

Distech Controls IP Networking Guide

User Guide

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CHAPTER 1

Introduction

There are two main approaches to network separation:

- A completely air-gapped Operational Technology (OT) network. This means it has its own Internet access, firewalls, gateway, authentication server. It may even be managed by a different entity.
- A standalone OT network connected to the corporate/IT network through a firewall.

Optigo Networks and Distech Controls recommend separated, air-gapped networks for OT and IT networks. This will ensure optimal performance and security for your HVAC integration.

Although we recommend air-gapped separation, the network can still be managed or connected through a controlled path (VPN, router, and firewall) to the corporate/IT network.

CHAPTER 2

Choosing Edge Switches

- Optigo Networks offers different types of edge switches, ranging from four port with no PoE to 48 port with PoE plus.
- Your decision will likely be based on cost, size, number of ports needed, and specific characteristics such as PoE and temperature requirements.

Edge Switch Models:

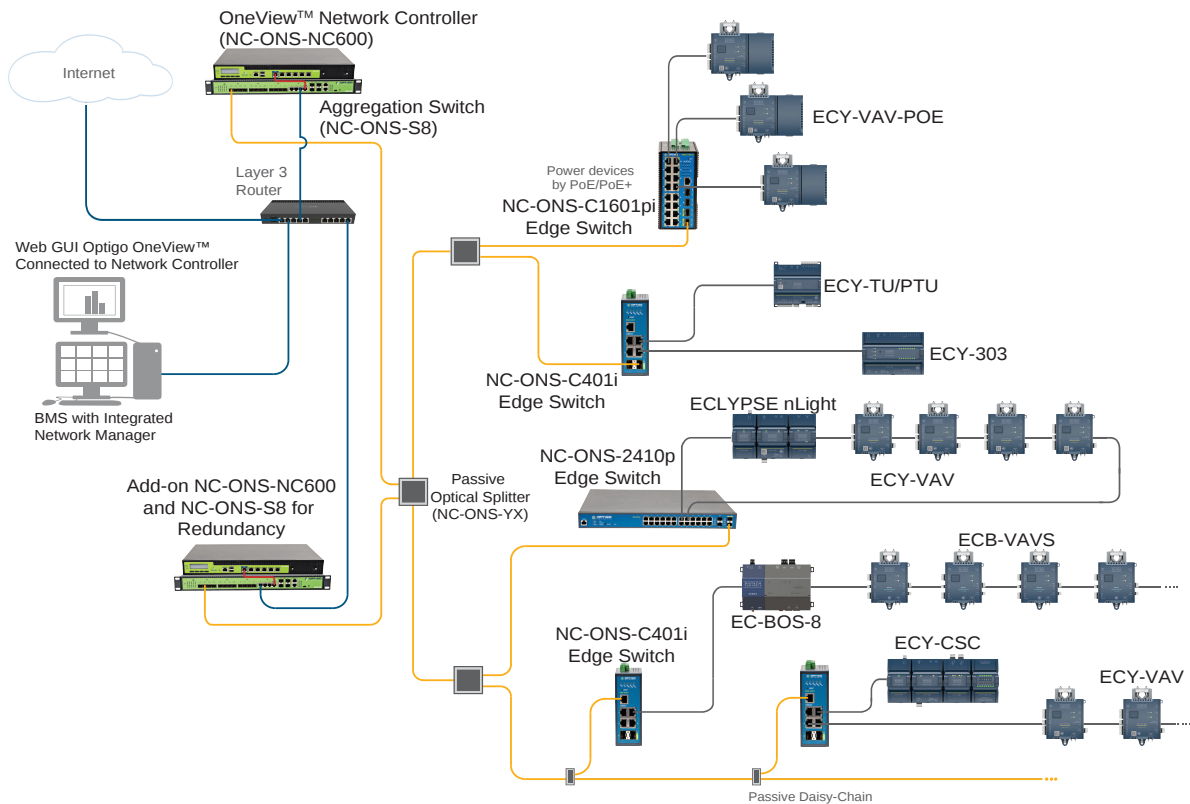
- **NC-ONS-C401i**
 - 4-port, small form-factor, industrial temperature rated, wall and DIN mountable Edge Switch.
- **NC-ONS-C810p**
 - 8-port, 1RU rack mountable Edge Switch with PoE.
- **NC-ONS-C801pi**
 - 8-port, PoE+, industrial temperature rated, small form, DIN mountable Edge Switch.
- **NC-ONS-C1601pi**
 - 16-port, PoE+, industrial temperature rated, small form, DIN mountable Edge Switch.
- **NC-ONS-C2410p**
 - 24-port, PoE+, 1RU rack mountable Edge Switch.
- **NC-ONS-C4801p**
 - 48-port, PoE+, 1RU rack mountable Edge Switch.



PoE devices require one port for each device. When choosing your Edge Switch, keep in mind that the number of ports on a PoE enabled switch must be equal to or greater than the number of PoE devices you require.

CHAPTER 3

Example of a Separated Network with Redundancy



CHAPTER 4

Subnets / VLANs

- We recommend separating services by VLAN and IP subnet, otherwise known as a network. VLANs allow networks and devices that must be kept separate to share the same physical cabling without interacting. This improves simplicity, security, traffic management, and economy. By separating different services, such as HVAC and security, each service can be independently managed by their respective professional service.
- The size of these networks depends greatly on the amount of broadcast traffic used by the connected devices of the service. If in doubt, we recommend keeping these networks to no more than 250 devices; which is a standard 24-bit mask subnet. Bigger networks are fine, but the performance — including ARP packets, BACnet Who-Is, and unconfirmed COV — can be affected.
- In no case should a network connect more than 500 devices without clear IT expertise.
- One way to think about networks is: Where is the majority of communication happening? We might want to connect the HVAC system from multiple buildings together because it is simpler. However, if the communication is mostly within a building or even within a floor, then it may make sense to contain that portion into a single subnet or VLAN network.
- Communication between different networks (subnets or VLANs) can be done several ways, however, in all cases, the supervisory device being used must be correctly configured to see all required VLAN's on the network.
 - Networks (Aggregation switch, PC, internet, VLANs) can be connected to a dedicated Layer 3 Router. Using this option to allow communication between multiple VLANs requires that the IP address for each VLAN with a different subnet be entered into a router table for the Layer 3 Router to pass traffic. If using the Layer 3 Router with the router management license provided by Optigo, all VLAN routing is easily done using OneView. This is the recommended option for continuous and uninterrupted cross-communication between VLANs.
 - Networks also can be routed through a supervisor such as EC-Net. However, VLAN cross-communication is only possible while the computer running the supervisor is on. If ever the computer fails, cross-communication will cease.
 - BBMD may be used for cross-subnet communications, but it requires a more extensive setup process.

CHAPTER 5

IT Network

- In IT, we recommend one port, one device. That is largely because it is more secure, and easier to manage.
- Particularly in HVAC, we want to be able to connect multiple devices in a chain to reduce the amount of cabling and IT network requirements.
- Remember: single-ended chains (chains that are only connected on one end) are vulnerable to failures. Any physical break in wiring will result in communication to cease downstream. To counter that, some manufacturers provide the ability to do a loop, which is a chain connected on both ends. This allows all the devices in the chain to communicate, even if there is a break. To make this work, however, a switch must support Spanning Tree Protocol (STP, RSTP, MSTP). All offered Optigo Edge switches support Spanning Tree Protocol. In the case where a controller may lose power and there is no physical break in wiring, all Distech Controls ECLYPSE controllers (except for the ECY-S1000) are equipped with a relay which will allow information to continue to pass through.
- It is our recommendation to keep these chains as short as possible. We recommend 25 devices on a daisy-chain (maximum 50), or a maximum of 25 devices when using Spanning Tree Protocol.
- Switches and routers that support Spanning Tree Protocol (IEEE 802.1D certified) are able to detect and eliminate a loop from being formed on the network by disabling any port on the switch that is causing a loop. Such switches can be used to enhance network availability by allowing you to create a ring network of controllers that is resistant to a single point network failure (a cut wire for example). In this scenario, non-PoE controllers are connected in a loop (or ring) such that the last controller is connected back to the switch / router. Under normal operation, the switch / router disables one of the ports to prevent a packet storm. This is shown in the following figures.

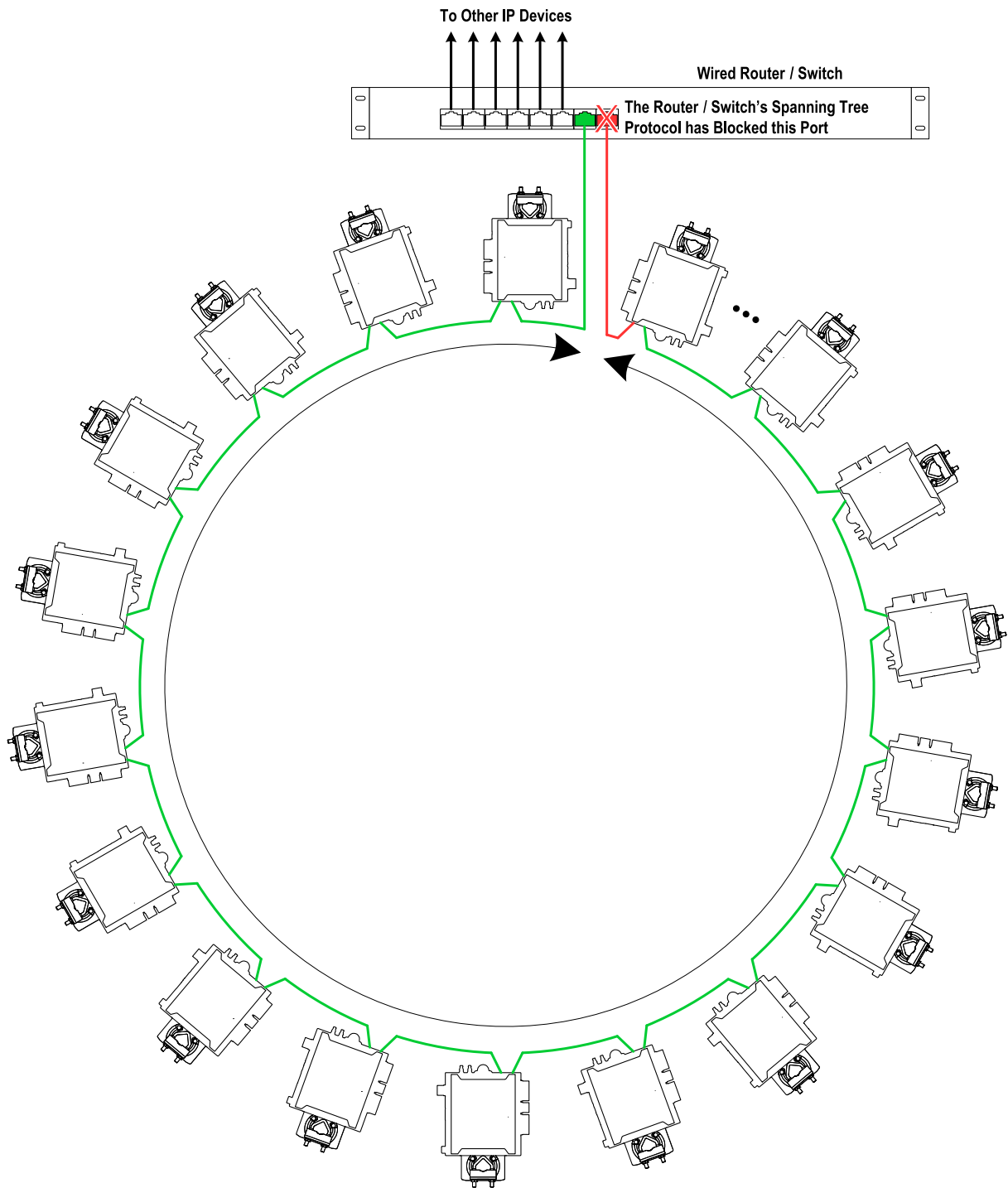


Figure 1: Spanning Tree Protocol – Normal Operation

When a network wire is cut, the ring is split into two – the switch / router automatically enables the port to maintain service. This is shown below.

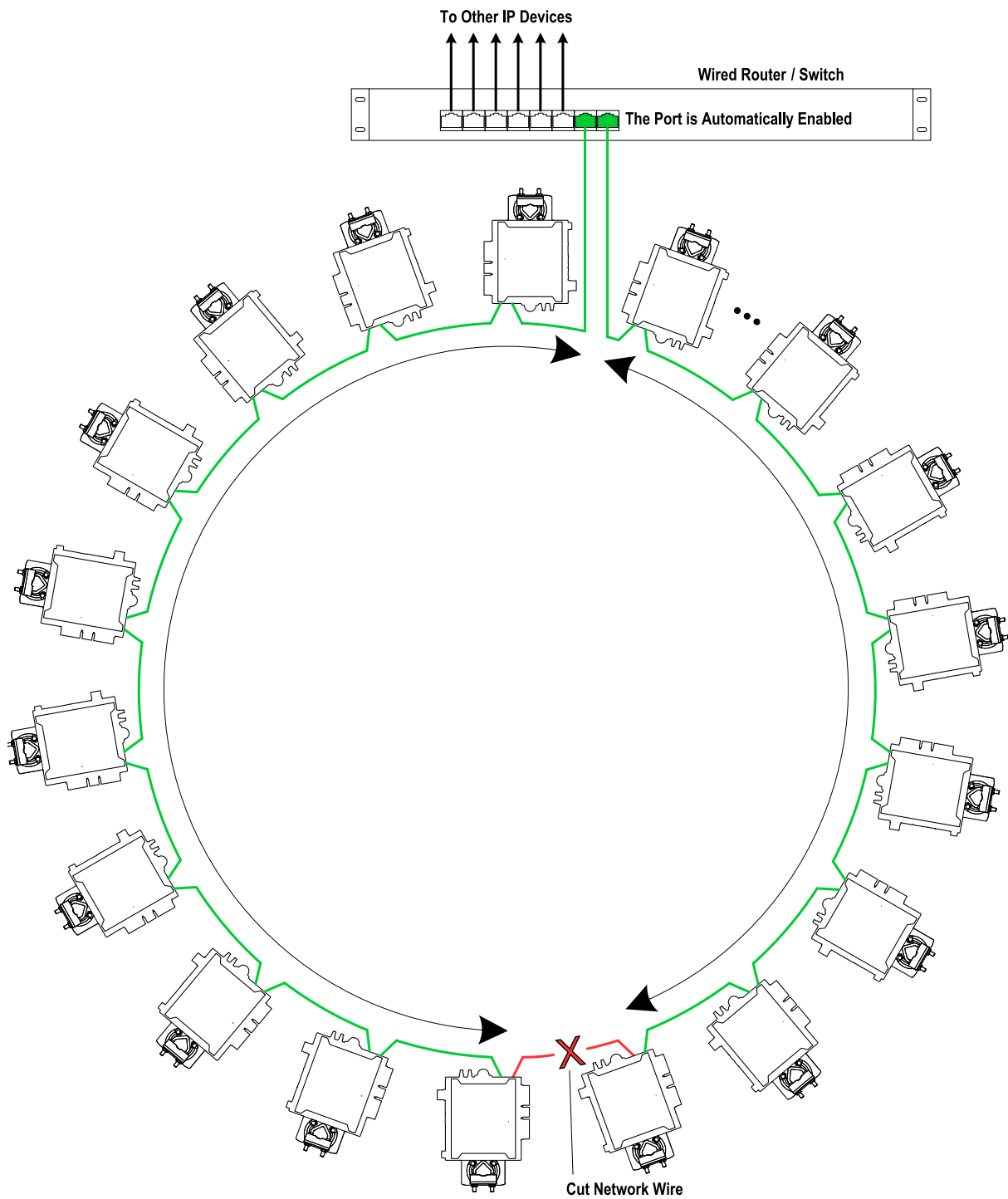


Figure 2: Spanning Tree Protocol – Failover Operation

CHAPTER 6

About Edge Switches

Several features are standard on all Optigo Edge Switches and should be kept in mind when designing and managing your network.

Default IP Addresses

All Optigo Edge Switches have the same factory assigned default IP address.

Small Building Network

- If using only one NC-ONS-C401i or NC-ONS-C810p Edge Switch, and an aggregation switch is **NOT** being used:
 - Port management is done through the last port on the Edge Switch (VLAN 4093) directly with a PC.

Small to Medium Sized Hybrid Networks

- If using only an NC-ONS-NC600 with one or more Edge Switches:
 - The OneView Management system auto assigns a unique IP address to all Optigo Edge Switches it finds.

Medium to Large Sized Fiber Networks

- If using several Edge Switches, an NC-ONS-S8 and NC-ONS-NC600:
 - The OneView Management system auto assigns a unique IP address to all Optigo Edge Switches it finds.
 - If using a redundant system (fibre only), both NC-ONS-S8 aggregation switches have the ability to synchronize Edge Switch IP and port settings through the OneView Management system.

CHAPTER 7

Controller Wiring Recommendations

Distech Controls Fail-Safe Ethernet

To support fail-safe Ethernet, the onboard switch on the ECY-VAV model, ECY-303 models and ECY-PTU models, have a bypass capability that links inbound and outbound network segments together when there is a disruption (controller or transformer failure, for example). Under normal operating conditions, the onboard switch regenerates the electrical signal when it forwards the IP packet to the next device to a maximum of 100 m (328 ft).

Maximum Wiring Lengths

When there is a failure and the switch is being bypassed, the network segments on both sides of the controller are directly connected, however, the same length limit applies. This means that the total maximum Cat 5e cable length between one functional switch and the next functional switch cannot exceed 100 m (328 ft). Therefore, during installation, it is recommended that the cable length between controllers be no more than 50m (164 ft) so that if ever one device fails, the total cable length between both working devices is less than 100 m (328 ft) as shown in the following diagram.

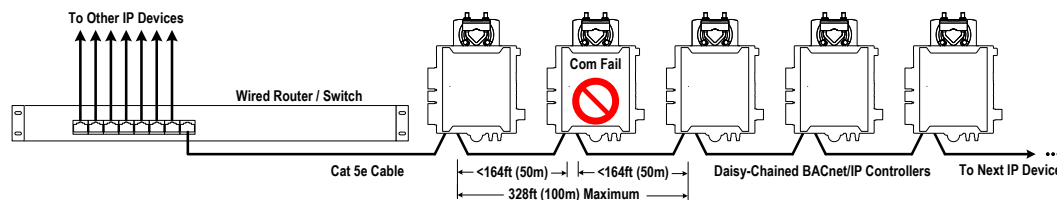


Figure 3: Wired Network Connection: Daisy-Chained ECY-VAV / ECY-303 / ECY-PTU Controllers with Fail-Safe Ethernet Support

Keep in mind that if there are consecutive controller failures, it is possible that the 100 m (328 ft) limit between working controllers is exceeded, and communication will cease. In this case, precaution must be taken with regards to maximum wiring length between controllers based on the number of potential consecutive controller failures. The wiring lengths should be respected in order for the network to continue functioning adequately in case of controller or transformer failure.

The maximum wiring lengths also take into consideration power wiring lengths. There should be no more than five controllers per 100 VA transformer. If there are extra loads on a controller (Allure UNI-TOUCH or Allure EC-Smart-Vue, for example), the maximum number of controllers per transformer may be less than five. Please see the [ECLYPSE User Guide](#) for more information on transformer selection and determining the maximum power run length.

Shown below are two scenarios showing maximum wiring lengths for 25 controllers (maximum ECY controllers wired in a loop), and 50 controllers (maximum ECY controllers on a straight daisy-chain) with no external loads.

Number of acceptable device failures of consecutive ECY controllers while still maintaining a fully functioning network	Total max wire length including the Switch					
	25 Controllers in a Loop		50 Controllers in a Daisy-Chain		Max wire length between two devices	
	Meters	Feet	Meters	Feet	Meters	Feet
1	1300	4264	2550	8364	50	164
2	867	2843	1700	5576	33	109
3	650	2132	1275	4182	25	82
4	520	1706	1020	3346	20	66
5	433	1421	850	2788	17	55
6	371	1218	729	2390	14	47
7	325	1066	638	2091	13	41
8	289	948	567	1859	11	36
9	260	853	510	1673	10	33
10	236	775	464	1521	9	30
11	217	711	425	1394	8	27
12	200	656	392	1287	8	25
13	186	609	364	1195	7	23
14	173	569	340	1115	7	22
15	163	533	319	1046	6	21
16	153	502	300	984	6	19
17	144	474	283	929	6	18
18	137	449	268	880	5	17
19	130	426	255	836	5	16
20	124	406	243	797	5	16
21	118	388	232	760	5	15
22	113	371	222	727	4	14
23	108	355	213	697	4	14
24	104	341	204	669	4	13

Table 1: Maximum wiring lengths for ECY controllers

EXAMPLE with five potential controller failures while maintaining communication

If the building specification permits a potential scenario where five (5) device failures are acceptable, then based on the table above:

- maximum wiring length between any two consecutive devices can be no more than 17 meters (55 ft)

WITH EITHER

-25 controllers in a loop with a total maximum length of 433 meters (1421 ft) **OR**

-50 controllers in a daisy-chain total with a total maximum length of 850 meters (2788 ft)

If your architecture is specified outside of these two scenarios, maximum wiring lengths can be calculated as follows. Keep in mind that a daisy-chain can have a maximum of 50 controllers, and a loop can have a maximum of 25 controllers.

$(a/(b+1)) * (c+1)$ = Total maximum wiring length

$(a/(b+1))$ = Maximum length between two controllers

Where:

a = 100m or 328ft

b = Number of acceptable consecutive ECY controller failures

c = Total number of ECY controllers (excluding S1000)

CHAPTER 8

Hybrid Topologies

A hybrid topology can consist of different wiring types such as copper Ethernet, single-mode fiber, multi-mode fiber, or mixed cabling and must include an NC-ONS-NC600 Network Controller, and at least one switch to act as an aggregation switch. The Optigo Edge Switches that are supported for use as the aggregation switch in a hybrid system (i.e. the very first switch after the NC-ONS-NC600) are:

- ☐ NC-ONS-C401i
- ☐ NC-ONS-C801pi
- ☐ NC-ONS-C810p
- ☐ NC-ONS-C2401p

After this first Edge / Aggregation Switch, any switch model may be used in the system.

The correct transceiver plug-in (SFP) must be used for each wiring type and the number of Edge Switches should be limited to 20.



IP network traffic must be carefully considered when designing a network that includes BACnet IP devices. Contact Technical Support if your network requires more than 50 ECY devices.

Daisy Chain

Connecting one device at a time along a line. This topology is very good for minimizing the amount of cabling and space required. This is the recommended topology.

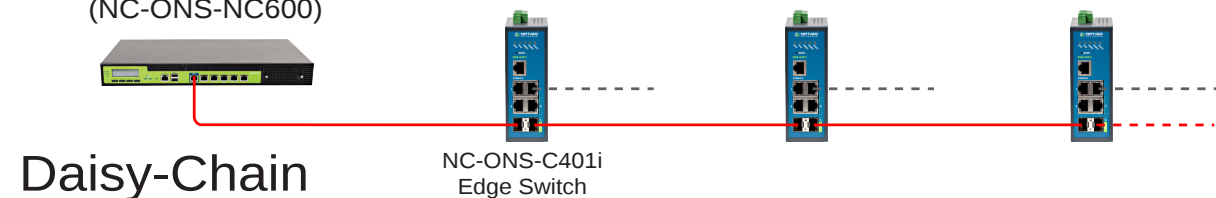
We recommend connecting the servers through a core switch that connects directly to ports on the Optigo aggregation switch.

