



NVIDIA UFM Enterprise User Manual v6.16.0-5

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About This Document

NVIDIA® UFM® Enterprise is a powerful platform for managing InfiniBand scale-out computing environments. UFM enables data center operators to efficiently monitor and operate the entire fabric, boost application performance and maximize fabric resource utilization.

Software Download

To download the UFM software, please visit [NVIDIA's Licensing Portal](#).

If you do not have a valid license, please fill out the [NVIDIA Enterprise Account Registration](#) form to get a UFM evaluation license.

Document Revision History

For the list of changes made to this document, refer to [Document Revision History](#).

Release Notes

NVIDIA® UFM® is a powerful platform for managing InfiniBand scale-out computing environments. UFM enables data center operators to efficiently monitor and operate the entire fabric, boost application performance and maximize fabric resource utilization.

Key Features

UFM provides a central management console, including the following main features:

- Fabric dashboard including congestion detection and analysis
- Advanced real-time health and performance monitoring
- Fabric health reports
- Threshold-based alerts
- Fabric segmentation/isolation
- Quality of Service (QoS)
- Routing optimizations
- Central device management
- Task automation
- Logging
- High availability
- Daily report: Statistical information of the fabric during the last 24 hours
- Event management
- Switch auto-provisioning
- UFM-SDN Appliance in-service software upgrade

- Fabric validation tests
- Client certificate authentication
- IPv6 on management ports

 **Warning**

Prior to installation, please verify that all prerequisites are met. Please refer to [System Requirements](#).

 **Warning**

The Logical Server Model Management feature is going to be deprecated in UFM v6.12.0.

Changes and New Features

This section lists the new and changed features in this software version.

 **Note**

For an archive of changes and features from previous releases, please refer to [Changes and New Features History](#).

Feature	Description
Syslog Streaming	Added the option for setting UFM syslog streaming facility. For more information, refer to Configuring Syslog .

Feature	Description
Switch Cables REST API	Added the option to query specific switch cables (using Ports API).
Switch Power Information	Added support for switch and modules power usage data in UFM telemetry and REST API. For more information, refer to Devices Window and Inventory Window .
UFM Data Streaming	Added the ability to change the UFM Data streaming log facility. For more information, refer to Configuring Syslog and Configuring UFM Logging .
Kerberos Authentication	Added the ability for Kerberos authentication, a strong network authentication protocol for client-server applications. For more information, refer to Kerberos Authentication and Enabling Kerberos Authentication .
SM Settings	Changed the default maximal number of VLs to 2 (VLO – VL1). For more information, refer to Appendix – UFM Subnet Manager Default Properties .
Cable Management	Added support for showing transceiver information for downed links. For more information, refer to Cables Window and Network Map .
Secondary Telemetry	Added the <code>secondary_slvl_support</code> flag and information on the default counters. For more information, refer to Secondary Telemetry .
Congestion Control	Added support for SM congestion control settings. For more information, refer to Appendix - OpenSM Configuration Files for Congestion Control .
UFM HA	Enhanced reliability and added support for setting UFM HA on LVM (Logical Volume Manager). For more information, refer to UFM High-Availability Documentation .
Plugins	Packet Mirroring Collector (PMC) Plugin: Added support for event on PF indicating a QP closing with error on any other GVMI/VF. For more

Feature	Description
	information, refer to Packet Mirroring Collector (PMC) Plugin .
	PDR Deterministic Plugin: Updated instructions. For more information, refer to PDR Deterministic Plugin .
	GNMI-Telemetry Plugin: Added gNMI telemetry streaming support (supporting secured mode streaming). For more information, refer to GNMI-Telemetry Plugin .
	NDT Plugin (Subnet Merger): Added the option to validate the extended fabric using cable validation tool. For more information, refer to the NDT Plugin .

Note

The items listed in the table below apply to all UFM license types.

Note

For bare metal installation of UFM, it is required to install MLNX_OFED 5.X (or newer) before the UFM installation.

Please make sure to use the UFM installation package that is compatible with your setup, as detailed in [Bare Metal Deployment Requirements](#).

Unsupported Functionalities/Features

The following distributions are no longer supported in UFM:

- RH7.0-RH7.7 / CentOS7.0-CentOS7.7

- SLES12 / SLES 15
- EulerOS2.2 / EulerOS2.3
- Mellanox Care (MCare) Integration
- UFM on VM (UFM with remote fabric collector)
- Logical server auditing
- UFM high availability script - **/etc/init.d/ufmha** - is no longer supported
- The UFM Multi-site portal feature is no longer supported. The Multi-Subnet feature can be used instead
- The UFM Monitoring Mode is deprecated and is no longer supported as of UFM Enterprise version 6.14.0 (July release) and onwards
- Logical Elements tab - Removed as of UFM Enterprise v6.12.0
- Removed the following fabric validation tests: **CheckPortCounters & CheckEffectiveBER**

Note

In order to continue working with **/etc/init.d/ufmha** options, use the same options using the **/etc/init.d/ufmd** script.

For example:

Instead of using **/etc/init.d/ufmha model_restart**, please use **/etc/init.d/ufmd model_restart** (on the primary UFM server)

Instead of using **/etc/init.d/ufmha sharp_restart**, please use **/etc/init.d/ufmd sharp_restart** (on the primary UFM server)

The same goes for any other option that was supported on the **/etc/init.d/ufmha** script

Installation Notes

Supported Devices

Supported NVIDIA Externally Managed Switches

Type	Model	Latest Tested Firmware Version
NDR switches	<ul style="list-style-type: none">MQM9790	31.2012.1068
HDR switches	<ul style="list-style-type: none">MQM8790	27.2012.1010
EDR switches	<ul style="list-style-type: none">SB7790SB7890	15.2010.5108

Supported NVIDIA Internally Managed Switches

Type	Model	Latest Tested OS Version
NDR switches	<ul style="list-style-type: none">MQM9700	MLNX-OS 3.11.1014
HDR switches	<ul style="list-style-type: none">MQ8700MCS8500TQ8100-HS2FTQ8200-HS2F	MLNX-OS 3.11.1014
EDR switches	<ul style="list-style-type: none">SB7700SB7780SB7800CS7500CS7510CS7520	MLNX-OS 3.10.5002

System Requirements

Bare Metal Deployment Requirements

Platform	Type and Version
OS and Kernel (Relevant for Standalone and High-Availability deployments)	64-bit OS: <ul style="list-style-type: none"> • RedHat 7.9: 3.10.0-1160.el7.x86_64 • RedHat 8.2: 4.18.0-193.el8.x86_64 • RedHat 8.4: 4.18.0-305.el8.x86_64 • RedHat 8.6: 4.18.0-372.9.1.el8.x86_64 • RedHat 8.8: 4.18.0-477.27.1.el8_8.x86_64 • RedHat 9.0: 5.14.0-70.13.1.el9_0.x86_64 • CentOS 7.9: 3.10.0-1160.el7.x86_64 • Ubuntu 18.04: 4.15 • Ubuntu 20.04: 5.4.0 • Ubuntu 22.04: 5.15.0
CPU ^(a)	x86_64
HCAs	<ul style="list-style-type: none"> • NVIDIA ConnectX[®]-4 with Firmware 12.12.xxxx and above^(c) • NVIDIA ConnectX[®]-4 Lx with Firmware 14.32.1010 • NVIDIA ConnectX[®]-5 with Firmware 16.19.1200 and above • NVIDIA ConnectX[®]-6 with Firmware 20.24.1000 and above • NVIDIA ConnectX[®]-7 with Firmware 28.33.1014 and above • NVIDIA Mezzanine Board with Four ConnectX-7 ASICs for Multi-GPU Connectivity (CEDAR) with Firmware 28.36.0394 and above • NVIDIA BlueField with Firmware 24.33.900 and above • NVIDIA BlueField-2 with Firmware 24.33.900 and above • NVIDIA BlueField-3 with Firmware 32.36.3058 and above
OFED ^(b)	<ul style="list-style-type: none"> • MLNX_OFED 5.X • MLNX_OFED23.x • MLNX_OFED24.x

i Note

(a) CPU requirements refer to resources consumed by UFM. You can also dedicate a subset of cores on a multicore server. For example, 4 cores for UFM on a 16-core server.

(b) For supported HCAs in each MLNX_OFED version, please refer to MLNX_OFED Release Notes.

(c) UFM v6.15.0 is the last version to support NVIDIA ConnectX-4 adapter cards

i Note

From RedHat 9* and onwards, packages with SHA1 signatures are no longer supported. The CONDA package binary is signed with SHA1 signatures and thus, CONDA will not be installed with RedHat 9*.

Two options are available to overcome this.

1. **Recommended Option:** Run the following command to install Conda (change gpgcheck from 1 to 0):

```
cat <<EOF > /etc/yum.repos.d/conda.repo
[conda]
name=Conda
baseurl=https://repo.anaconda.com/pkg/misc/rpmrepo/conda
enabled=1
gpgcheck=0
gpgkey=https://repo.anaconda.com/pkg/misc/gpgkeys/anaconda.asc
EOF

#install conda
yum install conda
```

2. **Alternative Option:** Run the following command to set the RedHat 9* system-wide cryptographic policy to use **legacy** (less-secured) policy:

```
update-crypto-policies --set LEGACY
```

Install Conda as instructed by the UFM installation script.

After Conda installation, the policy can be set back to default by running the following command:

```
update-crypto-policies --set DEFAULT
```

Note

For running SHARP Aggregation Manager within UFM, it is recommended to use MLNX_OFED-5.4.X version or newer.

Note

Installation of UFM on minimal OS distribution is not supported.

Note

UFM does not support systems in which NetworkManager service is enabled.

Before installing UFM on RedHat OS, make sure to disable the service.

Docker Installation Requirements

UFM Docker Container is supported on the standard docker environment (engine).

The following operating systems were tested with Docker Container (as standalone container):

Component	Type and Version
Supported OS	<ul style="list-style-type: none">• RHEL7• RHEL8• RHEL9• Ubuntu18.04• Ubuntu20.04• Ubuntu22.04

Note

For UFM Docker Container installation in HA mode, please refer to [Bare Metal Deployment Requirements](#) for the list of operating systems and kernels which support HA.

UFM Server Resource Requirements per Cluster Size

Fabric Size	CPU Requirements*	M e m o r y R e q u i r e m e n t s	Disk S p a c e R e q u i r e m e n t s	
			M i n i m u m	R e c o m m e n d e d
Up to 1000 nodes	4-core server	4 G B	2 0 G B	5 0 G B
1000-5000 nodes	8-core server	1 6 G B	4 0 G B	1 2 0 G B
5000-10000 nodes	16-core server	3 2 G B	8 0 G B	1 6 0 G B
Above 10000 nodes	Contact NVIDIA Support			

UFM GUI Client Requirements

The platform and GUI requirements are detailed in the following tables:

Platform	Details
Browser	Edge, Internet Explorer, Firefox, Chrome, Opera, Safari
Memory	<ul style="list-style-type: none">• Minimum: 8 GB• Recommended: 16 GB

MFT Package Version

Platform	Details
MFT	Integrated with MFT version mft-4.27.0-83.

UFM SM Version

Platform	Type and Version
SM	UFM package includes SM version 5.18.0

Note

Assuming the SM is connected to the production cluster, it can handle any events (IB traps) coming from the fabric that is being built; such events should not affect the routing on the production cluster. If events occurred in the production cluster, the routing could be changed.

However, NVIDIA recommends isolating fabric sections to allow faster bring-ups, **faster troubleshooting and misconfiguration avoidance** that can cause routing errors. Isolation provides clearer SM and

CollectX logs, avoiding warnings/errors from masking real production issues.

UFM NVIDIA SHARP Software Version

Platform	Type and Version
NVIDIA® Scalable Hierarchical Aggregation and Reduction Protocol (SHARP)™	UFM package includes NVIDIA SHARP software version 3.6.0

Software Update from Prior Versions

The installer detects versions previously installed on the machine and prompts you to run a clean install of the new version or to upgrade while keeping user data and configuration unchanged.

The upgrade from previous versions maintains the existing database and configuration, allowing a seamless upgrade process.

Info

Upgrading UFM Enterprise software version is supported up to two previous GA software versions (GA -1 or -2).

For example, if you wish to upgrade to UFM Enterprise v6.11.0, it is possible to do so only from UFM Enterprise v6.9.0 or v6.10.0.

For detailed installation and upgrade instructions, refer to the *UFM Quick Start Guide*.

Note

Due to a possible conflict, SM and SHARP installed by the MLNX_OFED must be uninstalled. The installation procedure will detect and print all MLNX_OFED packages that must be removed.

Note

It is recommended to upgrade to the latest UFM version from the last 2 GA releases that came before it. Upgrading from older UFM versions may result in failures.

Bug Fixes in This Release

Ref #	Description
#4287663	Fixed security issue in Ethernet management interface.
	Keywords: CVE-2024-0130
	Discovered in Release: 6.17.2-1

Known Issues in This Release

N/A

Info

For a list of known issues from previous releases, please refer to [Known Issues History](#).

Changes and New Features History

Note

The items listed in the table below apply to all UFM license types.

Feature	Description
Rev 6.16.0	
Syslog Streaming	Added the option for setting UFM syslog streaming facility. For more information, refer to Configuring Syslog .
Switch Cables REST API	Added the option to query specific switch cables (using Ports API).
Switch Power Information	Added support for switch and modules power usage data in UFM telemetry and REST API. For more information, refer to Devices Window and Inventory Window .
UFM Data Streaming	Added the ability to change the UFM Data streaming log facility. For more information, refer to Configuring Syslog and Configuring UFM Logging .
Kerberos Authentication	Added the ability for Kerberos authentication, a strong network authentication protocol for client-server applications. For more information, refer to Kerberos Authentication and Enabling Kerberos Authentication .
SM Settings	Changed the default maximal number of VLs to 2 (VL0 – VL1). For more information, refer to Appendix – UFM Subnet Manager Default Properties .
Cable Management	Added support for showing transceiver information for downed links. For more information, refer to Cables Window and Network Map .

Feature	Description
Secondary Telemetry	Added the <code>secondary_slvl_support</code> flag and information on the default counters. For more information, refer to Secondary Telemetry .
Congestion Control	Added support for SM congestion control settings. For more information, refer to Appendix - OpenSM Configuration Files for Congestion Control .
UFM HA	Enhanced reliability and added support for setting UFM HA on LVM (Logical Volume Manager). For more information, refer to UFM High-Availability Documentation .
Plugins	Packet Mirroring Collector (PMC) Plugin: Added support for event on PF indicating a QP closing with error on any other GVMI/VF. For more information, refer to Packet Mirroring Collector (PMC) Plugin .
	PDR Deterministic Plugin: Updated instructions. For more information, refer to PDR Deterministic Plugin .
	GNMI-Telemetry Plugin: Added gNMI telemetry streaming support (supporting secured mode streaming). For more information, refer to GNMI-Telemetry Plugin .
	NDT Plugin (Subnet Merger): Added the option to validate the extended fabric using cable validation tool. For more information, refer to the NDT Plugin .
Rev 6.15.2	
UFM SM	New routing algorithm for asymmetric QFT topologies
Rev 6.15.1	
SHARP Reservation	Added support for Auto-cleanup of zombie SHARP reservations
Rev 6.15.0	

Feature	Description
Defining Node Description	To prevent the formation of incorrect multi-NIC groups based on these default labels, this feature offers the option to establish a blacklist containing possible node descriptions that should be avoided when grouping Multi-NIC HCAs during host startup. For more information, refer to Defining Node Description Black-List .
Network Reports	Added the ability to view topology change events related to devices and links. For more information, refer to Events History , Device Status Events and Link Status Events .
User Authentication	Introduced a new user authentication login page. For more information, refer to Azure Authentication Login Page and Enabling Azure AD Authentication .
	Added support for a separate authentication server. For more information, refer to UFM Authentication Server and Enabling UFM Authentication Server .
Secondary Telemetry	Added the ability to expose SHARP telemetry in UFM Telemetry. For more information, refer to Exposing Switch Aggregation Nodes Telemetry .
	Added the ability to stop SHARP telemetry endpoint using CLI commands. For more information, refer to Stopping Telemetry Endpoint Using CLI Command .
REST APIs	Enhanced the logging REST API by adding the ability to get event logs in JSON file format. For more information, refer to Get Events Logs in JSON Format .
	Added the ability to expose managed switch power consumption in Web UI. For more information, refer to Get Managed Switches Power Consumption .
	Added ability to filter the event logs by source. For more information, refer to Create Log

Feature	Description
	<p data-bbox="760 218 873 254">History.</p> <p data-bbox="760 279 1455 432">Added the ability to generate enterprise network reports. For more information, refer to Events History, Device Status Events and Link Status Events.</p> <p data-bbox="760 457 1430 611">Introduced REST APIs for various authentication types. For more information, refer to Examples of REST APIs Using Various Authentication Types.</p> <p data-bbox="760 636 1455 751">Added the ability to update UFM Configuration REST API. For more information, refer to UFM Configuration REST API.</p> <p data-bbox="760 777 1446 892">Added the option to expose cable information. For more information, refer to Get Ports with Cable Information.</p> <p data-bbox="760 917 1455 1071">Improved dynamic telemetry by adding the ability to instantiate a new instance and delete a running instance. For more information, refer to UFM Dynamic Telemetry Instances REST API.</p> <p data-bbox="760 1096 1360 1211">Added the option to set “down” ports as unhealthy. For more information, refer to Unhealthy Ports REST API.</p> <p data-bbox="760 1236 1455 1352">Added forge InfiniBand anti-spoofing support. For more information, refer to Forge InfiniBand Anti-Spoofing REST API.</p> <p data-bbox="760 1377 1455 1543">Added the ability to expose the " <code>site_name</code> " field in all supported REST APIs. For more information, refer to REST API Complementary Information.</p>
Plugins	<p data-bbox="760 1575 1455 1806">Added support for the gNMI-Telemetry plugin that employs the gNMI protocol to stream data from UFM telemetry. In addition, added support for secure mode based on client authentication. For more information, refer to the gNMI-Telemetry Plugin.</p> <p data-bbox="760 1831 1382 1908">Added support for ALM configuration for controlling isolation/de-isolation. For more</p>

Feature	Description
	information, refer to ALM Configurations .
	REST over RDMA Plugin: Moved to Ubuntu 22-based docker container, OFED 5.8-3.0.7.0, ucx_py 0.35.0 and Python 3.10.
Supported Transceivers	Added support for FR4 transceivers
Rev 6.14.2	
Cable and Transceivers Burning	UFM supports second-source cable transceivers burn.
Module REST API	Added HW revision field in GET module REST API response.
Telemetry	Added support for the MRCS register read in UFM Telemetry.
UFM Reports	UFM Daily report will be disabled by default after upgrade or clean installation.
Rev 6.14.0	
UFM Upgrade	<p>Added support for in-service upgrade procedure for UFM HA. Refer to the following sections:</p> <ul style="list-style-type: none"> • Upgrading UFM on Bare Metal - High Availability Upgrade • Upgrading UFM Container in High Availability Mode
User Authorization	Added support for user-defined roles based on REST APIs subsets. Refer to Rest Roles Access Control .
User Authentication	Added support for user authentication based on Azure Active Directory. Refer to Azure AD Authentication .
Plugins Management	Added support for loading UFM plugin to both master and standby nodes in case of UFM HA deployment. Refer to Plugin Management .
Unhealthy Ports Policy Management	Added support for unhealthy ports policy management via UFM Web UI. Refer to Health Policy Management .

Feature	Description
REST over RDMA Plugin	Added support for remote ibdiagnet authentication. Refer to rest-rdma Plugin .
SHARP Reservation	Added support for synchronous SHARP reservation REST API (in addition to the existing asynchronous REST API). Refer to the NVIDIA SHARP REST API .
Secondary Telemetry	Added support for secondary telemetry running by default upon UFM startup, fetching NVIDIA Amber counters. Refer to Secondary Telemetry .
	Added support for down ports telemetry. Refer to Secondary Telemetry .
PCI Analysis	Added support for PCI analysis as part of UFM Fabric Analysis Report (added new events for degraded hosts PCI devices). Refer to Appendix - Supported Port Counters and Events .
UFM System Dump	Added human readable time to the dmsg de-message output as part of UFM system dump.
Factory Reset	Added support for UFM Factory Reset. Refer to Appendix - UFM Factory Reset .
Rev 6.13.0	
Network Fast Recovery	Added the ability to automatically isolate a malfunctioning switch port as detected by the switch. Refer to Enabling Network Fast Recovery .
Multi-Subnet UFM	Added support for multiple UFM instances, wherein multiple instances are aggregated, managed and controlled by a centralized UFM instance. Refer to Multi-Subnet UFM .
Switch ASIC Failure Detection	Added support for a new indication (UFM event) that identifies a failure of a specific switch ASIC. Refer to Configuring Partial Switch ASIC Failure Events .
UFM High-Availability Enhancements	Added support for configuring high-availability with dual-link connections to improve the high-availability robustness.

Feature	Description
Automatic Switch Grouping	Added support for enabling automatic grouping of 1U switches by UFM, as per a pre-defined user-configured mapping. Refer to Appendix - Switch Grouping .
SHARP Trees APIs	Incorporated support for a new UFM REST API that presents the current active SHARP trees. Refer to NVIDIA SHARP Resource Allocation REST API .
SHARP Reservation APIs	Added support for SHARP Reservation API enhancements. Refer to NVIDIA SHARP Resource Allocation REST API .
Operating System Update support	Implemented functionality to support the installation and upgrade of a standalone UFM after the upgrade of operating system packages (e.g., using yum update/apt upgrade). Furthermore, upgrading operating system packages will not impact a standalone UFM installation.
Email Time-Zone Settings	Added the ability to configure time-zone settings for UFM email notifications, ensuring that sent events or daily reports align with the configured time zone. Refer to Email .
Switch Connectivity Failure Indication	Incorporated support for a new UFM event indication that identifies failed communication with a specified managed switch. Appendix - Supported Port Counters and Events
Dynamic Telemetry	Added APIs that enable the creation and management of UFM Telemetry instances, allowing users to select desired counters and ports as per their requirements. Refer to UFM Dynamic Telemetry Instances REST API.
TFS (Telemetry Fluent Streaming) Plugin	Added support for UFM telemetry data streaming from multiple endpoints to Fluent Bit. Refer to Telemetry to Fluent Streaming (TFS) Plugin REST API .
	Added support for enabling white/black counters lists within the TFS Plugin. Refer to

Feature	Description
	Telemetry to Fluent Streaming (TFS) Plugin REST API .
DTS (DPU Telemetry) Plugin	Added support for displaying DPUs data within the UFM Web UI. Refer to DTS Plugin .
Cyber-AI Plugin	Added support for displaying Cyber-AI software within the UFM Web UI. Refer to UFM Cyber-AI Plugin .
Packet Mirroring Collector (PMC) Plugin	Added the Packet Mirroring Collector (PMC) plugin that allows users to catch and collect mirrored pFRN and congestion notifications from switches for enhanced real-time network visibility. Refer to Packet Mirroring Collector (PMC) Plugin .
SNMP Traps Listener Plugin	Added the capability to enable registration and monitoring of SNMP traps from managed switches, in addition to updating UFM with the relevant trap information. Refer to SNMP Plugin .
Bright Cluster Integration Plugin	Added support for integration of data from Bright Cluster Manager (BCM) into UFM, providing a more comprehensive network perspective. Refer to UFM Bright Cluster Integration Plugin .
UFM System Dump	UFM System Dump collection enhancement. Refer to UFM System Dump Tab .
Expanding Non-Blocking Fabric (NDT Plugin extension)	Added a feature that facilitates seamless expansion of the IB fabric, ensuring uninterrupted functionality and optimal performance throughout the fabric. Refer to NDT Format – Merger .
PDR (Packet Drop Rate) Plugin	Added a new functionality that enables automatic detection and isolation of port failures through monitoring of PDR (Packet Drop Rate), BER (Bit Error Rate), and high cable temperatures. Refer to PDR Deterministic Plugin .
Rev 6.12.0	

Feature	Description
Managed Switches - Sysinfo Mechanism	Added the ability to save switches inventory data into JSON format files and present the latest fetched switches data upon UFM start-up. The saved switches data is available UFM upon system dump. Refer to Appendix - Managed Switches Configuration Info Persistency .
REST over RDMA Plugin	Introduced security improvements (allowed read-only options in remote ibdiagnet) and added support for Telemetry API. Refer to rest-rdma Plugin .
Events and Notifications	Added support for indicating potential switch ASIC failure by detecting a defined percentage of unhealthy switch ports. Refer to Additional Configuration (Optional) .
SHARP AM Multi-Port	Added support for detecting IB fabric interface failure and automatic failover to an alternative active port in SHARP Aggregation Manager (AM). Refer to Multi-port SM
UFM System Dump	Added support for downloading the generated UFM system dump. Refer to UFM System Dump Tab
UFM REST API	Added support for adding or removing hosts to Partition key (PKey) assignments (when adding/removing hosts, all the related host GUIDs are assigned to/removed from the PKey). Refer to Add Host REST API
	UFM System Dump Improvements including Creating New System Dump API
UFM SLURM Integration	Enhanced UFM SLURM integration; allow flexible configuration of PKey and SHARP resources usage. Refer to Appendix - UFM SLURM Integration
UFM HA	Improved UFM HA configuration by setting UFM HA nodes using IP addresses only (removed the need of using hostnames and sync interface names). Refer to Configuring

Feature	Description
	UFM Docker in HA Mode and Installing UFM Server Software for High Availability
Managed Switch Operations	Added support for persistent enablement/disablement of managed switches ports. Refer to Ports Window
UFM SDK	Created a script to get TopX data by category. Refer to UFM Aggregation TopX README.md file
Proxy Authentication	Added option to delegate authentication to a proxy. Refer to Delegate Authentication to a Proxy
UFM Initial Settings	Removed the requirement to set the IPoIB address to the main IB interface used by UFM/SM (gv.cfg → fabric_interface)
Port auto-isolation	Symbol BER warning does not trigger port auto-isolation, only symbol BER error
MFT Package	Integrated with MFT version 4.23.0-104

Bug Fixes History

Ref. #	Description
Rev 6.16.0	
3754940	<p>Description: Fixed issue where following the UFM HA upgrade from version 5.0.1-2 to version 5.3.1-2, the <code>ufm_ha_cluster config</code> command wiped the root partition</p> <p>Keywords: UFM HA Upgrade, <code>ufm_ha_cluster config</code>, Root Partition, Wipe</p> <p>Discovered in Release: 6.15.2</p>
3752196	Description: Fixed intermittent UFM REST API Failures

Ref. #	Description
	Keywords: REST API, Failure
	Discovered in Release: 6.15.1
3758874	Description: Fixed manage_the_unmanaged tool failure
	Keywords: manage_the_unmanaged, Failure
	Discovered in Release: 6.15.2
3773902	Description: Fixed the issue in congestion control, where <code>cc-policy.conf</code> file remains unchanged following the upgrade of the container version (with no changes made by the user)
	Keywords: Congestion Control, cc-policy.conf, Upgrade, Container
	Discovered in Release: 6.16.0-4
3560659	Description: Fixed proper update in [MngNetwork] mtu_limit in gv.cfg when restarting UFM.
	Keywords: mtu_limit, gv.cfg, Update, UFM restart
	Discovered in Release: 6.13.1
Rev 6.15.1	
3670183	Description: Monitoring endpoint not returning counters for an active interface
	Keywords: Monitoring, Active Interface, Counters
	Discovered in release: v6.15.0
3670182	Description: Inconsistent port format type returned from the UFM
	Keywords: Inconsistent, Port, Format Type
	Discovered in release: v6.14.1
3666944	Description: Port auto isolation failed to activate when a port consistently exhibited a high Symbol BER (1e-7)

Ref. #	Description
	<p>Keywords: Port Auto Isolation, Symbol BER</p> <p>Discovered in release: v6.13.1</p>
3665316	<p>Description: The UFM REST API endpoint <code>/ufmRest/resources/ports</code> provide inaccurate port state information</p> <p>Keywords: Ports REST API, Port State</p> <p>Discovered in release: v6.14.1</p>
3604194	<p>Description: UFM Fabric Validation " <code>CheckPortCounters</code> " failure</p> <p>Keywords: Fabric Validation, <code>CheckPortCounters</code></p> <p>Discovered in release: v6.13.2</p>
Rev 6.15.0	
3665001	<p>Description: UFM Web UI does not display Network Map (stuck with "please wait" message)</p> <p>Keywords: Web UI, Network Map</p> <p>Discovered in release: v6.14.1</p>
3644553	<p>Description: When querying the ports, adding a <code>cable_info=true</code> as an argument will give cable information per port</p> <p>Keywords: Ports, Query, <code>cable_info=true</code></p> <p>Discovered in release: v6.14.0</p>
3604212	<p>Description: Broken links REST API</p> <p>Keywords: REST API, Broken link</p> <p>Discovered in release: v6.13.2</p>
3604183	<p>Description: UFM error UFM NOT performed OpenSM polling for fabric changes more than 230742 seconds</p> <p>Keywords: OpenSM, UFM Error</p>

Ref. #	Description
	Discovered in release: v6.13.2-5
3604021	Description: UFM Enterprise installation under Ubuntu 22.04 fails on <code>configure_ha_nodes.sh</code>
	Keywords: Ubuntu 22.04, Installation, <code>configure_ha_nodes.sh</code>
	Discovered in release: v6.14.1-5
3587849	Description: OpenSM restarted when backup UFM lost power
	Keywords: OpenSM, Restart
	Discovered in release: v6.9
3577427	Description: UFM REST API returns wrong switch type for NDR unmanaged switch
	Keywords: Unmanaged Switch, NDR, REST API
	Discovered in release: v6.13.1
3575882	Description: UFM event is not generated for a switch down
	Keywords: UFM Event, Switch Down
	Discovered in release: v6.13.1
3628421	Description: UFM Web UI timezone issue when selecting Local Time
	Keywords: Timezone, Web UI, Local Time
	Discovered in release: v6.14.1-5
3566193	Description: Request for docker UFM HA support on Debian OS 10.13
	Keywords: Docker, HA support, Debian
	Discovered in release: v6.14.1-5
3565820	Description: UFM container CLI bugs
	Keywords: CLI, Container
	Discovered in release: v6.13.2-5

Ref. #	Description
Rev 6.14.0	
3590777	Description: After upgrading UFM new telemetry data is not being collected and presented in UI Telemetry tab.
	Keywords: Telemetry, Coredump
	Discovered in release: 6.14.0
Rev 6.13.2	
3228893	Description: ufm-prolog.sh failure: hostnames are not found in the fabric after reboot
	Keywords: Hostnames; <code>ufm-prolog.sh</code> , reboot
	Discovered in Release: 6.10.0
3495692	Description: UFM Enterprise v6.13.1 server hangs intermittently, blocking UFM REST server, and UFM GUI
	Keywords: UFM REST, UFM GUI
	Discovered in Release: 6.13.1
N/A	Description: Reverted setGuidsForPkey APIs for supporting SHARP reservation (in case it is enabled)
	Keywords: setGuidsForPkey, SHARP Reservation
	Discovered in Release: 6.13.1
Rev 6.13.1	
3459431	Description: UFM System Dump cannot be extracted from UFM 3.0 Enterprise Appliance host when running in high-availability mode.
	Keywords: System Dump, High-Availability
	Discovered in Release: 6.12.0
3461658	Description: The network fast recovery configuration (<code>/opt/ufm/files/conf/opensm/fast_recovery.conf</code>

Ref. #	Description
) is missing when UFM is deployed in Docker Container mode.
	Keywords: Network Fast Recovery; Docker Container; Missing Configuration
	Discovered in Release: 6.12.0
3461058	Description: When using the Dynamic Telemetry API to create a new telemetry instance, the log rotation mechanism will not be applied for the newly generated logs of the UFM Telemetry instance
	Keywords: Dynamic, Telemetry, Log-rotate
	Discovered in Release: 6.13.0
Rev 6.13.0	
3410826	Description: Rectified inability to modify user password
	Keywords: User Password, Update, Fail
	Discovered in Release: 6.12.1
3383916	Description: Fixed Client CTRL+C server disruption
	Keywords: Client CTRL+C, Server functionality
	Discovered in Release: Rest Over RDMA Image 1.0.0-21
3375414	Description: Fixed improper functionality of UFM UI Dashboard
	Keywords: UI Dashboard
	Discovered in Release: 6.11.0
3342713	Description: Fixed UFM Health configuration for periodic restarts of the telemetry
	Keywords: UFM Health, Telemetry, Periodic restarts
	Discovered in Release: 6.11.1
3361160	Description: Fixed UFM long upgrade time due to a large historical Telemetry database file

Ref. #	Description
	Keywords: Long Upgrade Time, Historical Telemetry, Database File
	Discovered in Release: 6.11.0
3268270	Description: Show managed switches inventory data (Sysinfo) immediately after UFM initialization
	Keywords: Managed Switches, Inventory, Sysinfo
	Discovered in Release: 6.11.0
3338613	Description: Fixed UFM log rotation for supported Ubuntu OSs
	Keywords: Log rotation, Ubuntu
	Discovered in Release: 6.11.0
3338600	Description: Fixed UFM UI lockdown by adding protection to the failed path on backend side
	Keywords: UFM UI, lockdown
	Discovered in Release: 6.11.0
3276163	Description: Fixed remote syslog configuration in UFM Web UI to be persistent
	Keywords: Remote Syslog, Web UI
	Discovered in Release: 6.11.0

Known Issues History

Ref #	Issue
Rev 6.16.0	
3791820	Description: Configuring the collection of SLVL on the secondary telemetry will result in SLVL data being sampled at a reduced rate.
	Keywords: SLVL, Multi-Rate, Reduced Rate

Ref #	Issue
	<p>Workaround: Edit the <code>launch_ibdiagnet_config.ini</code> file and restart the UFM telemetry.</p> <ol style="list-style-type: none"> 1. Edit the <code>launch_ibdiagnet_config.ini</code> file by running the following command: <pre data-bbox="841 512 1463 816">vi /opt/ufm/files/conf/secondary_telemetry_defaults/launch_ibdiagnet_config.ini</pre> <p>Comment the following line:</p> <pre data-bbox="841 856 1463 1016">#base_freq=1</pre> <ol style="list-style-type: none"> 2. Restart UFM telemetry: <pre data-bbox="841 1056 1463 1360">/etc/init.d/ufmd ufm_telemetry_stop /etc/init.d/ufmd ufm_telemetry_start</pre> <p>Discovered in Release: 6.15.0</p>
3775405	<p>Description: Upon UFM startup, an empty temporary folder will be created at /tmp folder every 10 minutes (due to periodic telemetry status check)</p> <p>Keywords: Empty folder, temporary, /tmp</p> <p>Workaround: Add <code>'rm -f /tmp/tmp*'</code> to crontab to run daily or change <code>instances_sessions_compatibility_interval</code> parameter in <code>gv.cfg</code> to 30/60 minutes</p>

Ref #	Issue
	Discovered in Release: v6.15.0
Rev 6.15.0	
3791820	<p>Description: Configuring the collection of SLVL on the secondary telemetry will result in SLVL data being sampled at a reduced rate.</p> <p>Keywords: SLVL, Multi-Rate, Reduced Rate</p> <p>Workaround: Edit the <code>launch_ibdiagnet_config.ini</code> file and restart the UFM telemetry.</p> <ol style="list-style-type: none"> Edit the <code>launch_ibdiagnet_config.ini</code> file by running the following command: <pre data-bbox="841 842 1463 1142">vi /opt/ufm/files/conf/secondary_telemetry_defaults/launch_ibdiagnet_config.ini</pre> <p>Comment the following line:</p> <pre data-bbox="841 1184 1463 1339">#base_freq=1</pre> <ol style="list-style-type: none"> Restart UFM telemetry: <pre data-bbox="841 1381 1463 1682">/etc/init.d/ufmd ufm_telemetry_stop /etc/init.d/ufmd ufm_telemetry_start</pre> <p>Discovered in Release: 6.15.0</p>
3775405	<p>Description: Upon UFM startup, an empty temporary folder will be created at /tmp folder</p>

Ref #	Issue
	<p>every 10 minutes (due to periodic telemetry status check)</p> <p>Keywords: Empty folder, temporary, /tmp</p> <p>Workaround: Add 'rm -f /tmp/tmp*' to crontab to run daily or change instances_sessions_compatibility_interval parameter in gv.cfg to 30/60 minutes</p> <p>Discovered in Release: v6.15.0</p>
Rev 6.15.0	
3560659	<p>Description: Modifying the <code>mtu_limit</code> parameter for [MngNetwork] in gv.cfg does not accurately reflect changes upon restarting UFM.</p> <p>Keywords: <code>mtu_limit</code>, MngNetwork, gv.cfg, UFM restart</p> <p>Workaround: UFM needs to be restarted twice in order for the changes to take effect.</p> <p>Discovered in Release: v6.15.0</p>
3729822	<p>Description: The Logs API temporarily returns an empty response when SM log file contains messages from both previous year (2023) and current year (2024).</p> <p>Keywords: Logs API, Empty response, Logs file</p> <p>Workaround: N/A (issue will be automatically resolved after the problematic SM log file, which include messages from 2023 and 2024 years, will be rotated)</p> <p>Discovered in Release: v6.15.0</p>
3675071	<p>Description: UFM stops gracefully after the b2b primary cable is physically disconnected</p> <p>Keywords: UFM HA, B2B, Primary Cable Disconnection</p> <p>Workaround: N/A</p> <p>Discovered in Release: 6.14.1</p>

Ref #	Issue
N/A	<p>Description: Execution of UFM Fabric Health Report (via UFM Web UI / REST API) will trigger ibdiagnet to use SLRG register which might cause some of the switch and HCA's firmware to stuck and cause the HCA's ports to stay at "Init" state.</p> <p>Keywords: Fabric Health Report, SLRG register, "Init" state, Switch, HCA</p> <p>Discovered in Release: 6.14.0</p>
3538640	<p>Description: Fixed ALM plugin log rotate function.</p> <p>Keywords: ALM, Plugin, Log rotate</p> <p>Discovered in Release: 6.13.0</p>
3532191	<p>Description: Fixed UFM hanging (database is locked) after corrective restart of UFM health.</p> <p>Keywords: Hanging, Database, Locked</p> <p>Discovered in Release: 6.13.0</p>
3555583	<p>Description: Resolved REST API links' inability to return hostname for computer nodes.</p> <p>Keywords: REST API, Links, Hostname, Computer Nodes</p> <p>Discovered in Release: 6.12.1</p>
3549795	<p>Description: Fixed ufm_ha_cluster status to show DRBD sync status.</p> <p>Keywords: ufm_ha_cluster, DRBD, Sync Status</p> <p>Discovered in Release: 6.13.0</p>
3549793	<p>Description: Fixed UFM HA installation failure.</p> <p>Keywords: HA, Installation</p> <p>Discovered in Release: 6.13.0</p>
3547517	<p>Description: Fixed UFM logs REST API returning empty result when SM logs exist on the disk.</p> <p>Keywords: Logs, SM logs, Empty</p>

Ref #	Issue
	Discovered in Release: 6.11.0
3546178	Description: Fixed SHARP jobs failure when SHARP reservation feature is enabled.
	Keywords: SHARP, Jobs, Reservation
	Discovered in Release: 6.13.0
3541477	Description: Fixed UFM module temperature alerting on wrong thresholds.
	Keywords: Module Temperature, Alert Threshold
	Discovered in Release: 6.13.0

Overview

Scale-Out Your Fabric with Unified Fabric Manager

NVIDIA's Unified Fabric Manager (UFM[®]) is a powerful platform for managing scale-out computing environments. UFM enables data center operators to efficiently monitor and operate the entire fabric, boost application performance and maximize fabric resource utilization.

While other tools are device-oriented and involve manual processes, UFM's automated and application-centric approach bridges the gap between servers, applications and fabric elements, thus enabling administrators to manage and optimize from the smallest to the largest and most performance-demanding clusters.

UFM Benefits

Benefit	Description
Central Console for Fabric Management	UFM provides all fabric management functions in one central console. The ability to monitor, troubleshoot, configure and optimize all fabric aspects is available via one interface. UFM's central dashboard provides a one-view fabric-wide status view.
In-Depth Fabric Visibility and Control	UFM includes an advanced granular monitoring engine that provides real-time access to switch and host data, enabling cluster-wide monitoring of fabric health and performance, real-time identification of fabric-related errors and failures, quick problem resolution via granular threshold-based alerts and a fabric utilization dashboard.
Advanced Traffic Analysis	Fabric congestion is difficult to detect when using traditional management tools, resulting in unnoticed congestion and fabric under-utilization. UFM's unique traffic map quickly identifies traffic trends, traffic bottlenecks, and

Benefit	Description
	congestion events spreading over the fabric, which enables the administrator to identify and resolve problems promptly and accurately.
Enables Multiple Isolated Application Environments on a Shared Fabric	Consolidating multiple clusters into a single environment with multi-tenant data centers and heterogeneous application landscapes requires specific policies for the different parts of the fabric. UFM enables segmentation of the fabric into isolated partitions, increasing traffic security and application performance.
Service-Oriented Automatic Resource Provisioning	UFM uses a logical fabric model to manage the fabric as a set of business-related entities, such as time critical applications or services. The logical fabric model enables fabric monitoring and performance optimization on the application level rather than just at the individual port or device level. Managing the fabric using the logical fabric model provides improved visibility into fabric performance and potential bottlenecks, improved performance due to application-centric optimizations, quicker troubleshooting and higher fabric utilization.
Quick Resolution of Fabric Problems	UFM provides comprehensive information from switches and hosts, showing errors and traffic issues such as congestion. The information is presented in a concise manner over a unified dashboard and configurable monitoring sessions. The monitored data can be correlated per job and customer, and threshold-based alarms can be set.
Seamless Failover Handling	Failovers are handled seamlessly and are transparent to both the user and the applications running on the fabric, significantly lowering downtime. The seamless failover makes UFM in conjunction with other Mellanox products, a robust, production-ready solution for the most demanding data center environments.
Open Architecture	UFM provides an advanced Web Service interface and CLI that integrate with external

Benefit	Description
	management tools. The combination enables data center administrators to consolidate management dashboards while flawlessly sharing information among the various management applications, synchronizing overall resource scheduling, and simplifying provisioning and administration.

Main Functionality Modules

Fabric Dashboard

UFM's central dashboard provides a one-view fabric-wide status view. The dashboard shows fabric utilization status, performance metrics, fabric-wide events, and fabric health alerts.

The dashboard enables you to efficiently monitor the fabric from a single screen and serves as a starting point for event or metric exploration.

Fabric Segmentation (PKey Management)

In the PKey Management view you can define and configure the segmentation of the fabric by associating ports to specific defined PKeys. You can add, remove, or update the association of ports to the related PKeys and update the qos_parameters for pkey (mtu, rate, service_level).

Fabric Discovery and Physical View

UFM discovers the devices on the fabric and populates the views with the discovered entities. In the physical view of the fabric, you can view the physical fabric topology, model the data center floor, and manage all the physical-oriented events.

Central Device Management

UFM provides the ability to centrally access switches and hosts, and perform maintenance tasks such as firmware and software upgrade, shutdown and restart.

Monitoring

UFM includes an advanced granular monitoring engine that provides real time access to switch and server data. Fabric and device health, traffic information and fabric utilization are collected, aggregated and turned into meaningful information.

Configuration

In-depth fabric configuration can be performed from the Settings view, such as routing algorithm selection and access credentials.

The Event Policy Table, one of the major components of the Configuration view, enables you to define threshold-based alerts on a variety of counters and fabric events. The fabric administrator or recipient of the alerts can quickly identify potential errors and failures, and actively act to solve them.

Fabric Health

The fabric health tab contains valuable functions for fabric bring-up and on-going fabric operations. It includes one-click fabric health status reporting, UFM Server reporting, database and logs' snapshots and more.

Logging

The Logging view enables you to view detailed logs and alarms that are filtered and sorted by category, providing visibility into traffic and device events as well as into UFM server activity history.

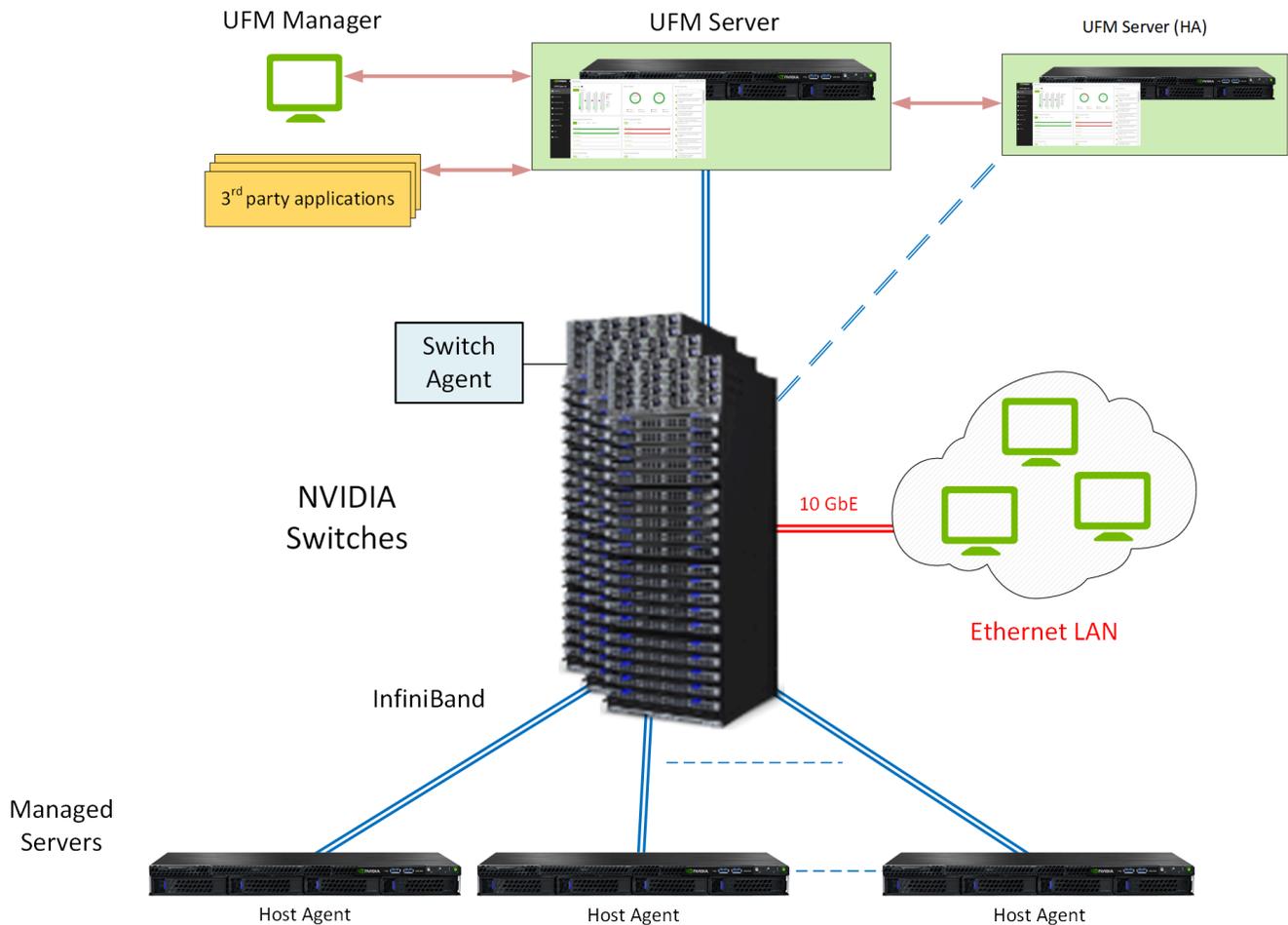
High Availability

In the event of a failover, when the primary (active) UFM server goes down or is disconnected from the fabric, UFM's High Availability (HA) capability allows for a secondary (standby) UFM server to immediately and seamlessly take over fabric management tasks. Failovers are handled seamlessly and are transparent to both the user and the applications running in the fabric. UFM's High Availability capability, when combined with Mellanox's High Availability switching solutions allows for non-disruptive operation of complex and demanding data center environments.

InfiniBand Fabric Managed by UFM

NVIDIA®UFM is a host-based solution that provides all the management functionalities required for managing fabrics.

Fabric Topology with UFM



UFM Server is a server on which UFM is installed and has complete visibility over the fabric to manage routing on all devices.

UFM HA Server is a UFM installed server on a secondary server for High Availability deployment.

Managed Switching Devices are fabric switches, gateways, and routers managed by UFM.

Managed Servers are the compute nodes in the fabric on which the various applications are running, and UFM manages all servers connected to the fabric.

UFM Host Agent is an optional component that can be installed on the Managed Servers. UFM Host Agent provides local host data and host device management functionality.

The UFM Host Agent provides the following functionality:

- Discovery of IP address, CPU, and memory parameters on host

- Collection of CPU/Memory/Disk performance statistics on host
- Upgrading HCA Firmware and OFED remotely
- Creating an IP interface on top of the InfiniBand partition

UFM Switch Agent is an embedded component in NVIDIA switches that allows IP address discovery on the switch and allows UFM to communicate with the switch. For more information, please refer to [Device Management Feature Support](#).

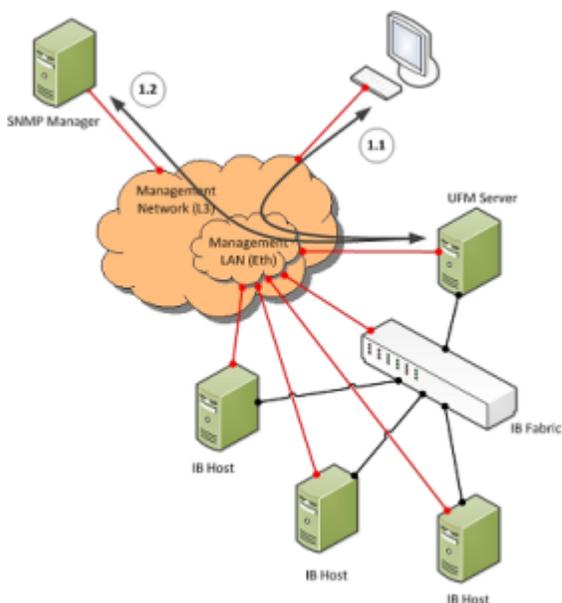
UFM Communication Requirements

This chapter describes how the UFM server communicates with InfiniBand fabric components.

UFM Server Communication with Clients

The UFM Server communicates with clients over IP. The UFM Server can belong to a separate IP network, which can also be behind the firewall.

UFM Server Communication with Clients



UFM Server Communication with UFM Web UI Client

Communication between the UFM Server and the UFM web UI client is HTTP(s) based. The only requirement is that TCP port 80 (443) must not be blocked.

UFM Server Communication with SNMP Trap Managers

The UFM Server can send SNMP traps to configured SNMP Trap Manager(s). By default, the traps are sent to the standard UDP port 162. However, the user can configure the destination port. If the specified port is blocked, UFM Server traps will not reach their destination.

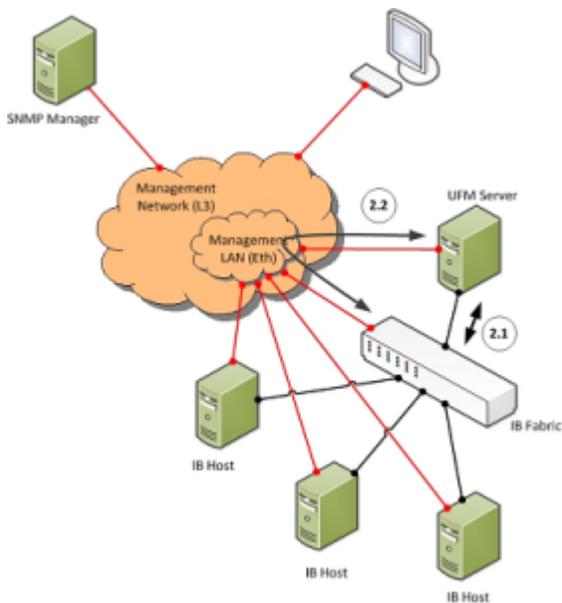
Summary of UFM Server Communication with Clients

Affected Service	Network	Address / Service / Port	Direction
Web UI Client	Out-of-band management*	HTTP / 80 HTTPS / 443	Bi-directional
SNMP Trap Notification	Out-of-band management*	UDP / 162 (configurable)	UFM Server to SNMP Manager

*If the client machine is connected to the IB fabric, IPoIB can also be used.

UFM Server Communication with InfiniBand Switches

UFM Server Communication with InfiniBand Switches



UFM Server InfiniBand Communication with Switch

The UFM Server must be connected directly to the InfiniBand fabric (via an InfiniBand switch). The UFM Server sends the standard InfiniBand Management Datagrams (MAD) to the switch and receives InfiniBand traps in response.

UFM Server Communication with Switch Management Software (Optional)

The UFM Server auto-negotiates with the switch management software on Mellanox Grid Director switches. The communication is bound to the switch Ethernet management port.

The UFM Server sends a multicast notification to MCast address 224.0.23.172, port 6306 (configurable). The switch management replies to UFM (via port 6306) with a unicast message that contains the switch GUID and IP address. After auto-negotiation, the UFM server uses Switch JSON API (HTTPS based) to retrieve inventory data and to apply switch actions (software upgrade and reboot) on the managed switch.

The following Device Management tasks are dependent on successful communication as described above:

- Switch IP discovery
- FRU Discovery (PSU, FAN, status, temperature)

- Software and firmware upgrades

The UFM Server manages IB Switch Devices over **HTTPS** (default port **443** – configurable) and / or SSH (default port 22 – configurable).

UFM Server Communication with Externally Managed Switches (Optional)

UFM server uses lbdagnet tool to discover chassis information (PSU, FAN, status, temperature) of the externally managed switches.

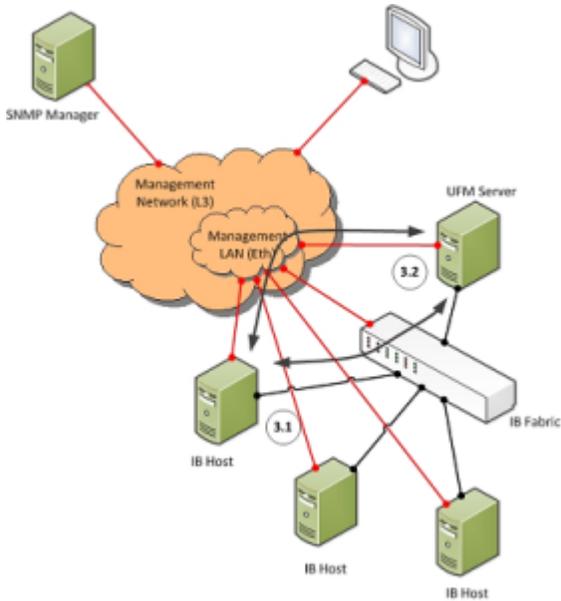
By monitoring chassis information data, UFM can trigger selected events when module failure occurs or a specific sensor value is above threshold.

Summary of UFM Server Communication with InfiniBand Switches

Affected Service	Network	Address / Service / Port	Direction
InfiniBand Management / Monitoring	InfiniBand	Management Datagrams	Bi-directional
Switch IP Address Discovery (auto-negotiation with switch management software)	Out-of-band management	Multicast 224.0.23.172, TCP / 6306 (configurable)	Multicast: UFM Server to switch TCP: Bi-directional
Switch Chassis Management / Monitoring	Out-of-band management	TCP / UDP / 6306 (configurable) SNMP / 161 (configurable) SSH / 22 (configurable)	Bi-directional

UFM Server Communication with InfiniBand Hosts

UFM Server Communication with InfiniBand Hosts



UFM Server InfiniBand Communication with HCAs

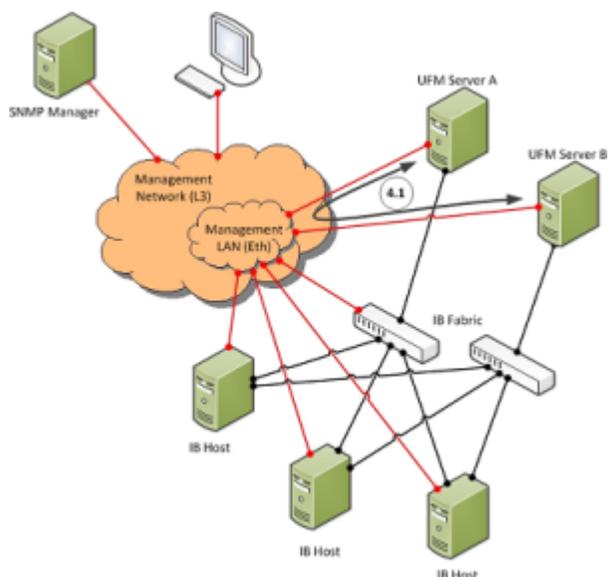
The UFM Server must be connected directly to the InfiniBand fabric. The UFM Server sends the standard InfiniBand Management Datagrams (MADs) to the Host Card Adapters (HCAs) and receives InfiniBand traps.

UFM Server Communication with InfiniBand Hosts

Affected Service	Network	Address / Service / Port	Direction
InfiniBand Management / Monitoring	InfiniBand	Management Datagrams	Bi-directional

UFM Server High Availability (HA) Active—Standby Communication

UFM Server HA Active—Standby Communication



UFM Server HA Active—Standby Communication

UFM Active — Standby communication enables two services: heartbeat and DRBD.

- *heartbeat* is used for auto-negotiation and keep-alive messaging between active and standby servers. *heartbeat* uses port 694 (udp).
- DRBD is used for low-level data (disk) synchronization between active and standby servers. DRBD uses port 8888 (tcp).

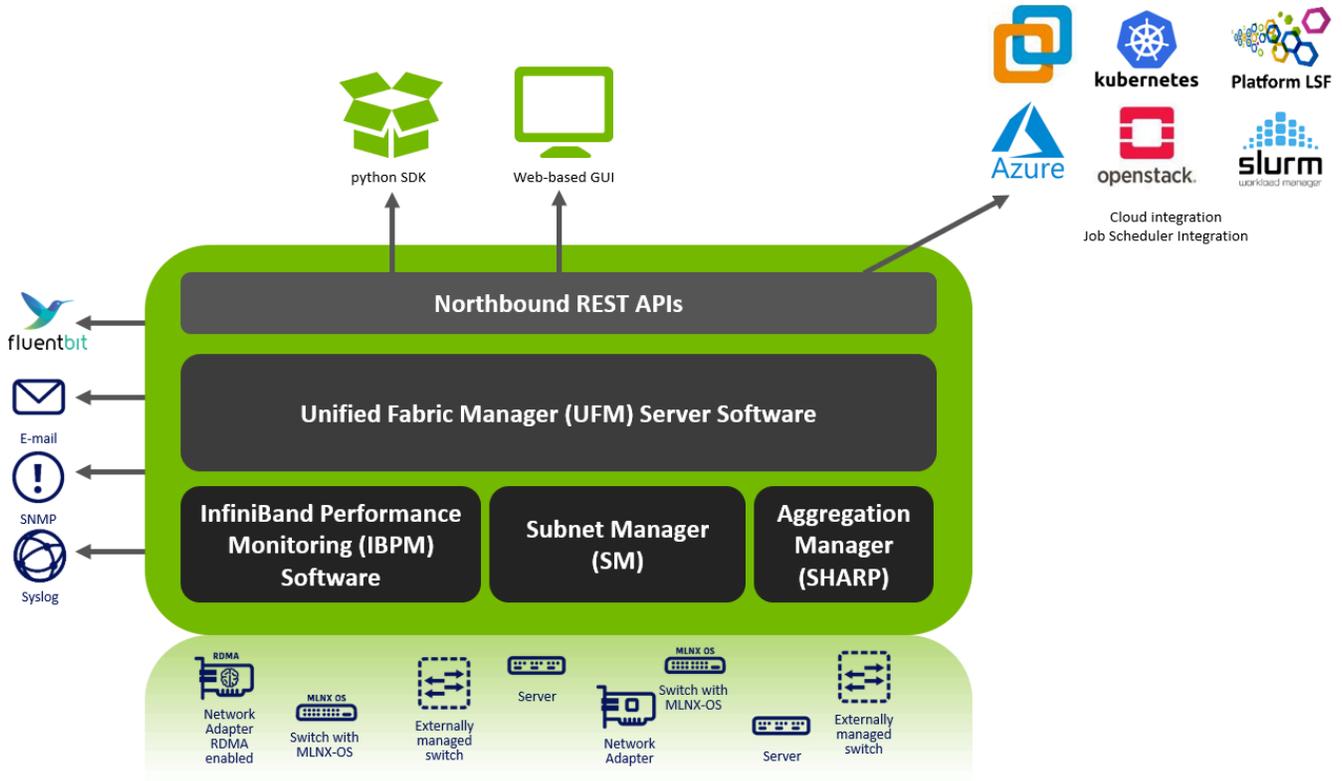
Affected Service	Network	Address / Service / Port	Direction
UFM HA heartbeat	Out-of-band management*	UDP / 694	Bi-directional
UFM HA DRBD	Out-of-band management*	TCP / 8888	Bi-directional

*An IPoIB network can be used for HA, but this is not recommended, since any InfiniBand failure might cause split brain and lack of synchronization between the active and standby servers.

UFM Software Architecture

The following figure shows the UFM high-level software architecture with the main software components and protocols. Only the main logical functional blocks are displayed and do not necessarily correspond to system processes and threads.

UFM High-Level Software Architecture



Graphical User Interface

UFM User Interface is a web application based on JavaScript and Angular JS, which is supported by any Web Browser. The Web application uses a standard REST API provided by the UFM server.

Client Tier API

Third-party clients are managed by the REST API.

Client Tier SDK Tools

Support for UFM’s API and a set of tools that enhance UFM functionality and interoperability with third-party applications are provided as part of UFM.

UFM Server

UFM server is a central data repository and management server that manages all physical and logical data. UFM-SDN Appliance receives all data from the Device and Network tiers and invokes Device and Network tier components for management and configuration tasks. UFM-SDN Appliance uses a database for data persistency. The UFM-SDN Appliance is built on the Python twisted framework.

Subnet Manager

Subnet Manager (SM) is the InfiniBand “Routing Engine”, a key component used for fabric bring-up and routing management. UFM uses the Open Fabric community OpenSM Subnet Manager. UFM uses a plug-in API for runtime management and fabric data export.

NVIDIA Scalable Hierarchical Aggregation and Reduction Protocol (SHARP)™ Aggregation Manager

NVIDIA Scalable Hierarchical Aggregation and Reduction Protocol (SHARP) is a technology that improves the performance of mathematical and machine learning applications by offloading collective operations from the CPU to the switch network.

Aggregation Manager (AM) is a key component of NVIDIA SHARP software, used for NVIDIA SHARP resources management.

For further information about NVIDIA SHARP AM, refer to [Appendix - NVIDIA SHARP Integration](#) .

Performance Manager

The UFM Performance Manager component collects performance data from the managed fabric devices and sends the data to the UFM-SDN Appliance for fabric-wide analysis and display of the data.

Device Manager

The Device Manager implements the set of common device management tasks on various devices with varying management interfaces. The Device Manager uses SSH protocol and operates native device CLI (command-line interface) commands.

UFM Switch Agent

UFM Switch Agent is an integrated part of NVIDIA switch software. The agent supports system parameter discovery and device management functionality on switches.

Communication Protocols

UFM uses the following communication protocols:

- Web UI communicates with the UFM server utilizing **Web Services** carried on **REST API**.
- The UFM server communicates with the switch Agent located on managed switches by proprietary **TCP/UDP**-based discovery and monitoring protocol and **SSH**.
- Monitoring data is sent by the switch Agent to UFM server Listener by a proprietary **TCP**-based protocol.

Overview of Data Model

UFM enables the fabric administrator to manage the fabric based on discovery data collected from the fabric. This data is mapped into model elements (objects) available to the end user via UFM REST API and UFM Web UI.

UFM Model Basics

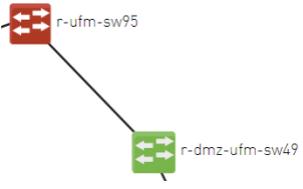
The fabric managed by UFM consists of a set of physical and logical objects, including their connections. The Object Model has a hierarchical object-oriented tree structure with objects as the tree elements. Each object defines an abstraction for physical or logical fabric elements.

Physical Model

The Physical Model represents the physical resources and connectivity topology of the Network. UFM enables discovery, monitoring and configuration of the managed physical objects.

Physical Objects

Icon	Name	Description
N/A	Port Object	Represents the external physical port on switch or on Host Channel Adapter (HCA). A port is identified by its number. UFM provides InfiniBand standard

Icon	Name	Description
		management and monitoring capabilities on the port level.
N/A	Module Object	Represents the Field Removable Unit, Line card, and Network card on switch or HCA on host. For NVIDIA Switches, Line and Network Cards are modeled as modules.
	Link Object	Represents the physical connection between two active ports.
N/A	Cable Object	Represents the physical cable or the transceiver connected to one of the link edges.
	Computer Object	Represents the computer (host) connected to the Fabric. The UFM Agent installed on the host provides extended monitoring and management capabilities. Hosts without agents are limited to InfiniBand standard management and monitoring capabilities.
	Switch Object	Represents the switch chassis in the Fabric. A Switch object is created for every NVIDIA Switch. Switches of other vendors are represented as InfiniBand Switches and limited by InfiniBand standard management and monitoring capabilities.
	Rack Object	Represents the arbitrary group of switches or computers. When linked devices are shown as a group, the link is shown between the group and the peer object.

UFM Installation and Initial Configuration

UFM® software includes Server and Agent components. UFM Server software should be installed on a central management node. For optimal performance, and to minimize interference with other applications, it is recommended to use a dedicated server for UFM. The UFM Agent is an optional component and should be installed on fabric nodes. The UFM Agent should not be installed on the Management server.

The following sections provide step-by-step instructions for installing and activating the license file, installing the UFM server software, and installing the UFM Agent.

- [UFM Installation Steps](#)
- [Running UFM Server Software](#)
- [Upgrading UFM Software](#)
- [Uninstalling UFM](#)
- [Appendix – UFM Migration](#)
- [Appendix - UFM Factory Reset](#)
- [Historical Telemetry Collection in UFM](#)

UFM Installation Steps

- [Downloading UFM Software and License File](#)
- [Installing UFM Server Software](#)

Downloading UFM Software and License File

Before you obtain a license for the UFM[®] software, prepare a list of servers with the MAC address of each server on which you plan to install the UFM software. These MAC addresses are requested during the licensing procedure.

Obtaining License

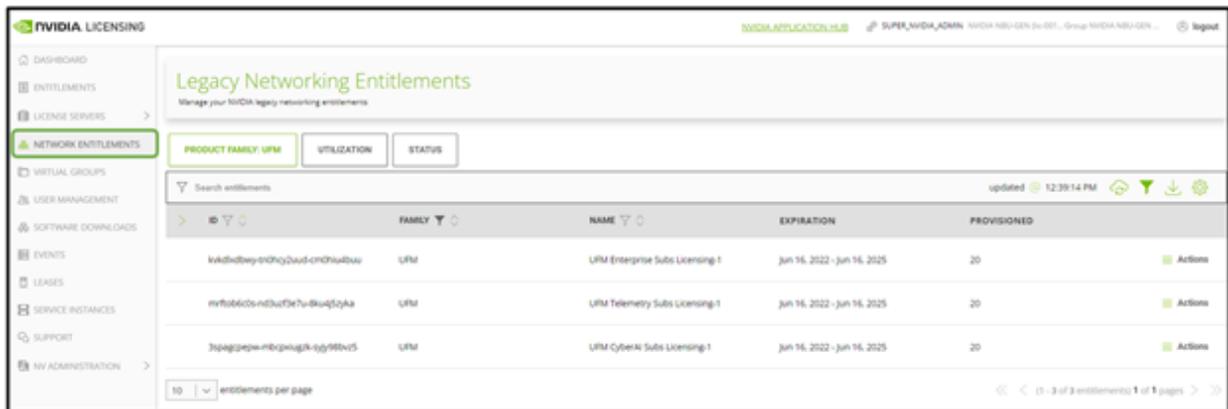
UFM is licensed per managed device according to the UFM license agreement.

When you purchase UFM, you will receive an email with instructions on obtaining your product license. A valid UFM license is a prerequisite for the installation and operation of UFM.

UFM licenses are per managed node and are aggregative. If you install an additional license, the system adds the previous node number and the new node number and manages the sum of the nodes. For example, if you install a license for 10 managed nodes and an additional license for 15 nodes, UFM will be licensed for up to 25 managed nodes.

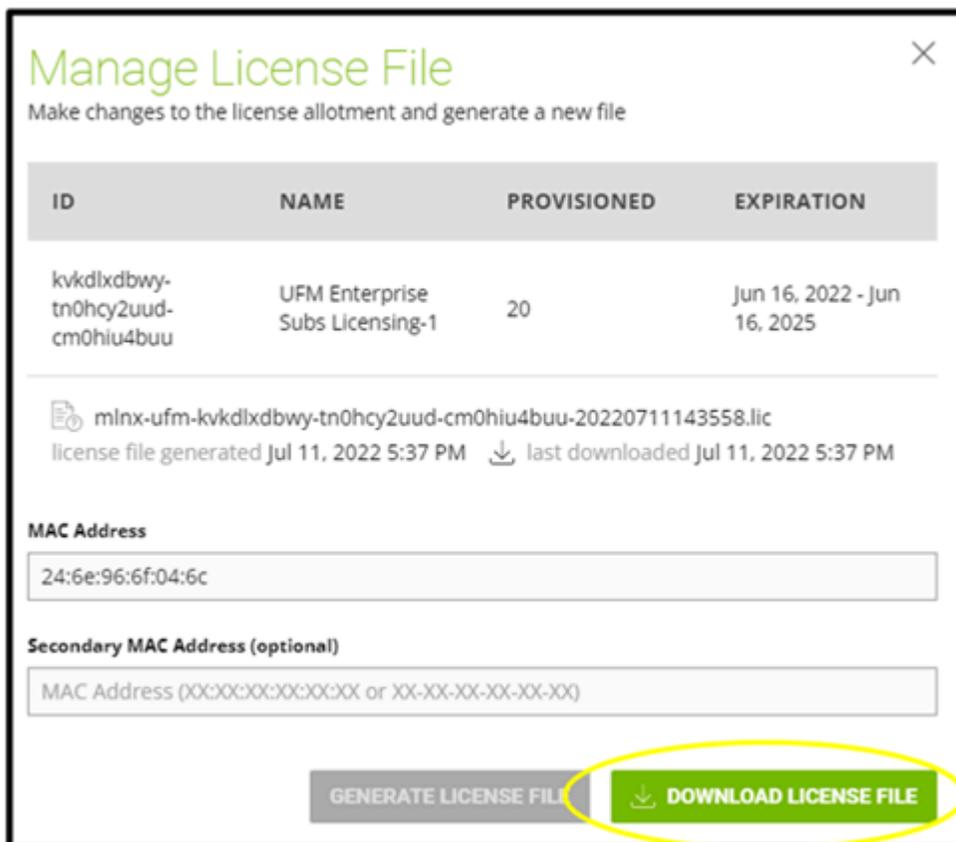
To obtain the license:

1. Go to NVIDIA's [Licensing and Download Portal](#) and log in as specified in the licensing email you received.
 - o If you did not receive your NVIDIA Licensing and Download Portal login information, contact your product reseller.
2. If you purchased UFM directly from NVIDIA and you did not receive the login information, contact enterprisesupport@nvidia.com. Click on the Network Entitlements tab. You'll see a list with the serial licenses of all your software products and software product license information and status.



3. Select the license you want to activate and click on the “Actions” button.

4. In the MAC Address field, enter the MAC address of the delegated license-registered host. If applicable, in the HA MAC Address field, enter your High Availability (HA) server MAC address. If you have more than one NIC installed on a UFM Server, use any of the MAC addresses.



Manage License File ×

Make changes to the license allotment and generate a new file

ID	NAME	PROVISIONED	EXPIRATION
kvkdlxdbwy-tn0hcy2uud-cm0hiu4buu	UFM Enterprise Subs Licensing-1	20	Jun 16, 2022 - Jun 16, 2025

 mlnx-ufm-kvkdlxdbwy-tn0hcy2uud-cm0hiu4buu-20220711143558.lic
license file generated Jul 11, 2022 5:37 PM  last downloaded Jul 11, 2022 5:37 PM

MAC Address

Secondary MAC Address (optional)

GENERATE LICENSE FILE **DOWNLOAD LICENSE FILE**

5. Click on Generate License File to create the license key file for the software.
6. Click on Download License File and save it on your local computer.

If you replace your NIC or UFM server, repeat the process of generating the license to set new MAC addresses. You can only regenerate a license two times. To regenerate the license after that, contact NVIDIA Sales Administration at enterprisesupport@nvidia.com.

Downloading UFM Software

Note

Due to internal packaging incompatibility, this release has two different packages for each of the supported distributions:

- One for UFM deployments over MLNX_OFED 5.X (or newer)

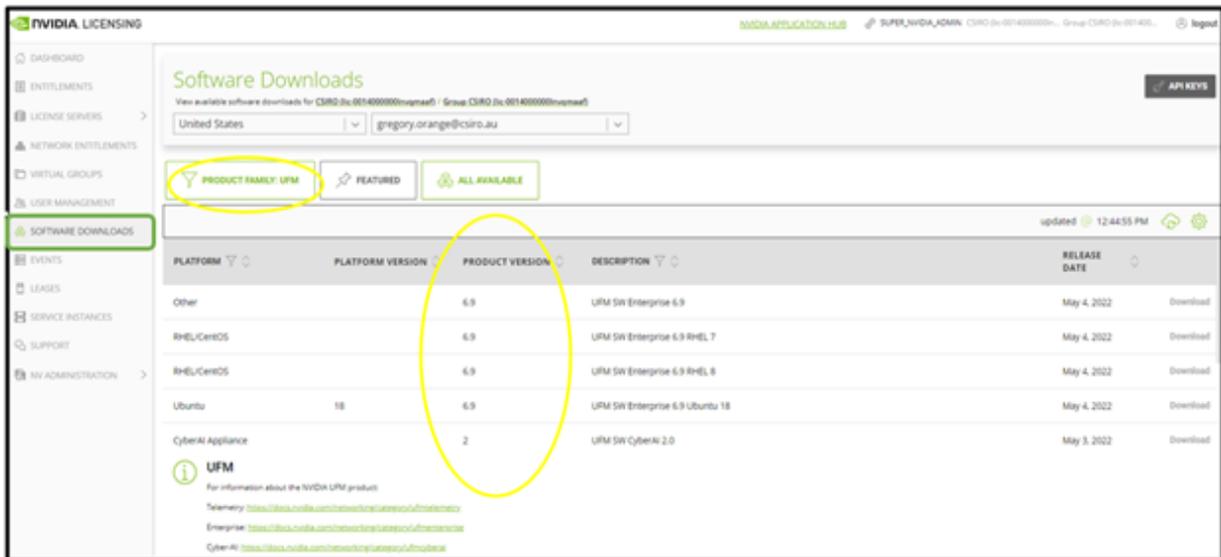
Please make sure to use the UFM installation package compatible to your setup.

This software download process applies to software updates and first-time installation.

If you own the UFM Media Kit and this is your first-time installation, skip this section.

To download the UFM software:

1. Click on Software Downloads, filter the product family to UFM, and select the relevant version of the software. Click on Download.



2. Save the file on your local drive.

3. Click Close.

Installing UFM Server Software

The default UFM installation directory is `/opt/ufm`.

UFM Server installation options are:

- Standalone

- High Availability (HA) - Delivered in a separate package as of UFM v6.10.0.
- Docker Container

The following processes might be interrupted during the installation process:

- httpd (Apache2 in Ubuntu)
- dhcpd

After installation:

1. Activate the software license.
2. Perform initial configuration.

Note

Before you run UFM, ensure that all ports used by the UFM server for internal and external communication are open and available. For the list of ports, see [Used Ports](#).

Installed Packages

A of UFM Enterprise v6.11.0, installation is based on Conda-4.12 (or newer) for Python3.9 environment and third-party packages deployments. The below-listed packages can be used for all supported operating systems.

Conda binaries	Conda Python Environment
_libgcc_mutex=0.1=main	appdirs==1.4.4
_openmp_mutex=5.1=1_gnu	apscheduler==3.9.1
c-ares=1.18.1=h7f8727e_0	asgiref==3.5.2
ca-certificates=2022.07.19=h06a4308_0	asn1crypto==1.5.1
curl=7.84.0=h5eee18b_0	attrs==21.4.0
krb5=1.19.2=hac12032_0	automat==20.2.0

Conda binaries	Conda Python Environment
ld_impl_linux-64=2.38=h1181459_1	bcrypt==3.2.2
libcurl=7.84.0=h91b91d3_0	cached-property==1.5.2
libedit=3.1.20210910=h7f8727e_0	cachetools==5.1.0
libev=4.33=h7f8727e_1	cairocffi==1.0.0
libffi=3.3=he6710b0_2	cairosvg==2.5.2
libgcc-ng=11.2.0=h1234567_1	carbon==1.1.10
libgomp=11.2.0=h1234567_1	certifi==2022.5.18
libnghttp2=1.46.0=hce63b2e_0	cffistring==1.15.0
libssh2=1.10.0=h8f2d780_0	chardet==4.0.0
libstdcxx-ng=11.2.0=h1234567_1	charset-normalizer==2.0.12
ncurses=6.3=h5eee18b_3	click==8.1.3
openssl=1.1.1q=h7f8727e_0	constantly==15.1.0
pip=22.1.2=py39h06a4308_0	cryptography==37.0.2
python=3.9.12=h12debd9_1	cssselect==1.1.0
readline=8.1.2=h7f8727e_1	cssselect2==0.6.0
sqlite=3.39.2=h5082296_0	daemonize==2.5.0
tk=8.6.12=h1ccaba5_0	defusedxml==0.7.1
wheel=0.37.1=pyhd3eb1b0_0	distro==1.7.0
xz=5.2.5=h7f8727e_1	django==3.0.14
zlib=1.2.12=h7f8727e_2	django-piston3==0.3rc2
	django-tagging==0.4.3
	docker==5.0.3
	ecdsa==0.17.0
	flask==1.1.1
	graphite-web==1.1.10
	hyperlink==21.0.0
	idna==3.3
	importlib-metadata==4.11.3

Conda binaries	Conda Python Environment
	incremental==21.3.0
	inotify==0.2.10
	ipaddress==1.0.23
	ipy==1.1
	isodate==0.6.1
	itsdangerous==1.1.0
	jinja2==2.10.3
	jsonschema==4.5.1
	lxml==4.8.0
	markupsafe==1.1.1
	more-itertools==8.13.0
	mysqlclient==2.1.0
	netaddr==0.8.0
	netifaces==0.11.0
	nose==1.3.7
	ntlm-auth==1.5.0
	numpy==1.22.4
	paramiko==2.11.0
	pbr==5.9.0
	pillow==9.1.1
	platformdirs==2.5.2
	ply==3.11
	psutil==5.9.0
	pyasn1==0.4.8
	pyasn1-modules==0.2.8
	pycairo==1.21.0
	pycparser==2.21
	pycrypto==2.6.1

Conda binaries	Conda Python Environment
	pycryptodomex==3.14.1
	pydes==2.0.1
	pydo==2.0.5
	pygal==3.0.0
	pyhamcrest==2.0.3
	pyinotify==0.9.6
	pynacl==1.5.0
	pyopenssl==22.0.0
	pyparsing==3.0.9
	pyrsistent==0.18.1
	pyserial==3.5
	pysmi==0.3.4
	pysnmp==4.4.12
	python-dateutil==2.8.2
	python-hostlist==1.21
	python-magic==0.4.27
	python-mimeparse==1.6.0
	pytz==2022.1
	pytz-deprecation-shim==0.1.0.post0
	PyYAML==6.0
	requests==2.27.1
	requests-file==1.5.1
	requests-ntlm==1.1.0
	requests-toolbelt==0.9.1
	service-identity==21.1.0
	setproctitle==1.1.10
	setuptools==62.3.2
	six==1.16.0

Conda binaries	Conda Python Environment
	soappy-py3==0.52.27
	south==0.8.4
	sqlparse==0.4.2
	stdeb==0.10.0
	subprocess32==3.5.4
	tinycss==0.4
	tinycss2==1.1.1
	twisted==22.4.0
	txamqp==0.8.2
	typing-extensions==4.2.0
	tzdata==2022.1
	tzlocal==4.2
	ujson==5.3.0
	urllib3==1.26.9
	webencodings==0.5.1
	websocket-client==1.3.2
	werkzeug==0.16.0
	wheel==0.37.1
	whisper==1.1.8
	wstools==0.4.8
	wstools-py3==0.54.4
	zeep==4.1.0
	zipp==3.8.0
	zope-interface==5.4.0
	aiohttp==3.8.1
	aiosignal==1.2.0
	async_timeout==4.0.2
	asyncctest==0.13.0

Conda binaries	Conda Python Environment
	frozenset==1.2.0
	idna_ssl==1.1.0
	multidict==5.2.0
	yaml==1.7.2

Installing UFM Server Software

For instructions on installing the UFM server software, please refer to following instructions per desired installation mode.

Installing UFM Server on Bare Metal Server

- [Installing UFM on Bare Metal Server- Standalone Mode](#)
- [Installing UFM on Bare Metal Server - High Availability Mode](#)

Installing UFM Docker Container Mode

- [Installing UFM on Docker Container - Standalone Mode](#)
- [Installing UFM on Docker Container - High Availability Mode](#)

Activating Software License

For instructions on how to activate the software license, please refer to the [Activating Software License](#).

Running UFM Server Software

- Perform initial configuration.
- Ensure that all ports used by the UFM server for internal and external communication are open and available. For the list of ports, see [Used Ports](#).

You can run the UFM server software in the following modes:

- Management

- Monitoring
- High Availability
- High Availability with failover to an external SM

Note

In Management or High Availability mode, ensure that all Subnet Managers in the fabric are disabled *before* running UFM. Any remaining active Subnet Managers will prevent UFM from running.

Running UFM Server Software in Management Mode

After installing, run the UFM Server by invoking:

```
systemctl start ufm-enterprise.service
```

Note

`/etc/init.d/ufmd` - Available for backward compatibility.

Log files are located under `/opt/ufm/files/log` (the links to log files are in `/opt/ufm/log`).

Running UFM Software in High Availability Mode

On the Master server, run the UFM Server by invoking:

```
ufm_ha_cluster start
```

You can specify additional command options for the ufmha service.

ufm_ha_cluster Command Options

Command	Description
start	Starts UFM HA cluster.
stop	Stops UFM HA cluster.
failover	Initiates failover (change mastership from local server to remote server).
takeover	Initiates takeover (change mastership from remote server to local server).
status	Shows current HA cluster status.
cleanup	Cleans the HA configurations on this node.
help	Displays help text.

Running UFM Software in Monitoring Mode

Run UFM in Monitoring mode while running concurrent instances of Subnet Manager on NVIDIA switches. Monitoring and event management capabilities are enabled in this mode. UFM non-monitoring features such as provisioning and performance optimization are disabled in this mode.

The following table describes whether features are enabled or disabled in Monitoring mode.

Features Enabled/Disabled in Monitoring Mode

Feature	Enabled/Disabled in Monitoring Mode
Fabric Discovery	Enabled
Topology Map	Enabled
Fabric Dashboard	Enabled
Fabric Monitoring	Enabled
Alerts and Thresholds (inc. SNMP traps)	Enabled
Fabric Logical Model	Enabled

Feature	Enabled/Disabled in Monitoring Mode
Subnet Manager and plugins	Disabled
Subnet Manager Configuration	Disabled
Automatic Fabric Partitioning	Disabled
Central Device Management	Disabled
Quality of Service	Disabled
Failover (High Availability mode)	Disabled
Traffic Aware Routing Algorithm	Disabled
Device Management	Disabled
Integration with Schedulers	Disabled
Unhealthy Ports	Disabled

In Monitoring mode, UFM periodically discovers the fabric and updates the topology maps and database.

For Monitoring mode, connect UFM to the fabric using port ib0 only. The fabric must have a subnet manager (SM) running on it (on another UFM, HBSM, or switch SM).

Note

When UFM is running in Monitoring mode, the internal OpenSM is not sensitive to changes in OpenSM configuration (opensm.conf).

Note

When running in Monitoring mode, the following parameters are automatically

overwritten in the `/opt/ufm/files/conf/opensm/opensm_mon.conf` file on startup:

- `event_plugin_name osmufmpi`

- `event_plugin_options --vendinfo -m 0`

Any other configuration is not valid for Monitoring mode.

1. In the `/opt/ufm/conf/gv.cfg` configuration file:

- Set **monitoring_mode** to `yes`
- If required, change **mon_mode_discovery_period** (the default is 60 seconds)
- Set **reset_mode** to `no_reset`

We recommend this setting when running multiple instances of UFM so that each port counter is not reset by different UFM instances. For more information, see [Resetting Physical Port Counters](#).

2. Restart the UFM Server.

The Running mode is set to Monitoring, and the frequency of fabric discovery is updated according to the setting of **mon_mode_discovery_period**.

Note that a monitor icon will appear at the top of the navigation bar indicating that monitoring mode is enabled:



HTTP/HTTPS Configuration

By default, UFM is configured to work with the secured HTTPS protocol.

After installation, the user can change the the Web Server configuration to communicate in secure (HTTPS) or non-secure (HTTP) protocol.

For changing the communication protocol, use the following parameter under the [Server] section in the `gv.cfg` file:

- `ws_protocol = https`

Changes will take effect after restarting UFM.

For further information, please refer to the [Launching a UFM Web UI Session](#) available in the [UFM Quick Start Guide](#).

UFM Internal Web Server Configuration

UFM uses Apache as the main Web Server for client external access. The UFM uses an internal web server process to where the Apache forwards the incoming requests.

By default, the internal web server listens to the local host interface (127.0.0.1) on port 8000.

For changing the listening local interface or port, use the following parameters under the [Server] section in the `gv.cfg` file:

- `rest_interface = 127.0.0.1`
- `rest_port = 8000`

Changes will take effect after restarting UFM.

User Authentication

UFM User Authentication is based on standard Apache User Authentication. Each Web Service client application must authenticate against the UFM server to gain access to the system.

The UFM software comes with one predefined user:

- Username: admin
- Password: 123456

You can add, delete, or update users via [User Management Tab](#).

UFM Authentication Server

The UFM Authentication Server, a centralized HTTP server, is responsible for managing various authentication methods supported by UFM.

Configurations of the UFM Authentication Server

The UFM Authentication Server is designed to be configurable and is initially turned off by default. This means that existing authentication methods are managed either by the native Apache functionality (such as Basic, Session, and Client Certificate authentication) or at the UFM level (including Token-Based authentication and Proxy Authentication).

Enabling the UFM Authentication Server provides a centralized service that oversees all supported authentication methods within a single service, consolidating them under a unified authentication API.

Apache utilizes the authentication server's APIs to determine a user's authentication status.

To enable the UFM Authentication Server, refer to [Enabling UFM Authentication Server](#).

All activities of the UFM Authentication Server are logged in the `authentication_service.log` file, located at `/opt/ufm/files/log`.

Azure AD Authentication

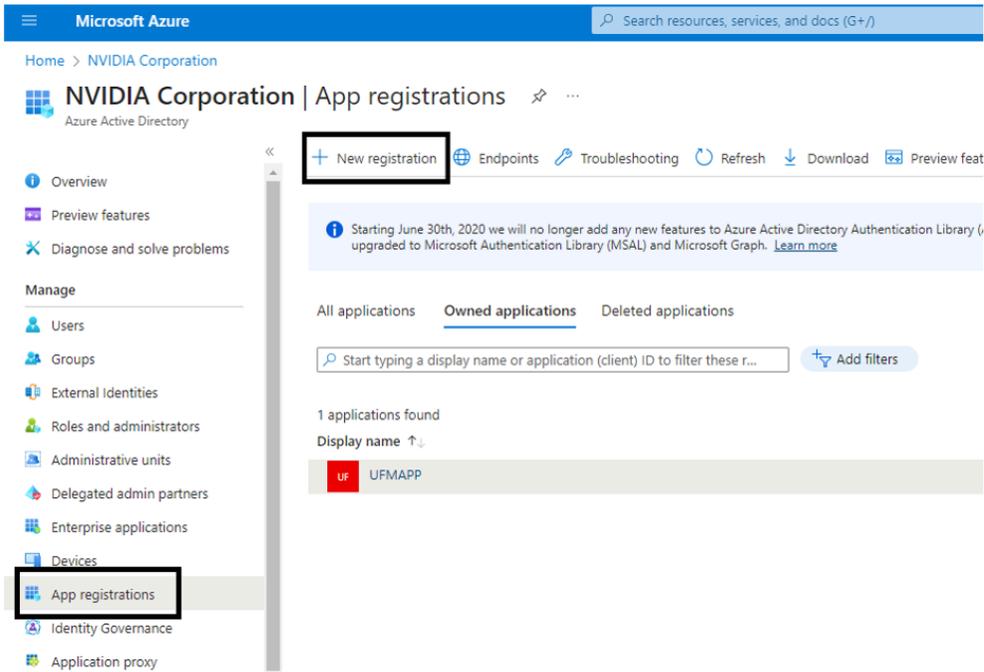
Microsoft Azure Authentication is a service provided by Microsoft Azure, the cloud computing platform of Microsoft. It is designed to provide secure access control and authentication for applications and services hosted on Azure.

UFM supports Authentication using Azure Active Directory, and to do so, you need to follow the following steps:

Register UFM in Azure AD Portal

To log in via Azure, UFM must be registered in the Azure portal using the following steps:

1. Log in to [Azure Portal](#), then click "**Azure Active Directory**" in the side menu.
2. If you have access to more than one tenant, select your account in the upper right. Set your session to the Azure AD tenant you wish to use.
3. Under "**Manage**" in the side menu, click App Registrations > New Registration.



4. Provide the application details:

1. **Name:** Enter a descriptive name.
2. **Supported account types:** Account types that are allowed to login and use the registered application.
3. **Redirect URL:** select the app type **Web**, and Add the following redirect URL `https:///auth/login`

Register an application ...

* Name

The user-facing display name for this application (this can be changed later).

UFM_APP ✓

Supported account types

Who can use this application or access this API?

- Accounts in this organizational directory only (NVIDIA Corporation only - Single tenant)
- Accounts in any organizational directory (Any Azure AD directory - Multitenant)
- Accounts in any organizational directory (Any Azure AD directory - Multitenant) and personal Microsoft accounts (e.g. Skype, Xbox)
- Personal Microsoft accounts only

[Help me choose...](#)

Redirect URI (optional)

We'll return the authentication response to this URI after successfully authenticating the user. Providing this now is optional and it can be changed later, but a value is required for most authentication scenarios.

Web ✓

Register an app you're working on here. Integrate gallery apps and other apps from outside your organization by adding from [Enterprise applications](#).

By proceeding, you agree to the [Microsoft Platform Policies](#)

[Register](#)

Then, click **Register**. The app's **Overview** page opens.

5. Under **Manage** in the side menu, click **Certificates & Secrets** > New client secret.

Add a client secret



Description

UFM_APP_sec

Expires

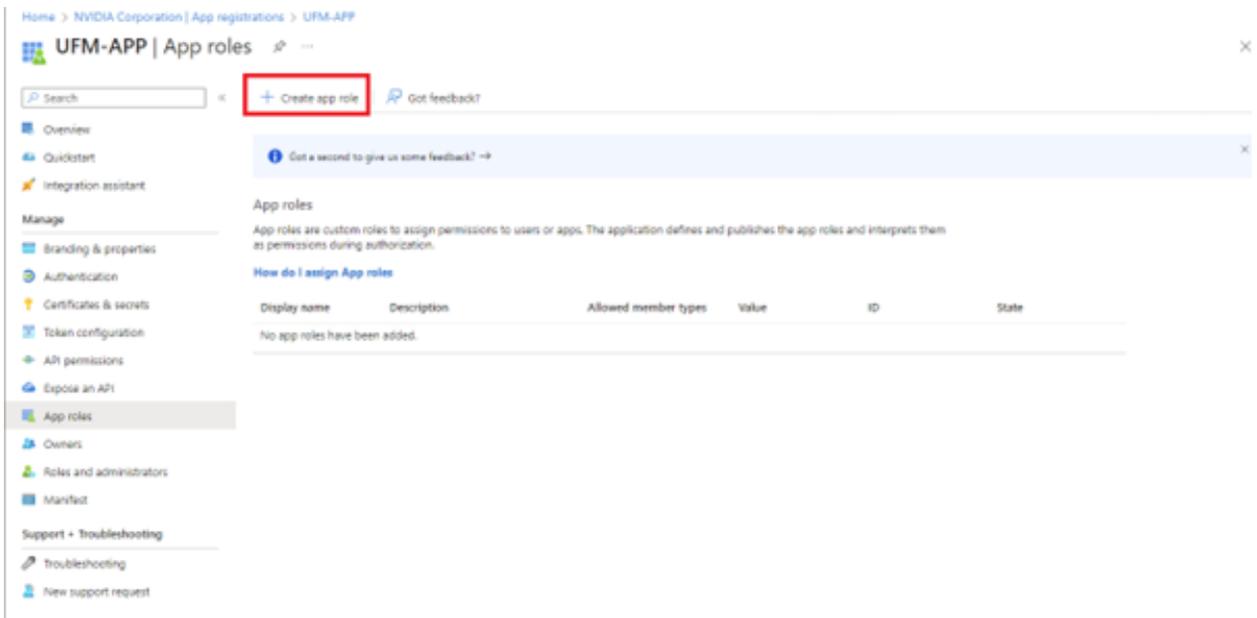
Recommended: 180 days (6 months)



Provide a description for the client secret and set an expiration time, then click **"Add."**

6. Copy the client secret key value which will be needed to configure the UFM with Azure AD (Please note that the value of the generated secret will be hidden and will not be able to be copied/read after you leave the page.

Under **"Manage"** in the side menu, click App roles > Create app role.



7. Provide the role details. Please note that the role value must be a valid UFM role; otherwise, the login will fail.

Create app role ✕

Display name * ⓘ

System_Admin ✓

Allowed member types * ⓘ

Users/Groups
 Applications
 Both (Users/Groups + Applications)

Value * ⓘ

System_Admin ✓

Description * ⓘ

System_Admin

Do you want to enable this app role? ⓘ

8. Assign the created role to the user. Follow the below steps:

App roles

App roles are custom roles to assign permissions to users or apps. The application determines the permissions during authorization.

[How do I assign App roles](#) 1

Display name	Description	Allowed member ty...	Value
System_Admin	System_Admin	Users/Groups,Applicat...	Syste

Assigning app roles ✕

App roles for Users/Groups

Assign app roles with 'User' allowed member types in **Enterprise** applications or in Microsoft Graph APIs. 2

[Learn more about how to assign App roles for Users/Groups](#)

App roles for applications

Assign app roles with 'Applications' allowed member types in API permissions blade.

Properties

UF Name ⓘ Copy to clipboard
UFM-APP

Application ID ⓘ
0d5e6cda-9144-47a2-b685-...

Object ID ⓘ
dd2a68d5-a3e0-45e3-9c1c-...

Getting Started

3

**1. Assign users and groups**
Provide specific users and groups access to the applications
[Assign users and groups](#)

**2. Provision User Accounts**
You'll need to create user accounts in the application
[Learn more](#)

**3. Self service**
Enable users to request access to the application using their Azure AD credentials
[Get started](#)

+ Add user/group 4 Edit assignment Remove Update credentials | Columns | Got feedback?

i The application will not appear for assigned users within My Apps. Set 'visible to users?' to yes in properties to enable this. →

Assign users and groups to app-roles for your application here. To create new app-roles for this application, use the [application registration](#).

First 200 shown, to search all users & gro...

Display Name	Object Type	Role assigned
No application assignments found		

Add Assignment

NVIDIA Corporation

Users and groups

1 user selected.

Select a role *

System_Admin

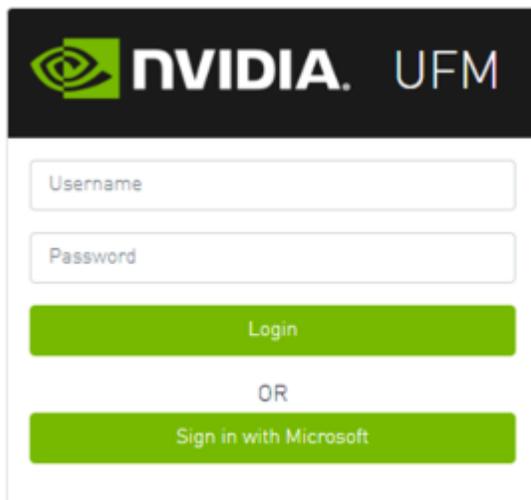
9. Click on "**Overview**" in the side menu to view the application information, such as tenant ID, client ID, and other details.

Enable Azure Authentication From UFM

Azure authentication is disabled by default. To enable it, please refer to [Enabling Azure AD Authentication](#).

Azure Authentication Login Page

After enabling and configuring Azure AD authentication, an additional button will appear on the primary UFM login page labeled 'Sign In with Microsoft,' which will lead to the main Microsoft sign-in page:



The screenshot shows the NVIDIA UFM login interface. At the top, there is a black header with the NVIDIA logo and the text 'NVIDIA. UFM'. Below the header, there are two input fields: 'Username' and 'Password'. A green 'Login' button is positioned below the password field. Below the 'Login' button, the word 'OR' is centered. At the bottom, there is a green button labeled 'Sign in with Microsoft'.

Kerberos Authentication

Kerberos is a network authentication protocol designed to provide strong authentication for client-server applications by using secret-key cryptography.

The Kerberos protocol works on the basis of tickets, it helps ensure that communication between various entities in a network is secure. It uses symmetric-key cryptography, which means both the client and servers share secret keys for encrypting and decrypting communication.

To enable Kerberos Authentication, refer to [Enabling Kerberos Authentication](#).

Setting Up Kerberos Server Machine

To set up a system as a Kerberos server, perform the following:

1. Install the required packages:

```
#Redhat
sudo yum install krb5-libs krb5-server
# Ubuntu
sudo apt-get install krb5-kdc krb5-admin-server
```

2. Edit the Kerberos configuration file `/etc/krb5.conf` to reflect your realm, domain and other settings:

```
[libdefaults]
    default_realm = YOUR-REALM

[realms]
    YOUR-REALM = {
        kdc = your-kdc-server
        admin_server = your-admin-server
    }
```

```
[domain_realm]
    your-domain = YOUR-REALM
    your-domain = YOUR-REALM
```

- Use the `kdb5_util` command to create the Kerberos database:

```
kdb5_util create -r YOUR-REALM -s
```

- Add administrative principals:

```
Kadmin.local addprinc -randkey HTTP/YOUR-HOST-NAME@YOUR-
REALM
```

- Start KDC and Kadmin services:

```
sudo systemctl start krb5kdc kadmin
sudo systemctl enable krb5kdc kadmin
```

- Generate a keytab file. The keytab file contains the secret key for a principal and is used to authenticate the service.

```
kadmin.local ktadd -k /path/to/your-keytab-file HTTP/YOUR-
HOST-NAME@YOUR-REALM
```

Replace `/path/to/your-keytab-file` with the actual path where you want to store the keytab file.

Setting Up Kerberos Client Machine

Follow the below steps to set up a system as a Kerberos client.

1. Install the required packages. When installing the UFM, the following packages will be installed as dependencies:

```
#Redhat
krb5-libs krb5-workstation mod_auth_gssapi
# Ubuntu
krb5-config krb5-user libapache2-mod-auth-gssapi
```

2. Configure the `/etc/krb5.conf` file to reflect your realm, domain, local names map and other settings:

```
[libdefaults]
    default_realm = YOUR-REALM

[realms]
    YOUR-REALM = {
        kdc = your-kdc-server
        admin_server = your-admin-server
        auth_to_local_names = {
            your-principle-name = your-local-user
        }
    }

[domain_realm]
    your-domain = YOUR-REALM
    your-domain = YOUR-REALM
```

3. Copy the keytab file from the Kerberos server to the machine where your service runs (the client). It is important to ensure that it is kept confidential.

Please ensure that the keytab file exists and that Apache has the necessary read permissions to access the keytab file; otherwise, Kerberos authentication will not function properly.

4. Obtain a Kerberos ticket-granting ticket (TGT):

```
kinit -k -t /path/to/your-keytab-file HTTP/YOUR-HOST-NAME@YOUR-REALM
```

5. Enable Kerberos Authentication from UFM. Kerberos authentication is disabled by default. To enable it, please refer to [Enabling Kerberos Authentication](#).

6. Test the Kerberos Authentication. You can use curl to test whether the user can authenticate to UFM REST APIs using Kerberos.

```
curl --negotiate -i -u : -k 'https://ufmc-eos01/ufmRestKrb/app/tokens'
```

Licensing

UFM license is subscription-based featuring the following subscription options:

- 1-year subscription
- 3-year subscription
- 5-year subscription
- Evaluation 30-day trial license

Note

UFM will continue to support old license types, but they are no longer available to obtain.

2 months before the expiration of your subscription license, UFM will warn you that your license will expire soon. After the subscription expires, UFM will continue to work with the expired license for two months beyond its expiration.

During this extra two-month period, UFM will generate a critical alarm indicating that the UFM license has expired and that you need to renew your subscription. Failing to do so within that 2-month period activates UFM Limited Mode. Limited mode blocks all REST APIs and access to the UFM web UI.

UFM enables functionality based on the license that was purchased and installed. This license determines the functionality and the maximum allowed number of nodes in the fabric.

To renew your UFM subscription, purchase a new license and install the new license file by downloading the license file to a temp directory on the UFM master server and then copying the license file to `/opt/ufm/files/licenses/` directory.

Note

UFM may not detect new license files if downloaded directly to `/opt/ufm/files/licenses`. If UFM does not detect the new license file, a UFM restart may be required.

If several licenses are installed on the server (more than one license file exists under `/opt/ufm/files/licenses/`), UFM uses only the strongest license and takes into consideration the expiration date, and the managed device limits on it, regardless of any other licenses that may exist on the server.

For instructions on how to view your license, please refer to the [UFM Quick Start Guide](#).

Showing UFM Processes Status

This functionality allows users to view the current status of main processes handled by the UFM.

- To view the main UFM processes, run the script `show_ufm_status.sh` under the `/opt/ufm/scripts` . Example: `/opt/ufm/scripts/show_ufm_status.sh`
- To view the UFM main and child processes, run the script `show_ufm_status.sh` with `-e` (extended_processes).

Example: `/opt/ufm/scripts/show_ufm_status.sh -e`

```
[root@r-ufm77 gvvm_github]# /opt/ufm/scripts/show_ufm_status.sh
=====
                        UFM Main Processes
=====
ModelMain      Process is : [ Running ]
Opensm         Process is : [ Running ]
SHARP          Process is : [ Running ]
Unhealthy Ports Process is : [ Running ]
Daily Report   Process is : [ Running ]
UFM Health     Process is : [ Running ]
UFM Telemetry  Process is : [ Running ]

-----

[root@r-ufm77 gvvm_github]# /opt/ufm/scripts/show_ufm_status.sh -e
=====
                        UFM Main Processes
=====
ModelMain      Process is : [ Running ]
Opensm         Process is : [ Running ]
SHARP          Process is : [ Running ]
Unhealthy Ports Process is : [ Running ]
Daily Report   Process is : [ Running ]
UFM Health     Process is : [ Running ]
UFM Telemetry  Process is : [ Running ]

-----

                        UFM ModelMain Child Processes
=====
SMClientConsumer Process is : [ Running ]
SMTrapHandler    Process is : [ Running ]
SysinfoJsonAgent Process is : [ Running ]
Telemetry Agent  Process is : [ Running ]
Telemetry History Process is : [ Running ]
```

Upgrading UFM Software

After UFM® installation, UFM detects existing UFM versions previously installed on the machine and prompts you to run a clean install of the new version or to upgrade. We recommend backing up the UFM configuration before upgrading the UFM as specified in section UFM Database and Configuration File Backup.

For instructions, please refer to the [UFM Quick Start Guide](#).

Uninstalling UFM

UFM Server can be uninstalled by running an uninstall script as described in the [UFM Quick Start Guide](#).

Appendix – UFM Migration

Overview

UFM migration enables backup and restores UFM configuration files.

Backup UFM configuration

By default, the following folders (placed in `/opt/ufm/files`) are being backed up:

- conf
- dashboardViews
- licenses
- networkViews
- scripts
- sqlite
- templates/user-defined
- ufmhealth/scripts
- userdata
- users_preferences

Note

The user may also backup the UFM historical telemetry data ("-t" argument).

UFM (Bare Metal)

```
/opt/ufm/scripts/ufm_backup.sh --help
usage: ufm_backup.pyc [-h] [-f BACKUP_FILE] [-t]
```

Optional Arguments

-h	--help	show this help message and exit
-f	--backup-file BACKUP_FILE	full path of zip file to be generated
-t	--telemetry	backup UFM historical telemetry

UFM Docker Container

1. Backup UFM configuration. Run:

```
docker exec ufm /opt/ufm/scripts/ufm_backup.sh
```

2. Copy the backup file from UFM docker container to the host. Run:

```
docker cp ufm:/root/<backup file> <path on host>
```

UFM Appliance

1. Backup UFM configuration. Run:

```
ufm data backup [with-telemetry]
```

2. Upload the backup file to a remote host. Run:

```
ufm data upload <backup file> <upload URL>
```

Note

More details can be found in the log file `/tmp/ufm_backup.log`.

Restore UFM Configuration

Note

All folders which are a part of the UFM backup are restored (filter is done during the backup stage).

UFM Bare Metal

```
/opt/ufm/scripts/ufm_restore.sh --help  
usage: ufm_restore.py [-h] -f BACKUP_FILE [-u] [-v]
```

Optional Arguments

-h	--help	show this help message and exit
-f BACKUP_FILE	--backup-file BACKUP_FILE	full path of zip file generated by backup script

-u	--upgrade	upgrades the restored UFM files
-v	--verbose	makes the operation more talkative

UFM Docker Container

1. Stop UFM. Run:

```
docker exec ufm /etc/init.d/ufmd stop
```

2. Copy the backup file from the host into UFM docker container. Run:

```
docker cp <backup file> ufm:/tmp/<backup file>
```

3. Restore UFM configuration. Run:

```
docker exec ufm /opt/ufm/scripts/ufm_restore.sh -f  
/tmp/<backup file> [--upgrade]
```

4. Start UFM. Run:

```
docker exec ufm /etc/init.d/ufmd start
```

UFM Appliance

1. Stop UFM. Run:

```
no ufm start
```

2. Copy the backup file from a remote host into UFM appliance. Run:

```
ufm data fetch <download URL>
```

3. Restore UFM configuration. Run:

```
ufm data restore <backup file>
```

4. Start UFM. Run:

```
ufm start
```

Note

When restoring the UFM configuration from host to a container, the following parameters in `/opt/ufm/files/conf/gv.cfg` may be reset the following:

- fabric_interface
- ufma_interfaces
- mgmt_interface

Note

UFM configuration upgrade during restore is not supported in UFM Appliance GEN2/GEN2.5

More details can be found in the log files `/tmp/ufm_restore.log` and `/tmp/ufm_restore_upgrade.log`

Appendix - UFM Factory Reset

This section provides a comprehensive guide on resetting UFM to its original factory settings.

Note

WARNING!!! this operation will remove all user data and configuration and will restore UFM to its factory defaults.

Note

The UFM Factory-Reset will exclusively revert UFM to its original factory settings, leaving HA configurations unaffected. To remove HA, it is essential to execute `ufm_ha_cluster cleanup` before initiating the factory reset.

UFM Docker Container Factory Reset

To reset UFM to its factory defaults when using UFM on a Docker container, follow these steps.

1. Ensure that UFM is not up and running. If UFM is running, stop it.

For Stand-alone (SA) installations:

```
systemctl stop ufm-enterprise
# validate that ufm is not running
systemctl status ufm-enterprise
```

For High-Availability setups (perform the following on the master node only):

```
ufm_ha_cluster stop
# validate that ufm is not running
ufm_ha_cluster status
```

2. Run `mellanox/ufm-enterprise` Docker Container with the following flags:

i Note

WARNING: This operation will erase all user data and configurations, resetting UFM to its factory defaults.

CAUTION: This step does not require user confirmation, meaning UFM will be restored to factory defaults immediately once initiated.

```
docker run -it --name=ufm_installer --rm \
          -v /var/run/docker.sock:/var/run/docker.sock
\
          -v /tmp:/tmp \
```

```

-
v /opt/ufm/files/:/opt/ufm/shared_config_files/ \
mellanox/ufm-enterprise:latest \
--factory-reset

```

Flag	Type	Description
--name=ufm_installer	Mandatory	The container name must be called ufm_installer.
-v /var/run/docker.sock:/var/run/docker.sock	Mandatory	The docker socket must be mounted on the docker container.
-v /tmp:/tmp	Optional	Logs of the operation can be viewed in /tmp on the host in case it is mounted.
-v /opt/ufm/files/:/opt/ufm/shared_config_ufm/	Mandatory	For the factory reset to persist, it is essential to have the /opt/ufm/files directory mounted from the host.
mellanox/ufm-enterprise:latest	Mandatory	The docker image name.
--factory-reset	Mandatory	This action will signal the UFM container to initiate the factory reset process.

UFM Enterprise Factory Reset

To restore UFM Enterprise to factory defaults:

1. Ensure that UFM is not up and running. If UFM is running, stop it.

For Stand-alone (SA) installations:

```
systemctl stop ufm-enterprise
# validate that ufm is not running
systemctl status ufm-enterprise
```

For High-Availability setups (perform the following on the master node only):

```
ufm_ha_cluster stop
# validate that ufm is not running
ufm_ha_cluster status
```

2. Run the `ufm_factory_reset.sh` script:

Note

WARNING: This operation will erase all user data and configurations, resetting UFM to its factory defaults.

```
/opt/ufm/scripts/ufm_factory_reset.sh [-y]
```

Flag:

Flag	Type	Description
<code>-y</code>	Optional	Does not require user confirmation.

Storage Considerations

UFM periodically collects fabric port statistics and saves them in its SQLite database. Before starting up UFM Enterprise, please consider the following disk space utilization for

various fabric sizes and duration.

The measurements in the table below were taken with sampling interval set to once per 30 seconds.

i Note

Be aware that the default sampling rate is once per 300 seconds. Disk utilization calculation should be adjusted accordingly.

Number of Nodes	Ports per Node	Storage per Hour	Storage per 15 Days	Storage per 30 Days
16	8	1.6 MB	576 MB (0.563 GB)	1152 MB (1.125 GB)
100	8	11 MB	3960 MB (3.867 GB)	7920 MB (7.734 GB)
500	8	50 MB	18000 MB (17.58 GB)	36000 MB (35.16 GB)
1000	8	100 MB	36000 MB (35.16 GB)	72000 MB (70.31 GB)

UFM Software Installation Prerequisites

Before installing UFM software, verify the prerequisites for standalone and high availability installation.

Prerequisites for UFM Server Software Installation

Please refer to the [UFM Quick Start Guide](#).

Additional Prerequisites for UFM High Availability (HA) Installation

Please refer to the [UFM Quick Start Guide](#).

UFM System Requirements

Please refer to [Installation Notes](#) for information on system prerequisites.

UFM Server Health Monitoring

The UFM Server Health Monitoring module is a standalone module that monitors UFM resources and processes according to the settings in the `/opt/ufm/files/conf/UFMHealthConfiguration.xml` file.

For example:

- Each monitored resource or process has its own failure condition (number of retries and/or timeout), which you can configure.
- If a test fails, UFM will perform a *corrective operation*, if defined for the process, for example, to restart the process. You can change the configured corrective operation. If the corrective operation is set to "None", after the defined number of failures, the *give-up* operation is performed.
- If a test reaches the configured threshold for the number of retries, the health monitoring initiates the *give-up* operation defined for the process, for example, UFM failover or stop.
- By default, events and alarms are sent when a process fails, and they are also recorded in the internal log file.

Each process runs according to its own defined schedule, which you can change in the configuration file.

Changes to the configuration file take effect only after a UFM Server restart. (It is possible to kill and run in background the process `nohup python /opt/ufm/ufmhealth/UfmHealthRunner.pyo &.`)

You can also use the configuration file to improve disk space management by configuring:

- How often to purge MySQL binary log files.
- When to delete compressed UFM log files (according to free disk space).

The settings in the `/opt/ufm/files/conf/UFMHealthConfiguration.xml` file are also used to generate the UFM Health Report.

The following section describes the configuration file options for UFM server monitoring.

UFM Health Configuration

The UFM health configuration file contains three sections:

- Supported Operations—This section describes all the operations that can be used in tests, and their parameters.
- Supported Tests—This section describes all the tests. Each test includes:
 - The main test operation.
 - A corrective operation, if the main operation fails.
 - A give-up operation, if the main operation continues to fail after the corrective operation and defined number of retries.

