



NVIDIA UFM Cyber-AI Documentation

v2.14.1

Table of Contents

1	Release Notes.....	9
1.1	Changes and New Features in This Release	9
1.1.1	Changes and New Features in v2.14.1	9
1.2	Installation Notes	9
1.2.1	Hardware Platform Support	9
1.2.2	Important Notes.....	9
1.2.3	Determining Your Hardware Platform.....	9
1.3	Bug Fixes in This Release	10
1.4	Known Issues.....	10
2	Software Management	11
2.1	Deploying UFM Cyber-AI	11
2.2	Upgrading UFM Cyber Software.....	13
3	Cyber-AI Analytics	15
3.1	Anomaly Analysis.....	15
3.1.1	Link Failure Prediction	15
3.1.2	Link Anomaly	18
3.1.2.1	Time Filter	19
3.1.2.2	Event Flow Charts.....	19
3.1.2.3	Anomaly Details	19
3.1.2.4	Total Anomalies Over Time	20
3.1.2.5	Link Anomaly Snapshots.....	22
3.1.3	Cluster Status.....	22
3.1.3.1	Filters.....	22
3.1.3.2	Attributes	23
3.1.3.3	Counters.....	24
3.1.3.4	Counters Threshold	25
3.1.3.5	Links Snapshots.....	26
3.1.3.6	Anomalies	27
3.2	Job Analytics.....	27
3.2.1	Introduction.....	27
3.2.2	Job Types.....	28
3.2.3	Output Sample	28
4	REST API	29
4.1	Session Management.....	29

4.1.1	Login	29
4.1.2	Logout	29
4.2	User Management	30
4.2.1	Get User/All Users	30
4.2.2	Add User	30
4.2.3	Modify User/Change Password	31
4.2.4	Delete User	31
4.3	System Details	32
4.3.1	UFM Telemetry	32
4.3.2	UFM Enterprise	32
4.3.3	Run Analytic Job	33
4.3.4	Get Analytic Jobs statistics	33
4.4	Application Details	34
4.4.1	Cyber-Ai Release Version	34
4.4.2	License Details	34
4.5	Configuration	35
4.5.1	Set UFM Enterprise Connections Parameters	35
4.5.2	Get UFM Enterprise Connections Parameters	35
4.5.3	Alert Count Summary	35
4.6	Analytics	36
4.6.1	Alert Count Summary	36
4.7	Suspicious Behavior	37
4.7.1	Get All Network Alerts	37
4.7.2	Get Specific Network Alert	38
4.7.3	Get All Tenant/Application Alerts	39
4.7.4	Get Specific Tenant Alert	40
4.7.5	Get Logical Server Alerts	41
4.7.6	Get Specific Logical Server Alert	42
4.7.7	Cables Alerts	42
4.7.7.1	Cable Alerts Summary	42
4.7.7.2	Threshold Events	43
4.7.7.3	Specific Threshold Event	44
4.7.7.4	Threshold Event Tachometer	44
4.7.7.5	Deviation Events	45
4.7.7.6	Specific Deviation Event	46

4.8	Link Analysis	47
4.8.1	Get All Link Failure Predictions.....	47
4.8.2	Get Link Failure Prediction History	47
4.8.3	Get All Link Anomaly Predictions	48
4.8.4	Get Link Anomaly Prediction History.....	49
4.8.5	Events Flows	50
4.8.6	Elements	51
4.8.7	Timeline	51
4.8.8	Influencers	52
4.9	Resources	53
4.9.1	Get Link Failure Distribution.....	53
4.9.2	Get Anomaly Nodes	54
4.9.3	Get Anomaly Cables	54
4.9.4	Get Tenants Allocation	55
4.9.5	Get Tenant Nodes	56
4.9.6	Get Top Congested Tenants/Applications	56
4.9.7	Get Logical Servers Allocation	57
4.9.8	Get Top Congested Logical Servers.....	57
4.9.9	Get Link Anomalies	58
4.9.10	Get Link Anomalies For influencer	59
4.10	Telemetry Data	59
4.10.1	Get the Telemetry Counter List.....	59
4.10.2	Get Link Telemetry Data	60
4.10.3	Get Link Status Telemetry Data.....	61
4.10.4	Get Link Status Counter Histogram Telemetry Data	63
4.10.5	Get Link Status Histogram Attribute Telemetry Data.....	64
4.11	Alert Filters	65
4.11.1	Add Alerts Filter.....	65
4.11.2	Delete Alert Filter	66
4.11.3	Enable Alert Filter	66
4.11.4	Get Alerts Filter	67
4.11.5	Get Alert Filter	67
4.11.6	Link Status	68
4.11.7	Get Histogram for Link Status	71

4.11.8	Get Properties for Link Status	73
4.12	Pagination	74
5	CLI Tools	76
5.1	ufm-cai-sanity	76
5.1.1	Tests	76
5.1.2	Usage	76
5.2	ufm-cai-jobs	76
5.2.1	Usage	76
5.3	ufm-cai-ufm-params.....	77
5.3.1	Usage	77
5.3.1.1	Update.....	77
5.3.1.2	Show	77
5.4	ufm-cai-status	77
5.4.1	Usage	77
5.4.2	Configuration	77
5.4.3	Cron Job	78
5.5	ufm-cai-sysdump.....	78
5.5.1	Usage	78
5.5.1.1	Options	78
5.5.1.2	Output	79
5.6	ufm-cai-weekly-alerts-report	79
5.6.1	Usage	79
5.6.1.1	Options	79
6	High Availability	80
6.1	Overview	80
6.1.1	Supported Platforms.....	80
6.1.2	Prerequisites.....	80
6.1.2.1	Pacemaker packages	80
6.1.2.2	DRBD Package	80
6.2	Configuration	80
6.2.1	ufm_ha_cluster usage	80
6.2.2	Configuring Pacemaker and DRBD	80
6.2.3	Stopping UFM Services	81
6.2.4	Takeover Services	81
6.2.5	Master Failover.....	81

6.2.6	Replace HA Node	82
7	UFM Cyber-AI OS Upgrade	83
7.1	Hardware Platform Support:	83
7.2	Important Notes:.....	83
7.3	Extracting the Software.....	83
7.3.1	Upgrading in Standalone Mode.....	84
7.3.2	Upgrade in High-Availability Mode	85
8	Morpheus Integration.....	88
8.1	Features	88
8.2	Prerequisites.....	88
8.3	Installing Morpheus AI Engine	88
8.4	Starting Morpheus AI Engine.....	89
9	List of Supported Events	90
10	Settings and Configuration	95
10.1	CyberAI.cfg Basic Configuration Parameters	95
10.2	Scheduler Settings Configuration File	96
10.3	UFM-Telemetry Main Configuration File	96
11	Appendixes.....	98
11.1	Appendix - Supported Counters.....	98
11.1.1	Supported InfiniBand Counters	98
11.1.2	Supported Per-lane Counters.....	100
11.2	Appendix - Cable Information.....	100
11.3	Appendix - Cyber-AI Appliance OS Remanufacture	101
11.3.1	Step 1: Extract the TAR file to a temporary directory	102
11.3.2	Step: 2 - Burn ISO to USB	102
11.3.2.1	Windows	102
11.3.2.2	Linux	104
11.3.3	Step: 3 - Manufacture Cyber-AI from USB.....	105
11.4	Appendix - Deploying UFM Cyber-AI from an ISO File	114
11.4.1	Step 1: Extract the TAR file to a temporary directory	115
11.4.2	Step: 2 - Burn ISO to USB	115
11.4.2.1	Windows	115
11.4.2.2	Linux	117
11.4.3	Step: 3 - Manufacture Cyber-AI from USB.....	117
12	Documentation History.....	128

- 12.1 Document Revision History 128
- 12.2 Release Notes History 128
 - 12.2.1 Changes and New Features History 128
 - 12.2.2 Bug Fixes History..... 129
 - 12.2.3 Known Issues History 129

About This Document

NVIDIA® Unified Fabric Manager (UFM®) Cyber-AI platform determines a data center's unique vital signs and uses them to identify performance degradation, component failures and abnormal usage patterns.

Downloading Software

To download Cyber-AI software, please visit [NVIDIA's Licensing Portal](#).

Technical Support

Customers who purchased NVIDIA products directly from NVIDIA are invited to contact us through the following methods:

- E-mail: enterprisesupport@nvidia.com
- Enterprise Support page: [Enterprise Support Services](#)

Customers who purchased NVIDIA M-1 Global Support Services, please see your contract for details regarding technical support.

Customers who purchased NVIDIA products through an NVIDIA-approved reseller should first seek assistance through their reseller.

Document Revision History

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

1 Release Notes

These release notes pages provide information for NVIDIA UFM Cyber-AI software such as changes and new features, bug fixes, and known issues.