OneView™ Network Controller
(NC-ONS-NC600)



Daisy-Chain

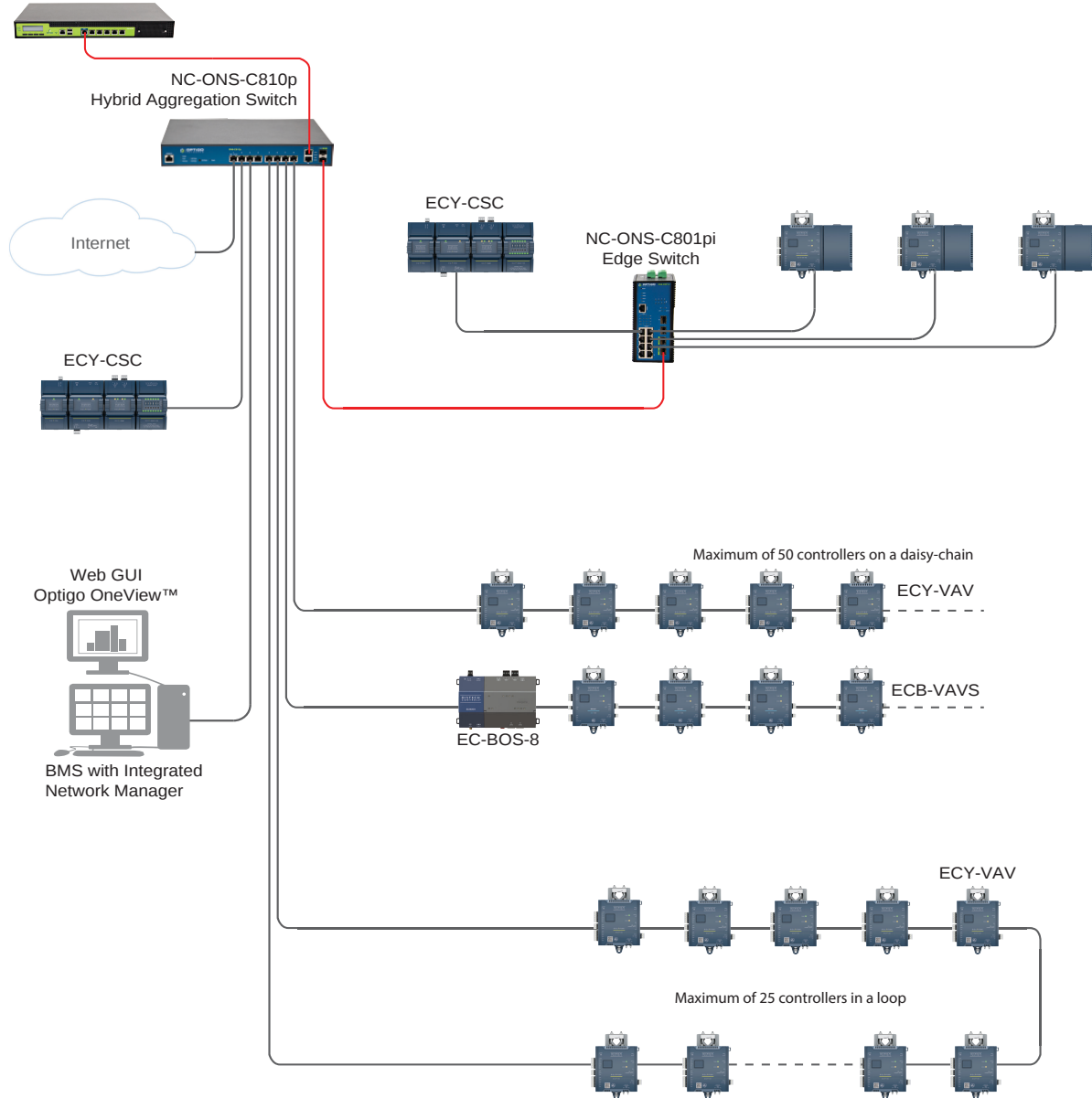
NC-ONS-C401i
Edge Switch



Small Building Hybrid Network

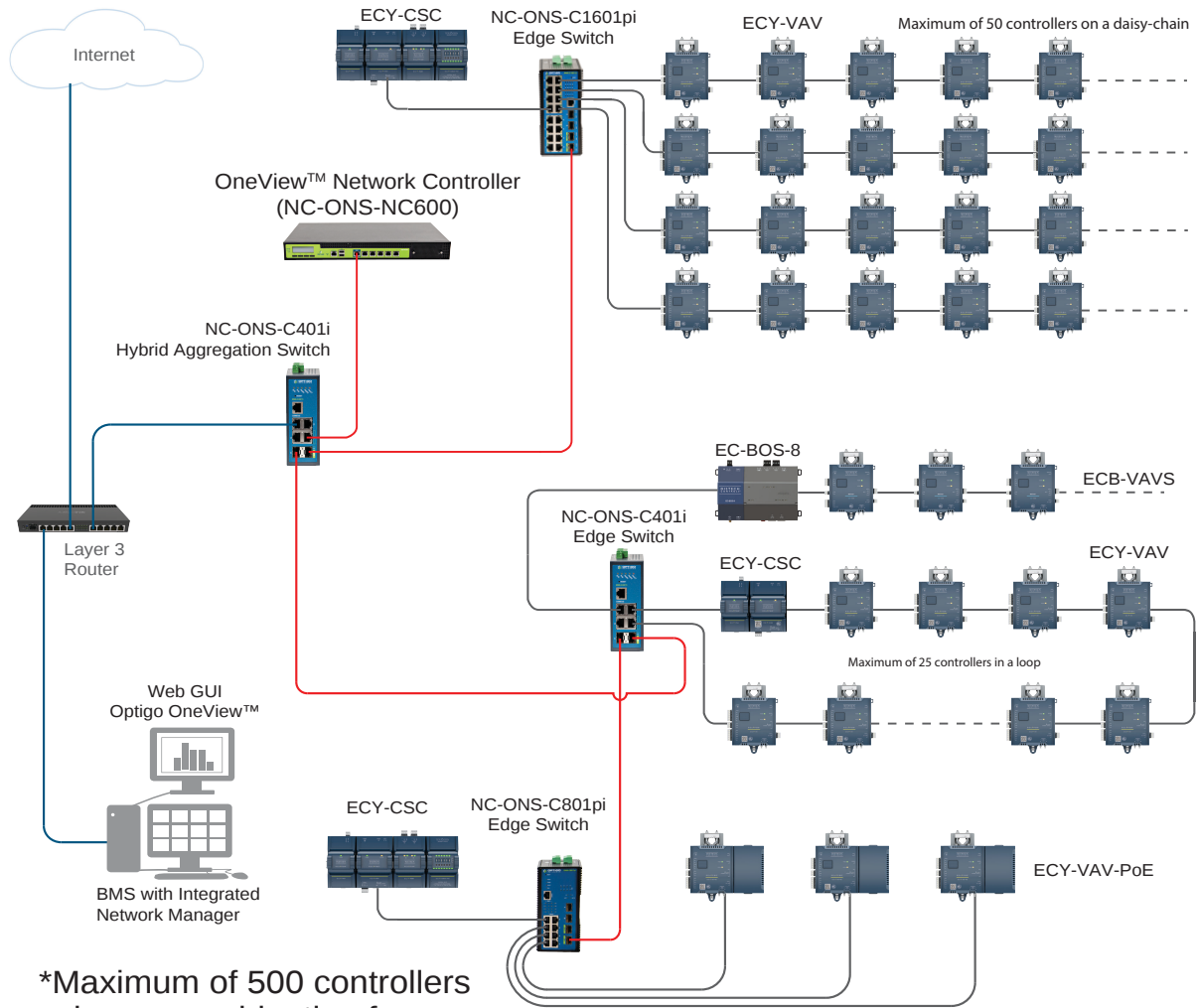
A small building network can consist of up to 50 devices and may use an NC-ONS-NC600 and at least one Optigo Edge Switch with a minimum of two ports being used.

OneView™ Network Controller
(NC-ONS-NC600)



Medium Building Hybrid Network

A medium building network may consist of up to 500 devices and use a recommended minimum of 20 ports.



*Maximum of 500 controllers in any combination for a medium building network

CHAPTER 9

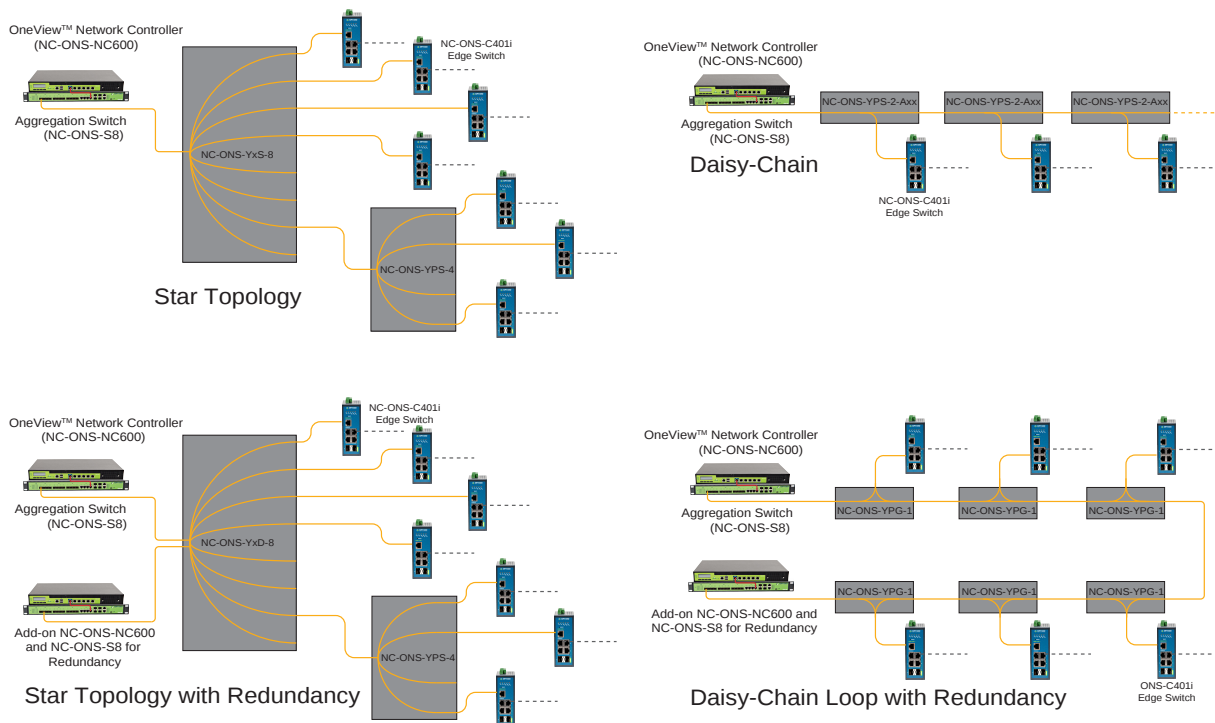
Single-Mode Fiber Topologies

A single-mode fiber topology uses single-mode fiber only and must include both an NC-ONS-S8 Aggregation Switch and an NC-ONS-NC600 Network Controller. These topologies can be made into redundant systems and should consist of more than 20 Edge Switches.

There are three major fiber topologies:

1. **Star:** one input with multiple outputs. These can be stacked, as a star connecting to another star. These topologies are very popular in scenarios such as connecting multiple buildings such as a campus, or in a shopping center going into multiple wings.
2. **Daisy Chain:** connecting one device at a time along a line. This one is very good for minimizing the amount of cabling and space required. This scenario is often used in high-rise buildings. A daisy chain connected on one end is very susceptible to failures, however.
3. **Redundancy** can be added to both Star and Daisy Chain topologies. Star redundancy is two inputs to multiple outputs. Daisy chain redundancy turns into a loop.

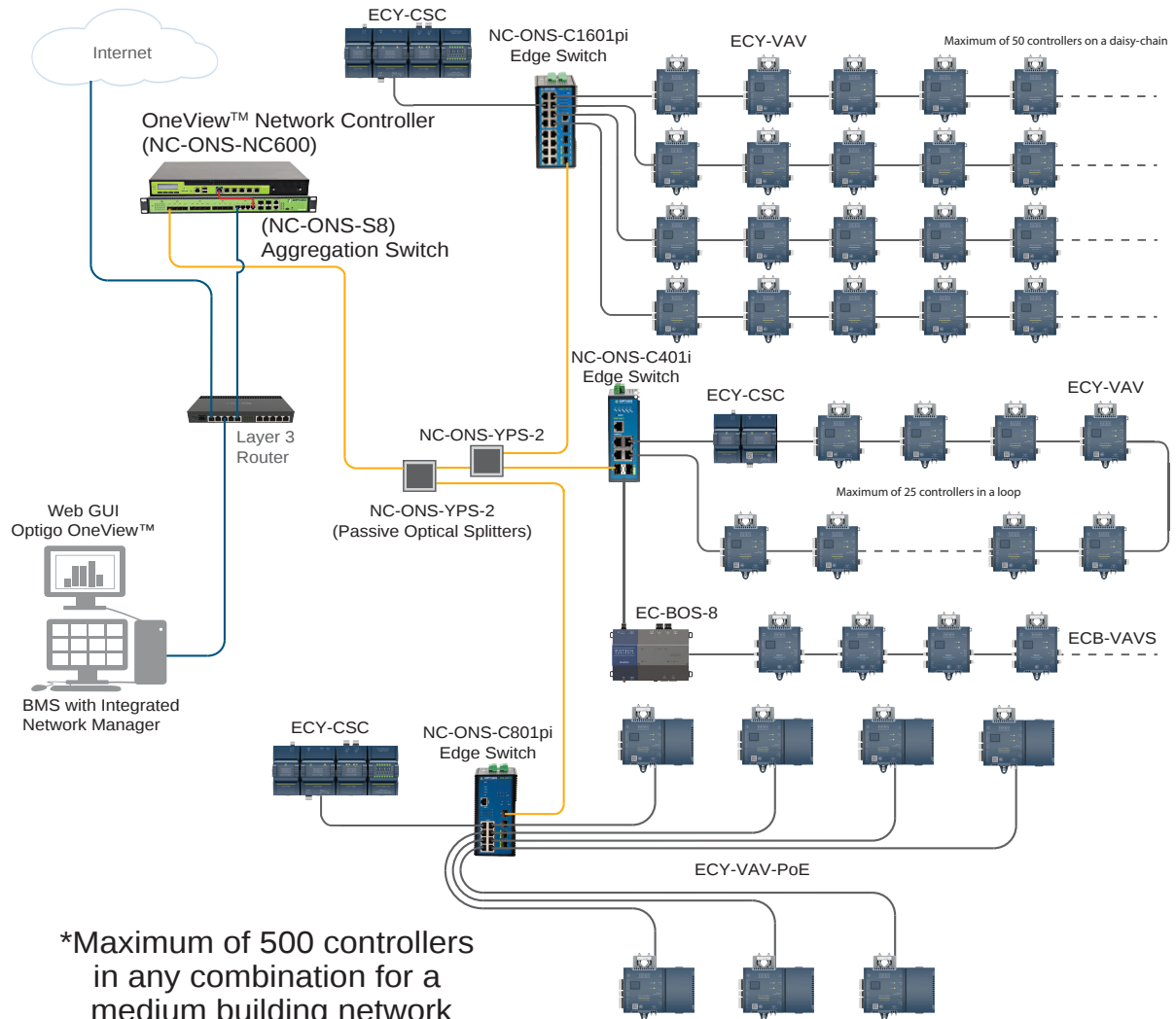
We recommend connecting the servers through a core switch that connects directly to ports on the Optigo aggregation switch.



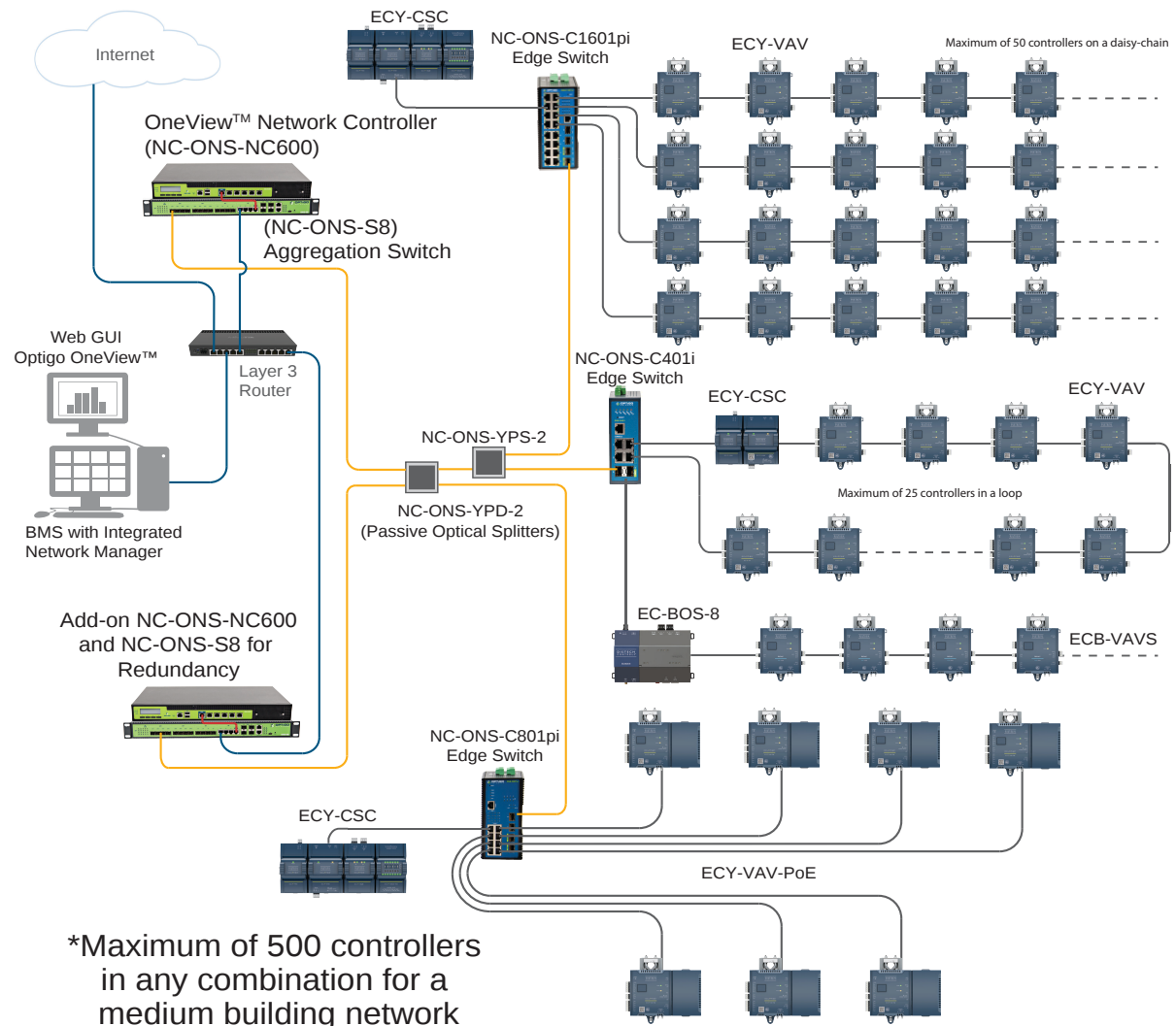
Medium Building Fiber Network

A medium building network may consist of up to 500 devices and use a minimum recommended 20 ports.

Medium Building Network Example



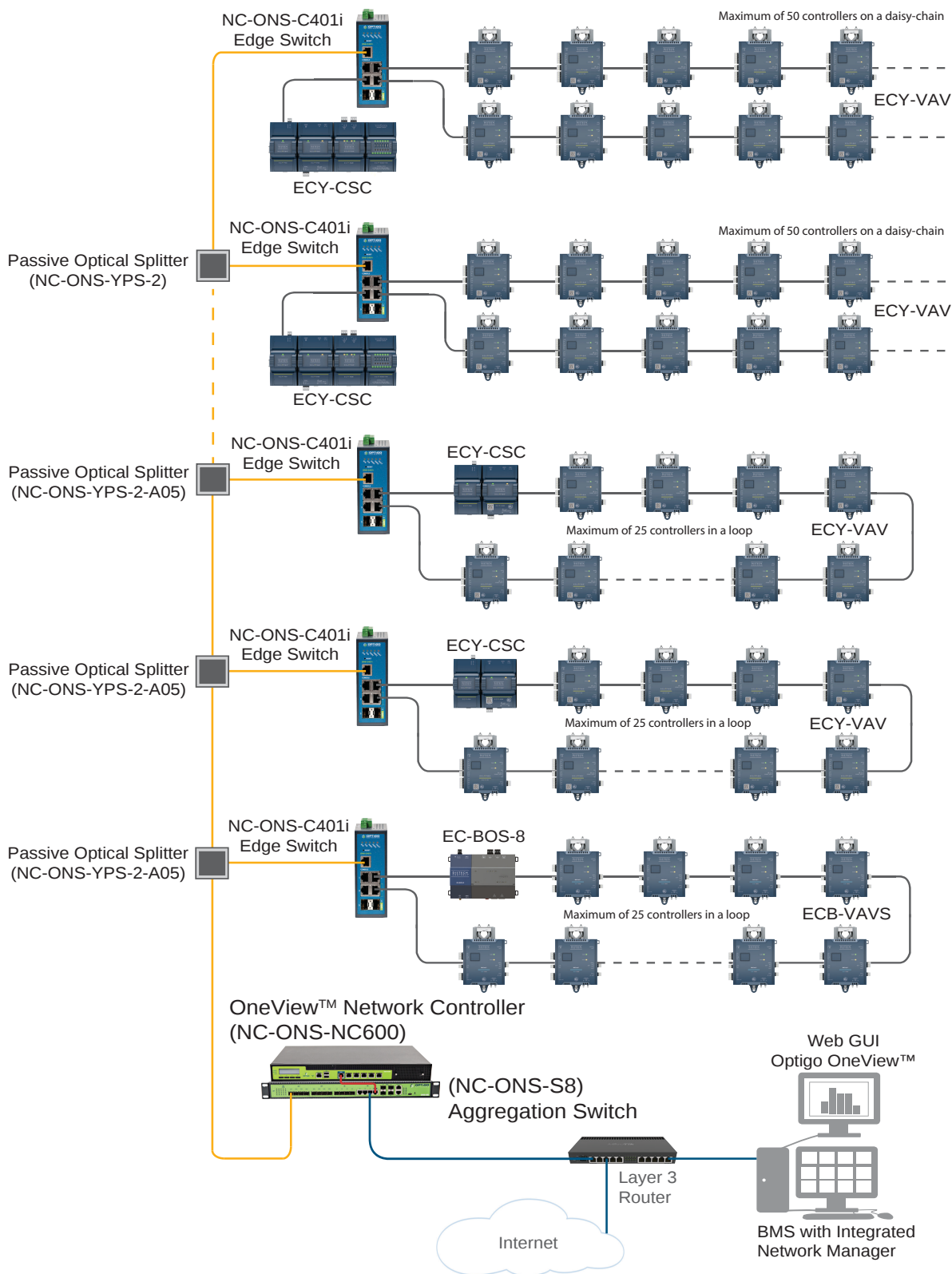
Medium Building Network with Redundancy Example