The number of retries and timeout is also configured for each test operation.

- Test Schedule - This section lists the tests in the order in which they are performed and their configured frequency.

The following table describes the default settings in the */opt/ufm/files/conf/UFMHealthConfiguration.xml* file for each test. The tests are listed in the order in which they are performed in the default configuration file.

You might need to modify the default values depending on the size of your fabric.

For example, in a large fabric, the SM might not be responsive for *sminfo* for a long time; therefore, it is recommended to increase the values for timeout and number of retries for **SMResponseTest**.

Recommended configurations for *SMResponseTest* are:

- For a fabric with 5000 nodes:
 - Number of retries = 12
 - Frequency = 10
- For a fabric with 10000 nodes:
 - Number of retries = 12

- o Frequency = 20

Test Name / Description	Test Operation	Corrective Operation (if Test Operation fails)	No. Retries / Give-up Operation	Test Frequency
CpuUsageTest Checks total CPU utilization.	CPUTest Tests that overall CPU usage does not exceed 80% (this percentage is configurable).	None If UFM Event Burst Management is enabled, it is automatically initiated when the test operation fails	1 Retry None	1 minute
AvailableDiskSpaceTest Checks available disk space.	FreeDiskTest Tests that disk space usage for <i>/opt/ufm</i> does not exceed 90% (this percentage is configurable).	CleanDisk Delete compressed UFM log files under <i>/opt/ufm</i>	3 Retries None	1 hour
CheckIBFabricInterface Checks state of active fabric interface.	IBInterfaceTest Tests that active fabric interface is up.	BringUpIBFabricInterface Bring up the fabric interface	3 Retries SMOrUFMFailoverOrDoNothing	35 seconds
CheckIBFabricInterfaceStandby (HA only) Checks state of fabric interface on standby.	IBInterfaceTestOnStandby Tests that fabric interface on standby is up.	None	1 Retry None	1 minute
MemoryTest Checks total memory usage.	MemoryUsageTest Tests that memory usage does not exceed 90% (this percentage is configurable).	None	1 Retry None	1 minute

Test Name / Description	Test Operation	Corrective Operation (if Test Operation fails)	No. Retries / Give-up Operation	Test Frequency
SMProcessTest Checks status of the OpenSM service.	SMRunningTest Tests that the SM process is running.	RestartProcess Restart the SM process	1 Retry UFMFailoverOrDoNothing	10 seconds
SMResponseTest Checks responsiveness of SM (when SM process is running).	SMTTest Tests SM responsiveness by sending the sminfo query to SM.	None	9 Retries UFMFailoverOrDoNothing	10 seconds
IbpmTest Checks status of the IBPM (Performance Manager) service.	ProcessIsRunningTest Tests that the IBPM service is running.	RestartProcess Restart the IBPM service	3 Retries None	1 minute
ModelMainTest Checks status of the main UFM service	ProcessIsRunningTest Tests that the UFM service is running.	RestartProcess Restart the UFM service	3 Retries UFMFailoverOrDoNothing	20 seconds
HttpdTest Checks status of the httpd service.	ProcessIsRunningTest Tests that the httpd service is running.	RestartProcess Restart the httpd service	3 Retries None	20 seconds
MySqlTest Checks status of the MySql service.	ConnectToMySql Tests that the MySql service is running.	None	1 Retry UFMFailoverOrDoNothing	20 seconds
CleanMySql Purges MySql Logs	AlwaysFailTest Fails the test in order to perform	PurgeMySqlLogs Purge all MySql Logs on each test	1 Retry None	24 hours

Test Name / Description	Test Operation	Corrective Operation (if Test Operation fails)	No. Retries / Give-up Operation	Test Frequency
	the corrective action.			
UFMServerVersionTest Checks UFM software version and build.	UfmVersionTest Returns UFM software version information.	None	1 Retry None	24 hours
UFMServerLicenseTest Checks UFM License information.	UfmLicenseTest Returns UFM License information.	None	1 Retry None	24 hours
UFMServerHAConfigurationTest (HA only) Checks the configuration on master and standby.	UfmHAConfigurationTest Returns information about the master and standby UFM servers.	None	1 Retry None	24 hours
UFMMemoryTest Checks available UFM memory.	UfmMemoryUsageTest Tests that UFM memory usage does not exceed 80% (this percentage is configurable).	None	1 Retry None	1 minute
UFMCpuUsageTest Checks UFM CPU utilization.	CPUTest Tests that UFM CPU usage does not exceed 60% (this percentage is configurable).	None	1 Retry None	1 minute
CheckDrbdTcpConnectionPerformanceTest	TcpConnectionPerformanceTest	None	2 Retry None	10 minute

Test Name / Description	Test Operation	Corrective Operation (if Test Operation fails)	No. Retries / Give-up Operation	Test Frequency
st (HA only) Checks the tcp connection between master and standby	Tests that bandwidth is greater than 100 Mb/sec and latency is less than 70 usec (configurable).			

Note

The Supported Operations section of the configuration file includes additional optional operations that can be used as corrective operations or give-up operations.

UFM Core Files Tracking

To receive a notification every time OpenSM or ibpm creates a core dump, please refer to the list of all current core dumps of OpenSM and ibpm in the UFM health report.

➤ To receive core dump notifications, do the following:

1. Set the `core_dumps_directory` field in the `gv.cfg` file to point to the location where all core dumps are created (by default, this location is set to `/tmp`).

```
core_dumps_directory = /tmp
```

2. Set the naming convention for the core dump file. The name must include the directory configured in the step above.

The convention we recommend is:

```
echo "/tmp/%t.core.%e.%p.%h" > /proc/sys/kernel/core_pattern
```

3. Make sure core dumps directory setting is persistent between reboots. Add the `kernel.core_pattern` parameter with the desired file name format to the `/etc/systctl.conf` file. Example:

```
kernel.core_pattern=/tmp/%t.core.%e.%p.%h
```

4. Configure the core file size to be unlimited.

```
ulimit -c unlimited
```

5. (Only on UFM HA master) Update the UFM configuration file `gv.cfg` to enable core dump tracking.

```
track_core_dumps = yes
```

Example of Health Configuration

The default configuration for the overall memory test in the `opt/ufm/files/conf/UFMHealthConfiguration.xml` file is:

```
<Test Name="MemoryTest" NumOfRetriesBeforeGiveup="3"  
RetryTimeoutInSeconds="10">  
  <TestOperation Name="MemoryUsageTest">  
    <Parameters>  
      <Parameter Name="ThresholdInPercents" Value="90"/>  
    </Parameters>
```

```

    </TestOperation>
    <CorrectiveOperation Name="None" />
    <GiveupOperation Name="None" />
</Test>

```

This configuration tests the available memory. If memory usage exceeds 90%, the test is repeated up to 3 times at 10 second intervals, or until memory usage drops to below 90%. No corrective action is taken and no action is taken after 3 retries.

To test with a usage threshold of 80%, and to initiate UFM failover or stop UFM after three retries, change the configuration to:

```

<Test Name="MemoryTest" NumOfRetriesBeforeGiveup="3"
RetryTimeoutInSeconds="10">
  <TestOperation Name="MemoryUsageTest">
    <Parameters>
      <Parameter Name="ThresholdInPercents" Value="80" />
    </Parameters>
  </TestOperation>
  <CorrectiveOperation Name="None" />
  <GiveupOperation Name="UFMFailoverOrStop" />
</Test>

```

Event Burst Management

UFM event burst management can lower the overall CPU usage following an event burst by suppressing events. Event burst management is configured in the *gv.cfg* configuration file.

When the overall CPU usage exceeds the threshold configured by the *CpuUsageTest* in the */opt/ufm/files/conf/UFMHealthConfiguration.xml* file, a High CPU Utilization event occurs.

This event initiates the UFM event burst management, which:

- Suppresses events. The default level of suppression enables critical events only.

- If, after a specified period of time (30 seconds, by default), no further High CPU Utilization event occurs, the UFM server enables all events.

To modify Event burst management configuration, change the following parameters in the `gv.cfg` file:

```
# The events' level in case events are suppressed (the possible
levels are disable_all_events, enable_critical_events, and
enable_all_events)
# The entire feature can be turned off using the level
"enable_all_events"
suppress_events_level = enable_critical_events
# The amount of time in seconds which events are suppressed
suppress_events_timeout = 30
```

Recovery from Consecutive Failures

UFM Server Health Monitor might restart or trigger a failover in order to recover from specific failures. In case a re-start or failover fails, UFM Server Health Monitor tries the operation again. Upon a number of consecutive failure attempts to restart or failover, UFM Server Health Monitor stops trying to restart Model Main and allows OpenSM to run without intervention. The behavior maximum number of consecutive restart attempts is defined in the configuration file `/opt/ufm/files/conf/UFMHealthConfiguration.xml`:

```
<Parameter Name="RestartAttempts" Value="8" />
<Failover MaxAllowedAttempts="6" />
```

UFM Web UI

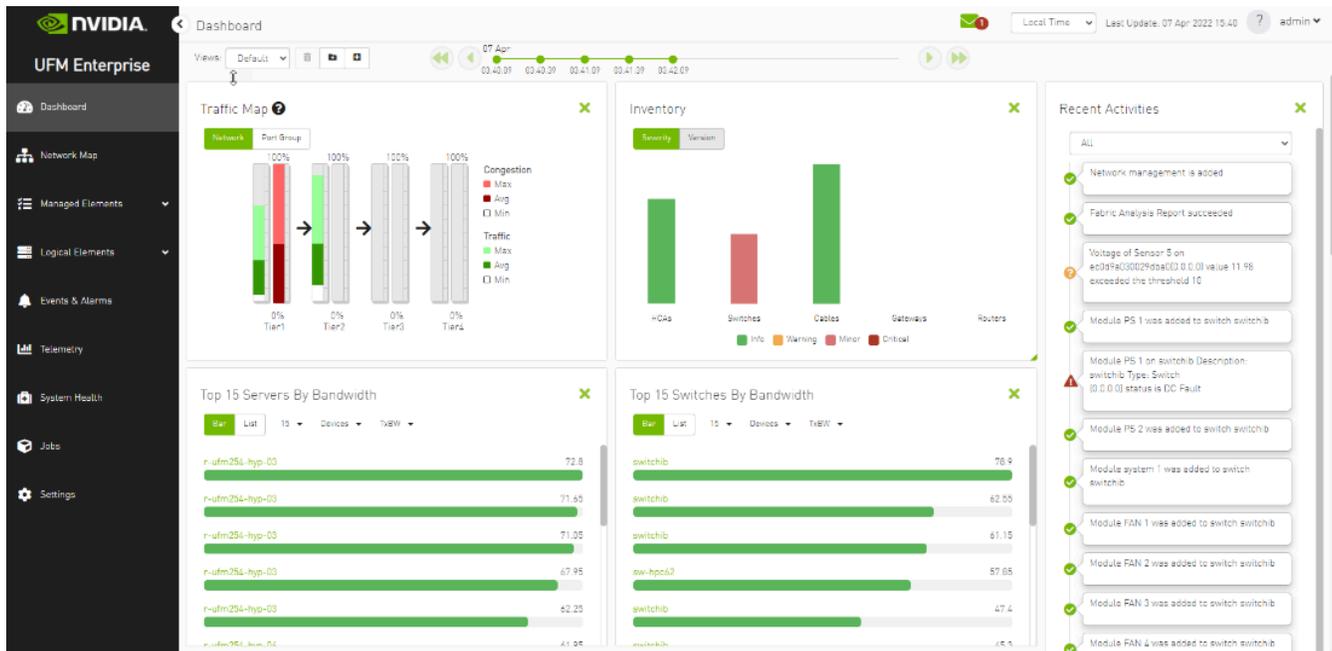
This section is constituted by the following sub-sections:

- [Fabric Dashboard](#)
- [Network Map](#)
- [Managed Elements](#)
- [Events & Alarms](#)
- [Telemetry](#)
- [System Health](#)
- [Jobs](#)
- [Settings](#)

Fabric Dashboard

The dashboard window summarizes the fabric's status, including events, alarms, errors, traffic and statistics.

Fabric Dashboard View

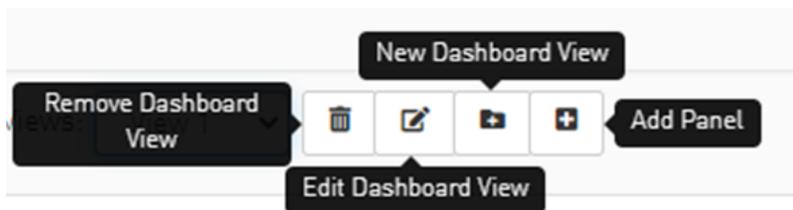


The Fabric Dashboard view consists of the following six dashboards, which provide real-time information about the fabric.

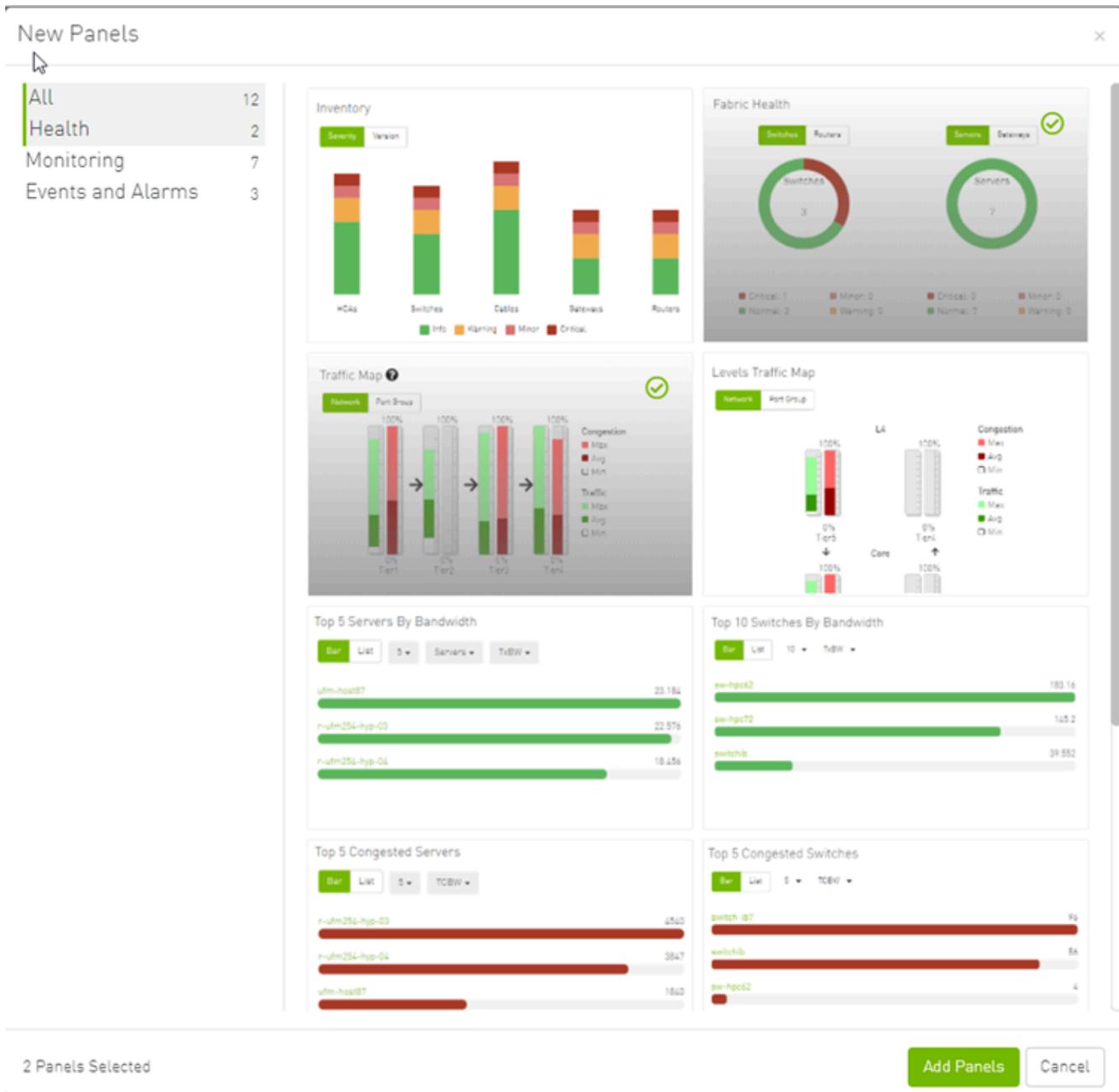
Dashboard Views and Panel Management

UFM is installed with a default view of the most important panels. These panels are resizable and draggable. Users can customize their default view or create new views altogether

The dashboard views and panels are managed by a set of action buttons appearing at the top of the main dashboard screen:



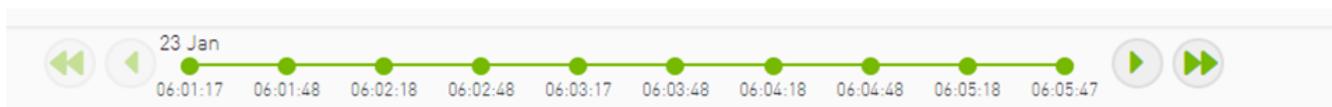
Clicking on the Add Panel button will show a model to select which panels you wish to add to the current dashboard view.



Dashboard Timeline Snapshots

Once the user is logged into the UFM Enterprise, the UFM will start recording snapshots of the dashboard panel data every 30 seconds.

The user is able to navigate between these snapshots and load the dashboard data of a specific data snapshot.



Dashboard Panels

The Fabric Dashboard view consists of the following 12 panels, which are categorized into 3 main categories and provide real-time information about the fabric.

- Health:
 - Inventory
 - Fabric Health
- Monitoring:
 - Traffic Map
 - Levels Traffic Map
 - Top X Servers by bandwidth
 - Top X Switches by bandwidth
 - Top X congested servers
 - Top X congested switches
 - Top X utilized Pkeys
- Events and Alarms:
 - Recent Activities
 - Top X alarmed servers
 - Top X alarmed switches
 - Events History

Top N Servers/Switches by Rx or Tx Bandwidth

The Top N servers/switches by Rx or Tx Bandwidth component shows the top elements that are transmitting or receiving the most bandwidth per second. These elements are classified top-down according the defined Transmit (Tx) or Receive (Rx) bandwidth (MB/sec Rate).

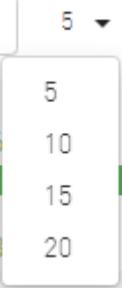
Bandwidth is measured as a rate in bytes/sec.

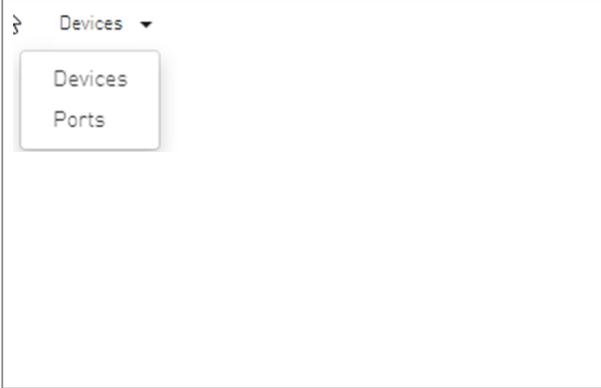
- Transmitted (Tx) bandwidth is measured by N server/switch ports in MB/sec
- Received (Rx) bandwidth is measured by N server/switch ports in MB/sec

Note

N can be 5, 10, 15, or 20.

The following table lists the icons of this component:

Options	Description
<p>List view</p> 	<p>Shows the top N elements as a list Each element is shown in a row with the name of the element and the bandwidth rate</p>
<p>Bar view</p> 	<p>Shows the top N nodes as a bar graph</p> <ul style="list-style-type: none"> • X axis shows the rate as a value • Y axis shows the Node (server) name
<p>Drop-down menu</p> 	<p>Selects the number of items to display Default: 10 nodes</p>
<p>Monitoring attributes</p> 	<p>Selects the attribute for monitoring:</p> <ul style="list-style-type: none"> • TxBW – Transmit Bandwidth • RxBW – Receive Bandwidth
<p>View by port/element</p>	<p>Switches view to top 5 elements by bandwidth or top 5 ports by bandwidth. Nodes view is presented by default.</p>

Options	Description
	<ul style="list-style-type: none"> • Clicking a specific port in the ports view under the port column redirects to the ports table and highlights that particular port • Clicking a specific device in the devices view under the device column redirects to the Devices table and highlights that particular node
	Toggles the filter textbox

Top Servers/Switches by Bandwidth—Bar View





Top Servers/Switches by Bandwidth—List View

Top 15 Servers By Bandwidth

Bar List 15 Devices TxBW

5

Device	TxBW BandWidth (Gbps) ↓
r-ufm254-hyp-04	75.35
r-ufm254-09	74.6
r-ufm254-011	65.95
r-ufm254-04	64.7
r-ufm254-012	63.2

1 to 5 of 15 |< < Page 1 of 3 > >|

Right-clicking a device displays a list of the actions that can be performed. These actions (shown in the following screenshot) are the same actions available in the devices table (see [Devices Actions](#) table under [Devices Window](#)).

Device	TxBW BandWidth (Gbps)
r-ufm254-hyp-03	38.8
r-ufm254-hy	40.1
ufm-host87	79.05
r-ufm254-01	47.6
r-ufm254-02	72.8

Right-clicking a port displays a list of the actions that can be performed. These actions (shown in the following screenshot) are the same actions available in the Ports table (see [Ports Window](#) for more information).

Top N Congested Servers/Switches by Rx/Tx Bandwidth

The Top N Congested devices by Rx or Tx Bandwidth component shows the top congested devices, classified top-down according to the defined Transmit (Tx) or Receive (Rx) bandwidth.

Bandwidth is measured as congestion bandwidth rate (CBW) by percentage.

- For Tx, congestion is measured by N HCA ports.
- For Rx, congestion is measured by N switch ports connected to HCAs.

Note

N can be 5, 10, 15, or 20.

Top N Congested Servers by Bandwidth—List View

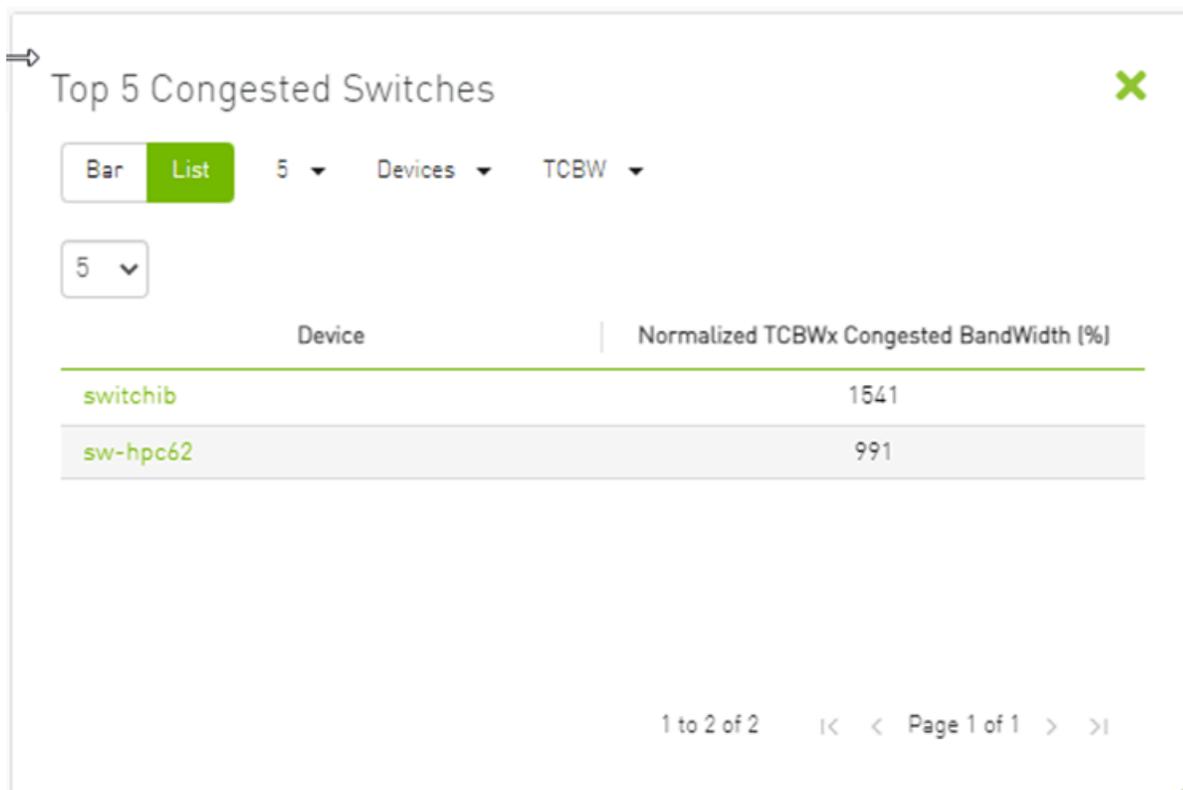
Top 5 Congested Servers

Bar List 5 Devices TCBW

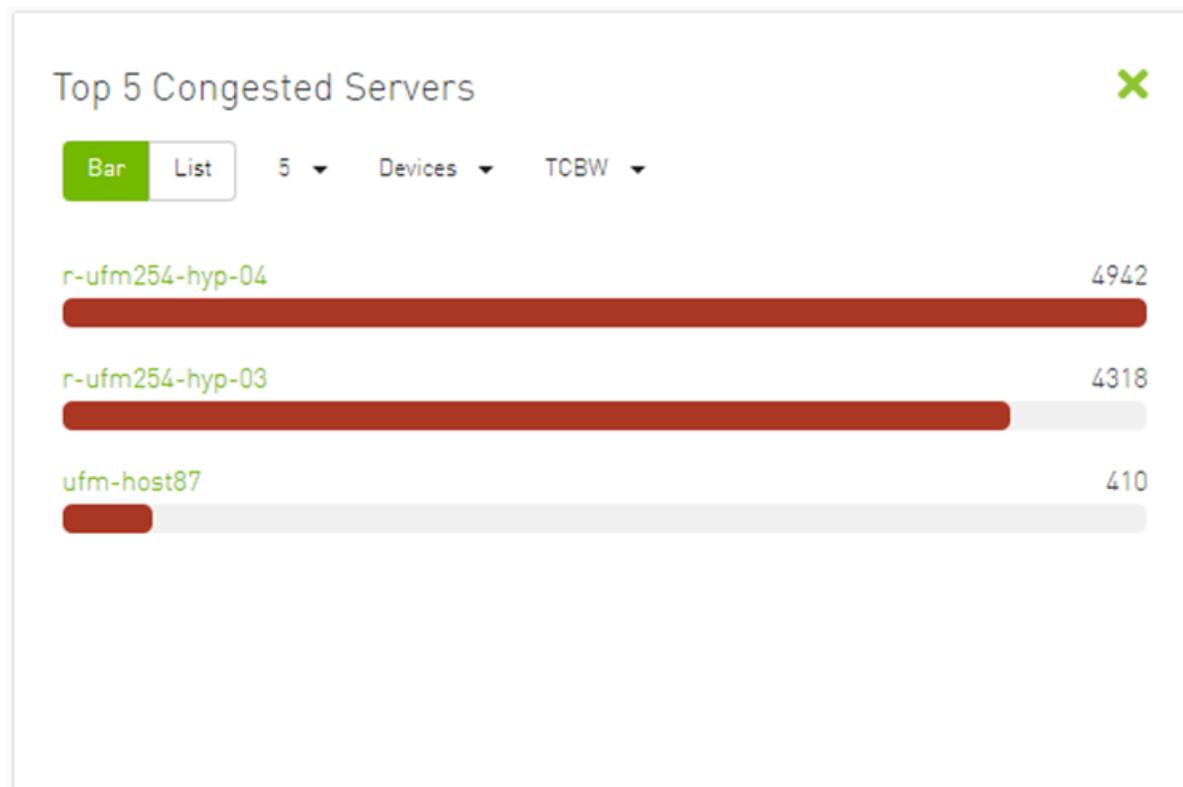
5

Device	Normalized TCBWx Congested BandWidth (%)
r-ufm254-hyp-04	3896
ufm-host87	3506
r-ufm254-hyp-03	3489

1 to 3 of 3 |< < Page 1 of 1 > >|

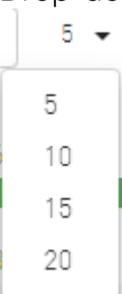
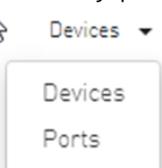


Top N Congested Servers/Switches by Bandwidth—Bar View



The following table describes the options available in this component.

Top N Congested Devices by Rx/Tx Bandwidth

Options	Description
<p>Bar view</p> 	<p>Shows the top N congested devices as a bar graph</p> <ul style="list-style-type: none"> • X axis shows the rate as a percentage • Y axis shows the congested Node (server) name
<p>List view</p> 	<p>Shows the top N congested nodes as a list Each congested node is shown in a row with the name of the node and its picture. It also shows the bandwidth rate</p>
<p>Drop-down menu</p> 	<p>Enables selecting the number of top N congested nodes Default: 10 nodes</p>
<p>View by port/element</p> 	<p>Switches view to Top 5 elements By Bandwidth or Top 5 Ports By Bandwidth. Devices view is presented by default.</p> <ul style="list-style-type: none"> • Clicking a specific port in the Ports view under the Port column redirects to the Ports table and highlights that particular port • Clicking a specific device in the Nodes view under the Device column redirects to the Devices table and highlights that particular node
<p>Monitoring attributes</p> 	<ul style="list-style-type: none"> • RCBW – Receive Congested Bandwidth (percentage) • TCBW – Transmit Congested Bandwidth (percentage)

Top N Utilized PKeys

Top N Utilized PKeys displays the top utilized PKeys based on the number of the PKey members.

Note

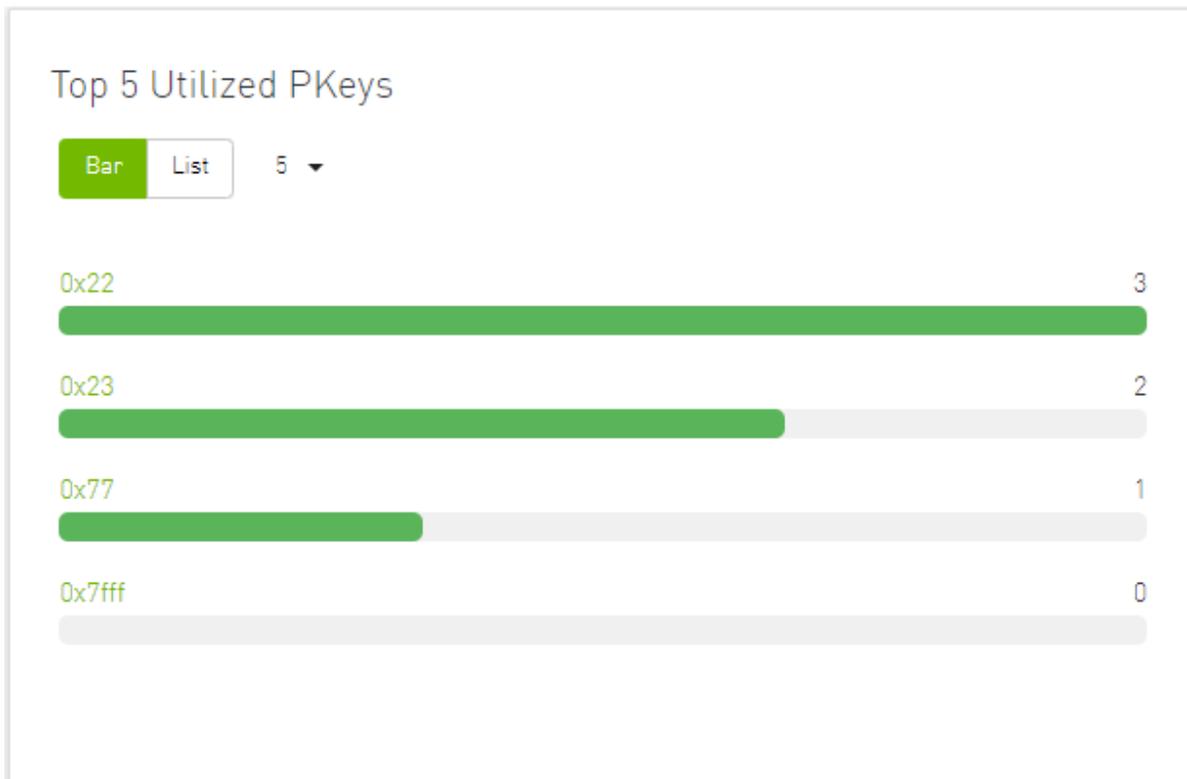
N can be 5, 10, 15, or 20.

Top N Utilized PKeys—List View

The screenshot shows a web interface titled "Top 5 Utilized PKeys". At the top, there are two tabs: "Bar" and "List", with "List" being the active tab. To the right of the tabs is a dropdown menu showing the number "5". Below the tabs is another dropdown menu also showing "5". A search icon is located to the right of this second dropdown. The main content is a table with two columns: "Pkey" and "# of GUIDs". The table contains four rows of data. The first row has Pkey "0x22" and "# of GUIDs" "3". The second row has Pkey "0x23" and "# of GUIDs" "2". The third row has Pkey "0x77" and "# of GUIDs" "1". The fourth row has Pkey "0x7fff" and "# of GUIDs" "0". At the bottom of the interface, there is a pagination control showing "1 to 4 of 4" and "Page 1 of 1".

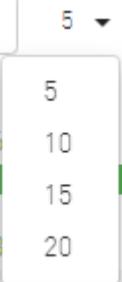
Pkey	# of GUIDs
0x22	3
0x23	2
0x77	1
0x7fff	0

Top N Utilized PKeys—Bar View



The following table describes the options available in this component.

Top N Utilized PKeys

Options	Description
Bar view 	Shows the top N Utilized PKeys as a bar graph <ul style="list-style-type: none"> • X axis shows the number of members • Y axis shows the names of the PKeys
List view 	Shows the top N Utilized PKeys as a list Each PKey is shown in a row with the name of the PKey and the number of its members
Drop-down menu 	Enables selecting the number of top N Utilized PKeys Default: 10 Utilized PKeys

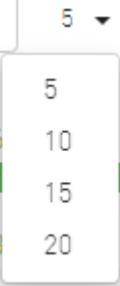
Top N Alarmed Servers/Switches

The Top N Alarmed Servers/Switches component shows the top nodes with alarms classified in a descending order. Alarmed nodes are measured according to the following:

- Severity – only the top nodes, in order of severity:
 - Critical
 - Minor
 - Warning
 - Normal
- Alarm – numbers (N can be 5, 10, 15, or 20)

The following table lists the components.

Top N Alarmed Servers/Switches

Options	Description
List view 	Shows the top N alarmed servers/switches as a list. Each alarmed device is shown in a row with the name of the node and the number of alarms.
Bar view 	Shows the top N alarmed devices as a bar graph. <ul style="list-style-type: none"> • X axis shows the number of alarms • Y axis shows the names of the alarmed nodes (servers)
Drop down menu 	Enables selecting the number of top N alarmed nodes. Selects the number of items to display. Default: 10 alarmed nodes
Filter toggle	Toggles the Filter textbox

Options	Description
<input type="checkbox"/>	

Top Alarmed Servers/Switches—List View

Top 5 Alarmed Servers
✕

Bar

List

5 ▾

5 ▾

Device	Alarms
r-ufm254-hyp-03	9
r-ufm254-hyp-04	9
ufm-host87	7

1 to 3 of 3
|<
<
Page 1 of 1
>
>|

Top 5 Alarmed Switches ✕

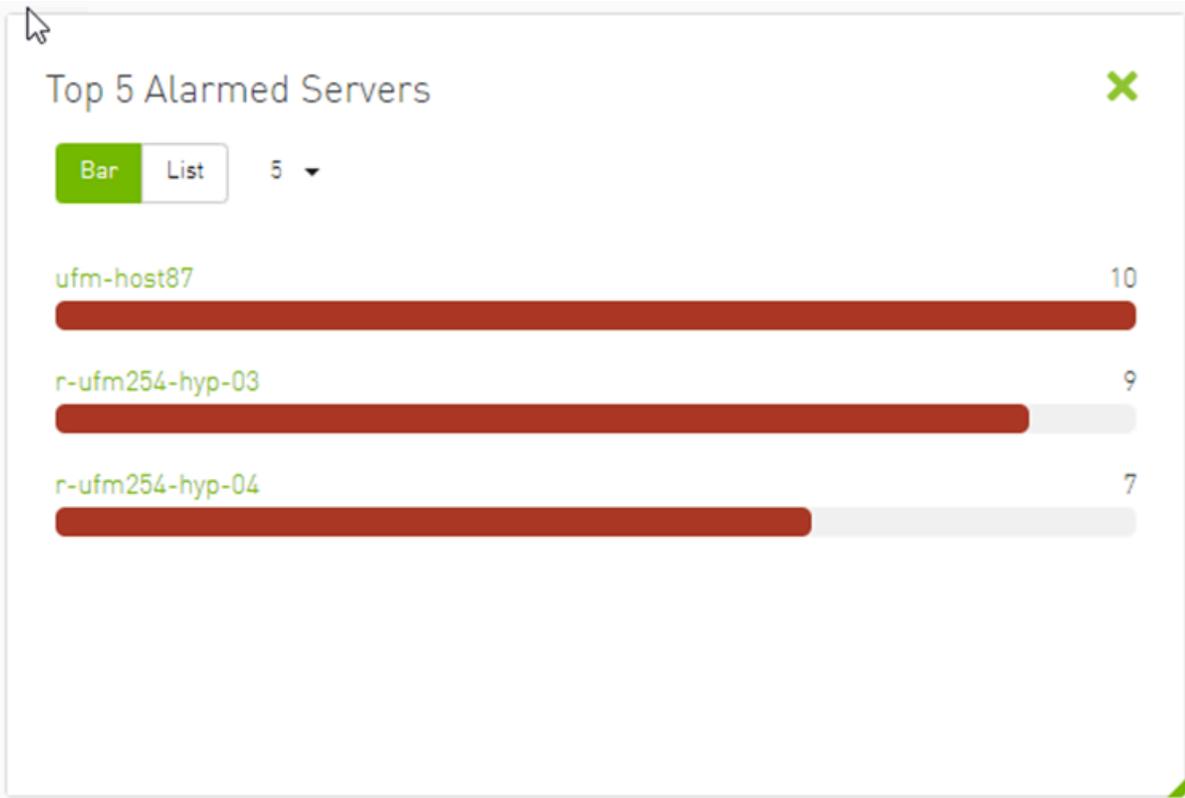
5 ▾

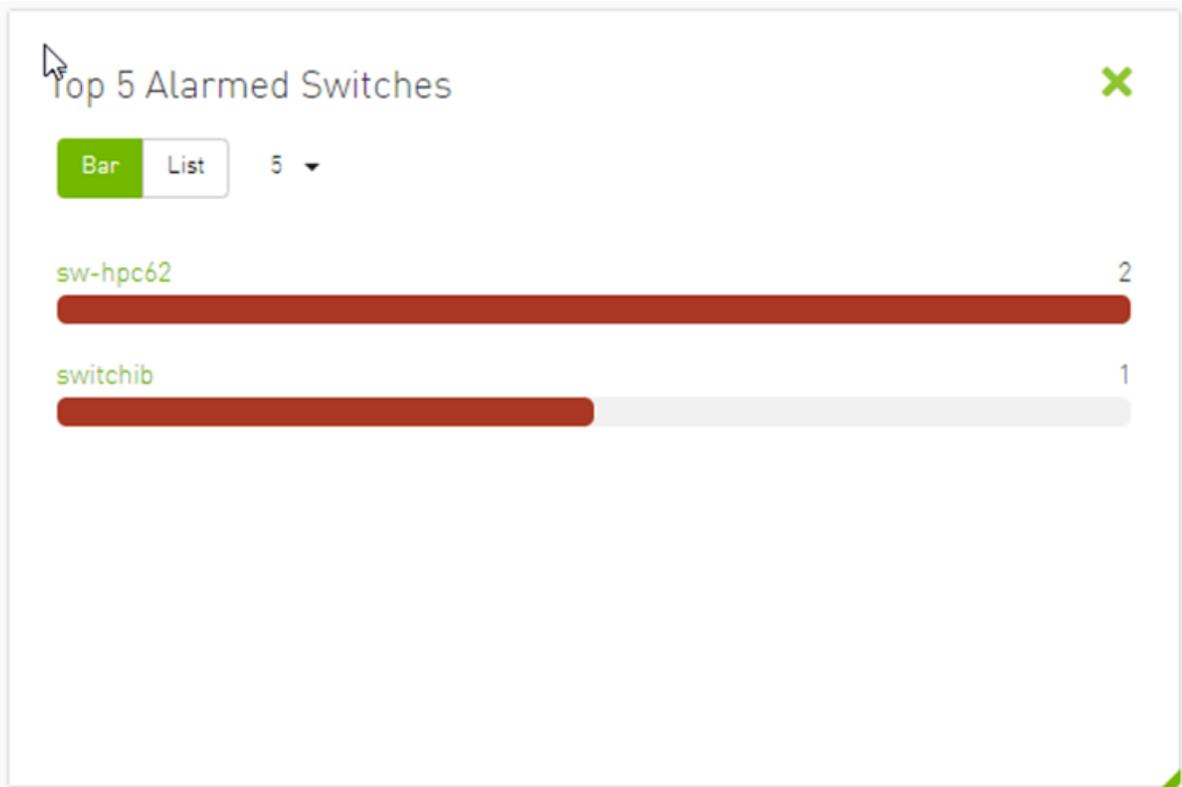
▾

Device	Alarms
sw-hpc62	9
switchib	8

1 to 2 of 2 |< < Page 1 of 1 > >|

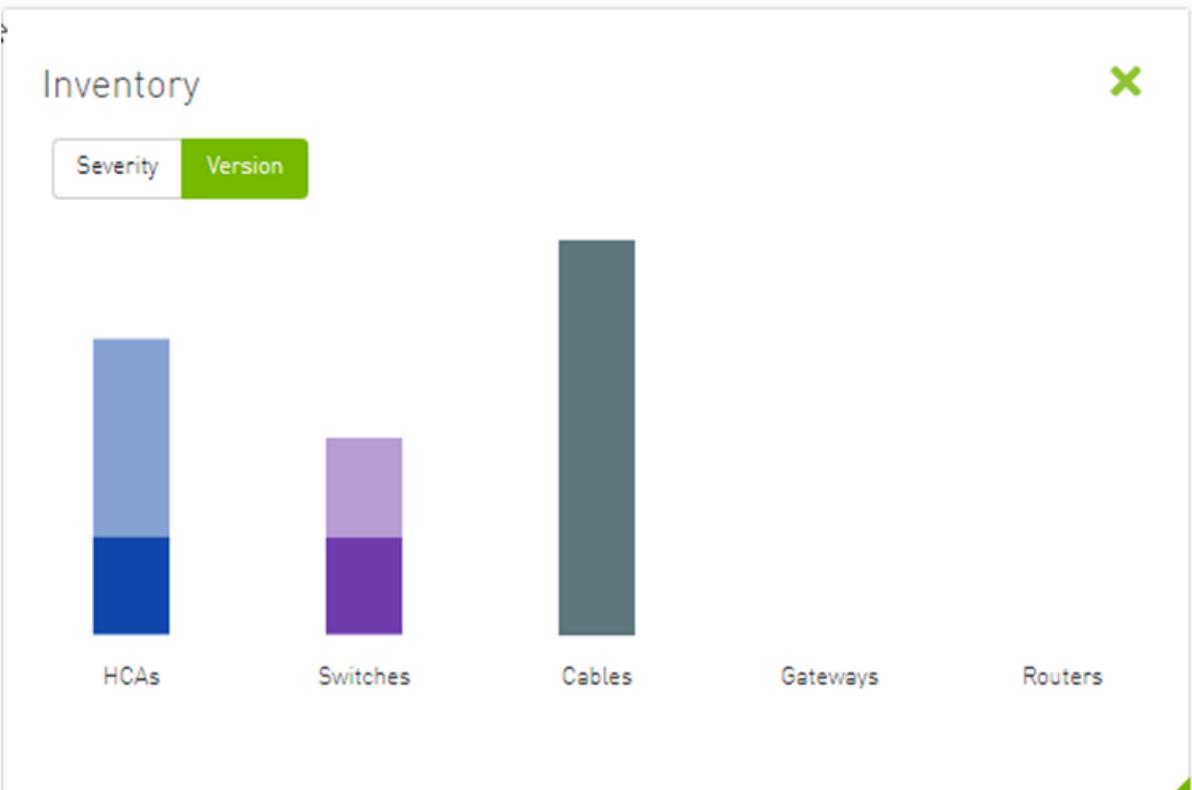
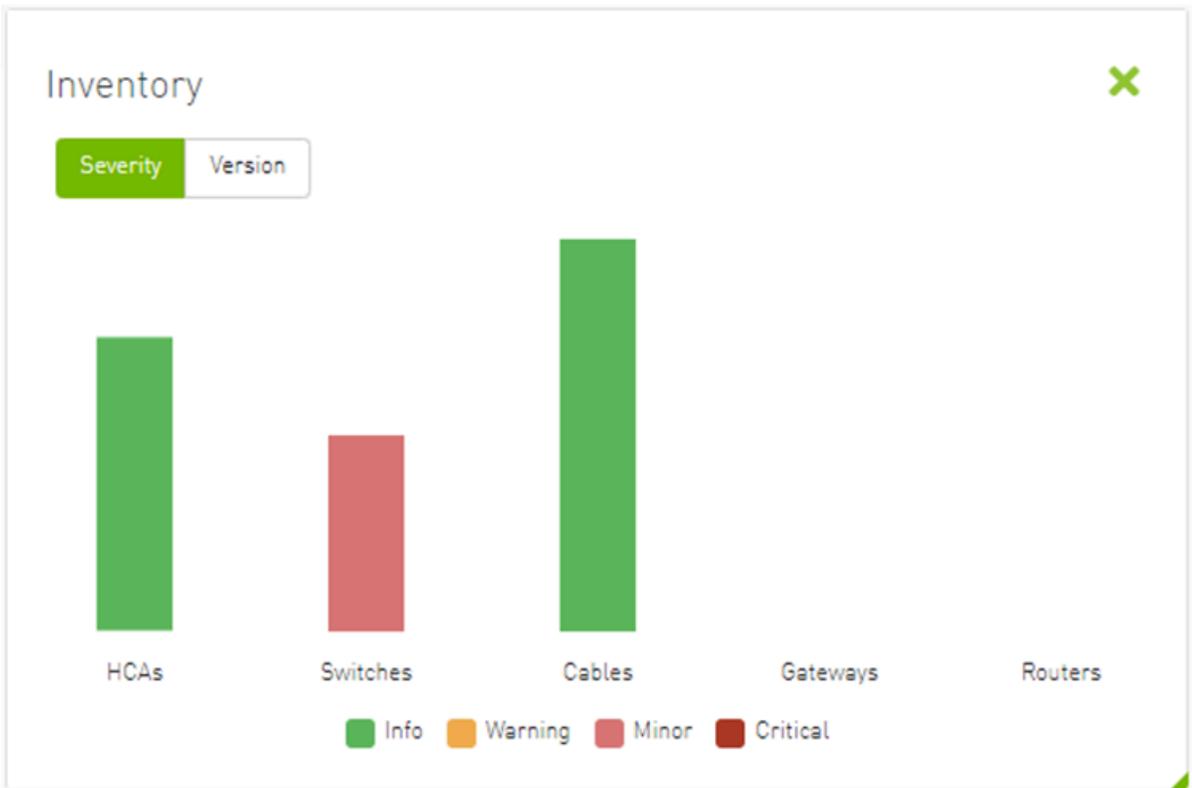
Top N Alarmed Servers/Switches—Bar View





Inventory Summary

The Fabric Inventory Summary component shows a summary of your fabric inventory (HCAs, Switches, Gateways, Routers and Cables) categorized by the element's severity or firmware version.



Clicking on one bar element with specific severity/firmware version will redirect you to the clicked element's table.

Fabric Utilization

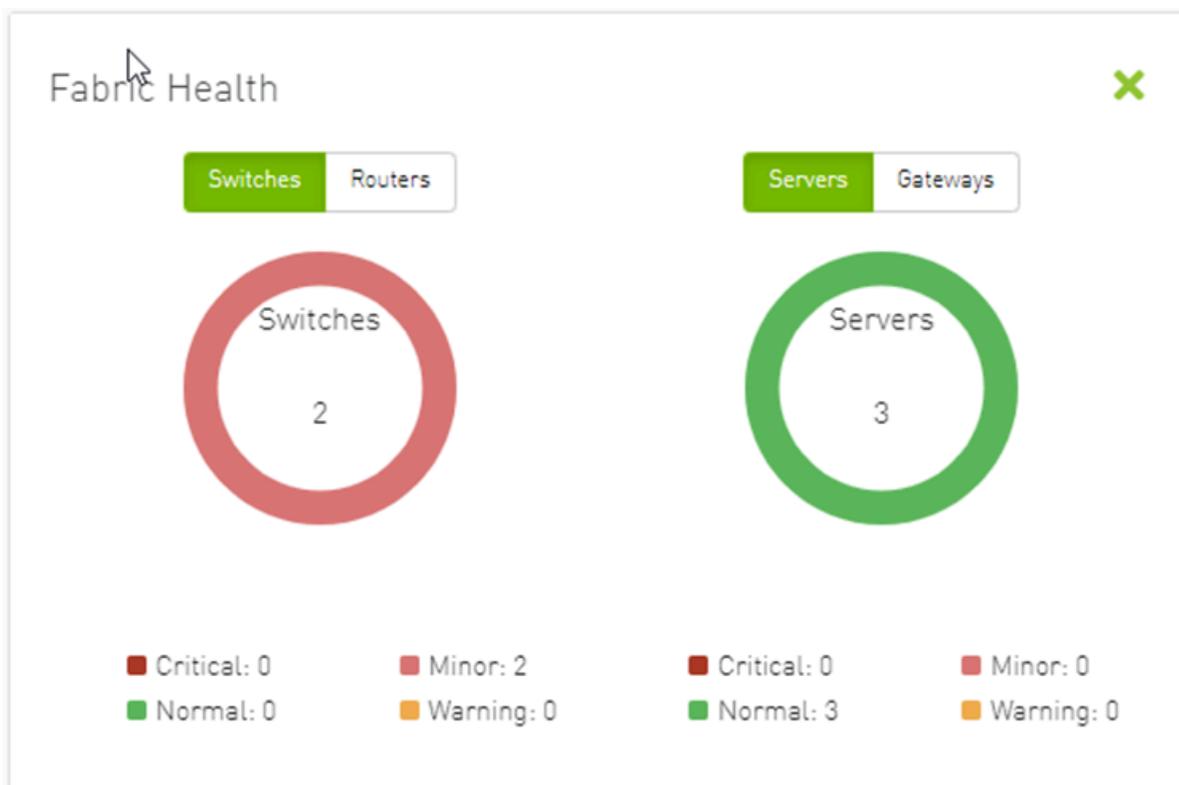
The Fabric Utilization component shows the number of alarmed objects, categorized by the alarm's severity. They are as follows:

1. Warning
2. Minor
3. Normal
4. Critical

If Server X has 2 minor alarms, 1 warning alarm and 2 critical alarms, and Server Y has 0 minor alarms, 2 warning alarms and 1 critical alarm, the **Fabric Resource Utilization** pie chart will show 2 servers in the critical slice, 2 servers in the warning slice and 1 server in the minor slice.

You can filter for both switches and nodes of a specific severity level by clicking the specific pie slice indicating the severity.

In the example below, the Devices table lists all the switches of severity level "Minor" after clicking the red (Minor) slice from the Switches pie chart.



Devices Local Time Last Update: 07 Apr 2022 17:01 admin

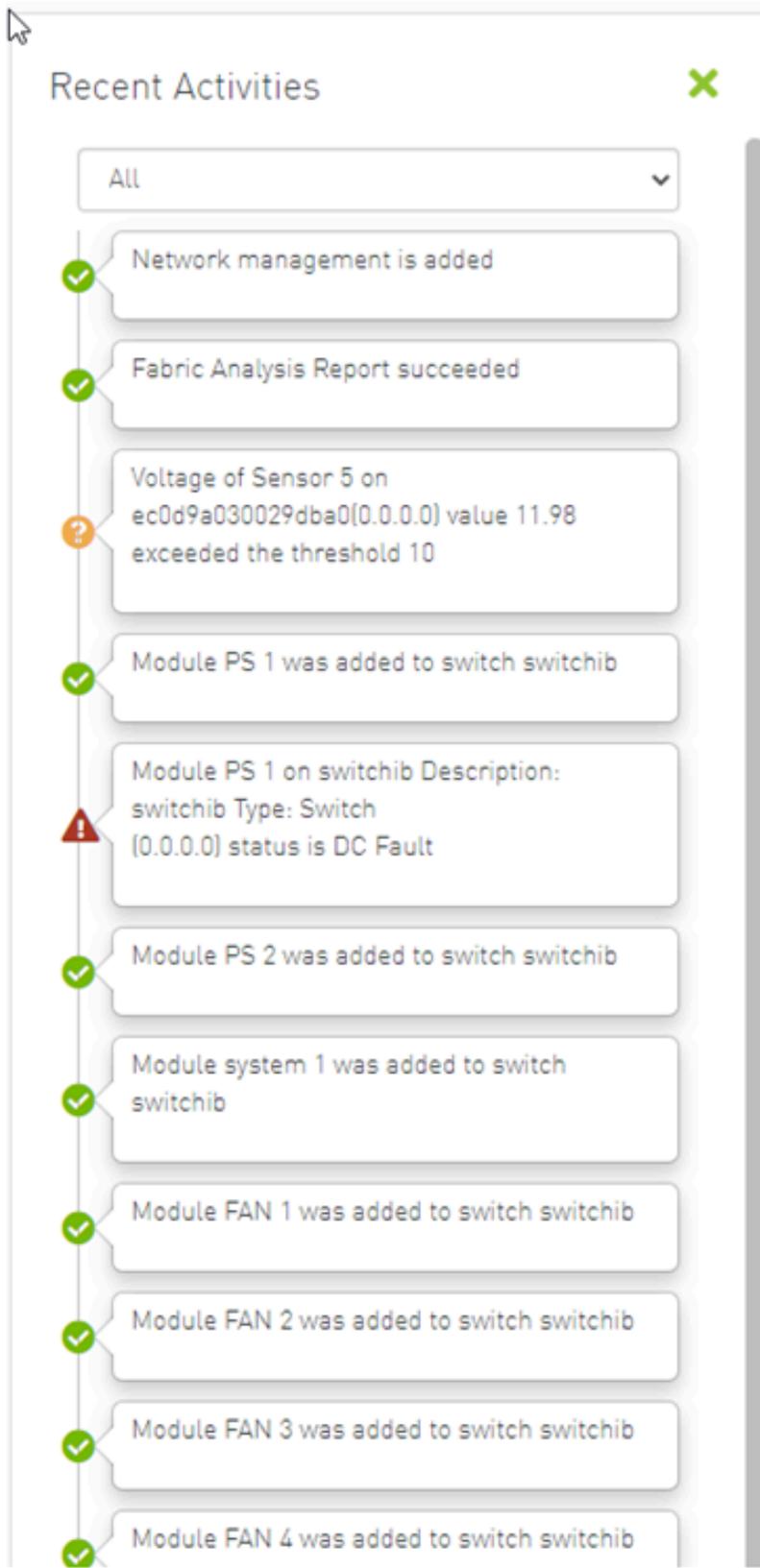
Showing 2 out of 5. [Click to reset all filters](#) Switch [Refresh](#) [Displayed Columns](#) [CSV](#)

Severity	Name	GUID	Type	Model	IP	Firmware Version
Minor	sw-hpcc2	0x7cfe90c300de5a2a0	switch	MSB7800	N/A	18.1200.102
Minor	switch1a	0x6ed7e0c0027e6a0	switch	EDR	N/A	18.2008.1029

Viewing 1-2 of 2 « »

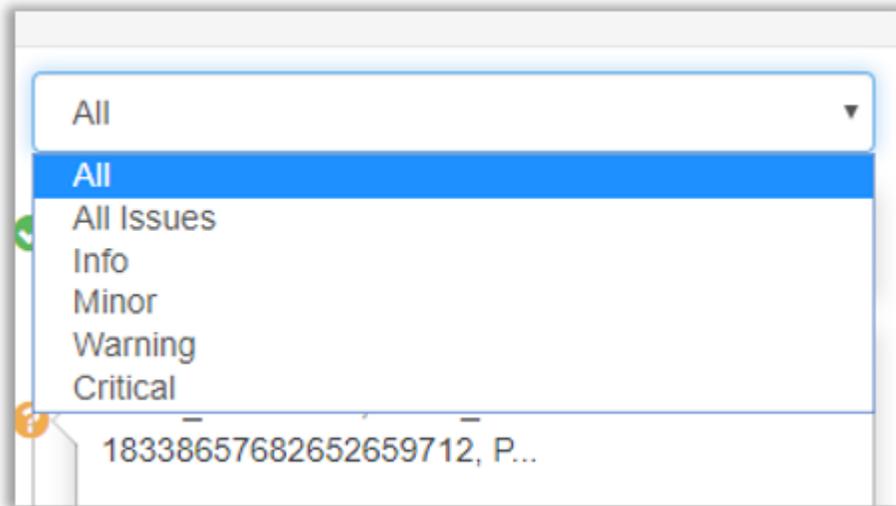
Recent Activities

The Recent Activities component lists the recent events detected by the UFM system.



You can filter for the events you would like to see in one list using the drop-down menu that provides the following options:

- All – shows all recent activities
- All issues – shows all non-Info activities
- Info – shows all activities with Info severity or higher
- Minor – shows you all activities with Minor severity or higher
- Warning – shows you all activities with Warning severity or higher
- Critical – shows you all activities with Critical severity

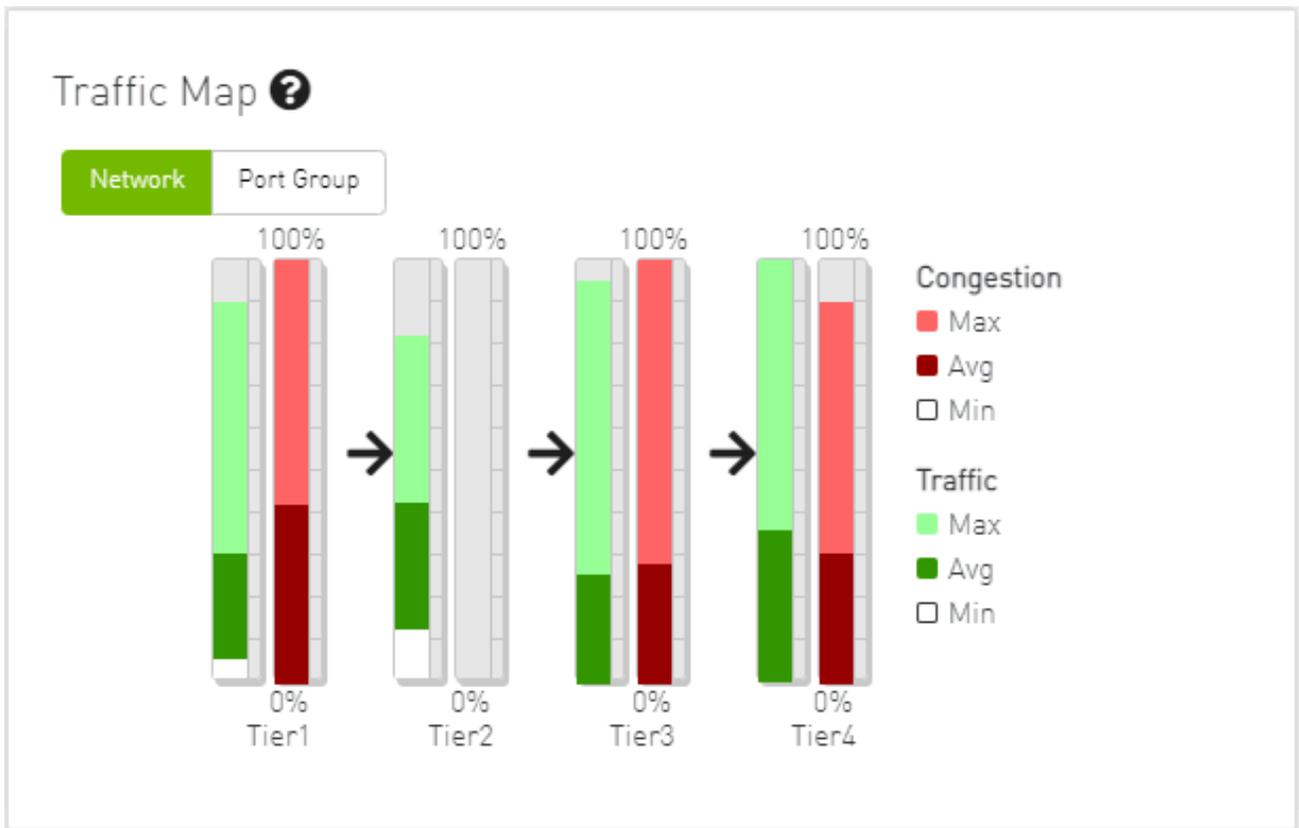


Traffic Map

The Traffic Map dashboard shows the normal traffic versus congested traffic distributed on switch tiers and on port groups. This view, together with the **Top N Congestion** dashboard, gives a full status of the traffic congestion of the fabric.

Network Traffic Map

Four double bars represent the transmitted bandwidth (normalized transmit data) and normalized congested bandwidth (CBW), both measured in bytes/sec with minimum, average, and maximum bandwidth values.



An explanatory window on traffic map opens once clicked on the  icon.

Traffic Map Guide

Mellanox's unique Traffic Map provides a valuable real-time aggregate view of the fabric performance by showing the overall bandwidth utilization per switching tier coupled with congestion information.

Reading the Traffic Map Chart

The Traffic Map contains four tiers; each tier is represented by a green and a red bar, as shown in the following Traffic Map Chart :



Close

The percentage of total theoretical bandwidth (TBW) is calculated based on the underlying InfiniBand technology (SDR, DDR, QDR, FDR or EDR). The speed can be viewed when checking the ports.

- The vertical axis shows the following:
 - Bandwidth (BW) is represented by a green bar and is measured in percentages
 - Congested Bandwidth (CBW) is represented by a red bar and is measured in percentages
 - Minimum, average, and maximum bandwidth are represented in each bar by a subset color

- The horizontal axis represents the tiers.

The bottom of the dashboard represents the tier-related transmitted traffic, which is divided into four segments by measurement ports:

- Tier 1 – represents the traffic injected by all adapters
- Tier 2 – represents the traffic sent from the edge switches to the core of the fabric (in case of a single Director switch, this tier indicates traffic utilization inside the Director between the line and fabric boards)
- Tier 3 – represents the traffic sent from the core to the edge switches
- Tier 4 – represents the traffic sent from the edge switch to the adapters

Note

The illustrations at the bottom of the tiers show a four-tier topology:

Server [tier 1] Switch [tier 2] Director Switch [tier 3] Switch [tier 4]
Server.

Levels Network Traffic Map

Different representation of the fabric traffic map that based on the devices/ports levels.

Levels Traffic Map ?



Network Port Group



The level of the device/port is the distance between the device and the nearest server/gateway.

Levels Calculations:

- The levels calculations are configurable from the `gv.cfg` file under TopologyLevels section enable item and it is disabled by default.
- The levels names are configurable from the `gv.cfg` file under TopologyLevels section levels item and by default we are defining up to 4 levels levels equals server, leaf, spine, core
 - Server: hosts and gateways.
 - Leaf: switches and routers that are directly connected to the server
 - Spine: switches and routers that are directly connected to the leaf
 - Core: switches and routers that are directly connected to the spine

If the fabric has more than 4 levels, the level value will be L + distance e.g., L4, L5, L(N), and if levels was empty, the levels will start from L0, L1, L2, etc.

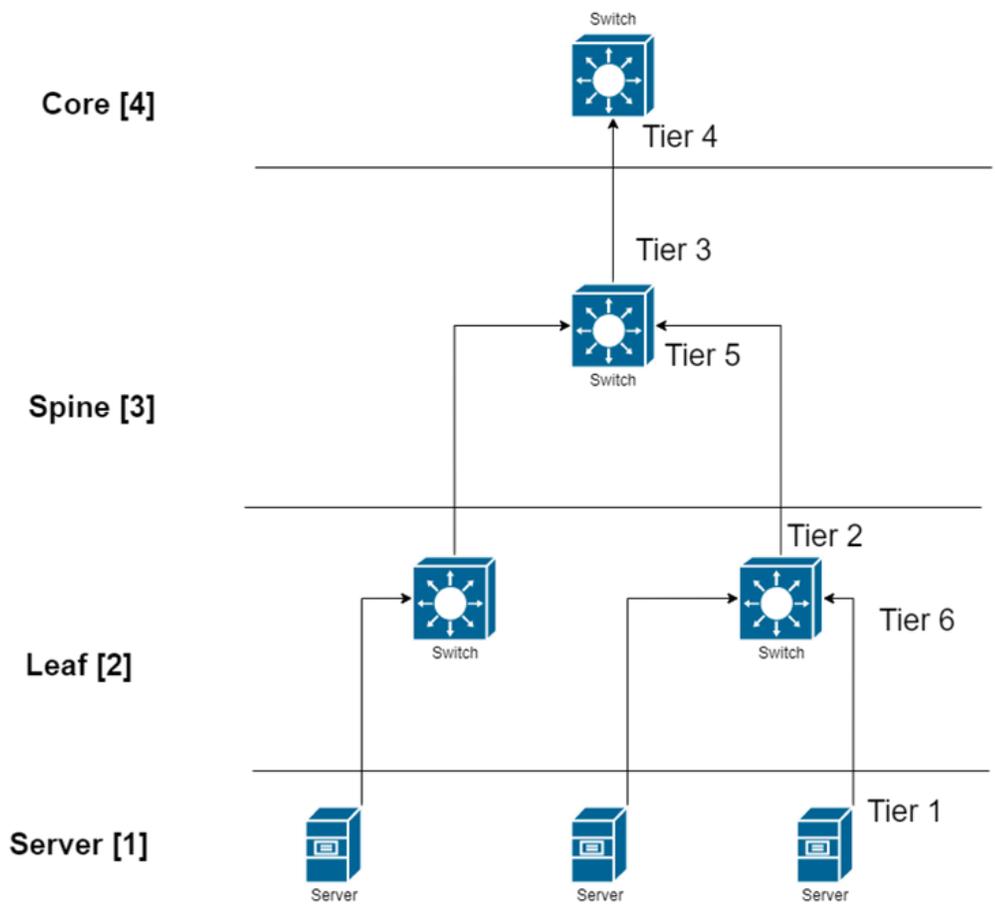
The levels calculations are done at either the discovery stage or once the topology changes.

Ports Tiers calculations based on the levels:

If the levels calculations is enabled, the port's tier will be calculated as the following steps:

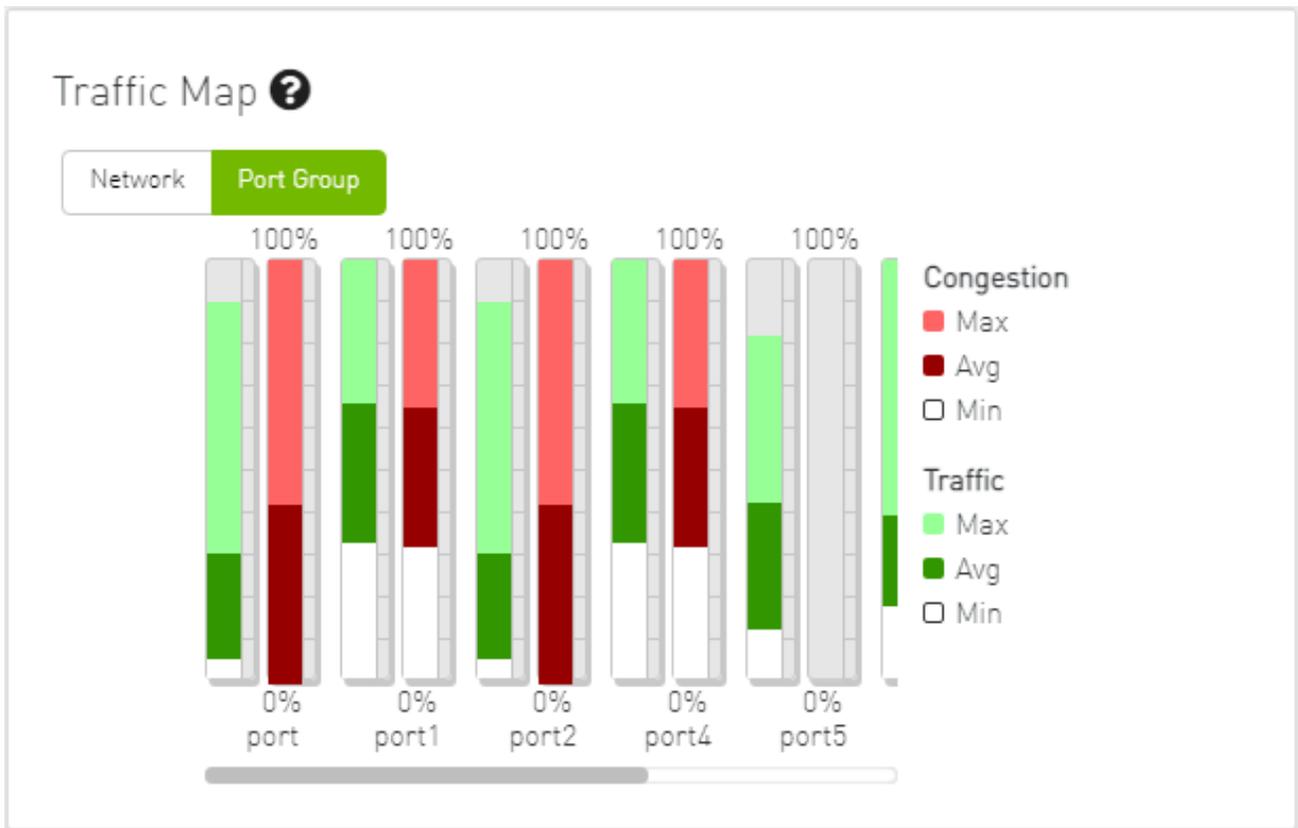
1. Get the level for both port's parent device and port's peer parent device
2. Decide whether the port's data flow is the up or down direction, by checking the order of the parent and peer parent level:
 1. If the parent's level order is less than or equals the parent peer level, then the port's flow is up and tier is the parent level order
 2. If the port's flow is down and the tier is the distance between the host to the root device and the distance between the root to the parent device

Example:



If the level calculations are disabled, the tier calculations will be done as mentioned in this section.

Port Group Traffic Map



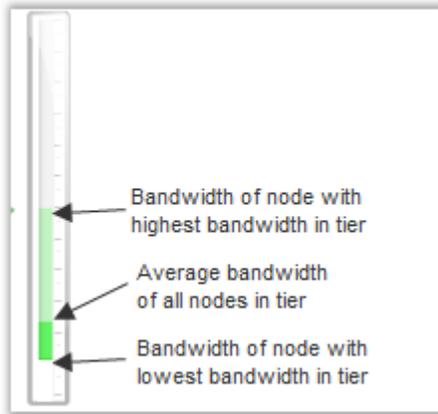
Traffic Map Bar Chart

- **Bandwidth Bars**

The bandwidth graph shows how traffic is traversing the fabric and how traffic is being transmitted between the servers. For example, the following considerations could be evaluated:

- The size of the difference between max bandwidth and min bandwidth.
- The traffic that is flowing in the middle tiers and whether it would be more efficient to move the traffic to the edges to save the uplinks.

Bandwidth levels are measured in percentages, as shown below:

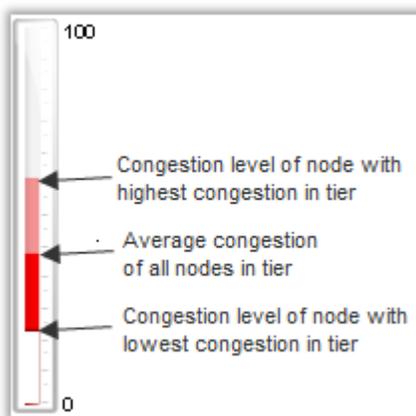


- **Congestion Bars**

The Congestion graph shows where congestion starts. For example, the following considerations could be evaluated:

- If congestion is in the first or second tier, there is probably a routing problem
- If there is no red bar, it means that there is no congestion or no routing problems

Congestion levels are measured in percentages, as shown:

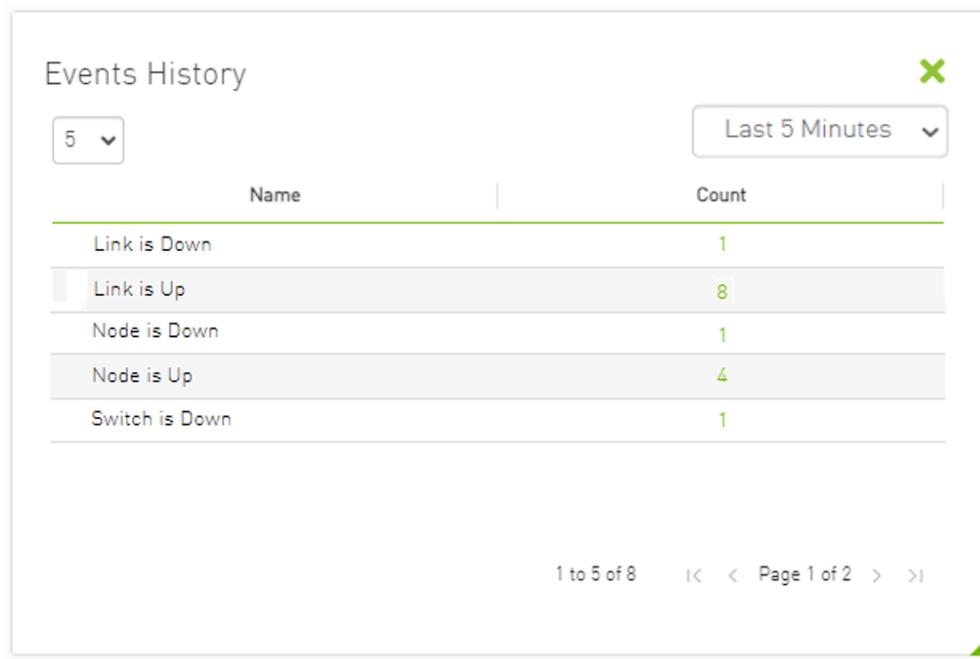


Events History

Note

To view the Event History panel in the dashboard, the System Monitoring feature must be enabled. Otherwise, the panel will be hidden. Users can enable System Monitoring by setting the `system_monitoring_metrics` flag under the `SystemMonitoring` section in the `gv.cfg` file to true.

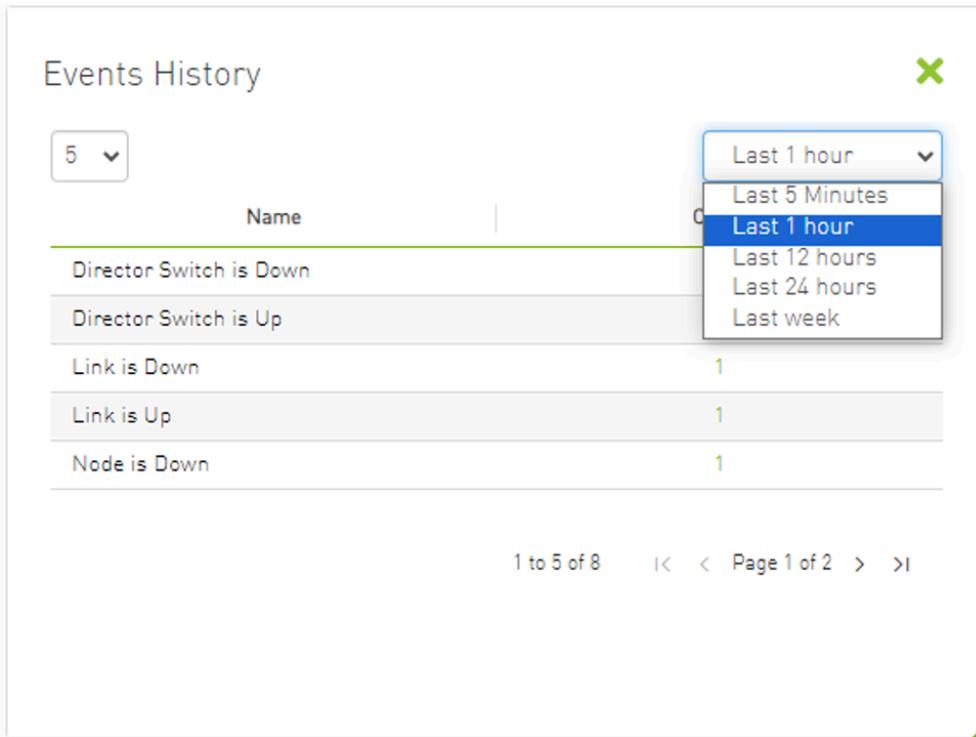
The Events History panel presents the topology change events in a table along with their respective counts.



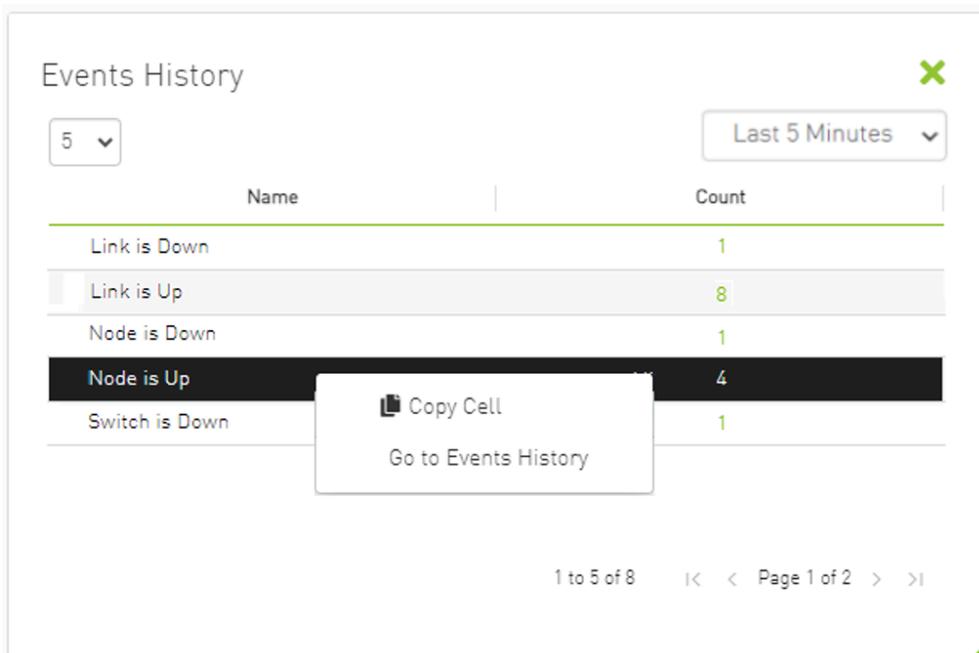
The screenshot shows the 'Events History' panel with a close button (X) in the top right. Below the title, there is a dropdown menu set to '5' and a time interval dropdown set to 'Last 5 Minutes'. The main content is a table with two columns: 'Name' and 'Count'. The table lists five event types: 'Link is Down' (1), 'Link is Up' (8), 'Node is Down' (1), 'Node is Up' (4), and 'Switch is Down' (1). The 'Link is Up' row is highlighted. At the bottom, there is a pagination control showing '1 to 5 of 8' and 'Page 1 of 2'.

Name	Count
Link is Down	1
Link is Up	8
Node is Down	1
Node is Up	4
Switch is Down	1

The user can filter the event count by selecting the desired time interval.

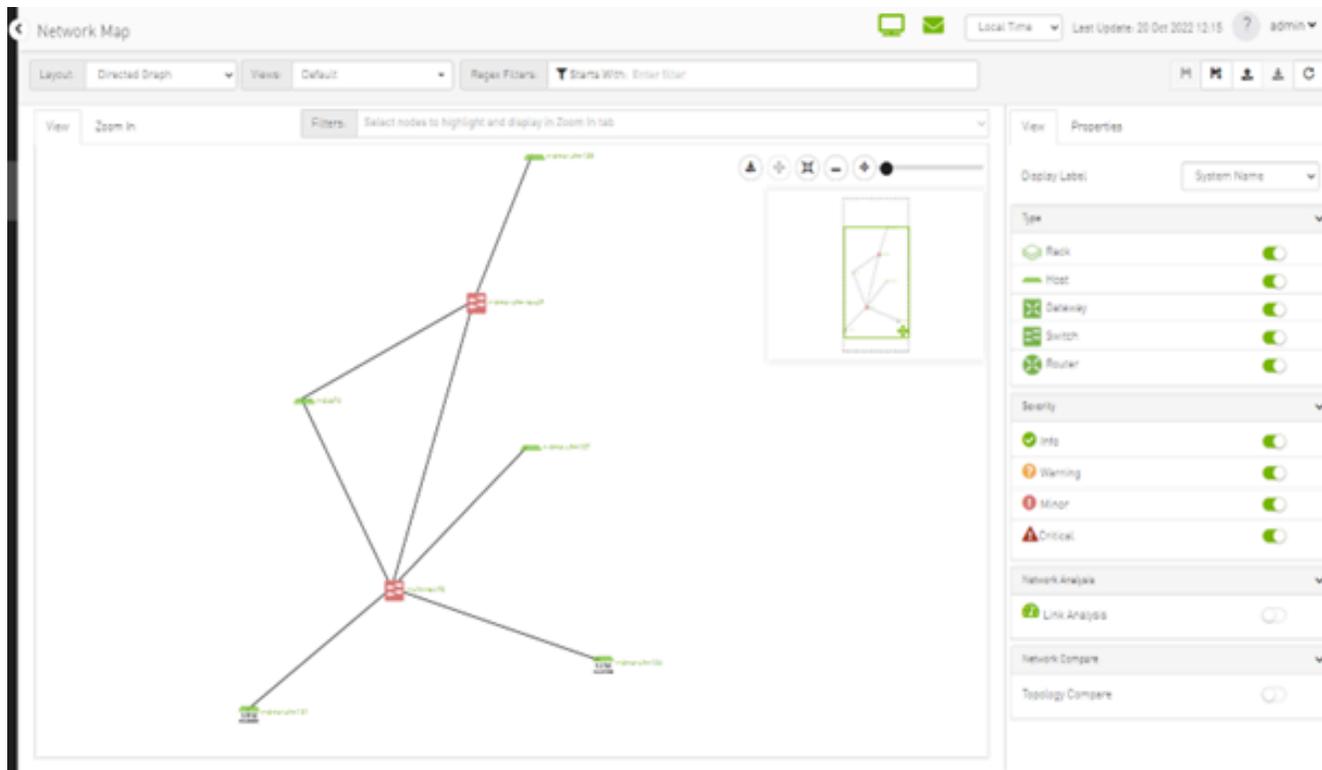


Users can navigate to the 'Device/Link Status Events' tabs by either clicking on the counter value or by right-clicking and selecting 'Go to Events History'.



Network Map

The Network Map window shows the fabric, its topology, elements and properties. UFM performs automatic fabric discovery and displays the fabric elements and their connectivity. In the Network Map window, you can see how the fabric and its elements are organized (e.g., switches and hosts).



Network Map Components

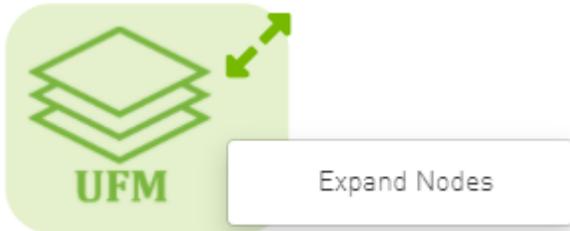
Component	Icon	Description
Switches		Represents third party switches discovered/managed by UFM
Hosts		Represents the computer (host) connected to the discovered/managed switches
Routers		Represents third party routers discovered/managed by UFM
Gateways		Represents third party gateways discovered/managed by UFM
Links		Represents the connections between devices on the fabric

Component	Icon	Description
Racks		Represents all nodes (hosts) physically connected to a switch

Note

The level of severity of devices affects the color they are displayed in. For further information, refer to table "[Device Severity Levels](#)".

- To zoom in/out of the map, scroll the mouse wheel up and down or using the slider on the right top corner
- To move around in the map, press and hold down the left key while you move sideways and up/down
- To see the hosts inside a rack, right-click the Rack icon and click "Expand Hosts"



Selecting Map Elements

Users are able to select elements from the Network Map. Right-clicking an element opens a context menu which allows users to perform actions on it.

It is possible to select multiple elements at once using any of the following methods:

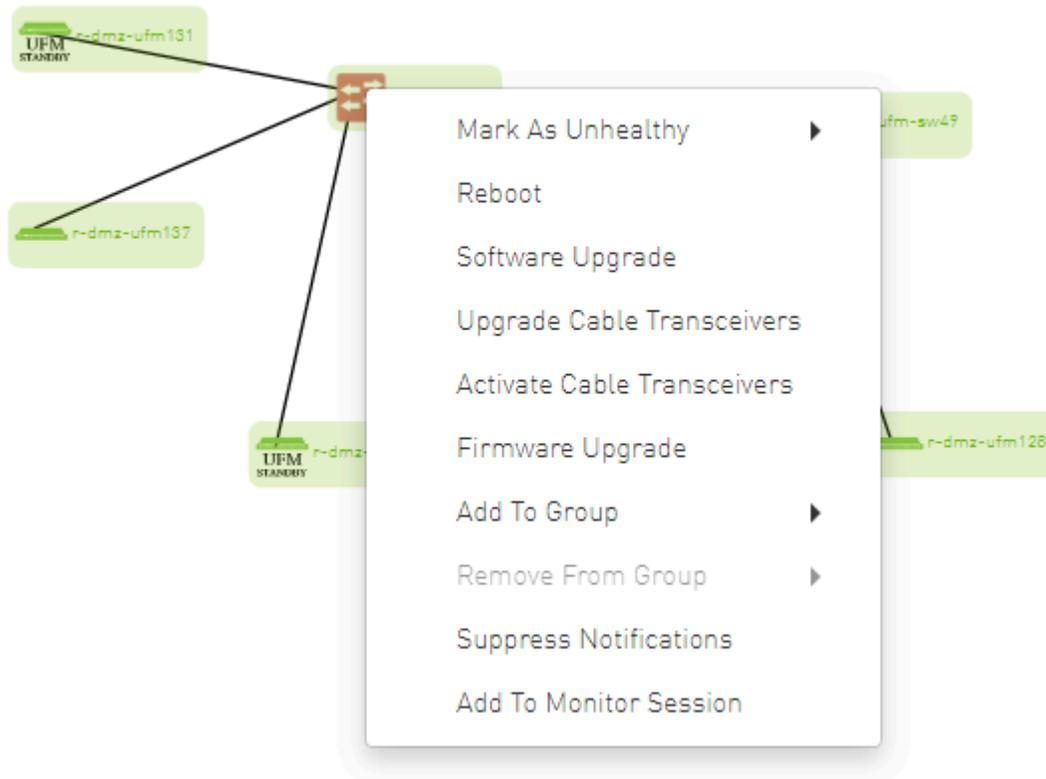
- By holding down Ctrl or Shift and dragging their mouse across the map.

Note

Please note that Ctrl starts new selection, while Shift adds to the current selection.

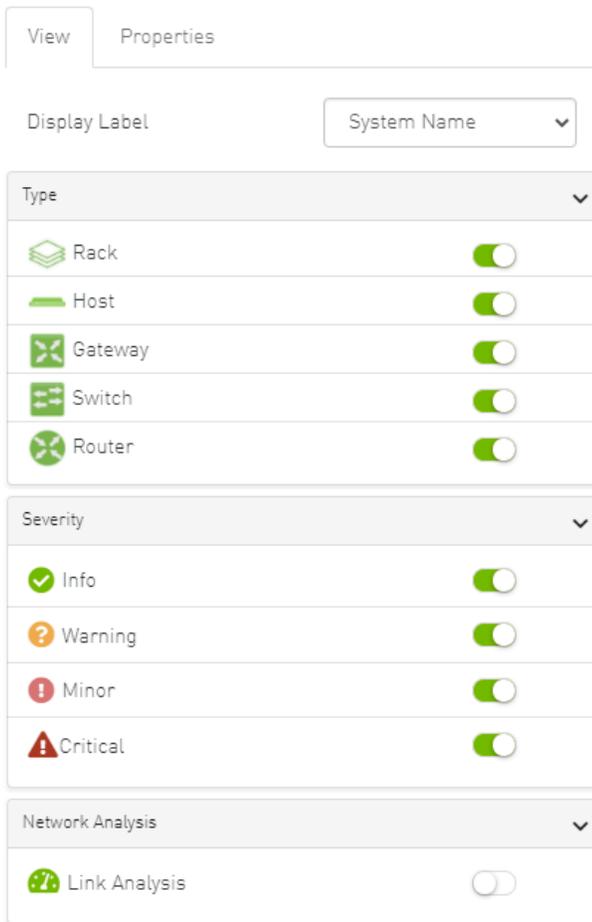
- By holding down Shift and clicking a new element on the map.

Multi-select makes it possible for users to perform actions on multiple devices with one right-click rather than repeating the same process per device.



Map Information and Settings

The right pane of the Network Map view enables you to control the view settings, as well as obtain further information on selected elements from the map.



The customized views created using the type and severity filters, selected fabric nodes, zoom level, and Expand/Collapse All Racks options can be saved for later access. These customized views can be saved and accessed using the bar available on top of the Network Map:

- "Save As" icon () saves newly created customized views
- "Save" icon () saves edits performed on existing views
- "Import" icon () import map from local device. The file format should be txt
- "Export" icon () export network as text file
- To reload/refresh the network map, use the refresh icon ().
- Drop down menu gives access to all previously saved views
- "Default" view is a predefined view where nodes are positioned randomly, all filters are enabled, and all racks are collapsed. Changes made to this view cannot be saved unless under a new view name using the "Save As" icon.

- Saved views can be deleted using the "x" button.

You can select a node from the dropdown menu located above the Network Map view in order to highlight/display them in the "Zoom In" tab.

Map View Tab

The Network Map "View" tab displays the fabric containing all nodes (e.g. switches, racks including the hosts, etc).

If your fabric consists of more than 500 nodes, please note that:

- The "View" tab will show only the switches in your fabric. Therefore, "Expand all racks" and "Rack filter" functions will be disabled.
- Link analysis will be disabled.

To have a better experience in this instance, you can switch to the "Zoom In" tab.

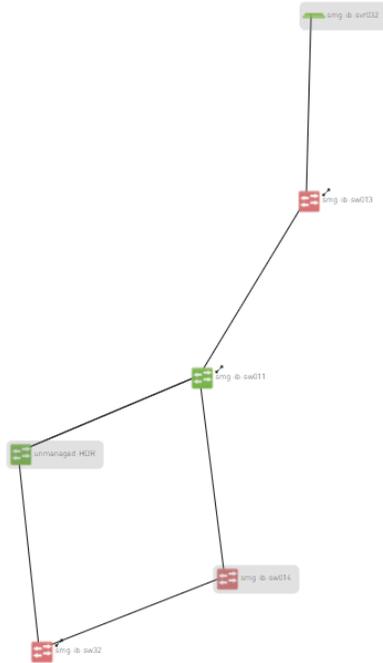
Map Zoom In Tab

The Network Map "Zoom In" tab displays only the selected nodes from the dropdown menu above the map view and the nodes directly connected to the selected nodes.

Network Map

Views: Default [Home] [Refresh] [Close] unmanaged-HDR x smg-ib-sw014 x smg-ib-svr032 x

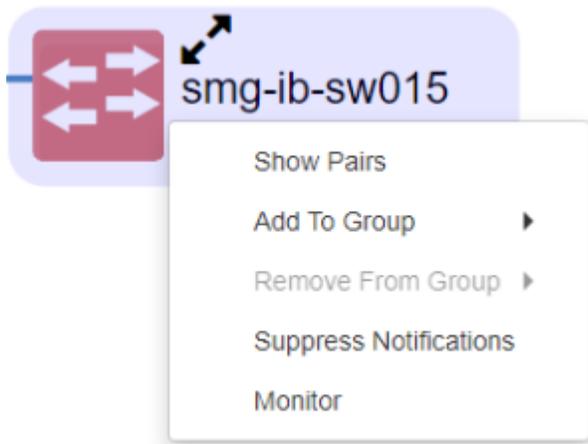
View Zoom In



If some switches still have hidden connected nodes, you will see the following icon:



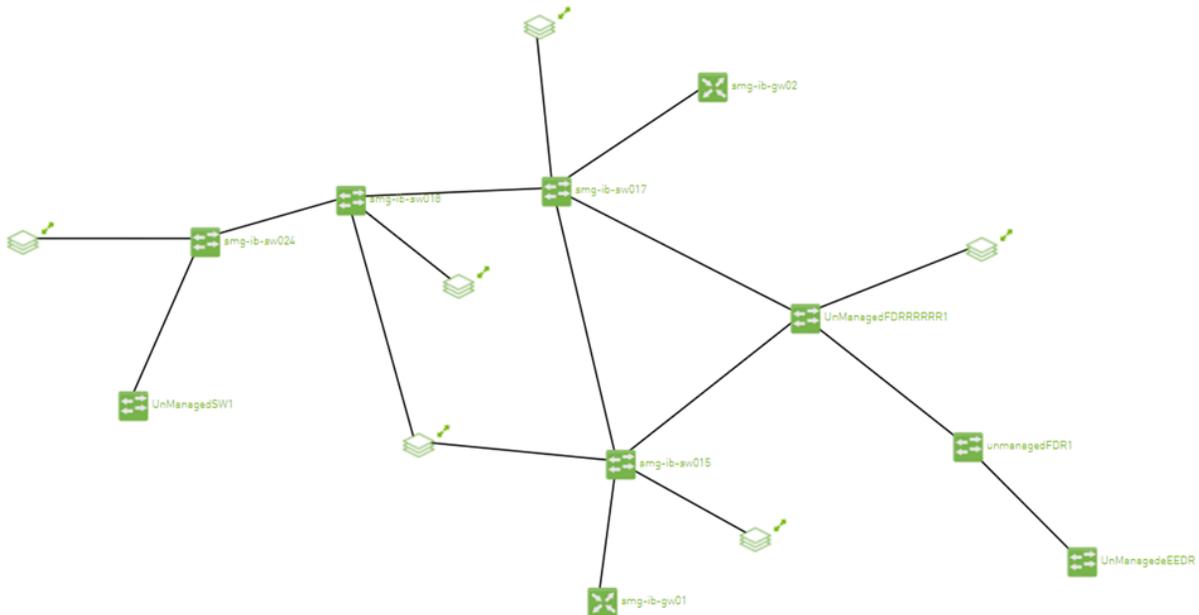
To reveal the hidden nodes connected to this switch, you can right-click it and select "Show Pairs" which adds this switch to the selected nodes list and shows the direct connected nodes to this switch.



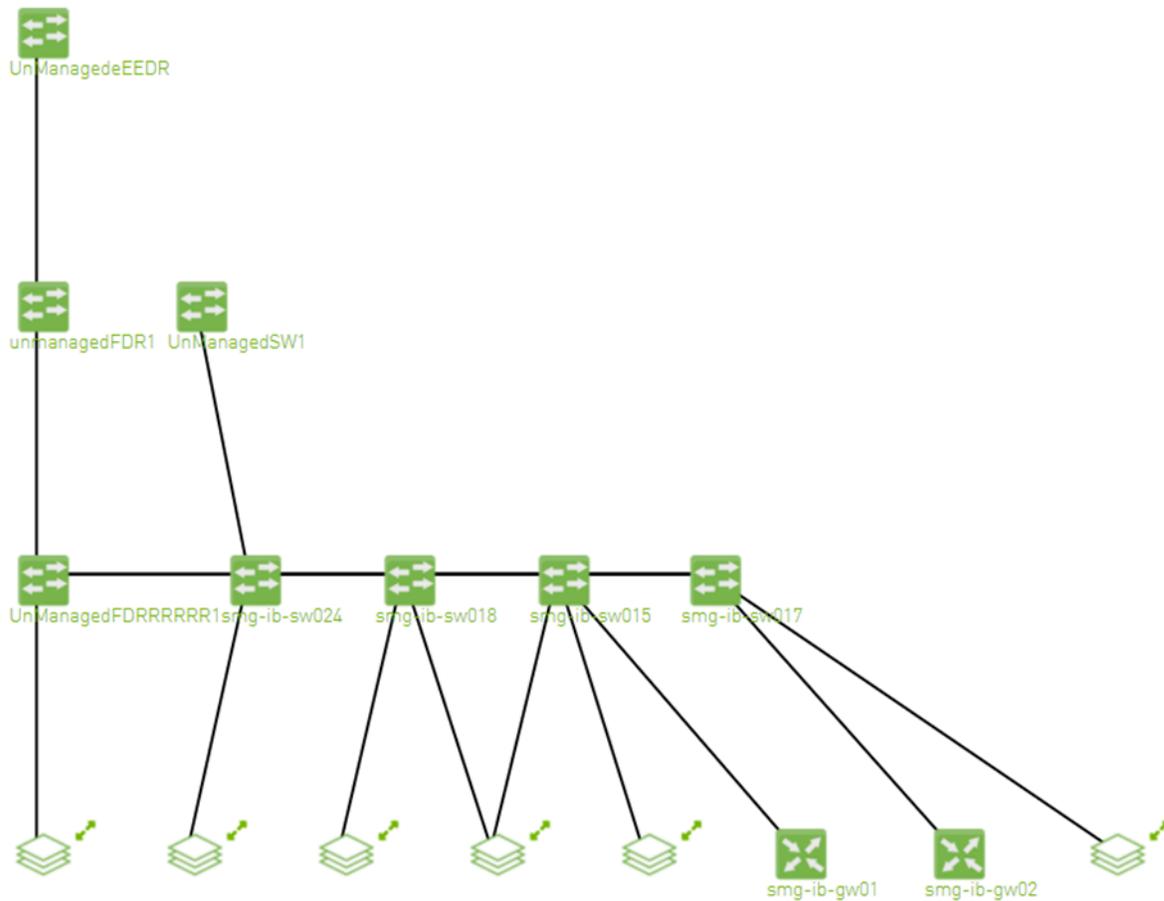
Map Layouts

Layout controls nodes positions in the map. UFM network map supports two types of layouts:

- Directed layout: the nodes are distributed depending on the connections between them so that the connected nodes will be near each other without conflict.



- Hierarchical layout: the nodes are distributed as layers; each layer will contain nodes that have the same level value.



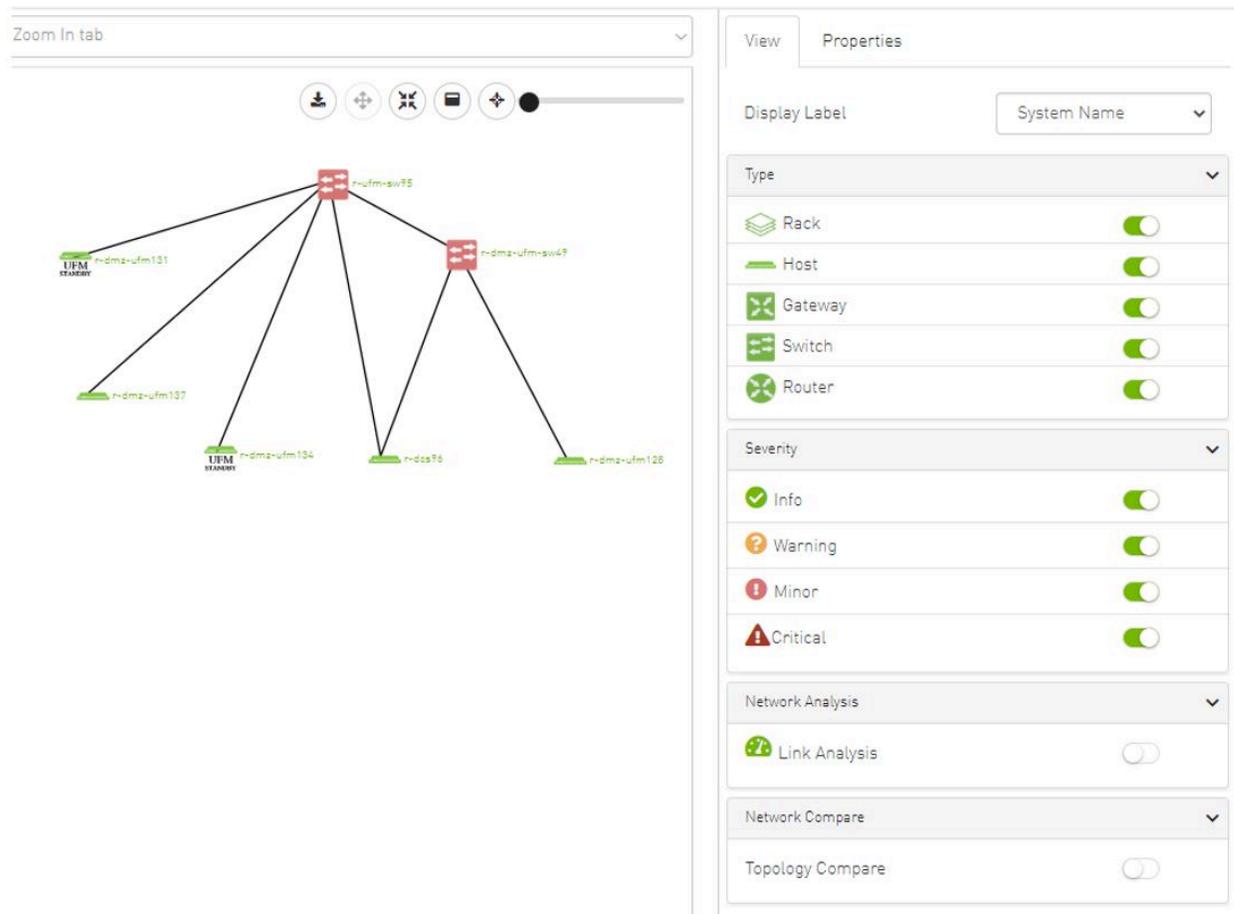
You can switch between layouts from the dropdown menu located above the Network Map view.

Information View Tab

- Enables searching for one or more elements in the map, by typing either their name or their GUID in the Search field. Note that the search mechanism is **not** case-sensitive.
- Enables displaying the elements either by their name, GUID, or IP.
- Enables viewing all hosts of all racks in the fabric using the "Expand All Racks" button.



- Enables customizing the view of the map by filtering for certain elements to appear in the map using the Type (see table "[Network Map Components](#)") and Severity (see table "[Device Severity Levels](#)") filters. Example:



Device Severity Levels

Component	Description
	Info
	Critical
	Minor
	Warning

Link Analysis

Link analysis allows the user to display the link analytics according to a selected static counter, and define the conditions on which the analysis is based. The links are colored according to the specified conditions. It is possible to define up to five conditions per counter.

The counter's conditions are applied on four values:

- The source values of the selected counter

- The destination value of the selected counter
- The source value of the opposite of the selected counter
- The destination value of the opposite of the selected counter

The worst matched value between these four is taken into consideration.

The "Network Analysis" section on the right side under the View tab contains a radio button to enable/disable the link analysis.

View

Properties

Display Label System Name ▼

Type ▼

Rack	<input checked="" type="checkbox"/>
Host	<input checked="" type="checkbox"/>
Gateway	<input checked="" type="checkbox"/>
Switch	<input checked="" type="checkbox"/>
Router	<input checked="" type="checkbox"/>

Severity ▼

Info	<input checked="" type="checkbox"/>
Warning	<input checked="" type="checkbox"/>
Minor	<input checked="" type="checkbox"/>
Critical	<input checked="" type="checkbox"/>

Network Analysis ▼

Link Analysis

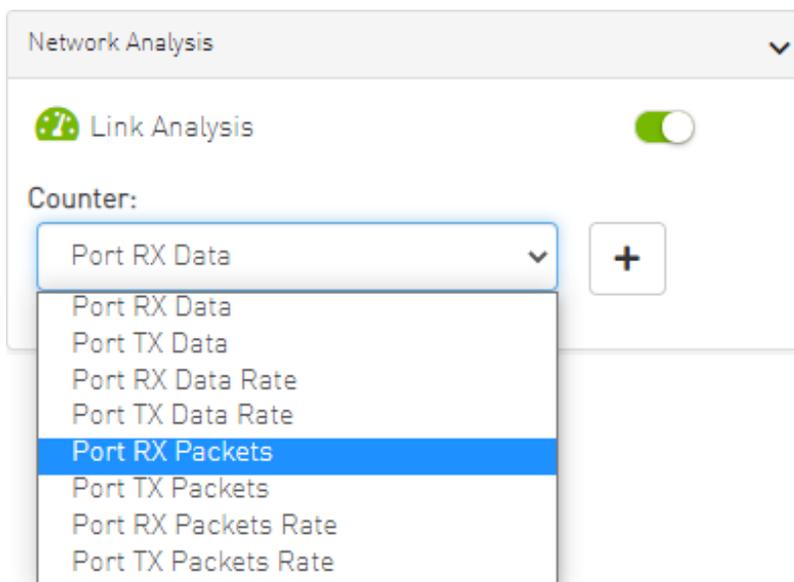
Counter:

Port RX Data ▼

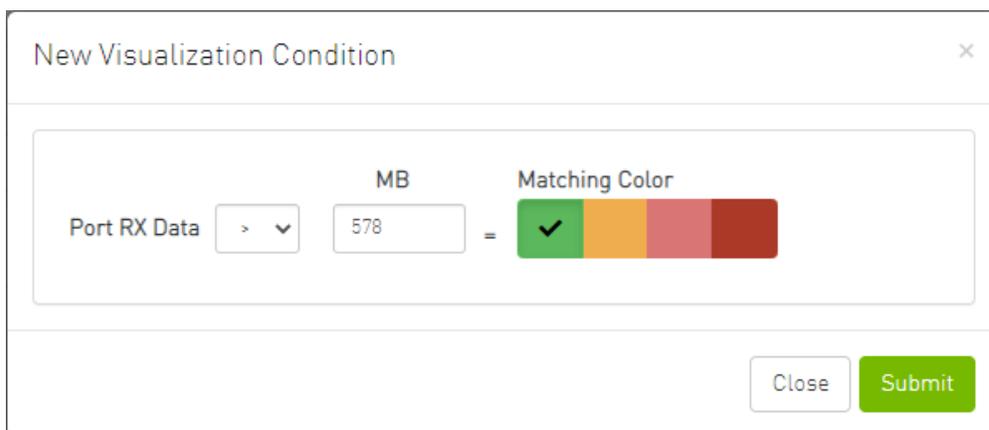
+

To define a condition:

1. Select the desired counter, and click the + button.



2. Select the appropriate operator, and define the desired threshold and color on the form that pops up. This color is applied on the link if the link monitoring value matches the respective condition.



Note

The colors are sorted from the lowest to the highest priority (i.e. from left to right, green to red).

Note

The counter's conditions are sorted based on the threshold values:

- Ascending if the operator is greater than (>)
- Descending if the operator is smaller than (<)

Last matched condition's color are taken into consideration in the link coloring.

3. Once the condition is set, the network map lights up the links that meet your condition.

The screenshot displays a network monitoring interface. On the left, a network map shows a central switch (n-ufm-sw12) connected to several other devices: n-dmz-ufm131, n-dmz-ufm137, n-dmz-ufm134, n-dmz-ufm128, and n-dmz-ufm-s49. The links are color-coded: orange for links with Port RX Data > 140 Gb and green for links with Port RX Data > 0 Gb. The right panel, titled 'Properties', shows various settings for the selected link analysis. The 'Display Label' is set to 'System Name'. The 'Type' section includes checkboxes for Rack, Host, Gateway, Switch, and Router, all of which are checked. The 'Severity' section includes checkboxes for Info, Warning, Minor, and Critical, all of which are checked. The 'Network Analysis' section includes a checkbox for 'Link Analysis', which is checked. The 'Counter' section shows 'Port RX Data' selected, with a '+' button. Below this, two conditions are listed: 'Port RX Data > 0 Gb' (green) and 'Port RX Data > 140 Gb' (orange). The 'Network Compare' section is also visible at the bottom.

Note

Note how the added conditions are listed in the Network Analysis section, if Link Analysis is enabled, and they are colored accordingly.

Link 1

Link/Port Properties ▼		
Property	Source	Destination
System GUID	0x248a0703 00ef19a0	0x7cfe900300 292356
Port	23	HCA-1/1
MTU	4096	4096
Width	4X	4X
Speed	FDR	FDR
Port RX Data	20379.9 Gb	5.9 Gb
Port TX Data	18.05 Gb	98.75 Gb
Port RX Data Rate	0 Gb/s	0 Gb/s
Port TX Data Rate	0 Gb/s	0 Gb/s
Port RX Packets	2533520412 5 Packets	45788053 Packets
Port TX Packets	1172677890 Packets	44948657 Packets
Port RX Packets Rate	2.9 Packets/s	2.9 Packets/s
Port TX Packets Rate	2.9 Packets/s	2.9 Packets/s

Source Cable Info	
Property	Value
Part Number	MC2207130-00A
Length	1 m
Serial Number	MT1618VS05669
Identifier	QSFP+
Technology	Copper cable- unequalized
Revision	A3

Destination Cable Info	
Property	Value
Part Number	MC2207130-00A
Length	1 m
Serial Number	MT1618VS05669
Identifier	QSFP+
Technology	Copper cable- unequalized
Revision	A3

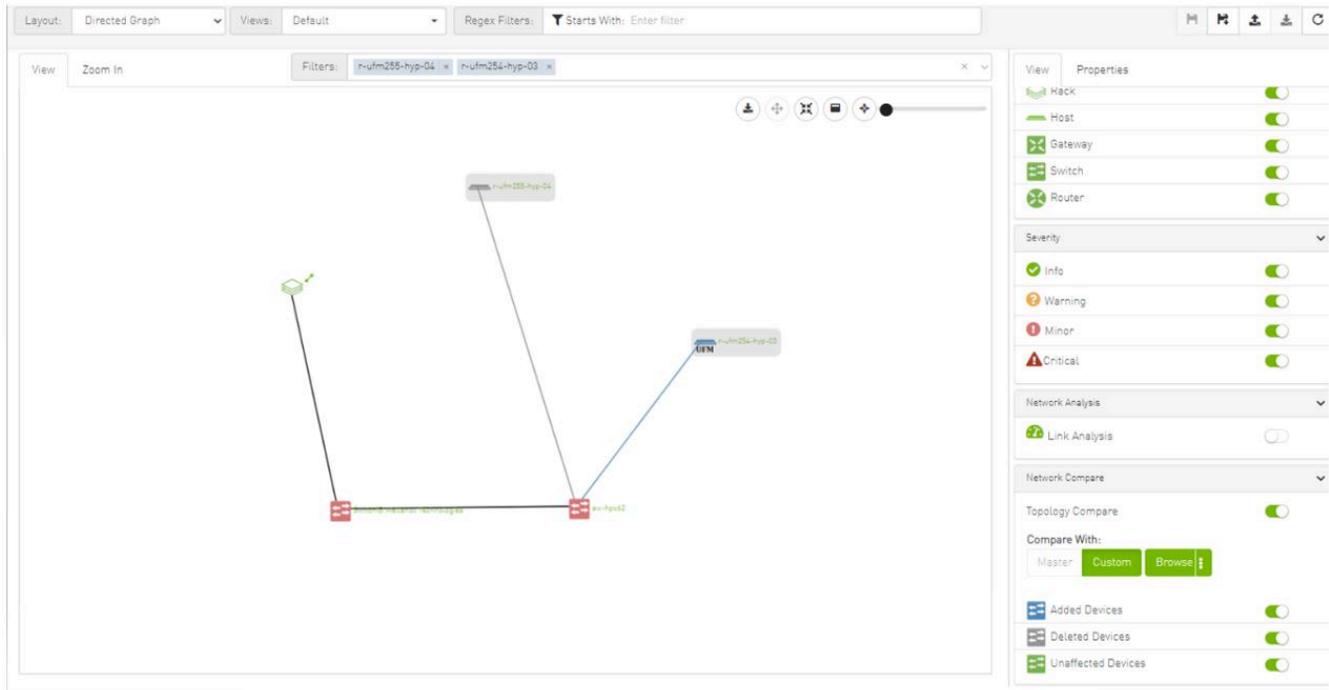
(i) Note

Notice how the monitored counter is presented in boldface, and the background color is presented with the worst matched condition.