1.1 Changes and New Features in This Release

1.1.1 Changes and New Features in v2.14.1

Added support for UFM 4.5 Cyber-AI Appliance.

1.2 Installation Notes

1.2.1 Hardware Platform Support

Starting with version 2.14.1, UFM Cyber-AI provides separate OMU files for different hardware platforms:

- For UFM 4.0 Appliances (Ubuntu 18) use

```
ufm-cyberai-appliance-<version>-<revision>-omu.tar
```

- For UFM 4.5 Appliances (Ubuntu 24) use:

```
ufm-cyberai-appliance-4.5-<version>-<revision>-omu.tar
```

1.2.2 Important Notes

- **Hardware Compatibility:** Always download and use the OMU file that matches your appliance hardware (UFM 4.0 or UFM 4.5).
- **Version Requirements:** UFM 4.5-specific OMU files are available starting with Cyber-AI version 2.14.1.
- **Installation Risk:** Using an incorrect OMU file for your hardware may cause installation failures or operational issues.

1.2.3 Determining Your Hardware Platform

You can verify your appliance version by checking the operating system:

```
cat /etc/os-release
```

- Ubuntu 18 → UFM 4.0
- Ubuntu 24 → UFM 4.5

1.3 Bug Fixes in This Release

Ref #	Description
4681048	Description: Fixed issue with unnecessary restart for Cyber-AI web container in case where the health check was triggered while the database is locked.
	Keywords: Web Container, Health Check, Database
	Discovered in version: v2.13.0
4565367	Description: Fixed Cyber-AI watchdog issues when Cyber-AI is used in HA mode
	Keywords: Watchdog, HA mode
	Discovered in version: v2.8.0
4565359	Description: Fixed the detection of active port when Cyber-AI runs Telemetry to allow proper Telemetry operation on the active port
	Keywords: active port, Telemetry
	Discovered in version: v2.8.0

1.4 Known Issues

N/A

2 Software Management

This chapter describes how to deploy UFM Cyber-AI on UFM Cyber-AI appliance.

2.1 Deploying UFM Cyber-AI

NVIDIA® UFM® Cyber-AI is packaged in a tar file. The tar file consists of several docker images and an installation script. The script will load the docker images and create a UFM Cyber-AI service. UFM Cyber-AI should be installed on UFM Cyber-AI appliance.

To deploy the UFM Cyber-AI:

1. Copy the tar file to the UFM Cyber-AI appliance, for example, to the `/tmp` folder.
2. Copy the license file to the same directory on the UFM Cyber-AI appliance.
3. Connect to the UFM Cyber-AI appliance via SSH.
4. Extract the tar file and install the service. Run:

```
[root@r-ufm ~]# cd /tmp
[root@r-ufm ~]# tar xvf ufm-cyberai-sw-<version>.tar
[root@r-ufm ~]# cd ufm-cyberai-sw-<version>
[root@r-ufm ~]# ./install.sh
```

Installer options:

- `-n|--no-ufm` : By default, UFM Enterprise is installed
- `-q|--quiet` : Upgrade Cyber-AI without a prompt
- `-l|--license` : License file location

Example:

```
./install -u -l <license_file_path>
```

5. If you did not provide the license when running the install script, copy the license file. Run:

```
[root@r-ufm ~]# cp /tmp/<cyberai-license-file>.lic /opt/ufm/cyberai/licenses
```

6. Start the UFM Cyber-AI service. Run:

```
[root@r-ufm ~]# systemctl start ufm-cyberai.service
```

7. Start the UFM Enterprise service. Run:

```
[root@r-ufm ~]# systemctl start ufm-enterprise.service
```

8. Wait 1 minute for the system to come up.
9. Ensure the service health by running the following:

```
[root@r-ufm ~]# ufm-cai-sanity -u <username> -p <password>
Where the username and password are the default username and password for cyberai
Checking Service...
Done
Checking Images...
Done
Checking Containers...
Done
Checking ufm-cyberai REST server...
Done
Sanity tests completed successfully!
```

10. Set the NVIDIA UFM Enterprise connection parameters:

```
[root@r-ufm ~]# ufm-cai-ufm-params update-i <ufm_ip> -p <ufm_port> -U <username> -P <password> -s <site_name> -t <protocol>
```

Options:

```
-h|--help          Show this message
-i|--ip           UFM server IP
-p|--port         UFM REST API connection port
-U|--username     UFM username
-P|--password     UFM password
-s|--site         UFM site name
-t|--protocol     UFM Rest API connection protocol
```

This step can be done also using the web UI. However, it is recommended to set the UFM Enterprise parameters as early as possible, as UFM Cyber-AI needs it to retrieve the fabric topology.

11. To access the UFM Cyber-AI logs, run the following on the UFM Cyber-AI appliance:

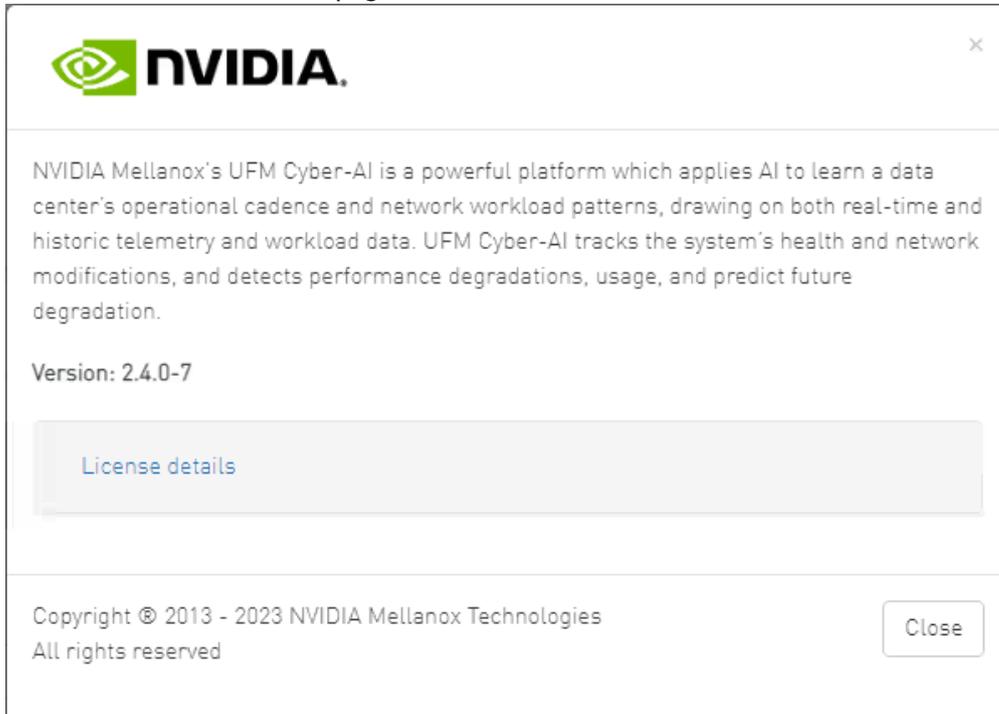
```
[root@r-ufm ~]# ls -la /var/log/cyberai/
total 86160
drwxr-xr-x 2 root root 4096 Mar 6 03:28 .
drwxr-xr-x 3 root root 4096 Mar 5 18:46 ..
-rw-r--r-- 1 root root 0 Mar 5 19:51 access.log
-rw-r--r-- 1 root root 45563430 Mar 12 16:09 console.log
-rw-r--r-- 1 root root 42646820 Mar 12 16:09 cyberai.log
-rw-r--r-- 1 root root 0 Mar 5 19:53 rest.log
```

12. Access the Cyber-AI User Interface at <https://<ip>:8443/cyberai>.

13. For settings and configuration instructions, see [Settings and Configuration](#).

To view the license details:

1. After installing and activating the software, licenses can be viewed in the Web UI by clicking the about icon on the main page.



2. The main about screen displays the current UFM Cyber-AI version and build. To view more information, click "License details".



2.2 Upgrading UFM Cyber Software

The first step of upgrading UFM Cyber-AI are similar to the first steps of a fresh installation. The installation process consists of replacing the containers with the new version and upgrading the data according to the new scheme.