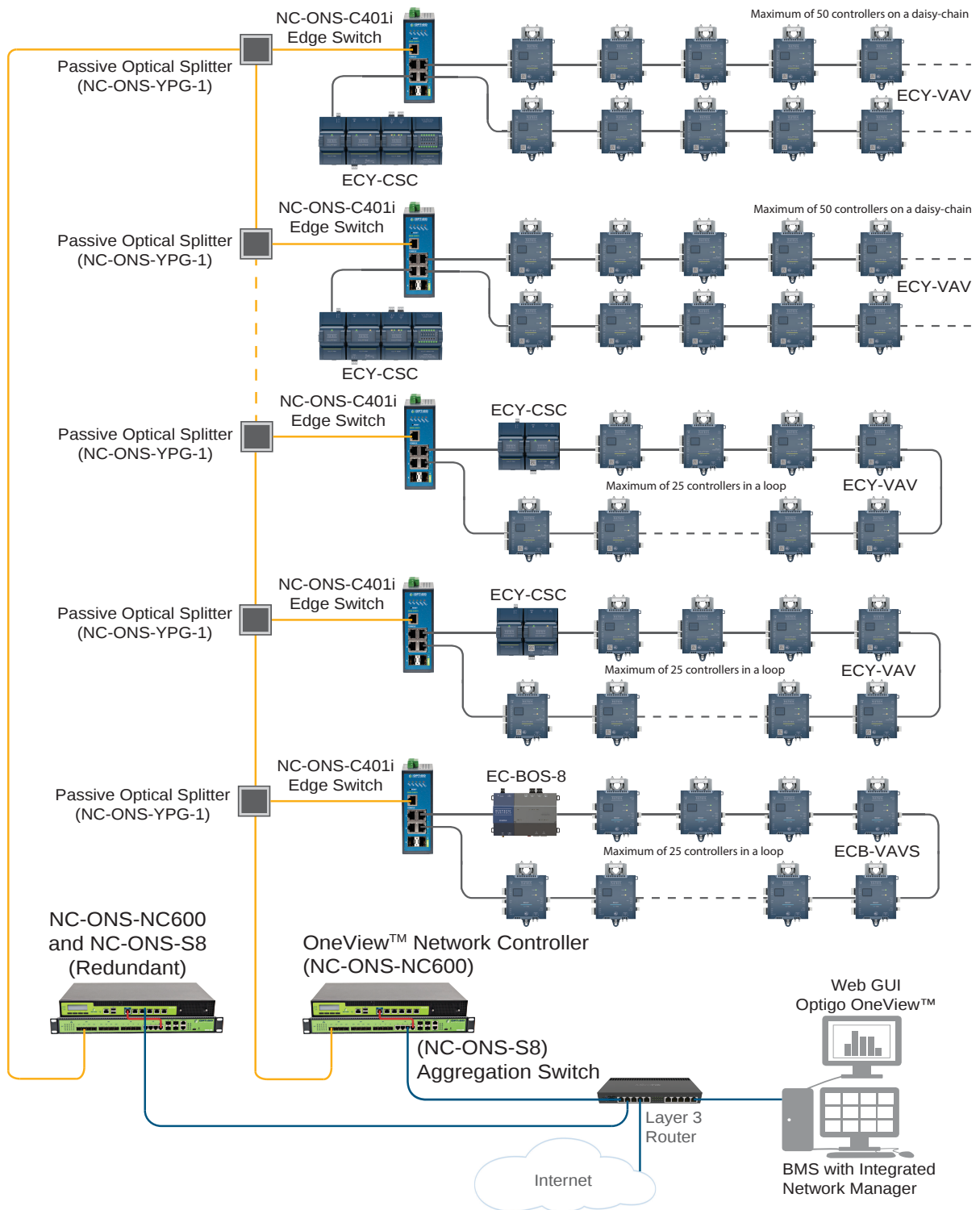
Large Building Fiber Network

A large building network can consist of 500 or more devices. Technical Support should be contacted for help to correctly set up a network of this size.

Large Building Network Example



Large Building Network with Redundancy Example



Fiber Requirements

Only single-mode fiber is acceptable for use with Optigo networked systems that include both an NC-ONS-S8 Aggregation Switch and an NC-ONS-NC600 Network Controller.

Either OS1 or OS2 grade fiber is acceptable. The fiber must have an internal diameter of 9 microns, an external diameter of 125 microns and must be terminated with SC/UPC connectors.

Only a single strand of fiber is required for each fiber run. Pairs are not required since Optigo uses separate wavelengths of light to enable bidirectional traffic on a single fiber.

Insertion losses must be less than 0.3 dB / termination plus 1.0 dB / km.

Maximum Optical Budget of fiber insertion loss is -30 dB for any path from Aggregation Switch to Edge Switch. Optigo recommends designing for -26 dB. Insertion loss for Optigo branded passive optical splitters can vary based on the type of splitter required for the application.

Optigo equipment requires a minimum insertion loss of -13 dB to ensure reliable information transfer. If this minimum cannot be reached due to the smaller size of an installation, an attenuator can be used to reach this minimum.

For larger installations, a “light” budget must be followed during the planning of the installation to be sure that insertion loss does not exceed the recommended -26 dB. If the number of splitters required on a single fiber run results in the -26 dB maximum being exceeded, an additional laser and fiber run should be considered.

About Fiber Splitters

Different fiber splitters are required for different situations. For example, the splitter needed for a daisy-chain topology is not the same splitter needed for a loop. In addition, insertion loss is also not the same for each splitter.

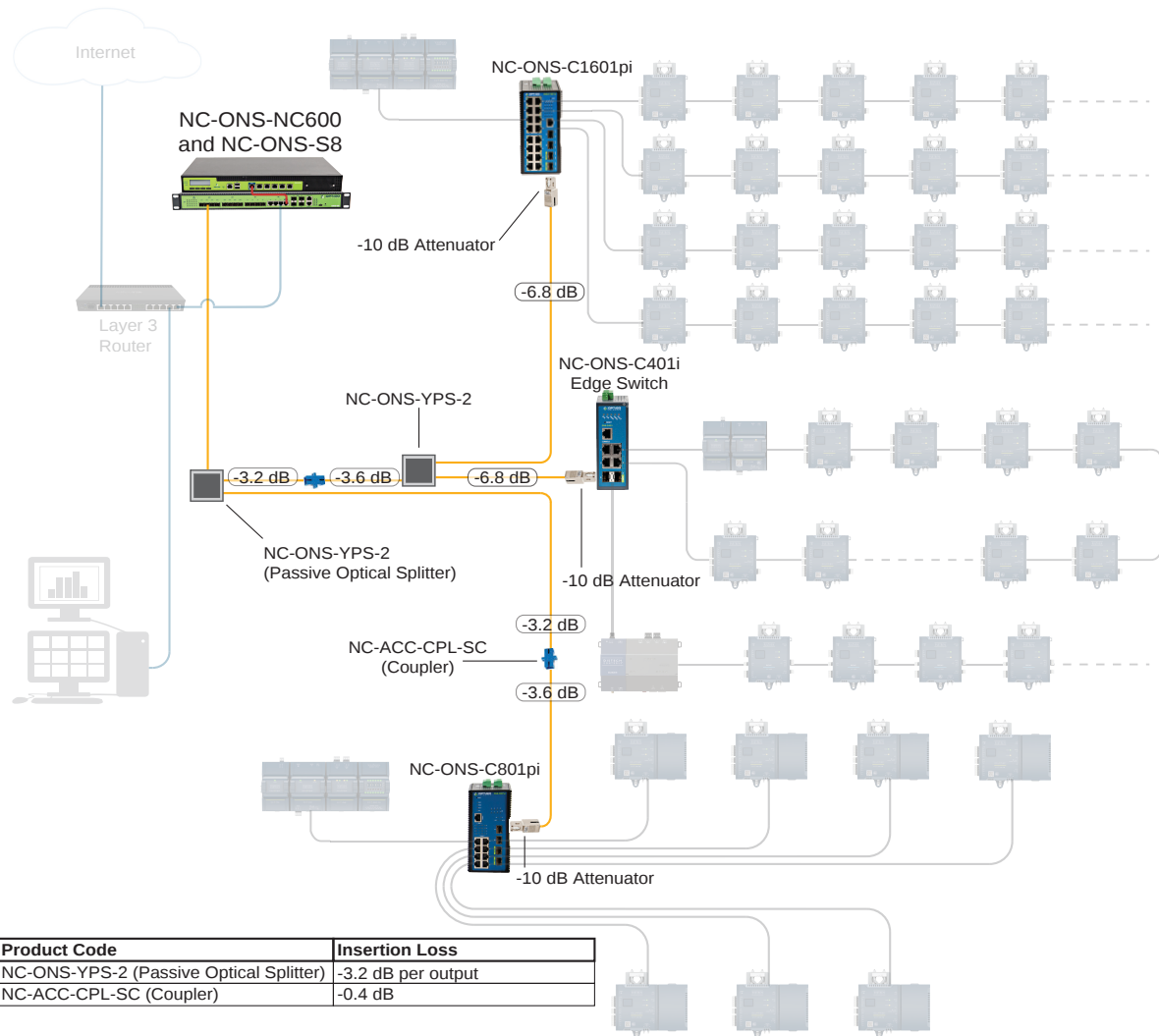
In some installations, couplers may also be required when lengths between splitters is so long that a patch cable is necessary. Each coupler has an insertion loss of -0.4 dB.

If the total insertion loss does not reach -13 dB when it reaches an Edge Switch, a light attenuator is required.

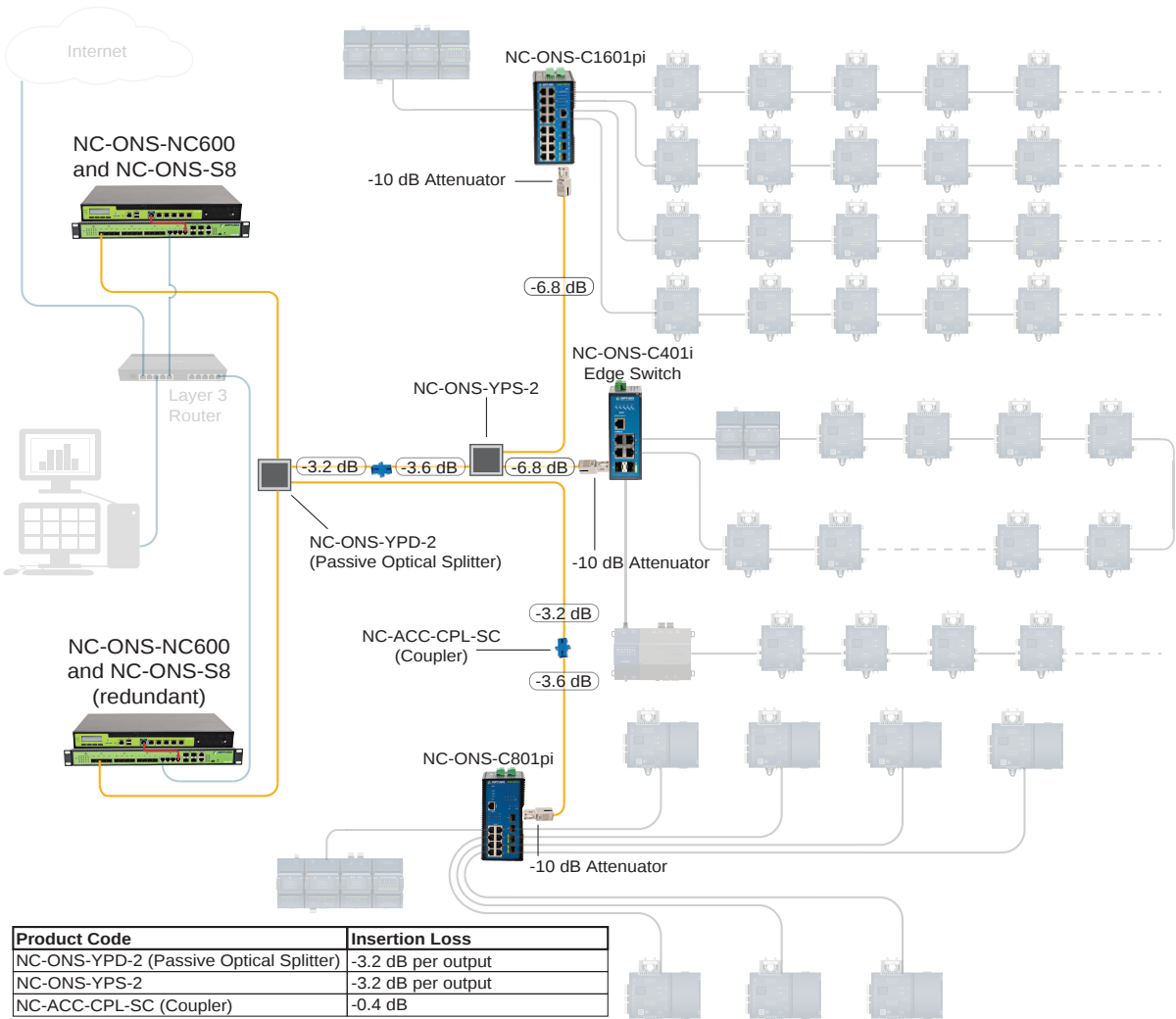
These factors must be taken into account when designing your network.

Medium Building Fiber Attenuation

Insertion Loss for a Medium Building Network Example

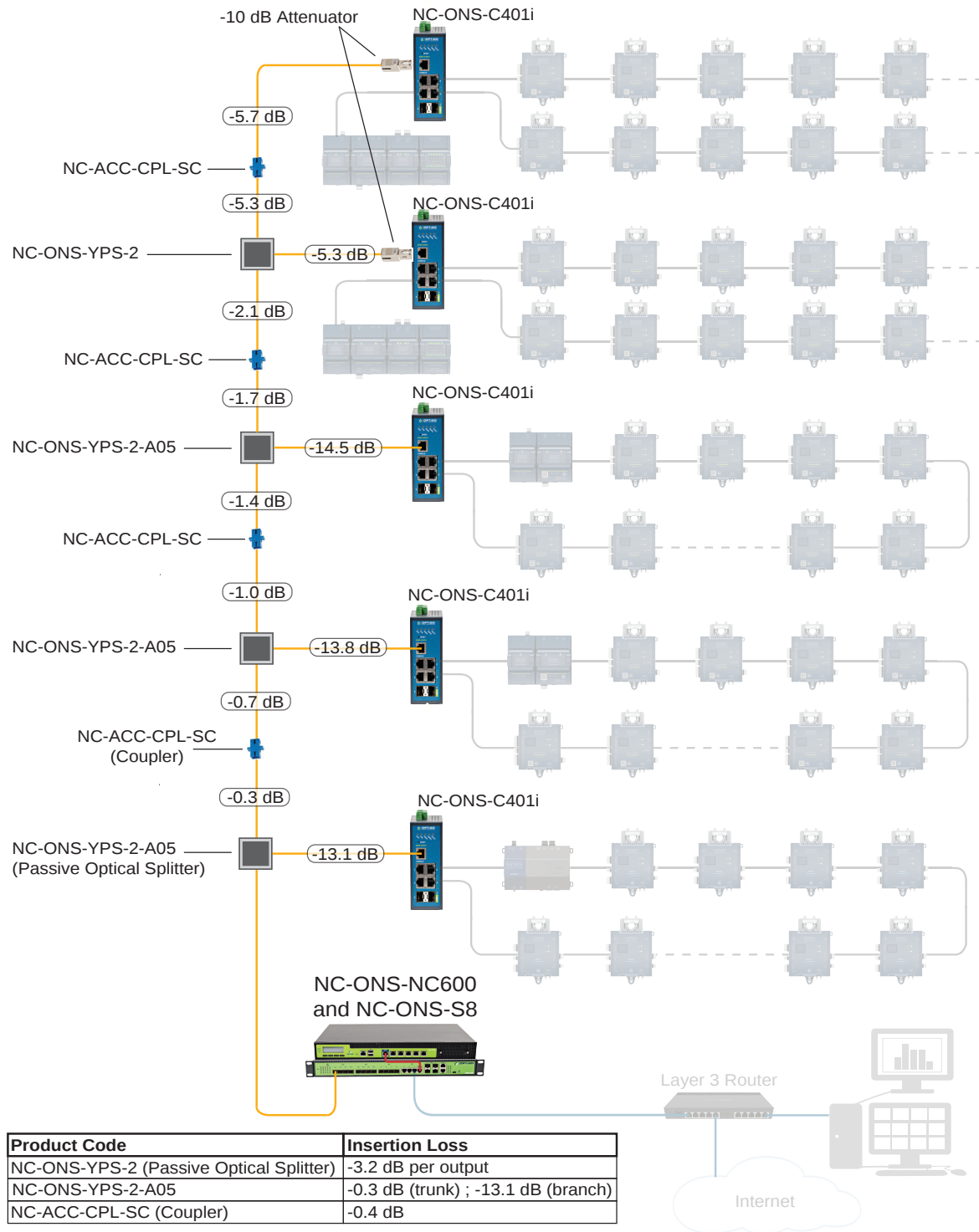


Insertion Loss for a Medium Building Network with Redundancy Example

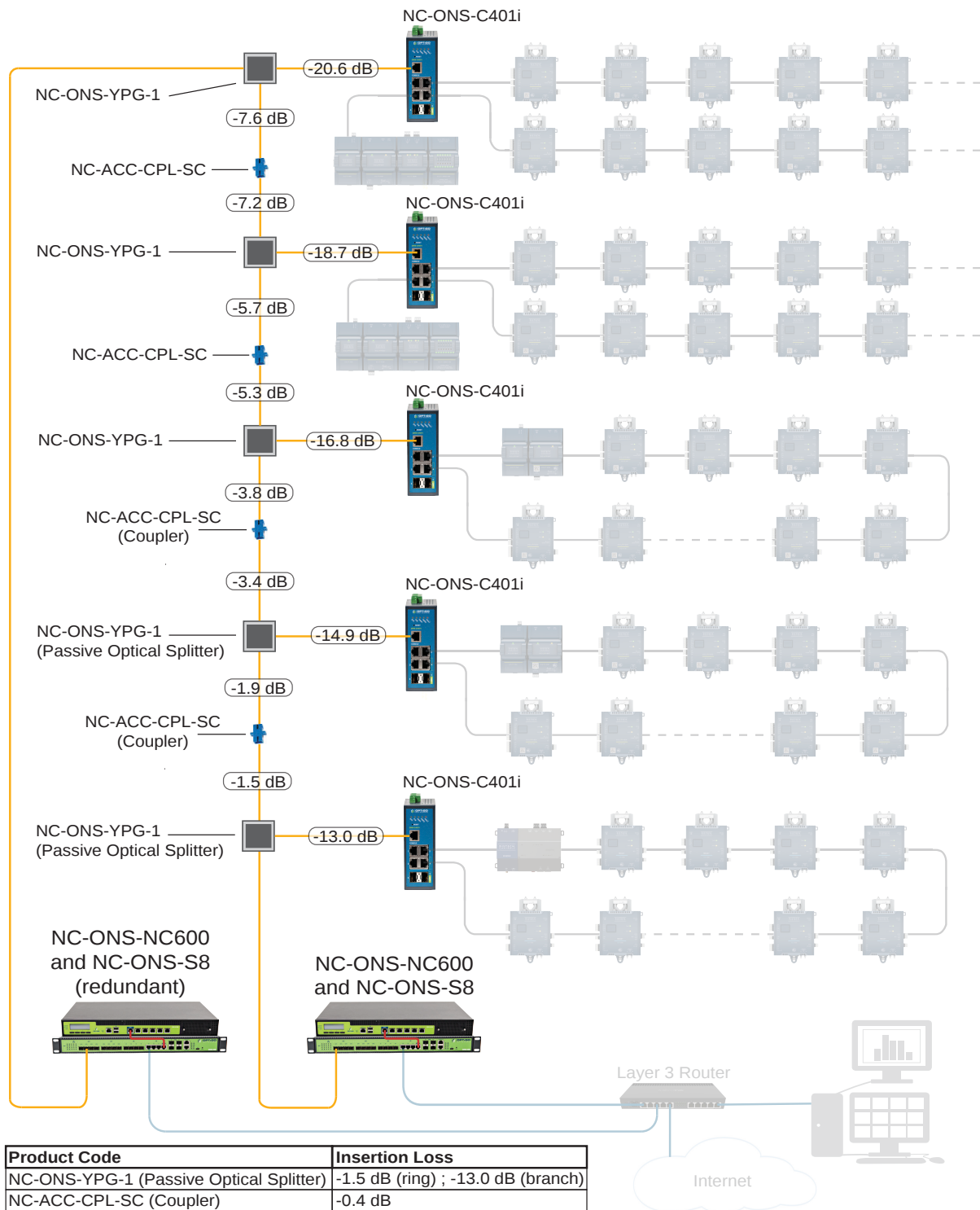


Large Building Fiber Attenuation

Insertion Loss for a Large Building Network Example



Insertion Loss for a Large Building Network with Redundancy Example



CHAPTER 10

Installing and Setting Up the NC-ONS-S8 and NC-ONS-NC600

Required accessories for installation:

- ☐ NC-ONS-S8 (Network Controller)
- ☐ NC-ONS-NC600 (Aggregation Switch)
- ☐ Edge Switch(es)
- ☐ Power cords (1 for the NC-ONS-NC600, 2 for the NC-ONS-S8, 1 per Edge Switch)
- ☐ Ethernet cables
- ☐ NC-ONS-SX-SFP(s) (one for each fiber connection to the NC-ONS-S8)
- ☐ NC-ONS-CX-SFP(s) (one for each fiber connection to an Edge Switch)
- ☐ Passive Optical Network (PON) Splitter(s)
- ☐ Fiber cleaner
- ☐ Access to Internet (optional)
- ☐ Google Chrome web browser

NC-ONS-NC600 and NC-ONS-S8

The NC-ONS-NC600 is intended to be mounted in a server rack directly above the NC-ONS-S8, which is how it is depicted in this document. However, if cable routing requirements on the NC-ONS-S8 make this inconvenient, you can mount the NC-ONS-NC600 below the NC-ONS-S8 or even a few rack spaces away. We do recommend that you keep them in the same rack though, if practical.

Edge Switches and Fiber

Ideally, before configuring your single-mode fiber network with Optigo's OneView software, all Edge Switches (e.g. NC-ONS-C2401p, NC-ONS-C810p, etc) should be installed in their intended locations and powered up, but with no OT devices (e.g. VAV controllers, cameras, etc) connected to them.

The fiber network (fiber cables, splitters, and couplers) should be installed and connected to all of the Edge Switches via NC-ONS-CX-SFP's plugged into the Edge Switches' OPT ports.



- ☐ Until instructed to do so, do not connect any fiber cables to the to the NC-ONS-S8's OPT ports.
- ☐ Do not uncap your fiber cables until you are ready to use them.
- ☐ Ensure that you plug the correct SFP into the correct device.
 - The NC-ONS-SX-SFP only connects to OPT ports (OPT 1 - OPT 8) on the front of the NC-ONS-S8.
 - The NC-ONS-CX-SFP only connects to OPT ports on Edge Switches (e.g. NC-ONS-C2401p, NC-ONS-C810p, etc).

NC-ONS-S8 and NC-ONS-NC600 Connections

Ethernet Cables

Using a short ethernet cable, connect the NC-ONS-S8 to the NC-ONS-NC600 through each of their respective MGMT ports. Then, using another ethernet cable, connect your computer to port **D6** on the NC-ONS-S8 no other network connections. This is the computer that will be used for the initial set-up of your NC-ONS-S8 system.



