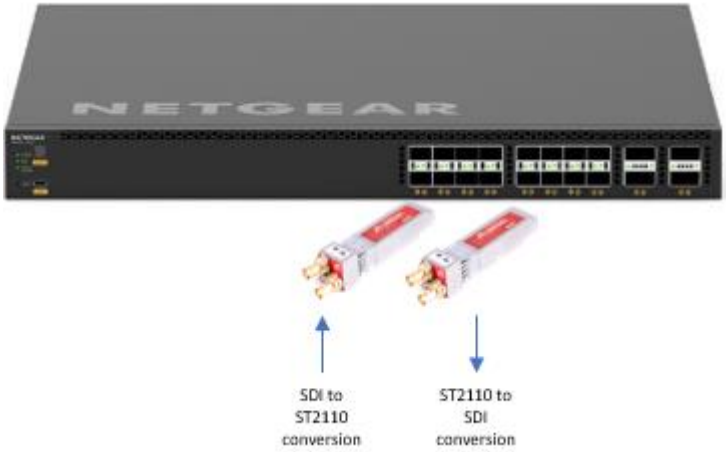
Networking MN-MuoN Devices with the Netgear M4350-16V4C

1 Introduction

This document provides information on how to properly configure and use the Netgear M4350-16V4C switch with Riedel MN-MuoN A devices. This combination results in a fully integrated 32 × SDI-ST2110 Gateway solution with full support of SMPTE ST 2022-7 hitless redundancy.

This document explains the recommended topology and proper configuration for optimal performances for the switch in typical broadcast use cases.



2 High level product description

- The Netgear M4350-16V4C is an effective solution to host MuoN A SFP gateways.
- The switch features:
  - 16 25GBASE-X SFP28 ports
  - 4 100GBASE-X QSFP28 uplinks
  - Supports SMPTE ST2110 IP broadcast protocol
  - PTP boundary clock
  - Layer 3 feature set includes static, policy-based, and dynamic routing
  - NETGEAR IGMP Plus™, AV User Interface, and Engage Controller speed up AV installations
  - Compact 1 RU frame
  - Front to back cooling
  - Redundant power supplies with one internal and one insertable
  - 420W internal power supply

3 Netgear Hosting MN-MuoN A Devices

The Netgear switch can be equipped with up to 16 MN-MuoN A devices, each one providing 2 channels of encapsulation or 2 channels of de-encapsulation of SMPTE ST 2110. The switch was tested using its extra cooling capacity to properly handle the thermal load of MN-MuoN A SFPs and make sure that each MN-MuoN A is properly cooled. Temperature testing has been performed so the switch can be used in ambient temperatures ranging from 0 to +45°C.

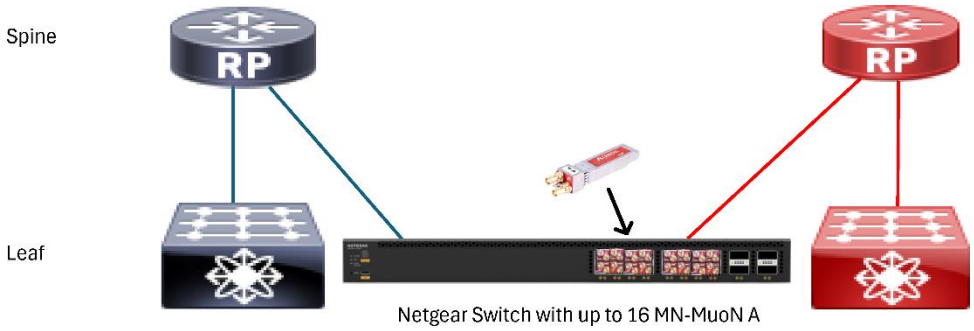
3.1 Ventilation setting

Switch setting example. Set fan to 'Cool mode' as follows:

```
enable
config
environment fan control mode cool
```

4 High Level Spine and Leaf design for Broadcast

The Netgear M4350-16V4C is intended to be used in a Spine and Leaf Topology. This White Paper provides details about how it can be used as a leaf switch, supporting both RED and BLUE networks for 2022-7 hitless redundancy.

