Grass Valley
WE LOVE LIVE

K Frame

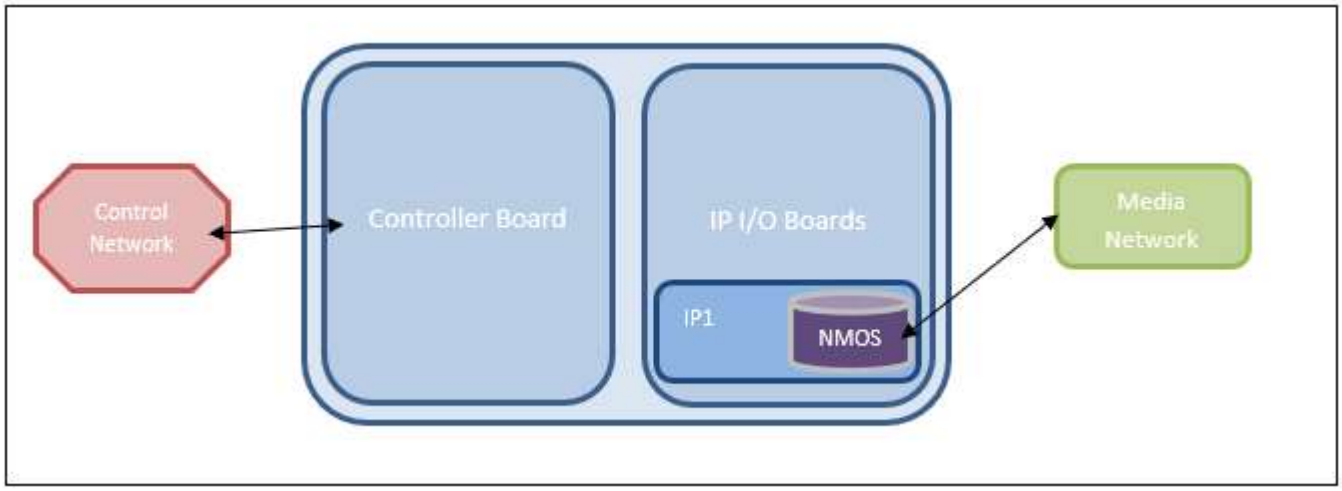
Application Note

K-Frame NMOS Setup and Debug Guide V1

By:
Ryan Zink & Liam Dixon

Date:
April 2024

NMOS Overview (Static Routes and IS04 Registration):



Static Routes:

NMOS runs an individual server for each IP I/O Board communicating on the Media Network ONLY. The entirety of the NMOS service runs on each IP I/O Board and status is reported to the mainframe (controller board). The NMOS service is In-band, meaning it communicates with other NMOS registries and Control Systems on the Media network ONLY.

Static routes for each board must be set in order to allow for communication between each IP Board (NMOS Node) and the NMOS Registries on the network. There are multiple interfaces for each board (8-16) depending on the size of the board. The static routes define how the NMOS service will route traffic to NMOS Registries on the Media network.

The result of the static routes locks down the possible communication interfaces for the NMOS service to two interfaces only, a primary (SFP1A / eth1) and secondary (SFP1B / eth2).

IS04 Registration – NMOS Easy Connect:

Easy Connect NMOS allows customers to dynamically connect to different NMOS registries without the need for mDNS and/or Unicast DNS-SD. The Switchers NMOS Configuration Menu menu provides a list of 6 possible registry entries (IP address and port). Each IP board iterates through the list of the given registries. One by one the IP Board establishes whether or not a registry is available at the time NMOS starts up.

If the IP Board determines the registry exists for a given IP and port, the NMOS Node will use that information to connect to that registry. The first successful registry that is discovered will be used. If the NMOS Node disconnects from a registry the entire process is restarted to determine the next best available registry. If no registries are found from the list of registries given it will try again in ~15-30 second intervals. Leaving all entries blank will have NMOS use its default discovery mechanism (mDNS and/or Unicast DNS-SD).