Power Cables

With its two red power switches in the ON position (see photo below), connect both of the ONS-S8's included AC power cables to the AC power inputs on the back.

Then immediately connect the ONS-NC600's included AC power cable to its rear AC power input.

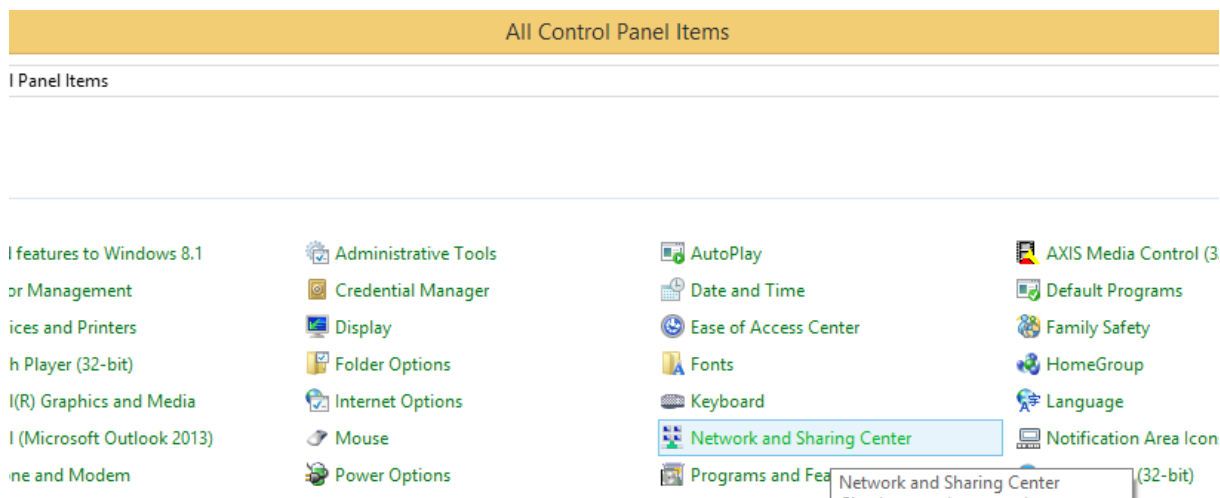


You may have to press the NC-ONS-NC600's black power switch on the back of the unit the first time it is plugged in

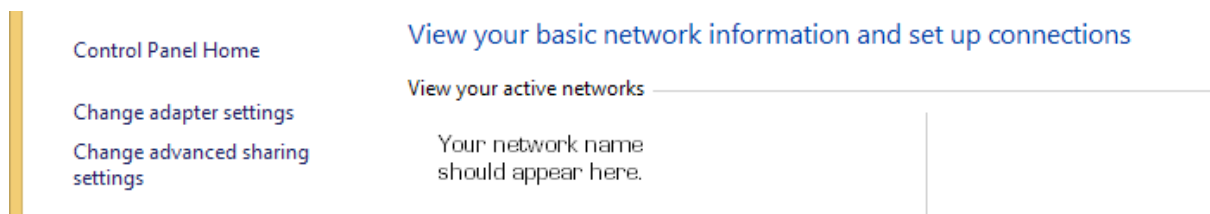


Configuring PC Network Settings

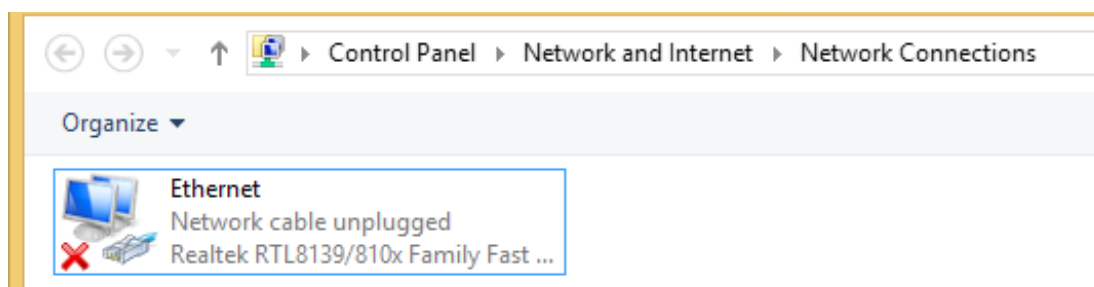
1. On your Windows computer, access the **Control Panel** and select **Network and Sharing Center**.



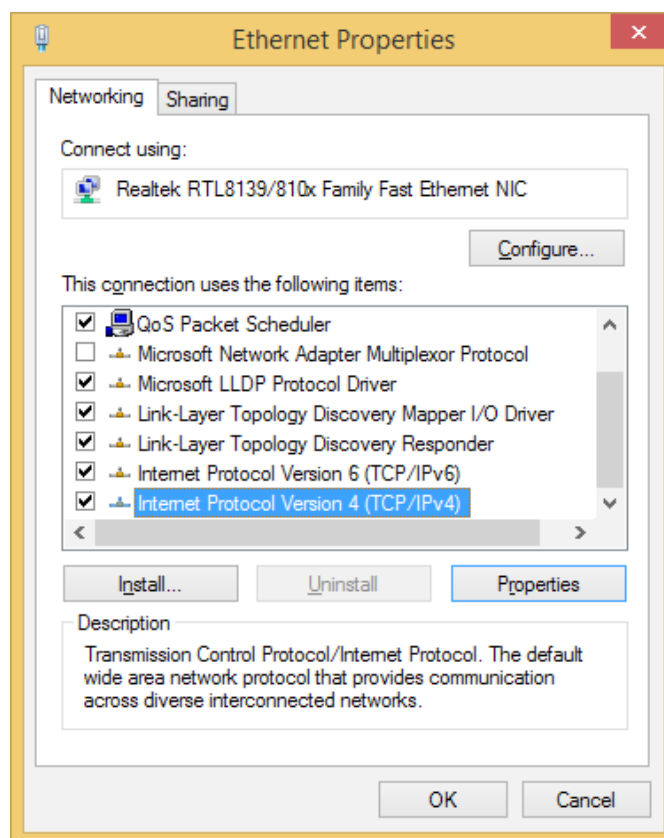
2. Select **Change Adapter Settings**.



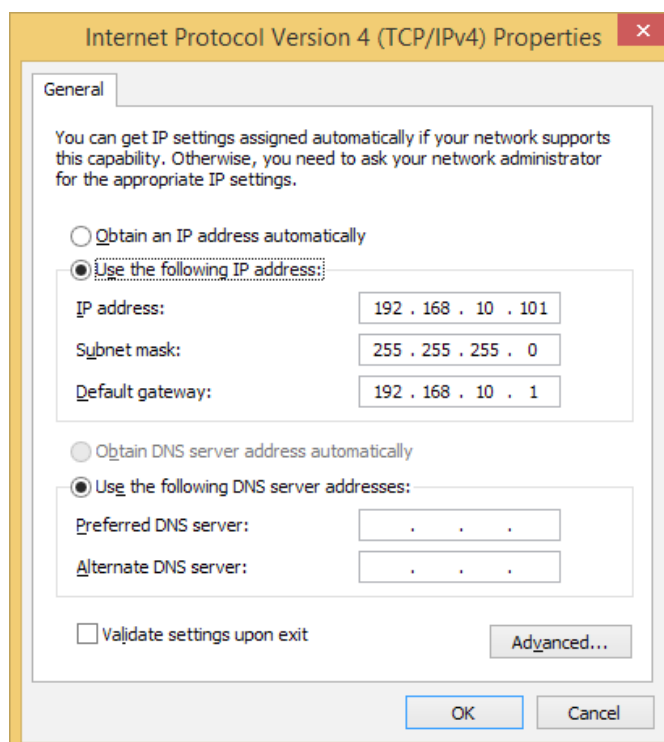
3. Click on the **Ethernet** option.



4. Select **IPv4**, and then click on **Properties**.



5. Input the provided IP Address, Subnet Mask and Default Gateway. Click **OK** when you are ready to proceed.



Logging into Optigo OneView™

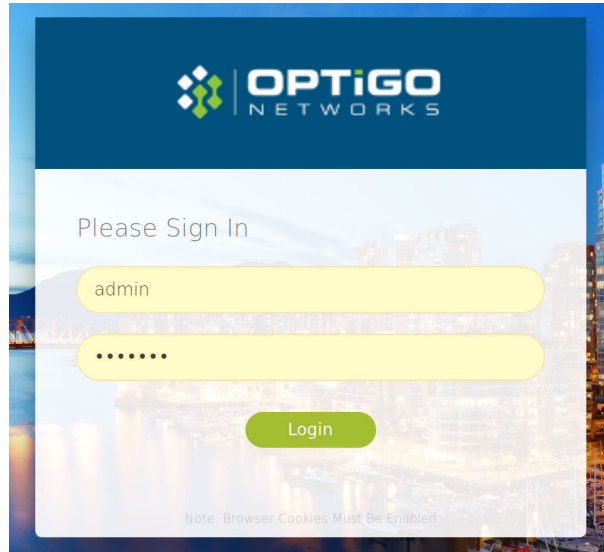
Now you will be able to login to the Optigo OneView graphical user interface (GUI).

1. Enter the default management IP address, **192.168.10.254**, into your Google Chrome web browser.



Only Google's free Chrome web browser is officially supported

2. Use the default username **admin** and password **_admin_**.



3. Click on the menu icon (3 horizontal lines in the top right), select **Settings**, and then go to the **Change Password** section. Enter a hard-to-guess password that only you will remember, and then click **Submit**.



Please remember your new password. If you forget your password, please contact Technical Support.

Setting the Time and Date

Once logged into OneView, navigate to **System > Config** and click the **Edit** button in the Date and Time section to set the correct time.

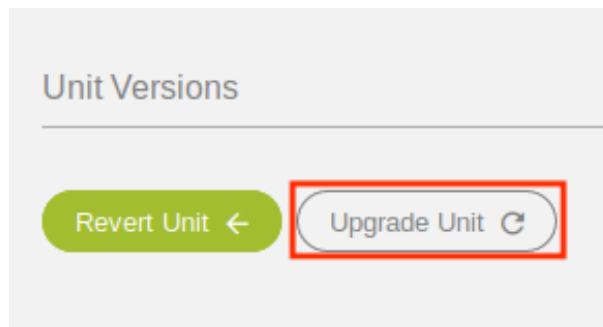
Upgrading to the Latest Software

If you haven't already done so, download the latest [ONS-NC600 software package](#) and put a copy of it on the computer connected to the ONS-S8.

Navigate to **System > Version > Unit Versions**, click the **Upgrade Unit** button, and follow the prompts to complete the software upgrade.



Don't forget to click **'Next'** after the file has been uploaded


here.' At the bottom is a green bar that says 'File Upload Complete!'. At the very bottom are 'Next' and 'Cancel' buttons."/>

Configuring Network Settings and VLAN Management

1. Navigate to the **Ports** page and change the VLAN for port **d7** to a unique value that will *only* be used for OneView management (e.g. 10).

d7	(ETH)		N/A			10
----	---------	---	-----	---	---	----

2. Navigate to **System > Config > Management IP**.
3. Configure the NC-ONS-S8's IP Address, Subnet Mask, and Default Gateway to be compatible with your BMS network or dedicated management PC.
4. Set the VLAN ID to the same value you used for port **D7** (e.g. 10). For added security, we recommended not using common default subnets for your management interface or the devices connected to your Edge Switches (e.g. 192.168.1.x, 192.168.0.x, etc).

Management IP

This management address is accessible from any port that is configured to access this VLAN.

 Careful! If you change your IP Address, make sure you update the URL in your browser to match the one you saved, otherwise you may lose access to the system.

IP Address:

Subnet Mask:

Default Gateway:

Vlan ID:

Save Data

Cancel



The values above are just examples.

5. Save your settings and then connect your BMS network or dedicated management PC to port **D7** on the NC-ONS-S8.



ONLY connect your BMS network or dedicated management computer to a D-port on your ONS-S8, NEVER to an Edge Switch port.



6. Log into OneView™ again using the new management IP address in your Chrome web browser.

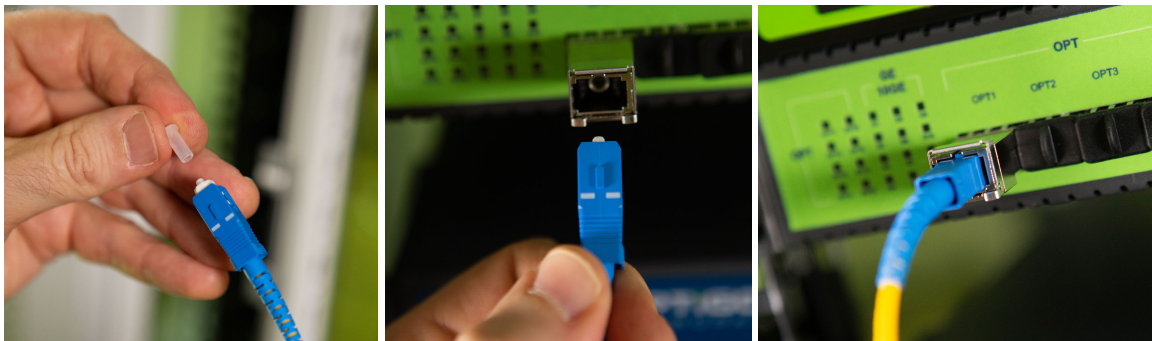
Connecting Fiber

1. Insert an NC-ONS-SX-SFP into each OPT port that will be used on the NC-ONS-S8.



ONLY insert SFP modules into SFP ports if they are going to be connected to something.

2. Confirm that all edge switches have been powered on and are connected to their fiber networks (i.e. fiber cables, splitters, and NC-ONS-CX-SFP's).
3. Uncap a fiber cable and insert it into its correct NC-ONS-SX-SFP on the NC-ONS-S8. Repeat until all fiber cables have been connected.





NEVER plug an ONS-CX-SFP into ANY of the ONS-S8 OPT ports!
ONLY the ONS-SX-SFP is permitted.



Anytime you are using splitters or fiber, only uncap the ends when you are ready to connect to a device. Keep the splitter and fiber ends capped when not in use.



You may need to use an attenuator, to ensure that the light is not too strong for the transceiver. The recommended minimum insertion loss is around 10 dB. The recommended max dBm is around -5. This will prevent saturation.

Ideal Insertion Loss Minimum	13 dB
Ideal Insertion Loss Maximum	26 dB

Registering Edge Switches

1. Navigate to the Edge Switches menu.
2. Confirm that all Edge Switches have been automatically registered.



It may take some time, depending on the number of Edge Switches in your system.

Edge Switches								
Clear Filters				Export		Add +	Upgrade ↑	Refresh
Switch ID	Status	Laser	Connection	Description	Model	MAC Address	Security	Options
c1		OPT 1			ONS-C4801p	D0:D9:4F:51:25:18	48 0 0 0	More →
c2		OPT 2			ONS-C2401p	D0:D9:4F:50:1F:2E	24 0 0 0	More →
c3		OPT 2			ONS-C2401p	D0:D9:4F:50:1B:E5	24 0 0 0	More →
c4		OPT 2			ONS-C2401p	D0:D9:4F:50:1E:46	24 0 0 0	More →
c5		OPT 2			ONS-C2401p	D0:D9:4F:50:19:4A	24 0 0 0	More →
c6		OPT 3			ONS-C2401p	D0:D9:4F:50:19:67	24 0 0 0	More →
c7		OPT 4			ONS-C2401p	D0:D9:4F:50:10:3A	24 0 0 0	More →

CHAPTER 11

Installing and Setting Up a Hybrid Network

Required accessories for installation:

- ☐ NC-ONS-NC600 (Aggregation Switch)
- ☐ Hybrid Aggregation Switch (ONS-C401i, ONS-C801pi, ONS-C810p, or ONS-C2401p)*
- ☐ Edge Switch(es)
- ☐ Power cords (1 for the ONS-NC600, 1 for the Hybrid Aggregation Switch, 1 per Edge Switch)
- ☐ Ethernet cables
- ☐ Hybrid SFPs (e.g. NC-ONS-CU-SFP, 2 per switch, including the Edge Switches and Hybrid Aggregation Switch)
- ☐ Access to Internet (optional)
- ☐ Google Chrome web browser



Hybrid Aggregation Switches are simply Optigo Edge Switches configured as such by OneView

NC-ONS-NC600 and Hybrid Aggregation Switch

The NC-ONS-NC600 is intended to be mounted in a server rack directly above the chosen Hybrid Aggregation Switch (NC-ONS-C401i, NC-ONS-C801pi, NC-ONS-C810p, or NC-ONS-C2401p). However, if cable routing requirements make this inconvenient, you can mount the NC-ONS-NC600 below the Aggregation Switch or even a few rack spaces away. We do recommend that you keep them in the same rack though, if practical.

Edge Switches and Connections

Ideally, before configuring your hybrid system with Optigo's OneView software, install and power up all Edge Switches (e.g. NC-ONS-C2401p, NC-ONS-C810p, etc.) in their intended locations. Do not connect any OT devices (e.g. VAV controllers, cameras, etc.) to them.

All of the Edge Switches should be daisy-chained together via Optigo-approved SFPs (e.g. NC-ONS-CU-SFP), using copper, multimode fiber, or a mix of both. The OPT SFP port of every new switch in the daisy chain should be connected to the OPT-R SFP port of the switch before it, all the way up to the first Edge Switch in the daisy chain.



- ☐ Do not connect any SFPs to the Hybrid Aggregation Switch until specifically instructed to do so.

Aggregation Switch and NC-ONS-NC600 Connections

1. Connect AC Power and turn on the NC-ONS-NC600 and the supported Optigo edge switch that you've chosen to use for your aggregation switch (e.g. NC-ONS-C810p).



You may have to press the NC-ONS-NC600's black power switch on the back of the unit the first time it is plugged in

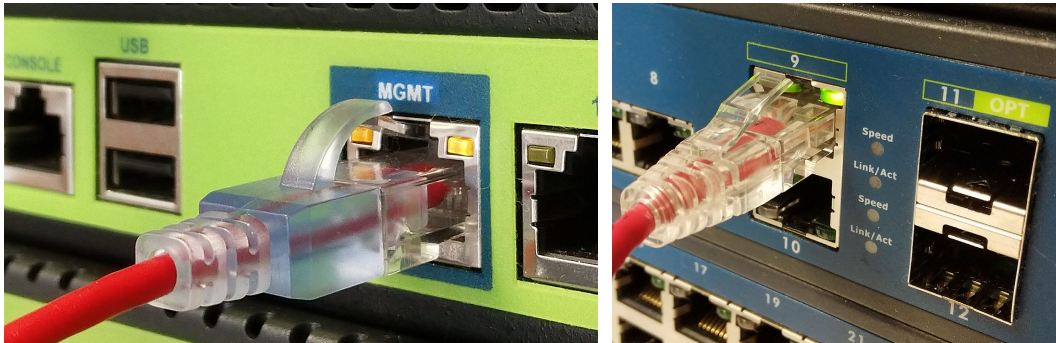


2. Reset the Aggregation Switch to Factory Default Settings by holding the reset button down on your chosen Aggregation Switch until all of the lights flash on.



3. Connect a short Ethernet cable between the port marked 'MGMT' on the NC-ONS-NC600 and the designated management port on your chosen Aggregation Switch (see table below). Refer to Connecting a Hybrid System, which contains connection diagrams for all 4 supported aggregation switches.

Model	Port
NC-ONS-C401i	4
NC-ONS-C801pi	8
NC-ONS-C810p	9
NC-ONS-C2401p	24

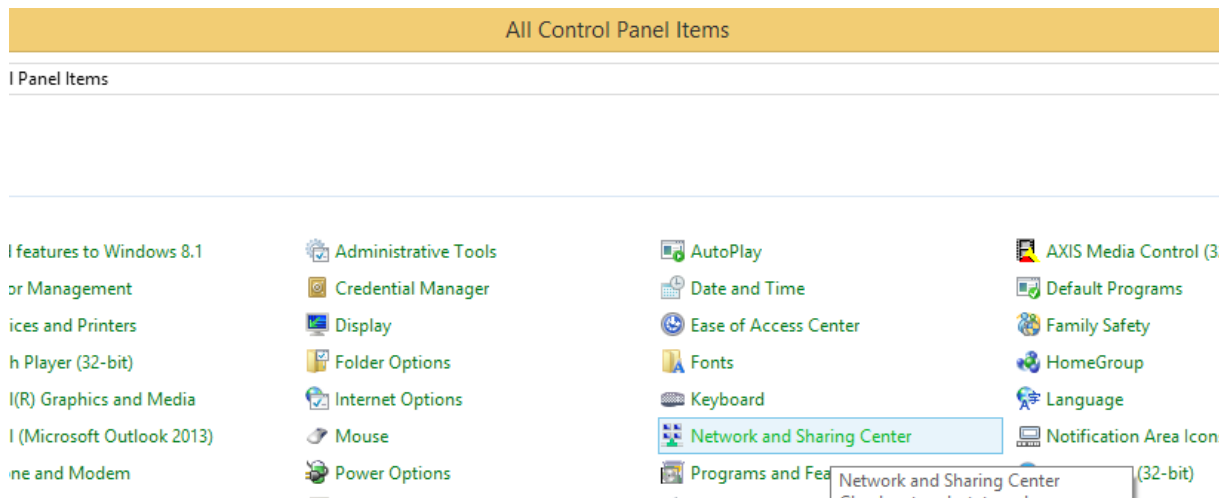


4. Connect a cable from a computer directly to port 1 on your aggregation switch. You will use this computer for initial OneView configuration.

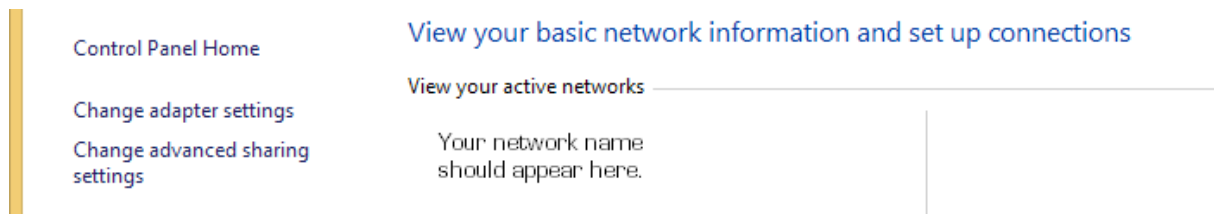


Configuring PC Network Settings

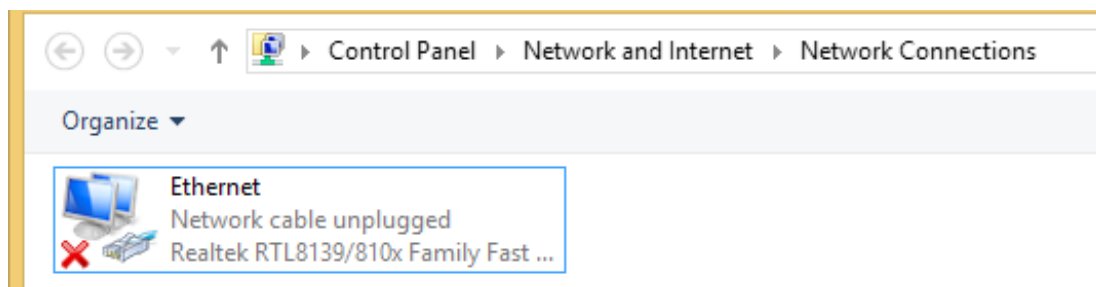
1. On your Windows computer, access the **Control Panel** and select **Network and Sharing Center**.



