version of tcpdump called swxtch-tcpdump. This tool helps with capturing multicast packets sent to and from the cloudSwXtch. It is the same as tcpdump but with logic to decode our own header and display the original MC payload.

In this article, users will learn about the available arguments for swxtch-tcpdump.

### Using swxtch-tcpdump

Execute the following command:

Bash	Copy
swxtch-tcpdump	

**Note:** The default is **swxtch-tun (Windows)** or **swxtch-tun0 (Linux)**. If their multicast is running on a different interface, then a user will need to specify that interface. To get a list of interfaces for Windows, you can use **ip config**. For Linux, you can use **ip a**. After you get the name of the correct interface, you can use the **-i** argument followed by your desired interface name.

**Example:**

Bash	Copy
swxtch-tcpdump -i ens6	

### Additional arguments

Users can use the **-h** argument as shown below to get a list of available arguments for swXtch-tcpdump.

Bash	Copy
<pre>ubuntu@ip-172-41-128-232:/var/opt\$ swxtch-tcpdump -h swxtch-tcpdump version 5.0.0-PRE-GIT libpcap version 1.9.1 (with TPACKET_V3) OpenSSL 1.1.1f 31 Mar 2020 Usage: swxtch-tcpdump [-AbDefhHIJKlLnNOpqStuUvxX#] [-B size] [-c count] [--count]       [-C file_size] [-E algo:secret] [-F file] [-G seconds]       [-i interface] [--immediate-mode] [-j tstamptype]       [-M secret] [--number] [--print]       [--print-sampling nth] [-Q in out inout] [-r file]       [-s snaplen] [-T type] [--version]       [-V file] [-w file] [-W filecount] [-y datalinktype]       [--time-stamp-precision precision] [--micro] [--nano]       [-z postrotate-command] [-Z user] [expression]</pre>	

# swxtch-where

WHAT TO EXPECT

swxtch-where allows users to call for hardware information regarding their cloudSwXtch VM.

In this article, users will learn about the different arguments they can use with swxtch-where and example outputs they should expect.

## swXtch-where Cloud Type

Below are the Linux and Windows commands to call swxtch-where. An empty command (without an argument) like the examples below will only return the cloud type.

### Windows

For Windows VM, swxtch-where must be called from the xNIC directory and have the .exe extension.

Bash	Copy
PS C:\Program Files\SwXtch.io\Swxtch-xNIC2> .\swxtch-where.exe	

### Linux

For Linux VM, a user would only need to input the following:

Bash	Copy
swxtch-where	

## swxtch-where Format

What is probably the most useful option in the swxtch-where argument list is **-f json** or **--format json**, which provides users with a json of hardware-related information regarding the cloudSwXtch VM. This information is similar to the Hardware view in swxtch-top and Hardware panel in wXcked Eye's Settings' General tab. It presents a breakdown of the control and data subnet with information categorized as either metadata or operating system.

### Windows

Bash	Copy
PS C:\Program Files\SwXtch.io\Swxtch-xNIC2> .\swxtch-where.exe --format json	

### Linux

Bash	Copy
swxtch-where -f json	

### Example Output in Windows:

Bash	Copy	
<pre>S C:\Program Files\SwXtch.io\Swxtch-xNIC2&gt; .\swxtch-where.exe --format json {   "cloudType": "AZURE",   "nics": [     {       "computed": {         "isPreferredControlNic": false,         "isPreferredDataNic": true,         "isSRIOV": false       },       "meta": {         "ipAddress": "10.5.1.7",         "ipBroadcast": "10.5.1.255",         "ipSubnet": "10.5.1.0",         "mac": "00:22:48:27:0e:dc",         "subnetMask": "255.255.255.0"       },       "os": {         "driver": "mlx5.sys",         "mac": "00:22:48:27:0e:dc",         "mtu": 1500,         "name": "Ethernet 261",         "pciAddress": "65025:00:02.0"       }     },     {       "computed": {         "isPreferredControlNic": true,         "isPreferredDataNic": false,         "isSRIOV": false       },       "meta": {         "ipAddress": "10.5.2.7",         "ipBroadcast": "10.5.2.255",         "ipSubnet": "10.5.2.0",         "mac": "00:22:48:27:07:14",         "subnetMask": "255.255.255.0"       },       "os": {         "driver": "netvsc.sys",         "ipAddress": "10.5.2.7",         "ipBroadcast": "10.5.2.255",         "ipSubnet": "10.5.2.0",         "mac": "00:22:48:27:07:14",         "mtu": 1500,         "name": "Ethernet",         "pciAddress": "",         "subnetMask": "255.255.255.0"       }     }   ] }</pre>		

## swxtch-where Version

Using the **-v** or **--version** argument after the swxtch-where command will return the version.

### Example in Windows:

Bash	Copy	
<pre>PS C:\Program Files\SwXtch.io\Swxtch-xNIC2&gt; .\swxtch-where.exe -v 1.0</pre>		

## swxtch-where Help

The swXtch-where **-h** or **--help** argument provides users with a detailed list of available arguments.

### Example in Windows:

```
PS C:\Program Files\SwXtch.io\Swxtch-xNIC2> .\swxtch-where.exe - h
Usage: C:\Program Files\SwXtch.io\Swxtch-xNIC2\swxtch-where.exe [options]
```

swxtch-where utility.  
Calling with no arguments simply returns the cloud type.

Optional arguments:

```
-h --help      shows help message and exits [default: false]
-v --version   prints version information and exits [default: false]
-f --format    output format (example: "json")
```

# Universal Third-Party Testing Tools

## WHAT TO EXPECT

While xNIC installation provides you with a number of useful tools to test the functionality of your cloudSwXtch network (swxtch-perf, swxtch-tcpdump, etc.), there is also a wealth of universal third-party testing tools at your disposal.

In this article, we will take a deeper dive into these alternative options and understand their benefits and pitfalls.

- [VLC](#)
- [ffmpeg/ffplay](#)
- [iPerf \(v2\)](#)
- [sockperf](#)
- [Python/Go](#)

**Please Note:** These tools should be used for testing purposes only.

## VLC

VLC is a free and open-source cross-platform multimedia player and framework that plays most multimedia files, and various streaming protocols. As a highly visual tool, it can be used to demonstrate the delivery and fidelity of video streams from the cloudSwXtch to the xNIC.

### Example

In the following example, a producer is streaming a .ts file using the RTP protocol to the multicast address 239.1.1.2 to port 1000 in a indefinite loop. The agent is consuming the stream.

#### Producer:

PowerShell	Copy
<pre>vlc file:///home/ubuntu/surfing.ts --sout '#rtp{dst=239.1.1.2,port=10000,mux=ts}' --loop</pre>	

#### Consumer:

PowerShell	Copy
<pre>vlc rtp://@239.1.1.2:10000</pre>	

#### vlc vs. cvlc

When using Linux, you can use cvlc instead of vlc. cvlc is an alias for "vlc -l dummy". It is VLC without the user interface, lighter and faster to open remotely, and will show a window playing the video only. **Note:** cvlc does not work for Windows.

## ffmpeg/ffplay

ffmpeg/ffply are command line tools to demonstrate the delivery of a stream. **ffmpeg** is the streamer, **ffplay** is the command to see the stream. While VLC requires a file to stream from the producer to the consumer, ffmpeg/ffplay can produce video test patterns. In the following example, we will use "testsrc", which will generate a test video pattern. This will display a color pattern with a scrolling gradient and a timestamp. If a stream appears, it means this was a successful delivery. **Please note:** Other test patterns are available for use.

### Example

In this example, the user is testing a stream signal with a resolution of 640x480 at 30fps, in MPEG using labfi (Libavfilter input virtual device) for 1000 seconds to the multicast address 239.1.1.1, port 10000 using a packet size of 1316 bytes.

#### Producer

PowerShell	Copy
<pre>ffmpeg -hide_banner -f lavfi -re -i testsrc=duration=1000:size=640x480:rate=30 -f mpegts "udp://239.1.1.1:10000?pkt_size=1316"</pre>	

Below is an example of **ffmpeg producer output**.

```
ubuntu@FS2A1AD22:~$ ffmpeg -hide_banner -f lavfi -re -i testsrc=duration=1000:size=640x480:rate=30 -f mpegts "udp://239.1.1.1:11000?pkt_size=1316"
Input #0, lavfi, from 'testsrc=duration=1000:size=640x480:rate=30':
  Duration: N/A, start: 0.000000, bitrate: N/A
  Stream #0:0: Video: rawvideo (RGB[24] / 0x18424752), rgb24, 640x480 [SAR 1:1 DAR 4:3], 30 tbr, 30 tbn, 30 tbc
Stream mapping:
  Stream #0:0 → #0:0 (rawvideo (native) → mpeg2video (native))
Press [q] to stop, [?] for help
Output #0, mpegts, to 'udp://239.1.1.1:11000?pkt_size=1316':
  Metadata:
    encoder         : Lavf58.76.100
  Stream #0:0: Video: mpeg2video (Main), yuv420p(tv, progressive), 640x480 [SAR 1:1 DAR 4:3], q=2-31, 200 kb/s, 30 fps, 90k tbn
  Metadata:
    encoder         : Lavc58.134.100 mpeg2video
  Side data:
    cpb: bitrate max/min/avg: 0/0/200000 buffer size: 0 vbv_delay: N/A
frame= 517 fps= 30 q=31.0 size=    909kB time=00:00:17.13 bitrate= 434.8kbits/s speed=0.996x
```

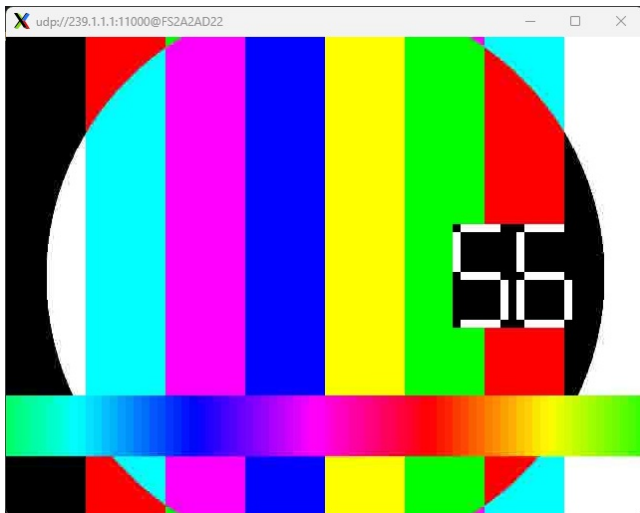
### Consumer:

PowerShell	Copy
ffplay -hide_banner "udp://239.1.1.1:11000"	

Below is an example ffplay consumer output.

```
ubuntu@FS2A2AD22:~$ ffplay -hide_banner "udp://239.1.1.1:11000"
[mpeg2video @ 0x7811f0029e40] Invalid frame dimensions 0x0. f=0/0
Input #0, mpegts, from 'udp://239.1.1.1:11000':KB sq=    0B f=0/0
  Duration: N/A, start: 57.800000, bitrate: N/A
  Program 1
  Metadata:
    service_name     : Service01
    service_provider : FFmpeg
  Stream #0:0[0x100]: Video: mpeg2video (Main) ([2][0][0][0] / 0x0002), yuv420p(tv, progressive), 640x480 [SAR 1:1 DAR 4:3], 30 fps, 30 tbr, 90k tbn, 60 tbc
  Side data:
    cpb: bitrate max/min/avg: 0/0/0 buffer size: 49152 vbv_delay: N/A
65.46 M-V:  0.866 fd= 179 aq=    0KB vq= 1039KB sq=    0B f=0/0
```

A successful delivery of the stream will display the following stream in the consumer's VM:



## iPerf (v2)

Similar to swxtch-perf, iPerf is a multi-platform tool for network performance measurement and tuning. It is commonly used for bandwidth and latency measurements. However, what differs is that iPerf has additional arguments not found in swxtch-perf, our streamlined tool. Since iPerf (v3) does not support multicast, it is recommended to use iPerf (v2) for cloudSwXtch networking testing.

### Example

In this example, the user is creating a UDP stream at multicast address 239.1.1.3, port 1000 for 120 seconds with a buffer length of 1000 bytes. The enhanced report will display stats for every second with enhanced reporting.

#### Producer:

```
PowerShell
Copy
iperf -c 239.1.1.3 -p 10000 -u -t 120 -i 1 -e -l 1000
```

#### • Arguments Explained:

- **-c:** the machine as the producer, specifying the multicast address
- **-p:** the port
- **-u:** the producer will be sending UDP packets
- **-t:** the duration of the stream in seconds
- **-i:** the time interval stats will be reported. In this case, it is every second (1).
- **-e:** enhanced reporting (interval, transfer, bandwidth, write/err, PPS)
- **-l:** length of buffers to read or write (1000)

This is an example of an iPerf producer output.

```
ubuntu@FS2A1AD22:~$ iperf -c 239.1.1.3 -p 10000 -u -t 120 -i 1 -e -l 1000
-----
Client connecting to 239.1.1.3, UDP port 10000 with pid 2535 (1 flows)
TOS set to 0x0 (Nagle on)
Sending 1000 byte datagrams, IPG target: 7629.39 us (kalman adjust)
UDP buffer size: 208 KByte (default)
-----
[ 1] local 172.41.128.64 port 53524 connected with 239.1.1.3 port 10000 (sock=3) on 2024-05-31 15:07:03 (UTC)
[ ID] Interval           Transfer     Bandwidth   Write/Err    PPS
[ 1] 0.0000-1.0000 sec    130 KBytes  1.06 Mbits/sec  0/0         133 pps
[ 1] 1.0000-2.0000 sec    128 KBytes  1.05 Mbits/sec  0/0         131 pps
[ 1] 2.0000-3.0000 sec    128 KBytes  1.05 Mbits/sec  0/0         131 pps
[ 1] 3.0000-4.0000 sec    128 KBytes  1.05 Mbits/sec  0/0         131 pps
[ 1] 4.0000-5.0000 sec    128 KBytes  1.05 Mbits/sec  0/0         131 pps
[ 1] 5.0000-6.0000 sec    128 KBytes  1.05 Mbits/sec  0/0         131 pps
[ 1] 6.0000-7.0000 sec    128 KBytes  1.05 Mbits/sec  0/0         131 pps
[ 1] 7.0000-8.0000 sec    128 KBytes  1.05 Mbits/sec  0/0         131 pps
[ 1] 8.0000-9.0000 sec    128 KBytes  1.05 Mbits/sec  0/0         131 pps
[ 1] 9.0000-10.0000 sec   128 KBytes  1.05 Mbits/sec  0/0         131 pps
[ 1] 10.0000-11.0000 sec   128 KBytes  1.05 Mbits/sec  0/0         131 pps
[ 1] 11.0000-12.0000 sec   128 KBytes  1.05 Mbits/sec  0/0         131 pps
[ 1] 12.0000-13.0000 sec   128 KBytes  1.05 Mbits/sec  0/0         131 pps
[ 1] 13.0000-14.0000 sec   128 KBytes  1.05 Mbits/sec  0/0         131 pps
[ 1] 14.0000-15.0000 sec   129 KBytes  1.06 Mbits/sec  0/0         131 pps
[ 1] 15.0000-16.0000 sec   128 KBytes  1.05 Mbits/sec  0/0         131 pps
```

#### Consumer:

```
PowerShell
Copy
iperf -s -u -B 239.1.1.3 -p 10000 -i 1
```

#### • Arguments Explained:

- **-s:** server, signifying a consumer

- **-u**: consumer will be taking in UDP packets
- **-B**: bind, specifying the multicast address (Note the capitalization.)
- **-p**: the port
- **-i**: the time interval stats will be reported (1)

This is an example of an iPerf consumer output. Note how each line item coincides with the single second interval.

```
ubuntu@FS2A2AD22:~$ ./iperf -s -u -B 239.1.1.3 -p 10000 -i 1
-----
Server listening on UDP port 10000
Joining multicast group 239.1.1.3
Server set to single client traffic mode (per multicast receive)
UDP buffer size: 208 KByte (default)
-----
[ 1] local 239.1.1.3 port 10000 connected with 172.41.128.64 port 56156
[ ID] Interval      Transfer    Bandwidth   Jitter     Lost/Total Datagrams
[ 1] 0.00-1.00 sec  129 KBytes  1.06 Mbits/sec  0.017 ms  7001/7133 (98%)
[ 1] 1.00-2.00 sec  128 KBytes  1.05 Mbits/sec  0.014 ms  0/131 (0%)
[ 1] 2.00-3.00 sec  128 KBytes  1.05 Mbits/sec  0.010 ms  0/131 (0%)
[ 1] 3.00-4.00 sec  128 KBytes  1.05 Mbits/sec  0.016 ms  0/131 (0%)
[ 1] 4.00-5.00 sec  128 KBytes  1.05 Mbits/sec  0.015 ms  0/131 (0%)
[ 1] 5.00-6.00 sec  129 KBytes  1.06 Mbits/sec  0.017 ms  0/132 (0%)
[ 1] 6.00-7.00 sec  128 KBytes  1.05 Mbits/sec  0.014 ms  0/131 (0%)
[ 1] 7.00-8.00 sec  128 KBytes  1.05 Mbits/sec  0.027 ms  0/131 (0%)
[ 1] 8.00-9.00 sec  128 KBytes  1.05 Mbits/sec  0.015 ms  0/131 (0%)
[ 1] 9.00-10.00 sec 128 KBytes  1.05 Mbits/sec  0.017 ms  0/131 (0%)
```

### No Consumer Output

On some older versions of iPerf 2, the consumer will not show any output. This can happen even when configured to do so. However, you can still check `swtch-top` to see if the xNIC interface is getting traffic. To remedy this issue, ensure you have the latest version of iPerf 2.

## sockperf

Another alternative to `swtch-perf` is **sockperf**, a Linux-only network benchmarking utility over socket API that is designed for testing the latency and throughput of high-performance systems. While it is similar to both `swtch-perf` and iPerf, it has far less commands than its counterparts. It is recommended to use sockperf when saturating the NIC and using the VM's maximum amount of bandwidth.

### Example

In this example, the user will create a stream at multicast address 239.1.1.4, port 10000 using a message size of 1472, sending 2000 messages per second in 30 seconds.

#### Producer (sockperf throughput):

PowerShell	Copy
sockperf throughput --ip 239.1.1.4 --msg-size 1472 --port 10000 --mps 2000 --time 30	

#### Consumer (sockperf server):

PowerShell	Copy
sockperf server --ip 239.1.1.4 --Activity 800 --port 10000	

This will consume the traffic and print the activity for the last 800 messages processed. The consumer will continually wait for the producer until it is shut off.

## Python/Go

Users may choose to also build their own tool to test their cloudSwXtch network. Below are two examples using Python or Go programming language to test multicast messaging. What is great about cloudSwXtch is that when we say it requires no code changes, the same applies for testing.

### Python

As a pre-installed program on Linux-based machines, using Python is a simple way to test your xNIC.

#### Producer

The key object here is the socket module and the instruction used to send is `sock.sendto`. As you can see in the code, no modification to the code is necessary in order to make "compatible" with the xNIC/cloudSwXtch. The following code will work on any multicast-compatible environment.

1. Create a **producer.py** file on the producer VM. One method is to use nano. **Note:** You can name the file anything.

Plaintext	Copy
nano python.py	

2. Copy and paste the following script:



Profile	Copy
<pre>import socket import struct import time  def send_multicast_message(ip, port, message, delay):     # Create the socket     multicast_group = (ip, port)     sock = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)      # Set the time-to-live for messages to 1 so they do not go past the local network segment     ttl = struct.pack('b', 1)     sock.setsockopt(socket.IPPROTO_IP, socket.IP_MULTICAST_TTL, ttl)      try:         while True:             # Send the message             print(f'Sending "{message}" to {ip}:{port}')             sock.sendto(message.encode('utf-8'), multicast_group)              # Delay between messages             time.sleep(delay)     finally:         print('Closing socket')         sock.close()  # Example usage send_multicast_message('239.1.1.1', 10000, 'Hello, Multicast!', 2)Save the file and close.</pre>	

3. Save and close.
4. Run the script:

Profile	Copy
<pre>python3 producer.py</pre>	

Below is an example of the output:

```
ubuntu@FS2A1AD22:~$ python3 producer.py
Sending "Hello, Multicast!" to 239.1.1.1:10000
Sending "Hello, Multicast!" to 239.1.1.1:10000
Sending "Hello, Multicast!" to 239.1.1.1:10000
█
```

## Consumer

1. Create a **receiver.py** file on your consumer VM. One method is to use nano. **Note:** You can name the file anything.

Plaintext	Copy
<pre>nano consumer.py</pre>	

2. Copy and paste the following script:

Profile	Copy
<pre>import socket import struct  def receive_multicast_message(ip, port):     # Create the socket     sock = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)      # Bind to the server address     sock.bind(('', port))      # Tell the operating system to add the socket to the multicast group     group = socket.inet_aton(ip)     mreq = struct.pack('4sL', group, socket.INADDR_ANY)     sock.setsockopt(socket.IPPROTO_IP, socket.IP_ADD_MEMBERSHIP, mreq)      # Receive/respond loop     while True:         print('Waiting to receive')         data, address = sock.recvfrom(1024)          print(f'Received "{data.decode("utf-8")}" from {address}')  # Example usage receive_multicast_message('239.1.1.1', 10000)Save and close.</pre>	

3. Save and exit.
4. Run the script:

PowerShell	Copy
<pre>python3 receiver.py</pre>	

Below is an example of the output on the consumer VM:

```
ubuntu@FS2A2AD22:~$ python3 receiver.py
Waiting to receive
Received "Hello, Multicast!" from ('172.41.128.64', 36601)
Waiting to receive
Received "Hello, Multicast!" from ('172.41.128.64', 36601)
Waiting to receive
Received "Hello, Multicast!" from ('172.41.128.64', 36601)
Waiting to receive
```

## Go

Go is an alternative programming language. However, unlike Python, it must be installed manually. Use the following example scripts to test.

### Producer

The producer uses the command **net.Dial** to send a message using multicast.

Go	Copy
<pre>// producer.go package main  import (     "fmt"     "net"     "os"     "time" )  func main() {     multicastAddr := "239.1.1.1:10000"      conn, err := net.Dial("udp", multicastAddr)     if err != nil {         fmt.Println("Error connecting:", err)         os.Exit(1)     }     defer conn.Close()      for {         message := "Hello, Multicast!"         _, err = conn.Write([]byte(message))         if err != nil {             fmt.Println("Error sending message:", err)             os.Exit(1)         }         fmt.Println("Message sent:", message)         time.Sleep(2 * time.Second)     } }</pre>	

## Consumer

The receiver uses the command `net.ListenMulticastUDP`.

Go	Copy
<pre>// receiver.go package main  import (     "fmt"     "net"     "os" )  func main() {     multicastAddr := "239.1.1.1:10000"     addr, err := net.ResolveUDPAddr("udp", multicastAddr)     if err != nil {         fmt.Println("Error resolving address:", err)         os.Exit(1)     }      conn, err := net.ListenMulticastUDP("udp", nil, addr)     if err != nil {         fmt.Println("Error listening for multicast:", err)         os.Exit(1)     }     defer conn.Close()      buf := make([]byte, 1024)     for {         n, src, err := conn.ReadFromUDP(buf)         if err != nil {             fmt.Println("Error receiving message:", err)             os.Exit(1)         }         message := string(buf[:n])         fmt.Printf("Received message from %v: %s\n", src, message)     } }</pre>	

### Other Programming Languages

As with Python or Go, you can create programs in virtually any language with the same logic for sending multicast traffic and let the xNIC + cloudSwXtch take care of the rest. For example, in Javascript, the commands will be `server.send` and `server.on`. In C++, the commands will be `sendto()` and `recvfrom()`.



# How to View cloudSwXtch Logs for Troubleshooting

WHAT TO EXPECT

In this article, users will learn about accessing cloudSwXtch logs for the purpose of troubleshooting. We will break down two commands: **swx support** and **sudo journalctrl**. Common arguments that can be used when compiling information for the support team at swXtch.io will also be discussed.

Support may also request for you to send xNIC logs. For more information, see [How to Find xNIC Logs](#).

## swx support Logs

When troubleshooting, swXtch.io Support will request a report detailing the statistical data stored within the cloudSwXtch during a certain period. This report will include max highmarks, list highmarks, logs, swxtch Info, xNIC Logs, License and Config -- all in a compressed tar.gz file.

### Accessing the Report

The following command will compile the data stored on the disk between a certain time period by executing all other commands, saving it in a compressed file.

Bash	Copy
<pre>./swx support -f "yyyy-mm-dd" -t "yyyy-mm-dd" -s localhost</pre>	

An example output file would be **swxtch-report-2024-05-22\_15-58-55.tar.gz**.

Alternatively, you can export swx support logs using the wXcked Eye UI. To learn more, see the [wXcked Eye Support Page](#) article.

### Available swx support Arguments

#### Exporting only xNIC Logs (xnic-logs)

Users can export xNIC logs by specifying it with the swx support command. In addition to the xnic-logs command, they must use the argument --xnic and specify the xNIC's control IP. In the example below, the xNIC's control IP is 10.5.1.4.

Example:

Bash	Copy
<pre>./swx support xnic-logs -since 2h -s localhost --xnic 10.5.1.4</pre>	

An example output file would be **xnicLogs-10.5.1.4-2024-05-22\_20-27-55.tar.gz**.

#### Date from (-f) and date to (-t)

- Following the **-f (date\_from)**, enter the starting date.
- Following the **-t (date\_to)**, enter the end date.
- Both dates can also include the time, using the ISO 8601 date format (Example: 2006-01-02T15:04:05Z)

**Please note:** Both "From" and "to" are optional. **If nothing is set, the default is over the past 7 days.**

#### Since hours/days (--since)

Following **-since**, users can specify number of days (d) or hours (h). For example, if a user would like to get logs since 8 hours ago, they would specify **-since 8h**. If they would like 4 days ago, they would specify **-since 2d**.

Example:

Bash	Copy
<div>Hours \$ ./swx support -s localhost --since 8h</div> <div>Days \$ ./swx support -s localhost --since 2d</div>	

#### Core dumps (--dump)

Add **-dump** if you wish to include the core dumps in the report.

#### Help (-h) for additional commands

Add a **-h** to the command if you wish to see an extensive list of available commands. For example, you can specify a certain section of the report to export as a tar.gz file, similar to the xNIC logs example above.

Example:

```
Bash Copy

root@dtd-core-200:/swtch# ./swtch support -h
Swxtch support tool

Usage:
  swtch support [flags]
  swtch support [command]

Available Commands:
  bridge-log      Bridge log file
  list-highmarks  List highmarks metrics within time range
  logs            Logs
  max-highmarks   Max highmarks metrics
  swtch-info      Swtch Info
  xnic-logs       xNIC logs file

Flags:
  -b, --bridge string      bridge address
  -f, --date-from string    Date from
  -t, --date-to string      Date to
  -d, --dump                Dump enable
  -h, --help                help for support
  -o, --path string         Path location
  -s, --service-host-address string Host swtch address in the form <host>[:port] (default "localhost")
  -c, --since string        Since
  -x, --xnic string         xnic

Use "swtch support [command] --help" for more information about a command.
```

## cloudSwXtch Service Logs

In addition to the swx support logs, swXtch.io Support might request logs for the -ctrl/-repl services. For log requests, the standard command, **sudo journalctl -u**, can be used with either **swxtch-ctrl.service** or **swxtch-repl.service** to get a detailed breakdown of cloudSwXtch activity.

- **swxtch-ctrl.service** - This will display information regarding the cloudSwXtch's control plane.
- **swxtch-repl.service** - This will display information regarding the cloudSwXtch's replicator app that is on the data plane.

In addition, the log request command can be used for **swxtch-bridge2 (Bridge Type 2)** and **swXtch-bridge (Bridge Type 1)** for bridge-related logs.

It is recommended for users to send logs from both services to [support@swxtch.io](mailto:support@swxtch.io). The logs should cover 24 hours worth of time, starting from before the issue to up until now.

Users can use any combination of the arguments below to create their logs.

### Accessing and Following Logs (-f)

The following command will begin to display logs for either the swxtch-ctrl or swxtch-repl service at the time of the request. The -f argument will follow the logs and continually update. Logs prior to the call will not display.

```
Bash Copy

sudo journalctl -u <swxtch-ctrl.service OR swxtch-repl.service> -f
```

**Note:** A user will need to choose between swxtch-ctrl or swxtch-repl. The .service is not necessary and will work with or without.

### Listing a Certain Number of Lines in a Log (-n)

The following argument can be used to list a specific number of lines in a log.

```
Bash Copy

sudo journalctl -u <swxtch-ctrl OR swxtch-repl> -n <number of lines>
```

**Example:**

```
Bash Copy

sudo journalctl -u swxtch-repl -n 200
```

### Displaying Logs within a Timeframe (--since --until)

The following command will display logs within a set timeframe (between 2 dates).

```
Bash Copy

sudo journalctl -u <swxtch-ctrl OR swxtch-repl> --since <yyyy-mm-dd> --until <yyyy-mm-dd>
```

**Example:**

Bash	Copy
<pre>sudo journalctl -u swxtch-repl --since 2023-03-07 --until 2023-03-10</pre>	

### --since "Yesterday", "today", "now"

You can also use the words "yesterday," "today" or "now" after --since to get logs from that time period.

Bash	Copy
<pre>sudo journalctl -u swxtch-repl --since yesterday</pre>	

## Displaying Logs since Last Boot (-b)

To display logs since last boot, users can use the -b argument.

Bash	Copy
<pre>sudo journalctl -u &lt;swxtch-ctrl OR swxtch-repl&gt; -b</pre>	

## List boots (--list-boot)

The following argument can be used to list all the boots in date/time order.

Bash	Copy
<pre>sudo journalctl -u &lt;swxtch-ctrl OR swxtch-repl&gt; --list-boot</pre>	

## Exporting Logs (>)

The following command will export your logs to a .txt file. Logs should be emailed to [support@swxtch.io](mailto:support@swxtch.io).

Bash	Copy
<pre>sudo journalctl -u &lt;swxtch-ctrl or swxtch-repl&gt; &gt; &lt;file-name&gt;.txt</pre>	

### Example:

Bash	Copy
<pre>sudo journalctl -u swxtch-repl &gt; cloudswxtch-test.txt</pre>	

You can also combine arguments to export logs from a timeframe or from last boot. It is recommended that logs should cover 24 hours worth of time, starting from before the issue to up until now.

### Example:

Bash	Copy
<p>LAST BOOT:</p> <pre>sudo journalctl -u swxtch-ctrl -b &gt; cloudswxtch-test.txt</pre>	
<p>TIMEFRAME:</p> <pre>sudo journalctl -u swxtch-repl --since 2023-03-07 --until 2023-03-10 &gt; cloudswxtch-test.txt</pre>	

## Change Logs to UTC (--utc)

To switch logs from local time to UTC, use the following argument:

Bash	Copy
<pre>sudo journalctl --utc</pre>	

# How to Install xNIC Dependencies in an Air-Gapped Environment

## WHAT TO EXPECT

In this article, users will learn how to download and install the appropriate packages necessary to successfully deploy an xNIC in an air-gapped environment. Without the dependencies already on your air-gapped client, xNIC installation will fail.

Please follow the instructions based on your operating system:

- [RHEL-based Distros](#)
- [Ubuntu](#)

## Installing Dependencies for RHEL-based Distros

The easiest way to install dependencies on RHEL-based distros is using the built-in tool called [repotrack](#). By using this tool, users can download the necessary packages with their dependencies using a single command. Then, they can copy the rpm files from an **ancillary VM** to the **target agents** (the VMs within the air-gapped environment) and install them there.

### List of dependencies

Based on the version of operating system, a user will have different package requirements.

Major Version	Packages list
RHEL 8 or 9	libpcap iproute-tc bpftool jq
Amazon Linux	libpcap iproute-tc bpftool wget jq

Make sure you download the correct packages for your operating system.

### Prerequisites: Install yum-utils to get repotrack

If you want to use repotrack, you will need to install yum-utils. To do this, enter the following command and respond yes when asked:

PowerShellCopy

```
$ sudo yum install yum-utils
```

Here is an example output:

Example



```
PowerShell Copy

$ sudo yum install yum-utils
Last metadata expiration check: 0:04:24 ago on Fri 26 Jul 2024 03:35:50 PM UTC.
Dependencies resolved.
=====
Package                Architecture    Version          Repository        Size
=====
Installing:
yum-utils              noarch         4.0.21-25.el8   rhui-rhel-8-for-x86_64-baseos-rhui-rpms 76 k

Transaction Summary
=====
Install 1 Package

Total download size: 76 k
Installed size: 23 k
Is this ok [y/N]: y
Downloading Packages:
yum-utils-4.0.21-25.el8.noarch.rpm                                1.5 MB/s | 76 kB    00:00
-----
Total                                                                987 kB/s | 76 kB    00:00
Running transaction check
Transaction check succeeded.
Running transaction test
Transaction test succeeded.
Running transaction
  Preparing      : 1/1
  Installing     : yum-utils-4.0.21-25.el8.noarch                    1/1
  Running scriptlet: yum-utils-4.0.21-25.el8.noarch                    1/1
  Verifying      : yum-utils-4.0.21-25.el8.noarch                    1/1

Installed:
yum-utils-4.0.21-25.el8.noarch

Complete!
```

## STEP ONE: Download All Packages and Dependencies onto your Ancillary VM

1. Select a VM that is connected to a repository or the internet that is similar to the one that will be used as an agent in your air-gapped environment. This will act as your "ancillary VM."
2. Execute the following command, replacing <packages-list> with the list associated with the correct version.

Shell  
 

```
Bash Copy

sudo repotrack <packages-list>
```

- a. This will download the packages and ALL their dependencies onto your ancillary VM.

## STEP TWO: Copy the .rpm files to the Target VM

1. Secure copy the files now to the target machine on the air-gapped environment by issuing the following command. Here, we use a SCP command but there are other ways to move files. SCP needs both the ancillary and target VMs be connected, and sometimes that's not an option.

Shell  
 

```
Bash Copy

scp -i <private-key-path&file> *.rpm <target-username>@<target-hostname-or-IP>:<target-path>
```

- a. Example with replaced values:

Shell  
 

```
Bash Copy

scp -i ~/.ssh/key.priv *.rpm swxtchadmin@172.41.130.20:/home/swxtchadmin
```

## STEP THREE: Install the packages and dependencies on the Target VM

1. In the folder containing all the RPM files sent from the ancillary VM, issue the following command on the Target VM:

Shell  
 

Bash	Copy
<pre>sudo dnf install *.rpm --disablerepo=* --allowerase --skip-broken</pre>	

a. This will analyze the system, skip what's already installed, give a report, and ask for confirmation.

You are now ready to [install the xNIC](#).