Please note that if the current layout and view are saved, the defined conditions are saved inside the view being saved.

Topology Compare

It is possible to enable the [Topology Compare](#) feature from the View tab in the right-hand pane. When the radio button is enabled, it is possible to compare the current topology with the master topology or with a custom topology whose `.topo` file you may upload.



Topology compare key:

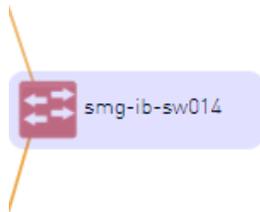
- A blue node signifies an added node
- A gray host signifies a deleted node
- A gray and black line signifies that some links were deleted and others were unchanged
- A gray and blue line signifies that some links were deleted, and others were added
- A gray, blue, and black line signifies that some links were deleted, some were added, and some were unchanged
- A blue and black line signifies that some links were added, and some were unchanged

Properties Tab

- Provides details on a specific system selected from the map, as shown in the following example:



2



View Properties

System Properties

Property	Value
Name	smg-ib-sw014
IP	0.0.0.0
GUID	0xe41d2d030004cf20
Type	switch
Vendor	Mellanox
Severity	Minor
State	Active
FW Version	11.2008.1604
PSID	MT_1870110032
Total Alarms	1
Temperature	N/A
Description	MSB7700
SW Version	N/A

System Ports

Severity	Port #
Minor	1
Info	35

- Provides link/port properties and cable info on a specific link selected from the map, including destination and source ports, as shown in the following example:

View Properties

Link 1

Collect System Dump

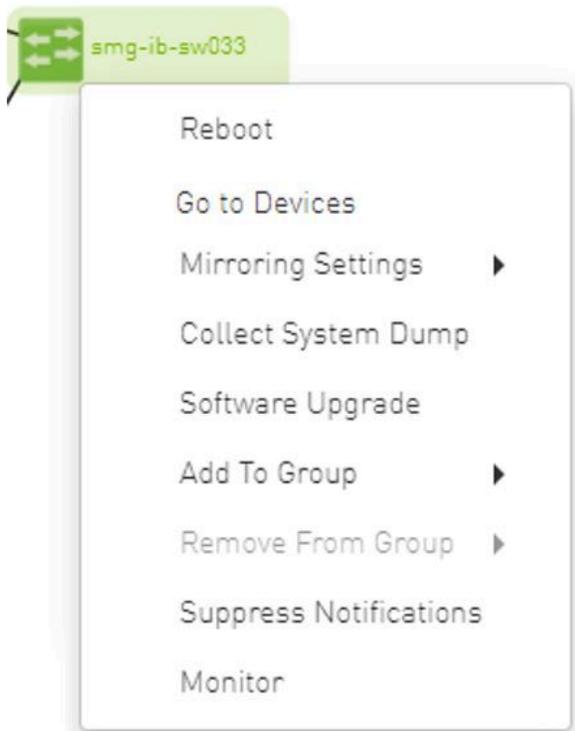
Link/Port Properties		
Property	Source	Destination
System GUID	0x0008f105002020fb	0x248a070300f88fe0
Port	18	1
MTU	4096	4096
Width	4X	4X
Speed	EDR	EDR
Port RX Data	614 MB	164 MB
Port TX Data	164 MB	614 MB
Port RX Data Rate	0 MB/s	0 MB/s
Port TX Data Rate	0 MB/s	0 MB/s
Port RX Packets	1662888 Packets	597647 Packets
Port TX Packets	597646 Packets	1662723 Packets
Port RX Packets Rate	0.45 Packets/s	0.25 Packets/s
Port TX Packets Rate	0.25 Packets/s	0.45 Packets/s

Cable Info	
Property	Value
Part Number	MCP1600-E00A
Length	1 m
Serial Number	MT1714VS00778
Identifier	QSFP+
Technology	Copper cable- unequalized
Revision	A2

Network Map Elements Actions

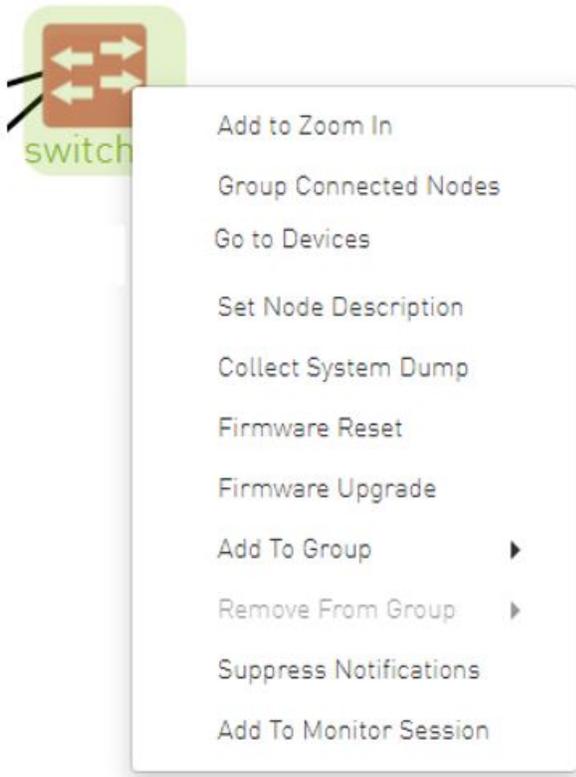
In the Network Map, a right-click on any of the elements enables performing a set of actions depending on the element type and its capabilities. See the list of available actions for each element type in the tables below.

Supported Actions for Internally Managed Switches



Element Type	Supported Actions	Description
Managed Switch	Reboot	Reboot the switch software
	Mirroring Settings	Set the mirroring configuration for the switch
	Collect System Dump	Collect system dump from the device
	Software Upgrade	Perform switch software upgrade
	Add to Group	Add switch to logical group
	Remove from Group	Remove switch from logical group
	Suppress Notification	Suppress all event notifications for the switch
	Monitor	Configure and activate switch monitoring
	Go to Devices	Go to devices page and select the device

Supported Actions for Externally Managed Switches



Element Type	Supported Actions	Description
Externally Managed Switch	Set Node Description	Sets description for specific node
	Firmware Reset	Perform switch firmware reset
	Firmware Upgrade	Perform switch firmware upgrade
	Add to Group	Add switch to logical group
	Remove from Group	Remove switch from logical group
	Suppress Notification	Suppress all event notifications for the switch
	Monitor	Configure and activate switch monitoring
	Go To Devices	Go to devices page and select the device

Supported Actions for Hosts



Element Type	Supported Actions	Description
Hosts	Firmware Upgrade	Perform switch firmware upgrade

Element Type	Supported Actions	Description
		ra de
	Add to Group	A d d h o s t t o l o g i c a l g r o u p
	Remove from Group	R e m o v e h o s t f r o m

Element Type	Supported Actions	Description
		logical group
	Suppress Notification	Suppress all event notifications

Element Type	Supported Actions	Description
		OrthoHost
	Monitor	Configure and activate host monitor

Element Type	Supported Actions	D e s c r i p t i o n
		o r i n g

Managed Elements

The UFM **Managed Elements** window allows you to obtain information on the fabric physical elements, such as devices, ports and cables.

Note

All information provided in a tabular format in UFM web UI can be exported into a CSV file.

- [Devices Window](#)
- [Ports Window](#)
- [Virtual Ports Window](#)
- [Unhealthy Ports Window](#)
- [Cables Window](#)
- [Groups Window](#)
- [Inventory Window](#)

- [PKeys Window](#)
- [HCAs Window](#)

Devices Window

The Devices window shows data pertaining to the physical devices in a tabular format.

The screenshot shows the 'Devices' window with a header bar containing a monitor icon, an envelope icon, a 'Local Time' dropdown, and a 'Last Update: 20 Oct 2022 16:54' timestamp. Below the header is a search bar and a table of devices. The table has columns for Severity, Name, GUID, Type, Model, IP, and Firmware Version. The first two rows show 'Minor' severity for switches, while the remaining five rows show 'Info' severity for hosts. At the bottom right, there is a pagination control showing 'Viewing 1-7 of 7'.

Severity	Name	GUID	Type	Model	IP	Firmware Version
Minor	r-dmz-ufm-sw49	0x0002c903007b78b0	switch	SX6036	fcfc:fcfc:209:36:202:c...	9.4.5110
Minor	r-ufm-sw95	0xb8599f0300fc6de4	switch	MQM8700	fcfc:fcfc:209:36:ba59...	27.2022.612
Info	r-dmz-ufm134	0x1070fd03000b22f8	host		192.168.1.153	22.34.282
Info	r-dcs96	0x1070fd030071aa4e	host		0.0.0.0	20.31.1014
Info	r-dmz-ufm131	0x1070fd03000b22c4	host		0.0.0.0	22.34.282
Info	r-dmz-ufm137	0x1070fd03000b22cc	host		0.0.0.0	22.32.1062
Info	r-dmz-ufm128	0xe41d2d03005cf34c	host		0.0.0.0	12.22.252

Devices Window Data

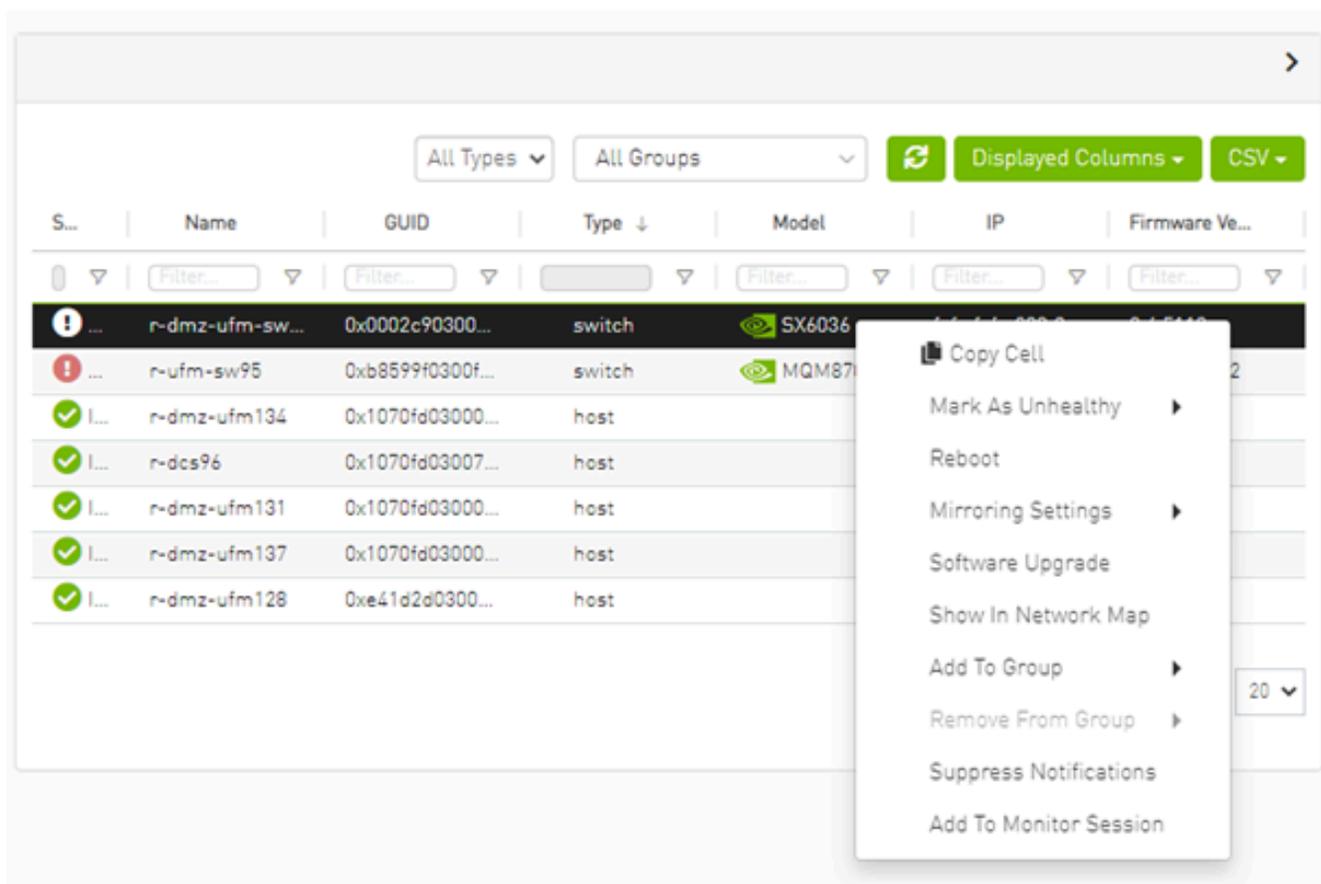
Data Type	Description
Health	Health of the device reflecting the highest alarm severity. Please refer to the Health States table.
Name	Name of the device <div style="background-color: #ffffcc; padding: 10px;"> <p>Note</p> <p>If UFM Agent is running on a device, the following icon will appear next to the device name: images/download/thumbna</p> </div>

Data Type	Description
	ils/3620309524/image2019-6-20_12-15-36-version-1-modificationdate-1739720982767-api-v2.png
GUID	System GUID of the device
Type	Type of the device: switch, node, IB router, and getaway
IP	IP address of the device
Vendor	The vendor of the device
Firmware Version	The firmware version installed on the device

Health States

Icon	Name	Description
	Normal	Information/notification displayed during normal operating state or a normal system event.
	Critical	Critical means that the operation of the system or a system component fails.
	Minor	Minor reflects a problem in the fabric with no failure.
	Warning	Warning reflects a low priority problem in the fabric with no failure. A warning is asserted when an event exceeds a predefined threshold.

A right-click on the device name displays a list of actions that can be performed on it.



Devices Actions

Action	Description
Firmware Upgrade	Perform a firmware upgrade on the selected device
Firmware Reset	Reboot the device. This action is only applicable to unmanaged hosts (servers).
Set Node Description	Configure a description to this node
Collect System Dump	Collect the system dump log for a specific device
Add to Group	Add the selected device to a devices group
Remove from Group	Remove the selected device from a devices group
Suppress Notifications	Suppress all event notifications for the device
Add to Monitor Session	Configure and activate host monitoring

Action	Description
Show in Network Map	Move to Zoom In tab in network map and add the selected device to filter list

 **Note**

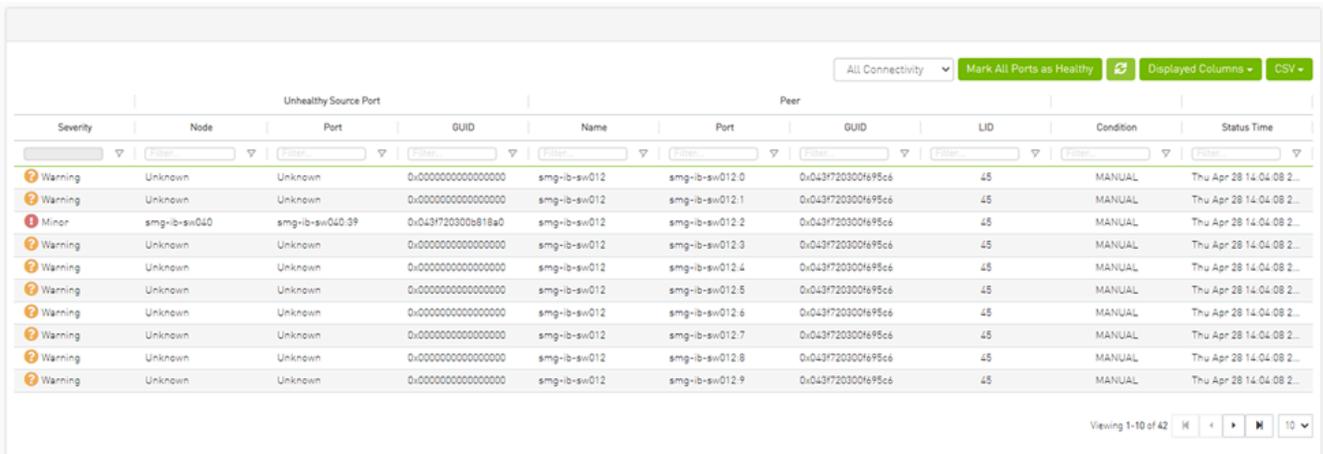
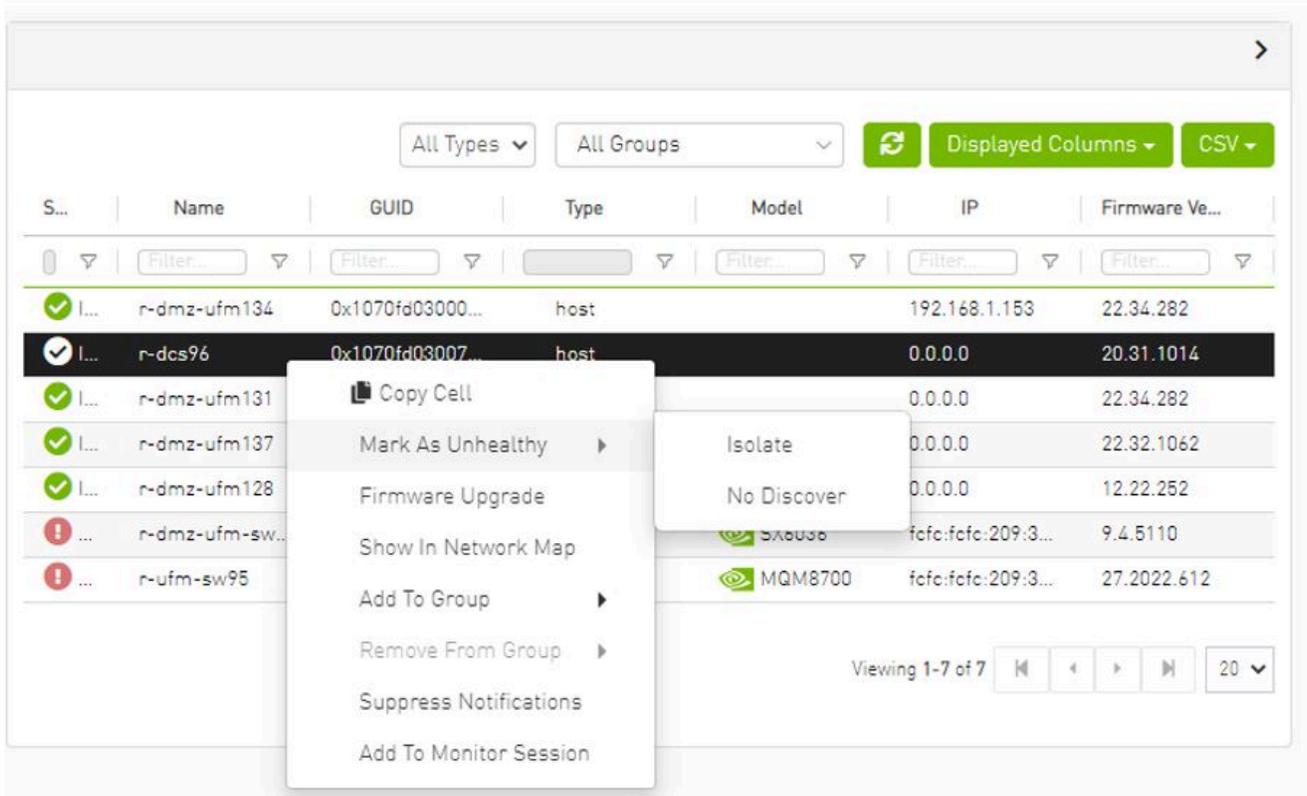
Collecting system dump for hosts, managed by UFM, is available only for hosts which are set with a valid IPv4 address and installed with MLNX_OFED.

Mark Device as Unhealthy

From the Devices table, it is possible to mark devices as healthy or unhealthy using the context menu (right-click).

There are two options for marking a device as unhealthy:

- Isolate
- No Discover



Server: `conf/opensm/opensm-health-policy.conf` content:

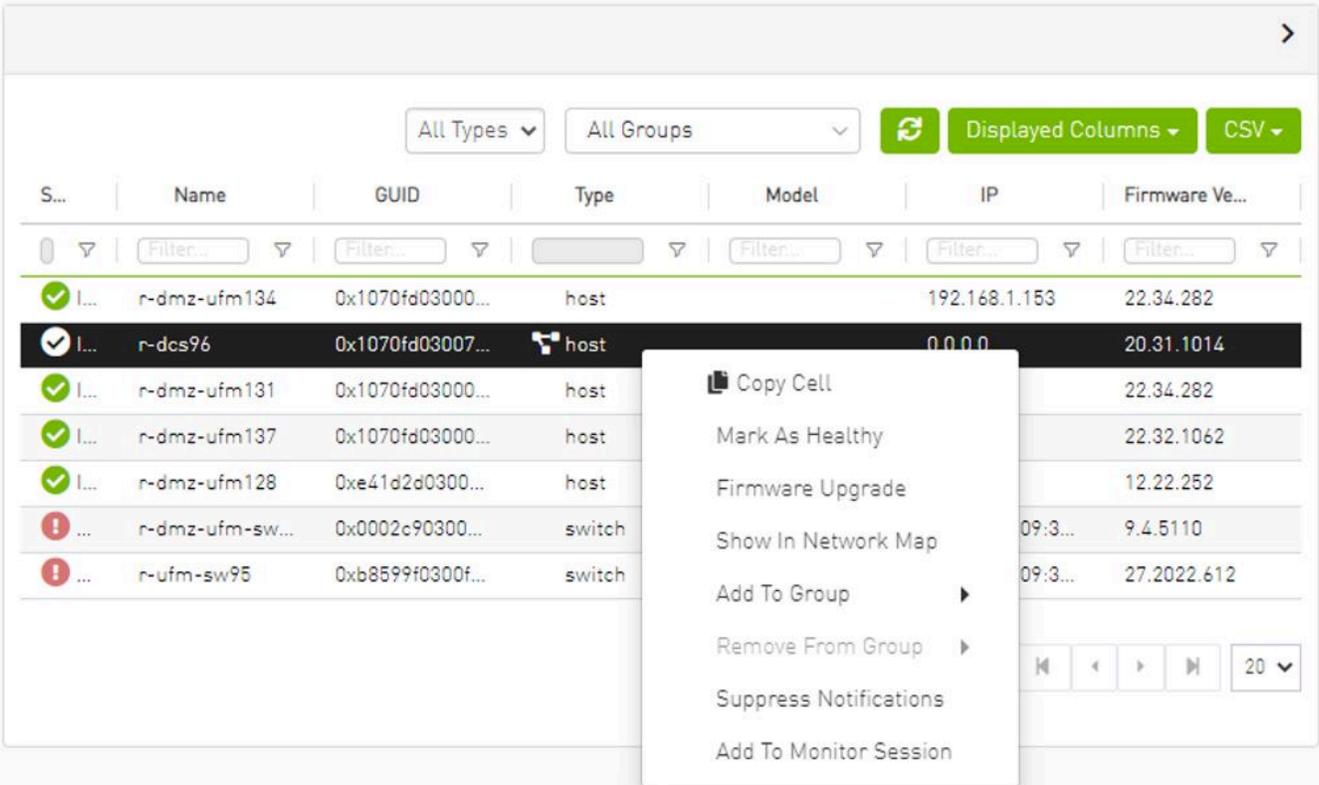
```
0xe41d2d030003e3b0 34 UNHEALTHY isolate
0xe41d2d030003e3b0 19 UNHEALTHY isolate
0xe41d2d030003e3b0 3 UNHEALTHY isolate
0xe41d2d030003e3b0 26 UNHEALTHY isolate
0xe41d2d030003e3b0 0 UNHEALTHY isolate
0xe41d2d030003e3b0 27 UNHEALTHY isolate
```

```
0xe41d2d030003e3b0 7 UNHEALTHY isolate
0xe41d2d030003e3b0 10 UNHEALTHY isolate
0xe41d2d030003e3b0 11 UNHEALTHY isolate
0xe41d2d030003e3b0 22 UNHEALTHY isolate
0xe41d2d030003e3b0 18 UNHEALTHY isolate
0xe41d2d030003e3b0 29 UNHEALTHY isolate
0xe41d2d030003e3b0 8 UNHEALTHY isolate
0xe41d2d030003e3b0 5 UNHEALTHY isolate
0xe41d2d030003e3b0 17 UNHEALTHY isolate
0xe41d2d030003e3b0 23 UNHEALTHY isolate
0xe41d2d030003e3b0 15 UNHEALTHY isolate
0xe41d2d030003e3b0 24 UNHEALTHY isolate
0xe41d2d030003e3b0 2 UNHEALTHY isolate
0xe41d2d030003e3b0 16 UNHEALTHY isolate
0xe41d2d030003e3b0 13 UNHEALTHY isolate
0xe41d2d030003e3b0 14 UNHEALTHY isolate
0xe41d2d030003e3b0 32 UNHEALTHY isolate
0xe41d2d030003e3b0 33 UNHEALTHY isolate
0xe41d2d030003e3b0 35 UNHEALTHY isolate
0xe41d2d030003e3b0 20 UNHEALTHY isolate
0xe41d2d030003e3b0 21 UNHEALTHY isolate
0xe41d2d030003e3b0 28 UNHEALTHY isolate
0xe41d2d030003e3b0 1 UNHEALTHY isolate
0xe41d2d030003e3b0 9 UNHEALTHY isolate
0xe41d2d030003e3b0 4 UNHEALTHY isolate
0xe41d2d030003e3b0 31 UNHEALTHY isolate
0xe41d2d030003e3b0 30 UNHEALTHY isolate
0xe41d2d030003e3b0 36 UNHEALTHY isolate
0xe41d2d030003e3b0 12 UNHEALTHY isolate
0xe41d2d030003e3b0 25 UNHEALTHY isolate
0xe41d2d030003e3b0 6 UNHEALTHY isolate
```

/opt/ufm/files/log/opensm-unhealthy-ports.dump content:



Mark Device as Healthy



The screenshot shows a table of network devices with columns for Name, GUID, Type, Model, IP, and Firmware Version. The device 'r-dcs96' is highlighted, and a context menu is open over it, showing options like 'Copy Cell', 'Mark As Healthy', 'Firmware Upgrade', 'Show In Network Map', 'Add To Group', 'Remove From Group', 'Suppress Notifications', and 'Add To Monitor Session'.

S...	Name	GUID	Type	Model	IP	Firmware Ve...
✓ I...	r-dmz-ufm134	0x1070fd03000...	host		192.168.1.153	22.34.282
✓ I...	r-dcs96	0x1070fd03007...	host		0.0.0	20.31.1014
✓ I...	r-dmz-ufm131	0x1070fd03000...	host			22.34.282
✓ I...	r-dmz-ufm137	0x1070fd03000...	host			22.32.1062
✓ I...	r-dmz-ufm128	0xe41d2d03000...	host			12.22.252
! ...	r-dmz-ufm-sw...	0x0002c90300...	switch		09:3...	9.4.5110
! ...	r-ufm-sw95	0xb8599f0300f...	switch		09:3...	27.2022.612

Server `/opt/ufm/files/conf/opensm/opensm-health-policy.conf` content:

```
0xe41d2d030003e3b0 15 HEALTHY
0xe41d2d030003e3b0 25 HEALTHY
0xe41d2d030003e3b0 35 HEALTHY
0xe41d2d030003e3b0 0 HEALTHY
0xe41d2d030003e3b0 11 HEALTHY
0xe41d2d030003e3b0 21 HEALTHY
0xe41d2d030003e3b0 28 HEALTHY
0xe41d2d030003e3b0 7 HEALTHY
0xe41d2d030003e3b0 17 HEALTHY
0xe41d2d030003e3b0 14 HEALTHY
0xe41d2d030003e3b0 24 HEALTHY
0xe41d2d030003e3b0 34 HEALTHY
0xe41d2d030003e3b0 3 HEALTHY
0xe41d2d030003e3b0 10 HEALTHY
```

```
0xe41d2d030003e3b0 20 HEALTHY
0xe41d2d030003e3b0 31 HEALTHY
0xe41d2d030003e3b0 6 HEALTHY
0xe41d2d030003e3b0 16 HEALTHY
0xe41d2d030003e3b0 27 HEALTHY
0xe41d2d030003e3b0 2 HEALTHY
0xe41d2d030003e3b0 13 HEALTHY
0xe41d2d030003e3b0 23 HEALTHY
0xe41d2d030003e3b0 33 HEALTHY
0xe41d2d030003e3b0 30 HEALTHY
0xe41d2d030003e3b0 9 HEALTHY
0xe41d2d030003e3b0 19 HEALTHY
0xe41d2d030003e3b0 26 HEALTHY
0xe41d2d030003e3b0 36 HEALTHY
0xe41d2d030003e3b0 5 HEALTHY
0xe41d2d030003e3b0 12 HEALTHY
0xe41d2d030003e3b0 22 HEALTHY
0xe41d2d030003e3b0 32 HEALTHY
0xe41d2d030003e3b0 1 HEALTHY
0xe41d2d030003e3b0 8 HEALTHY
0xe41d2d030003e3b0 18 HEALTHY
0xe41d2d030003e3b0 29 HEALTHY
0xe41d2d030003e3b0 4 HEALTHY
```

`/opt/ufm/files/log/opensm-unhealthy-ports.dump` content:

```
# NodeGUID, PortNum, NodeDesc, PeerNodeGUID, PeerPortNum,
PeerNodeDesc, {BadCond1, BadCond2, ...}, timestamp
```

Upgrading Software and Firmware for Hosts and Externally Managed Switches

Software/Firmware Upgrade via FTP

Software and firmware upgrade over FTP is enabled by the UFM Agent. UFM invokes the Software/Firmware Upgrade procedure locally on switches or on hosts. The procedure copies the new software/firmware file from the defined storage location and performs the operation on the device. UFM sends the set of attributes required for performing the software/firmware upgrade to the agent.

The attributes are:

- File Transfer Protocol – default FTP
 - The Software/Firmware upgrade on InfiniScale III ASIC-based switches supports FTP protocol for transmitting files to the local machine.
 - The Software/Firmware upgrade on InfiniScale IV-based switches and hosts supports TFTP and protocols for transmitting files to the local machine.
- IP address of file-storage server
- Path to the software/firmware image location

The software/firmware image files should be placed according to the required structure under the defined image storage location. Please refer to section [Devices Window](#).

- File-storage server access credentials (User/Password)

In-Band Firmware Upgrade

You can perform in-band firmware upgrades for externally managed switches and HCAs. This upgrade procedure does not require the UFM Agent or IP connectivity, but it does require current PSID recognition. Please refer to section [PSID and Firmware Version In-Band Discovery](#). This feature requires that the Mellanox Firmware Toolkit (MFT), which is included in the UFM package, is installed on the UFM server. UFM uses flint from the MFT for in-band firmware burning.

Before upgrading, you must create the firmware repository on the UFM server under the directory `/opt/ufm/files/userdata/fw/`. The subdirectory should be created for each PSID and one firmware image should be placed under it. For example:

```
/opt/ufm/files/userdata/fw/
```

```

        MT_0D80110009
        fw-ConnectX2-rel-2_9_1000-MHQH29B-
XTR_A1.bin
        MT_0F90110002
        fw-IS4-rel-7_4_2040-MIS5023Q_A1-A5.bin

```

Directory Structure for Software or Firmware Upgrade Over FTP

Before performing a software or firmware upgrade, you must create the following directory structure for the upgrade image. The path to the `<ftp user home>/<path>/` directory should be specified in the upgrade dialog box.

```

<ftp user home>/<path>/
    InfiniScale3 - For anafa based switches
Software/Firmware upgrade images
    voltaire_fw_images.tar - firmware image
file
    ibswmpr-<s/w version>.tar - software
image file
    InfiniScale4 - For InfiniScale IV based switches
Software/Firmware upgrade images
    firmware_2036_4036.tar - Firmware image
file
    upgrade_2036_4036.tgz - Software image
file
    OFED /* For host SW upgrade*/
    OFED-<OS label>.tar.bz2
    <PSID>* - For host FW upgrade
    fw_update.img

```

The `<PSID>` value is extracted from the `mstflint` command:

```
mstflint -d <device> q
```

The device is extracted from the `lspci` command. For example:

```
# lspci
06:00.0 InfiniBand: Mellanox Technologies MT25208 InfiniHost III
Ex
# mstflint -d 06:00.0 q | grep PSID
PSID: VLT0040010001
```

PSID and Firmware Version In-Band Discovery

The device PSID and device firmware version are required for in-band firmware upgrade and for the correct functioning of Subnet Manager plugins, such as Congestion Control Manager and Lossy Configuration Management. For most devices, UFM discovers this information and displays it in the Device Properties pane. The PSID and the firmware version are discovered by the Vendor-specific MAD.

By default, the `gv.cfg` file value for `event_plugin_option` is set to (null). This means that the plugin is disabled and `opensm` does not send MADs to discover devices' PSID and FW version. Therefore, values for devices' PSID and FW version are taken from `ibdiagnet` output (section `NODES_INFO`).

The below is an example of the default value:

```
event_plugin_options = (null)
```

To enable the vendor-specific discovery by `opensm`, in the `gv.cfg` configuration file, change the value of `event_plugin_option` to `(--vendinfo -m 1)`, as shown below:

```
event_plugin_options = --vendinfo -m 1
```

If the value is set to `--vendinfo -m 1`, the data should be supplied by opensm, and in this case the `ibdiagnet` output is ignored.

Note

In some firmware versions, the information above is currently not available.

Switch Management IP Address Discovery

From NVIDIA switch FM version 27.2010.3942 and up, NVIDIA switches support switch management IP address discovery using MADs. This information can be retrieved as part of `ibdiagnet` run (`ibdiagnet` output), and assigned to discover switches in UFM.

There is an option to choose the IP address of which IP protocol version that is assigned to the switch: IPv4 or IPv6.

The `discovered_switch_ip_protocol` key, located in the `gv.cfg` file in section `[FabricAnalysis]`, is set to 4 by default. This means that the IP address of type IPv4 is assigned to the switch as its management IP address. In case this value is set to 6, the IP address of type IPv6 is assigned to the switch as its management IP address.

After changing the `discover_switch_ip_protocol` value in `gv.cfg`, the UFM Main Model needs to be restarted for the update to take effect. The discovered IP addresses for switches are not persistent in UFM – every UFM Main Model restarts the values of management IP address which is assigned from the `ibdiagnet` output.

Upgrading Server Software

The ability to update the server software is applicable only for hosts (servers) with the UFM Agent.

To upgrade the software:

1. Select a device.
2. From the right-click menu, select Software Update.
3. Enter the parameters listed in the following table.

Parameter	Description
Protocol	Update is performed via FTP protocol
IP	Enter the host IP
Path	Enter the parent directory of the FTP directory structure for the Upgrade image. The path should not be an absolute path and should not contain the first slash (/) or trailer slash.
User	Name of the host username
Password	Enter the host password

4. Click Submit to save your changes.

Upgrading Firmware

You can upgrade firmware over FTP for hosts and switches that are running the UFM Agent, or you can perform an in-band upgrade for externally managed switches and HCAs.

Before you begin the upgrade ensure that the new firmware version is in the correct location. For more information, please refer to section [In-Band Firmware Upgrade](#).

To upgrade the firmware:

1. Select a host or server.
2. From the right-click menu, select Firmware Upgrade.

3. Select protocol In Band.

4. For upgrade over FTP, enter the parameters listed in the following table.

Parameter	Description
IP	Enter device IP
Path	Enter the parent directory of the FTP directory structure for the Upgrade image. The path should not be an absolute path and should not contain the first slash (/) or trailer slash.
Username	Name of the host username
Password	Enter the host password

5. Click submit to save your changes.

 **Note**

The firmware upgrade takes effect only after the host or externally managed switch is restarted.

Upgrade Cables Transceivers Firmware Version

The main purpose of this feature is to add support for burning of multiple cables transceiver types on multiple devices using linkx tool which is part of flint. This needs to be done from both ends of the cable (switch and HCA/switch).

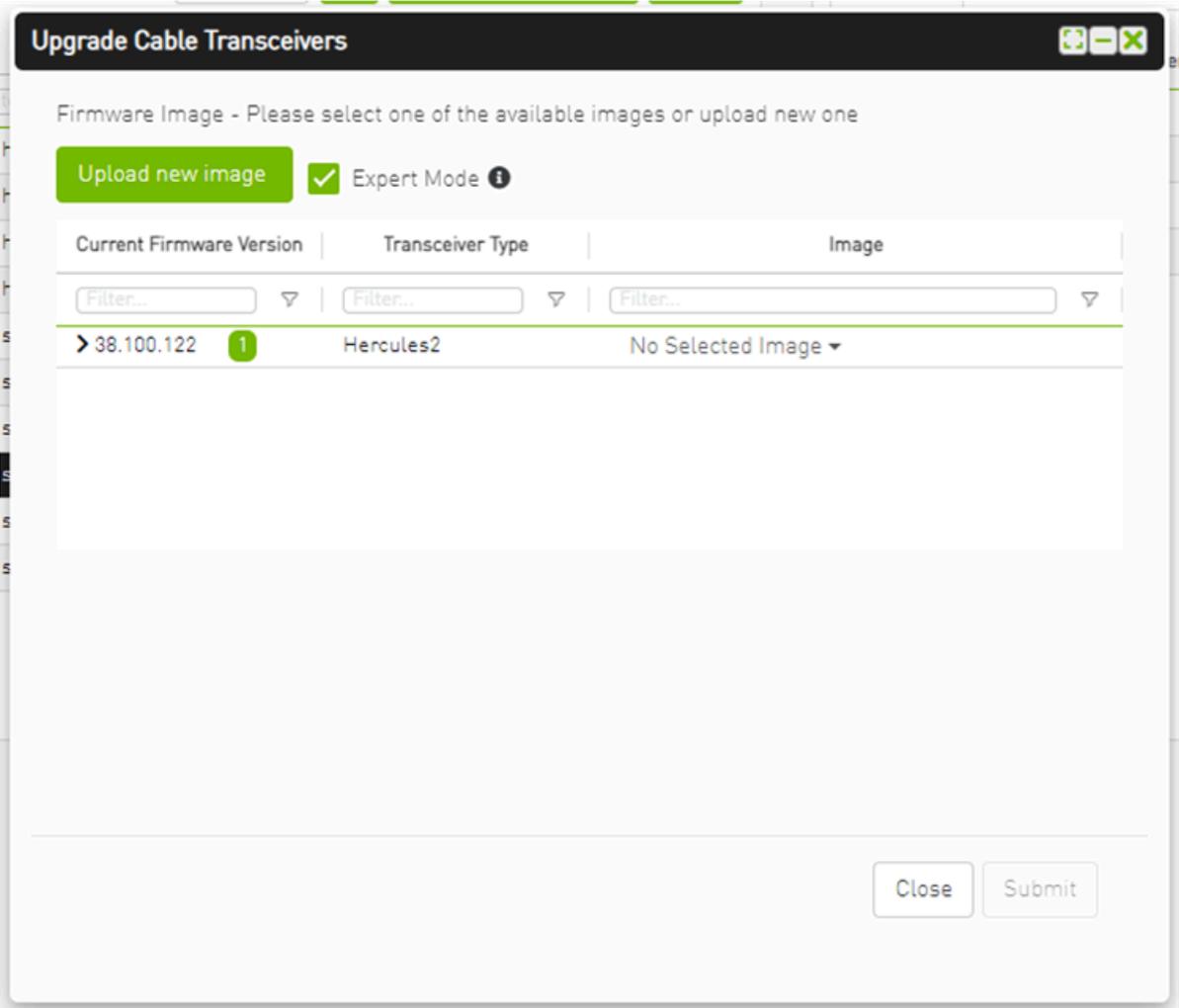
To upgrade cables transceivers FW version:

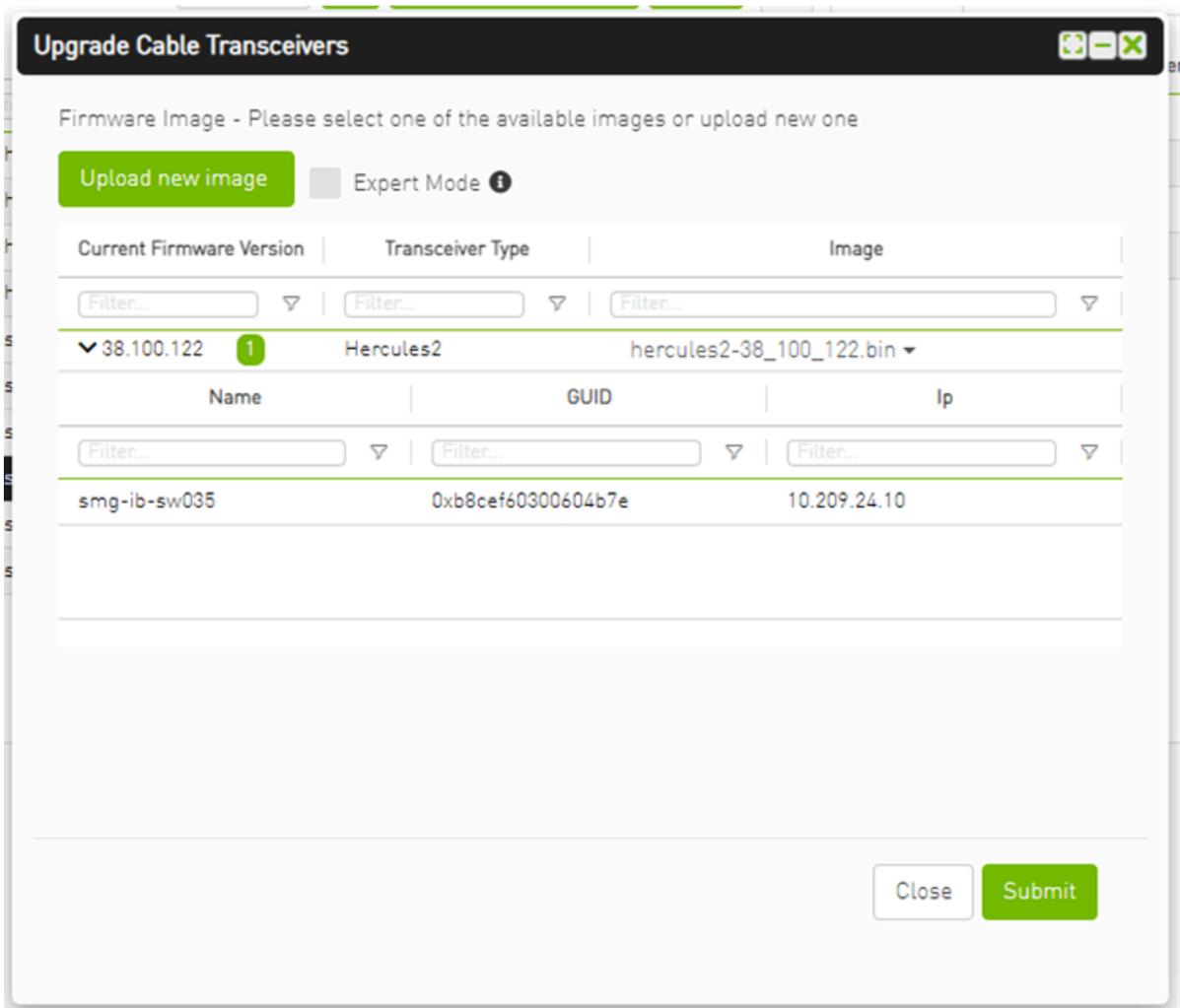
1. Navigate to managed elements page
2. select the target switches and click on Upgrade Cable Transceivers option

The screenshot shows a network management interface with a table of devices. The table has columns for Name, GUID, Type, Model, IP, and Firmware Version. A context menu is open over a switch device row, showing options like 'Copy Cell', 'Show In Network Map', 'Reboot', 'Collect System Dump', 'Mark As Unhealthy', 'Upgrade Cable Transceivers', 'Software Upgrade', 'Add To Group', 'Remove From Group', 'Suppress Notifications', and 'Add To Monitor Session'.

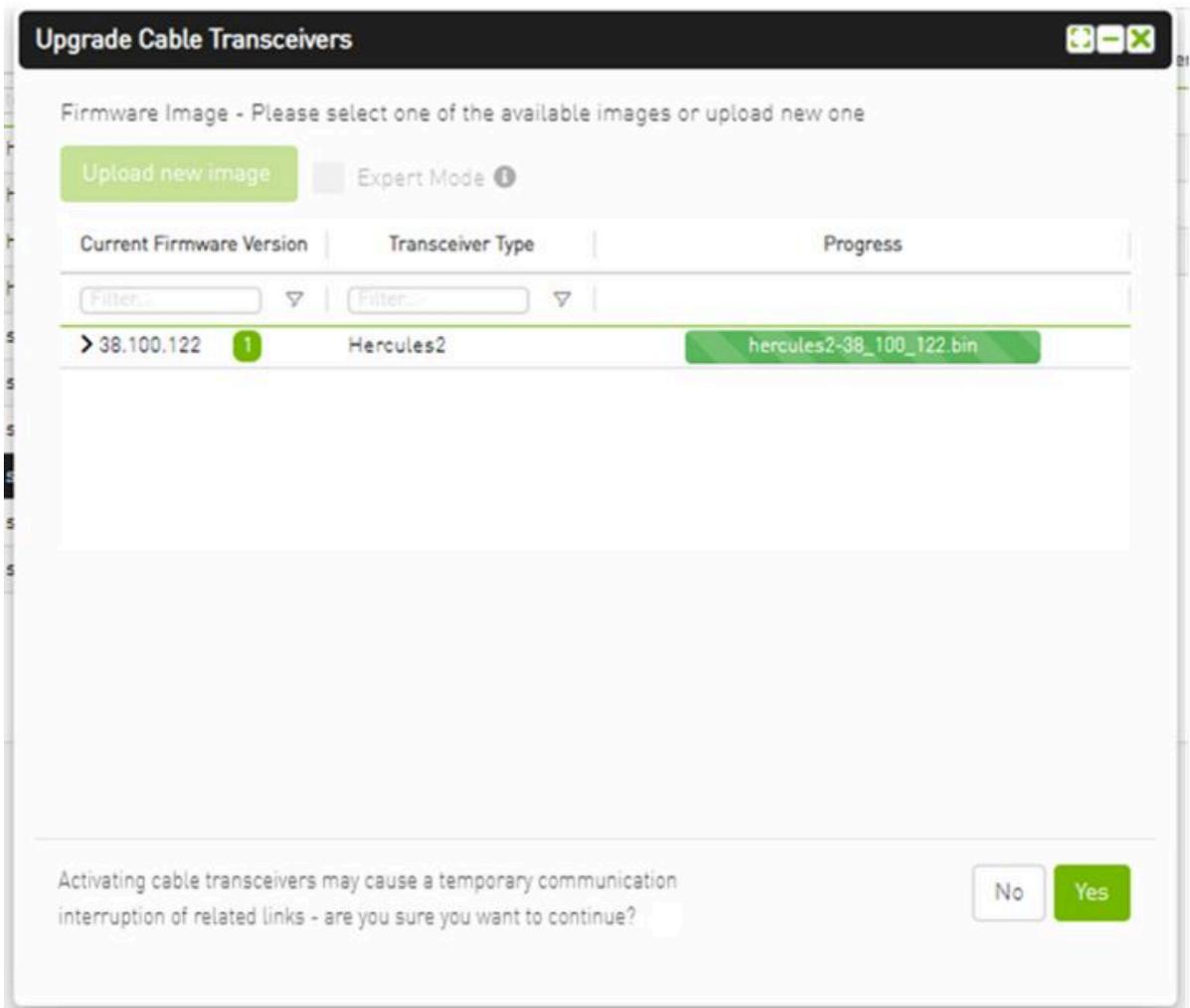
S...	Name	GUID	Type	Model	IP	Firmware Ve...
✓ I...	smg-ib-sim001	0xb8599f0300c...	host		0.0.0.0	18.32.524
✓ I...	smg-ib-svr031	0x98039b0300...	host		0.0.0.0	20.31.2006
✓ I...	smg-ib-apl022...	0x98039b0300...	host		0.0.0.0	20.32.1010
? ...	smg-ib-svr032	0x1070fd03007...	host		0.0.0.0	28.33.810
! ...	smg-ib-sw...	0x98039b0300...	switch	MQM8700	10.209.24.136	27.2000.2046
! ...	smg-ib-clg...			CS7520	10.209.27.99	mismatched
? ...	smg-ib-sw...			MQM9700	10.209.24.121	31.2010.2036
! ...	smg-ib-sw...			MQM8700	10.209.24.10	27.2010.2010
! ...	smg-ib-sw...			MQM8700	10.209.24.57	27.2010.1202
! ...	smg-ib-sw...			MSB7700	10.209.27.36	11.2008.3328

3. A model will be shown containing list of the active firmware versions for the cables of the selected switches, besides the version number, a badge will show the number of matched switches:





- After the user clicks Submit, the GUI will start sending the selected binaries with the relevant switches sequentially, and a model with a progress bar will be shown (this model can be minimized):



5. After the whole action is completed successfully, you will be able to see the following message at the model bottom The upgrade cable transceivers completed successfully, do you want to activate it? by clicking the yes button it will run a new action on all the burned devices to activate the new uploaded binary image.
6. Another option to activate burned cables transceivers you can go to the Groups page and right click on the predefined Group named **Devices Pending FW Transceivers Reset** or you can right click on the upgraded device from managed element page and select Activate cable Transceivers action.

The screenshot shows a web-based interface for managing network devices. At the top, there are filters for 'All Types' and 'All Groups', along with buttons for 'Refresh', 'Displayed Columns', and 'CSV'. Below this is a table with columns: S..., Name, GUID, Type, Model, IP, and Firmware Ve... Each column has a 'Filter' dropdown. The table contains several rows of device information. A context menu is open over the row with Name 'smg-ib-sw...', GUID '0x98039b0300...', Type 'switch', Model 'MQM8700', IP '10.209.24.136', and Firmware '27.2000.2046'. The menu options are: Copy Cell, Show In Network Map, Reboot, Collect System Dump, Mark As Unhealthy, Activate Cable Transceivers, Software Upgrade, Add To Group, Remove From Group, Suppress Notifications, and Add To Monitor Session. At the bottom right of the table, it says 'Viewing 1-10 of 24' with navigation buttons.

S...	Name	GUID	Type	Model	IP	Firmware Ve...
✓ I...	smg-ib-sim001	0xb8599f0300c...	host		0.0.0.0	18.32.524
✓ I...	smg-ib-svr031	0x98039b0300...	host		0.0.0.0	20.31.2006
✓ I...	smg-ib-apl022...	0x98039b0300...	host		0.0.0.0	20.32.1010
?	smg-ib-svr032	0x1070fd03007...	host		0.0.0.0	28.33.810
!	smg-ib-sw...	0x98039b0300...	switch	MQM8700	10.209.24.136	27.2000.2046
!	smg-ib-olg...			CS7520	10.209.27.99	mismatched
?	smg-ib-sw...			MQM9700	10.209.24.121	31.2010.2036
!	smg-ib-sw...			MQM8700	10.209.24.10	27.2010.2010
!	smg-ib-sw...			MQM8700	10.209.24.57	27.2010.1202
!	smg-ib-sw...			MSB7700	10.209.27.36	11.2008.3328

Device Information Tabs

Selecting a device from the Devices table reveals the **Device Information** table on the right side of the screen. This table provides information on the device's ports, cables, groups, events, alarms, , and device access.

The screenshot shows a management interface with a table of devices on the left and a detailed view for a selected device on the right.

Device Table:

S.	Name	GUID	Type	Model	IP	Firmware...
✓	r-dmz-ufm...	0x1070fd03...	host		192.168.1.153	22.34.282
✓	r-dcs96	0x1070fd03...	host		0.0.0.0	20.31.1014
✓	r-dmz-ufm...	0x1070fd03...	host		0.0.0.0	22.34.282
✓	r-dmz-ufm...	0x1070fd03...	host		0.0.0.0	22.32.1062
✓	r-dmz-ufm...	0xe41a2d03...	host		0.0.0.0	12.22.282
!	r-dmz-ufm...	0x0002c903...	switch	SX6036	fcfc:fcfc:209...	9.4.5110
!	r-ufm-sw95	0xb8599f03...	switch	MQM870I	fcfc:fcfc:209...	27.2022.612

Viewing 1-7 of 7

0xb8599f0300fc6de4 - Device Information

General | Ports | Cables | Groups | Alarms | Events | Inventory | Device Access

Property	Value
Name	r-ufm-sw95
Type	switch
IP	fcfc:fcfc:209:36:ba59:9fff:fe6:7db4
Model	MQM8700
Up Time	92d 0h 30m 50.368s

General Tab

Provides general information on the selected device.

The screenshot shows the 'General' tab for a selected device.

0x0c42a1030079a66c - Device Information

General | Ports | Cables | Groups | Alarms | Events | Inventory | Device Access

Property	Value
Name	sw-ufm-qm01
Type	switch
IP	10.209.224.32
Model	MQM8700
Up Time	1d 22h 8m 35.312s
Total Power Consumption	112.88 Watts
Temperature	38

Ports Tab

This tab provides a list of the ports connected to this device in a tabular format.

0x98039b0300a8b71e - Device Information

General Ports Cables Groups Alarms Events Inventory Device Access

Active Displayed Columns CSV

Source Port

Severity	State	System Name	Port Name	LID	Peer Node Name
Info	✓	smg-ib-sw032	3	5	smg-ib-sw036
Minor	✓	smg-ib-sw032	5	5	smg-ib-sw036
Info	✓	smg-ib-sw032	16	5	smg-ib-sw056

Viewing 1-3 of 3

Ports Data

Data Type	Description
Port Number	The number of ports on device.
Node	The node name/GUID/IP that the port belongs to. Note that you can choose the node label (name/GUID/IP) using the drop-down menu available above the Ports data table.
Health	Health of the port reflecting the highest alarm severity. Please refer to the Health States table.
State	Indicates whether the port is connected (active or inactive).
LID	The local identifier (LID) of the port.
MTU	Maximum Transmission Unit of the port.
Speed	Lists the highest value of active, enabled and supported speeds in icons indicating their

Data Type	Description
	status: <ul style="list-style-type: none"> • Dark green – active speed • Light green – enabled speed • Grey – supported yet disabled speed
Width 	Lists the highest value of active, enabled and supported widths in icons indicating their status: <ul style="list-style-type: none"> • Dark green – active width • Light green – enabled width • Grey – supported yet disabled width
Peer	The GUID of the device the port is connected to.
Peer Port	The name of the port that is connected to this port.

Cables Tab

This tab provides a list of the cables connected to this device in a tabular format.

0x248a070300ef19a0 - Device Information

General Ports **Cables** Groups Alarms Events Inventory

Device Access

Displayed Columns ▾ CSV ▾

Severity	Serial #	Identifier	GUID	Port
Info	MT1618VS05669	QSFP+	0x248a070300ef19a0	r-hyp-sw-01:1
Info	MT1544VS05091	QSFP+	0x248a070300ef19a0	r-hyp-sw-01:2
Minor	MT1233VS01161	QSFP+	0x248a070300ef19a0	r-hyp-sw-01:3

Viewing 1-3 of 3

Cables Data

Data Type	Description
Basic Information	
Health	Health of the cable reflecting the highest alarm severity. Please refer to the Health States table.
Serial Number	Serial number of the cable.
Identifier	Identifier of the cable.
Source Port Information	
Source GUID	GUID of the source port the cable is connected to.
Source Port	The number of the source port the cable is connected to.
Destination Port Information	
Destination GUID	GUID of the destination port the cable is connected to.

Data Type	Description
Destination Port	The number of the destination port the cable is connected to.
Advanced Information	
Revision	Revision of the cable.
Link Width	The maximum link width of the cable.
Part Number	Part number of the cable.
Technology	The transmitting medium of the cable: copper/optical/etc.
Length	The cable length in meters.

Groups Tab

This tab provides a list of the groups to which the selected device belongs.

0x98039b0300a8b71e - Device Information

General Ports Cables **Groups** Alarms Events Inventory Device Access

All Displayed Columns CSV

Severity	Name ↑	Description	Type
Critical	1U Switches	Includes all 1U Switches that exi...	General
Critical	Alarmed Devices	Devices with alarms	General
Critical	Switches	Includes all Switches that exist i...	General

Viewing 1-3 of 3

Groups Data

Data Type	Description
Severity	Aggregated severity level of the group (the highest severity level of all group members).
Name	Name of the group.
Description	Description of the group.
Type	Type of the group: General/Rack.

Alarms Tab

This tab provides a list of all UFM alarms related to the selected device.

Alarms Data

Data Type	Description
Alarms ID	Alarm identifier.
Source	Source object (device/port) on which the alarm was triggered.
Severity	The severity of the alarm.
Description	Description of the alarm.
Date/Time	The time when the alarm was triggered.

Data Type	Description
Reason	Reason for the alarm.
Count	Number of instances that the alarm occurred on the related source object.

Events Tab

This tab provides a list of the UFM events that are related to the selected device.

0x043f720300b818a0 - Device Information

General Ports Cables Groups Alarms **Events** Inventory Device Access

Clear All Events
 Displayed Columns
CSV

Severity	Date/Time ↓	Source	Source Type	Descri
✔ Info	2022-04-28 14:16:42	default(12) / Switch: smg-ib-s	Switch	Action reboot on
✔ Info	2022-04-28 14:10:13	default(12) / Switch: smg-ib-s	Switch	System Image G
✔ Info	2022-04-28 14:10:13	default(12) / Switch: smg-ib-s	Switch	Capability Mask
✔ Info	2022-04-28 14:09:24	default(12) / Switch: smg-ib-s	Switch	smg-ib-sw040: l
? Warning	2022-04-28 14:08:24	Source 043f720300b818a0_39	Link	Link went down:
? Warning	2022-04-28 14:08:24	Source 043f720300b818a0_41	Link	Link went down:
✔ Info	2022-04-28 14:07:41	default(12) / Switch: smg-ib-s	Switch	Action reboot st:
✔ Info	2022-04-28 14:04:14	default(12) / Switch: smg-ib-s	Switch	Switch Upgrade
✔ Info	2022-04-28 14:02:42	default(12) / Switch: smg-ib-s	Switch	Switch SW upgr:
✔ Info	2022-04-28 14:02:42	default(12) / Switch: smg-ib-s	Switch	Action sw_upgre

Viewing 1-10 of 11 10

Events Data

Data Type	Description
Severity	Event severity – Info, Warning, Error, Critical or Minor.
Event Name	The name of the event.

Data Type	Description
Source	The source object (device/port) on which the event was triggered.
Date/Time	The time when the event was triggered.
Category	The category of the event indicated by icons. Hovering over the icon will display the category name.
Description	Description of the event. Full description can be displayed by hovering over the text.

Inventory Tab

This tab provides a list of the device's modules with information in a tabular format.

Note

This tab is available for switches only.

0x0c42a1030079a66c - Device Information

General Ports Cables Groups Alarms Events **Inventory** Device Access

Displayed Columns CSV

Severity	Status	Serial Num...	Sy...	Description	Type	Software V...	Part Numb...	Hardware ...	Power
 Info	OK	MT2019T11021	sw-ufm-qm01	SYSTEM	SYSTEM	3.11.2016-X8...	MQM8700-H...	AF	
 Info	OK	MT2019T11021	sw-ufm-qm01	MGMT - 1	MGMT		MQM8700-H...	AF	
 Info	OK		sw-ufm-qm01	FAN - 1	FAN				
 Info	OK		sw-ufm-qm01	FAN - 3	FAN				
 Info	OK		sw-ufm-qm01	FAN - 2	FAN				
 Info	OK		sw-ufm-qm01	FAN - 5	FAN				
 Info	OK		sw-ufm-qm01	FAN - 4	FAN				
 Info	OK		sw-ufm-qm01	FAN - 6	FAN				
 Info	OK	MT2019T10901	sw-ufm-qm01	PS - 2	PS		MTEF-PSF-A...	A3	118.25
 Warning	fatal	MT2019T10902	sw-ufm-qm01	PS - 1	PS		MTEF-PSF-A...	A3	-
 Info	active		sw-ufm-qm01	Aggregation ...	SHARP				

Viewing 1-11 of 11

Inventory Data

Data Type	Description
Severity/Health	Health of the module reflecting the highest alarm severity. Please refer to the Health States table.
Status	The module status.
Serial Number	Serial number of the module.
System	Name of the device.
Description	Description of the module.
Type	Type of the module: spine/line/etc.
Software Version	Firmware version installed on the module.
Part Number	Part number of the module.
Hardware Version	Hardware version of the module.
Power	Power supply of the PSU.

HCAs Tab

This tab provides a list of the device's HCAs with information in a tabular format.

Note

This tab is available for hosts only.

0xec0d9a0300bf551c - Device Information

General Ports Cables Groups Alarms Events **HCA's** Device Access

Displayed Columns CSV

Severity	System Name	GUID	Type	Port 1 Name	Port 2
Info	smg-ib-svr45	0xec0d9a0300bf551c	ConnectX-5	smg-ib-svr45 HCA-3	smg-ib-
Info	smg-ib-svr45	0x98039b03009ffb22	ConnectX-6	smg-ib-svr45 HCA-1	smg-ib-

Viewing 1-2 of 2

Data Type	Description
Health	Health of the HCA reflecting the highest alarm severity. Please refer to the Health States table.
Name	HCA Index
GUID	HCA GUID
Type	HCA Type
Port GUID	HCA ports GUIDs
PSID	HCA PSID
FW Version	HCA firmware version

Device Access Tab

This tab allows for managing the access credentials of the selected device for remote accessibility. To be able to set access credentials for the device, a device IP must be set either by installing UFM Agent on the device, or by manually setting the IP under **IP Address Settings** (IP is now supported with v4 and v6).

0xe41d2d030021d450 - Device Information

General Ports Cables Groups Alarms Events Inventory **Device Access**

IP Address Settings ▼

Mode Auto Manual

Static IP v4 v6

Device Access is not available right now, try enabling ufm agent or set manual IP from IP Address Settings Above

Note

After manually setting the IP address of NVIDIA® Mellanox® InfiniScale IV® and SwitchX® based switches, UFM will first validate the new IP before setting it.

To edit your device access credentials

1. Select the preferred protocol tab:

- **SSH** – allows you to define the SSH parameters to open an SSH session on your device (available for **nodes** and **switches**)
- **IPMI** – allows you to set the IPMI parameters to open an IPMI session on your device for remote power control (available for **nodes only**)
- **HTTP** – allows you to define the HTTP parameters to open an HTTP session on your device (available for **switches only**)

2. Click **Update** to save your changes.

0x98039b0300a8b71e - Device Information

General Ports Cables Groups Alarms Events Inventory **Device Access**

IP Address Settings >

SSH v

Credentials

Override Global Settings

User:

Password:

Confirmation:

Connection

Port

Timeout

Manual IP v4 v6

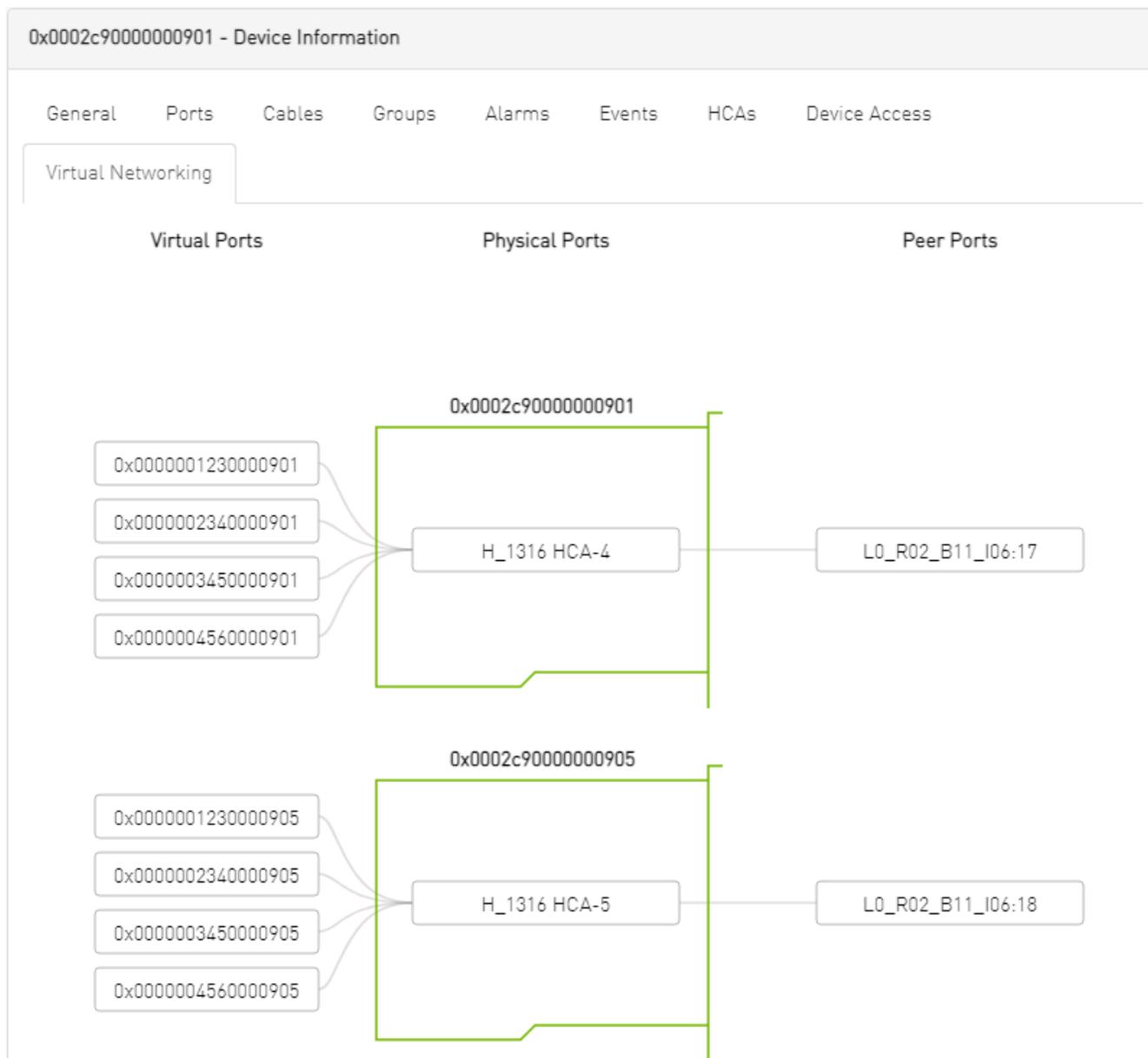
HTTP >

Device Access Credentials Parameters

Field	Description
User	Fill in or edit the computer user name.
Password	Enter the device password.
Confirmation	Enter the device password a second time to confirm.
Manual IP	Enter the device IP address (could be IPv4/IPv6).
Port	Enter the port number.
Timeout	Enter the connection timeout (in seconds) for the device specific protocol (SSH/HTTP/IPMI).

Virtual Networking Tab

This tab displays a map containing the HCAs for the selected device, and the ports and virtual ports it is connected to.



Ports Window

Provides a list of all ports in UFM.

Severity	State	System Name	P. Name	LID	Peer Node Name	Peer Name	Peer LID	MTU	Speed	Width
Warning	✓	r-hyp-sw-01	1	9	r-ufm254-hyp-01	HCA-1/1	1	4096	SDR	4X
Info	✓	r-hyp-sw-01	23	9	ufm-host86	HCA-1/1	3	4096	EDR	4X
Minor	✓	r-hyp-sw-01	36	9	SwitchIB Mellanox Technologies	36	2	4096	FDR EDR	4X
Info	✓	r-ufm254-hyp-01	HCA-1/1	1	r-hyp-sw-01	1	9	4096	SDR EDR	4X
Info	✓	r-ufm254-hyp-02	HCA-1/1	10	SwitchIB Mellanox Technologies	1	2	4096	FDR EDR	4X
Minor	✓	SwitchIB Mellanox Technologies	1	2	r-ufm254-hyp-02	HCA-1/1	10	4096	FDR EDR	4X
Info	✓	SwitchIB Mellanox Technologies	36	2	r-hyp-sw-01	36	9	4096	FDR EDR	4X
Info	✓	ufm-host86	HCA-1/1	3	r-hyp-sw-01	23	9	4096	EDR	4X

The table can be filtered by port state. The filter contains two options:

- Active – only active ports
- All – all ports

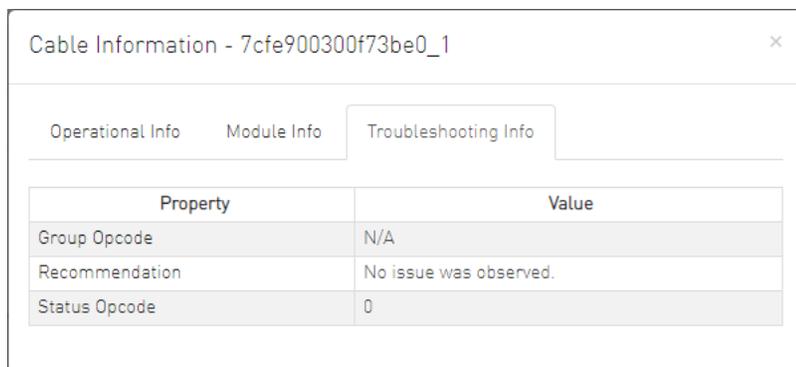
When right-clicking one of the available ports, the following actions appear:

Severity	State	System Name	P. Name	LID	Peer Node Name	Peer Name	Peer LID	MTU	Speed	Width
Warning	✓	r-hyp-sw-01	1	9	r-ufm254-hyp-01	HCA-1/1	1	4096	SDR	4X
Info	✓	r-hyp-sw-01	23	9	ufm-host86	HCA-1/1	3	4096	EDR	4X
Minor	✓	r-hyp-sw-01	36	9	SwitchIB Mellanox Technologies	36	2	4096	FDR EDR	4X
Info	✓	r-ufm254-hyp-01	HCA-1/1	1	r-hyp-sw-01	1	9	4096	SDR EDR	4X
Info	✓	r-ufm254-hyp-02	HCA-1/1	10	SwitchIB Mellanox Technologies	1	2	4096	FDR EDR	4X
Minor	✓	SwitchIB Mellanox Technologies	1	2	r-ufm254-hyp-02	HCA-1/1	10	4096	FDR EDR	4X
Info	✓	SwitchIB Mellanox Technologies	36	2	r-hyp-sw-01	36	9	4096	FDR EDR	4X
Info	✓	ufm-host86	HCA-1/1	3	r-hyp-sw-01	23	9	4096	EDR	4X

Note

All enable/disable actions on managed switches' ports are persistent. Thus, if a managed switch port is disabled, the port remains disabled even when rebooting the switch.

Clicking "Cable Information" opens up a window which provides data on operational, module, and troubleshooting information as shown in the following:



The screenshot shows a window titled "Cable Information - 7cfe900300f73be0_1". It has three tabs: "Operational Info", "Module Info", and "Troubleshooting Info". The "Troubleshooting Info" tab is active and displays a table with the following data:

Property	Value
Group Opcode	N/A
Recommendation	No issue was observed.
Status Opcode	0

Cable Information - 7cfe900300f73be0_1

Operational Info Module Info Troubleshooting Info

Property	Value
Vendor Serial Number	MT1515VS07837
Vendor Part Number	MCP1600-E001
Vendor Name	Mellanox
Attenuation (5g,7g,12g) [dB]	4,5,9
Bias Current [mA]	N/A
Cable Technology	Copper cable unequalized
Cable Type	Passive copper cable
CDR RX	N/A
CDR TX	N/A
Compliance	N/A
Digital Diagnostic Monitoring	No
FW Version	N/A
Identifier	QSFP+
LOS Alarm	N/A
OUI	Mellanox
Power Class	1.5 W max
Rev	A2
Rx Power Current [dBm]	N/A
Temperature [C]	N/A
Transfer Distance [m]	1
Tx Power Current [dBm]	N/A
Voltage [mV]	N/A
Wavelength [nm]	N/A

Cable Information - 7cfe900300f73be0_1

Operational Info Module Info Troubleshooting Info

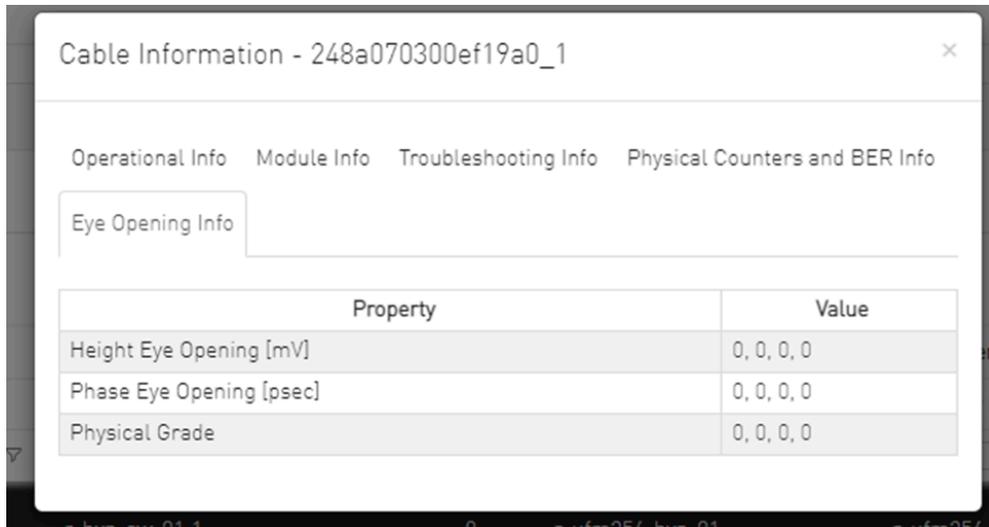
Property	Value
Auto Negotiation	ON
FEC	Standard LL RS-FEC - RS[271,257]
Loopback Mode	No Loopback
Physical state	LinkUp
Speed	IB-EDR
State	Active
Width	0x
Enabled Link Speed	0x0000003f (EDR,FDR,FDR10,QDR,DDR,SDR)
Supported Cable Speed	0x0000003f (EDR,FDR,FDR10,QDR,DDR,SDR)

Physical Grade and Eye Opening Information

Eye opening information contains the following data:

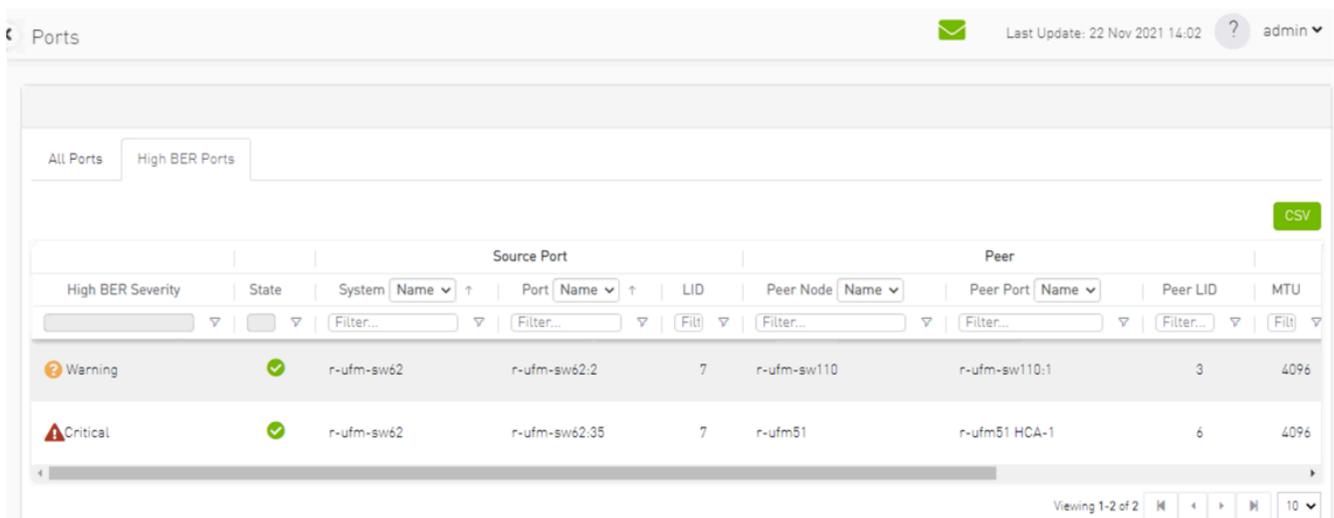
- Physical Grade: [Grade0, Grade1, Grade2, Grade3]
- Height Eye Opening [mV]: [Height0, Height1, Height2, Height3]
- Phase Eye Opening [psec]: [Phase0, Phase1, Phase2, Phase3]

A new tab called Eye Information was added under cable information modal in ports table.



Auto-isolation of High-BER Ports

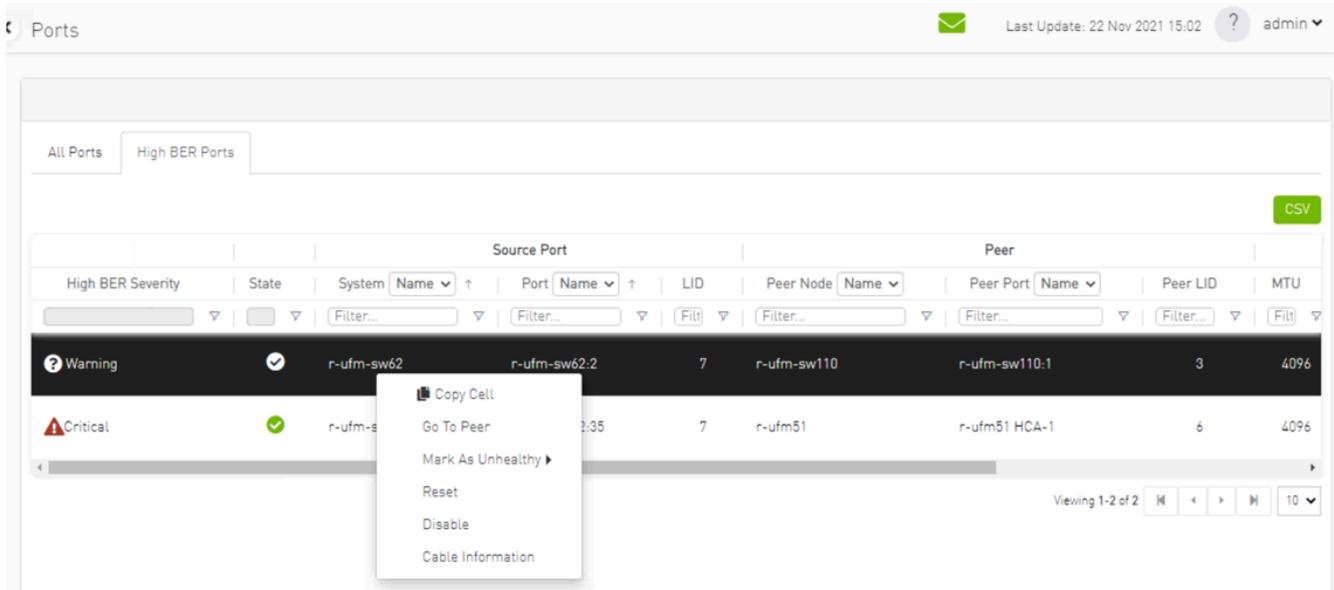
The High BER Ports tab lists all high-BER ports in the fabric.



The flags `high_ber_ports_auto_isolation` must be configured in the `gv.cfg` file to enable this feature.

For each port discovered as a high-BER port, a new event is triggered in the Events table.

Marking the high-BER port as unhealthy suppresses all events and notifications related to the auto-isolated port.



Virtual Ports Window

Note

This page is only available if [Virtualization is enabled in gv.cfg](#).

Provides a list of all virtual ports in UFM.

Virtual Ports Last Update: 27 Dec 2020 13:36 ? admin

Virtual Port State	System Name	Port Name	Virtual Port GUID	Virtual Port LID
✔	H_2303	H_2303 HCA-1	0x0000001230009209	100000
✔	H_2303	H_2303 HCA-1	0x0000002340009209	100001
✔	H_2303	H_2303 HCA-1	0x0000003450009209	100002
✔	H_2303	H_2303 HCA-1	0x0000004560009209	100003
⌚	H_2303	H_2303 HCA-2	0x000000123000920d	100004
⌚	H_2303	H_2303 HCA-2	0x000000234000920d	100005
⌚	H_2303	H_2303 HCA-2	0x000000345000920d	100006
⌚	H_2303	H_2303 HCA-2	0x000000456000920d	100007
⌚	H_2303	H_2303 HCA-3	0x0000001230009211	100008
⌚	H_2303	H_2303 HCA-3	0x0000002340009211	100009

Viewing 1-10 of 99440

Right-clicking a virtual port allows navigation to the physical port mapped it is mapped to.

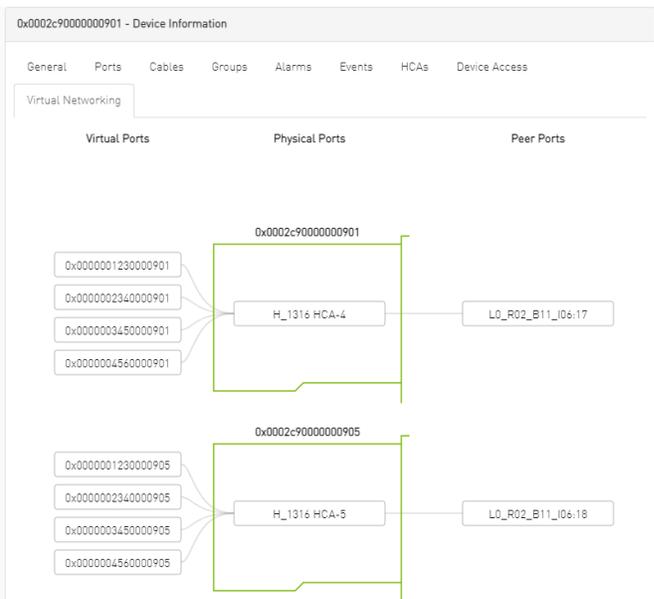
Virtual Port State	System Name	Port Name	Virtual Port GUID	Virtual Port LID
✔	H_2303	H_2303 HCA-1	0x0000001230009209	100000
✔	H_2303	H_2303 HCA-1	0x0000002340009209	100001
✔	H_2303	H_2303 HCA-1	0x0000003450009209	100002
		Go to port		
✔	H_2303	H_2303 HCA-1	0x0000004560009209	100003

Clicking "Go to port" navigates to the Virtual Networking tab of the Device Information screen.

Showing 10 out of 8400. [Click to reset all filters](#)

10 All CSV

S...	Name ↑	GUID	Type ▾	Model	IP	Firmware ...
✓ I...	H_1287	0x0002c9000...	host	Computer	N/A	N/A
✓ I...	H_3130	0x0002c9000...	host	Computer	N/A	N/A
✓ I...	H_1294	0x0002c9000...	host	Computer	N/A	N/A
✓ I...	H_3138	0x0002c9000...	host	Computer	N/A	N/A
✓ I...	H_1301	0x0002c9000...	host	Computer	N/A	N/A
✓ I...	H_3145	0x0002c9000...	host	Computer	N/A	N/A
✓ I...	H_132	0x0002c9000...	host	Computer	N/A	N/A
✓ I...	H_3152	0x0002c9000...	host	Computer	N/A	N/A
⊗ I...	H_1316	0x0002c9000...	host	Computer	N/A	N/A



Unhealthy Ports Window

The Unhealthy Ports view shows all the unhealthy nodes in the fabric and the OpenSM health policy of the healthy/unhealthy nodes.

After the Subnet Manager examines the behavior of subnet nodes (switches and hosts) and discovers that a node is “unhealthy” according to the conditions specified below, the node is displayed in the Unhealthy Ports window. Once a node is declared as “unhealthy”, Subnet Manager can either ignore, report, isolate or disable the node. The user is provided with the ability to control the actions performed and the phenomena that declares a node “unhealthy.” Moreover, the user can “clear” nodes that were previously marked as “unhealthy.”

The information is displayed in a tabular form and includes the unhealthy port’s state, source node, source port, source port GUID, peer node, peer port, peer GUID, peer LID, condition, and status time.

All Connectivity Mark All Ports as Healthy Displayed Columns CSV

Severity	Node	Port	GUID	Name	Port	GUID	LID	Condition	Status Time
✓ Info	smg-ib-sw012	smg-ib-sw012.2	0x043f720300f695c6	smg-ib-sw040	smg-ib-sw040.39	0x043f720300f6818a0	33	FLAPPING	Thu Apr 28 14:04:08 2...
⚠ Minor	smg-ib-sw012	smg-ib-sw012.40	0x043f720300f695c6	smg-ib-sw022	smg-ib-sw022.36	0x7cfe900300fa05b0	39	FLAPPING	Thu Apr 28 14:10:11 2...
⚠ Warning	smg-ib-sw012	smg-ib-sw012.16	0x043f720300f695c6	smg-ib-sw056	smg-ib-sw056.1/30/1/1	0x900a84030040c840	12	FLAPPING	Thu Apr 28 14:10:11 2...
⚠ Warning	smg-ib-sw012	smg-ib-sw012.31	0x043f720300f695c6	smg-ib-apl022-gen3	smg-ib-apl022-gen3 ...	0x98039b03009fcdee	53	FLAPPING	Thu Apr 28 14:10:11 2...
⚠ Warning	smg-ib-sw012	smg-ib-sw012.32	0x043f720300f695c6	smg-ib-apl022-gen3	smg-ib-apl022-gen3 ...	0x98039b03009fcdef	54	FLAPPING	Thu Apr 28 14:10:11 2...
⚠ Warning	smg-ib-sw012	smg-ib-sw012.26	0x043f720300f695c6	smg-ib-vm003	smg-ib-vm003 HCA-1	0x98039b03009fcf4e	14	FLAPPING	Thu Apr 28 14:10:11 2...
⚠ Warning	smg-ib-sw012	smg-ib-sw012.33	0x043f720300f695c6	smg-ib-apl021-gen3	smg-ib-apl021-gen3 ...	0xb8599f03005681a0	1	FLAPPING	Thu Apr 28 14:10:11 2...
⚠ Warning	smg-ib-sw012	smg-ib-sw012.34	0x043f720300f695c6	smg-ib-apl021-gen3	smg-ib-apl021-gen3 ...	0xb8599f03005681a1	35	FLAPPING	Thu Apr 28 14:10:11 2...
⚠ Warning	smg-ib-sw012	smg-ib-sw012.29	0x043f720300f695c6	smg-ib-sw036	smg-ib-sw036.33/1	0xb8cfe60300e04afe	56	FLAPPING	Thu Apr 28 14:10:11 2...

Viewing 1-9 of 9

i Note

The feature requires OpenSM parameter `hm_unhealthy_ports_checks` to be set to TRUE (default).

i Note

This feature is not available in the "Monitoring Only Mode."

The following are the conditions that would declare a node as “unhealthy”:

- Reboot - If a node was rebooted more than 10 times during last 900 seconds
- Flapping - If several links of the node found in Initializing state in 5 out of 10 previous sweeps
- Unresponsive - A port that does not respond to one of the SMPs and the MAD status is TIMEOUT in 5 out of 7 previous SM sweeps
- Noisy Node - If a node sends traps 129, 130 or 131 more than 250 traps with interval of less than 60 seconds between each two traps
- Seterr - If a node respond with bad status upon SET SMPs (PortInfo, SwitchInfo, VLArb, SL2VL or Pkeys)
- Illegal - If illegal MAD fields are discovered after a check for MADs/fields during `receive_process`
- Manual - Upon user request mark the node as unhealthy/healthy
- Link Level Retransmission (LLR) – Activated when retransmission-per-second counter exceeds its threshold

All conditions except LLR generate Unhealthy port event, LLR generates a High Data retransmission event.

➤ **To clear a node from the Unhealthy Ports Tab, do the following:**

1. Go to the Unhealthy Ports window under Managed Elements.
2. From the Unhealthy Ports table, right click the desired port it and mark it as healthy.

Severity	Node	Unhealthy Source Port	GUID	Name	Port	Peer	GUID	LID	Condition	Status Time
Info	smg-ib-sw012	smg-ib-sw012.2	0x043720300f95c6	smg-ib-sw040	smg-ib-sw040.99	0x043720300d818a0	33	FLAPPING	Thu Apr 28 14:04:08 2...	
Minor	smg-ib-sw012	smg-ib-sw012.40	0x043720300f95c6	smg-ib-sw033	smg-ib-sw033.36	0x7efe9003009a05b0	39	FLAPPING	Thu Apr 28 14:10:11 2...	
Warning	smg-ib-sw012	smg-ib-sw012.16	0x043720300f95c6	smg-ib-sw033	smg-ib-sw033.12	0x900a84030040c840	12	FLAPPING	Thu Apr 28 14:10:11 2...	
Warning	smg-ib-sw012	smg-ib-sw012.31	0x043720300f95c6	smg-ib-sw033	smg-ib-sw033.53	0x98039b03009fcdce	53	FLAPPING	Thu Apr 28 14:10:11 2...	
Warning	smg-ib-sw012	smg-ib-sw012.32	0x043720300f95c6	smg-ib-asi022-gen3	smg-ib-asi022-gen3...	0x98039b03009fcdce	54	FLAPPING	Thu Apr 28 14:10:11 2...	

➤ **To mark a node as permanently healthy, do the following:**

1. Open the `/opt/ufm/files/conf/health-policy.conf.user_ext` file.
2. Enter the node and the port information and set it as "Healthy."
3. Run the `/opt/ufm/scripts/sync_hm_port_health_policy_conf.sh` script.

Note

To control Partial Switch ASIC Failure event:

Trigger Partial Switch ASIC Failure whenever number of unhealthy ports exceed the defined percent of the total number of the switch ports.

The `switch_asic_fault_threshold` flag (under the UnhealthyPorts section in `gv.cfg` file) default value is 20.

Unhealthy Port Connectivity Filter

It is possible to filter the Unhealthy Ports table by connectivity (all, host-to-switch, or switch-to-host).

Filtering the Unhealthy Ports table is possible from the dropdown options at the top of the table which includes

- All Connectivity
- Switch to Switch
- Host to Switch

Severity	Node	Port	GUID	Name	Port	Peer	LID	Condition	Status Time
Info	smg-ib-sw012	smg-ib-sw012.2	0x043f720300f695c6	smg-ib-sw040	smg-ib-sw040.39	0x043f720300b818a0	33	FLAPPING	Thu Apr 28 14:04:08 2...
Minor	smg-ib-sw012	smg-ib-sw012.40	0x043f720300f695c6	smg-ib-sw022	smg-ib-sw022.36	0x7efe9003009a06b0	39	FLAPPING	Thu Apr 28 14:10:11 2...
Warning	smg-ib-sw012	smg-ib-sw012.16	0x043f720300f695c6	smg-ib-sw056	smg-ib-sw056:1/30/1/1	0x900a840300d0c840	12	FLAPPING	Thu Apr 28 14:10:11 2...
Warning	smg-ib-sw012	smg-ib-sw012.31	0x043f720300f695c6	smg-ib-apl022-gen3	smg-ib-apl022-gen3 ...	0x98039b03009fcdee	53	FLAPPING	Thu Apr 28 14:10:11 2...
Warning	smg-ib-sw012	smg-ib-sw012.32	0x043f720300f695c6	smg-ib-apl022-gen3	smg-ib-apl022-gen3 ...	0x98039b03009fcdef	54	FLAPPING	Thu Apr 28 14:10:11 2...
Warning	smg-ib-sw012	smg-ib-sw012.26	0x043f720300f695c6	smg-ib-vrt003	smg-ib-vrt003 HCA-1	0x98039b03009fc4e	14	FLAPPING	Thu Apr 28 14:10:11 2...
Warning	smg-ib-sw012	smg-ib-sw012.33	0x043f720300f695c6	smg-ib-apl021-gen3	smg-ib-apl021-gen3 ...	0xb8599f03005681a0	1	FLAPPING	Thu Apr 28 14:10:11 2...
Warning	smg-ib-sw012	smg-ib-sw012.34	0x043f720300f695c6	smg-ib-apl021-gen3	smg-ib-apl021-gen3 ...	0xb8599f03005681a1	35	FLAPPING	Thu Apr 28 14:10:11 2...
Warning	smg-ib-sw012	smg-ib-sw012.29	0x043f720300f695c6	smg-ib-sw036	smg-ib-sw036.33/1	0xb8cfe60300604afe	56	FLAPPING	Thu Apr 28 14:10:11 2...

Health Policy Management

This view manages the OpenSM health policy for the healthy/unhealthy nodes and ports. The OpenSM health policy is stored in the `/opt/ufm/files/conf/opensm/opensm-health-policy.conf` file.

The information is displayed in a tabular form, with an option to group it either by devices or ports, and includes the health nodes/ports details (GUID, Name, policy [healthy/unhealthy])

1. Health Policy by devices:

Node GUID	Node Name	# of policies
0x0c0d9a03002f0ba0	switchb	1
0x7cfe9003005a5a0	sharp2	1

2. Health Policy by ports:

Unhealthy Ports Health Policy

Delete All Healthy Ports Displayed Columns CSV

Node GUID	Node Name	Port	Policy	Action	Last Update
0xec0d9a0300294ba0	switch1b	11	UNHEALTHY	isolate	Wed Jul 26 15:17:49 2023
0x7cfe900300a5a2a0	sharp2	36	UNHEALTHY	isolate	Wed Jul 26 15:18:33 2023

Viewing 1-2 of 2

To switch between the above views, simply click on the control button located at the top right corner of the table. By default, the devices view will be shown.

The health policy supports the following capabilities. When you select a policy and right-click, you can perform the following actions:

1. Delete the Policy
2. Mark the selected healthy policies as unhealthy (Isolate/No discover)
3. Mark the selected unhealthy policies as healthy

If you wish to delete all the healthy ports from the health policy, click on the 'Delete All Healthy Ports' option situated at the top right corner of the policy table.

Cables Window

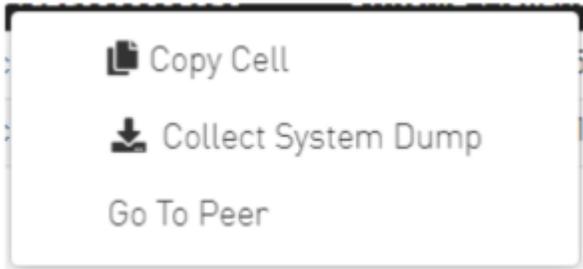
Provides a list of all cables in UFM. For more information, see [Device's Cables Tab](#).

Displayed Columns CSV

Severity	Serial #	Identifier	GUID	Port	Revision	Link Wi...	Part #	Techno...	Firmwa...	Length
Info	MT1618VS...	QSFP+	0x248a070300ef19a0	r-hyp-sw-01:1	A3	4X	MC220713...	Copper ca...		1 m
Info	MT1544VS...	QSFP+	0x248a070300ef19a0	r-hyp-sw-01:23	A2	4X	MCP1600-...	Copper ca...		2 m
Minor	MT1233VS...	QSFP+	0x248a070300ef19a0	r-hyp-sw-01:36	A3	4X	MC220713...	Copper ca...		2 m
Minor			0xe41d2d030003e3b0	Switch1B Mellanox Technologies:36		4X				
Warning	MT1544VS...	QSFP+	0x7cfe900300292356	ufm-host86 mlx5_0	A2	4X	MCP1600-...	Copper ca...		2 m
Info	MT1618VS...	QSFP+	0x0c42a103007ab890	r-ufm254-hyp-01 mlx5_0	A3	4X	MC220713...	Copper ca...		1 m

Viewing 1-6 of 6

Right-clicking a cable from the list allows users to Collect System Dump for the endpoints of the link and navigate to peer port.



Groups Window

The Groups window allows users to create new groups of devices and provides information about existing groups.

Note

All predefined groups have Read permissions only, except Suppressed_Devices to/from which the user is also able to add/remove members or devices.

Note

The following predefined groups auto-populate upon UFM startup: Switches, 1U_Switches, Modular_Switches, Gateway_Devices, and Hosts.

To create a group of devices, do the following:



1. Click “New” under “Groups.”

Severity	Name ↑	Description	Type
⚠ Critical	1U Switches	Includes all 1U Switches that exist in the fabric	General
⚠ Critical	Alarmed Devices	Devices with alarms	General
✅ Info	Devices Pending FW Transceivers Reset	Includes all Devices that pending FW transceivers reset to active burned ...	General
✅ Info	Gateway Devices	Includes all Gateway Devices that exist in the fabric	General
⚠ Minor	Modular Switches	Includes all Modular Switches that exist in the fabric	General
✅ Info	Routers	Includes all Router Devices that exist in the fabric	General
⚠ Warning	Servers	Includes all Hosts that exist in the fabric	General
✅ Info	Servers With DPU	Includes all Devices that has DPU that exist in the fabric	General
✅ Info	Suppressed Devices	No event notifications issued	General
⚠ Critical	Switches	Includes all Switches that exist in the fabric	General

Viewing 1-10 of 10

- In the New Group wizard, fill in the required information under the General tab: Name (must be between 4-20 characters), Type (General/Rack/Port), and Description (optional), and click **Next**.

New Group
×

1 General

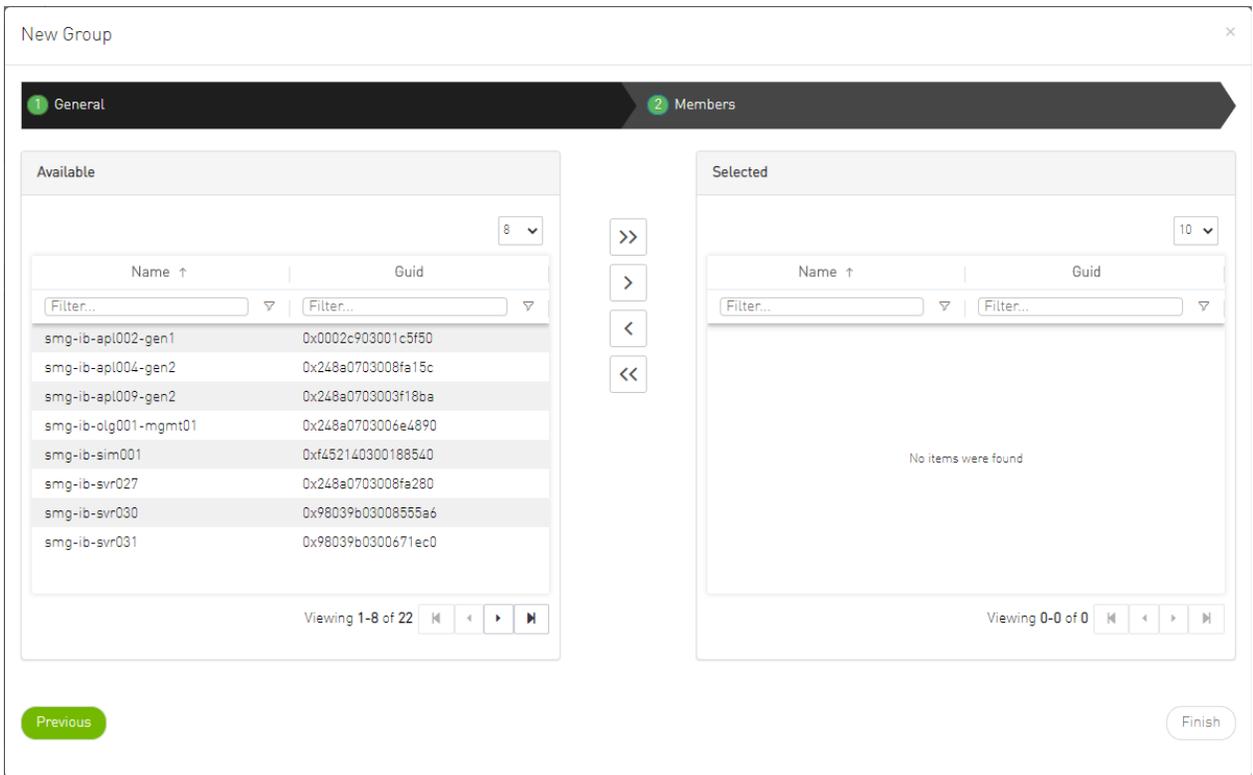
2 Members

Name

Type

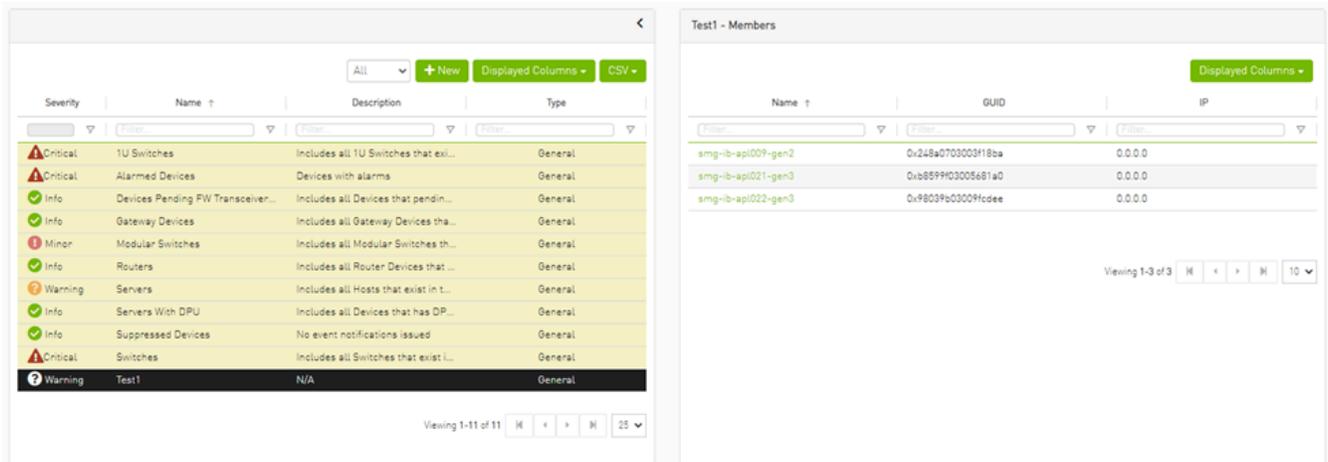
Description

- Under Members tab, move the members of the new group from the **Available** list to the **Selected** list.



4. Click “Finish” and the new group will appear under the Groups window.

Group members details – port’s hostname, port’s GUID, and device’s IP address – can be viewed when selecting the group from the list of all groups available.



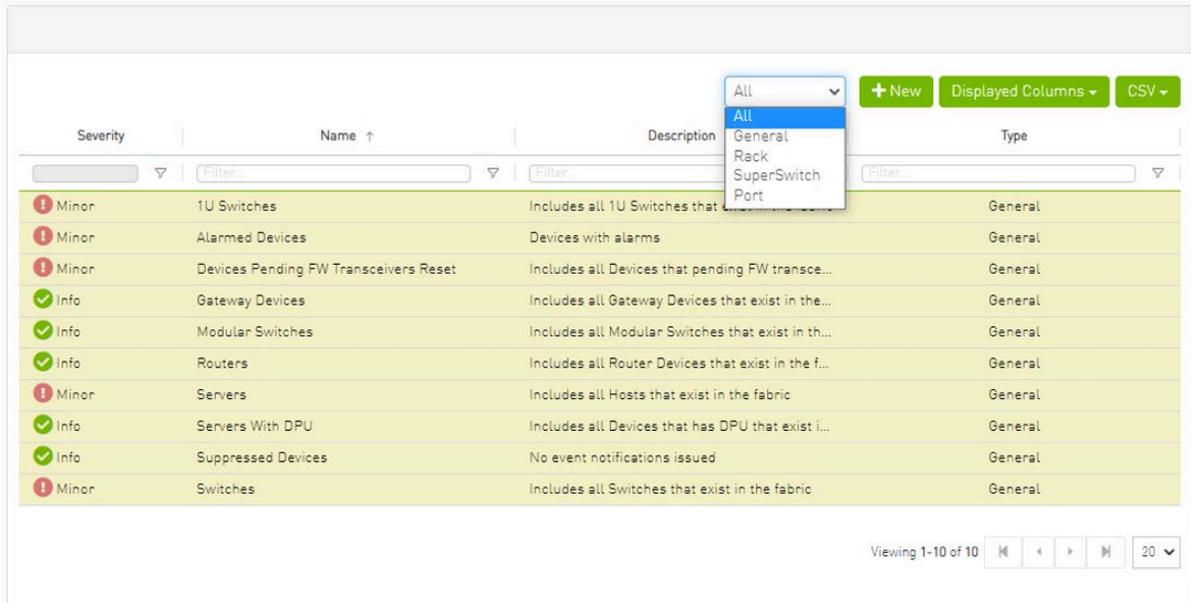
Group Actions

Right-clicking a group enables performing the following actions:

- **Edit** – groups can be modified either by editing the group description under **General** tab, or substituting group members under **Members** tab

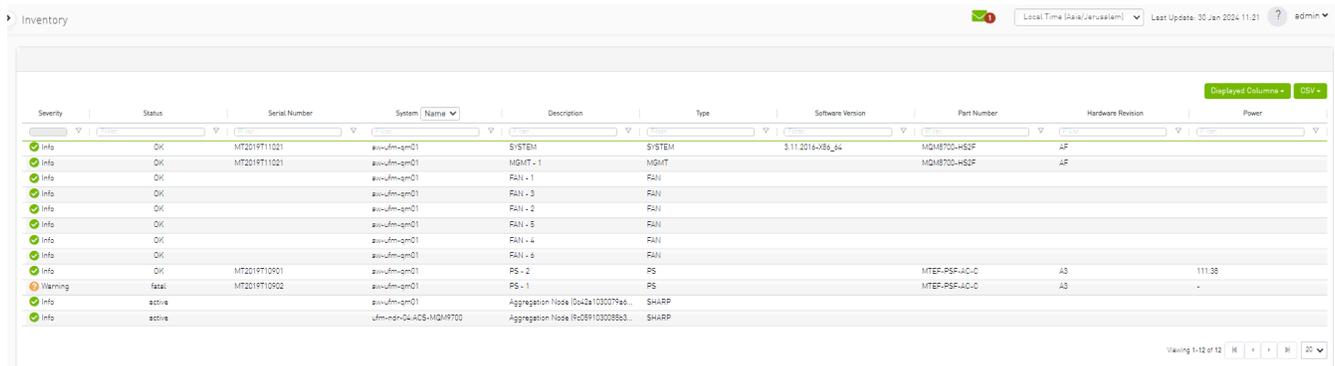
- **Delete** – existing groups can be deleted from the list
- **Remove All Members** – all members of an existing group can be removed at once
- **Collect System Dump** – sysdump may be generated for all members of an existing group

The user can filter group by type (General, Rack, Super Switch and Port)



Inventory Window

Provides a list of all modules in UFM. For more information, see [Device's Inventory Tab](#).



PKeys Window

The PKeys window allows users to create new groups of ports and provides information about existing PKeys.

Note

This window offers one predefined PKey (highlighted in the list of PKeys): Management key 0x7fff with Read permissions only.

For further information about InfiniBand partitioning (Pkeys management), please refer to the [Partitioning Appendix](#).

Creating New PKey

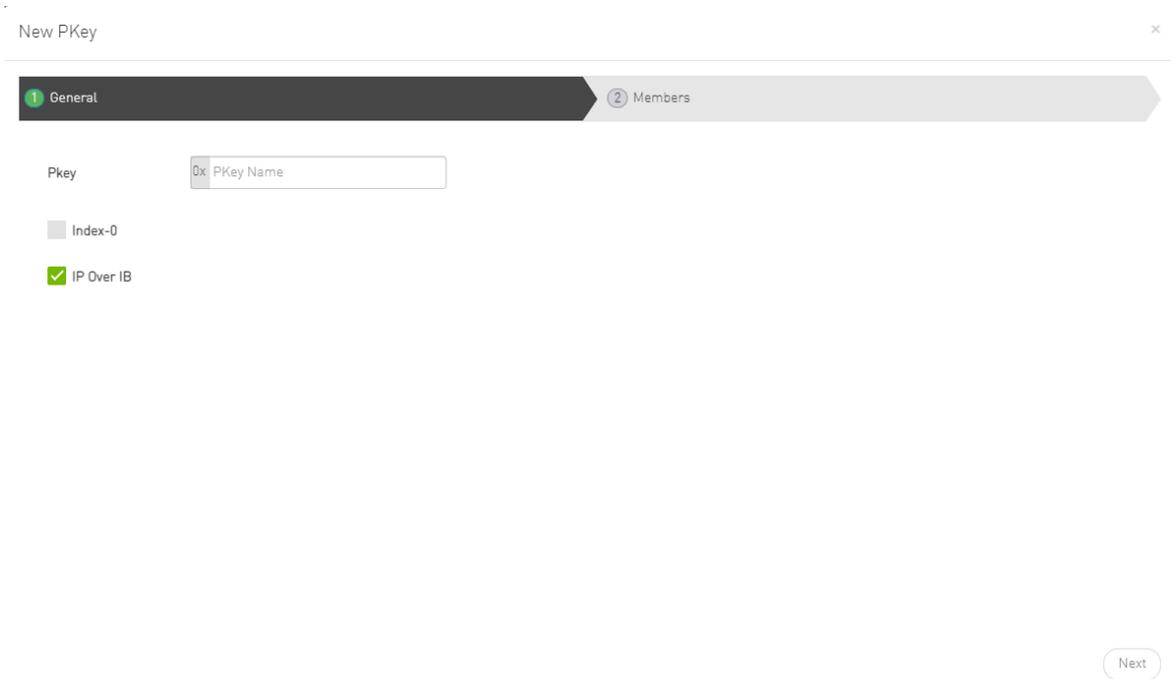
1. Click the “New” button under “PKeys”.

Please note that the yellow highlighted PKeys are predefined ones.



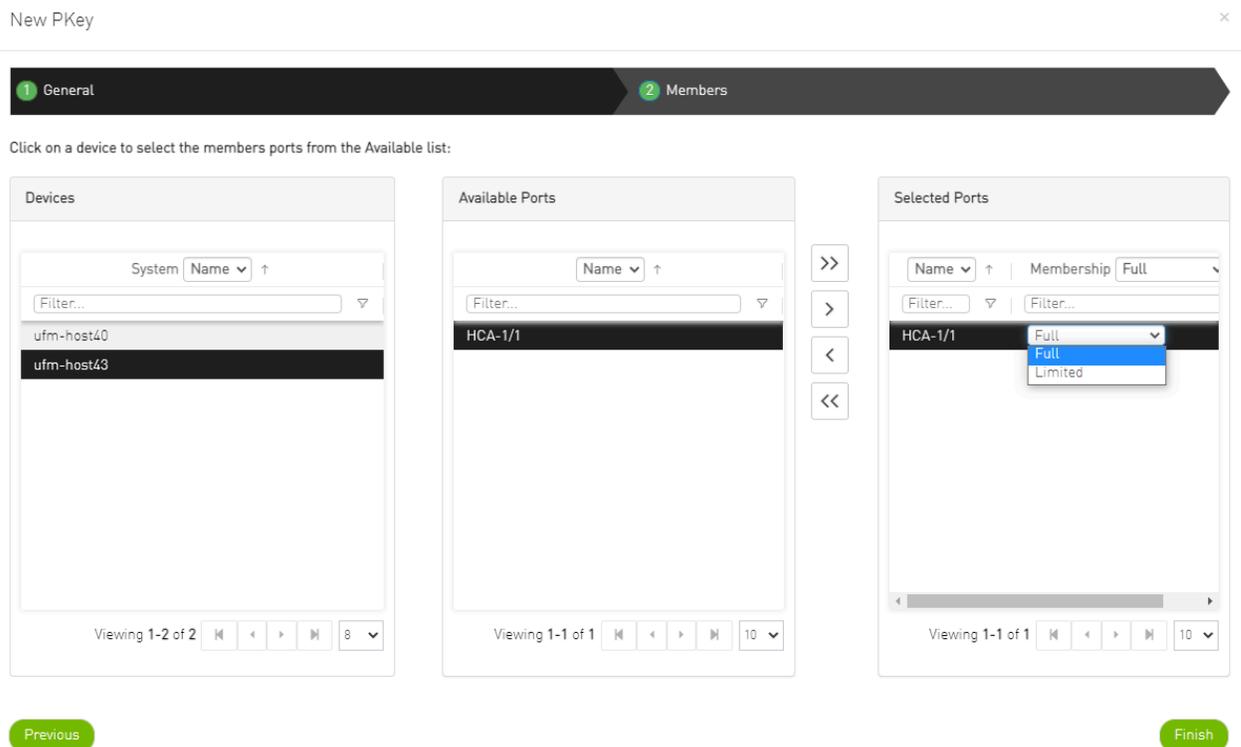
2. In the New PKey wizard, fill in the required information under the General tab:

- Name—must be between 0x1 and 0x7fff, inclusive
- Index-0 attribute—True/False
- IP Over IB attribute—True/False



3. Click "Next."

4. Under Members tab, select the device of which ports you would like to group in one PKey, and move the members (ports) from the **Available** list to the **Selected** list. For each member (port) you may specify a membership type (Full/limited).