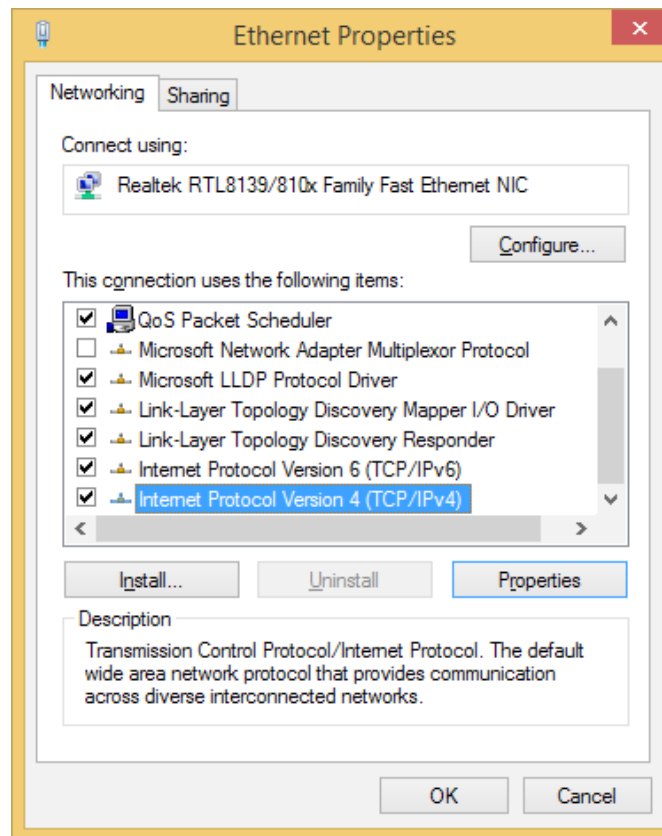
2. Select **Change Adapter Settings**.



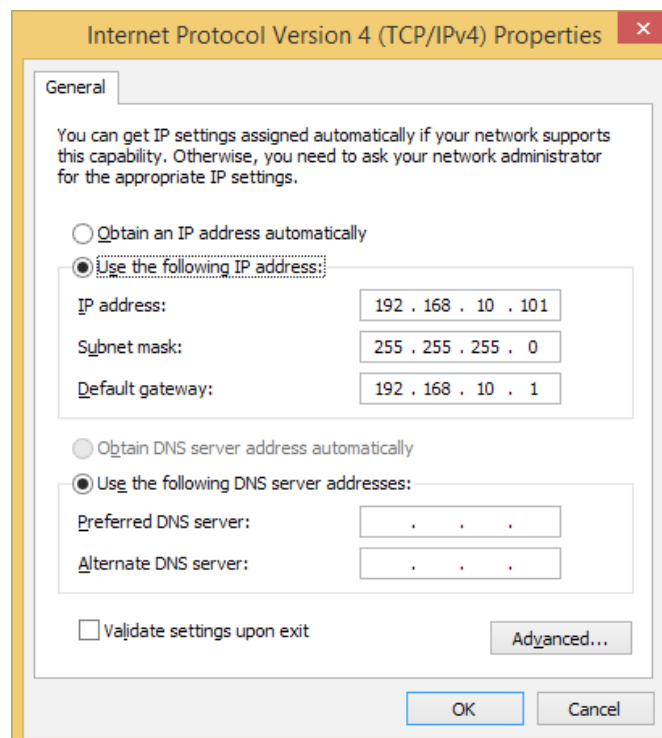
3. Click on the **Ethernet** option.



4. Select **IPv4**, and then click on **Properties**.



5. Input the provided IP Address, Subnet Mask and Default Gateway. Click **OK** when you are ready to proceed.



Logging into Optigo OneView™

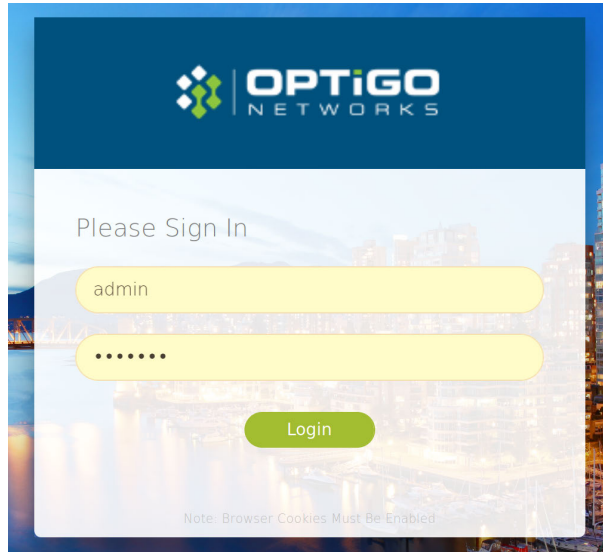
Now you will be able to login to the Optigo OneView graphical user interface (GUI).

1. Enter the default management IP address, **192.168.10.254**, into your Google Chrome web browser.



Only Google's free Chrome web browser is officially supported

2. Use the default username **admin** and password **_admin_**.



3. Click on the menu icon (3 horizontal lines in the top right), select **Settings**, and then go to the **Change Password** section. Enter a hard-to-guess password that only you will remember, and then click **Submit**.



Please remember your new password. If you forget your password, please contact Technical Support.

Change Password

Changing Password for: admin

Current Password:

Current Password

New Password:

New Password

Confirm New Password:

Confirm New Password

Submit

Setting the Time and Date

Once logged into OneView, navigate to **System > Config** and click the **Edit** button in the Date and Time section to set the correct time.

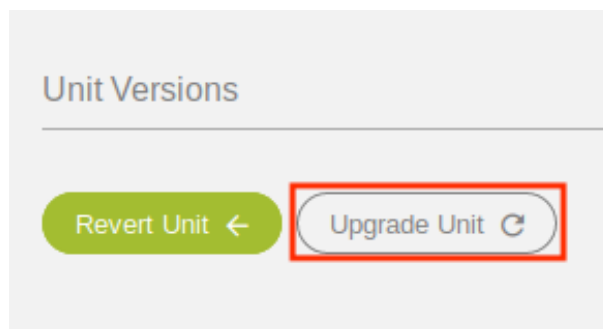
Upgrading to the Latest Software

If you haven't already done so, download the latest [ONS-NC600 software package](#) and put a copy of it on the computer connected to the ONS-S8.

Navigate to **System > Version > Unit Versions**, click the **Upgrade Unit** button, and follow the prompts to complete the software upgrade.



Don't forget to click **'Next'** after the file has been uploaded


here.' At the bottom is a green bar that says 'File Upload Complete!'. At the very bottom are 'Next' and 'Cancel' buttons."/>

Configuring Network Settings and VLAN Management

1. Navigate to the **Ports** page and change the VLAN for port **d2** to a unique value that will *only* be used for OneView management (e.g. 10).

☐	▼ OPTG-HSW					
	d1			1000		1
	d2					10
	d3					1
	d4					1
	d5					1
	d6					1
	d7					1
	d8					1

2. Navigate to **System > Config > Management IP**.
3. Configure the NC-ONS-NC600's IP Address, Subnet Mask, and Default Gateway to be compatible with your BMS network or dedicated management PC.
4. Set the VLAN ID to the same value you used for port **d2** (e.g. 10) in the previous step. For added security, we recommended not using common default subnets for your management interface or the devices connected to your Edge Switches (e.g. 192.168.1.x, 192.168.0.x, etc).

Management IP

This management address is accessible from any port that is configured to access this VLAN.

Careful! If you change your IP Address, make sure you update the URL in your browser to match the one you saved, otherwise you may lose access to the system.

IP Address:

Subnet Mask:

Default Gateway:

Vlan ID:

Save Data
Cancel



The values above are just examples.

5. Save your settings and then connect your BMS network or dedicated management PC to port **d2** on the Aggregation Switch.



ONLY connect your BMS network or dedicated management computer to a D-port on your Aggregation Switch, NEVER to an Edge Switch port.



6. Log into OneView™ again using the new management IP address in your Chrome web browser.

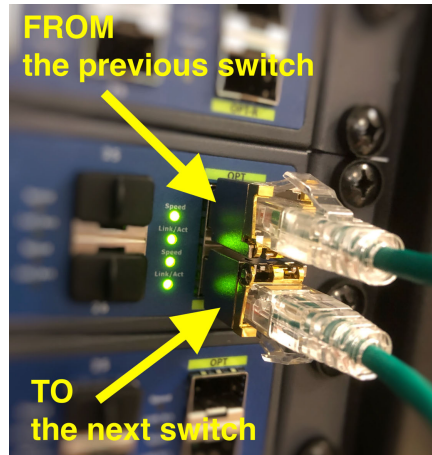
Connecting SFP's

1. To register edge switches, plug an approved SFP into your Aggregation Switch's OPT port and one into the OPT port of the first edge switch in the daisy chain. Connect the two SFPs using your chosen medium (copper or fiber).



ONLY insert SFP modules into SFP ports if they are going to be connected to something.

- After that first switch in the daisy chain, additional edge switches should be added by connecting the OPT port of the new switch with the OPT-R port of the previous switch.



If your switch does not have an 'OPT-R' port, just use the port below the 'OPT' port

Registering Edge Switches

- Navigate to the Edge Switches menu.
- Confirm that all Edge Switches have been automatically registered and are showing up as connected (green link icon).



It may take some time, depending on the number of Edge Switches in your system.

Clear Filters						
Export Add + Topology Upgrade Refresh						
Switch ID	Connection	Description	Model	MAC Address	Security	Options
OPTG-ASW		Aggregation Switch - Connected to ONS-NC600	ONS-C801pi	D8:D9:4F:50:80:96	7 1 0 0	More →
c1			ONS-C810p	88:DC:96:6E:55:55	8 0 0 0	More →
c3			ONS-C4801p	D8:D9:4F:51:25:18	48 0 0 0	More →
c4			ONS-C401i	D8:D9:4F:51:15:09	4 0 0 0	More →
c5			ONS-C2401p	D8:D9:4F:50:13:DA	24 0 0 0	More →
c6			ONS-C1601pi	D8:D9:4F:50:8F:66	16 0 0 0	More →
25	50	100	500	View all		

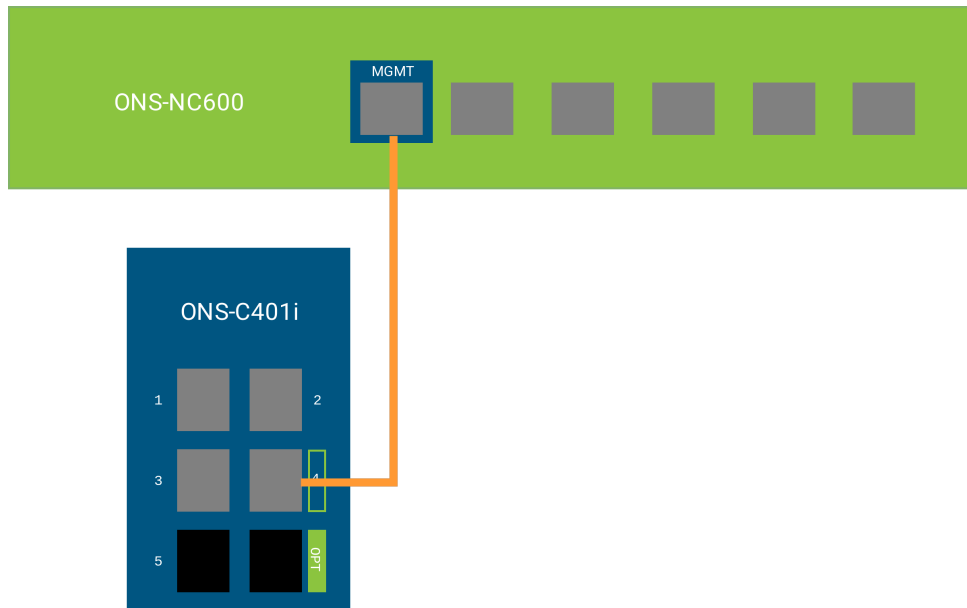


If any edge switches fail to register or go offline after initially registering, click on the 'Topology' button (above the 'Edge Switches' list) and then click the 'Check All SFP Ports' button in the topology window.

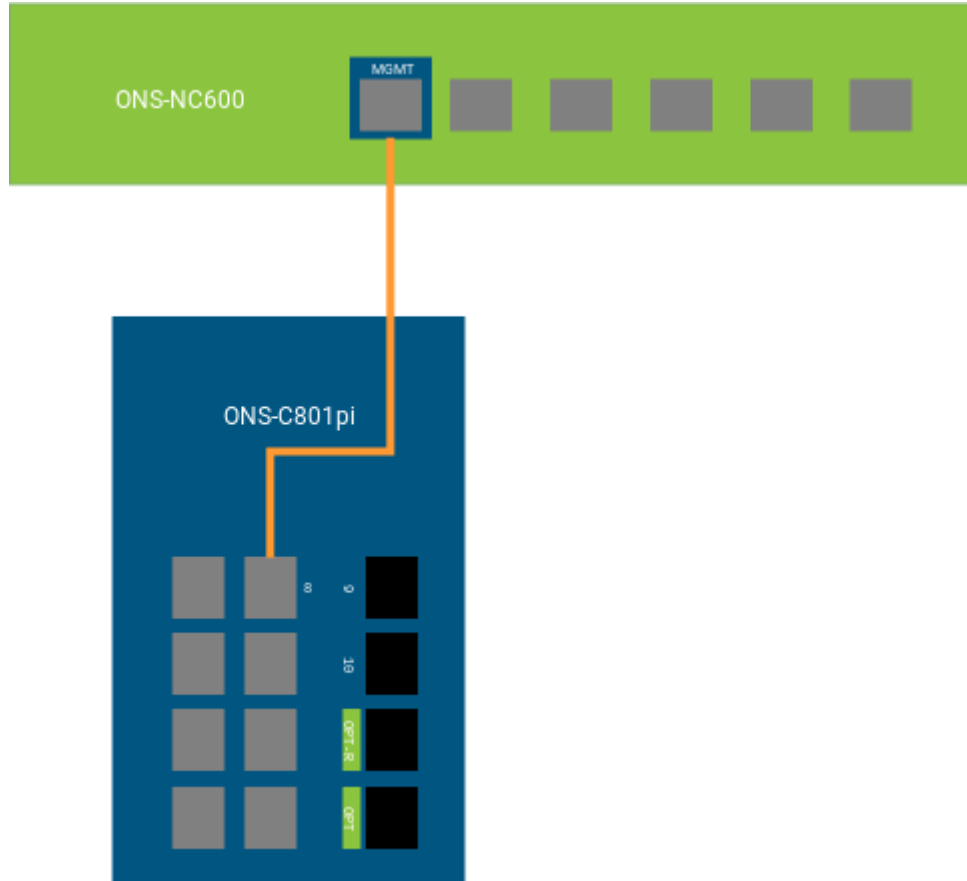
Connecting A Hybrid Network

In all images below, grey ports are RJ45, whereas black ports are SFP slots.

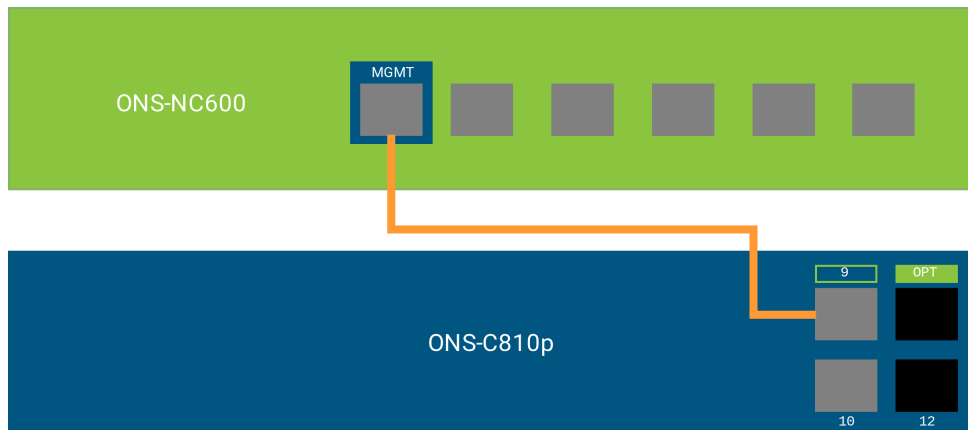
NC-ONS-NC600 and NC-ONS-C401i



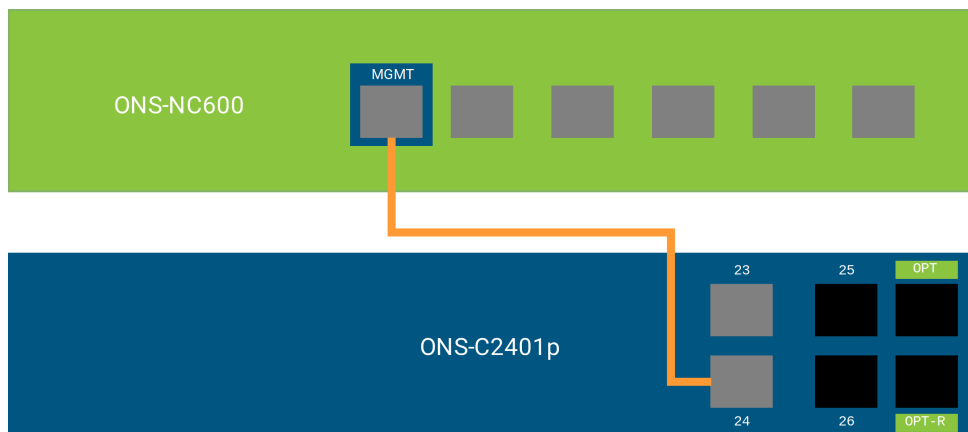
NC-ONS-NC600 and NC-ONS-C801pi



NC-ONS-NC600 and NC-ONS-C810p

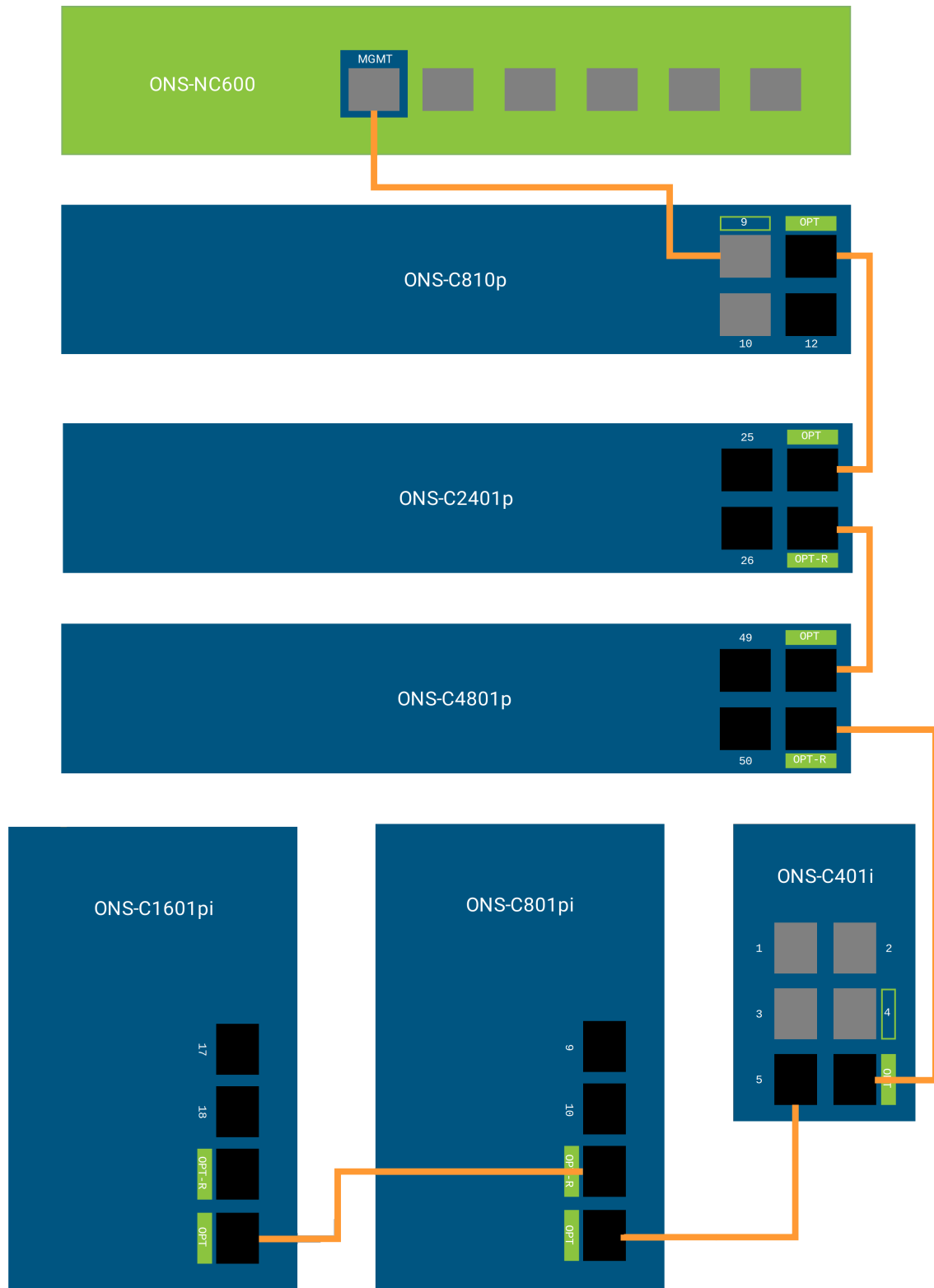


NC-ONS-NC600 and NC-ONS-C2401p



Daisy Chaining Edge Switches

You can daisy chain edge switches off of the aggregation switch from any SFP port. On the NC-ONS-C810p, port 10, which is an RJ45 port without PoE, can also be used for the daisy chain. When adding a new edge switch to the daisy chain, you must use the OPT port on the added edge switch. You can use any free SFP port to connect from the previous to the newly added edge switch. See the image below.



CHAPTER 12

OneView Web Interface

In the screenshots of this example, we have connected an NC-ONS-C401i and NC-ONS-C810p to the NC-ONS-S8.

System Menu

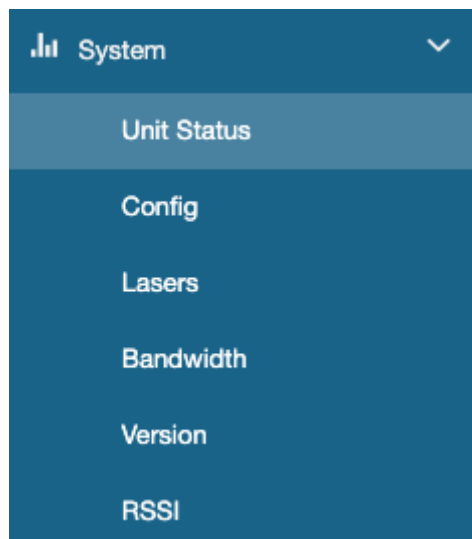
From the System menu, the user can view the unit status, change configuration settings, enable redundancy, monitor bandwidth, update software, and view incoming signal strength (if supported). These tabs are outlined in detail below.