1. Copy the tar file to the UFM Cyber-AI appliance, for example, to the `/tmp` folder.
2. Connect to the UFM Cyber-AI appliance via SSH.
3. Stop the UFM Cyber-AI service. Run:

```
[root@r-ufm ~]# systemctl stop ufm-cyberai.service
```

4. Extract the tar file and install the service for upgrade. Run:

```
root@r-ufm ~]# cd /tmp
[root@r-ufm ~]# tar xvf ufm-cyberai-sw-<version>.tar
[root@r-ufm ~]# cd ufm-cyberai-sw-<version>
[root@r-ufm ~]# ./install.sh
UFM Cyber-AI version <old-version> is installed on this machine
Would you like to upgrade to version <new-version>? [y|N]:
```

5. Enter 'y' to proceed with the upgrade.

Installer options:

- `-q|--quiet` : Upgrade Cyber-Ai without prompt
- `-n|--no-ufm` : Will not install UFM-Enterprise
- `-l|--license` : The License file location

6. Start the ufm-cyberai service. Run:

```
[root@r-ufm ~]# systemctl start ufm-cyberai.service
```

7. Wait 1 minute for the system to come up.
8. Ensure the service health by running the following:

```
root@r-ufm ~]# ufm-cai-sanity -u <username> -p <password>
Where the username and password are the default username and password for cyberai
Checking Service...
Done
Checking Images...
Done
Checking Containers...
Done
Checking ufm-cyberai REST server...
Done
Sanity tests completed successfully!
```

3 Cyber-AI Analytics

3.1 Anomaly Analysis

Link Analysis

Cluster Status
764 Link Anomaly
2 Link Failure Prediction

- **Cluster Status:** Collects information about the links periodically.
- **Link Anomaly:** Detects anomalous behavior in the cluster with a probability indicator. It detects the most significant influencers on the anomaly notice.
- **Link Failure Prediction:** Prediction of future link failures 1-to-24 hours in advance using machine learning algorithms with a probability indicator.

3.1.1 Link Failure Prediction

UFM Cyber-AI trains machine learning algorithms to predict future failures by collecting monitoring information (i.e. training data for the machine learning algorithms) over a time duration (e.g. 1-24 hours) in advance of (retrospectively known) previous failures that occurred and having the algorithms learn the connection between different parameters over time.

Using the machine learning algorithm, the processor derives the potential failure pattern by, for example, alerting future failure times of components. The processor repeatedly updates the alerted future failure times based on newly collected failures.

The dashboard displays a table showing 'Switch to Switch' and 'Switch to Host' link failure prediction alerts, along with the relation between Alerted and the Total number of devices in the cluster.

Time
Last 1 months

Predicted Failures

Switch switch	Switch host
Filter... <input type="text"/>	Filter... <input type="text"/>
0	1

Alerted vs Normal



Nodes

Alerted: 0
Normal: 6



Switches

Alerted: 1
Normal: 1

Link Failures

Click to reset all filters

Viewing 1-1 of 1

Timestamp	Link Type	Node Guid	Node Name	Port	Occurrence	Proba...
Filter... <input type="text"/>						
> 2024-09-30 15:35:00	host_switch	0x043f720300d27e84	ufm-ai03	1	1	76.99

Recommended Actions

To automate this procedure, please refer to the [User Manual](#).

In the “Predicted Failures” table, the user can filter the alerts table below by clicking any value on the table to add the appropriate filters to the table.

Users may see the detailed events through an event list where alert details like Node Name, Port, Occurrence and Probability are available.

Link Failures

Viewing 1-10 of 2249

Timestamp	Link Type	Node Guid	Node Name	Port	Occurrence	Probabil...
Filter... <input type="text"/>	Filter... <input type="text"/>	Filter... <input type="text"/>	Filter... <input type="text"/>	Filter... <input type="text"/>	Filter... <input type="text"/>	Filter... <input type="text"/>
> 2024-09-05 08:15:00	switch_switch	0x1070fd0300241488	il-sim-yokt-0114	1	499	0
> 2024-09-05 08:15:00	host_switch	0xe9ebd3030054e8fe	MTL-T-F0-IB-ICD-SW56	9	499	38.79
> 2024-09-17 01:25:00	switch_switch	0x0002c90200428490	Infiniscale-IV Mellanox Technologies	1	3512	0
> 2024-09-17 01:25:00	host_switch	0x0002c90200428490	Infiniscale-IV Mellanox Technologies	16	3512	0
> 2024-09-17 01:25:00	switch_switch	0x0002c90200428490	Infiniscale-IV Mellanox Technologies	18	3512	0
> 2024-09-17 01:25:00	host_switch	0x0002c90200428490	Infiniscale-IV Mellanox Technologies	22	3510	0
> 2024-09-17 01:25:00	switch_switch	0x0002c90200428490	Infiniscale-IV Mellanox Technologies	23	3510	0
> 2024-09-17 01:25:00	host_switch	0x0002c90200428490	Infiniscale-IV Mellanox Technologies	24	3510	0
> 2024-09-17 01:25:00	switch_switch	0x0002c90200428490	Infiniscale-IV Mellanox Technologies	25	3510	0
> 2024-09-17 01:25:00	host_switch	0x0002c90200428490	Infiniscale-IV Mellanox Technologies	27	3510	0

When clicking on the arrow icon in the alert row, the table will expand and will show the history for the specific link.

Viewing 1-2 of 2 10 Displayed Columns CSV

Timestamp	Link Type	Node Guid	Node Name	Port	Occurrence	Proba...
2024-09-29 04:15:00	switch_switch	0xb83fd20300a6b9c4	MTL-S-F1-DC-IB-Spine-01	27	1	65.12
2024-09-30 15:35:00	host_switch	0x043f720300d27e84	ufm-ai03	1	1	76.99

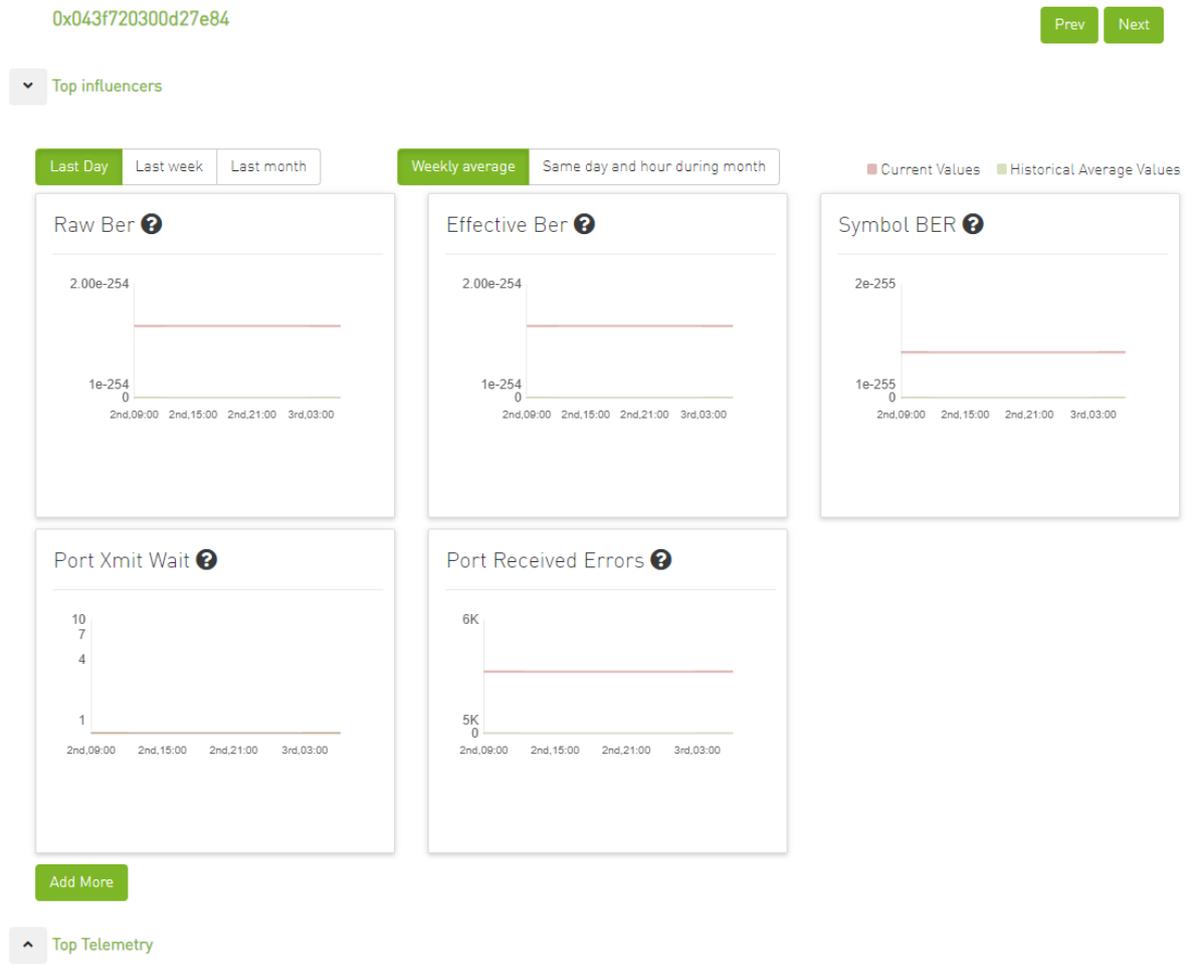
Start Time	Node Guid	Port	Probability
2024-09-30 15:35	0x043f720300d27e84	1	76.99000000000001

Clicking on any alert in the list displays five graphs representing the counters that influenced the alert's triggering, with several time ranges available.