Installing Dependencies for Ubuntu distros

List of dependencies

The following packages must be installed on the target VM in order to successfully deploy an xNIC in an air-gapped environment:

Plaintext	Copy
<pre>libpcap-dev binutils iproute2 linux-tools-generic jq</pre>	

Instructions

- 1. Select a VM that is connected to a repository or the internet that is similar to the one that will be used as an agent in your air-gapped environment. This will act as your "ancillary VM."
- 2. Run the following command in the ancillary VM to acquire the updated repositories:

PowerShell



PowerShell	Copy
<pre>sudo apt update</pre>	

a. Here is an example output:

Example ^

PowerShell	Copy
<pre>\$ sudo apt update Hit:1 http://us-central1.gce.archive.ubuntu.com/ubuntu focal InRelease Get:2 http://us-central1.gce.archive.ubuntu.com/ubuntu focal-updates InRelease [128 kB] Get:3 http://us-central1.gce.archive.ubuntu.com/ubuntu focal-backports InRelease [128 kB] Get:4 http://security.ubuntu.com/ubuntu focal-security InRelease [128 kB] Get:5 http://us-central1.gce.archive.ubuntu.com/ubuntu focal/universe amd64 Packages [8628 kB] Get:6 http://us-central1.gce.archive.ubuntu.com/ubuntu focal/universe Translation-en [5124 kB] Get:7 http://us-central1.gce.archive.ubuntu.com/ubuntu focal/universe amd64 c-n-f Metadata [265 kB] Get:8 http://us-central1.gce.archive.ubuntu.com/ubuntu focal/multiverse amd64 Packages [144 kB] Get:9 http://us-central1.gce.archive.ubuntu.com/ubuntu focal/multiverse Translation-en [104 kB] Get:10 http://us-central1.gce.archive.ubuntu.com/ubuntu focal/multiverse amd64 c-n-f Metadata [9136 B] Get:11 http://us-central1.gce.archive.ubuntu.com/ubuntu focal-updates/main amd64 Packages [3456 kB] Get:12 http://us-central1.gce.archive.ubuntu.com/ubuntu focal-updates/main Translation-en [538 kB] Get:13 http://us-central1.gce.archive.ubuntu.com/ubuntu focal-updates/main amd64 c-n-f Metadata [17.7 kB] Get:14 http://us-central1.gce.archive.ubuntu.com/ubuntu focal-updates/restricted amd64 Packages [3104 kB] Get:15 http://us-central1.gce.archive.ubuntu.com/ubuntu focal-updates/restricted Translation-en [434 kB] Get:16 http://us-central1.gce.archive.ubuntu.com/ubuntu focal-updates/restricted amd64 c-n-f Metadata [540 B] Get:17 http://us-central1.gce.archive.ubuntu.com/ubuntu focal-updates/universe amd64 Packages [1215 kB] Get:18 http://us-central1.gce.archive.ubuntu.com/ubuntu focal-updates/universe Translation-en [293 kB] Get:19 http://us-central1.gce.archive.ubuntu.com/ubuntu focal-updates/universe amd64 c-n-f Metadata [27.5 kB] Get:20 http://us-central1.gce.archive.ubuntu.com/ubuntu focal-updates/multiverse amd64 Packages [27.1 kB] Get:21 http://us-central1.gce.archive.ubuntu.com/ubuntu focal-updates/multiverse Translation-en</pre>	

```
[7936 B]
Get:22 http://us-central1.gce.archive.ubuntu.com/ubuntu focal-updates/multiverse amd64 c-n-f
Metadata [616 B]
Get:23 http://us-central1.gce.archive.ubuntu.com/ubuntu focal-backports/main amd64 Packages
[45.7 kB]
Get:24 http://us-central1.gce.archive.ubuntu.com/ubuntu focal-backports/main Translation-en
[16.3 kB]
Get:25 http://us-central1.gce.archive.ubuntu.com/ubuntu focal-backports/main amd64 c-n-f
Metadata [1420 B]
Get:26 http://us-central1.gce.archive.ubuntu.com/ubuntu focal-backports/restricted amd64 c-n-f
Metadata [116 B]
Get:27 http://us-central1.gce.archive.ubuntu.com/ubuntu focal-backports/universe amd64 Packages
[25.0 kB]
Get:28 http://us-central1.gce.archive.ubuntu.com/ubuntu focal-backports/universe Translation-en
[16.3 kB]
Get:29 http://us-central1.gce.archive.ubuntu.com/ubuntu focal-backports/universe amd64 c-n-f
Metadata [880 B]
Get:30 http://us-central1.gce.archive.ubuntu.com/ubuntu focal-backports/multiverse amd64 c-n-f
Metadata [116 B]
Get:31 http://security.ubuntu.com/ubuntu focal-security/main amd64 Packages [3086 kB]
Get:32 http://security.ubuntu.com/ubuntu focal-security/main Translation-en [459 kB]
Get:33 http://security.ubuntu.com/ubuntu focal-security/main amd64 c-n-f Metadata [14.0 kB]
Get:34 http://security.ubuntu.com/ubuntu focal-security/restricted amd64 Packages [2985 kB]
Get:35 http://security.ubuntu.com/ubuntu focal-security/restricted Translation-en [417 kB]
Get:36 http://security.ubuntu.com/ubuntu focal-security/restricted amd64 c-n-f Metadata [544 B]
Get:37 http://security.ubuntu.com/ubuntu focal-security/universe amd64 Packages [996 kB]
Get:38 http://security.ubuntu.com/ubuntu focal-security/universe Translation-en [211 kB]
Get:39 http://security.ubuntu.com/ubuntu focal-security/universe amd64 c-n-f Metadata [20.9 kB]
Get:40 http://security.ubuntu.com/ubuntu focal-security/multiverse amd64 Packages [24.8 kB]
Get:41 http://security.ubuntu.com/ubuntu focal-security/multiverse Translation-en [5968 B]
Get:42 http://security.ubuntu.com/ubuntu focal-security/multiverse amd64 c-n-f Metadata [540 B]
Fetched 32.1 MB in 5s (6704 kB/s)
Reading package lists... Done
Building dependency tree
Reading state information... Done
22 packages can be upgraded. Run 'apt list --upgradable' to see them.
```

PowerShell



3. **Create** an empty folder **and enter** that folder. This will house the dependencies.
4. Use the following command **to get the list of URLs** that will be downloaded:

PowerShell



PowerShell	Copy
<pre>apt-get -y install --print-uris libpcap-dev binutils iproute2 linux-tools-generic jq   cut -d\ ' -f2   grep http:// &gt; apturls</pre>	

- a. This will not generate a visible output.
5. Download all the files with the following command:

PowerShell



PowerShell	Copy
<pre>wget -i apturls</pre>	

- a. Here is an example output:

Example



Plaintext

Copy

```
$ wget -i apturls
--2024-07-26 15:07:14-- http://us-
central1.gce.archive.ubuntu.com/ubuntu/pool/main/n/numactl/libnuma1_2.0.12-1_amd64.deb
Resolving us-central1.gce.archive.ubuntu.com (us-central1.gce.archive.ubuntu.com)...
```

```

35.224.11.34, 35.193.225.125, 35.184.25.42, ...
Connecting to us-central1.gce.archive.ubuntu.com (us-
central1.gce.archive.ubuntu.com)|35.224.11.34|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 20828 (20K) [application/vnd.debian.binary-package]
Saving to: 'libnuma1_2.0.12-1_amd64.deb'

libnuma1_2.0.12-1_amd64.deb          100%
[=====>]
20.34K  --.-KB/s    in 0.001s

2024-07-26 15:07:14 (20.2 MB/s) - 'libnuma1_2.0.12-1_amd64.deb' saved [20828/20828]

--2024-07-26 15:07:14--  http://us-
central1.gce.archive.ubuntu.com/ubuntu/pool/main/b/binutils/binutils-common_2.34-
6ubuntu1.9_amd64.deb
Reusing existing connection to us-central1.gce.archive.ubuntu.com:80.
HTTP request sent, awaiting response... 200 OK
Length: 207936 (203K) [application/vnd.debian.binary-package]
Saving to: 'binutils-common_2.34-6ubuntu1.9_amd64.deb'

binutils-common_2.34-6ubuntu1.9_amd64.deb  100%
[=====>]
203.06K  --.-KB/s    in 0.009s

2024-07-26 15:07:14 (22.5 MB/s) - 'binutils-common_2.34-6ubuntu1.9_amd64.deb' saved
[207936/207936]

--2024-07-26 15:07:14--  http://us-
central1.gce.archive.ubuntu.com/ubuntu/pool/main/b/binutils/libbinutils_2.34-
6ubuntu1.9_amd64.deb
Reusing existing connection to us-central1.gce.archive.ubuntu.com:80.
HTTP request sent, awaiting response... 200 OK
Length: 474932 (464K) [application/vnd.debian.binary-package]
Saving to: 'libbinutils_2.34-6ubuntu1.9_amd64.deb'

libbinutils_2.34-6ubuntu1.9_amd64.deb      100%
[=====>]
463.80K  --.-KB/s    in 0.01s

2024-07-26 15:07:14 (32.8 MB/s) - 'libbinutils_2.34-6ubuntu1.9_amd64.deb' saved [474932/474932]

--2024-07-26 15:07:14--  http://us-
central1.gce.archive.ubuntu.com/ubuntu/pool/main/b/binutils/libctf-nobfd0_2.34-
6ubuntu1.9_amd64.deb
Reusing existing connection to us-central1.gce.archive.ubuntu.com:80.
HTTP request sent, awaiting response... 200 OK
Length: 48248 (47K) [application/vnd.debian.binary-package]
Saving to: 'libctf-nobfd0_2.34-6ubuntu1.9_amd64.deb'

libctf-nobfd0_2.34-6ubuntu1.9_amd64.deb    100%
[=====>]
47.12K  --.-KB/s    in 0s

2024-07-26 15:07:14 (145 MB/s) - 'libctf-nobfd0_2.34-6ubuntu1.9_amd64.deb' saved [48248/48248]

--2024-07-26 15:07:14--  http://us-
central1.gce.archive.ubuntu.com/ubuntu/pool/main/b/binutils/libctf0_2.34-6ubuntu1.9_amd64.deb
Reusing existing connection to us-central1.gce.archive.ubuntu.com:80.
HTTP request sent, awaiting response... 200 OK
Length: 46620 (46K) [application/vnd.debian.binary-package]
Saving to: 'libctf0_2.34-6ubuntu1.9_amd64.deb'

libctf0_2.34-6ubuntu1.9_amd64.deb          100%
[=====>]
45.53K  --.-KB/s    in 0.001s

```

```

2024-07-26 15:07:14 (41.1 MB/s) - 'libctf0_2.34-6ubuntu1.9_amd64.deb' saved [46620/46620]

--2024-07-26 15:07:14-- http://us-
central1.gce.archive.ubuntu.com/ubuntu/pool/main/b/binutils/binutils-x86-64-linux-gnu_2.34-
6ubuntu1.9_amd64.deb
Reusing existing connection to us-central1.gce.archive.ubuntu.com:80.
HTTP request sent, awaiting response... 200 OK
Length: 1613596 (1.5M) [application/vnd.debian.binary-package]
Saving to: 'binutils-x86-64-linux-gnu_2.34-6ubuntu1.9_amd64.deb'

binutils-x86-64-linux-gnu_2.34-6ubuntu1.9_a 100%
[=====>]
1.54M --.-KB/s in 0.03s

2024-07-26 15:07:14 (59.6 MB/s) - 'binutils-x86-64-linux-gnu_2.34-6ubuntu1.9_amd64.deb' saved
[1613596/1613596]

--2024-07-26 15:07:14-- http://us-
central1.gce.archive.ubuntu.com/ubuntu/pool/main/b/binutils/binutils_2.34-6ubuntu1.9_amd64.deb
Reusing existing connection to us-central1.gce.archive.ubuntu.com:80.
HTTP request sent, awaiting response... 200 OK
Length: 3380 (3.3K) [application/vnd.debian.binary-package]
Saving to: 'binutils_2.34-6ubuntu1.9_amd64.deb'

binutils_2.34-6ubuntu1.9_amd64.deb 100%
[=====>]
3.30K --.-KB/s in 0s

2024-07-26 15:07:14 (532 MB/s) - 'binutils_2.34-6ubuntu1.9_amd64.deb' saved [3380/3380]

--2024-07-26 15:07:14-- http://us-
central1.gce.archive.ubuntu.com/ubuntu/pool/universe/libo/libonig/libonig5_6.9.4-1_amd64.deb
Reusing existing connection to us-central1.gce.archive.ubuntu.com:80.
HTTP request sent, awaiting response... 200 OK
Length: 141948 (139K) [application/vnd.debian.binary-package]
Saving to: 'libonig5_6.9.4-1_amd64.deb'

libonig5_6.9.4-1_amd64.deb 100%
[=====>]
138.62K --.-KB/s in 0.005s

2024-07-26 15:07:14 (25.1 MB/s) - 'libonig5_6.9.4-1_amd64.deb' saved [141948/141948]

--2024-07-26 15:07:14-- http://us-
central1.gce.archive.ubuntu.com/ubuntu/pool/universe/j/jq/libjq1_1.6-1ubuntu0.20.04.1_amd64.deb
Reusing existing connection to us-central1.gce.archive.ubuntu.com:80.
HTTP request sent, awaiting response... 200 OK
Length: 120892 (118K) [application/vnd.debian.binary-package]
Saving to: 'libjq1_1.6-1ubuntu0.20.04.1_amd64.deb'

libjq1_1.6-1ubuntu0.20.04.1_amd64.deb 100%
[=====>]
118.06K --.-KB/s in 0.04s

2024-07-26 15:07:14 (2.64 MB/s) - 'libjq1_1.6-1ubuntu0.20.04.1_amd64.deb' saved [120892/120892]

--2024-07-26 15:07:14-- http://us-
central1.gce.archive.ubuntu.com/ubuntu/pool/universe/j/jq/jq_1.6-1ubuntu0.20.04.1_amd64.deb
Reusing existing connection to us-central1.gce.archive.ubuntu.com:80.
HTTP request sent, awaiting response... 200 OK
Length: 50196 (49K) [application/vnd.debian.binary-package]
Saving to: 'jq_1.6-1ubuntu0.20.04.1_amd64.deb'

jq_1.6-1ubuntu0.20.04.1_amd64.deb 100%
[=====>]

```

```

49.02K  --.-KB/s    in 0.002s

2024-07-26 15:07:14 (21.7 MB/s) - 'jq_1.6-1ubuntu0.20.04.1_amd64.deb' saved [50196/50196]

--2024-07-26 15:07:14-- http://us-central1.gce.archive.ubuntu.com/ubuntu/pool/main/g/glibc/libc-dev-bin_2.31-0ubuntu9.16_amd64.deb
Reusing existing connection to us-central1.gce.archive.ubuntu.com:80.
HTTP request sent, awaiting response... 200 OK
Length: 71612 (70K) [application/vnd.debian.binary-package]
Saving to: 'libc-dev-bin_2.31-0ubuntu9.16_amd64.deb'

libc-dev-bin_2.31-0ubuntu9.16_amd64.deb    100%
[=====>]
69.93K  --.-KB/s    in 0.001s

2024-07-26 15:07:14 (70.3 MB/s) - 'libc-dev-bin_2.31-0ubuntu9.16_amd64.deb' saved [71612/71612]

--2024-07-26 15:07:14-- http://us-central1.gce.archive.ubuntu.com/ubuntu/pool/main/l/linux/linux-libc-dev_5.4.0-190.210_amd64.deb
Reusing existing connection to us-central1.gce.archive.ubuntu.com:80.
HTTP request sent, awaiting response... 200 OK
Length: 1138252 (1.1M) [application/vnd.debian.binary-package]
Saving to: 'linux-libc-dev_5.4.0-190.210_amd64.deb'

linux-libc-dev_5.4.0-190.210_amd64.deb    100%
[=====>]
1.08M  --.-KB/s    in 0.01s

2024-07-26 15:07:14 (94.7 MB/s) - 'linux-libc-dev_5.4.0-190.210_amd64.deb' saved
[1138252/1138252]

--2024-07-26 15:07:14-- http://us-central1.gce.archive.ubuntu.com/ubuntu/pool/main/libx/libxcrypt/libcrypt-dev_4.4.10-10ubuntu4_amd64.deb
Reusing existing connection to us-central1.gce.archive.ubuntu.com:80.
HTTP request sent, awaiting response... 200 OK
Length: 104104 (102K) [application/vnd.debian.binary-package]
Saving to: 'libcrypt-dev_4.4.10-10ubuntu4_amd64.deb'

libcrypt-dev_4.4.10-10ubuntu4_amd64.deb    100%
[=====>]
101.66K  --.-KB/s    in 0.001s

2024-07-26 15:07:14 (111 MB/s) - 'libcrypt-dev_4.4.10-10ubuntu4_amd64.deb' saved
[104104/104104]

--2024-07-26 15:07:14-- http://us-central1.gce.archive.ubuntu.com/ubuntu/pool/main/g/glibc/libc6-dev_2.31-0ubuntu9.16_amd64.deb
Reusing existing connection to us-central1.gce.archive.ubuntu.com:80.
HTTP request sent, awaiting response... 200 OK
Length: 2520144 (2.4M) [application/vnd.debian.binary-package]
Saving to: 'libc6-dev_2.31-0ubuntu9.16_amd64.deb'

libc6-dev_2.31-0ubuntu9.16_amd64.deb    100%
[=====>]
2.40M  --.-KB/s    in 0.04s

2024-07-26 15:07:14 (56.0 MB/s) - 'libc6-dev_2.31-0ubuntu9.16_amd64.deb' saved
[2520144/2520144]

--2024-07-26 15:07:14-- http://us-central1.gce.archive.ubuntu.com/ubuntu/pool/main/e/elfutils/libdw1_0.176-1.1ubuntu0.1_amd64.deb
Reusing existing connection to us-central1.gce.archive.ubuntu.com:80.
HTTP request sent, awaiting response... 200 OK
Length: 225528 (220K) [application/vnd.debian.binary-package]

```

```

Saving to: 'libdw1_0.176-1.1ubuntu0.1_amd64.deb'

libdw1_0.176-1.1ubuntu0.1_amd64.deb          100%
[=====]
220.24K  --.-KB/s    in 0.005s

2024-07-26 15:07:14 (42.4 MB/s) - 'libdw1_0.176-1.1ubuntu0.1_amd64.deb' saved [225528/225528]

--2024-07-26 15:07:14--  http://us-
central1.gce.archive.ubuntu.com/ubuntu/pool/main/libp/libpcap/libpcap0.8-dev_1.9.1-3_amd64.deb
Reusing existing connection to us-central1.gce.archive.ubuntu.com:80.
HTTP request sent, awaiting response... 200 OK
Length: 244140 (238K) [application/vnd.debian.binary-package]
Saving to: 'libpcap0.8-dev_1.9.1-3_amd64.deb'

libpcap0.8-dev_1.9.1-3_amd64.deb          100%
[=====]
238.42K  --.-KB/s    in 0.009s

2024-07-26 15:07:14 (27.1 MB/s) - 'libpcap0.8-dev_1.9.1-3_amd64.deb' saved [244140/244140]

--2024-07-26 15:07:14--  http://us-
central1.gce.archive.ubuntu.com/ubuntu/pool/main/libp/libpcap/libpcap-dev_1.9.1-3_amd64.deb
Reusing existing connection to us-central1.gce.archive.ubuntu.com:80.
HTTP request sent, awaiting response... 200 OK
Length: 3484 (3.4K) [application/vnd.debian.binary-package]
Saving to: 'libpcap-dev_1.9.1-3_amd64.deb'

libpcap-dev_1.9.1-3_amd64.deb          100%
[=====]
3.40K  --.-KB/s    in 0s

2024-07-26 15:07:14 (568 MB/s) - 'libpcap-dev_1.9.1-3_amd64.deb' saved [3484/3484]

--2024-07-26 15:07:14--  http://us-
central1.gce.archive.ubuntu.com/ubuntu/pool/main/l/linux/linux-tools-common_5.4.0-
190.210_all.deb
Reusing existing connection to us-central1.gce.archive.ubuntu.com:80.
HTTP request sent, awaiting response... 200 OK
Length: 225144 (220K) [application/vnd.debian.binary-package]
Saving to: 'linux-tools-common_5.4.0-190.210_all.deb'

linux-tools-common_5.4.0-190.210_all.deb  100%
[=====]
219.87K  --.-KB/s    in 0.007s

2024-07-26 15:07:14 (29.4 MB/s) - 'linux-tools-common_5.4.0-190.210_all.deb' saved
[225144/225144]

--2024-07-26 15:07:14--  http://us-
central1.gce.archive.ubuntu.com/ubuntu/pool/main/l/linux/linux-tools-5.4.0-190_5.4.0-
190.210_amd64.deb
Reusing existing connection to us-central1.gce.archive.ubuntu.com:80.
HTTP request sent, awaiting response... 200 OK
Length: 5633692 (5.4M) [application/vnd.debian.binary-package]
Saving to: 'linux-tools-5.4.0-190_5.4.0-190.210_amd64.deb'

linux-tools-5.4.0-190_5.4.0-190.210_amd64.d 100%
[=====]
5.37M  --.-KB/s    in 0.1s

2024-07-26 15:07:14 (39.3 MB/s) - 'linux-tools-5.4.0-190_5.4.0-190.210_amd64.deb' saved
[5633692/5633692]

--2024-07-26 15:07:14--  http://us-
central1.gce.archive.ubuntu.com/ubuntu/pool/main/l/linux/linux-tools-5.4.0-190-generic_5.4.0-

```

```

190.210_amd64.deb
Reusing existing connection to us-central1.gce.archive.ubuntu.com:80.
HTTP request sent, awaiting response... 200 OK
Length: 1996 (1.9K) [application/vnd.debian.binary-package]
Saving to: 'linux-tools-5.4.0-190-generic_5.4.0-190.210_amd64.deb'

linux-tools-5.4.0-190-generic_5.4.0-190.210 100%
[=====>]
1.95K --.-KB/s in 0s

2024-07-26 15:07:14 (354 MB/s) - 'linux-tools-5.4.0-190-generic_5.4.0-190.210_amd64.deb' saved
[1996/1996]

--2024-07-26 15:07:14-- http://us-central1.gce.archive.ubuntu.com/ubuntu/pool/main/l/linux-
meta/linux-tools-generic_5.4.0.190.188_amd64.deb
Reusing existing connection to us-central1.gce.archive.ubuntu.com:80.
HTTP request sent, awaiting response... 200 OK
Length: 2480 (2.4K) [application/vnd.debian.binary-package]
Saving to: 'linux-tools-generic_5.4.0.190.188_amd64.deb'

linux-tools-generic_5.4.0.190.188_amd64.deb 100%
[=====>]
2.42K --.-KB/s in 0s

2024-07-26 15:07:14 (410 MB/s) - 'linux-tools-generic_5.4.0.190.188_amd64.deb' saved
[2480/2480]

--2024-07-26 15:07:14-- http://us-
central1.gce.archive.ubuntu.com/ubuntu/pool/main/m/manpages/manpages-dev_5.05-1_all.deb
Reusing existing connection to us-central1.gce.archive.ubuntu.com:80.
HTTP request sent, awaiting response... 200 OK
Length: 2265524 (2.2M) [application/vnd.debian.binary-package]
Saving to: 'manpages-dev_5.05-1_all.deb'

manpages-dev_5.05-1_all.deb 100%
[=====>]
2.16M --.-KB/s in 0.05s

2024-07-26 15:07:14 (47.2 MB/s) - 'manpages-dev_5.05-1_all.deb' saved [2265524/2265524]

FINISHED --2024-07-26 15:07:14--
Total wall clock time: 0.5s
Downloaded: 22 files, 14M in 0.4s (40.0 MB/s)

```

6. Compress every .deb file into a .tar.gz file:

PowerShell

Copy

```
tar -czvf debs.tar.gz *.deb
```

a. Here is an example output:

Example





```
PowerShell Copy

$ tar -czvf debs.tar.gz *.deb
binutils-common_2.34-6ubuntu1.9_amd64.deb
binutils-x86-64-linux-gnu_2.34-6ubuntu1.9_amd64.deb
binutils_2.34-6ubuntu1.9_amd64.deb
jq_1.6-1ubuntu0.20.04.1_amd64.deb
libbinutils_2.34-6ubuntu1.9_amd64.deb
libc-dev-bin_2.31-0ubuntu9.16_amd64.deb
libc6-dev_2.31-0ubuntu9.16_amd64.deb
libcrypt-dev_4.4.10-10ubuntu4_amd64.deb
libctf-nobfd_2.34-6ubuntu1.9_amd64.deb
libctf0_2.34-6ubuntu1.9_amd64.deb
libdw1_0.176-1.1ubuntu0.1_amd64.deb
libjq1_1.6-1ubuntu0.20.04.1_amd64.deb
libnuma1_2.0.12-1_amd64.deb
libonig5_6.9.4-1_amd64.deb
libpcap-dev_1.9.1-3_amd64.deb
libpcap0.8-dev_1.9.1-3_amd64.deb
linux-libc-dev_5.4.0-190.210_amd64.deb
linux-tools-5.4.0-190-generic_5.4.0-190.210_amd64.deb
linux-tools-5.4.0-190_5.4.0-190.210_amd64.deb
linux-tools-common_5.4.0-190.210_all.deb
linux-tools-generic_5.4.0-190.188_amd64.deb
manpages-dev_5.05-1_all.deb
```

7. Move that **debs.tar.gz** to the target VM in the air-gapped environment. One option is to use the SCP command if both VMs are connected over the network and there's no firewall blocking traffic.
8. Check the file details with the following command:

```
PowerShell Copy

ll debs.tar.gz
```

- a. Here is an example output:

```
Example ^

Plaintext Copy

$ ll debs.tar.gz
-rw-rw-r-- 1 fsuarezo fsuarezo 15165956 Jul 26 15:09 debs.tar.gz
```

9. Uncompress the **.tar.gz** in the air-gapped VM:

```
PowerShell Copy

tar -xvzf debs.tar.gz
```

- a. Here is an example output:

```
Example ^
```

Plaintext	Copy
<pre>\$ tar -xvzf debs.tar.gz binutils-common_2.34-6ubuntu1.9_amd64.deb binutils-x86-64-linux-gnu_2.34-6ubuntu1.9_amd64.deb binutils_2.34-6ubuntu1.9_amd64.deb jq_1.6-1ubuntu0.20.04.1_amd64.deb libbinutils_2.34-6ubuntu1.9_amd64.deb libc-dev-bin_2.31-0ubuntu9.16_amd64.deb libc6-dev_2.31-0ubuntu9.16_amd64.deb libcrypt-dev_4.4.10-10ubuntu4_amd64.deb libctf-nobfd0_2.34-6ubuntu1.9_amd64.deb libctf0_2.34-6ubuntu1.9_amd64.deb libdw1_0.176-1.1ubuntu0.1_amd64.deb libjq1_1.6-1ubuntu0.20.04.1_amd64.deb libnuma1_2.0.12-1_amd64.deb libonig5_6.9.4-1_amd64.deb libpcap-dev_1.9.1-3_amd64.deb libpcap0.8-dev_1.9.1-3_amd64.deb linux-libc-dev_5.4.0-190.210_amd64.deb linux-tools-5.4.0-190-generic_5.4.0-190.210_amd64.deb linux-tools-5.4.0-190_5.4.0-190.210_amd64.deb linux-tools-common_5.4.0-190.210_all.deb linux-tools-generic_5.4.0.190.188_amd64.deb manpages-dev_5.05-1_all.deb</pre>	

10. Install all the **.deb** files with the following command:

PowerShell	Copy
<pre>sudo dpkg -i *.deb</pre>	

a. Here is an example output:

Example					
<table border="1"><thead><tr><th>PowerShell</th><th>Copy</th></tr></thead><tbody><tr><td><pre>\$ sudo dpkg -i *.deb Selecting previously unselected package binutils-common:amd64. (Reading database ... 62143 files and directories currently installed.) Preparing to unpack binutils-common_2.34-6ubuntu1.9_amd64.deb ... Unpacking binutils-common:amd64 (2.34-6ubuntu1.9) ... Selecting previously unselected package binutils-x86-64-linux-gnu. Preparing to unpack binutils-x86-64-linux-gnu_2.34-6ubuntu1.9_amd64.deb ... Unpacking binutils-x86-64-linux-gnu (2.34-6ubuntu1.9) ... Selecting previously unselected package binutils. Preparing to unpack binutils_2.34-6ubuntu1.9_amd64.deb ... Unpacking binutils (2.34-6ubuntu1.9) ... Selecting previously unselected package jq. Preparing to unpack jq_1.6-1ubuntu0.20.04.1_amd64.deb ... Unpacking jq (1.6-1ubuntu0.20.04.1) ... Selecting previously unselected package libbinutils:amd64. Preparing to unpack libbinutils_2.34-6ubuntu1.9_amd64.deb ... Unpacking libbinutils:amd64 (2.34-6ubuntu1.9) ... Selecting previously unselected package libc-dev-bin. Preparing to unpack libc-dev-bin_2.31-0ubuntu9.16_amd64.deb ... Unpacking libc-dev-bin (2.31-0ubuntu9.16) ... Selecting previously unselected package libc6-dev:amd64. Preparing to unpack libc6-dev_2.31-0ubuntu9.16_amd64.deb ... Unpacking libc6-dev:amd64 (2.31-0ubuntu9.16) ... Selecting previously unselected package libcrypt-dev:amd64. Preparing to unpack libcrypt-dev_4.4.10-10ubuntu4_amd64.deb ... Unpacking libcrypt-dev:amd64 (1:4.4.10-10ubuntu4) ... Selecting previously unselected package libctf-nobfd0:amd64.</pre></td><td></td></tr></tbody></table>	PowerShell	Copy	<pre>\$ sudo dpkg -i *.deb Selecting previously unselected package binutils-common:amd64. (Reading database ... 62143 files and directories currently installed.) Preparing to unpack binutils-common_2.34-6ubuntu1.9_amd64.deb ... Unpacking binutils-common:amd64 (2.34-6ubuntu1.9) ... Selecting previously unselected package binutils-x86-64-linux-gnu. Preparing to unpack binutils-x86-64-linux-gnu_2.34-6ubuntu1.9_amd64.deb ... Unpacking binutils-x86-64-linux-gnu (2.34-6ubuntu1.9) ... Selecting previously unselected package binutils. Preparing to unpack binutils_2.34-6ubuntu1.9_amd64.deb ... Unpacking binutils (2.34-6ubuntu1.9) ... Selecting previously unselected package jq. Preparing to unpack jq_1.6-1ubuntu0.20.04.1_amd64.deb ... Unpacking jq (1.6-1ubuntu0.20.04.1) ... Selecting previously unselected package libbinutils:amd64. Preparing to unpack libbinutils_2.34-6ubuntu1.9_amd64.deb ... Unpacking libbinutils:amd64 (2.34-6ubuntu1.9) ... Selecting previously unselected package libc-dev-bin. Preparing to unpack libc-dev-bin_2.31-0ubuntu9.16_amd64.deb ... Unpacking libc-dev-bin (2.31-0ubuntu9.16) ... Selecting previously unselected package libc6-dev:amd64. Preparing to unpack libc6-dev_2.31-0ubuntu9.16_amd64.deb ... Unpacking libc6-dev:amd64 (2.31-0ubuntu9.16) ... Selecting previously unselected package libcrypt-dev:amd64. Preparing to unpack libcrypt-dev_4.4.10-10ubuntu4_amd64.deb ... Unpacking libcrypt-dev:amd64 (1:4.4.10-10ubuntu4) ... Selecting previously unselected package libctf-nobfd0:amd64.</pre>		
PowerShell	Copy				
<pre>\$ sudo dpkg -i *.deb Selecting previously unselected package binutils-common:amd64. (Reading database ... 62143 files and directories currently installed.) Preparing to unpack binutils-common_2.34-6ubuntu1.9_amd64.deb ... Unpacking binutils-common:amd64 (2.34-6ubuntu1.9) ... Selecting previously unselected package binutils-x86-64-linux-gnu. Preparing to unpack binutils-x86-64-linux-gnu_2.34-6ubuntu1.9_amd64.deb ... Unpacking binutils-x86-64-linux-gnu (2.34-6ubuntu1.9) ... Selecting previously unselected package binutils. Preparing to unpack binutils_2.34-6ubuntu1.9_amd64.deb ... Unpacking binutils (2.34-6ubuntu1.9) ... Selecting previously unselected package jq. Preparing to unpack jq_1.6-1ubuntu0.20.04.1_amd64.deb ... Unpacking jq (1.6-1ubuntu0.20.04.1) ... Selecting previously unselected package libbinutils:amd64. Preparing to unpack libbinutils_2.34-6ubuntu1.9_amd64.deb ... Unpacking libbinutils:amd64 (2.34-6ubuntu1.9) ... Selecting previously unselected package libc-dev-bin. Preparing to unpack libc-dev-bin_2.31-0ubuntu9.16_amd64.deb ... Unpacking libc-dev-bin (2.31-0ubuntu9.16) ... Selecting previously unselected package libc6-dev:amd64. Preparing to unpack libc6-dev_2.31-0ubuntu9.16_amd64.deb ... Unpacking libc6-dev:amd64 (2.31-0ubuntu9.16) ... Selecting previously unselected package libcrypt-dev:amd64. Preparing to unpack libcrypt-dev_4.4.10-10ubuntu4_amd64.deb ... Unpacking libcrypt-dev:amd64 (1:4.4.10-10ubuntu4) ... Selecting previously unselected package libctf-nobfd0:amd64.</pre>					

```

Preparing to unpack libctf-nobfd0_2.34-6ubuntu1.9_amd64.deb ...
Unpacking libctf-nobfd0:amd64 (2.34-6ubuntu1.9) ...
Selecting previously unselected package libctf0:amd64.
Preparing to unpack libctf0_2.34-6ubuntu1.9_amd64.deb ...
Unpacking libctf0:amd64 (2.34-6ubuntu1.9) ...
Selecting previously unselected package libdw1:amd64.
Preparing to unpack libdw1_0.176-1.1ubuntu0.1_amd64.deb ...
Unpacking libdw1:amd64 (0.176-1.1ubuntu0.1) ...
Selecting previously unselected package libjq1:amd64.
Preparing to unpack libjq1_1.6-1ubuntu0.20.04.1_amd64.deb ...
Unpacking libjq1:amd64 (1.6-1ubuntu0.20.04.1) ...
Selecting previously unselected package libnuma1:amd64.
Preparing to unpack libnuma1_2.0.12-1_amd64.deb ...
Unpacking libnuma1:amd64 (2.0.12-1) ...
Selecting previously unselected package libonig5:amd64.
Preparing to unpack libonig5_6.9.4-1_amd64.deb ...
Unpacking libonig5:amd64 (6.9.4-1) ...
Selecting previously unselected package libpcap-dev:amd64.
Preparing to unpack libpcap-dev_1.9.1-3_amd64.deb ...
Unpacking libpcap-dev:amd64 (1.9.1-3) ...
Selecting previously unselected package libpcap0.8-dev:amd64.
Preparing to unpack libpcap0.8-dev_1.9.1-3_amd64.deb ...
Unpacking libpcap0.8-dev:amd64 (1.9.1-3) ...
Selecting previously unselected package linux-libc-dev:amd64.
Preparing to unpack linux-libc-dev_5.4.0-190.210_amd64.deb ...
Unpacking linux-libc-dev:amd64 (5.4.0-190.210) ...
Selecting previously unselected package linux-tools-5.4.0-190-generic.
Preparing to unpack linux-tools-5.4.0-190-generic_5.4.0-190.210_amd64.deb ...
Unpacking linux-tools-5.4.0-190-generic (5.4.0-190.210) ...
Selecting previously unselected package linux-tools-5.4.0-190.
Preparing to unpack linux-tools-5.4.0-190_5.4.0-190.210_amd64.deb ...
Unpacking linux-tools-5.4.0-190 (5.4.0-190.210) ...
Selecting previously unselected package linux-tools-common.
Preparing to unpack linux-tools-common_5.4.0-190.210_all.deb ...
Unpacking linux-tools-common (5.4.0-190.210) ...
Selecting previously unselected package linux-tools-generic.
Preparing to unpack linux-tools-generic_5.4.0.190.188_amd64.deb ...
Unpacking linux-tools-generic (5.4.0.190.188) ...
Selecting previously unselected package manpages-dev.
Preparing to unpack manpages-dev_5.05-1_all.deb ...
Unpacking manpages-dev (5.05-1) ...
Setting up binutils-common:amd64 (2.34-6ubuntu1.9) ...
Setting up libbinutils:amd64 (2.34-6ubuntu1.9) ...
Setting up libc-dev-bin (2.31-0ubuntu9.16) ...
Setting up libcrypt-dev:amd64 (1:4.4.10-10ubuntu4) ...
Setting up libctf-nobfd0:amd64 (2.34-6ubuntu1.9) ...
Setting up libctf0:amd64 (2.34-6ubuntu1.9) ...
Setting up libdw1:amd64 (0.176-1.1ubuntu0.1) ...
Setting up libnuma1:amd64 (2.0.12-1) ...
Setting up libonig5:amd64 (6.9.4-1) ...
Setting up linux-libc-dev:amd64 (5.4.0-190.210) ...
Setting up linux-tools-common (5.4.0-190.210) ...
Setting up manpages-dev (5.05-1) ...
Setting up binutils-x86-64-linux-gnu (2.34-6ubuntu1.9) ...
Setting up binutils (2.34-6ubuntu1.9) ...
Setting up libc6-dev:amd64 (2.31-0ubuntu9.16) ...
Setting up libjq1:amd64 (1.6-1ubuntu0.20.04.1) ...
Setting up libpcap0.8-dev:amd64 (1.9.1-3) ...
Setting up linux-tools-5.4.0-190 (5.4.0-190.210) ...
Setting up jq (1.6-1ubuntu0.20.04.1) ...
Setting up libpcap-dev:amd64 (1.9.1-3) ...
Setting up linux-tools-5.4.0-190-generic (5.4.0-190.210) ...
Setting up linux-tools-generic (5.4.0.190.188) ...
Processing triggers for man-db (2.9.1-1) ...
Processing triggers for libc-bin (2.31-0ubuntu9.16) ...

```

11. You should now be able to [Install an xNIC](#) without an internet connection.

# How to View swXtchBridge Logs

## WHAT TO EXPECT

In this article, users will learn how to access swXtchBridge logs for the purpose of troubleshooting. Common arguments that can be used when compiling information for the Support team at swXtch.io will also be discussed.

Support may also request for you to send xNIC logs. For more information, see [How to Find xNIC Logs](#).

## swXtchBridge Service Logs

For log requests, the standard command, `sudo journalctl -u` can be used with either `swxtch-bridge3-ctrl` or `swxtch-bridge3-data` to get a detailed breakdown of swXtchBridge control or data service, respectively.

For example:

BashCopy

```
sudo journalctl -u swxtch-bridge3-ctrl
```

It is recommended to send logs to [support@swxtch.io](mailto:support@swxtch.io), covering 24 hours worth of time, starting form before the issue to up until now. Users can use any combination of arguments below to create their logs.

## Accessing and Following Logs (-f)

The following command will begin to display swXtchBridge logs at the time of the request. The `-f` argument will follow the logs and continually update. Logs prior to the call will not display.

BashCopy

```
sudo journalctl -u <swxtch-bridge3-ctrl or swxtch-bridge3-data> -f
```

**Note:** You will have to select which swXtchBridge service you would like your logs for: **control** (`swxtch-bridge3-ctrl`) or **data** (`swxtch-bridge3-data`).

**Example:**

BashCopy

```
sudo journalctl -u swxtch-bridge3-ctrl -n 200
```

## Displaying Logs within a Timeframe (--since --until)

The following command will display logs within a set timeframe (between 2 dates).

BashCopy

```
sudo journalctl - u <swxtch-bridge3-ctrl or swxtch-bridge3-data> --since <yyyy-mm-dd> --until <yyyy-mm-dd>
```

**Example:**

BashCopy

```
sudo journalctl - u swxtch-bridge3-ctrl --since 2023-03-07 --until 2023-03-10
```

## --since "Yesterday", "today", "now"

You can also use the words "yesterday," "today", or "now" after `--since` to get logs from that time period.

BashCopy

```
sudo journalctl - u swxtch-bridge3-ctrl --since yesterday
```

## Displaying Logs since Last Boot (-b)

To display logs since last boot, users can use the `-b` argument.

BashCopy

```
sudo journalctl -u swxtch-bridge3-ctrl -b
```

## List boots (--list-boot)

The following argument can be used to list all the boots in date/time order.

Bash	Copy
<code>sudo journalctl -u swxtch-bridge3-ctrl --list-boot</code>	

## Exporting Logs (>)

The following command will export your logs to a .txt file. Logs should be emailed to [support@swxtch.io](mailto:support@swxtch.io).

Bash	Copy
<code>sudo journalctl -u &lt;swxtch-bridge3-ctrl or swxtch-bridge3-data&gt; &gt; &lt;file-name&gt;.txt</code>	

### Example:

Bash	Copy
<code>sudo journalctl -u swxtch-bridge3-ctrl &gt; cloudswxtch-test.txt</code>	

You can also combine arguments to export logs from a timeframe or from last boot. It is recommended that logs should cover 24 hours worth of time, starting from before the issue to up until now.

### Example:

Bash	Copy
<p>LAST BOOT:</p> <pre>sudo journalctl -u swxtch-bridge3-ctrl -b &gt; cloudswxtch-test.txt</pre>	
<p>TIMEFRAME:</p> <pre>sudo journalctl -u swxtch-bridge3-ctrl --since 2023-03-07 --until 2023-03-10 &gt; cloudswxtch-test.txt</pre>	

## Change Logs to UTC (--utc)

To switch logs from local time to UTC, use the following argument:

Bash	Copy
<code>sudo journalctl --utc</code>	

# How to Find xNIC Logs

### WHAT TO EXPECT

In this article, you will learn how to find xNICs logs on your VM and how to alter its verbosity level.

swXtch.io Support may also request for you to send cloudSwXtch logs. For more information, see [How to View cloudSwXtch Logs for Troubleshooting](#).

## Locating xNIC Logs

An xNIC installed on a virtual machine creates one .log file per day with the following naming structure: **swxtch-xnic-YYYYMMDD.log**. If the file size exceeds the maximum within the same day (16MB), it will be renamed by adding a counter as a suffix. Then, a new file will be created.

To find your logs, use the following file paths:

### Windows

- C:\Users\Public\swx\logs\xnic-control
- C:\Users\Public\swx\logs\xnic-data

### Linux

- /var/log/swx/xnic-control
- /var/log/swx/xnic-data

For Linux, logs can also be viewed by using either journalctl examples below:

#### xnic-control

Bash	Copy
<pre>sudo journalctl -u swxtch-xnic-control -n 500 -f</pre>	

#### xnic-data

Bash	Copy
<pre>sudo journalctl -u swxtch-xnic-data -n 500 -f</pre>	

**Please note:** Standard journalctl arguments apply. The above examples use **-n** for number of lines and **-f** to follow.

### Log File Deletion

Log files older than 30 days are automatically deleted.

## What is verbosity?

Depending on the level of verbosity detailed in the xNIC config file, a log will contain different application messages and usage statistics. The default verbosity level after xNIC installation is 0, which means that no periodic statistics are being reported. It will only show start and stop information as well as critical errors.

A user can change the verbosity to pull more information out from their xNIC. The levels are detailed below:

- **Level 0:** Only show start and stop info as well as critical errors. This is the default.
- **Level 1:** Shows statistics and IGMP messages
- **Level 2:** Additional control messages
- **Level 3:** Hexadecimal dumps of control/config packages
- **Level 4:** Hexadecimal dumps of data packages

An average user would typically only need up to Level 2 for troubleshooting issues with their xNIC.

### Verbosity and File Size

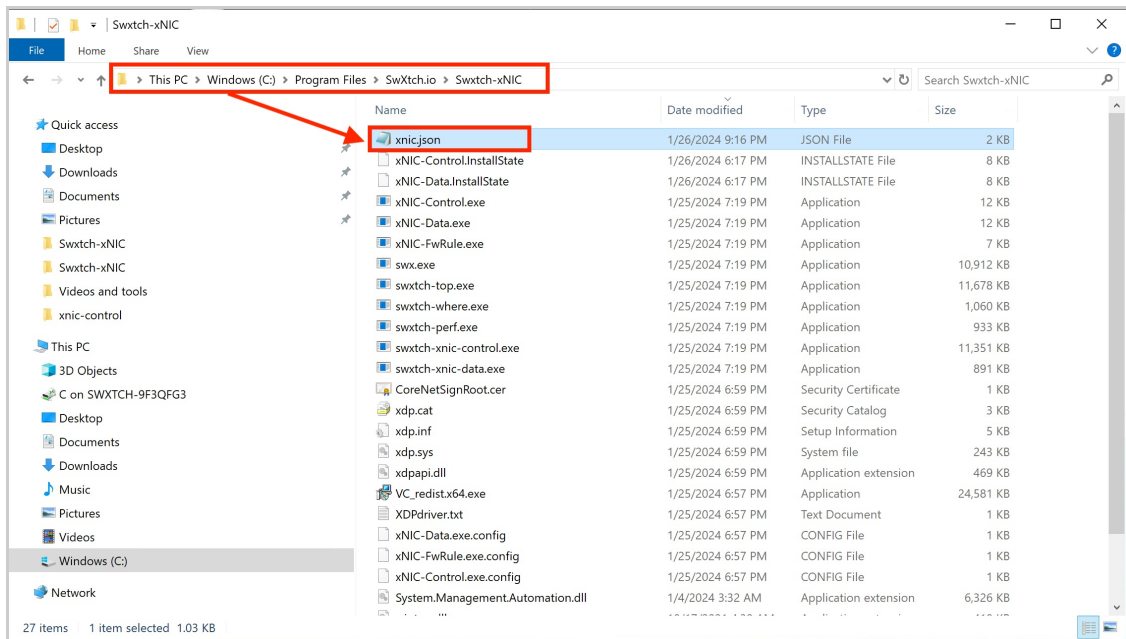
Please note that increasing the verbosity level of future logs will result in larger file sizes. It is recommended to revert back to the default Level 0 when testing and troubleshooting is complete.