Unit Status

OneView's **Unit Status** page provides a summary of your entire system's current state, including up-time, the NC-ONS-S8's temperature (not applicable in Hybrid systems), the number of Edge Switches you currently have online, the number of ports in the system that are connected to devices, and the state of the NC-ONS-S8's optical ports (not applicable in Hybrid systems). The system can also be reset from this page.

Accessing the Unit Status Page

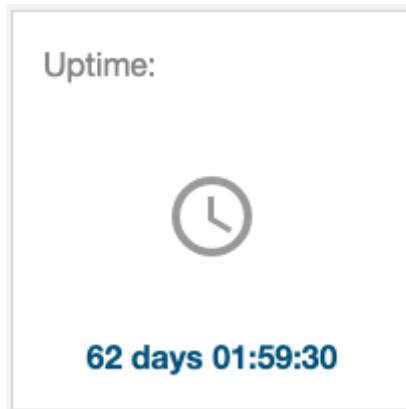
To access the **Unit Status** page, just click on **Unit Status** in the **System** dropdown menu on the left side of the screen.



The Unit Status page is the first screen you see when you log into OneView

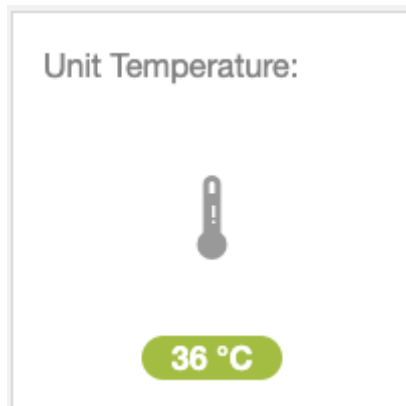
Uptime

This widget displays the total amount of time that has elapsed since the system was last powered up.



Unit Temperature

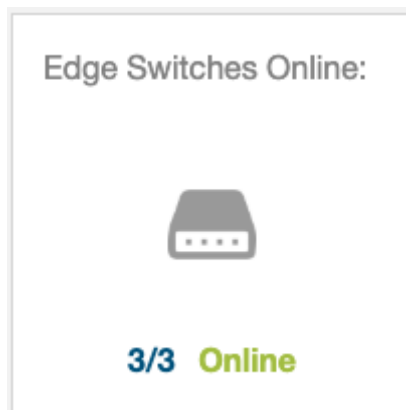
This widget displays the NC-ONS-S8's current temperature (not applicable in Hybrid mode).



Edge Switches

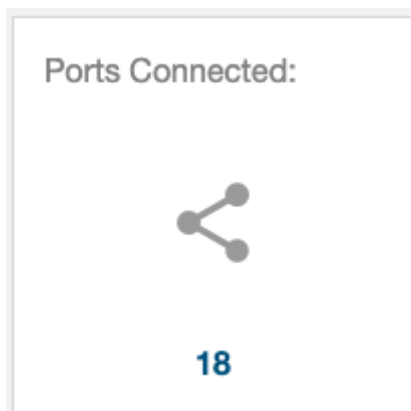
This widget displays the number of Edge Switches that are currently online (actual) versus the total number of Edge Switches that have ever registered with the system (expected).

For instance, if your system contained 10 Edge Switches, but only 8 of them were actually online and communicating with OneView, then it would read '8/10 Online'.



Ports Connected

This widget displays the number of ports in the system that are currently connected to devices. The ports on the system's Edge Switches and the Aggregation Switch are included in this total.



Optical Ports

This table displays the status of the optical ports on the NC-ONS-S8 (not applicable in Hybrid mode). In addition to indicating the temperature of the NC-ONS-SX-SFP plugged into each optical port (N/A if there's no SFP present), the current 'Link Status' is also displayed. You will see one of three potential Link Statuses:

no SFP

There is currently no SFP plugged into the optical port

link down

There is an SFP plugged into the optical port, but no fiber-connected devices

link up

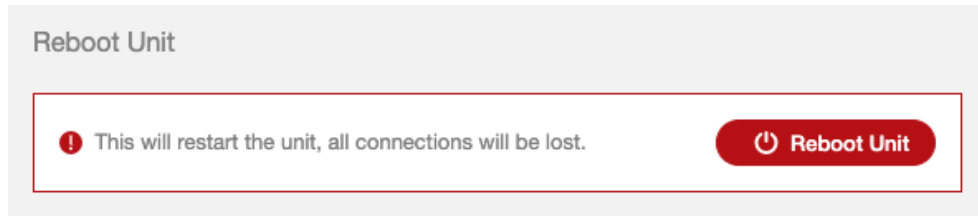
There is an SFP plugged into the optical port and fiber-connected devices

Optical Ports

Laser ID	Link Status	Temperature
OPT 1:	link up	43.7 °C
OPT 2:	link up	40.5 °C
OPT 3:	link down	33.3 °C
OPT 4:	no SFP	N/A
OPT 5:	no SFP	N/A
OPT 6:	no SFP	N/A
OPT 7:	no SFP	N/A
OPT 8:	no SFP	N/A

Reboot Unit

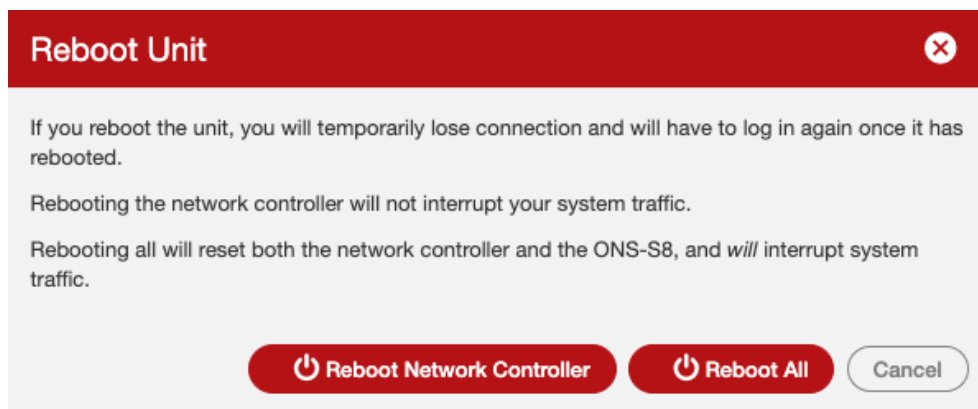
To reboot the system via OneView, click on the 'Reboot Unit' button at the bottom of the 'Unit Status' screen.



After pressing the 'Reboot Unit' button, a dialog box will appear that offers reboot options.

On Single-mode fiber only systems, the user will be presented with the option to reboot only the Network Controller (NC-ONS-NC600) or also the Aggregation Switch (NC-ONS-S8) at the same time (as in the above screenshot).

On Hybrid systems the only option available is to reboot the Network Controller, so only the 'Reboot Network Controller' button is visible.

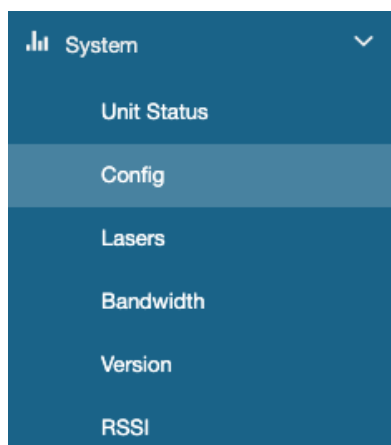


Config

OneView's **Config** page is where the user can configure the system's management IP address (i.e. the network address used to access OneView), clock settings (i.e. time, date, time-zone), the system's name, and the system's description. This is also where the entire system configuration can be backed up to a file or restored from a previously saved backup file.

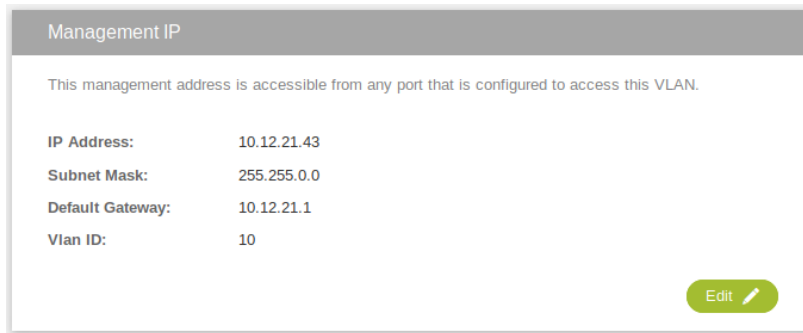
Accessing the Config Page

To access the **Config** page, just click on **Config** in the **System** dropdown menu on the left side of the screen.



Management IP

To change the **Management IP** settings, click the **Edit** button.



Management IP

This management address is accessible from any port that is configured to access this VLAN.

IP Address:	10.12.21.43
Subnet Mask:	255.255.0.0
Default Gateway:	10.12.21.1
Vlan ID:	10

Edit 

- ❑ **IP Address** (e.g. 10.12.21.43) is the address you type into the address bar of Chrome web browser to access OneView on your NC-ONS-NC600.
- ❑ **Subnet Mask** (e.g. 255.255.0.0) should match that of other devices on that same LAN (e.g. your management computer).
- ❑ **Default Gateway** (e.g. 10.12.21.1) should match that of other devices on that same LAN (e.g. your management computer).
- ❑ **VLAN ID** (e.g. 10) is required on all ports (on the Aggregation Switch or Edge Switches) that will be used to access OneView.

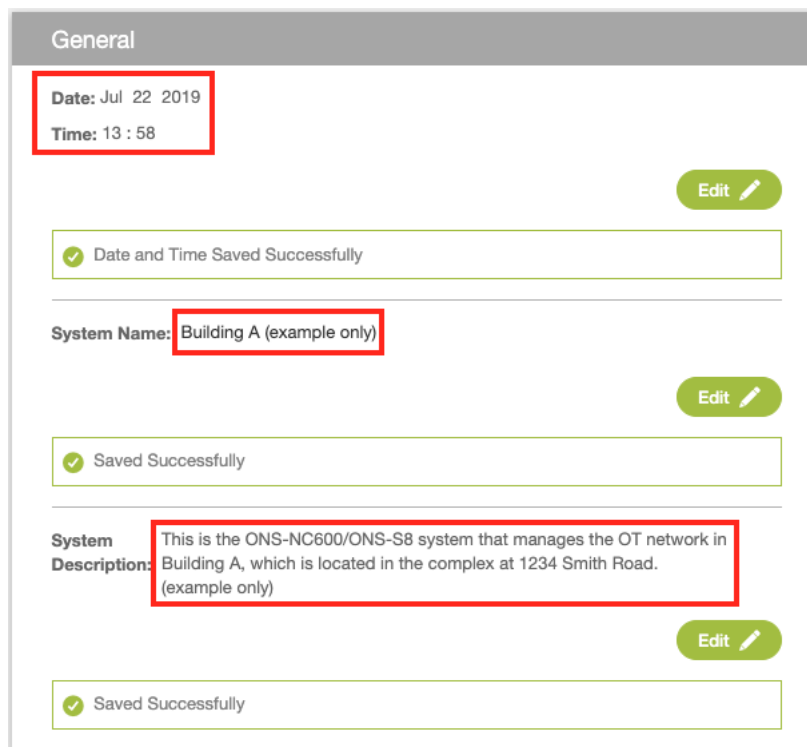
When you are finished, click the **Save Data** button.



Before changing the VLAN ID, make sure that there is at least one accessible port on the Aggregation Switch that is also configured with the VLAN ID you want to use. Failure to do so could result in the user being locked out of the system, necessitating a reset to default settings.

General

In the **General** section, you can set the clock (date, time, and time-zone), the system name, and the system description. Just click the **Edit** button beside each field.



General

Date: Jul 22 2019
Time: 13 : 58

Edit 

✓ Date and Time Saved Successfully

System Name: Building A (example only)

Edit 

✓ Saved Successfully

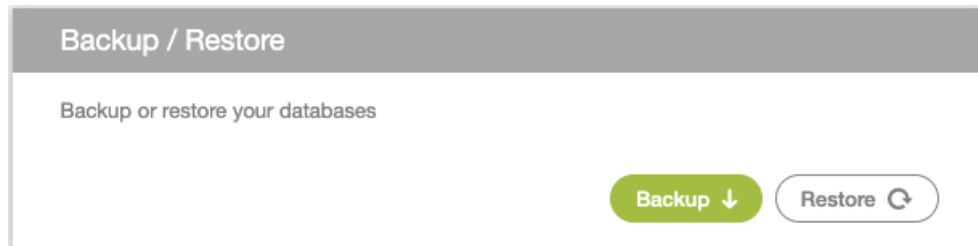
System Description: This is the ONS-NC600/ONS-S8 system that manages the OT network in Building A, which is located in the complex at 1234 Smith Road. (example only)

Edit 

✓ Saved Successfully

Backup / Restore

In the **Backup / Restore** section, you can back up your OneView settings to a file. Just click on the **Backup** button and follow the prompts. Then, if you need to restore your system to those saved settings, click the **Restore** button and follow the prompts. It is highly recommended that you back up your system configuration whenever you finish making a set of changes.



Lasers

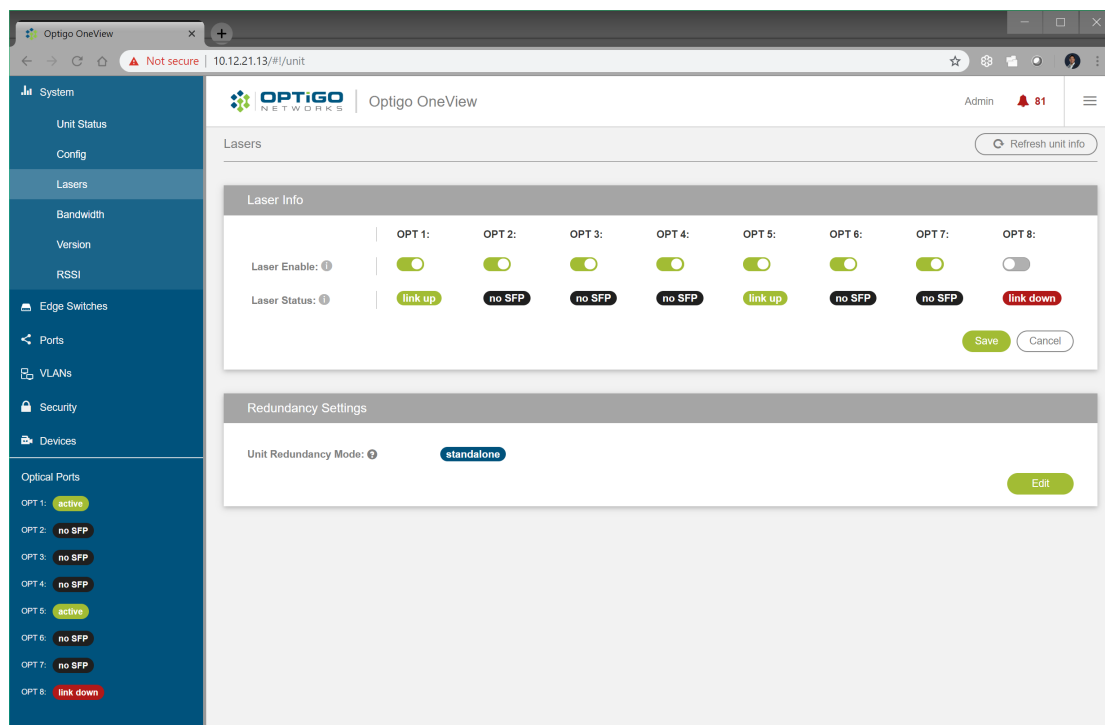
OneView's **Lasers** page consists of two sections: **Laser Info** and **Redundancy Settings**.



This page is only available when configured as a fiber network with an NC-ONS-S8 Aggregation Switch.

Laser Info

The Laser Info section contains two rows: **Laser Enable** and **Laser Status**



The **Laser Enable** row contains 8 sliding switches that allow you to enable or disable each NC-ONS-S8 OPT port (OPT 1 to OPT 8).

 Laser Enabled

 Laser Disabled

When disabled, all Edge Switches connected to an OPT port will be disconnected, or de-registered, from the system and will no longer be passing traffic.

Do NOT forget to save your settings after making changes.

The **Laser Status** row displays three possible states:

no SFP

No SFP is inserted into the OPT port

link up

An SFP is inserted and at least one Edge Switch is connected/registered

link down

An SFP is inserted, but no Edge Switches are connected/registered



The ONS-S8 only accepts Optigo's ONS-SX-SFP transceivers.

Redundancy Settings

The screenshot shows the Optigo OneView web interface. The left sidebar contains navigation links for System, Unit Status, Config, Lasers, Bandwidth, Version, RSSI, Edge Switches, Ports, VLANs, Security, Devices, and Optical Ports. The main content area is divided into two sections: Lasers and Redundancy Settings.

Lasers Section: Displays a table of laser ports (OPT 1 to OPT 8). Each port has a 'Laser Enable' toggle and a 'Laser Status' indicator. The status indicators are: link up (green), no SFP (black), and link down (red). The 'Save' button is visible at the bottom right of the table.

Redundancy Settings Section: Contains the following settings:

- Unit Redundancy Mode:** A dropdown menu currently set to 'strict'.
- Peer IP Address:** A text input field containing '203.0.113.83'.
- Peer Connection:** A status indicator showing 'unreachable' (red) and 'Last Seen: Never'.
- Peer Sync:** A status indicator showing 'unsynced' (red) and a 'Sync Config DB' button (yellow).

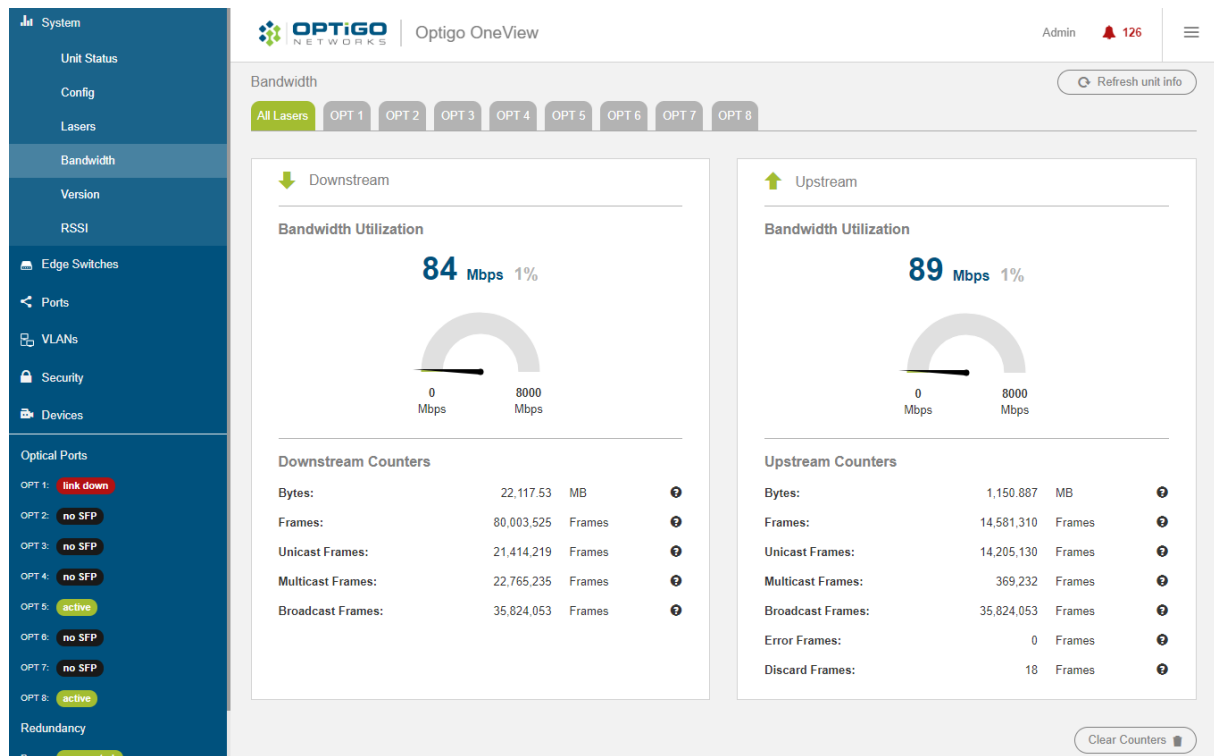
The 'Save' and 'Cancel' buttons are located at the bottom right of the Redundancy Settings section.

This section is for status and configuration of system redundancy, and includes the following:

Setting	Description
Unit Redundancy Mode	Strict (in redundancy mode) Standalone (not in redundancy mode)
Peer IP Address	The IP address of the partner system
Peer Connection	The status of the link to the partner system
Peer Sync	The status of both systems' databases and a button to sync them

Bandwidth

OneView's **Bandwidth** page displays detailed network traffic information for the entire system (see 'All Lasers' tab) and for individual OPT ports (see 'OPT' tabs).



This page is only available when configured as a fiber network with an NC-ONS-S8 Aggregation Switch.

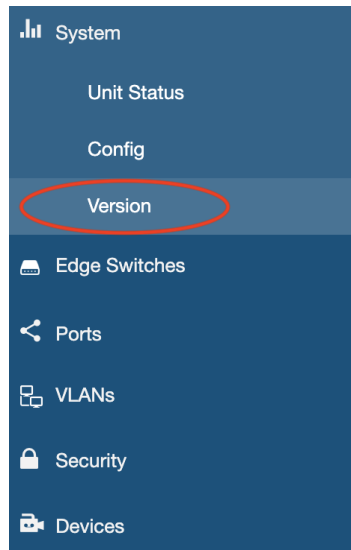
For each bandwidth tab at the top (All Lasers, OPT 1 through OPT 8) the network traffic information is displayed for two different 'directions', **Downstream** (NC-ONS-S8 to Edge Switches) and **Upstream** (Edge Switches to NC-ONS-S8), and contains the following information:

- ☐ **Bandwidth Utilization** (current average data rate and percentage of maximum)
- ☐ **Bytes** (the count since last counter reset)
- ☐ **Frames** (the count since last counter reset)
- ☐ **Unicast Frames** (the count since last counter reset)
- ☐ **Multicast Frames** (the count since last counter reset)
- ☐ **Broadcast Frames** (the count since last counter reset)

To clear all counters, just hit the **Clear Counters** button (bottom right).

Version

Software and Hardware version information and actions are available on the **Version** page.



Software Version Info

Software Version Info	
Current SW Version:	4.3.0-089
Previous SW Version:	4.3.0-086
Factory Default Version:	4.2.1-084

The **Software Version Info** section includes the current, previous, and factory default versions of the Optigo OneView application installed on the NC-ONS-NC600 network controller.



The previous software version field may be blank if the unit's software has never been updated.