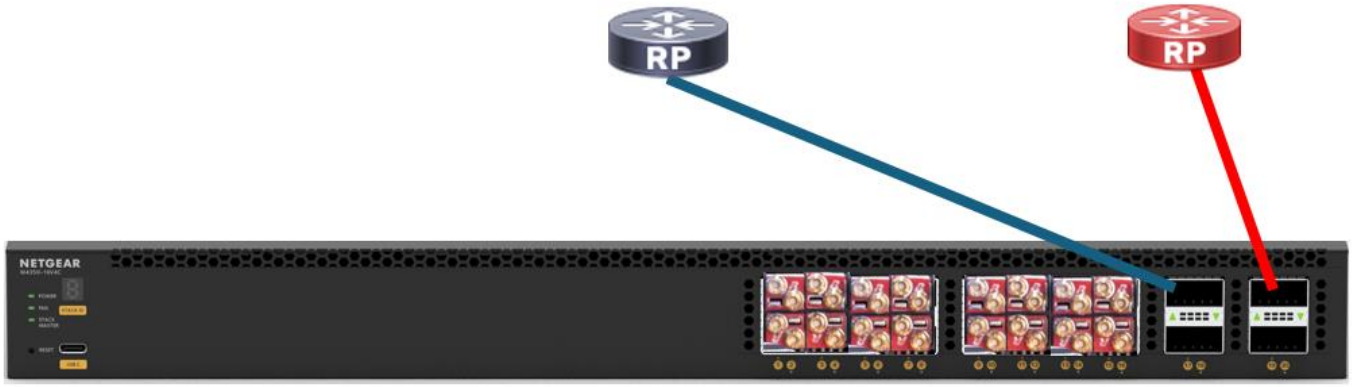


5 Bandwidth

The MN-MuoN-A provides either dual transmitter or dual receivers of 1.5/3G SMPTE ST 2110 signals with 2022-7 protection. This results in a total of 16 x 3G = 48G per 100G Uplink per network.

An MN-MuoN-A configuration running with 1.5G signals can support a fully redundant ST2022-7 architecture. When running at 3G, the Hitless redundancy can only be supported if only one of the two connectors on the MuoN A is used.

This MN-MuoN A configuration is non-blocking.



6 Switch Configuration Overview

This system was successfully tested in Riedel Labs with the following settings:

- The switch is running V14.0.2.26 firmware.
- The targeted IP topology is a Layer 3 Spine and Leaf network, where this leaf switch connects to both the Red and Blue networks.
- Each Network provides SMPTE ST 2110 flows over multicast in Any Source Multicast (ASM).
- Each Spine (Red and Blue network) has his own multicast Rendez-Vous Point (RP) taking care of the Multicast Source Discovery Protocol (MSDP or PIM).
- Spine uplink is configured in Layer 3 point to point connection. PTP is provided to the leaf switch through the aggregation link.
- The host ports are configured in Layer 3 with Open Shortest Path First (OSPF) to enable unicast routing in the IP network.
- The IGMPv2 must be set on the host endpoint. The RP for each Spine must be configured, including the IP address range for each one.

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7 Configuring OSPF, PIM, MSDP, PTP, and Fabric and Host Links for Netgear

- This switch has a webpage (GUI); however, the configuration examples shown below are executed using CLI commands. These configuration examples are limited to the optimization of the switch for use with MN-MuoN A devices. Further switch configuration may be required according to your current installation needs.
- For SMPTE ST 2022-7 operation:
  - The MN-MuoN A has a primary address for the Red network and Alias IP for the Blue network.
  - The MN-MuoN A has two multicast address ranges to be routed through two different PIM rendezvous points.