NMOS Setup

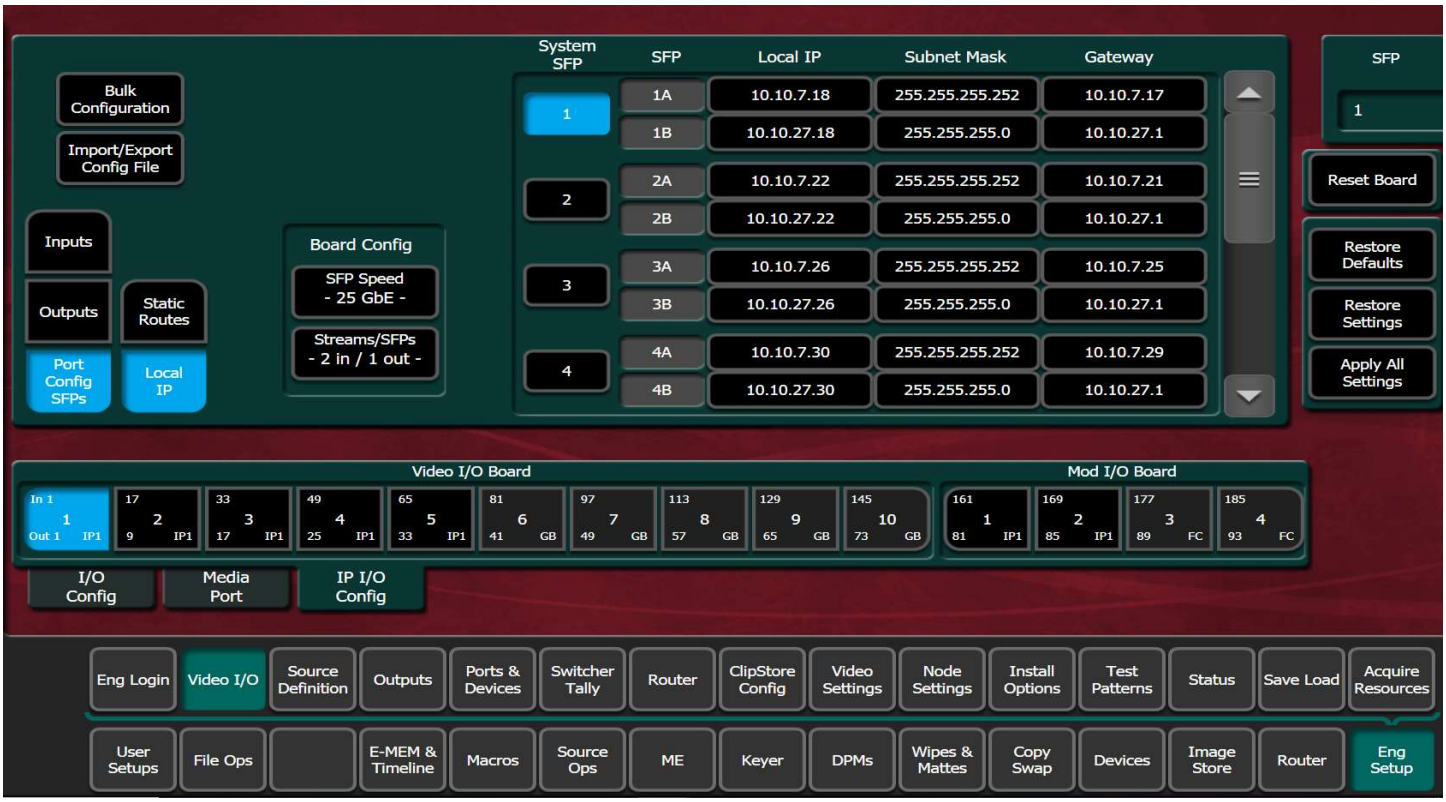
Step 1: Setting Up Static Routes for an IP I/O Board:

Since each board has an NMOS Server running on it, they must be configured individually. Each board has a unique SFP IP address for each interface on the board. This unique “Local IP” address ensures that communication between two IP’s is always aligned.

Multiple IP’s of the same address will cause issues and is prohibited. Redundant network subnets must not overlap and will not work. The network should be easily divided into unique subnets.

The static routes need to correctly define how traffic is routed to the primary (Red network) and the secondary (Blue network) for communication to work on the Media network.

- Below is an example Menu page of the Eng Setup -Video I/O - IP I/O Config - Port Config SFPs – Local IP, defining two Media networks:

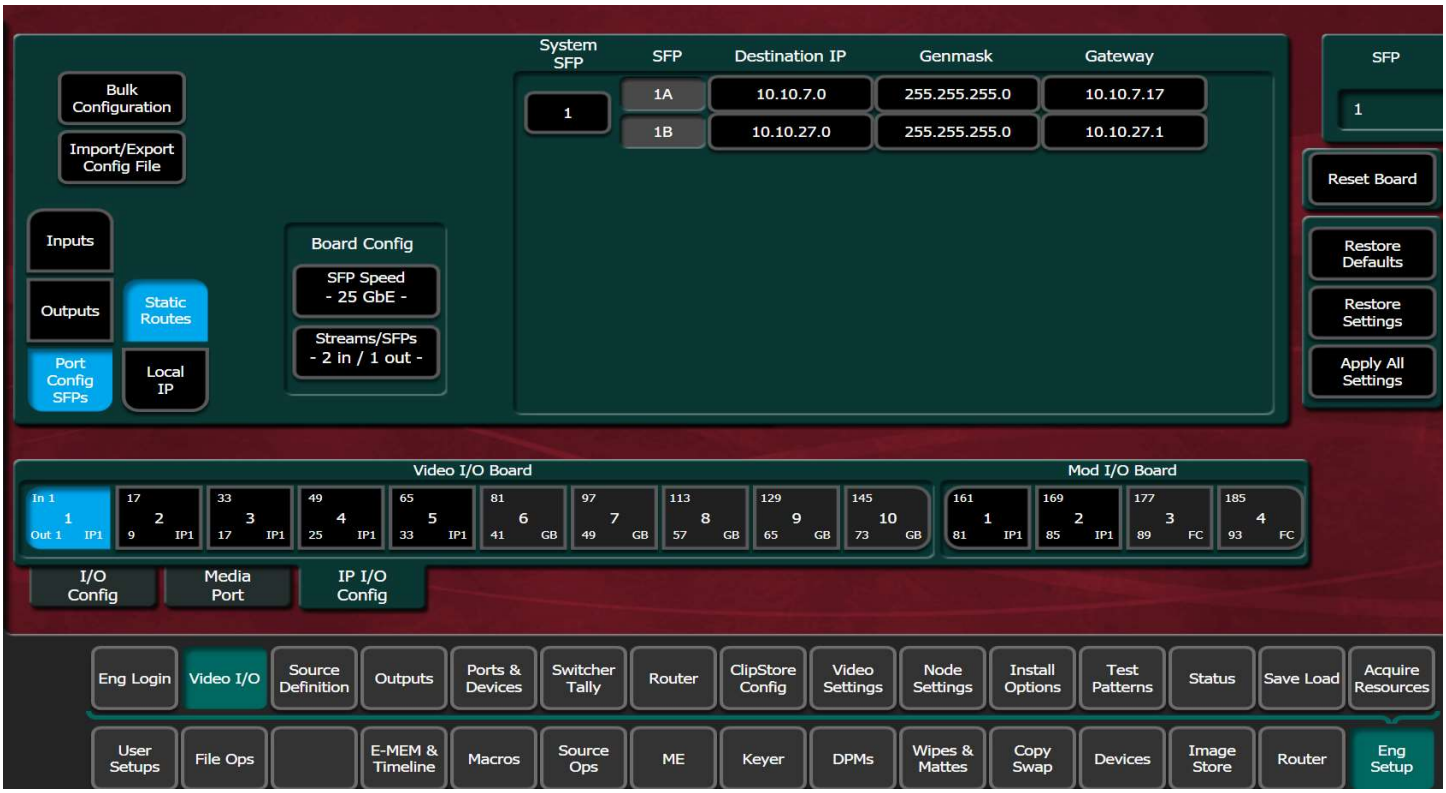


All the information needed to set up the correct static route can be found in the above page. The Red network is defined by the SFP A’s, so 10.10.7.18, 10.10.7.22, etc. The Red network can be defined as 10.10.7.0, every IP that contains those first 3 octets is the Red network.

The Blue network is defined by the SFP’s B, which is 10.10.27.18, 10.10.27.22, etc. Therefore, the Blue network can be defined as 10.10.27.0. All IP’s that contain 10.10.27 in the first 3 octets are Blue network IP addresses. The final important piece for Static Routes is the Gateway for the first SFP for both Networks which in the above example is 10.10.7.17 for Red and 10.10.27.1 for Blue. Note how the default gateway is the same

for the Blue network but different for the Red. This is simply to show that each network can be defined differently but what's important is that the Gateway for the first pair of SFP's (1A & 1B) is used in the static routes. This ensures the NMOS service will communicate using the proper interface depending on the Red/Blue respective ethernet traffic.

- Static Routes are set up in the Eng Setup – Video I/O – IP I/O Config – Port Config SFPs – Static Routes Menu as below:



- The Red network we defined earlier in the "local IP" Menu is used in the Destination IP. The Genmask defines how much of the Destination IP to use when defining the network. This will be made clearer in further examples.

- Lastly is the Gateway for SFP 1A which defines where the traffic should be routed when the Board is about to send a Red network ethernet packet. The Blue network is setup similarly but with the different Destination IP and Gateway. The Gateway will be different for each static route for each board. But the Destination IP and Genmask should remain the same for the Red and Blue networks for all the Boards in the frame.

- Example Static Route 1

SFP 1 “Local IP” Settings

SFP	Local IP	Subnet Mask	Gateway
1A	10.1.1.120	255.255.0.0	10.1.1.1
1B	10.2.1.120	255.255.0.0	10.2.1.1

Static Route

SFP	Destination IP	Genmask	Gateway
1A	10.1.0.0	255.255.0.0	10.1.1.1
1B	10.2.0.0	255.255.0.0	10.2.1.1

- Example Static Route 2

SFP 1 “Local IP” Settings

SFP	Local IP	Subnet Mask	Gateway
1A	10.100.1.10	255.255.255.252	10.100.1.9
1B	20.100.1.10	255.255.255.252	20.100.1.9

Static Route

SFP	Destination IP	Genmask	Gateway
1A	10.0.0.0	255.0.0.0	10.100.1.9
1B	20.0.0.0	255.0.0.0	20.100.1.9

Step 2: Setting Up IS-04 Registration entries for Easy Connect:

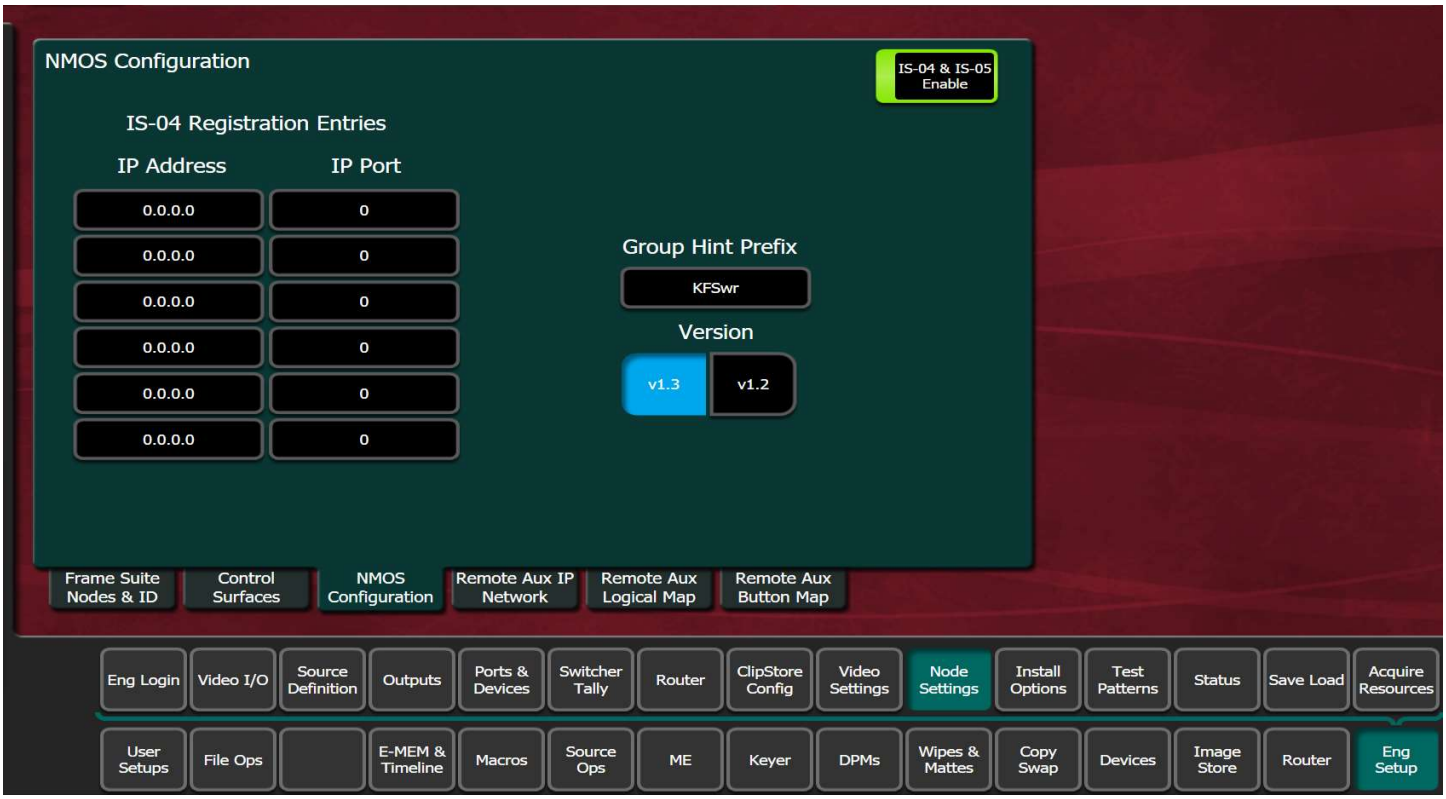
To connect to an NMOS registry, the correct IP address and port must be used. NMOS for the switcher is in-band, therefore the IP address of the registry must be on the media network.

The port needs to be the port the NMOS registry uses for /x-nmos/registration. For example, GVO uses the same port for /x-nmos/registration, ../query, ../system and ../node.

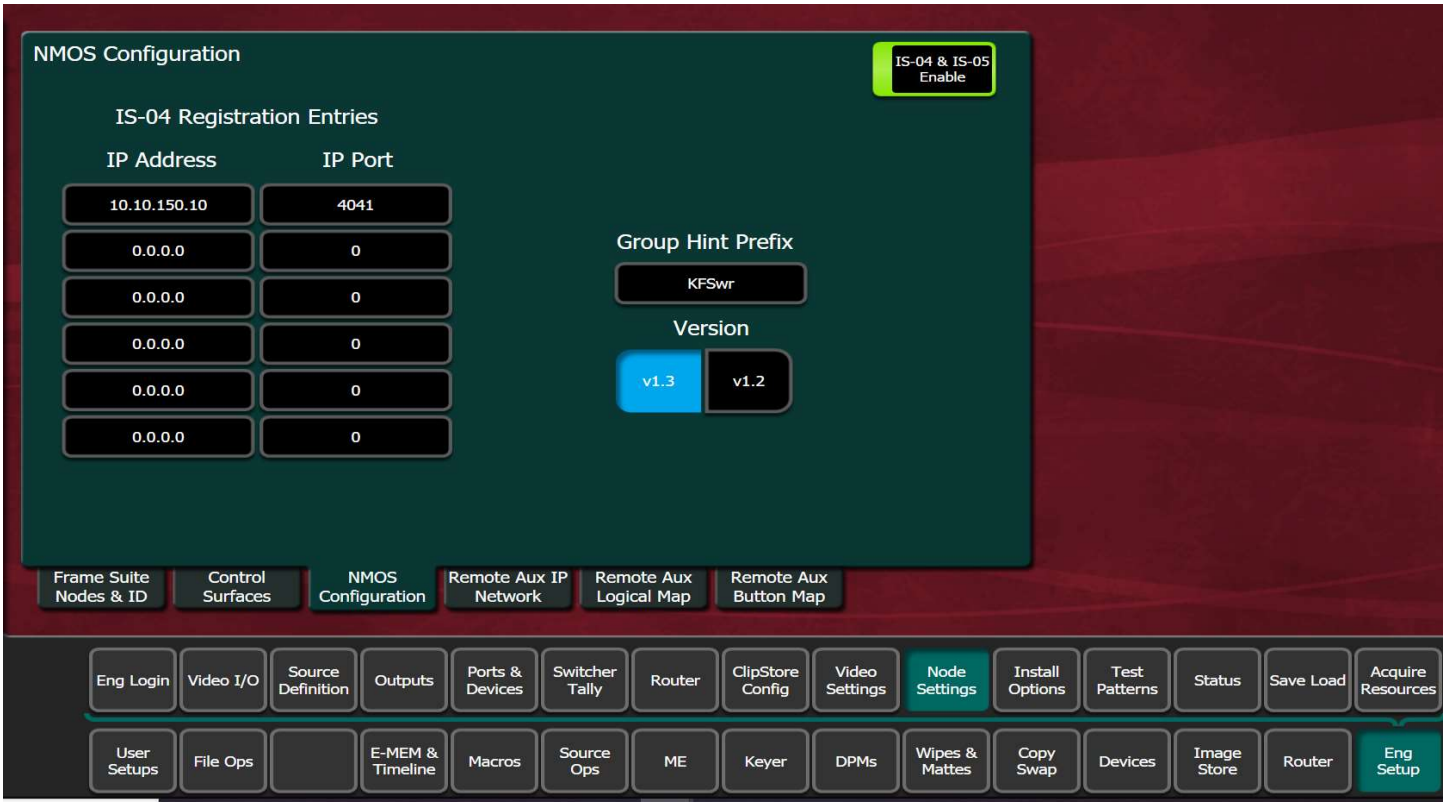
Other NMOS registries might use a different port for each service, like Sony's NMOS registry. It's important to use the /x-nmos/registration API port when entering the NMOS registries into the menu.

