PRIME Matrox IP NMOS User Guide

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SINCE DAY ONE.

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Overview

This user guide is an addendum to the Prime IP Playout Configuration Guide. It describes the additional configuration required for Matrox IP Devices to support the NMOS (Networked Media Open Specification) IS-04 Discovery and Registration Specification.

The current Prime MX and HX platforms support NMOS IS-04 and IS-05 for Matrox ST 2110 Network Adapters. The hardware supported by Prime are the Matrox DSXLE5 IP Q25 or the DSXLE4 IP E.

NMOS IS-04 and IS-05

The Matrox NMOS API supports the NMOS IS-04 Node and Registry API. This allows for control and monitoring applications to find the Matrox Node on the network, as well as querying information about its Devices, Senders, Receivers, Sources, and Flows. It also supports the NMOS IS-05 Connection API, allowing for Input and Output Connection requests to modify the Sender and Receiver.

NMOS IS-04 and IS-05 enables automation and reduces manual overhead in setting up networked systems.

The Matrox Nodes will automatically locate an IS-04 registry using DNS-SD, as well as automatically registering their resource information using HTTP and JSON. A monitoring application can query the Matrox Node using HTTP. An NMOS explorer can issue input and output connection requests to the Matrox Senders and Receivers.

Matrox Driver and Supported Operating System

Matrox IP is supported on Windows 10 using Matrox DSX.Topology-Utils Driver version 10.2.100 for Prime 4.3. This driver is automatically installed as a component within the Prime Installer. It is downloadable through the Compact Installer.

Existing MX and HX platforms using the DSXLE4 IP E will require the firmware to be upgraded from 9.9.1 to be compatible with Prime 4.3 and later.

Configuring the System for NMOS

NMOS Configuration

The Matrox NMOS API is configured using a Matrox NMOS configuration file, based on the serial number of the installed Matrox card (for example, C:\Program Files\Matrox DSX-TopologyUtils\System64\A123456.json).

Prime automatically enables the Matrox NMOS API by configuring the Matrox NMOS configuration file on startup. No further intervention is typically required by the user if automatic discovery of the RDS using DNS-SD has already been configured.

Advanced NMOS Configuration

Advanced configuration may be performed by modifying the configuration file manually. The user can reset their settings by deleting this file. Any modification to the configuration requires a system restart.

These fields have been renamed from previous versions and may need to be reconfigured. Refer to section Deprecated NMOS Configuration.

By default, “use service discovery” is enabled by Prime, which requires DNS-SD to be configured on the network. However, the user can also manually specify a fallback registration server’s host name and port if DNS-SD is either not configured or to be ignored.

```
"fallback registration server”:
{
"api version": "auto",
“host name”: “127.0.0.1”,
"port": 5000
}
```

Fallback Registration Server is the block describing the Registration and Discovery Server (RDS) configurable settings.
API Version is the IS-04 Node and Registry API and IS-05 Connection API version. Matrox supports API version 1.2 (as “v1.2”), and version 1.3 (as “v1.3”). Automatic detection of the supported API version (as “auto”) is the default recommended setting.
Host Name is the IPv4 of the Registration and Discovery Server (RDS).
Port is the UDP port in use by the RDS.

By default, the “local port” is 50000. However, the user can also specify a particular port if this conflicts with another application on the system.

```
"local host name": "0.0.0.0",
"local port": 50000,
```

Local Host Name specifies the address of the network adapter that will be used for listening to NMOS related HTTP requests. Typically this is the address of the network interface card (NIC) within the system that communicates with the RDS. The default value is 0.0.0.0, which indicates any IPv4 address on any Ethernet adapter.
Local Port indicates the port that will be used for listening to incoming NMOS related HTTP requests, reserved exclusively for the Matrox NMOS API.

Deprecated NMOS Configuration

If the user previously upgraded from Prime 4.1 or earlier using Matrox DSX.Topology-Utils Driver version 10.1.101, then the settings file will contain default settings for new fields described in section Advanced NMOS Configuration, while ignoring the following deprecated fields which must be manually ported by the user.

Registration Server IP has been renamed **Host Name** in the **Fallback Registration Server** block.
Registration Server API Version has been renamed **API Version** in the **Fallback Registration Server** block.
Registration Server Port has been renamed **Port** in the **Fallback Registration Server** block.
Control IP has been renamed **Local Host Name**.
Control Port has been renamed **Local Port**.

Enabling NMOS Connection Requests through Windows Firewall

In order to allow NMOS connection requests, the control port must be opened to allow inbound TCP (Transmission Control Protocol) socket communication for the mvNetworkService.exe service.

The following rule must be manually added to the firewall settings using Network Shell (netsh) in administrator mode.

netsh advfirewall firewall add rule name="Matrox NMOS API" protocol=TCP dir=in localport={control port} action=allow program="C:\Program Files\Matrox DSX-TopologyUtils\System64\mvNetworkService.exe"

Where {control port} is the port that will be used for listening to incoming NMOS related HTTP requests defined in the Matrox NMOS configuration file that is associated to your Matrox card. It is **50000**, by default.