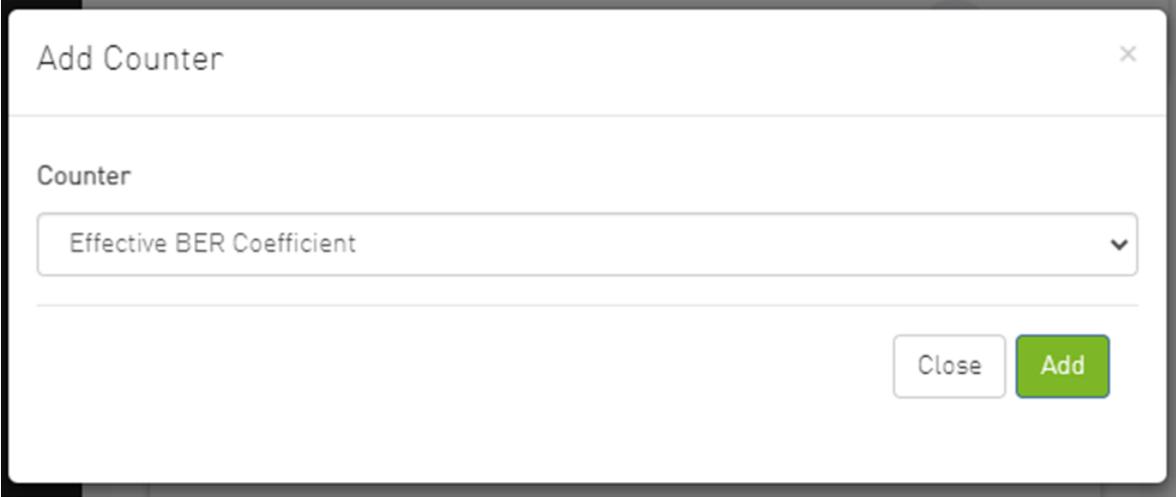
The default view provides two lines for each graph: one for the current data, and another for the calculated historical data based on average values from the prior week.

Users can choose to switch between Weekly average (default) to Day of Week average.

Day of Week Average is based on the calculation of the statistics in the same hours and day of the week of the past month. For example The average for 8AM-9AM on Mondays during the past month.



Also, users can add more graphs for more counters by clicking the "Add More" button below the graphs.



Then a new counter could be chosen, and a new graph for that counter will be added.

Additionally, it shows the top telemetry table, which is collapsed by default.

Top Telemetry

Viewing 1-10 of 43

node_guid	port	port_guid	sample_time	dow	hour	node_description	lid	device_id	phy_mgr_fsm_state
Dx1070fd0300241488	1	0x1070fd0300241488	2024-09-03 14:00:00	Tue	14	N/A	N/A	ConnectX-5	Active_or_Linkup
Dx1070fd0300241488	1	0x1070fd0300241488	2024-09-03 15:00:00	Tue	15	N/A	N/A	ConnectX-5	Active_or_Linkup
Dx1070fd0300241488	1	0x1070fd0300241488	2024-09-03 16:00:00	Tue	16	N/A	N/A	ConnectX-5	Active_or_Linkup
Dx1070fd0300241488	1	0x1070fd0300241488	2024-09-03 17:00:00	Tue	17	N/A	N/A	ConnectX-5	Active_or_Linkup
Dx1070fd0300241488	1	0x1070fd0300241488	2024-09-03 18:00:00	Tue	18	N/A	N/A	ConnectX-5	Active_or_Linkup
Dx1070fd0300241488	1	0x1070fd0300241488	2024-09-03 19:00:00	Tue	19	N/A	N/A	ConnectX-5	Active_or_Linkup
Dx1070fd0300241488	1	0x1070fd0300241488	2024-09-03 20:00:00	Tue	20	N/A	N/A	ConnectX-5	Active_or_Linkup
Dx1070fd0300241488	1	0x1070fd0300241488	2024-09-03 21:00:00	Tue	21	N/A	N/A	ConnectX-5	Active_or_Linkup
Dx1070fd0300241488	1	0x1070fd0300241488	2024-09-03 22:00:00	Tue	22	N/A	N/A	ConnectX-5	Active_or_Linkup
Dx1070fd0300241488	1	0x1070fd0300241488	2024-09-03 23:00:00	Tue	23	N/A	N/A	ConnectX-5	Active_or_Linkup

The recommended actions section will always appear at the bottom of the page with a reference to the user manual.

Recommended Actions

To automate this procedure, please refer to the [User Manual](#)

3.1.2 Link Anomaly

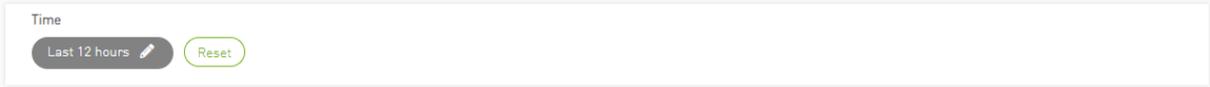
Port anomaly detection is based on defining composite metrics to reliably detect anomalies, where such metrics dynamically change, for example, according to a baseline that is determined and subsequently updated by a system.

In addition, there is a process for defining an anomaly score that provides a statistical estimation, such as the number of standard deviations, or the number of Mean Absolute Errors (MAEs) from a baseline value of the feature (i.e., metrics value), and assigning a degree of severity according to the number of standard deviations or MAEs.

The dashboard provides the following views:

3.1.2.1 Time Filter

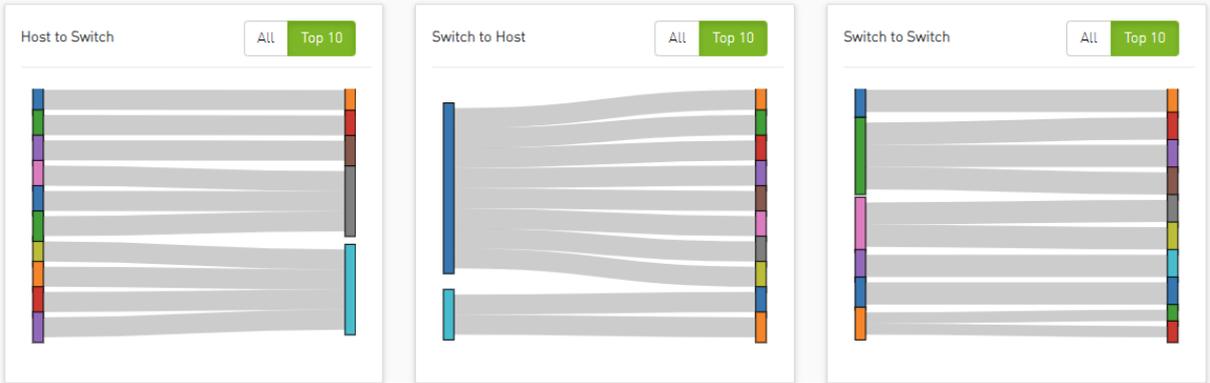
Users can filter link anomaly data by time via searching for either an absolute or relative time.



3.1.2.2 Event Flow Charts

Event flow charts display anomalies between devices, with each link in the chart describing the number of anomalies between two devices.

The width of the link reflects the number of anomalies that occurred between the two devices.



By default, the 'Top 10' button is selected, displaying the top 10 devices with the highest occurrences of anomalies.

Clicking on link/device filters the table below.

3.1.2.3 Anomaly Details

The table below represents the anomaly details such as Last Anomaly time, Number of Occurrences, Node and Partner Node.

Users can filter the anomaly details table by clicking on either a device or a link in the event flow charts.

Anomaly Details

Viewing 1-10 of 913 ⏪ ⏩ 10 CSV

Last Anomaly time	Number of Occur...	Node	Port	Node Description	Partner Node	Partner ...	Anomaly
2024-01-25 09:00	341	0xb83fd20300803...	1	MTL-S-F1-DC-IB...	0x248a0703003e0...	1	switch issues
2024-01-18 11:00	210	0xb83fd20300803...	1	MTL-S-F1-DC-IB...	0x0c42a10300d30...	1	switch issues
2024-01-25 09:00	341	0xb83fd20300803...	1	MTL-S-F1-DC-IB...	0x0c42a10300604...	1	switch issues
2024-01-25 09:00	337	0xb83fd20300803...	1	MTL-S-F1-DC-IB...	0x0c42a10300604...	1	switch issues
2024-01-18 11:00	210	0xb83fd20300803...	1	MTL-S-F1-DC-IB...	0x506b4b0300018...	1	switch issues
2024-01-25 09:00	341	0xb83fd20300803...	1	MTL-S-F1-DC-IB...	0x0c42a10300604...	1	switch issues
2024-01-25 09:00	341	0xb83fd20300a6b...	1	MTL-S-F1-DC-IB...	0x98039b03006c6...	1	switch issues
2024-01-25 09:00	341	0xb83fd20300a6b...	1	MTL-S-F1-IB-DC...	0xb8599f0300c30...	1	switch issues
2024-01-25 09:00	341	0xb83fd20300a6b...	1	MTL-S-F1-DC-IB...	0x0c42a10300d30...	1	switch issues
2024-01-25 09:00	340	0xb83fd20300a6b...	1	MTL-S-F1-IB-DC...	0x0c42a10300d30...	1	switch issues

Clicking on the arrow icon in the anomaly node, the table will expand and will show all the history for the specific alert.