5. Click “Finish”. The new PKey will become available under the PKey window.

When selecting a PKey from the PKeys table, **PKey Information** table will appear on the right side of the screen. This table provides information on the PKey's members and QoS settings.

PKey Members Tab

Provides details on the PKey members: port's hostname (node), device's IP address, port GUID, port number, membership and index-0 attributes values.

S.	GUID	Membership	Index-0	Port Type
smg-ib-apl...	0x248a0703003f18bb	Full	⊗	Physical
smg-ib-apl...	0xb8599f03005681a0	Full	⊗	Physical
smg-ib-apl...	0xb8599f03005681a1	Full	⊗	Physical

PKey QoS Tab

Displays the current partitioning parameter settings of the selected PKey: MTU Limit, Service Level and Rate limit. These settings can be modified by the user.

MTU Limit: 2 KB
Service Level: 0
Rate Limit: 2.5 Gbps

⚠ Changing one of the above partition parameters requires restarting UFM in order for the changes to take effect.

Update

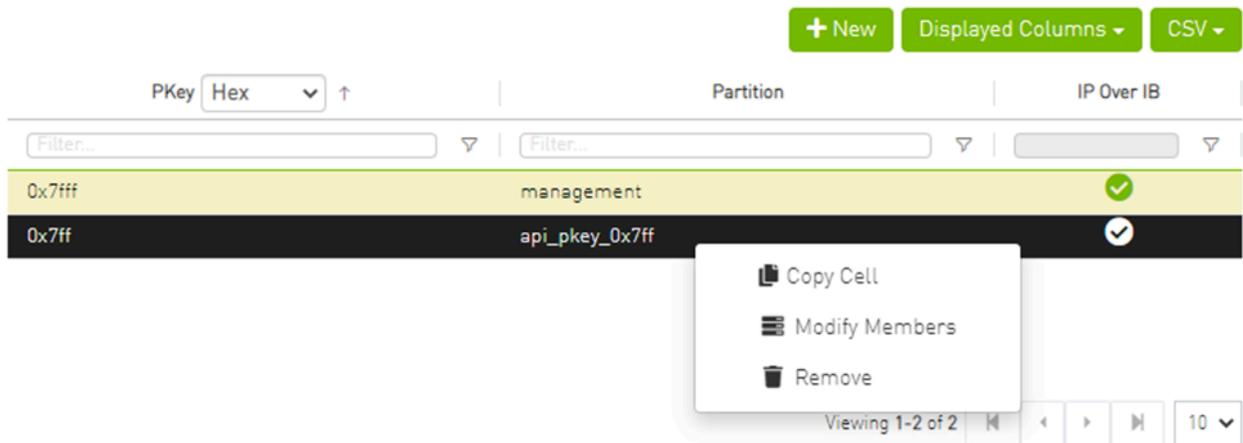
PKey Actions

Right-clicking one PKey from the list enables performing the following actions:

- **Modify Members** – PKeys can be modified either by editing the attributes under **General** tab, or updating the members under **Members** tab. Including updating ports

memberships.

- **Remove** – existing PKeys can be deleted from the list.



Note

For information on partitioning, refer to [Appendix – Partitioning](#).

Note

Note that restarting OpenSM is required for the QoS parameters change to take effect.

Support Pkey with Virtual Ports

Creating a pkey with virtual ports is supported, so pkey can contain the following types of port:

- Physical
- Virtual
- Both physical and virtual

The create new pkey wizard dropdown includes port types.

New PKey ×

1 General **2** Members

Click on a device to select the members ports from the Available list:

Devices

System Name ↑

Filter...

- r-ufm254-hyp-03
- r-ufm254-hyp-04
- ufm-host87

Viewing 1-3 of 3 ⏪ ⏩ 8

Available Ports Show: Physical

GUID ↑

Filter...

0x0c42a103007aca90

Viewing 1-1 of 1 ⏪ ⏩ 10

Selected Ports

GUID ↑ Memb... Full

Filter... Filter...

No items were found

Viewing 0-0 of 0 ⏪ ⏩ 10

PreviousFinish

New PKey ×

1 General **2** Members

Click on a device to select the members ports from the Available list:

Devices

System Name ↑

Filter...

- r-ufm254-hyp-03
- r-ufm254-hyp-04
- ufm-host87

Viewing 1-3 of 3 ⏪ ⏩ 8

Available Ports Show: Virtual

GUID ↑

Filter...

- 0x1122334477667700
- 0x1122334477667701
- 0x1122334477667710
- 0x1122334477667711

Viewing 1-4 of 4 ⏪ ⏩ 10

Selected Ports

GUID ↑ Memb... Full

Filter... Filter...

No items were found

Viewing 0-0 of 0 ⏪ ⏩ 10

PreviousFinish

1 General 2 Members

Click on a device to select the members ports from the Available list:

Devices

System **Name** ↑

Filter...

- r-ufm254-hyp-03
- r-ufm254-hyp-04
- ufm-host87

Viewing 1-3 of 3

Available Ports Show: Both ↓

GUID ↑

Filter...

- 0x0c42a103007aca90
- 0x1122334477667700
- 0x1122334477667701
- 0x1122334477667710
- 0x1122334477667711

Viewing 1-5 of 5

Selected Ports

GUID ↑ Memb... Full ↓

Filter... Filter...

No items were found

Viewing 0-0 of 0

Previous Finish

HCA's Window

Provides a list of all the HCAs of the hosts in UFM. For more information, see section "[HCAs Tab](#)".

Severity	System Name ↓	GUID	Type	Port 1 Name ↓	Port 2 Name ↓	PSID	FW Version
Info	smg-lib-svr45	0xec0d9a0300b1551c	ConnectX-5	smg-lib-svr45 HCA-3	smg-lib-svr45 HCA-4	MT_0000000008	16.32.566
Info	smg-lib-gw01-lb-gw	0x0c42a103009b138	ConnectX-6	smg-lib-gw01-lb-gw HCA-7	N/A	MT_0000000691	20.30.1004
Info	smg-lib-vrt003	0x98039b030091c4e	ConnectX-6	smg-lib-vrt003 HCA-1	N/A	MT_0000000228	20.29.550
Info	smg-lib-svr036	0x7cfe900300d5ba54	ConnectX-4	smg-lib-svr036 HCA-1	smg-lib-svr036 HCA-2	MT_2190110032	12.28.2006
Info	smg-lib-sim001	0x1070e0300a0e980	BlueField2	smg-lib-sim001 HCA-1	smg-lib-sim001 HCA-2	MT_0000000872	24.33.900
Info	smg-lib-svr027	0x248a0703008fa280	ConnectX-4	smg-lib-svr027 HCA-1	smg-lib-svr027 HCA-2	MT_2190110032	12.28.2006
Info	smg-lib-apl021-gen3	0xb8599f03005681a0	ConnectX-6	smg-lib-apl021-gen3 mlx5_0	smg-lib-apl021-gen3 mlx5_1	MT_0000000224	20.32.1010
Info	smg-lib-svr46	0xec0d9a0300a41ab2	ConnectX-5	smg-lib-svr46 HCA-3	N/A	MT_0000000010	16.32.566
Info	smg-lib-apl009-gen2	0x248a0703003f18ba	ConnectX-4	N/A	smg-lib-apl009-gen2 HCA-2	MT_2190110032	12.28.2006
Info	smg-lib-svr031	0x98039b0300b671ec0	ConnectX-6	smg-lib-svr031 HCA-1	N/A	IBM0000000027	20.31.2006

Viewing 1-10 of 23

Events & Alarms

Note

All information provided in a tabular format in UFM web UI can be exported into a CSV file.

UFM allows you to identify any problem including ports and device connectivity using events and alarms. Problems can be detected both prior to running applications and during standard operation.

Events trigger alarms (except for "normal" events. i.e., Info events) when they exceed a predefined threshold. Events and alarms can be configured under Events Policy tab under Settings window. For more information, refer to [Events Policy Tab](#).

Events & Alarms Local Time Last Update: 28 Apr 2022 16:46 admin

Alarms

Clear All Alarms Refresh Displayed Columns CSV

Severity	Date/Time ↓	Alarm Name	Source	Source Type	Reason	Count
Minor	2022-04-28 16:43:46	Non-opti...	Switch: smg-ib-sw032 / 5	IBPort	Found a [50.0] link that operates in [25.0] speed mode.	56
Minor	2022-04-28 16:43:46	Non-opti...	Switch: smg-ib-olg001-mgmt1	IBPort	Found a [25.0] link that operates in [14.0] speed mode.	56
Minor	2022-04-28 16:43:46	Non-opti...	Switch: smg-ib-sw035 / 1	IBPort	Found a [50.0] link that operates in [25.0] speed mode.	56
Minor	2022-04-28 16:43:46	Non-opti...	Switch: smg-ib-sw035 / 23	IBPort	Found a 4x link that operates in 2x width mode.	56
Minor	2022-04-28 16:43:46	Non-opti...	Switch: smg-ib-sw035 / 24	IBPort	Found a 4x link that operates in 2x width mode.	56
Minor	2022-04-28 16:43:46	Non-opti...	Switch: smg-ib-sw035 / 26	IBPort	Found a [50.0] link that operates in [25.0] speed mode.	56
Minor	2022-04-28 16:43:46	Non-opti...	default[12] / Switch: smg-ib-s	IBPort	Found a [50.0] link that operates in [25.0] speed mode.	53
Minor	2022-04-28 16:43:46	Non-opti...	Switch: smg-ib-sw022 / 28	IBPort	Found a [25.0] link that operates in [14.0] speed mode.	56
Minor	2022-04-28 16:43:46	Non-opti...	default[12] / Switch: smg-ib-s	IBPort	Found a [25.0] link that operates in [2.5] speed mode.	56
Minor	2022-04-28 16:43:46	Non-opti...	default[12] / Switch: smg-ib-s	IBPort	Found a [50.0] link that operates in [25.0] speed mode.	53

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Events

Clear All Events Refresh Displayed Columns CSV

Severity	Date/Time ↓	Event Name	Source	Source Type	Description	Category
Info	2022-04-28 16:41:29	Network Interface...	logical2(0/0)	LogicalServer	Network Interface env1_logical2_manage...	
Info	2022-04-28 16:41:29	Logical Server Ad...	env1(1)	Environment	Logical Server logical2 is added	
Info	2022-04-28 16:41:29	Compute Resourc...	logical2(1/1)	LogicalServer	Compute Resource logical2/1 [smg-ib-svr...	
Info	2022-04-28 16:41:29	Logical Server Re...	logical2(1/1)	LogicalServer	Logical Server allocated 1 Resources	
Info	2022-04-28 16:41:29	Network Interface...	logical2(1/1)	LogicalServer	Network Interface env1_logical2_net1 is a...	
Critical	2022-04-28 16:38:38	Module status FA...	default[12] / Switch: smg-ib-sw	Switch	Module PS 2 on smg-ib-sw040(10.209.24...	
Info	2022-04-28 16:32:22	Environment Added	Grid	Grid	Environment env2 is added	
Info	2022-04-28 16:31:35	Network Interface...	logical1(0/0)	LogicalServer	Network Interface env1_logical1_manage...	
Info	2022-04-28 16:31:35	Logical Server Ad...	env1(0)	Environment	Logical Server logical1 is added	
Info	2022-04-28 16:31:35	Compute Resourc...	logical1(1/1)	LogicalServer	Compute Resource logical1/1 [smg-ib-svr...	

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Users can enable the events persistency mechanism from the `gv.cfg`. This allows the user to see the events in the case of restarting the UFM or in HA mode.

Note

Alternatively you can run the following commands:

- `ufm events persistency enable`
- `ufm events max-restored`

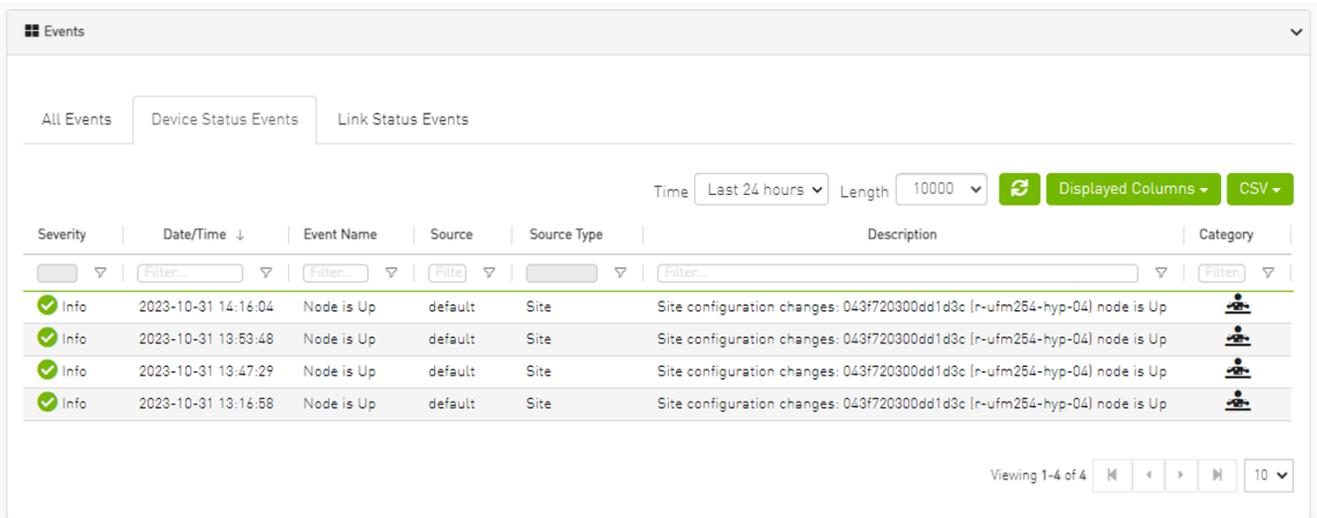
The persistency is deactivated by default and can be enabled by the following controlled parameters in the config file:

- `max_restored_events = 50 #` – will determine the number of events to restore
- `events_persistency_enabled = true #` – will set to true for the feature to work

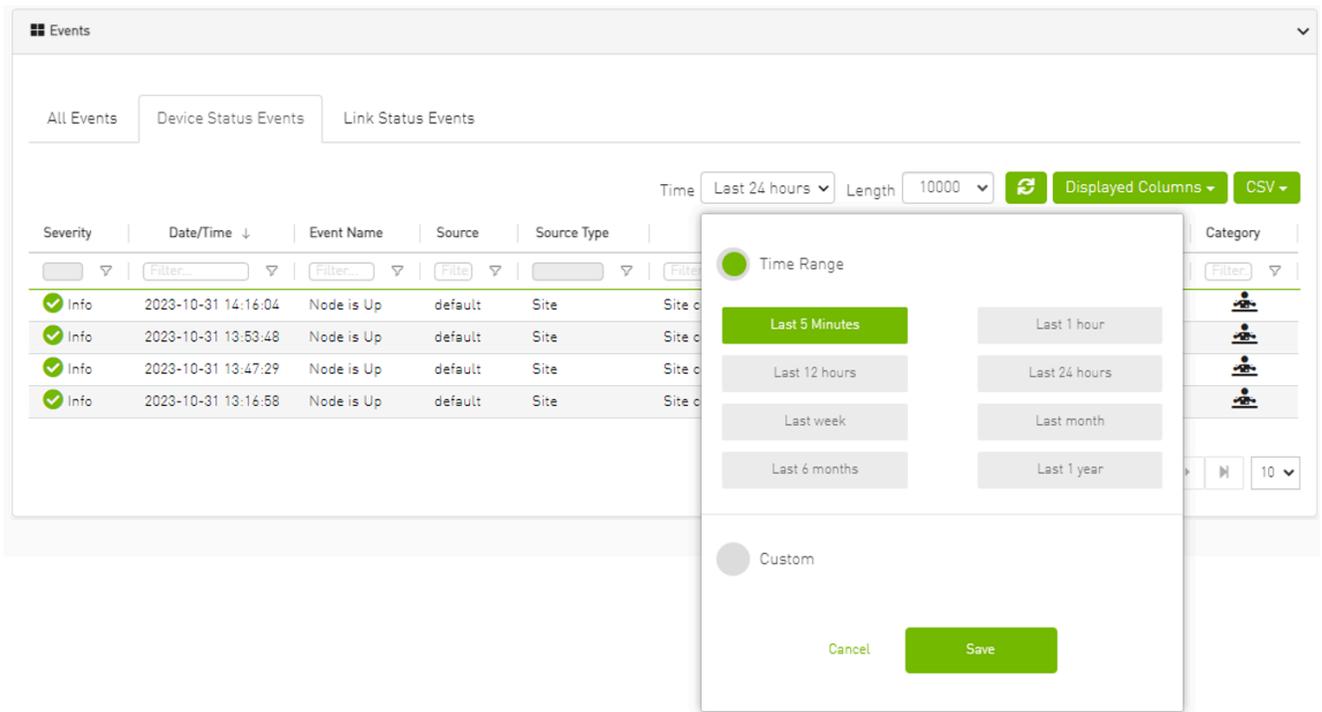
Device Status Events

The Device Status Events tab displays topology change events related to devices in a table. it will support the following event types:

- None is Up/Down
- Switch is Up/Down
- Director Switch is Up/Down



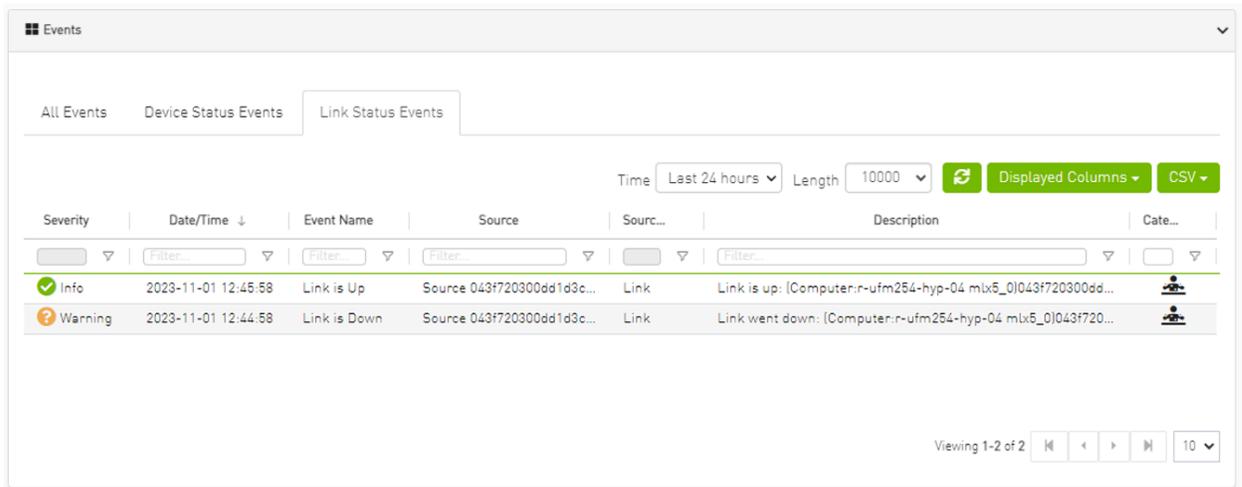
Filters are provided to allow events filtering by the desired time interval with a length limit.



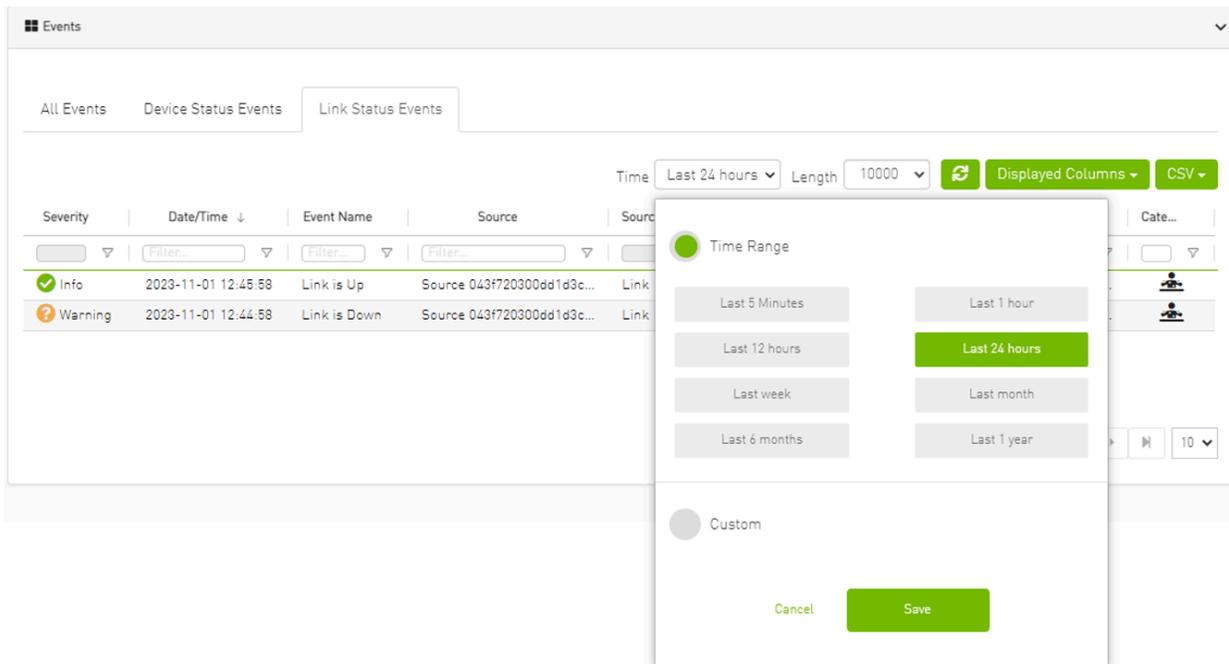
Link Status Events

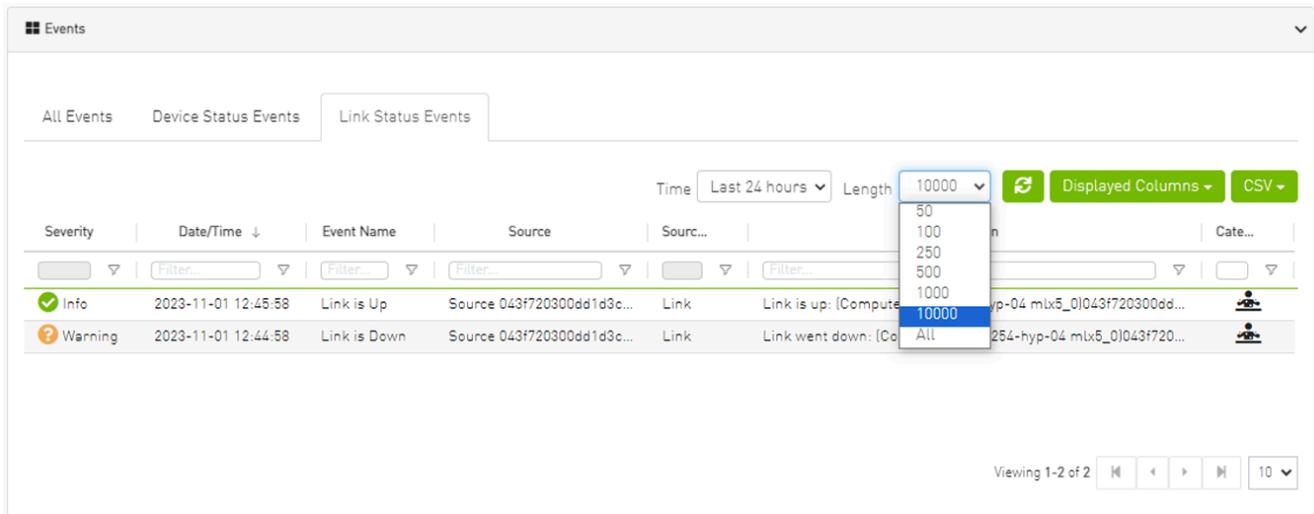
The Link Status Events tab displays topology change events related to links in a table. It supports the following event type:

- Link is Up/Down



Filters are provided to allow filtering by the desired time interval in a time range.





Note

Rge related switch context menu is displayed only if the event type is 'Switch is Up/Down'. Other event types show the default context menu, which is 'Copy Cell'.

Telemetry

Establishing Telemetry Sessions

UFM Telemetry allows tracking network bandwidth, congestion, errors, and latency. UFM offers the following telemetry features:

- Real-time monitoring views
- Multiple attributes monitoring
- Intelligent Counters: provide error and congestion counters
- InfiniBand port-based error counters
- InfiniBand congestion XmitWait counter-based congestion measurement
- InfiniBand port-based bandwidth data

The following actions may be taken with the telemetry session panels:

- Rearranging – using a simple drag-and-drop function
- Resizing – by hovering over the panel's border

It is also possible to get a larger view of a telemetry session by clicking the pop-out button on the top right-hand corner of each panel.

Telemetry Session Objects and Attributes

Monitored objects may be ports or devices in the fabric.

Monitored attributes can be raw counters or calculated counters:

- A raw attribute is a simple attribute to be monitored (e.g., Port TX Wait)
- A calculated attribute is an attribute that has been calculated based on one or more counters (e.g., PortXmitPktsRate)

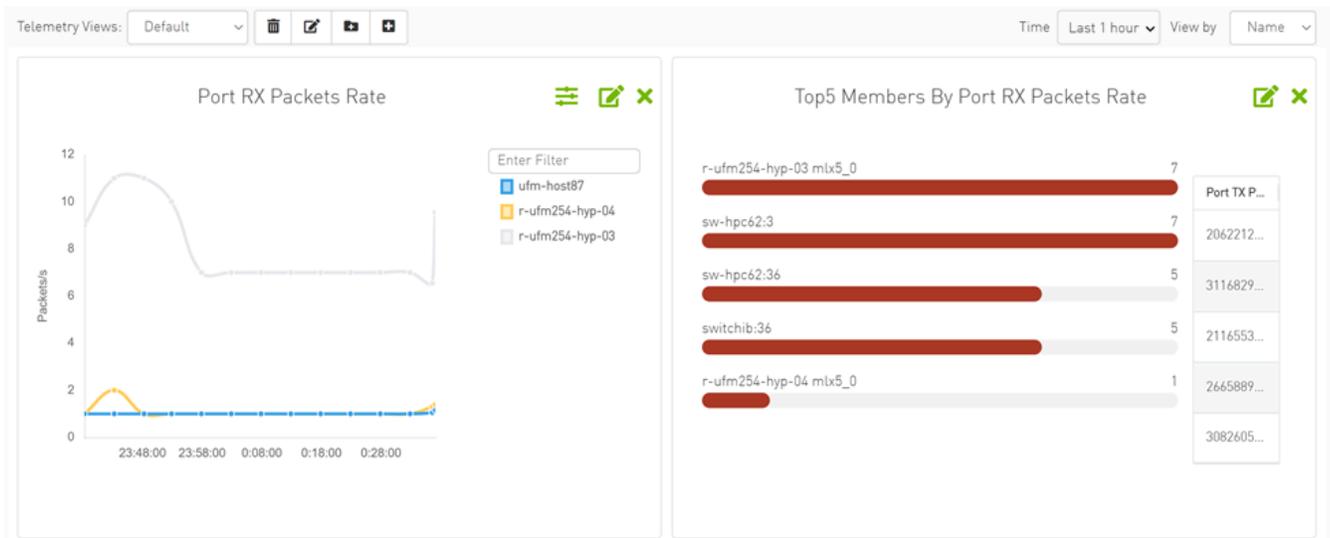
Telemetry Views

Telemetry contains multiple views; the user can create, edit, and delete views.

Telemetry supports two types of panels, time-series which show the relationship between time and counter value for a specific device, and topX, which show all ports with pick by counter greater than topX value.

Note

TopX is not supported in the case of the ibpm telemetry provider. The telemetry provider is hidden in this case.



The panel can be created by filling in the following model:

The screenshot shows the 'New Telemetry Session' configuration form. It includes the following sections:

- Telemetry Session:** Two buttons, 'Timeseries' (selected) and 'Top X'.
- Members:** Two buttons, 'Devices' (selected) and 'Ports'.
- Counters:** A dropdown menu labeled 'Select Counters' with the text 'All counters' to its right.
- Devices:** A dropdown menu labeled 'Select Devices' with the text 'All devices' to its right.
- Finish:** A button at the bottom right.

The user can select one of the following telemetry session modes:

Telemetry Session

Two buttons are shown: 'Timeseries' (selected, highlighted in green) and 'Top X'.

- Timeseries: Provide the user with historical/live time-series graphs of the selected counters for the selected devices/ports.

- Top X: Provides the user with Top X ports by the selected counters (where X is 5, 10, 15, 20).

You can select the members grouping type; Devices or Ports:

Members

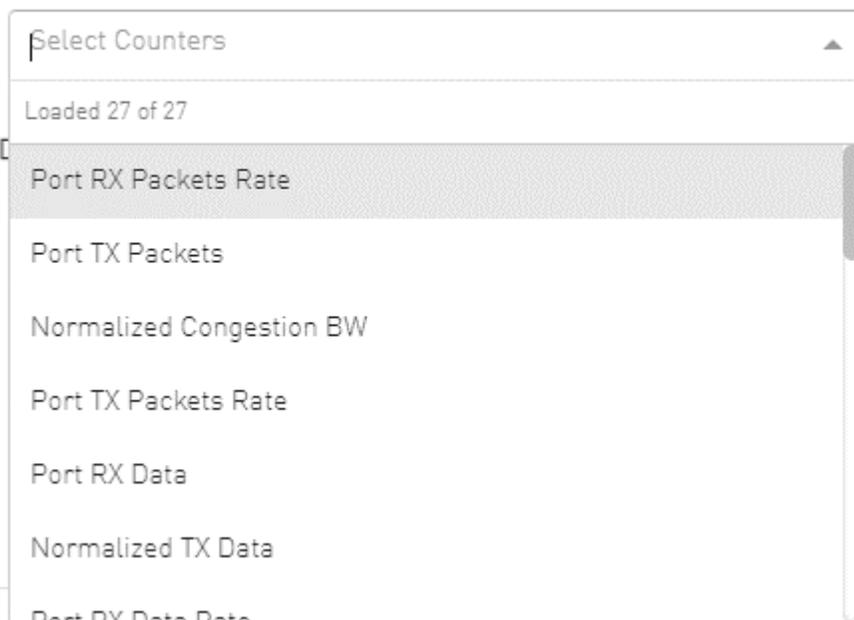


Note

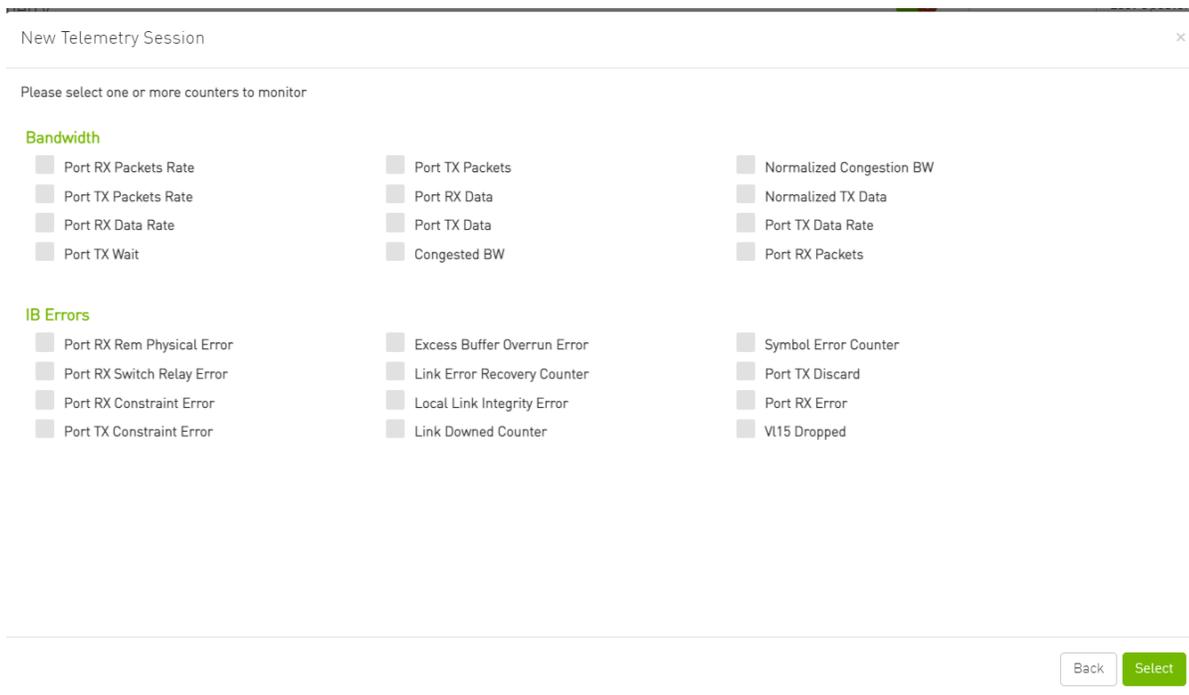
In case the selected telemetry session is Top-X, only the ports are supported.

The user can select one or more counters from the counters dropdown menu:

Counters

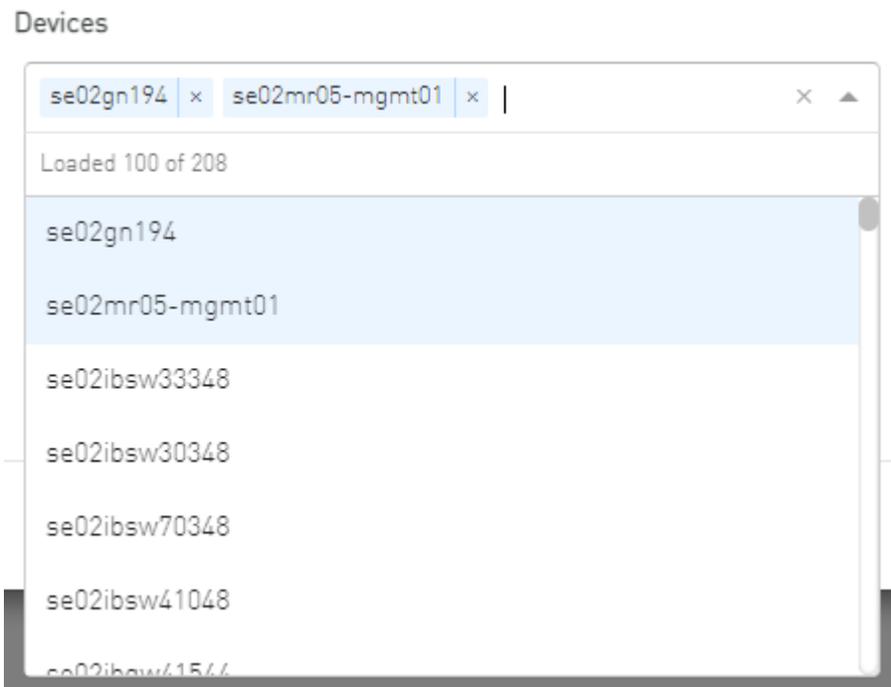


Alternatively, the user can get a full view of all the supported counters and select one or more by clicking on the "All Counters" button:



The user can select one or more devices/ports from the relevant dropdown menu:

- Devices:



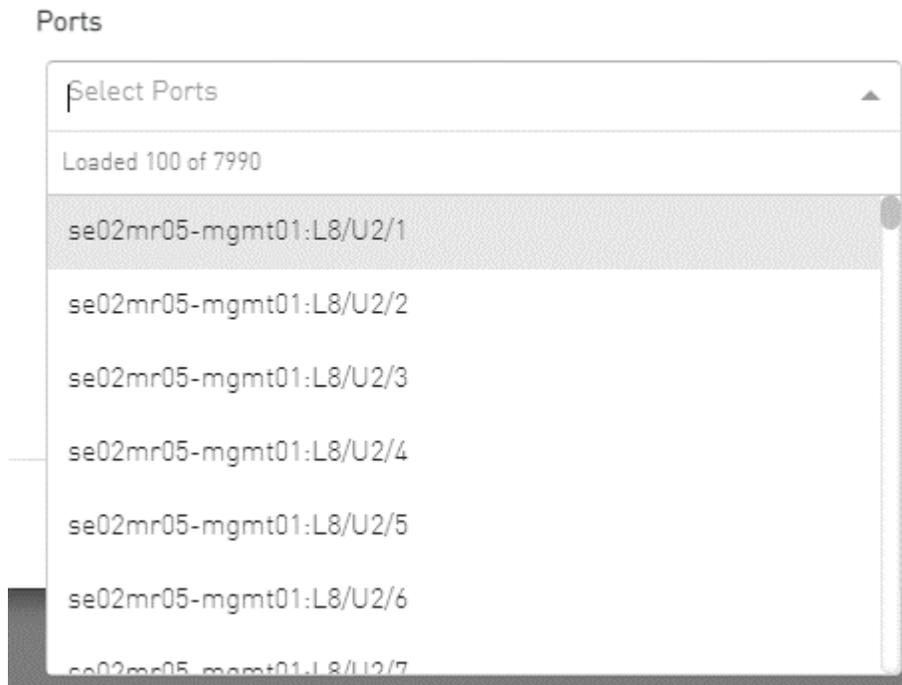
Alternatively, the user can choose to get a full view of the devices by clicking on the "All Devices" button:



com.atlassian.confluence.content.render.xhtml.XhtmlException: Missing required attribute: {http://atlassian.com/resource/identifier}value

- Ports:

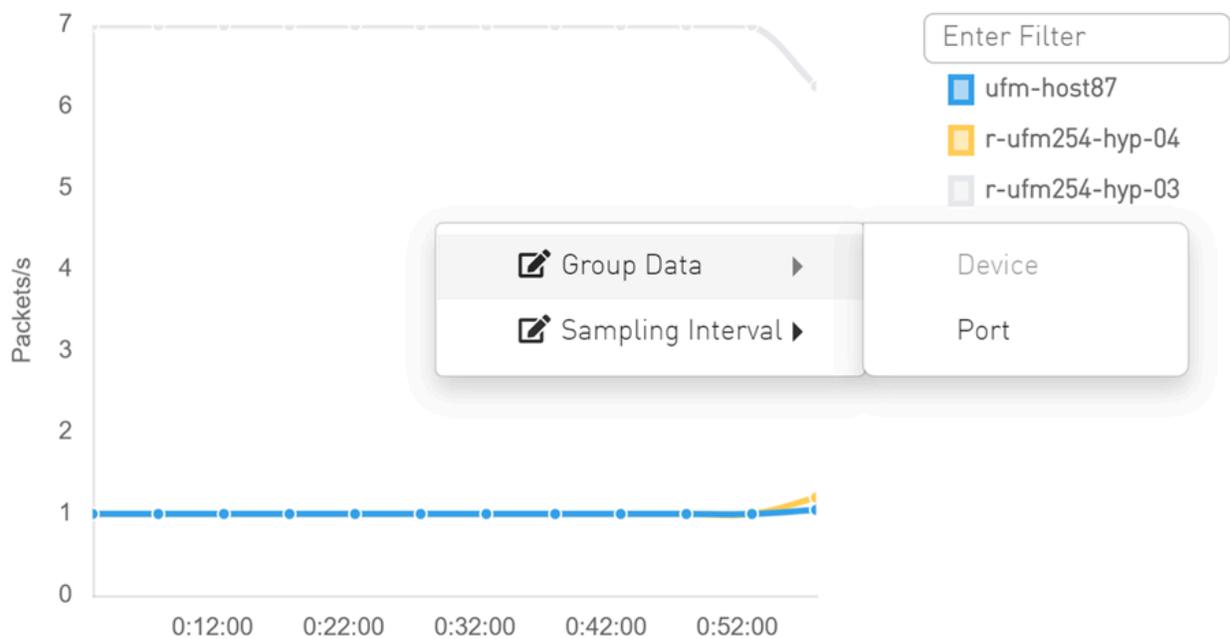
After switching from "Devices" to "Ports," you user can view the ports' dropdown menu:

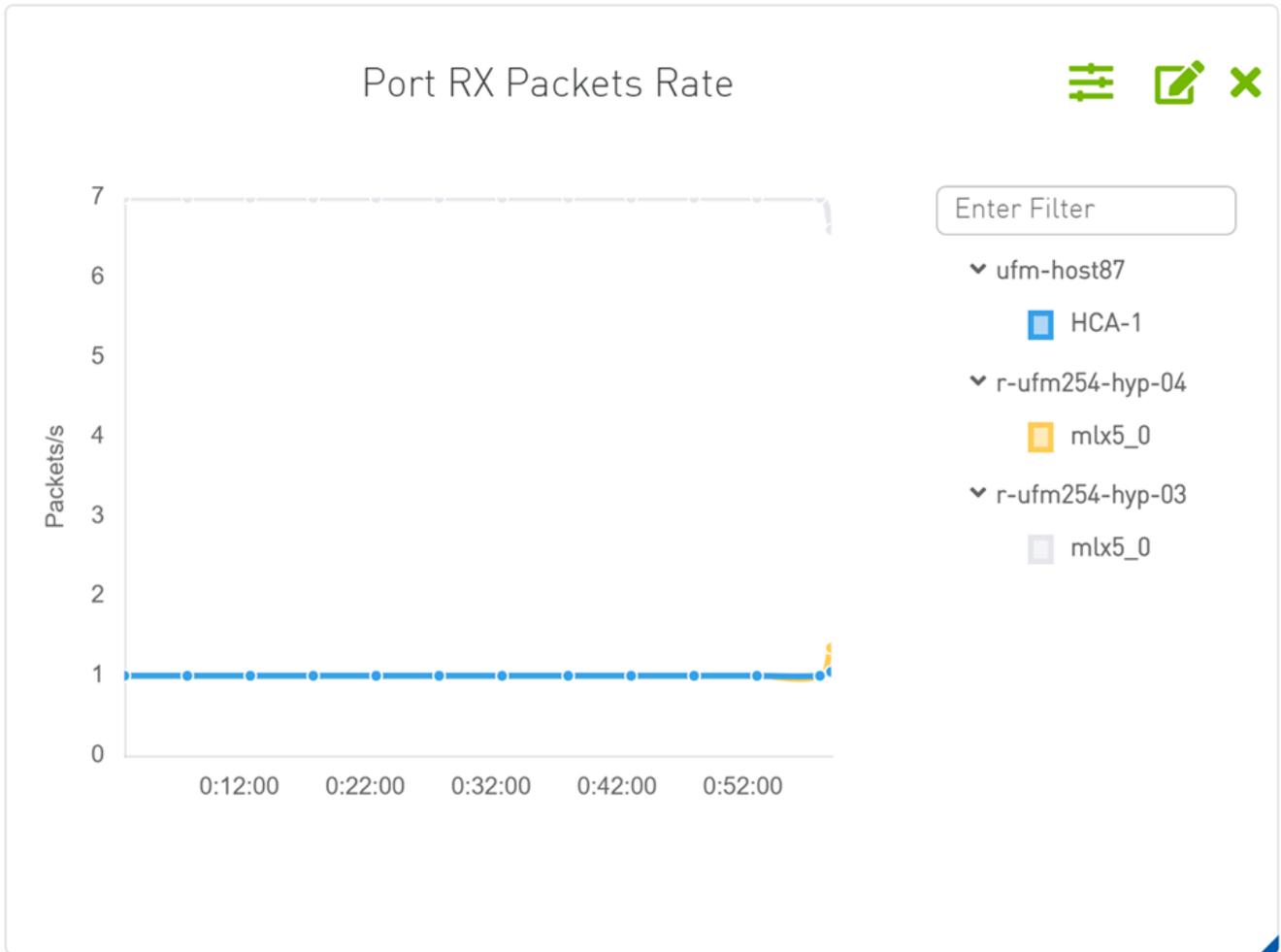


Alternatively, the user can choose to get a full view of the ports by clicking on the "All Ports" button.

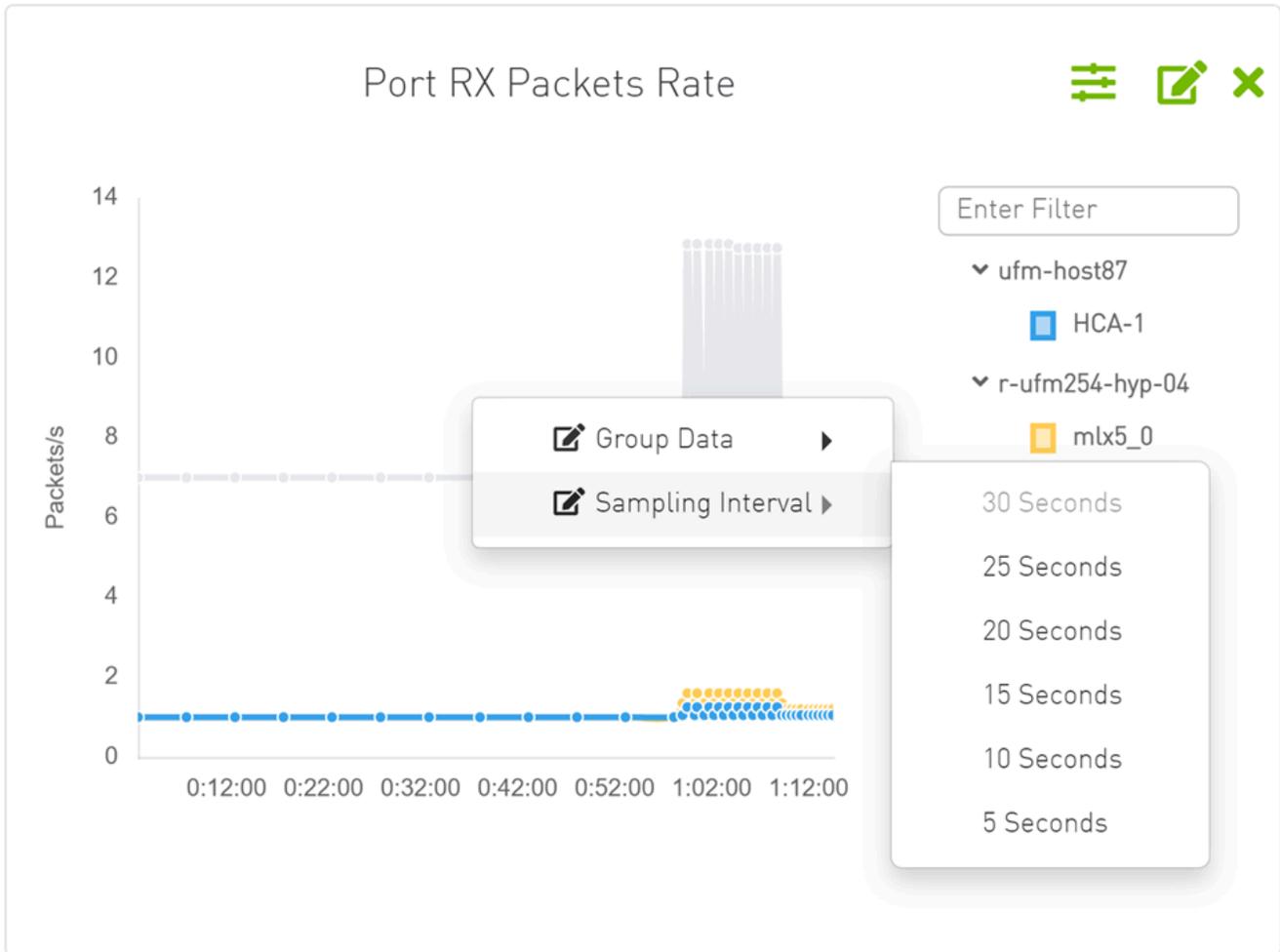
Data aggregation can be changed in the timeseries panel by grouping the members by device or ports; this functionality is an option in the context menu. Therefore, if the timeseries panel is created with the "Devices" members, the panel shows each port in an individual line by right-clicking and then grouping by ports.

Port RX Packets Rate



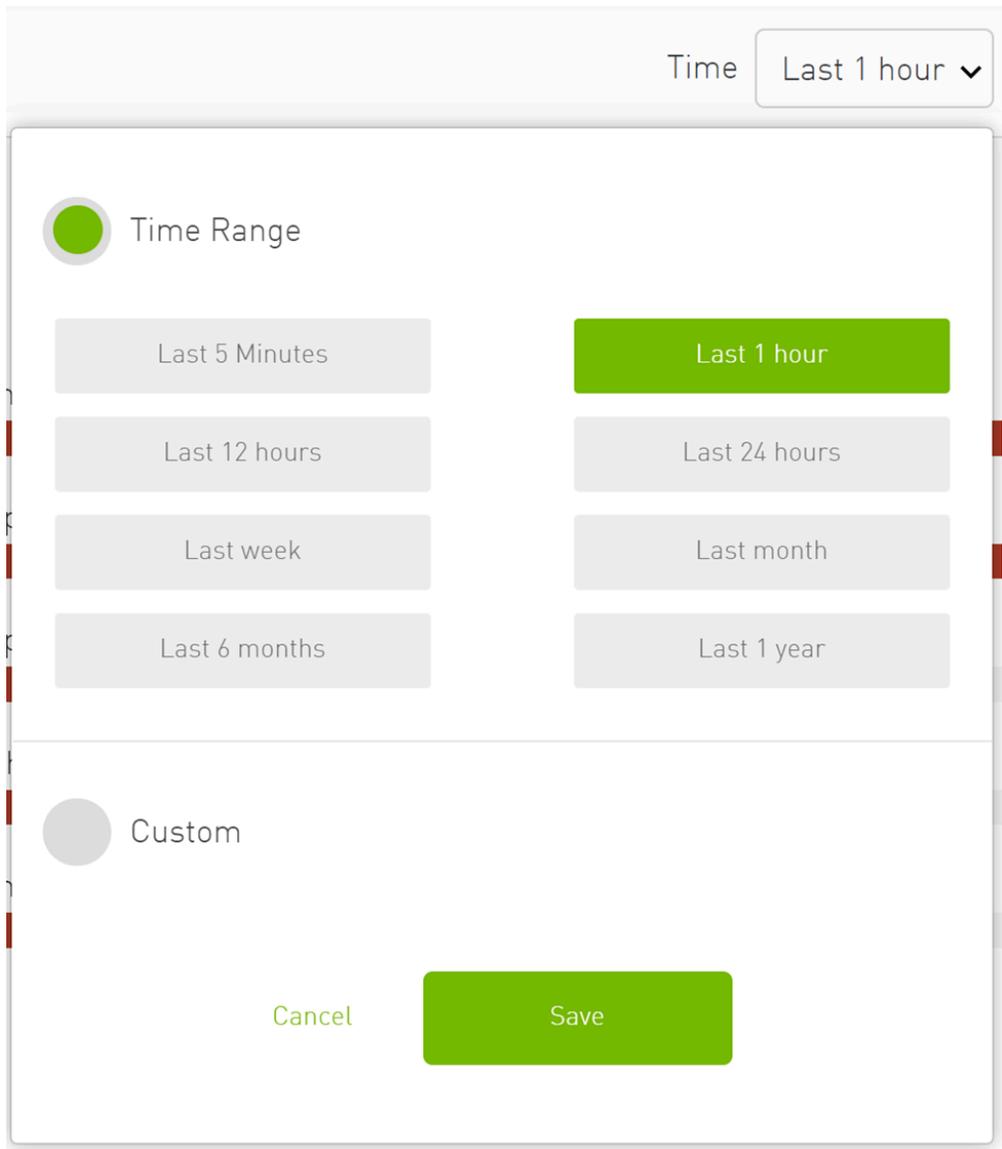


The Telemetry obtains live data from the server's each specific interval which equals the default session interval. The interval can be changed from the sampling rate option in the context menu.

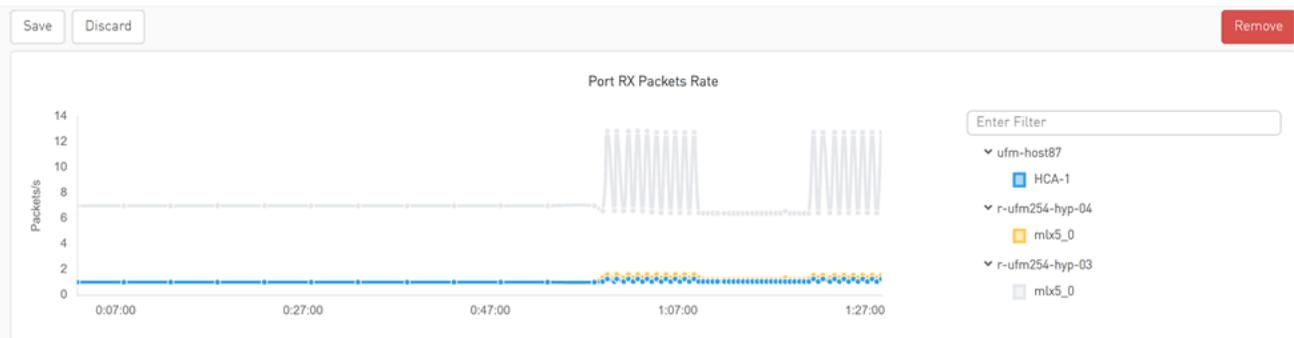
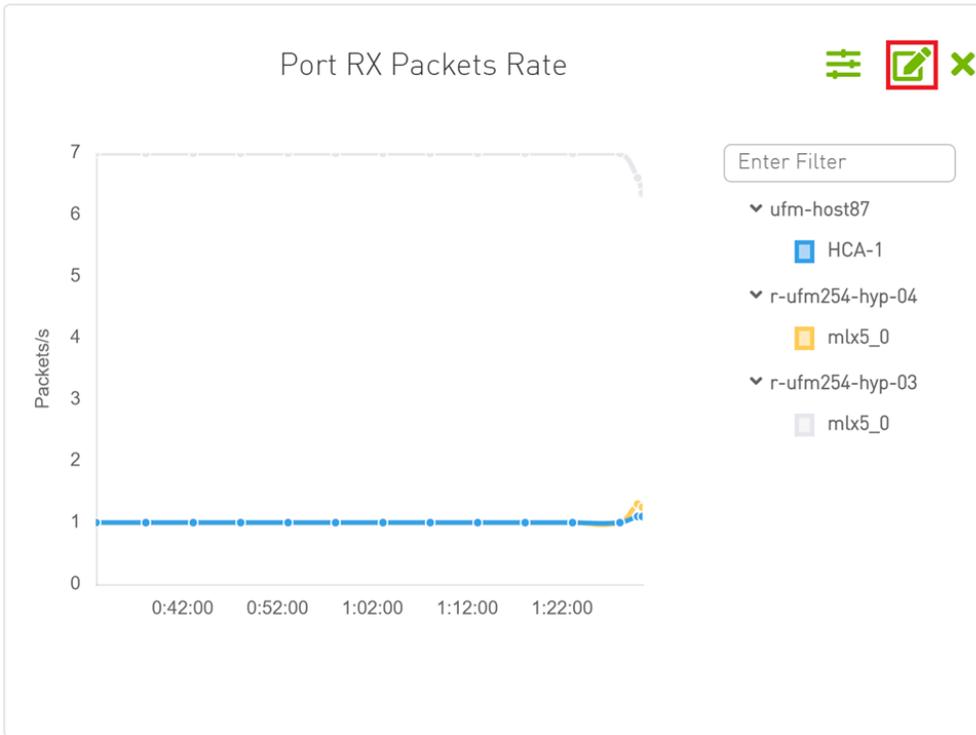


Time Range

The starting time of timeseries panel can be changed from the time calendar at the top of the page, time can be "Time Range" or "Custom". In case the "Custom" option is chosen, only history data is shown.



The panel can be edited by changing members, members' type and grouping. The changes can be discarded or saved. The panel can also be deleted.



Members

-

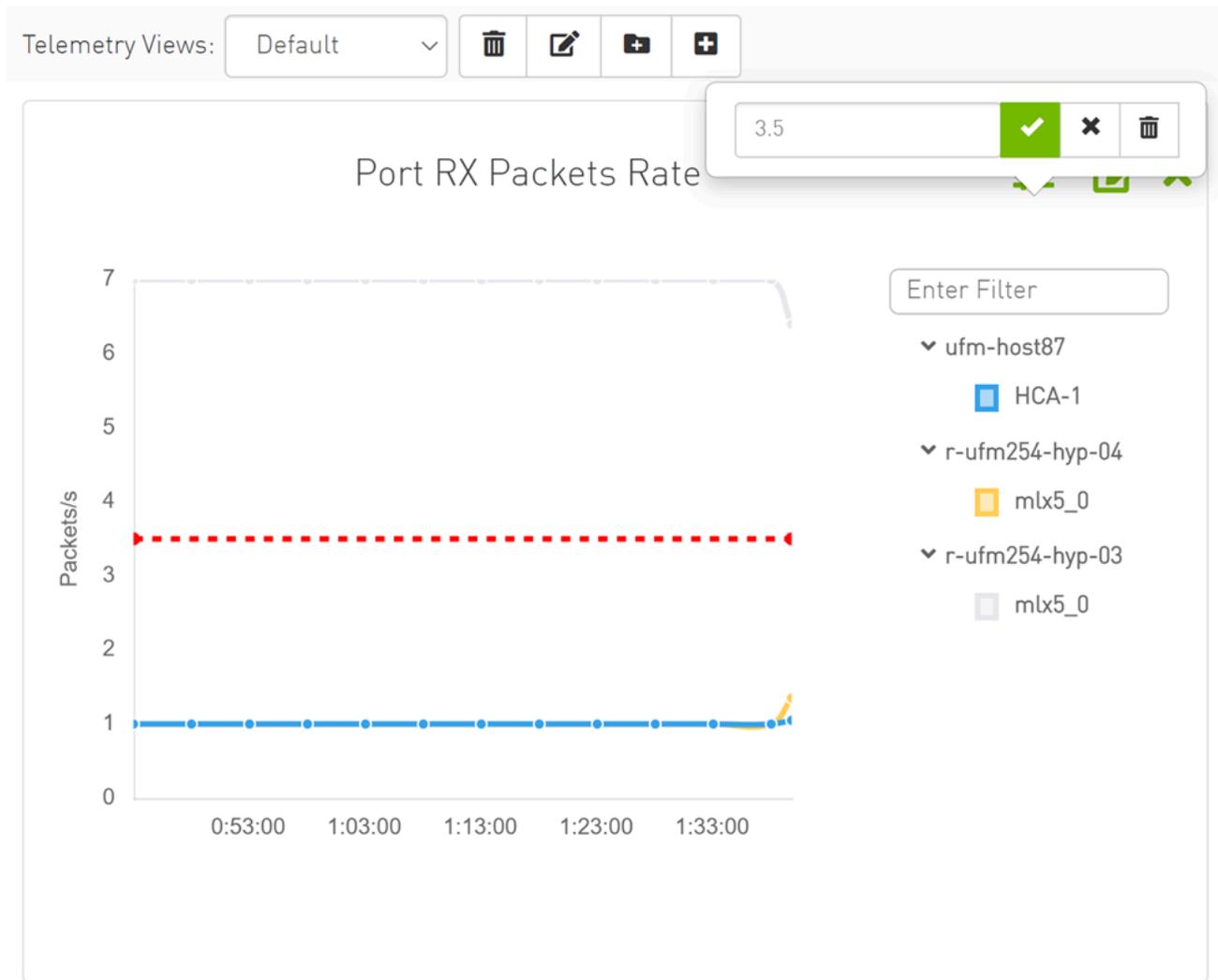
Please select one device or more to monitor

Available Devices		Selected Devices	
Type	Name	Type	Name
host	ufm-host87 <input checked="" type="checkbox"/>	host	ufm-host87
host	r-ufm254-hyp-04 <input checked="" type="checkbox"/>	host	r-ufm254-hyp-04
host	r-ufm254-hyp-03 <input checked="" type="checkbox"/>	host	r-ufm254-hyp-03
switch	sw-hpc62 <input type="checkbox"/>		



Threshold

The threshold is supported in Telemetry as a line drawn at the threshold value.



Add Monitoring Session from Devices Table

In the Devices table, the user can see telemetry data for one or multiple devices as timeseries chart by clicking on the monitoring option in the context menu.

S...	Name	GUID	Type	Model	IP	Firmware Ve...
!	smg-ib-sw032	0x98039b0300...	switch	MQM8700	N/A	27.2000.2046
!	smg-ib-olg001...	0x248a070300...	switch	CS7520	N/A	mismatched
?	smg-ib-sw056	0x900a840300...	switch	MQM9700	N/A	31.2010.2036
!	smg-ib-sw035			MQM8700	N/A	27.2010.2010
!	smg-ib-sw040			MQM8700	10.209.24.57	27.2010.1404
!	smg-ib-sw022			MSB7700	N/A	11.2008.3328
!	smg-ib-sw012			MQM8700	N/A	27.2008.2538
✓	unmanagedEDR			EDR	N/A	15.2008.1604
!	unmanagedHDT			HDR	N/A	27.2008.2402
!	smg-ib-sw036			MQM8700	N/A	27.2010.1404

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System Health

The System Health window enables running and viewing reports and logs for monitoring and analyzing UFM server and fabric health through the following tabs: UFM Health, UFM Logs, UFM Snapshot, Fabric Health, Daily Reports and Topology Compare.

- [UFM Health Tab](#)
- [UFM Logs Tab](#)

- [UFM System Dump Tab](#)
- [Fabric Health Tab](#)
- [Daily Reports Tab](#)
- [Topology Compare Tab](#)
- [Fabric Validation Tab](#)
- [IBDiagnet Tab](#)

UFM Health Tab

Through **UFM Health** tab, you can create reports that run a series of checks on the UFM server.

Each check that is run for a report triggers a corresponding event. Events are also triggered when a report starts and ends. For more information, see [Events & Alarms](#).

To run a new report, click “Run New Report”. Results will be displayed inline automatically.

The screenshot shows the 'System Health' dashboard with the 'UFM Health' tab selected. Below the navigation tabs, there is a 'UFM Health Report' section. It displays the report date as '2020-10-11 17:21:00' and was created by 'admin'. There are three buttons: 'Show Problems Only' (unchecked), 'Expand All', and 'Run New Report'. Below this, a list of seven checks is shown, all with green checkmarks and the status 'Completed Successfully'. Each check has a 'See details below' link with a right-pointing arrow.

Check Name	Status	Action
UFM Configuration	Completed Successfully	See details below >
UFM Processes	Completed Successfully	See details below >
Memory Monitoring	Completed Successfully	See details below >
CPU Monitoring	Completed Successfully	See details below >
Disk Monitoring	Completed Successfully	See details below >
Fabric Interface	Completed Successfully	See details below >
Core Dumps List	Completed Successfully	See details below >

You can expand the results of each check or expand the results of all checks at once by clicking the "Expand All" button.

To view only the errors of the report results, click the "Show Problems Only" checkbox.

The following tables describe the checks included in the report.

UFM Health Report Checks

UFM Configuration	
Check	Description
Release Number	UFM software version and build.
License Type	Type of license, permanent or evaluation.
License Customer Number	The customer number provided by NVIDIA.
License UID	The UFM serial number provided by NVIDIA.
License Expiration Date	License expiration date for limited licenses.
License Functionality	Level of functionality enabled for the end-user, standard or advanced.
License Devices Limit	The maximum number of devices that UFM is licensed to manage. Note that it displays the current active and valid UFM licenses (not the sum of all valid licenses devices)
Running Mode	UFM running mode, Standalone or High Availability (HA). When UFM is in HA mode, additional information is displayed for the master and standby servers.

UFM Processing	
Check	Description
OpenSM	Status of the OpenSM service.
ibpm	Status of the ibpm (Performance Manager) service.
ModelMain	Status of the main UFM service.
httpd	Status of the httpd service.
MySql	Status of the MySql service.

Memory Monitoring	
Check	Description
Total memory usage	Percentage of total memory usage.
UFM memory usage	Percentage of UFM memory usage

CPU Monitoring	
Check	Description
Total CPU Capacity	Percentage of CPU capacity available
CPUs Number	Number of CPUs
Total CPU utilization	Percentage of total CPU utilization.
UFM CPU utilization	Percentage of UFM CPU utilization.

Disk Monitoring	
Check	Description
Disk <diskname>	Percentage of disk usage.

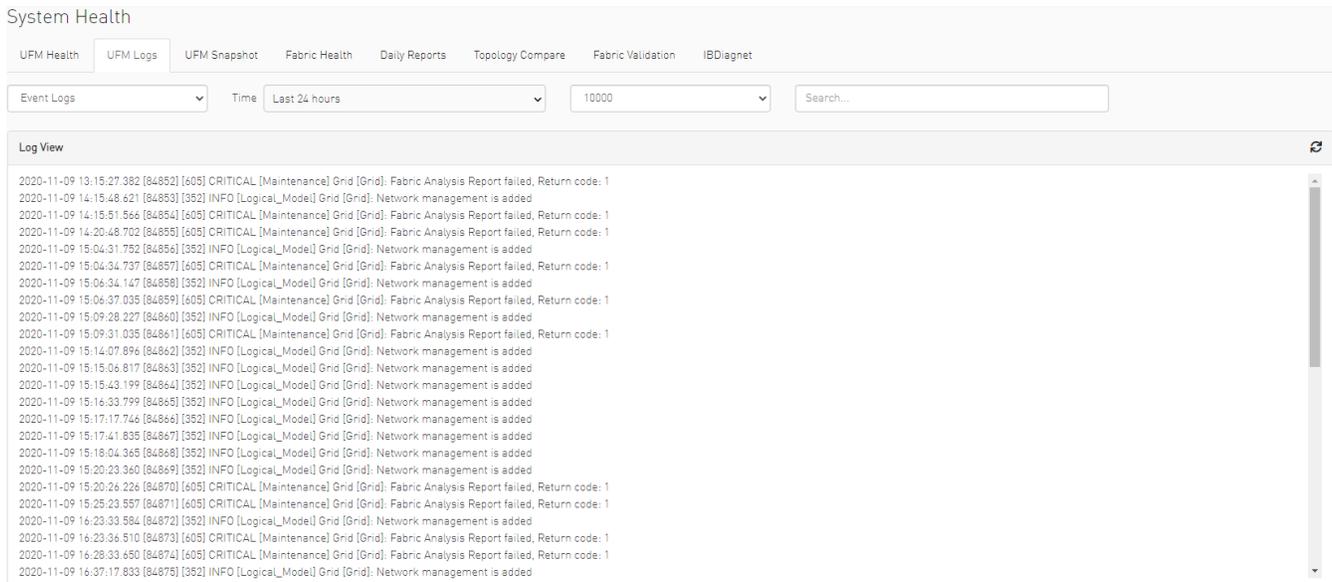
Fabric Interface	
Check	Description
Fabric Interface	Name and state of fabric interface.

UFM Logs Tab

UFM logging records events and actions that can serve to identify fabric and UFM server issues and assist in troubleshooting.

The logs are categorized into three files according to the activities they record: **Event** logs, **SM** logs, and **UFM** logs.

To view the log files, select the desired log file from the drop-down menu. Log data will be displayed:



In the Logs window, you can do the following:

- Refresh the data using the Refresh button on the right-hand side of the screen
- Search for a specific value using the Search bar
- Limit the display to a specific time period using the Time drop-down menu
- Limit the display to a specific number of lines using the drop-down menu (use "All" option to display all lines)
- Control the display of log occurrences by either showing all lines or hiding the duplicated ones.

Event Logs

Event Logs show the history of fabric events detected and initiated by the UFM server. The timestamp and severity of an event is indicated as well as the cause of the event and additional relevant information. *The Event log is kept on the UFM server in the /opt/ufm/log/events.log file.* Events can be configured whether to appear in the log files under the Events Policy tab in the Settings window. For more information, see [Events Policy](#).

See "[Appendix - Supported Port Counters and Events](#)" for a comprehensive list of Events.

Subnet Manager (SM) Logs

SM Logs show messages of the Subnet Manager and communication plug-in.

The log verbosity is defined by selecting the Log Levels in the Subnet Manager tab under Settings window. For more information, see [Subnet Manager Tab](#).

UFM Logs

UFM Logs is a general log of UFM Server. The log saves a history of user actions, events, polling results and other server activities and errors. Log verbosity is defined on start-up in the configuration file `/opt/ufm/conf/gv.cfg`:

```
[Logging]
# optional logging levels
#CRITICAL, ERROR, WARNING, INFO, DEBUG
level = WARNING
```

The default verbosity level is WARNING.

UFM System Dump Tab

You can export and save UFM database information, configuration and log files in a predefined location allowing you to create full system dump before upgrading, or for NVIDIA Enterprise Support.

By default, the system dump includes UFM database, UFM configuration, machine configuration and log files. You can also save troubleshooting information to send the required information for debugging with NVIDIA Enterprise Support. The additional troubleshooting information includes system snapshot files, system configurations and UFM reports.

To create a system dump, click the “Create System dump” button.

To extend the troubleshooting information for debugging purposes, check the "Include Troubleshooting" Information checkbox.



UFM will create the system dump and save the data to the predefined location. By default, the system dump files are stored under `/opt/ufm/backup` directory. You can change the location of the system dump files in the `gv.cfg` configuration file in the backup folder location section.

For example:

```
#backup folder location
backup_folder=/opt/ufm/backup
```

In addition, if you did not switch from the tab, once the system dump creation process is complete, a download link will be available for downloading the system dump file directly to the user's machine, as shown in the below example:



The `ufm_sysdump` script can be employed to extract UFM system information. The script is located in diverse locations depending on the UFM installation method.

The `ufm_sysdump` can be run without any arguments. The default location of the script output depends on the installation method. To change the default location of the script output, add the `-o` argument and specify the desired script location (e.g. `ufm_sysdump -o <output location >`).

Additionally, the UFM script gathers the Cyber-AI and HA modules system dump output and stores it in the same tar file.

Location of the `ufm_sysdump` script is as follow:

- On baremetal/HA master or standby Modes: `/usr/bin/ufm_sysdump.sh`
- Standalone Mode: it is located in `/opt/ufm/files/scripts/ufm_sysdump.sh`

The default script output location:

- Baremetal Mode: backup folder `/opt/ufm/backup`
- Standalone Mode: backup folder inside the docker. Additionally, the working directory has been established for easier copying of the results
- HA master and standby Modes: `/tmp` folder

Fabric Health Tab

Through **Fabric Health** tab, you can create reports that run a series of checks on the fabric.

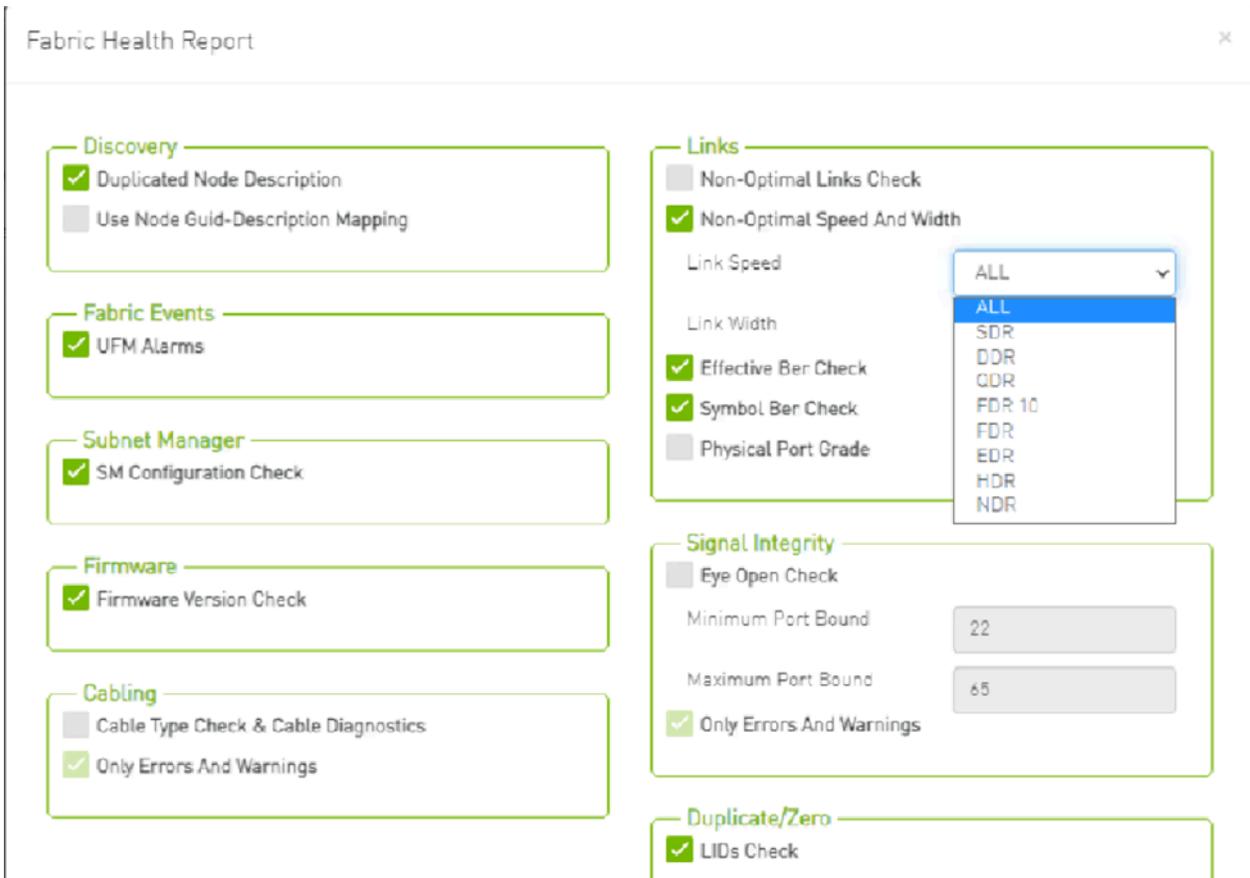
Each check that is run for a report triggers a corresponding event. Events are also triggered when a report starts and ends. For more information, see [Events & Alarms](#).

➤ **To run a new report, do the following:**

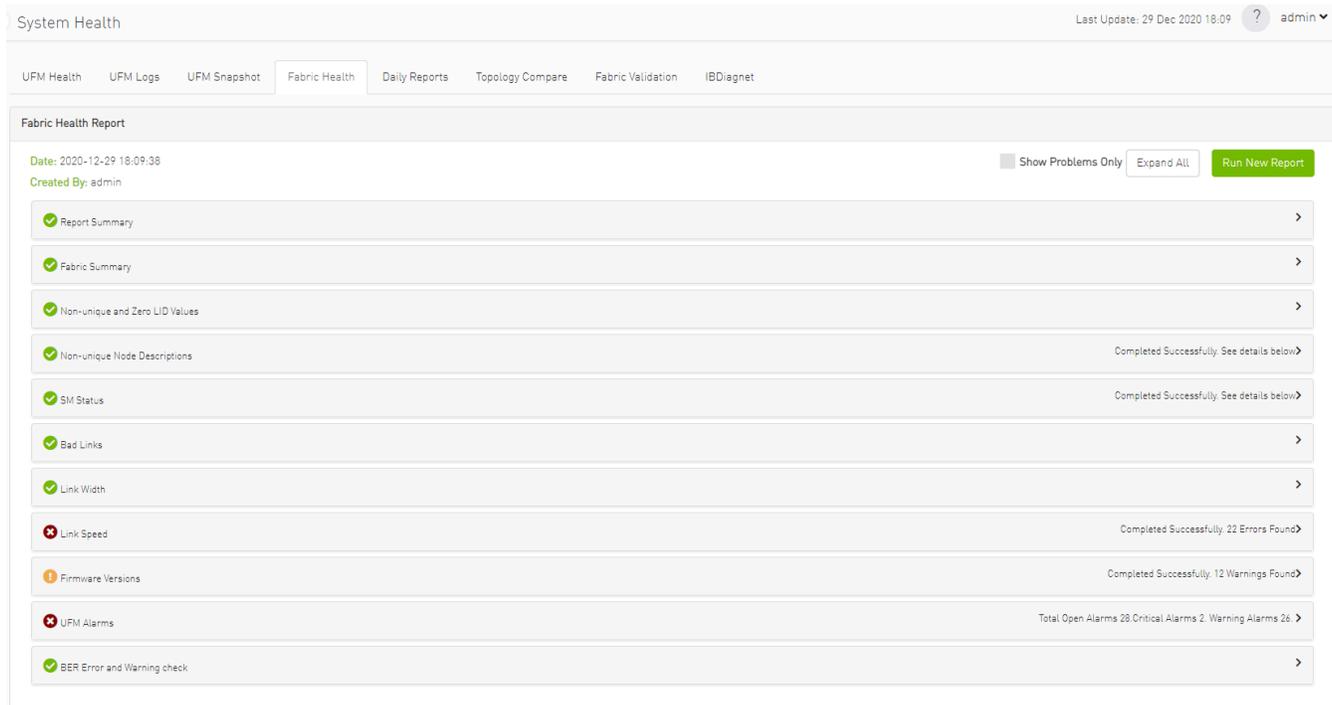
1. Click “Run New Report.”



2. Select the desired fabric health checks to run in the Fabric Health Report window and click “Run Report.”



Results will be displayed automatically:



The report displays, the following:

- A report summary table of the errors and warnings generated by the report.
- A fabric summary of the devices and ports in the fabric.
- Details of the results of each check run by the report.

You can expand the view of each check or expand the view of all checks at once by clicking "Expand All."

To view only the errors of the report results, click the "Show Problems Only" checkbox.



The following table describes the checks included in the report.

Fabric Health Report Checks

Check	Description	To run, select:
Duplicate/Zero LID Check	Lists all ports with same LID or zero LID value.	LIDs Check Default: Selected
Duplicated Node Description	Lists all nodes with same node description. Does not include switches with the same description.	Duplicated Node Description Default: Selected
Use Node GUID-Description Mapping	Enables the usage of a mapping file (between node GUID and node description) when running duplicate node description analysis of the fabric. This file is located on the UFM server side at: <i>/opt/ufm/conf/sm_guid_desc_mapping.cfg</i> , and	Use Node GUID-Description Mapping Default: Unchecked Note: In order for this checkbox to be available, the Duplicated Node Description checkbox should also be selected. Otherwise, this checkbox will be greyed-out.

Check	Description	To run, select:
	uses the following format (node_guid → description): <i>0x248a070300702710</i> <i>"Desc1"</i> <i>0x248a0703007026f0</i> <i>"Desc2"</i> <i>0x0002c90300494100</i> <i>"Desc3"</i>	
SM Check	Checks that: <ul style="list-style-type: none"> • There is one and only one active (master) Subnet Manager in the fabric. • The master is selected according to highest priority and lowest port GUID. The report lists all SMs in the fabric with their attributes.	SM Configuration Check Default: Selected
Bad Links Check	Performs a full-fabric discovery and reports "non-responsive" ports with their path.	Non-Optimal Links Check Default: Selected
Link Width	Checks if link width is optimally used. <ul style="list-style-type: none"> • When a width is selected, the report lists the active links that do not meet the optimum for the selection. • When no width is selected (All), the test checks whether the enabled width 	None-Optimal Speed and Width Default: Selected Link Width: The default is ALL.

Check	Description	To run, select:
	<p>on both sides of the link equals the configured maximum (confirms that auto-negotiation was successful).</p>	
Link Speed	<p>Checks if link speed is optimally used.</p> <ul style="list-style-type: none"> • When a speed is selected, the report lists the active links that do not meet the optimum for the selection. • When no speed is selected (All), the test checks whether the enabled speed on both sides of the link equals the configured maximum (confirms that auto-negotiation was successful). 	<p>None-Optimal Speed and Width Default: Selected Link Speed: The default is ALL.</p>
Effective Ber Check	<p>Provides a BER test for each port, calculates BER for each port and check no BER value has exceeded the BER thresholds. In the results, this section will display all ports that has exceeded the BER thresholds. Note that there are two levels of threshold: Warning threshold (default= 1e-13) and Error threshold (default= 1e-8).</p>	<p>Effective Ber Check Default: Selected</p>

Check	Description	To run, select:
Effective Port Grade	Provides a grade per port lane in the fabric, which indicates the current port lane quality.	Physical Port Grade Default: Not Selected
Firmware Check	Checks for firmware inconsistencies. For each device model in the fabric, the test finds the latest installed version of the firmware and reports devices with older versions.	Firmware Version Check Default: Selected
Eye Open Check	(For QDR only) Lists Eye-Opener information for each link. When minimum and maximum port bounds are specified, the report lists the links with eye size outside of the specified bounds.	Eye Open Check Default: Selected Minimum and Maximum port bound: By default no bounds are defined.
Cable Information	Reports cable information as stored in EPROM on each port: cable vendor, type, length and serial number.	Cable Type Check & Cable Diagnostics Default: NOT selected because this test might take a long time to complete (40 msec per port)
UFM Alarms	Lists all open alarms in UFM.	UFM Alarms Default: Selected

Daily Reports Tab

The Daily Report feature collects, analyzes, and reports the most significant issues of the fabric in the last 24 hours (from 00:00 to 24:00). The reports present statistical information such as Summary of Traffic, Congestions and UFM events that occurred during the last 24 hours. These statistics are sent to a pre-defined recipients list on a daily basis. It is also possible to specify a non-24-hour range, by updating the UFM configuration file—see section [Other Daily Report Configurations](#) for details.

The following are the formats of the Daily Report:

- Interactive—opened via the browser. The charts are displayed in SVG format. This format can be accessed from the UFM Web UI and is also sent by email as an attachment (see [Daily Report View in the Web UI](#) section below).
- Static—opened via mail client (Outlook, Gmail, Hotmail, etc). The charts are displayed in PNG format.

Activating and Deactivating the Daily Report

Daily Report can be activated/deactivated via the `/opt/ufm/conf/gv.cfg` file.

Note

Daily Reports mechanism is activated by default.

To deactivate the Daily Report, do the following:

1. Open the `/opt/ufm/conf/gv.cfg` file.
2. Find the DailyReport section.
3. Set the `daily_report_enabled` option to false.

```
daily_report_enabled = false
```

To re-activate the Daily Report:, do the following:



1. Open the `/opt/ufm/conf/gv.cfg` file.
2. Find the DailyReport section.
3. Set the `daily_report_enabled` option to true.

```
daily_report_enabled = true
```

Saving Daily Reports

UFM saves the interactive Daily Reports under the `/opt/ufm/files/reports/Daily` directory. Each report will be saved under a directory with its respective date. For example, report for Sept. 28th, 2014 will be located under: `/opt/ufm/files/reports/Daily/2014-09-28/` By default, the maximum number of reports that will be saved is 365 (one per day).

To configure the maximum number of reports to save, do the following:



1. Open the `/opt/ufm/conf/gv.cfg` file.

2. Find the DailyReport section.

3. Set the `max_reports` option to the desired value. A count of 0 (zero) means no copies are retained. (default and max is 365).

4. Restart UFM.

Other Daily Report Configurations

All the Daily Report configuration parameters can be found in the "DailyReport" section in `gv.cfg` configuration file.

The following are additional Daily Report configurations options:

- `top_x` option specifies the number of results in the "Top X" charts. Max number can be 20. (Default value is 10). `top_x` value will be applied to all charts existing in the Daily Report.
- `mail_send_interval` option specifies the epoch in minutes after midnight that the report can be emailed. By default, if UFM was down during midnight, and was restarted after 1:00, the report of the previous day will be generated and saved, but will not be emailed. This can be changed by editing the `mail_send_interval`. (default value is 60 minutes, meaning that the report will be send only between 00:00 to 1:00).

- `log_level` option specifies the Daily Report log verbosity. Default value is INFO (optional values: INFO, WARNING and ERROR).
- `attach_fabric_health_report` option indicates whether or not to add the fabric health report as attachment to the mail. Default value is true (optional values: true or false).
- `fabric_health_report_timeout` specifies the max time in seconds, to wait for fabric health report generation. Default value is 900 seconds (15 minutes).

In case of large fabrics, fabric health report might take longer than the default 15 minutes. User can enlarge the timeout for fabric health report to complete.

- **`max_attached_file_size`** specifies the maximum file size in Bytes for each email attachment that can be sent. Default value is 2 Megabytes.

If the size of a certain file has exceeded this value, the file will not be sent as an attachment in the Daily Report mail.

```
[DailyReport]
# top_x specifies the number of results per each top x chart.
# max number can be 20.(default is 10)
top_x=10
# max_reports specifies the number of reports to save.
# A count of 0 (zero) means no copies are retained.(default and
max is 365)
max_reports = 365
#time interval in minutes after midnight
#when passed mail will not be sent
mail_send_interval=60
log_level = INFO
daily_report_enabled = true
attach_fabric_health_report = true
fabric_health_report_timeout = 900
# max attached file size in bytes, default is 2M (2097152 Bytes)
max_attached_file_size = 2097152
```

- **`max_attached_file_size`** specifies the maximum file size in Bytes for each email attachment that can be sent. Default value is 2 Megabytes.

- The **start_hour** and **end_hour** options enable selecting a sub-range of the day, during which, the relevant report data will be collected. Since by default this option is configured to collect data from the last 24 hours, the default start_hour is set to 0 (or 00), and the default end_hour is set to 24.

If these options are configured to different values, the generated report will include data from the specified interval only. The start_hour values range is 00 to 23, and the end_hour values range is 00 to 24. The specified end_hour must be greater than the specified start_hour. If, for example, the start_hour is configured to 08, and the end_hour is configured to 10, the generated report will include data collected between 08:00-10:00 (excluding 10:00).

Report Content

Sidebar

The Sidebar includes general information regarding the fabric, such as: the site name, number of switches and hosts in the fabric, and the dates on which the report was generated.

Navigation between the charts can be done via the menu charts on the sidebar.

Fabric
Events (by severity)
Normalized Traffic and Congestion
Hosts Utilization
Most active events
Hosts
Top Senders (Hosts only)
Hosts with most events
Hosts with most critical events
Most congested hosts
Hosts with most link down events
Switches
Switches with most events
Switches with most critical events
Most congested switches
Switches with most link down events

Daily Report Highlights

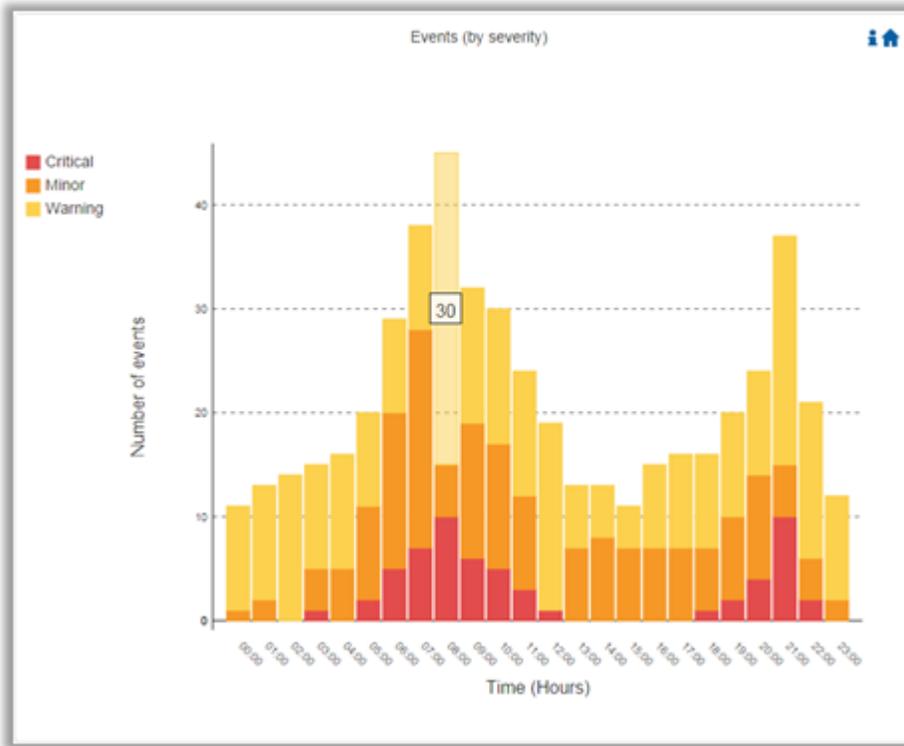
The top of the report shows highlight activities of the network, such as: the host with the most events, the most congested host and switch, and top sender host. To see the related chart of each highlight, click the corresponding  icon in the "Link to chart" column.

Highlights		
	Highlight	Link to chart
Switch with most events	'switch-630744'	
Host with most events	'r-ufm135 HCA-1'	
Total events during the last 24 hours	total: 110973, critical events: 14877, warning events: 14784, minor events: 81312.	
Most congested host	'r-ufm87 HCA-1' (20.0% congestion)	
Top sender host	'r-ufm86 HCA-1' (46.0% BW and 0% congestion)	
Highest traffic patterns	Highest traffic hour: 09:00-10:00 (46.0% BW), Most congested hour: 23:00-24:00 (10.0% congestion)	
Number of unhealthy ports	0	N/A

Available Charts

Events by Severity

Events by Severity displays in a graphical view the distribution of all the UFM events that occurred during each hour. Events are separated into the following severity levels: Critical, Minor, and Warning.



Note

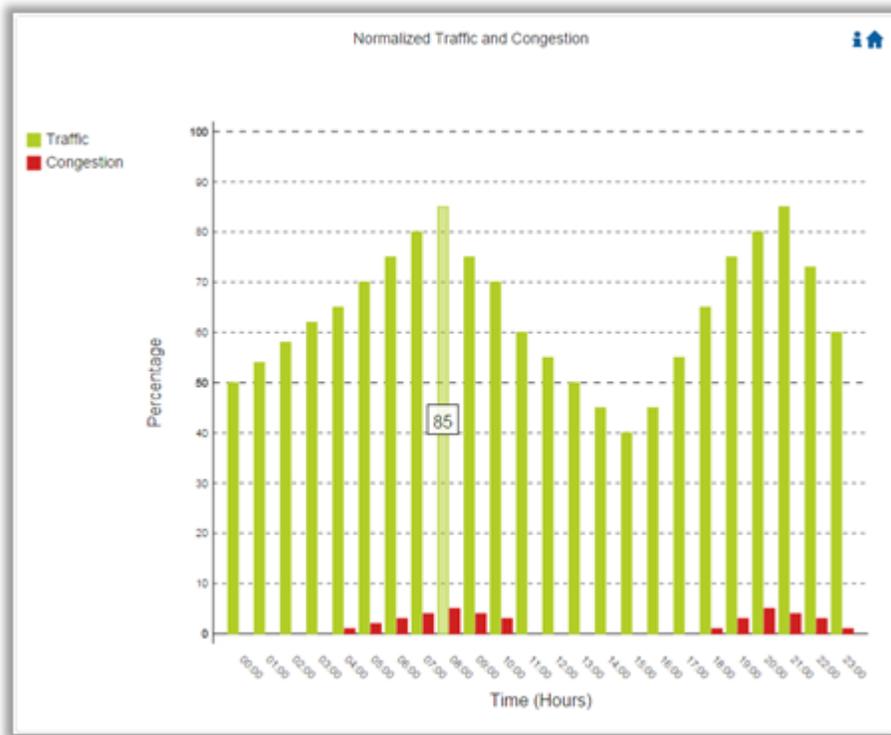
Hovering over the bars in the interactive report displays the amount of events per hour.

Normalized Traffic and Congestion

Normalized Traffic and Congestion displays in a graphical view the normalized traffic and congestions of the fabric. This graph displays the accumulated data for the Senders in the fabric (not including switches).

Congestion normalization is based on the number of delayed packets (packets that wait in the queue) and bandwidth loss.

The graph displays the percentage of the traffic utilization in green and the percentage of the congestion in red.



Note

Hovering over the bars in the interactive report displays the percentage of the traffic/congestion per hour.

Hosts Utilization Distribution

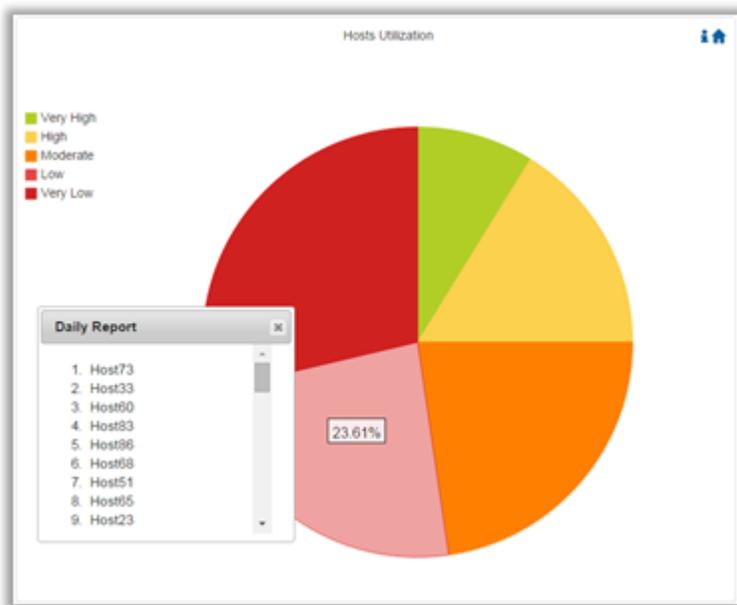
Hosts Utilization Distribution displays in a graphical view the groups of hosts, where each host belongs to a specific group according to its utilization status.

To see the hosts in each group, click on the pie chart (at the interactive report).

The utilization groups are:

- Very low—up to 20% utilized
- Low—20–40% utilized

- Moderate—40–60% utilized
- High—60–80% utilized
- Very high—80–100% utilized

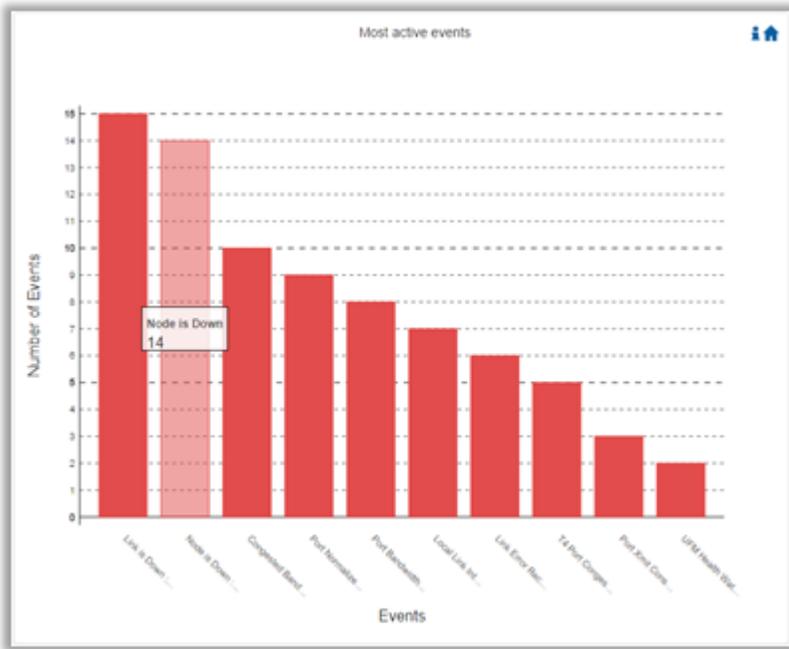


i Note

Hovering over the slices in the interactive report displays the percentage of hosts in this group.

Most Active Events

Most Active Events displays in a graphical view the most active events, ordered by the number of occurrences during the last 24 hours.



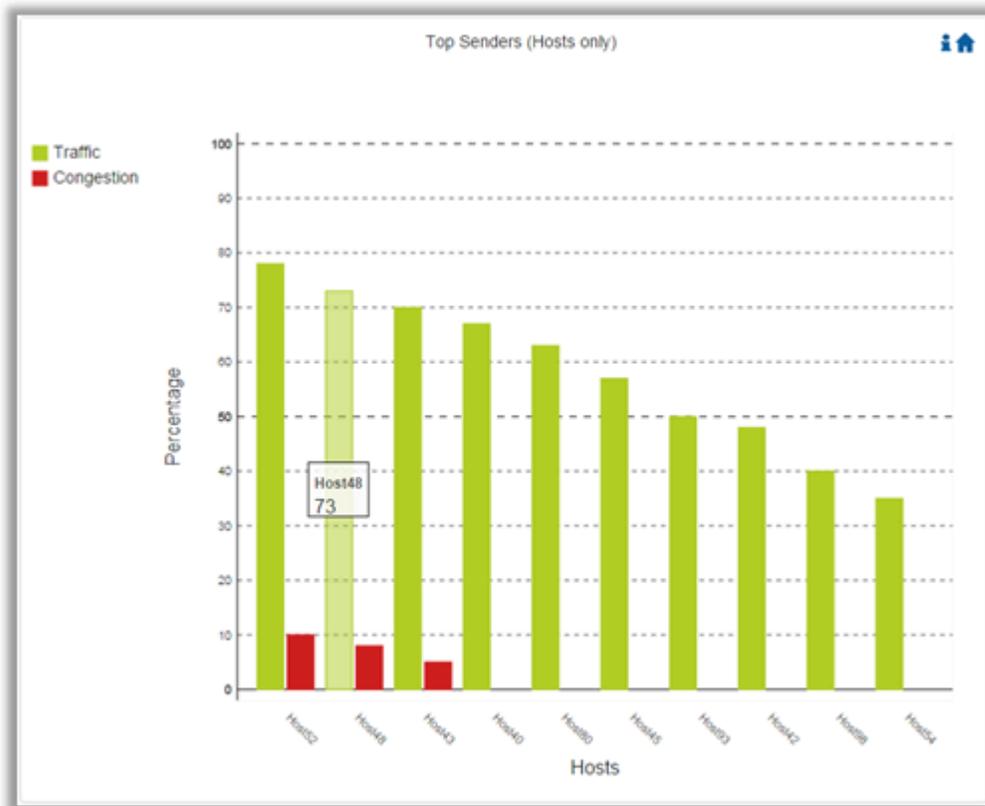
Note

Hovering over the bars in the interactive report displays the number of occurrences for each active event, and hovering on each event’s name displays a tooltip with the event’s description.

Top Senders

Top Senders displays in a graphical view the normalized traffic and congestions of the top sender hosts. Congestion normalization is based on the number of the delayed packets (packets that wait in queue) and bandwidth loss.

The graph displays the percentage of the traffic utilization in green and the percentage of the congestion in red.

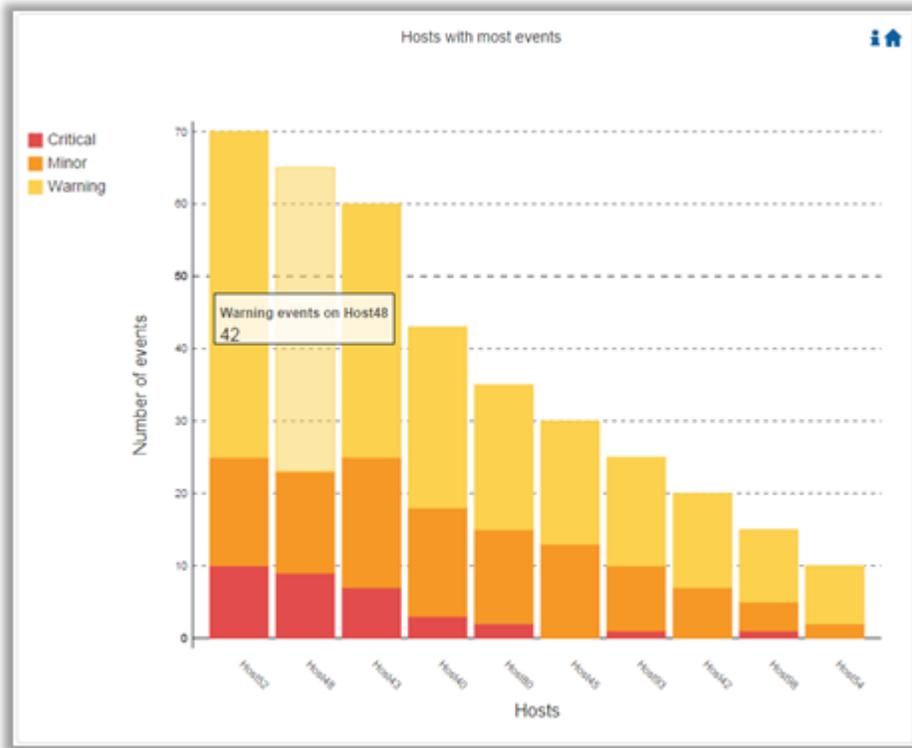


Note

Hovering over the bars in the interactive report displays the percentage of the traffic/congestion for a selected host.

Hosts with Most Events

Hosts with Most Events displays in a graphical view the hosts with the most events. Events are separated into the following severity levels: Critical, Minor, and Warning.

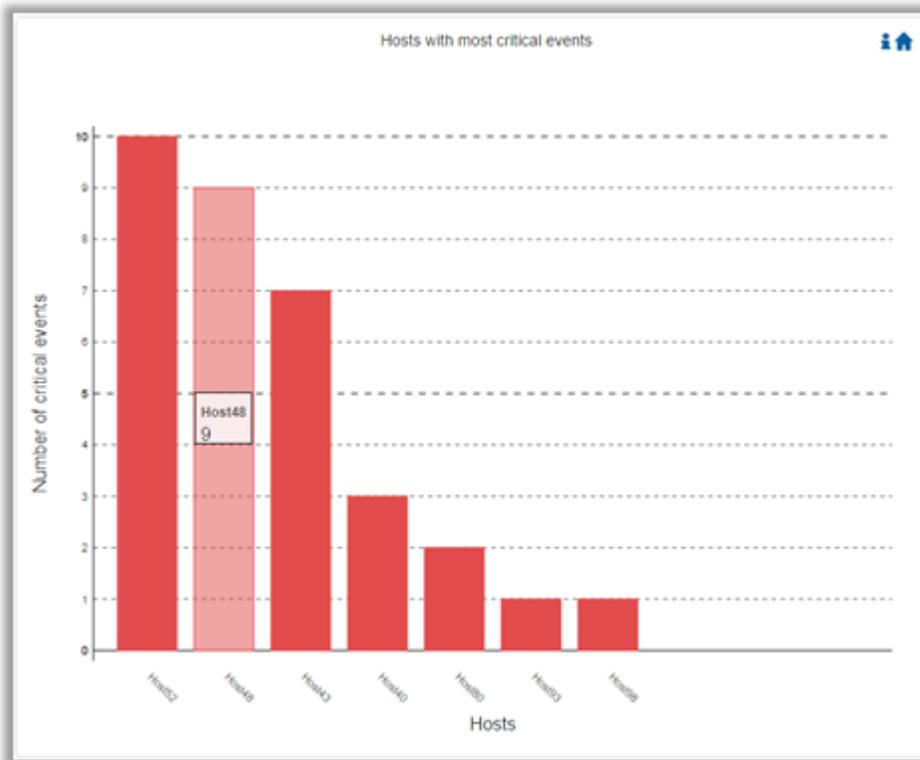


Note

Hovering over the bars in the interactive report displays the amount of events per severity for a selected host.

Hosts with Most Critical Events

Hosts with Most Critical Events displays in a graphical view the hosts with the most critical events.

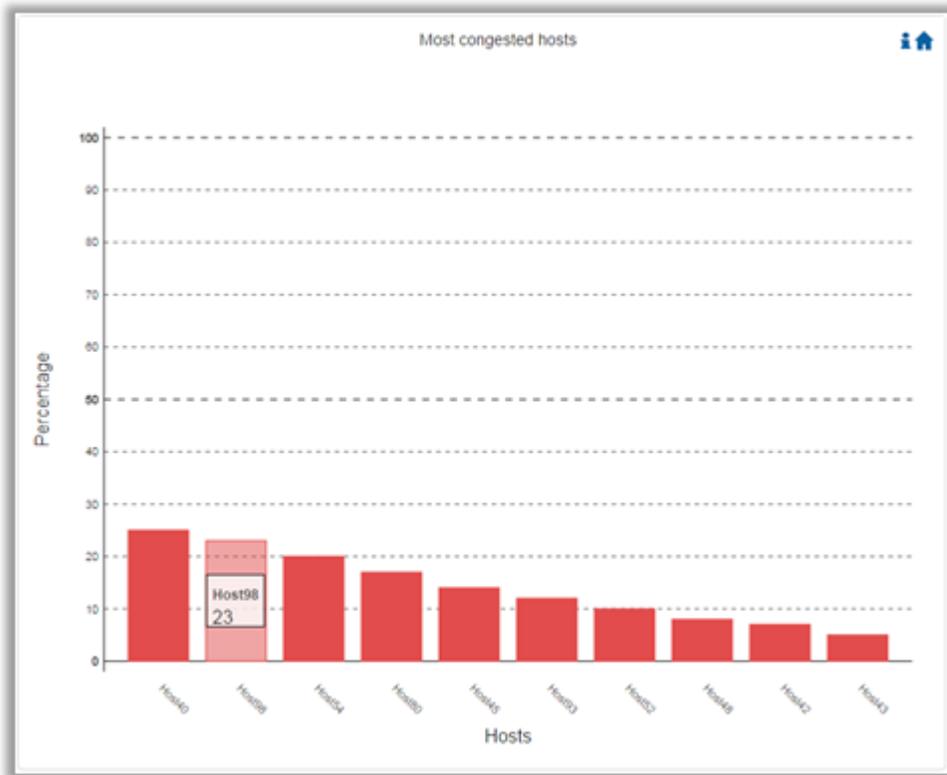


Note

Hovering over the bars in the interactive report displays the amount of critical events for a selected host.

Most Congested Hosts

Most Congested Hosts displays in a graphical view the normalized congestions of the most congested hosts. Congestion normalization is based on the number of the delayed packets (packets that wait in queue) and bandwidth loss.

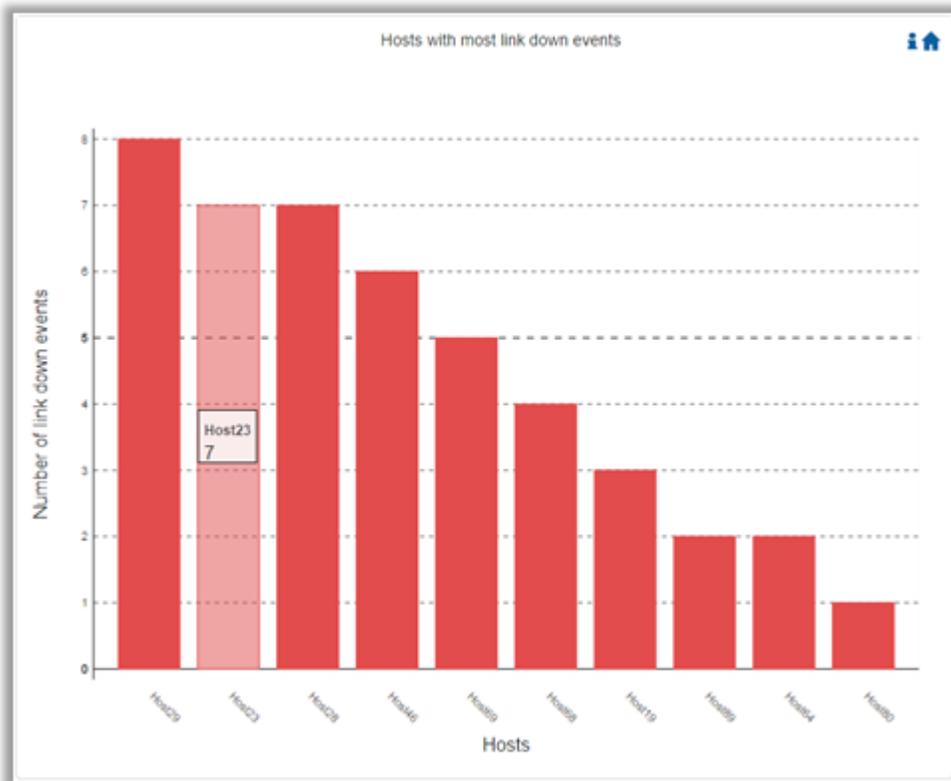


Note

Hovering over the bars in the interactive report displays the percentage of the congestion for a selected host.

Hosts with Most Link Down Events

Hosts with Most Link Down Events displays in a graphical view the list of the hosts with the most link down events during the last 24 hours.

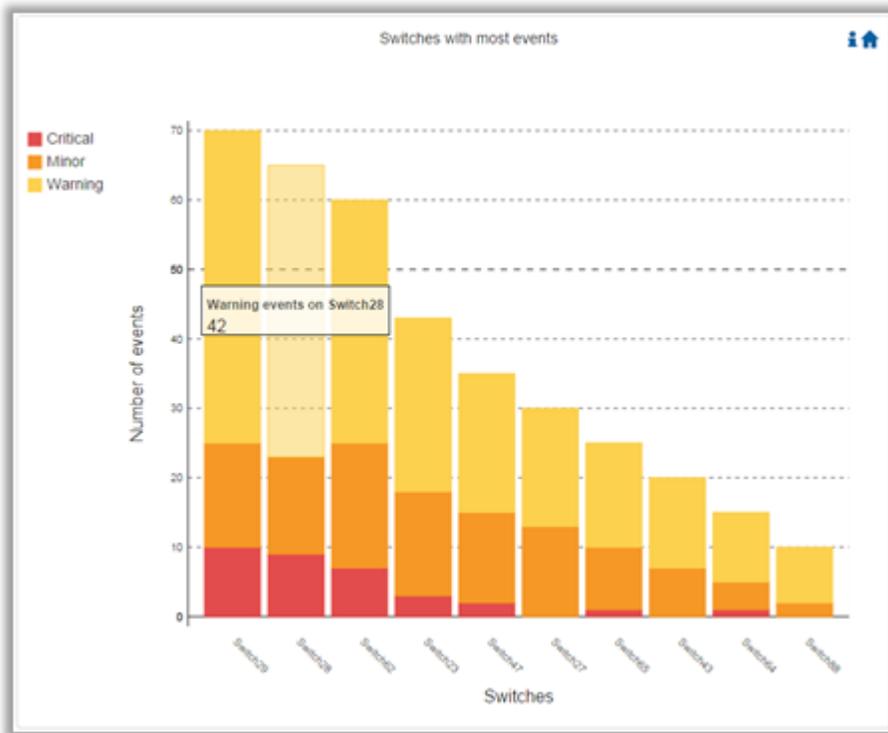


Note

Hovering over the bars in the interactive report displays the amount of link-down events for a selected host.

Switches with Most Events

Switches with Most Events displays in a graphical view the switches with the most events. Events are separated into the following severity levels: Critical, Minor, and Warning.

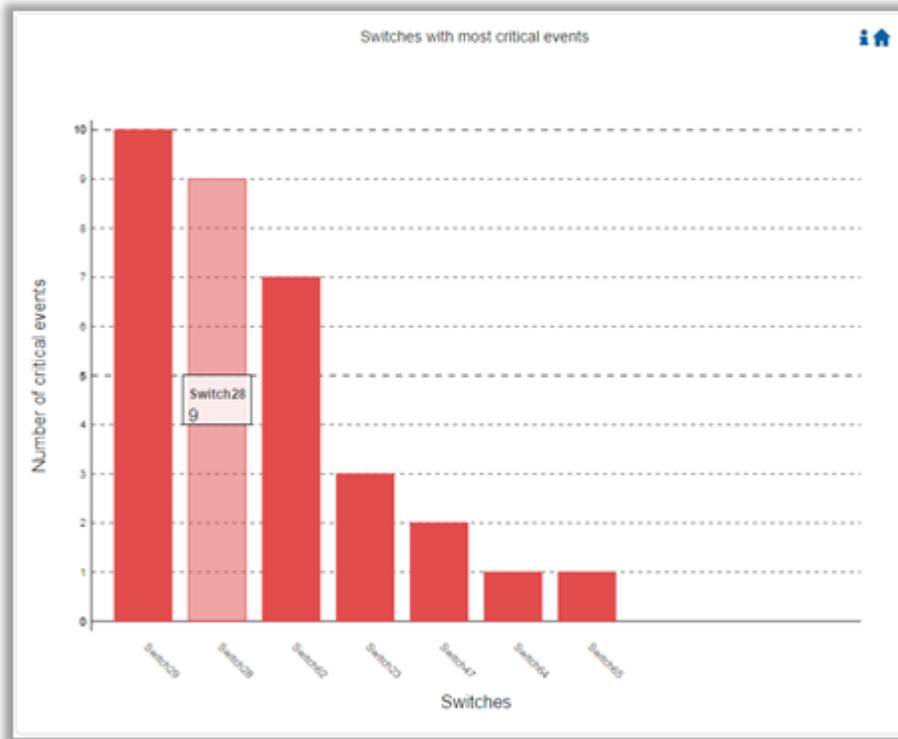


Note

Hovering over the bars in the interactive report displays the amount of events per severity for a selected switch.