## How to Change Verbosity

To change the verbosity, a user can manually edit the xNIC config file on their VM.

### For Windows:

1. Go to the Swxtch-xNIC folder on the VM you have an xNIC installed. Make sure it is the xNIC you want logs for.
  - a. C:\Program Files\SwXtch.io\Swxtch-xNIC

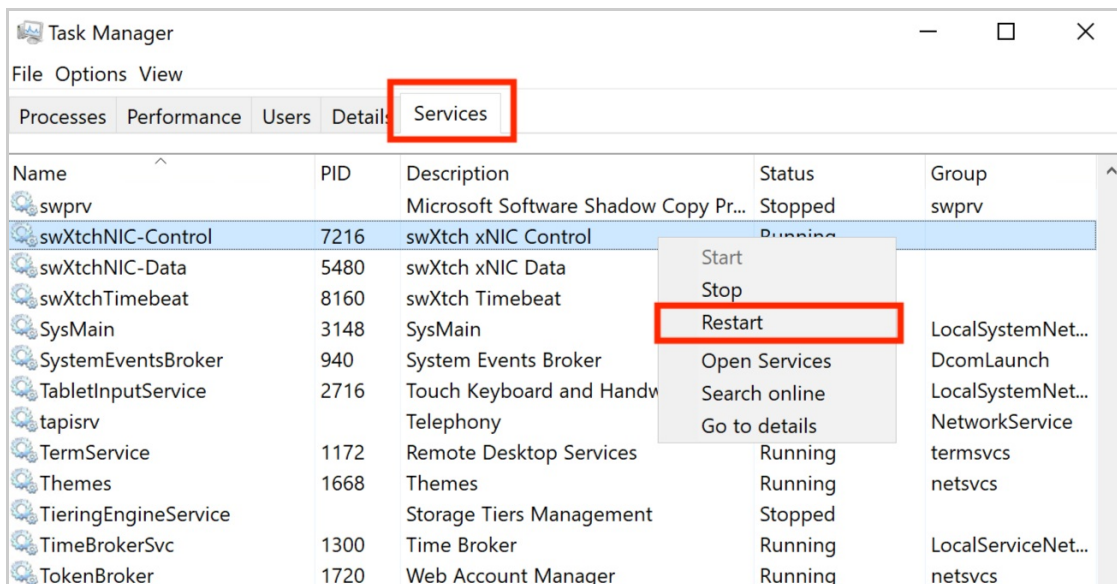


2. Open the **xnic.json** file.
3. For xNIC-Data, **change** the number next to "verbosity" so that it matches the level you desire. The default is 0.
4. For xNIC-Control, modify the StatsReportWait to change the time in seconds of the report stats.



```
{
  "swxtch": "10.2.128.10",
  "controlInterface": "Ethernet",
  "dataInterface": "Ethernet 2",
  "dataPort": 9999,
  "xnicType": 1,
  "dataPlaneSpecs": {
    "verbosity": 0,
    "virtualInterface": {
      "name": "swxtch-tun0",
      "ip": "172.30.0.0",
      "subnet": "255.255.0.0",
      "mtu": 4096
    }
  },
  "ha": {
    "maxTimeToBufferPacketsMs": 50,
    "bufferSizeInPackets": 131072,
    "protocol": "rtp"
  },
  "streamSpecs": {
    "mmcProducerEnable": true,
    "multipleMulticastGroups": [
      {
        "parent": "239.2.2.2:4000",
        "children": [
          "239.1.1.1:4000",
          "239.1.1.2:4000"
        ]
      },
      {
        "parent": "239.3.3.3:4000",
        "children": [
          "239.1.1.3:4000",
          "239.1.1.4:4000"
        ]
      }
    ]
  },
  "statsReportWait": 60
}
```

5. **Save and Close** the json file.
6. **Open** "Task Manager" and **go to** the "Services" tab towards the top of the window.
7. To apply changes from the json file, **scroll** down to "swXtchNIC-Control" and **right-click** on it.
8. **Select** "Restart."
  - a. **Please note:** Only xNIC-Control has to be restarted to update both control and data logs.



Your selection in verbosity will now be applied to future logs. This should only be changed if directed by swXtch.io and ensure that they are set back to default when troubleshooting is complete.

#### For Linux:

1. Enter the following command to view your config file in the Bash terminal. Make sure it is on the xNIC you want logs for.

Text



```
Bash
```

```
Copy
```

```
sudo nano /var/opt/swxtch/swxtch-xnic/swxtch-xnic.conf
```

2. For xNIC-Data, **change** the number next to "verbose" so that it matches the level you desire. The default is 0.
3. For xNIC-Control, **modify** the StatsReportWait to change the time in seconds of the report stats.

```
GNU nano 4.8
{
  "swxtch": "10.2.128.10",
  "controlInterface": "eth0",
  "dataInterface": "eth1",
  "dataPort": 9999,
  "xnicType": 1,
  "dataPlaneSpecs": {
    "verbosity": 0,
    "virtualInterface": {
      "name": "swxtch-tun0",
      "ip": "172.30.0.0",
      "subnet": "255.255.0.0",
      "mtu": 4096
    }
  },
  "ha": {
    "maxTimeToBufferPacketsMs": 50,
    "bufferSizeInPackets": 131072,
    "protocol": "rtp"
  },
  "streamSpecs": {
    "mmcProducerEnable": true,
    "multipleMulticastGroups": [
      {
        "parent": "239.2.2.2:4000",
        "children": [
          "239.1.1.1:4000",
          "239.1.1.2:4000"
        ]
      },
      {
        "parent": "239.3.3.3:4000",
        "children": [
          "239.1.1.3:4000",
          "239.1.1.4:4000"
        ]
      }
    ]
  },
  "statsReportWait": 60
}
```

4. **Save** and **Exit** the file.
5. **Restart** your swxtch-xnic-control by using the following command. **Please note:** Only xNIC-Control has to be restarted to update both control and data logs.

Text



Bash	Copy
<pre>sudo systemctl restart swxtch-xnic-control</pre>	

Your selection in verbosity will now be applied to future logs. This should only be changed if directed by swXtch.io and ensure that they are set back to default when troubleshooting is complete.

#### PRO-TIP

Rename your existing log file before restarting the xNIC service in order to differentiate it with the freshly generated log file containing the new verbosity data.

## How to set MTU size

In some cases the MTU Size of the multicast group may exceed the 1500 set limit in Windows and Linux virtual machines. This article will explain how to increase the MTU size if this should occur.

To know if the MTU size has been exceeded Wireshark or tcpdump can be used. Below is an example from Wireshark.

Time	Source	Destination	Protocol	Length	Info
1 0.000000	172.30.0.11	239.192.10.160	UDP	1482	60000 → 4002 [BAD UDP LENGTH 1449 > IP PAYLOAD LENGTH] Len=1441
2 0.000000	172.30.0.11	239.192.10.160	UDP	1482	60000 → 4002 [BAD UDP LENGTH 1450 > IP PAYLOAD LENGTH] Len=1442
3 0.000000	172.30.0.11	239.192.10.160	UDP	1482	60000 → 4002 [BAD UDP LENGTH 1450 > IP PAYLOAD LENGTH] Len=1442
4 0.000000	172.30.0.11	239.192.10.160	UDP	1482	60000 → 4002 [BAD UDP LENGTH 1450 > IP PAYLOAD LENGTH] Len=1442
5 0.000203	172.30.0.11	239.192.10.160	UDP	1482	60000 → 4002 [BAD UDP LENGTH 1450 > IP PAYLOAD LENGTH] Len=1442
6 0.000203	172.30.0.11	239.192.10.160	UDP	1482	60000 → 4002 [BAD UDP LENGTH 1450 > IP PAYLOAD LENGTH] Len=1442

your title goes here

your content goes here

:::Note: The UDP length error shows it is exceeding the Length.

### Linux update MTU Size:

First check MTU current size by running the following command:

None	Copy
ifconfig   grep mtu	

Example:

None	Copy
someadmin@my-agent-101:~\$ ifconfig   grep mtu enP43852s1: flags=6211<UP,BROADCAST,RUNNING,SLAVE,MULTICAST> mtu 1500 enP4589s2: flags=6211<UP,BROADCAST,RUNNING,SLAVE,MULTICAST> mtu 1500 eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500 eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500 lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536	

Note: The MTU size of eth1 = 1500

To change MTU size to 2000 for example - use the command below:

None	Copy
sudo ifconfig eth1 mtu 2000 up	

Validate it is set to new value in this case 2000 by running this command:

None	Copy
ifconfig   grep mtu	

Example:

None	Copy
someadmin@my-agent-101:~\$ ifconfig   grep mtu enP43852s1: flags=6211<UP,BROADCAST,RUNNING,SLAVE,MULTICAST> mtu 1500 enP4589s2: flags=6211<UP,BROADCAST,RUNNING,SLAVE,MULTICAST> mtu 2000 eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500 eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 2000 lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536	

Note: The MTU size of eth1 is now = 2000

### Windows Update MTU Size

1. Check MTU Size by running this command:

None	Copy
netsh interface ipv4 show subinterfaces	

You will see a list of network interfaces.

2. Set the MTU Size (in this case to 2000) using the following commands:

None [Copy](#)

netsh

None [Copy](#)

interface

None [Copy](#)

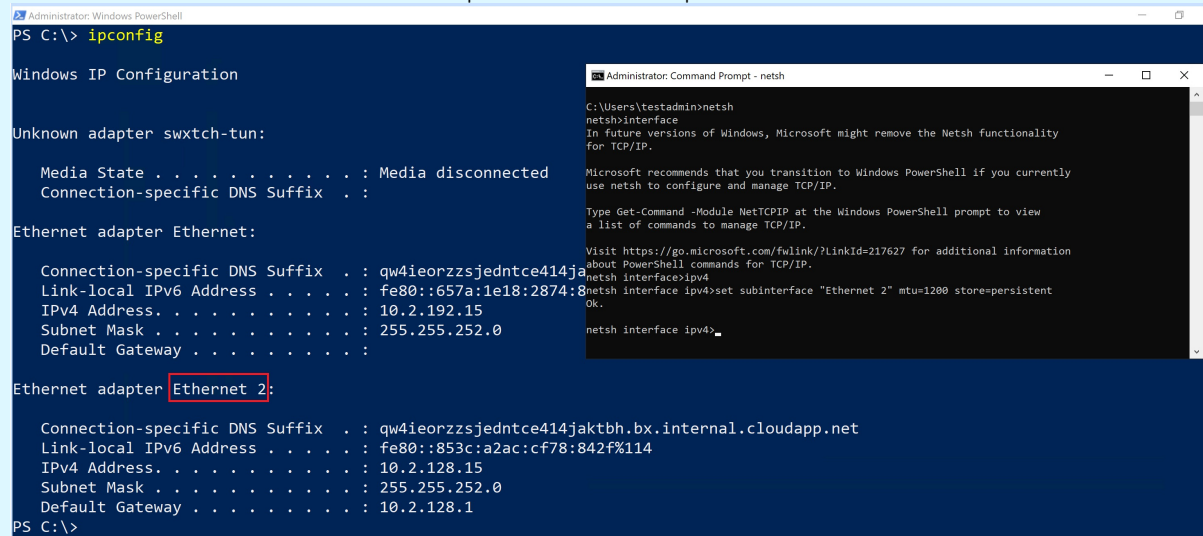
ipv4

and finally to actually set the value:

None [Copy](#)

set subinterface "Local Area Connection" mtu=2000 store=persistent

Where "Local Area Connection" is the Ethernet adaptor to be set - for example:



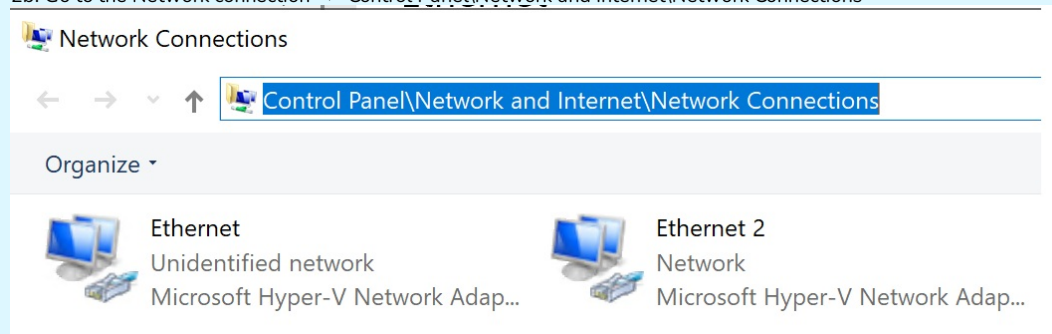
{height="" width=""}

2a. If you get the following error then follow steps after error:

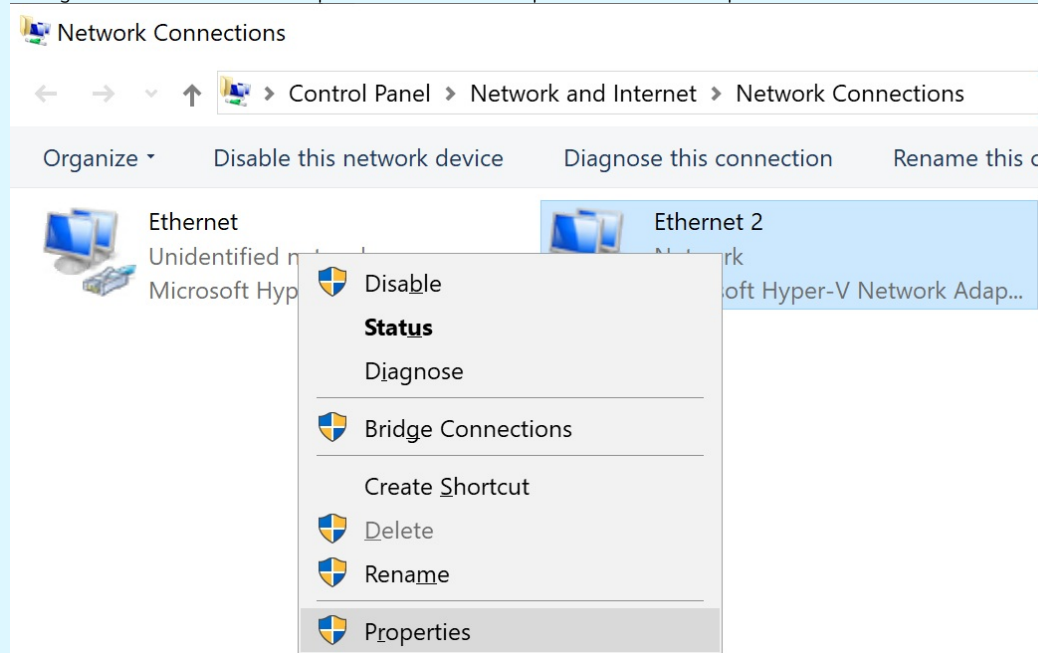
None [Copy](#)

netsh interface ipv4>set subinterface "Ethernet 2" mtu=2000 store=persistent  
The parameter is incorrect.

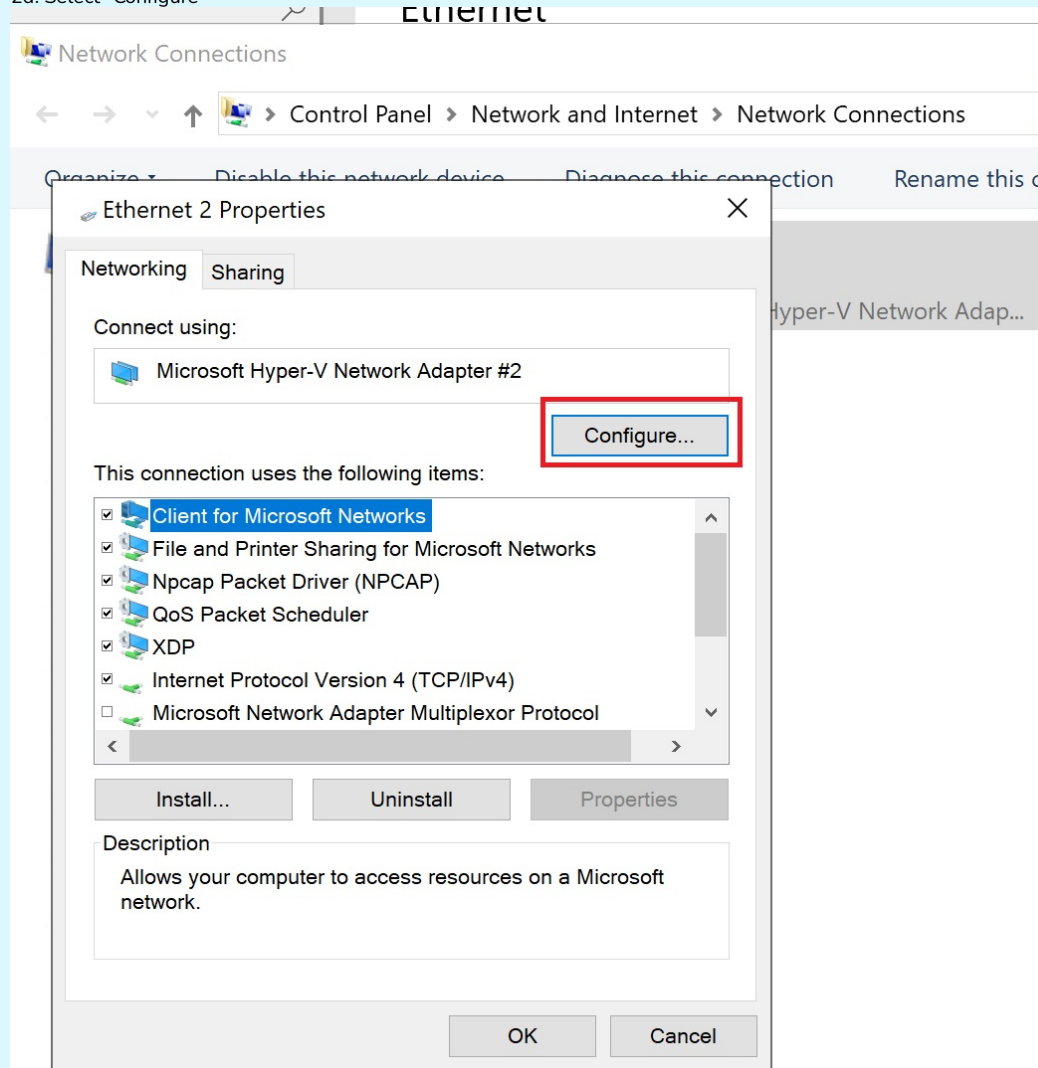
2b. Go to the Network connection → "Control Panel\Network and Internet\Network Connections"



2c. Right click on the Ethernet Adaptor that the traffic is expected and select Properties.

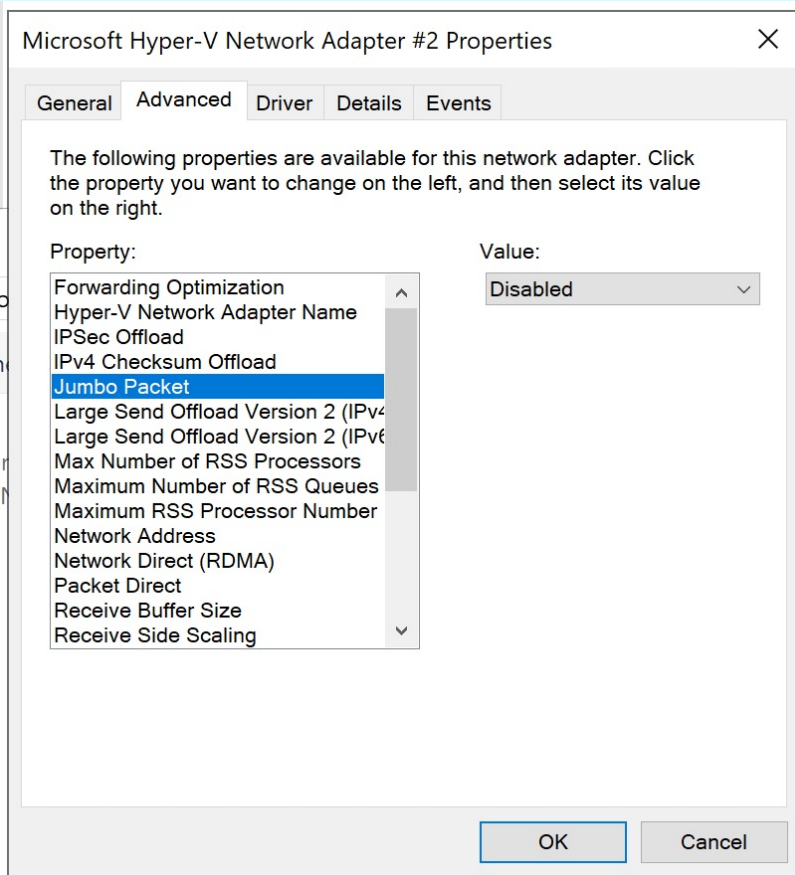


2d. Select "Configure"

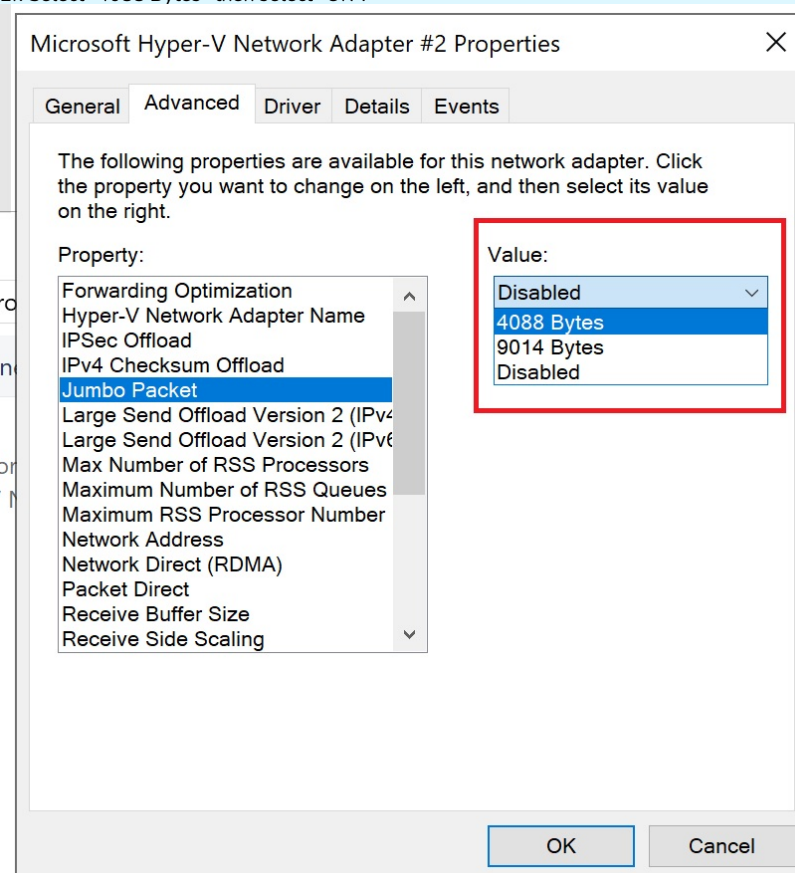




2e. Select "Jumbo Packet"



2f. Select "4088 Bytes" then select "OK".



{height="" width=""}

3. Re-run step 2 to set MTU size
5. Reboot your computer
6. Re-run step 1 to validate the MTU size is correct

# How to Peer between VPCs in Different Regions for AWS

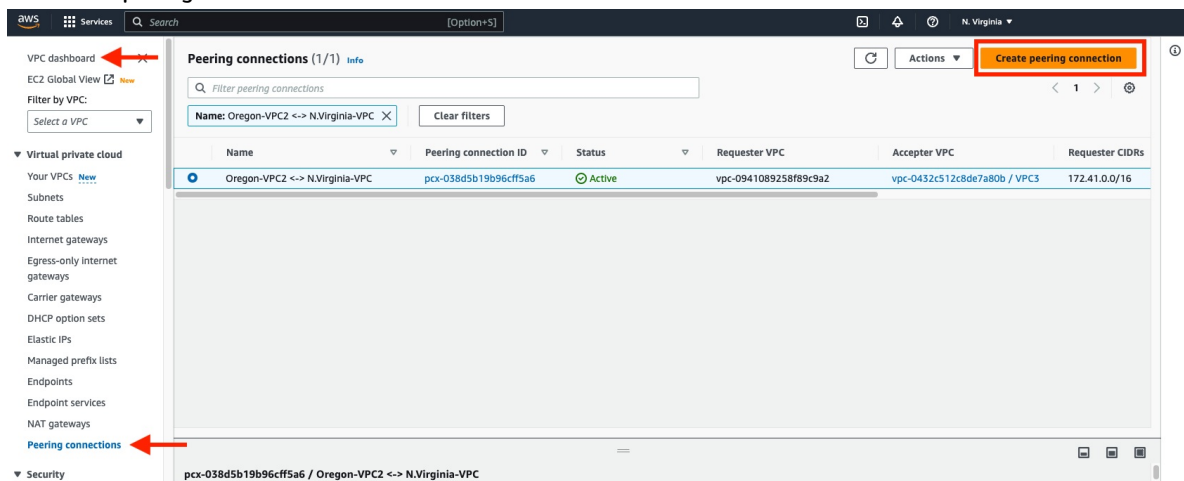
## WHAT TO EXPECT

In order to successfully do Peering Connections between VPCs in different regions on AWS, a user must configure their route tables to allow traffic between instances. This will ensure that packets destined for a specific network segment on the other region/VPC/subnet are correctly routed.

In this article, users will learn how to [Create a Peering Connection between Different Regions](#), [Modify Route Tables](#) and [Edit Subnet Associations](#). Step 2 and 3 of the process will need to be repeated for both regions.

## STEP ONE: Create a Peering Connection between Different Regions

1. Go to the **VPC Dashboard** and select **Peering Connections**.
2. Click **Create peering connection**.



3. Edit the following in the **Create peering connection** form:
  - a. Set a descriptive name. In the example, the user lists the connection between VPCs from Oregon and N. Virginia.
  - b. Select the VPC of the instance you want to connect from.
  - c. Select **Another Region** and select the destination region from the dropdown menu.
  - d. Enter the **VPC ID** of the target VPC in the target region.
  - e. Add any tag needed for organization purposes.



## Create peering connection

A VPC peering connection is a networking connection between two VPCs that enables you to route traffic between them privately. [Info](#)

### Peering connection settings

#### Name - optional

Create a tag with a key of 'Name' and a value that you specify.

Oregon-VPC2 <-> N.Virginia-VPC

#### Select a local VPC to peer with

VPC ID (Requester)

vpc-0432c512c8de7a80b (VPC1)

VPC CIDRs for vpc-0432c512c8de7a80b (VPC1)

CIDR	Status	Status reason
172.31.0.0/16	Associated	-

#### Select another VPC to peer with

Account

☒ My account

☐ Another account

Region

☐ This Region (us-east-1)

☒ Another Region

US West (Oregon) (us-west-2)

VPC ID (Accepter)

vpc-0941089258f89c9a2

### Tags

A tag is a label that you assign to an AWS resource. Each tag consists of a key and an optional value. You can use tags to search and filter your resources or track your AWS costs.

Key

Name

Value - optional

Oregon-VPC2 <-> N.Virginia-VPC

Remove

Add new tag

You can add 49 more tags.

Cancel

Create peering connection

- Click **Create peering connection**. A new Peering Connection should now be listed for the region you're on. **Please note:** A "mirrored connection" will be created on the "destination" region. It must be accepted manually to be active.

Name	Peering connection ID	Status	Requester VPC	Accepter VPC	Requester CIDRs	Accepter CIDRs	Requester owner ID	Accepter owner ID
eastus-to-westus2	pcx-0cfd2bf57c419028	Active	vpc-019af57e1ad2e78a0	vpc-032478a302937fd9e / SA...	172.91.0.0/16	172.31.0.0/16	639720666639	639720666639
Oregon-VPC2 <-> N.Virginia-VPC	pcx-0fd12221d86e30677	Active	vpc-0941089258f89c9a2	vpc-0432c512c8de7a80b / VPC1	172.31.0.0/16	172.31.0.0/16	639720666639	639720666639

- Change to the other region.
- Go to **Peering Connections**.
- Select the new **Peering Connection** listed as "Pending acceptance."

Name	Peering connection ID	Status	Requester VPC	Accepter VPC	Requester CIDRs	Accepter CIDRs	Requester owner ID	Accepter owner ID
RegionalTestV...	pcx-0cfd2bf57c419028	Active	vpc-019af57e1ad2e78a0	vpc-032478a302937fd9e / SA...	172.91.0.0/16	172.31.0.0/16	639720666639	639720666639
-	pcx-012996f2c0ff6d69c	Pending acceptance	vpc-0dd3720d5088eadf6	vpc-0941089258f89c9a2 / SA...	172.31.0.0/16	-	639720666639	639720666639
Oregon-VPC2 ...	pcx-0fd12221d86e30677	Active	vpc-0941089258f89c9a2 / SA...	vpc-0432c512c8de7a80b	172.41.0.0/16	172.31.0.0/16	639720666639	639720666639
MLP-VPC-Peer	pcx-06d670c3874f620f1	Active	vpc-093b945e59a8ef1a8 / SA...	vpc-0941089258f89c9a2 / SA...	172.52.0.0/16	172.41.0.0/16	639720666639	639720666639
SA-Test-1-and-...	pcx-098b8f5b3c70c920	Active	vpc-032478a302937fd9e / SA...	vpc-0941089258f89c9a2 / SA...	172.31.0.0/16	172.41.0.0/16	639720666639	639720666639

- Under the Actions dropdown, select **Accept request**.

Peering connections (1/5) Info								Actions	Create peering connection
<input type="text" value="Filter peering connections"/>								View details	< 1 >
Name	Peering connection ID	Status	Requester VPC	Accepter VPC	Requester CIDRs	Accepter CIDRs		Accept request	Accepter owner ID
RegionalTestV...	pcx-0cfd2bf57c419028	Active	vpc-019af57e1ad2e78a0	vpc-032478a302937fd9e / SA...	172.31.0.0/16	172.31.0.0/16		Reject request	9720666639
-	pcx-012996f2cfff6d9c	Pending acceptance	vpc-0dd3720d5088eadf6	vpc-0941089258f89c9a2 / SA...	172.31.0.0/16	-		Edit DNS settings	9720666639
Oregon-VPC2 ...	pcx-0fd12221d86e30677	Active	vpc-0941089258f89c9a2 / SA...	vpc-0452c512c8de7a80b	172.41.0.0/16	172.31.0.0/16		Edit ClassicLink settings	9720666639
MLP-VPC-Peer	pcx-06d670c3874f620f1	Active	vpc-093b945e59a8ef1a8 / SA...	vpc-0941089258f89c9a2 / SA...	172.52.0.0/16	172.41.0.0/16		Manage tags	9720666639
SATest-1-and-...	pcx-098b8f5b53c70c920	Active	vpc-032478a302937fd9e / SA...	vpc-0941089258f89c9a2 / SA...	172.31.0.0/16	172.41.0.0/16		Delete peering connection	9720666639
									639720666639

## STEP TWO: Modify Route Tables in Both Regions

Once the peering connections are created, the route table must be modified in both regions. Start with the 1st region and complete STEP TWO and STEP THREE.

- Go to the **VPC Dashboard**.
- Click on **Route tables** in the Virtual private cloud section.
- Select **Create route table** button.

Route tables (5) Info								Actions	Create route table
<input type="text" value="Find resources by attribute or tag"/>								< 1 >	
Name	Route table ID	Explicit subnet associations	Edge associations	Main	VPC	Owner ID			
Private subnet routes for VPC1	rtb-0b9bdd248a3dbe66	-	-	No	vpc-0432c512c8de7a80b   VPC1	639720666639			
RegionalTestVPC-rt	rtb-06b64a11e29effed5	2 subnets	-	No	vpc-019af57e1ad2e78a0   RegionalTestVPC	639720666639			
Public subnet routes for VPC1	rtb-0f73d496d1bed158c	subnet-01aaca91957af72d7 / VPC1-public	-	Yes	vpc-0432c512c8de7a80b   VPC1	639720666639			
Oregon-VPC2 <-> N.Virginia-VPC	rtb-016f9783e7c943796	2 subnets	-	No	vpc-0432c512c8de7a80b   VPC1	639720666639			
RegionalTestVPC-public-rtb	rtb-0d5c6db021244e9ec	subnet-058d27396c0dc1e08 / Public-subnet	-	Yes	vpc-019af57e1ad2e78a0   RegionalTestVPC	639720666639			

4. Edit the following in the **Create route table** form:
  - Enter a descriptive name.
  - Select the correct VPC.
  - Add any necessary tags.

VPC > Route tables > Create route table

## Create route table Info

A route table specifies how packets are forwarded between the subnets within your VPC, the internet, and your VPN connection.

### Route table settings

Name - optional

Create a tag with a key of 'Name' and a value that you specify.

VPC

The VPC to use for this route table.

vpc-0432c512c8de7a80b (VPC1)

### Tags

A tag is a label that you assign to an AWS resource. Each tag consists of a key and an optional value. You can use tags to search and filter your resources or track your AWS costs.

No tags associated with the resource.

Add new tag

You can add 50 more tags.

Cancel

Create route table

5. Select **Create route table**.
6. Select the **Route table ID** of the route table you just created.

Route tables (1/5) Info		
<input type="text" value="Find resources by attribute or tag"/>		
<input type="checkbox"/>	Name	Route table ID
<input type="checkbox"/>	Private subnet routes for VPC1	rtb-0b9bdd248a3dbe66
<input type="checkbox"/>	RegionalTestVPC-rt	rtb-06b64a11e29effed5
<input type="checkbox"/>	Public subnet routes for VPC1	rtb-0f73d496d1bed158c
<input checked="" type="checkbox"/>	Oregon-VPC2 <-> N.Virginia-VPC	rtb-016f9783e7c943796
<input type="checkbox"/>	RegionalTestVPC-public-rtb	rtb-0d5c6db021244e9ec

7. Select **Edit routes** button the next screen.

The screenshot shows the AWS Management Console interface for a VPC. The left sidebar contains navigation links for VPC dashboard, EC2 Global View, and various VPC services. The main content area displays the 'Route tables' page for a specific route table. The 'Routes' tab is selected, showing a list of routes. The 'Edit routes' button is highlighted with a red rectangle.

8. Add the **Destination** by entering the CIDR of the destination network.
9. Under Target, select the recently created **Peering Connection** from the list.

The screenshot shows the 'Edit routes' page in the AWS Management Console. The 'Add route' button is highlighted with a red rectangle. The page displays a table with columns for Destination, Target, Status, and Propagated. The 'Add route' button is located at the bottom left of the table.

10. Click the **Save changes** button.

#### Internet Access

If you need the agents to have access to the internet, you will also need to add the route for the 0.0.0.0/0 towards the NAT gateway.

### STEP THREE: Edit Subnet Associations

1. Select **Subnet associations** tab.
2. Select **Edit subnet associations** button under the **Explicit subnet associations** box.

The screenshot shows the AWS Management Console interface for a VPC. The left sidebar contains navigation links for VPC dashboard, EC2 Global View, and various VPC services. The main content area displays the 'Route tables' page for a specific route table. The 'Subnet associations' tab is selected, showing a list of subnet associations. The 'Edit subnet associations' button is highlighted with a red rectangle.

3. Select the subnet(s) of the instance that must be connected to the destination.

## Edit subnet associations

Change which subnets are associated with this route table.

**Available subnets (2/8)**

< 1 > ⚙

<input type="checkbox"/>	Name	Subnet ID	IPv4 CIDR	IPv6 CIDR	Route table ID
<input type="checkbox"/>	Default VPC1-d	subnet-0d6aac918668cedbe	172.31.80.0/20	–	Main (rtb-0f73d496d1bed158c / Public subnet routes for VPC1)
<input type="checkbox"/>	Default VPC1-f	subnet-0d9977ffb242c0086	172.31.64.0/20	–	Main (rtb-0f73d496d1bed158c / Public subnet routes for VPC1)
<input type="checkbox"/>	VPC1-public	subnet-01aaca91957af72d7	172.31.112.0/24	–	rtb-0f73d496d1bed158c / Public subnet routes for VPC1
<input checked="" type="checkbox"/>	VPC1-ctrl-subnet	subnet-03de822f9248b91ff	172.31.16.0/20	–	rtb-016f9783e7c943796 / Oregon-VPC2 <-> N.Virginia-VPC
<input checked="" type="checkbox"/>	VPC1-data-subnet	subnet-01df022a4f373fa17	172.31.96.0/20	–	rtb-016f9783e7c943796 / Oregon-VPC2 <-> N.Virginia-VPC
<input type="checkbox"/>	Default VPC1-e	subnet-068d4969f6ec1457a	172.31.48.0/20	–	Main (rtb-0f73d496d1bed158c / Public subnet routes for VPC1)
<input type="checkbox"/>	Default VPC1-b	subnet-06e372352e6a55935	172.31.32.0/20	–	Main (rtb-0f73d496d1bed158c / Public subnet routes for VPC1)
<input type="checkbox"/>	Default VPC1-c	subnet-0c633106e2e3bc850	172.31.0.0/20	–	Main (rtb-0f73d496d1bed158c / Public subnet routes for VPC1)

**Selected subnets**

subnet-01df022a4f373fa17 / VPC1-data-subnet X

subnet-03de822f9248b91ff / VPC1-ctrl-subnet X

Cancel

Save associations

- Click the **Save associations** button.

### Security Groups

It is important that security groups on each EC2 and on each Subnet on both Regions match and should both encompass the port exceptions listed in the [cloudSwXtch System Requirements](#) article.

**Repeat STEP TWO and THREE for the Other Region**

# How to Modify CPU Core Usage in lcore for Large Instances

## WHAT TO EXPECT

There is a known issue where users with large instance types experience reduced performance. To solve this issue, users can manually modify their CPU core usage to ensure an optimal thread configuration.

## Prerequisites

- Aim to use only one CPU per core to maximize efficiency.
- Restrict usage to CPUs from the same socket, most likely from SOCKET 0.
- Try not to use more than 14 CPUs as listed in the lcores setting.

If you have any questions or concerns, please contact support@swxtch.io **before** attempting reconfiguration.

1. Check your core topology by using the following command on your cloudSwXtch VM:

PowerShellCopy

```
lscpu --extend --all
```

Example Output:

PowerShellCopy

```
CPU NODE SOCKET CORE L1d:L1i:L2:L3 ONLINE    MAXMHZ   MINMHZ
  0    0      0      0  0:0:0:0          yes 2800.0000 800.0000
  1    0      0      0  0:0:0:0          yes 2800.0000 800.0000
  2    0      0      1  1:1:1:0          yes 2800.0000 800.0000
  3    0      0      1  1:1:1:0          yes 2800.0000 800.0000
  4    0      0      2  2:2:2:0          yes 2800.0000 800.0000
  5    0      0      2  2:2:2:0          yes 2800.0000 800.0000
  6    0      0      3  3:3:3:0          yes 2800.0000 800.0000
  7    0      0      3  3:3:3:0          yes 2800.0000 800.0000
```

2. Adjust your thread assignment by editing the `/swxtch/lcores.json` configuration file. This file specifies which CPU your application should use.  
This is an example of the format you can use in lcores.json:

PowerShellCopy

```
{
  "lcores": "1,3,4,6,8-12"
}
```

## How to Install Docker on RHEL and Ubuntu

### WHAT TO EXPECT

In this section, users will learn how to install docker for either RHEL or Ubuntu. For a more detailed instructions, see their respective pages on the Docker documentation site:

- Ubuntu: <https://docs.docker.com/engine/install/ubuntu/>
- RHEL: <https://docs.docker.com/engine/install/rhel/>

### Installing Docker on RHEL

1. Run the following command to prepare the repositories for the docker install:

Bash

Copy

```
sudo dnf config-manager --add-repo https://download.docker.com/linux/rhel/docker-ce.repo
cat /etc/yum.repos.d/docker-ce.repo
sudo sed -i 's/$releasever/9/g' /etc/yum.repos.d/docker-ce.repo
cat /etc/yum.repos.d/docker-ce.repo
sudo dnf -y install dnf-plugins-core
```

2. Install Docker:

Bash

Copy

```
sudo dnf install docker-ce docker-ce-cli containerd.io docker-buildx-plugin docker-compose-plugin
```

3. Continue on to [Enabling Docker](#).

### Installing Docker on Ubuntu

1. Install Docker:

Bash

Copy

```
curl https://get.docker.com/ > dockerinstall && chmod 777 dockerinstall && sudo ./dockerinstall
```

2. Continue on to [Enabling Docker](#).

### Enabling Docker

After installing Docker on either RHEL or Ubuntu, run the following commands to enable it on your machine:

Bash

Copy

```
sudo usermod -aG docker $USER
sudo systemctl enable docker
sudo systemctl start docker
```

# Helpful Docker Service Commands

## WHAT TO EXPECT

In this section, users will find helpful docker service commands used during cloudSwXtch Bridge and Licensing Server installations and upgrades.