Anomaly Details

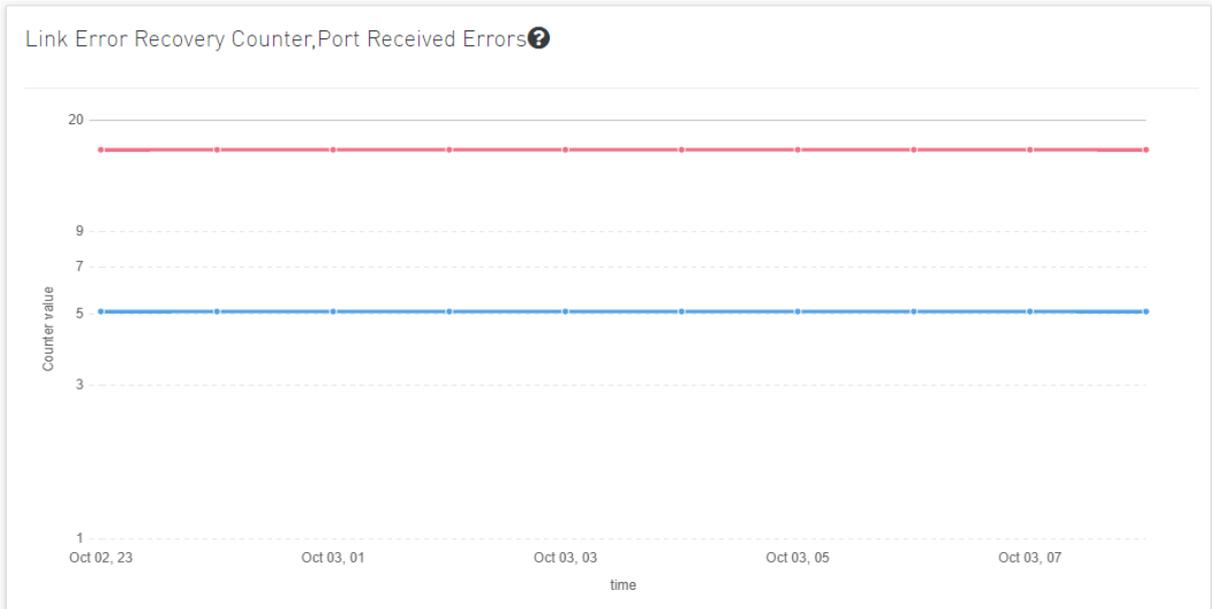
Viewing 1-10 of 914 ⏪ ⏩ 10 CSV

Last Anomaly time	Number of Occurre...	Node	Port	Node Description	Partner Node	Partner ...	Anomaly
2024-01-25 09:00	341	0xb83fd20300803...	1	MTL-S-F1-DC-IB...	0x248a0703003e0...	1	switch issues
Start Time	Anomaly	Counter Anomaly	Values	Threshold/ Delta	Comments		
2024-01-09 11:00	switch issues	port_rcv_switch_relay...	4 3333333333333333				
2024-01-09 12:00	switch issues	port_rcv_switch_relay...	3.7142857142857135				
2024-01-09 13:00	switch issues	port_rcv_switch_relay...	3.7142857142857135				
2024-01-18 11:00	210	0xb83fd20300803...	1	MTL-S-F1-DC-IB...	0x0c42a10300d30...	1	switch issues

3.1.2.4 Total Anomalies Over Time

When clicking on any anomaly node, an overtime graph will appear, showing all counters related to that anomaly.

The chart will display the number of anomalies over time, with the time scale based on the selected filter.



When clicking on a counter from the expanded table, the chart will display the counter values over time.

Start Time	Anomaly	Counter Anomaly	Values	Threshold/ Delta	Comments
2024-09-03 14:00	switch issues	port_rcv_switch_r...	293.5833333333333		
2024-09-03 15:00	switch issues	port_rcv_switch_r...	293.6666666666667		
2024-09-03 16:00	switch issues	port_rcv_switch_r...	293.75		



3.1.2.5 Link Anomaly Snapshots

Clicking on the anomaly node will display all telemetry counters for the selected port, starting from the selected time range, the table is collapsed by default.

Link Anomaly Snapshots

Viewing 1-10 of 10 Displayed Columns CSV

Timestamp	Time Since Last Clear	Device Name	Link Down Events	Phy Mngr Fsm State	Phy State	Logical State
2024-10-03 02:00:00	55424.032	Quantum	0.0833333333333333	Active_or_Linkup	Phy_Up	Active
2024-10-03 03:00:00	55484.045	Quantum	0.0833333333333333	Active_or_Linkup	Phy_Up	Active
2024-10-03 04:00:00	55544.032	Quantum	0.0833333333333333	Active_or_Linkup	Phy_Up	Active
2024-10-03 05:00:00	55604.03	Quantum	0.0833333333333333	Active_or_Linkup	Phy_Up	Active
2024-10-03 06:00:00	55664.028	Quantum	0.0833333333333333	Active_or_Linkup	Phy_Up	Active
2024-10-03 07:00:00	55724.03	Quantum	0.0833333333333333	Active_or_Linkup	Phy_Up	Active
2024-10-03 08:00:00	55784.028	Quantum	0.0833333333333333	Active_or_Linkup	Phy_Up	Active
2024-10-03 09:00:00	55844.033	Quantum	0.0833333333333333	Active_or_Linkup	Phy_Up	Active
2024-10-03 10:00:00	55904.027	Quantum	0.0833333333333333	Active_or_Linkup	Phy_Up	Active
2024-10-03 11:00:00	55964.029	Quantum	0.0833333333333333	Active_or_Linkup	Phy_Up	Active

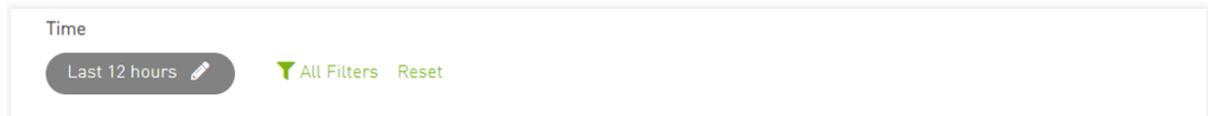
3.1.3 Cluster Status

Provides information about the cluster and the distribution of the attributes value according to the selected time range.

The dashboard provides the following views:

3.1.3.1 Filters

Users can filter link status data by time by searching for either an absolute or relative time, or by link attribute by clicking on the 'All Filters' button.



Clicking on the 'All Filters' button will open the following modal:

Excessive Buffer Overrun Errors Extended

Select Filter

Link Error Recovery Counter Extended

Select Filter

Local Link Integrity Errors Extended

Select Filter

Port Buffer Overrun Errors

Select Filter

Port Dlidmapping Errors

Select Filter

Port Feccorrectable Block Counter

Select Filter

Port Feccorrected Symbol Counter

Select Filter

Port Fecuncorrectable Block Counter

Select Filter

Port Local Physical Errors

Select Filter

Port Malformed Packet Errors

Select Filter

Port Multi Cast Rcv Pkts Extended

Select Filter

Cancel Apply

This modal filters the link status dashboard by the selected attribute values. Each attribute represents a dropdown containing the available values.

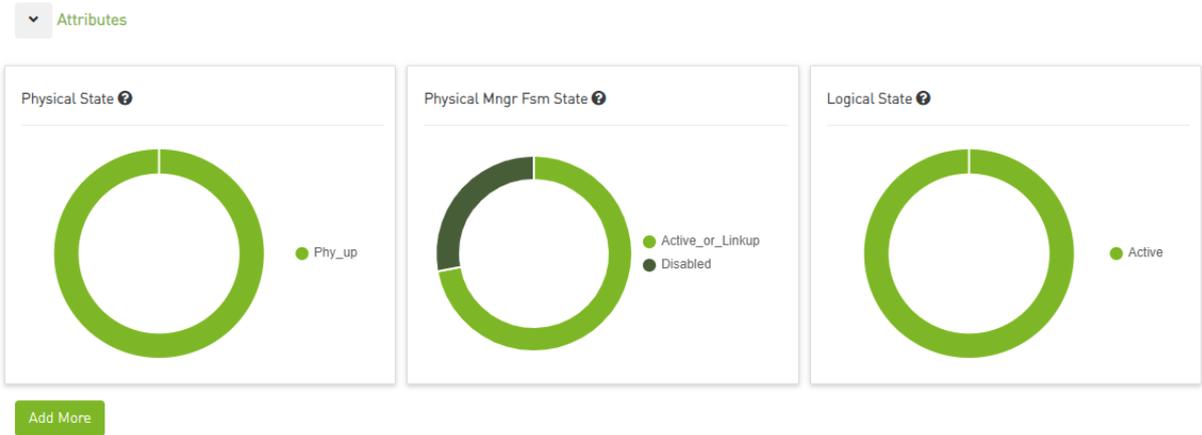
Additionally, clicking on the reset button will reset all filters.