The menu allows for up to 6 registries. The priority of the registries is the order in which they are shown in the menu, starting from top to bottom.

- Go to Eng Setup – Node Settings – NMOS Configuration Menu:



- As default, if no Registry Addresses have been configured (0.0.0.0), the Switcher will use mDNS and/or Unicast DNS-SD to search for a Registry.
- Enable NMOS (if not already enabled)
- To connect to a Registry, enter the IP address and port of the NMOS registry:

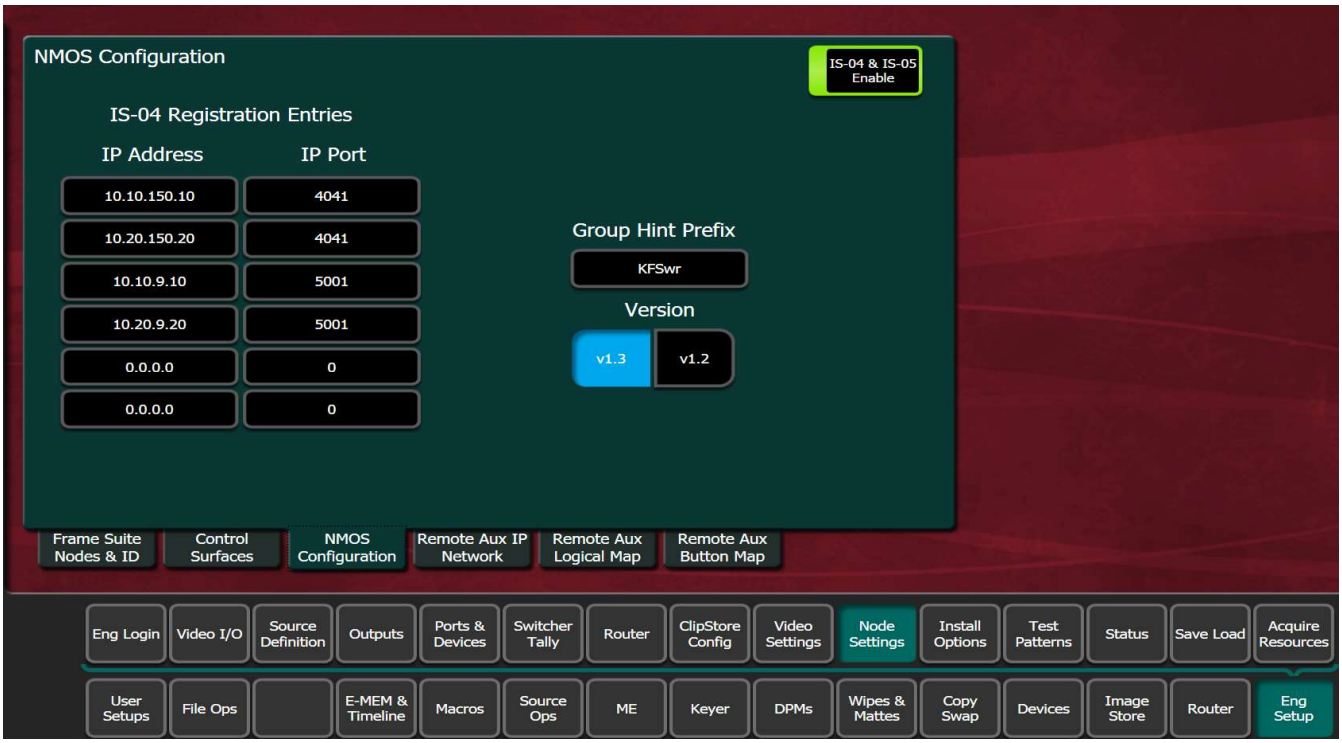


- It's important to allow the Switcher time to discover the registry.