7.1 loopback Configuration

Loopback interface is used for the OSPF router-id and PTP (BC) boundary clock source IP.

```
interface loopback 0
ip address 192.26.151.135 255.255.255.255
ip ospf area 0
exit
```

7.2 IGMP and PIM Configuration

```
ip igmp
ip pim sparse
ip multicast
! For the Red network:
ip pim rp-address 192.11.0.1 239.0.0.0 255.0.0.0 override
! For the Blue network:
ip pim rp-address 192.12.0.1 238.0.0.0 255.0.0.0 override
exit
```

7.3 OSPF Configuration

```
router ospf
router-id 192.26.151.135
exit
ipv6 router ospf
exit
```

7.4 PTP Configuration

```
ptp
ptp priority1 127
ptp priority2 127
ptp source ipv4-address 192.26.151.135
ptp profile smpte-2059-2
ptp profile smpte-2059-2 domain 0
exit
```

7.5 Host MN-MuoN (Endpoint Layer3) Configuration

```
interface 1/0/1
mtu 1500
ptp
routing
ip address 11.1.1.1 255.255.255.252
ip address 12.1.1.1 255.255.255.252 secondary
ip ospf area 0
ip igmp
ip igmp version 2
ip pim
Exit
```

Note: The use of “igmp version 2” needs to be forced since version 3 not supported on the host port.

7.6 Uplink to Red Spine Configuration

```
interface 1/0/17
set igmp mrouter interface
ptp
routing
ip address 11.0.0.2 255.255.255.252
ip ospf area 0
ip ospf network point-to-point
ip igmp
ip pim
exit
```

7.7 Uplink to Blue Spine Configuration

```
interface 1/0/19
set igmp mrouter interface
ptp
routing
ip address 12.0.0.2 255.255.255.252
ip ospf area 0
ip ospf network point-to-point
ip igmp
ip pim
exit
```

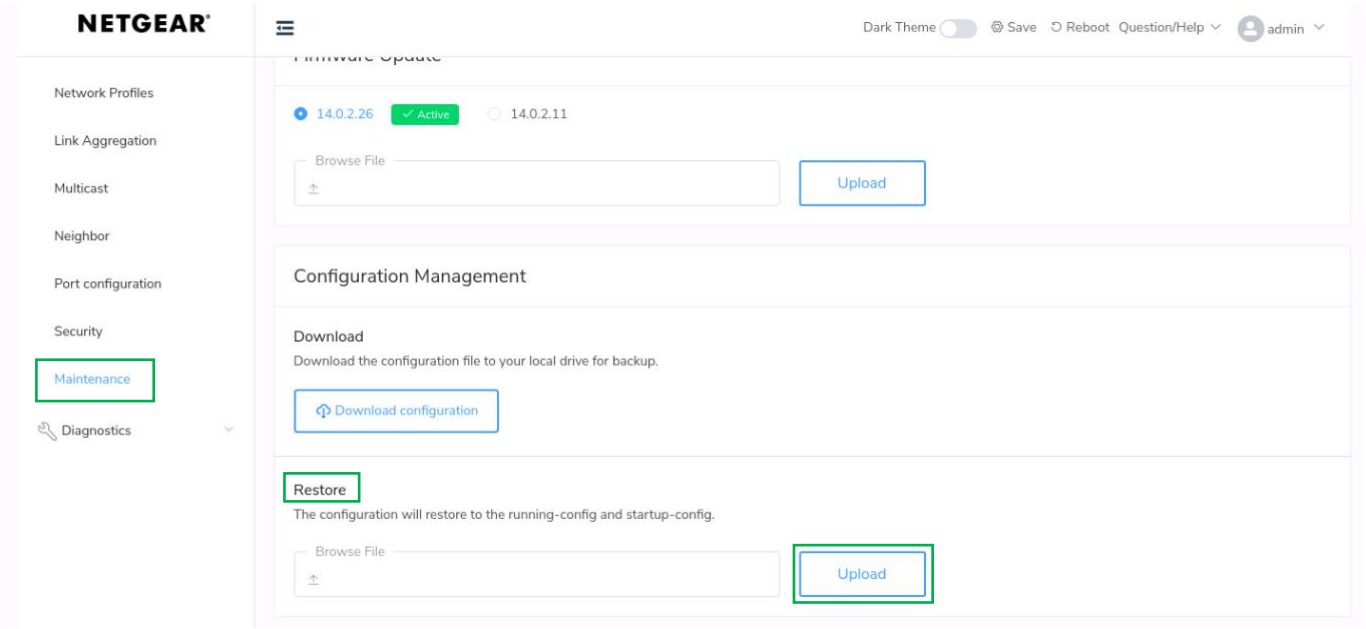
8 Make Your Configuration Changes Permanent