Enabling mDNS Configuration through Windows Firewall

The Matrox Driver automatically adds a rule to Windows Firewall to allow mDNS to automatically discover network services.

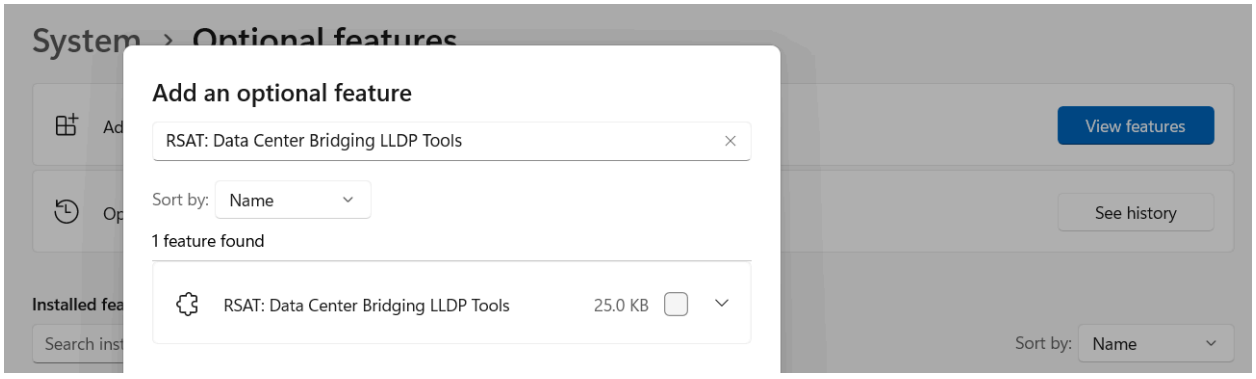
If the default Windows firewall is not in use, the following port must be opened through Bonjour. Through command line, from the Bonjour subdirectory (C:\Program Files\Bonjour), execute:

mDNSResponder.exe process inbound UDP 5353

Enabling Link Layer Discovery Protocol

Link Layer Discovery Protocol (LLDP) is supported on Prime platforms which use the DSXLE5 IP. If LLDP is desired, such as according to JT-NM TR-1001-1 recommendation to help switches and endpoints advertise their capabilities, then LLDP must be configured from Windows Powershell.

First, verify LLDP Tools has been installed on your device. To verify this, in Windows 11, go to Settings -> System -> Optional Features, and verify it is in the list of Installed Features. If not, go to Add an Optional Feature, and add “RSAT: Data Center Bridging LLDP Tools”.



Windows 11 LLDP Feature Setting (Settings -> System -> Optional Features -> Add an Optional Feature)

Then, through Windows Powershell, execute:

Enable-NetLldpAgent -NetAdapterName "Ethernet1"

Where Ethernet1 is the system’s primary network adapter interface name that NMOS commands will be sent to.

NMOS IS-04 AND IS-05 WORKFLOWS

Registering Matrox NMOS Receivers and Senders

The Matrox NMOS API will use the Matrox NMOS configuration file that is associated to the Matrox card (for example, A123456.json) to register the NMOS Nodes, Devices, Senders, and Receivers to a Registration and Discovery Server (RDS).

An NMOS Receiver and Sender will be registered dynamically into an RDS as soon as its associated connector is used with a Prime Input or Output Channel, respectively. This occurs when Prime starts.

The NMOS Receiver and Sender will be automatically unregistered when Prime exits.

Finding the Matrox NMOS Node

Every NMOS Node acts as an HTTP server providing functionality defined using the NMOS Node API. The user can monitor the status of the NMOS Node that is associated to the Matrox card using a web browser by entering the address of the local host name (eg. localhost when 0.0.0.0 is used in the Matrox NMOS configuration file) and port as a URL eg http://localhost:50000.

Additional status information about the RDS used when automatic discovery is enabled can be viewed on the x-manufacturer page (control IP:control port/x-manufacturer/registration-info/ eg. http://localhost:50000/x-manufacturer/registration-info/).

Processing Connection Requests

After NMOS Receivers and Senders are dynamically registered with the RDS, the Matrox NMOS Application (*mvNmos*) is invoked as a sub-process of Prime to handle NMOS IS-05 Connection Requests. This application will monitor and log connection requests to the user.

These requests can configure the Receivers and Senders matching the IP Input and Output Connector Flow settings associated with a Prime Input or Output Channel, respectively. Refer to the Prime IP Playout Configuration Guide for a complete description of available IP Connector Flow settings.

Each NMOS Sender (IP Video, Audio, or Ancillary Out) or Receiver (IP Video, Audio, or Ancillary In) can be separately enabled or disabled using a **Master Control toggle**. Further, the request can be handled **immediately** or as a **scheduled activation**. Pending activation requests can also be cancelled.