3.1.3.2 Attributes

The most important attributes will be displayed as histograms and donut charts.

By clicking on a graph, the entire link status dashboard will be filtered based on the selection in the graph.

For example, clicking on "Disabled" in the "Physical Mngr Fsm State" graph will filter all the other graphs and tables by this selection.



Users can add more graphs for more attributes by clicking the "Add More" button below the graphs.

The figure shows a dialog box titled "Add Attribute" with a close button (X) in the top right corner. Below the title is a label "Attribute" followed by a dropdown menu showing "destination_fw_version". At the bottom right of the dialog are two buttons: "Close" and "Add".

3.1.3.3 Counters

The most important counters will be displayed as histograms.

By clicking on a graph, the entire link status dashboard will be filtered based on the selection. Users can also filter the x-axis values (counter values) using the slider above.



Additional graphs for more counters can be added by clicking the "Add More" button below the graphs.

The image shows a dialog box titled "Add Counter" with a close button (X) in the top right. It contains a "Counter" dropdown menu with "Diag Supply Voltage" selected. At the bottom right, there are "Close" and "Add" buttons.

3.1.3.4 Counters Threshold

The user can assign a threshold value for each counter, with a new file added under `/opt/ufm/cyber-ai/conf/counters_threshold.cfg` for this purpose:

```
[raw_ber]
threshold= 1E-4

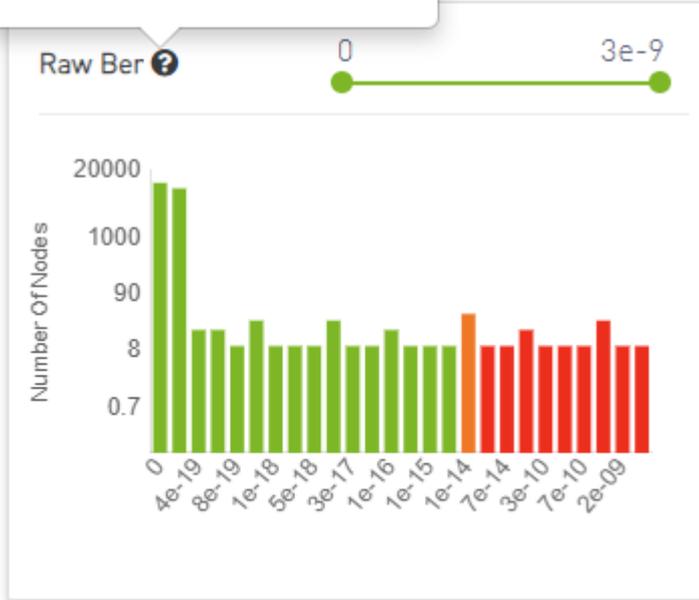
[eff_ber]
normal_range = 1E-8

[symbol_ber]
normal_range = 1E-10
```

Any value equal to the threshold will be highlighted in orange, while any value exceeding the threshold will be highlighted in red.

Users can view the threshold value by hovering over the question mark icon next to the counter name, which will display a popover containing a short description of the chart and the threshold value.

Raw Ber: The number of bit errors is the number of received bits of a data stream over a communication channel that have been altered due to noise, interference, distortion or bit synchronization errors. The bit error rate (BER) is the number of bit errors per unit time, Threshold value is $1e-14$



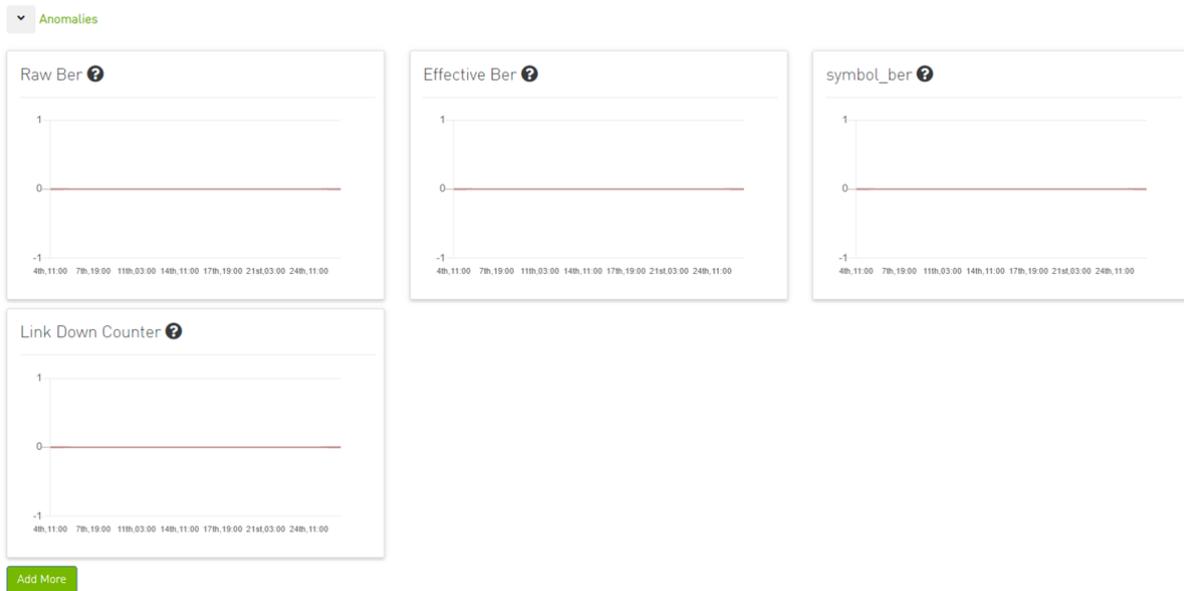
3.1.3.5 Links Snapshots

The table below shows the link snapshot details, including the device name, node GUID, port number, and related counters. By default, the table is collapsed and will automatically expand when a new counter or attribute is added, or when the user clicks on a chart to filter the data. When new attributes or counters are added, they will be included as columns in the table.

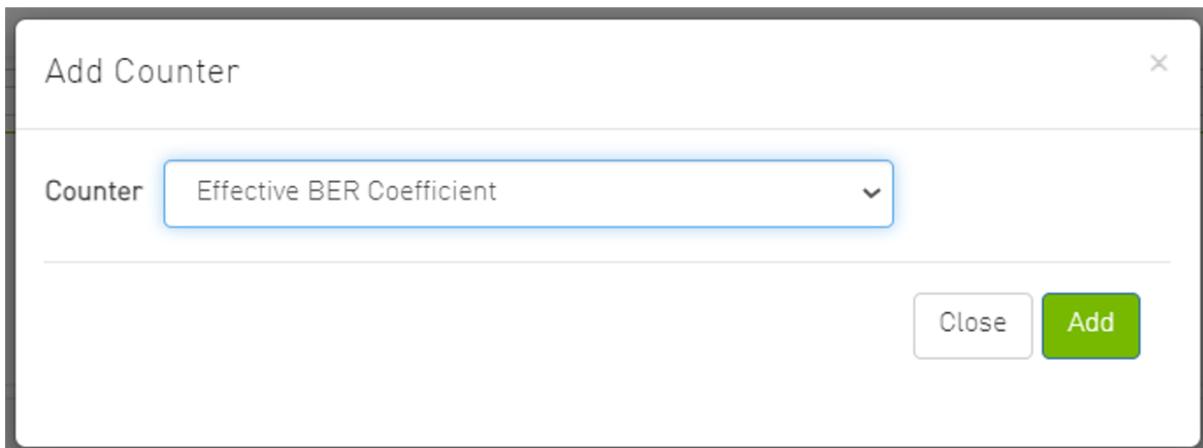
Timestamp	Time Since Last Clear	Device Name	Link Down Events	Phy Mngr Fsm State	Phy State	Logical State
2024-10-03 04:00:00	0	UNKNOWN	0	Disabled	Phy_up	Active
2024-10-03 04:00:00	0	UNKNOWN	0	Disabled	Phy_up	Active
2024-10-03 04:00:00	0	UNKNOWN	0	Disabled	Phy_up	Active
2024-10-03 04:00:00	0	UNKNOWN	0	Disabled	Phy_up	Active
2024-10-03 04:00:00	0	UNKNOWN	0	Disabled	Phy_up	Active
2024-10-03 04:00:00	0	UNKNOWN	0	Disabled	Phy_up	Active
2024-10-03 04:00:00	0	UNKNOWN	0	Disabled	Phy_up	Active
2024-10-03 04:00:00	0	UNKNOWN	0	Disabled	Phy_up	Active
2024-10-03 04:00:00	0	UNKNOWN	0	Disabled	Phy_up	Active
2024-10-03 04:00:00	0	UNKNOWN	0	Disabled	Phy_up	Active

3.1.3.6 Anomalies

Clicking on a snapshot in the Links Snapshots table will display the most important counters as time graphs. These charts will show the counter values over time, with the time scale corresponding to the selected time filter.