Once your configuration changes have been made and you are satisfied with the switch’s operation, you should make your changes permanent so that they remain after the switch is power cycled.

```
copy system:running-config nvram:startup-config
```

9 Configuration Example

The following is an example of a preset configuration with instructions about how to use it shown as comments. You may edit this configuration to your needs before loading it onto the switch. Once you have edited the following content to your needs, save it as a text file and upload it into the switch through the **Restore** feature. The switch's admin password will be reset when restoring this configuration file.



Note that the following configuration is attached to this PDF as a text file.

```
vlan database
vlan routing 1 1
exit
ip http port 49151
configure
stack
member 1 8
exit

line console
exit
line telnet
exit
line ssh
exit

!Cool mode required for Riedel MuoN A
environment fan control mode cool

!All ports in VLAN 1
interface 1/0/1-1/0/16
description "MuoN"
set igmp fast-leave
mtu 1500
ptp
exit

!Layer 3 example
!interface  1/0/16
!description "MuoN"
```

```
!mtu 1500
!ptp
!routing
!ip address 10.26.200.213 255.255.255.254
!ip address 10.26.200.217 255.255.255.254 secondary
!ip igmp
!ip igmp version 2
!ip pim
!ip helper-address 10.26.200.1 dhcp
!exit

interface 1/0/17
description "Red"
mtu 1500
ptp
routing
ip address 10.26.204.133 255.255.255.254
ip pim
exit

interface 1/0/18
description "Blue"
mtu 1500
ptp
routing
ip address 10.26.205.133 255.255.255.254
ip pim
exit

interface 1/0/19
description "Red redundant"
mtu 1500
ptp
routing
ip address 10.26.224.133 255.255.255.254
ip pim
shutdown
exit

interface 1/0/20
description "Blue redundant"
mtu 1500
ptp
routing
ip address 10.26.225.133 255.255.255.254
ip pim
shutdown
exit

interface vlan 1
description "Riedel MuoN A"
mtu 1500
routing
ip address 10.26.206.157 255.255.255.224
ip address 10.26.207.157 255.255.255.224 secondary
ip helper-address 10.26.200.1 dhcp
ip igmp
```

```
ip pim
ptp
exit

interface loopback 0
ip address 172.206.0.1 255.255.255.255
exit

ip management vlan 1 10.26.206.157 255.255.255.224
ip helper enable
ip igmp
set igmp querier address 10.26.206.157
ip pim sparse
!Red RP
ip pim rp-address 172.204.0.1 239.0.0.0 255.0.0.0
!Blue RP
ip pim rp-address 172.205.0.1 238.0.0.0 255.0.0.0
ip multicast

!Default route
ip route 0.0.0.0 0.0.0.0 10.26.204.132

!Red
ip route 10.26.204.0 255.255.255.0 10.26.204.132
ip route 172.204.0.1 255.255.255.255 10.26.204.132

!Blue
ip route 10.26.205.0 255.255.255.0 10.26.205.132
ip route 172.205.0.1 255.255.255.255 10.26.205.132

ptp
ptp priority1 127
ptp priority2 127
ptp profile smpte-2059-2
ptp profile smpte-2059-2 domain 0
ptp source ipv4-address 172.206.0.1
exit
ip http secure-port 49152
```