Switches with Most Critical Events

Switches with Most Critical Events displays in a graphical view the switches with the most critical events.

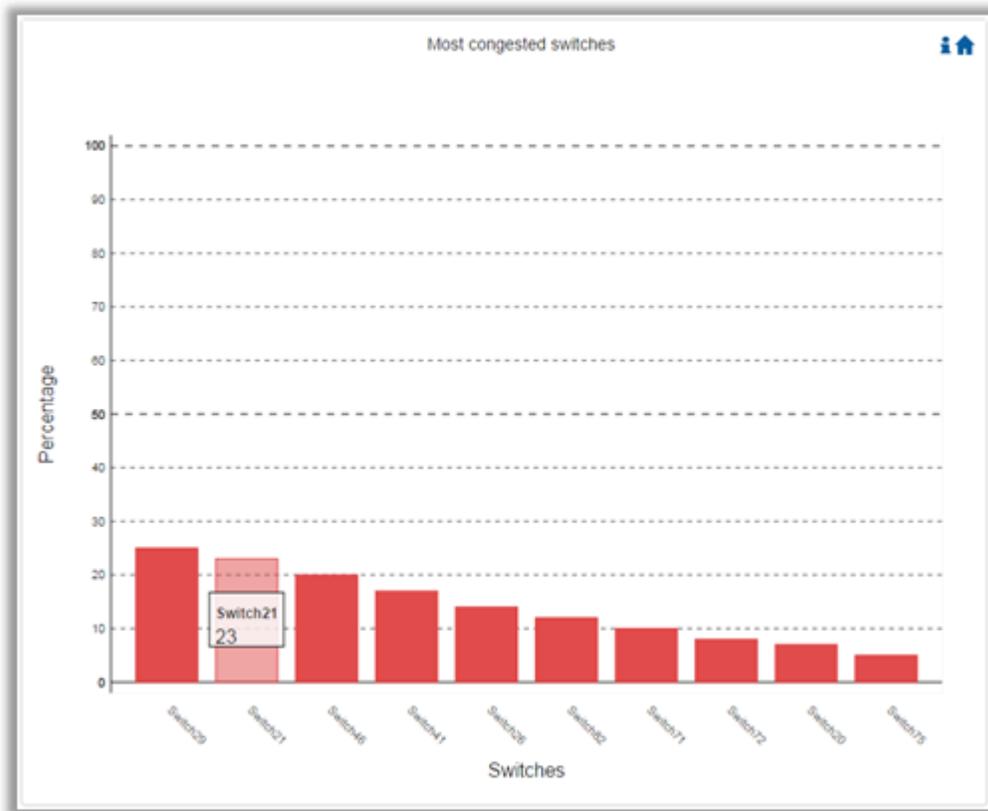


Note

Hovering over the bars in the interactive report displays the amount of critical events for a selected switch.

Most Congested Switches

Most Congested Switches displays in a graphical view the normalized congestions of the most congested switches. Congestion normalization is based on the number of delayed packets (packets that wait in queue) and bandwidth loss.

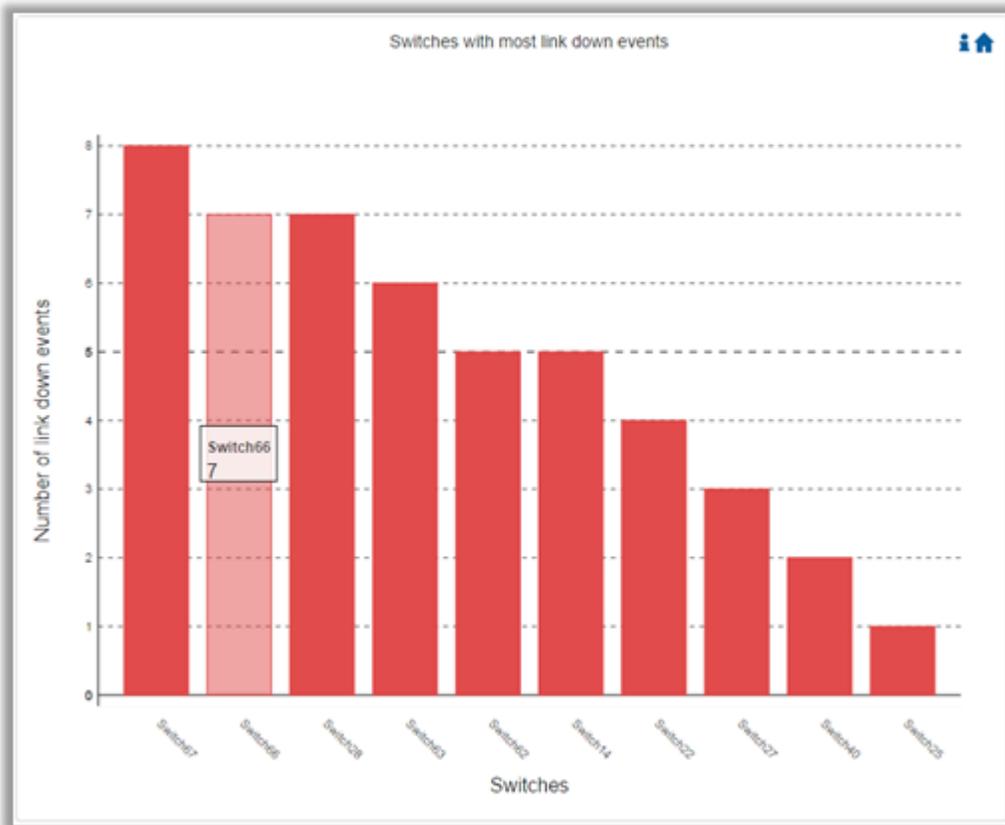


Note

Hovering over the bars in the interactive report displays the percentage of the congestion for a selected switch.

Switches with Most Link Down Events

Switches with Most Link Down Events displays in a graphical view the list of the switches with the most link down events during the last 24 hours.



Note

Hovering over the bars in the interactive report displays the amount of link-down events for a selected switch.

Note

Clicking on the “help” icon images/download/thumbnails/3620309972/image2019-6-16_14-28-50-version-1-modificationdate-1739721101349-api-v2.png in the upper right corner of each chart, in the interactive report, will display a short description of the chart.

Clicking on the “home” icon images/download/thumbnails/3620309972/image2019-6-16_14-28-59-version-1-modificationdate-1739721101638-api-v2.png in the

upper right corner of each chart, in the interactive report , will move the display to the beginning of the report.

Note

On charts: “Events by Severity”, “Hosts with Most Events”, and “Switches with Most Events”, if the maximum value in the Y-axis is less than 5, an “m” unit will appear and stand for “milli”.

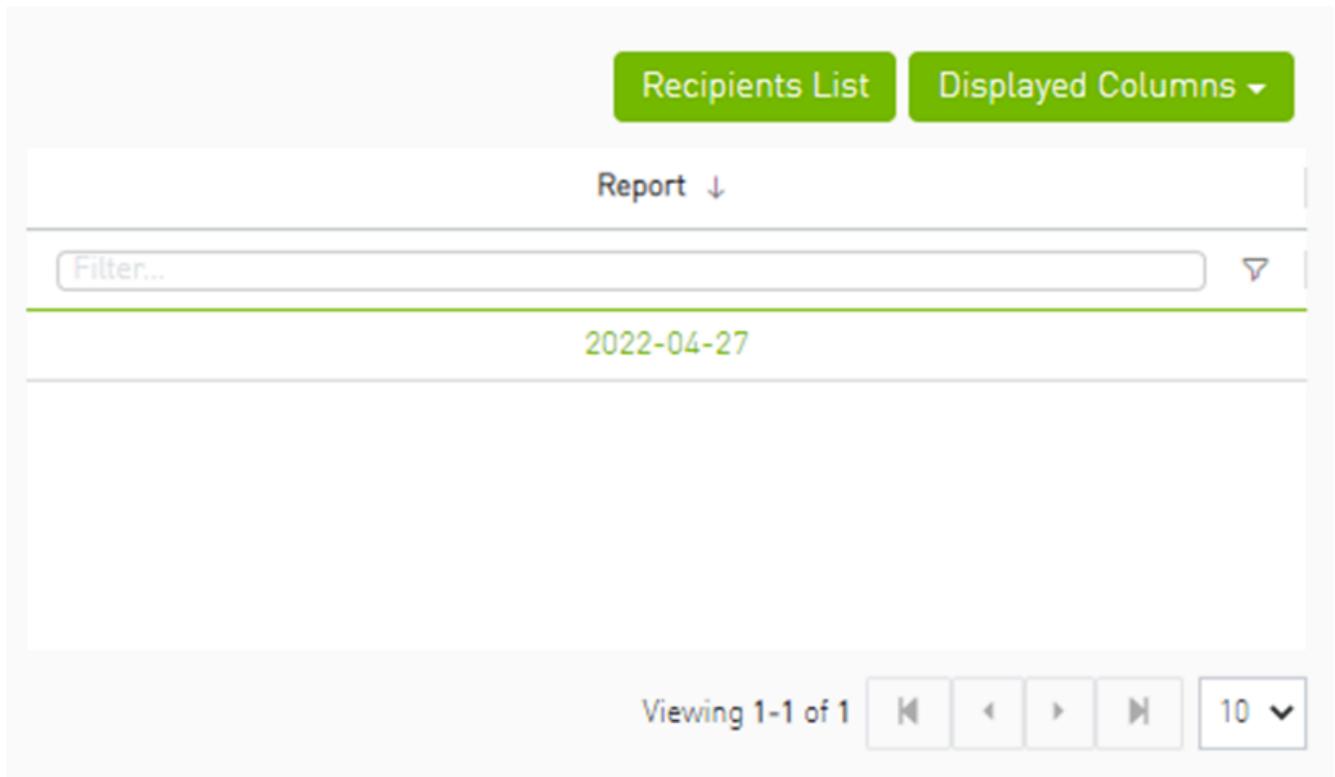
Note

For all charts, if the value is higher than 1000 in the Y-axis, a “k” unit will appear and stand for “killo”.

Daily Report View in the Web UI

In this tab, you can select the UFM daily reports that you wish to view and you can specify the recipients to which these daily reports will be sent.

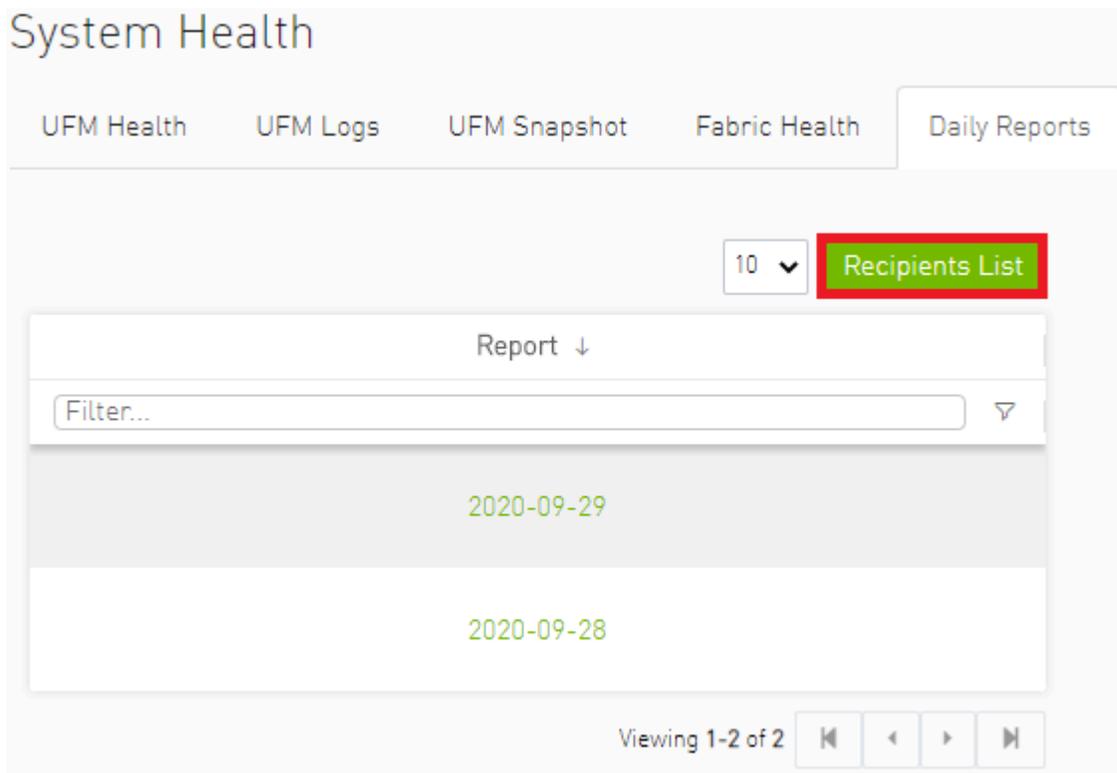
 ***To view a specific daily report, click the relevant report date from the list of available daily reports.***



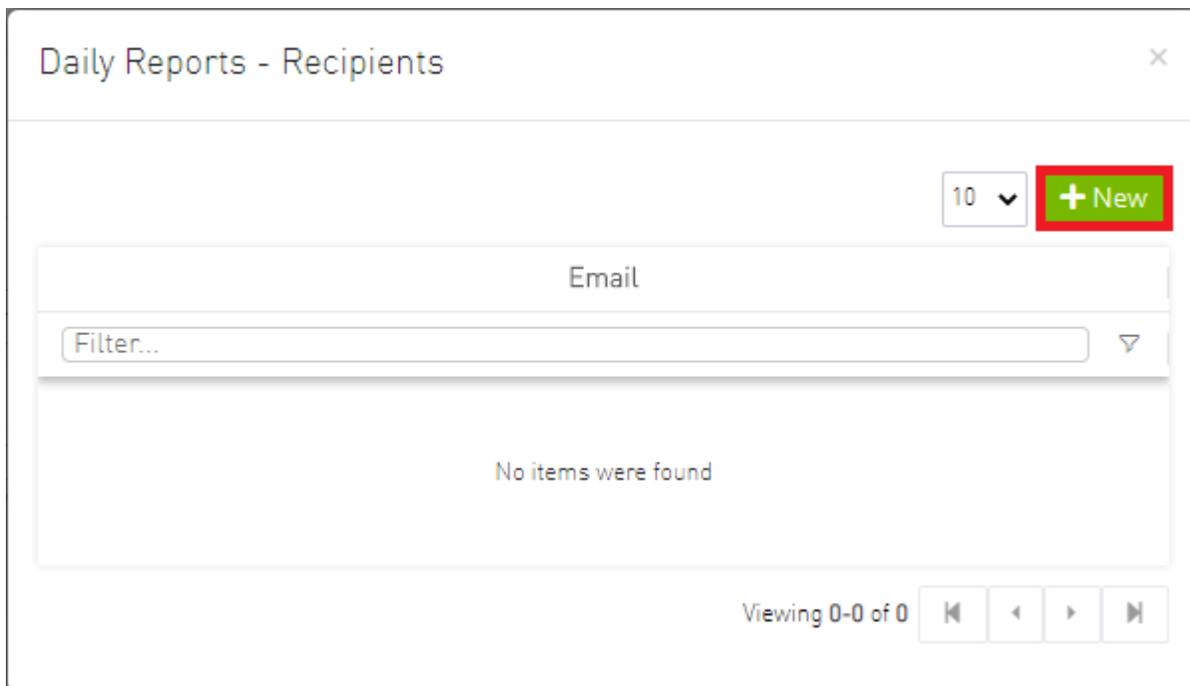
The specified report content will be displayed when clicking the report (see [Activating and Deactivating the Daily Report](#)).

➤ **To configure the Recipients list for the daily reports, do the following:**

1. Click **Recipients List** under System Health → Daily Reports tab.



2. Click **New**.



3. In the Recipients List window, enter valid recipient email addresses, comma-separated, and click **Submit**.

New Recipients ×

Recipients

username@nvidia.com,example@nvidia.com

Close Submit

The new recipient/recipients will be added to the Daily Reports Recipients list.

Daily Reports - Recipients ×

+ New Displayed Columns ▾

Email

Filter... ▾

user@user.com

Viewing 1-1 of 1 ⏪ ⏩ 10 ▾

These recipients will automatically start receiving the UFM daily reports.

Topology Compare Tab

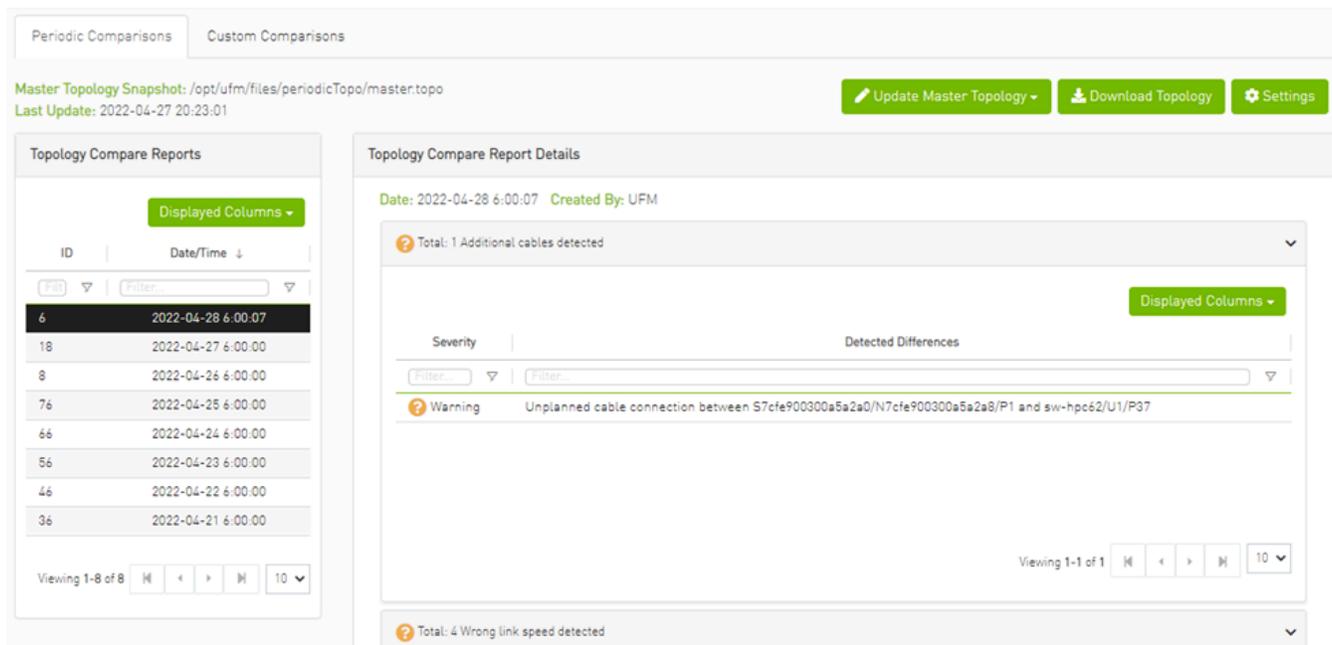
Overview

The Topology Compare tab allows two methods of topology comparison:

- Periodic Comparison
- Custom Comparison

Periodic Comparison

Periodic comparison allows users to compare the current fabric topology with a preset master topology. The master topology may be set either by selecting the current topology or uploading a predefined custom topology.



When a report is selected from the "Topology Compare Reports" table, its result are displayed on the right side under "Topology Compare Report Details".

- To update the master topology with the latest (current) topology or a custom topology saved in external file, click the "Updated Master Topology" dropdown button.



- To download the current topology as a `. topo` file, click the "Download Topology" button.
- The Settings button navigates to the [Topology Compare](#) tab of the Settings view which allows users to configure periodic comparison settings.

Custom Comparison

Custom comparison compares user-defined topology with the current fabric topology. UFM compares the current fabric topology to a topology snapshot (of the same setup) and reports any differences between them.

To be able to use the UFM topology comparison mechanism, first you need to create a TOPO file that defines the current topology of the fabric.

Info

Ideally, the topology snapshot (`. topo` file) should be taken after the setup bring-up phase has been completed so that no more topology changes are expected to take place.

Once the TOPO file is created, you can use the topology comparison mechanism to compare the current fabric topology to the one in the TOPO file and view their differences (if found).

Periodic Comparisons Custom Comparisons

Custom Topology Compare Report

Date: 2022-04-28 3:00:07 Created By: UFM Compare Latest Topology

Total: 1 Additional cables detected

Severity	Detected Differences
Warning	Unplanned cable connection between S7cfe900300a5a2a0/N7cfe900300a5a2a8/P1 and sw-hpc62/U1/P37

Viewing 1-1 of 1

Total: 4 Wrong link speed detected

To compare the current topology with the master topology or a custom topology (external file), make a selection from the "Compare Latest Topology" dropdown button and upload the `.topo` file to compare against.

Topology Comparison Flow

To create the topology file for later comparison with the current topology, do the following:



1. Verify that the following path for ibdiagnet ibnl directory exists: `/opt/ufm/tmp/ibdiagnet.out/tmp/ibdiag_ibnl`. If the path does not exist, make sure to create it manually.
2. Run the following command on the UFM server machine to create the topology file (`mytopo.topo`). Note that the file extension must be `.topo` for UFM to recognize it.

```
/opt/ufm/opensm/bin/ibdiagnet -w /tmp/mytopo.topo
--out_ibnl_dir /opt/ufm/tmp/ibdiagnet.out/tmp/ibdiag_ibnl
```

Once command execution is completed, the new topology file (`/tmp/mytopo.topo`) will be created and can be used for later comparison with the current fabric topology. Also, several .ibnl files that were (optionally) created will be found in the defined output directory (`/opt/ufm/tmp/ibdiagnet.out/tmp/ibdiag_ibnl`). These `.ibnl` files will be used when comparing any topology file to the current fabric topology.

At any time during your UFM session, you can view the last generated report through the UFM web UI or in HTML format in a browser window.

To perform topology comparison, do the following:



1. Click **Run Now Report** under System Health à Topology Compare.

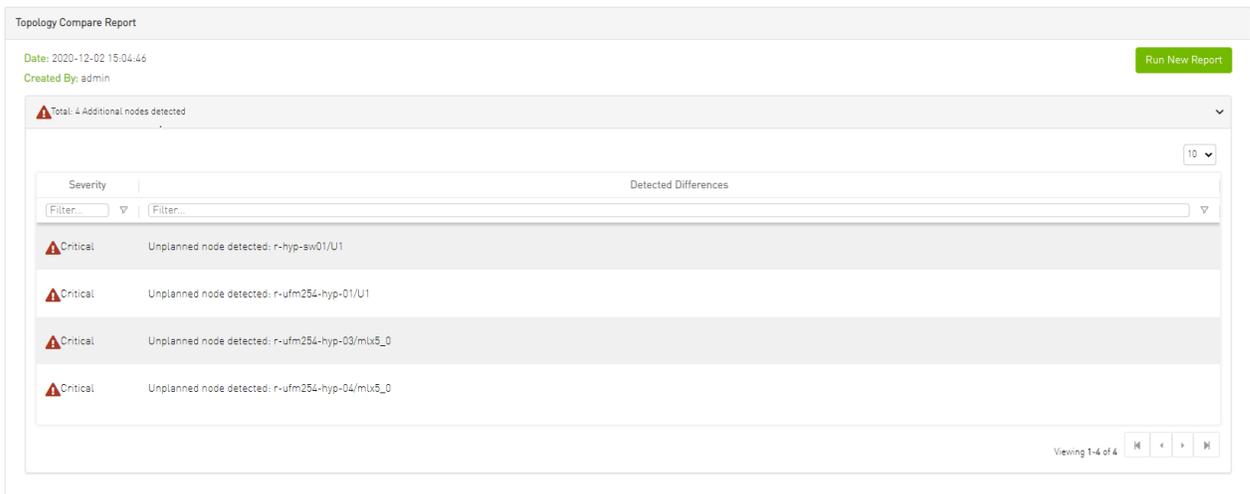


2. Browse for the required topology setup file in the *Load Topology File* dialog box.



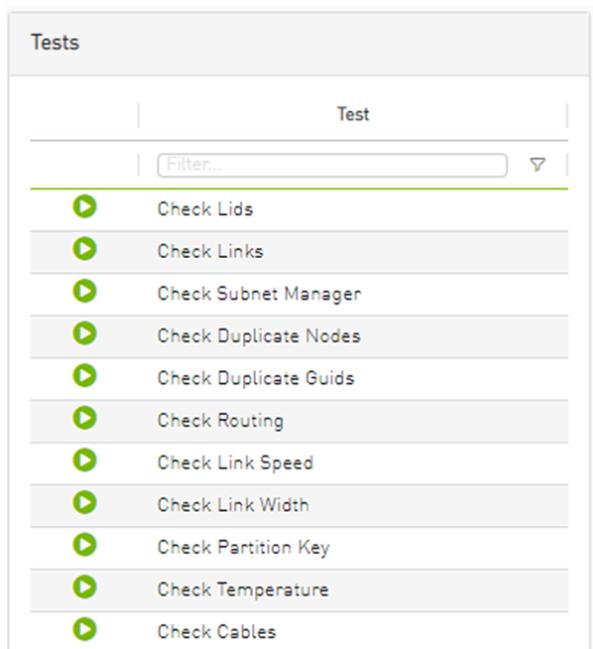
3. Click Load.

UFM will compare topologies and display the results.



Fabric Validation Tab

The Fabric Validation tab displays the fabric validation tests and gives the ability to run the test and receive/view the summary as a job output. Summary of the job contains all errors and warnings that were found during the test execution.



Test	Description
Check Lids	Checks for bad lids. Possible lid errors are: <ul style="list-style-type: none"> • zero lid • lid duplication

Test	Description
Check Links	Checks for connectivity issues where all ports connected are not in the same state (active)
Check Subnet Manager	Checks for errors related to subnet manager. Possible SM errors are: <ul style="list-style-type: none"> • Failed to get SMInfo Mad • SM Not Found • SM Not Correct (master SM with wrong priority) • Many master SMs exists
Check Duplicate Nodes	Checks for duplications in nodes description
Check Duplicate Guids	Checks for GUIDs duplications
Check Routing	Checks for failures in getting routing MADs
Check Link Speed	Checks for errors related to link speed. Possible link speed errors are: <ul style="list-style-type: none"> • Different speed between ports • Wrong configuration – 'enable' not part of the 'supported' • Unexpected speed
Check Link Width	Checks for errors related to link width. Possible link width errors are: <ul style="list-style-type: none"> • Different width between ports • Wrong configuration – 'enable' not part of the 'supported' • Unexpected width
Check Partition Key	Checks for errors related to PKey. Possible PKey errors are: <ul style="list-style-type: none"> • Failed to get Pkey Tables • Mismatching pkeys between ports
Check Temperature	Checks for failure in getting temperature sensing.
Check Cables	Checks for errors related to cables. Possible cable errors are:

Test	Description
	<ul style="list-style-type: none"> This device does not support cable info capability Failed to get cable information (provides a reason)
Check Effective BER	Checks that the Effective BER does not exceed the threshold
Dragonfly Topology Validation	Validate if the topology is Dragonfly
SHARP Fabric Validation	Checks for SHARP Configurations in the fabric
Tree Topology Validation	Checks if the fabric is a tree topology
Socket Direct Mode Reporting	Presents the inventory of fabric HCAs that are using socket direct

To run a specific test, click the play button. The job will be displayed once completed.

The screenshot shows two panels. The left panel, titled 'Tests', contains a list of tests: Check Lids (selected), Check Links, Check Subnet Manager, Check Duplicate Nodes, Check Duplicate GUIDs, Check Routing, Check Link Speed, Check Link Width, Check Partition Key, Check Temperature, Check Cables, and Check Effective BER. The right panel, titled 'Check Lids', shows a job created at 2022-04-28 17:09:35 with a status of 'Passed'. Below this is a 'Fabric Summary' table:

Category	Count
Total Nodes	56
IB Switches	15
IB Channel Adapters	30
IB Aggregation Nodes	11
IB Routers	0

Note

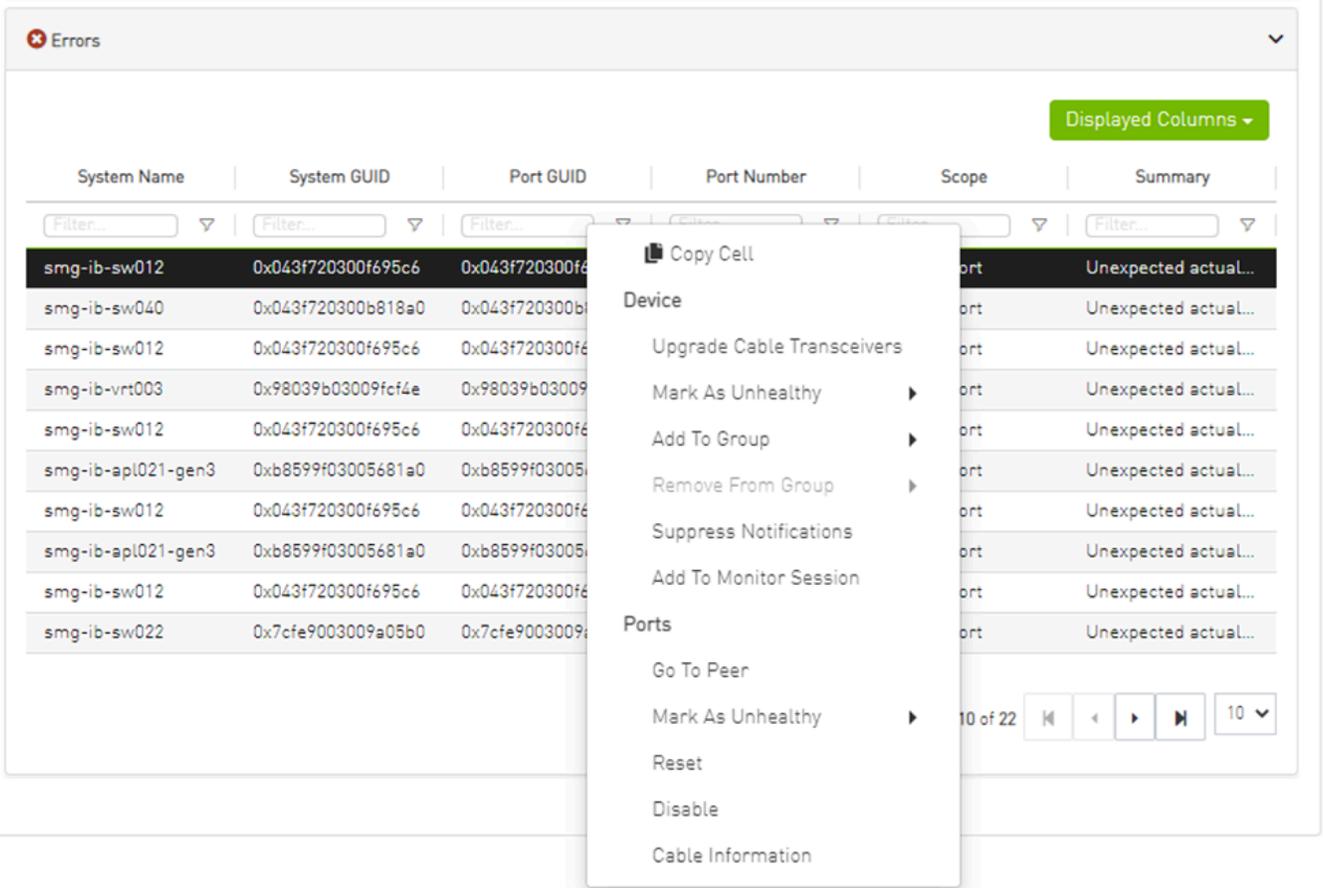
The job will also be displayed in the Jobs window.

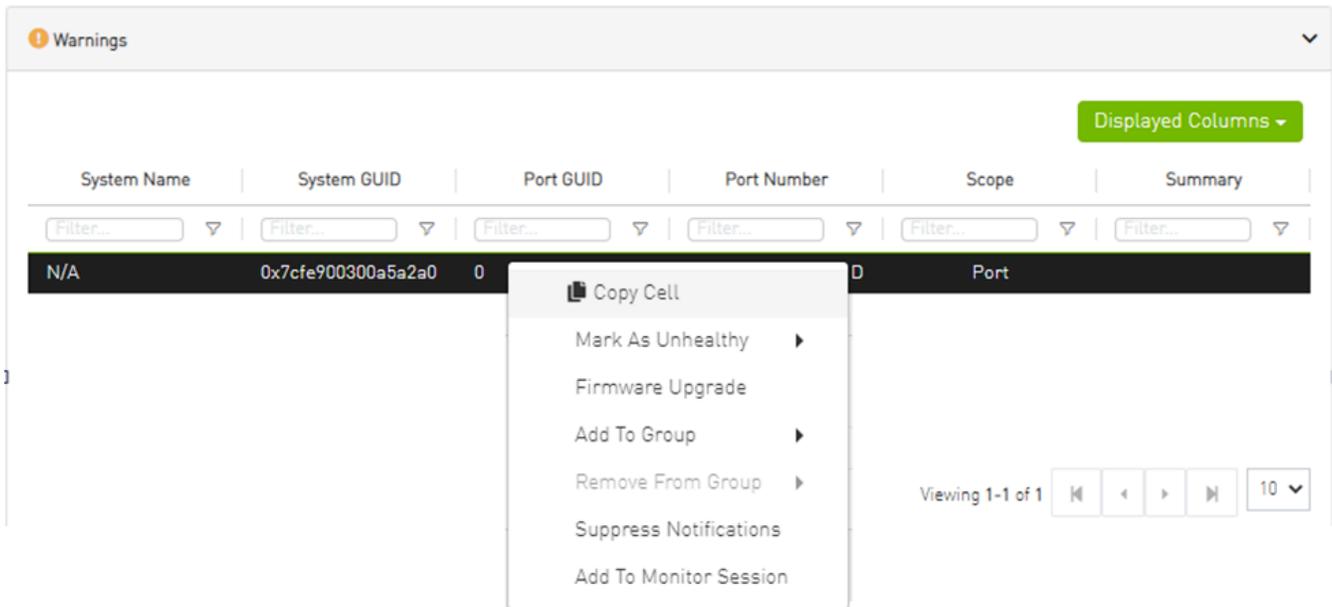
Some validation tests contain data related to devices or ports like device GUID and port GUID.

Depending on that information a context menu for each related device/port can be shown.

Note

If the data is related to a port the context menu will contain both port and device options .





IBDiagnet Tab

The periodic IBDiagnet tab allows users to create scheduled ibdiagnet tasks on their devices using any of the defined parameters.

Users can also configure a remote location (local/remote) to save the ibdiagnet output to. To create a new ibdiagnet command:

1. Click the New button on the top right of the IBDiagnet tab to open the “New IBDiagnet Command” wizard.

New IBDiagnet Command x

1 Parameters 2 Run

Name

Category	Status	Flag Name	Value
Filter... ▾			
▶ General			
▼ Link Validation			
	<input checked="" type="checkbox"/>	--ls	2.5 ▾
	<input type="checkbox"/>	--lw	1x ▾
▼ Port Counters			
	<input type="checkbox"/>	--pc	
	<input checked="" type="checkbox"/>	--pm_pause_time	1 ▾
	<input type="checkbox"/>	--per_slvl_cntrs	
	<input type="checkbox"/>	--sc	
	<input type="checkbox"/>	--scr	
	<input type="checkbox"/>	--extended_speeds	SW ▾

Additional Parameters

Next

2. Select the desired ibdiagnet flags for your command by selecting the listed flags (categories are expandable), or by manually adding the desired flags into the Additional Parameters box below, and then click Next.

New IBDiagnet Command x

1 Parameters **2** Run

Name

Category	Status	Flag Name	Value
Filter... ▾			
<ul style="list-style-type: none"> ➤ General ▼ Link Validation <ul style="list-style-type: none"> <input checked="" type="checkbox"/> --ls 2.5 ▾ <input checked="" type="checkbox"/> --lw 1x ▾ ▼ Port Counters <ul style="list-style-type: none"> <input type="checkbox"/> --pc <input checked="" type="checkbox"/> --pm_pause_time 1 <input type="checkbox"/> --per_slvl_cntrs <input type="checkbox"/> --sc <input type="checkbox"/> --scr <input type="checkbox"/> --extended_speeds SW ▾ 			
Additional Parameters			
<input type="text" value="Type additional flags for ibdiagnet run"/>			

Next

i Note

It is possible to use the filters at the top of the Category and Flag Name columns in order to search for flags.

3. In the Run screen:

1. Select the location of the ibdiagnet results. UFM can export ibdiagnet command run results to a local location on the UFM server, or to a configurable remote location.
2. Select whether you would like to save this run for later (Save), run it immediately (Save and Run Now), or schedule it for a later time (Schedule) and then click Finish.

1 Parameters 2 Run

Location

Local Remote

Output Path: /opt/ufm/files/periodicibdignet

Running Mode

Save

- Save
- Save and Run Now
- Schedule


Save

Summary

 **Note**

Note that you can see the summary of your chosen flags for this run in the Summary panel.

You will then be able to see run results on the tab which will display where the output is saved on the server.

Output Path: /opt/ufm/files/periodicIbdiagnet

IBDiagnet			
Name	Task State	Last Run ↓	Last Run Output
IBDiagnet_CMD_1651155713770	Disabled	✓ 28/04/2022 17:22:15	/opt/ufm/files/periodicIbdiagnet/IBDiag...

Viewing 1-1 of 1

It is also optional to edit/activate/deactivate/delete a running task using right-click.

Under gv.cfg, it is possible to configure other parameters.

```
[PeriodicIbdiagnet]
# Directory location where outputs are written
periodic_ibdiagnet_dir_location=/opt/ufm/files/periodicIbdiagnet
# Minimum time between two tasks (in minutes)
minimum_task_interval=60
# Maximum number of tasks running simultaneously
max_optional_tasks=5
# Maximum number of outputs to save per task (oldest gets
deleted)
max_saved_outputs=5
# Percentage threshold for disk usage from which UFM deletes old
task results
disk_usage_threshold=80
```

Note

UFM restart is required for these changes to take effect.

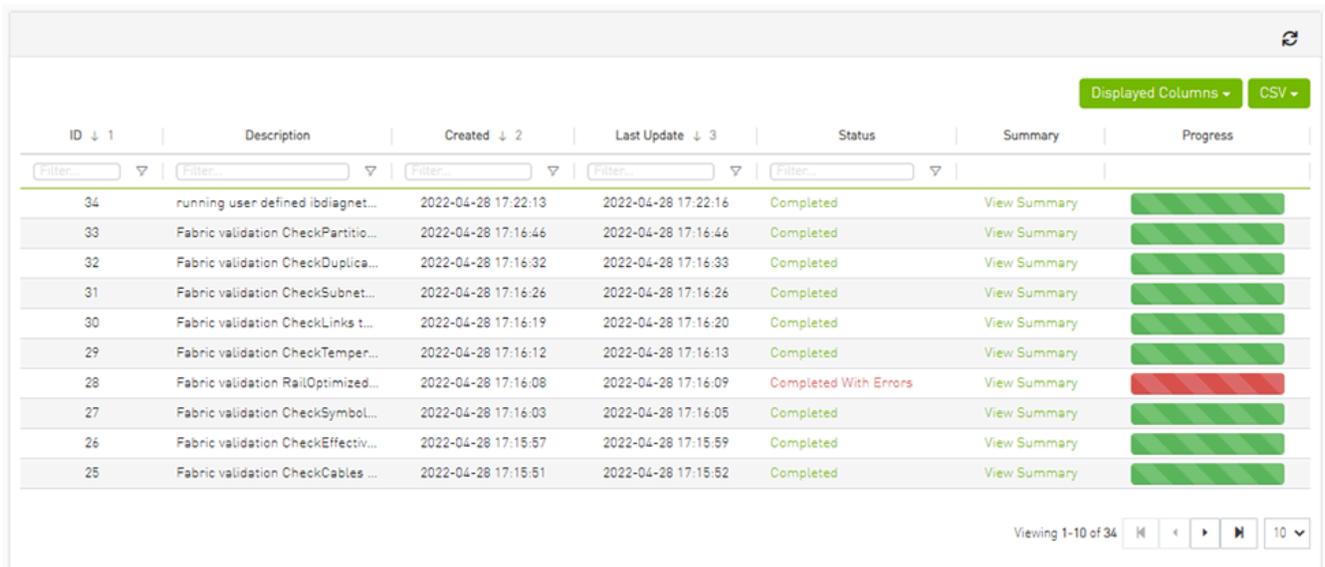
Jobs

Note

All information provided in a tabular format in UFM web UI can be exported into a CSV file.

The Jobs window displays all of UFM running Jobs. A Job is a running task defined by the user and applied on one or more of the devices (provisioning, software upgrade, firmware upgrade, reboot, etc.).

UFM users can monitor the progress of a running job, as well as the time it was created, its last update description and its status. The status value can be “Running” (during operation) “Completed with Errors”, in case an error has occurred, and “Completed.”



ID ↓ 1	Description	Created ↓ 2	Last Update ↓ 3	Status	Summary	Progress
34	running user defined ibdiagnet...	2022-04-28 17:22:13	2022-04-28 17:22:16	Completed	View Summary	
33	Fabric validation CheckPartitio...	2022-04-28 17:16:46	2022-04-28 17:16:46	Completed	View Summary	
32	Fabric validation CheckDuplica...	2022-04-28 17:16:32	2022-04-28 17:16:33	Completed	View Summary	
31	Fabric validation CheckSubnet...	2022-04-28 17:16:26	2022-04-28 17:16:26	Completed	View Summary	
30	Fabric validation CheckLinks t...	2022-04-28 17:16:19	2022-04-28 17:16:20	Completed	View Summary	
29	Fabric validation CheckTemper...	2022-04-28 17:16:12	2022-04-28 17:16:13	Completed	View Summary	
28	Fabric validation RailOptimized...	2022-04-28 17:16:08	2022-04-28 17:16:09	Completed With Errors	View Summary	
27	Fabric validation CheckSymbol...	2022-04-28 17:16:03	2022-04-28 17:16:05	Completed	View Summary	
26	Fabric validation CheckEffectiv...	2022-04-28 17:15:57	2022-04-28 17:15:59	Completed	View Summary	
25	Fabric validation CheckCables ...	2022-04-28 17:15:51	2022-04-28 17:15:52	Completed	View Summary	

When selecting a job from the main Jobs table, its related sub jobs will be displayed in the Sub Jobs table below.

ID ↓ 1	Description	Created ↓ 2	Last Update ↓ 3	Status	Summary	Progress
34	running user defined ibdiagnet...	2022-04-28 17:22:13	2022-04-28 17:22:16	Completed	View Summary	
33	Fabric validation CheckPartitio...	2022-04-28 17:16:46	2022-04-28 17:16:46	Completed	View Summary	
32	Fabric validation CheckDuplica...	2022-04-28 17:16:32	2022-04-28 17:16:33	Completed	View Summary	
31	Fabric validation CheckSubnet...	2022-04-28 17:16:26	2022-04-28 17:16:26	Completed	View Summary	
30	Fabric validation CheckLinks t...	2022-04-28 17:16:19	2022-04-28 17:16:20	Completed	View Summary	
29	Fabric validation CheckTemper...	2022-04-28 17:16:12	2022-04-28 17:16:13	Completed	View Summary	
28	Fabric validation RailOptimized...	2022-04-28 17:16:08	2022-04-28 17:16:09	Completed With Errors	View Summary	
27	Fabric validation CheckSymbol...	2022-04-28 17:16:03	2022-04-28 17:16:05	Completed	View Summary	
26	Fabric validation CheckEffectiv...	2022-04-28 17:15:57	2022-04-28 17:15:59	Completed	View Summary	
25	Fabric validation CheckCables ...	2022-04-28 17:15:51	2022-04-28 17:15:52	Completed	View Summary	

Viewing 1-10 of 34

ID ↓ 1	Related Object	Description	Created ↓ 2	Last Update ↓ 3	Status	Summary	Progress
34.1	Site	running user defi...	2022-04-28 17:22:13	2022-04-28 17:22:16	Completed	View Summary	

Settings

Note

All information provided in a tabular format in UFM web UI can be exported into a CSV file.

This window enables configuring the following UFM server and fabric-related settings:

- [Events Policy](#)
- [Device Access](#)
- [Network Management](#)
- [Subnet Manager Tab](#)
- [Non-Optimal Links](#)

- [User Management Tab](#)
- [Email](#)
- [Remote Location](#)
- [Data Streaming](#)
- [Topology Compare](#)
- [Token-based Authentication](#)
- [Plugin Management](#)
- [Rest Roles Access Control](#)
- [User Preferences](#)

Events Policy

The Events Policy tab allows you to define how and when events are triggered for effective troubleshooting and fabric maintenance.

Event	Category	Mail	GUI	Alarm	Syslog	Log File	SNMP	Threshold	TTL/Sec	Severity
GID Address In Service	Network	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1	300	Info
GID Address Out of Service	Network	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1	300	Warning
New MCast Group Created	Network	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1	300	Info
MCast Group Deleted	Network	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1	300	Info
Symbol Error	Network	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	200	300	Warning
Link Error Recovery	Network	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1	300	Minor
Link Downed	Network	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0	300	Warning
Port Receive Errors	Network	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	5	300	Warning
Port Receive Remote Error	Network	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	5	300	Minor
Port Receive Switch Reset	Network	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	9999	300	Minor

Events are reported by setting the following parameters:

Option	Description/Instructions
Event	Event description.

Option	Description/Instructions
Category	Event category, such as Communication Error and Hardware represented by icons.
Mail	When selected, the corresponding events will be sent a list of recipients according to Configuring Email-on-Events .
Web UI	When selected, the corresponding events are displayed in the Events & Alarms window in the Web UI.
Alarm	Select the Alarm option to trigger an alarm for a specific event. When selected, the alarms will appear in the Events & Alarms window in the Web UI.
Syslog	When checked along with the Log file option, the selected events will be written to Syslog.
Log File	Select the Log File option if you would like the selected event to be reported in a log file.
SNMP	The UFM Server will send events to third-party clients by means of SNMP traps. Select the event SNMP check box option to enable the system to send an SNMP trap for the specific event. The SNMP trap will be sent to the port defined in Configuration file located under: /opt/ufm/conf/gv.cfg. For further information, refer to SNMP Settings .
Threshold	An event will be triggered when the traffic/error rate exceeds the defined threshold. For example: when PortXmit Discards is set to 5 and the counter value grows by 5 units or more between two sequential reads, an event is generated.
TTL (Sec)	TTL (Alarm Time to Live) sets the time during which the alarm on the event is visible on UFM Web UI. TTL is defined in seconds. CAUTION: Setting the TTL to 0 makes the alarm permanent, meaning that the alarm does not disappear from the Web UI until cleared manually.

Option	Description/Instructions
Action	The action that will be executed in case the event which has triggered the action can be none or isolated (make the port unhealthy or isolated). This attribute can be set only for ports event policy.
Severity	Select the severity level of the event and its alarm from the drop-down list: Info, Warning, Minor, and Critical.

Note

- Category column in the Events Policy table indicates to which category the event belongs. These categories are defined in the event configuration file and cannot be modified. Categories are: Hardware, Fabric Configuration, Communication Error, Fabric Notification, Maintenance, Logical Model, Fabric Topology, Gateway, Module Status, and UFM Server.
- Event logs can still be checked even if the events.log file checkbox was not checked during Syslog configuration.
- For a certain event to be sent to Syslog, both the Syslog and the Log File checkboxes must be checked. Otherwise, the selected events will not be sent to Syslog.

See [Appendix - Supported Port Counters and Events](#) for detailed information on port counters and events.

SNMP Settings

When UFM is running, the Web UI Policy Table shows the SNMP traps. You can then modify and save an SNMP Trap flag for each event. SNMP settings are enabled only after the installation of the UFM license.

UFM sends SNMP Trap using version SNMPV2 to the default port 162.

➤ To set the SNMP properties:

1. Open the `/opt/ufm/conf/gv.cfg` configuration file.
2. Under the [Notifications] line (see the following example):
 1. Set the (snmp_listeners) IP addresses and ports
 2. Port is optional – the default port number is 162
 3. Use a comma to separate multiple listeners

Format:

```
snmp_listeners = <IP Address 1>[:<port 1>][,<IP Address 2>[:  
<port 2>]...]
```

Example:

```
[Notifications]  
snmp_listeners = host1, host2:166
```

Configuring Email-on-Events

UFM enables you to configure each event to be sent by email to a list of pre-defined recipients. Every 5 minutes (configurable) UFM will collect all “Mail” selected events and send them to the list of pre-defined recipients. By default, the maximum number of events which can be sent in a single email is 100 (configurable, should be in the range of 1–1000)

The order of events in the email body can be set as desired. The available options are: order by severity or order by time (by default: order by severity)

 **To change email-on-events setting, do the following:**

1. Edit the `/opt/ufm/conf/gv.cfg` file.
2. Go to section “[Events]” and set the relevant parameters:

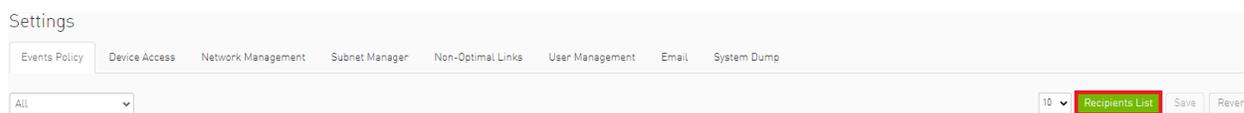
- `sending_interval` (default=5)—Time interval for keeping events (minimum 10 seconds, maximum 24 hours)
- `sending_interval_unit` (default = minute)—Optional units: minute, second, hour
- `cyclic_buffer` (default=false)—If the cyclic buffer is set to true, older events will be dropped, otherwise newer events will be dropped (if reaches max count)
- `max_events` (default=100)—Maximum number of events to be sent in one mail (buffer size), should be in the range of 1–1000
- `group_by_severity` (default=true)—Group events in mail by severity or by time

➤ **To receive the email-on-events, do the following:**

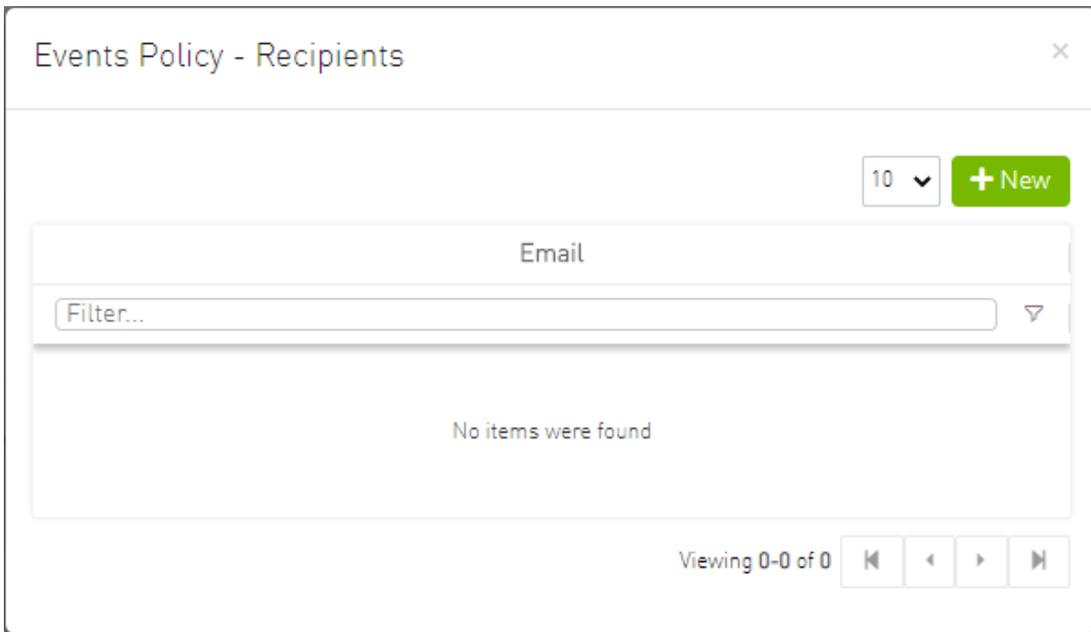
Note

Configure SMTP settings under Settings window → Email tab – see [Email Tab](#).

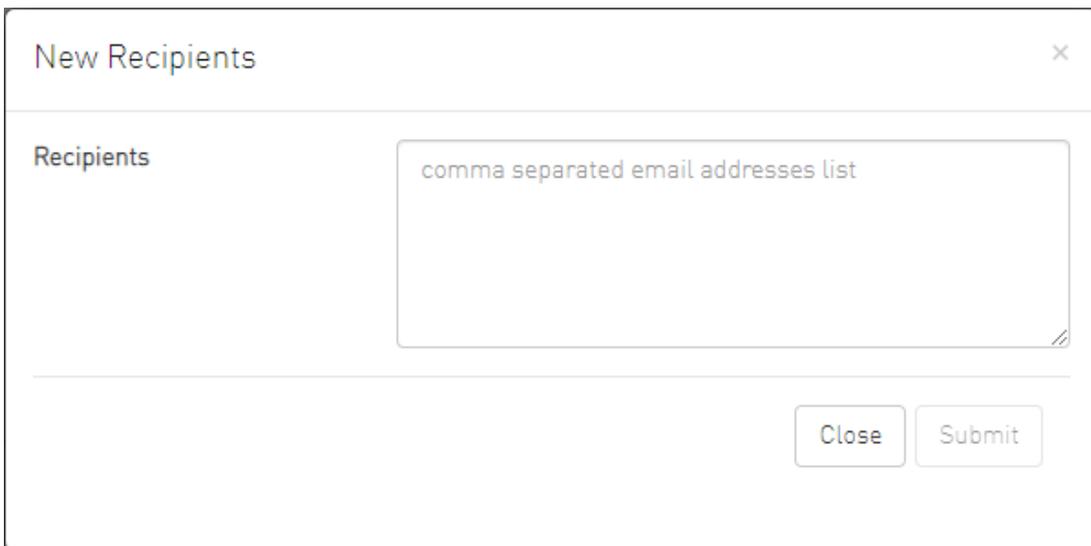
1. Configure the **Recipients List** under Settings → Events Policy.



2. Click **New**.



3. In the Recipients List window, enter valid recipient email addresses, comma-separated, and click **Submit**.



The new recipients are then added to the Events Policy Recipients list.

These recipients automatically start receiving emails on the events for which the Mail checkbox is checked in the table under Events Policy.

Device Access

You can configure default access parameters for remote administration via the following protocols:

- **Switch/Server SSH** – allows you to define the SSH parameters to open an SSH session on your device
- **IPMI** – allows you to set the IPMI parameters to open an IPMI session on your device for remote power control
- **HTTP** – allows you to define the HTTP parameters to open an HTTP session on your device

Default credentials are applicable to all switches and servers in the fabric.

Note

The default SSH (CLI) switch credentials match the Grid Director series switch. To change the credentials for IS5030/IS5035 edit the [SSH_Switch] section in the gv.cfg file.

Define access parameters for the remote user as described in the following table.

Site Access Credential Parameters

Parameter	Description
User	The name of the user allowed remote access.
Password	Enter the user password.
Confirmation	Re-enter the password.
Port	Each communication protocol has a default port for connection. You can modify the port number, if required.
Timeout	Each communication protocol has a default timeout, i.e. the maximum time, in seconds, to wait for a response from the peer. You can modify the timeout, if required.

Network Management

UFM achieves maximum performance with latency-critical tasks by implementing traffic isolation, which minimizes cross-application interference by prioritizing traffic to ensure critical applications get the optimal service levels.

UFM Routing Protocols

UFM web UI supports the following routing engines:

- MINHOP – based on the minimum hops to each node where the path length is optimized (i.e., shortest path available).
- UPDN – also based on the minimum hops to each node but it is constrained to ranking rules. Select this algorithm if the subnet is not a pure Fat Tree topology and deadlock may occur due to a credit loops in the subnet.
- DNUP – similar to UPDN, but allows routing in fabrics that have some channel adapter (CA) nodes attached closer to the roots than some switch nodes.
- File-Based (FILE) – The FILE routing engine loads the LFTs from the specified file, with no reaction to real topology changes.
- Fat Tree – an algorithm that optimizes routing for congestion-free "shift" communication pattern.

Select Fat Tree algorithm if a subnet is a symmetrical or almost symmetrical fat-tree. The Fat Tree also optimizes K-ary-N-Trees by handling non-constant K in cases where leafs (CAs) are not fully staffed, and the algorithm also handles any Constant Bisectional Bandwidth (CBB) ratio. As with the UPDN routing algorithm, Fat Tree routing is constrained to ranking rules.

- Quasi Fat Tree – PQFT routing engine is a closed formula algorithm for two flavors of fat trees
- Quasi Fat Tree (QFT)
- Parallel Ports Generalized Fat Tree (PGFT)

PGFT topology may use parallel links between switches at adjacent levels, while QFT uses parallel links between adjacent switches in different sub-trees. The main motivation for that is the need for a topology that is not just optimized for a single large job but also for smaller concurrent jobs.

- Dimension Order Routing (DOR) – based on the Min Hop algorithm, but avoids port equalization, except for redundant links between the same two switches. The DOR

algorithm provides deadlock-free routes for hypercubes, when the fabric is cabled as a hypercube and for meshes when cabled as a mesh.

- Torus-2QoS – designed for large-scale 2D/3D torus fabrics. In addition, you can configure Torus-2QoS routing to be *traffic aware*, and thus optimized for neighbor-based traffic.
- Routing Engine Chain (Chain) – an algorithm that allows configuring different routing engines on different parts of the IB fabric.
- Adaptive Routing (AR) – enables the switch to select the output port based on the port's load. This option is not available via UFM Web UI.
 - AR_UPDN
 - AR_FTREE
 - AR_TORUS
 - AR_DOR
- Dragonfly+ (DFP, DPF2)

Configuring Routing Protocol

Network Management tab enables setting the preferred routing protocol supported by the UFM software, as well as routing priority.

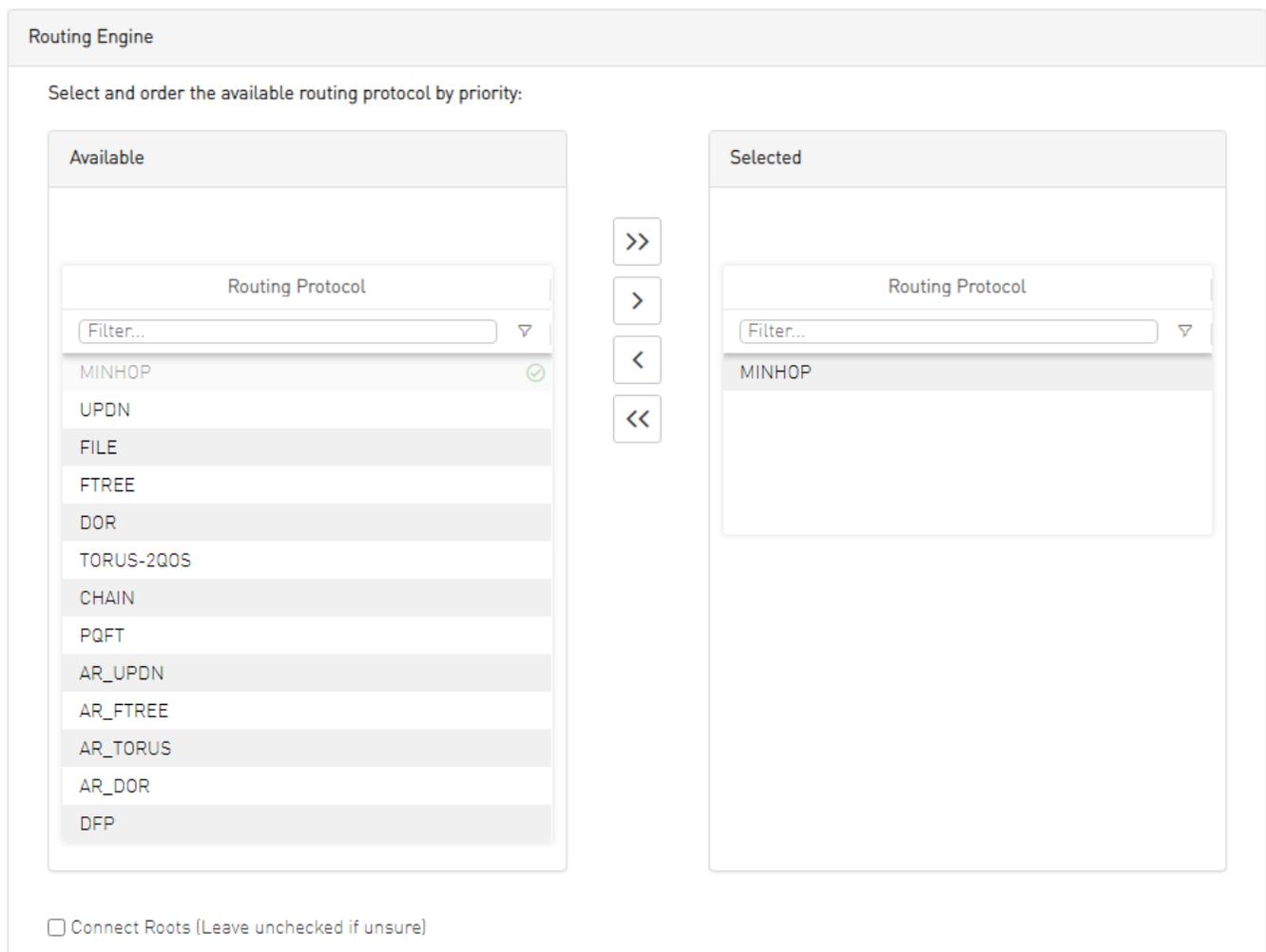
To set the desired routing protocol, move one routing protocol or more from the **Available** list to the **Selected** list, and click "Save" in the upper right corner.

Routing Information	
Lid Matrix Dump File	/opt/ufm/files/conf/opensm/lid_matrix.conf
LFTS File	/opt/ufm/files/conf/opensm/lfts.conf
Root Guid File	/opt/ufm/files/conf/opensm/root_guid.conf
Compute Nodes File	N/A
Node IDs File	N/A
Guid Routing Order File	N/A
Active Routing Engine	minhop

The protocol at the top of the list has the highest priority and will be chosen as the **Active Routing Engine**. If the settings for this protocol are not successful, UFM takes the next available protocol.

Routing Information is listed on the top of the screen:

Field/Box	Description
LID Matrix Dump File	File holding the LID matrix dump configuration
LFTS File	File holding the LFT routing configuration
Root GUID File	File holding the root node GUIDS (for fat-tree or Up/Down)
Compute Nodes File	File holding GUIDs of compute nodes for fat-tree routing algorithm
GUID Routing Order File	File holding the routing order GUIDs (for MinHop and Up/Down)
Node IDs File	File holding the node IDs
Active Routing Engine	The current active routing algorithm used by the managing OpenSM



Subnet Manager Tab

UFM is a management platform using a user-space application for InfiniBand fabric management. This application is developed within the context of an open-source environment. This application serves as an InfiniBand Subnet Manager and a Subnet Administration tool.

The UFM Subnet Manager (SM) is a centralized entity running on the server that discovers and configures all the InfiniBand fabric devices to enable traffic flow throughout the fabric.

To view and configure SM parameters in the **Subnet Manager** tab, select the relevant tab according to the required configuration.

For more information, please refer to [Appendix – Enhanced Quality of Service](#).

SM Keys Configuration

The SM Keys tab enables you to view the Subnet Manager Keys. You cannot change the configuration in this tab.

Keys	MKey	0x0
Limits	SA Key	0x1
Lossy	Subnet Prefix	0xfe80000000000000
SL2VL	SM Key	0x1
Sweep	MKey Lease Period	60 (sec)
Handover	LMC	0
Threading	No Partition Enforcement	false
Logging		
Misc		
QoS		
Congestion Control		
Adaptive Routing		

Field	Description	Default
MKey	A field that allows you to view or edit the M_Key value sent to all ports to qualify all the set (PortInfo). Authentication is performed by the management entity at the destination port and is achieved by comparing the key contained in the SMP with the key (the M_Key Management key) residing at the destination port.	0x0000000000000000
SA Key	Shows the SM_Key value to qualify the	0x0000000000000001

Field	Description	Default
	receive SA queries as 'trusted'.	
Subnet Prefix	An identifier of the subnet. The subnet prefix is used as the most significant 64 bit of the GID of each InfiniBand node in the subnet.	0xfe80000000000000
SM Key	Read-only field that displays the Key of the Subnet Manager (SM).	0x0000000000000001
MKey Lease Period	A field that allows you to view or edit the lease period used for the M_Key on this subnet in [sec].	0
LMC	Defines the LID Mask Control value for the SM. Possible values are 0 to 7. LID Mask Control (LMC) allows you to assign more than one LID per port. NOTE: Changes to the LMC parameter require a UFM restart.	0
No Partition Enforcement	Disables partition enforcement by switches.	Disabled

SM Limits Configuration

The SM Limits tab enables you to view and set the Subnet Manager Limits.

Keys	Packet Life Time	0x 12
Limits	Subnet Timeout	18
Lossy	Maximal Operational VL	VL0-VL3
SL2VL	Head Of Queue Life Time	0x 12
Sweep	Leaf Head Of Queue Life Time	0x 10
Handover	VL Stall Count	0x 7
Threading	Leaf VL Stall Count	0x 7
Logging	Force Link Speed	Max Supported
Misc	Local Physical Error Threshold	0x 8
QoS	Overrun Errors Threshold	0x 8
Congestion Control		
Adaptive Routing		

To configure SM Limits, set the fields as described in the table below, and click "Save."

Field	Description	Default
Packet Life Time	A field that allows you to view and/or edit the code of maximum lifetime a packet in a switch. The actual time is 4.096 usec * $2^{<packet_life_time>}$. The value 0x 14 disables this mechanism	0x12
Subnet Timeout	A field that allows you to view and/or edit the subnet_timeout code that will be set for all the ports. The actual timeout is 4.096usec * $2^{<subnet_timeout>}$	18
Maximal Operational VL	A field that allows you to view and/or edit the limit of the maximal operational VLs:	3

Field	Description	Default
	<ul style="list-style-type: none"> • 0: NO_CHANGE • 1: VLO 1 • 2: VLO_VL1 • 3: VLO_VL3 • 4: VLO_VL7 • 5: VLO_VL14 	
Head of Queue Life Time	<p>A field that allows you to view and/or edit the code of maximal time a packet can wait at the head of transmission queue. The actual time is $4.096\text{usec} * 2^{\langle\text{head of queue lifetime}\rangle}$</p> <p>The value 0x14 disables this mechanism.</p>	0x12
Leaf Head of Queue Life Time	<p>A field that allows you to view and/or edit the maximum time a packet can wait at the head of queue on a switch port connected to a CA or gateway port.</p>	0x10
VL Stall Count	<p>A field that allows you to view the number of sequential packets dropped that cause the port to enter the VLStalled state. The result of setting this value to zero is undefined.</p>	0x07
Leaf VL Stall Count	<p>This field allows you to view the number of sequential packets dropped that cause the port to enter the VLStalled state. This value is for switch ports driving a CA or gateway</p>	0x07

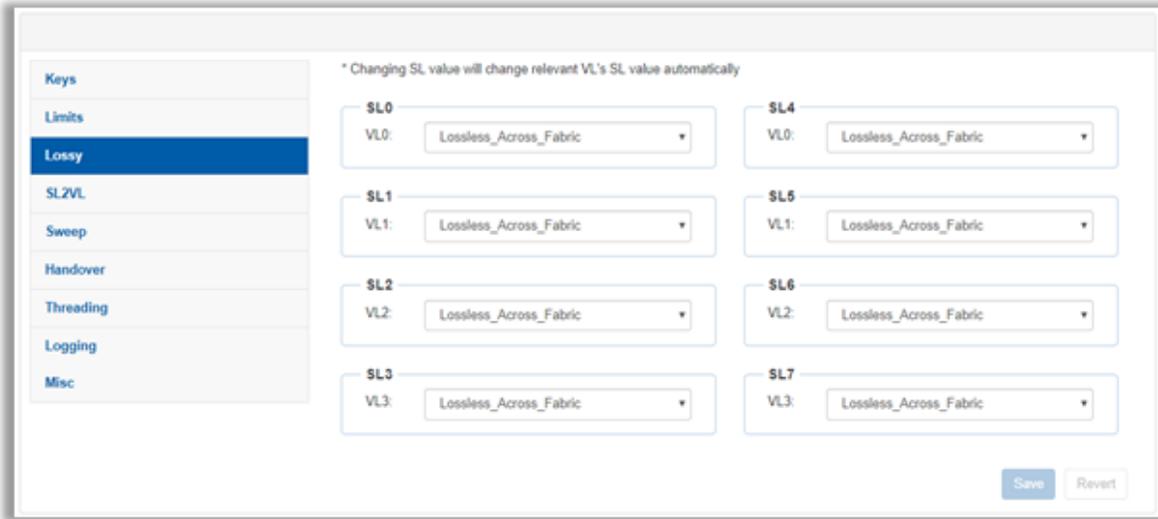
Field	Description	Default
	port. The result of setting the parameter to zero is undefined.	
Force Link Speed	<p>A parameter that allows you to modify the PortInfo:LinkSpeedEnabled field on switch ports. If 0, do not modify.</p> <ul style="list-style-type: none"> • Values are: • 1: 2.5 Gbps • 3: 2.5 or 5.0 Gbps • 5: 2.5 or 10.0 Gbps • 7: 2.5 or 5.0 or 10.0 Gbps • 2,4,6,8-14 Reserved • 15: set to PortInfo:LinkSpeedSupported 	<p>15</p> <p>By default, UFM sets the enabled link speed equal to the supported link speed.</p>
Local Physical Error Threshold	A field that allows you to view and/or edit the threshold of local phy errors for sending Trap 129.	0x08
Overrun Errors Threshold	A field that allows you to view and/or edit the threshold of credit overrun errors for sending Trap 130.	0x08

SM Lossy Manager Configuration

Note

This tab is available to users with an advanced license only.

The SM Lossy tab enables you to view and set the Lossy Configuration Manager options after Lossy Configuration has been enabled.



SM SL2VL Mapping Configuration

The SM SL2VL tab enables you to view the SL (service level) to VL (virtual lane) mappings and the configured Lossy Management. You cannot change the configuration in this tab.

However, you can change it in the previous [SM Lossy Manager Configuration \(Advanced License only\)](#) tab.

Qos Option Type	SL0	SL1	SL2	SL3	SL4	SL5	SL6	SL7
Default	0	1	2	3	0	1	2	3
Hca	0	1	2	3	0	1	2	3
Switch Port 0	0	1	2	3	0	1	2	3
Switch External Ports	0	1	2	3	0	1	2	3
Router	0	1	2	3	0	1	2	3

SM Sweep Configuration

The Sweep tab enables you to view and/or set the Subnet Manager Sweep Configuration parameters.

The screenshot shows a configuration window with a sidebar on the left containing the following tabs: Keys, Limits, Lossy, SL2VL, Sweep (highlighted), Handover, Threading, Logging, Misc, QoS, Congestion Control, and Adaptive Routing. The main content area displays the following settings:

- Sweep Interval: 10 seconds
- Reassign Lids:
- Sweep On Trap:
- Force Heavy Sweep: false

Buttons for 'Revert' and 'Save' are located at the bottom right of the configuration area.

To configure SM Sweep, set the fields as described in the table below and click "Save."

Field/Box	Description	Default
Sweep Interval	A field that allows you to view and/or edit the number of seconds between light sweeps (0 disables it).	10
Reassign LIDs	If enabled, causes all LIDs to be reassigned.	Disabled
Sweep on Trap	If enabled, traps 128 and 144 will cause a heavy sweep.	Enabled
Force Heavy Sweep	If enabled, forces every sweep to be a heavy sweep.	Disabled

SM Handover Configuration

The SM Handover tab enables you to view the Subnet Manager Handover Configuration parameters. You cannot change the configuration in this tab.

Keys	SM Priority	15
Limits	Polling Timeout	5 (sec)
Lossy	Polling Retries	4
SL2VL	Honor GUID to LID File	false
Sweep	Ignore Other SMs	false
Handover		
Threading		
Logging		
Misc		
QoS		
Congestion Control		
Adaptive Routing		

Field/Box	Description	Default
SM Priority	A field that shows the SM priority used for determining the master. Range is 0 (lowest priority) to 15 (highest). Note: Currently, these settings may not be changed.	15
Polling Timeout	A field that shows the timeout in [sec] between two polls of active master SM.	Range= 10000
Polling Retries	Number of failing polls of remote SM that declares it "not operational."	4

Field/Box	Description	Default
Honor GUID to LID File	If enabled, honor the guid2lid file when coming out of standby state, if the file exists and is valid.	Disabled
Ignore other SMs	If enabled, other SMs on the subnet are ignored.	Disabled

SM Threading Configuration

The SM Threading tab enables you to view the Subnet Manager Timing and Threading Configuration parameters. You cannot change the configuration in this tab.

Keys	Max Wire SMPs	8
Limits	Transaction Timeout	200 (ms)
Lossy	Max Message FIFO Timeout	10000
SL2VL	Single Thread	false
Sweep		
Handover		
Threading		
Logging		
Misc		
QoS		
Congestion Control		
Adaptive Routing		

Field/Box	Description	Default
Max Wire SMPs	A field that shows the maximum number of SMPs sent in parallel.	4
Transaction Timeout	A field that shows the maximum time in [msec] allowed for a	200

Field/Box	Description	Default
	transaction to complete.	
Max Message FIFO Timeout	A field that shows the maximum time in [msec] a message can stay in the incoming message queue.	10000
Single Thread	When enabled, a single thread is used for handling SA queries.	Disabled

SM Logging Configuration

The SM Logging tab enables you to view and/or set the **Subnet Manager Logging Configuration** parameters.

To configure SM Logging, set the fields as described in the table below and click “Save.”

Field/Box	Description	Default
Log File	Path of the Log file to be used.	cond/opt/ufm/files/log/opensm.log

Field/Box	Description	Default
Log Max Size	A field that allows you to view and/or edit the size limit of the log file in MB. If overrun, the log is restarted.	4096
Dump Files Directory	The directory that holds the SM dump file.	<code>/opt/ufm/files/log</code>
Force Log Flush	Force flush to the log file for each log message.	Disabled
Accumulate Log File	If enabled, the log accumulates over multiple SM sessions.	Enabled
Log Levels	Available log levels: Error, Info, Verbose, Debug, Funcs, Frames, Routing, and Sys.	Error and Info

SM Miscellaneous Settings

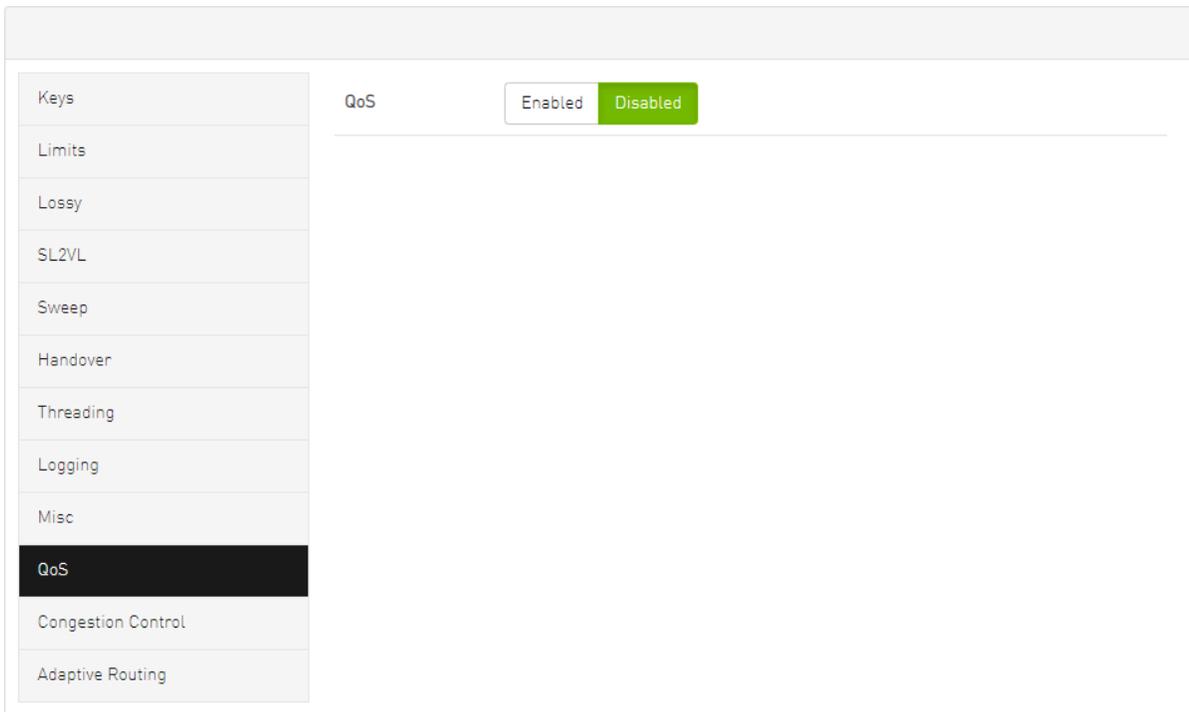
The Misc tab enables you to view additional **Subnet Manager Configuration** parameters. You cannot change the configuration in this tab.

Keys	Node Names Map File	N/A
Limits	SA Database File	N/A
Lossy	No Clients Reregistration	false
SL2VL	Disable MultiCast	false
Sweep	Exit On Fatal Event	true
Handover		
Threading		
Logging		
Misc		
QoS		
Congestion Control		
Adaptive Routing		

Field/Box	Description	Default
Node Names Map File	A field that allows you to view and/or set the node name map for mapping nodes to more descriptive node descriptions.	None
SA Database File	SA database file name	None
No Clients Reregistration	If enabled, disables client re-registration.	Disabled
Disable Multicast	If enabled, the SM disables multicast support and no multicast routing is performed.	Disabled
Exit on Fatal Event	If enabled, the SM exits on fatal initialization issues.	Enabled

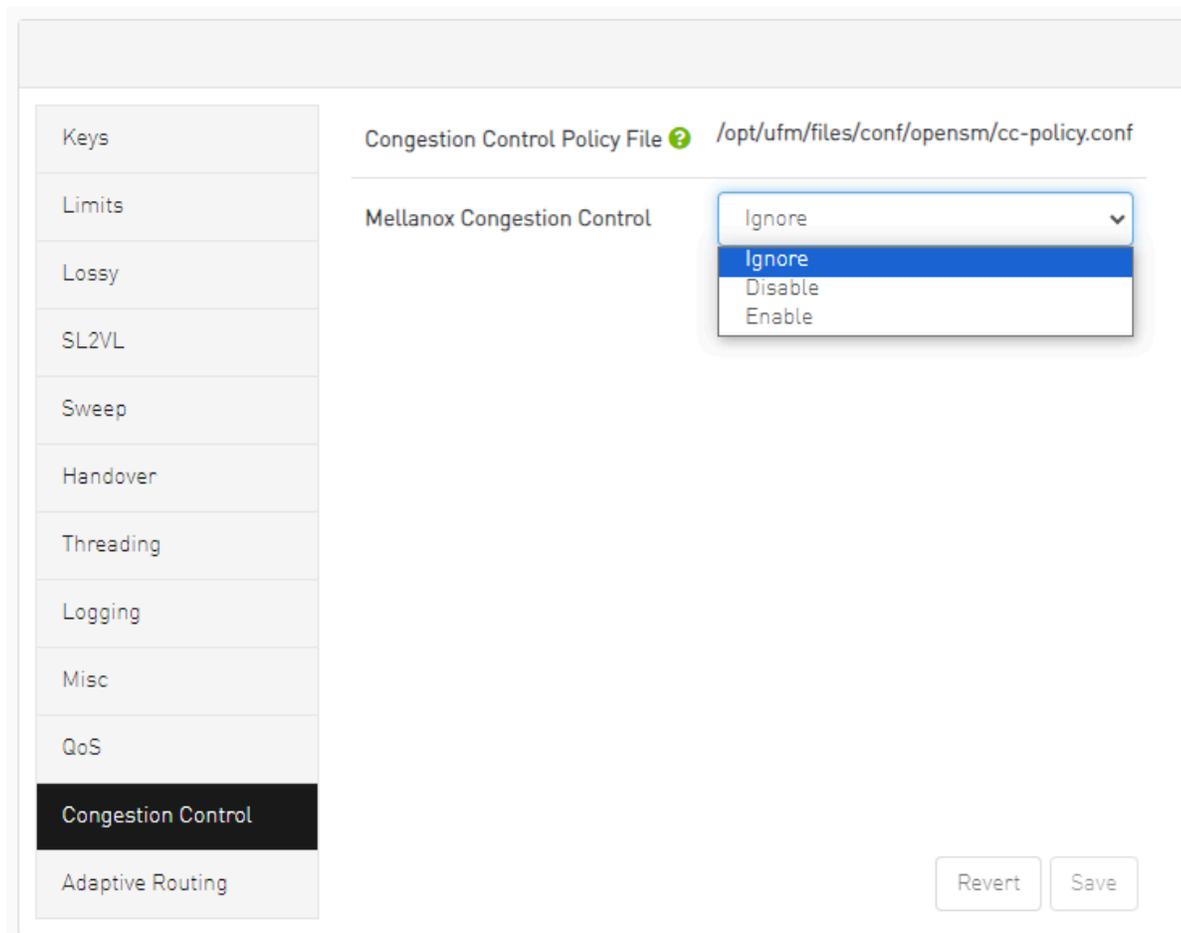
SM QoS Configuration

The QoS tab allows you to enable or disable QoS functionality. QoS is disabled by default.



SM Congestion Control Configuration

The Congestion Control tab allows you to enable, disable, or ignore congestion control.



SM Adaptive Routing Configuration

The Adaptive Routing tab allows you to configure adaptive routing parameters.

Keys	DFP Down Up Turns Mode 	<input type="text" value="0"/>
Limits		
Lossy	DFP Max Cas On Spine 	<input type="text" value="2"/>
SL2VL		
Sweep	Adaptive Routing SL Mask 	<input type="text" value="0x FFFF"/>
Handover		
Threading		
Logging		
Misc		
QoS		
Congestion Control		
Adaptive Routing		

Non-Optimal Links

A non-optimal link is a link between two ports that is configured to operate at a certain speed and width and is operating at a lower rate. The Non-optimal links feature helps you identify potential link failures and reduce fabric inefficiencies.

Non-optimal links can be any of the following:

- NDR links that operate in HDR, EDR, FDR, QDR, DDR or SDR mode
- HDR links that operate in EDR, FDR, QDR, DDR or SDR mode
- EDR links that operate in FDR, QDR, DDR or SDR mode
- FDR links that operate in QDR, DDR or SDR mode
- QDR links that operate in DDR or SDR mode
- 4X links that operate in 1X mode

The Non-Optimal Links window allows you to set the preferred action for non-optimal links.

Settings

Events Policy

Device Access

Network Management

Subnet Manager

Non-Optimal Links

Non-optimal Links Configuration

Non-optimal link is a link that is configured to operate in certain speed and width and is operating in a lower rate. This helps to identify potential link failures and helps reduce fabric inefficiencies.

Non-optimal Links Behavior:

Reset all Non-optimal Links

Disable all Non-optimal Links

To set the non-optimal links policy:

From the drop-down menu, select the action for Non-optimal Links behavior.

The drop-down menu defines the default behavior. Options are: **Ignore** (default), **Disable**, and **Reset**.

Option	Description
Ignore	Ignore the non-optimal links
Reset	Reset all non-optimal links ports
Disable	Disable all non-optimal links ports

Reset all Non-Optimal Links allows users to reset all current non-optimal links ports on-demand.

Disable all Non-Optimal Links allows users to disable all current non-optimal links ports on-demand.

User Management Tab

UFM User Authentication is based on standard Apache User Authentication. Each Web Service client application must authenticate against the UFM Server to gain access to the

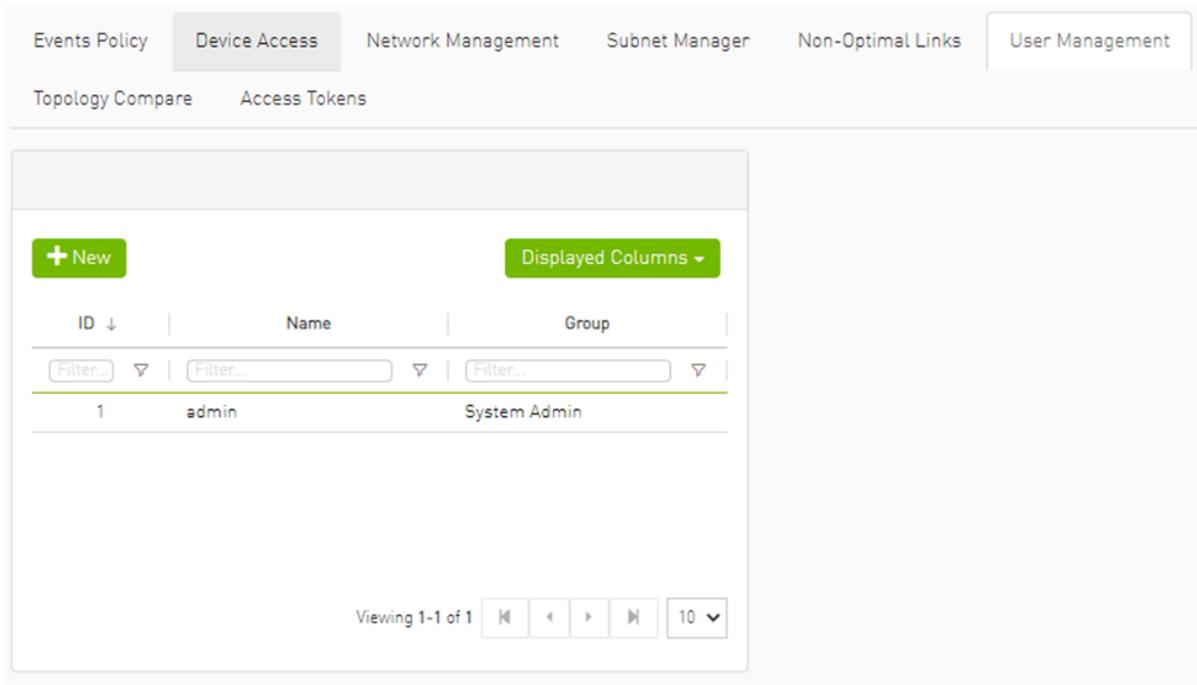
system. UFM implements any kind of third-party authentication supported by the Apache Web Server.

The default user (admin) has System Administration rights. A user with system Administration rights can manage other users' accounts, including creation, deletion, and modification of accounts. The system's default user is the **admin** user.

To add a new user account, do the following:



1. Click the “New” button.



2. Fill in the required fields in the dialog box.

The image shows a 'Create A User' dialog box with the following fields:

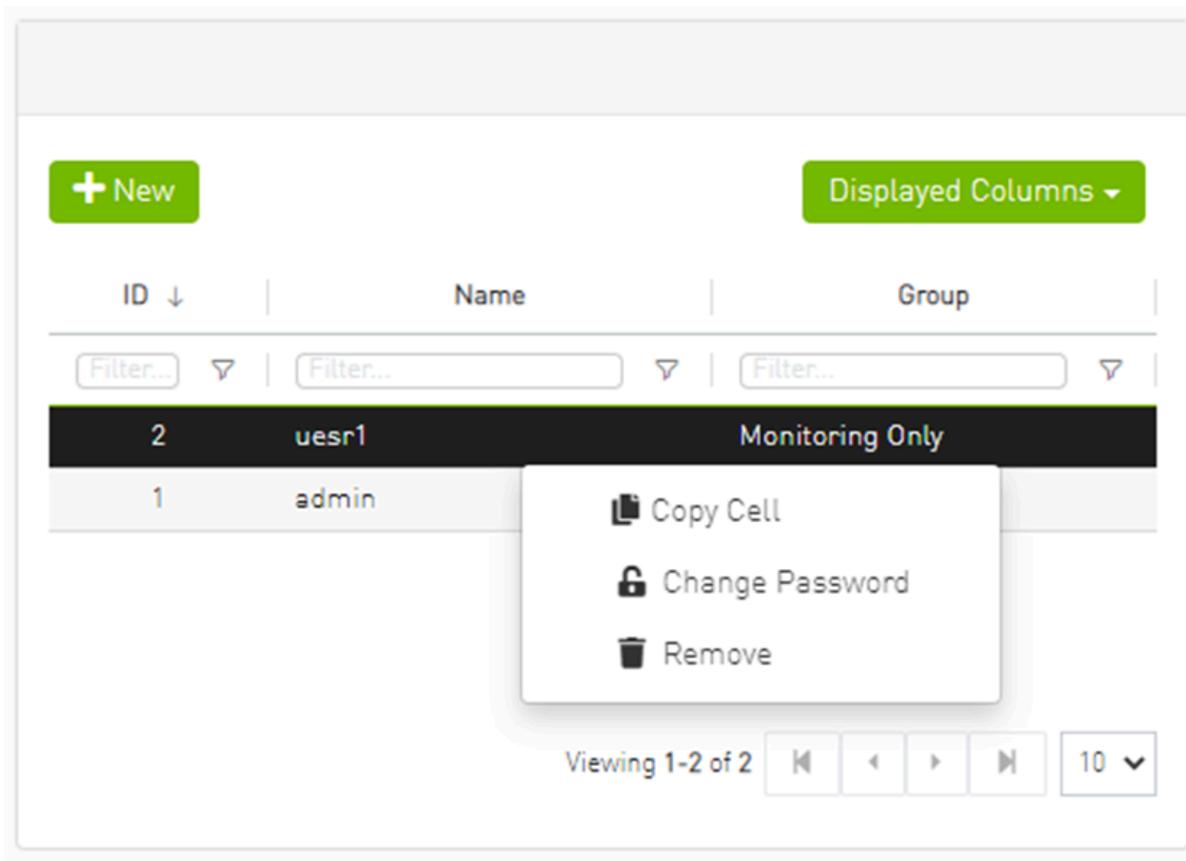
- User Name:
- Group:
- Password:
- Confirm Password:

A green 'Create' button is positioned at the bottom right of the dialog.

Each user can be assigned to one of the following Group (role) options:

- **System Admin** – users can perform all operations including managing other users accounts.
- **Fabric Admin** – users can perform fabric administrator actions such as update SM configuration, update global credentials, manage reports, managing unhealthy ports, and manage PKeys, etc.
- **Fabric Operator** – users can perform fabric operator actions such as device management actions (enable/disable port, add/remove devices to/from groups, reboot device, upgrade software, etc.)
- **Monitoring Only** – users can perform monitoring actions such as view the fabric configuration, open monitoring sessions, define monitoring templates, and export monitoring data to CSV files, etc.

To edit existing users accounts, right-click the account from the list of user accounts and perform the desired action (Change Password/Remove).



Email

SMTP configuration is required to set both the [Daily Reports Tab](#) and the Email-on-Events features.

1. In the SMTP Configuration dialogue window, enter the following information:

Attribute	Description
SMTP Server	The IP or host name of the SMTP server. Examples: <ul style="list-style-type: none"> ◦ If mail service is installed, localhost is a valid value for this field, but usually it cannot send mails outside the local domain. ◦ smtp.gmail.com
SMTP Port	Default value – 25
Sender Name	The name that will be displayed in the email header
Sender Address	A valid email address that will be displayed in the email header
Time Zone	The default time zone for receiving sent emails is the server time zone. Users have

Attribute	Description
	the option to specify a different preferable time zone
Use Authentication	By default, this field is unchecked. If checked, you must supply a username and password in the respective fields
Use SSL	Default value is false – not using SSL
Username	SMTP account username
Password	SMTP account password

2. Click “Save.” All configuration of the SMTP server will be saved in the UFM Database.

Click “Send Test Email” to test the configuration and the following model will appear:

Attribute	Description
Recipients	User can choose email from event policy and daily report recipients or enter any email

Attribute	Description
Subject	Email subject
Message	Email message

The System Health window enables running and viewing reports and logs for monitoring and analyzing UFM server and fabric health through the following tabs: UFM Health, UFM Logs, UFM Snapshot, Fabric Health, Daily Reports and Topology Compare.

Remote Location

Remote location tab is used to set a predefined remote location for the results of System Dump action on switches and hosts and for IBDiagnet executions.

Field	Description
Protocol	The protocol to use to move the dump file to the external storage (scp/sftp)
Server	Hostname or IP address of the server
Path	The path where dump files are saved
Username	Username for the server

Field	Description
Password	Respective password

After configuring these parameters, it would be possible for users to collect sysdumps for specific devices, groups, or links (through Network Map/Cables Window) by right-clicking the item and selecting System Dump.

Data Streaming

This section allows users to configure System Logs settings via web UI.

Data Streaming Configurations

System Logs

Status

Disabled

Enabled

Mode

Local

Remote

Destination

:

System logs level

Warning
▼

Streaming Data

UFM logs
 Event logs (allows selecting which events to stream from [Events policy](#))

Save

Field	Description
Status	Enable/disable exporting UFM logs to system logs
Mode	Export logs to local or remote system logs
Destination	Remote server IP/hostname and port
System Logs Level	Log level to export

Field	Description
Streaming Data	<p>Logs to export to system logs.</p> <p>Note Events logs are selected one by one from Events Policy settings when the system logs feature is enabled.</p>

Topology Compare

This tab controls the settings for the [Periodic Topology Comparison](#) feature.

The screenshot shows the 'Topology Compare Settings' configuration page. It includes a navigation bar with tabs for 'Events Policy', 'Device Access', 'Network Management', 'Subnet Manager', 'Non-Optimal Links', 'User Management', 'Email', 'Remote Location', 'Data Streaming', and 'Topology Compare'. The 'Topology Compare Settings' section contains two configuration options:

- Comparison Interval** (For comparing the current topology with master topology): Set to 1 Days.
- Stable Topology Period** (For offering user to update the master topology for comparison): Set to 8 Hours.

A 'Save' button is located at the bottom right of the settings area.

- Comparison Interval – determines how often the current topology is compared against the master topology
- Stable Topology Period – determines how long a topology must be stable before it is designated the new master topology

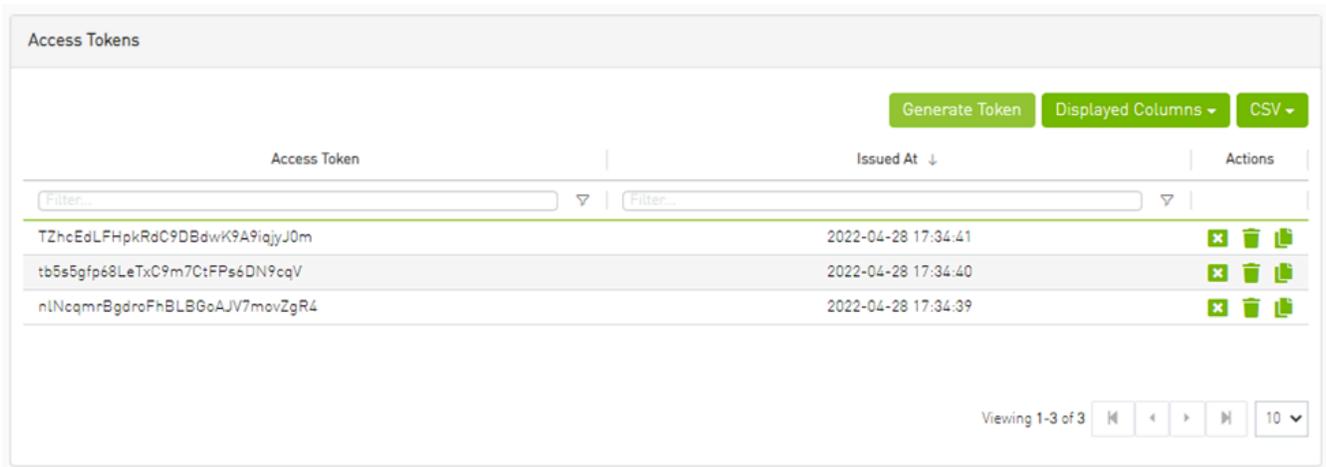
Token-based Authentication

Token-based authentication is a protocol which allows users to verify their identity, and in return receive a unique access token. During the life of the token, users then access the UFM APIs that the token has been issued for, rather than having to re-enter credentials each time they need to use any UFM API.

Note

Under the Settings section there is a tab titled called “Access Tokens”.

The functionality of the added tab is to give the user the ability to create new tokens & manage the existing ones (list, copy, revoke, delete):



Access Token	Issued At ↓	Actions
TZhcEdLFHpkRdC9DBdwK9A9iajyJ0m	2022-04-28 17:34:41	  
tb5s5gfp68LeTxC9m7C:FPs6DN9cqV	2022-04-28 17:34:40	  
nINcqmrBgdroFhBLBG6AJV7movZgR4	2022-04-28 17:34:39	  

Actions:

Name	Icon	Description
Revoke		Revoke a specific token.  Note The revoked token will no longer be valid.
Delete		Delete a specific token.
Copy		Copy specific token into the clipboard.

Note

Each user is able to list and manage only the tokens that have been created by themselves. Only the users with system_admin role will be able to create tokens.

Plugin Management

Plugin management allows users to manage UFM plugins without using CLI commands. Under "Settings", there is a tab titled "Plugin Management".

The functionality of the "Plugin Management" tab is to give the user the ability to add, remove, disable and enable plugins.

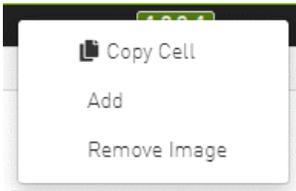
Furthermore, the plugin management feature allows loading a plugin's image in two ways: either by remotely pulling it from a Docker Hub repository or by directly uploading the image file from the user's local machine.

Name	Enabled	Tags	Port	Shared Volumes	Status
advanced_hello_world	✘	1.0.0-1	NA	NA	stopped
tfs	✘	LATEST	NA	NA	stopped

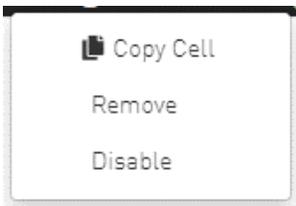
Name	Enabled	Tag	Port	Shared Volumes	Status
ahxmonitor	✔	latest	8910	/opt/ufm/files/log:/opt/ufm/files/conf:/opt/ufm/files/conf	stop
ndt	✘	NA	NA	NA	stop

Actions:

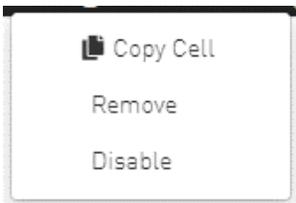
- Add – Used to add a selected plugin, opens a model to select the needed tag.



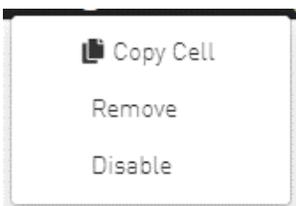
- Remove – Used to remove a selected plugin.



- Disable – Used to disable a selected plugin, so the plugin is disabled once the UFM is disabled.



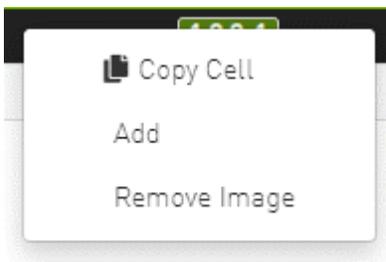
- Enable – Used to enable a selected plugin, so the plugin is enabled once the UFM is enabled.



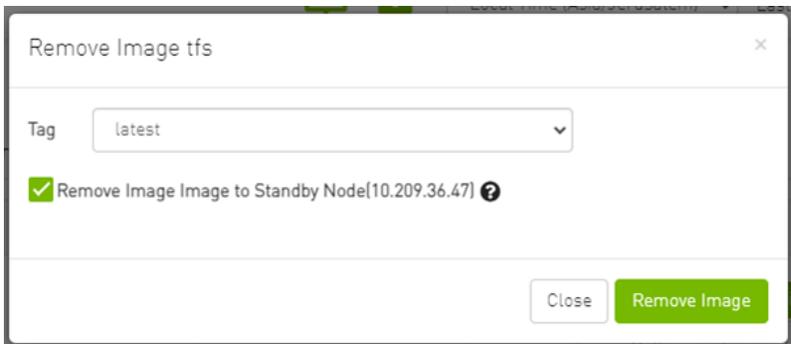
- Add ahxmonitor – Used to add a selected plugin; the action opens a modal to select the requested tag.



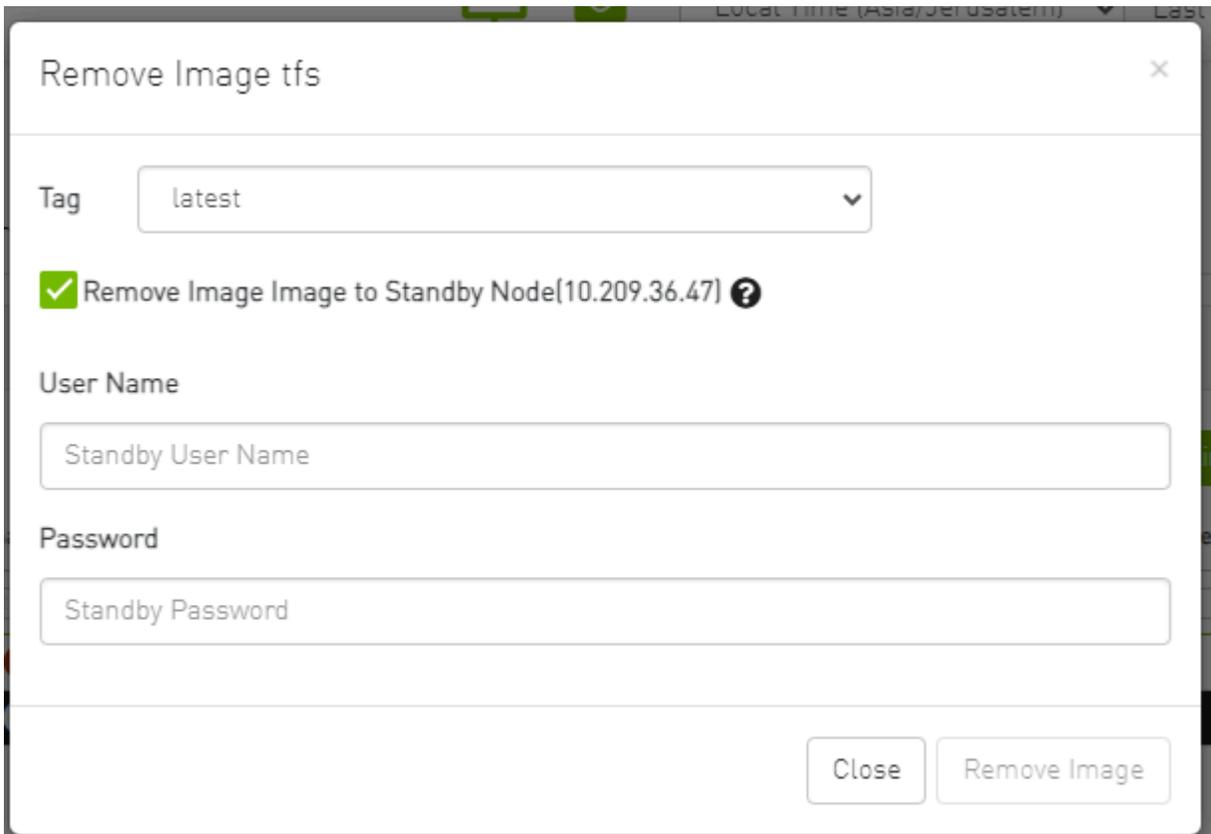
- Remove plugin Image – Used to remove plugin image



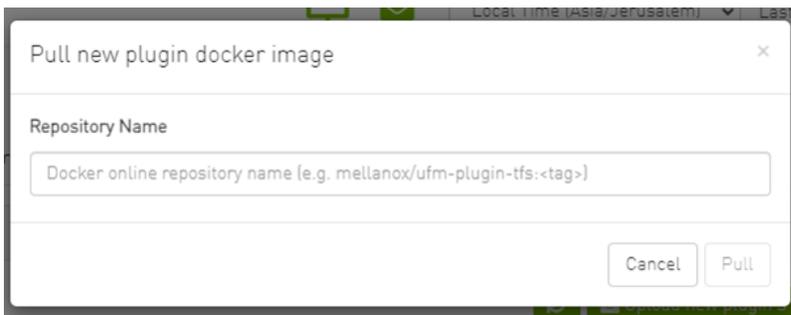
If the high availability (HA) mode is enabled, the user will see the option to remove the image from the standby node as well.



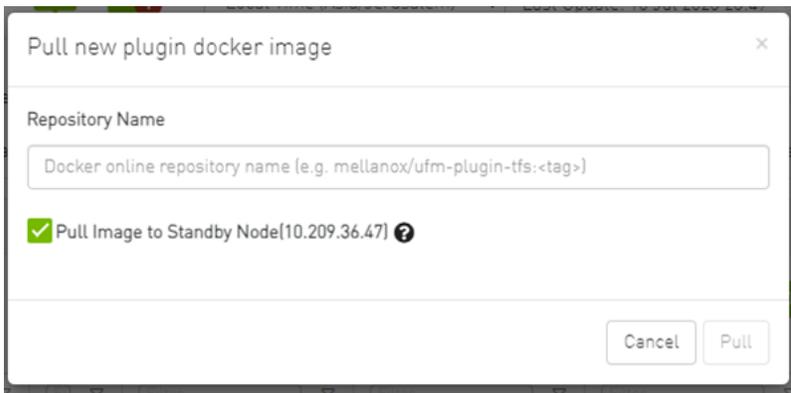
In cases where there is no established trust communication between the master and standby nodes, the user will be required to provide a username and password to establish an SSH connection between them.



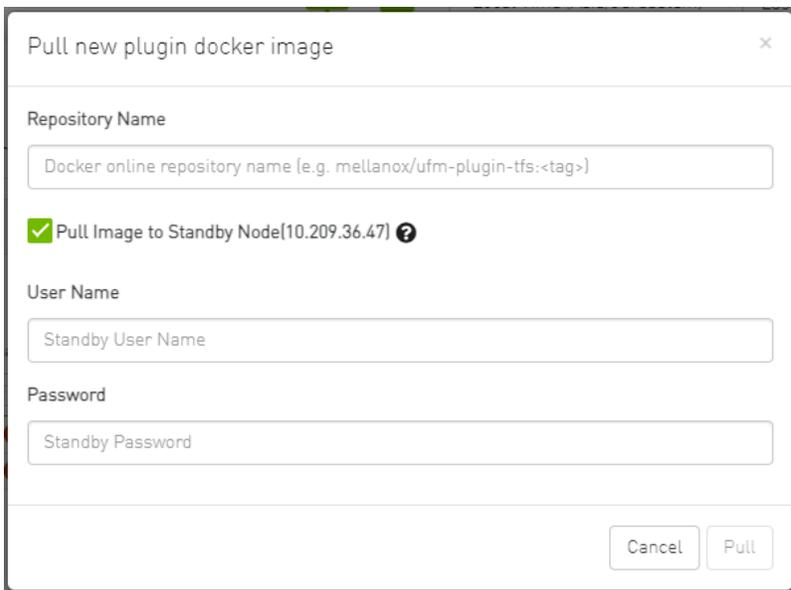
- Pull plugin Image – Used to pull plugin image remotely (e.g. from a Docker Hub repository) or by loading it from user local machine by uploading the image file itself.



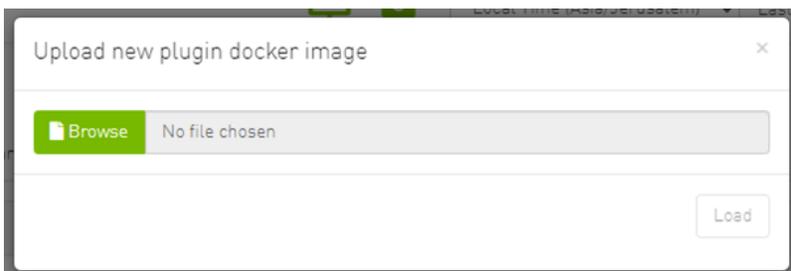
If the high availability (HA) mode is active, the user will be presented with the choice to pull the image to the standby node as well.



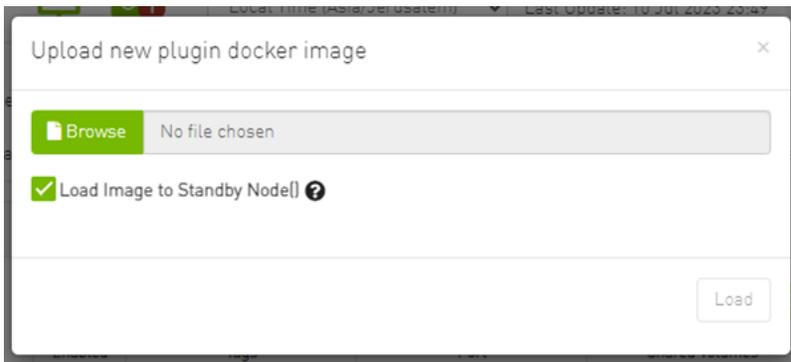
Once again, in the absence of trusted communication between the master and standby nodes, the user will need to input a username and password to create an SSH connection between the nodes.



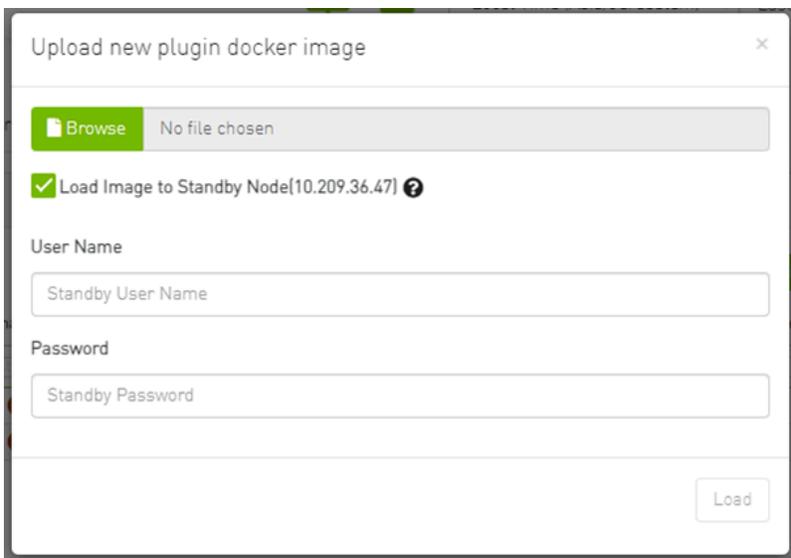
- Load plugin Image: this feature allows the user to upload the image file from their local machine directly.



Similarly, if the high availability (HA) mode is enabled, the user will have the option to load the image to the standby node too.



And, as mentioned earlier, if there is no trusted communication between the master and standby node, the user will need to provide a username and password to establish an SSH connection between the nodes.



Rest Roles Access Control

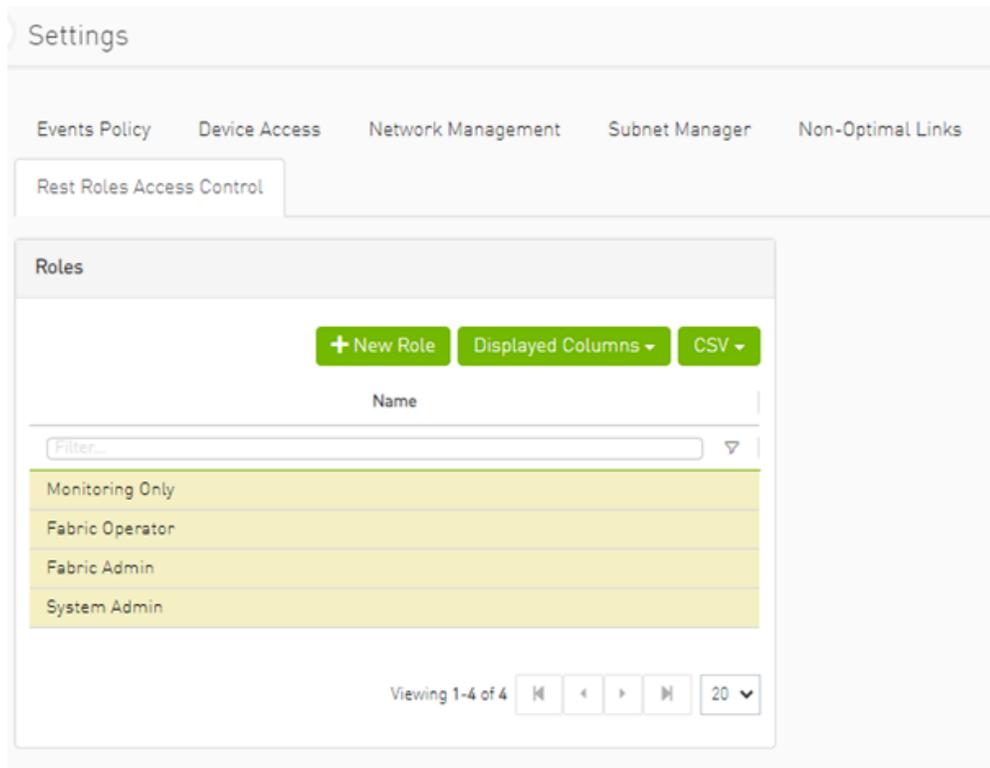
In UFM, there are four predefined roles with the following corresponding values:

1. System Admin (Role value: 5)
2. Fabric Admin (Role value: 4)
3. Fabric Operator (Role value: 3)
4. Monitoring Only (Role value: 2)

For more information, refer to the [User Management Tab](#).