## docker ps

This command will list all the docker containers currently running on your machine.

Bash

Copy

```
docker ps
```

### Example Output:

Bash

Copy

```
ubuntu@ip-10-64-29-105:~$ docker ps
CONTAINER ID   IMAGE                                COMMAND                  CREATED        STATUS        PORTS
4a6499471644   ghcr.io/swxtchio/swx-license-server:latest  "/swxtch/swxtch-lice...  11 minutes ago Up 11 minutes  0.0.0.0:8081->8081/tcp, :::8081->8081/tcp
swx-license-server
```

## Container ID

Using `docker ps` will list all the container IDs found on your machine. You will use these for other commands in this article.

## docker logs

This command will list the logs related to a container.

Bash

Copy

```
docker logs <Container-ID> -f
```

### Example:

Bash

Copy

```
ubuntu@ip-10-64-29-105:~$ docker logs 4a6499471644 -f
```

## docker stop

This command stops the docker service on your machine.

Bash

Copy

```
docker stop <Container-ID>
```

### Example:

Bash

Copy

```
ubuntu@ip-10-64-29-105:~$ docker stop 4a6499471644
4a6499471644
```

## WARNING

If you plan on restarting the same container, it is important that you record the Container ID. A stopped container will not appear when you do a `docker ps`.

## docker start

This command starts the docker service on your machine.

Bash

Copy

```
ubuntu@ip-10-64-29-105:~$ docker start <Container-ID>
```

### Example:

Bash	Copy
<pre>ubuntu@ip-10-64-29-105:~\$ docker start 4a6499471644 4a6499471644</pre>	

Example Output:

```

s7cb94a82e05  swtch-bridge  "/entrypoint.sh" 30 minutes ago  Up 29 minutes  swtch-bridge-control-1
[ec2-user@ip-172-41-128-60 ~]$ docker logs bfb1dee3743d -f
===== DATA =====
Feb 05 20:47:36 ip-172-41-128-60.us-west-2.compute.internal #7 swx_bridge_data.cpp[35]: STARTING BRIDGE APPLICATION
===== DATA =====
Feb 05 20:48:04 ip-172-41-128-60.us-west-2.compute.internal #7 swx_bridge_data.cpp[35]: STARTING BRIDGE APPLICATION
Feb 05 20:48:19 ip-172-41-128-60.us-west-2.compute.internal #7 dataplaneManager.cpp[51]: Handling Start RPC Message
Feb 05 20:48:19 ip-172-41-128-60.us-west-2.compute.internal #7 dataplaneManager.cpp[56]: Config received: Bridge Start Configuration:
Data Interface Name ..... : eth1
Data Interface IP Address ... : 172.41.21.211
User Interface Name ..... : eth1
User Interface IP Address ... : 172.41.21.211
MTU ..... : 1500
Verbosity ..... : 1
CPU ..... : -1
Feb 05 20:48:19 ip-172-41-128-60.us-west-2.compute.internal #7 dataplaneManager.cpp[57]: Verbose level: 1
Feb 05 20:48:19 ip-172-41-128-60.us-west-2.compute.internal #7 dataplaneManager.cpp[18]: Building Bridge's Bypass Client...
EAL: Detected CPU lcores: 4
EAL: Detected NUMA nodes: 1
EAL: Detected static linkage of DPDK
EAL: Multi-process socket /var/run/dpdk/swtch/mp_socket_7_100ffd93b7
EAL: Selected IOVA mode 'PA'
Attach command has been signed for internal app: 'bridge' (signature: 'EFjYDtjgUjFkLRDPXW7B1qDKizWUIj0N34i+Qp5sNVhCWZMgTfJfTgx0T2NEdBY0aTkJHs7HLNd0t0ee/K+FIEKt+TxcPb48RvMIOA9j9XK
BINu7Belr9oYarMT5yihw0ksZRNW0tsfLU4SYybX3CSThMrn6j3PyJ036oI08baNj+pzycv9o+rezHcBa+Vg8F0IEp+kdJjYXENTY505LVVAI3Ns/eMzNJlw33CZKN4MzChyaG1ZwDEU021sMEK1ZSoSuo17kKodUKroPl+zp607Cm0dp
bckKz29pZHQ61DAAAKA0hpG0tRf0W9KZcKkbaifZaZicmKZ2YxcidJZm1sbF9wa3RtY291bnTHwqlzb2Nrx21vZG0').
Feb 05 20:48:19 ip-172-41-128-60.us-west-2.compute.internal #7 Bridge.cpp[657]: Bridge started.
Feb 05 20:48:19 ip-172-41-128-60.us-west-2.compute.internal #7 Bridge.cpp[600]: Main Thread Successfully created
Feb 05 20:48:19 ip-172-41-128-60.us-west-2.compute.internal #7 Bridge.cpp[627]: Request Worker Thread successfully created
Feb 05 20:48:19 ip-172-41-128-60.us-west-2.compute.internal #7 Bridge.cpp[176]: Generic socket created on interface: 172.41.21.211

```

docker remove

This command will remove the docker service from your machine.

Bash	Copy
<pre>ubuntu@ip-10-64-29-105:~\$ docker rm &lt;Container-ID&gt;</pre>	

Example:

Bash	Copy
<pre>ubuntu@ip-10-64-29-105:~\$ docker rm 4a6499471644 4a6499471644</pre>	



## Media Use Cases

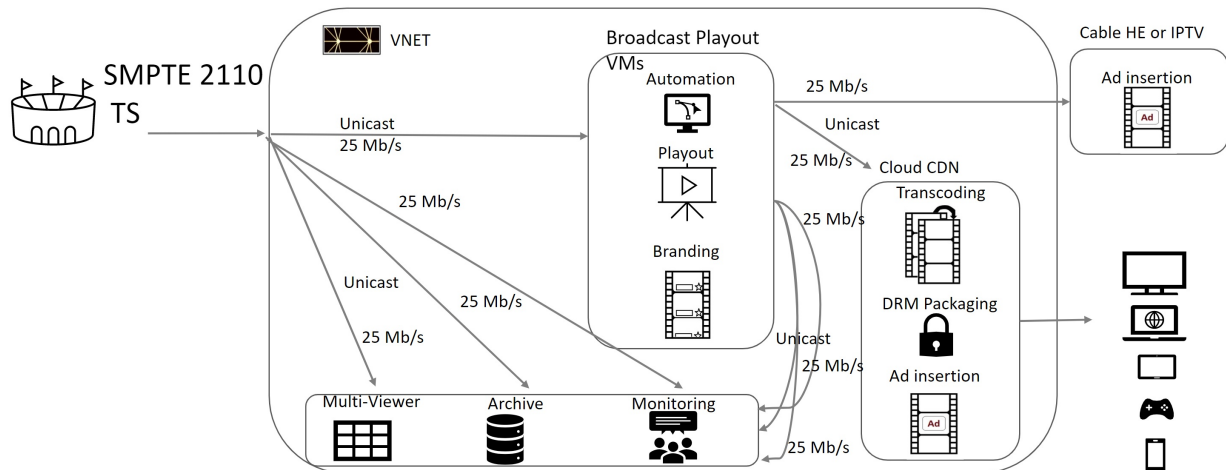
The media market can take advantage of several cloudSwXtch features such as:

- [Multicast](#)
- [Hitless Merge](#)
- [Compression support](#)
- [Protocol Fanout](#)
- [Disaster Recovery](#)

## Media Multicast made easy with cloudswXtch

Media companies want to build dynamic workflows on the cloud, but clouds only support unicast workflows. This makes media workflows cumbersome as each stream would need to be configured for each receiver. Network provisioning and administration is complex, distributed, difficult to modify and must be replicated for every workflow as shown below:

### Unicast Playout in cloud without cloudSwXtch

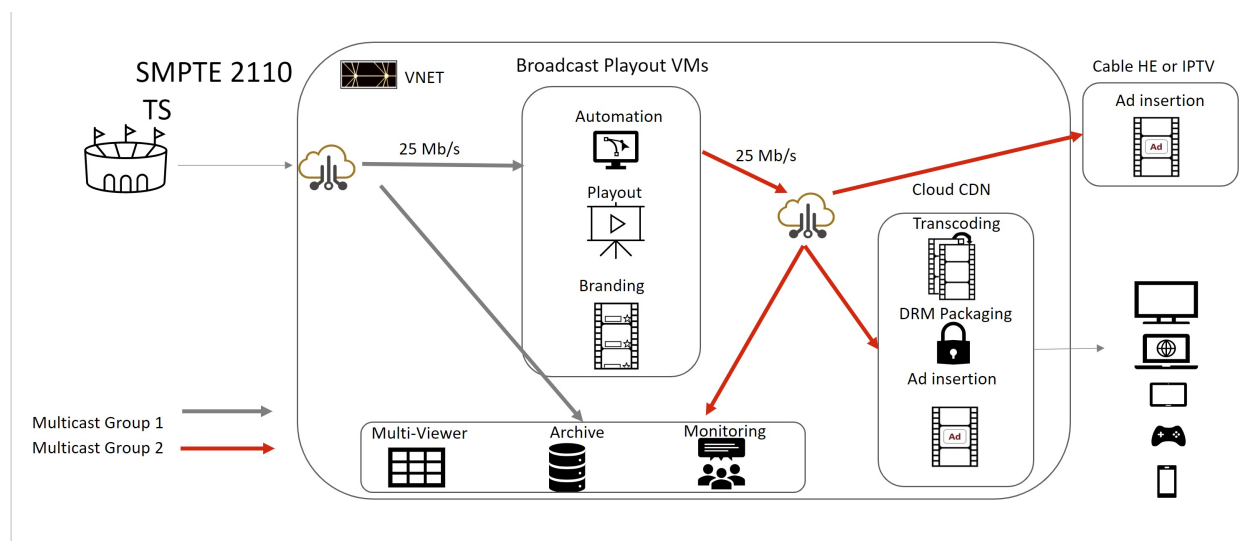


With unicast there are a number of issues:

- Network provisioning and administration is complex, distributed, difficult to modify and must be replicated for each channel or workflow
- The users cannot add endpoints without reconfiguring servers
- Larger VMs are required to support unicast which equates to higher cloud costs.
- Disaster Recovery is difficult to execute
- The load to the network is much larger
- SMPTE 2110 - 100+x more bandwidth

### Multicast Playout in cloud with cloudSwXtch Multicast

cloudSwXtch enables true and seamless IP-multicast. Using multicast instead of unicast optimizes your network configuration and reduces your cloud distribution and egress costs. In addition, receivers can dynamically subscribe and unsubscribe to your streams as workflows dictate. cloudSwXtch eliminates having to configure and unconfigure unicast streams to accommodate configuration changes.



With **cloudSwXtch** Multicast:

- Network may be modified and extended simply by joining multicast groups, with powerful centralized control and monitoring.
- Users can dynamically add new endpoints without playout server (or any other workflows/products) involvement.
- VM Sizes are minimized to workflow/product needs
- Disaster recovery is easy to set-up

- Minimal network load

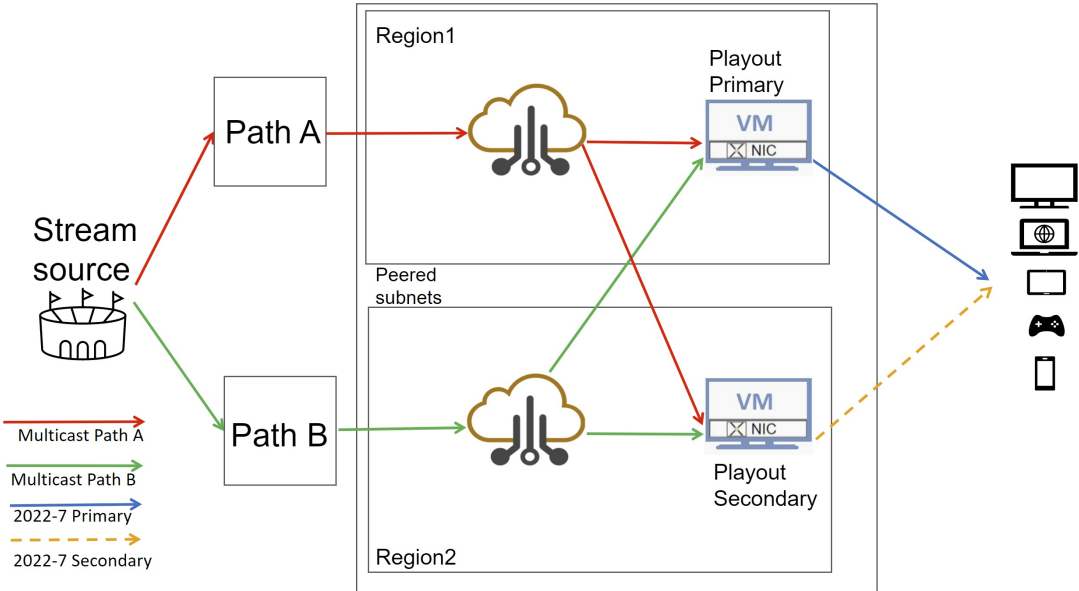
# Hitless Merge - 2022-7

It is never good enough to have one broadcast instance, we all know things can and will go wrong. The show must always go on, media companies are used to having primary and backup streams to ensure the best user experience with NO downtime.



cloudSwXtch SMPTE 2022-7 Hitless Merge protects against data path failures by supporting two or more data paths. It

compares packet reception from the multiple streams, detecting dropped packets, and reconstructs the output stream in the correct packet order.



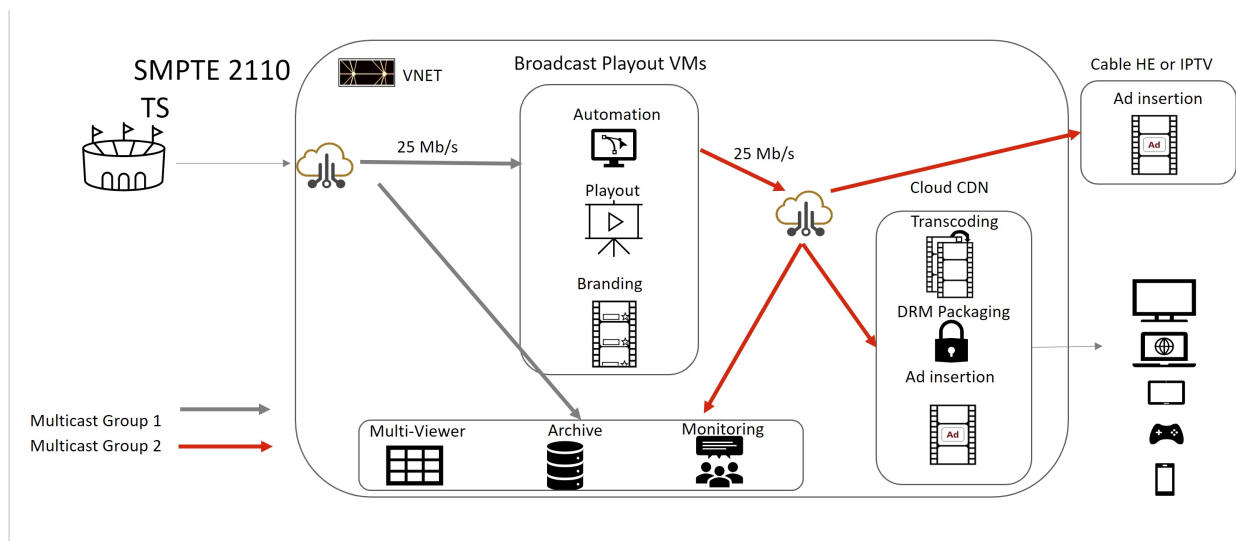
## Media support for Compressed and Uncompressed Workflows



At **swXtch.io** we know that the media companies rely highly on both compressed and uncompressed content. **cloudSwXtch** has SMPTE 2110 support without the necessity of additional gateways or other on-ramp/off-ramp appliances. The **cloudSwXtch** architecture is designed to treat content the same whether it is compressed or uncompressed. This means the ingest of streams from on-prem to the cloud and the streaming of content within the cloud, whether unicast or multicast, is the same regardless of the content type. No SDK is required for uncompressed video, and the cloud network becomes an extension of your broadcast network.

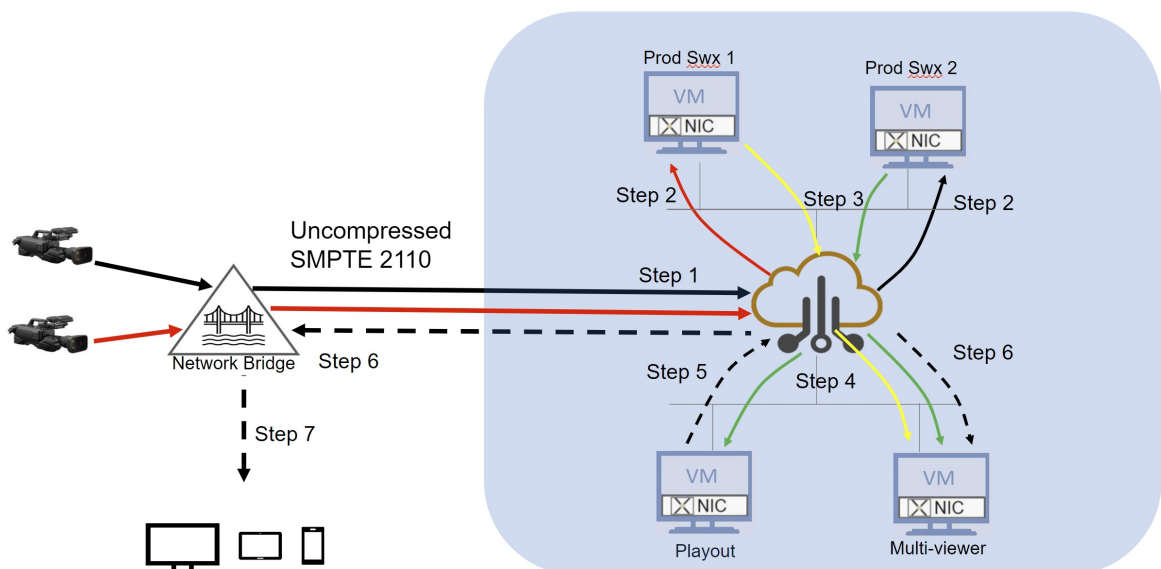
There are two workflow examples below, one is a compressed workflow and the other is an uncompressed workflow. The compressed workflow is a typical playout scenario where compressed inputs come into the cloud environment and are distributed via multicast to the necessary VM workloads by **cloudSwXtch**. All that is required is for the workloads to subscribe to the necessary multicast group(s). This eliminates the need to continually update unicast configurations to ensure your streams get to where they need to go. However, if there are workloads that only work with unicast, **cloudSwXtch** can map multicast streams to unicast devices.

### Example Compressed Playout in the Cloud with SMPTE 2110 Multicast TS



### Example Uncompressed Playout in the Cloud with SMPTE 2110 Multicast

Consider the following production workflow:



The workflow consists of a playout server which receives multiple camera feeds via 2 production switchers and determines which camera's to take to air. The **cloudSwXtch** is used to deliver the various streams via multicast to the workloads that subscribe to the stream:

Step 1: Two inputs red and black go from Network Bridge into **cloudSwXtch**.

Step 2: Red stream goes from **cloudSwXtch** to Production Switcher 1 and black stream goes to production switcher 2.

Step 3: The modified output stream from production switcher 1 is represented by the yellow path and the modified output stream from production switcher 2 is represented by the green path to the **cloudSwXtch**.

Step 4: All streams are multicasted to the multiviewer, via **cloudSwXtch**, so the director can make operational decisions.


Step 5: The playout server is directed to process and output one of the switcher outputs as represented by the dotted black to the **cloudSwXtch**.

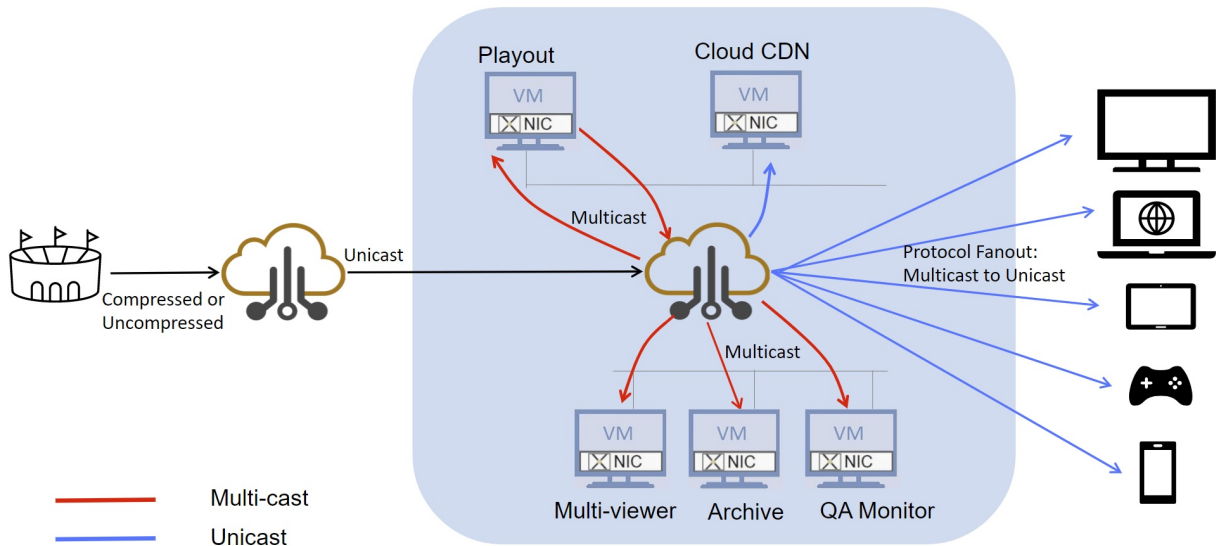
Step 6: **cloudSwXtch** outputs the stream to the multiviewer, and the network bridge.

Step 7: The network bridge distributes to the clients for viewing consumption.

# Protocol Fanout

\*\*\*\*Media companies have many devices. Some require unicast, and some require multicast. Configuring for each device can be difficult and supporting both unicast and multicast for the same stream is impossible. Additionally multicast is not offered in the cloud see .

 swXtch.io has the answer to your needs with the 'Protocol FanOut' feature which can take non-multicast packet protocols and fan them out in the same way that multicast does. It can forward a stream to many interested receivers or distribute a multicast stream to many unicast devices. This integrates unicast and multicast workflows in a way that hasn't been possible in the cloud.



# Disaster Recovery

## Disaster Recovery Scenerio

Coupling [Hitless Merge - 2022-7](#) with redundant media workloads ensures high availability uptime for critical content and provides a new method to create highly available disaster recovery pathways in and between clouds.

There are many configurations that **cloudSwXtch** can recommend for redundancy, one is depicted below.

### Path Redundancy

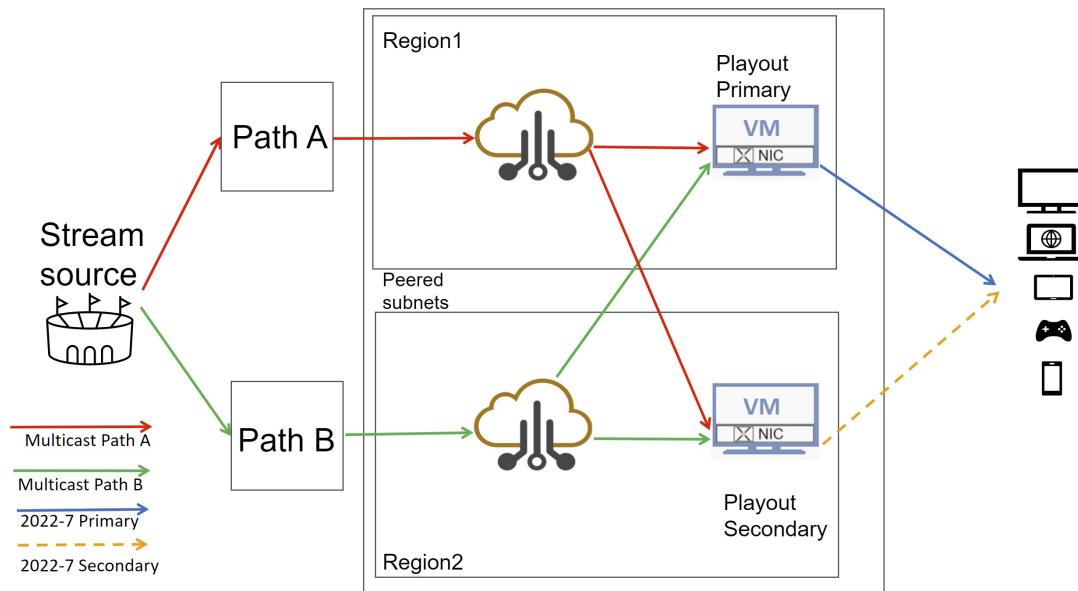
- The **cloudswXtch** in Region 1 can recieve the stream from Path A to Region 2.
- The **cloudswXtch** in Region 2 can recieve the stream from Path B to Region 1.
- If either path were to fail then the stream is still available in both Region 1 and 2 due to the redundancy.

### Playout Redundancy

- Each Region has a playout system, "Primary Playout" in Region 1 and "Secondary Playout" in Region 2.
- If the "Primary Playout" should fail, the stream is still playing out in the "Secondary Playout".
- As long as it is just the playout server that fails, then there is still stream redundancy from Path A and Path B.

### Region Redundancy

If one region should fail the playout should still succeed in the other Region.



This depiction only shows two stream paths, there could be a third or more. In any of these scenarios the paths could be in different regions or different clouds. This is done by using a **cloudSwXtch** as a [Bridge](#) between clouds or from on-prem to cloud.



# Monitoring API

## Overview

The swXtch.io Monitoring API allows the integration of data from various cloudSwXtch component types into third party tools for monitoring and topology purposes within a customer's user interfaces. This section will outline the API, with examples of data results. **Unless otherwise noted, these API calls are only applicable to cloudSwXtch versions 3.0.0 or greater.**

### Prerequisites

- A cloudSwXtch must exist as well as two or more agents with xNICs.
- Traffic (multicast, broadcast, SRT, RIST, or unicast) should be flowing between the cloudSwXtch and the endpoints.
  - **Note:** SRT, RIST and unicast require additional configuration on the cloudSwXtch.

By using a GET command, data will be provided in the response.

## swXtch.io API Concepts Explained

Before you start, there are a number of key concepts and terms that are important to understand before diving into the complexities of the monitoring and topology API.

### Source Address vs. Adjacent Address

In the example responses, users will notice both an source and adjacent address. A **source address** represents a producer's control NIC. This is where the stream originated from.

The **adjacent address** represents the data NIC of either the producer/consumer that is sending out or receiving multicast data. In the monitoring API, this value is dependent on whether it is in the **rxStreamLinks** or the **txStreamLinks** section of the response.

- Under **rxStreamLinks**, the adjacent address is the IP address of the producer — an endpoint **sending traffic to** the cloudSwXtch
- Under **txStreamLinks**, the adjacent address is the IP address of the consumer — an endpoint **receiving traffic from** the cloudSwXtch.

In the topology API, this value is dependent on whether it is in the ingress or egress streamLinks section.

- Under **ingress**, the adjacent address is the IP address of the producer — an endpoint **sending traffic to** the cloudSwXtch
- Under **egress**, the adjacent address is the IP address of the consumer — an endpoint **receiving traffic from** the cloudSwXtch.

### Protocol Types

In the streamLinks section of the cloudSwXtch stats example response, the API specifies the protocol of the stream.

- **xMC**: multicast or broadcast
- **SRT (C)**: SRT Caller
- **SRT (L)**: SRT Listener
- **RIST (C)**: RIST Caller
- **RIST (L)**: RIST Listener

### Timestamps

To track time as a running total of seconds, the Timestamps are in Unix Timestamp. This count starts at the Unix Epoch on January 1st, 1970, at UTC. At any point in time, the API can be run, and certain metrics can be obtained from the response payload by calculating certain counter and timestamp Delta values.

## Monitoring API

The monitoring API allows developers to get data from the cloudSwXtch as well as data about its xNIC's. This data is broken down into 5 categories:

- [Topology](#)
- [Cloud information](#)
- [cloudSwXtch information](#)
- [cloudSwXtch Stats](#)
- [xNIC Totals](#)
- [xNIC Stats](#)

## Topology

GET

/api/topology/v1/topology

- Get information about the components and streamLinks in the Topology Graph

URL:

PowerShell

Copy

http://<cloudSwXtch-control-IP>/api/topology/v1/topology

**Example URL:**  
http://10.2.128.10/api/topology/v1/topology  
**Request:**  
Empty  
**Response:**  
200 - successful response

**Example Response →**

```
PowerShell Copy
{
  "components": {
    "10.2.128.10": {
      "general": {
        "id": "10.2.128.10",
        "name": "dsd-core-100",
        "componentKind": {
          "code": "swxtch",
          "displayName": "swXtch"
        }
      },
      "environment": {
        "hostname": "dsd-core-100",
        "cloud": "AZURE",
        "osDistribution": "Ubuntu 20.04",
        "region": "eastus",
        "instanceType": "Standard_D8as_v4"
      },
      "hardware": {
        "nics": {
          "eth0": {
            "name": "eth0",
            "index": 2,
            "ip": "10.2.128.10",
            "subnetPrefix": "10.2.128.0/22",
            "subnetMask": "255.255.252.0",
            "mtu": 1500,
            "mac": "00:0d:3a:19:cc:e1",
            "broadcastIp": "10.2.131.255",
            "driver": "hv_netvsc",
            "pciAddress": "",
            "publicIp": null,
            "masterOf": null,
            "vpc": null
          },
          "eth1": {
            "name": "eth1",
            "index": 3,
            "ip": "10.2.192.116",
            "subnetPrefix": "10.2.192.0/22",
            "subnetMask": "255.255.252.0",
            "mtu": 1500,
            "mac": "00:0d:3a:54:0f:37",
            "broadcastIp": "10.2.195.255",
            "driver": "mlx5_core",
            "pciAddress": "a6bd:00:02.0",
            "publicIp": null,
            "masterOf": "enP42685s2",
            "vpc": null
          }
        },
        "vpcs": {}
      },
      "swxGeneral": {
        "type": "X1",
        "dataInterfaceName": "eth1",
        "controlInterfaceName": "eth0",
        "dataPort": 9999,
        "version": "dev.7f1520",
        "configuration": null,
        "services": null,
        "subscriptions": null
      },
      "parentId": null,
      "timing": {
        "Master": null,
        "LocalOffset": null,
        "RootOffset": null,
        "TimebeatPresent": null
      }
    }
  }
}
```

```

"adaptors": [
  {
    "id": "16704273857340480058",
    "isConnected": false,
    "isActive": false,
    "alive": true,
    "clientIp": "0.0.0.0",
    "clientPort": 0,
    "sourceIp": "0.0.0.0",
    "sourcePort": 0,
    "socketIp": "0.0.0.0",
    "socketPort": 0,
    "timestamp": 1724082856715428500,
    "counters": {
      "txPackets": 0,
      "txBytes": 0,
      "rxPackets": 0,
      "rxBytes": 0,
      "txLostPackets": 0,
      "txLostBytes": 0,
      "rxLostPacket": 0,
      "rxLostBytes": 0,
      "txRetransmittedPackets": 0,
      "txRetransmittedBytes": 0,
      "rxRetransmittedPackets": 0,
      "rxRetransmittedBytes": 0
    },
    "info": {
      "id": "16704273857340480058",
      "protocol": "srt-caller",
      "direction": "egress",
      "streamIp": "239.4.2.3",
      "streamPort": 5400,
      "nodeIp": "10.2.128.37",
      "nodePort": 5401,
      "listenerPort": null,
      "options": []
    }
  },
  {
    "id": "4777854487999137884",
    "isConnected": false,
    "isActive": false,
    "alive": true,
    "clientIp": "0.0.0.0",
    "clientPort": 0,
    "sourceIp": "0.0.0.0",
    "sourcePort": 0,
    "socketIp": "0.0.0.0",
    "socketPort": 0,
    "timestamp": 1724082856715423300,
    "counters": {
      "txPackets": 0,
      "txBytes": 0,
      "rxPackets": 0,
      "rxBytes": 0,
      "txLostPackets": 0,
      "txLostBytes": 0,
      "rxLostPacket": 0,
      "rxLostBytes": 0,
      "txRetransmittedPackets": 0,
      "txRetransmittedBytes": 0,
      "rxRetransmittedPackets": 0,
      "rxRetransmittedBytes": 0
    },
    "info": {
      "id": "4777854487999137884",
      "protocol": "srt-caller",
      "direction": "ingress",
      "streamIp": "239.4.2.3",
      "streamPort": 5400,
      "nodeIp": "10.2.128.36",
      "nodePort": 5400,
      "listenerPort": null,
      "options": []
    }
  },
  {
    "id": "5062225067104987852",
    "isConnected": false,
    "isActive": false,
    "alive": true,