Users can add more graphs for more counters by clicking the "Add More" button below the graphs.



3.2 Job Analytics

3.2.1 Introduction

Analytic jobs are critical components in CyberAI. Each analytic job has a specific task to accomplish and runs periodically in a docker container. They process raw data collected from UFM Telemetry and generate informative data that can be displayed to the user in a form of alerts that can be used in making decisions. The process of data includes splitting the data into chunks of 5 mins,

calculating the delta (difference between counters values), aggregating data (hourly, day of week, topology, and PKey), and inference the data for any alerts.

3.2.2 Job Types

1. File Splitter: This job splits the file if it contains more than one timestamp.
2. Delta Processing: This job calculates the delta from the current sampling and the previous 5 minutes.
3. Hourly Aggregation: This job aggregates all delta files in the previous hour into one csv file.
4. DOW Aggregation: Collect the CSV files on the same day of the week (DOW), at the same hour, to be aggregated.
5. Topology Aggregation: Merges data collected from hourly aggregation, cables, and UFM topology files, and generates a file to be used by ML hourly aggregation.
6. ML hourly Anomaly: Analyzes the topology merged file using ML model files and looks for link anomalies alert
7. ML Failure Prediction Aggregation: Analyzes the delta output using ML model and predict port failures.
8. Weekly Aggregation: Makes weekly average on hourly data to be displayed to compare the hourly data with the weekly average of this hour.

3.2.3 Output Sample

The screenshot shows the 'Job Analytics' interface for NVIDIA UFM Cyber AI. It features a sidebar with navigation options: Anomaly Detection, Cable Anomaly Detection, Anomaly Analysis, Job Analytics (selected), and Settings. The main area displays a table of jobs with columns for Job Name, Type, Frequency (seconds), Last Run, Last Run Status, Total Runs, Total Successful Runs, Next Run, Dependencies, and Summary. The table lists various jobs such as File Splitter, Delta Processing, Hourly Aggregation, DOW Aggregation, Topology Aggregation, ML Hourly Aggregation, Play Port Join, PKey Aggregation, ML Weekly Aggregation, and Network Hourly Aggregation, along with their respective frequencies, last run dates, and statuses.

Job Name	Type	Frequency (seconds)	Last Run	Last Run Status	Total Runs	Total Successful Runs	Next Run	Dependencies	Summary
file_splitter	File Splitter	300	2021-10-01 14:08:54	Completed			2021-10-01 14:10:54	Port counters	
delta_proc	Delta Processing	300	2021-10-01 14:10:50	Next			2021-10-01 14:18:50	File Splitter	
hourly_agg	Hourly Aggregation	3600	2021-10-03 16:06:50	Completed			2021-10-03 17:06:50	Delta Processing	/opt/ufm/cyber/ai/d
dow_agg	DOW Aggregation	86400	2021-10-04 16:07:49	Completed			2021-10-05 16:07:49	Hourly Aggregation	/opt/ufm/cyber/ai/d
topology_agg	Topology Aggregation	3600	2021-10-03 21:06:54	Completed			2021-10-03 22:06:54	Hourly Aggregation	/opt/ufm/cyber/ai/d
ml_hourly_agg	ML Hourly Aggregation	3600					2021-09-30 17:07:04	Topology Aggregation	
play_port_join	Play Port Join	300	2021-10-01 14:16:48	Completed			2021-10-01 14:21:48	Delta Processing	/opt/ufm/cyber/ai/d
pkey_agg	PKey Aggregation	300	2021-09-30 18:02:48	Completed			2021-09-30 18:07:48	Play Port Join	/opt/ufm/cyber/ai/d
ml_weekly_agg	ML Weekly Aggregation	404800					2021-10-07 16:08:04		
network_hourly_agg	Network Hourly Aggregat...	3600	2021-10-02 17:07:07	Next			2021-10-02 18:07:07	Delta Processing	/opt/ufm/cyber/ai/d

4 REST API

- [Session Management](#)
- [User Management](#)
- [System Details](#)
- [Application Details](#)
- [Configuration](#)
- [Analytics](#)
- [Suspicious Behavior](#)
- [Link Analysis](#)
- [Resources](#)
- [Telemetry Data](#)
- [Alert Filters](#)
- [Pagination](#)

4.1 Session Management

4.1.1 Login

- URL

```
POST /cyber-ai/login
```

- Request Data

```
login=<username>&password=<password>
```

- Response - if successful, a session is created and a cookie with the session data is returned to the client
- Response codes:

Status	Description
302	Found (login success)
401	Unauthorized (login failure)

4.1.2 Logout

- URL

```
POST /cyber-ai/logout
```

- Request Data

```
None
```

- Response codes:

Status	Description
200	Success
401	Unauthorized

4.2 User Management

4.2.1 Get User/All Users

- URL

```
GET /cyber-ai/users/
GET /cyber-ai/users/{username}
```

- Request Data

```
none
```

- Response - for all users, it returns a list, while for single user it returns single object

```
[
  {
    "username": "admin",
    "pwd": "*****",
    "role": "Admin"
  }
]
```

- Response codes:

Status	Description
200	Success
404	Not found

4.2.2 Add User

- URL

```
POST /cyber-ai/users
```

- Request data

```
{
  "username": "johns",
  "pwd": "drowssap",
  "role": "User"
}
```

Supported Roles: Admin/User

- Response codes:

Status	Description
201	Created
409	Conflicted

4.2.3 Modify User/Change Password

Users can change their own password only. Admins can modify both passwords and roles.

- URL

```
PATCH /cyber-ai/users/{username}
```

- Request data - just `pwd` and/or `role` can be used in the request

```
{
  "pwd": "drowssap",
}
```

- Response

```
none
```

- Response codes:

Status	Description
200	Success
400	Bad request
403	Forbidden
404	Not found

4.2.4 Delete User

- URL

```
DELETE /cyber-ai/users/{username}
```

- Request data

```
none
```

- Response

```
none
```

- Response codes:

Status	Description
204	No content (success)
403	Forbidden
404	Not found

4.3 System Details

4.3.1 UFM Telemetry

- URL

```
GET /cyber-ai/system/ufm-telemetry
```

- Request Data

```
none
```

- Response: number of collected results for port counters and cable information

```
{
  "port_counters": 20,
  "cable_info": 8
}
```

- Response codes

Status	Description
200	Success

4.3.2 UFM Enterprise

- URL

```
GET /cyber-ai/system/ufm-enterprise
```

- Request Data

```
none
```

- Response codes

Status	Description
200	Ok

4.3.3 Run Analytic Job

- URL

```
POST /cyber-ai/system/analytic-jobs
```

- Request Data

```
{  
  "job_type": "delta_proc"  
}
```

- Response details regarding the fabric

```
none
```

- Response codes

Status	Description
201	Created
400	Bad Request (invalid argument)

4.3.4 Get Analytic Jobs statistics

- URL

```
GET /cyber-ai/system/analytic-jobs
```

- Request Data

```
none
```

- Response details regarding the fabric

```
[  
  {  
    "job_name": "file_splitter",  
    "job_type": "File Splitter",  
    "frequency": 300,  
    "runs": 50,  
    "successful_runs": 40,  
    "last_run_status": "Success",  
    "last_run_time": 1631520596.290813,  
    "next_run_time": 1631520596.290813,  
    "summary": "",  
    "dependencies": "Port counters"  
  },  
  ...  
]
```

- Response codes

Status	Description
200	Ok

Status	Description
400	Bad Request (invalid argument)

4.4 Application Details

4.4.1 Cyber-Ai Release Version

- URL

```
GET /cyber-ai/app/version
```

- Request Data

```
none
```

- Response

```
{
  "release_version": "0.9.4-6"
}
```

- Response codes

Status	Description
200	Ok

4.4.2 License Details

- URL

```
GET /cyber-ai/app/license
```

- Request Data

```
none
```

- Response

```
{
  "license_functionality": "functionality",
  "customer_num": "123456789",
  "serial_num": "987654321",
  "license_type": "type",
  "expiration_date": "2090-09-08"
}
```

- Response codes

Status	Description
200	Ok

4.5 Configuration

4.5.1 Set UFM Enterprise Connections Parameters

- URL

```
PUT /cyber-ai/config/ufm-params
```

- Request data

```
{  "password": "qwerty",  "ip": "10.210.4.57",  "username": "admin",  "protocol": "[http|https]"  "port": 443}
```

- Response codes

Status	Description
204	Success
400	Bad request

4.5.2 Get UFM Enterprise Connections Parameters

- URL

```
GET /cyber-ai/config/ufm-params
```

- Request data

```
none
```

- Response

```
none
```

- Response codes

Status	Description
200	Success

4.5.3 Alert Count Summary

- URL

```
GET /cyber-ai/analytics/summary
```

- URL filters

- From - retrieve alerts triggered within the last given time period

```
from=-<time>
```



Supported time units: h (for hours), d (for days), w (for weeks), m (for months). For example: from=-6h.