The "Rest Roles Access Control" tab empowers Admin users to design their custom roles alongside the existing predefined roles. Admins can set permissions and access levels for these custom roles, defining which APIs the roles can access.

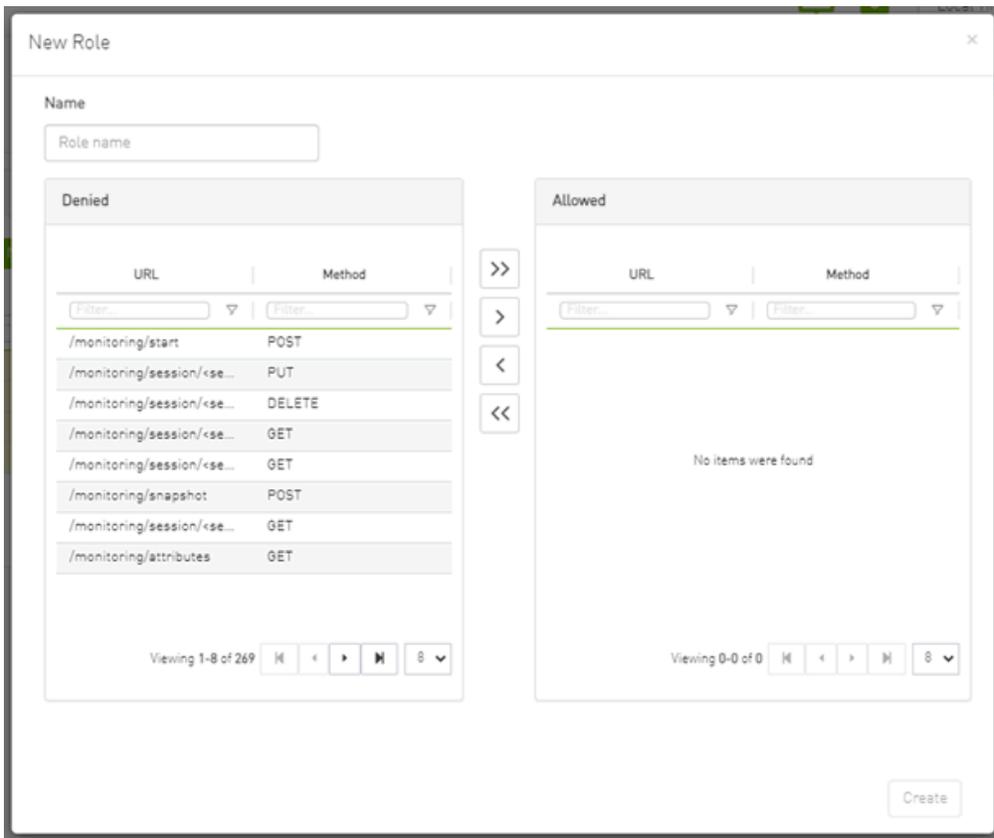
Roles are presented in a table format, with the predefined roles highlighted in yellow.



This tab is exclusively available to System_Admin users and can be enabled or disabled through the `gv.cfg` file. By default, it is enabled.

Adding a New Role

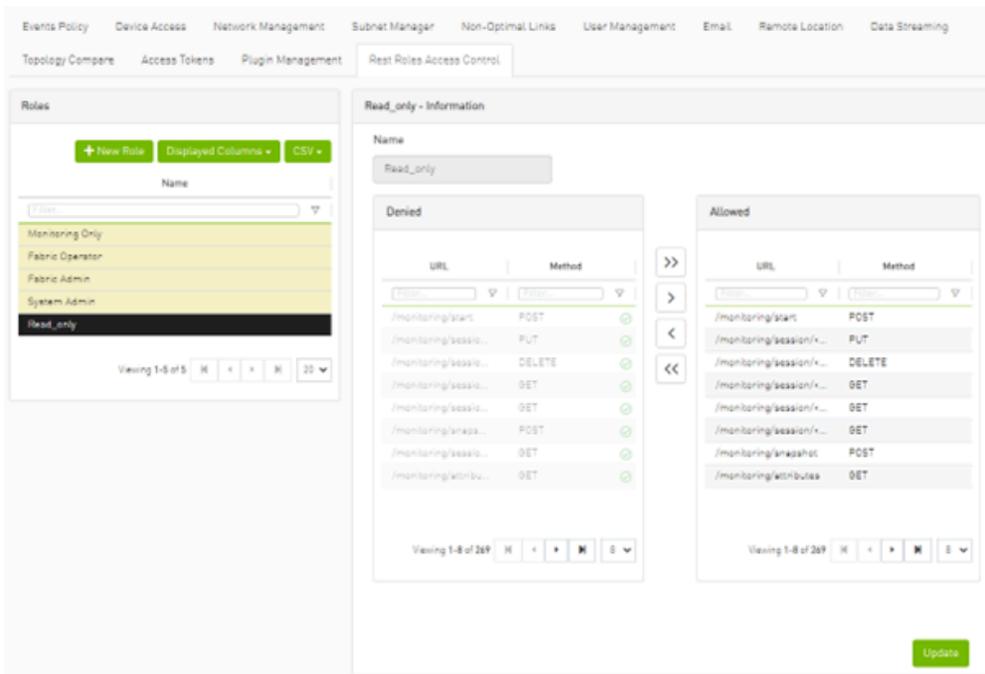
1. Click the **+ New Role** button.
2. Fill in the necessary details in the dialog box.



By default, all URLs are denied. To allow specific URLs for this role, move them to the "allowed" category.

Updating Custom Roles

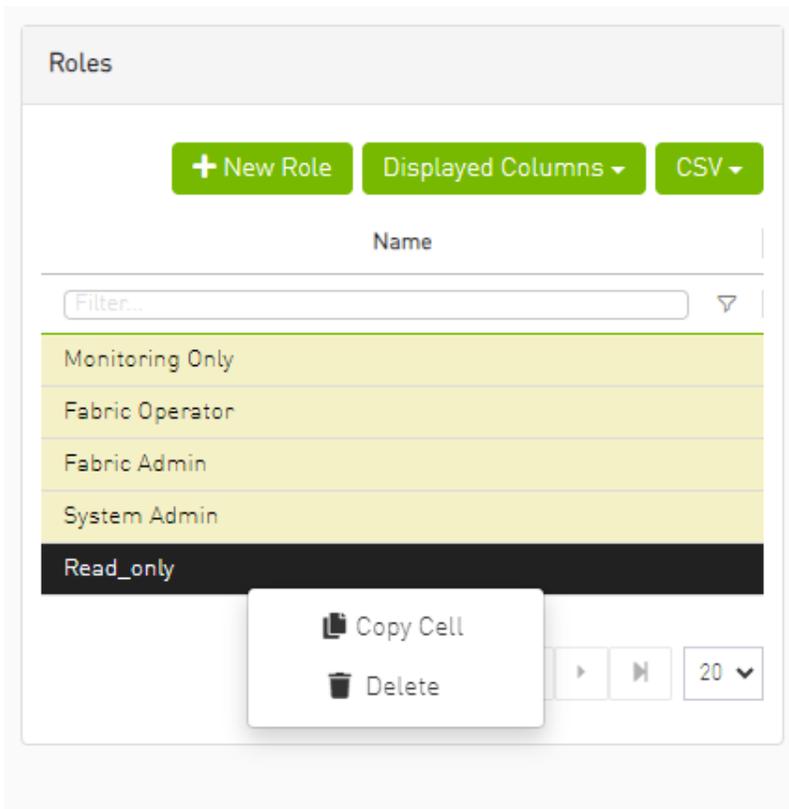
1. Select the role that requires updating.



2. Modify the allowed list from the role information section.

Deleting Custom Roles

1. Right-click on the role that needs deletion.
2. Choose the "Delete" option from the context menu.



(i) Note

Deleting and updating predefined roles is not permitted.

Creating a User with a Custom Role

1. Navigate to the Users Management tab.
2. Create a new user, and you will find all roles (both custom and predefined) listed under the group list.

Create A User

User Name

Group

Monitoring Only

Fabric Operator

Fabric Admin

System Admin

Read_only

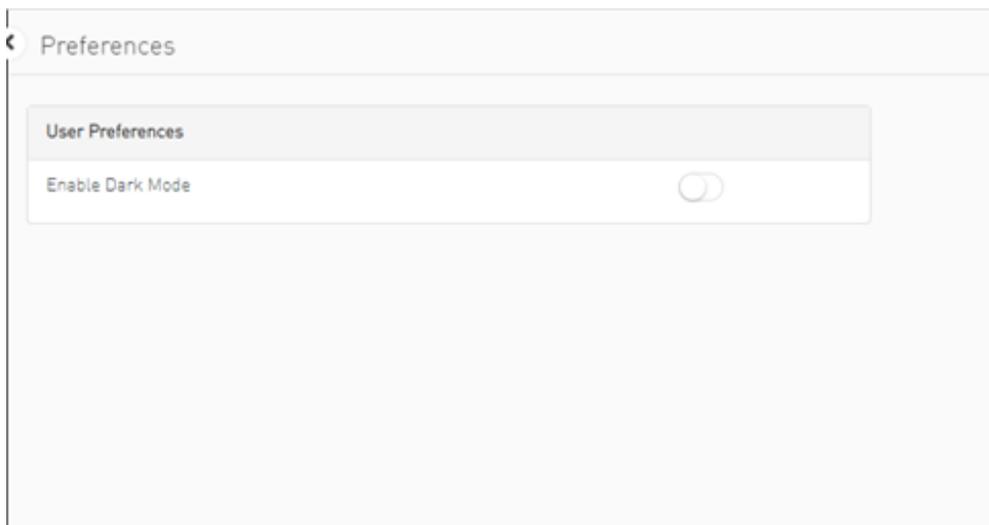
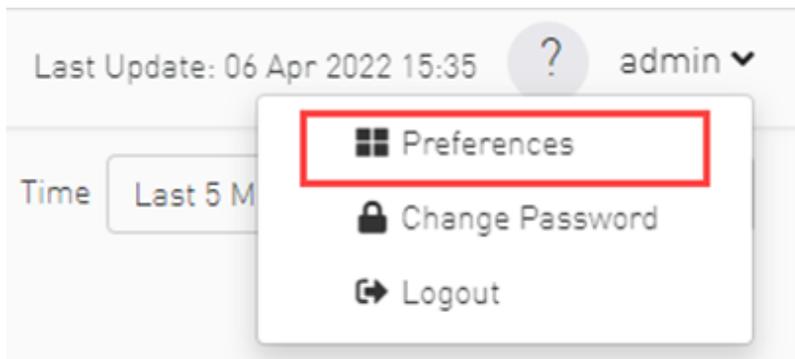
Password

Confirm Password

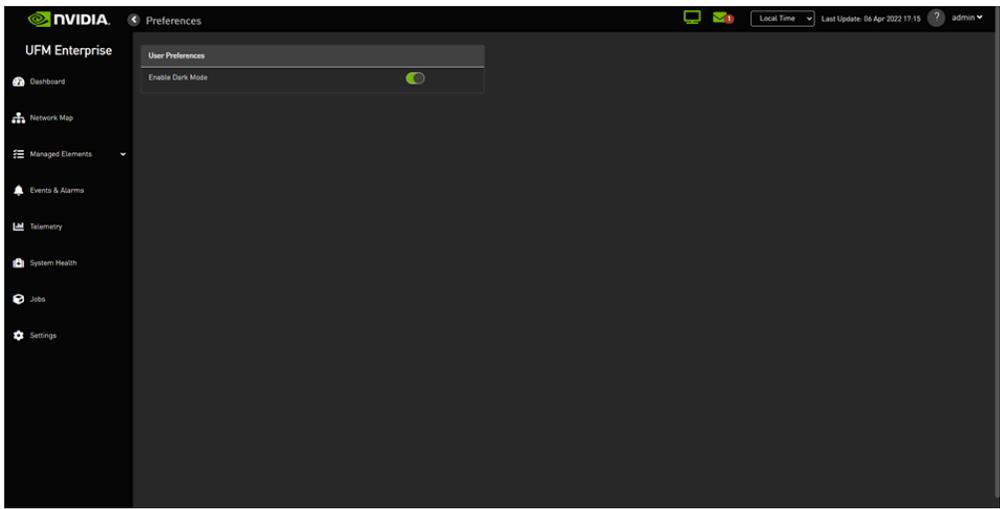
Create

User Preferences

This page allows user to change UI preferences in general.



When user enables dark mode, the UFM is presented in dark theme.



Multi-Subnet UFM

Overview

The Multi-Subnet UFM feature allows for the management of large fabrics, consisting of multiple sites, within a single product, namely Multi-Subnet UFM.

This feature is comprised of two layers: UFM Multi-Subnet Provider and UFM Multi-Subnet Consumer.

The UFM Provider functions as a Multi-Subnet Provider, exposing all local InfiniBand fabric information to the UFM consumer. On the other hand, the UFM Consumer acts as a Multi-Subnet Consumer, collecting and aggregating data from currently configured UFM Providers, enabling users to manage multiple sites in one place. While UFM Consumer offers similar functionality to regular UFM, there are several behavioral differences related to aggregation.

Setting Up Multi-Subnet UFM

In `/opt/ufm/files/conf/gv.cfg`, fill in the section named `[Multisubnet]` for UFM Multi-Subnet Provider and Consumer.

To set up UFM as a Multi-Subnet Provider, perform the following:

- Set `multisubnet_enabled` to `true`
- Set `multisubnet_role` to `provider`
- Set `multisubnet_site_name` (optional, if not set, it will be randomly generated); e.g., `provider_1`
- Start UFM

To set up UFM as a Multi-Subnet Consumer, perform the following:

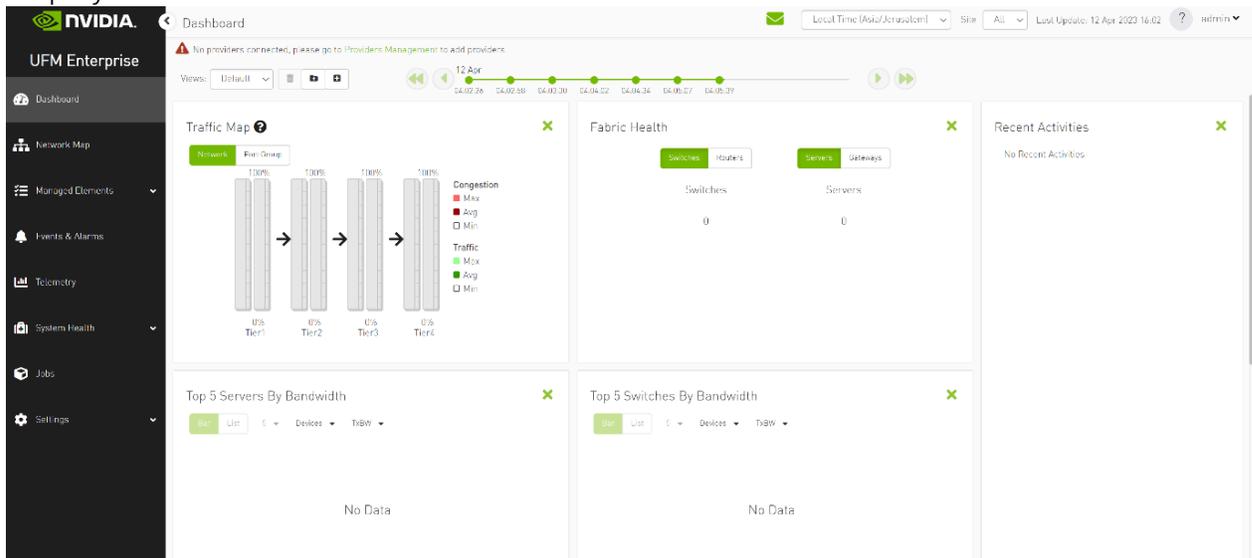
- Set `multisubnet_enabled` to `True`
- Set `multisubnet_role` to `consumer`

- Start UFM

It is important to note that UFM Multi-Subnet Consumer can be configured on a machine or VM without an established InfiniBand connectivity. Additionally, users may customize UFM Provider and Consumer using optional configuration parameters found in the [`Multisubnet`] section of `/opt/ufm/files/conf/gv.cfg`.

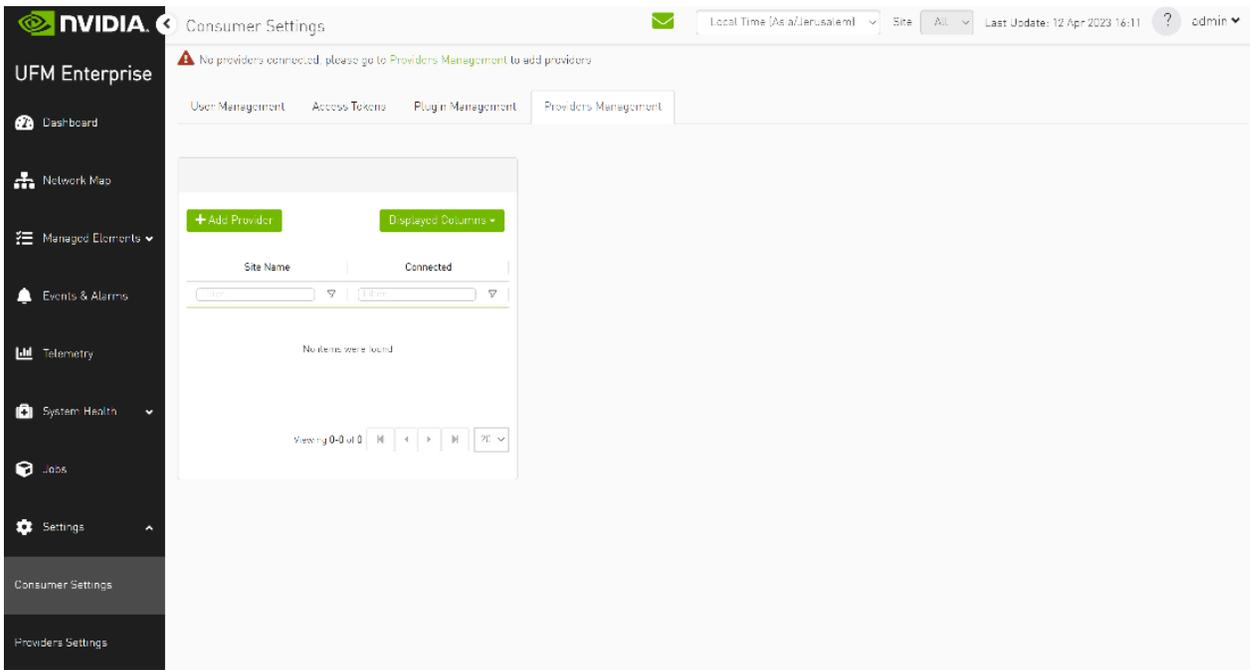
Functionality

1. Following the initial launch of the Consumer, the Dashboard view is devoid of data, and a message containing a hyperlink leading to the Provider Management section is displayed.



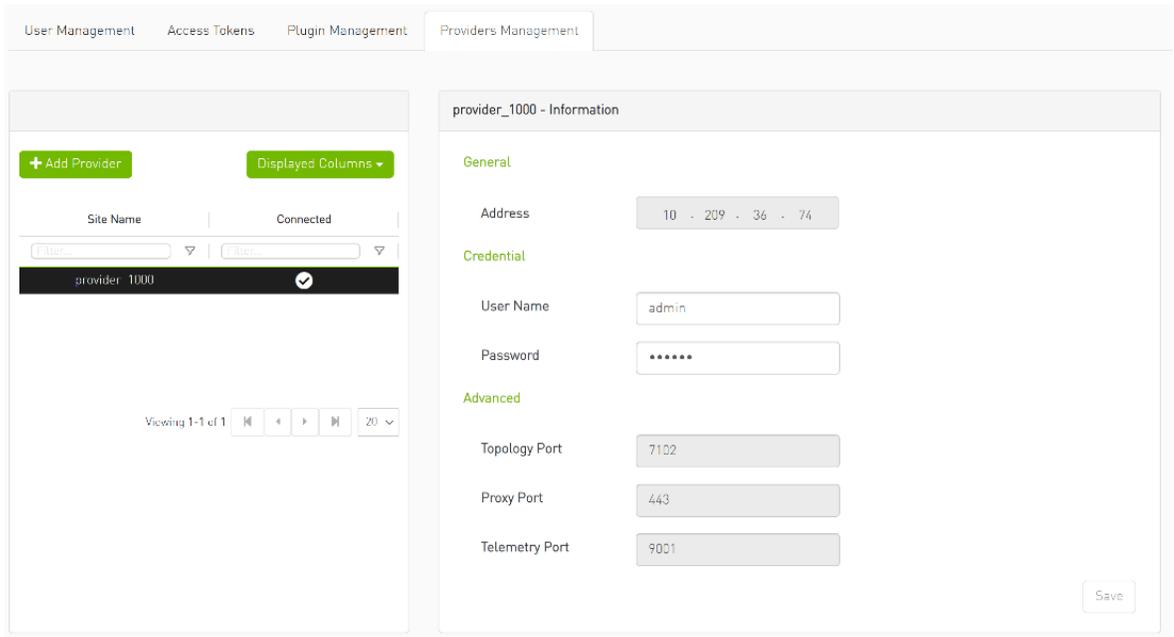
 No providers connected, please go to [Providers Management](#) to add providers

2. As shown in the below snapshot, a new section for Provider Management has been added, enabling users to configure UFM Providers.

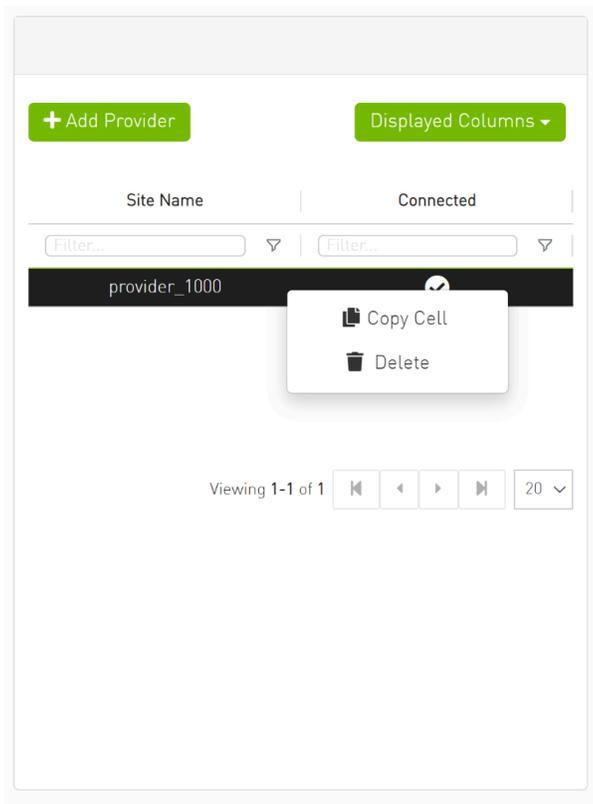


1. To add a provider, the user is required to enter its IP address and credentials. Unless there are multiple instances of UFM providers on a single machine, the advanced section parameters should be set with default values. However, if there are multiple instances, the advanced parameters may be set per Provider and then be configured in the Providers Management view.

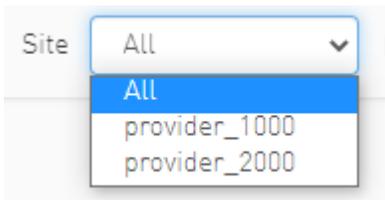
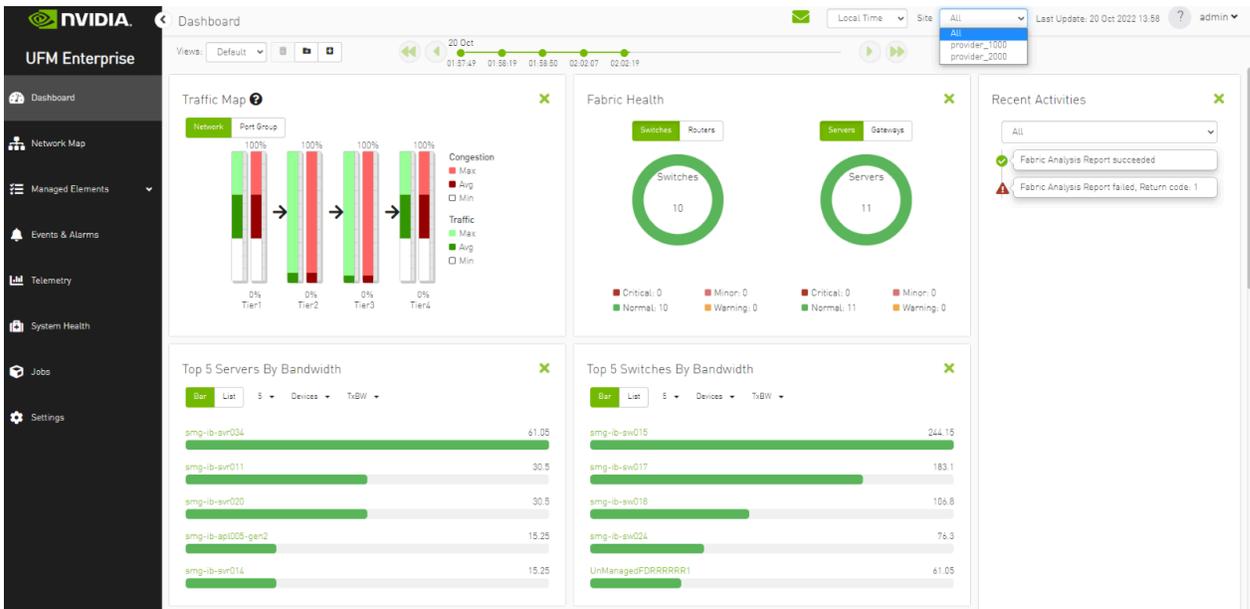
2. By editing the Provider view, you can change Provider's credentials.



- The "Delete Provider" function removes the selected Provider from the Consumer. Please note that this action may take some time to complete, and changes may only be reflected in the view after approximately 30 seconds.



- A general filter has been added to the top right corner of the page, enabling users to filter displayed data by site.



Local Time (Asia/Jerusalem) Site: All Last Update: 12 Apr 2023 16:35

Severity	Name	GUID	Type	Model	IP	Firmware Version	Site Name
Warn...	r-utm83	0xecDd9a0300b152f4	host		0.0.0.0	16.33.1048	provider_2000
Info	sharp2	0x7cfe900300a5a7a0	switch	MS18/800	0.0.0.0		provider_1000
Info	switchib	0xecDd9a030079dba0	switch	FDR	0.0.0.0		provider_1000
Info	utm-host87	0xecDd9a03007d7f0a	host		0.0.0.0		provider_1000
Info	r-utm2%4-hyp-04	0x043f770300d0d1d3c	host		0.0.0.0		provider_1000
Info	r-utm2%4-hyp-03	0x0c47a103007aca90	host		0.0.0.0		provider_1000
Warn...	desc1	0x043f770300206650	switch	FDR	0.0.0.0	15.2007.354	provider_2000
Info	node001	0xecDd9a0300c04b74	host		0.0.0.0	16.31.1046	provider_2000
Info	swx-tor01	0xecDd9a0300469ffc	host		0.0.0.0		provider_2000

Viewing 1-9 of 9

Devices Local Time (Asia/Jerusalem) Site provider_2000 Last Update: 12 Apr 2023 16:35 admin

All Types All Groups Displayed Columns CSV

Severity	Name	GUID	Type	Model	IP	Firmware Version	Site Name
Warn...	r-ufm83	0xec0d9a0300bf52f4	host		0.0.0.0	16.33.1048	provider_2000
Warn...	desc1	0x043f720300206650	switch	EDR	0.0.0.0	15.2007.354	provider_2000
Info	node001	0xec0d9a0300c04bf4	host		0.0.0.0	16.31.1046	provider_2000
Info	swx-tor01	0xec0d9a0300469ffc	host		0.0.0.0		provider_2000

Viewing 1-4 of 4

4. Network map contains “clouds” for each provider.

Network Map Local Time Site All Last Update: 20 Oct 2022 14:44 admin

Layout: Hierarchical Graph Views: Default Regex Filters: Starts With: Enter filter

View: Zoom In Filters: Select nodes to highlight and display in Zoom In tab



4 Nodes
provider_2000



19 Nodes
provider_1000

View Properties

Display Label: System Name

Type

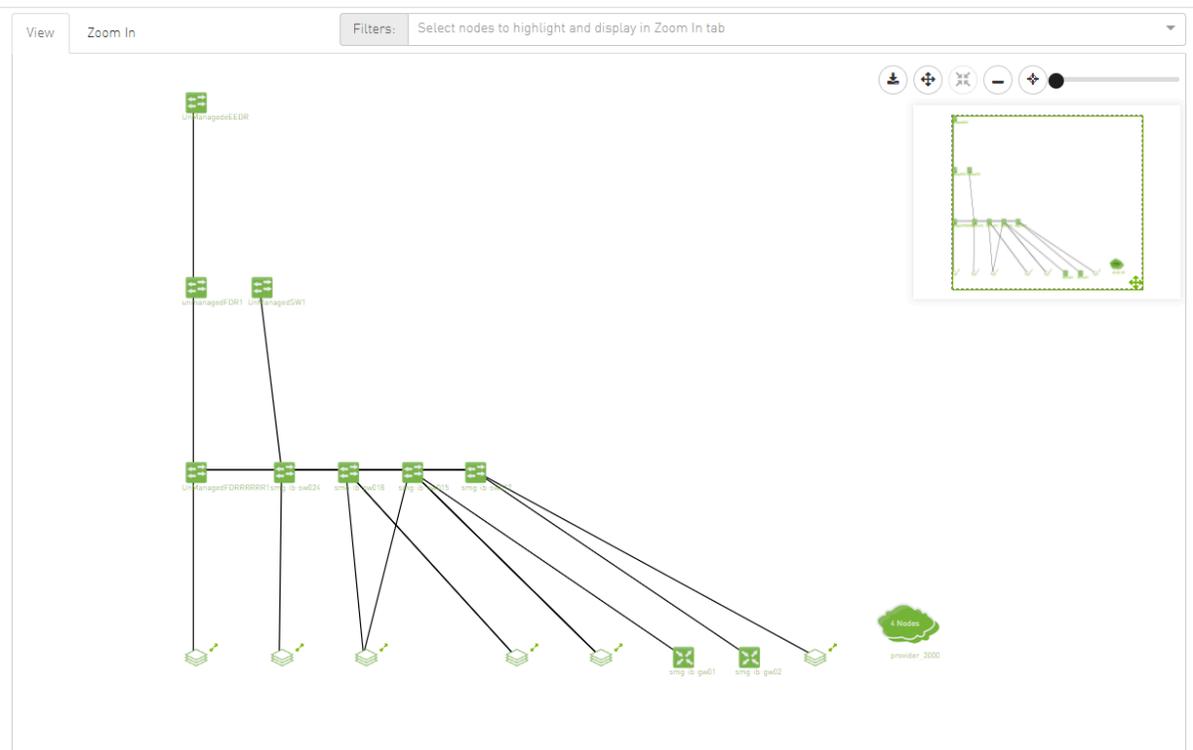
- Rack
- Host
- Gateway
- Switch
- Router

Severity

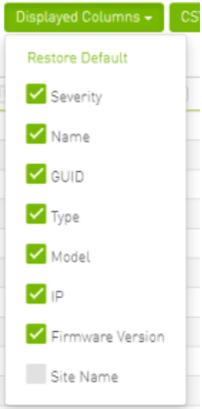
- Info
- Warning
- Minor
- Critical

Network Analysis

- Link Analysis



5. A "Site Name" column is present in all Managed Elements sections. The column is disabled (hidden) by default.



Devices Local Time (Asia/Jerusalem) Site All Last Update: 12 Apr 2023 16:56 admin

All Types All Groups Displayed Columns CSV

Severity	Name	GUID	Type	Model	IP
Info	r-ufm83	0xec0d9a0300b52f4	host		0.0.0.0
Info	sharp2	0x7cfe900300a5a2a0	switch	MSB7800	0.0.0.0
Info	switchib	0xec0d9a030029dba0	switch	LDIR	0.0.0.0
Info	ufm-host87	0xec0d9a03007d7f0a	host		0.0.0.0
Info	r-ufm254-hyp-04	0x043f720300d1d3c	host		0.0.0.0
Info	r-ufm254-hyp-03	0x0c42a103007aca90	host		0.0.0.0
Info	desc1	0x043f720300206650	switch	FDR	0.0.0.0
Info	node001	0xec0d9a0300c04bf4	host		0.0.0.0
Info	swx-tor01	0xec0d9a0300469ffc	host		0.0.0.0

Viewing 1-9 of 9

- Restore Default
- Severity
 - Name
 - GUID
 - Type
 - Model
 - IP
 - Firmware Version
 - Site Name

Devices Local Time (Asia/Jerusalem) Site All Last Update: 12 Apr 2023 16:56 admin

All Types All Groups Displayed Columns CSV

Severity	Name	GUID	Type	Model	IP	Site Name
Info	r-ufm83	0xec0d9a0300b52f4	host		0.0.0.0	provider_2000
Info	sharp2	0x7cfe900300a5a2a0	switch	MSB7800	0.0.0.0	provider_1000
Info	switchib	0xec0d9a030029dba0	switch	EDR	0.0.0.0	provider_1000
Info	ufm-host87	0xec0d9a03007d7f0a	host		0.0.0.0	provider_1000
Info	r-ufm254-hyp-04	0x043f720300d1d3c	host		0.0.0.0	provider_1000
Info	r-ufm254-hyp-03	0x0c42a103007aca90	host		0.0.0.0	provider_1000
Info	desc1	0x043f720300206650	switch	EDR	0.0.0.0	provider_2000
Info	node001	0xec0d9a0300c04bf4	host		0.0.0.0	provider_2000
Info	swx-tor01	0xec0d9a0300469ffc	host		0.0.0.0	provider_2000

Viewing 1-9 of 9

- Restore Default
- Severity
 - Name
 - GUID
 - Type
 - Model
 - IP
 - Firmware Version
 - Site Name

6. The "Group" and "Telemetry" sections include "Site" filters.

New Group

1 General 2 Members

Site: All (dropdown menu showing All, provider_2000, provider_1000)

Available Devices

Type	Name ↑	Site Name
switch	desc1	provider_2000
host	node001	provider_2000
host	r-ufm83	provider_2000
host	r-ufm254-hyp-03	provider_1000
host	r-ufm254-hyp-04	provider_1000
switch	sharp2	provider_1000
switch	switchib	provider_1000
host	swx-tor01	provider_2000

Viewing 1-8 of 9

Selected Devices

Type	Name	Site Name
No items were found		

Viewing 0-0 of 0

Previous Finish

7. The filter in "Groups" impacts the Members table only.

New Telemetry Session

View by: Name

Telemetry Session

Timeseries Top X

Members

Devices Ports

Counters

Select Counters All counters

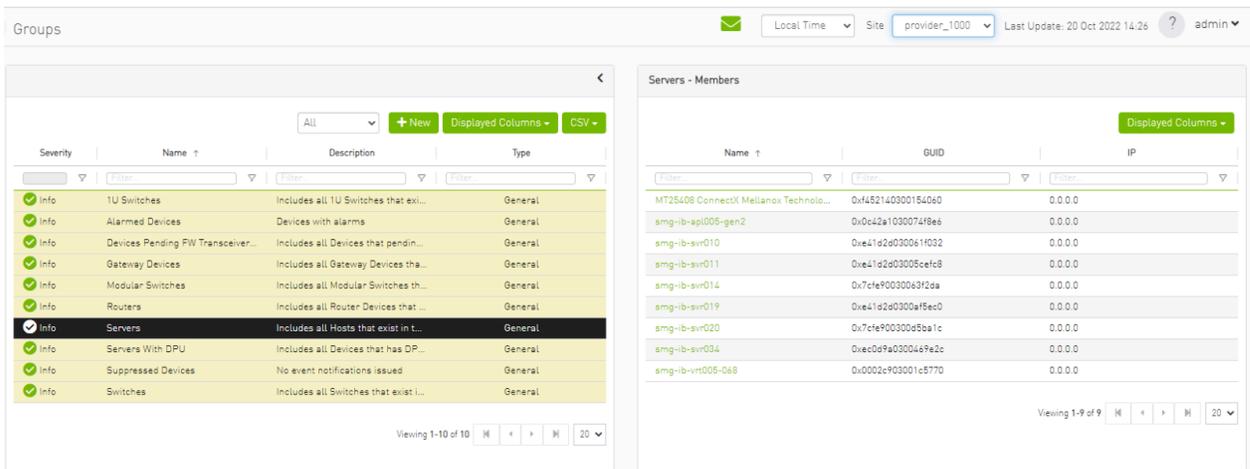
Sites

provider_1000

Devices

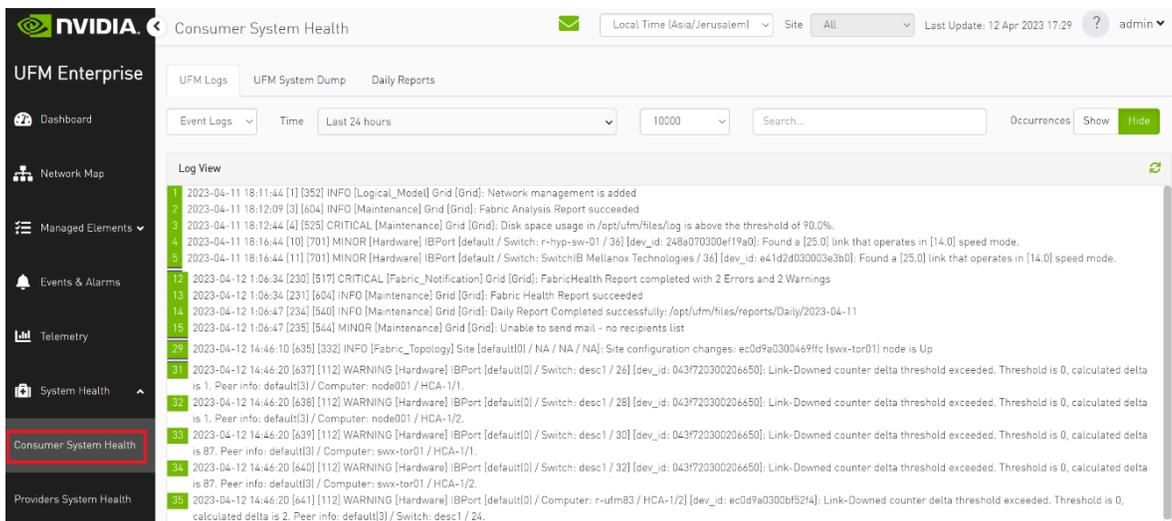
Select Devices All devices

Finish

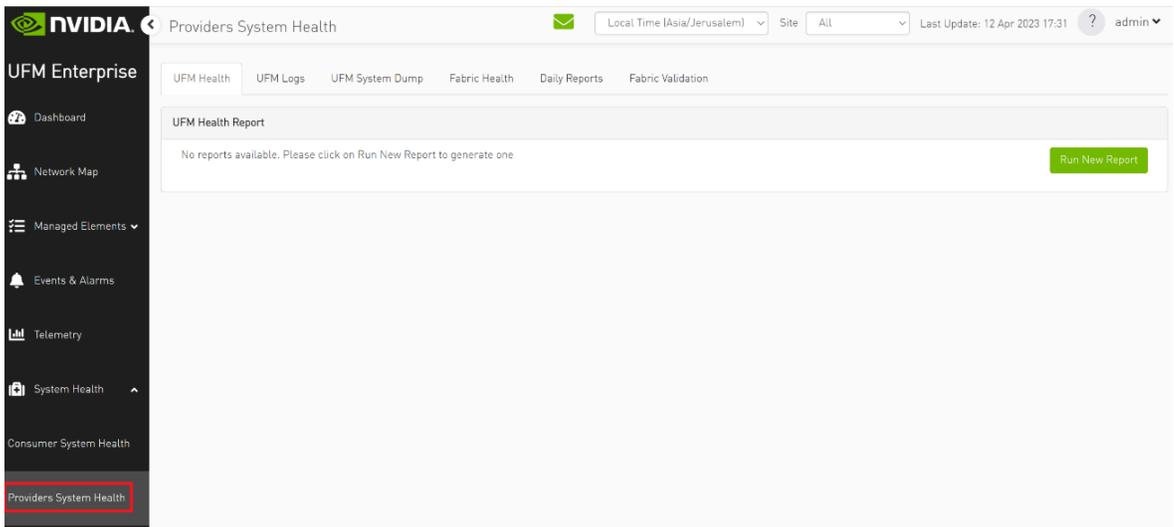


8. In the System Health tab, subsections for Consumer and Provider are available.

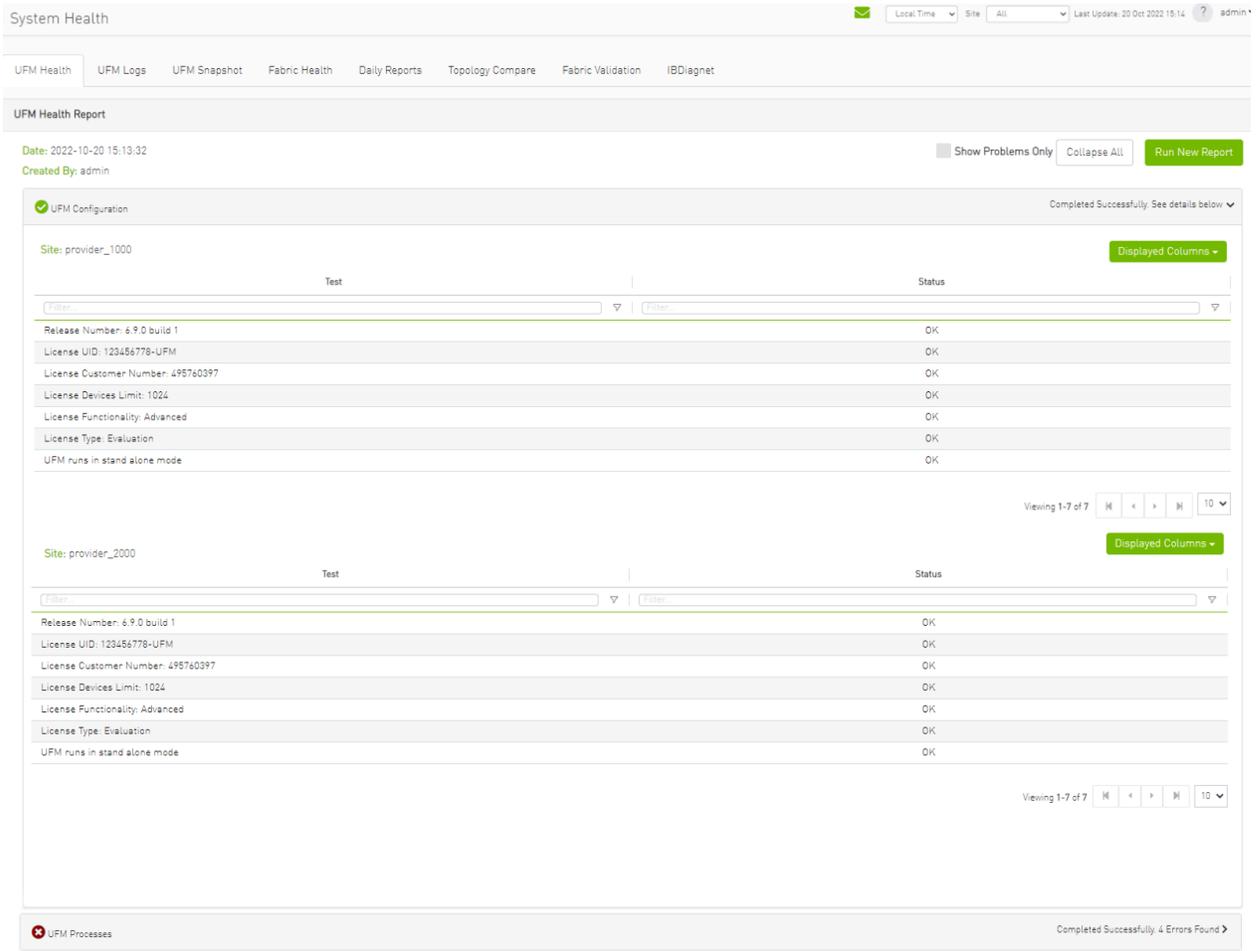
1. Consumer System Health tab contains sections applicable to Consumer UFM specifically (e.g., logs from Consumer UFM).



2. Provider System Health contains sections applicable to one or multiple providers (e.g., Fabric Health Report can be triggered on multiple Providers from the Consumer).



9. UFM Health tab contains sub report tables for each provider.



10. Fabric Health contains sub report tables for each provider.

System Health Local Time Site: All Last Update: 20 Oct 2022 15:14 ? admin

UFM Health UFM Logs UFM Snapshot **Fabric Health** Daily Reports Topology Compare Fabric Validation IBDiagnet

Fabric Health Report

Date: 2022-10-20 14:49:44 Show Problems Only Collapse All Run New Report

Created By: admin

Report Summary

Site: provider_1000 Displayed Columns

Fabric Test	Warnings	Errors	Total
Non-unique and Zero LID Values	0	0	0
Non-unique Node Descriptions	2	0	2
SM Status	0	0	0
Bad Links	0	0	0
Link Width	0	0	0
Link Speed	0	6	6
Firmware Versions	2	0	2
UFM Alarms	0	1	1
BER Error and Warning check	0	0	0
Symbol BER Error and Warning check	0	0	0

Viewing 1-10 of 11

Site: provider_2000 Displayed Columns

Fabric Test	Warnings	Errors	Total
Non-unique and Zero LID Values	0	0	0
Non-unique Node Descriptions	2	0	2
SM Status	0	0	0
Bad Links	0	0	0
Link Width	0	0	0
Link Speed	0	6	6
Firmware Versions	2	0	2
UFM Alarms	198	2	200
BER Error and Warning check	0	0	0
Symbol BER Error and Warning check	0	0	0

Viewing 1-10 of 11

Fabric Summary

11. Daily Reports:

1. Consumer Daily reports display consumer reports.

Consumer System Health Local Time (Asia/Jerusalem) Site: All

UFM Logs UFM System Dump **Daily Reports**

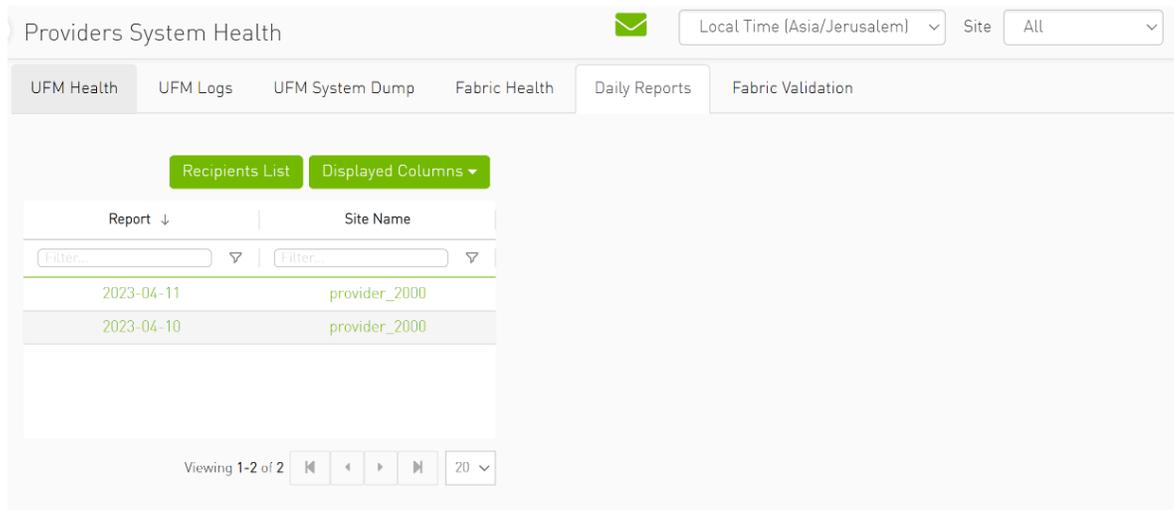
Recipients List Displayed Columns

Report ↓

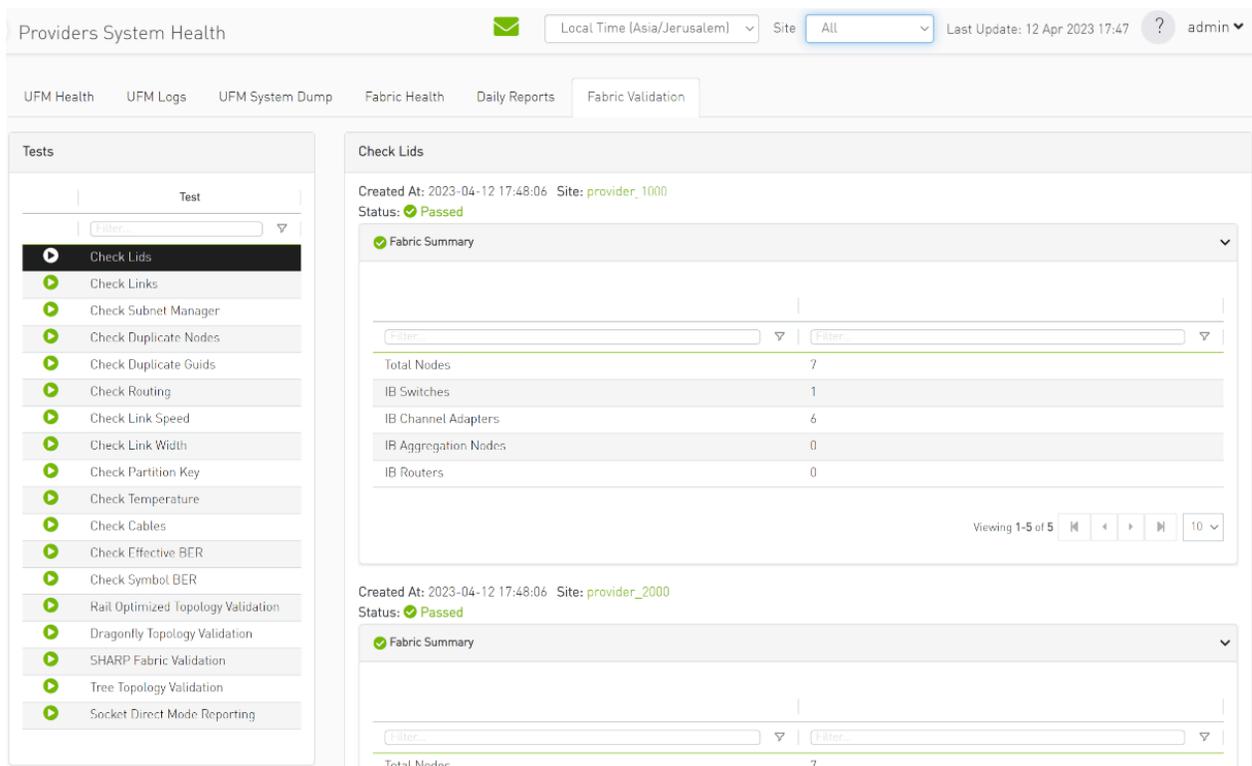
2023-04-11

Viewing 1-1 of 1 20

2. Providers Daily reports display reports from all providers.



12. The "Fabric Validation" tab contains sub report tables for each provider.



13. In "UFM Logs" Tab:

1. Consumer logs:

Consumer System Health

Local Time (Asia/Jerusalem) Site All Last Update: 12 Apr 2023 18:01 admin

UFM Logs UFM System Dump Daily Reports

Event Logs Time Last 24 hours 10000 Search... Occurrences Show Hide

Log View

- 1 2023-04-11 18:11:44 [1] [352] INFO [Logical_Model] Grid [Grid]: Network management is added
- 2 2023-04-11 18:12:09 [3] [604] INFO [Maintenance] Grid [Grid]: Fabric Analysis Report succeeded
- 3 2023-04-11 18:12:44 [4] [525] CRITICAL [Maintenance] Grid [Grid]: Disk space usage in /opt/ufm/files/log is above the threshold of 90.0%
- 4 2023-04-11 18:16:44 [10] [701] MINOR [Hardware] IBPort [default / Switch: r-hyp-sw-01 / 36] [dev_id: 268a070300e1f9a0]: Found a [25.0] link that operates in [14.0] speed mode.
- 5 2023-04-11 18:16:44 [11] [701] MINOR [Hardware] IBPort [default / Switch: SwitchB Mellanox Technologies / 36] [dev_id: e41d2d030003e3b0]: Found a [25.0] link that operates in [14.0] speed mode.
- 12 2023-04-12 1:06:34 [230] [517] CRITICAL [Fabric_Notification] Grid [Grid]: FabricHealth Report completed with 2 Errors and 2 Warnings
- 13 2023-04-12 1:06:34 [231] [604] INFO [Maintenance] Grid [Grid]: Fabric Health Report succeeded
- 14 2023-04-12 1:06:47 [234] [540] INFO [Maintenance] Grid [Grid]: Daily Report Completed successfully:/opt/ufm/files/reports/Daily/2023-04-11
- 15 2023-04-12 1:06:47 [235] [544] MINOR [Maintenance] Grid [Grid]: Unable to send mail - no recipients list
- 29 2023-04-12 14:46:10 [635] [332] INFO [Fabric_Topology] Site [default(0) / NA / NA / NA]: Site configuration changes: ec0d9a0300469ffc (swx-tor01) node is Up
- 31 2023-04-12 14:46:20 [637] [112] WARNING [Hardware] IBPort [default(0) / Switch: desc1 / 26] [dev_id: 043f720300206650]: Link-Downed counter delta threshold exceeded. Threshold is 0, calculated delta is 1. Peer info: default(3) / Computer: node001 / HCA-1/1.
- 32 2023-04-12 14:46:20 [638] [112] WARNING [Hardware] IBPort [default(0) / Switch: desc1 / 28] [dev_id: 043f720300206650]: Link-Downed counter delta threshold exceeded. Threshold is 0, calculated delta is 1. Peer info: default(3) / Computer: node001 / HCA-1/2.
- 33 2023-04-12 14:46:20 [639] [112] WARNING [Hardware] IBPort [default(0) / Switch: desc1 / 30] [dev_id: 043f720300206650]: Link-Downed counter delta threshold exceeded. Threshold is 0, calculated delta is 87. Peer info: default(3) / Computer: swx-tor01 / HCA-1/1.
- 34 2023-04-12 14:46:20 [640] [112] WARNING [Hardware] IBPort [default(0) / Switch: desc1 / 32] [dev_id: 043f720300206650]: Link-Downed counter delta threshold exceeded. Threshold is 0, calculated delta is 87. Peer info: default(3) / Computer: swx-tor01 / HCA-1/2.
- 35 2023-04-12 14:46:20 [641] [112] WARNING [Hardware] IBPort [default(0) / Computer: r-ufm83 / HCA-1/2] [dev_id: ec0d9a0300b52f4]: Link-Downed counter delta threshold exceeded. Threshold is 0, calculated delta is 2. Peer info: default(3) / Switch: desc1 / 24.
- 36 2023-04-12 16:28:20 [642] [332] INFO [Fabric_Topology] Site [default(0) / NA / NA / NA]: Site configuration changes: ec0d9a0300b52f4 (r-ufm83) node is Up
- 38 2023-04-12 16:29:10 [644] [525] CRITICAL [Maintenance] Grid [Grid]: Disk space usage in /opt/ufm/tmp is above the threshold of 80.0%
- 39 2023-04-12 16:29:10 [645] [605] CRITICAL [Maintenance] Grid [Grid]: Fabric Analysis Report failed, Return code: 1
- 40 2023-04-12 16:31:40 [647] [112] WARNING [Hardware] IBPort [default(6) / Computer: r-ufm83 / HCA-1/2] [dev_id: ec0d9a0300b52f4]: Link-Downed counter delta threshold exceeded. Threshold is 0, calculated delta is 2. Peer info: default(3) / Switch: desc1 / 24.
- 41 2023-04-12 16:31:40 [648] [112] WARNING [Hardware] IBPort [default(6) / Switch: desc1 / 26] [dev_id: 043f720300206650]: Link-Downed counter delta threshold exceeded. Threshold is 0, calculated delta

2. Providers logs display providers log separately, displaying logs for all providers is not supported.

Providers System Health

Local Time (Asia/Jerusalem) Site provider_2000 Last Update: 12 Apr 2023 18:05 admin

UFM Health UFM Logs UFM System Dump Fabric Health Daily Reports Fabric Validation

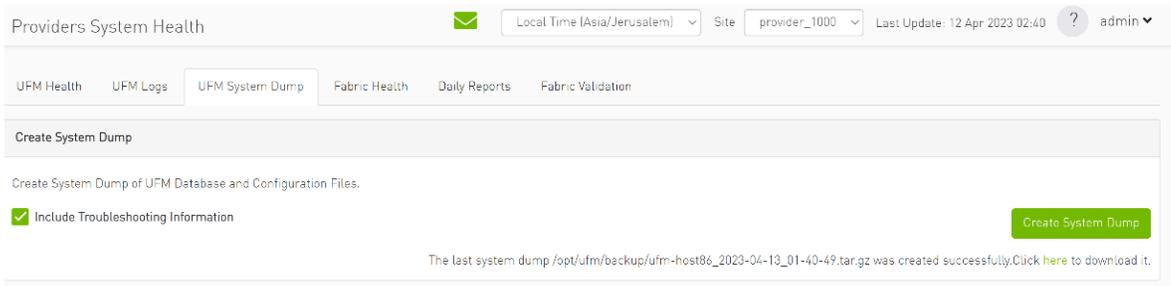
Event Logs Time Last 24 hours 10000 Search... Occurrences Show Hide

Log View

- 1 2023-04-12 1:07:52 [53] [516] WARNING [Fabric_Notification] Grid [Grid]: FabricHealth Report completed with 4 Warnings
- 2 2023-04-12 1:07:52 [54] [604] INFO [Maintenance] Grid [Grid]: Fabric Health Report succeeded
- 3 2023-04-12 1:08:03 [55] [540] INFO [Maintenance] Grid [Grid]: Daily Report Completed successfully:/opt/ufm/files/reports/Daily/2023-04-11
- 4 2023-04-12 1:08:03 [56] [544] MINOR [Maintenance] Grid [Grid]: Unable to send mail - no recipients list
- 5 2023-04-12 2:34:20 [57] [65] WARNING [Fabric_Notification] IBPort [default(3) / Computer: swx-tor01 / HCA-1/2] [dev_id: ec0d9a0300469ffc]: GID Address Out of Service: prefix fe80000000000000.guid ec0d9a0300469fd Link Source 043f720300206650_32 TO Dest: ec0d9a0300469fd_2
- 6 2023-04-12 2:34:20 [58] [65] WARNING [Fabric_Notification] IBPort [default(3) / Computer: swx-tor01 / HCA-1/1] [dev_id: ec0d9a0300469ffc]: GID Address Out of Service: prefix fe80000000000000.guid ec0d9a0300469fc Link Source 043f720300206650_30 TO Dest: ec0d9a0300469fc_1
- 7 2023-04-12 2:34:20 [59] [329] WARNING [Fabric_Topology] Link [Source 043f720300206650_30 TO Dest: ec0d9a0300469fc_1]: Link went down: [Switch:desc1:30]043f720300206650:30 - [Computer:swx-tor01 mlx5_0]ec0d9a0300469ffc:1, cable S/N: MT2042V504276
- 8 2023-04-12 2:34:20 [60] [329] WARNING [Fabric_Topology] Link [Source 043f720300206650_32 TO Dest: ec0d9a0300469fd_2]: Link went down: [Switch:desc1:32]043f720300206650:32 - [Computer:swx-tor01 mlx5_1]ec0d9a0300469ffc:2, cable S/N: MT2042V504200
- 9 2023-04-12 2:34:20 [61] [331] WARNING [Fabric_Topology] Site [default(2) / NA / NA / NA]: Site configuration changes: ec0d9a0300469ffc (swx-tor01) node is Down
- 10 2023-04-12 2:36:45 [63] [64] INFO [Fabric_Notification] Site [default(2) / NA / NA / NA]: GID Address In Service: prefix fe80000000000000.guid ec0d9a0300469fd
- 11 2023-04-12 2:36:50 [65] [332] INFO [Fabric_Topology] Site [default(3) / NA / NA / NA]: Site configuration changes: ec0d9a0300469ffc (swx-tor01) node is Up
- 12 2023-04-12 2:36:50 [66] [329] INFO [Fabric_Topology] Link [Source 043f720300206650_30 TO Dest: ec0d9a0300469fc_1]: Link is up: [Switch:desc1:30]043f720300206650:30 - [Computer:swx-tor01 mlx5_0]ec0d9a0300469fc:1
- 13 2023-04-12 2:36:50 [67] [328] INFO [Fabric_Topology] Link [Source 043f720300206650_32 TO Dest: ec0d9a0300469fd_2]: Link is up: [Switch:desc1:32]043f720300206650:32 - [Computer:swx-tor01 mlx5_1]ec0d9a0300469ffc:2
- 14 2023-04-12 2:36:58 [68] [1500] INFO [Security] Link [Source 043f720300206650_30 TO Dest: ec0d9a0300469fc_1]: New cable S/N: MT2042V504276 is detected
- 15 2023-04-12 2:36:58 [69] [1500] INFO [Security] Link [Source 043f720300206650_32 TO Dest: ec0d9a0300469fd_2]: New cable S/N: MT2042V504200 is detected
- 16 2023-04-12 2:36:58 [70] [604] INFO [Maintenance] Grid [Grid]: Fabric Analysis Report succeeded
- 26 2023-04-12 7:38:24 [82] [702] WARNING [Hardware] IBPort [default(3) / Switch: desc1 / 30] [dev_id: 043f720300206650]: Peer Port swx-tor01 mlx5_0 is considered by SM as unhealthy due to FLAPPING.
- 27 2023-04-12 7:38:24 [83] [702] WARNING [Hardware] IBPort [default(3) / Computer: swx-tor01 / HCA-1/1] [dev_id: ec0d9a0300469ffc]: Peer Port desc1:30 is considered by SM as unhealthy due to FLAPPING.

14. In the "System Dump" tab:

1. "Consumer System Dump" collects system dump for consumer

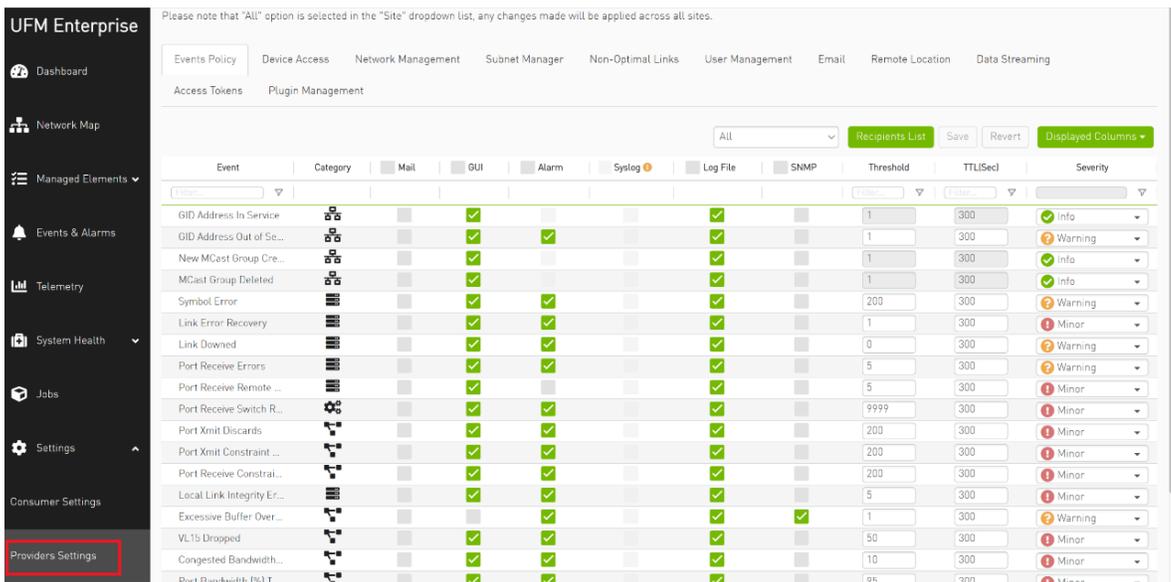


2. "Providers System Dump" collect system dumps for one or all providers and mergeS them into one folder



15. Under "Settings", subsections for Consumer and Provider are available.

1. "Consumer Settings" contain sections applicable to Consumer UFM specifically (e.g., creation of access tokens for UFM consumer authentication);



2. "Provider Settings" contain sections applicable to one or multiple providers (e.g., Event Policies can be changed for multiple Providers at once from the Consumer).

UFM Enterprise

- Dashboard
- Network Map
- Managed Elements
- Events & Alarms
- Telemetry
- System Health
- Jobs
- Settings
- Consumer Settings**
- Providers Settings

User Management | Access Tokens | Plugin Management | Providers Management

[+ New](#) [Displayed Columns](#)

ID ↓	Name	Group
1	admin	System Admin

Viewing 1-1 of 1

UFM Plugins

- [rest-rdma Plugin](#)
- [NDT Plugin](#)
- [UFM Telemetry FluentD Streaming \(TFS\) Plugin](#)
- [UFM Events Fluent Streaming \(EFS\) Plugin](#)
- [UFM Bright Cluster Integration Plugin](#)
- [UFM Cyber-AI Plugin](#)
- [Autonomous Link Maintenance \(ALM\) Plugin](#)
- [DTS Plugin](#)
- [GRPC-Streamer Plugin](#)
- [Sysinfo Plugin](#)
- [SNMP Plugin](#)
- [Packet Mirroring Collector \(PMC\) Plugin](#)
- [PDR Deterministic Plugin](#)
- [GNMI-Telemetry Plugin](#)

rest-rdma Plugin

rest-rdma is a tool designed for sending requests over InfiniBand to the UFM server. These REST requests can fall into three categories:

1. UFM REST API requests
2. ibdiagnet requests

3. Telemetry requests

The rest-rdma utility is distributed as a Docker container, capable of functioning both as a server and a client.

Deployment Server

Deploy Plugin on UFM Appliance

1. Log into your UFM as admin.
2. Enter config mode. Run:

```
enable
config terminal
```

Note

Make sure that UFM is running with `show ufm status`. If UFM is down, then run with `ufm start`.

3. Ensure that rest-rdma plugin is disabled with the `show ufm plugin` command.
4. Pull the plugin container with `docker pull mellanox/ufm-plugin-rest-rdma:[version]`.
5. Run `ufm plugin rest-rdma add tag [version]` to enable the plugin.
6. Check that plugin is up and running with `docker pull mellanox/ufm-plugin-rest-rdma:[version]`

Deploy Plugin on Bare Metal Server

1. Verify that UFM is installed and running.
2. Pull image from docker hub:

```
docker pull mellanox/ufm-plugin-rest-rdma:[version]
```

3. To load image run:

```
/opt/ufm/scripts/manage_ufm_plugins.py add -p rest-rdma
```

Deployment Client

Run the following command to pull the image from the docker hub:

```
docker pull mellanox/ufm-plugin-rest-rdma:[version]
```

Verify that the `/tmp/ibdiagnet` directory exists on the client's computer. If not – create it.

To start container as client (on any host in the same fabric as UFM server) run:

```
docker run -d --network=host --privileged --name=ufm-plugin-rest-rdma --rm -v /tmp/ibdiagnet:/tmp/ibdiagnet mellanox/ufm-plugin-rest-rdma:[version] client
```

To check that plugin is up and running, run:

```
docker ps
```

How to Run

Server

In server mode `ufm_rdma.py` is started automatically and is restarted if exited. If the `ufm_rdma.py` server is not running – enter to the docker and run the following commands to start the server:

```
cd /opt/ufm/src/ufm-plugin-ufm-rest
./ufm_rdma.py -r server
```

Client

There are three options to run client. Running the client from inside the Docker container, using a custom script from the hosting server to execute the client or using the "docker exec" command from the hosting server.

1. **Option 1:** Run the client from inside the Docker container

1. Enter the docker container using

```
docker exec -it ufm-plugin-rest-rdma bash
```

2. Then, run `cd /opt/ufm/src/ufm-plugin-rest-rdma`

3. Use the `-h` help option to see the available parameters

```
./ufm_rdma.py -h
```

2. **Option 2:** From the host server, the scripts can be located at

`/opt/ufm/ufm-plugin-ufm-rest/ directory` inside the docker container.

They can copied using the following command:

Note

```
cp <containerId>:/opt/ufm/ufm-plugin-ufm-rest/[script name]
/host/path/target
```

Example:

Note

```
cp <containerId>:/opt/ufm/ufm-plugin-ufm-rest/ufm-rest-  
rdma_client.sh /host/path/target
```

1. To see the available options, run:

```
./ufm-rest-rdma_client.sh -h
```

3. **Option 3:** From hosting server, use the `docker exec` command.

Note

To run from inside docker, run:

```
docker exec ufm-plugin-rest-rdma prior to the  
command.
```

For example:

```
docker exec ufm-plugin-rest-rdma /opt/ufm/ufm-  
plugin-ufm-rest/src/ufm_rdma.py -r client -u  
admin -p password -t simple -a GET -w  
ufmRest/app/ufm_version
```

Authentication Configuration

Telemetry and ibdiagnet request authentication options could be enabled or disabled (enabled by default – set to True) in `ufm_rdma.ini file` in [Server] section on the server. The `rest_rdma` server performs simple requests to UFM server, using supplied credentials to verify that the user is allowed to run telemetry or ibdiagnet requests.

```
[Server]  
use_ufm_authentication=True
```

Remote ibdiagnet Request

The following two user scripts can run on the hosting server.

- remote_ibdiagnet_auth.sh
- remote_ibdiagnet.sh

These scripts should be copied from the container to the hosting server using the following command:

```
cp <containerId>:/opt/ufm/ufm-plugin-ufm-rest/[script name]  
/host/path/target
```

Example :

```
cp <containerId>:/opt/ufm/ufm-plugin-ufm-  
rest/remote_ibdiagnet_auth.sh /host/path/target
```

The `remote_ibdiagnet.sh` script does not require authentication as the server side can run on a machine which does not run UFM (which is responsible for the authentication). This means it can run from the hosting server.

```
/remote_ibdiagnet.sh [options]
```

Authenticated Remote ibdiagnet Request

The `remote_ibdiagnet_auth.sh` script can receive parameters as credentials for authentication with UFM server.

```
/remote_ibdiagnet_auth.sh [options]
```

To get all the options, run the following command:

```
/remote_ibdiagnet_auth.sh -h
```

Note

Important Note:

When using `remote_ibdiagnet.sh`, authentication is not required and the the `ibdiagnet` parameters should be sent in `ibdiagnet` format.

Example: `./remote_ibdiagnet.sh --get_phy_info`

When using the `remote_ibdiagnet_auth.sh`, the `ibdiagnet` parameters should be sent using the `-l` key.

Example without credentials:

```
./remote_ibdiagnet_auth.sh -l '--get_phy_info'
```

Example with credentials:

```
./remote_ibdiagnet_auth.sh -u username -p password -l  
'-get_phy_info'
```

Please use the `-h` option to see the examples of credential usage.

Rest Request with Username/Password Authentication

To get the UFM version from inside the docker:

```
./ufm_rdma.py -r client -u admin -p admin_pwd -t simple -a GET -w
ufmRest/app/ufm_version
```

To get the UFM version from hosting server using script:

```
./ufm_rest_rdma_client.sh -u admin -p admin_pwd -t simple -a GET
-w ufmRest/app/ufm_version
```

For telemetry:

```
./ufm_rdma.py -r client -u admin -p admin_pwd -t telemetry -a GET
-g 9001 -w /csv/enterprise
```

To get ibdiagnet run result using UFM REST API from inside the docker:

```
./ufm_rdma.py -r client -u admin -p admin_pwd -t ibdiagnet -a
POST -w ufmRest/reports/ibdiagnetPeriodic -l '{"general":{"name":
"IBDiagnet_CMD_1234567890_199_88", "location": "local", "running_mode": "once"}, "command_flags": {"--
pc": ""}}'
```

Rest Request with Client Certificate Authentication

need to pass path to client certificate file and name of UFM server machine:

```
6. ./ufm_rdma.py -r client -t simple -a GET -w
ufmRest/resources/modules -d /path/to/certificate/file/ufm-
```

```
client.pfx -s ufm.azurehpc.core.azure-test.net
for telemetry if need authentication from inside the docker
./ufm_rdma.py -r client -t telemetry -a GET -g 9001 -w
csv/enterprise -d /path/to/certificate/file/ufm-client.pfx -s
ufm.azurehpc.core.azure-test.net
```

Note

Client certificate file should be located INSIDE the docker container.

Rest Request with Token Authentication

```
need to pass token for authentication
./ufm_rdma.py -r client -k OGUY7TwLvTmFkXyTkcsEWD9KKNvq6f -t
simple -a GET -w ufmRestV3/app/ufm_version
for telemetry if need to perform authentication
./ufm_rdma.py -r client -k 4rQRf7i7wEeliuJEurGbeecc210V6G -t
telemetry -a GET -g 9001 -w /csv/enterprise
```

Note

Token could be generated using UFM UI.

Note

If a token is used for client authentication, `ufmRestV3` must be used.

NDT Plugin

Overview

NDT plugin is a self-contained Docker container with REST API support managed by UFM. The NDT plugin introduces the following capabilities:

1.

1. **NDT topology comparison:** Allows the user to compare InfiniBand fabric managed by the UFM and NDT files which are used for the description of InfiniBand clusters network topology.

- Verifies the IB fabric connectivity during cluster bring-up.
- Verifies the specific parts of IB fabric after component replacements.
- Automatically detects any changes in topology.

2. **Subnet Merger - Expansion of the fabric based on NDT topology files**

Allows users to gradually extend the InfiniBand fabric without causing any disruption to the running fabric. The system administrator should prepare the NDT topology files, which describe the InfiniBand fabric extensions. Then, an intuitive and user-friendly UI wizard facilitates the topology extension process with a step-by-step guidance for performing necessary actions.

- The Subnet Merger tool verifies the fabric topology within a predefined NDT file, and reports issues encountered for immediate resolution.
- Once the verification results are acceptable by the network administrator, the tool creates a topoconfig file to serve as input for OpenSM. This allows setting the physical port states of the designated boundary ports as desired (physical ports can be set as disabled or no-discover).

- Once the topoconfig file is deployed, the IB network can be extended and verified for the next IB extension.

Deployment

The following are the possible ways NDT plugin can be deployed:

1. On UFM Appliance
2. On UFM Software

For detailed instructions on how to deploy the NDT plugin refer to this [page](#).

Authentication

Following authentication types are supported:

- basic (/ufmRest)
- client (/ufmRestV2)
- token (/ufmRestV3)

REST API

The following REST APIs are supported:

Topodiff

- GET /help
- GET /version
- POST /upload_metadata
- GET /list
- POST /compare
- POST /cancel
- GET /reports

- GET /reports/<report_id>
- POST /delete

Subnet Merger

- GET /merger_ndts_list
- GET /merger_ndts_list/<ndt_file_name>
- POST /merger_upload_ndt
- POST /merger_verify_ndt
- GET /merger_verify_ndt_reports
- GET /merger_verify_ndt_reports/<report_id>
- POST /merger_update_topoconfig
- POST /merger_deploy_ndt_config
- POST /merger_update_deploy_ndt_config
- POST /merger_delete_ndt
- GET /merger_deployed_ndt
- POST /merger_create_topoconfig

For detailed information on how to interact with NDT plugin, refer to the [NVIDIA UFM Enterprise > Rest API > NDT Plugin REST API](#).

NDT Format – Topodiff

NDT is a CSV file containing data relevant to the IB fabric connectivity. The NDT plugin extracts the IB connectivity data based on the following fields:

1. Start device

2. Start port
3. End device
4. End port
5. Link type

Switch to Switch NDT

By default, IB links are filtered by:

- Link Type is Data
- Start Device and End Device end with IBn, where n is a numeric value.

For TOR switches, Start port/End port field should be in the format **Port N**, where **N** is a numeric value.

For Director switches, Start port/End port should be in the format **Blade N_Port i/j**, where **N** is a leaf number, **i** is an internal ASIC number and **j** is a port number.

Examples:

Start Device	Start Port	End Device	End Port	Link Type
DSM07-0101-0702-01IB0	Port 21	DSM07-0101-0702-01IB1	Blade 2_Port 1/1	Data
DSM07-0101-0702-01IB0	Port 22	DSM07-0101-0702-01IB1	Blade 2_Port 1/1	Data
DSM07-0101-0702-01IB0	Port 23	DSM07-0101-0702-02IB1	Blade 3_Port 1/1	Data
DSM09-0101-0617-001IB2	Port 33	DSM09-0101-0721-001IB4	Port 1	Data
DSM09-0101-0617-001IB2	Port 34	DSM09-0101-0721-001IB4	Port 2	Data
DSM09-0101-0617-001IB2	Port 35	DSM09-0101-0721-001IB4	Port 3	Data

Switch to Host NDT

NDT is a CSV file containing data not only relevant to the IB connectivity.

Extracting the IB connectivity data is based on the following five fields:

1. Start device
2. Start port
3. End device
4. End port
5. Link type

IB links should be filtered by the following:

- Link type is "Data".
- "Start Device" or "End Device" end with **IBN**, where **N** is a numeric value.
 - The other Port should be based on persistent naming convention: **ibpXsYfZ**, where **X**, **Y** and **Z** are numeric values.

For TOR switches, Start port/End port field will be in the format Port n, where n is a numeric value.

For Director switches, Start port/End port will be in the format **Blade N_Port i/j**, where **N** is a leaf number, **i** is an internal ASIC number and **j** is a port number.

Examples:

Start Device	Start Port	End Device	End Port	Link Type
DSM071081704019	DSM071081704019 ibp11s0f0	DSM07-0101-0514-01IB0	Port 1	Data
DSM071081	DSM071081704019 ibp21s0f0	DSM07-0101-0514-01IB0	Port 2	Data

Start Device	Start Port	End Device	End Port	Link Type
704019				
DSM071081704019	DSM071081704019 ibp75s0f0	DSM07-0101-0514-01IB0	Port 3	Data

Other

Comparison results are forwarded to syslog as events. Example of `/var/log/messages` content:

1. Dec 9 12:32:31 <server_ip> ad158f423225[4585]: NDT: missing in UFM "SAT111090310019/SAT111090310019 ibp203s0f0 - SAT11-0101-0903-19IB0/15"
2. Dec 9 12:32:31 <server_ip> ad158f423225[4585]: NDT: missing in UFM "SAT11-0101-0903-09IB0/27 - SAT11-0101-0905-01IB1-A/Blade 12_Port 1/9"
3. Dec 9 12:32:31 <server_ip> ad158f423225[4585]: NDT: missing in UFM "SAT11-0101-0901-13IB0/23 - SAT11-0101-0903-01IB1-A/Blade 08_Port 2/13"

For detailed information about how to check syslog, please refer to the [NVIDIA UFM-SDN Appliance Command Reference Guide](#) > UFM Commands > UFM Logs.

Minimal interval value for periodic comparison in five minutes.

In case of an error the clarification will be provided.

For example, the request "`POST /compare`" without NDTs uploaded will return the following:

- URL: https://<server_ip>/ufmRest/plugin/ndt/compare
- response code: 400
- Response:

```
{
  "error": [
    "No NDTs were uploaded for comparison"
  ]
}
```

Configurations could be found in “`ufm/conf/ndt.conf`”

- Log level (default: INFO)
- Log size (default: 10240000)
- Log file backup count (default: 5)
- Reports number to save (default: 10)
- NDT format check (default: enabled)
- Switch to switch and host to switch patterns (default: see NDT format section)

For detailed information on how to export or import the configuration, refer to the [NVIDIA UFM-SDN Appliance Command Reference Guide](#) > UFM Commands > UFM Configuration Management.

Logs could be found in “`ufm/logs/ndt.log`”.

For detailed information on how to generate a debug dump, refer to the [NVIDIA UFM-SDN Appliance Command Reference Guide](#) > System Management > Configuration Management > File System.

NDT Format – Subnet Merger

The Subnet Merger tool facilitates the seamless expansion of the InfiniBand fabric based on Non-Disruptive Topology (NDT) files. This section outlines the process of extending the fabric while ensuring uninterrupted operation. The tool operates through an intuitive UI wizard, guiding users step-by-step in extending the fabric topology.

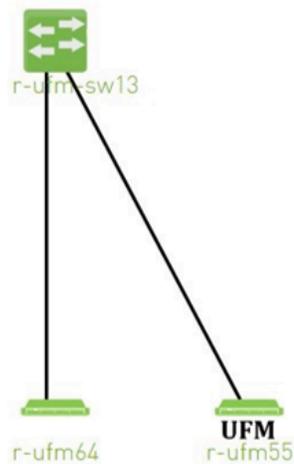
The Subnet Merger tool enables the gradual expansion of the InfiniBand fabric without causing disruptions to the existing network. To achieve this, system administrators need to prepare NDT topology files that describe the planned fabric extensions. The tool offers an intuitive UI wizard that simplifies the extension process.

Functionality

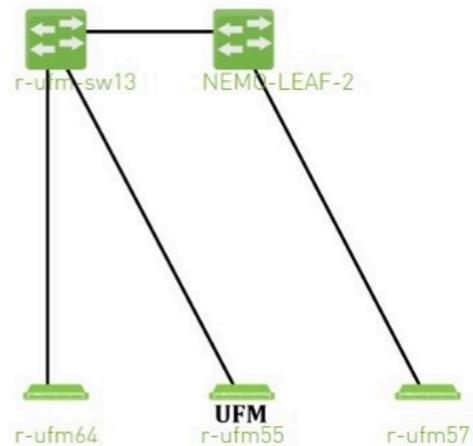
1. **NDT Topology File Verification:** The Subnet Merger tool verifies the InfiniBand fabric topology specified in a predefined NDT file. During this verification, any issues encountered are reported to the user for immediate resolution. This step ensures the integrity of the planned fabric extension.
1. **Topology Extension Preparation:** Upon successful verification of the NDT topology file, the tool generates a comprehensive verification report. The network administrator reviews this report and ensures its acceptability.
1. **Topoconfig File Generation:** After obtaining acceptable verification results, the tool generates a topoconfig file. This file serves as input for OpenSM, the Subnet Manager for InfiniBand fabrics. The topoconfig file allows the network administrator to define the desired physical port states for designated boundary ports. These states include "disabled" or "no-discover."
1. **Fabric Extension and Verification:** With the topoconfig file prepared, the Subnet Merger tool initiates the deployment of the extended fabric configuration. The tool ensures that the defined physical port states are implemented. Once the extension is in place, the IB network can be extended further as needed. The fabric extension is executed while maintaining the operational stability of the existing network.
1. **Conclusion:** The Subnet Merger tool offers a reliable and user-friendly solution for expanding InfiniBand fabrics using NDT topology files. By following the steps provided in the intuitive UI wizard, system administrators can seamlessly extend the fabric while adhering to predefined physical port states. This tool ensures the smooth operation of the fabric throughout the expansion process, eliminating disruptions and enhancing network scalability.

Subnet Merger Flow

Initial Fabric Topology



Target Fabric Topology



1. Create NDT, file that describes initial topology with definition of boundary ports. Boundary ports – switch ports that will be used for fabric extension. In our case it will be r-ufm-sw13 switch ports number 1 and 3. In NDT file those ports should be defined as boundary and disabled:

```
rack #,U
height,#Fields:StartDevice,StartPort,StartDeviceLocation,EndDe
height_1,LinkType,Speed,_2,Cable
Length,_3,_4,_5,_6,_7,State,Domain
,,MF0;r-ufm-sw13:MQM8700/U1,Port
1,,,,,,,,,,,,,Disabled,Boundary
,,MF0;r-ufm-sw13:MQM8700/U1,Port 30,,r-ufm55 mlx5_1,Port
1,,,,,,,,,,,,,Active,In-Scope
,,MF0;r-ufm-sw13:MQM8700/U1,Port 29,,r-ufm55 mlx5_0,Port
1,,,,,,,,,,,,,Active,In-Scope
,,MF0;r-ufm-sw13:MQM8700/U1,Port 26,,r-ufm64 mlx5_0,Port
1,,,,,,,,,,,,,Active,In-Scope
,,MF0;r-ufm-sw13:MQM8700/U1,Port
3,,,,,,,,,,,,,Disabled,Boundary
```

2. Upload a new NDT topology file which describes the desired topology. Before deploying to UFM, the new NDT topology file should be verified against the existing topology – to find out mismatches and problems.

After the verification, the plugin generates reports including information about:

- - Duplicated GUIDs
 - Misswired links
 - Non-existent links in the pre-defined NDT files
- 1.
 - Links that exist in the fabric and not in the NDT file
- 2. Following the issues detected in the plugin reports, the network administrator changes the NDT file or the fabric. The verification process can be repeated as many times as necessary until the network administrator is satisfied with the results.
- 3. If the NDT verification results are satisfactory, a topoconfig file is generated and can be deployed to the UFM server to be used as configuration input for OpenSM. Topoconfig file should be located at /opt/ufm/files/conf/opensm/topoconfig.cfg on UFM server. By sending SIGHUP signal to opensm it forced to read configuration and to deploy it. In topoconfig file at this stage boundary ports will be defined as **Disabled**.

Example of topoconfig.cfg:

```
0xb83fd2030080302e, 1, -, -, Any, Disabled
0xb83fd2030080302e, 30, 0xf452140300280081, 1, Any, Active
0xb83fd2030080302e, 29, 0xf452140300280080, 1, Any, Active
0xb83fd2030080302e, 26, 0xf452140300280040, 1, Any, Active
0xb83fd2030080302e, 3, -, -, Any, Disabled
```

4. Next stage is to extend the fabric. Prepare separately new subnet that will be added to the existing fabric and, once it is ready, connect to the boundary ports, that are defined as Disabled in configuration file, so newly added subnet will not be discovered by opensm and will not affect in any way current setup functionality.
5. Once new subnet connected to the fabric - prepare next NDT file, that contains setup, that describes current fabric with extended, when previously defined as

boundary ports defined as Active and if planned to continue with extension new ports defined as boundary.

For example port number 9 of switch r-ufm-sw13:

```

rack #,U
height,#Fields:StartDevice,StartPort,StartDeviceLocation,EndDe
height_1,LinkType,Speed,_2,Cable
Length,_3,_4,_5,_6,_7,State,Domain
,,MF0;r-ufm-sw13:MQM8700/U1,Port 1,,NEMO-LEAF-2,Port
1,,,,,,,,,Active,In-Scope
,,MF0;r-ufm-sw13:MQM8700/U1,Port 30,,r-ufm55 mlx5_1,Port
1,,,,,,,,,Active,In-Scope
,,MF0;r-ufm-sw13:MQM8700/U1,Port 29,,r-ufm55 mlx5_0,Port
1,,,,,,,,,Active,In-Scope
,,NEMO-LEAF-2,Port 11,,r-ufm57 mlx5_0,Port
1,,,,,,,,,Active,In-Scope
,,MF0;r-ufm-sw13:MQM8700/U1,Port 26,,r-ufm64 mlx5_0,Port
1,,,,,,,,,Active,In-Scope
,,NEMO-LEAF-2,Port 1,,MF0;r-ufm-sw13,Port
1,,,,,,,,,Active,In-Scope
,,MF0;r-ufm-sw13:MQM8700/U1,Port 3,,NEMO-LEAF-2,Port
3,,,,,,,,,Active,In-Scope
,,NEMO-LEAF-2,Port 3,,MF0;r-ufm-sw13,Port
3,,,,,,,,,Active,In-Scope
,,MF0;r-ufm-sw13:MQM8700/U1,Port
9,,,,,,,,,Disabled,Boundary

```

6. After new subnet connected physically to the fabric, in opensm configuration file (topoconfig.cfg) boundary ports previously defined as Disabled should be set as No-discover. Example:

```

0xb83fd2030080302e,1,-,-,Any,No-discover
0xb83fd2030080302e,30,0xf452140300280081,1,Any,Active

```

```
0xb83fd2030080302e , 29, 0xf452140300280080 , 1 , Any, Active
0xb83fd2030080302e , 26, 0xf452140300280040 , 1 , Any, Active
0xb83fd2030080302e , 3, -, -, Any, No-discover
```

7. Updated file should be deployed to UFM. In case boundary ports will be defined as No-discover – fabric, connected beyond those ports will not be discovered by opensm, but all the ibutils (ibdiagnet...) could send mads beyond those ports to newly added subnet - so NDT file verification for extended setup could be performed.
8. Upload new NDT file and run verification for this file. Fix problems detected by verification. Once satisfied with results – deploy configuration to UFM.

Example of topoconfig file for extended setup:

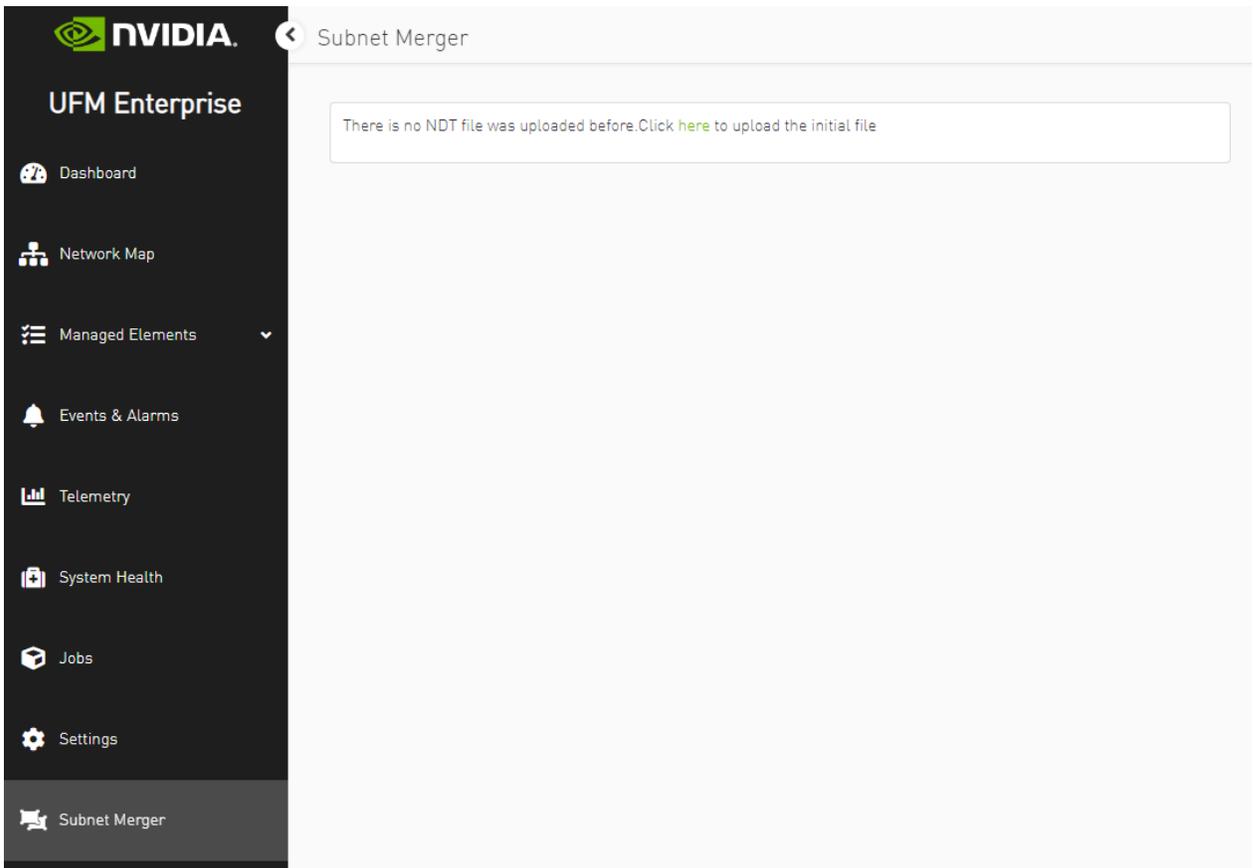
```
0xb83fd2030080302e , 1, 0x98039b0300867bba , 1, Any, Active
0xb83fd2030080302e , 30, 0xf452140300280081 , 1, Any, Active
0xb83fd2030080302e , 29, 0xf452140300280080 , 1, Any, Active
0x98039b0300867bba , 11, 0x248a0703009c0066 , 1, Any, Active
0xb83fd2030080302e , 26, 0xf452140300280040 , 1, Any, Active
0x98039b0300867bba , 1, 0xb83fd2030080302e , 1, Any, Active
0xb83fd2030080302e , 3, 0x98039b0300867bba , 3, Any, Active
0x98039b0300867bba , 3, 0xb83fd2030080302e , 3, Any, Active
0xb83fd2030080302e , 9, -, -, Any, Disabled
```

9. Repeat previous steps if need to perform additional setup extension.

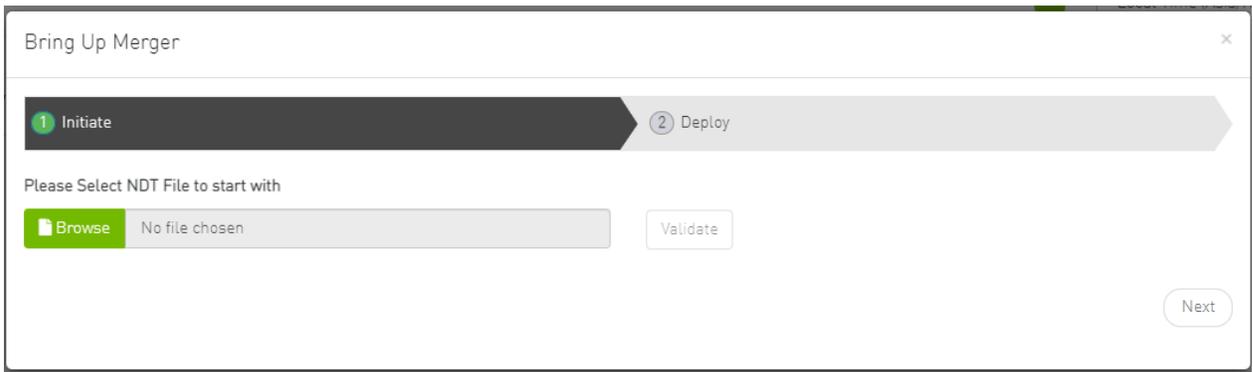
Subnet Merger UI

Bring-Up Merger Wizard

1. Add the NDT plugin to UFM by loading the plugin's image through Settings->Plugins Management. A new item will appear in the main left navigator menu of the UFM labeled "Subnet Merger".

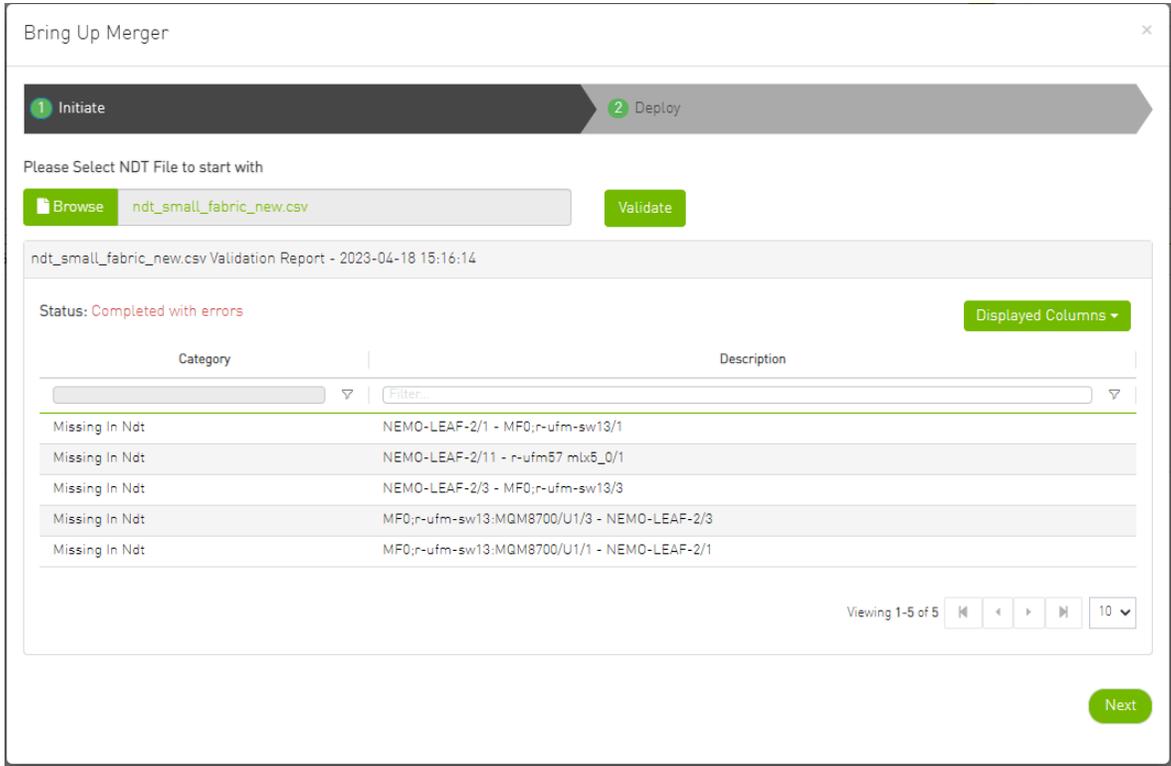
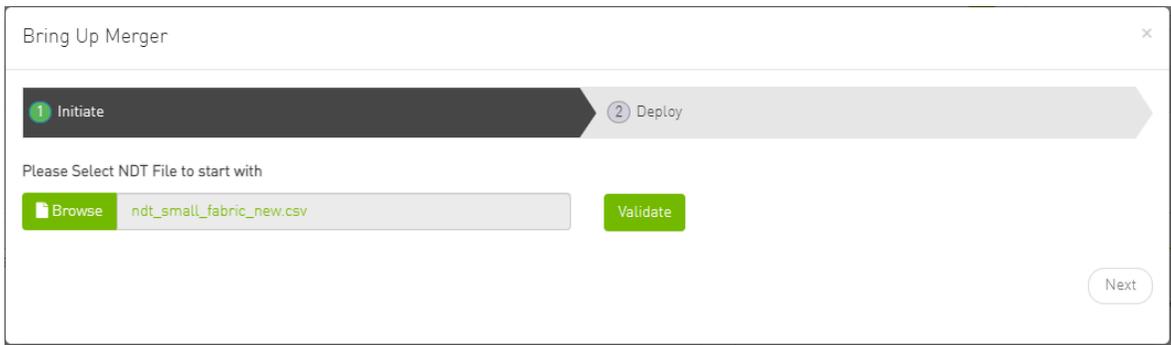


2. Access "Subnet Merger" to initiate the bring-up wizard.

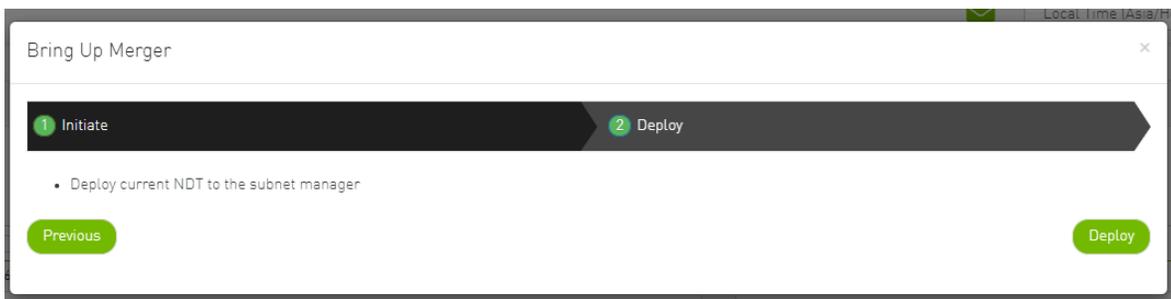


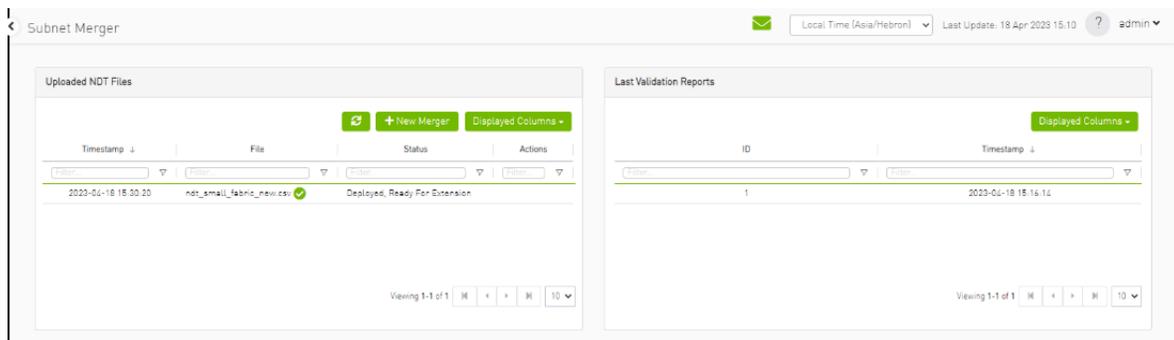
3. The wizard will guide you through the process, containing the following steps:

1. Upload the initial NDT tab and validate it.



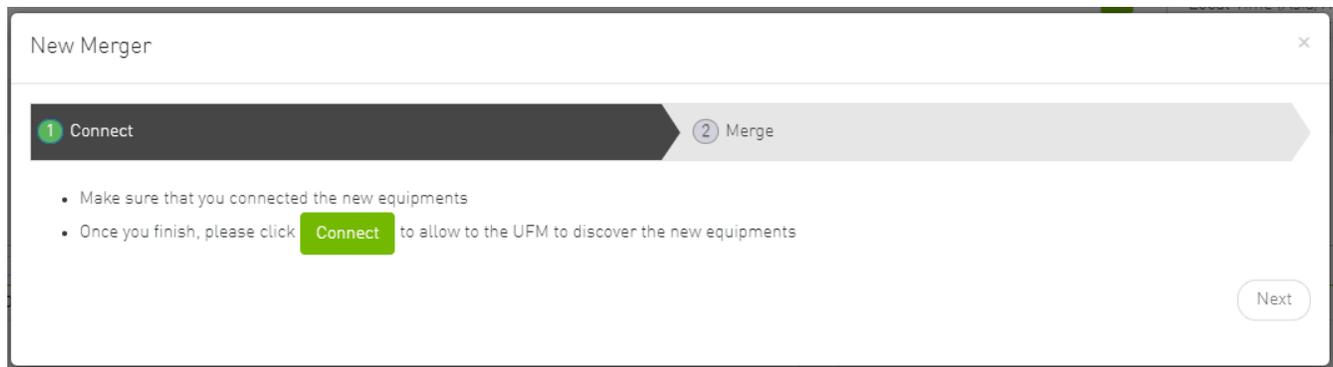
2. Once you are satisfied with the results of the validation in the previous tab, you can proceed to deploy the file.



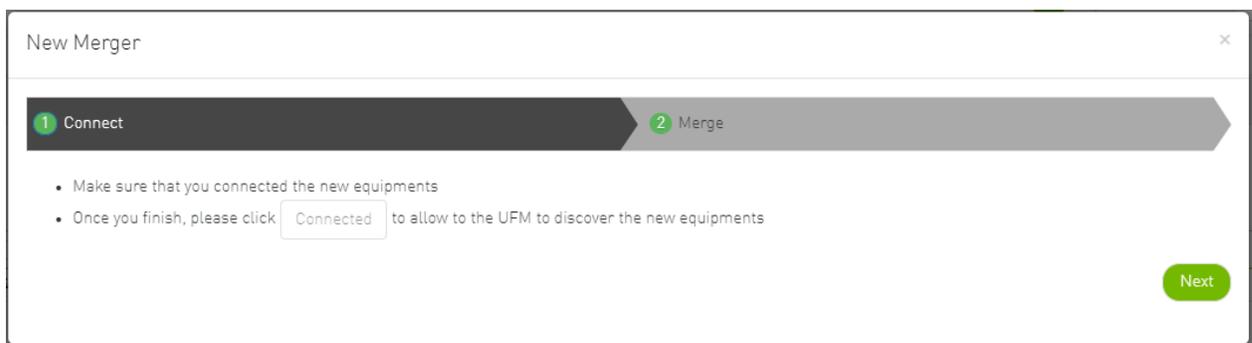


New Subnet Merger

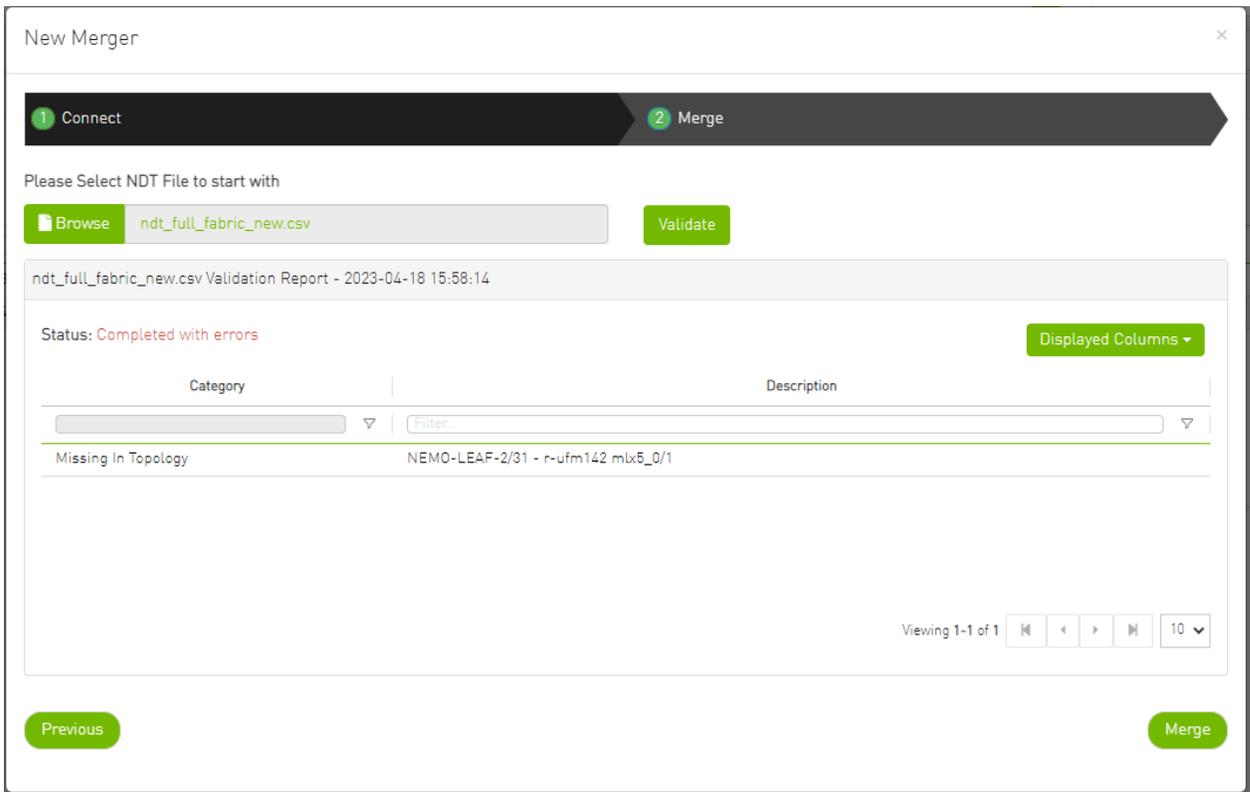
Once you have successfully deployed the initial NDT file, you can initiate a new merger process by clicking the "New Merger" button.



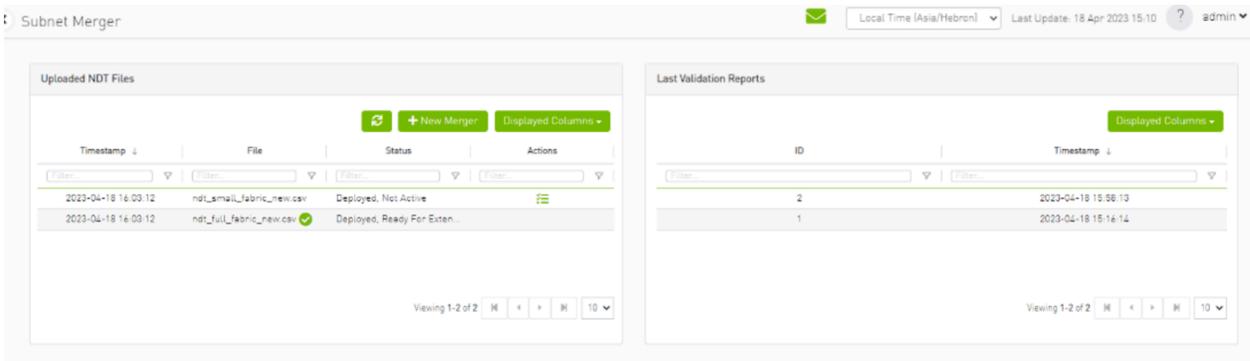
1. "Connect" Tab, it is important to physically connect the new equipment and confirm the connection. Then, click on a button which will open the boundary ports, change their state from Disabled to No-discover, and then deploy the active file again.



2. "Merge" Tab: Once the new equipment is connected and the boundary ports are updated, upload a new NDT file that includes both the current and newly added equipment, along with their boundary ports for future merges. Please note that you cannot merge the file if there are duplicate GUIDs in the report's results.



3. After completing the merge wizard, and if necessary, you can further proceed to extend the IB fabric.



Extending the InfiniBand Setup via Subnet Merger

The following instructions outline the necessary steps for expanding the InfiniBand setup or fabric using subnet merging.

1. Step 1: NDT File Upload (Repeatable)

Upload the NDT file, performing this action as many times as required, especially when addressing file-related issues.

2. **Step 2: NDT File Validation and Verification (Repeatable)**

Validate the NDT file, a process that can be repeated multiple times, particularly after fixing fabric topology or NDT file errors. After initiating this call, you will obtain a validation report ID. The progress of this process is asynchronous, with the report's status initially indicated as "running." Once the report is completed, the status will change to either "Successfully completed" or "Completed with errors."

3. **Step 3: Retrieving and Monitoring the Validation Report**

Retrieve the validation report by its corresponding ID, running this step through continuous polling until the report reaches completion.

4. **Step 4: Review and Potential Fixes**

Inspect the report and address any necessary fixes to either the NDT file or the topology. Should changes be made to the file, upload the corrected NDT file anew. Alternatively, in case of topology has changed, repeat the verification process.

5. **Step 5: Topology Deployment to UFM**

Deploy the verified topology to UFM once you are satisfied with the verification outcomes.

6. **Step 6: Adjusting Boundary Ports and Deployment**

Following the physical connection of the setup extension, change the boundary ports' state from "Disabled" to "No-discover."

7. **Step 7: Uploading Updated Topoconfig File**

Deploy the updated topoconfig file to the UFM server.

8. **Step 8: Next NDT File Upload (Combined Fabric and Extension)**

Upload the next NDT file, which consolidates the current fabric and extension components.

9. **Step 9: NDT File Verification**

Conduct the NDT file verification process.

10. **Step 10: Reviewing Verification Report**

Review the verification report.

11. **Step 11: Addressing Setup or NDT File Issues**

If necessary, make necessary adjustments to the setup or NDT file.

12. **Step 12: Final Configuration Deployment**

Once content with the modifications, proceed to deploy the configuration to UFM.

13. **Step 13: Iterative Workflow**

Repeat this flow as many times as needed to further the expansion process.