Hardware Version Info

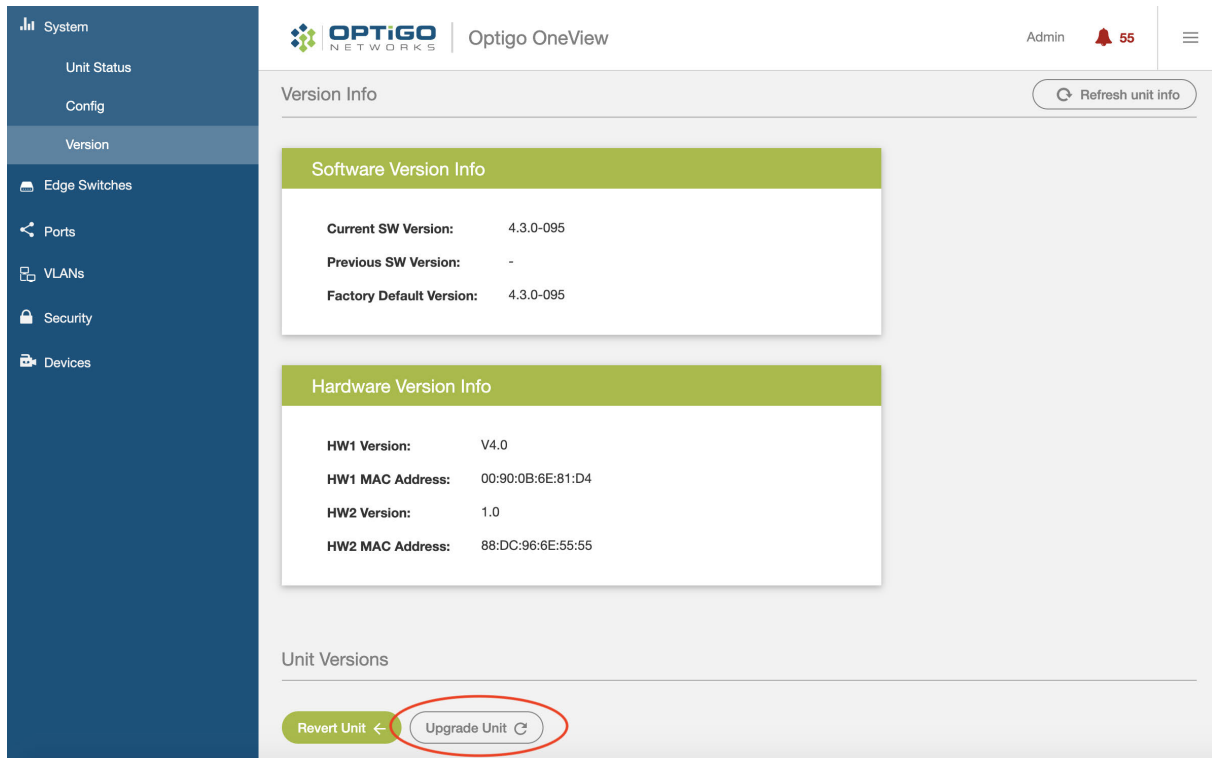
Hardware Version Info	
HW1 Version:	V4.0
HW1 MAC Address:	00:90:0B:5A:0F:F8
HW2 Version:	1.0
HW2 MAC Address:	D0:D9:4F:51:0C:E4

the Hardware Version Info for the NC-ONS-NC600 (HW1) and the attached Aggregation Switch (HW2). The MAC addresses for both of these units appear below their hardware version information.

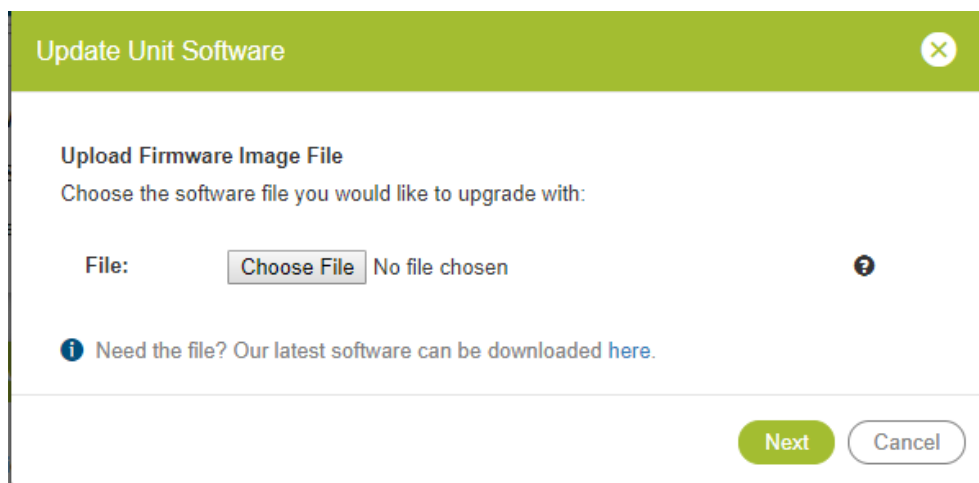
Upgrade Procedure

To upgrade the software you will need to obtain the latest [NC-ONS-NC600 software package](#).

1. Click on the **Upgrade Unit** button at the bottom of the 'Version' screen. The Upgrade Unit Software dialog box will appear.



2. Click the **Choose File** button and find the new software on your computer (e.g. Downloads). Once you have chosen the software package, click the **Next** button.



Wait for the upgrade to complete and the ONS-NC600 to reboot, which may take up to 5 minutes. During this time you will lose access to the OneView GUI. Once the reboot is complete, you can reload the GUI and navigate to the 'Version' page to confirm that the upgrade was successful. Please note that you may have to refresh your browser.

RSSI

The **RSSI** page shows the list of Edge Switches with the corresponding receive and transmit signal strength of their transceivers (NC-ONS-CX-SFP).



This page is only available when configured as a fiber network with an NC-ONS-S8 Aggregation Switch.

Rx Power is an RSSI (Received Signal Strength Indicator), which is a measurement of the amount of light received by the NC-ONS-CX-SFP transceiver. The NC-ONS-CX-SFP supports a maximum RSSI of -3 dBm and a minimum RSSI of -27 dBm.

Tx Power is a TSSI (Transmitted Signal Strength Indicator), which is a measurement of the amount of light transmitted by the NC-ONS-CX-SFP transceiver. The NC-ONS-CX-SFP is expected to have a TSSI between 0 and 4 dBm.

System

Unit Status

Config

Lasers

Bandwidth

Version

RSSI

Edge Switches

Ports

VLANs

Security

Devices

Optical Ports

OPT 1: link down

OPT 2: no SFP

OPT 3: no SFP

OPT 4: no SFP

OPT 5: active

OPT 6: no SFP

OPT 7: no SFP

OPT 8: active

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RSSI Readings

Refresh Refresh unit info

Switch ID	Model	Description	Rx Power	Tx Power	Unit
c2	ONS-C801pi		-3.5	2.3	dBm
c3	ONS-C2401p				dBm

Edge Switches (Fiber Only)

The **Edge Switches** page shows the list of active and inactive Edge Switches in your fiber network. When you make edits, make sure to click the '**Save Changes**' button (bottom) before leaving that screen. If you change your mind after modifying some settings, simply click the '**Cancel Changes**' button.

Item	Description
Switch ID	An identifier for quick reference. This value can be edited.
Status	Each slider switch in this column can be used to enable (right/green) or disable (left/gray) the entire Edge Switch.
Laser	This indicates which NC-ONS-S8 optical port (OPT 1 - OPT 8) the Edge Switch's NC-ONS-CX-SFP is connected to via its fiber network.
Connection	A switch is active if the link is green. A switch is inactive if the link is red. A green link with a yellow triangle means the switch is active and troubled. A red link with a grey triangle means the switch is inactive and troubled.
Description	Use this field to record meaningful information about your Edge Switch (e.g. location).
Model	This is the Optigo model number for the Edge Switch.
MAC Address	This is the Edge Switch's Media Access Control (MAC) address, which is unique to each Edge Switch.
Security	The grey lock symbol indicates the number of ports on the Edge Switch that do not have MAC address authorization rules set. The red lock symbol indicates the number of ports on the Edge Switch that have MAC address authorization rules set but are disabled. The red prohibition (or 'do not') symbol indicates the number of ports on the Edge Switch that are disabled. The green lock symbol indicates the number of ports on the Edge Switch that have MAC address authorization rules set and are enabled.
Options	Summary contains Transceiver Info, Edge Switch Info, PoE Budget, PoE by port. <i>NOTE: PoE-related information is omitted on non-POE Edge Switches.</i> Ports This tab is similar to the main Ports page, but only applies to that particular Edge Switch. In addition, mirror ports can be configured here by clicking on the square icon in the top-right. OneClick Security This tab allows you to secure your Connect Spectra system similarly to how you would on the Security page, but only applies to that particular Edge Switch, not globally.
Clear Filters	Click Clear Filters to remove any filters that may be chosen.

Item	Description
 Export	This saves the ' Edge Switches ' list to an Excel spreadsheet or CSV file, which can be shared with others.
 Add	This allows a new Edge Switch to be added manually, which is handy for pre-configuring a single switch or even an entire system before anything is even connected on-site.
 Upgrade	This allows you to upgrade the firmware on any connected Optigo Edge Switches that support this functionality.
 Refresh	This simply refreshes the ' Edge Switches ' list.

Edge Switches

Clear Filters 

 Export  Add  Upgrade  Refresh

Switch ID	Status	Laser	Connection	Description	Model	MAC Address	Security	Options

The white boxes at the top of the 'Edge Switches' list allow you to filter by one or more of the following parameters:

- ☐ Switch ID
- ☐ Status
- ☐ Laser
- ☐ Connection
- ☐ Description
- ☐ Model
- ☐ MAC Address

To clear your filters, simply click **Clear Filters** 

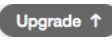
Edge Switches (Hybrid)

The **Edge Switches** page shows the list of active and inactive Edge Switches in your hybrid network. When you make edits, make sure to click the '**Save Changes**' button (bottom) before leaving that screen. If you change your mind after modifying some settings, simply click the '**Cancel Changes**' button.

The '**Edge Switches**' page shows the list of active and inactive Edge Switches in your hybrid system. When you make edits, make sure to click the '**Save Changes**' button (bottom) before leaving that screen. If you change your mind after modifying some settings, simply click the '**Cancel Changes**' button.

The screenshot shows the Optigo OneView web interface. On the left is a dark blue sidebar with navigation links: System, Unit Status, Config, Version, Edge Switches (selected), Ports, VLANs, Security, and Devices. The main content area is titled 'Edge Switches' and features a table with the following columns: Switch ID, Connection, Description, Model, MAC Address, Security, and Options. The table contains data for an 'OPTG-ASW' switch and several 'C' series switches (c1 to c6). Each row shows the switch's status (green or red link with a triangle), its description, model number, MAC address, and security status (locks and prohibition symbols). At the bottom of the table are pagination controls (25, 50, 100, 500, View all) and a row of action buttons: Clear Filters, Export, Add, Topology, Upgrade, and Refresh.

Item	Description
Switch ID	An identifier for quick reference. This value can be edited.
Connection	A switch is active if the link is green. A switch is inactive if the link is red. A green link with a yellow triangle means the switch is active and troubled. A red link with a grey triangle means the switch is inactive and troubled.
Description	Use this field to record meaningful information about your Edge Switch (e.g. location).
Model	This is the Optigo model number for the Edge Switch.
MAC Address	This is the Edge Switch's Media Access Control (MAC) address, which is unique to each Edge Switch.
Security	The grey lock symbol indicates the number of ports on the Edge Switch that do not have MAC address authorization rules set. The red lock symbol indicates the number of ports on the Edge Switch that have MAC address authorization rules set but are disabled. The red prohibition (or 'do not') symbol indicates the number of ports on the Edge Switch that are disabled. The green lock symbol indicates the number of ports on the Edge Switch that have MAC address authorization rules set and are enabled.
Options	Summary Contains Edge Switch Info, PoE Budget, PoE by port. <i>NOTE: PoE-related information is omitted on non-POE Edge Switches.</i> Ports This tab is similar to the main Ports page, but only applies to that particular Edge Switch. In addition, mirror ports can be configured here by clicking on the square icon in the top-right. OneClick Security This tab allows you to secure your hybrid system similarly to how you would on the Security page, but only applies to that particular Edge Switch, not globally.
Clear Filters	Click Clear Filters to remove any filters that may be chosen.
Export	This saves the ' Edge Switches ' list to an Excel spreadsheet or CSV file, which can be shared with others.
Add	This allows a new Edge Switch to be added manually, which is handy for pre-configuring a single switch or even an entire system before anything is even connected on-site.
Topology	This displays a diagram showing how all Edge Switches in the system are connected to the Aggregation Switch. Just click the ' Check All SFP Ports ' button if any switches are missing from the diagram.

Item	Description
	This allows you to upgrade the firmware on any connected Optigo Edge Switches that support this functionality.
	This simply refreshes the 'Edge Switches' list.

Clear Filters 
Export 
Add 
Topology 
Upgrade 
Refresh 

Switch ID	Connection	Description	Model	MAC Address	Security	Options

The white boxes at the top of the 'Edge Switches' list allow you to filter by one or more of the following parameters:

- ☐ Switch ID
- ☐ Connection
- ☐ Description
- ☐ Model
- ☐ MAC Address

To clear your filters, simply click **Clear Filters** 

Ports

Clicking on 'Ports' (in the left-hand menu) will bring you to the 'Ports' page, which allows you to configure each of your system's ports for the specific devices connected to them.

System
Edge Switches
Ports
VLANs
Security
Devices
Optical Ports
OPT 1: active
OPT 2: active
OPT 3: link down
OPT 4: no SFP
OPT 5: no SFP
OPT 6: no SFP
OPT 7: no SFP
OPT 8: no SFP


Optigo OneView - ONS-S8 (Sales/Marketing Demo)
OptigoDemo 500

Ports
Enabled Ports
Active Ports
Troubled Ports
Clear Filters
Export
Refresh

Port	Status	PoE	Link	VLAN Mode	VLAN ID	Description	Security	Options
Dedicated								
d1		N/A			HVAC (1)	d1		More →
d2		N/A			HVAC (1)	d2		More →
d3		N/A			HVAC (1)	d3		More →
d4		N/A			HVAC (1) Mgmt (10) Cameras (100)	d4		More →
d5		N/A			Cameras (100)	NVR's Camera LAN (All channels converge here)		More →
d6		N/A			Cameras (100)	CAM 1 --- ReoLink Camera		More →
d7		N/A			MGMT	Connection to Optigo network - disabled for demo		More →
d8		N/A			MGMT	System Management		More →
10-Gigabit								

Here, you will see every port for every Edge Switch that is connected to the system. This list is also updated as each new switch is added.

As you plug in each Edge Switch, it will automatically appear with an auto-assigned device ID and model number, such as 'c1 (ONS-C2401p)'. We recommend documenting each device ID in your configuration spreadsheet and/or updating the device name in the 'Edge Switches' page.



Although a fiber system with an NC-ONS-S8 was used for the, the 'Ports' page in a hybrid system is almost identical. The only real difference is that hybrid systems do not have optical ports.

Item	Description
Port	This field displays the port's number and the switch it belongs to. For instance, the first port on a 24-port NC-ONS-C2401p Edge Switch with a switch ID of 'c4' would be listed as 'c4-01' and the last port on that switch would be listed as 'c4-24'. If odd and even ports have green arrows pointing to each other (e.g. port 1 is pointing to port 2, port 7 is pointing to port 8, etc), then these ports are paired (see 'Device / Security' below).
Status	You can enable or disable individual ports by toggling the 'Status' slider switch:  Enabled  Disabled.
PoE	You can control PoE (Power-over-Ethernet) power to individual ports by toggling the 'PoE' slider switch: right/green  Power ON  Power OFF <i>Note: Switches that do not support PoE will have n/a in this column.</i>
Link	This field displays the link state:  Switch is disabled/off or the port is disabled  Link is down (i.e. does not have a device connected)  Link is up and the number is the speed of the link (in Mbps)
VLAN Mode	This column indicates whether the VLAN is in access (A), trunk (T), or local (L) mode. Click on the field to change the mode and click " Save Changes " in the bottom right.
VLAN ID	This column allows you to set the VLAN for each port. Click on it to change the VLAN. A dropdown of VLANs you are already using will show up, but you can write in any VLAN number (between 2 and 4092). If you have already set the VLAN name and color in the VLANs page, these will automatically populate. Make sure you save your changes before leaving the screen.
Description	In this section you can fill in any info you like, such as which device is connected to that port, where it is located, etc. Don't forget to save your changes when you're done.
Security	This column shows you if the port has been secured to only accept traffic from a certain MAC address (or addresses in the case of device loops).  The port will accept traffic from any device.  2 The device is only accepting traffic from specific devices with specific MAC addresses. The number specifies how many devices are accepted by that port. Click on the lock icon to see which MACs are authorized for that port, and the associated vendor. The accepted MACs can be set individually for each port by clicking on the  button in the 'Options' column. They can also be applied across the entire network using OneClick Secure.
Options	Clicking on the  button in the ' Options ' column will give you detailed information about the port.

Filters

Enabled Ports 
Active Ports 
Troubled Ports 
Clear Filters 

Export 
Refresh 

	Port 	Status 	PoE 	Link 	VLAN Mode 	VLAN ID 	Description 	Security 	Options
	☐								

The top row of the '**Ports**' table contains fields for filtering for specific ports (e.g. port number, status, VLAN Mode, etc).

Item	Description
Enabled Ports	Filter with all ports with 'Status' set to enabled.
Active Ports	Filter with all ports that have a device connected to them (i.e. blue link up icon with a link speed value).
Troubled Ports	Filter with all enabled ports with no device connected to them (i.e. red link down icon).
Clear Filters	Remove all filters and reset the page to display all ports.
Export	Export the contents of the 'Ports' page to an Excel spreadsheet or CSV file.
Refresh	Click to refresh the page.

Detailed View

Clicking on the button in the 'Options' column will give you detailed information about the port.

Summary

Summary
Device / Security
Counters

Port c1-07 Detailed View

Configuration

Port-ID: c1-07
VLAN Mode: access
Link Status: up

Port Status: enabled
VLAN ID: 100
Link Speed: 100

PoE Status: enabled
Description: CAM 11 ---
ReoLink Camera

PoE

Power 3.5 W

The summary contains much of the same information seen on the main 'Ports' screen, however for PoE devices it also includes the following options:

Item	Description
	This button turns off the PoE power at that port.
	This button turns the PoE off and then back on again (i.e. power cycle).
Power 3.5 W	This displays how much PoE power is being drawn by the devices connected to this port.

Device / Security

Summary
Device / Security
Counters

Port c1-07 Detailed View

Device Authorization:

Connected Devices
1

Authorized MACs
2 / 124

Search

Add a MAC address or mask XX:XX:XX:XX:XX:XX

Device MAC Address	Link	Authorized	Action
EC:71:DB:1D:89:61 (Shenzhen Baichuan Digital Technology Co., Ltd.)			
11:22:33:44:55:66 (undefined)			

Security Rules: enabled
Disable
Unauthorized All
Authorize All

Pair Port: disabled
Enable

Additional Details:

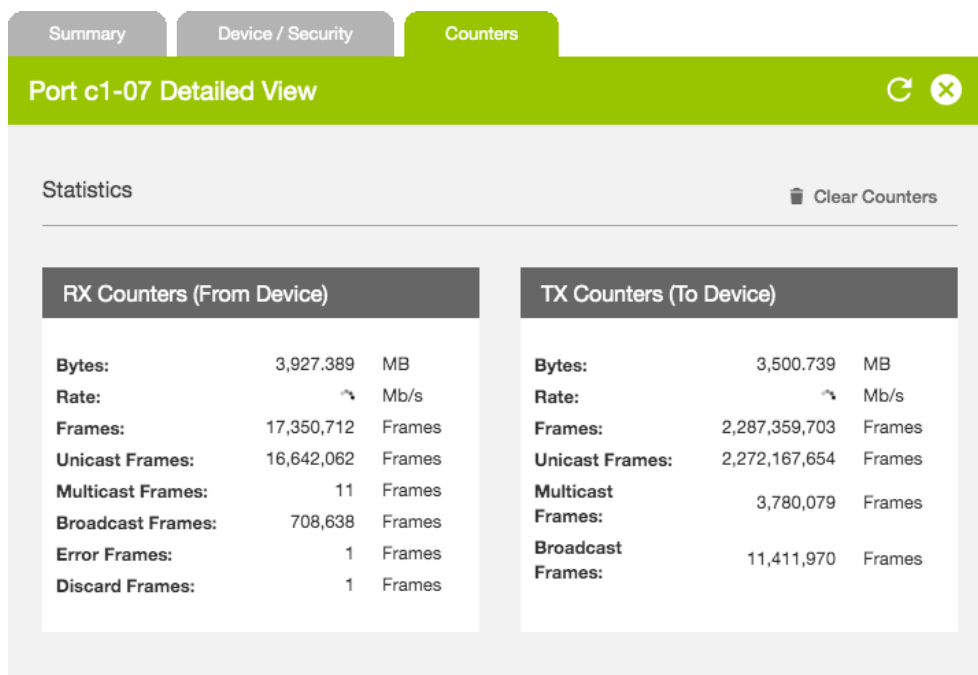
Switch Model: ONS-C2401p
Maximum MAC rules per switch: 256
Maximum MAC rules per port: 126

This table will automatically populate with any devices that are connected to that port. If there are multiple devices connected to the port, use the search bar to find specific devices. The table contains the following info and options:

Item	Description
Device MAC Address	The MAC address of the device is listed here.
Link	Indicates whether the device is connected to the port.
Authorized	Indicates whether the device is currently authorized to be connected to the port.
Add/Remove	Enable or disable the port.
	Unauthorize all devices in the list.
	Authorize all of the MAC addresses shown in the list to send traffic through this port. Type a MAC Address into the "Authorized MACs" box to authorize additional MACs.
	Disable MAC authorization. Use this temporarily if you would like the switch to find new devices. Make sure you enable again before you finish.
Pair Port	To pair a port, click the button and it will automatically be paired with its designated partner port. Odd ports are paired with the next port. Even ports are paired with the previous port (e.g. 1 and 2 are always paired together).

Additional details at the bottom will tell you how many MAC addresses can be connected per port and per switch, depending on the model.

Counters

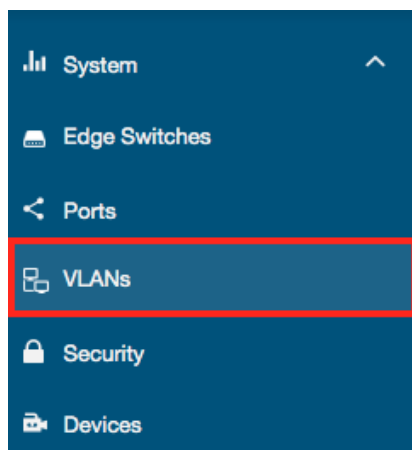


The 'Counters' tab provides the current statistics for network traffic to and from the device connected to that port.

VLANs

The VLANs page allows you to configure names and colors for each VLAN. For example, if all HVAC devices are on VLAN 5, you can call VLAN 5 'HVAC' and make it blue. Then, when you go to the Ports page, each port will be color-coded with the VLAN name.

Navigate to the VLANs page from the left-hand side of the OneView screen, click on **VLANs**.



Edit or Add a VLAN

Optigo OneView - ONS-S8 (Sales/Marketing Demo)

VLANs

Clear Filters

Add +

Color	VLAN ID	VLAN Name	Description	Number of Ports	Options
	1	HVAC	All HVAC devices	31	
	10	Mgmt	This is the management VLAN	1	
	100	Cameras	Reolink video surveillance system.	14	
	999	BCT-Test	BCT continuous capture test VLAN.	3	

25 50 100 View all

Any VLAN IDs that are already being used will be listed. To edit them, click on the pen icon in the Options column and then change the Color, VLAN ID, VLAN Name, or Description. The 'Number of Ports' value, which is auto-generated, displays the number of ports on the entire system that are configured with the specified VLAN ID.