```

```

        "clientIp": "0.0.0.0",
        "clientPort": 0,
        "sourceIp": "0.0.0.0",
        "sourcePort": 0,
        "socketIp": "0.0.0.0",
        "socketPort": 6000,
        "timestamp": 1724082856715416700,
        "counters": {
            "txPackets": 0,
            "txBytes": 0,
            "rxPackets": 0,
            "rxBytes": 0,
            "txLostPackets": 0,
            "txLostBytes": 0,
            "rxLostPacket": 0,
            "rxLostBytes": 0,
            "txRetransmittedPackets": 0,
            "txRetransmittedBytes": 0,
            "rxRetransmittedPackets": 0,
            "rxRetransmittedBytes": 0
        },
        "info": {
            "id": "5062225067104987852",
            "protocol": "srt-listener",
            "direction": "egress",
            "streamIp": "225.1.1.1",
            "streamPort": 1599,
            "nodeIp": null,
            "nodePort": null,
            "listenerPort": 6000,
            "options": []
        }
    },
    {
        "id": "9489213241930010873",
        "isConnected": false,
        "isActive": false,
        "alive": true,
        "clientIp": "0.0.0.0",
        "clientPort": 0,
        "sourceIp": "0.0.0.0",
        "sourcePort": 0,
        "socketIp": "0.0.0.0",
        "socketPort": 1599,
        "timestamp": 1724082856715406300,
        "counters": {
            "txPackets": 0,
            "txBytes": 0,
            "rxPackets": 0,
            "rxBytes": 0,
            "txLostPackets": 0,
            "txLostBytes": 0,
            "rxLostPacket": 0,
            "rxLostBytes": 0,
            "txRetransmittedPackets": 0,
            "txRetransmittedBytes": 0,
            "rxRetransmittedPackets": 0,
            "rxRetransmittedBytes": 0
        },
        "info": {
            "id": "9489213241930010873",
            "protocol": "srt-listener",
            "direction": "ingress",
            "streamIp": "225.1.1.1",
            "streamPort": 1599,
            "nodeIp": null,
            "nodePort": null,
            "listenerPort": 1599,
            "options": []
        }
    }
],
"stats": {
    "totals": {
        "eth1": {
            "tx": {
                "packets": 9032846,
                "bytes": 1734306432
            },
            "txRate": {
                "packets": 1834,
                "bytes": 352169
            }
        }
    }
}

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    },
    "rx": {
      "packets": 6521926,
      "bytes": 1252209792
    },
    "rxRate": {
      "packets": 914,
      "bytes": 175414
    },
    "txDrops": null,
    "rxDrops": null,
    "timestamp": 1724082855663650000
  }
},
"streamLinks": {
  "eth1": {
    "ingress": {
      "Group = 239.1.1.2:3490 | Source = 10.2.128.15:50226 | Adjacent = 10.2.192.15:50226": {
        "packets": 6521926,
        "bytes": 1252209792,
        "protocol": "xMC",
        "protocolStats": null,
        "timestamp": 1724082855608192400,
        "packetsRate": 921,
        "bytesRates": 176757,
        "haPaths": [
          0
        ],
        "fragStats": null
      }
    },
    "egress": {
      "Group = 239.1.1.2:3490 | Source = 10.2.128.15:50226 | Adjacent = 10.2.192.24:9999": {
        "packets": 6491421,
        "bytes": 1246352832,
        "protocol": "xMC",
        "protocolStats": null,
        "timestamp": 1724082855634894800,
        "packetsRate": 921,
        "bytesRates": 176765,
        "haPaths": [
          0
        ],
        "fragStats": null
      },
      "Group = 239.1.1.2:3490 | Source = 10.2.128.15:50226 | Adjacent = 10.5.2.4:9999": {
        "packets": 2541425,
        "bytes": 487953600,
        "protocol": "xMC",
        "protocolStats": null,
        "timestamp": 1724082855634894800,
        "packetsRate": 921,
        "bytesRates": 176765,
        "haPaths": [
          0
        ],
        "fragStats": null
      }
    }
  }
},
"hsCounters": {
  "eth1": []
},
"hsSummary": {},
"slp": {
  "rxSlpStats": {},
  "txSlpStats": null
}
},
"isRemote": false
},
"10.2.128.15": {
  "general": {
    "id": "10.2.128.15",
    "name": "DSd-agent-105",
    "componentKind": {
      "code": "xnic",
      "displayName": "xNIC"
    }
  },
  "environment": {

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    "hostname": "DSd-agent-105",
    "cloud": "AZURE",
    "osDistribution": "Windows Server 2019 Datacenter - Microsoft Windows [Version 10.0.17763.6189]",
    "region": "eastus",
    "instanceType": "Standard_D8s_v4"
  },
  "hardware": {
    "nics": {
      "Ethernet": {
        "name": "Ethernet",
        "index": 415,
        "ip": "10.2.192.15",
        "subnetPrefix": "10.2.192.0/22",
        "subnetMask": "255.255.252.0",
        "mtu": 4074,
        "mac": "00:22:48:1e:61:cb",
        "broadcastIp": "10.2.195.255",
        "driver": "netvsc.sys",
        "pciAddress": "34454:00:02.0",
        "publicIp": null,
        "masterOf": "Ethernet 626",
        "vpc": null
      },
      "Ethernet 2": {
        "name": "Ethernet 2",
        "index": 494,
        "ip": "10.2.128.15",
        "subnetPrefix": "10.2.128.0/22",
        "subnetMask": "255.255.252.0",
        "mtu": 4074,
        "mac": "00:22:48:1e:6b:5b",
        "broadcastIp": "10.2.131.255",
        "driver": "netvsc.sys",
        "pciAddress": "53755:00:02.0",
        "publicIp": null,
        "masterOf": "Ethernet 625",
        "vpc": null
      }
    },
    "vpcs": {}
  },
  "swxGeneral": {
    "type": "2",
    "dataInterfaceName": "Ethernet",
    "controlInterfaceName": "Ethernet 2",
    "dataPort": 9999,
    "version": "dev.7f1520",
    "configuration": {
      "controlInterface": "Ethernet 2",
      "dataInterface": "Ethernet",
      "dataPlaneSpecs": {
        "bpfPrograms": null,
        "verbosity": 0,
        "virtualInterface": {
          "ip": "172.30.0.15",
          "mtu": 4096,
          "name": "swxtch-tun0",
          "subnet": "255.255.252.0",
          "type": "tun"
        }
      },
      "dataPort": 9999,
      "ha": {
        "bufferSizeInPackets": 131072,
        "maxTimeToBufferPacketsMs": 50,
        "protocol": "swxtch",
        "removeInactiveStreamTimeoutSec": 5
      },
      "nicsConfig": null,
      "overrideSrcIp": false,
      "primarySwxtchAddress": "http://10.2.128.10:80",
      "statsReportWait": 60,
      "streamSpecs": null,
      "subscriptionsPollingIntervalMs": 100,
      "swxtch": "10.2.128.10",
      "xnicRpcPort": 10002,
      "xnicType": 2
    },
    "services": [
      {
        "name": "swXtchNic-control",
        "isRunning": true
      }
    ]
  }
}

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```

    },
    {
      "name": "swXtchNic-data",
      "isRunning": true
    }
  ],
  "subscriptions": {
    "Ethernet": {
      "224.0.0.251": {
        "filter": "exclude",
        "srcList": []
      },
      "224.0.0.252": {
        "filter": "exclude",
        "srcList": []
      },
      "224.0.1.129": {
        "filter": "exclude",
        "srcList": []
      }
    }
  }
},
"parentId": "10.2.128.10",
"timing": {
  "Master": null,
  "LocalOffset": null,
  "RootOffset": null,
  "TimebeatPresent": null
},
"adaptors": null,
"stats": {
  "totals": {
    "Ethernet": {
      "tx": {
        "packets": 13037688,
        "bytes": 2503236096
      },
      "txRate": {
        "packets": 1105536,
        "bytes": 212262961
      },
      "rx": {
        "packets": 0,
        "bytes": 0
      },
      "rxRate": {
        "packets": 0,
        "bytes": 0
      },
      "txDrops": {
        "packets": 0,
        "bytes": 0
      },
      "rxDrops": {
        "packets": 0,
        "bytes": 0
      }
    },
    "timestamp": 1724082852269631100
  }
},
"streamLinks": {
  "Ethernet": {
    "ingress": {},
    "egress": {
      "Group = 239.1.1.2:3490 | Source = 10.2.128.15:50226 | Adjacent = 10.2.192.116:3879": {
        "packets": 6518844,
        "bytes": 1251618048,
        "protocol": "xMC",
        "protocolStats": null,
        "timestamp": 1724082852270144000,
        "packetsRate": 0,
        "bytesRates": 0,
        "haPaths": [
          0
        ],
        "fragStats": null
      },
      "Group = 239.1.1.2:3490 | Source = 10.2.128.15:50226 | Adjacent = 10.5.2.6:3879": {
        "packets": 6518844,
        "bytes": 1251618048,
        "protocol": "xMC",

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        "protocolStats": null,
        "timestamp": 1724082852270144000,
        "packetsRate": 0,
        "bytesRates": 0,
        "haPaths": [
            1
        ],
        "fragStats": null
    }
}
},
"hsCounters": {
    "Ethernet": [
        {
            "streamId": {
                "ip": 4286775818,
                "port": 35328
            },
            "pathStats": [
                {
                    "ingressPackets": 0,
                    "ingressBytes": 0,
                    "ingressPacketsRate": 0,
                    "ingressBytesRate": 0,
                    "missingPackets": 0,
                    "missingPacketsRate": 0,
                    "outputStreamPackets": 0,
                    "pathUsage": 0,
                    "outputStreamPacketsRate": 0
                },
                {
                    "ingressPackets": 1,
                    "ingressBytes": 275,
                    "ingressPacketsRate": 0,
                    "ingressBytesRate": 0,
                    "missingPackets": 0,
                    "missingPacketsRate": 0,
                    "outputStreamPackets": 1,
                    "pathUsage": 0,
                    "outputStreamPacketsRate": 0
                }
            ],
            "enqueueFailurePackets": 0,
            "egressPackets": 1,
            "egressBytes": 275,
            "egressPacketsRate": 0,
            "egressBytesRate": 0,
            "outputStreamLoss": 0,
            "outputStreamLossRate": 0,
            "senderIp": "10.2.128.75"
        },
        {
            "streamId": {
                "ip": 4290970122,
                "port": 35328
            },
            "pathStats": [
                {
                    "ingressPackets": 0,
                    "ingressBytes": 0,
                    "ingressPacketsRate": 0,
                    "ingressBytesRate": 0,
                    "missingPackets": 0,
                    "missingPacketsRate": 0,
                    "outputStreamPackets": 0,
                    "pathUsage": 0,
                    "outputStreamPacketsRate": 0
                },
                {
                    "ingressPackets": 1,
                    "ingressBytes": 275,
                    "ingressPacketsRate": 0,
                    "ingressBytesRate": 0,
                    "missingPackets": 0,
                    "missingPacketsRate": 0,
                    "outputStreamPackets": 1,
                    "pathUsage": 0,
                    "outputStreamPacketsRate": 0
                }
            ],
            "enqueueFailurePackets": 0,

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        "egressPackets": 1,
        "egressBytes": 275,
        "egressPacketsRate": 0,
        "egressBytesRate": 0,
        "outputStreamLoss": 0,
        "outputStreamLossRate": 0,
        "senderIp": "10.2.192.82"
    }
}
],
},
"hsSummary": {
    "Ethernet": {
        "pathSummaries": [
            {
                "ingressPacketsTotal": 0,
                "ingressBytesTotal": 0,
                "missingPacketsTotal": 0,
                "outputStreamPacketsTotal": 0,
                "ingressPacketsRate": 0,
                "ingressBytesRate": 0,
                "missingPacketsRate": 0,
                "outputStreamPacketsRate": 0,
                "pathUsage": 0
            },
            {
                "ingressPacketsTotal": 2,
                "ingressBytesTotal": 550,
                "missingPacketsTotal": 0,
                "outputStreamPacketsTotal": 2,
                "ingressPacketsRate": 0,
                "ingressBytesRate": 0,
                "missingPacketsRate": 0,
                "outputStreamPacketsRate": 0,
                "pathUsage": 0
            }
        ],
        "enqueueFailurePackets": 0,
        "egressPackets": 2,
        "egressBytes": 550,
        "outputStreamLoss": 0,
        "egressPacketsRate": 0,
        "egressBytesRate": 0,
        "outputStreamLossRate": 0
    }
},
"slp": null
},
"isRemote": false
},
"10.2.128.27": {
    "general": {
        "id": "10.2.128.27",
        "name": "DSd-agent-101",
        "componentKind": {
            "code": "xnic",
            "displayName": "xNIC"
        }
    },
    "environment": {
        "hostname": "DSd-agent-101",
        "cloud": "AZURE",
        "osDistribution": "Ubuntu 20.04",
        "region": "eastus",
        "instanceType": "Standard_D4ds_v4"
    },
    "hardware": {
        "nics": {
            "eth0": {
                "name": "eth0",
                "index": 2,
                "ip": "10.2.128.27",
                "subnetPrefix": "10.2.128.0/22",
                "subnetMask": "255.255.252.0",
                "mtu": 1500,
                "mac": "60:45:bd:d5:0f:e1",
                "broadcastIp": "10.2.131.255",
                "driver": "mlx5_core",
                "pciAddress": "e629:00:02.0",
                "publicIp": null,
                "masterOf": "enP58921s1",
                "vpc": null
            }
        }
    }
},

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        "eth1": {
            "name": "eth1",
            "index": 3,
            "ip": "10.2.192.24",
            "subnetPrefix": "10.2.192.0/22",
            "subnetMask": "255.255.252.0",
            "mtu": 1500,
            "mac": "60:45:bd:d5:0a:05",
            "broadcastIp": "10.2.195.255",
            "driver": "mlx5_core",
            "pciAddress": "1681:00:02.0",
            "publicIp": null,
            "masterOf": "enP5761s2",
            "vpc": null
        },
        "swxtch-tun0": {
            "name": "swxtch-tun0",
            "index": 6,
            "ip": "172.30.0.27",
            "subnetPrefix": "172.30.0.0/22",
            "subnetMask": "255.255.252.0",
            "mtu": 4096,
            "mac": "",
            "broadcastIp": "172.30.3.255",
            "driver": null,
            "pciAddress": null,
            "publicIp": null,
            "masterOf": null,
            "vpc": null
        }
    },
    "vpcs": {}
},
"swxGeneral": {
    "type": "2",
    "dataInterfaceName": "eth1",
    "controlInterfaceName": "eth0",
    "dataPort": 9999,
    "version": "dev.7f1520",
    "configuration": {
        "controlInterface": "eth0",
        "dataInterface": "eth1",
        "dataPlaneSpecs": {
            "bpfPrograms": [
                {
                    "attachPoint": "BPF_TC_INGRESS",
                    "interface": "eth1",
                    "name": "tc-ingress"
                },
                {
                    "attachPoint": "BPF_TC_EGRESS",
                    "interface": "eth1",
                    "name": "tc-egress"
                },
                {
                    "attachPoint": "BPF_TC_EGRESS",
                    "interface": "eth0",
                    "name": "tc-forwarder"
                }
            ]
        },
        "verbosity": 0,
        "virtualInterface": {
            "ip": "172.30.0.27",
            "mtu": 4096,
            "name": "swxtch-tun0",
            "subnet": "255.255.252.0",
            "type": "tun"
        }
    },
    "dataPort": 9999,
    "ha": {
        "bufferSizeInPackets": 131072,
        "maxTimeToBufferPacketsMs": 50,
        "protocol": "swxtch",
        "removeInactiveStreamTimeoutSec": 5
    },
    "nicsConfig": null,
    "overrideSrcIp": false,
    "primarySwxtchAddress": "http://10.2.128.10:80",
    "statsReportWait": 60,
    "streamSpecs": null,
    "subscriptionsPollingIntervalMs": 100,

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        "swxtch": "10.2.128.10",
        "xnicRpcPort": 10002,
        "xnicType": 2
    },
    "services": [
        {
            "name": "swxtch-xnic-data",
            "isRunning": true
        },
        {
            "name": "swxtch-xnic-control",
            "isRunning": true
        }
    ],
    "subscriptions": {
        "eth1": {
            "224.0.0.251": {
                "filter": "exclude",
                "srcList": []
            },
            "239.1.1.2": {
                "filter": "exclude",
                "srcList": []
            }
        }
    },
    "parentId": "10.2.128.10",
    "timing": {
        "Master": null,
        "LocalOffset": null,
        "RootOffset": null,
        "TimebeatPresent": null
    },
    "adaptors": null,
    "stats": {
        "totals": {
            "eth1": {
                "tx": {
                    "packets": 0,
                    "bytes": 0
                },
                "txRate": {
                    "packets": 0,
                    "bytes": 0
                },
                "rx": {
                    "packets": 12811621,
                    "bytes": 2459831232
                },
                "rxRate": {
                    "packets": 1846,
                    "bytes": 354383
                },
                "txDrops": {
                    "packets": 0,
                    "bytes": 0
                },
                "rxDrops": {
                    "packets": 0,
                    "bytes": 0
                }
            },
            "timestamp": 1724082856842266400
        }
    },
    "streamLinks": {
        "eth1": {
            "ingress": {
                "Group = 239.1.1.2:3490 | Source = 10.2.128.15:50226 | Adjacent = 10.2.192.116:5026": {
                    "packets": 6492383,
                    "bytes": 1246537536,
                    "protocol": "xMC",
                    "protocolStats": null,
                    "timestamp": 1724082856842280400,
                    "packetsRate": 923,
                    "bytesRates": 177177,
                    "haPaths": [
                        0
                    ],
                    "fragStats": null
                },
                "Group = 239.1.1.2:3490 | Source = 10.2.128.15:50226 | Adjacent = 10.5.2.6:5026": {

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        "packets": 6319238,
        "bytes": 1213293696,
        "protocol": "xMC",
        "protocolStats": null,
        "timestamp": 1724082856842280400,
        "packetsRate": 923,
        "bytesRate": 177206,
        "haPaths": [
            1
        ],
        "fragStats": null
    },
    },
    "egress": {}
}
},
"hsCounters": {
    "eth1": [
        {
            "streamId": {
                "ip": 33620463,
                "port": 41485
            },
            "pathStats": [
                {
                    "ingressPackets": 6492383,
                    "ingressBytes": 1246537536,
                    "ingressPacketsRate": 923,
                    "ingressBytesRate": 177177,
                    "missingPackets": 165,
                    "missingPacketsRate": 0,
                    "outputStreamPackets": 177731,
                    "pathUsage": 0,
                    "outputStreamPacketsRate": 0
                },
                {
                    "ingressPackets": 6319238,
                    "ingressBytes": 1213293696,
                    "ingressPacketsRate": 923,
                    "ingressBytesRate": 177206,
                    "missingPackets": 173311,
                    "missingPacketsRate": 0,
                    "outputStreamPackets": 6314818,
                    "pathUsage": 100,
                    "outputStreamPacketsRate": 923
                }
            ],
            "enqueueFailurePackets": 0,
            "egressPackets": 6492549,
            "egressBytes": 1246569408,
            "egressPacketsRate": 923,
            "egressBytesRate": 177206,
            "outputStreamLoss": 0,
            "outputStreamLossRate": 0,
            "senderIp": "10.2.128.15"
        }
    ]
},
"hsSummary": {
    "eth1": {
        "pathSummaries": [
            {
                "ingressPacketsTotal": 6492383,
                "ingressBytesTotal": 1246537536,
                "missingPacketsTotal": 165,
                "outputStreamPacketsTotal": 177731,
                "ingressPacketsRate": 923,
                "ingressBytesRate": 177177,
                "missingPacketsRate": 0,
                "outputStreamPacketsRate": 0,
                "pathUsage": 0
            },
            {
                "ingressPacketsTotal": 6319238,
                "ingressBytesTotal": 1213293696,
                "missingPacketsTotal": 173311,
                "outputStreamPacketsTotal": 6314818,
                "ingressPacketsRate": 923,
                "ingressBytesRate": 177206,
                "missingPacketsRate": 0,
                "outputStreamPacketsRate": 923,
                "pathUsage": 100
            }
        ]
    }
}

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    },
    "enqueueFailurePackets": 0,
    "egressPackets": 6492549,
    "egressBytes": 1246569408,
    "outputStreamLoss": 0,
    "egressPacketsRate": 923,
    "egressBytesRate": 177206,
    "outputStreamLossRate": 0
  }
},
"slp": null
},
"isRemote": false
},
"10.5.1.4": {
  "general": {
    "id": "10.5.1.4",
    "name": "DSd-agent-201",
    "componentKind": {
      "code": "xnic",
      "displayName": "xNIC"
    }
  },
  "environment": {
    "hostname": "DSd-agent-201",
    "cloud": "AZURE",
    "osDistribution": "Ubuntu 20.04",
    "region": "eastus",
    "instanceType": "Standard_D4s_v4"
  },
  "hardware": {
    "nics": {
      "eth0": {
        "name": "eth0",
        "index": 2,
        "ip": "10.5.1.4",
        "subnetPrefix": "10.5.1.0/24",
        "subnetMask": "255.255.255.0",
        "mtu": 1500,
        "mac": "00:22:48:23:4c:48",
        "broadcastIp": "10.5.1.255",
        "driver": "mlx5_core",
        "pciAddress": "1e1b:00:02.0",
        "publicIp": null,
        "masterOf": "enP7707s1",
        "vpc": null
      },
      "eth1": {
        "name": "eth1",
        "index": 3,
        "ip": "10.5.2.4",
        "subnetPrefix": "10.5.2.0/24",
        "subnetMask": "255.255.255.0",
        "mtu": 1500,
        "mac": "00:22:48:23:43:76",
        "broadcastIp": "10.5.2.255",
        "driver": "mlx5_core",
        "pciAddress": "6df3:00:02.0",
        "publicIp": null,
        "masterOf": "enP28147s2",
        "vpc": null
      }
    },
    "swxtch-tun0": {
      "name": "swxtch-tun0",
      "index": 6,
      "ip": "172.30.0.4",
      "subnetPrefix": "172.30.0.0/24",
      "subnetMask": "255.255.255.0",
      "mtu": 4096,
      "mac": "",
      "broadcastIp": "172.30.0.255",
      "driver": null,
      "pciAddress": null,
      "publicIp": null,
      "masterOf": null,
      "vpc": null
    }
  },
  "vpcs": {}
},
"swxGeneral": {

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```

"type": "2",
"dataInterfaceName": "eth1",
"controlInterfaceName": "eth0",
"dataPort": 9999,
"version": "dev.7f1520",
"configuration": {
  "controlInterface": "eth0",
  "dataInterface": "eth1",
  "dataPlaneSpecs": {
    "bpfPrograms": [
      {
        "attachPoint": "BPF_TC_INGRESS",
        "interface": "eth1",
        "name": "tc-ingress"
      },
      {
        "attachPoint": "BPF_TC_EGRESS",
        "interface": "eth1",
        "name": "tc-egress"
      },
      {
        "attachPoint": "BPF_TC_EGRESS",
        "interface": "eth0",
        "name": "tc-forwarder"
      }
    ],
    "verbosity": 0,
    "virtualInterface": {
      "ip": "172.30.0.4",
      "mtu": 4096,
      "name": "swxtch-tun0",
      "subnet": "255.255.255.0",
      "type": "tun"
    }
  },
"dataPort": 9999,
"ha": {
  "bufferSizeInPackets": 131072,
  "maxTimeToBufferPacketsMs": 50,
  "protocol": "swxtch",
  "removeInactiveStreamTimeoutSec": 5
},
"nicsConfig": null,
"overrideSrcIp": false,
"primarySwxtchAddress": "http://10.5.1.6:80",
"statsReportWait": 60,
"streamSpecs": null,
"subscriptionsPollingIntervalMs": 100,
"swxtch": "10.5.1.6",
"xnicRpcPort": 10002,
"xnicType": 2
},
"services": [
  {
    "name": "swxtch-xnic-control",
    "isRunning": true
  },
  {
    "name": "swxtch-xnic-data",
    "isRunning": true
  }
],
"subscriptions": {
  "eth1": {
    "224.0.0.251": {
      "filter": "exclude",
      "srcList": []
    },
    "239.1.1.2": {
      "filter": "exclude",
      "srcList": []
    }
  }
}
},
"parentId": "10.2.128.10",
"timing": {
  "Master": null,
  "LocalOffset": null,
  "RootOffset": null,
  "TimebeatPresent": null
},

```

```

"adaptors": null,
"stats": {
  "totals": {
    "eth1": {
      "tx": {
        "packets": 0,
        "bytes": 0
      },
      "txRate": {
        "packets": 0,
        "bytes": 0
      },
      "rx": {
        "packets": 5083429,
        "bytes": 976018368
      },
      "rxRate": {
        "packets": 1847,
        "bytes": 354719
      },
      "txDrops": {
        "packets": 0,
        "bytes": 0
      },
      "rxDrops": {
        "packets": 0,
        "bytes": 0
      },
      "timestamp": 1724082856353285592
    }
  },
  "streamLinks": {
    "eth1": {
      "ingress": {
        "Group = 239.1.1.2:3490 | Source = 10.2.128.15:50226 | Adjacent = 10.2.192.116:5026": {
          "packets": 2541784,
          "bytes": 488022528,
          "protocol": "xMC",
          "protocolStats": null,
          "timestamp": 1724082856353297892,
          "packetsRate": 924,
          "bytesRates": 177344,
          "haPaths": [
            0
          ],
          "fragStats": null
        },
        "Group = 239.1.1.2:3490 | Source = 10.2.128.15:50226 | Adjacent = 10.5.2.6:5026": {
          "packets": 2541645,
          "bytes": 487995840,
          "protocol": "xMC",
          "protocolStats": null,
          "timestamp": 1724082856353297892,
          "packetsRate": 924,
          "bytesRates": 177375,
          "haPaths": [
            1
          ],
          "fragStats": null
        }
      },
      "egress": {}
    }
  },
  "hsCounters": {
    "eth1": [
      {
        "streamId": {
          "ip": 33620463,
          "port": 41485
        },
        "pathStats": [
          {
            "ingressPackets": 2541784,
            "ingressBytes": 488022528,
            "ingressPacketsRate": 924,
            "ingressBytesRate": 177344,
            "missingPackets": 27,
            "missingPacketsRate": 0,
            "outputStreamPackets": 1526,
            "pathUsage": 0,
            "outputStreamPacketsRate": 0
          }
        ]
      }
    ]
  }
}

```

```

    },
    {
      "ingressPackets": 2541645,
      "ingressBytes": 487995840,
      "ingressPacketsRate": 924,
      "ingressBytesRate": 177375,
      "missingPackets": 167,
      "missingPacketsRate": 0,
      "outputStreamPackets": 2540286,
      "pathUsage": 100,
      "outputStreamPacketsRate": 924
    }
  ],
  "enqueueFailurePackets": 0,
  "egressPackets": 2541812,
  "egressBytes": 488027904,
  "egressPacketsRate": 924,
  "egressBytesRate": 177375,
  "outputStreamLoss": 0,
  "outputStreamLossRate": 0,
  "senderIp": "10.2.128.15"
}
]
},
"hsSummary": {
  "eth1": {
    "pathSummaries": [
      {
        "ingressPacketsTotal": 2541784,
        "ingressBytesTotal": 488022528,
        "missingPacketsTotal": 27,
        "outputStreamPacketsTotal": 1526,
        "ingressPacketsRate": 924,
        "ingressBytesRate": 177344,
        "missingPacketsRate": 0,
        "outputStreamPacketsRate": 0,
        "pathUsage": 0
      },
      {
        "ingressPacketsTotal": 2541645,
        "ingressBytesTotal": 487995840,
        "missingPacketsTotal": 167,
        "outputStreamPacketsTotal": 2540286,
        "ingressPacketsRate": 924,
        "ingressBytesRate": 177375,
        "missingPacketsRate": 0,
        "outputStreamPacketsRate": 924,
        "pathUsage": 100
      }
    ],
    "enqueueFailurePackets": 0,
    "egressPackets": 2541812,
    "egressBytes": 488027904,
    "outputStreamLoss": 0,
    "egressPacketsRate": 924,
    "egressBytesRate": 177375,
    "outputStreamLossRate": 0
  }
},
"slp": null
},
"isRemote": false
},
"10.5.1.6": {
  "general": {
    "id": "10.5.1.6",
    "name": "dsd-core-200",
    "componentKind": {
      "code": "swxtch",
      "displayName": "swXtch"
    }
  },
  "environment": {
    "hostname": "dsd-core-200",
    "cloud": "AZURE",
    "osDistribution": "Ubuntu 20.04",
    "region": "eastus",
    "instanceType": "Standard_D8s_v4"
  },
  "hardware": {
    "nics": {
      "eth0": {

```



```

        "name": "eth0",
        "index": 2,
        "ip": "10.5.1.6",
        "subnetPrefix": "10.5.1.0/24",
        "subnetMask": "255.255.255.0",
        "mtu": 1500,
        "mac": "00:22:48:24:75:06",
        "broadcastIp": "10.5.1.255",
        "driver": "hv_netvsc",
        "pciAddress": "",
        "publicIp": null,
        "masterOf": null,
        "vpc": null
    },
    "eth1": {
        "name": "eth1",
        "index": 3,
        "ip": "10.5.2.6",
        "subnetPrefix": "10.5.2.0/24",
        "subnetMask": "255.255.255.0",
        "mtu": 1500,
        "mac": "00:22:48:24:77:db",
        "broadcastIp": "10.5.2.255",
        "driver": "mlx5_core",
        "pciAddress": "76ac:00:02.0",
        "publicIp": null,
        "masterOf": "enP30380s2",
        "vpc": null
    }
},
"vpcs": {}
},
"swxGeneral": {
    "type": "X1",
    "dataInterfaceName": "eth1",
    "controlInterfaceName": "eth0",
    "dataPort": 9999,
    "version": "dev.7f1520",
    "configuration": null,
    "services": null,
    "subscriptions": null
},
"parentId": null,
"timing": {
    "Master": null,
    "LocalOffset": null,
    "RootOffset": null,
    "TimebeatPresent": null
},
"adaptors": [],
"stats": {
    "totals": {
        "eth1": {
            "tx": {
                "packets": 5204581,
                "bytes": 999279552
            },
            "txRate": {
                "packets": 1844,
                "bytes": 354105
            },
            "rx": {
                "packets": 2664303,
                "bytes": 511546176
            },
            "rxRate": {
                "packets": 925,
                "bytes": 177565
            },
            "txDrops": null,
            "rxDrops": null,
            "timestamp": 1724082855943717450
        }
    },
    "streamLinks": {
        "eth1": {
            "ingress": {
                "Group = 239.1.1.2:3490 | Source = 10.2.128.15:50226 | Adjacent = 10.2.192.15:50226": {
                    "packets": 2664303,
                    "bytes": 511546176,
                    "protocol": "xMC",
                    "protocolStats": null,

```

```

        "timestamp": 1724082855918726621,
        "packetsRate": 921,
        "bytesRates": 176781,
        "haPaths": [
            1
        ],
        "fragStats": null
    },
    },
    "egress": {
        "Group = 239.1.1.2:3490 | Source = 10.2.128.15:50226 | Adjacent = 10.2.192.24:9999": {
            "packets": 2663319,
            "bytes": 511357248,
            "protocol": "xMC",
            "protocolStats": null,
            "timestamp": 1724082855943490143,
            "packetsRate": 921,
            "bytesRates": 176772,
            "haPaths": [
                1
            ],
            "fragStats": null
        },
        "Group = 239.1.1.2:3490 | Source = 10.2.128.15:50226 | Adjacent = 10.5.2.4:9999": {
            "packets": 2541262,
            "bytes": 487922304,
            "protocol": "xMC",
            "protocolStats": null,
            "timestamp": 1724082855943490143,
            "packetsRate": 921,
            "bytesRates": 176772,
            "haPaths": [
                1
            ],
            "fragStats": null
        }
    },
    },
    "hsCounters": {
        "eth1": []
    },
    "hsSummary": {},
    "slp": {
        "rxSlpStats": {},
        "txSlpStats": null
    },
    },
    "isRemote": true
}
},
"timestamp": "2024-08-19T15:54:17.4656522Z",
"aliases": {
    "components": {},
    "sockets": {},
    "streams": {
        "225.1.1.1:1599": "SRT_L_I_225_1_1_1599",
        "239.4.2.3:5400": "SRT_C_239_4_2_3_1400"
    }
}
}
}

```

## Cloud Information

GET

/swxtch/monitoring/v1/info/cloud

- Get information of the cloud for which the cloudSwXtch is installed on

URL:

Bash

Copy

http://<cloudSwXtch-control-IP>/swxtch/monitoring/v1/info/cloud

Example URL:

http://10.2.128.10/swxtch/monitoring/v1/info/cloud

Request:

Empty

Response:

200 - successful operation

Example Response:

ActionScript

Copy

```
{
  "azureData": {
    "subscriptionId": "b10209ad-ad22-4c26-8aef-be93b2f0bb58",
    "managedResourceGroupName": "saDevNetwork",
    "resourceGroupname": "saDevNetwork",
    "sku": null,
    "billingFields": null,
    "plan": "byol-001"
  },
  "awsData": null,
  "gcpData": null,
  "ociData": null,
  "alibabaData": null
}
```

## cloudSwXtch Information

GET

/swxtch/monitoring/v1/info/swxtch

- Get information on the cloudSwXtch

URL:

Bash

Copy

```
curl http://<cloudSwXtch-control-IP>/swxtch/monitoring/v1/info/swxtch
```

Example URL:

http://10.2.128.10/swxtch/monitoring/v1/info/swxtch

Request:

Empty

Response:

200 - successful response

Example Response:

PowerShell

Copy

```
{
  "cloudSwxtchVersion": "3.0.0",
  "planType": "dsd-core-100",
  "cloudProvider": "AZURE",
  "ipAddr": "10.2.128.10",
  "swxtchGuid": "213de388-ccb5-4d93-9159-3fa9ad5585ea",
  "swxtchName": "dsd-core-100",
  "hostName": "dsd-core-100",
  "numCores": 1,
  "numXnics": null,
  "numBridges": null,
  "replStatus": "running",
  "authorized": true,
  "isMarketplace": true,
  "remainingDays": null,
  "license": null,
  "entitlements": {
    "maxClientCount": 40,
    "maxBridgeCount": 2,
    "bandwidthMbps": 25000,
    "enableMesh": true,
    "enableUnicast": true,
    "enableHA": true,
    "enableClockSync": true,
    "enableBridge": true,
    "enableWxckedEye": true,
    "enableAllowsMajorVersionUpdate": true,
    "enableTachyonLive": false
  },
  "subnetDataPrefix": "10.2.192.0/22",
  "subnetCtrlPrefix": "10.2.128.0/22",
  "dataGatewayIp": "10.2.192.1",
  "ctrlIp": "10.2.128.10",
  "ctrlPort": 10802,
  "gatewayMacAddr": "12:34:56:78:9a:bc",
  "replInfo": {
    "ctrlIp": "127.0.0.1",
    "ctrlPort": 9996,
    "dataIp": "10.2.192.116",
    "dataPort": 9999,
    "dataMac": "AA06VA83"
  },
  "licenseType": null,
  "licenseExpiryDate": null,
}
```

## cloudSwXtch Stats

GET

/swxtch/monitoring/v1/stats/swxtch

- Get status of the cloudSwXtch

URL:

Bash

Copy

```
curl http://<cloudSwXtch-control-IP>/swxtch/monitoring/v1/stats/swxtch
```

Example URL:

http://10.2.128.10/swxtch/monitoring/v1/stats/swxtch

Request: Empty

Response:

200 - successful response

Example Response —>

PowerShell

Copy

```
{
  "host": "10.2.192.116",
  "sequence": 9907,
  "rxCount": 18717937,
  "txCount": 21711090,
  "rxBytes": 3593894567,
  "txBytes": 4168642226,
  "rxBridgeBytes": 0,
  "rxBridgeCount": 0,
  "txBridgeBytes": 0,
  "txBridgeCount": 0,
  "timestamp": 1723834796290675315,
  "dropsByByteLimit": 0,
  "dropsByCountLimit": 0,
  "rxMeshPktCount": 0,
  "rxMeshBytes": 0,
  "txMeshPktCount": 0,
  "txMeshBytes": 0,
  "rxUnicastPktCount": 0,
  "rxUnicastBytes": 0,
  "txUnicastPktCount": 0,
  "txUnicastBytes": 0,
  "streams": {
    "rxStreamLinks": [
      {
        "packets": 13159186,
        "bytes": 2526563712,
        "protocol": "xMC",
        "protocolstats": null,
        "fragStats": null,
        "timestamp": 1723829520431370897,
        "groupAddress": "239.1.1.2:3490",
        "adjacentAddress": "10.2.192.15:57795",
        "sourceAddress": "10.2.128.15:57795"
      },
      {
        "packets": 3927329,
        "bytes": 754047168,
        "protocol": "xMC",
        "protocolstats": null,
        "fragStats": null,
        "timestamp": 1723834796288368432,
        "groupAddress": "239.1.1.2:3490",
        "adjacentAddress": "10.2.192.15:57449",
        "sourceAddress": "10.2.128.15:57449"
      },
      {
        "packets": 63503,
        "bytes": 12192576,
        "protocol": "xMC",
        "protocolstats": null,
        "fragStats": null,
        "timestamp": 1723834796288368432,
        "groupAddress": "239.1.1.3:3490",
        "adjacentAddress": "10.2.192.24:50583",
        "sourceAddress": "10.2.192.24:50583"
      }
    ],
    "txStreamLinks": [
      {
        "packets": 21258,
        "bytes": 4081536,
        "protocol": "xMC",
        "protocolstats": null,
        "fragStats": null,
        "timestamp": 1723834796289254064,
        "groupAddress": "239.1.1.3:3490",
        "adjacentAddress": "10.2.192.11:9999",
        "sourceAddress": "10.2.192.24:50583"
      },
      {
        "packets": 13136117,
```

```

        "bytes": 2522134464,
        "protocol": "xMC",
        "protocolStats": null,
        "fragStats": null,
        "timestamp": 1723829520439529491,
        "groupAddress": "239.1.1.2:3490",
        "adjacentAddress": "10.2.192.24:9999",
        "sourceAddress": "10.2.128.15:57795"
    },
    {
        "packets": 3927319,
        "bytes": 754045248,
        "protocol": "xMC",
        "protocolStats": null,
        "fragStats": null,
        "timestamp": 1723834796276642010,
        "groupAddress": "239.1.1.2:3490",
        "adjacentAddress": "10.2.192.24:9999",
        "sourceAddress": "10.2.128.15:57449"
    },
    {
        "packets": 3069122,
        "bytes": 589271424,
        "protocol": "xMC",
        "protocolStats": null,
        "fragStats": null,
        "timestamp": 1723834796289254064,
        "groupAddress": "239.1.1.2:3490",
        "adjacentAddress": "10.2.192.11:9999",
        "sourceAddress": "10.2.128.15:57449"
    }
  ]
}

```

For definitions of source/adjacent addresses and protocol types, see [swXtch.io API Concepts explained](#) above.

## xNIC Totals

GET

/swxtch/monitoring/v1/stats/xnicsTotals

- Get status of the xNIC totals

URL:

Bash

Copy

```
curl http://<cloudSwxtch-control-IP>/swxtch/monitoring/v1/stats/xnicsTotals
```

Example URL:

http://10.2.128.10/swxtch/monitoring/v1/stats/xnicsTotals

Request:

Empty

Response:

200 - successful response

Example Response:

PowerShell

Copy

```
{
  "activeConnectionCount": null,
  "byteCounters": {
    "rxMulticastCount": 0,
    "rxTotalCount": 7885695384,
    "txMulticastCount": 0,
    "txTotalCount": 3500298564
  },
  "cloudSwxtchVersion": null,
  "dataAddress": null,
  "hostAddress": null,
  "latencies": null,
  "maxActiveConnections": null,
  "osDistribution": null,
  "packetCounters": {
    "-": 0,
    "rxDroppedCount": 0,
    "rxMulticastCount": 0,
    "rxTotalCount": 41070499,
    "txDroppedCount": 0,
    "txIgmpCount": 0,
    "txMulticastCount": 0,
    "txTotalCount": 18228612
  },
  "rxHaCounters": [],
  "rxMulticastGroups": [],
  "timestamp": 1723835599071011224,
  "txMulticastGroups": [],
  "xNicMode": null,
  "xNicType": null
}
```

## xNIC Stats

GET

/swxtch/monitoring/v1/stats/xnics

- Get status of the xNICs

URL:

Bash

Copy

```
curl http://<cloudSwxtch-control-IP>/swxtch/monitoring/v1/stats/xnics
```

Example URL:

http://10.2.128.10/swxtch/monitoring/v1/stats/xnics

Request:

Empty

Response:

200- successful response

Example Response —>

ActionScript

Copy

```
{
  "10.2.128.13": {
    "activeConnectionCount": 2,
    "byteCounters": {
```

```

    "rxMulticastCount": 0,
    "rxTotalCount": 6170369908,
    "txMulticastCount": 0,
    "txTotalCount": 2832
  },
  "cloudSwxtchVersion": "dev.ac84d0",
  "dataAddress": "10.2.192.11",
  "hostAddress": "10.2.128.13",
  "latencies": {
    "buckets": {},
    "count": 0,
    "sum": 0
  },
  "maxActiveConnections": 2,
  "osDistribution": "Ubuntu 20.04",
  "packetCounters": {
    "-": 0,
    "rxDroppedCount": 0,
    "rxMulticastCount": 0,
    "rxTotalCount": 32137435,
    "txDroppedCount": 0,
    "txIgmpCount": 0,
    "txMulticastCount": 0,
    "txTotalCount": 22
  },
  "rxHaCounters": [
    {
      "byteCount": 1976033472,
      "destinationCount": 0,
      "groupIp": "239.1.1.3",
      "packetCount": 10291841,
      "protocolType": 0,
      "sourceIp": "",
      "sourcePort": 0,
      "updateTime": "0001-01-01T00:00:00Z"
    },
    {
      "byteCount": 1109021376,
      "destinationCount": 0,
      "groupIp": "239.1.1.2",
      "packetCount": 5776153,
      "protocolType": 0,
      "sourceIp": "",
      "sourcePort": 0,
      "updateTime": "0001-01-01T00:00:00Z"
    },
    {
      "byteCount": 1976052480,
      "destinationCount": 0,
      "groupIp": "239.1.1.3",
      "packetCount": 10291940,
      "protocolType": 0,
      "sourceIp": "",
      "sourcePort": 0,
      "updateTime": "0001-01-01T00:00:00Z"
    },
    {
      "byteCount": 1109027520,
      "destinationCount": 0,
      "groupIp": "239.1.1.2",
      "packetCount": 5776185,
      "protocolType": 0,
      "sourceIp": "",
      "sourcePort": 0,
      "updateTime": "0001-01-01T00:00:00Z"
    }
  ],
  "timestamp": 1723837738833165495,
  "txMulticastGroups": [
    {
      "byteCount": 294,
      "destinationCount": 0,
      "groupIp": "255.255.255.255",
      "packetCount": 2,
      "protocolType": 0,
      "sourceIp": "",
      "sourcePort": 0,
      "updateTime": "0001-01-01T00:00:00Z"
    },
    {
      "byteCount": 89,
      "destinationCount": 0,

```



```

        "groupIp": "255.255.255.255",
        "packetCount": 1,
        "protocolType": 0,
        "sourceIp": "",
        "sourcePort": 0,
        "updateTime": "0001-01-01T00:00:00Z"
    }
},
"xNicMode": "HA",
"xNicType": "t2"
},
"10.2.128.15": {
    "activeConnectionCount": 2,
    "byteCounters": {
        "rxMulticastCount": 0,
        "rxTotalCount": 59072,
        "txMulticastCount": 0,
        "txTotalCount": 2546472892
    },
    "cloudSwxtchVersion": "dev.ac84d0",
    "dataAddress": "10.2.192.15",
    "hostAddress": "10.2.128.15",
    "latencies": {
        "buckets": {},
        "count": 0,
        "sum": 0
    },
    "maxActiveConnections": 2,
    "osDistribution": "Windows Server 2019 Datacenter - Microsoft Windows [Version 10.0.17763.6189]",
    "packetCounters": {
        "-": 0,
        "rxDroppedCount": 0,
        "rxMulticastCount": 0,
        "rxTotalCount": 340,
        "txDroppedCount": 0,
        "txIgmpCount": 0,
        "txMulticastCount": 0,
        "txTotalCount": 13262608
    },
    "rxHaCounters": [
        {
            "egressByteCount": 275,
            "egressPacketCount": 1,
            "enqueueFailureCount": 0,
            "groupIp": {
                "ip": 4286775818,
                "port": 35328
            },
            "outputStreamLossCount": 0,
            "paths": [
                {
                    "ingressByteCount": 275,
                    "ingressPacketCount": 1,
                    "missingPacketCount": 0,
                    "usedPacketCount": 0
                },
                {
                    "ingressByteCount": 275,
                    "ingressPacketCount": 1,
                    "missingPacketCount": 0,
                    "usedPacketCount": 1
                }
            ],
            "senderIp": "10.2.128.75"
        },
        {
            "egressByteCount": 275,
            "egressPacketCount": 1,
            "enqueueFailureCount": 0,
            "groupIp": {
                "ip": 4290970122,
                "port": 35328
            },
            "outputStreamLossCount": 0,
            "paths": [
                {
                    "ingressByteCount": 275,
                    "ingressPacketCount": 1,
                    "missingPacketCount": 0,
                    "usedPacketCount": 0
                },
                {

```

```

        "ingressByteCount": 275,
        "ingressPacketCount": 1,
        "missingPacketCount": 0,
        "usedPacketCount": 1
    }
    ],
    "senderIp": "10.2.192.82"
}
],
"rxMulticastGroups": [
{
    "byteCount": 1925,
    "destinationCount": 0,
    "groupId": "10.2.131.255",
    "packetCount": 7,
    "protocolType": 0,
    "sourceIp": "",
    "sourcePort": 0,
    "updateTime": "0001-01-01T00:00:00Z"
},
{
    "byteCount": 1116,
    "destinationCount": 0,
    "groupId": "10.2.195.255",
    "packetCount": 9,
    "protocolType": 0,
    "sourceIp": "",
    "sourcePort": 0,
    "updateTime": "0001-01-01T00:00:00Z"
}
],
"timestamp": 1723837734873976100,
"txMulticastGroups": [
{
    "byteCount": 1273105920,
    "destinationCount": 0,
    "groupId": "239.1.1.2",
    "packetCount": 6630760,
    "protocolType": 0,
    "sourceIp": "",
    "sourcePort": 0,
    "updateTime": "0001-01-01T00:00:00Z"
},
{
    "byteCount": 1273105920,
    "destinationCount": 0,
    "groupId": "239.1.1.2",
    "packetCount": 6630760,
    "protocolType": 0,
    "sourceIp": "",
    "sourcePort": 0,
    "updateTime": "0001-01-01T00:00:00Z"
}
],
"xNicMode": "Normal",
"xNicType": "t2"
},
"10.2.128.27": {
    "activeConnectionCount": 2,
    "byteCounters": {
        "rxMulticastCount": 0,
        "rxTotalCount": 6094630132,
        "txMulticastCount": 0,
        "txTotalCount": 3968082038
    },
    "cloudSwxtchVersion": "dev.ac84d0",
    "dataAddress": "10.2.192.24",
    "hostAddress": "10.2.128.27",
    "latencies": {
        "buckets": {},
        "count": 0,
        "sum": 0
    },
    "maxActiveConnections": 2,
    "osDistribution": "Ubuntu 20.04",
    "packetCounters": {
        "-": 0,
        "rxDroppedCount": 0,
        "rxMulticastCount": 0,
        "rxTotalCount": 31742957,
        "txDroppedCount": 0,
        "txIgmpCount": 0,

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    "txMulticastCount": 0,
    "txTotalCount": 20667102
  },
  "rxHaCounters": [
    {
      "egressByteCount": 1273770240,
      "egressPacketCount": 6634220,
      "enqueueFailureCount": 0,
      "groupIp": {
        "ip": 33620463,
        "port": 41485
      },
      "outputStreamLossCount": 0,
      "paths": [
        {
          "ingressByteCount": 1273767936,
          "ingressPacketCount": 6634208,
          "missingPacketCount": 11,
          "usedPacketCount": 18
        },
        {
          "ingressByteCount": 1273770240,
          "ingressPacketCount": 6634220,
          "missingPacketCount": 0,
          "usedPacketCount": 6634202
        }
      ],
      "senderIp": "10.2.128.15"
    }
  ],
  "rxMulticastGroups": [
    {
      "byteCount": 1771408320,
      "destinationCount": 0,
      "groupIp": "239.1.1.2",
      "packetCount": 9226085,
      "protocolType": 0,
      "sourceIp": "",
      "sourcePort": 0,
      "updateTime": "0001-01-01T00:00:00Z"
    },
    {
      "byteCount": 1273770240,
      "destinationCount": 0,
      "groupIp": "239.1.1.2",
      "packetCount": 6634220,
      "protocolType": 0,
      "sourceIp": "",
      "sourcePort": 0,
      "updateTime": "0001-01-01T00:00:00Z"
    },
    {
      "byteCount": 1775448576,
      "destinationCount": 0,
      "groupIp": "239.1.1.2",
      "packetCount": 9247128,
      "protocolType": 0,
      "sourceIp": "",
      "sourcePort": 0,
      "updateTime": "0001-01-01T00:00:00Z"
    },
    {
      "byteCount": 1273767936,
      "destinationCount": 0,
      "groupIp": "239.1.1.2",
      "packetCount": 6634208,
      "protocolType": 0,
      "sourceIp": "",
      "sourcePort": 0,
      "updateTime": "0001-01-01T00:00:00Z"
    }
  ],
  "timestamp": 1723837738670810658,
  "txMulticastGroups": [
    {
      "byteCount": 1984039872,
      "destinationCount": 0,
      "groupIp": "239.1.1.3",
      "packetCount": 10333541,
      "protocolType": 0,
      "sourceIp": ""
    }
  ]
}

```

```

        "sourcePort": 0,
        "updateTime": "0001-01-01T00:00:00Z"
    },
    {
        "byteCount": 1984039872,
        "destinationCount": 0,
        "groupIp": "239.1.1.3",
        "packetCount": 10333541,
        "protocolType": 0,
        "sourceIp": "",
        "sourcePort": 0,
        "updateTime": "0001-01-01T00:00:00Z"
    },
    {
        "byteCount": 111,
        "destinationCount": 0,
        "groupIp": "255.255.255.255",
        "packetCount": 1,
        "protocolType": 0,
        "sourceIp": "",
        "sourcePort": 0,
        "updateTime": "0001-01-01T00:00:00Z"
    }
],
"xNicMode": "HA",
"xNicType": "t2"
}

```

# Configuration API

## Overview

The cloudSwXtch Configuration API is intended for use to integrate the cloudSwXtch data with third party tools for configuring High Availability and Protocol Fanout.