UFM Telemetry FluentD Streaming (TFS) Plugin

Overview

TFS plugin is a self-contained Docker container with REST API support managed by UFM. TFS plugin provides Telemetry counters streaming to FluentD capability. As a fabric manager, the UFM Telemetry holds real-time network telemetry information of the network topology. This information changes over time and is reflected to the telemetry console. In order to do so, we present a stream of the UFM Telemetry data to the FluentD plugin.

Deployment

The following are the possible ways the TFS plugin can be deployed:

1. On UFM Appliance
2. On UFM Software

For complete instructions on deploying the TFS plugin, refer to [UFM Telemetry endpoint stream To Fluentd endpoint \(TFS\)](#).

Authentication

The following authentication types are supported:

- basic (/ufmRest)
- client (/ufmRestV2)
- token (/ufmRestV3)

Rest API

The following REST APIs are supported:

- POST /plugin/tfs/conf
- GET /plugin/tfs/conf
- POST /plugin/tfs/conf/attributes
- GET /plugin/tfs/conf/attributes

For detailed information on interacting with TFS plugin, refer to the [NVIDIA UFM Enterprise > Rest API > TFS Plugin REST API](#).

UFM Events Fluent Streaming (EFS) Plugin

Overview

EFS plugin is a self-contained Docker container with REST API support managed by UFM. EFS plugin extracts the UFM events from UFM Syslog and streams them to a remote FluentD destination. It also has the option to duplicate current UFM Syslog messages and forward them to a remote Syslog destination. As a fabric manager, it will be useful to collect the UFM Enterprise events/logs, stream them to the destination endpoint and monitor them.

Deployment

The following are the ways EFS plugin can be deployed:

1. On UFM Appliance

2. On UFM Software

For detailed instructions on how to deploy EFS plugin, refer to [UFM Event Stream to FluentBit endpoint \(EFS\)](#).

Authentication

The following authentication types are supported:

- basic (/ufmRest)
- client (/ufmRestV2)
- token (/ufmRestV3)

Rest API

The following REST APIs are supported:

- PUT /plugin/efs/conf
- GET /plugin/efs/conf

For detailed information on how to interact with EFS plugin, refer to the [NVIDIA UFM Enterprise > Rest API > EFS Plugin REST API](#).

UFM Bright Cluster Integration Plugin

Overview

The Bright Cluster Integration plugin is a self-contained docker container managed by UFM and is managed by the REST APIs. It enables integrating data from Bright Cluster Manager (BCM) into UFM, providing a more comprehensive network perspective. This integration improves network-centered Root Cause Analysis (RCA) tasks and enables better scoping of workload failure domains.

Deployment

The Bright Cluster Integration plugin can be deployed either on the UFM Appliance or on UFM Software.

For detailed instructions on Bright Cluster Integration plugin deployment, refer to [UFM Bright Cluster Integration Plugin](#).

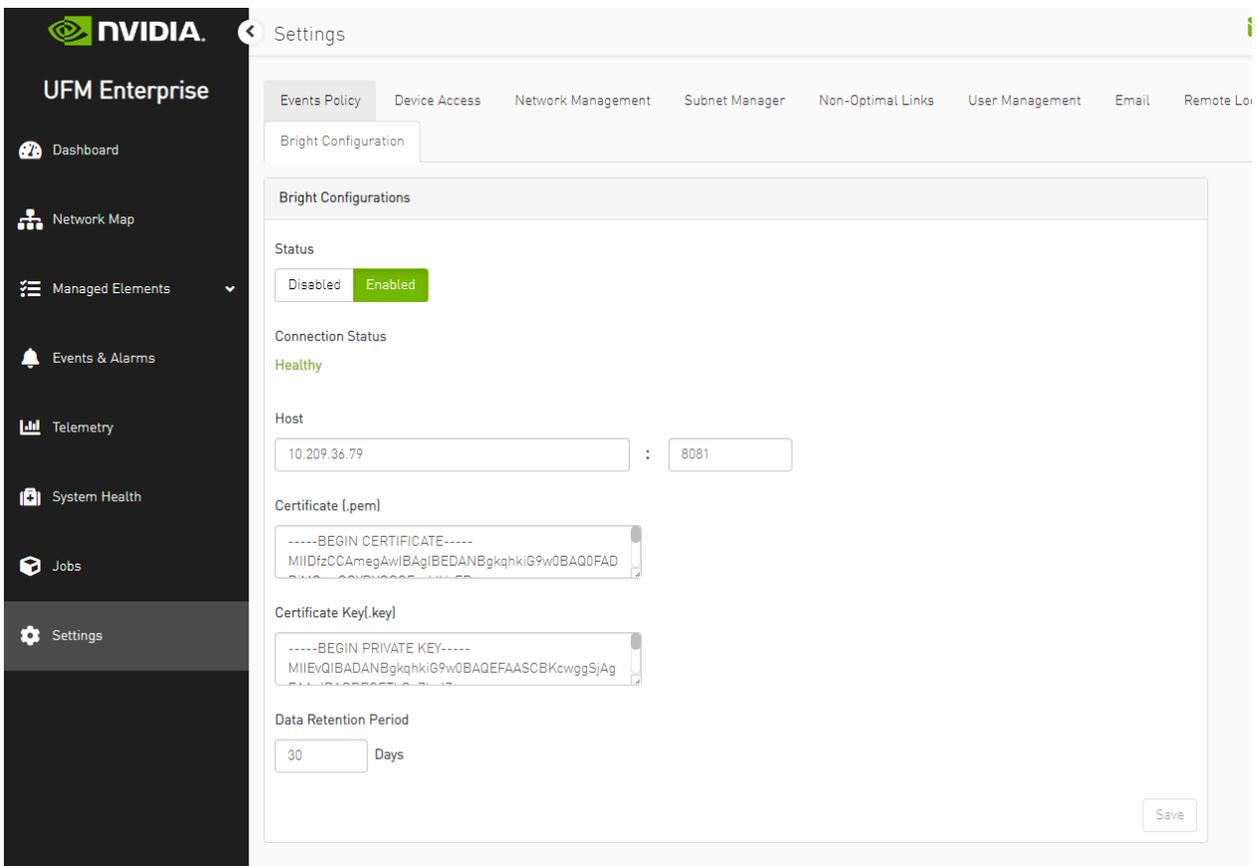
Authentication

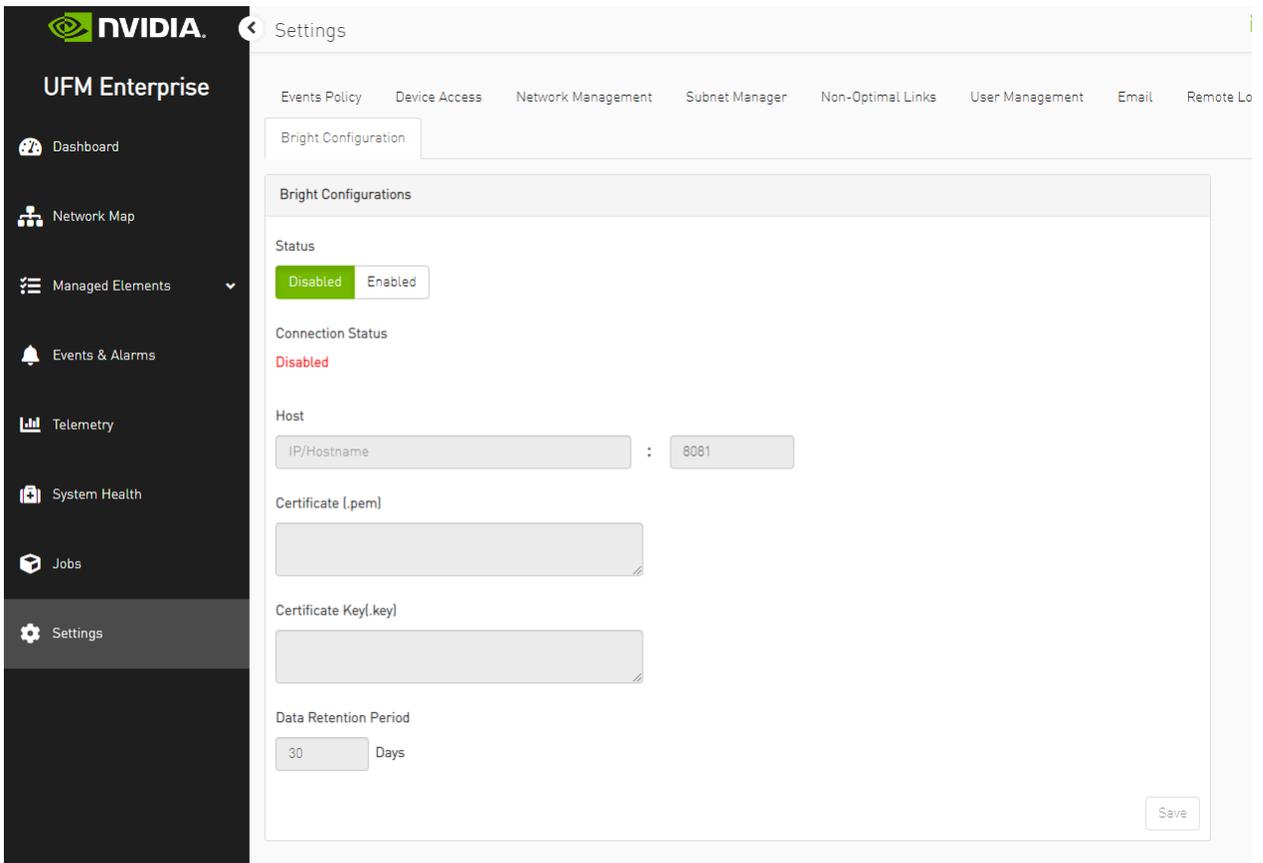
The following authentication types are supported:

- basic (/ufmRest)
- client (/ufmRestV2)
- token (/ufmRestV3)

Bright Cluster Integration UI

1. After the successful deployment of the plugin, a new tab is shown under the UFM settings section for bright configurations management:

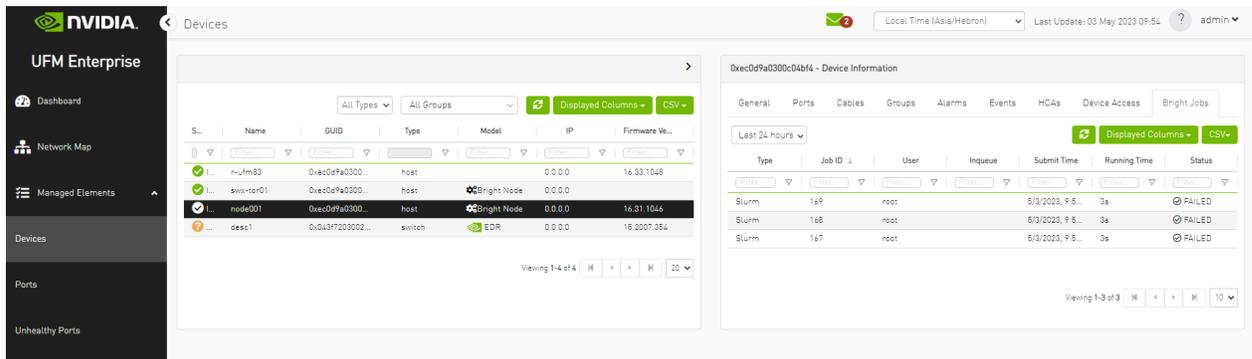




Fill the below required configurations:

Parameter	Description
Host	Hostname or IP of the BCM server
Port	Port of the BCM server, is typically 8081
Certificate	BMC client certificate content that could be located in the BMC server machine under <code>.cm/XXX.pem</code>
Certificate key	BMC client certificate key that could be located in the BMC server machine under <code>.cm/XXX.key</code>
Data retention period	UFM erases the data gathered in the database after the configured retention period. By default, after 30 days.

- After you ensure you have successfully completed the plugin configuration, and that you have established a healthy connection with the BMC, navigate to the UFM Web GUI -> Managed Elements -> Devices



Rest API

The following REST APIs are supported:

- PUT plugin/bright/conf
- GET plugin/bright/conf
- GET plugin/bright/data/nodes
- GET plugin/bright/data/jobs

For detailed information on how to interact with bright plugin APIs, refer to [NVIDIA UFM Enterprise > Rest API > UFM Bright Cluster Integration Plugin REST API](#).

UFM Cyber-AI Plugin

Overview

The primary objective of this plugin is to integrate the UFM CyberAI product into the UFM Enterprise WEB GUI. This integration would result in both products being available within a single application.

Deployment

The following are the ways UFM CyberAI plugin can be deployed:

1. On UFM Appliance
2. On UFM Software

First, download the `ufm-plugin-cyberai-image` from the [NVIDIA License Portal \(NLP\)](#), then load the image on the UFM server, using the UFM GUI -> Settings -> Plugins Management tab or by loading the image via the following command:

1. Login to the [UFM server terminal](#).
2. Run:

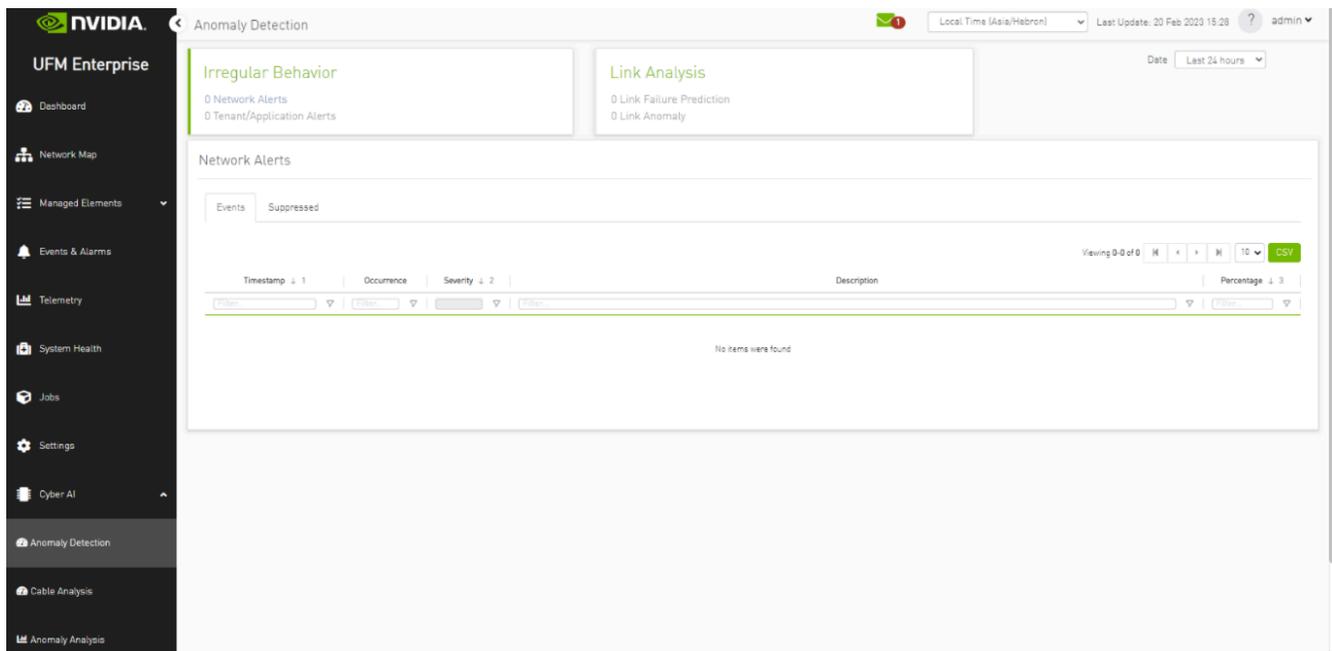
```
docker load -I <path_to_image>
```

Once the plugin's image has been successfully loaded, you can locate the plugin in the Plugins management table within the UFM GUI. You can then run the plugin by right-clicking on the row associated with the plugin.

The screenshot shows the NVIDIA UFM Enterprise Settings page. The left sidebar contains navigation options: Dashboard, Network Map, Managed Elements, Events & Alarms, Telemetry, System Health, Jobs, Settings, and Cyber AI. The main content area is titled 'Settings' and 'Plugin Management'. A table lists the installed plugins:

Name	Enabled	Tag	Port	Shared Volumes	Status
dts	✖	NA	NA	NA	stopped
bright	✖	NA	NA	NA	stopped
ufm	✖	NA	NA	NA	stopped
CyberAI	✔	latest	8981	/opt/ufm/files/log/ /log	running

After running the plugin successfully. You should be able to see the Cyber-AI items under the main UFM navigation menu:



For more details, please refer to the [UFM Cyber-AI User Manual](#)

Autonomous Link Maintenance (ALM) Plugin

Overview

The primary objective of the Autonomous Link Maintenance (ALM) plugin is to enhance cluster availability and improve the rate of job completion. This objective is accomplished by utilizing machine learning (ML) models to predict potential link failures. The plugin then isolates the expected failing links, implements maintenance procedures on them, and subsequently restores the fixed links to their original state by removing the isolation.

The ALM plugin performs the following tasks:

1. Collects telemetry data from UFM and employs ML jobs to predict which ports need to be isolated/de-isolated
2. Identifies potential link failures and isolates them to avert any interruption to traffic flow
3. Maintains a record of maintenance procedures that can be executed to restore an isolated link

4. After performing the required maintenance, the system verifies if the links can be de-isolated and restored to operational status (brought back online)

The ALM plugin operates in the following two distinct modes:

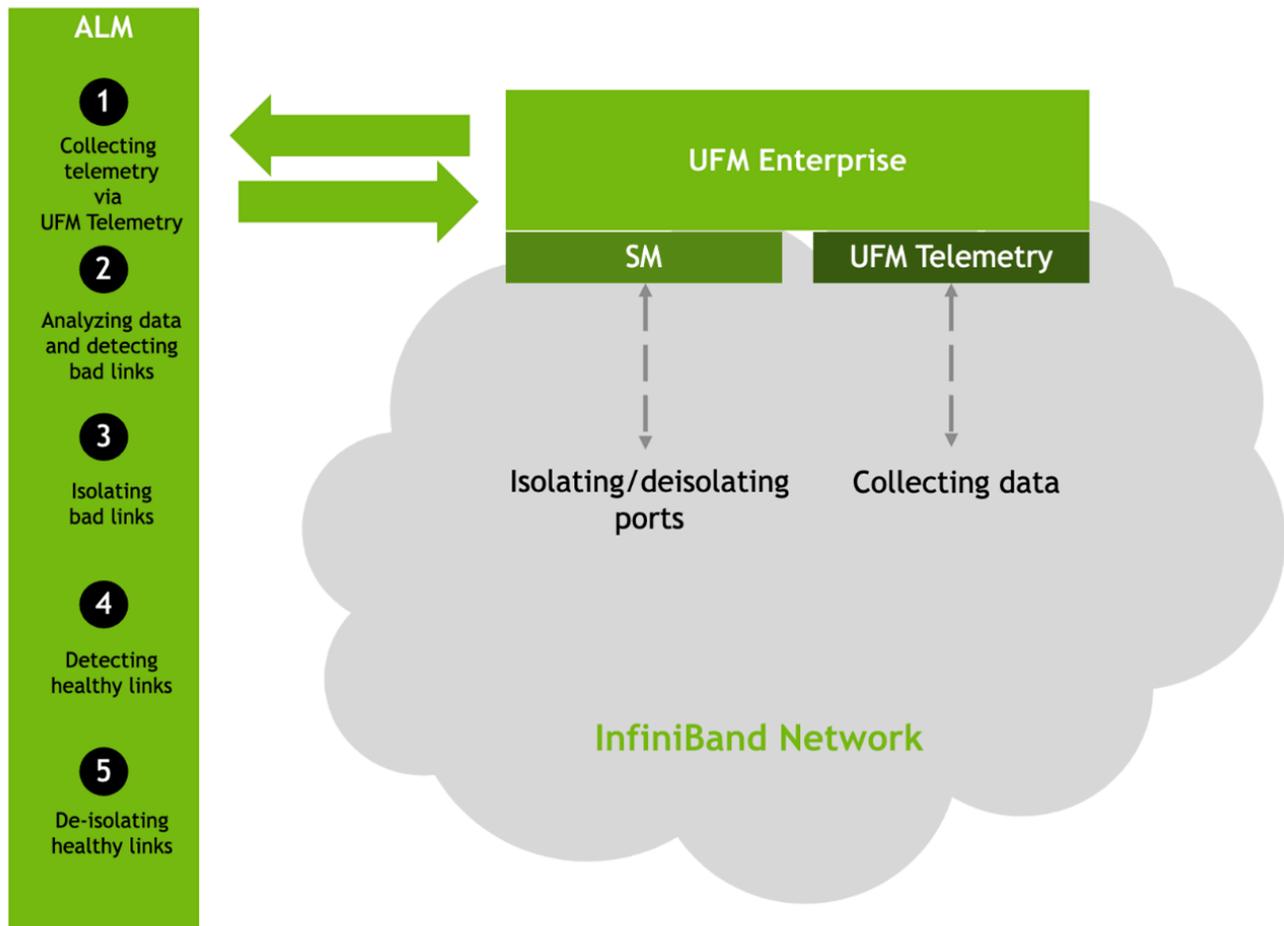
1. Shadow mode

- Collects telemetry data, runs ML prediction jobs, and saves the predictions to files.

2. Active mode

- Collects telemetry data, runs ML prediction jobs, and saves the predictions to files.
- Automatically isolates and de-isolates based on predictions.
- It is essential to note that a subset of the links must be specified in the allow list to enable this functionality.

Schematic Flow



Deployment

The Autonomous Link Maintenance (ALM) plugin can be deployed using the following methods:

1. On the UFM Appliance
2. On the UFM Software

To deploy the plugin, follow these steps:

1. Download the `ufm-plugin-alm-image` from the [NVIDIA License Portal \(NLP\)](#).
2. Load the downloaded image onto the UFM server. This can be done either by using the UFM GUI by navigating to the Settings -> Plugins Management tab or by loading the image via the following instructions:
3. Log in to the [UFM server terminal](#).

4. Run:

```
docker load -I <path_to_image>
```

5. After successfully loading the plugin image, the plugin should become visible within the plugins management table within the UFM GUI. To initiate the plugin's execution, simply right-click on the respective in the table.

Name	Enabled	Tags	Port	Shared Volumes	Status
alm	<input checked="" type="checkbox"/>	LATEST	NA	/opt/ufm/files/log/alm:/var/log/cyb...	running

Note

The supported InfiniBand hardware technologies are HDR, Beta on NDR.

Data Collection

The ALM plugin collects data from the UFM Enterprise appliance in the following two methods:

1. Low-frequency collection: This process occurs every 7 minutes and gathers data for the following counter: hist0, hist1, hist2, hist3, hist4, phy_effective_errors, phy_symbol_errors

2. High-frequency collection : This process occurs every 10 seconds and gathers data for the following counters:
 - phy_state,logical_state,link_speed_active,link_width_active,fec_mode_active,raw_ber,eff_ber,symbol_ber,phy_raw_errors_lane0,phy_raw_errors_lane1,phy_raw_errors_lane3,phy_effective_errors,phy_symbol_errors,time_since_last_clear,hist0,hist1,hist2,hist3,hist4,switch_temperature,CableInfo.temperature,link_down_event,plr_rcv_codes,plr_rcv_code_err,plr_rcv_uncorrectable_code,plr_xmit_codes,plr_xmit_retry_events,plr_sync_events,hi_retransmission_rate,fast_link_up_status,time_to_link_up,status_opcode,status_message,down_blame,local_reason_opcode,remote_reason_opcode,e2e_reason_opcode,num_of_ber_alarms,PortRcvRemotePhy,PortRcvErrorsExtended,PortXmitDiscardsExtended,PortRcvSwitchRelayErrorsExtended,VL15DroppedExtended,PortXmitWaitExtended,PortXmitDataExtended,PortRcvDataExtended,PortRcvPktsExtended,PortUniCastXmitPktsExtended,PortUniCastRcvPktsExtended,F
3. The collected counters can be configurable and customized to suit your requirements. The counters can be found at /opt/ufm/conf/plugins/alm/counters.cfg

```

root@r-ufm116:~# cat /opt/ufm/conf/plugins/alm/counters.cfg
[HighFreq]
phy_state = last_update_value
logical_state = last_update_value
link_speed_active = last_update_value
link_width_active = last_update_value
fec_mode_active = last_update_value
raw_ber = last_update_value
eff_ber = last_update_value
symbol_ber = last_update_value
phy_raw_errors_lane0 = delta
phy_raw_errors_lane1 = delta
phy_raw_errors_lane2 = delta
phy_raw_errors_lane3 = delta
phy_effective_errors = delta
phy_symbol_errors = delta
time_since_last_clear = last_update_value
hist0 = delta
hist1 = delta
hist2 = delta
hist3 = delta
hist4 = delta
switch_temperature = last_update_value
CableInfo.Temperature = last_update_value
link_down_events = delta
plr_rcv_codes = delta
plr_rcv_code_err = delta
plr_rcv_uncorrectable_code = delta
plr_xmit_codes = delta
plr_xmit_retry_codes = delta
plr_xmit_retry_events = delta
plr_sync_events = delta
hi_retransmission_rate = delta
fast_link_up_status = last_update_value
time_to_link_up = last_update_value
status_opcode = last_update_value
status_message = last_update_value
down_blame = last_update_value
local_reason_opcode = last_update_value
remote_reason_opcode = last_update_value
e2e_reason_opcode = last_update_value
num_of_ber_alarms = delta
PortRcvRemotePhysicalErrorsExtended = delta
PortRcvErrorsExtended = delta
PortXmitDiscardsExtended = delta
PortRcvSwitchRelayErrorsExtended = delta

```

ALM Configuration

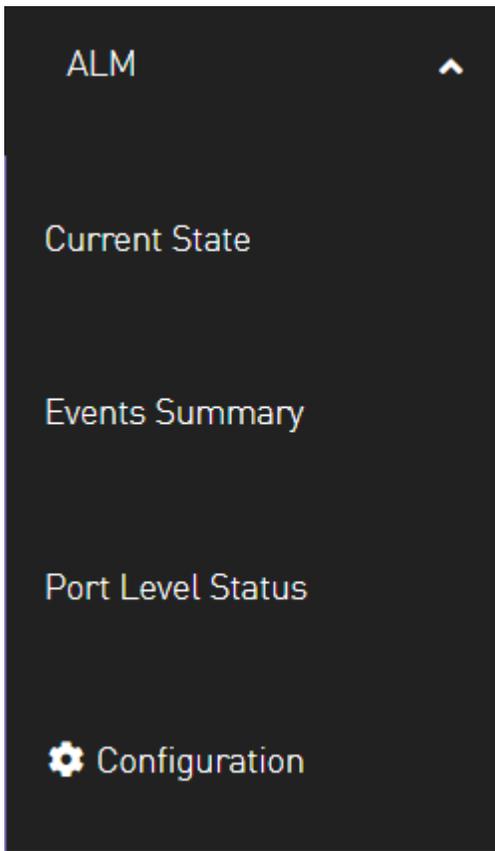
The ALM configuration is used for controlling isolation/de-isolation. The configuration can be found under `/opt/ufm/cyber-ai/conf/cyberai.cfg`.

Name	Section name	Description
mode	CyberAi	The mode can be either "active" or "shadow." In active mode, the ALM will enforce isolation/deisolation rules on all ports except those listed in the "expect" list. In shadow mode, the ALM will enforce isolation/deisolation rules on the ports

Name	Section name	Description
		listed in the "except" list.
<code>except_list</code>	CyberAi	Includes the ports that receive the opposite treatment compared to the mode. Format: portguid_number, portguid_portnumber2
<code>max_per_hour</code>	Isolation	The maximum number of ports that can be isolated in a hour
<code>max_per_week</code>	Isolation	Maximum number of ports that can be isolated in a week
<code>max_per_month</code>	Isolation	Maximum number of the ports that can be isolated in a month
<code>Deisolation_time</code>	Delsolation	The waiting time before deisolate the isolated port
<code>max_per_hour</code>	Delsolation	The maximum number of deisolated port per hour
<code>absolute_threshold_of_isolated_ports</code>	Isolation	The maximum number of ports than can be isolated in one sample

ALM UI

After the successful deployment of the plugin, a new item is shown in the UFM side menu for the ALM plugin:



Current State

This page displays a table presenting the current cluster status, outlining the following counts:

1. Number of ports
2. Number of isolated ports
3. Number of ports in active/shadow mode
4. Number of ports out of NOC

Current State				
	Switch to Switch		Switch to Host	Total, currently
Filter...	Filter...	Filter...	Filter...	Filter...
Number of ports	8(36.36%)		14(63.64%)	22(100%)
Number of isolated ports	0(0%)		0(0%)	0(0%)
Number of ports in active mode	0(0%)		0(0%)	0(0%)
Number of ports in shadow mode	8(36.36%)		14(63.64%)	22(100%)
Out of NOC	0(0%)		0(0%)	0(0%)

Viewing 1-5 of 5

Events Summary

This page displays a table presenting a port count summary, outlining the following counts:

1. Number of isolated ports in the past hour, week, and month for 'host to switch' and 'switch to switch'.
2. Number of de-isolated ports in the past hour, week, and month for 'host to switch' and 'switch to switch'.
3. Number of isolation actions **not** taken by ALM in the past hour, week, and month for 'host to switch' and 'switch to switch'.

Events Summary						
	Switch to Switch			Switch to Host		
	Past Hour	Past Week	Past Month	Past Hour	Past Week	Past Month
Filter...	Filter...	Filter...	Filter...	Filter...	Filter...	Filter...
Number of isolation	0	0	0	0	0	0
Number of de-isolation	0	0	0	0	0	0
Number of isolation actions not taken	0	0	0	0	0	0

Viewing 1-3 of 3

Port Level Status

This page displays a table presenting the cluster ports.

Node ID	Port Number	Mode	Isolation Status	Type	Last Recommendation	Last Recommendation Time	Last Action	Last Action Time	Last Reason
0x1070fd030058c896	39		Health	switch_switch	NA	N/A	NA	N/A	NA
0x1070fd030058c896	40		Health	switch_switch	NA	N/A	NA	N/A	NA
0x043f720300f695e6	1		Health	switch_switch	NA	N/A	NA	N/A	NA
0x043f720300f695e6	3		Health	switch_switch	NA	N/A	NA	N/A	NA
0x900a8403006fd800	58		Health	switch_host	NA	N/A	NA	N/A	NA
0x900a8403006fd800	57		Health	switch_host	NA	N/A	NA	N/A	NA
0x1070fd03006c7960	1		Health	host_switch	NA	N/A	NA	N/A	NA
0x043f720300f695e6	32		Health	switch_host	NA	N/A	NA	N/A	NA
0x043f720300f695e6	26		Health	switch_host	NA	N/A	NA	N/A	NA
0x043f720300f695e6	25		Health	switch_host	NA	N/A	NA	N/A	NA

Configuration

This page displays ALM plugin configuration update method.

Configuration

Max Number of Isolated Ports by ALM

Max Number of Isolated by ALM Per Time Window

Hour
 Day
 Week
 Month

Max Number of De-isolated by ALM Per Time Window

Hour

Minimum Time Port Should be Healthy Before De-isolation

Minutes

Default Mode

Exception List

ALM Jobs

The table presented below displays the names and descriptions of ALM jobs. These jobs are designed to predict the ports that require isolation/de-isolation. Upon enabling the ALM plugin, these ALM jobs run periodically.

ALM Job Name	Description	Frequency
Port_hist	By using the low frequency bit error histogram counters, the ALM job identifies the ports that will be monitored at high frequency in the next time interval. The job generates an output file that is later read by the high frequency telemetry monitoring	600 seconds

ALM Job Name	Description	Frequency
	job. It prioritizes links that are more susceptible to failure.	
Low_freq_predict	Predicts the likelihood of a port failure by analyzing input data from low frequency telemetry, while only utilizing physical layer counters. The prediction works for isolated ports as well. The resulting output from this task serves as a critical input for determining whether to isolate or de-isolate ports.	10 seconds

DTS Plugin

Overview

The DTS Monitor can be run either as a standalone tool or as a plugin within UFM. It collects all the endpoint information for DPUs and consolidates it into a single interface.

Deployment

DPU Requirements

- OS: ubuntu 20/22
- BlueField: BlueField-2 or BlueField-3
- DTS: version > 1.12
- DPE service up and running
- yaml configured with "DTS_CONFIG_DIR=ufm"

- - Add to the following line in `file doca_telemetry_standalone.yaml`

- -

- Command:

```
/bin/bash","-c","/usr/bin/telemetry-init.sh &&  
/usr/bin/enable-fluent-forward.sh
```

- Command:

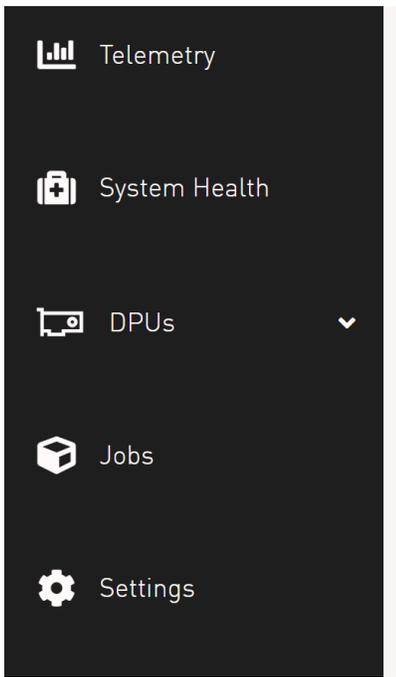
```
/bin/bash","-c"," DTS_CONFIG_DIR=ufm  
/usr/bin/telemetry-init.sh && /usr/bin/enable-  
fluent-forward.sh
```

Installation

you need to load the image on the UFM server; either using the UFM GUI -> Settings -> Plugins Management tab or by loading the image via the following command:

1. Login to the UFM server terminal.
2. Run: `docker load -I <path to image>`

After completing the plugin addition and refreshing the UFM GUI, a new menu item, titled DPUs, will be added to the left navigation bar.



DTS UI

Info

Health

Telemetry

Data Sources

Data Sources Configuration

[+ New](#) [Displayed Columns ▾](#)

Source	Port	Status
<input type="text" value="Filter..."/> ▾	<input type="text" value="Filter..."/> ▾	<input type="text" value="Filter..."/> ▾
r-ufm10-bf1	9100	Up
r-ufm11-bf1	9100	Up
r-ufm12-bf1	9100	Failed to connect

Viewing 1-3 of 3 ⏪ ⏩ 10 ▾

GRPC-Streamer Plugin

Authentication

The following authentication types are supported:

- Basic (/ufmRest)
- Token (/ufmRestV3)

Create a Session to UFM from GRPC

Description: Creates a session to receive REST API results from the UFM's GRPC server. After a stream or one call, the session is deleted so the server would not save the authorizations.

- Call: CreateSession in the grpc
- Request Content Type – message SessionAuth

- Request Data:

```
message SessionAuth{
    string job_id=1;
    string username = 2;
    string password = 3;
    optional string token = 4;
}
```

- Job_id - The unique identifier for the client you want to have
- Username - The authentication username
- Password – The authentication password
- Token – The authentication token
- Response:

```
message SessionRespond{
    string respond=1;
}
```

- Respond types:
 - Success – Ok.
 - ConnectionError – UFM connection error (bad parameters or UFM is down).
 - Other exceptions – details sent in the respond.
- Console command:

```
client session --server_ip=server_ip --id=client_id --
```

```
auth=username,password --token=token
```

Create New Subscription

- Description: Only after the server has established a session for this grpc client, add all the requested REST APIs with intervals and delta requests.
- Call: AddSubscriber
- Request Content Type – Message SubscriberParams
- Request Data:

```
message SubscriberParams{  
  message APIParams {  
    string ufm_api_name = 1;  
    int32 interval = 2;  
    optional bool only_delta = 3;  
  }  
  string job_id = 1;  
  repeated APIParams apiParams = 2;  
}
```

- Job_id – A unique subscriber identifier
- apiParams – The list of apiParams from the above message above:
 - ufm_api_name – The name from the known to server request api list
 - interval – The interval between messages conducted in a stream run. Presented in seconds.
 - only_delta – Receives the difference between the previous messages in a stream run.
- Response content type:

```
message SessionRespond{
    string respond=1;
}
```

- Respond Types:
 - Created a user with session and added new IP– Ok.
 - Cannot add subscriber that do no have an established session – need to create a session before creating subscriber.
 - The server already have the ID – need to create new session and new subscriber with a new unique ID.
- Console command:

```
client create --server_ip=localhost --id=client_id --
apis=events;40;True,links,alarms;10
```

The API's list is separated by commas, and each modifier for the REST API is separated by a semi comma.

If the server is not given a modifier, default ones are used (where only_delta is False and interval is based on the API).

Edit Known Subscription

- Description: Changes a known IP. Whether the server has the IP or not.
- Call: AddSubscriber
- Request Content Type – Message SubscriberParams
- Request Data:

```
message SubscriberParams{
```

```

message APIParams {
    string ufm_api_name = 1;
    int32 interval = 2;
    optional bool only_delta = 3;
}
string job_id = 1; //unique identifier for this job
repeated APIParams apiParams = 2;
}

```

- Job_id – The subscriber unique identifier
- apiParams – A list of apiParams from the above message.
 - ufm_api_name – name from the known to server request api list
 - interval – The interval between messages conducted in a stream run. Presented in seconds.
 - only_delta – Receives the difference between the previous messages in a stream run.
- Response content type:

```

message SessionRespond{
    string respond=1;
}

```

- Respond Types:
 - Created user with new IP– Ok.
 - Cannot add subscriber without an established session – need to create a session before creating subscriber.
 - Cannot add subscriber illegal apis – cannot create subscriber with empty API list, call again with correct API list.

Get List of Known Subscribers

- Description: Gets the list of subscribers, including the requested list of APIs.
- Call: ListSubscribers
- Request Content Type: google.protobuf.Empty
- Response:

```
message ListSubscriberParams{
  repeated SubscriberParams subscribers = 1;
}
```

- Console command: server subscribes --server_ip=server_ip

Delete a Known Subscriber

- Description: Deletes an existing subscriber and removes the session.
- Call: DeleteSubscriber
- Request Content Type: Message gRPCStreamerID
- Request Data:

```
message gRPCStreamerID{
  string job_id = 1;
}
```

- Response:protobuf.Empty

Run a Known Subscriber Once

- Description: Runs the Rest API list for a known subscriber once and returns the result in message runOnceRespond, and then delete the subscriber's session.

- Call: RunOnceJob
- Request Content Type: Message gRPCStreamerID
- Request Data:

```
message gRPCStreamerID{
  string job_id = 1;
}
```

- Response content type:

```
message runOnceRespond{
  string job_id=1;
  repeated gRPCStreamerParams results = 2;
}
```

- Job_id- The first message unique identifier.
- Results – list of gRPCStreamerParams contains results from each REST API
- Responses:
 - Job id - Cannot run a client without an established session. Empty results – an existing session for this client is not found, and the client is not known to the server.
 - Job id - Cannot run the client without creating a subscriber. Empty results – a session was created for the client but the subscription is not created.
 - Job_id - Cannot connect to the UFM. empty result – the GRPC server cannot connect to the UFM machine and receive empty results, because it cannot create a subscriber with an empty API list. This means that the UFM machine is experiencing a problem.
 - Job_id - The first unique message identifier of the messages. Not empty results – Ok

- Console command:

```
client once_id --server_ip=server_ip --id=client_id
```

Run Streamed Data of a Known Subscriber

- Description: Run a stream of results from the Rest API list for a known Subscriber and return the result as iterator, where each item is message gRPCStreamerParams. at the end, delete the session.
- Call: RunStreamJob
- Request Content Type: Message gRPCStreamerID
- Request Data:

```
message gRPCStreamerID{  
  string job_id = 1;  
}
```

- Response content type: iterator of messages gRPCStreamerParams

```
message gRPCStreamerParams{  
  string message_id = 1; // unique identifier for messages  
  string ufm_api_name = 2; // what rest api receive the data from  
  google.protobuf.Timestamp timestamp = 3; //what time we created the  
  message, can be converted to Datetime  
  string data = 4; // data of rest api call  
}
```

- Response:
 - One message only containing "Cannot run a client without a session" – A session has not been established

- No message – A session and/or a subscriber with this ID does not exist.
- Messages with interval between with the modifiers – Ok
- Console command:

```
client stream_id --server_ip=server_ip --id=client_id
```

Run a New Subscriber Once

- Description: After ensuring that a session for this specific job ID is established, the server runs the whole REST API list for the new subscriber once and returns the following result in message `runOnceRespond`. This action does not save the subscribe ID or the established session in the server.
- Call: RunOnce
- Request Content Type: Message SubscriberParams
- Request Data:

```
message SubscriberParams{
  message APIParams {
    string ufm_api_name = 1;
    int32 interval = 2;
    optional bool only_delta = 3;
  }
  string job_id = 1; //unique identifier for this job
  repeated APIParams apiParams = 2;
}
```

- Response content type:

```
message runOnceRespond{
```

```
string job_id=1;
repeated gRPCStreamerParams results = 2;
}
```

- Responses:
 - Job id = Cannot run a client without an established session. Empty results – no session for this client.
 - Job_id = 0 – The GRPC server cannot connect to the UFM machine and receive empty results, or it cannot create a subscriber with an empty API list.
 - Job_id = The messages' first unique identifier, and not an empty result – Ok.
- Console command:

```
client once --server_ip=server_ip --id=client_id --
auth=username,password --token=token --
apis=events;40;True,links;20;False,alarms;10
```

- The console command creates a session for this specific client.
- A token or the basic authorization is needed, not both.

Run New Subscriber Streamed Data

- Description: After the server checks it has a session for this job ID, Run a stream of results from the Rest API list for a new Subscriber and return the result as iterator, where each item is message gRPCStreamerParams. at the end, delete the session.
- Call: RunPeriodically
- Request Content Type: Message SubscriberParams
- Request Data:

```
message SubscriberParams{
```

```

message APIParams {
    string ufm_api_name = 1;
    int32 interval = 2;
    optional bool only_delta = 3;
}
string job_id = 1; //unique identifier for this job
repeated APIParams apiParams = 2;
}

```

- Response content type: iterator of messages gRPCStreamerParams
- Response:
 - Only one message with data equals to Cant run client without session – no session
 - Messages with intervals between with the modifiers – Ok
- Console command:

```

client stream --server_ip=server_ip --id=client_id --
auth=username,password --token=token --
apis=events;40;True,links;20;False,alarms;10

```

- console command also create session for that client.
- no need for both token and basic authorization, just one of them.

Run A Serialization on All the Running Streams

- Description: Run a serialization for each running stream. The serialization will return to each of the machines the results from the rest api list.
- Call: Serialization
- Request Content Type: google.protobuf.Empty
- Response: google.protobuf.Empty

Stop a Running Stream

- Description: Cancels running stream using the client id of the stream and stop it from outside, If found stop the stream.
- Call: StopStream
- Request Content Type: Message gRPCStreamerID
- Request Data:

```
message gRPCStreamerID{
  string job_id = 1;
}
```

- Response: google.protobuf.Empty

Run a subscribe stream

- Description: Create a subscription to a client identifier, all new messages that go to that client, will be copied and also sent to this stream.
- Call: Serialization
- Request Content Type: message gRPCStreamerID
- Response: iterator of messages gRPCStreamerParams

```
message gRPCStreamerParams{
  string message_id = 1; // unique identifier for messages
  string ufm_api_name = 2; // what rest api receive the data from
  google.protobuf.Timestamp timestamp = 3; //what time we created the
  message, can be converted to Datetime
  string data = 4; // data of rest api call
}
```

- the identifier may or may not be in the grpc server.
- Cannot be stop streamed using StopStream.
- Console command:

```
client subscribe --server_ip=server_ip --id=client_id
```

Get the variables from a known subscriber

- Description: Get the variables of known subscriber if found, else return empty variables.
- Call: GetJobParams
- Request Content Type: message gRPCStreamerID
- Response:

```
message SubscriberParams{
  message APIParams {
    string ufm_api_name = 1; //currently the list of api from ufm that are
supported are [Jobs, Events, Links, Alarms]
    int32 interval = 2;
    optional bool only_delta = 3;
  }
  string job_id = 1; //unique identifier for this job
  repeated APIParams apiParams = 2;
}
```

Get Help / Version

- Description: Get help and the version of the plugin, how to interact with the server. What stages need to be done to extract the rest apis (Session>run once/stream or Session>AddSubscriber>once_id/stream_id)

- Call: Help or Version
- Request Content Type: google.protobuf.Empty
- Response:

```
message SessionRespond{  
    string respond=1;  
}
```

Sysinfo Plugin

Overview

The Sysinfo plugin is a Docker container that is managed by UFM and comes with REST API support. Its purpose is to allow users to run commands and extract information from managed switches. This feature enables users to schedule runs at regular intervals and execute commands on switches directly from UFM.

The plugin takes care of managing sessions to the switches and can extend them if necessary. It also enables users to send both synchronous and asynchronous commands to all the managed switches. Additionally, it can intersect the given switches with the running UFM to ensure that only those switches that are on the UFM are activated.

Deployment

The following are the possible ways plugin plugin can be deployed:

1. On UFM Appliance
2. On UFM Software.
3. Authentication

Following authentication types are supported:

- basic (/ufmRest)

- client (/ufmRestV2)
- token (/ufmRestV3)

REST API

The following REST APIs are supported:

- GET /help
- GET /version
- POST /query
- POST /update
- POST /cancel
- POST /delete

Sysinfo Query Format

The Sysinfo plugin is responsible for extracting basic data needed to create a query. This is done using the following five fields:

1. Switches - An array of switch IP addresses. If this field is left empty, the plugin will gather all switches from the running UFM.
2. Callback - The URL location to which the answers should be sent.
3. Commands - An array of commands that need to be executed.
4. Schedule_run - An optional field used to set intervals for running the commands. The interval can be specified in seconds and can be set to run until a certain duration or end time. The start time can also be controlled.

There are additional flags for a configurable query:

- `ignore_ufm=True`: Does not check the UFM for switches or intersect it with given switches
- `username`: Overrides the switches' default username

- `password`: Overrides the switches' default password
- `is_async`: Rather than attempting to execute all commands simultaneously at the switch, the commands are executed one after the other in sequence.
- `one_by_one=False`: Instead of sending results from each switch as soon as information is obtained, all data is sent at once to the callback. This change eliminates multiple small sends and replaces them with a single large send.

For detailed information on how to interact with Sysinfo plugin, refer to the [NVIDIA UFM Enterprise > Rest API > Sysinfo Plugin REST API](#).

SNMP Plugin

The SNMP plugin is a self-contained Docker container that includes REST API support and is managed by UFM. Its primary function is to receive SNMP traps from switches and forward them to UFM as external events. This feature enhances the user experience by providing additional information about switches in the InfiniBand fabric via UFM events and alarms.

Deployment

There are two potential deployment options for the SNMP plugin:

- On UFM Appliance
- On UFM Software

For detailed instructions on how to deploy the SNMP plugin, refer to [this page](#).

Authentication

The following authentication types are supported:

- basic (/ufmRest)
- client (/ufmRestV2)
- token (/ufmRestV3)

REST API

The following REST API are supported:

- GET /switch_list
- GET /trap_list
- POST /register
- POST /unregister
- POST /enable_trap
- POST /disable_trap
- GET /version

For more information, please refer to [UFM Enterprise Documentation](#) → UFM REST API → SNMP Plugin REST API.

Usage

By default, upon initialization, the SNMP plugin captures traps from all switches within the fabric. However, this behavior can be modified through configuration settings utilizing the "snmp_mode" option, with available values of "auto" or "manual".

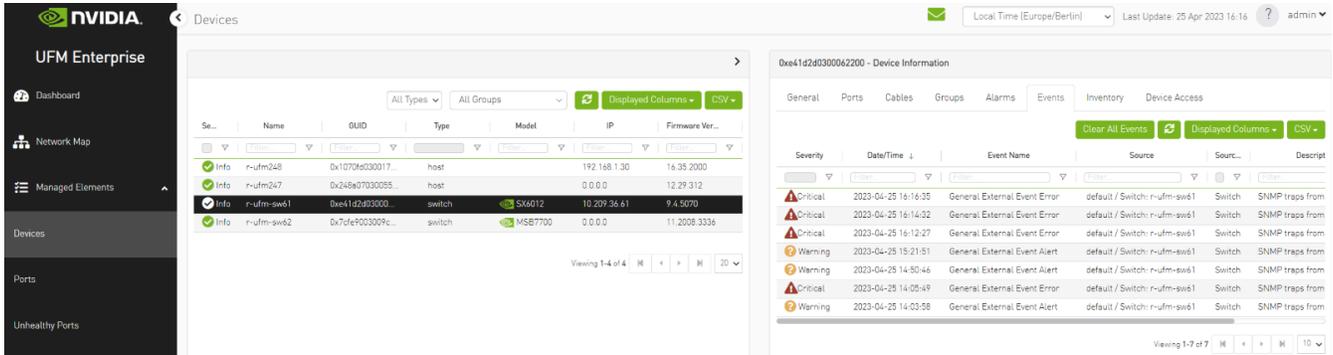
It is important to ensure that the switch is visible to UFM and has a valid IP address. As illustrated in the following example, switch traps will only be received from "r-ufm-sw61".

Severity	Name	GUID	Type	Model	IP	Firmware Version
Info	r-ufm248	Dx1070f603001763ec	host		192.168.1.30	16.35.2000
Info	r-ufm247	Dx248a0703000554548	host		0.0.0.0	12.29.312
Info	r-ufm-sw61	Dxe41d2d0300062200	switch	SX6012	10.209.36.61	9.4.5070
Info	r-ufm-sw62	Dx7dfe900300fcebb0	switch	MSB7700	0.0.0.0	11.2008.3336

The following is an instance of a trap received by the SNMP plugin and displayed as a UFM event:



Additionally, there is an option to verify events/alarms for a particular switch:



The SNMP plugin performs a periodic check of the fabric every 180 seconds, allowing for prompt receipt of traps from new switches or updated IP addresses of existing switches in under 180 seconds. This interval may be adjusted via the "ufm_switches_update_interval" option. To manually register or unregister a switch, please refer to the [UFM Enterprise Documentation](#) → UFM REST API → SNMP Plugin REST API.

The SNMP plugin employs the most up-to-date SNMP v3 protocol, which incorporates advanced security measures such as authentication and encryption. The "snmp_version" option enables the selection of SNMP versions "1" or "3". It is essential to note that only switch-exposed traps will be transmitted to UFM as events.

OID	Name	Description	Status	Severity
MELLANOX-EFM-MIB::testTrap	send-test	A test trap ordered by the system administrator	Enabled	Warning
MELLANOX-EFM-MIB::asicChipDown	asic-chip-down	ASIC (Chip) Down	Enabled	Critical
MELLANOX-EFM-	cpu-util-high	CPU utilization has risen too high	Enabled	Warning

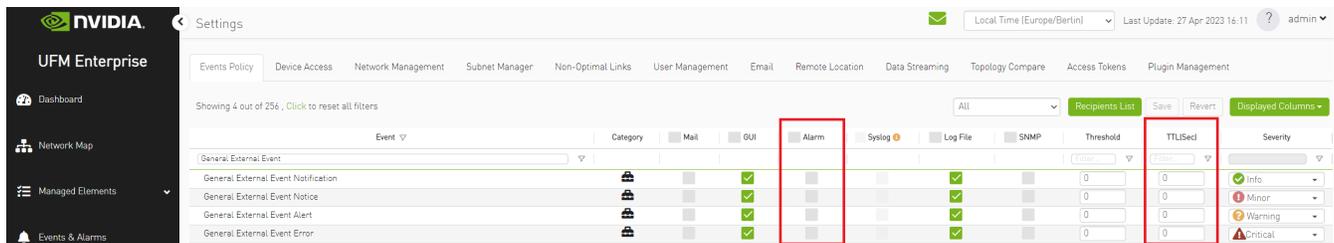
OID	Name	Description	Status	Severity
MIB::cpuUtilHigh				
MELLANOX-EFM-MIB::diskSpaceLow	disk-space-low	Filesystem free space has fallen too low	Enabled	Warning
MELLANOX-EFM-MIB::expectedShutdown	expected-shutdown	Expected system shutdown	Enabled	Info
MELLANOX-EFM-MIB::systemHealthStatus	health-module-status	Health module Status	Enabled	Critical
MELLANOX-EFM-MIB::insufficientFans	insufficient-fans	Insufficient amount of fans in system	Enabled	Warning
MELLANOX-EFM-MIB::insufficientFansRecover	insufficient-fans-recover	Insufficient amount of fans in system recovered	Enabled	Info
MELLANOX-EFM-MIB::insufficientPower	insufficient-power	Insufficient power supply	Enabled	Warning
RFC1213::linkdown	interface-down	An interface's link state has changed to down	Enabled	Minor
RFC1213::linkup	interface-up	An interface's link state has changed to up	Enabled	Info
MELLANOX-EFM-MIB::unexpectedShutdown	unexpected-shutdown	Unexpected system shutdown	Enabled	Minor
SNMPv2-MIB::coldStart	cold-start	SNMP entity reinitialized	Enabled	Info

To learn more about how to enable or disable a specific trap, please refer to the [UFM Enterprise Documentation](#) → UFM REST API → SNMP Plugin REST API.

If some traps are not included in the default list, they may be added using the "snmp_additional_traps" option. The SNMP plugin will consider these traps as "enabled" and transmit them to UFM as events with an "Info" severity level.

To ensure the uninterrupted reception of traps from switches within a large fabric, changes must be made to the UFM configuration in the [/opt/ufm/conf/gv.cfg] file's [Events] section. Specifically, the "max_events" option should be raised from 100 to 1000, while "medium_rate_threshold" and "high_rate_threshold" should both be set to 500. To implement configuration adjustments, disable and then enable the plugin.

In case of an event storm, it is necessary to adjust the Event Policy settings such that General Events are non-alarmable and the TTL is set to zero, as illustrated in the following screenshot:



Other

Additional configurations are located in "/opt/ufm/conf/plugins/snmp/snmp.conf". To implement configuration adjustments, disable and then enable the plugin. For instructions on modifying the appliance, please refer to the [UFM-SDN App CLI Guide](#).

Logs for the SNMP plugin are stored in "/opt/ufm/logs/snmptrap.log". For guidance on accessing logs on the appliance, please refer to the [UFM-SDN App CLI Guide](#).

Packet Mirroring Collector (PMC) Plugin

Overview

The Packet Mirroring Collector/Controller plugin facilitates the configuration of pFRN, Fast Recovery and Congestion mirroring on switches as well as CQE mirroring on HCAs and

subsequently captures mirrored packets, enabling users to conduct real-time monitoring of network events

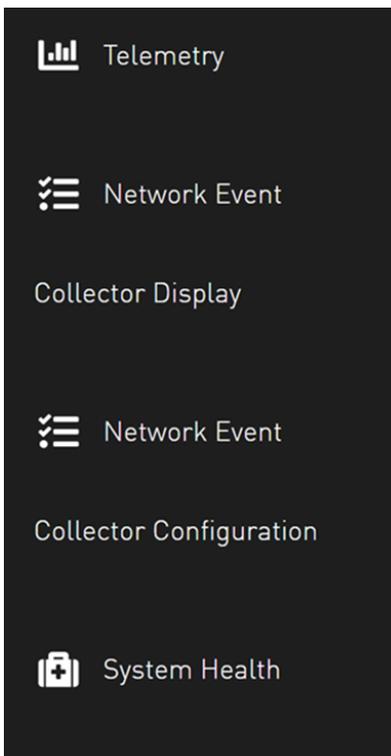
Deployment

Installation

Load the image on the UFM server; either using the UFM GUI -> Settings -> Plugins Management tab, or by loading the image via the following command:

1. [Login to the UFM server terminal.](#)
2. [Run](#)

```
docker load -I <path_to_image>
```



Upon completion of the plugin addition and subsequent refresh of the UFM GUI, the left navigation bar will display two new menu items. These two tabs can be observed in the following GUI screenshots

PMC UI

Network Event Collector Display

Network Event Collector Display

pFRN Events Congestion Events Fast Recovery Events CQE Events

Profile Event summary Time Last 24 hours

Please wait...

timestamp	src guid	src lid	src desc	local qpn	dst lid	remote qpn	transport	syndrome
2024-01-02 11:20:13.607486	0x98039b03009fce86	1	smg-ib-svr065 mbx5_0	72	6	224	RC	Remote Access Error

Viewing 1-1 of 1

Network Event Collector Configuration

NVIDIA UFM Enterprise

Network Event Collector Display Local Time [Asia/Jerusalem] Last Update: 25 Dec 2023 17:18 admin

Network Event Collector Display

pFRN Events Congestion Events Fast Recovery Events CQE Events

Profile Event summary Time Last 24 hours

Displayed Columns

No items were found

Viewing 0-0 of 0

Network Event Collector Configuration

Collectors

pFRN Notifications	Disabled	Browse
Fast Recovery Notifications	Disabled	Browse
Notification Level	Normal	
CQE Notifications	on Entire Network	Browse
Congestion Notifications	Disabled	Browse
Mirrored packets (%)	1	
High threshold	75	
Low threshold	50	

General Options

enable adaptive routing	<input type="checkbox"/>
enable aggregation	<input checked="" type="checkbox"/>

Submit

PDR Deterministic Plugin

Overview

The PDR deterministic plugin, overseen by the UFM, is a docker container that isolates malfunctioning ports, and then reinstates the repaired links to their previous condition by lifting the isolation. The PDR plugin uses a specific algorithm to isolate ports, which is based on telemetry data from the UFM Telemetry. This data includes packet drop rate, BER counter values, link down counter, and port temperature. Any decisions made by the plugin will trigger an event in the UFM for tracking purposes.

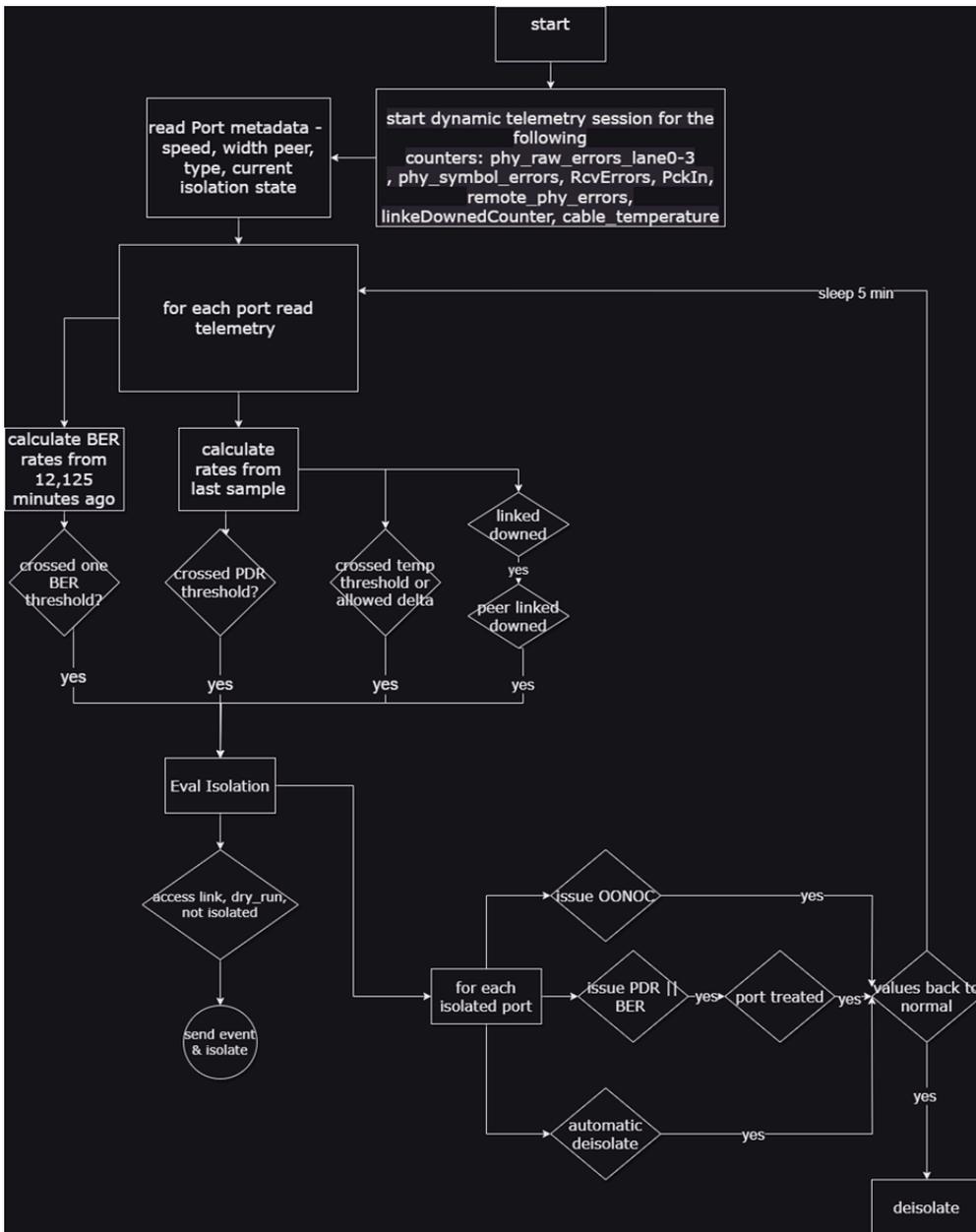
The PDR plugin performs the following tasks:

1. Collects telemetry data using UFM Dynamic Telemetry
2. Identifies potential failures based on telemetry calculations and isolates them to avert any interruption to traffic flow

3. Maintains a record of maintenance procedures that can be executed to restore an isolated link
4. After performing the required maintenance, the system verifies if the ports can be de-isolated and restored to operational status (brought back online).

The plugin can simulate port isolation without actually executing it for the purpose of analyzing the algorithm's performance and decision-making process in order to make future adjustments. This behavior is achieved through the implementation of a "`dry_run`" flag that changes the plugin's behavior to solely record its port "isolation" decisions in the log, rather than invoking the port isolation API. All decisions will be recorded in the plugin's log.

Schematic Flow



Deployment

To deploy the plugin, follow these steps:

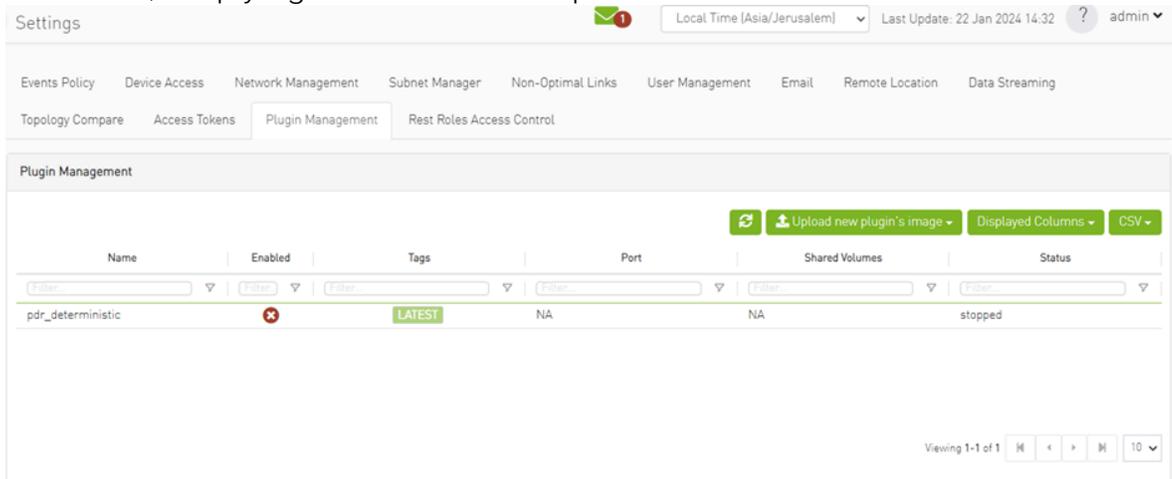
1. Download the `ufm-plugin-pdr_deterministic-image` from the **Docker Hub**.
2. Load the downloaded image onto the UFM server. This can be done either by using the UFM GUI by navigating to the Settings -> Plugins Management tab or by loading the image via the following instructions:

1. Log in to the [UFM server terminal](#).

2. Run:

```
docker load -I <path_to_image>
```

3. After successfully loading the plugin image, the plugin should become visible in the plugin management table within the UFM GUI. To initiate the plugin's execution, simply right-click on the respective in the table.



Isolation Decisions

NDR Link Validation Procedure

Verify ports that are in INIT, ARMED or ACTIVE states only. Track the SymbolErrorsExt of every such link for at least 120m. If polling period is Pm, need to keep $N=(125+Pm+1)/Pm$ samples. Also, two delta samples are computed: number of samples covering 12 minutes $S_{12m} = (12 + Pm + 1)/Pm$ and $S_{125m} = (125 + Pm + 1)/Pm$. $12m_thd = LinkBW_Gbps * 1e9 * 12 * 60 * 1e-14$ (2.88 for NDR) and

$125m_thd = LinkBW_Gbps * 1e9 * 125 * 60 * 1e-15$ (3 for NDR).

Check the following conditions for every port in the given set:

1. If the `Delta(LinkDownedCounterExt)` port is > 0 and the `Delta(LinkDownedCounterExt)` remote port is > 0 , add it to the list of `bad_ports`. This condition should be ignored if the `--no_down_count` flag is provided.

2. If the `symbol_errors[now_idx] - symbol_errors[now_idx - S12m]` is > 12m_thd, add the link to the list of `bad_ports`, and continue with next link.
3. If the `symbol_errors[now_idx] - symbol_errors[now_idx - S125m]` is > 125m_thd, add the link to the list of `bad_ports`, continue with next linkPacket drop rate criteria

When packet drops due to the link health are detected, isolate the problematic link. To achieve this, a target packet_drop/packet_delivered ratio can be employed to include TX ports with a receiver exceeding this threshold in the list of bad_ports. However, the drawback of this method is that such links may fluctuate between bad/good state since their BER may be normal. Therefore, it is advisable to track their statistics over time and refrain from reintegrating them after their second or third de-isolation.

Return to Service

Continuously monitoring the collection of `bad_ports`, the plugin persistently assess their Bit Error Rate (BER) and determines their reintegration when they successfully pass the 126m test without errors.

Configuration

The following parameters are configurable via the plugin's configuration file. (`pdr_deterministic.conf`)

Name	Description	Default Value
<code>T_ISOLATE</code>	Interval for requesting telemetry counters, in seconds.	300
<code>MAX_NUM_ISOLATE</code>	Maximum ports to be isolated. max(MAX_NUM_ISOLATE, 0.5% * fabric_size)	10
<code>TMAX</code>	Maximum temperature threshold	70 (Celsius)

Name	Description	Default Value
D_TMAX	Maximum allowed Temperature Delta	10
MAX_PDR	Maximum allowed packet drop rate	1e-12
CONFIGURED_BER_CHECK	If set to true, the plugin will isolate based on BER calculations	True
CONFIGURED_TEMP_CHECK	If set to true, the plugin will isolate based on temperature measurements	True
NO_DOWN_COUNT	If set to true, the plugin will isolate based on LinkDownedCounterExt measurements	True
ACCESS_ISOLATION	If set to true, the plugin will isolate ports connected via access link	True
DRY_RUN	Isolation decisions will be only logged and will not take effect	False
DEISOLATE_CONSIDER_TIME	Consideration time for port de-isolation (in minutes)	5
DO_DEISOLATION	If set to false, the plugin will not perform de-isolation	True
DYNAMIC_WAIT_TIME	Seconds to wait for the dynamic telemetry session to respond	30

Calculating BER Counters

For calculating BER counters, the plugin extracts the maximum window it needs to wait for calculating the BER value, using the following formula:

$$seconds = \frac{max_BER_target^{-1}}{min_port_rate}$$

Example:

Rate		BER Target	Minimum Bits	Minimum Time in Seconds	In Minutes
HDR	2.00E+11	1.00E-12	1.00E+12	5	0.083333
HDR	2.00E+11	1.00E-13	1.00E+13	50	0.833333
HDR	2.00E+11	1.00E-14	1.00E+14	500	8.333333
HDR	2.00E+11	1.00E-16	1.00E+16	50000	833.3333

BER counters are calculated with the following formula:

$$BER = \frac{error\ bits_i - error\ bits_{i-1}}{total\ bits_i - total\ bits_{i-1}} = \frac{error\ bits_i - error\ bits_{i-1}}{Link\ data\ rate * (time_i - time_{i-1})}$$

Deployment

GNMI-Telemetry Plugin

The GNMI Telemetry Plugin functions as a server that employs the gNMI protocol to stream data from UFM telemetry. Users can select what data to stream, specify the intervals, and choose whether to include only deltas (on-change mode).

The GNMI server is designed to support four functions: capability, get, subscribe, and set. However, it should be noted that the server does not currently support the "set" function, only "capability," "get," and "subscribe."

The streamed data is delivered in CSV format. Headers are initially provided in the first message, and subsequently, they are included in every other message. The data is presented in hex format to conserve space for data that remains unchanged. The values are presented as an array of strings, each representing a unique identifier (GUID) and port.

Depending on the selected mode, the values may have missing rows if there have been no changes in the GUID and port.

Furthermore, the plugin has the capability to stream UFM's metadata by providing an inventory of it. While the provided examples will use the gNMIc client for convenience, this functionality can work with any gNMI client.

Authentication

The server's authentication is determined by the gNMI protocol, and whether it is secured or unsecured is specified in the configuration. Two configurable items require authentication: the UFM Telemetry URL and the UFM inventory IP. Both of these items must be configured in the configuration file.

- Authentication is not necessary for the UFM telemetry URL. Therefore, only the telemetry URL is required.
- By default, the inventory is sourced from the UFM of the local host. However, it is possible to change the UFM inventory location to a different machine in the config file. To do so, token access to that machine is necessary.

Secure Server

The server can be secured by using certificates. To secure the server, modify the "`secure_mode_enabled`" flag to "`true`" in the configuration.

Upon initialization, the gNMI server retrieves the UFM certificates from the `/opt/ufm/conf/webclient` folder, utilizing both the server certificates and CA certificates. It is possible to change the certificate folder by changing the shared volume.

The server will require certificates for client calls and grants access only if the client certificates match its own. The gNMI server periodically examines its certificates for updates and ensures that they remain up to date. In addition, the server requires that the client certifications naming convention is aligned with the DNS name (SAN) as the UFM.

Capability Request

Description: The capability request provides information about the Yang files that the server supports, including their versions. This request can be fulfilled without the need for a connection to the telemetry or inventory.

Example:

```
gnmic -a localhost:9339 capability
```

Get Request

The Get request retrieves data at a specified path. If the telemetry is devoid of information, the server will respond with an empty response. Otherwise, it will respond with counters it can locate.

The path construction follows these steps:

1. Begin with "nvidia/ib"
2. Specify the `node_guid` that the user wants to select, with an asterisk (*) representing a selection of all nodes.
3. Choose the desired ports for the selected nodes.
4. Select "amber" and the desired counters group, and then specify the counter.

Example:

```
gnmic -a localhost:9339 --insecure get --path  
nvidia/ib/guid[guid=0x5255456]/port[port_number=2]/amber/port_counter
```

The request retrieves data from node_guid `0x5255456`, specifically in port number 2, with the request counter set to hist0.

Example 2:

```
gnmic -a localhost:9339 --insecure get --path  
nvidia/ib/guid[guid=*]/port[port_number=*]/amber/port_counters/his
```

The request retrieves the data from all the ports and the node_guids, with the request counter set to hist0.

Example3:

```
gnmic -a localhost:9339 --insecure get --path
nvidia/ib/guid[guid=0x5255456]/port[port_number=2]/amber/*
```

The request retrieves the data from node_guid `0x5255456`, port 2, with the request counters set to "all".

Subscribe Stream Request

The subscribe request, similar to the get request, provides data from the specified path. When the telemetry is empty, the server responds with an empty result. However, if there is data available, the server responds with the counters it can locate. The stream delivers information at intervals corresponding to the requested interval. If a user fails to specify an interval, the server will transmit the information as soon as it becomes available. The path construction follows the same pattern as the get request.

Example:

```
gnmic -a localhost:9339 --insecure sub --path
nvidia/ib/guid[guid=0x5255456]/port[port_number=2]/amber/port_counter
-i 30s
```

This request retrieves data from the node_guid `0x5255456`, port 2, where the request counter is hist0, and the interval is configured for 30 seconds. If the user wishes to test the stream, the stream mode can be configured to "once," and following a single response, the stream will be stopped.

Example:

```
gnmic -a localhost:9339 --insecure sub --path
nvidia/ib/guid[guid=0x5255456]/port[port_number=2]/amber/port_counter
-i 30s --mode once
```

This request retrieves the data from node_guid `0x5255456`, port 2, where the request counter is hist0. The stream shuts down after one response, similar to a GET request.

Subscribe On-Change Request

The subscribe on-change request, much like the standard subscribe request, provides data from the specified path. In the event that the telemetry lacks data, the server responds with an empty result. However, when data is available, the server responds with the counters it can locate. The stream delivers information according to the interval specified in the request, but only if there is new information to transmit. Otherwise, it will wait for the next interval to check the telemetry for updates. The path construction follows the same pattern as the get request. On-change requests contain inventory and event paths as well.

Importantly, only the data that has been updated will be included in the response; all other parts will be empty but retain the specified format. Similarly, only the nodes that have been updated will be included in the response.

Example:

```
gnmic -a localhost:9339 --insecure sub --path
nvidia/ib/guid[guid=0x5255456]/port[port_number=2]/amber/port_counter
--stream-mode on-change --heartbeat-interval 1m
```

This request retrieves data from node_guid `0x5255456`, port 2, with the request counters set to hist0. It periodically checks for changes every minute, and when changes are detected, it promptly sends the updated values.

Example:

```
gnmic -a localhost:9339 --insecure sub --path
nvidia/ib/guid[guid=*]/port[port_number=*]/amber/port_counters/*
--stream-mode on-change --heartbeat-interval 1m
```

This request involves all nodes and ports, aiming to retrieve all counters from the telemetry. It periodically checks for changes every minute, and when changes are detected, it promptly sends the updated values.


```
"240771222771818,0x667203ac69f3f2bf,1,2",  
"240771222771818,0x113cd807bfed3853,1,0,"  
]}}}]}
```

The second message on the headers will be set to hash values.

Inventory Requests

Inventory messages are conveyed in separate updates, presenting the inventory details of the UFM associated with the provided IP. These messages display comprehensive information, including the total count of various components within the UFM, such as switches, routers, servers, and more, along with details about active ports and the total number of ports, including disabled ones. In cases where the plugin is unable to establish contact with the UFM, it will revert to using default values defined in the configuration file. It is worth noting that the path for inventory requests differs from the conventional path structure, as they do not rely on specific nodes or ports. Consequently, inventory requests are initiated after "`nvidia/ib`".

Example:

```
gnmic -a localhost:9339 --insecure get -path  
nvidia/ib/inventory/*
```

Response:

```
[ {  
  "source": "localhost:9339",  
  "timestamp": 1698824237536878067,  
  "time": "2023-11-01T09:37:17.536878067+02:00",  
  "updates": [ {  
    "Path": "nvidia/ib/inventory",  
    "values": {  
      "nvidia/ib/inventory": {  
        "ActivePorts": 4, "Cables": 2, "Gateways": 0, "HCAs": 2, "Routers":  
0, "Servers": 2, "Switches": 1, "TotalPorts": 38, "timestamp":
```

```
1698824211535069000 }
    } } } ]
```

Events Requests

Events messages are provided in separate updates, offering insights into the events occurring within the UFM associated with the specified IP. Given that the event metadata remains consistent, even when numerous events are part of a request, the message format adopts a CSV-like structure. The Headers section contains essential metadata regarding UFM events, while the Values section contains the raw event data. Users can subscribe to these events with the on-change feature enabled, receiving only the events triggered within the subscription interval. Notably, the path structure for event requests differs from the typical node or port-based structure and is requested after "`nvidia/ib`".

Example:

```
gnmic -a localhost:9339 --insecure get -path nvidia/ib/events/*
```

Response:

```
[ {
  "source": "localhost:9339",
  "timestamp": 1698824809647515575,
  "time": "2023-11-01T09:46:49.647515575+02:00",
  "updates": [ {
    "Path": "nvidia/ib/events",
    "values": {
      "nvidia/ib/events": {
        "Headers": [
          "id", "object_name", "write_to_syslog", "description", "type", "event_type", "severity", "timestamp", "counter"
        ],
        "Values": [
          "7718,Grid,false,Disk space usage in /opt/ufm/files/log is above the threshold of 90.0%,Grid,525,Critical,2023-11-01 07:25:54,N/A,Maintenance,Grid,Disk utilization threshold reached",
```

```
"7717,Grid,false,Disk space usage in /opt/ufm/files/log is above the threshold of
90.0%,Grid,525,Critical,2023-11-01 07:24:54,N/A,Maintenance,Grid,Disk utilization threshold reached" ,
"7716,Grid,false,Disk space usage in /opt/ufm/files/log is above the threshold of
90.0%,Grid,525,Critical,2023-11-01 07:23:54,N/A,Maintenance,Grid,Disk utilization threshold reached" ,
... .
"7491,ec0d9a0300d42e54,false,Mcast group is deleted: ff12601bffff0000,
00000002,Computer,67,Info,2023-10-31 06:39:21,N/A,Fabric Notification,default / Computer: r-
ufm59,MCast Group Deleted" ]      }
} } ] }]
```

Troubleshooting

Split-Brain Recovery in HA Installation

The split-brain problem is a DRBD synchronization issue (HA status shows `DUnknown` in the DRBD disk state), which occurs when both HA nodes are rebooted. For example, in cases of electricity shut-down. To recover, please follow the below steps:

- **Step 1:** Manually choose a node where data modifications will be discarded.

It is called the split-brain victim. Choose wisely; all modifications will be lost! When in doubt, run a backup of the victim's data before you continue.

When running a Pacemaker cluster, you can enable maintenance mode. If the split-brain victim is in the Primary role, bring down all applications using this resource. Now switch the victim to the Secondary role:

```
victim# drbdadm secondary ha_data
```

- **Step 2:** Disconnect the resource if it's in connection state **WFConnection**:

```
victim# drbdadm disconnect ha_data
```

- **Step 3:** Force discard of all modifications on the split-brain victim:

```
victim# drbdadm -- --discard-my-data connect ha_data
```

For DRBD 8.4.x:

```
victim# drbdadm connect --discard-my-data ha_data
```

- **Step 4:** Resync starts automatically if the survivor is in a WFConnection network state. If the split-brain survivor is still in a Standalone connection state, reconnect it:

```
survivor# drbdadm connect ha_data
```

Now the resynchronization from the survivor (SyncSource) to the victim (SyncTarget) starts immediately. There is no full sync initiated, but all modifications on the victim will be overwritten by the survivor's data, and modifications on the survivor will be applied to the victim.

Performing Failover on Non-Master Node

The `ufm_ha_cluster` failover action fails with the following error: "Cannot perform failover on non-master node". To fix, follow the below action:

- **Step 1:** Verify that `/etc/hosts` file on both the master and standby UFM hosts contains the correct host names and IP addresses mapping.
- **Step 2:** If necessary, fix the mapping and retry the failover command.

Appendixes

- [Appendix – Diagnostic Utilities](#)
- [Appendix - Supported Port Counters and Events](#)
- [Appendix – Used Ports](#)
- [Appendix – Configuration Files Auditing](#)
- [Appendix - Managed Switches Configuration Info Persistency](#)
- [Appendix – IB Router](#)
- [Appendix – NVIDIA SHARP Integration](#)
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- [Appendix - Switch Grouping](#)
- [Appendix – Device Management Feature Support](#)
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Appendix – Diagnostic Utilities

Note

For UFM-SDN Appliance, all the below diagnostics commands have `ib` prefix.

For example, for UFM-SDN Appliance, the command `ibstat` is `ib ibstat.`

InfiniBand Diagnostics Commands

Command	Description
ibstat	Shows the host adapters status.
ibstatus	Similar to ibstat but implemented as a script.
ibnetdiscover	Scans the topology.
ibaddr	Shows the LID range and default GID of the target (default is the local port).
ibroute	Displays unicast and multicast forwarding tables of the switches.
ibtracert	Displays unicast or multicast route from source to destination.
ibping	Uses vendor MADs to validate connectivity between InfiniBand nodes. On exit, (IP) ping-like output is shown.
ibsysstat	Obtains basic information for the specific node which may be remote. This information includes: hostname, CPUs, memory utilization.
sminfo	Queries the SMInfo attribute on a node.
smpdump	A general purpose SMP utility which gets SM attributes from a specified SMA. The result is dumped in hex by default.
smpquery	Enables a basic subset of standard SMP queries including the following: node info, node description, switch info, port info. Fields are displayed in human readable format.
perfquery	Dumps (and optionally clears) the performance counters of the destination port (including error counters).
ibswitches	Scans the net or uses existing net topology file and lists all switches.
ibhosts	Scans the net or uses existing net topology file and lists all hosts.
ibnodes	Scans the net or uses existing net topology file

Command	Description
	and lists all nodes.
ibportstate	Gets the logical and physical port states of an InfiniBand port or disables or enables the port (only on a switch). Note: This tool can change port settings. Should be used with caution.
saquery	Issues SA queries.
ibdiagnet	ibdiagnet scans the fabric using directed route packets and extracts all the available information regarding its connectivity and devices.
ibnetsplit	Automatically groups hosts and creates scripts that can be run to split the network into sub-networks each containing one group of hosts.
lbqueryerrors	Queries IB spec-defined errors from all fabric ports. Note: This tool can change reset port counters. Should be used with caution.
smparquery	Queries adaptive-routing related settings from a particular switch. Note: This tool can change reset port counters. Should be used with caution.

Diagnostic Tools

Model of operation: All utilities use direct MAD access to operate. Operations that require QP 0 mads only, may use direct routed mads, and therefore may work even in subnets that are not configured. Almost all utilities can operate without accessing the SM, unless GUID to lid translation is required.

Dependencies

Multiple port/Multiple CA support:

When no InfiniBand device or port is specified (as shown in the following example for "Local umad parameters"), the tools select the interface port to use by the following criteria:

1. The first InfiniBand ACTIVE port.

2. If not found, the first InfiniBand port that is UP (physical link up).

If a port and/or CA name is specified, the **tool** attempts to fulfill the user's request and will fail if it is not possible.

For example:

```
ibaddr          # use the 'best port'
ibaddr -C mthca1      # pick the best port from mthca1 only.
ibaddr -P 2          # use the second (active/up) port from
the first available IB device.
ibaddr -C mthca0 -P 2 # use the specified port only.
```

Common Options & Flags

Most diagnostics take the following flags. The exact list of supported flags per utility can be found in the usage message and can be shown using `util_name -h` syntax.

```
# Debugging flags
-d  raise the IB debugging level. May be used several times (-
ddd or -d -d -d).
-e  show umad send receive errors (timeouts and others)
-h  show the usage message
-v  increase the application verbosity level.
    May be used several times (-vv or -v -v -v)
-V  show the internal version info.
```

```
# Addressing flags
-D          use directed path address arguments.
            The path is a comma separated list of out ports.
            Examples:
            "0"    # self port
            "0,1,2,1,4" # out via port 1, then 2, ...
-G          use GUID address arguments.
```

In most cases, it is the Port GUID.

Examples:

```
"0x08f1040023"
```

```
-s <smlid> use 'smlid' as the target lid for SA queries.
```

```
# Local umad parameters:
```

```
-C <ca_name> use the specified ca_name.
```

```
-P <ca_port> use the specified ca_port.
```

```
-t <timeout_ms> override the default timeout for the  
solicited mads.
```

CLI notation: all utilities use the POSIX style notation, meaning that all options (flags) must precede all arguments (parameters).

Utilities Descriptions

ibstatus

A script that displays basic information obtained from the local InfiniBand driver. Output includes LID, SMLID, port state, link width active, and port physical state.

Syntax

```
ibstatus [-h] [devname[:port]]
```

Examples:

```
ibstatus # display status of all IB ports  
ibstatus mthca1 # status of mthca1 ports  
ibstatus mthca1:1 mthca0:2 # show status of specified ports
```

See also: `ibstat`

ibstat

Similar to the `ibstatus` utility but implemented as a binary and not as a script. Includes options to list CAs and/or ports.

Syntax

```
ibstat [-d(ebug) -l(ist_of_cas) -p(ort_list) -s(hort)] <ca_name>
[portnum]
```

Examples:

```
ibstat           # display status of all IB ports
ibstat mthca1    # status of mthca1 ports
ibstat mthca1 2  # show status of specified ports
ibstat -p mthca0 # list the port guids of mthca0
ibstat -l        # list all CA names
```

See also: `ibstatus`

ibroute

Uses SMPs to display the forwarding tables (unicast (LinearForwardingTable or LFT) or multicast (MulticastForwardingTable or MFT)) for the specified switch LID and the optional lid (mlid) range. The default range is all valid entries in the range 1...FDBTop.

Syntax

```
ibroute [options] <switch_addr> [<startlid> [<endlid>]]
```

Nonstandard flags:

```
-a          show all lids in range, even invalid entries.
-n          do not try to resolve destinations.
-M          show multicast forwarding tables. In this case
the range  parameters are specifying mlid range.
node-name-map  node name map file
```

Examples:

```
ibroute 2          # dump all valid entries of switch lid 2
ibroute 2 15       # dump entries in the range 15...FDBTop.
ibroute -a 2 10 20 # dump all entries in the range 10..20
ibroute -n 2       # simple format
ibroute -M 2       # show multicast tables
```

See also: `ibtracert`

ibtracert

Uses SMPs to trace the path from a source GID/LID to a destination GID/LID. Each hop along the path is displayed until the destination is reached or a hop does not respond. By using the `-m` option, multicast path tracing can be performed between source and destination nodes.

Syntax

```
ibtracert [options] <src-addr> <dest-addr>
```

Nonstandard flags:

```
-n          simple format; don't show additional information.
-m <mlid>  show the multicast trace of the specified mlid.
```

```
-f <force>      force
node-name-map  node name map file
```

Examples:

```
ibtracert 2 23          # show trace between lid 2 and 23
ibtracert -m 0xc000 3 5 # show multicast trace between lid 3
and 5 for mcast lid 0xc000.
```

smpquery

Enables a basic subset of standard SMP queries including the following node info, node description, switch info, port info. Fields are displayed in human readable format.

Syntax

```
smpquery [options] <op> <dest_addr> [op_params]
```

Currently supported operations and their parameters:

```
nodeinfo <addr>
nodedesc <addr>
portinfo <addr> [<portnum>] # default port is zero
switchinfo <addr>
pkeys <addr> [<portnum>]
sl2vl <addr> [<portnum>]
vlarb <addr> [<portnum>]
GUIDInfo (GI) <addr>
MlnxExtPortInfo (MEPI) <addr> [<portnum>]
Combined (-c) : use Combined route address argument
node-name-map : node name map file
```

```
extended (-x) : use extended speeds
```

Examples:

```
smpquery nodeinfo 2      # show nodeinfo for lid 2  
smpquery portinfo 2 5   # show portinfo for lid 2 port 5
```

smpdump

A general purpose SMP utility that gets SM attributes from a specified SMA. The result is dumped in hex by default.

Syntax

```
smpdump [options] <dest_addr> <attr> [mod]
```

Nonstandard flags:

```
-s          show output as string
```

Examples:

```
smpdump -D 0,1,2 0x15 2      # port info, port 2  
smpdump 3 0x15 2           # port info, lid 3 port 2
```

ibaddr

Can be used to show the LID and GID addresses of the specified port or the local port by default. This utility can be used as simple address resolver.

Syntax

```
ibaddr [options] [<dest_addr>]
```

Nonstandard flags:

```
gid_show (-g) : show gid address only  
lid_show (-l) : show lid range only  
Lid_show (-L) : show lid range (in decimal) only
```

Examples:

```
ibaddr                # show local address  
ibaddr 2              # show address of the specified port lid  
ibaddr -G 0x8f1040023 # show address of the specified port guid
```

sminfo

Issues and dumps the output of an sminfo query in human readable format. The target SM is the one listed in the local port info or the SM specified by the optional SM LID or by the SM direct routed path.

Warning

CAUTION: Using sminfo for any purpose other than a simple query might result in a malfunction of the target SM.

Syntax

```
sminfo [options] <sm_lid|sm_dr_path> [sminfo_modifier]
```

Nonstandard flags:

```
-s <state>           # use the specified state in sminfo mad  
-p <priority>        # use the specified priority in sminfo mad  
-a <activity>        # use the specified activity in sminfo mad
```

Examples:

```
sminfo                # show sminfo of SM listed in local portinfo  
sminfo 2              # query SM on port lid 2
```

perfquery

Uses PerfMgt GMPs to obtain the PortCounters (basic performance and error counters) from the Performance Management Agent (PMA) at the node specified. Optionally show aggregated counters for all ports of node. Also, optionally, reset after read, or only reset counters.

```
perfquery [options] [<lid|guid> [[port] [reset_mask]]]
```

Nonstandard flags:

```
-a                    Shows aggregated counters for all ports  
of the destination lid.  
-r                    Resets counters after read.  
-R                    Resets only counters.  
Extended (-x)        Shows extended port counters
```

```

Xmtsl (-X)           Shows Xmt SL port counters
Rcvsl ,(-S)         Shows Rcv SL port counters
Xmtdisc (-D)        Shows Xmt Discard Details
rcvrr, (-E)         Shows Rcv Error Details
extended_speeds (-T) Shows port extended speeds counters
oprcvcounters       Shows Rcv Counters per Op code
flowctlcounters     Shows flow control counters
vloppackets         Shows packets received per Op code per VL
vlopdata            Shows data received per Op code per VL
vlxmitflowctlerrors Shows flow control update errors per VL
vlxmitcounters      Shows ticks waiting to transmit counters per VL
swportvlcong        Shows sw port VL congestion
rcvcc               Shows Rcv congestion control counters
slrcvfecn           Shows SL Rcv FECN counters
slrcvbecn           Shows SL Rcv BECN counters
xmitcc              Shows Xmit congestion control counters
vlxmittimecc        Shows VL Xmit Time congestion control counters
smpctl (-c)         Shows samples control
loop_ports (-l)     Iterates through each port

```

Examples:

```

perfquery           # read local port's performance counters
perfquery 32 1      # read performance counters from lid 32,
port 1
perfquery -a 32     # read from lid 32 aggregated performance
counters
perfquery -r 32 1   # read performance counters from lid 32
port 1 and reset
perfquery -R 32 1   # reset performance counters of lid 32 port
1 only
perfquery -R -a 32  # reset performance counters of all lid 32
ports

```

```
perfquery -R 32 2 0xf000 # reset only non-error counters of lid
32 port 2
```

ibping

Uses vendor mads to validate connectivity between InfiniBand nodes. On exit, (IP) ping like output is show. ibping is run as client/server. The default is to run as client. Note also that a default ping server is implemented within the kernel.

Syntax

```
ibping [options] <dest lid|guid>
```

Nonstandard flags:

```
-c <count>      stop after count packets
-f              flood destination: send packets back to back w/o
delay
-o <oui>        use specified OUI number to multiplex vendor MADs
-S             start in server mode (do not return)
```

ibnetdiscover

Performs InfiniBand subnet discovery and outputs a human readable topology file. GUIDs, node types, and port numbers are displayed as well as port LIDs and node descriptions. All nodes (and links) are displayed (full topology). This utility can also be used to list the current connected nodes. The output is printed to the standard output unless a topology file is specified.

Syntax

```
ibnetdiscover [options] [<topology-filename>]
```

Nonstandard flags:

```
l      Lists connected nodes
H      Lists connected HCAs
S      Lists connected switches
g      Groups
full (-f)      Shows full information (ports' speed and width,
               vlcap)
show (-s)      Shows more information
Router_list (-R) Lists connected routers
node-name-map  Nodes name map file
cache filename to cache ibnetdiscover data to
load-cache filename of ibnetdiscover cache to load
diff filename of ibnetdiscover cache to diff
diffcheck Specifies checks to execute for --diff
ports : (-p) Obtains a ports report
max_hops (-m) Reports max hops discovered by the library
outstanding_smps (-o) Specifies the number of outstanding SMP's
               which should be issued during the scan
```

ibhosts

Traces the InfiniBand subnet topology or uses an already saved topology file to extract the CA nodes.

Syntax

```
ibhosts [-h] [<topology-file>]
```

Dependencies: ibnetdiscover, ibnetdiscover format

ibswitches

Traces the InfiniBand subnet topology or uses an already saved topology file to extract the InfiniBand switches.

Syntax

```
ibswitches [-h] [<topology-file>]
```

Dependencies: ibnetdiscover, ibnetdiscover format

ibportstate

Enables the port state and port physical state of an InfiniBand port to be queried or a switch port to be disabled or enabled.

Syntax

```
ibportstate [-d(ebug) -e(rr_show) -v(erbose) -D(irect) -G(uid) -s  
smlid -V(ersion) -C ca_name -P ca_port -t timeout_ms] <dest  
dr_path|lid|guid> <portnum> [<op>]
```

Supported ops: enable, disable, query, on, off, reset, speed, espeed, fdr10, width, down, arm, active, vls, mtu, lid, smlid, lmc, mkey, mkeylease, mkeyprot

Examples:

```
ibportstate 3 1 disable # by lid  
ibportstate -G 0x2C9000100D051 1 enable # by guid  
ibportstate -D 0 1 # by direct route
```

ibnodes

Uses the current InfiniBand subnet topology or an already saved topology file and extracts the InfiniBand nodes (CAs and switches).

Syntax

```
ibnodes [<topology-file>]
```

Dependencies: ibnetdiscover, ibnetdiscover format

ibqueryerrors

Queries or clears the PMA error counters in PortCounters by walking the InfiniBand subnet topology.

```
ibqueryerrors [options]
```

Syntax

Options:

```
--suppress, -s <err1,err2,...>  suppress errors listed
--suppress-common, -c            suppress some of the common counters
--node-name-map <file>          node name map file
--port-guid, -G <port_guid>     report the node containing the
port
                                specified by <port_guid>
--, -S <port_guid>              Same as "-G" for backward compatibility
--Direct, -D <dr_path>         report the node containing the port
specified
                                by <dr_path>
--skip-sl                        don't obtain SL to all destinations
--report-port, -r               report port link information
--threshold-file <val>         specify an alternate threshold file,
default: /etc/infiniband-diags/error_thresholds
--GNDN, -R                      (This option is obsolete and does
nothing)
--data                           include data counters for ports with
errors
```

```

--switch                print data for switches only
--ca                    print data for CA's only
--router                print data for routers only
--details               include transmit discard details
--counters              print data counters only
--clear-errors, -k      Clear error counters after read
--clear-counts, -K      Clear data counters after read
--load-cache <file>    filename of ibnetdiscover cache to load
--outstanding_smps, -o <val> specify the number of outstanding
SMP's

                                which should be issued during the
scan
--config, -z <config>  use config file, default:
/etc/infiniband-diags/ibdiag.conf
--Ca, -C <ca>          Ca name to use
--Port, -P <port>      Ca port number to use
--timeout, -t <ms>     timeout in ms
--m_key, -y <key>      M_Key to use in request
--errors, -e            show send and receive errors
--verbose, -v           increase verbosity level
--debug, -d             raise debug level
--help, -h              help message
--version, -V           show version

```

smparquery

Issues Adaptive routing-related queries to the fabric switch.

Syntax

```

Supported ops (and aliases, case insensitive):
  ARInfo (ARI) <addr>

```

```

    ARGroupTable (ARGT) <addr> [<plft>] [<group_table>]
    [<blocknum>]
    ARLFTTable (ARLT) <addr> [<plft>] [<blocknum>]
    PLFTInfo (PLFTI) <addr>
    PLFTDef (PLFTD) <addr> [<blocknum>]
    PLFTMap (PLFTM) <addr> [<plft>] [<control_map>]
    PortSLToPLFTMap (PLFTP) <addr> [<blocknum>]
    RNSubGroupDirectionTable (DIRT) <addr> [<blocknum>]
    RNGenStringTable (GSTR) <addr> [<plft>] [<blocknum>]
    RNGenBySubGroupPriority (GSGP) <addr>
    RNRcvString (RSTR) <addr> [<blocknum>]
    RNXmitPortMask (RNXM) <addr> [<blocknum>]
    PortRNCounters (RNPC) <addr>

```

Options:

Main

```

    -C|--Ca <ca>                : Ca name to use
    -P|--Port <port>            : Ca port number to use
    -D|--Direct                  : use Direct address

```

argument

```

    -L|--Lid                     : use LID address argument
    -h|--help                    : help message
    -V|--version                 : show version
    -d|--debug                   : Print debug logs

```

saquery

Issues SA queries.

Syntax

```
saquery [-h -d -P -N -L -G -s -g][<name>]
```

Queries node records by default.

d	Enables debugging
P	Gets PathRecord info
N	Gets NodeRecord info
L (-L)	Returns just the Lid of the name specified
G (-G)	Returns just the Guid of the name specified
S (-S)	Returns the PortInfoRecords with isSM capability mask bit on
G (-g)	on
L (-l)	Gets multicast group info
O (-O)	Returns the unique Lid of the name specified
m(-m)	Returns name for the Lid specified
x (-x)	Gets multicast member info (if multicast group specified, list member GIDs only for group specified for example 'saquery -m 0xC000')
c (-c)	
S (-S)	
l (-l)	Gets LinkRecord info"
list (-D)	Gets the SA's class port info
src-to-dst (<src:dst>)	Gets ServiceRecord info
sgid-to-dgid (<sgid-dgid>)	Gets InformlInfoRecord (subscription) info
node-name-map	the node desc of the CA's
smkey <val>	Gets a PathRecord for <src:dst> where src and dst are either node names or LIDs
slid <lid>	
dlid <lid>	Gets a PathRecord for <sgid-dgid> where sgid and dgid are addresses in IPv6 format
mild <lid>	
sgid <gid>	Specifies a node name map file
dgid <gid>	SA SM_Key value for the query. If non-numeric value (like 'x') is specified then saquery will prompt for a value. Default (when not specified here or in ibdiag.conf) is to use SM_Key == 0 (or \"untrusted\")
gid <gid>	
mgid <gid>	
Reversible", 'r', 1, NULL"	
numb_path ", 'n', 1, NULL"	Source LID (PathRecord)
pkey: P_Key (PathRecord, MCMemberRecord).	Destination LID (PathRecord)
qos_class (-Q)	Multicast LID (MCMemberRecord)
sl	Source GID (IPv6 format) (PathRecord)
mtu : (-M)	Destination GID (IPv6 format) (PathRecord)
rate (-R)	Port GID (MCMemberRecord)
pkt_lifetime	Multicast GID (MCMemberRecord)
qkey (-q) (PathRecord, MCMemberRecord).	Reversible path (PathRecord)
tclass (-T)	Number of paths (PathRecord)
flow_label : (-F)	
hop_limit : (-H)	QoS Class (PathRecord)
scope	Service level (PathRecord, MCMemberRecord)
join_state (-j)	MTU and selector (PathRecord, MCMemberRecord)
proxy_join (-X)	Rate and selector (PathRecord, MCMemberRecord)
service_id	Packet lifetime and selector (PathRecord, MCMemberRecord)
	If non-numeric value (like 'x') is specified then saquery will prompt for a value.
	Traffic Class (PathRecord, MCMemberRecord)
	Flow Label (PathRecord, MCMemberRecord)
	Hop limit (PathRecord, MCMemberRecord)

Scope (MCMemberRecord) Join state (MCMemberRecord) Proxy join (MCMemberRecord) ServiceID (PathRecord)
--

Dependencies: OpenSM libvendor, OpenSM libopensm, libibumad

ibsysstat

```
ibsysstat [options] <dest lid|guid> [<op>]
```

Nonstandard flags:

Current supported operations:

```
ping - verify connectivity to server (default)
host - obtain host information from server
cpu - obtain cpu information from server
-o <oui>    use specified OUI number to multiplex vendor mads
-S         start in server mode (do not return)
```

ibnetsplit

Automatically groups hosts and creates scripts that can be run in order to split the network into sub-networks containing one group of hosts.

Syntax

- Group:

```
ibnetsplit [-v][-h][-g grp-file] -s <.lst|.net|.topo> <-r  
head-ports|-d max-dist>
```

- Split:

```
ibnetsplit [-v][-h][-g grp-file] -s <.lst|.net|.topo>  
-o out-dir
```

- Combined:

```
ibnetsplit [-v][-h][-g grp-file] -s <.lst|.net|.topo> <-r  
head-ports|-d max-dist> -o out-dir
```

Usage

- Grouping:

The grouping is performed if the -r or -d options are provided.

- If the -r is provided with a file containing group head ports, the algorithm examines the hosts distance from the set of node ports provided in the head-ports file (these are expected to be the ports running standby SM's).
- If the -d is provided with a maximum distance of the hosts in each group, the algorithm partition the hosts by that distance.

Note

This method of analyzation may not be suitable for some topologies.

The results of the identified groups are printed into the file defined by the -g option (default ibnetsplit.groups) and can be manually edited. For groups where the head port is a switch, the group file uses the FIRST host port as the port to run the isolation script from.

- Splitting:

- If the -o flag is included, this algorithm analyzes the MinHop table of the topology and identifies the set of links and switches that may potentially be used for routing each group ports. The cross-switch links between switches of the group to other switches are declared as split-links and the commands to turn them off using Directed Routes from the original Group Head ports are written into the out-dir provided by the -o flag.

Both stages require a subnet definition file to be provided by the -s flag. The supported formats for subnet definition are:

- *.net - for ibnetdiscover
- *.lst - for opensm-subnet.lst or ibiagnet.lst
- *.topo - for a topology file

HEAD PORTS FILE

This file is provided by the user and defines the ports by which grouping of the other host ports is defined.

Format:

Each line should contain either the name or the GUID of a single port. For switches the port number shall be 0.

```
<node-name>/P<port-num> | <PGUID>
```

GROUPS FILE

This file is generated by the program if the head-ports file is provided to it. Alternatively it can be provided (or edited) by the user if different grouping is desired. The generated script for isolating or connecting the group should be run from the first node in each group.

Format:

Each line may be either:

```
GROUP: <group name>
```

```
<node-name>/P<port-num> | <PGUID>
```

ibdiagnet

ibdiagnet scans the fabric using directed route packets and extracts all the available information regarding its connectivity and devices.

It then produces the following files in the output directory (see below):

- "ibdiagnet2.log" - A log file with detailed information.
- "ibdiagnet2.db_csv" - A dump of the internal tool database.
- "ibdiagnet2.lst" - A list of all the nodes, ports and links in the fabric.
- "[ibdiagnet2.pm](#)" - A dump of all the nodes PM counters.
- "ibdiagnet2.mlnx_cntrs" - A dump of all the nodes Mellanox diagnostic counters.
- "ibdiagnet2.net_dump" - A dump of all the links and their features.
- "ibdiagnet2.pkey" - A list of all pkeys found in the fabric.
- "ibdiagnet2.aguid" - A list of all alias GUIDs found in the fabric.
- "[ibdiagnet2.sm](#)" - A dump of all the SM (state and priority) in the fabric.
- "ibdiagnet2.fdfs" - A dump of unicast forwarding tables of the fabric switches.
- "ibdiagnet2.mcfdfs" - A dump of multicast forwarding tables of the fabric switches.
- "ibdiagnet2.svl" - A dump of SLVL tables of the fabric switches.
- "ibdiagnet2.nodes_info" - A dump of all the nodes vendor specific general information for nodes who supports it.
- "ibdiagnet2.plft" - A dump of Private LFT Mapping of the fabric switches.
- "[ibdiagnet2.ar](#)" - A dump of Adaptive Routing configuration of the fabric switches.
- "ibdiagnet2.vl2vl" - A dump of VL to VL configuration of the fabric switches.

Load plugins from:

/tmp/ibutils2/share/ibdiagnet2.1.1/plugins/

You can specify additional paths to be looked in with "IBDIAGNET_PLUGINS_PATH" env variable.

Plugin Name	Result	Comment
libibdiagnet_cable_diag_plugin-2.1.1	Succeeded	Plugin loaded
libibdiagnet_phy_diag_plugin-2.1.1	Succeeded	Plugin loaded

Syntax

```
[-i|--device <dev-name>] [-p|--port <port-num>]
[-g|--guid <GUID in hex>] [--skip <stage>]
[--skip_plugin <library name>] [--sc]
[--scr] [--pc] [-P|--counter <<PM>=<value>>]
[--pm_pause_time <seconds>] [--ber_test]
[--ber_thresh <value>] [--llr_active_cell <64|128>]
[--extended_speeds <dev-type>] [--pm_per_lane]
[--ls <2.5|5|10|14|25|FDR10|EDR20>]
[--lw <1x|4x|8x|12x>] [--screen_num_errs <num>]
[--smp_window <num>] [--gmp_window <num>]
[--max_hops <max-hops>] [--read_capability <file name>]
[--write_capability <file name>]
[--back_compat_db <version.sub_version>]
[-V|--version] [-h|--help] [-H|--deep_help]
[--virtual] [--mads_timeout <mads-timeout>]
[--mads_retries <mads-retries>] [-m|--map <map-file>]
[--vlr <file>] [-r|--routing] [--r_opt <[vs,][mcast,]>]
[--sa_dump <file>] [-u|--fat_tree]
[--scope <file.guid>] [--exclude_scope <file.guid>]
[-w|--write_topo_file <file name>]
[-t|--topo_file <file>] [--out_ibnl_dir <directory>]
[-o|--output_path <directory>]
Cable Diagnostic (Plugin)
```

```
[--get_cable_info] [--cable_info_disconnected]
Phy Diagnostic (Plugin)
[--get_phy_info] [--reset_phy_info]
```

Options

```
-i|--device <dev-name>          : Specifies the name of the device
of the port                               used to connect to the IB fabric
                                           (in case
                                           of multiple devices on he local
system).
-p|--port <port-num>            : Specifies the local device's port
number                                   used to connect to the IB fabric.
-g|--guid <GUID in hex>         : Specifies the local port GUID
value of the                             port used to connect to the IB
fabric. If                               GUID given is 0 than ibdiagnet
displays                                 a list of possible port GUIDs and
waits                                    for user input.
--skip <stage>                   : Skip the executions of the given
stage.                                   Applicable skip stages
                                           (vs_cap_smp
                                           vs_cap_gmp | links | pm |
                                           speed_width_check | all).
--skip_plugin <library name>     : Skip the load of the given
library name.                           Applicable skip plugins:
```

```

2.1.1 | (libibdiagnet_cable_diag_plugin-
2.1.1). libibdiagnet_phy_diag_plugin-
--sc : Provides a report of Mellanox
counters
--scr : Reset all the Mellanox
counters (if -sc option selected).
--pc : Reset all the fabric PM
counters.
-P|--counter <<PM>=<value>> : If any of the provided PM is
greater than its provided value than print
it.
--pm_pause_time <seconds> : Specifies the seconds to wait
between first counters sample and
second counters sample. If seconds given is 0
than no second counters sample will be
done. (default=1).
--ber_test :Provides a BER test for each
port. Calculate BER for each port
and check no BER value has exceeds the BER
threshold. (default threshold="10^-12").
--ber_thresh <value> :Specifies the threshold value
for the BER test. The reciprocal
number of the

```

Example: for

0 than all

be

--llr_active_cell <64|128>
cell size

active in the

--extended_speeds <dev-type>
extended speeds

all).

--pm_per_lane
(when

--ls <0|2.5|5|10|14|25|50|100|FDR10>
link speed.

--lw <1x|4x|8x|12x>
link width.

--screen_num_errs <num>
for printing

(default=5).

--smp_window <num>
(default=8).

--gmp_window <num>
(default=128).

--max_hops <max-hops>
for the

BER should be provided.

10^{-12} than value need to be
1000000000000 or 0xe8d4a51000
(10^{12}).If threshold given is

BER values for all ports will
reported.

: Specifies the LLR active

for BER test, when LLR is

fabric.

: Collect and test port

counters. dev-type: (sw |

: List all counters per lane
available).

: Specifies the expected

: Specifies the expected

: Specifies the threshold

errors to screen.

: Max smp MADs on wire.

: Max gmp MADs on wire.

: Specifies the maximum hops

(default=64).	discovery process.
--read_capability <file name>	: Specifies capability masks configuration file, giving
capability	mask configuration for the
fabric.	ibdiagnet will use this
mapping for	Vendor Specific MADs
sending.	
--write_capability <file name>	: Write out an example file
for	capability masks
configuration,	and also the default
capability	masks for some devices.
--back_compat_db <version.sub_version>	: Show ports section in
according to	"ibdiagnet2.db_csv"
version 2.0.	given version. Default
-V --version	: Prints the version of the
tool.	
-h --help	: Prints help information
(without	plugins help if exists).
-H --deep_help	: Prints deep help
information	(including plugins help).
--virtual	: Discover VPorts during
discovery	stage.
--mads_timeout <mads-timeout>	: Specifies the timeout (in

and received	milliseconds) for sent
<code>--mads_retries <mads-retries></code>	<code>mads. (default=500).</code>
retries for	: Specifies the number of
(default=2).	every timeout mad.
<code>-m --map <map-file></code>	: Specifies mapping file,
that maps	node guid to name
"name").	(format: <code>0x[0-9a-fA-F]+</code>)
specified by	Mapping file can also be
<code>"IBUTILS_NODE_NAME_MAP_FILE_PATH".</code>	Environment variable
<code>--src_lid <src-lid></code>	: source lid
<code>--dest_lid <dest-lid></code>	: destination lid
<code>--dr_path <dr-path></code>	: direct route path
<code>-o --output_path <directory></code>	: Specifies the directory
where the	Output files will be
placed.	
(default="/var/tmp/ibdiagpath/").	
Cable Diagnostic (Plugin)	
<code>--get_cable_info</code>	: Indicates to query all
QSFP cables	for cable information.
Cable	information will be
stored	in "ibdiagnet2.cables".
<code>--cable_info_disconnected</code>	: Get cable info on
disconnected	

```

Phy Diagnostic (Plugin)
--get_phy_info          : Indicates to query all
ports for phy          information.
--reset_phy_info       : Indicates to clear all
ports phy              information.

```

ibdiagpath

ibdiagpath scans the fabric using directed route packets and extracts all the available information regarding its connectivity and devices. It then produces the following files in the output directory (see below):

- "ibdiagnet2.log" - A log file with detailed information.
- "ibdiagnet2.db_csv" - A dump of the internal tool database.
- "ibdiagnet2.lst" - A list of all the nodes, ports and links in the fabric.
- "[ibdiagnet2.pm](#)" - A dump of all the nodes PM counters.
- "ibdiagnet2.mlnx_cntrs" - A dump of all the nodes Mellanox diagnostic counters.
- "ibdiagnet2.net_dump" - A dump of all the links and their features.

Cable Diagnostic (Plugin):

This plugin performs cable diagnostic. It can collect cable info (vendor, PN, OUI etc..) on each valid QSFP cable, if specified.

It produces the following files in the output directory (see below):

- "ibdiagnet2.cables" - In case specified to collect cable info, this file will contain all collected cable info.

Phy Diagnostic (Plugin)

This plugin performs phy diagnostic.