Senders

The following settings can be configured for NMOS Senders:

Primary Destination Address. Indicates the IPv4 address of the destination (that is, receiver).

Primary Destination Port. Indicates the UDP port of the destination (that is, receiver).
Primary Source Port. Indicates the User Datagram Protocol (UDP) port of the sender (that is, transmitter).
Redundancy. Enable the redundant stream for seamless reconstruction conforming to SMPTE ST 2022-7.
Redundant Destination Address. Indicates the redundant stream IPv4 address of the destination (that is, receiver).
Redundant Destination Port. Indicates the redundant stream UDP port of the destination (that is, receiver).
Redundant Source Port. Indicates the redundant stream UDP port of the sender (that is, transmitter).

Remaining settings must be statically configured when the channel is created. This includes the RTP Payload Filter and RTP Sync Source, the Type of Service (DSCP or ECN), the Packet Time to Live, and the Audio Packet Duration.

Receivers

The following settings can be configured for NMOS Receivers:

Primary Multicast Address. Indicates the reception multicast IPv4 address.
Primary Destination Port. Indicates the reception User Datagram Protocol (UDP) port.
Primary Source Address. Indicates the sender's IPv4 address. When this is configured, it is applied to an Inclusion Filter for Source Specific Multicast (SSM) using IGMP Version 3.
Redundancy. Enable the redundant stream for seamless reconstruction conforming to SMPTE ST 2022-7.
Redundant Multicast Address. Indicates the redundant reception multicast IPv4 address.
Redundant Destination Port. Indicates the redundant reception User Datagram Protocol (UDP) port.
Redundant Source Address. Indicates the redundant sender's IPv4 address. When this is configured, it is applied to an Inclusion Filter for Source Specific Multicast (SSM) using IGMP Version 3.

Remaining settings must be statically configured when the channel is created. This includes the RTP Payload Filter, the Multicast Join Type, the IGMPv3 Filter, and the Audio Packet Duration.

Known Issues and Feature Limitations

SDP Session Profiles with Input Connection Requests

Modifying the NMOS Receiver's Video and Audio Format through an SDP session profile attached to an Input Connection Request is not yet supported in Prime.

This includes the Video Width, Height, Scan Mode, Frame Rate and Colorimetry for Video Input Streams, and the Audio Packet Duration and Track Count for Audio Input Streams. This must be configured within the Prime IP Playout Configuration on Prime start.

However, the Matrox NMOS Application will honor Video and Audio Format activation requests obtained from the SDP session profile, if used in this way, causing unpredictable behavior on the Input Channel, including malformed video and audio present in Prime's Video and Audio Mix.

If this workflow is required, then a separate Prime IP Input Channel should be used for each SDP session profile, and toggled during run-time using the Master Control feature.

Logging

Persistent logging of NMOS IS-05 Connection Requests to the Prime Logger is not yet supported. This is only visible at run-time using the Matrox NMOS Application.

Troubleshooting

I don’t see the system with my Network Orchestration (NMOS IS-04)

By default, Prime configures the system to enable NMOS and Service Discovery using mDNS or DNS-SD. If the user is not using mDNS or DNS-SD, then a fallback registration server must be configured. See section Advanced NMOS Configuration.

Everything was working fine, but I upgraded from an earlier version of Prime and I no longer see the system with my Network Orchestration (NMOS IS-04)

Advanced NMOS Configuration changed from version 4.1 and earlier. These settings are now deprecated by the Matrox Driver. Refer to section Deprecated NMOS Configuration and re-configure the fallback registration server. See section Advanced NMOS Configuration.

I am using Network Orchestration (NMOS IS-05) to dynamically configure my Output Connector Flow, but I can’t connect to it

When provided with an IPv4 at startup, the Matrox Driver configures a flow with master control enabled. If this is to be dynamically configured, the Destination (Multicast) IPv4 may be set to 0.0.0.0:0. The Matrox Driver will create the flow with a default IPv4 but will leave the flow disabled. As part of the Output Connection Request, master control must be enabled for the flow.

Ensure IGMP has been properly configured for your receiver to process the IGMP join request.

My Network Orchestration doesn’t see the correct SDP session profile information / NMOS IS-05 Input or Output Connection Requests do not appear to work

Verify that the NMOS IS-05 Connection Request is logged in the Matrox NMOS Application with the proper Destination Multicast Address : Destination Port and that Master Control is enabled for all flows as part of the request.

The SDP session profile of individual Input and Output Connector Flows may be directly monitored by checking the stream metadata of the Matrox Node:

http://localhost:50000/x-nmos/node/v1.3/receivers/

http://localhost:50000/x-nmos/node/v1.3/senders/

The SDP file link will contain a fully qualified domain name reflecting the “local host name” field in the Matrox NMOS Configuration file. See NMOS Configuration for how to configure the Matrox NMOS Configuration file manually to modify the local host name. For example:

http://{“local host name”}:50000/x-matrox/senders/6751aa6b-af21-44b3-bfea-a1b7fdf8f24a/stream.sdp

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