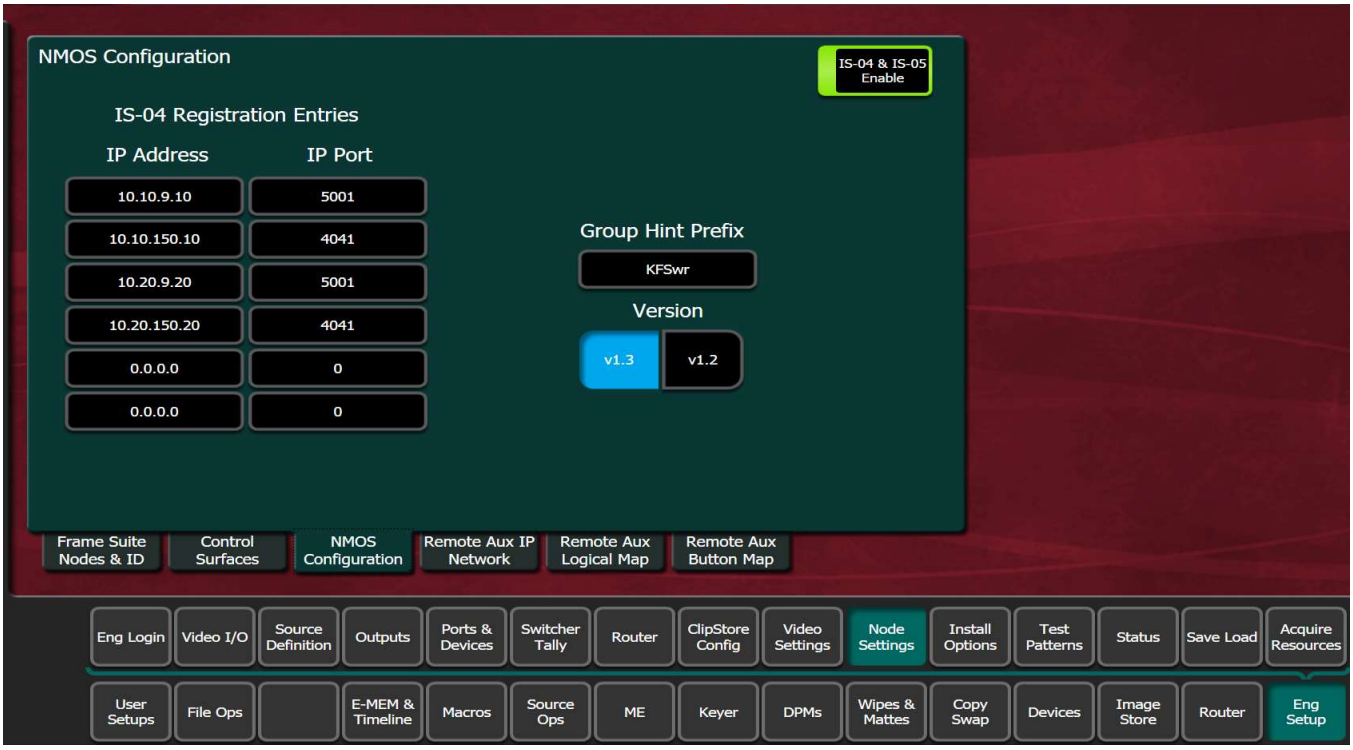
Example of Configuring Redundancy for EC NMOS (registry name - ip:port):

- GVO Red – 10.10.150.10:4041
- GVO Blue – 10.20.150.20:4041
- Sony Red – 10.10.9.10:5001
- Sony Blue – 10.20.9.20:5001

- Example 1: Configure GVO Registry as Primary and Sony as Secondary:



- Example 2: Configure Red network as primary and Blue as secondary, with Sony registry higher priority than GVO on both networks:



- **Clearing Registry Entries**

To clear the registry entries, type a single period “.” For the IP Address and 0 for the port. If all entries are empty, then the NMOS will revert to using MDNS and/or Unicast-SD:

Debug Tips

- **Pinging the IP Boards from the Media PC:**

Being able to ping the interface on the IP I/O Board from the Media PC proves out good communication on the Media network. If the Media PC is unable to ping the boards, the NMOS registry will be unable to reach the boards as well and NMOS will not work. There is also the possibility of a congested network where ping packets are missed sporadically. Without a consistent ping, there's a higher risk for an NMOS heartbeat message to be lost between the NMOS Node (IP Board) and the NMOS Registry. This can cause the NMOS Node to repeatedly reconnect to the NMOS registry causing slow responses and other issues when using NMOS.

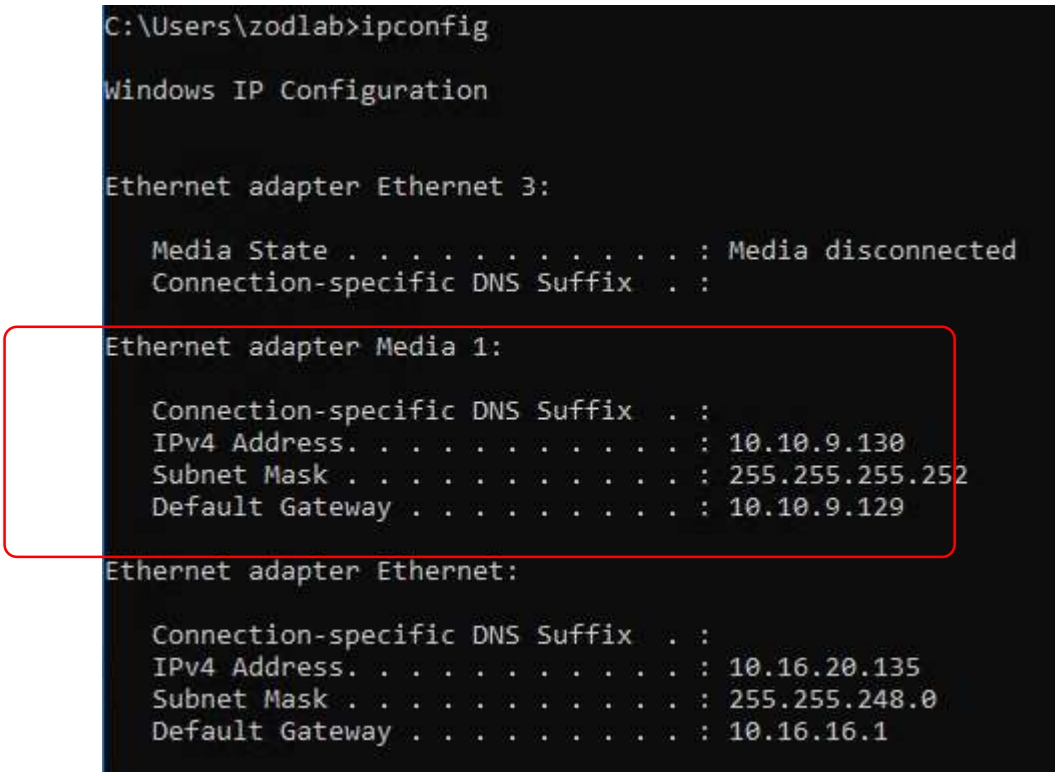
Note: If it's possible to ping the gateway for SFP 1 but not for the SFP IP, it's indictive of an issue with the static routes.