Load Plugins from:

```
/tmp/ibutils2/share/ibdiagnet2.1.1/plugins/
```

You can specify additional paths to be looked in with "IBDIAGNET_PLUGINS_PATH" env variableLoad plugins from:

Plugin Name	Result	Comment
libibdiagnet_cable_diag_plugin-2.1.1 loaded	Succeeded	Plugin
libibdiagnet_phy_diag_plugin-2.1.1 loaded	Succeeded	Plugin

Syntax

```
[-i|--device <dev-name>] [-p|--port <port-num>]  
[-g|--guid <GUID in hex>] [--skip <stage>]  
[--skip_plugin <library name>] [--sc]  
[--scr] [--pc] [-P|--counter <<PM>=<value>>]  
[--pm_pause_time <seconds>] [--ber_test]  
[--ber_thresh <value>] [--llr_active_cell <64|128>]  
[--extended_speeds <dev-type>] [--pm_per_lane]  
[--ls <2.5|5|10|14|25|FDR10|EDR20>]  
[--lw <1x|4x|8x|12x>] [--screen_num_errs <num>]  
[--smp_window <num>] [--gmp_window <num>]  
[--max_hops <max-hops>] [--read_capability <file name>]  
[--write_capability <file name>]  
[--back_compat_db <version.sub_version>]  
[-V|--version] [-h|--help] [-H|--deep_help]  
[--virtual] [--mads_timeout <mads-timeout>]  
[--mads_retries <mads-retries>] [-m|--map <map-file>]  
[--src_lid <src-lid>] [--dest_lid <dest-lid>]
```

```
[--dr_path <dr-path>] [-o|--output_path <directory>]
```

Cable Diagnostic (Plugin)

```
[--get_cable_info] [--cable_info_disconnected]
```

Phy Diagnostic (Plugin)

```
[--get_phy_info] [--reset_phy_info]
```

Options

<pre>-i --device <dev-name> -p --port <port-num> -g --guid <GUID in hex> --skip <stage> --skip_plugin <library name> --sc --scr --pc -P --counter <<PM>=<value>> --pm_pause_time <seconds> --ber_test --ber_thresh <value> --llr_active_cell <64 128> --extended_speeds <dev-type> --pm_per_lane :List all counters per lane (when available). --ls <2.5 5 10 14 25 FDR10 EDR20> --lw <1x 4x 8x 12x> --screen_num_errs <num> --smp_window <num> --gmp_window <num> --max_hops <max-hops> --read_capability <file name> --write_capability <file name> --back_compat_db <version.sub_version> -V --version -h --help -H --deep_help --virtual --mads_timeout <mads-timeout> --mads_retries <mads-retries> -m --map <map-file> --src_lid <src-lid> --dest_lid <dest-lid> --dr_path <dr-path> -o --output_path <directory> Cable Diagnostic (Plugin) --get_cable_info</pre>	<pre>:Specifies the name of the device of the port used to connect to the IB fabric (in case of multiple devices on the local system). :Specifies the local device's port number used to connect to the IB fabric. :Specifies the local port GUID value of the port used to connect to the IB fabric. If GUID given is 0 than ibdiagnet displays a list of possible port GUIDs and waits for user input. :Skip the executions of the given stage. Applicable skip stages: (vs_cap_smp vs_cap_gmp links pm speed_width_check all). :Skip the load of the given library name. Applicable skip plugins: (libibdiagnet_cable_diag_plugin-2.1.1 libibdiagnet_phy_diag_plugin- 2.1.1). :Provides a report of Mellanox counters :Reset all the Mellanox counters (if -sc option selected). :Reset all the fabric PM counters. :If any of the provided PM is greater then its provided value than print it. :Specifies the seconds to wait between first counters sample and second counters sample. If seconds given is 0 than no second counters sample will be done. (default=1). :Provides a BER test for each port. Calculate BER for each port and check no BER value has exceeds the BER threshold.(default threshold="10^-12"). :Specifies the threshold value for the BER test. The reciprocal number of the BER should be provided. Example: for 10^-12 than value need to be 1000000000000 or 0xe8d4a51000(10^12).If threshold given is 0 than all BER values for all ports will be reported. :Specifies the LLR active cell size for BER test, when LLR is active in the fabric. :Collect and test port extended speeds counters. dev-type: (sw all). :Specifies the expected link speed. :Specifies the expected link width. :Specifies the threshold for printing errors to screen. (default=5). :Max smp MADs on wire. (default=8). :Max gmp MADs on wire. (default=128). :Specifies the maximum hops for the discovery process.(default=64).</pre>
--	--

<pre>--cable_info_disconnected Phy Diagnostic (Plugin) --get_phy_info --reset_phy_info</pre>	<pre>:Specifies capability masks configuration file, giving capability mask configuration for the fabric. ibdiagnet will use this mapping for Vendor Specific MADs sending. :Write out an example file for capability masks configuration, and also the default capability masks for some devices. :Show ports section in "ibdiagnet2.db_csv" according to given version. Default version 2.0. :Prints the version of the tool. :Prints help information (without plugins help if exists). :Prints deep help information (including plugins help). :Discover VPorts during discovery stage. :Specifies the timeout (in milliseconds) for sent and received mads. (default=500). :Specifies the number of retries for every timeout mad.(default=2). :Specifies mapping file, that maps node guid to name (format: 0x[0- 9a-fA-F]+ "name"). Mapping file can also be specified by environment variable "IBUTILS_NODE_NAME_MAP_FILE_PATH". :source lid destination lid :direct route path :Specifies the directory where the output files will be placed. (default="/var/tmp/ibdiagpath/"). :Indicates to query all QSFP cables for cable information. Cable information will be stored in "ibdiagnet2.cables". :Get cable info on disconnected ports. :Indicates to query all ports for phy information. :Indicates to clear all ports phy information.</pre>
--	--

Appendix - Supported Port Counters and Events

Port counters and events are available in the following views:

- Events and Port Counters area, at the bottom of the UFM window
- Error window (Error tab) in the Manage Devices tab
- In the New Monitoring Session window, in the Monitor tab, when clicking Create New Session
- Event Log in the Log tab (click Show Event Log)

InfiniBand Port Counters

The following tables list and describe the port counters and events currently supported:

- InfiniBand Port Counters
- Calculated Port Counters

<i>InfiniBand Port Counters</i>	
Counter	Description
Xmit Data (in bytes)	Total number of data octets, divided by 4, transmitted on all VLs from the port, including all octets between (and not including) the start of packet delimiter and the VCRC, and may include packets containing errors. All link packets are excluded. Results are reported as a multiple of four octets.
Rcv Data (in bytes)	Total number of data octets, divided by 4, received on all VLs at the port. All octets between (and not including) the start of packet delimiter and the VCRC are excluded and may include packets containing errors. All link packets are excluded. When the received packet length exceeds the maximum allowed packet length specified in C7-45: the counter may include all data octets exceeding this limit. Results are reported as a multiple of four octets.
Xmit Packets	Total number of packets transmitted on all VLs from the port, including packets with errors and excluding link packets.
Rcv Packets	Total number of packets, including packets containing errors and excluding link packets, received from all VLs on the port.
Rcv Errors	Total number of packets containing errors that were received on the port including: <ul style="list-style-type: none"> • Local physical errors (ICRC, VCRC, LPCRC, and all physical errors that cause entry into the BAD PACKET or BAD PACKET)

<i>InfiniBand Port Counters</i>	
	<p>DISCARD states of the packet receiver state machine)</p> <ul style="list-style-type: none"> • Malformed data packet errors (LVer, length, VL) • Malformed link packet errors (operand, length, VL) • ackets discarded due to buffer overrun (overflow)
Xmit Discards	<p>Total number of outbound packets discarded by the port when the port is down or congested for the following reasons:</p> <ul style="list-style-type: none"> • Output port is not in the active state • Packet length has exceeded NeighborMTU • Switch Lifetime Limit exceeded • Switch HOQ Lifetime Limit exceeded, including packets discarded while in VLStalled State.
Symbol Errors	<p>Total number of minor link errors detected on one or more physical lanes.</p>
Link Error Recovery	<p>Total number of times the Port Training state machine has successfully completed the link error recovery process.</p>
Link Error Downed	<p>Total number of times the Port Training state machine has failed the link error recovery process and downed the link.</p>
Local Integrity Error	<p>The number of times that the count of local physical errors exceeded the threshold specified by LocalPhyErrors</p>
Rcv Remote Physical Error	<p>Total number of packets marked with the EBP delimiter received on the port.</p>
Xmit Constraint Error	<p>Total number of packets not transmitted from the switch physical port for the following reasons:</p> <ul style="list-style-type: none"> • FilterRawOutbound is true and packet is raw

<i>InfiniBand Port Counters</i>	
	<ul style="list-style-type: none"> PartitionEnforcementOutbound is true and packet fails partition key check or IP version check
Rcv Constraint Error	<p>Total number of packets received on the switch physical port that are discarded for the following reasons:</p> <ul style="list-style-type: none"> FilterRawInbound is true and packet is raw PartitionEnforcementInbound is true and packet fails partition key check or IP version check
Excess Buffer Overrun Error	The number of times that OverrunErrors consecutive flow control update periods occurred, each having at least one overrun error
Rcv Switch Relay Error	<p>Total number of packets received on the port that were discarded when they could not be forwarded by the switch relay for the following reasons:</p> <ul style="list-style-type: none"> DLID mapping VL mapping Looping (output port = input port)
VL15 Dropped	Number of incoming VL15 packets dropped because of resource limitations (e.g., lack of buffers) in the port
XmitWait	The number of ticks during which the port selected by PortSelect had data to transmit but no data was sent during the entire tick because of insufficient credits or of lack of arbitration.

<i>InfiniBand Calculated Port Counters</i>	
Counter	Description
Normalized XmitData	Effective port bandwidth utilization in % XmitData incremental/ Link Capacity

InfiniBand Calculated Port Counters

Normalized Congested Bandwidth

Amount of bandwidth that was suppressed due to congestion
 $(XmitWait\ incremental / Time) * Link\ Capacity$
 Separate counters are used for Tier 4 ports and for the rest of the ports.

Supported Traps and Events

Device events are listed as VDM or CDM in the Source column of the Events table in the UFM GUI. For information about defining event policy, see [Configuring Event Management](#).

Alarm ID	Alarm Name	To Log	Alarm	Default Severity	Default Threshold	Default TTL	Related Object	Category	Source
64	GID Address In Service	1	0	Info	1	300	Port	Fabric Notification	SM
65	GID Address Out of Service	1	0	Warning	1	300	Port	Fabric Notification	SM
66	New MCast Group Created	1	0	Info	1	300	Port	Fabric Notification	SM
67	MCast Group Deleted	1	0	Info	1	300	Port	Fabric Notification	SM
110	Symbol Error	1	1	Warning	200	300	Port	Hardware	Telemetry
111	Link Error Recovery	1	1	Minor	1	300	Port	Hardware	Telemetry

Alarm ID	Alarm Name	To Log	Alarm	Default Severity	Default Threshold	Default TTL	Related Object	Category	Source
112	Link Downed	1	1	Critical	1	300	Port	Hardware	Telemetry
113	Port Receive Errors	1	1	Minor	5	300	Port	Hardware	Telemetry
114	Port Receive Remote Physical Errors	0	0	Minor	5	300	Port	Hardware	Telemetry
115	Port Receive Switch Relay Errors	1	1	Minor	999	300	Port	Fabric Configuration	Telemetry
116	Port Xmit Discards	1	1	Minor	200	300	Port	Communication Error	Telemetry
117	Port Xmit Constraint Errors	1	1	Minor	200	300	Port	Communication Error	Telemetry
118	Port Receive Constraint Errors	1	1	Minor	200	300	Port	Communication Error	Telemetry
119	Local Link Integrity Errors	1	1	Minor	5	300	Port	Hardware	Telemetry

Alarm ID	Alarm Name	To Log	Alarm	Default Severity	Default Threshold	Default TTL	Related Object	Category	Source
120	Excessive Buffer Overrun Errors	1	1	Minor	100	300	Port	Communication Error	Telemetry
121	VL15 Dropped	1	1	Minor	50	300	Port	Communication Error	Telemetry
122	Congested Bandwidth (%) Threshold Reached	1	1	Minor	10	300	Port	Hardware	Telemetry
123	Port Bandwidth (%) Threshold Reached	1	1	Minor	95	300	Port	Communication Error	Telemetry
130	Non-optimal link width	1	1	Minor	1	0	Port	Hardware	SM
134	T4 Port Congested Bandwidth	1	1	Warning	10	300	Port	Communication Error	Telemetry
141	Flow Control Update Watchdog	1	0	Warning	1	300	Port	Hardware	SM

Alarm ID	Alarm Name	To Log	Alarm	Default Severity	Default Threshold	Default TTL	Related Object	Category	Source
	Timer Expired								
144	Capability Mask Modified	1	0	Info	1	300	Port	Fabric Notification	SM
145	System Image GUID changed	1	0	Info	1	300	Port	Communication Error	SM
156	Link Speed Enforcement Disabled	1	0	Critical	0	300	Site	Fabric Notification	SM
250	Running in Limited Mode	1	1	Critical	1	0	Grid	Maintenance	Licensing
251	Switching to Limited Mode	1	1	Critical	1	0	Grid	Maintenance	Licensing
252	License Expired	1	1	Warning	1	0	Grid	Maintenance	Licensing
253	Duplicated licenses	1	0	Critical	1	0	Grid	Maintenance	Licensing
254	License Limit Exceeded	1	0	Critical	1	0	Grid	Maintenance	Licensing

Alarm ID	Alarm Name	To Log	Alarm	Default Severity	Default Threshold	Default TTL	Related Object	Category	Source
255	License is About to Expire	1	0	Warning	1	0	Grid	Maintenance	Licensing
256	Bad M_Key	1	0	Minor	1	300	Port	Security	SM
257	Bad P_Key	1	0	Minor	1	300	Port	Security	SM
258	Bad Q_Key	1	0	Minor	1	300	Port	Security	SM
259	Bad P_Key Switch External Port	1	0	Critical	1	300	Port	Security	SM
328	Link is Up	1	0	Info	1	0	Link	Fabric Topology	SM
329	Link is Down	1	0	Warning	1	0	Site	Fabric Topology	SM
331	Node is Down	1	0	Warning	1	0	Site	Fabric Topology	SM
332	Node is Up	1	0	Info	1	300	Site	Fabric Topology	SM
336	Port Action Succeeded	1	0	Info	1	0	Port	Maintenance	UFM
337	Port Action	1	0	Minor	1	0	Port	Maintenance	UFM

Alarm ID	Alarm Name	To Log	Alarm	Default Severity	Default Threshold	Default TTL	Related Object	Category	Source
	Failed								
338	Device Action Succeeded	1	0	Info	1	0	Port	Maintenance	UFM
339	Device Action Failed	1	0	Minor	1	0	Port	Maintenance	UFM
344	Partial Switch ASIC Failure	1	1	Critical	1	0	Switch	Maintenance	UFM
370	Gateway Ethernet Link State Changed	1	0	Warning	1	0	Gateway	Gateway	SM
371	Gateway Reregister Event Received	1	0	Warning	1	0	Gateway	Gateway	SM
372	Number of Gateways Changed	1	0	Warning	1	0	Gateway	Gateway	SM
373	Gateway will be Rebooted	1	0	Warning	1	0	Gateway	Gateway	SM

Alarm ID	Alarm Name	To Log	Alarm	Default Severity	Default Threshold	Default TTL	Related Object	Category	Source
374	Gateway Reloading Finished	1	0	Info	1	0	Gateway	Gateway	SM
380	Switch Upgrade Error	1	1	Critical	1	0	Switch	Maintenance	UFM
381	Switch Upgrade Failed	1	0	Info	1	0	Switch	Maintenance	UFM
328	Module status NOT PRESENT	1	1	Warning	1	420	Switch	Module Status	UFM
383	Host Upgrade Failed	1	0	Info	1	0	Computer	Maintenance	UFM
384	Switch Module Powered Off	1	1	Info	1	420	Switch	Module Status	UFM
385	Switch FW Upgrade Started	1	0	Info	1	0	Switch	Maintenance	UFM
386	Switch SW Upgrade Started	1	0	Info	1	0	Switch	Maintenance	UFM

Alarm ID	Alarm Name	To Log	Alarm	Default Severity	Default Threshold	Default TTL	Related Object	Category	Source
387	Switch Upgrade Finished	1	0	Info	1	0	Switch	Maintenance	UFM
388	Host FW Upgrade Started	1	0	Info	1	0	Computer	Maintenance	UFM
389	Host SW Upgrade Started	1	0	Info	1	0	Computer	Maintenance	UFM
391	Switch Module Removed	1	0	Info	1	0	Switch	Fabric Notification	Switch
392	Module Temperature Threshold Reached	1	0	Info	40	0	Module	Hardware	Switch
393	Switch Module Added	1	0	Info	1	0	Switch	Fabric Notification	Switch
394	Module Status FAULT	1	1	Critical	1	420	Switch	Module Status	Switch
395	Device Action Started	1	0	Info	1	0	Port	Maintenance	UFM

Alarm ID	Alarm Name	To Log	Alarm	Default Severity	Default Threshold	Default TTL	Related Object	Category	Source
396	Site Action Started	1	0	Info	1	0	Port	Maintenance	UFM
397	Site Action Failed	1	0	Minor	1	0	Port	Maintenance	UFM
398	Switch Chip Added	1	0	Info	1	0	Switch	Fabric Notification	Switch
399	Switch Chip Removed	1	0	Critical	1	0	Switch	Fabric Notification	Switch
403	Device Pending Reboot	1	1	Warning	0	300	Device	Maintenance	UFM
404	System Information is missing	1	1	Warning	1	300	Switch	Communication Error	UFM
405	Switch Identity Validation Failed	1	1	Warning	1	300	Switch	Communication Error	UFM
406	Switch System Information is missing	1	1	Warning	1	300	Switch	Communication Error	UFM
407	COMEX Ambient Temperature	1	1	Minor	60	300	Switch	Hardware	Switch

Alarm ID	Alarm Name	To Log	Alarm	Default Severity	Default Threshold	Default TTL	Related Object	Category	Source
	Threshold Reached								
408	Switch is Unresponsive	1	1	Critical	1	300	Switch	Communication Error	UFM
502	Device Upgrade Finished	1	0	Info	1	300	Device	Maintenance	UFM
506	Device Upgrade Finished	1	0	Info	1	300	Device	Maintenance	UFM
508	Core Dump Created	1	1	Info	1	300	Grid	Maintenance	UFM
510	SM Failover	0	1	Critical	1	300	Grid	Fabric Notification	SM
511	SM State Change	0	1	Info	1	300	Grid	Fabric Notification	SM
512	SM UP	0	1	Info	1	300	Grid	Fabric Notification	SM
513	SM System Log Message	0	1	Minor	1	300	Grid	Fabric Notification	SM

Alarm ID	Alarm Name	To Log	Alarm	Default Severity	Default Threshold	Default TTL	Related Object	Category	Source
514	SM LID Change	0	1	Warning	1	300	Grid	Fabric Notification	SM
515	Fabric Health Report Info	1	1	Info	1	300	Grid	Fabric Notification	UFM
516	Fabric Health Report Warning	1	1	Warning	1	300	Grid	Fabric Notification	UFM
517	Fabric Health Report Error	1	1	Critical	1	300	Grid	Fabric Notification	UFM
518	UFM-related process is down	1	1	Critical	1	300	Grid	Maintenance	UFM
519	Logs purge failure	1	1	Minor	1	300	Grid	Maintenance	UFM
520	Restart of UFM-related process succeeded	1	1	Info	1	300	Grid	Maintenance	UFM
521	UFM is being stopped	1	1	Critical	1	300	Grid	Maintenance	UFM

Alarm ID	Alarm Name	To Log	Alarm	Default Severity	Default Threshold	Default TTL	Related Object	Category	Source
522	UFM is being restarted	1	1	Critical	1	300	Grid	Maintenance	UFM
523	UFM failover is being attempted	1	1	Info	1	300	Grid	Maintenance	UFM
524	UFM cannot connect to DB	1	1	Critical	1	300	Grid	Maintenance	UFM
525	Disk utilization threshold reached	1	1	Critical	1	300	Grid	Maintenance	UFM
526	Memory utilization threshold reached	1	1	Critical	1	300	Grid	Maintenance	UFM
527	CPU utilization threshold reached	1	1	Critical	1	300	Grid	Maintenance	UFM

Alarm ID	Alarm Name	To Log	Alarm	Default Severity	Default Threshold	Default TTL	Related Object	Category	Source
528	Fabric interface is down	1	1	Critical	1	300	Grid	Maintenance	UFM
529	UFM standby server problem	1	1	Critical	1	300	Grid	Maintenance	UFM
530	SM is down	1	1	Critical	1	300	Grid	Maintenance	UFM
531	DRBD Bad Condition	1	1	Critical	1	300	Grid	Maintenance	UFM
532	Remote UFM-SM Sync	1	1	Info	1	0	Grid	Maintenance	UFM
533	Remote UFM-SM problem	1	1	Critical	1	0	Site	Maintenance	UFM
535	MH Purge Failed	1	1	Warning	1	300	Grid	Maintenance	UFM
536	UFM Health Watchdog Info	1	1	Info	1	300	Grid	Maintenance	UFM
537	UFM Health Watchdog	1	1	Critical	1	300	Grid	Maintenance	UFM

Alarm ID	Alarm Name	To Log	Alarm	Default Severity	Default Threshold	Default TTL	Related Object	Category	Source
	Log Critical								
538	Time Diff Between HA Servers	1	1	Warning	1	300	Grid	Maintenance	UFM
539	DRBD TCP Connection Performance	1	1	Warning	1	900	Grid	Maintenance	UFM
540	Daily Report Completed successfully	1	0	Info	1	300	Grid	Maintenance	UFM
541	Daily Report Completed with Error	1	0	Minor	1	300	Grid	Maintenance	UFM
542	Daily Report Failed	1	0	Critical	1	300	Grid	Maintenance	UFM
543	Daily Report Mail Sent successfully	1	0	Info	1	300	Grid	Maintenance	UFM
544	Daily Report	1	0	Minor	1	300	Grid	Maintenance	UFM

Alarm ID	Alarm Name	To Log	Alarm	Default Severity	Default Threshold	Default TTL	Related Object	Category	Source
	Mail Sent Failed								
545	SM is not responding	1	1	Critical	1	300	Grid	Maintenance	UFM
560	User Connected							Security	UFM
561	User Disconnected							Security	UFM
602	UFM Server Failover	1	1	Critical	1	0	Site	Fabric Notification	UFM
603	Events Suppression	1	0	Critical	0	300	Site	Maintenance	UFM
604	Report Succeeded	1	1	Info	1	300	Grid	Maintenance	UFM
605	Report Failed	1	1	Critical	1	300	Grid	Maintenance	UFM
606	Correction Attempts Paused	1	0	Warning	1	0	Site	Fabric Notification	UFM
701	Non-optimal Link Speed	1	1	Minor	1	0	Port	Hardware	UFM
702	Unhealthy IB	1	1	Warning	1	0	Port	Hardware	SM

Alarm ID	Alarm Name	To Log	Alarm	Default Severity	Default Threshold	Default TTL	Related Object	Category	Source
	Port								
703	Fabric Collector Connected	1	0	Info	1	0	Grid	Maintenance	UFM
704	Fabric Collector Disconnected	1	1	Critical	1	0	Grid	Maintenance	UFM
750	High data retransmission count on port	1	1	Warning	500	1	Port	Hardware	SM
901	Fabric Configuration Started	0	1	Info	1	0	Grid	Fabric Notification	UFM
902	Fabric Configuration Completed	0	1	Info	1	0	Grid	Fabric Notification	UFM
903	Fabric Configuration Failed	0	1	Critical	1	0	Grid	Fabric Notification	UFM
904	Device Configuration Failure	0	1	Critical	1	0	Device	Fabric Notification	UFM
905	Device Configu	0	1	Critical	1	0	Device	Fabric Notifica	UFM

Alarm ID	Alarm Name	To Log	Alarm	Default Severity	Default Threshold	Default TTL	Related Object	Category	Source
	ration Timeout							tion	
906	Provisioning Validation Failure	0	1	Critical	1	0	Grid	Fabric Notification	UFM
907	Switch is Down	1	1	Critical	1	0	Site	Fabric Topology	UFM
908	Switch is Up	1	1	Info	1	300	Site	Fabric Topology	UFM
909	Director Switch is Down	1	1	Critical	1	300	Site	Fabric Topology	UFM
910	Director Switch is Up	1	1	Info	1	0	Site	Fabric Topology	UFM
911	Module Temperature Low Threshold Reached	1	1	Warning	60	300	Module	Hardware	Telemetry
912	Module Temperature High Threshold	1	1	Critical	60	300	Module	Hardware	Telemetry

Alarm ID	Alarm Name	To Log	Alarm	Default Severity	Default Threshold	Default TTL	Related Object	Category	Source
	Reached								
913	Module High Voltage	1	1	Warning	10	420	Switch	Module Status	Telemetry
914	Module High Current	1	1	Warning	10	420	Switch	Module Status	Telemetry
915	BER_ERROR	1	1	Critical	1e-8	420	Port	Hardware	Telemetry
916	BER_WARNING	1	1	Warning	1e-13	420	Port	Hardware	Telemetry
917	SYMBOL_BER_ERROR	1	1	Critical	10	420	Port	Hardware	Telemetry
918	High Symbol BER reported	1	1	Warning	10	420	Port	Hardware	Telemetry
919	Cable Temperature High	1	1	Critical	0	0	Port	Hardware	Telemetry
920	Cable Temperature Low	1	1	Critical	0	0	Port	Hardware	Telemetry
1300	SM_SAKY_VIOLATION	1	1	Warning		5300	Port	Security	SM
1301	SM_SGID_SPO	1	1	Warning		5300	Port	Security	SM

Alarm ID	Alarm Name	To Log	Alarm	Default Severity	Default Threshold	Default TTL	Related Object	Category	Source
	OFED								
1302	SM_RATE_LIMIT_EXCEEDED	1	1	Warning		5300	Port	Security	SM
1303	SM_MULTICAST_GROUPS_LIMIT_EXCEEDED	1	1	Warning		5300	Port	Security	SM
1304	SM_SERVICES_LIMIT_EXCEEDED	1	1	Warning		5300	Port	Security	SM
1305	SM_EVENT_SUBSCRIPTION_LIMIT_EXCEEDED	1	1	Warning		5300	Port	Security	SM
1306	Unallowed SM was detected in the fabric	1	1	Warning	0	300	Port	Fabric Notification	SM
1307	SMInfo SET request was received from	1	1	Warning	0	300	Port	Fabric Notification	SM

Alarm ID	Alarm Name	To Log	Alarm	Default Severity	Default Threshold	Default TTL	Related Object	Category	Source
	unallowed SM								
1309	SM was detected with non-matching SMKey	1	1	Warning	0	300	Port	Fabric Notification	SM
1310	Duplicated node GUID was detected	1	1	Critical	1	0	Device	Fabric Notification	SM
1311	Duplicated port GUID was detected	1	1	Critical	1	0	Port	Fabric Notification	SM
1312	Switch was Rebooted	1	1	Info	1	0	Device	Fabric Notification	UFM
1315	Topo Config File Error	1	1	Critical	1	0	Grid	Fabric Notification	UFM
1316	Topo Config Subnet Mismatch	1	1	Critical	1	0	Grid	Fabric Notification	Topodiff

Alarm ID	Alarm Name	To Log	Alarm	Default Severity	Default Threshold	Default TTL	Related Object	Category	Source
1400	High Ambient Temperature	1	1	Warning	0	86400	Switch	Hardware	Switch
1401	High Fluid Temperature	1	1	Warning	0	86400	Switch	Hardware	Switch
1402	Low Fluid Level	1	1	Warning	0	86400	Switch	Hardware	Switch
1403	Low Supply Pressure	1	1	Warning	0	86400	Switch	Hardware	Switch
1404	High Supply Pressure	1	1	Warning	0	86400	Switch	Hardware	Switch
1405	Low Return Pressure	1	1	Warning	0	86400	Switch	Hardware	Switch
1406	High Return Pressure	1	1	Warning	0	86400	Switch	Hardware	Switch
1407	High Differential Pressure	1	1	Warning	0	86400	Switch	Hardware	Switch
1408	Low Differential	1	1	Warning	0	86400	Switch	Hardware	Switch

Alarm ID	Alarm Name	To Log	Alarm	Default Severity	Default Threshold	Default TTL	Related Object	Category	Source
	Pressure								
1409	System Fail Safe	1	1	Warning	0	86400	Switch	Hardware	Switch
1410	Fault Critical	1	1	Critical	0	86400	Switch	Hardware	Switch
1411	Fault Pump1	1	1	Critical	0	86400	Switch	Hardware	Switch
1412	Fault Pump2	1	1	Critical	0	86400	Switch	Hardware	Switch
1413	Fault Fluid Level Critical	1	1	Critical	0	86400	Switch	Hardware	Switch
1414	Fault Fluid Over Temperature	1	1	Critical	0	86400	Switch	Hardware	Switch
1415	Fault Primary DC	1	1	Critical	0	86400	Switch	Hardware	Switch
1416	Fault Redundant DC	1	1	Critical	0	86400	Switch	Hardware	Switch
1417	Fault Fluid Leak	1	1	Critical	0	86400	Switch	Hardware	Switch
1418	Fault Sensor Failure	1	1	Critical	0	86400	Switch	Hardware	Switch
1419	Cooling Device	1	0	Critical	0	1	Grid	Hardware	Switch

Alarm ID	Alarm Name	To Log	Alarm	Default Severity	Default Threshold	Default TTL	Related Object	Category	Source
	Monitoring Error								
1420	Cooling Device Communication Error	1	1	Critical	0	86400	Switch	Hardware	Switch
1500	New cable detected	1	0	Info	1	0	Link	Security	UFM
1502	Cable detected in a new location	1	0	Warning	1	0	Link	Security	UFM
1503	Duplicate Cable Detected	1	0	Critical	1	0	Link	Security	UFM
1315	Topo Config File Error	1	1	Critical	1	0	Grid	Fabric Notification	UFM
1504	SHARP Allocation Succeeded	1	1	Info	1	0	Grid	SHARP	SHARP
1505	SHARP Allocation Failed	1	0	Warning	1	0	Grid	SHARP	SHARP

Alarm ID	Alarm Name	To Log	Alarm	Default Severity	Default Threshold	Default TTL	Related Object	Category	Source
1506	SHARP Deallocation Succeeded	1	0	Info	1	0	Grid	SHARP	SHARP
1507	SHARP Deallocation Failed	1	0	Warning	1	0	Grid	SHARP	SHARP
1508	Device Collect System Dump Started	1	0	Info	1	300	Device	Maintenance	UFM
1509	Device Collect System Dump Finished	1	0	Info	1	300	Device	Maintenance	UFM
1510	Device Collect System Dump Error	1	0	Critical	1	300	Device	Maintenance	UFM
1511	Virtual Port Added	1	0	Info	1	0	Port	Fabric Notification	SM
1512	Virtual Port Removed	1	0	Warning	1	0	Port	Fabric Notification	SM
1513	Burn Cables Transce	1	0	Info	1	0	Device	Maintenance	UFM

Alarm ID	Alarm Name	To Log	Alarm	Default Severity	Default Threshold	Default TTL	Related Object	Category	Source
	ivers Started								
1514	Burn Cables Transceivers Finished	1	0	Info	1	0	Device	Maintenance	UFM
1515	Burn Cables Transceivers Failed	1	0	Warning	1	0	Device	Maintenance	UFM
1516	Activate Cables Transceivers FW Finished	1	0	Info	1	0	Device	Maintenance	UFM
1517	Activate Cables Transceivers FW Failed	1	0	Warning	1	0	Device	Maintenance	UFM
1520	Aggregation Node Discovery Failed	1	0	Critical	1	0	SHARP AM	SHARP	SHARP
1521	Job Started	1	0	Info	1	0	SHARP AM	SHARP	SHARP

Alarm ID	Alarm Name	To Log	Alarm	Default Severity	Default Threshold	Default TTL	Related Object	Category	Source
1522	Job Ended	1	0	Info	1	0	SHARP AM	SHARP	SHARP
1523	Job Start Failed	1	0	Critical	1	0	SHARP AM	SHARP	SHARP
1524	Job Error	1	0	Critical	1	0	SHARP AM	SHARP	SHARP
1525	Trap QP Error	1	0	Critical	1	0	SHARP AM	SHARP	SHARP
1526	Trap Invalid Request	1	0	Critical	1	0	SHARP AM	SHARP	SHARP
1527	Trap Sharp Error	1	0	Critical	1	0	SHARP AM	SHARP	SHARP
1528	Trap QP Alloc timeout	1	0	Critical	1	0	SHARP AM	SHARP	SHARP
1529	Trap AMKey Violation	1	0	Critical	1	0	SHARP AM	SHARP	SHARP
1530	Unsupported Trap	1	0	Critical	1	0	SHARP AM	SHARP	SHARP
1531	Reservation Updated	1	0	Info	1	0	SHARP AM	SHARP	SHARP

Alarm ID	Alarm Name	To Log	Alarm	Default Severity	Default Threshold	Default TTL	Related Object	Category	Source
1532	Sharp is not Responding	1	0	Critical	1	0	SHARP AM	SHARP	SHARP
1533	Agg Node Active	1	0	Info	1	0	SHARP AM	SHARP	SHARP
1534	Agg Node Inactive	1	0	Warning	1	0	SHARP AM	SHARP	SHARP
1535	Trap AMKey Violation Triggered by AM	1	0	Warning	1	0	SHARP AM	SHARP	SHARP
1550	Guids Were Added to Pkey	1	0	Info	1	0	Port	Fabric Notification	UFM
1551	Guids Were Removed from Pkey	1	0	Info	1	0	Port	Fabric Notification	UFM
1600	VS/CC Classes Key Violation							Security	SM
1602	PCI Speed Degradation	1	1	Warning	1	0	Port	Fabric Notification	UFM

Alarm ID	Alarm Name	To Log	Alarm	Default Severity	Default Threshold	Default TTL	Related Object	Category	Source
	Warning								
1603	PCI Width Degradation Warning	1	1	Warning	1	0	Port	Fabric Notification	UFM

Appendix – Used Ports

The following is the list of ports used by the UFM Server for internal and external communication:

Port	Purpose
80(tcp), 443(tcp)	Used by WS clients (Apache Web Server)
8000(udp)	Used for UFM server listening for REST API requests (redirected by Apache web server)
6306(udp)	Used for Multicast requests – communication with latest UFM Agents
8005(udp)	Used as UFM monitoring listening port
8089(tcp)	Used for internal communication between UFM server and MonitoringHistoryEngine
8888(tcp)	Used by DRBD – communication between UFM Primary and Standby server
15800(tcp)	Used for communication with legacy UFM Agents on Mellanox Grid Director DDR switches
8081(tcp), 8082(tcp)	Used for internal communication with Subnet Manager

Appendix – Configuration Files Auditing

The main purpose of this feature is to allow users to track changes made to selected configuration files. When activating the feature, all the changes are reflected in specific log files which contain information about the changes and when they took place.

To activate this feature:

In *TrackConfig* section in *gv.cfg*, file value of *track_config* key should be set to **true** and value of *track_conf_files* key should contain a comma-separated list of defined conf files to be tracked.

By default – ALL conf-files are tracked. To activate the feature, after *track_config* key is set to true, the UFM server should be restarted.

Example:

```
[TrackConfig]
# track config files changes
track_config = true
# Could be selected options (comaseparated) UFM, SM, SHARP,
Telemetry. Or ALL for all the files.
track_conf_files = ALL
```

The below lists the configuration files that can be tracked:

Conf File Alias	Configuration Files
UFM	/opt/ufm/files/conf/gv.cfg
SM	/opt/ufm/files/conf/opensm/opensm.conf
SHARP	/opt/ufm/files/conf/sharp2/sharp_am.cfg
Telemetry	/opt/ufm/files/conf/telemetry/launch_ibdiagnet_config.ini
ALL	All the above configuration files.

Once the feature is activated and the UFM server is restarted, the UFM generates file which list the changes made in each of the tracked conf files. These files are located in `/opt/ufm/files/auditing/` directory and the file naming convention is as follows: original conf file name with `audit.log` suffix.

Example: For `gv.cfg`, the name of the changes-tracking file is `gv.cfg.audit.log`. Changes are stored in auditing files in “linux diff”-like format.

Example:

```
cat /opt/ufm/files/auditing/gv.cfg.audit.log
=== Change occurred at 2022-07-24 07:31:48.679247 ===
---
+++
@@ -45,7 +45,7 @@
mon_mode_discovery_period = 60
check_interface_retry = 5
# The number of times to try if the InfiniBand fabric interface is
down. The duration of each retry is 1 second.
-ibport_check_retries = 90
+ibport_check_retries = 92
ws_address = UNDEFINED
ws_port = 8088
ws_protocol = https
```

Appendix - Managed Switches Configuration Info Persistency

UFM uses a periodic system information-pulling mechanism to query managed switches inventory data. The inventory information is saved in local JSON files for persistency and tracking of managed switches' status.

Upon UFM start up, UFM loads the saved JSON files to present them to the end user via REST API or UFM WEB UI.

After UFM startup is completed, UFM pulls all managed switches data and updates the JSON file and the UFM model periodically (the interval is configurable). In addition, the JSON files are part of UFM system dump.

The following parameters allow configuration of the feature via gv.cfg file:

```
[SrvMgmt]
# how often UFM should send json requests for sysinfo to switches
(in seconds)
systems_poll = 180
# To create UFM model in large setups might take a lot of time.
# This is an initial delay (in minutes) before starting to pull
sysinfo from switches.
systems_poll_init_timeout = 5
# to avoid sysinfo dump overloading and multiple writing to host
# switches sysinfo will be dumped to disc in json format every
set in this variable
# sysinfo request. If set to 0 - will not be dumped, if set to 1 -
will be dumped every sysinfo request
# this case (as example defined below) dump will be created every
fifth sysinfo request, so if system_poll is 180 sec (3 minutes)
sysinfo dump to the file will e performed every 15 minutes.
sysinfo_dump_interval = 5
# location of the sysinfo dump file (it is in /opt/ufm/files/logs
(it will be part of UFM dump)
sysinfo_dump_file_path = /opt/ufm/files/log/sysinfo.dump
```

Appendix – IB Router

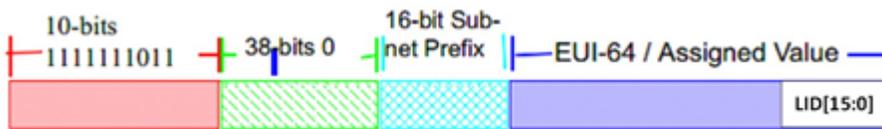
IB router provides the ability to send traffic between two or more IB subnets thereby potentially expanding the size of the network to over 40k end-ports, enabling separation and fault resilience between islands and IB subnets, and enabling connection to different topologies used by different subnets.

The forwarding between the IB subnets is performed using GRH lookup. The IB router's basic functionality includes:

- Removal of current L2 LRH (local routing header)
- Routing table lookup – using GID from GRH
- Building new LRH according to the destination according to the routing table

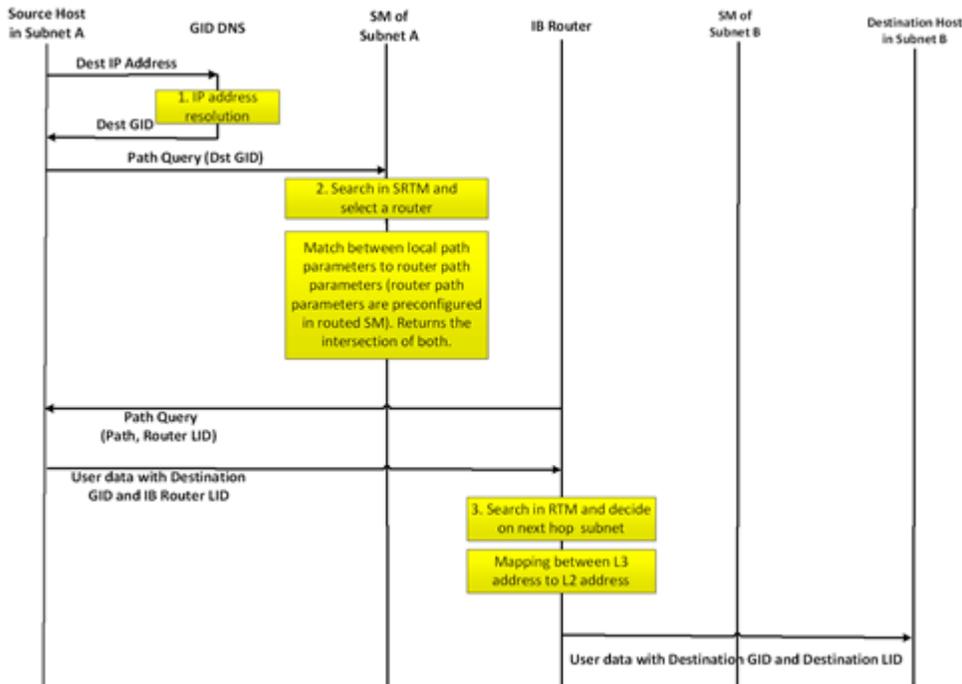
The DLID in the new LRH is built using simplified GID-to-LID mapping (where LID = 16 LSB bits of GID) thereby not requiring to send for ARP query/lookup.

Site-Local Unicast GID Format



For this to work, the SM allocates an alias GID for each host in the fabric where the alias GID = {subnet prefix[127:64], reserved[63:16], LID[15:0]}. Hosts should use alias GIDs in order to transmit traffic to peers on remote subnets.

Host-to-Host IB Router Unicast Flow



IB Router Scripts

The following scripts are supplied as part of UFM installation package.

set_num_of_subnets.sh

- **Arguments**

```
/opt/ufm/scripts/ib_router/set_num_of_subnets.sh --hostname  
<hostname> --username <username> --password <password> --num-  
of-subnets <num-of-subnets>
```

- **Description** – Configures system profile to InfiniBand allowing multiple switch IDs

- **Syntax Description**

hostname	IB router hostname or IP address
username	IB router username
password	IB router user password
num-of-subnets	Specified number of subnets (AKA SWIDs) to be initialized by the system. Value range: 2-6

- **Example**

```
/opt/ufm/scripts/ib_router/set_num_of_subnets.sh --hostname  
10.6.204.12 --username admin --password admin --num-of-  
subnets 6
```

 **Note**

As a result of running this script, reboot is performed and all configuration is removed

add_interfaces_to_subnet.sh

- **Arguments**

```
/opt/ufm/scripts/ib_router/add_interfaces_to_subnet.sh --  
hostname <hostname> --username <username> --password  
<password> --interface <interface | interface-range> --subnet  
<subnet>
```

- **Description**

Maps an interface to a subnet and enables it

- **SyntaxDescription**

hostname	IB router hostname or IP address
username	IB router username
password	IB router user password
interface interface-range	Single IB interface or range of IB interfaces. Single IB interface: 1/<interface> Range of IB interfaces: 1/<interface>-1/<interface>
subnet	Name of IB subnet (AKA SWID): infiniband-default, infiniband-1...infiniband-5

- **Example**

```
/opt/ufm/scripts/ib_router/add_interfaces_to_subnet.sh --  
hostname 10.6.204.12 --username admin --password admin --  
interface 1/1-1/6 --subnet infiniband-1
```

remove_interfaces_from_subnet.sh

- **Arguments**

```
/opt/ufm/scripts/ib_router/remove_interfaces_from_subnet.sh  
--hostname <hostname> --username <username> --password  
<password> --interface <interface | interface-range>
```

- **Description**

Un-maps an interface from a subnet after it has been disabled

- **Syntax Description**

hostname	IB router hostname or IP address
username	IB router username
password	IB router user password
interface interface-range	Single IB interface or range of IB interfaces. Single IB interface: 1/<interface> Range of IB interfaces: 1/<interface>-1/<interface>

- **Example**

```
/opt/ufm/scripts/ib_router/remove_interfaces_from_subnet.sh  
--hostname 10.6.204.12 --username admin --password admin --  
interface 1/6Example
```

add_subnet_to_router.sh

- **Arguments**

```
/opt/ufm/scripts/ib_router/add_subnet_to_router.sh --hostname  
<hostname> --username <username> --password <password> --  
subnet <subnet>
```

- **Description**

Creates routing on IB subnet interface and enables routing on that interface

- **Syntax Description**

hostname	IB router hostname or IP address
username	IB router username
password	IB router user password
subnet	Name of IB subnet (AKA SWID): infiniband-default, infiniband-1... infiniband-5

- **Example**

```
/opt/ufm/scripts/ib_router/add_subnet_to_router.sh --hostname  
10.6.204.12 --username admin --password admin --subnet  
infiniband-3Example
```

 **Note**

As a result of running this script, the set of commands that allow control of IB router functionality is being enabled

remove_subnet_from_router.sh

- **Arguments**

```
/opt/ufm/scripts/ib_router/remove_subnet_from_router.sh --  
hostname <hostname> --username <username> --password  
<password> --subnet <subnet>
```

- **Description**

Destroys routing on IB subnet interface after routing on that interface has been disabled

- **Syntax Description**

hostname	IB router hostname or IP address
username	IB router username
password	IB router user password
subnet	Name of IB subnet (AKA SWID): infiniband-default, infiniband-1... infiniband-5

- **Example**

```
/opt/ufm/scripts/ib_router/remove_subnet_from_router.sh --  
hostname 10.6.204.12 --username admin --password admin --  
subnet infiniband-defaultExample
```

set_ufm_sm_router_support.sh

- **Arguments**

```
/opt/ufm/scripts/ib_router/set_ufm_sm_router_support.sh [-c
```

```
<subnet prefix>] [-r][-h]
```

- **Description**

[-c <subnet prefix>]: Used for updating OpenSM configuration file with new subnet prefix and forces OpenSM to re-read configuration.

[-r]: Used for resetting OpenSM configuration to default value and canceling IB routing.

- **Syntax Description**

-c	Configure new IB subnet prefix. Should be followed by new IB router subnet prefix value
-r	Reset to default
-h	Show help

- **Example**

```
/opt/ufm/scripts/ib_router/set_ufm_sm_router_support.sh -c  
0xfec0000000001234Examples
```

```
/opt/ufm/scripts/ib_router/set_ufm_sm_router_support.sh -r
```

IB Router Configuration

Step 1: Configure multi-switch. Run:

```
/opt/ufm/scripts/set_num_of_subnets.sh --hostname 10.6.204.12 --  
username admin --password admin --num-of-subnets 6
```

Step 2: Map interface to a subnet. Run:

```
/opt/ufm/scripts/add_ports_to_subnet.sh --hostname 10.6.204.12 --  
username admin --password admin --interface 1/1 --subnet  
infiniband-default
```

Step 3: Create routing on IB subnet interface. Run:

```
/opt/ufm/scripts/add_subnet_to_router.sh --hostname 10.6.204.12  
--username admin --password admin --subnet infiniband-default
```

Appendix – NVIDIA SHARP Integration

NVIDIA Scalable Hierarchical Aggregation and Reduction Protocol (SHARP)[™]

NVIDIA SHARP is a technology that improves the performance of MPI operation by offloading collective operations from the CPU and dispatching to the switch network, and eliminating the need to send data multiple times between endpoints. This approach decreases the amount of data traversing the network as aggregation nodes are reached, and dramatically reduces the MPI operation time.

NVIDIA SHARP software is based on:

- Hardware capabilities in Switch-IB[™] 2
- Hierarchical communication algorithms (HCOL) library into which NVIDIA SHARP capabilities are integrated
- NVIDIA SHARP daemons, running on the compute nodes
- NVIDIA SHARP Aggregation Manager, running on UFM

1. These components should be installed from HPCX or MLNX_OFED packages on compute nodes. Installation details can be found in SHARP Deployment Guide.

NVIDIA SHARP Aggregation Manager

Aggregation Manager (AM) is a system management component used for system level configuration and management of the switch-based reduction capabilities. It is used to set up the NVIDIA SHARP trees, and to manage the use of these entities.

AM is responsible for:

- NVIDIA SHARP resource discovery
- Creating topology aware NVIDIA SHARP trees
- Configuring NVIDIA SHARP switch capabilities
- Managing NVIDIA SHARP resources
- Assigning NVIDIA SHARP resource upon request
- Freeing NVIDIA SHARP resources upon job termination

AM is configured by a topology file created by Subnet Manager (SM): subnet.lst. The file includes information about switches and HCAs.

NVIDIA SHARP AM Prerequisites

In order for UFM to run NVIDIA SHARP AM, the following conditions should be met:

- Managed InfiniBand fabric must include at least one of the following Switch-IB 2 switches with minimal firmware version of 15.1300.0126:
 - CS7500
 - CS7510
 - CS7520
 - MSB7790
 - MSB7800
- NVIDIA SHARP software capability should be enabled for all Switch-IB 2 switches in the fabric (a dedicated logical port #37, for NVIDIA SHARP packets transmission, should be enabled and should be visible via UFM).

- UFM OpenSM should be running to discover the fabric topology.

NVIDIA SHARP AM is tightly dependent on OpenSM as it uses the topology discovered by OpenSM.

- NVIDIA SHARP AM should be enabled in UFM configuration by running:

```
[Sharp]
sharp_enabled = true
```

NVIDIA SHARP AM Configuration

By default, when running NVIDIA SHARP AM by UFM, there is no need to run further configuration. To modify the configuration of NVIDIA SHARP AM, you can edit the following NVIDIA SHARP AM configuration file:

```
/opt/ufm/files/conf/sharp/sharp_am.cfg.
```

Running NVIDIA SHARP AM in UFM

➤ **To run NVIDIA SHARP AM within UFM, do the following:**

1. Make sure that the root GUID configuration file (root_guid.conf) exists in conf/opensm. This file is required for activating NVIDIA SHARP AM.
2. Enable NVIDIA SHARP in conf/opensm/opensm.conf OpenSM configuration file by running "ib sm sharp enable" or by setting the sharp_enabled parameter to 2:

```
# SHArP support
# 0: Ignore SHArP - No SHArP support
# 1: Disable SHArP - Disable SHArP on all supporting switches
# 2: Enable SHArP - Enable SHArP on all supporting switches
sharp_enabled 2
```

3. Make sure that port #6126 (on which NVIDIA SHARP AM is communicating with NVIDIA SHARP daemons) is not being used by any other application. If the port is being used, you can change it by modifying **smx_sock_port** parameter in the NVIDIA SHARP AM configuration file: `conf/sharp2/sharp_am.cfg` or via the command "ib sharp port".
4. Enable NVIDIA SHARP AM in `conf/gv.cfg` UFM configuration file by running the command "ib sharp enable" or by setting the `sharp_enabled` parameter to true (it is false by default):

```
[Sharp]
sharp_enabled = true
```

5. (Optional) Enable NVIDIA SHARP allocation in `conf/gv.cfg` UFM configuration file by setting the `sharp_allocation_enabled` parameter to true (it is false by default):

```
[Sharp]
sharp_allocation_enabled = true
```

Note

If the field `sharp_enabled`, and `sharp_allocation_enabled` are both set as true in `gv.cfg`, UFM sends an allocation (reservation) request to NVIDIA SHARP Aggregation Manager (AM) to allocate a list of GUIDs to the specified PKey when a new "Set GUIDs for PKey" REST API is called. If an empty list of GUIDs is sent, a PKEY deallocation request is sent to the SHARP AM.

NVIDIA SHARP allocations (reservations) allow SHARP users to run jobs on top of these resource (port GUID) allocations for the specified PKey. For more information, please refer to the *UFM REST API Guide* under Actions REST API → PKey GUIDs → Set/Update PKey GUIDs.

Operating NVIDIA SHARP AM with UFM

If NVIDIA SHARP AM is enabled, running UFM will run NVIDIA SHARP AM, and stopping UFM will stop NVIDIA SHARP AM.

To

➤ **start UFM with NVIDIA SHARP AM (enabled):**

```
/etc/init.d/ufmd start
```

The same command applies to HA, using `/etc/init.d/ufmha`.

Upon startup of UFM or SHARP Aggregation Manager, UFM will resend all existing persistent allocation to SHARP AM.

➤ **To stop UFM with NVIDIA SHARP AM (enabled):**

```
/etc/init.d/ufmd stop
```

➤ **To stop only NVIDIA SHARP AM while leaving UFM running:**

```
/etc/init.d/ufmd sharp_stop
```

➤ **To start only NVIDIA SHARP AM while UFM is already running:**

```
/etc/init.d/ufmd sharp_start
```

Upon startup of UFM or SHARP Aggregation Manager, UFM will resend all existing persistent allocation to SHARP AM.

To restart only NVIDIA SHARP AM while UFM is running:

```
/etc/init.d/ufmd sharp_restart
```

Upon startup of UFM or SHARP Aggregation Manager, UFM will resend all existing persistent allocation to SHARP AM.

To display NVIDIA SHARP AM status while UFM is running:

```
/etc/init.d/ufmd sharp_status
```

Monitoring NVIDIA SHARP AM by UFMHealth

UFMHealth monitors SHARP AM and verifies that NVIDIA SHARP AM is always running. When UFMHealth detects that NVIDIA SHARP AM is down, it will try to re-start it, and will trigger an event to the UFM to notify it that NVIDIA SHARP AM is down.

Managing NVIDIA SHARP AM by UFM High Availability (HA)

In case of a UFM HA failover or takeover, NVIDIA SHARP AM will be started on the new master node using the same configuration that was used prior to the failover/takeover.

NVIDIA SHARP AM Logs

NVIDIA SHARP AM log file (sharp_am.log) at /opt/ufm/files/log.

NVIDIA SHARP AM log files are rotated by UFM logrotate mechanism.

NVIDIA SHARP AM Version

NVIDIA SHARP AM version can be found at /opt/ufm/sharp/share/doc/SHARP_VERSION.

Appendix – AHX Monitoring

AHX Monitoring is a tool that is used to monitor AHX devices.

Overview

AHX monitoring enables monitoring HDR director switch cooling devices (i.e. AHX) and sends events to UFM.

The events are triggered on the switch associated with the cooling device if the monitoring utility encounters an issue.

The monitoring utility runs periodically and communicates with the AHX devices over the Modbus protocol (TCP port 502).

For deployment and configuration, please refer to the AHX Monitoring plugin in [Mellanox Docker HUB](#).

Appendix - UFM SLURM Integration

Simple Linux Utility for Resource Management (SLURM) is a job scheduler for Linux and Unix-like kernels.

By integrating SLURM with UFM, you can:

- Assign partition keys (PKeys) to SLURM nodes that are assigned for specific SLURM jobs.
- Create SHARP reservations based on SLURM nodes assigned for specific SLURM jobs.

Prerequisites

- UFM 6.9.0 (or newer) installed on a RedHat 7.x
- Python 2.7 on SLURM controller
- UFM-SLURM integration files (provided independently)

Automatic Installation

A script is provided to install the UFM-SLURM integration automatically.

1. Using the SLURM controller, extract the UFM-SLURM integration tar file:

```
tar -xf ufm_slurm_integration.tar.gz
```

2. Run the installation script using root privileges.

```
sudo ./install.sh
```

Manual Installation

To install the UFM-SLURM integration manually:

1. Extract the UFM-SLURM integration tar file:

```
tar -xf ufm_slurm_integration.tar.gz
```

2. Copy the UFM-SLURM integration files to the SLURM controller folder.
3. Change the permissions of the UFM-SLURM integration files to 755.
4. Modify the SLURM configuration file on the SLURM controller, `/etc/slurm/slurm.conf`, and add/modify the following two parameters:

```
PrologSlurmctld=/etc/slurm/ufm-prolog.sh  
EpilogSlurmctld=/etc/slurm/ufm-epilog.sh
```

UFM SLURM Config File

The integration process uses a configuration file located at `/etc/slurm/ufm_slurm.conf`. This file is used to configure settings and attributes for UFM-SLURM integration.

Here are the contents:

Attribute Name	Description	Optionality
ufm_server	IP of UFM server to connect to	Mandatory
auth_type	Should be <code>token_auth</code> , or <code>basic_auth</code> If you select <code>basic_auth</code> , you need to set <code>ufm_server_user</code> and <code>ufm_server_pass</code> If you select <code>token_auth</code> , you need to set <code>token_auth</code>	Mandatory
ufm_server_user	Username of UFM server used to connect to UFM, if you set <code>auth_type=basic_auth</code>	Mandatory, depends on the auth_type
ufm_server_pass	UFM server user password	Mandatory, depends on the auth_type
token	Generated token when you set <code>uth_type</code> to <code>token_auth</code>	Mandatory, depends on the auth_type
pkey_allocation	By setting <code>pkey_allocation</code> to true, UFM SLURM Integration will use static Pkey assignment to create new Pkey, otherwise it will use the default management Pkey 0x7fff	Mandatory, default is True.
pkey	Hexadecimal string between "0x0001"- "0x7ffe" exclusive	Optional, default is "0x7fff" (This is the default management pkey)

Attribute Name	Description	Optionality
ip_over_ib	PKey is a member in a multicast group that uses IP over InfiniBand	Hidden param, default is True
index0	If true, the API will store the PKey at index 0 of the PKey table of the GUID	Hidden param, default is False
sharp_allocation	By setting <code>sharp_allocation</code> to true, UFM SLURM Integration will create new SHARP allocation with all SLURM job IDs allocated to hosts	Mandatory, default is False
partially_alloc	By setting this to false, UFM will fail the SHARP allocation request if at least one node does not exist in the fabric	Optional, default is False
app_resources_limit	Application resources limitation	Hidden param, default is -1
log_file_name	Name of integration logging file	Optional

Configuring UFM for NVIDIA SHARP Allocation

To configure UFM for NVIDIA SHARP allocation/deallocation you must set `sharp_enabled` and `enable_sharp_allocation` to true in `gv.cfg` file.

Generate token_auth

If you set `auth_type=token_auth` in UFM SLURM's config file, you must generate a new token by logging into the UFM server and running the following `curl` command:

```
curl -H "X-Remote-User:admin" -XPOST
```

```
http://127.0.0.1:8000/app/tokens
```

Then you must copy the generated token and paste it into the config file beside the `token_auth` parameter.

Prolog and Epilog

After submitting jobs on SLURM, there are two scripts that are automatically executed:

- `ufm-prolog.sh` – the prolog script is executed when a job is submitted and before running the job itself. It creates the partition key (pkey) assignment and/or NVIDIA SHARP reservation and assigns the SLURM job hosts for them.
- `ufm-epilog.sh` – the epilog script is executed when a job is complete. It removes the partition key (PKey) assignment and/or NVIDIA SHARP reservation and free the associated SLURM job hosts.

Integration Files

The integration use scripts and configuration files to work, which should be copied to SLURM controller `/etc"/slurm`. Here is a list of these files:

File Name	Description
<code>ufm-prolog.sh</code>	Bash file which executes jobs related to UFM after the SLURM job is completed
<code>ufm-epilog.sh</code>	Bash file which executes jobs related to UFM before the SLURM job is executed
<code>ufm_slurm.conf</code>	UFM-SLURM integration configuration file
<code>ufm_slurm_prolog.py</code>	Python script file which creates the partition key (pkey) assignment and/or SHARP reservation when the prolog bash script is running
<code>ufm_slurm_epilog.py</code>	Python script file which removes partition key (pkey) assignment and/or SHARP reservation based on the SLURM job hosts.

File Name	Description
ufm_slurm_utils.py	Utility Python file containing functions and utilities used by the integration process

Running UFM-SLURM Integration

Using the SLURM controller, execute the following commands to run your batch job:

```
$ sbatch -N4 slurm_demo.sh
Submitted batch job 1
```

Note

N4 is the number of compute nodes used to run the jobs.
`slurm_demo.sh` is the job batch file to be run.

The output and result are stored on the working directory `slurm-{id}.out` where `{id}` is the ID of the submitted job.

In the above example, after executing `sbatch` command, you can see that the submitted job ID is 1. Therefore, the output file would be stored in `slurm-1.out`.

Execute the following command to see the output:

```
$cat slurm-1.out
```

On the UFM side, a partition key (PKey) is created in case the `pkey_allocation` parameter is set to true in the configuration file, and the user provided the PKey name including the SLURM job IDs allocated to the hosts. Otherwise it will use the default management PKey.

In addition, the UFM-SLURM will create SHARM AM reservation in case the `sharp_allocation` parameter is set to true in the `ufm_slurm.conf` file.

After the SLURM job is completed, the UFM removes the job-related partition key (PKey) assignment and SHARP reservation, if they were created.

From the moment a job is submitted by the SLURM server until its completion, a log file named `/tmp/ufm_slurm.log` logs all of the actions and errors that occurred during the execution.

This log file can be changed by modifying the `log_file_name` parameter in `/etc/slurm/ufm_slurm.conf`.

Appendix - Switch Grouping

To facilitate the logical grouping of 1U switches into a "director-like switch" group, the UFM implements a special dedicated group of interconnected 1U switches based on a YAML configuration file. This group, which is of type "superswitch", only includes 1U switches connected to each other, with some functioning as lines and others as spines.

To access the configuration file for superswitches, users can define the path in the [SubnetManager] section of the `gv.cfg` file, using the variable name "`super_switch_config_file_path`". For instance, the path can be specified as follows:

```
super_switch_config_file_path=/opt/ufm/files/conf/super_switches_conf
```

It is important to note that the file must be located in the `/opt/ufm/files` tree, as it should be replicated between master and slave UFM servers in a high-availability configuration.

The structure of the superswitch definition should be as follows, based on the following example:

```
superswitch:  
  - name: "Marlin01" # Director switch name  
    description: "primary dc switch" # Free text with the customer  
      facing description
```

```

    location: "US,NC,DC01" # Director switch location (global
location, includes all racks/switches)
    racks: # Director switch Racks definitions
        #Rack definition
        - name: "rack A" # Director switch rack name
          location:
            dc-grid-row: "A" # formalized rack location in DC
            dc-grid-column: "1" # formalized
            comments: "left-most rack in the line" #Cutomer facing comment on
the rack
          leafs: # List of Director switch leafs (for the rack
specified)
            - guid: "0x043f720300922a00" #required filed. Switch GUID.
              location-u: 1 # required field. Device location in
rack: "U#"
              description: "MF0;gorilla-01:MQM9700/U1" # optional field.
            - guid: "0x043f720300899cc0" #required filed. Switch GUID.
              location-u: XX # required field. Device location in
rack: "U#"
              description: "MF0;gorilla-01:MQM9700/U2" # optional field.
          spines: # List of Director switch spines (for the rack
specified)
            - guid: "0x043f720900922a00" #required filed. Switch GUID.
              location-u: 10 # required field. Device location in
rack: "U#"
              description: "MF0;gorilla-02:MQM9700/U1" # optional field.
            - guid: "0x043f720900899cc0" #required filed. Switch GUID.
              location-u: XX # required field. Device location in
rack: "U#"
              description: "MF0;gorilla-02:MQM9700/U2" # optional field.
        - name: "Marlin02" # Director switch name
          description: "primary dc switch" # Free text with the customer
facing description
          location: "US,NC,DC01" # Director switch location (global
location, includes all racks/switches)
          racks: # Director switch Racks definitions

```

```

#Rack definition
- name: "rack B" # Director switch rack name
  location:
    dc-grid-row: "B" # formalized rack location in DC
    dc-grid-column: "1" # formalized
    comments: "left-most rack in the line" #Cutomer facing comment on
the rack
    leafs: # List of Director switch leafs (for the rack
specified)
      - guid: "0x093f720300922a00" #required filed. Switch GUID.
        location-u: 1 # required field. Device location in
rack: "U#"
        description: "MF0;gorilla-03:MQM9700/U1" # optional field.
      - guid: "0x093f720300899cc0" #required filed. Switch GUID.
        location-u: XX # required field. Device location in
rack: "U#"
        description: "MF0;gorilla-03:MQM9700/U2" # optional field.
    spines: # List of Director switch spines (for the rack
specified)
      - guid: "0x093f720900922a00" #required filed. Switch GUID.
        location-u: 10 # required field. Device location in
rack: "U#"
        description: "MF0;gorilla-04:MQM9700/U1" # optional field.
      - guid: "0x093f720900899cc0" #required filed. Switch GUID.
        location-u: XX # required field. Device location in
rack: "U#"
        description: "MF0;gorilla-04:MQM9700/U2" # optional field

```

UI Presentation

The logical grouping can be accessed under the "Groups" view, specifically listed as "SuperSwitch group" type.

Groups Local Time [redacted] ? admin

All + New Displayed Columns CSV

Severity	Name ↑	Description	Type
Info	1U Switches	Includes all 1U Switches that exist in the fabric	General
Info	Alarmed Devices	Devices with alarms	General
Info	Devices Pending FW Transceivers Reset	Includes all Devices that pending FW transceivers reset t...	General
Info	Gateway Devices	Includes all Gateway Devices that exist in the fabric	General
Info	Marlin01	SuperSwitch group	SuperSwitch
Info	Marlin02	SuperSwitch group	SuperSwitch
Info	Modular Switches	Includes all Modular Switches that exist in the fabric	General
Info	Routers	Includes all Router Devices that exist in the fabric	General
Info	Servers	Includes all Hosts that exist in the fabric	General
Info	Servers With DPU	Includes all Devices that has DPU that exist in the fabric	General
Info	Suppressed Devices	No event notifications issued	General
Info	Switches	Includes all Switches that exist in the fabric	General

Viewing 1-12 of 12 ⏪ ⏩ 20

Upon selecting the group type SuperSwitch, additional columns containing information related to the SuperSwitch are added to the details view.

Groups Local Time [redacted] Last Update [redacted] ? admin

All + New Displayed Columns CSV

Severity	Name ↑	Description	Type
Info	1U Switches	Includes all 1U Switche...	General
Info	Alarmed Devices	Devices with alarms	General
Info	Devices Pending FW Tr...	Includes all Devices tha...	General
Info	Gateway Devices	Includes all Gateway D...	General
Info	Marlin01	SuperSwitch group	SuperSwitch
Info	Marlin02	SuperSwitch group	SuperSwitch
Info	Modular Switches	Includes all Modular S...	General
Info	Routers	Includes all Router Dev...	General
Info	Servers	Includes all Hosts that ...	General
Info	Servers With DPU	Includes all Devices tha...	General
Info	Suppressed Devices	No event notifications i...	General
Info	Switches	Includes all Switches t...	General

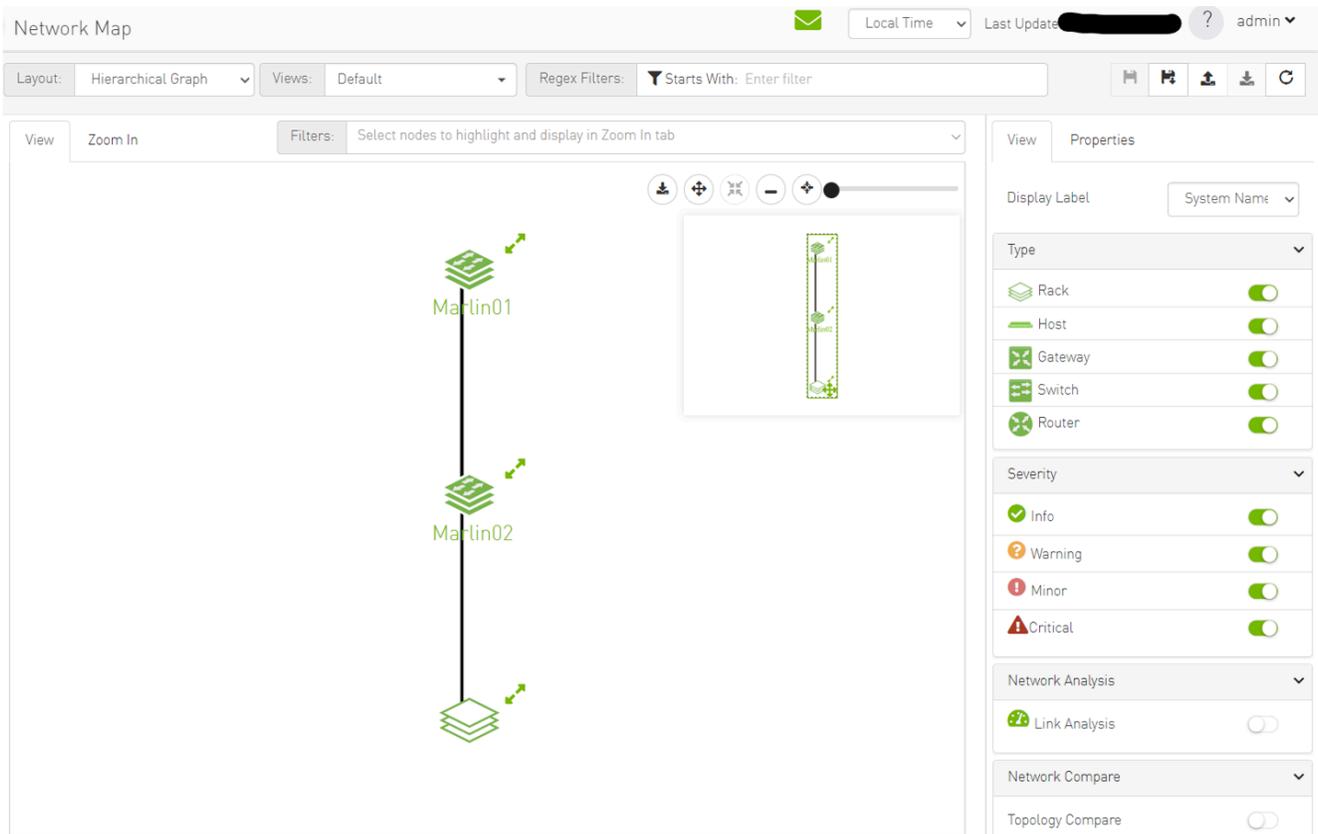
Viewing 1-12 of 12 ⏪ ⏩ 20

Marlin01 - Members Displayed Columns

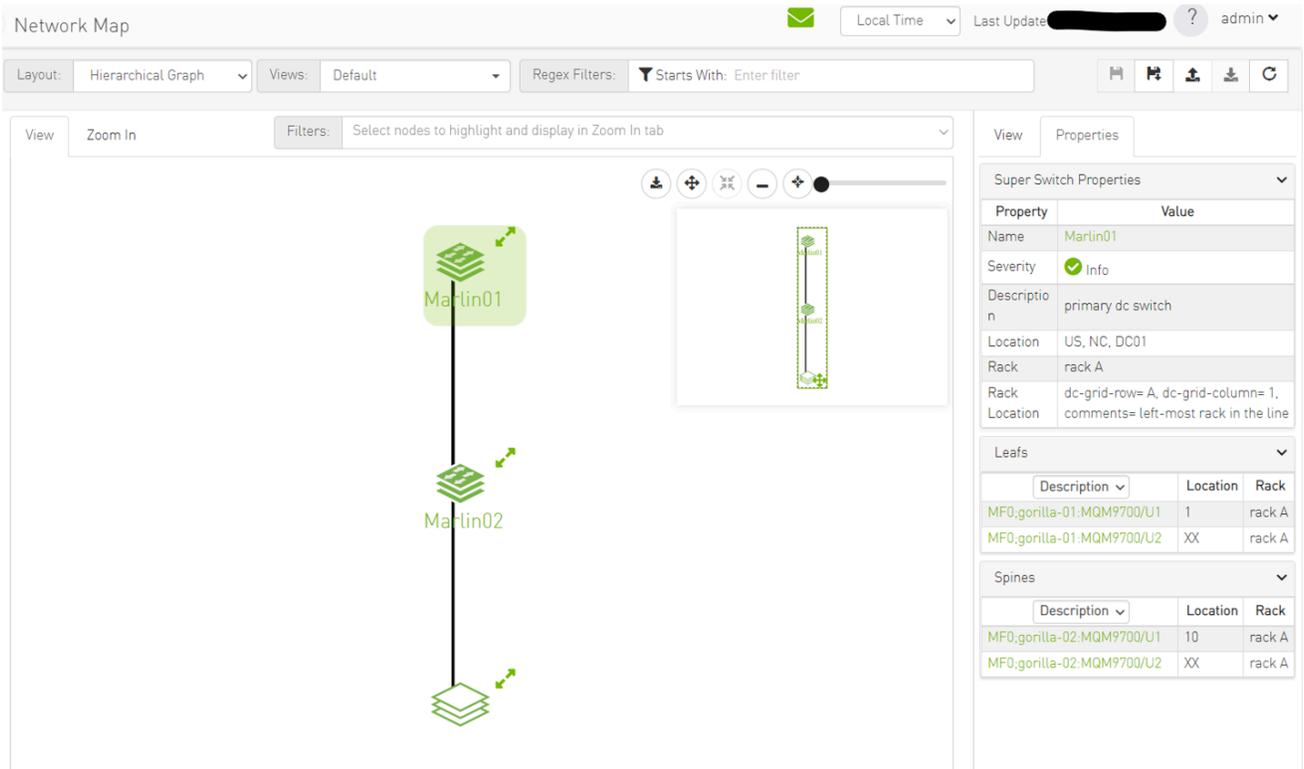
Name ↑	GUID	IP	Type	Descri...	Locati...	Rack
gorilla-01	0x043f72...	0.0.0.0	leaf	MF0:gori...	1	rack A
gorilla-01	0x043f72...	0.0.0.0	leaf	MF0:gori...	XX	rack A
gorilla-07	0x073f72...	0.0.0.0	spine	MF0:gori...	10	rack A
gorilla-07	0x073f72...	0.0.0.0	spine	MF0:gori...	XX	rack A

Viewing 1-4 of 4 ⏪ ⏩ 20

An icon for the SuperSwitch group in its collapsed view exists on the network map.



Upon selecting the SuperSwitch group, all of its properties can be viewed in the details view.



Expanding the SuperSwitch group icon displays all the switches included in the group as separate 1U switches, along with their respective properties.

Network Map

Local Time Last Update admin

Layout: Hierarchical Graph Views: Default Regex Filters: Starts With: Enter filter

View Zoom In Filters: Select nodes to highlight and display in Zoom In tab

View Properties

Super Switch Properties

Property	Value
Name	Marlin01
Severity	Info
Description	primary dc switch
Location	US, NC, DC01
Rack	rack A
Rack Location	dc-grid-row= A, dc-grid-column= 1, comments= left-most rack in the line

Leafs

Description	Location	Rack
MF0.gorilla-01.MQM9700/U1	1	rack A
MF0.gorilla-01.MQM9700/U2	XX	rack A

Spines

Description	Location	Rack
MF0.gorilla-02.MQM9700/U1	10	rack A
MF0.gorilla-02.MQM9700/U2	XX	rack A

Network Map

Layout: Hierarchical Graph Views: Default Regex Filters: Starts With: Enter filter

View: Zoom In Filters: Select nodes to highlight and display in Zoom In tab

View Properties

System Properties

Property	Value
Name	gorilla-07
IP	0.0.0.0
GUID	0x073f720300922a00
Type	switch
Model	MQM9700
Severity	Info
FW Version	N/A
PSID	N/A
Total Alarms	0
Temperature	N/A
Description	MQM9700
SW Version	N/A

System Ports

Port Name
gorilla-07:1
gorilla-07:13
gorilla-07:14

On the devices view, switches that are part of the SuperSwitch group are marked with an additional icon that indicates their role in the group. The "S" icon denotes spines, while the "L" icon denotes lines.

Devices

Local Time Last Update admin

All Types All Groups Displayed Columns CSV

Severity	Name	GUID	Type	Model	IP	Firmware Version
Info	gorilla-01	0x043f720300922a00	switch	MQM9700	0.0.0.0	
Info	gorilla-07	0x073f720300922a00	switch	MQM9700	0.0.0.0	
Info	gorilla-08	0x083f720300922a00	switch	MQM9700	0.0.0.0	
Info	gorilla-02	0x093f720300922a00	switch	MQM9700	0.0.0.0	
Info	gorilla-01	0x043f720300899cc0	switch	MQM9700	0.0.0.0	
Info	gorilla-07	0x073f720300899cc0	switch	MQM9700	0.0.0.0	
Info	gorilla-08	0x083f720300899cc0	switch	MQM9700	0.0.0.0	
Info	gorilla-02	0x093f720300899cc0	switch	MQM9700	0.0.0.0	
Info	r-ufm50	0x248a0703008fa050	host		0.0.0.0	

Viewing 1-9 of 9

Selecting a switch that belongs to the SuperSwitch group in the properties view allows you to view all the switch properties related to the SuperSwitch group.

Devices Local Time Last Update [redacted] ? admin

All Types All Groups Refresh Displayed Columns CSV

Name	GUID	Type	Model	IP	Firmwa...
gorilla-01	0x043f720...	switch	MQM97	0.0.0.0	
gorilla-07	0x073f720...	switch	MQM97	0.0.0.0	
gorilla-08	0x083f720...	switch	MQM97	0.0.0.0	
gorilla-02	0x093f720...	switch	MQM97	0.0.0.0	
gorilla-01	0x043f720...	switch	MQM97	0.0.0.0	
gorilla-07	0x073f720...	switch	MQM97	0.0.0.0	
gorilla-08	0x083f720...	switch	MQM97	0.0.0.0	
gorilla-02	0x093f720...	switch	MQM97	0.0.0.0	
r-ufm50	0x248a07...	host		0.0.0.0	

Viewing 1-9 of 9

0x073f720300922a00 - Device Information

General Ports Cables Groups Alarms Events Inventory

Device Access Super Switch

Property	Value
Description	MF0:gorilla-02:MQM9700/U1
Location	10
Type	spine
Rack Name	rack A
Rack Location	dc-grid-row=A, dc-grid-column=1, comment...
Super Switch Name	Marlin01

Note

Each SuperSwitch definition can include one or more racks where each embedded rack can include multiple leafs and spines switches.

Appendix – Device Management Feature Support

The following table describes the management features available on supported devices.

Feature	10 Gb Ethernet Gateway Module	Grid Director 4700/4200/4036/4036E v3.5	Managed IS5000 Switches	Managed SX6000 Switches	Externally Managed IS5000 / SX6000 Switches	Gateway BX5020	HP C-Class	Linux Hosts	Windows Hosts
Discovery									

Feature	10 Gb Ethernet Gateway Module	Grid Director 4700/4200/4036/4036E v3.5	Managed IS5000 Switches	Managed SX6000 Switches	Externally Managed IS5000 / SX6000 Switches	Gateway BX5020	HP C-Class	Linux Hosts	Windows Hosts
IB L2 Discovery	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Advanced Discovery (IP, hostname, Hosts: CPU, memory, FW version)	Yes	Yes	No	Yes	No	No	No	Yes with UFM Host Agent	No
Ethernet access Management interface	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes
Provisioning/ Configuration									
IB Partitioning (pkey)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Feature	10 Gb Ethernet Gateway Module	Grid Director 4700/4200/4036/4036E v3.5	Managed IS5000 Switches	Managed SX6000 Switches	Externally Managed IS5000 / SX6000 Switches	Gateway BX5200	HP C-Class	Linux Hosts	Windows Hosts
QoS: SL (SM configuration)	N/A	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
QoS: Rate Limit (SM configuration)	N/A	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Interface/VIF Configuration (IP, hostname, mtu, Bonding)	N/A	N/A	N/A	N/A	N/A	No	N/A	Yes with UFM Host Agent	No
Device Monitoring									
Device Resources: CPU, Memory, Disk	No	Yes	No	No	No	No	No	Yes with UFM Host Agent	No

Feature	10 Gb Ethernet Gateway Module	Grid Director 4700/4200/4036/4036E v3.5	Managed IS5000 Switches	Managed SX6000 Switches	Externally Managed IS5000 / SX6000 Switches	Gateway BX5020	HP C-Class	Linux Hosts	Windows Hosts
Get device alerts (Temperature, PS, Fan) Note: This feature is not supported on Switch-X switches.	Yes	Yes	No	Yes	Yes	No	No	No	No
L1 (Physical Port) – Monitoring	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
L2-3 (Interface/VIF) – Monitoring	No	No	No	No	No	No	No	Yes with UFM Host Agent	No
Congestion	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Feature	10 Gb Ethernet Gateway Module	Grid Director 4700/4200/4036/4036E v3.5	Managed IS5000 Switchesv	Managed SX6000 Switches	Externally Managed IS5000 / SX6000 Switches	Gateway BX5200	HP C-Class	Linux Hosts	Windows Hosts
Monitoring per port (enables congestion map)									
Congestion Monitoring per flow (Advanced Package)	No	Yes	No	No	No	No	No	No	No
Device Management									
Add/remove to/from Rack	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Add/remove to/from Logical Server	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes	Yes

Feature	10 Gb Ethernet Gateway Module	Grid Director 4700/4200/4036/4036E v3.5	Managed IS5000 Switches	Managed SX6000 Switches	Externally Managed IS5000 / SX6000 Switches	Gateway BX5200	HP C-Class	Linux Hosts	Windows Hosts
View/clear Alarms	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SSH terminal to device	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes
Power On	No	No	No	No	No	No	No	Yes with IPMI	No
Reboot	No	No	No	Yes (SX3606 only)	No	No	No	Yes with IPMI	No
Shutdown	No	No	No	No	No	No	No	Yes with IPMI	No
Port Enable/Disable	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firmware Upgrade (HCA & switch)	No	Yes	No	Yes (Upon SW upgrade – SX6036 only)	No	No	No	Yes	No
Inband Firmw	No	No	No	No	Yes	No	No	Yes	Yes

Feature	10 Gb Ethernet Gateway Module	Grid Director 4700/4200/4036/4036E v3.5	Managed IS5000 Switches	Managed SX6000 Switches	Externally Managed IS5000 / SX6000 Switches	Gateway BX5020	HP C-Class	Linux Hosts	Windows Hosts
are Upgrade (over InfiniB and connection)									
Software Upgrade (OFED & switch)	No	Yes	No	Yes (SX3606 only)	No	No	No	Yes with UFM Host Agent	No
Protocols									
Communication UFM Server - Device	IB/SNMP	IB/UDP/SSH	IB	IB/HTTP/SSH	IB	IB	IB	IB, SSH, IPMI, UDP	IB

1. For a full list of supported IS5000 switches, see [Supported IS5000 Switches](#).
2. QoS Rate Limit (SM configuration): On ConnectX HCAs-only, for hosts.
3. XmitWait counter monitoring requires ConnectX HCAs with firmware version 2.6 and above.
4. This feature requires that the IP address is configured.

Appendix – UFM Event Forwarder

UFM Event Forwarder enables streaming of UFM events via FluentBit forwarder plugin to any external destination.

To deploy the UFM Event Forwarder on a Linux machine:

1. Connect to the Linux host via SSH.
2. Ensure the docker is installed on the host. Run:

```
# docker -version
```

3. Make sure that the docker service is up and running. If it is not, start the docker service. Run:

```
# sudo service docker start
```

4. Pull the UFM Event Forwarder image. Run:

```
# sudo docker pull mellanox/ufm-events-forwarder
```

Alternatively, if you do not have internet connection, contact NVIDIA Support to receive the UFM Event Forwarder docker image and load it to the host. Run:

```
# sudo cp <ufm-events-forwarder image path> /tmp/  
# sudo docker load -i /tmp/<image name>
```

5. If you are running in HA mode, repeat step 1-4 on the standby node.

Note

Steps 6-9 should only be configured on the master node.

6. Enable the event-forwarder in main UFM config file. Run:

```
# vim /opt/ufm/files/conf/gv.cfg
[Plugins]
events_forwarder_enabled=true
```

7. Configure UFM to send events via syslog to the FluentBit event forwarder in gv.cfg.

```
[Logging]
syslog_addr=127.0.0.1:5140
syslog = true
ufm_syslog = true
event_syslog = true
syslog_level = <severity>
```

Note

`<severity>` may be set to any of the following values:
CRITICAL, ERROR, WARNING, INFO, or DEBUG.

8. Configure the destination IP and port for the FluentBit event forwarder (requires Python 3):

```
# python /opt/ufm/scripts/events-forwarder/configure-fluent-bit.pyc -i <IP> -p <port>
```

Alternatively, if you have Python 2:

```
# /opt/ufm/venv_ufm/bin/python /opt/ufm/scripts/events-forwarder/configure-fluent-bit.pyc -i <IP> -p <port>
```

9. Start UFM. Run:

```
# /etc/init.d/ufmd start
```

Alternatively, if you are running in HA:

```
# /etc/init.d/ufmha start
```

10. Verify that UFM Event Forwarder is running successfully. Run:

```
# /etc/init.d/ufmd start
ufmd start
Starting opensm: [
OK ]
Starting MySQL: [
OK ]
Restarting httpd: [
OK ]
Starting snmpd: [
OK ]
```

```

Starting UFM main module:           [
OK ]
Starting Events-Forwarder:         [
OK ]
Starting Daily Report:             [
OK ]
Starting UnhealthyPorts:          [
OK ]
Starting ibpm:                     [
OK ]

```

Note

Make sure the status of Events-Forwarder is OK.

Stopping UFM will also stop the Event Forwarder.

```

# /etc/init.d/ufmd stop
ufmd stop
Stopping ibpm:                       [ OK
]
Stopping Daily Report:              [ OK
]
Stopping UnhealthyPorts:            [ OK
]
Stopping Events-Forwarder:          [ OK
]
Stopping UFM main module:           [ OK
]
Stopping MySQL:                     [ OK
]

```

Stopping OpenSM:

[OK

]

After configuration, the Event Forwarder should always be running on the active node only. After a failover, for example, it will be stopped on the old master and will be started on the new active node.

If the destination IP and port are reconfigured (step 8), the Event Forwarder container should be restarted automatically with the newly applied configuration.

Document Revision History

Release	Date	Description
6.16.0-5	Feb 16, 2025	Updated Bug Fixes in This Release
6.16.0	Feb 8, 2024	<p>Updated:</p> <ul style="list-style-type: none"> • Changes and New Features • Bug Fixes in This Release • Installation Notes • Secondary Telemetry - Added the secondary_slvl_support flag and information on the default counters and added Secondary Telemetry Exposing IPv6 Counters • PDR Deterministic Plugin - Updated instructions • Link Analysis - Updated GUI screenshots • Device Cable Tab - Updated GUI screenshots • Cables Window - Updated GUI screenshots • Packet Mirroring Collector (PMC) Plugin - Updated overview and GUI screenshots • General Tab, Inventory Tab and Inventory Window - Updated GUI screenshots • SM Congestion Control Configuration - Updated GUI screenshot • Autonomous Link Maintenance (ALM) Plugin - Added GUI screenshots in ALM UI • Appendix - UFM Subnet Manager Default Properties - Updated the max_op_vls from 3 to 2. <p>Added:</p>

Release	Date	Description
		<ul style="list-style-type: none"> • Kerberos Authentication and Enabling Kerberos Authentication • Secondary Telemetry Exposing IPv6 Counters • Dynamic Telemetry • Configuring Syslog • Configuring UFM Logging • Appendix - OpenSM Configuration Files for Congestion Control
	Mar 6, 2024	Updated: <ul style="list-style-type: none"> • Troubleshooting • Known Issues in This Release • Installation Notes
	Jul 2, 2024	Updated Installation Notes - Added RedHat 8.8 support
6.15.2	Jan 4, 2024	Updated: <ul style="list-style-type: none"> • Changes and New Features • Known Issues in This Release
	Jan 23, 2024	Added a note to Installation Notes about the UFM SM version
6.15.1	Dec 14, 2023	Updated: <ul style="list-style-type: none"> • Bug Fixes in This Release • Known Issues in This Release • Supported NVIDIA Internally Managed Switches - Removed MTX6100, MTX6240 and MTX6280 switches and the SX6036G (FDR) gateway • Installation Notes - Updated with the new MFT package version • System Requirements - Added MLNX_OFED23.x • Unsupported Functionalities/Features Added: Cable Validation Report in Subnet Merger

Release	Date	Description
	Dec 19, 2023	<ul style="list-style-type: none"> • Updated Changes and New Features • Added a Known issue to Bug Fixes in This Release
6.15.0	Nov 5, 2023	<p>Updated:</p> <ul style="list-style-type: none"> • Changes and New Features • Bug Fixes in This Release • Azure Authentication Login Page - Introduced new Azure authentication login page • Enabling Azure AD Authentication - Added further instructions • UFM Logs Tab - Added log occurrences display <p>Added</p> <ul style="list-style-type: none"> • Events History • Device Status Events • Link Status Events • GNMI-Telemetry Plugin • In Secondary Telemetry, added instructions on Exposing Switch Aggregation Nodes Telemetry and Stopping Telemetry Endpoint Using CLI Command • UFM Authentication Server • Enabling UFM Authentication Server • Appendix – Secondary Telemetry Fields
6.14.1	Aug 31, 2023	<p>Updated:</p> <ul style="list-style-type: none"> • Changes and New Features • Bug Fixes in This Release
	Oct 17, 2023	<p>Updated:</p> <p>System Requirements</p>
6.14.0	Aug 10, 2023	<p>Updated:</p> <ul style="list-style-type: none"> • Changes and New Features

Release	Date	Description
		<ul style="list-style-type: none"> • Bug Fixes in This Release • Known Issues in This Release • Plugin Management • Secondary Telemetry • PDR Deterministic Plugin - Updated step 3 in "Deployment". • rest-rdma Plugin • NDT Plugin • Autonomous Link Maintenance (ALM) Plugin • Appendix - Supported Port Counters and Events - Added alarm ID #134, 1602 and 1603 and status column for all alarm IDs. <p>Added:</p> <ul style="list-style-type: none"> • Disabling Rest Roles Access Control • Enabling Azure AD Authentication • Azure AD Authentication • Health Policy Management • Rest Roles Access Control • Appendix - UFM Factory Reset
6.13.1	May 18, 2023	<p>Updated:</p> <ul style="list-style-type: none"> • Changes and New Features • Bug Fixes in This Release
6.13.0	May 5, 2023	<p>Updated:</p> <ul style="list-style-type: none"> • Changes and New Features • Bug Fixes in This Release • Known Issues in This Release • Email - Added time zone preference • NDT Plugin • UFM Telemetry FluentD Streaming (TFS) Plugin - Updated REST API • UFM System Dump Tab • Appendix - Supported Port Counters and Events <p>Added:</p>

Release	Date	Description
		<ul style="list-style-type: none"> • Multi-Subnet UFM • Enable Network Fast Recovery • NDT Format Merger • Subnet Merger UI • Added the following Plugins: <ul style="list-style-type: none"> ◦ UFM Bright Cluster Integration Plugin ◦ UFM Cyber-AI Plugin ◦ Autonomous Link Maintenance (ALM) Plugin ◦ DTS Plugin ◦ Sysinfo Plugin ◦ SNMP Plugin ◦ Packet Mirroring Collector (PMC) Plugin ◦ PDR Deterministic Plugin
	May 9, 2023	Updated <ul style="list-style-type: none"> • Known Issues in This Release • Appendix – Enhanced Quality of Service - Updated notes and example
6.12.1	Feb 19, 2023	Updated <ul style="list-style-type: none"> • Changes and New Features • Bug Fixes in This Release • Known Issues in This Release
	Mar 1, 2023	Updated Changes and New Features
	Mar 16, 2023	Updated Changes and New Features - Added MFT package integration details
	Mar 27, 2023	Updated UFM Server Communication with Externally Managed Switches
6.12.0	Feb 2, 2023	Updated: <ul style="list-style-type: none"> • Changes and New Features • Bug Fixes in This Release • Known Issues in This Release • Configuring Partial Switch ASIC Failure Events

Release	Date	Description
		<ul style="list-style-type: none"> Updated example in Multi-port SM UFM System Dump Tab Appendix – Used Ports Appendix - UFM SLURM Integration <p>Added:</p> <ul style="list-style-type: none"> Added a note under Ports Window Added a note under Unhealthy Ports Window Delegate Authentication to a Proxy <p>Removed:</p> <ul style="list-style-type: none"> UFM Logical Elements tab from the Web UI
	Feb 6, 2023	Updated Troubleshooting
6.11.1	Dec 1, 2022	<p>Updated:</p> <ul style="list-style-type: none"> Changes and New Features to include the upgrade of NVIDIA SHARP SW version Installation Notes Known Issues in This Release Troubleshooting
	Dec 19, 2022	Updated Changes and New Features
6.11.0	Nov 21, 2022	<p>Updated:</p> <ul style="list-style-type: none"> Added a link to UFM SDK 3.0 under Related Documentation Changes and New Features Installation Notes Bug Fixes in This Release Known Issues in This Release Installing UFM HA Package Network Map with new screenshots and new instructions for Map Information and Settings Devices Window with new screenshots

Release	Date	Description
		<ul style="list-style-type: none"> • PSID and Firmware Version In-Band Discovery • Groups Window with new screenshots • Table Enhancements with new screenshots • UFM Telemetry FluentD Streaming (TFS) Plugin • Enabling UFM Telemetry <p>Added:</p> <ul style="list-style-type: none"> • CPU Affinity on UFM • Switch Management IP Address Discovery • UFM Events Fluent Streaming (EFS) Plugin • In Telemetry <ul style="list-style-type: none"> ◦ Changing UFM Telemetry Default Configuration ◦ Supporting Generic Counters Parsing and Display ◦ Supporting Multiple Telemetry Instances Fetch ◦ Secondary Telemetry
6.10.0	July 31, 2022	<p>Updated:</p> <ul style="list-style-type: none"> • Release Notes • UFM Installation and Initial Configuration • Installation Notes • UFM Software Architecture • Network Management • Subnet Manager Tab • Non-Optimal Links • Cable Transceiver Temperatures • Telemetry • Network Management • Supported Actions for Internally Managed Switches • Appendix – NVIDIA SHARP Integration • Appendix – SM Default Files

Release	Date	Description
		<ul style="list-style-type: none"> • Appendix – UFM Subnet Manager Default Properties • Appendix – SM Activity Report • Appendix – Configuration Files Auditing • Appendix – Enhanced Quality of Service • Appendix – Partitioning • Appendix – Diagnostic Utilities • Appendix – Adaptive Routing • Appendix - UFM SLURM Integration <p>Added:</p> <ul style="list-style-type: none"> • Showing UFM Processes Status • Plugin Management • Appendix – Configuration Files Auditing
	September 2022	<p>Updated:</p> <ul style="list-style-type: none"> • Appendix – UFM Event Forwarder • NDR switches firmware version in Supported NVIDIA Externally Managed Switches. • Licensing • License Devices limit in UFM Health Tab • Operating NVIDIA SHARP AM with UFM • Changes and New Features • Unsupported Functionalities/Features
	October 2022	Updated the examples in Docker Installation

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Apache HTTP Server	1.3.7, 1.3.8	http://httpd.apache.org/	Apache License 1.0
Apache HTTP Server	2, 2.0.11, 2.0.23, 2.0.25, 2.0.26, 2.0.30, 2.0.33, 2.0.35, 2.0.36, 2.0.38, 2.0.39, 2.0.40, 2.0.41, 2.0.43, 2.1.0	http://httpd.apache.org/	Apache License 1.1
Apache HTTP Server	2.0.59, 2.1.1, 2.1.10, 2.1.2, 2.1.3, 2.1.4, 2.1.5, 2.1.6, 2.1.7, 2.1.8, 2.1.9, 2.2.1, 2.2.2, 2.2.12, 2.2.13, 2.2.14, 2.2.15, 2.2.16, 2.2.17, 2.2.22, 2.2.26, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.9, 2.3.0, 2.3.1, 2.3.4	http://httpd.apache.org/	Apache License 2.0
Apache HTTP Server	STRIKER_2_1_0_RC1	http://httpd.apache.org/	Apache License 2.0
Apache Portable Runtime	0.9.13, 0.9.15, 1.2.0, 1.2.10, 1.2.11, 1.2.12, 1.2.7, 1.2.8, 1.2.9, 1.3.0, 1.3.1, 1.3.10, 1.3.12, 1.3.2, 1.3.3, 1.3.4, 1.3.5, 1.3.7, 1.3.8, 1.3.9, 1.4.7, 1.5.1, 1.5.2; APR_1_0_RC2; JCW_0_9_5_PRE1	http://apr.apache.org/	Apache License 2.0

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Apache Portable Runtime	0.9.4 APACHE_2_0_37 APACHE_2_0_40 APACHE_2_0_44 APACHE_2_0_48	http://apr.apache.org/	Apache License 1.1
Apache Portable Runtime	APU_1_0_RC1	http://apr.apache.org/	(MIT License AND RSA Message-Digest License AND Apache License 2.0 AND Beerware License AND RSA MD4 or MD5 Message-Digest Algorithm License AND Christian Michelsen Research License AND Apache License 1.1)
Apache Tomcat	1.1.0, 6.0.24	http://tomcat.apache.org/	Apache License 2.0
BIND9 (Berkeley Internet Name Domain)	9.9.11	https://www.isc.org/wordpress/software/bind/	Mozilla Public License 2.0
Berkeley DB	4.5.20	http://www.oracle.com/technology/products/berkeley-db/db/index.html	BSD 3-clause "New" or "Revised" License
Chromium (Google Chrome)	32.0.1700.102	http://code.google.com/chromium/	BSD 3-clause "New" or "Revised" License
Cinder	v0.8.0	http://libcinder.org	BSD 3-clause "New" or

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			"Revised" License
Clonezilla	1.2.10	http://clonezilla.org/	GNU General Public License v3.0 or later
Cron	3.0pl1	https://alioth.debian.org/projects/pkg-cron/	Cron License
CyanogenMod - android_external_busybox	cm-10.1-M1, cm-10.1-M2	https://github.com/CyanogenMod/android_external_busybox/blob/cm-12.0/LICENSE	GNU General Public License v2.0 or later
D-Bus	1.2.6	http://www.freedesktop.org/wiki/Software/dbus	Academic Free License v2.1
DHCP (ISC)	4.3.6	http://www.isc.org/downloads/dhcp/	ISC License
Darik's Boot and Nuke	dban-2.0.0	http://sourceforge.net/projects/dban	(GNU Lesser General Public License v3.0 or later AND GNU General Public License v3.0 or later)
Debian Games	11.04.1+repack	http://wiki.debian.org/Games	BSD 3-clause "New" or "Revised" License
FLAC - Free Lossless Audio Codec	flac-1.1.1-beta1-src	http://flac.sourceforge.net	BSD 3-clause "New" or "Revised" License
FarGroup/FarManager	builds/3.0.2890	https://github.com/FarGroup/FarManager/blob/master/LICENSE	BSD 3-clause "New" or "Revised" License
FreeBSD	5.5, 6, 9.0-BETA1, release/11.2.0,12.2, 2.2.0, 2.2.6, 5.0.0cvs	https://github.com/truEOS/trueOS	BSD 2-clause "Simplified" License

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FreeBSD	bsd_44_lite	https://github.com/truEOS/truEOS	BSD 4-clause "Original" or "Old" License
FreeBSD Ports	RELEASE_4_5_0 RELEASE_4_6_0	https://www.freebsd.org/ports/	BSD 2-clause FreeBSD License
FreeNAS	0.7	https://www.freenas.org/	BSD 3-clause "New" or "Revised" License
GD	2.0.1beta, 2.0.32, 2.0.33, 2.0.34RC1, 2.0.35, 2.0.35RC5	http://www.libgd.org	GD License
GD	2.0.36_rc1	http://www.libgd.org	(X11 License OR MIT License)
GLib	1.2.3, 2.14.6, 2.19.5	http://library.gnome.org/devel/glib/	Apache License 2.0
GNU Compiler Collection	4.7.0	http://gcc.gnu.org/	(GD License OR Unknown License)
GNU Libtool	1.4.1	http://www.gnu.org/software/libtool/	BSD 3-clause "New" or "Revised" License
GNU Parted	1.8.1, 2.4	http://www.gnu.org/software/parted	GNU General Public License v2.0 or later
GNU Parted	2.4	http://www.gnu.org/software/parted	GNU General Public License v3.0 or later
Gentoo Linux	release_1_3_17	https://www.gentoo.org/	GNU General Public License v2.0 or later
Heimdal Kerberos	heimdal-0.0n	http://www.h5l.org/	BSD 3-clause "New" or

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			"Revised" License
HipHop Virtual Machine for PHP	HHVM-3.1.0	https://github.com/facebook/hhvm	(PHP License v3.01 AND Zend License v2.0)
Kablinc	1.1 Alpha1	https://www.kablinc.org/	Apache License 2.0
Less	374	http://www.greenwoodsoftware.com/less/	BSD 2-clause "Simplified" License
Less	429	http://www.greenwoodsoftware.com/less/	GNU General Public License v2.0 or later OR Less License
LineageOS	cm-10.1.0-RC1	https://lineageos.org/	(FSF Unlimited License AND BSD 3-clause "New" or "Revised" License)
Linux Test Project	2004	https://github.com/linux-test-project/ltp	GNU General Public License v2.0 or later
Linux-Pam	0.59, 0.72, 0.74, 0.76, 0.99.1.0, 0.99.2.0, 0.99.4.0, 0.99.5.0, 0.99.6.1, 0.99.6.2, 1.0.0	http://www.linux-pam.org	BSD 3-clause "New" or "Revised" License
Linux-Pam	1.0.1	http://www.linux-pam.org	(X11 License AND FSF Unlimited License)
MapServer	rel-1-0-0	http://mapserver.org	(X11 License AND MIT License)

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Merruk-Technology	2.0-20121113	http://www.merruk.ma	GNU General Public License v2.0 only
MinGW - Minimalist GNU for Windows	binutils-2.20	http://mingw.sourceforge.net/	Public Domain
MythTV	v0.13	http://www.mythtv.org	GNU General Public License v2.0 or later
NFS	1.0.6	http://linux-nfs.org/	GNU General Public License v2.0 or later
Net-SNMP	5.0.9, 5.4.2.1, 5.5.2.pre1, 5.7.3, END-UCD-SNMP. Ext-5-3-cvs20050331, JBPN-CBL-1, 5.0.11.1, 5.2.2	http://www.net-snmp.org	(CMU License AND BSD 3-clause "New" or "Revised" License)
Net-SNMP	5.1.2, Ext-5-0, Ext-5-0-2, Ext-5-0-4, Ext-5-4-1-1, V4-2-patches-merge2	http://www.net-snmp.org	(Diffstat License OR BSD 3-clause "New" or "Revised" License)
Net-SNMP	Ext-5-0, Ext-5-0-4	http://www.net-snmp.org	(Diffstat License AND BSD 3-clause "New" or "Revised" License AND Christian Michelsen Research License)
Net-SNMP	Ext-5-4-1-1	http://www.net-snmp.org	(Diffstat License AND BSD 3-clause "New" or

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			"Revised" License AND Christian Michelsen Research License AND Bzip2 License)
Net-SNMP	V4-2-patches-merge2	http://www.net-snmp.org	Diffstat License AND Christian Michelsen Research License)
Net-SNMP	5.2.4 source code, 5.2.5 pre-releases, 5.3.1, 5.3.2 pre-releases, 5.4.2 pre-releases, 5.5, Ext-4-0-pre5, Ext-4-1-pre1, Ext-5-0-2-pre1, Ext-5-0-7-pre1, Ext-5-0-8-pre1, Ext-5-2-2rc6, Ext-5-2-pre2, Ext-5-2-pre3, Ext-5-3-pre1, Ext-5-3-pre3, Ext-5-3-pre4, Ext-5-4-1-pre1, Ext-5-4-1-pre3, Ext-5-4-pre1, Ext-5-4-pre4, Ext-5-5-pre1, Ext-5-5-pre2, Ext-5-5-pre3, Ext-5-5-rc1, Ext-5-5-rc3, 5.3.0.1. 5.8.1.pre1, 5.8.1.pre2	http://www.net-snmp.org	BSD 3-clause "New" or "Revised" License
NetBSD	1.1, 1.5, 2	http://www.netbsd.org	BSD 3-clause "New" or

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			"Revised" License
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OpenFabrics Enterprise Distribution - OFED	3.1.8	https://www.openfabrics.org/downloads/rdmacm/	BSD 3-clause "New" or "Revised" License
OpenLDAP	2.4.44	http://www.openldap.org/	Open LDAP Public License v2.8
OpenSSH	5.3p1, 7.4p1, 7.7, 7.7p1, 7.8, 7.8p1, 7.9, 7.9p1, 8.0p1, pre-reorder	http://www.openssh.com/	BSD 3-clause "New" or "Revised" License
OpenSSH	7.2p2, 7.6p1	http://www.openssh.com/	X11 License
OpenWrt	12.09, 14.07	http://openwrt.org/	GNU General Public License v2.0 or later
PCRE	7.1, 7.4, 7.6	http://www.pcre.org/	PCRE License
PCRE	4, 7.6, 7.7, 7.8	http://www.pcre.org/	BSD 3-clause "New" or "Revised" License
PHP	MERGE_FROM_NEW_LOOK_2001_TAG_1	http://svn.php.net	BSD 2-clause "Simplified" License
PortableApps.com	WinMerge 2.10.0 , 2.6.12Source	http://portableapps.com/	Apache License 2.0
Python programming language	v2.4a2	https://www.python.org	Python Software Foundation License 2.0

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Qualcomm Kernel Tree for MSM/QSD family and Android 4.4	ath-201808291719	https://www.codeaurora.org/projects/all-active-projects/linux-msm	ISC License
TACACS+ client library and PAM module	1.2.10, 1.2.9	https://sourceforge.net/projects/tacplus	BSD 3-clause "New" or "Revised" License
Stephane-D/SGDK	V1.62	https://github.com/Stephane-D/SGDK/blob/master/license.txt	MIT License
TACACS+ client library and PAM module	1.3.2	https://sourceforge.net/projects/tacplus	GNU General Public License v2.0 or later
Tarifa	Tarifa019.tar	http://sourceforge.net/projects/tarifa	GNU General Public License v2.0 or later
Tcl/Tk	8.1.1	http://www.tcl.tk/	TCL/TK License
Tecla Library	1.2.3, 1.4.0, 1.4.1, 1.5.0, 1.6.0, 1.6.2	http://www.astro.caltech.edu/~mcs/tecla/index.html	MIT License
The GWARE Project	2.10.2	http://sourceforge.net/projects/gware	GNU Lesser General Public License v2.1 or later
TizenRT	1.1_Public_Release	https://github.com/Samsung/TizenRT	Apache License 2.0
UC-7402.7408.7410.7420-LX Plus Source	20100210	http://www.moxa.com/product/UC-7408.htm	GNU General Public License v2.0 only
WinMerge	2.11.1.7	https://winmerge.org/	Apache License 2.0
XAMPP	1.4.5, 1.6.4	https://www.apachefriends.org/index.html	BSD 3-clause "New" or "Revised" License

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XAMPP	1.6.4	https://www.apachefriends.org/index.html	GNU General Public License v2.0 or later
XQilla	1.1.0	http://xqilla.sourceforge.net	BSD 3-clause "New" or "Revised" License
YaST	broken/svn/openSUSE-9_3	http://opensuse.org/YaST	MIT License
Zile (Zile is Lossy Emacs)	1.4, 1.5, 1.5.2, 1.5.3, 1.6, 1.6.1, 1.6.2	http://zile.sourceforge.net	GNU General Public License v2.0 or later
afwall	V2.6.0.1, v2.8.0, v2.9.0, v2.9.1, v2.9.4	https://github.com/ukanth/afwall	MIT License
alcatel	20	http://www.alcatel-mobilephones.com/	Apache License 2.0
alcatel	4/18/2012, 20120601, 918	http://www.alcatel-mobilephones.com/	GNU General Public License v2.0 or later
appweb	3.0B.0-0	http://code.google.com/p/appweb	Apache License 2.0
asuswrt-merlin	376.48, 376.48, 380.62	https://github.com/RMerl/asuswrt-merlin	Artistic License 1.0
asuswrt-merlin	378.51, 380.62	https://github.com/RMerl/asuswrt-merlin	GNU General Public License v2.0 or later
avahi	v0.6	http://avahi.org	GNU Lesser General Public License v2.1 or later
awokengazebo-lfi	lfi-20080723	http://www.awokengazebo.com/software/lfi/	BSD 4-clause "Original" or "Old" License

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beefproject	beef-0.4.3.1	http://beefproject.com	Apache License 2.0
bitswitcher	0.2.0, 0.3.0, 0.3.3	http://sourceforge.net/projects/bitswitcher	GNU General Public License v2.0 or later
buildroot-kindle	master-20130206	https://github.com/twobob/buildroot-kindle	GNU General Public License v2.0 or later
busybox	1.10.0, 1.12.0, 1.2.0, 1.4.0, 1.5.0, 1.8.0, 1_11_0, 1_13_0, 1_14_1, 1_16_0, 1_17_1 17 1, 1_17_2, 1_18_0, 1_18_2, 1_19_0, 1_19_1, 1_19_4, 1_20_2, 1_21_0, 1_24_0, 1_29_0, 1_3_0, 1_7_0	https://github.com/mirror/busybox	GNU General Public License v2.0 only
busybox	1_14_0, 1_15_0, 1_17_0, 1_19_2, 1_19_3, 1_20_0, 1_20_1, 1_28_0,	https://github.com/mirror/busybox	GNU General Public License v2.0 or later
catboost/catboost	v0.2	https://catboost.ai	Apache License 2.0
curl	7.16.0	https://curl.se/	curl License
decorator-ko	26, 28	http://jinseltistory.com/372	Public Domain
file	5.22	http://www.darwinsys.com/file/	Fine Free File Command License
fluxcapacitor	0	https://github.com/majek/fluxcapacitor	MIT License
fvpatwds : fvpat Webdev Server	fvpatwds v0.1.4	http://sourceforge.net/projects/fvpatwds	Apache License 2.0

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generator-minxing	1.0.2	https://github.com/yeoman/generator-minxing#readme	Apache License 2.0
geonkick	2.3.6	https://github.com/iurie-sw/geonkick	GNU General Public License v3.0 or later
hostap-ct	If-5.1.7, If-5.3.3, If-5.3.3b, If-5.3.4, If-5.3.5	https://github.com/greearb/hostap-ct	BSD 3-clause "New" or "Revised" License
hostapd	hostap_0_5_2, hostap_0_5_3, hostap_0_5_6,	http://w1.fi/hostapd/	GNU General Public License v2.0 or later
howl	0.9.4, 0.9.6, 0.9.7, 0.9.9, 1.0.0, 0.9.3, 0.9.1	https://howl.io	BSD 3-clause "New" or "Revised" License
illumos-joyent	20121101	http://www.illumos.org/projects/illumos-gate	Common Development and Distribution License 1.0
krb5/krb5	1.0-alpha3, 1.0-beta2, 1.0-beta5	https://github.com/krb5/krb5	Krb5-MIT License
libevent - an event notification library	0.1, 1.0d, 1.0e, 1.4.1-beta	http://libevent.org/	BSD 3-clause "New" or "Revised" License
libexpat	1.95.0, 1.95.1, 1.95.2, 2.0.0, v19991013	http://www.libexpat.org/	Expat License
libexpat	V19991013	http://www.libexpat.org/	Mozilla Public License 1.1
linux-yocto-dev	v2.6.12	http://git.yoctoproject.org/cgit/cgit.cgi/linux-yocto-dev/	GNU General Public License v2.0 with Linux Syscall Note

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littlekernel-m900-eclair	master-20110326	http://github.com/LouZiffer/littlekernel-m900-eclair	GNU General Public License v2.0 only
lmbd	0.9.18	http://symas.com/mdb/	Open LDAP Public License
math-linux	0.0.1	http://sourceforge.net/projects/math-linux	GNU General Public License v3.0 or later
mod_dup	2.5.0	http://github.com/Orange-OpenSource/mod_dup/	Apache License 2.0
ngx_pagespeed	1.9.32.4-dbg-ssl-crash	https://github.com/pagespeed/nginx_pagespeed	Apache License 2.0
nss_ldap	253	https://github.com/PADL/nss_ldap	GNU Library General Public License v2 or later
opensm	3.3.17	http://www.openfabrics.org/	BSD 2-clause "Simplified" License
pGina	Plugin Bundle 05-11-2006	http://pgina.org/	MIT License
pam_radius	release_2_0_0	http://freeradius.org/pam_radius_auth/	GNU General Public License v2.0 only
protovis	3.3.1	http://mbostock.github.io/protovis/	BSD 3-clause "New" or "Revised" License
root-project	5-13-04e	https://root.cern	(GNU Lesser General Public License v2.1 or later AND MIT License AND GNU General Public License v2.0 or later)

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rsyslog	sysklogd-141-import	https://www.rsyslog.com/	GNU General Public License v2.0 or later
rtems-libbsd	5.1	http://git.rtems.org/rtems-libbsd.git/	Apache License 2.0
rtl8186 - toolchain	0.5.5_src	http://rtl8186.sourceforge.net	GNU General Public License v2.0 or later
snake-os	0.9	http://code.google.com/p/snake-os/	GNU General Public License v2.0 or later
ssmtp	2.61	http://packages.qa.debian.org/s/ssmtp.html	GNU General Public License v2.0 or later
svn://svn.tug.org/texlive/trunk	texlive-2009.0	http://www.tug.org/texlive/	LaTeX Project Public License - Version Unspecified
util-linux	2.11q, 2.11w, 2.12a, 2.13-pre1	https://en.wikipedia.org/wiki/Util-linux	GNU General Public License v2.0 or later
videolan/vlc	0.5.0	https://github.com/videolan/vlc	(GNU Lesser General Public License v2.1 or later AND GNU General Public License v2.0 or later)
wakame-vdc	v13.06.0	http://wakame.axsh.jp/	Unknown License
wpa_supplicant - IEEE 802.1X, WPA, WPA2, RSN, IEEE 802.11i	0.5.0, 0.5.3, 0.5.5, 0.5.6, 0.5.8, 0.6.0, 0.6.10, 0.6.2, 0.6.3, 0.6.4, 0.6.8, 0.7.0, 0.7.1, 0.7.2, 0.7.3, 1, 2, 2.1, 2.2, 2.3,	http://w1.fi/wpa_supplicant/	BSD 3-clause "New" or "Revised" License

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	2.4, 2.5, 2.6, 2.7, 2.7+git20190108+ 11ce7a1,, 2.7~git20180504+ 60a5737, 2.7~git20180606+ b915f2c, 2.7~git20180706+ 420b5dd		
xorp.ct	1.5, xorp-1-7	http://www.candelatech.com/xorp.ct	MIT License
zeroconf	0.9	https://files.pythonhosted.org/packages/20/d7/418ff6c684ace0f5855ec56c66cfa99ec50443c41693b91e9abccccfa096c/zeroconf-0.20.0.tar.gz	GNU General Public License v2.0 or later

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