## Prerequisites

A cloudSwXtch must exist as well as two or more agents with xNICs. To have data, agents must be producing and consuming data via the cloudSwXtch. By using a GET command, data will be provided in the response.

GET

/services/settings

URL:

PowerShell

Copy

http://<cloudSwXtch-control-IP>/services/settings

Example URL:

http://10.2.128.10/services/settings

Request:

Empty

Response:

200 - successful operation

The wXcked Eye Settings API call will give users information based on the “Settings” page in the wXcked Eye UI, specifically General, High Availability, and Protocol Fanout. While it takes one call to get all this information, we will be split it into sections based on the appropriate tab.

Expand for an example response of the Settings call:

Bash

Copy

```
{
  "general": {
    "hostName": "dsd-core-100",
    "switchName": "dsd-core-100",
    "version": "dev.7f1520",
    "numCores": 1,
    "entitlements": {
      "maxClientCount": 40,
      "maxBridgeCount": 2,
      "bandwidthMbps": 25000,
      "enableMesh": true,
      "enableUnicast": true,
      "enableHA": true,
      "enableClockSync": true,
      "enableBridge": true,
      "enableWxckedEye": true,
      "enableAllowsMajorVersionUpdate": true,
      "enableTachyonLive": false
    },
    "subnetDataPrefix": "10.2.192.0/22",
    "subnetCtrlPrefix": "10.2.128.0/22",
    "dataGatewayIp": "10.2.192.1",
    "ctrlIp": "10.2.128.10",
    "ctrlPort": 10802,
    "gatewayMacAddr": "12:34:56:78:9a:bc",
    "replInfo": {
      "ctrlIp": "127.0.0.1",
      "ctrlPort": 9996,
      "dataIp": "10.2.192.116",
      "dataPort": 9999,
      "dataMac": "AA06VA83"
    },
    "numClientsConnected": 8,
    "hardwareInfo": {
      "control": {
        "meta": {
          "mac": "00:0d:3a:19:cc:e1",
          "ipAddress": "10.2.128.10",
```

```

        "ipBroadcast": "10.2.131.255",
        "ipSubnet": "10.2.128.0",
        "subnetMask": "255.255.252.0",
        "mtu": null,
        "driver": null,
        "masterOf": null,
        "ifIndex": null,
        "vpc": null,
        "publicIpAddress": null
    },
    "os": {
        "mac": "00:0d:3a:19:cc:e1",
        "ipAddress": "10.2.128.10",
        "ipBroadcast": "10.2.131.255",
        "ipSubnet": "10.2.128.0",
        "subnetMask": "255.255.252.0",
        "mtu": 1500,
        "driver": "hv_netvsc",
        "masterOf": null,
        "ifIndex": 2,
        "vpc": null,
        "publicIpAddress": null,
        "name": "eth0",
        "pciAddress": "",
        "state": "up"
    },
    "computed": {
        "isPreferredControlNic": true,
        "isPreferredDataNic": false
    }
},
"data": {
    "meta": {
        "mac": "00:0d:3a:54:0f:37",
        "ipAddress": "10.2.192.116",
        "ipBroadcast": "10.2.195.255",
        "ipSubnet": "10.2.192.0",
        "subnetMask": "255.255.252.0",
        "mtu": null,
        "driver": null,
        "masterOf": null,
        "ifIndex": null,
        "vpc": null,
        "publicIpAddress": null
    },
    "os": {
        "mac": "00:0d:3a:54:0f:37",
        "ipAddress": "10.2.192.116",
        "ipBroadcast": "10.2.195.255",
        "ipSubnet": "10.2.192.0",
        "subnetMask": "255.255.252.0",
        "mtu": 1500,
        "driver": "mlx5_core",
        "masterOf": "enP42685s2",
        "ifIndex": 3,
        "vpc": null,
        "publicIpAddress": null,
        "name": "eth1",
        "pciAddress": "a6bd:00:02.0",
        "state": "up"
    },
    "computed": {
        "isPreferredControlNic": false,
        "isPreferredDataNic": true
    }
}
},
"httpPort": 80
},
"mesh": {
    "config": null,
    "routingTable": null
},
"ha": {
    "config": {
        "uid": "cf81bcbb-2afd-ac36-72d0-a67ec56c742c",
        "name": "100-200HA",
        "paths": [
            {
                "name": "100",
                "color": "#fc0303",
                "swxtches": [

```

```

        "10.2.128.10:80"
    ]
},
{
    "name": "200",
    "color": "#033dfc",
    "swatches": [
        "10.5.1.6:80"
    ]
}
]
},
"membersData": {
    "10.2.128.10:80": {
        "ipAddr": "10.2.128.10:80",
        "isAlive": true,
        "host": null
    },
    "10.5.1.6:80": {
        "ipAddr": "10.5.1.6:80",
        "isAlive": true,
        "host": null
    }
}
},
"fanout": {
    "16704273857340480058": {
        "id": "16704273857340480058",
        "protocol": "srt-caller",
        "direction": "egress",
        "streamIp": "239.4.2.3",
        "streamPort": 5400,
        "nodeIp": "10.2.128.37",
        "nodePort": 5401,
        "listenerPort": null,
        "options": []
    },
    "4777854487999137884": {
        "id": "4777854487999137884",
        "protocol": "srt-caller",
        "direction": "ingress",
        "streamIp": "239.4.2.3",
        "streamPort": 5400,
        "nodeIp": "10.2.128.36",
        "nodePort": 5400,
        "listenerPort": null,
        "options": []
    },
    "5062225067104987852": {
        "id": "5062225067104987852",
        "protocol": "srt-listener",
        "direction": "egress",
        "streamIp": "225.1.1.1",
        "streamPort": 1599,
        "nodeIp": null,
        "nodePort": null,
        "listenerPort": 6000,
        "options": []
    },
    "9489213241930010873": {
        "id": "9489213241930010873",
        "protocol": "srt-listener",
        "direction": "ingress",
        "streamIp": "225.1.1.1",
        "streamPort": 1599,
        "nodeIp": null,
        "nodePort": null,
        "listenerPort": 1599,
        "options": []
    }
},
"channels": null,
"streams": {
    "exclusions": {
        "10.0.0.136": {
            "all": true,
            "ports": {},
            "except": {}
        },
        "10.0.0.197": {
            "all": true,
            "ports": {},

```

```

        "except": {}
    },
    "10.0.0.224": {
        "all": true,
        "ports": {},
        "except": {}
    },
    "10.0.0.54": {
        "all": true,
        "ports": {},
        "except": {}
    },
    "10.0.0.99": {
        "all": true,
        "ports": {},
        "except": {}
    },
    "10.0.1.193": {
        "all": true,
        "ports": {},
        "except": {}
    },
    "10.0.1.218": {
        "all": true,
        "ports": {},
        "except": {}
    },
    "10.0.1.244": {
        "all": true,
        "ports": {},
        "except": {}
    },
    "10.0.1.90": {
        "all": true,
        "ports": {},
        "except": {}
    },
    "10.2.131.255": {
        "all": true,
        "ports": {},
        "except": {}
    },
    "10.2.195.255": {
        "all": true,
        "ports": {},
        "except": {}
    },
    "10.5.1.255": {
        "all": true,
        "ports": {},
        "except": {}
    },
    "10.5.2.255": {
        "all": true,
        "ports": {},
        "except": {}
    },
    "172.30.0.255": {
        "all": true,
        "ports": {},
        "except": {}
    },
    "172.30.3.255": {
        "all": true,
        "ports": {},
        "except": {}
    },
    "255.255.255.255": {
        "all": true,
        "ports": {},
        "except": {}
    }
},
"groups": null,
"colors": null,
"aliases": {
    "225.1.1.1:1599": "CS_SRT_Lis_from-dsd-agent-104",
    "225.1.1.2:1599": "CS_SRT_Lis_from-dsd-agent-104e",
    "225.1.1.2:5400": "SRT-Caller_225.1.1.2",
    "225.1.1.4:1599": "Rist_C_I_225.1.1.4",
    "225.1.1.4:5700": "Rist_C_E_225.1.1.4",
    "234.1.1.2:5000": "test2",

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```

    "234.3.3.3": "test"
  },
  "streams": null,
  "excluded": null
},
"nodes": {
  "icons": {},
  "sizes": {},
  "positions": {
    "bridge-10.2.128.98": {
      "x": 314.33,
      "y": 320.17
    },
    "ss-10.2.128.10-10.2.128.36:5400-239.4.2.3:5400": {
      "x": 507.17,
      "y": 370.09
    },
    "ss-10.2.128.10-10.2.128.37:5401-239.4.2.3:5400": {
      "x": 542.94,
      "y": 315.28
    },
    "ss-10.2.128.10-1599-225.1.1.1:1599": {
      "x": 543.24,
      "y": 322.46
    },
    "ss-10.2.128.10-6000-225.1.1.1:1599": {
      "x": 540.65,
      "y": 304.84
    },
    "ss-10.2.128.15-opposite-225.1.1.1:1599-10.2.128.75:60041-10.2.128.15:49298": {
      "x": 737.89,
      "y": 145.89
    },
    "ss-10.2.128.98-2000-229.1.1.1:2000": {
      "x": 279.26,
      "y": 307.92
    },
    "ss-10.2.192.15-opposite-225.1.1.1:1599-10.2.128.75:35306-10.2.192.15:9999": {
      "x": 632.5,
      "y": 324
    },
    "ss-DSd-agent-102-opposite-239.4.2.3:5400-10.2.128.36:6165-10.2.192.11:9999": {
      "x": 992.06,
      "y": 268.46
    },
    "ss-DSd-agent-104-opposite-225.1.1.1:1599-10.2.128.75:60041-10.2.128.75:60041": {
      "x": 1498.03,
      "y": 749.39
    },
    "ss-DSd-agent-104-opposite-225.1.1.1:1599-10.2.128.75:63813-10.2.128.75:63813": {
      "x": 1498.03,
      "y": 749.39
    },
    "ss-DSd-agent-105-opposite-225.1.1.1:1599-10.2.128.75:17913-10.2.192.15:9999": {
      "x": 743.11,
      "y": 306.81
    },
    "ss-DSd-agent-105-opposite-225.1.1.1:1599-10.2.128.75:35306-10.2.192.15:9999": {
      "x": 788.06,
      "y": 307.15
    },
    "ss-DSd-agent-105-opposite-225.1.1.1:1599-10.2.128.75:60041-10.2.128.15:49298": {
      "x": 741.74,
      "y": 309.6
    },
    "ss-DSd-agent-105-opposite-225.1.1.1:1599-10.2.128.75:63813-10.2.128.15:58348": {
      "x": 739.81,
      "y": 320.84
    },
    "ss-DSd-agent-105-opposite-239.1.1.1:2000-10.2.128.15:64700-10.2.192.15:64700": {
      "x": 789.2,
      "y": 309.53
    },
    "ss-DSd-agent-105-opposite-239.255.255.250:1900-10.2.128.15:49407-10.2.192.15:49407": {
      "x": 790.27,
      "y": 312.59
    },
    "ss-DSd-agent-105-opposite-239.255.255.250:1900-10.2.128.15:51196-10.2.192.15:51196": {
      "x": 785.63,
      "y": 335.46
    },
    "ss-DSd-agent-105-opposite-239.255.255.250:1900-10.2.128.15:51309-10.2.192.15:51309": {

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        "x": 739.85,
        "y": 321.38
    },
    "ss-DSD-agent-105-opposite-239.255.255.250:1900-10.2.128.15:54334-10.2.192.15:54334": {
        "x": 739.79,
        "y": 320.46
    },
    "ss-DSD-agent-105-opposite-239.255.255.250:1900-10.2.128.15:55490-10.2.192.15:55490": {
        "x": 784.67,
        "y": 336.6
    },
    "ss-DSD-agent-105-opposite-239.255.255.250:1900-10.2.128.15:55498-10.2.192.15:55498": {
        "x": 739.93,
        "y": 322.25
    },
    "ss-DSD-agent-105-opposite-239.255.255.250:1900-10.2.128.15:56007-10.2.192.15:56007": {
        "x": 783.82,
        "y": 301.44
    },
    "ss-DSD-agent-105-opposite-239.255.255.250:1900-10.2.128.15:56936-10.2.192.15:56936": {
        "x": 755.27,
        "y": 343.06
    },
    "ss-DSD-agent-105-opposite-239.255.255.250:1900-10.2.128.15:59396-10.2.192.15:59396": {
        "x": 785.88,
        "y": 335.13
    },
    "ss-DSD-agent-105-opposite-239.255.255.250:1900-10.2.128.15:59735-10.2.192.15:59735": {
        "x": 772.8,
        "y": 344.12
    },
    "ss-DSD-agent-105-opposite-239.255.255.250:1900-10.2.128.15:61159-10.2.192.15:61159": {
        "x": 739.91,
        "y": 322.07
    },
    "ss-DSD-agent-105-opposite-239.255.255.250:1900-10.2.128.15:62242-10.2.192.15:62242": {
        "x": 739.85,
        "y": 321.4
    },
    "ss-DSD-agent-105-opposite-239.255.255.250:1900-10.2.128.15:63298-10.2.192.15:63298": {
        "x": 791.15,
        "y": 321.19
    },
    "ss-DSD-agent-105-opposite-239.255.255.250:1900-10.2.128.15:63615-10.2.192.15:63615": {
        "x": 788.5,
        "y": 307.98
    },
    "ss-DSD-agent-105-opposite-239.255.255.250:1900-10.2.128.15:64766-10.2.192.15:64766": {
        "x": 740.04,
        "y": 323.17
    },
    "ss-DSD-agent-105-opposite-239.255.255.250:1900-10.2.192.15:49406-10.2.192.15:49406": {
        "x": 764.87,
        "y": 293.76
    },
    "ss-DSD-agent-105-opposite-239.255.255.250:1900-10.2.192.15:51195-10.2.192.15:51195": {
        "x": 739.85,
        "y": 321.44
    },
    "ss-DSD-agent-105-opposite-239.255.255.250:1900-10.2.192.15:51308-10.2.192.15:51308": {
        "x": 781.34,
        "y": 339.72
    },
    "ss-DSD-agent-105-opposite-239.255.255.250:1900-10.2.192.15:54333-10.2.192.15:54333": {
        "x": 783.83,
        "y": 301.45
    },
    "ss-DSD-agent-105-opposite-239.255.255.250:1900-10.2.192.15:55489-10.2.192.15:55489": {
        "x": 739.81,
        "y": 320.78
    },
    "ss-DSD-agent-105-opposite-239.255.255.250:1900-10.2.192.15:55497-10.2.192.15:55497": {
        "x": 786.38,
        "y": 334.46
    },
    "ss-DSD-agent-105-opposite-239.255.255.250:1900-10.2.192.15:56006-10.2.192.15:56006": {
        "x": 739.95,
        "y": 316.48
    },
    "ss-DSD-agent-105-opposite-239.255.255.250:1900-10.2.192.15:56935-10.2.192.15:56935": {
        "x": 790.91,
        "y": 315.58
    }

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```

    },
    "ss-DSD-agent-105-opposite-239.255.255.250:1900-10.2.192.15:59395-10.2.192.15:59395": {
      "x": 739.81,
      "y": 320.77
    },
    "ss-DSD-agent-105-opposite-239.255.255.250:1900-10.2.192.15:59734-10.2.192.15:59734": {
      "x": 774.53,
      "y": 295.4
    },
    "ss-DSD-agent-105-opposite-239.255.255.250:1900-10.2.192.15:61158-10.2.192.15:61158": {
      "x": 786.32,
      "y": 334.54
    },
    "ss-DSD-agent-105-opposite-239.255.255.250:1900-10.2.192.15:62241-10.2.192.15:62241": {
      "x": 787.32,
      "y": 333.06
    },
    "ss-DSD-agent-105-opposite-239.255.255.250:1900-10.2.192.15:63297-10.2.192.15:63297": {
      "x": 788.67,
      "y": 308.33
    },
    "ss-DSD-agent-105-opposite-239.255.255.250:1900-10.2.192.15:63614-10.2.192.15:63614": {
      "x": 791.15,
      "y": 321.1
    },
    "ss-DSD-agent-105-opposite-239.255.255.250:1900-10.2.192.15:64765-10.2.192.15:64765": {
      "x": 786.65,
      "y": 304.87
    },
    "ss-dsd-core-100-main-225.1.1.1:1599-10.2.128.75:17913-10.2.192.15:9999": {
      "x": 444.76,
      "y": 300.27
    },
    "ss-dsd-core-100-main-225.1.1.1:1599-10.2.128.75:17913-10.2.192.20:9999": {
      "x": 539.93,
      "y": 302.8
    },
    "ss-dsd-core-100-main-225.1.1.1:1599-10.2.128.75:35306-10.2.192.15:9999": {
      "x": 456.93,
      "y": 358.77
    },
    "ss-dsd-core-100-main-225.1.1.1:1599-10.2.128.75:35306-10.2.192.20:9999": {
      "x": 539.95,
      "y": 302.85
    },
    "ss-dsd-core-100-main-225.1.1.1:1599-10.2.128.75:60041-10.2.128.15:49298": {
      "x": 473.51,
      "y": 272.94
    },
    "ss-dsd-core-100-main-225.1.1.1:1599-10.2.128.75:60041-10.2.128.75:60041": {
      "x": 543.22,
      "y": 318.98
    },
    "ss-dsd-core-100-main-225.1.1.1:1599-10.2.128.75:63813-10.2.128.15:58348": {
      "x": 453.39,
      "y": 286.84
    },
    "ss-dsd-core-100-main-225.1.1.1:1599-10.2.128.75:63813-10.2.128.75:63813": {
      "x": 543.25,
      "y": 321.61
    },
    "ss-dsd-core-100-main-239.1.1.1:2000-10.2.128.15:64700-10.2.192.15:64700": {
      "x": 543.26,
      "y": 320.65
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:51196-10.2.192.15:51196": {
      "x": 453.25,
      "y": 287
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:51196-10.2.192.20:9999": {
      "x": 539.99,
      "y": 302.96
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:51196-10.2.192.26:9999": {
      "x": 543.26,
      "y": 321.31
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:51196-10.2.192.80:9999": {
      "x": 472.37,
      "y": 368.6
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:51309-10.2.192.15:51309": {

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        "x": 453.39,
        "y": 286.84
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:51309-10.2.192.20:9999": {
        "x": 445.44,
        "y": 298.8
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:51309-10.2.192.26:9999": {
        "x": 517.03,
        "y": 365.83
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:51309-10.2.192.80:9999": {
        "x": 475.97,
        "y": 272.08
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:54334-10.2.192.15:54334": {
        "x": 453.39,
        "y": 286.84
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:54334-10.2.192.20:9999": {
        "x": 444.25,
        "y": 301.49
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:54334-10.2.192.26:9999": {
        "x": 517.03,
        "y": 365.83
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:54334-10.2.192.80:9999": {
        "x": 539.01,
        "y": 300.53
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:55490-10.2.192.15:55490": {
        "x": 453.33,
        "y": 286.9
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:55490-10.2.192.20:9999": {
        "x": 441.8,
        "y": 309.1
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:55490-10.2.192.26:9999": {
        "x": 543.25,
        "y": 321.62
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:55490-10.2.192.80:9999": {
        "x": 445.36,
        "y": 298.97
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:55498-10.2.192.15:55498": {
        "x": 451.63,
        "y": 353.08
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:55498-10.2.192.20:9999": {
        "x": 541.53,
        "y": 307.77
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:55498-10.2.192.26:9999": {
        "x": 501.37,
        "y": 270.46
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:55498-10.2.192.80:9999": {
        "x": 474.88,
        "y": 272.45
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:56007-10.2.192.15:56007": {
        "x": 499.32,
        "y": 371.88
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:56007-10.2.192.20:9999": {
        "x": 541.44,
        "y": 307.45
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:56007-10.2.192.26:9999": {
        "x": 501.32,
        "y": 270.46
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:56007-10.2.192.80:9999": {
        "x": 537.68,
        "y": 344.3
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:59396-10.2.192.15:59396": {
        "x": 453.33,
        "y": 286.91
    }

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    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:59396-10.2.192.20:9999": {
      "x": 476.53,
      "y": 370.1
    },
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:59396-10.2.192.26:9999": {
      "x": 543.25,
      "y": 321.61
    },
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:59396-10.2.192.80:9999": {
      "x": 537.09,
      "y": 296.58
    },
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:61159-10.2.192.15:61159": {
      "x": 451.61,
      "y": 353.05
    },
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:61159-10.2.192.20:9999": {
      "x": 535.27,
      "y": 293.47
    },
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:61159-10.2.192.26:9999": {
      "x": 501.35,
      "y": 270.46
    },
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:61159-10.2.192.80:9999": {
      "x": 443.03,
      "y": 304.77
    },
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:62242-10.2.192.15:62242": {
      "x": 499.32,
      "y": 371.88
    },
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:62242-10.2.192.20:9999": {
      "x": 517.42,
      "y": 365.61
    },
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:62242-10.2.192.26:9999": {
      "x": 452.97,
      "y": 287.31
    },
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.128.15:62242-10.2.192.80:9999": {
      "x": 541.69,
      "y": 308.41
    },
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:51195-10.2.192.15:51195": {
      "x": 543.24,
      "y": 322.46
    },
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:51195-10.2.192.20:9999": {
      "x": 445.62,
      "y": 298.42
    },
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:51195-10.2.192.26:9999": {
      "x": 543.25,
      "y": 321.72
    },
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:51195-10.2.192.80:9999": {
      "x": 537.6,
      "y": 344.45
    },
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:51308-10.2.192.15:51308": {
      "x": 451.61,
      "y": 353.05
    },
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:51308-10.2.192.20:9999": {
      "x": 537.24,
      "y": 345.14
    },
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:51308-10.2.192.26:9999": {
      "x": 501.38,
      "y": 270.47
    },
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:51308-10.2.192.80:9999": {
      "x": 467.34,
      "y": 366.22
    },
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:54333-10.2.192.15:54333": {
      "x": 451.58,
      "y": 353.02
    },
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:54333-10.2.192.20:9999": {

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        "x": 490.36,
        "y": 269.59
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:54333-10.2.192.26:9999": {
        "x": 501.38,
        "y": 270.47
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:54333-10.2.192.80:9999": {
        "x": 472.51,
        "y": 368.66
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:55489-10.2.192.15:55489": {
        "x": 499.32,
        "y": 371.88
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:55489-10.2.192.20:9999": {
        "x": 540.04,
        "y": 303.09
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:55489-10.2.192.26:9999": {
        "x": 452.05,
        "y": 353.6
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:55489-10.2.192.80:9999": {
        "x": 534.59,
        "y": 292.43
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:55497-10.2.192.15:55497": {
        "x": 453.39,
        "y": 286.84
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:55497-10.2.192.20:9999": {
        "x": 539.72,
        "y": 302.25
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:55497-10.2.192.26:9999": {
        "x": 517.02,
        "y": 365.83
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:55497-10.2.192.80:9999": {
        "x": 537.93,
        "y": 343.8
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:56006-10.2.192.15:56006": {
        "x": 543.24,
        "y": 322.26
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:56006-10.2.192.20:9999": {
        "x": 539.65,
        "y": 302.07
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:56006-10.2.192.26:9999": {
        "x": 543.25,
        "y": 321.65
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:56006-10.2.192.80:9999": {
        "x": 475.58,
        "y": 272.21
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:59395-10.2.192.15:59395": {
        "x": 499.32,
        "y": 371.88
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:59395-10.2.192.20:9999": {
        "x": 512.24,
        "y": 368.21
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:59395-10.2.192.26:9999": {
        "x": 452.04,
        "y": 353.59
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:59395-10.2.192.80:9999": {
        "x": 442.9,
        "y": 305.15
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:61158-10.2.192.15:61158": {
        "x": 543.24,
        "y": 322.46
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:61158-10.2.192.20:9999": {
        "x": 512.21,
        "y": 368.22
    }

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    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:61158-10.2.192.26:9999": {
      "x": 452.83,
      "y": 287.47
    },
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:61158-10.2.192.80:9999": {
      "x": 472.27,
      "y": 368.56
    },
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:62241-10.2.192.15:62241": {
      "x": 451.7,
      "y": 353.17
    },
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:62241-10.2.192.20:9999": {
      "x": 441.98,
      "y": 308.37
    },
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:62241-10.2.192.26:9999": {
      "x": 543.26,
      "y": 321.55
    },
    },
    "ss-dsd-core-100-main-239.255.255.250:1900-10.2.192.15:62241-10.2.192.80:9999": {
      "x": 534.98,
      "y": 293.02
    },
    },
    "ss-dsd-core-100-main-239.4.2.3:5400-10.2.128.36:5400-10.2.128.36:5400": {
      "x": 468.5,
      "y": 366.83
    },
    },
    "ss-dsd-core-100-main-239.4.2.3:5400-10.2.128.36:5400-10.2.128.37:5401": {
      "x": 543.25,
      "y": 321.62
    },
    },
    "ss-dsd-core-100-main-239.4.2.3:5400-10.2.128.36:6165-10.2.192.11:9999": {
      "x": 449.08,
      "y": 292.41
    },
    },
    "ss-dsd-core-100-main-239.4.2.3:5400-10.2.128.36:6165-10.2.192.26:9999": {
      "x": 452.04,
      "y": 353.58
    },
    },
    "ss-dsd-core-200-main-239.1.1.1:2000-10.2.128.15:64700-10.2.192.15:64700": {
      "x": 907.02,
      "y": 323.55
    },
    },
    "ss-dsd-core-200-main-239.255.255.250:1900-10.2.128.15:49407-10.2.192.15:49407": {
      "x": 908.06,
      "y": 323.8
    },
    },
    "ss-dsd-core-200-main-239.255.255.250:1900-10.2.128.15:51196-10.2.192.15:51196": {
      "x": 856.59,
      "y": 340.04
    },
    },
    "ss-dsd-core-200-main-239.255.255.250:1900-10.2.128.15:51309-10.2.192.15:51309": {
      "x": 946.15,
      "y": 364.77
    },
    },
    "ss-dsd-core-200-main-239.255.255.250:1900-10.2.128.15:54334-10.2.192.15:54334": {
      "x": 853.86,
      "y": 343.49
    },
    },
    "ss-dsd-core-200-main-239.255.255.250:1900-10.2.128.15:55498-10.2.192.15:55498": {
      "x": 907.39,
      "y": 423.71
    },
    },
    "ss-dsd-core-200-main-239.255.255.250:1900-10.2.128.15:56007-10.2.192.15:56007": {
      "x": 946.18,
      "y": 364.92
    },
    },
    "ss-dsd-core-200-main-239.255.255.250:1900-10.2.128.15:56936-10.2.192.15:56936": {
      "x": 870.32,
      "y": 328.83
    },
    },
    "ss-dsd-core-200-main-239.255.255.250:1900-10.2.128.15:59735-10.2.192.15:59735": {
      "x": 911.65,
      "y": 324.84
    },
    },
    "ss-dsd-core-200-main-239.255.255.250:1900-10.2.128.15:61159-10.2.192.15:61159": {
      "x": 907.74,
      "y": 423.62
    },
    },
    "ss-dsd-core-200-main-239.255.255.250:1900-10.2.128.15:62242-10.2.192.15:62242": {

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        "x": 946.24,
        "y": 365.27
    },
    "ss-dsd-core-200-main-239.255.255.250:1900-10.2.128.15:63298-10.2.192.15:63298": {
        "x": 903.7,
        "y": 322.9
    },
    "ss-dsd-core-200-main-239.255.255.250:1900-10.2.128.15:63615-10.2.192.15:63615": {
        "x": 877.52,
        "y": 325.49
    },
    "ss-dsd-core-200-main-239.255.255.250:1900-10.2.128.15:64766-10.2.192.15:64766": {
        "x": 852.12,
        "y": 346.05
    },
    "ss-dsd-core-200-main-239.255.255.250:1900-10.2.192.15:49406-10.2.192.15:49406": {
        "x": 853.41,
        "y": 344.12
    },
    "ss-dsd-core-200-main-239.255.255.250:1900-10.2.192.15:51195-10.2.192.15:51195": {
        "x": 946.35,
        "y": 365.99
    },
    "ss-dsd-core-200-main-239.255.255.250:1900-10.2.192.15:51308-10.2.192.15:51308": {
        "x": 854.03,
        "y": 343.25
    },
    "ss-dsd-core-200-main-239.255.255.250:1900-10.2.192.15:54333-10.2.192.15:54333": {
        "x": 946.18,
        "y": 364.93
    },
    "ss-dsd-core-200-main-239.255.255.250:1900-10.2.192.15:55497-10.2.192.15:55497": {
        "x": 850.99,
        "y": 347.91
    },
    "ss-dsd-core-200-main-239.255.255.250:1900-10.2.192.15:56006-10.2.192.15:56006": {
        "x": 854.06,
        "y": 343.21
    },
    "ss-dsd-core-200-main-239.255.255.250:1900-10.2.192.15:56935-10.2.192.15:56935": {
        "x": 906.05,
        "y": 323.34
    },
    "ss-dsd-core-200-main-239.255.255.250:1900-10.2.192.15:59734-10.2.192.15:59734": {
        "x": 855.86,
        "y": 340.9
    },
    "ss-dsd-core-200-main-239.255.255.250:1900-10.2.192.15:61158-10.2.192.15:61158": {
        "x": 850.76,
        "y": 348.31
    },
    "ss-dsd-core-200-main-239.255.255.250:1900-10.2.192.15:62241-10.2.192.15:62241": {
        "x": 858.48,
        "y": 337.97
    },
    "ss-dsd-core-200-main-239.255.255.250:1900-10.2.192.15:63297-10.2.192.15:63297": {
        "x": 870.65,
        "y": 328.64
    },
    "ss-dsd-core-200-main-239.255.255.250:1900-10.2.192.15:63614-10.2.192.15:63614": {
        "x": 908.37,
        "y": 323.88
    },
    "ss-dsd-core-200-main-239.255.255.250:1900-10.2.192.15:64765-10.2.192.15:64765": {
        "x": 877.67,
        "y": 325.43
    },
    "ss-dsd-win10-100-opposite-225.1.1.1:1599-10.2.128.75:17913-10.2.192.20:9999": {
        "x": 617.08,
        "y": -108.29
    },
    "ss-dsd-win10-100-opposite-225.1.1.1:1599-10.2.128.75:35306-10.2.192.20:9999": {
        "x": 617.42,
        "y": -108.29
    },
    "ss-dsd-win10-100-opposite-239.255.255.250:1900-10.2.128.15:51196-10.2.192.20:9999": {
        "x": 616.64,
        "y": -108.31
    },
    "ss-dsd-win10-100-opposite-239.255.255.250:1900-10.2.128.15:51309-10.2.192.20:9999": {
        "x": 601.21,
        "y": -153.76
    }