- Example ping with Media PC to an IP Board.

SFP 1 Settings

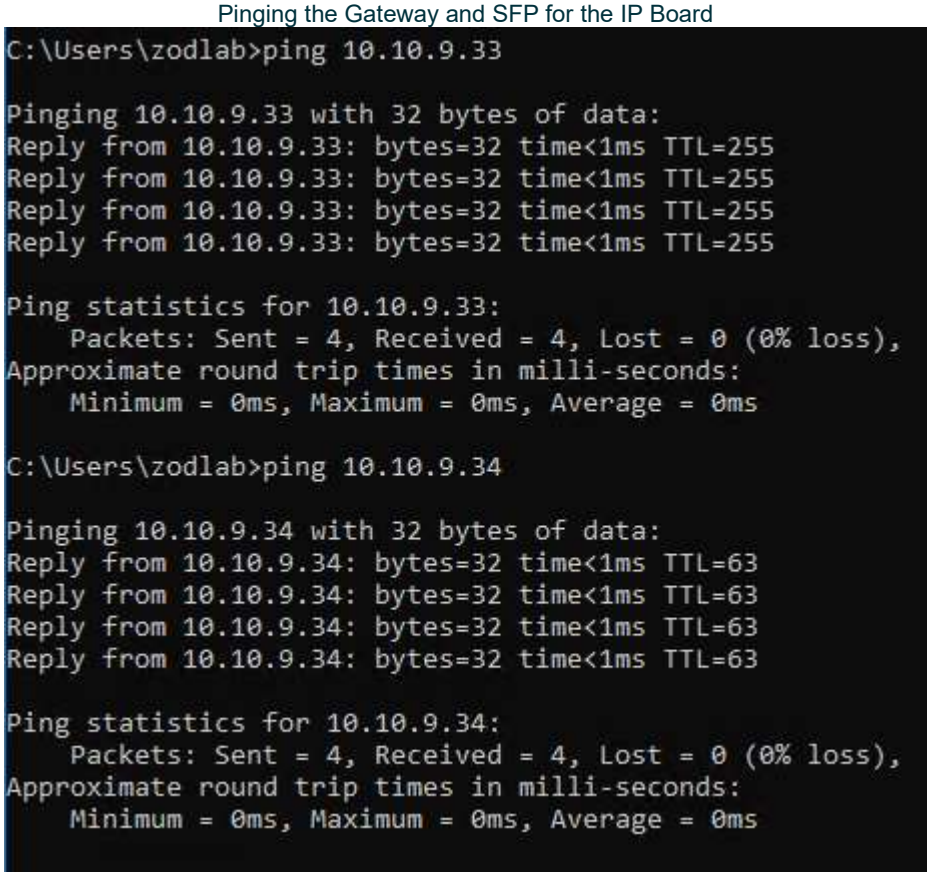
SFP	Local IP	Subnet Mask	Gateway
1A	10.10.9.34	255.255.255.252	10.10.9.33

Media PC IP Configurations for Windows, "ipconfig" from command prompt (Linux, "ifconfig" from terminal)



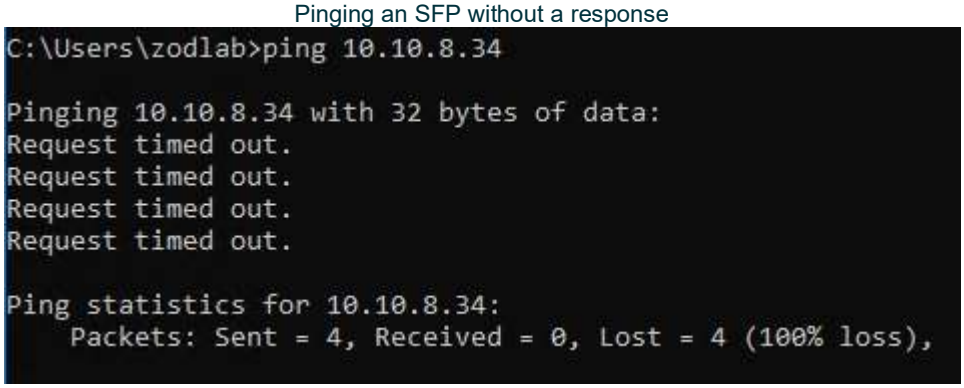
The example Media PC is connected to both a control network (10.16.0.0) and the Media network (10.10.0.0) as shown by the result of “ipconfig”.