To add additional VLANs, click on the 'Add +' button in the top right corner, and enter the required information.

Go to the Ports Page

Go to the ports page and verify that all of your VLAN settings have been correctly applied.

Optigo OneView - ONS-S8 (Sales/Marketing Demo)

Ports

Enabled Ports Active Ports Troubled Ports Clear Filters

Export Refresh

Port	Status	PoE	Link	VLAN Mode	VLAN ID	Description	Security	Options
Dedicated								
d1		N/A			HVAC (1)	d1		More →
d2		N/A			HVAC (1)	d2		More →
d3		N/A			HVAC (1)	d3		More →
d4		N/A			Mgmt (10) Cameras (100)	d4		More →
d5		N/A			Cameras (100)	NVR's Camera LAN (All channels converge here)		More →
d6		N/A			Cameras (100)	CAM 1 --- ReoLink Camera		More →
d7		N/A			MGMT	Connection to Optigo network - disabled for demo		More →
d8		N/A			MGMT	System Management		More →
10-Gigabit								

When clicking into a VLAN ID field on the Ports page, a drop-down list will appear containing all of the VLANs that have been created so far. Choose from that dropdown list or create a new one by manually entering a new number.

The screenshot shows the 'Ports' page in the Optigo OneView interface. The left sidebar contains navigation links for System, Edge Switches, Ports, VLANs, Security, and Devices. Under 'Optical Ports', there are status indicators for OPT 1 through OPT 8. The main table lists ports d1 through d8. Port d1 is highlighted, and its VLAN ID field is open, showing a dropdown menu with options: Cameras (100), Mgmt (10), and BCT-Test (999). The table columns include Port, Status, PoE, Link, VLAN Mode, VLAN ID, Description, Security, and Options. At the bottom right, there are 'Save Changes' and 'Cancel Changes' buttons.

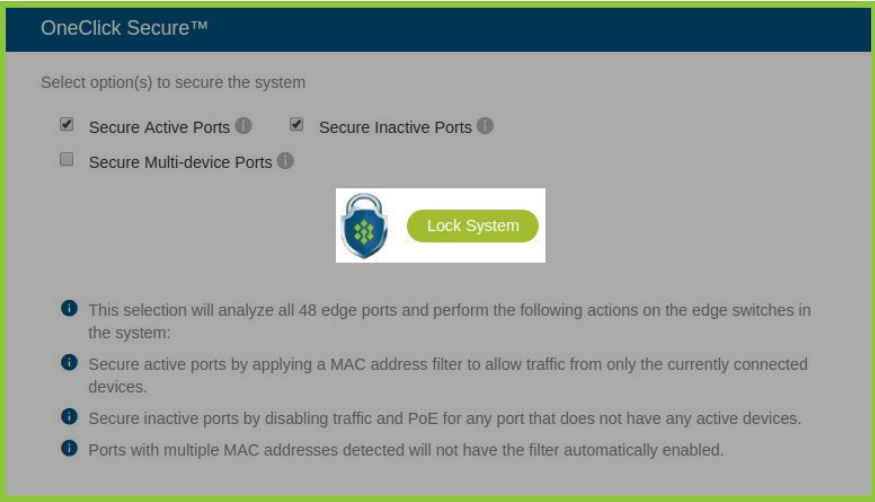
Security

Under Security, you can secure active and inactive ports or unlock the system at the click of a button using OneClick Secure. Navigate to the 'Security' page.

The screenshot shows the 'Optigo Connect - OneClick Secure™' page. The page has a header with the title and a sub-header. Below the header, there is a section titled 'OneClick Secure™' with a sub-header 'Select option(s) to secure the system'. There are three checkboxes: 'Secure Active Ports' (checked), 'Secure Inactive Ports' (checked), and 'Secure Multi-device Ports' (unchecked). Below these checkboxes is a 'Lock System' button. To the right of the 'Lock System' button is a 'OneClick Unlock' section with a sub-header 'This option will remove any existing security settings on all 48 edge ports in the system.' and an 'Unlock System' button. At the bottom of the 'OneClick Secure™' section, there is a list of instructions: 1. This selection will analyze all 48 edge ports and perform the following actions on the edge switches in the system: 2. Secure active ports by applying a MAC address filter to allow traffic from only the currently connected devices. 3. Secure inactive ports by disabling traffic and PoE for any port that does not have any active devices. 4. Ports with multiple MAC addresses detected will not have the filter automatically enabled.

OneClick Secure will not impact traffic for any currently connected devices.

In order to secure the system, simply click the 'Lock System' button. The recommended options are already selected when you navigate to the page.



OneClick Secure™

Select option(s) to secure the system

☒ Secure Active Ports ⓘ
 ☒ Secure Inactive Ports ⓘ
☐ Secure Multi-device Ports ⓘ

 **Lock System**

ⓘ This selection will analyze all 48 edge ports and perform the following actions on the edge switches in the system:
 ⓘ Secure active ports by applying a MAC address filter to allow traffic from only the currently connected devices.
 ⓘ Secure inactive ports by disabling traffic and PoE for any port that does not have any active devices.
 ⓘ Ports with multiple MAC addresses detected will not have the filter automatically enabled.

Upon completion, there will be a result summary displayed, with the modified port configurations highlighted in light-blue.

Result Summary

Actions Taken:

- Secured connected MAC addresses
- Secured port traffic

Shaded cells show changed values.

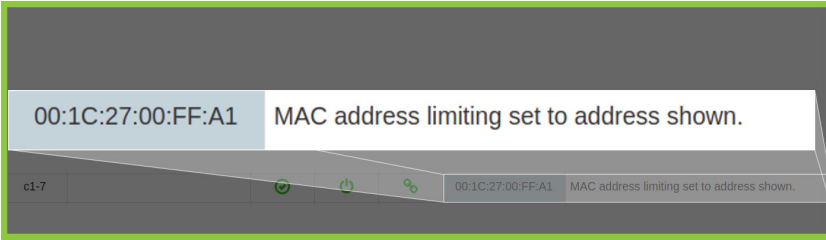
ALIAS - This is the long example description with 50 chars
 ONS-C2401p
 Enabled
 Online

Port #	Description	Status	PoE	Link	MAC Address	Message
01		⊗	⏻	🔌		Traffic disabled. PoE disabled.
02		⊗	⏻	🔌	44:19:B6:4D:6F:E5	MAC address authorization set to address(es) shown.
03		⊗	⏻	🔌		Traffic disabled. PoE disabled.

Secure Active Ports

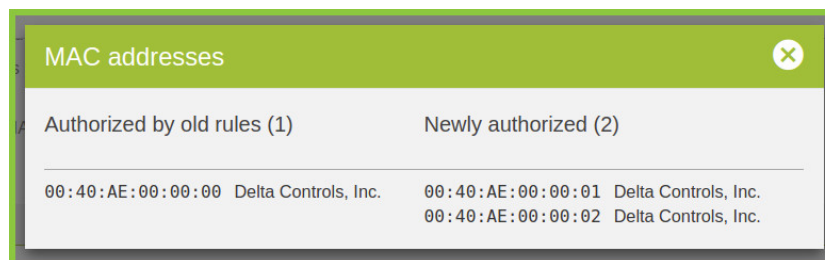
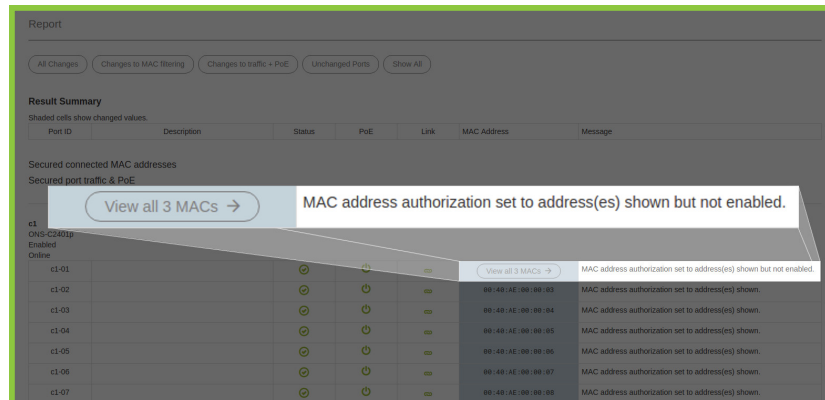
Selecting this option (checkbox) will apply MAC address authorization rules automatically. The points below cover the exact behavior in more detail.

- ☐ If a port has MAC address authorization enabled, it will not be affected by OneClick Secure. Any device that was connected to that port when the 'Lock System' button was clicked, will still be allowed to pass traffic on that port.
- ☐ MAC address authorization will be applied to Edge Switch ports that have single device connected to them.
- ☐ If there is a single device authorization rule that is disabled on a port, then the rule will be replaced if there is a different device detected.
- ☐ No configurations will be applied to the port if the link status is up, but no devices are detected on the port.
- ☐ When there are multiple devices, authorization rules are added to allow all of them to communicate, but the rules are not automatically enabled. This behavior is important, because some devices may not communicate frequently enough to be detected.



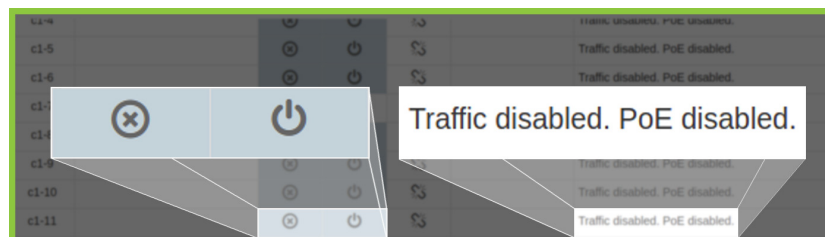
Port #	Description	Status	PoE	Link	MAC Address	Message
c1-7		⊗	⏻	🔌	00:1C:27:00:FF:A1	MAC address limiting set to address shown.

When multiple devices are detected, you can view them using the 'View all MACs' button. It is important to note that **OneClick Secure will not remove old authorization rules, even if the device is not detected** in the most recent iteration.



Secure Inactive Ports

Selecting this option will automatically disable the traffic and PoE on any Edge Switch port that has link status down.

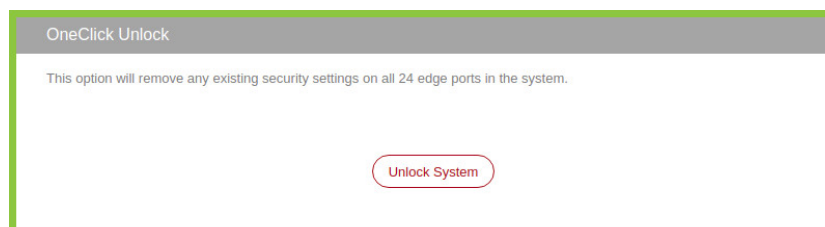


Secure Multi-device Ports

When this option is selected, the ports with multiple devices detected will have rules automatically enabled. As said in the warning shown when this option is selected, this option may adversely affect traffic for certain types of devices, if care is not taken.

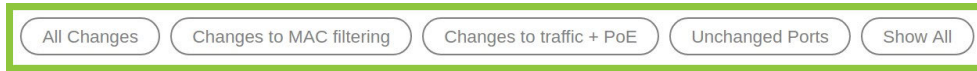
Unlock System

Clicking on this button will enable traffic and PoE and disable MAC address authorization on all Edge Switch ports. All MAC address authorization rules are kept intact, but traffic will be allowed on all ports.



Filters

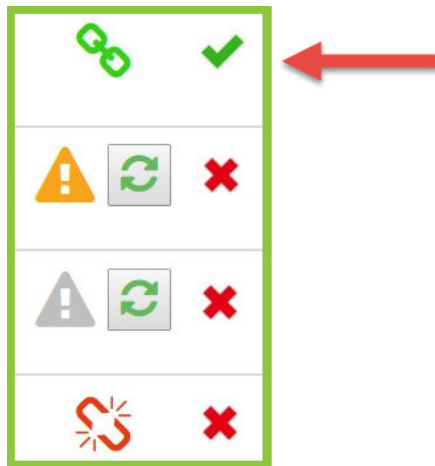
You can filter the OneClick Secure result summary using the buttons located directly above the results. By default, no filters will be applied.



Offline Edge Switches

OneClick Secure will not change the settings of Edge Switches that do not currently have management access.

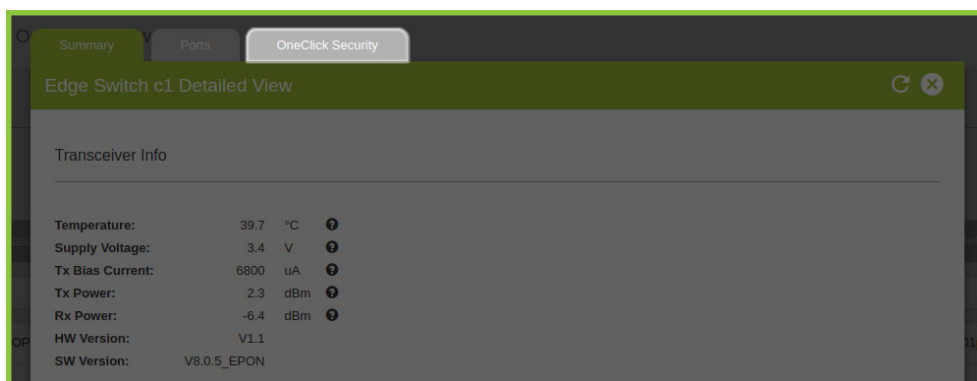
Below you will see the possible symbols that can appear under the 'Connection' column on the 'Edge Switches' page. OneClick Secure will only configure Edge Switches that have the green link symbol, which represents the online state.



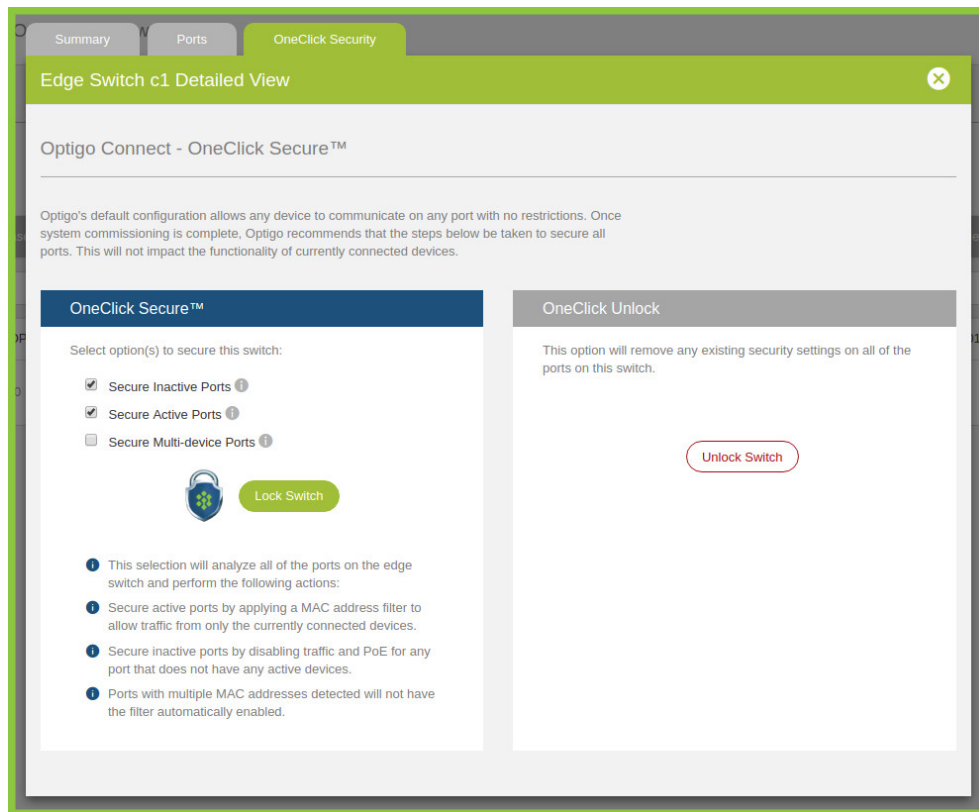
Secure Individual Edge Switches

You can also apply OneClick Secure to individual switches, rather than to all Edge Switches at once.

To do this, navigate to the '**Edge Switches**' page, then click [More →](#) for the desired Edge Switch. In the popup window, click on the '**OneClick Security**' tab.



You should see that Edge Switch's OneClick Secure view. Apart from only applying settings to the currently viewed Edge Switch, the behavior of OneClick Secure on this page is exactly the same as on the Security page. This allows you to have more control over which switches you want to lock down at a given time, which can be handy for troubleshooting purposes.

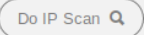


Devices

The devices page allows you to see devices that were discovered on the Edge Switch ports for a given timestamp. The primary information discovered is the MAC address of the device and the Edge Switch port that it is connected to. If a device's IP address is detected during the scan, it will also be displayed. This page helps users keep track of the devices connected to their system, including associated security rules.

Navigate to the Devices page from the left-hand side of the OneView screen and click on 'Devices'.

Discovery

To discover devices, click the  button on the top-right. It will open a prompt where you can input an IP address and VLAN to attempt to discover devices. Please note that it will scan with a 24-bit subnet, and you cannot scan on the MGMT VLAN (e.g. 10 in the screenshot below). This procedure will also discover MAC addresses on all Edge Switch ports regardless of VLAN or subnet, using the forwarding database of the Edge Switch.

IP Scan
✕

You may do an IP scan of a specific subnet + VLAN combination. This will send ARP packets at a rate of approximately 100 pps.

- Scanning the management VLAN –10– is not allowed
- Only a 24-bit prefix range will be scanned each time, ie. subnet mask of 255.255.255.0, and 256 addresses scanned.
 - For example, entering the IP address: 192.168.20.4 will scan IP addresses 192.168.20.0 to 192.168.20.255.
- You can choose any IP on the subnet, but there are some points to consider:
 - Choosing A.B.C.0 may not work; some devices do not respond to the 0 address of their subnet.
 - A.B.C.255 will likely not work, since it is the broadcast address.
 - If the chosen IP exists on a device, that device may not respond. You might wish to scan each subnet twice, with a different IP each time in case of conflict, eg. scan with 192.168.20.2 and then 192.168.20.3, both on VLAN 300.

IP Address:

VLAN:

Scan for IP addresses

Devices that have already been discovered will be displayed in the table that you see when you navigate to the page. Use the filters and different sorting methods to narrow down your search.

Port ID ▾	Port Description ▾	Port VLAN ▾	Device MAC ▾	Authorized ▾	Time discovered ▾
c1-07	CAM 11 --- ReoLink Camera	100	☐ EC:71:D8:1D:89:61	✓	2019-05-22 16:34:06
c1-10	CAM 12 --- ReoLink Camera	100	☐ EC:71:D8:31:72:66	✓	2019-05-22 16:34:06
c2-03		20	☐ 00:D0:6F:02:76:6F	✓	2019-05-15 11:41:24
c2-05	Delta device	20	☐ 00:40:AE:04:F7:51	✓	2019-05-22 16:34:06
c2-11	Delta device	20	☐ 00:40:AE:03:4F:A7	✓	2019-05-22 16:34:06
c2-22	CAM 15 --- ReoLink Camera (BACnet Wall)	100	☐ EC:71:D8:3D:F6:BA	✓	2019-05-22 16:34:06
c2-23	CAM 14--- ReoLink Camera (BACnet Wall)	100	☐ EC:71:D8:F6:19:93	✓	2019-05-22 16:34:06

25
|
50
|
100
|
View all

If an IP address is found for a device, it will be displayed in the 'IP address' column of the table. However, IP addresses that respond during the scan, but do not have a MAC address entry, will not be added to the table.

IP address ▾	IP scan time ▾	Scanned VLAN ▾
☐ 172.16.25.12	2019-05-22 16:34:01	100
☐ 172.16.25.10	2019-05-22 16:34:01	100
☐ 172.16.25.4	2019-05-22 16:34:01	100

Deleting Entries

You can delete IP address entries and MAC address entries. Deleting the IP address will remove it from the table but leave the device entry. Deleting the MAC address will remove the entire device entry (i.e. the entire row). Just check the item you want to delete and then click the **Remove** button.

Clear Filters Remove						
Port ID ▾	Port Description ▾	Port VLAN ▾	Device MAC ▾	Authorized ▾	Time discovered ▾	IP address ▾
c1-07	CAM 11 --- ReoLink Camera	100	☐ EC:71:DB:10:89:61	✓	2019-05-22 16:34:06	☒ 172.16.25.12
c1-10	CAM 12 --- ReoLink Camera	100	☒ EC:71:DB:31:72:66	✓	2019-05-22 16:34:06	☐ 172.16.25.10
c2-03		20	☒ 08:D8:6F:02:76:6F	✓	2019-05-15 11:41:24	
c2-05	Delta device	20	☒ 08:40:AE:04:F7:51	✓	2019-05-22 16:34:06	
c2-11	Delta device	20	☐ 08:40:AE:03:4F:A7	✓	2019-05-22 16:34:06	
c2-22	CAM 15 --- ReoLink Camera (BACnet Wall)	100	☐ EC:71:DB:3D:F6:BA	✓	2019-05-22 16:34:06	
c2-23	CAM 14--- ReoLink Camera (BACnet Wall)	100	☐ EC:71:DB:F6:19:93	✓	2019-05-22 16:34:06	☐ 172.16.25.4

IP Addresses with No Entry

As mentioned earlier, IP addresses with no known MAC-port association will not be displayed in the table. This means that devices plugged into the Aggregation Switch, which at the time of this writing does not support MAC address discovery in OneView, will not show up in the table. This also applies to Edge Switches that are stuck in the 'failed' state, where the switch's management is inaccessible, but traffic is still passing through the switch.

Optical Ports (Fiber System Only)

The Optical Ports section on the left-hand side of the screen displays a quick summary of the state of all of the ONS-S8 Aggregation Switch's optical ports (OPT 1 - OPT 8).

Optical Ports

OPT 1: active

OPT 2: link down

OPT 3: disabled

OPT 4: protect

OPT 5: no SFP

OPT 6: no SFP

OPT 7: no SFP

OPT 8: no SFP

Item	Description
active	The laser is on and Edge Switches are connected.
link down	The laser is on, but no Edge Switches are detected or it is in redundant protect mode and no light is detected in the fiber.
disabled	The laser has been manually disabled.
protect	The laser is off but detecting light in the fiber connection.
no SFP	There is no SFP physically plugged into the OPT port.

In a redundant system, where one of the system's NC-ONS-S8 Aggregation Switches is completely in **active** mode (passing traffic on all of its lasers) and the other NC-ONS-S8 Aggregation Switch is completely in **protect** mode (in standby and not passing traffic on any of its lasers), the systems' **Optical Ports** sidebar displays would look like this:

Optical Ports

OPT 1: active

OPT 2: active

OPT 3: active

OPT 4: active

OPT 5: active

OPT 6: active

OPT 7: active

OPT 8: active

Redundancy

Peer: connected

Config: synced

Optical Ports

OPT 1: protect

OPT 2: protect

OPT 3: protect

OPT 4: protect

OPT 5: protect

OPT 6: protect

OPT 7: protect

OPT 8: protect

Redundancy

Peer: connected

Config: synced

CHAPTER 13

Installing and Setting Up a Layer 3 Router

For the installation procedure and configuration for the Optigo provided MikroTik router, please visit <https://optigo.zendesk.com/hc/en-us/articles/360041361732-Router-Management-with-OneView->.