```



```

    },
    "ss-dsd-win10-100-opposite-239.255.255.250:1900-10.2.128.15:54334-10.2.192.20:9999": {
        "x": 635.03,
        "y": -152.96
    },
    "ss-dsd-win10-100-opposite-239.255.255.250:1900-10.2.128.15:55490-10.2.192.20:9999": {
        "x": 617.72,
        "y": -108.29
    },
    "ss-dsd-win10-100-opposite-239.255.255.250:1900-10.2.128.15:55498-10.2.192.20:9999": {
        "x": 601.06,
        "y": -153.64
    },
    "ss-dsd-win10-100-opposite-239.255.255.250:1900-10.2.128.15:56007-10.2.192.20:9999": {
        "x": 634.82,
        "y": -153.15
    },
    "ss-dsd-win10-100-opposite-239.255.255.250:1900-10.2.128.15:59396-10.2.192.20:9999": {
        "x": 616.47,
        "y": -108.31
    },
    "ss-dsd-win10-100-opposite-239.255.255.250:1900-10.2.128.15:61159-10.2.192.20:9999": {
        "x": 601.12,
        "y": -153.69
    },
    "ss-dsd-win10-100-opposite-239.255.255.250:1900-10.2.128.15:62242-10.2.192.20:9999": {
        "x": 601.18,
        "y": -153.74
    },
    "ss-dsd-win10-100-opposite-239.255.255.250:1900-10.2.192.15:51195-10.2.192.20:9999": {
        "x": 601.17,
        "y": -153.73
    },
    "ss-dsd-win10-100-opposite-239.255.255.250:1900-10.2.192.15:51308-10.2.192.20:9999": {
        "x": 616.53,
        "y": -108.31
    },
    "ss-dsd-win10-100-opposite-239.255.255.250:1900-10.2.192.15:54333-10.2.192.20:9999": {
        "x": 617.56,
        "y": -108.29
    },
    "ss-dsd-win10-100-opposite-239.255.255.250:1900-10.2.192.15:55489-10.2.192.20:9999": {
        "x": 635.08,
        "y": -152.91
    },
    "ss-dsd-win10-100-opposite-239.255.255.250:1900-10.2.192.15:55497-10.2.192.20:9999": {
        "x": 634.89,
        "y": -153.09
    },
    "ss-dsd-win10-100-opposite-239.255.255.250:1900-10.2.192.15:56006-10.2.192.20:9999": {
        "x": 601.05,
        "y": -153.63
    },
    "ss-dsd-win10-100-opposite-239.255.255.250:1900-10.2.192.15:59395-10.2.192.20:9999": {
        "x": 601.13,
        "y": -153.7
    },
    "ss-dsd-win10-100-opposite-239.255.255.250:1900-10.2.192.15:61158-10.2.192.20:9999": {
        "x": 616.47,
        "y": -108.31
    },
    "ss-dsd-win10-100-opposite-239.255.255.250:1900-10.2.192.15:62241-10.2.192.20:9999": {
        "x": 616.45,
        "y": -108.31
    },
    "ss-dsd-win10-100-opposite-239.4.2.3:5400-10.2.128.36:5400-10.2.128.36:5400": {
        "x": 617.69,
        "y": -108.29
    },
    "ss-dsd-win10-101-opposite-239.255.255.250:1900-10.2.128.15:51196-10.2.192.26:9999": {
        "x": 1721.4,
        "y": 991.44
    },
    "ss-dsd-win10-101-opposite-239.255.255.250:1900-10.2.128.15:51309-10.2.192.26:9999": {
        "x": 1721.4,
        "y": 991.44
    },
    "ss-dsd-win10-101-opposite-239.255.255.250:1900-10.2.128.15:54334-10.2.192.26:9999": {
        "x": 1698.44,
        "y": 948.92
    },
    "ss-dsd-win10-101-opposite-239.255.255.250:1900-10.2.128.15:55490-10.2.192.26:9999": {

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```

        "x": 1721.4,
        "y": 991.44
    },
    "ss-dsd-win10-101-opposite-239.255.255.250:1900-10.2.128.15:55498-10.2.192.26:9999": {
        "x": 1698.44,
        "y": 948.92
    },
    "ss-dsd-win10-101-opposite-239.255.255.250:1900-10.2.128.15:56007-10.2.192.26:9999": {
        "x": 1731.15,
        "y": 944.11
    },
    "ss-dsd-win10-101-opposite-239.255.255.250:1900-10.2.128.15:59396-10.2.192.26:9999": {
        "x": 1698.44,
        "y": 948.92
    },
    "ss-dsd-win10-101-opposite-239.255.255.250:1900-10.2.128.15:61159-10.2.192.26:9999": {
        "x": 1721.4,
        "y": 991.44
    },
    "ss-dsd-win10-101-opposite-239.255.255.250:1900-10.2.128.15:62242-10.2.192.26:9999": {
        "x": 1698.44,
        "y": 948.92
    },
    "ss-dsd-win10-101-opposite-239.255.255.250:1900-10.2.192.15:51195-10.2.192.26:9999": {
        "x": 1698.44,
        "y": 948.92
    },
    "ss-dsd-win10-101-opposite-239.255.255.250:1900-10.2.192.15:51308-10.2.192.26:9999": {
        "x": 1698.44,
        "y": 948.92
    },
    "ss-dsd-win10-101-opposite-239.255.255.250:1900-10.2.192.15:54333-10.2.192.26:9999": {
        "x": 1721.4,
        "y": 991.44
    },
    "ss-dsd-win10-101-opposite-239.255.255.250:1900-10.2.192.15:55489-10.2.192.26:9999": {
        "x": 1698.44,
        "y": 948.92
    },
    "ss-dsd-win10-101-opposite-239.255.255.250:1900-10.2.192.15:55497-10.2.192.26:9999": {
        "x": 1721.4,
        "y": 991.44
    },
    "ss-dsd-win10-101-opposite-239.255.255.250:1900-10.2.192.15:56006-10.2.192.26:9999": {
        "x": 1693.26,
        "y": 974.1
    },
    "ss-dsd-win10-101-opposite-239.255.255.250:1900-10.2.192.15:59395-10.2.192.26:9999": {
        "x": 1721.4,
        "y": 991.44
    },
    "ss-dsd-win10-101-opposite-239.255.255.250:1900-10.2.192.15:61158-10.2.192.26:9999": {
        "x": 1698.44,
        "y": 948.92
    },
    "ss-dsd-win10-101-opposite-239.255.255.250:1900-10.2.192.15:62241-10.2.192.26:9999": {
        "x": 1721.4,
        "y": 991.44
    },
    "ss-dsd-win10-101-opposite-239.4.2.3:5400-10.2.128.36:5400-10.2.128.37:5401": {
        "x": 1721.4,
        "y": 991.44
    },
    "ss-dsd-win10-101-opposite-239.4.2.3:5400-10.2.128.36:6165-10.2.192.26:9999": {
        "x": 1698.44,
        "y": 948.92
    },
    "ss-dsd-win11-100-opposite-239.255.255.250:1900-10.2.128.15:51196-10.2.192.80:9999": {
        "x": 715.1,
        "y": -8.41
    },
    "ss-dsd-win11-100-opposite-239.255.255.250:1900-10.2.128.15:51309-10.2.192.80:9999": {
        "x": 713.64,
        "y": -8.6
    },
    "ss-dsd-win11-100-opposite-239.255.255.250:1900-10.2.128.15:54334-10.2.192.80:9999": {
        "x": 715.29,
        "y": -8.4
    },
    "ss-dsd-win11-100-opposite-239.255.255.250:1900-10.2.128.15:55490-10.2.192.80:9999": {
        "x": 737,
        "y": -50.95
    }

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    },
    "ss-dsd-win11-100-opposite-239.255.255.250:1900-10.2.128.15:55498-10.2.192.80:9999": {
      "x": 702.98,
      "y": -55.11
    },
    "ss-dsd-win11-100-opposite-239.255.255.250:1900-10.2.128.15:56007-10.2.192.80:9999": {
      "x": 713.97,
      "y": -8.55
    },
    "ss-dsd-win11-100-opposite-239.255.255.250:1900-10.2.128.15:59396-10.2.192.80:9999": {
      "x": 702.98,
      "y": -55.11
    },
    "ss-dsd-win11-100-opposite-239.255.255.250:1900-10.2.128.15:61159-10.2.192.80:9999": {
      "x": 737.03,
      "y": -50.91
    },
    "ss-dsd-win11-100-opposite-239.255.255.250:1900-10.2.128.15:62242-10.2.192.80:9999": {
      "x": 713.56,
      "y": -8.62
    },
    "ss-dsd-win11-100-opposite-239.255.255.250:1900-10.2.192.15:51195-10.2.192.80:9999": {
      "x": 736.89,
      "y": -51.07
    },
    "ss-dsd-win11-100-opposite-239.255.255.250:1900-10.2.192.15:51308-10.2.192.80:9999": {
      "x": 703.14,
      "y": -55.22
    },
    "ss-dsd-win11-100-opposite-239.255.255.250:1900-10.2.192.15:54333-10.2.192.80:9999": {
      "x": 736.87,
      "y": -51.09
    },
    "ss-dsd-win11-100-opposite-239.255.255.250:1900-10.2.192.15:55489-10.2.192.80:9999": {
      "x": 715.49,
      "y": -8.38
    },
    "ss-dsd-win11-100-opposite-239.255.255.250:1900-10.2.192.15:55497-10.2.192.80:9999": {
      "x": 714.02,
      "y": -8.55
    },
    "ss-dsd-win11-100-opposite-239.255.255.250:1900-10.2.192.15:56006-10.2.192.80:9999": {
      "x": 702.99,
      "y": -55.12
    },
    "ss-dsd-win11-100-opposite-239.255.255.250:1900-10.2.192.15:59395-10.2.192.80:9999": {
      "x": 713.83,
      "y": -8.57
    },
    "ss-dsd-win11-100-opposite-239.255.255.250:1900-10.2.192.15:61158-10.2.192.80:9999": {
      "x": 715.2,
      "y": -8.4
    },
    "ss-dsd-win11-100-opposite-239.255.255.250:1900-10.2.192.15:62241-10.2.192.80:9999": {
      "x": 703.07,
      "y": -55.17
    },
    "swxtch-10.2.128.10": {
      "x": 491.83,
      "y": 321
    },
    "swxtch-10.5.1.6": {
      "x": 895.5,
      "y": 373.67
    },
    "vm-10.2.128.15": {
      "x": 758.89,
      "y": 131.06
    },
    "vm-10.2.192.15": {
      "x": 658.22,
      "y": 324
    },
    "xnic-10.2.128.104": {
      "x": 1217.66,
      "y": 466
    },
    "xnic-10.2.128.106": {
      "x": 917.66,
      "y": 166
    },
    "xnic-10.2.128.13": {

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        "x": 1017.66,
        "y": 266
    },
    "xnic-10.2.128.15": {
        "x": 765.49,
        "y": 319.47
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    "xnic-10.2.128.27": {
        "x": 1917.66,
        "y": 1166
    },
    "xnic-10.2.128.36": {
        "x": 617.66,
        "y": -134
    },
    "xnic-10.2.128.37": {
        "x": 1717.66,
        "y": 966
    },
    "xnic-10.2.128.74": {
        "x": 717.66,
        "y": -34
    },
    "xnic-10.2.128.75": {
        "x": 1517.66,
        "y": 766
    }
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"aliases": null,
"nodes": null
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            "name": "dsd-core-100",
            "componentKind": {
                "code": "swxtch",
                "displayName": "swXtch"
            },
            "environment": {
                "hostname": "dsd-core-100",
                "cloud": "AZURE",
                "osDistribution": "Ubuntu 20.04",
                "region": "eastus",
                "instanceType": "Standard_D8as_v4"
            },
            "interfaces": {
                "eth0": {
                    "ip": "10.2.128.10",
                    "name": "eth0"
                },
                "eth1": {
                    "ip": "10.2.192.116",
                    "name": "eth1"
                }
            }
        },
        "10.2.128.104": {
            "name": "aks-nodepool1-23164585-vmss00001Z",
            "componentKind": {
                "code": "xnic",
                "displayName": "xNIC"
            },
            "environment": {
                "hostname": "aks-nodepool1-23164585-vmss00001Z",
                "cloud": "AZURE",
                "osDistribution": "Ubuntu 20.04",
                "region": "eastus",
                "instanceType": "Standard_Ds2_v2"
            },
            "interfaces": {
                "cilium_host": {
                    "ip": "10.0.0.54",
                    "name": "cilium_host"
                },
                "eth0": {
                    "ip": "10.2.128.104",
                    "name": "eth0"
                },
                "swxtch-tun0": {
                    "ip": "172.30.0.104",
                    "name": "swxtch-tun0"
                }
            }
        }
    }
}

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```

    }
  },
  "10.2.128.106": {
    "name": "aks-nodepool1-23164585-vmss00001Y",
    "componentKind": {
      "code": "xnic",
      "displayName": "xNIC"
    },
    "environment": {
      "hostname": "aks-nodepool1-23164585-vmss00001Y",
      "cloud": "AZURE",
      "osDistribution": "Ubuntu 20.04",
      "region": "eastus",
      "instanceType": "Standard_Ds2_v2"
    },
    "interfaces": {
      "eth0": {
        "ip": "10.2.128.106",
        "name": "eth0"
      },
      "swtch-tun0": {
        "ip": "172.30.0.106",
        "name": "swtch-tun0"
      }
    }
  },
  "10.2.128.13": {
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    "componentKind": {
      "code": "xnic",
      "displayName": "xNIC"
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    "environment": {
      "hostname": "DSd-agent-102",
      "cloud": "AZURE",
      "osDistribution": "Ubuntu 20.04",
      "region": "eastus",
      "instanceType": "Standard_D4s_v4"
    },
    "interfaces": {
      "eth0": {
        "ip": "10.2.128.13",
        "name": "eth0"
      },
      "eth1": {
        "ip": "10.2.192.11",
        "name": "eth1"
      },
      "swtch-tun0": {
        "ip": "172.30.0.13",
        "name": "swtch-tun0"
      }
    }
  },
  "10.2.128.15": {
    "name": "DSd-agent-105",
    "componentKind": {
      "code": "xnic",
      "displayName": "xNIC"
    },
    "environment": {
      "hostname": "DSd-agent-105",
      "cloud": "AZURE",
      "osDistribution": "Windows Server 2019 Datacenter - Microsoft Windows [Version 10.0.17763.6189]",
      "region": "eastus",
      "instanceType": "Standard_D8s_v4"
    },
    "interfaces": {
      "Ethernet": {
        "ip": "10.2.192.15",
        "name": "Ethernet"
      },
      "Ethernet 2": {
        "ip": "10.2.128.15",
        "name": "Ethernet 2"
      }
    }
  },
  "10.2.128.27": {
    "name": "DSd-agent-101",
    "componentKind": {

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        "displayName": "xNIC"
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        "cloud": "AZURE",
        "osDistribution": "Ubuntu 20.04",
        "region": "eastus",
        "instanceType": "Standard_D4ds_v4"
    },
    "interfaces": {
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            "ip": "10.2.128.27",
            "name": "eth0"
        },
        "eth1": {
            "ip": "10.2.192.24",
            "name": "eth1"
        },
        "swtch-tun0": {
            "ip": "172.30.0.27",
            "name": "swtch-tun0"
        }
    }
},
"10.2.128.75": {
    "name": "DSd-agent-104",
    "componentKind": {
        "code": "xnic",
        "displayName": "xNIC"
    },
    "environment": {
        "hostname": "DSd-agent-104",
        "cloud": "AZURE",
        "osDistribution": "Windows Server 2019 Datacenter - Microsoft Windows [Version 10.0.17763.6189]",
        "region": "eastus",
        "instanceType": "Standard_D8s_v4"
    },
    "interfaces": {
        "Ethernet": {
            "ip": "10.2.128.75",
            "name": "Ethernet"
        },
        "Ethernet 2": {
            "ip": "10.2.192.82",
            "name": "Ethernet 2"
        }
    }
},
"10.2.128.98": {
    "name": "DSd-bridge-100",
    "componentKind": {
        "code": "bridge",
        "displayName": "Bridge"
    },
    "environment": {
        "hostname": "DSd-bridge-100",
        "cloud": "AZURE",
        "osDistribution": "Ubuntu 20.04",
        "region": "eastus",
        "instanceType": "Standard_D4ds_v4"
    },
    "interfaces": {
        "eth0": {
            "ip": "10.2.128.98",
            "name": "eth0"
        },
        "eth1": {
            "ip": "10.2.192.90",
            "name": "eth1"
        }
    }
},
"10.5.1.4": {
    "name": "DSd-agent-201",
    "componentKind": {
        "code": "xnic",
        "displayName": "xNIC"
    },
    "environment": {
        "hostname": "DSd-agent-201",
        "cloud": "AZURE",

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        "osDistribution": "Ubuntu 20.04",
        "region": "eastus",
        "instanceType": "Standard_D4s_v4"
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    "interfaces": {
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            "ip": "10.5.1.4",
            "name": "eth0"
        },
        "eth1": {
            "ip": "10.5.2.4",
            "name": "eth1"
        },
        "swxtch-tun0": {
            "ip": "172.30.0.4",
            "name": "swxtch-tun0"
        }
    }
},
"10.5.1.6": {
    "name": "dsd-core-200",
    "componentKind": {
        "code": "swxtch",
        "displayName": "swXtch"
    },
    "environment": {
        "hostname": "dsd-core-200",
        "cloud": "AZURE",
        "osDistribution": "Ubuntu 20.04",
        "region": "eastus",
        "instanceType": "Standard_D8s_v4"
    },
    "interfaces": {
        "eth0": {
            "ip": "10.5.1.6",
            "name": "eth0"
        },
        "eth1": {
            "ip": "10.5.2.6",
            "name": "eth1"
        }
    }
}
}
},
"vms": null,
"aliases": {
    "components": {},
    "sockets": {
        "10.2.128.36:5400": "10.2.128.36_win-10-100",
        "10.2.128.37:5401": "10_2_128_37_5401_Win-10_101"
    },
    "streams": {
        "225.1.1.1:1599": "SRT_L__I_225_1_1_1_1599",
        "239.4.2.3:5400": "SRT_C_239_4_2_3_1400"
    }
},
"bridges": {
    "10.2.128.98": {
        "ctrlIp": "10.2.128.98",
        "hostname": "DSd-bridge-100",
        "dataIp": "10.2.192.90",
        "gatewayMac": "12:34:56:78:9a:bc",
        "lastTime": "2024-08-19T16:43:15.8684573Z",
        "mcGroups": []
    }
},
"topology": {
    "graph": {
        "nClusterLinks": 4,
        "minPps": 1
    }
},
"tachyonlive": null
}

```

## General

The general tab shows information about the cloudSwXtch networking and entitlements.

Cluster > Topology Graph > Settings

Settings

General

Mesh

High Availability

Protocol Fanout

Channels

Streams

Aliases

Components

Tachyon Live

Summary

Version: dev.44af38  
Size: 4  
Control IP: 172.41.128.25  
Control Port: 10802  
Subnet Data Prefix: 172.41.21.0/24  
Subnet Control Prefix: 172.41.128.0/22  
Gateway IP: 172.41.21.1  
  
Licensing: License File  
License expiration: 2033-Nov-8

Entitlements

Max Clients	Max Bridges	Max Bandwidth (Mbps)	Enabled Features						
			Mesh	High Availability	Protocol Fanout	PTP	wXcked Eye	Major Version Update	Tachyon Live
30	1	50000	✓	✓	✓	✓	✓	✓	✗

Hardware

Expand to see the portion of the Settings call detailing information on the General tab —>

Bash

Copy

```
{
  "general": {
    "hostname": "dsd-core-100",
    "switchName": "dsd-core-100",
    "version": "dev.7f1520",
    "numCores": 1,
    "entitlements": {
      "maxClientCount": 40,
      "maxBridgeCount": 2,
      "bandwidthMbps": 25000,
      "enableMesh": true,
      "enableUnicast": true,
      "enableHA": true,
      "enableClockSync": true,
      "enableBridge": true,
      "enableWxckedEye": true,
      "enableAllowsMajorVersionUpdate": true,
      "enableTachyonLive": false
    },
    "subnetDataPrefix": "10.2.192.0/22",
    "subnetCtrlPrefix": "10.2.128.0/22",
    "dataGatewayIp": "10.2.192.1",
    "ctrlIp": "10.2.128.10",
    "ctrlPort": 10802,
    "gatewayMacAddr": "12:34:56:78:9a:bc",
    "replInfo": {
      "ctrlIp": "127.0.0.1",
      "ctrlPort": 9996,
      "dataIp": "10.2.192.116",
      "dataPort": 9999,
      "dataMac": "AA06VA83"
    },
    "numClientsConnected": 8,
    "hardwareInfo": {
      "control": {
        "meta": {
          "mac": "00:0d:3a:19:cc:e1",
          "ipAddress": "10.2.128.10",
          "ipBroadcast": "10.2.131.255",
          "ipSubnet": "10.2.128.0",
          "subnetMask": "255.255.252.0",
          "mtu": null,
          "driver": null,
          "masterOf": null,
          "ifIndex": null,

```



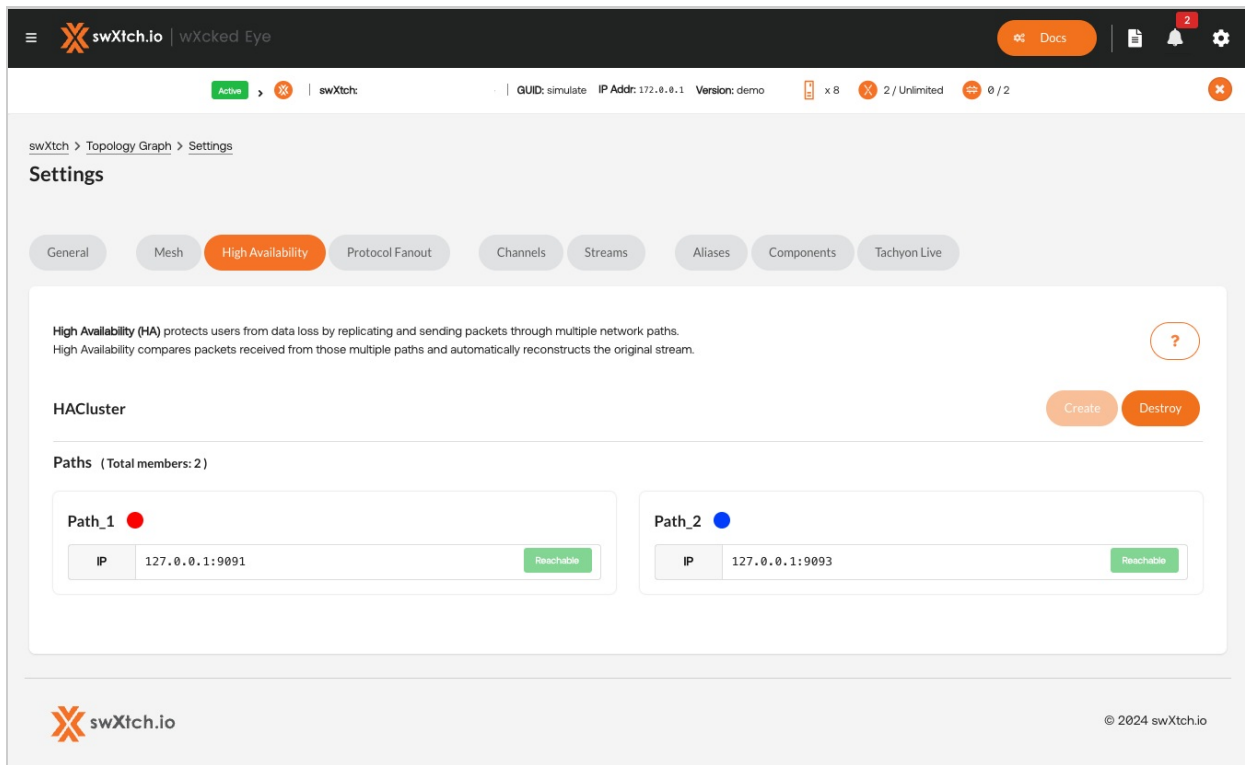
```

        "vpc": null,
        "publicIpAddress": null
    },
    "os": {
        "mac": "00:0d:3a:19:cc:e1",
        "ipAddress": "10.2.128.10",
        "ipBroadcast": "10.2.131.255",
        "ipSubnet": "10.2.128.0",
        "subnetMask": "255.255.252.0",
        "mtu": 1500,
        "driver": "hv_netvsc",
        "masterOf": null,
        "ifIndex": 2,
        "vpc": null,
        "publicIpAddress": null,
        "name": "eth0",
        "pciAddress": "",
        "state": "up"
    },
    "computed": {
        "isPreferredControlNic": true,
        "isPreferredDataNic": false
    }
},
"data": {
    "meta": {
        "mac": "00:0d:3a:54:0f:37",
        "ipAddress": "10.2.192.116",
        "ipBroadcast": "10.2.195.255",
        "ipSubnet": "10.2.192.0",
        "subnetMask": "255.255.252.0",
        "mtu": null,
        "driver": null,
        "masterOf": null,
        "ifIndex": null,
        "vpc": null,
        "publicIpAddress": null
    },
    "os": {
        "mac": "00:0d:3a:54:0f:37",
        "ipAddress": "10.2.192.116",
        "ipBroadcast": "10.2.195.255",
        "ipSubnet": "10.2.192.0",
        "subnetMask": "255.255.252.0",
        "mtu": 1500,
        "driver": "mlx5_core",
        "masterOf": "enP42685s2",
        "ifIndex": 3,
        "vpc": null,
        "publicIpAddress": null,
        "name": "eth1",
        "pciAddress": "a6bd:00:02.0",
        "state": "up"
    },
    "computed": {
        "isPreferredControlNic": false,
        "isPreferredDataNic": true
    }
}
},
"httpPort": 80
},

```

## High Availability

The High Availability tab shows the cloudSwXtches that are configured to be in a HA 2022-7 configuration. Note that both High Availability and Mesh are configured here for example purposes. Mesh and High Availability are, however, not compatible with the same cloudSwXtches.



Below is a portion of the Settings call response detailing information on High Availability:

```

Bash Copy
{
  "ha": {
    "config": {
      "uid": "cf81bcbb-2afd-ac36-72d0-a67ec56c742c",
      "name": "100-200HA",
      "paths": [
        {
          "name": "100",
          "color": "#fc0303",
          "swxtches": [
            "10.2.128.10:80"
          ]
        },
        {
          "name": "200",
          "color": "#033dfc",
          "swxtches": [
            "10.5.1.6:80"
          ]
        }
      ]
    },
    "membersData": {
      "10.2.128.10:80": {
        "ipAddr": "10.2.128.10:80",
        "isAlive": true,
        "host": null
      },
      "10.5.1.6:80": {
        "ipAddr": "10.5.1.6:80",
        "isAlive": true,
        "host": null
      }
    }
  }
}

```

## Create HA

swxtch/ha/v1/create

POST

swxtch/ha/v1/create

- Creates an High Availability configuration

URL:

Bash

Copy

```
curl http://<cloudSwXtch-control-IP>/swxtch/ha/v1/create
```

Example URL:

http://10.2.128.10/swxtch/ha/v1/create

Example Request Body:

Bash

Copy

```
{
  "uid": "0",
  "name": "Donna-ha",
  "paths": [
    {
      "name": "path_1",
      "swxtches": [
        "10.2.128.10:80"
      ]
    },
    {
      "name": "path_2",
      "swxtches": [
        "10.1.1.6:80"
      ]
    },
    {
      "name": "path_3",
      "swxtches": [
        "10.5.1.6:80"
      ]
    }
  ]
}
```

Responses:

200 - successful operation

Example Value:

Bash

Copy

```
{
  "joinClusterResultItems": null,
  "error": null
}
```

Get HA List

swxtch/ha/v1/show

GET

swxtch/ha/v1/show

- Returns a list of cloudSwXtches connected in an HA configuration.

URL:

Bash

Copy

```
curl http://<cloudSwXtch-control-IP>/swxtch/ha/v1/show
```

Example URL:

http://10.2.128.10/swxtch/ha/v1/show

Example Request Body:

None

Responses:

200 - successful operation

Example Value —>

Bash

Copy

```
{
  "clusterConfig": {
    "uid": "377a7cd7-98ed-47e3-27c9-fcf123de530a",
    "name": "Donna-ha",
    "paths": [
      {
        "name": "path_1",
        "color": null,
        "swxtches": [
          "10.2.128.10:80"
        ]
      },
      {
        "name": "path_2",
        "color": null,
        "swxtches": [
          "10.1.1.6:80"
        ]
      },
      {
        "name": "path_3",
        "color": null,
        "swxtches": [
          "10.5.1.6:80"
        ]
      }
    ]
  },
  "memberData": {
    "10.1.1.6:80": {
      "ipAddr": "10.1.1.6:80",
      "isAlive": true,
      "host": null
    },
    "10.2.128.10:80": {
      "ipAddr": "10.2.128.10:80",
      "isAlive": true,
      "host": null
    },
    "10.5.1.6:80": {
      "ipAddr": "10.5.1.6:80",
      "isAlive": true,
      "host": null
    }
  }
}
```

Destroy HA

swxtch/ha/v1/destroy

POST

swxtch/ha/v1/destroy

- Destroys a cloudSwXtch from the HA configuration

URL:

Bash

Copy

`curl` http://<cloudSwXtch-control-IP>/swxtch/ha/v1/destroy

Example URL:

http://10.2.128.10/swxtch/ha/v1/destroy

Example Request Body:

None

Responses:

200 - successful operation

Example Value:

```
Bash
{
  "Message": "HA destroyed successfully"
}
```

## Protocol Fanout Adaptors

The Protocol Fanout tab shows the cloudSwXtches that are configured for Protocol Fanout: multicast, UDP (Unicast), SRT Caller/Listener, and RIST Caller/Listener.

swXtch.io | wXcked Eye

Docs

4/30

0/1

Cluster > Settings

Settings

GeneralMeshHigh AvailabilityProtocol FanoutChannelsStreamsAliasesComponentsTachyon Live

Protocol Fanout enables users to configure **unicast adaptors** to send and receive traffic through the swXtch using different protocols (UDP, SRT and RIST).  
Ingress direction describes receiving unicast traffic in any supported protocol and converting it into a multicast stream on the swXtch.  
Egress describes sending copies of a single input stream in any supported protocol to multiple destinations.  
This gives each destination the option of being a different protocol from the input stream (for instance, an UDP input being sent to a set of multicast destinations and, additionally, to one using SRT).

Adaptors (8)

Filter by ProtocolDirection

Add Adaptor

Component	Protocol	Direction	Stream		Node		Listener Port	Status	Action
			IP: Port	Name	IP: Port	Name			
ip-172-41-128-25	SRT Listener	Egress	225.1.1.1:5500	SRTListenerIngress			5888	Active	<div>id</div> <div>of</div> <div>x</div>
ip-172-41-128-25	SRT Listener	Ingress	225.1.1.1:5500	SRTListenerIngress			1599	Active	<div>id</div> <div>of</div> <div>x</div>
ip-172-41-128-25	SRT Caller	Egress	225.1.2.2:5000	SRT_Caller	172.41.128.113:2222	drs2-ore-Win2019_1		Inactive	<div>id</div> <div>of</div> <div>x</div>
ip-172-41-128-25	RIST Listener	Egress	225.1.2.3:5000	RistIngress			5643	Inactive	<div>id</div> <div>of</div> <div>x</div>
ip-172-41-128-25	RIST Caller	Egress	225.1.2.4:5000	RistCaller	172.41.129.63:1598	Win2019_2 Egress Rist Cal		Inactive	<div>id</div> <div>of</div> <div>x</div>

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Below is a portion of the Settings call response detailing information on Protocol Fanout.

```
Bash Copy

"fanout": {
  "16704273857340480058": {
    "id": "16704273857340480058",
    "protocol": "srt-caller",
    "direction": "egress",
    "streamIp": "239.4.2.3",
    "streamPort": 5400,
    "nodeIp": "10.2.128.37",
    "nodePort": 5401,
    "listenerPort": null,
    "options": []
  },
  "4777854487999137884": {
    "id": "4777854487999137884",
    "protocol": "srt-caller",
    "direction": "ingress",
    "streamIp": "239.4.2.3",
    "streamPort": 5400,
    "nodeIp": "10.2.128.36",
    "nodePort": 5400,
    "listenerPort": null,
    "options": []
  },
  "5062225067104987852": {
    "id": "5062225067104987852",
    "protocol": "srt-listener",
    "direction": "egress",
    "streamIp": "225.1.1.1",
    "streamPort": 1599,
    "nodeIp": null,
    "nodePort": null,
    "listenerPort": 6000,
    "options": []
  },
  "9489213241930010873": {
    "id": "9489213241930010873",
    "protocol": "srt-listener",
    "direction": "ingress",
    "streamIp": "225.1.1.1",
    "streamPort": 1599,
    "nodeIp": null,
    "nodePort": null,
    "listenerPort": 1599,
    "options": []
  }
},
}
```

swxtch/protocols/v1/adaptors/add

POST

swxtch/protocols/v1/adaptors/add

- Add an adaptor and specify the protocol and direction for fanout

URL:

PowerShellCopy

http://<cloudSwXtch-Control-IP>/swxtch/protocols/v1/adaptors/add

Example URL:

http://10.2.128.10/swxtch/protocols/v1/adaptors/add

Request Body:

[SRT available options](#)

[RIST available options](#)

- UDP - Ingress

PowerShell

[Copy](#)

```
{
  "protocol": "udp",
  "direction": "ingress",
  "streamIp": "224.0.0.1",
  "streamPort": 4000,
  "listenerPort": 3500
}
```

- UDP - Egress

PowerShell

[Copy](#)

```
{
  "protocol": "udp",
  "direction": "egress",
  "streamIp": "224.0.0.2",
  "streamPort": 4001,
  "nodeIp": "10.0.0.1",
  "nodePort": 3501,
  "nodeMac": "00:22:48:37:8a:f9"
}
```

- SRT Caller - Ingress

PowerShell

[Copy](#)

```
{
  "protocol": "srt-caller",
  "direction": "ingress",
  "streamIp": "224.0.0.3",
  "streamPort": 4002,
  "nodeIp": "10.0.0.2",
  "nodePort": 3502
}
```

- SRT Caller - Egress

PowerShell

[Copy](#)

```
{
  "protocol": "srt-caller",
  "direction": "egress",
  "streamIp": "224.0.0.4",
  "streamPort": 4003,
  "nodeIp": "10.0.0.3",
  "nodePort": 3503
}
```

- SRT Listener - Ingress

PowerShell

[Copy](#)

```
{
  "protocol": "srt-listener",
  "direction": "ingress",
  "streamIp": "224.0.0.5",
  "streamPort": 4004,
  "listenerPort": 3504
}
```

- SRT Listener - Egress

PowerShell

[Copy](#)

```
{
  "protocol": "srt-listener",
  "direction": "egress",
  "streamIp": "224.0.0.6",
  "streamPort": 4005,
  "listenerPort": 3505
}
```

- RIST Caller - Ingress

PowerShell

Copy

```
{
  "protocol": "rist-caller",
  "direction": "ingress",
  "streamIp": "227.0.0.3",
  "streamPort": 4012,
  "nodeIp": "10.1.2.2",
  "nodePort": 4555
}
```

- RIST Caller - Egress

PowerShell

Copy

```
{
  "protocol": "srt-caller",
  "direction": "egress",
  "streamIp": "224.0.0.4",
  "streamPort": 4003,
  "nodeIp": "10.0.0.3",
  "nodePort": 3503
}
```

- RIST Listener - Ingress

PowerShell

Copy

```
{
  "protocol": "rist-listener",
  "direction": "ingress",
  "streamIp": "226.2.2.2",
  "streamPort": 8000,
  "listenerPort": 3502
}
```

- RIST Listener - Egress

PowerShell

Copy

```
{
  "protocol": "rist-listener",
  "direction": "egress",
  "streamIp": "225.1.2.3",
  "streamPort": 5000,
  "listenerPort": 8000
}
```

**Responses:**

200 - Success

**Example Value:**

None

swxtch/protocols/v1/adaptors/update





POST

### swxtch/protocols/v1/adaptors/update

- Update adaptor

#### URL:

PowerShell

Copy

http://<cloudSwXtch-Control-IP>/swxtch/protocols/v1/adaptors/update

#### Example URL:

http://10.2.128.10/swxtch/protocols/v1/adaptors/update

#### Request Body:

- [SRT available options](#)
- [RIST available options](#)

PowerShell

Copy

```
{
  "id": "12741484679446106659",
  "options": [
    {
      "name": "RISTO_CONGESTION_CONTROL_MODE",
      "value": "off"
    },
    {
      "name": "RISTO_TIMING_MODE",
      "value": "arrival"
    },
    {
      "name": "RISTO_MIN_RETRIES",
      "value": "1"
    },
    {
      "name": "RISTO_MAX_RETRIES",
      "value": "2"
    },
    {
      "name": "RISTO_RECOVERY_MAXBITRATE",
      "value": "50000"
    },
    {
      "name": "RISTO_RECOVERY_LEN_MAX",
      "value": "100"
    },
    {
      "name": "RISTO_RECOVERY_LEN_MIN",
      "value": "100"
    }
  ]
}
```

#### Responses:

200 - Responses

#### Example Value:

None

### swxtch/protocols/v1/adaptors/remove

^

POST

### swxtch/protocols/v1/adaptors/remove

Your content goes here

URL:

PowerShell

Copy

```
http://<cloudSwXtch-control-IP>/swxtch/protocols/v1/adaptors/remove
```

Example URL:

http://10.2.128.10/swxtch/protocols/v1/adaptors/remove

Request Body:

PowerShell

Copy

```
{
  "ids": [
    "12741484679446106659",
    "22731422274546106659"
  ]
}
```

Responses:

200 - Success

Example Value:

None

### swxtch/protocols/v1/adaptors/show

^

POST

### swxtch/protocols/v1/adaptors/show

Your content goes here

URL:

PowerShell

Copy

```
http://<cloudSwXtch-control-IP>/swxtch/protocols/v1/adaptors/show
```

Example URL:

http://10.2.128.10/swxtch/protocols/v1/adaptors/show

Request Body:

None

Responses:

200 - Success

Example Value:

```
{
  "10092296471997387357": {
    "id": "10092296471997387357",
    "protocol": "udp",
    "direction": "ingress",
    "streamIp": "224.0.0.1",
    "streamPort": 4000,
    "nodeIp": null,
    "nodePort": null,
    "listenerPort": 3500,
    "options": null
  },
  "14090786360518526144": {
    "id": "14090786360518526144",
    "protocol": "srt-caller",
    "direction": "ingress",
    "streamIp": "224.0.0.3",
    "streamPort": 4002,
    "nodeIp": "10.0.0.2",
    "nodePort": 3502,
    "listenerPort": null,
    "options": null
  },
  "14689058685391465390": {
    "id": "14689058685391465390",
    "protocol": "srt-caller",
    "direction": "egress",
    "streamIp": "224.0.0.4",
    "streamPort": 4003,
    "nodeIp": "10.0.0.3",
    "nodePort": 3503,
    "listenerPort": null,
    "options": null
  },
  "17428466851953349955": {
    "id": "17428466851953349955",
    "protocol": "srt-listener",
    "direction": "egress",
    "streamIp": "224.0.0.6",
    "streamPort": 4005,
    "nodeIp": null,
    "nodePort": null,
    "listenerPort": 3505,
    "options": null
  },
  "17465424783484296836": {
    "id": "17465424783484296836",
    "protocol": "rist-caller",
    "direction": "ingress",
    "streamIp": "227.0.0.3",
    "streamPort": 4012,
    "nodeIp": "10.1.2.2",
    "nodePort": 4555,
    "listenerPort": null,
    "options": null
  },
  "18141476381590292227": {
    "id": "18141476381590292227",
    "protocol": "srt-listener",
    "direction": "ingress",
    "streamIp": "224.0.0.5",
    "streamPort": 4004,
    "nodeIp": null,
    "nodePort": null,
    "listenerPort": 3504,
    "options": null
  },
  "86391891196034799": {
    "id": "86391891196034799",
    "protocol": "udp",
    "direction": "egress",
    "streamIp": "224.0.0.5",
    "streamPort": 4004,
    "nodeIp": "10.0.0.2",
    "nodePort": 4000,
    "listenerPort": null,
    "options": []
  }
}
```

POST

## swxtch/protocols/v1/adaptors/stats

Your content goes here

URL:

PowerShell

Copy

```
http://<cloudSwxtch-control-IP>/swxtch/protocols/v1/adaptors/stats
```

## Example URL:

```
http://10.2.128.10/swxtch/protocols/v1/adaptors/stats
```

## Request Body:

None

## Responses:

200 - Success

## Example Value:

PowerShell

Copy

```
[
  {
    "id": "11151931551572244000",
    "counters": {
      "timestamp": 1692713703747,
      "txPackets": 0,
      "rxPackets": 123,
      "txPacketsLoss": 0,
      "rxPacketsLoss": 4,
      "txRetransmittedPackets": 0,
      "rxRetransmittedPackets": 24
    },
    "info": {
      "protocol": "srt-listener",
      "direction": "ingress",
      "streamIp": "234.1.1.1",
      "streamPort": 2500,
      "listenerPort": 3000
    }
  },
  {
    "id": "4155232358006180400",
    "counters": {
      "timestamp": 1692713703747,
      "txPackets": 57,
      "rxPackets": 0,
      "txPacketsLoss": 2,
      "rxPacketsLoss": 0,
      "txRetransmittedPackets": 14,
      "rxRetransmittedPackets": 0
    },
    "info": {
      "protocol": "srt-caller",
      "direction": "egress",
      "streamIp": "230.1.1.1",
      "streamPort": 2500,
      "nodeIp": "10.1.1.1",
      "nodePort": 4545
    }
  },
  {
    "id": "11151931551572244001",
    "counters": {
      "timestamp": 1692713703747,
      "txPackets": 0,
      "rxPackets": 255,
      "txPacketsLoss": 0,
      "rxPacketsLoss": 17,
      "txRetransmittedPackets": 0,
      "rxRetransmittedPackets": 3
    },
    "info": {
      "protocol": "rist-listener",
```

```

        "direction": "ingress",
        "streamIp": "229.1.1.1",
        "streamPort": 4368,
        "listenerPort": 5741
    },
    {
        "id": "4155232358006180402",
        "counters": {
            "timestamp": 1692713703747,
            "txPackets": 74,
            "rxPackets": 0,
            "txPacketsLoss": 5,
            "rxPacketsLoss": 0,
            "txRetransmittedPackets": 11,
            "rxRetransmittedPackets": 0
        },
        "info": {
            "protocol": "rist-caller",
            "direction": "egress",
            "streamIp": "227.1.2.3",
            "streamPort": 3687,
            "nodeIp": "20.1.2.3",
            "nodePort": 7777
        }
    }
]

```

## Precision Timing Protocol (PTP)

The Timing Nodes page displays information regarding clock sync configuration for the cloudSwXtch. The page in wXcked Eye will only populate with information if the user has the PTP feature enabled.

The screenshot shows the wXcked Eye web interface. The header includes the swXtch.io logo and navigation links. The main content area is titled "Timing Nodes" and includes an "Update credentials" button. Below this, there is a section for the "Master Node" with a text box containing "Name: dsd-core-200" and "Time Sync Service: phc/dev/ptp\_hyperv". Underneath is a section for "Follower Nodes" with a "CSV" button. A table lists three follower nodes: DSD-agent-201, DSD-agent-202, and DSD-agent-204, each with a status of "Present" and their local and root offsets. The footer shows the swXtch.io logo and copyright information for 2023.

Name	Status	Local Offset	Root Offset
DSD-agent-201	Present	2.00 $\mu$ s	13.65 $\mu$ s
DSD-agent-202	Present	945.00 ns	7.81 $\mu$ s
DSD-agent-204	Present	10.56 $\mu$ s	13.45 $\mu$ s

## PTP Master

swxtch/ptp/v1/master

POST

swxtch/ptp/v1/master

- Assign the cloudSwXtch as the Master Node to receive time from the True Clock Source.

URL:

```
Bash Copy
curl http://<cloudSwXtch-control-IP>/swxtch/ptp/v1/master
```

**Example URL:**  
http://10.2.128.10/swxtch/ptp/v1/master

**Example Request Body:**  
None

**Example Response:**

```
Bash Copy
{
  "name": "core-100",
  "displayname": "phc:/dev/ptp_hyperv",
  "type": "primary"
}
```

## PTP followers

swxtch/ptp/v1/followers

POST

swxtch/ptp/v1/followers

- Assign xNICs as PTP Follower Nodes.