Pinging the Gateway and SFP for the IP Board

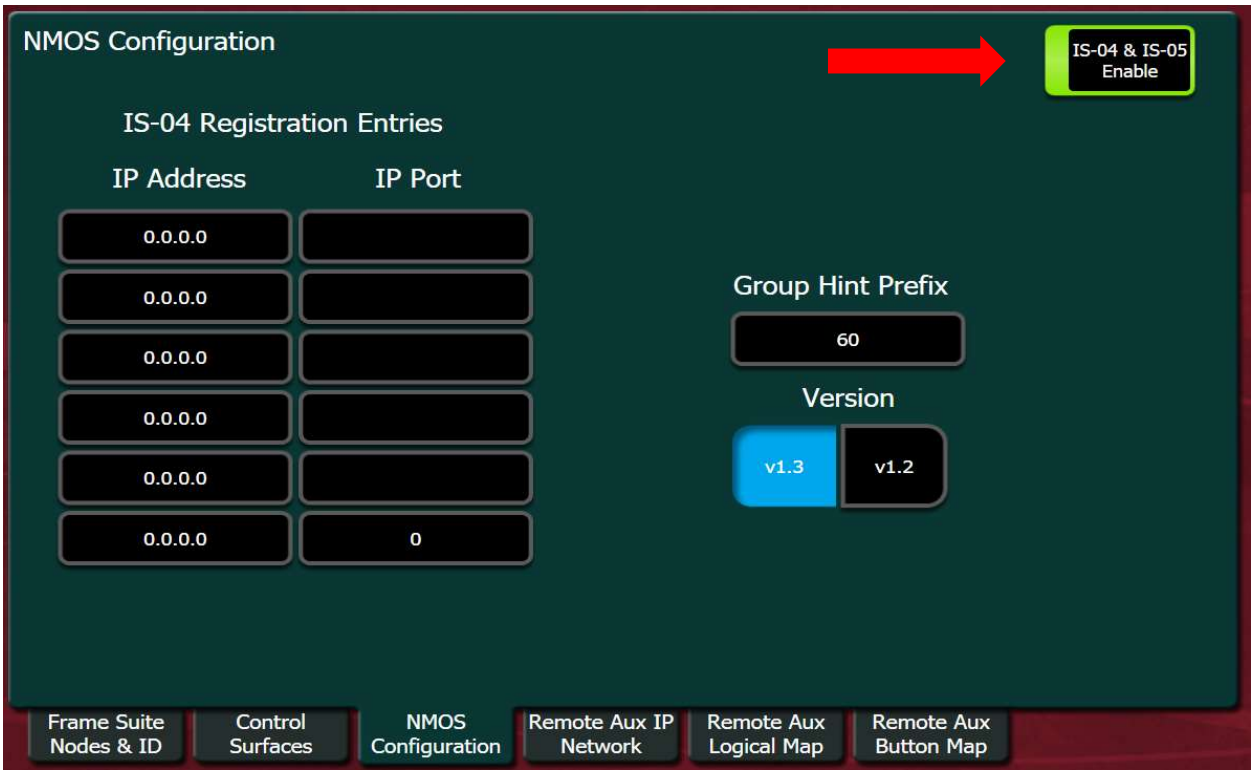


There is a consistent ping to both the gateway and SFP 1A IP address. If the network were congested, there’s a good chance not all packets would have been received in the ping.

Pinging an SFP without a response



- **NMOS is Enabled in the Menu**



Simple check in the Menu that the Enable button is highlighted green (Eng Setup->Node Settings->NMOS Configuration).

- **Check that the NMOS service is running on the IP Board using a web browser:**

Once all previous steps have been completed, the last thing to check is the NMOS Node server is running. It's possible to pull the NMOS Node server for its data using its API from any web browser. More in depth information about the API can be found here https://specs.amwa.tv/is-04/releases/v1.3.2/APIs/NodeAPI.html

For this example, we are going to pull data for the **/self** API for the NMOS Node. Here is the URL format we are going to fill out with the necessary information to check if the NMOS service is running.
http://[IP Address of SFP 1A]:[NMOS Node Server Port (always 4040)]/x-nmos/node/[NMOS Version]/self

SFP 1A Settings

SFP	Local IP	Subnet Mask	Gateway
1A	10.10.9.34	255.255.255.252	10.10.9.33

The NMOS URL for the 10.10.9.34 IP translates to: http://10.10.9.34:4040/x-nmos/node/v1.3/self

Entering the URL into the web browser will produce a json page of data relating to the NMOS Node for the Board which confirms that the NMOS Node server is running on the 10.10.9.34 IP Board:

The response in JSON confirms the NMOS Node service is up, and running on 10.10.9.34. If a JSON response is not found when entering the proper URL then an error has occurred. Check that the information entered in the URL is correct, with the correct IP Address for the IP Board and the port is 4040 has been included. If everything up to this point is correct and still no JSON response there could be an issue with the IS-04 Registration Entries in the Menu.

IMPORTANT: the NMOS Node service will not start until it knows what NMOS Registry to connect to when using the "Easy Connect" feature. To check if the any of the NMOS Registries are up and running, use the following URL http://[NMOS Registry IP]:[Registry Port]/x-nmos/registration. If the JSON is not coming up, then there is an issue with the Registry.
All information about the NMOS API's can be found here - https://specs.amwa.tv/nmos/