**URL:**

```
Bash Copy
curl http://<cloudSwXtch-control-IP>/swxtch/ptp/v1/followers
```

**Example URL:**  
http://10.2.128.10/swxtch/ptp/v1/followers

**Example Request Body:**  
None

**Example Response —>**

Bash

Copy

```
[
  {
    "name": "agent-101",
    "xnicPresent": true,
    "timebeatPresent": true,
    "localOffset": 2634.765912,
    "rootOffset": 22687.686621
  },
  {
    "name": "agent-104",
    "xnicPresent": true,
    "timebeatPresent": true,
    "localOffset": 4878.807692,
    "rootOffset": 17720.857275
  },
  {
    "name": "agent-105",
    "xnicPresent": true,
    "timebeatPresent": true,
    "localOffset": 10955.28,
    "rootOffset": 29702.527246
  },
  {
    "name": "agent-201",
    "xnicPresent": true,
    "timebeatPresent": null,
    "localOffset": null,
    "rootOffset": null
  },
  {
    "name": "agent-204",
    "xnicPresent": true,
    "timebeatPresent": null,
    "localOffset": null,
    "rootOffset": null
  },
  {
    "name": "aks-nodepool1-40504797-vmss00000C",
    "xnicPresent": true,
    "timebeatPresent": null,
    "localOffset": null,
    "rootOffset": null
  },
  {
    "name": "aks-nodepool1-40504797-vmss00000D",
    "xnicPresent": true,
    "timebeatPresent": null,
    "localOffset": null,
    "rootOffset": null
  }
]
```

## Update PTP Credentials

### swxtch/ptp/v1/updateTimebeatCredentials

#### swxtch/ptp/v1/updateTimebeatCredentials

- Update PTP credentials

#### URL:

Bash

Copy

```
curl http://<cloudSwxtch-control-IP>/swxtch/ptp/v1/updateTimebeatCredentials
```

#### Example URL:

http://10.2.128.10/swxtch/ptp/v1/updateTimebeatCredentials

#### Example Request Body:

Bash

Copy

```
{
  "username": "Admin1",
  "password": "TimePassword"
}
```

#### Example Response:

Bash

Copy

```
"Credentials updated successfully"
```



## Release Notes

### WHAT TO EXPECT

In this section, users will find release notes for current and past versions of our product. If you have any questions regarding your particular version, please contact us at [info@swxtch.io](mailto:info@swxtch.io).

To see past versions of our documentation site, please check out our [Resources](#) page.

#### 3.3.7 Release Notes - June 13, 2025

##### Bug Fixes

- Fixed issue where Windows xdp driver could cause the VM to be unresponsive.
- Fixed issue where swxtch-top cloudSwXtch RX goes to 0 then TX follows, then it displays normally again.

#### 3.3.6 Release Notes - May 6, 2025

##### Bug Fixes

- Fixed issue where if Windows needed a reboot, xNIC installer will not reboot, instead it will end in error, this allows users to have full control when upgrading using scripts.
- Fixed issue where swxtch-top could crash if user when in column setup selected name to be visible.

#### 3.3.4 Release Notes - April 2, 2025

##### Improvements

- We've reduced the amount of lag experienced in wXcked Eye when handling a higher number of flows.

#### 3.3.3 Release Notes - March 20, 2025

##### Bug Fixes

- **Improved SLP connections handling:** Old SLP connections will be cleared after disconnecting the cloudSwXtch Bridge.

#### 3.3.2 Release Notes - March 10, 2025

##### Improvements

- **xNIC**
  - Users can now install xNIC on Kubernetes nodes that have more than 32 virtual interfaces. There is no longer any limitations for the upper bounds.
  - The xNIC will no longer send multiple notifications per xNIC in the event of a version mismatch with the cloudSwXtch.

#### 3.3.1 Release Notes - February 21, 2025

##### New Features

- The wXcked Eye Topology Graph has been revamped, improving user accessibility. For more information, see [here](#).

## Improvements

- Performance and stability improvements to both the cloudSwXtch and the cloudSwXtch Bridge.

## 3.3.0 Release Notes - February 10, 2025

### New Features

- **The cloudSwXtch Bridge can now connect to multiple cloudSwXtch instances.** Prior to 3.3, cloudSwXtch Bridges were only able to create a 1:1 connection with a cloudSwXtch. In this new [cloudSwXtch Bridge to Multi-cloudSwXtch feature](#), users can better utilize their on-premises hardware. To learn more about configuring the bridge for multiple cloudSwXtches, see [here](#).
- The cloudSwXtch Bridge can now be installed [via Docker](#). For more information on how to install via Docker, see [here](#).
- A revamped self-hosted [Licensing Server](#) is now available for installation via Docker on your cloudSwXtch network. The Licensing Server allows users to self manage a bundle of cloudSwXtch licenses with matching entitlements for their deployments. Users would no longer need to request a single license per cloudSwXtch and can easily swap licenses between cloudSwXtch instances. Read more about it [here](#).
- A new [wXcked Eye Network Page](#) allows users to switch between cloudSwXtches in the same browser window.
- [Multiple Multicast and Source Specific Multicast configuration](#) has been relocated to the wXcked Eye High Availability Settings page. Users can also [Import](#) and [Export](#) their HA Streams Config here to allow for easier configuration in future sessions.

### New Improvements

- **xNIC**
  - The xNIC is now supported on Ubuntu 24.04.
- **cloudSwXtch Bridge**
  - Users can now specify their control interface during cloudSwXtch Bridge installation.
  - There are new arguments available when running the cloudSwXtch Bridge installer. This includes specifying interfaces, setting the control and data as the same interface, running installer via docker, and initiating high performance mode. For a complete list of arguments, see [here](#).
- **wXcked Eye**
  - A new [xNIC Config option](#) is available when selecting a cloudSwXtch component in the Topology Graph. Here, users can configure multiple xNICs associated with the highlighted cloudSwXtch for high availability and deduplication. For more information, see [here](#).
  - The Topology Graph will now display TX and RX rates at the end of each stream link to allow for improved monitoring. In addition, Out of Order (OoO) and Missing packets will also display at each probe point within the flow. To see what that looks like, view [wXcked Eye Topology Graph](#) article.
  - The Navigation Menu has been updated to include the new Network page.
  - The Current cloudSwXtch ribbon, detailing information about the cloudSwXtch, has been integrated into the swXtch.io black banner at the top of wXcked Eye.
- **swXtch-top**
  - Users can resize Panels in swXtch-top.
  - Users can [assign and delete aliases](#) for their components and streams in swXtch-top.
  - Users can display the [raw total amounts](#) for bit and packet statistics.
  - The Components view will now have a Primary swXtch column to show what cloudSwXtch a component was been installed against.
  - The [color selector](#) has been expanded to allow for more customization.
  - Some swXtch-top views include an expanded filter option where users can select specific categories to highlight.
- The Prometheus metrics output has been standardized, replacing all mentions of "xNIC" with "component." To see the changes, see [Prometheus Monitoring](#).

### Bug Fixes

- Containerized cloudSwXtch Bridge via Docker resolves a number of issues with potentially corrupted packages during install.
- Fixed an issue in swXtch-to where descriptions in the Notification view were cut off. Descriptions are now justified in the window and will display fully.
- Fixed an issue where wXcked Eye Topology Graph filters were not being saved between sessions. Now, all filters and settings will persist.

## 3.2.1 Release Notes - December 13, 2024

### New Features

- Multiple Multicast (MMC) producers can be configured for Linux xNIC Type 2.

### New Improvements

- **cloudSwXtch Bridge**
  - Ground-to-cloud and cloud-to-ground connections for swXtch Lossless Protocol (SLP) are optional and can be toggled on and off via the cloudSwXtch Bridge's JSON file.
- **swXtch-top**
  - New performance enhancements allow users to monitor up to 50,000 streams.

- The Setup function for column configuration has been relocated to a blue box next to the first column's name. Users can click here to select what columns are displayed in the view and the size for each. In addition, users can press the F3 button while highlighting a specific panel to open column setup.
- Settings has been split into two separate views: Aliases and Licensing. Aliases will display user assigned names for streams while Licensing will list the entitlements allotted to a specific cloudSwXtch.
- Users can configure the colors used in swXtch-top with the new Colors menu.
- Users can export cloudSwXtch reports for troubleshooting from swXtch-top, similar to the wXcked Eye Support page.
- A new Help (F4) menu provides users a breakdown of all the swXtch-top shortcuts.
- The cloudSwXtch information panel is fully collapsible using the F2 key.
- A new VM filter shortcut allows users to filter out non-xNIC VMs from their list of Components.
- The Filter search bar is no longer case-sensitive.
- The number of line items under each view will display by the view's name. For example, if a user has 10 components, that number will appear at the top.
- **wXcked Eye**
  - wXcked Eye will assign colors to each of the subnets when the Interfaces layer is selected in the Topology Toolbox. Users can highlight specific ones by selecting it from a new Subnets pop-up.
  - Users will no longer have to specify a MMC producer when configuring an xNIC for high availability in the endpoint's component information panel.
  - Adaptors for protocol fanout from the cloudSwXtch Bridge have been added to the Protocol Fanout stats page.
  - Making a selection in the View By/Filter By bar will highlight those components and streams while completely hiding other items in the graph. This will allow users to focus on specific workflows in the UI.
  - Sockets will center around a component node regardless of its resizing.

### 3.2.0 Release Notes - November 8, 2024

#### New Features

- cloudSwXtch Bridge Type 3 will now be known simply as cloudSwXtch Bridge. cloudSwXtch Bridge Type 1 and 2 will no longer be supported.
- The cloudSwXtch Bridge can run on any NIC. Certain NICs can be used to run the Bridge in a high performance mode for higher throughput. For a complete list, see [here](#).
- swXtch Lossless UDP (SLP) is now supported for cloud-to-ground traffic (C2G).
- Multiple Multicast Group (MMC) and Source Specific Multicast (SSM) is [now configurable](#) in the wXcked Eye Topology graph, applying changes directly to the xNIC config JSON file from the UI. For more information, see [wXcked Eye Topology Graph](#).
- Users can configure [adaptors](#) and [HA clusters](#) directly in swXtch-top interface.
- xNIC Type 2 on Windows now uses XDP Driver version 1.0.2 and will no longer require Test Mode on Windows VM.
- Users are no longer required to disable Windows SecureBoot UEFI during xNIC installation on Windows machines.

#### New Improvements

- **swXtch-top**
  - Users can click directly into the swxrch-top interface to navigate between views and interact with line items.
  - The top cloudSwXtch information panel is now collapsible.
  - The navigation bar has been moved into a [Views](#) hideaway menu, decluttering the swXtch-top UI and making room for additional views in the future.
  - New default columns have been set in the [Lossless](#) view for both SLP RX and TX stats, highlighting the most commonly used monitoring metrics.
  - The [Setup](#) function will open in a relocated side panel, where users can alter what columns are displayed and their width.
- **wXcked Eye Topology Graph**
  - A new SLP layer highlights swXtch Lossless UDP traffic traveling to and from the cloudSwXtch and the cloudSwXtch Bridge.
  - The SLP stats now match the default columns in the Lossless view on swXtch-top, streamlining the most commonly used monitoring metrics.
  - An updated HA layer is responsive to path usage with the shadow density for either paths reflective of the percentage being used.
  - The Interfaces layer will now minimize when zoomed out.

#### Bug Fixes

- Fixed an issue where metrics for HA path usage in wXcked Eye and swXtch-top weren't matching.
- Fixed an issue in the wXcked Eye Topology Table where the producers and consumers filtering options weren't working.
- Fixed an issue where the cloudSwXtch's total bandwidth use was not displaying the swXtch-top.
- Fixed an issue where the argument to install PTP for xNIC on Windows was incorrectly set as `-ptp_install`. It is now `--ptp true` as noted in the helper.
- Added a fix for Override Source IP in Multiple Multicast Groups configurations.
- Fixed an issue where users could not click into the Filter search bar in swXtch-top to start a search.

#### Known Issue

- cloudSwXtch Bridge installer and its relevant commands will still mention "bridge 3." This will be removed in the next version as we transition out of multiple cloudSwXtch Bridge types.
  - **Workaround:** Review Install cloudSwXtch Bridge article for up to date commands.
- Configurations in the JSON file and wXcked Eye for the cloudSwXtch Bridge and the xNIC will not persist between upgrades.

- **Workaround:** Before upgrading your cloudSwXtch Bridge and xNIC, it is recommended for users to download their respective JSON files into a local folder and then using them to replace their empty counterparts post-reinstall.

### 3.1.0 Release Notes - October 7, 2024

#### New Features

- Two new arguments have been added to the xNIC and Bridge JSON file for improved flexibility and control over high availability configurations.
  - HA Enable: The enable flag allows users to tell the xNIC/cloudSwXtch Bridge whether or not it should join a cloudSwXtch cluster for data and control traffic.
  - Deduplication: Users can now specify in the xNIC JSON file whether or not to deduplicate data plane traffic in favor of their own application at the endpoint.

#### New Improvements

- **cloudSwXtch Bridge Type 3**
  - The number of necessary 3rd party packages for cloudSwXtch Bridge 3 installation have been reduced. Please see [here](#) for updated list. (#3463)
  - A new --ag or --airgap argument has been added when running the installation script for air-gapped environments. Using ag requires users to download 3rd party packages onto their VM before bridge installation since there will be no internet access.
  - A new Firewall exception has been added to the cloudSwXtch Bridge Type 2 and 3 installer for IGMP. Review all firewall exceptions [here](#).
- **xNIC**
  - Precision Time Protocol installation is now optional and disabled by default.
- **wXcked Eye Topology Graph**
  - Users can add cloud to ground subscriptions for the cloudSwXtch Bridge in the Component Information panel.
  - Both the View By/Filter By bar and the Filters panel in the wXcked Eye Topology Graph are now collapsible. (#5913)
  - The Glossary, Settings, Center Graph, and Resize Node controls have been relocated to the right hand side of the graph. (#5913)
  - The Component Information panel is now moveable across the Topology Graph.
  - There is a new Interfaces layer which displays a streamSocket's interface. (#5912)
  - The velocity of the stream links will animate differently based on bps. (#6041)
  - The graph is now reactive to zoom with StreamSocket information only displayed when fully zoomed in.
- **swXtch-top**
  - Filtering is now implemented in every view in swXtch-top. (#5941)

#### Known Issues

- **[Resolved 3.2.0]** The filtering option in swXtch-top will not work if a user clicks into the Filter search bar.
  - **Workaround:** While using swXtch-top, do not click into the Filter search bar. Simply type the value you're searching for, followed by an asterisk (\*), to begin filtering. **Reminder:** Filtering is case-sensitive.
- **[Resolved 3.2.0]** The argument to enable PTP for xNIC on Windows is incorrectly defined when using the --help command as `--ptp true`.
  - **Workaround:** Users should use `-ptp_install true` when enabling PTP for the xNIC on Windows.

### 3.0.0 Release Notes - September 6, 2024

#### New Features:

- **A new way of bridging with cloudSwXtch Bridge Type 3!**
  - With added support on RHEL 9 and for non-Mellanox NICs, cloudSwXtch Bridge Type 3 is a DPDK-based variant, touting higher throughput and the ability to run **swXtch Lossless UDP for Ground-to-Cloud**. For more information on installation, see [here](#).
  - This includes major enhancements, such as configurable parameters that can be manually tuned when establishing a ground-to-cloud link.
  - High availability and Protocol Fanout is configurable in wXcked Eye for cloudSwXtch Bridge.
- **We've added support for Cinnafilm's Tachyon LIVE for cloudSwXtch**, adding a multitude of video transformations in wXcked Eye. For more information about installation, contact [support@swxtch.io](mailto:support@swxtch.io).
- **We've added multiple NIC support for High Availability configuration on the xNIC**. This allows users to completely separate 2022-7 or high availability traffic for each path. In addition, users can enable multiple agents to communicate with multiple cloudSwXtches without requiring peering. For more information, see [here](#).
- **A new and improved way of seeing things with wXcked Eye!**
  - The **wXcked Eye Topology graph** has been overhauled, introducing a slew of new features to allow for real-time monitoring with new streams and channels views.
    - Each graph component opens an information sidebar when selected. This information includes general, environment, hardware, total rx/tx, related streams, and related adaptors.
    - A new Layers toggle feature allows for users to view different combinations of data as required: name components, clouds, streams, rates, regions, sockets, instances, and precision time protocol.

- **Protocol Fanout** is now configurable directly in the Topology Graph. Users can add and edit adaptors via the components information panel.
- High Availability and swXtch Lossless UDP stats are now visible directly on the Topology Graph.
- A new **Topology Table** view gives users a detailed look into individual streams and channels. Additionally, users can view streams in a tree view with components pulled directly from the topology graph.
- A new **wXcked Eye Components** page allows users to merge interfaces into a single VM, removing duplicate virtual machines in the topology graph. This page also allows users to manually enter missing environment information for non-xNIC VMs.
- A new wXcked Eye **Aliases** tab allows users to assign user-friendly names and colors for Streams, Sockets, and Topology Graph Components.
- An updated **Support** page allows users to define log ranges by number of days and/or hours.
- The Settings page has a new **Channels** tab, allowing users to add channels based on streams linked by converter.
- Users can specify certain colors for HA paths, streams, and channels to carry throughout the wXcked Eye UI.
- Users can configure their cloudSwXtch for Tachyon LIVE via the wXcked Eye Settings page. Please contact support@swXtch.io for more information.

#### New Improvements:

- **Updates to swXtch-top:**
  - swXtch-top has been refactored with all new layout and updated navigation menu.
    - A new **Components** view to mirror what users see in wXcked Eye for their individual topology graph nodes.
    - Users can also see swXtch Lossless UDP stats from Ground-to-Cloud in a new **Lossless** view.
    - A new **Subscriptions** view details different source list configurations for single source multicast and multiple multicast groups.
    - A new **Configurations** page displays xNIC JSON configuration files.
  - Users can now navigate between different views by clicking directly into swXtch-top.
  - A new **Setup** function allows users to modify what columns are visible in a view and the width of those columns.
  - To see all the updates to the interface, see **swXtch-top** under Testing cloudSwXtch.
- **Updates to API:**
  - Our **Monitoring** and **Configuration API** has been updated with new responses. A **topology API** call has been added as well.
    - An issue with /stats/xnics showing multiple entries in RxMulticastGroups for the same Group IP has been resolved.
    - The Dashboard API (/wXckedEye/v1/dashboard) has been deprecated. Please use the **Topology API** call.
    - The **Protocol Fanout Adaptor API** calls have been streamlined with different body/payloads for each protocol. Old calls for specific protocols have been deprecated.

#### Known Issues:

- There are IP conflicts when multiple xNICs on different VPCs have a ctrl IP with similar host names. (4857)
  - **Workaround:** Avoid using the same IP and hostname between VPCs.
- Users may experience reduced performance on instances with large configurations. (5821)
  - **Workaround:** The issue stems from suboptimal thread configuration. For more information on how to manually modify core CPU usage, see [here](#).

## 2.2.0 Release Notes - March 18, 2024

#### New Features:

- **Say hello to updates to Bridge Type 2!**
  - **Protocol Fanout** is now available on the cloudSwXtch Bridge in Type 2. Previously, it was only available on the cloudSwXtch in the cloud. For more information on configuring the cloudSwXtch Bridge for Protocol Fanout, see the following [article](#).
  - **2022-7 for High Availability** is now configurable on a cloudSwXtch Bridge in both Type 2. For more information, see the [High Availability](#) article under Configuring cloudSwXtch.
- **Keep things secure with our verifiable xNIC installers!**
  - We now provide an optional way to verify the legitimacy of our xNIC installer script and installation packages against signed hash files with a swXtch.io public key. For more information, see [Verifying Installer Files](#) in the [Install xNIC on Linux](#) articles.
    - Currently, only available on Linux.

#### New Improvements:

- **Improved performance for AWS:**
  - c6in or m6in EC2 instance families are now recommended for cloudSwXtch instances running version 2.2.0 or greater. This ensures that users get the best performance out of their cloudSwXtch network on AWS. Any current m5zn cloudSwXtch based instances should migrate to one of the two family types.
- **Updates to swXtch-top:**
  - A new Bridge view has been added to swXtch-top, displaying data flow stats specifically for Bridge Type 2. For more information, see [swXtch-top](#) article.

#### Bug Fixes:

- Fixed issue where a double join was occurring in Cloud-to-Ground.
- Fix stream stats in swxtch-top showing intermittent negative values when the replicator service is restarted.

#### Known Issues:

- There are IP conflicts when multiple xNICs on different VPCs have a ctrl IP with similar host names. (4857)
  - **Workaround:** Avoid using the same IP and hostname between VPCs.
- **[Resolved 3.0.0]** /stats/xnics can show multiple entries in RxMulticastGroups for the same Group Ip. (4893)
  - **Workaround:** None. This will be addressed in an upcoming release.

### 2.1.3 Release Notes - March 5, 2024

#### New Improvements:

- **Updates to swXtch-top:**
  - A new Search bar in the interface will allow users to filter items in the xNICs, Streams and Notification views. (4743)
  - Navigating between swXtch-top's views will require hitting both the CTRL button on a user's keyboard and the associated letter. For example, to get to the xNICs view, a user will need to key in CTRL + X to switch to that page.
  - The Hardware view is now called "Environment."
  - A new Notifications view has been added. (4709)
  - Both the HA Summary and HA view will only list in the navigation menu when HA is configured.
    - For more information, check out the [swxtch-top](#) page under Testing cloudSwXtch.
- **Updates to wXcked Eye:**
  - The wXcked Eye Navigation menu will now properly scroll if using the UI on a lower resolution screen. (5029) [Known Issue 2.1.2]
- **Updates to swx support:**
  - Users can now export xNIC logs using the swx support command. For more information, see [How to View cloudSwXtch Logs for Troubleshooting](#). (4574)

#### Bug Fixes:

- We corrected a bug that would happen when PTP service start-up fails and the master node in swxtch-top shows as empty. (5110) [Known Issue 2.1.2]

#### Known Issues:

- There are IP conflicts when multiple xNICs on different VPCs have a ctrl IP with similar host names. (4857)
  - **Workaround:** Avoid using the same IP and hostname between VPCs.
- **[Resolved 3.0.0]** /stats/xnics can show multiple entries in RxMulticastGroups for the same Group Ip. (4893)
  - **Workaround:** None. This will be addressed in an upcoming release.

### 2.1.2 Release Notes - February 15, 2024

#### New Improvements:

- **Updates to xNIC:**
  - Users can now download and install the xNIC without having a valid license authorizing their cloudSwXtch. However, to begin packet flow from the cloudSwXtch to the xNIC(s), a license is required. (4974)
- **Updates to swx support:**
  - New parameters have been added to the swx support command. For a complete list, please see [How to View cloudSwXtch Logs for Troubleshooting](#). (4574)
- **Updates to wXcked Eye:**
  - The [Protocol Fanout stats page](#) will now display the Alias name by the stream IP address. The page also allows users to filter Adaptors by multiple protocols. (4572)
  - The [Protocol Fanout tab in Settings](#) will also now display the Alias name next to the Stream and Node IP addresses in the Adaptors table. (4572)
  - The [Support page](#) will now allow users to export xNIC logs.(4574)
- **Updates to Licensing Server:**
  - The [Licensing Server](#) will no longer require a manual start after initial install. (4919) [Known issue in 2.1.1]

#### Known Issues:

- **[Resolved 2.1.3]** PTP service start-up fails and swxtch-top shows that the master node is empty. (5110)
  - **Workaround:** Use the following four commands in succession to remedy this issue:

PowerShell

Copy

```
sudo systemctl start elasticsearch.service
sudo systemctl enable elasticsearch.service
sudo systemctl start grafana-server.service
sudo systemctl enable grafana-server.service
```

- There are IP conflicts when multiple xNICs on different VPCs have a ctrl IP with similar host names. (4857)

- **Workaround:** Avoid using the same IP and hostname between VPCs.
- **[Resolved 2.1.3]** wXcked Eye navigation menu does not scroll.
  - **Workaround:** Ensure you're using wXcked Eye in a high-res screen.
- **[Resolved 3.0.0]** /stats/xnics can show multiple entries in RxMulticastGroups for the same Group Ip. (4893)
  - **Workaround:** None. This will be addressed in an upcoming release.

### 2.1.1 Release Notes - February 5, 2024

#### New Improvements:

- **Updates to wXcked Eye:**
  - The Alias tab is now split into two separate pages, one for streams and exclusions and another for nodes.
- **Updates to Prometheus API:**
  - swx\_maxClientCount and swx\_numClientsConnected are two new metrics added to Prometheus while both swx\_xnic\_maxActiveConnections and swx\_xnic\_activeConnectionCount have been deprecated.
  - When calling for metrics regarding nodes, only current active ones will display. Inactive or disconnected nodes will no longer list.
- **Updates to xNIC Logs:**
  - File paths in Windows and Linux for xNIC logs have been changed. Please see the article, [How to Find xNIC Logs](#), for more information.
- **Updates to xnic.json file:**
  - "childs" has been updated to "children" in the xnic.json file for configuring HA paths. For more information, please see [High Availability](#) under Configuring cloudSwXtch.

#### Known Issues:

- **[Resolved 2.1.2]** The Licensing Server does not automatically start after install. (4919)
  - **Workaround:** After the initial installation, please use the following command to start the licensing server.

PowerShell	Copy
sudo systemctl start swxtch-license-svr	

Subsequent start-ups will happen automatically when the licensing server VM is turned on.

- There are IP conflicts when multiple xNICs on different VPCs have a ctrl IP with similar host names. (4857)
  - **Workaround:** Avoid using the same IP and hostname between VPCs.
- **[Resolved 2.1.3]** wXcked Eye navigation menu does not scroll.
  - **Workaround:** Ensure you're using wXcked Eye in a high-res screen.
- **[Resolved 3.0.0]** /stats/xnics can show multiple entries in RxMulticastGroups for the same Group Ip. (4893)
  - **Workaround:** None. This will be addressed in an upcoming release.

### 2.1.0 Release Notes - January 2024

#### New Features:

- **Users can now configure their High Availability for Multiple Multicast Groups (mMC-7).** For more information on how to configure the xNIC for mMC-7, please see [High Availability](#) under Configuring cloudSwXtch. (4239)
- The cloudSwXtch can now perform **Source Specific Multicast (SSM)** as a method of delivering multicast packets where the receiver includes or excludes them through a specific source address.
- A new **swx support** command is now available for users to export a tar.gz file detailing statistical data stored within a cloudSwXtch during a set period of time. This is especially helpful when troubleshooting with swXtch.io Support. (4107, 4488)
- A self-hosted Licensing Server is now available for installation on your cloudSwXtch network. This allows users to self manage cloudSwXtch licenses instead of having to request one for each instance from swXtch.io. Read more about it [here](#).
- **Kubernetes support expanded** to include GCP (GKE) and AWS (EKS) in addition to existing Azure (AKS) support.

#### New Improvements:

- **Updates to wXcked Eye:**
  - The new **wXcked Eye Cluster view** provides users with an expansive look of all cloudSwXtches connected in a high availability or mesh configuration. Serving as the new main page, users can easily navigate between cloudSwXtches for additional metrics. A universal Cluster quick view side panel has also been added, displaying up to 5 cloudSwXtches. (4568)
  - A new **wXcked Eye Support Page** has been added, allowing users to export a JSON file with a full cloudSwXtch report over a certain period of time. This is especially helpful when troubleshooting with swXtch.io Support. (4269)
  - A new batch select and delete feature has been added to the **Aliases** tab under Settings. (4320)
  - Users can now exclude certain streams via IP addresses from wXcked Eye and swXtch-top monitoring. (3732)



- The Hardware panel in the [General](#) tab under Settings now lists metadata and OS for the control and data subnets. (4351, 4352)
- A new [Protocol Fanout Stats](#) page displays SRT and RIST data flow to and from the cloudSwXtch. Previously, only multicast data flow was displayed across the UI. (4322)
- A new cloudSwXtch information banner now displays at the top of each page in wXcked Eye. (4571)
- The Network Graph is now called [Topology](#).
- [Timing Nodes](#) page has been relocated to under Monitoring.
- wXcked Eye is fully scalable with responsive views and page resizing. (4328)
- wXcked Eye and swXtch-top are both unified in their performance metrics and cloudSwXtch information.
- Users can now return to previously visited pages in the UI using a navigation history tool at the top of each page.
- **Updates to xNIC:**
  - The xNIC installer script will automatically install xNIC Type 2 as the **default** and **recommended** xNIC. From now on, whenever the documentation refers to the xNIC, it means Type 2. (4249)
  - The xNIC installer script will automatically open recommended ports in a user's firewall.
  - [HA Configuration for an xNIC](#) is now automatic as long as only one multicast group is required. (4305, 4460)
  - The xNIC configuration file is now a .json.
  - Precision Time Protocol (PTP) install is now optional for both the cloudSwXtch and the xNIC. (4368)
  - The xNIC has been enhanced to work with a single-NIC configuration if the cloudSwXtch's ctrl and data NIC share a single subnet.
  - Support for the following Operating Systems has been added: AlmaLinux 8.8, Amazon Linux 2023, RHEL 9.2, Rocky Linux 8 + 9, and Ubuntu 22.04. For a comprehensive list, see [xNIC System Requirements](#). (4414, 4314, 3371, 4261, 4154)
- **Updates to xNIC on K8s:**
  - The procedure to install the xNIC on a Kubernetes cluster has been updated with a new installer. See [Install xNIC on K8s Cluster](#) for more information. (3131, 4358)
- **Updates to Prometheus API:**
  - The [Prometheus API](#) metrics are now **swx\_core** for the cloudSwXtch and **swx\_xnic** for the xNICs. (4437)
  - The data for the xNICs are now grouped together, allowing users to filter by name.
- **Updates to swXtch-top:**
  - A new [Hardware](#) view has been added to swxctch-top, displaying metadata and OS for control and data subnets. (4351)
  - xNIC will now display as either Type 1 (t1) or Type 2 (t2). Type 2 is the default xNIC. (4445)
- **Updates to swXtch-perf:**
  - Single Source Multicast (SSM) include and exclude consumer commands have been added. In addition, a command to show the bps of all packet headers has also been included. For more information, see [swxctch-perf](#) article. (4386,
- **Bridge Installation**
  - Bridge installation command has been updated.

#### Bug Fixes:

- Fixed an issue with Protocol Fanout Egress Adaptors not working with xNIC Type 2. (4520)

## 2.0.34 Release Notes - October 2023

### New Features:

- **Say hello to cloudSwXtch on Google Cloud Platform (GCP) and Oracle Cloud Infrastructure (OCI)!**
  - cloudSwXtch is now available on GCP as a Cloud agnostic VM install. For more information, see [Cloud agnostic cloudSwXtch VM Install](#). These instructions can be applied to any cloud as an alternative method of installation.
  - cloudSwXtch is now available as a BYOL in the OCI Marketplace. For more information, see [cloudSwXtch on OCI](#).
  - Please note: Both installations will require a license from swXtch.io.
- Users can now **simplify** their cloudSwXtch and xNIC networking structure with the **new single-subnet configuration**. For more information, see System Requirements for [cloudSwXtch](#) and [xNIC](#).

### New Improvements:

- **Updates to wXcked Eye:**
  - Improved usability for Protocol Fanout configuration by creating a separate tab for Stream and Node Aliases. This new naming mechanism will work for both Protocol Fanout and for the Network Graph. (3733, 3840)
  - Rename High Availability paths directly in the UI (3849)
  - wXcked Eye and swXtch-top will now warn users if their cloudSwXtch license has less than 7 days left or has expired. (4101, 4199, 4205)
  - Added new warning messages in HA and Mesh settings page to remind users that these two configurations are mutually exclusive. (3794)
  - Fixed zoom scrolling capabilities in the wXcked Eye Network Graph to improve ease of use. (3657)
- **Expanded SMPTE 2022-7 Support:** For more information, see [High Availability](#) under Configuring cloudSwXtch. (3784)
- Added support for Ubuntu 22.04 with xNIC2 as the default. (4109)
- Added support for Amazon Linux 2 and Linux 2023. (3821)

## 2.0.10 Release Notes - July 2023



#### New Features:

- **Introducing wXcked Eye**, a brand new user interface to monitor and configure your cloudSwXtch environment. For more information on its functionality, see [Using wXcked Eye for cloudSwXtch](#). (2714)
- Added support for xNIC installation on AKS Cilium Native. For more information, see [Install xNIC on AKS Cilium Native](#). (3841)
- Added support for Prometheus and Grafana Monitoring for cloudSwXtch. For more information, see [Prometheus Monitoring](#). (3598)
- Added support for Protocol Fanout and Conversion including SRT to the wXcked Eye UI. For more information, see [Protocol Conversion and Fanout with wXcked Eye](#). (3181)
- Implemented Simple Packet Fragmentation for cloudSwXtch Bridge Type 2. (3276)

#### New Improvements:

- swXtch-top view 5 and 6 will now be dynamically hidden when a high availability configuration is destroyed. (3797)
- swxctch-top will now display a user's entitlements. (3738)
- Added support for Linux 2 on AWS for swXtch-xnic installation. (3570)
- Added in xNIC installer capability to add control and data NIC as well as unattended option. For more information, see [Install xNIC on Linux](#) or [Install xNIC on Windows](#). (3696)
- **Updates to API** - For more information on the changes below, see [Monitoring API](#) and [Configuration API](#). (2714)
  - The following additions break out the `http://<cloudSwXtch_IP>/api/wxckedeye/v1/dashboard` API into separate calls. The Dashboard call is still available, but will be deprecated in 2.1.10.
    - Added a new call to get information about the cloudSwXtch
    - Added a new call to get information about the Cloud
    - Added a new call to get statistics on the cloudSwXtch
    - Added a new call to get statistics on the xNIC's
    - Added a new call to get xNIC totals data
  - For mesh data the `listMembersAddress` was deprecated and replaced with `show`.
  - The word "switch" has been replaced with "swXtch" in all calls.
  - Added new calls for Streams to be used with Protocol Fanout: Add Stream, Update Streams, Show Streams and Remove Stream.
  - Added new calls for Nodes to be used with Protocol Fanout: Add Node, Update Node, Show Node and Remove Node.
  - Protocol Fanout Unicast changes:
    - Enable call has been changed from `"http://<cloudSwXtch>/swxtch/unicast-adaptor/enable"` to `"http://<cloudSwXtch>/swxtch/protocols/udp/v1/ingress/enable"`.
    - Enable call has been changed from `"http://<cloudSwXtch>/swxtch/unicast-adaptor/join"` to `"http://<cloudSwXtch>/swxtch/protocols/udp/v1/ingress/join"`, additionally, the body format has changed to add "Target Port" and "Group Port".
    - Added Unicast Adaptor "Ingress Show" call.
    - Added Unicast Adaptor "Egress Show" call.
    - Leave call has been changed from `"http://<cloudSwXtch>/swxtch/unicast-adaptor/leave"` to `"http://<cloudSwXtch>/swxtch/protocols/udp/v1/ingress/leave"`, additionally, the body format has changed to add "Target Port" and "Group Port".
    - Disable call has been changed from `"http://<cloudSwXtch>/swxtch/unicast-adaptor/disable"` to `"http://<cloudSwXtch>/swxtch/protocols/udp/v1/ingress/disable"`.
  - Protocol Fanout SRT for both "Caller" and "Listener" modes have been added.
  - PTP API has been added to get timing data and to update timing credentials

#### Bug Fixes:

- Fixed an install error when Timebeat returned a fail status. (3472)
- Fixed an issue where Mesh configuration was sometimes not persisted. (3640)
- Fixed an issue for xNIC2 in Windows, optimizing it for lower CPU utilization when idle. (2805)

### 1.9.85 Release Notes

#### New Features

- **Azure Air-Gapped** (No Internet) Image and Installation instructions are now available. (3694)

#### New Improvements:

- **Updates to PTP interface config:**
  - Modified the installation files for cloudSwXtch and xNIC so that they support Linux Ubuntu 18.x.20.x for both xNIC Type 1 and xNIC Type 2. (3522)
- We updated `install_swxtch.sh` to force a reboot if the UIO driver/module was installed. (3322)
- Added capability to add Gateway IP to Bridge Config.

#### Bug Fixes:

- **swXtch-top:**
  - Outdated or incorrect text has been fixed for the Mesh and Config views. (3560, 3562)
  - We removed duplicated flow values. (3436)

- We fixed spacing in between rows in HA Paths view. (3546)
- We fixed BigPacket detection and reset BigPacket counter for Linux xNIC2. (3401)

## 1.9.73 Release Notes

### New Features

- We added support for **Precision Time Protocol (PTP)**. (3068)
- **Updates to the wXcked Eye UI:**
  - The wXcked Eye UI main page is now the **Network Graph**, presenting users with a high-level view of their cloudSwXtch and its endpoints. For more information on this functionality, please refer to the "wXcked Eye Network Graph" article. (2771)
  - Under Configuration, a new **Settings** page has been added, allowing users to configure their cloudSwXtches for **Mesh**, **High Availability** and **Protocol Fanout**. A **General** tab displays information regarding their cloudSwXtch and the entitlements allowed by their license. (3087)
  - Under Configuration, a new **Notifications** page displays updates regarding a user's cloudSwXtch. (3344)
  - Under Configuration, a new **Timing Nodes** page has been added, displaying information on PTP. (3113)
- **Updates to swXtch-top:**
  - We added three new views: **HA Streams**, **Config** and **PTP**.
  - We condensed HA and multi-cloudSwXtch information into one column. (3275)

### Improvements:

- **xNIC2 for Windows** will now allow tunneling and broadcast traffic to pass.
- Updates to **swxtch-perf on Windows and Linux**: (3117)
  - **Consumer loopback mode**
  - **Producer loopback mode**
  - **Increase logging information (dbg)**
- Updates to **swxtch-perf on Windows**: (3117)
  - **One-way latency**
  - **RTT latency**
  - **One way/RTT latency buckets**
- Added Windows 11 support.
- **Linux xNIC** now uses the payload size of the received packets instead of the Data NIC MTU size when producing a loopback. This will prevent packets from dropping. (3180)
- Updated the maximum payload length for **swxtch-perf** to the maximum UDP payload length size (65507) - SWX header size (32 bytes) = 65475 bytes. This will allow swxtch-perf to be used in more versatile scenarios with large packets and not be constrained by payload length. (3274)

### Bug Fixes:

- We corrected issues with **installing xNIC on Centos7 for AWS**. (3349)
- We fixed an issue where **Windows xNIC2** wasn't able to send packets with a payload of 1470 and **bigpackets** counter didn't modify its value in the situation. This detection of big packets was also fixed on Windows and Linux xNIC1. (3401)

## Resources

### PDFs

[cloudSwXtch User Guide v1.9.85](#)

[cloudSwXtch User Guide v2.0.34](#)

[cloudSwXtch User Guide v2.1.0](#)

[cloudSwXtch User Guide v2.1.1](#)

[cloudSwXtch User Guide v2.1.2](#)

[cloudSwXtch User Guide v2.3.2](#)

[cloudSwXtch User Guide v3.0.0](#)

[cloudSwXtch User Guide v3.1.0](#)

[cloudSwXtch User Guide v3.2.0](#)

[cloudSwXtch User Guide v3.2.1](#)

## Quotas

### cloudSwXtch

All bandwidth and packet per second values are aggregate values (i.e ingress + egress) unless otherwise noted.

Name	Default Value	Configurable
Multicast Packet Size	Up to 3750	Yes
Endpoint Connections	Unlimited	NA
Max Throughput per cloudSwXtch	Up to 100 Gb/s	No
Max Bandwidth per flow	Up to 15 Gb/s	No
Max Packets per second per cloudSwXtch	Up to 10M	No
Max cloudSwXtch instances per mesh	32	No
Max Bridge instances per cloudSwXtch	4	No
Max fanout outputs per cloudSwXtch	1000	No

### cloudSwXtch Sizing

#### cloudSwXtch Multicast (Marketplace)

# Endpoints	Bandwidth	Core	Memory	Hard Drive
10 (max)	100 Mbps (max)	8	16GB DDR	64GB SSD

#### cloudSwXtch BYOL (Marketplace)

# Endpoints	Bandwidth	Core	Memory	Hard Drive
Up to 100	2 Gb/s (max)	16+	16GB DDR	64GB SSD
Up to 200	More than 2Gb/s	64+	16GB DDR	64GB SSD

### xNIC

Name	Default Value	Configurable
Multicast Packet Size	Up to 3750	Yes
Multicast Groups	Unlimited	NA
Max cloudSwXtch Connections	4	No
Max Bandwidth	Up to 15 Gb/s	Yes