- Probability - returns all alerts with probability equal to, or greater than the given probability

```
min_probability=<0-100>
```

- Request data

```
none
```

- Response

```
{
  "link_anomaly_predictions": {...},
  "link_failure_prediction": {...},
}
```



If successful, the analytics summary will be returned in JSON format.

- Response codes

Status	Description
204	Success
400	Bad request

4.6 Analytics

4.6.1 Alert Count Summary

- URL

```
GET /cyber-ai/analytics/summary
```

- URL filters:

- From - retrieve alerts triggered within the last given time period:

```
?from=-<time>
```

Supported time units: h (for hours), d (for days), w (for weeks), m (for months). For example: `?from=-6h`.

- Probability - return all alerts with probability equal to, or greater than the given probability

```
?min_probability=<0-100>
```

- Request Data

```
none
```

- Response

```
{
  "link_failures_predictions": {...},
},
"link_anomaly_predictions": {...},
}
```



If successful, the analytics summary is returned in JSON format.

- Response codes

Status	Description
200	Success
400	Bad Request (invalid argument)

4.7 Suspicious Behavior

4.7.1 Get All Network Alerts

- URL

```
GET /cyber-ai/anomalies/network
```

- URL filters:

- From - retrieve alerts triggered within the last given time period:

```
?from=-<time>
```

Supported time units: h (for hours), d (for days), w (for weeks), m (for months). For example: `?from=-6h`.

- Severity - retrieve only alerts with a severity included in the list:

```
?severities=<comma-separated list of severities>
```

Supported severity types: Critical, Major, Minor, Warning, Info.

- Request data

none

- Response

```
{
  [
    {
      "alert_id": 2001,
      "timestamp": "Mon Sep 7 07:54:17 2020",
      "network_name": "default",
      "severity": "Critical",
      "probability": 85,
      "percentage": 60,
      "influencers": [
        "infl1",
        "infl2",
        "infl3"
      ],
      "description": "Suspicious network behavior is detected in your cluster",
    }
  ]
}
```

- Response codes

Status	Description
200	Success
400	Bad request (invalid argument)

4.7.2 Get Specific Network Alert

- URL

GET /cyber-ai/anomalies/network/<alert_id>

- URL filters:

- From - retrieve alerts triggered within the last given time period:

?from=-<time>

Supported time units: h (for hours), d (for days), w (for weeks), m (for months). For example: ?from=-6h .

- Request data

none

- Response

```
{
  "alert_id": 39241,
  "occurrence": "1 time during the last 2 hours",
  "severity": "Warning",
  "description": "port_xmit_wait is 2735.23% above the average",
  "full_description": "port_xmit_wait:132470536 is above the average: 4672298",
  "influencers": [
    "port_xmit_wait"
  ],
  "recommended_actions": [
    "These steps should be applied on top 5 ports",
    "Port reset and keep monitoring",
    "If still getting the alerts, please check if there any related cable alerts via cable anomaly tab",
    "In addition, please check relevant cable measure trend via cable anomaly tab",
    "If there are alerts for connected cable and/or deprecating trend please consider cable replacement",
    "If known issue due to maintenance activity please use suppress function do define as known issue"
  ],
  "percentage": 2735.23,
  "nodes": [
    {

```

```

    "port_guid": "0x24be05ffffc13011",
    "port_xmit_wait": 467264335.5705527,
    "port_name": "HCA-1/1",
    "node_guid": "0x24be05ffffc13010",
    "system_name": "mtlx319",
    "type": "switch",
    "role": "tor"
  },
  {
    "port_guid": "0x98039b03006c6912",
    "port_xmit_wait": 466359722.25149757,
    "port_name": "1",
    "node_guid": "0x98039b03006c6912",
    "system_name": "mtlx473",
    "type": "host",
    "role": "endpoint"
  }
],
"first_occurrence_timestamp": "2022-09-21 13:00",
"influencers_display_names": [
  "Port Xmit Wait"
],
"timestamp": "2022-09-21 13:00"
}

```

- Response codes

Status	Description
200	Success
400	Bad request (invalid argument)
404	Not found

4.7.3 Get All Tenant/Application Alerts

- URL

```
GET /cyber-ai/anomalies/tenant
```

- URL filters:

- From - retrieve alerts triggered within the last given time period:

```
?from=-<time>
```

Supported time units: h (for hours), d (for days), w (for weeks), m (for months). For example: `?from=-6h`.

- Severity - retrieve only alerts with a severity included in the list:

```
?severities=<comma-separated list of severities>
```

Supported severity types: Critical, Major, Minor, Warning, Suspect, Info.

- Request data

```
none
```

- Response

```

{
  [
    {
      "alert_id": 3001,
      "timestamp": "Mon Sep 7 07:53:45 2020",
      "tenant_id": "0x0004",
      "severity": "Critical",
      "probability": 85,
      "influencers": [
        "infl1",
        "infl2",

```

```

    "infl3"
  ],
  "description": "Inefficient network utilization for PKey 0x0004"
}
}

```

- Response codes

Status	Description
200	Success
400	Bad request (invalid argument)

4.7.4 Get Specific Tenant Alert

- URL

```
GET /cyber-ai/anomalies/tenant/<alert_id>
```

- URL filters:

- From - retrieve alerts triggered within the last given time period:

```
?from=-<time>
```

Supported time units: h (for hours), d (for days), w (for weeks), m (for months). For example: `?from=-6h`.

- Request data

```
none
```

- Response

```

{
  "alert_id": 3001,
  "timestamp": "Mon Sep 7 07:54:17 2020",
  "tenant_id": "0x0004",
  "severity": "Critical",
  "probability": 85,
  "influencers": [
    "infl1",
    "infl2",
    "infl3"
  ],
  "description": "Inefficient network utilization for PKey 0x0004",
  "occurrence": "9 times during the last 24 hours",
  "recommended_actions": "It seems that your placement engine/job scheduler did not allocate the best nodes for this job",
  "nodes": [
    {
      "node_guid": "0x24be05ffffc13010",
      "system_name": "mtlx319",
      "type": "switch",
      "role": "tor"
    },
    {
      "node_guid": "0x98039b03006c6912",
      "system_name": "mtlx473",
      "type": "host",
      "role": "endpoint"
    }
  ]
}

```

- Response codes

Status	Description
200	Success

Status	Description
404	Not found

4.7.5 Get Logical Server Alerts

- URL

```
GET /cyber-ai/anomalies/ logical-server
```

- URL filters

- From - retrieve alerts triggered within the last given time period:

```
?from=-<time>
```

Supported time units: h (for hours), d (for days), w (for weeks), m (for months). For example: `?from=-6h`.

- Severity - retrieve only alerts with a severity included in the list:

```
?severities=<comma-separated list of severities>
```

Supported severity types: Critical, Major, Minor, Warning, Suspect, Info and Notice.

- Request data

```
none
```

- Response

```
[
  {
    "alert_id": 1,
    "logical_server": "LS_test",
    "severity": "Critical",
    "description": "Logical server test_ls is utilized above 71.54%",
    "influencers": [
      "utilization",
      "port_xmit_data",
      "port_rcv_data"
    ],
    "influencers_display_names": [
      "Utilization",
      "Port Xmit Data",
      "Port Received Data"
    ],
    "timestamp": "2022-02-21 18:10"
  }
]
```

- Response codes

Status	Description
200	Success
400	Bad request (invalid argument)

4.7.6 Get Specific Logical Server Alert

- URL

```
GET /cyber-ai/anomalies/logical-server/<alert_id>
```

- Request data

```
none
```

- Response

```
{
  "alert_id": 1,
  "logical_server": "LS_test",
  "severity": "Critical",
  "description": "Logical server test_ls is utilized above 71.54%",
  "influencers": [
    "utilization",
    "port_xmit_data",
    "port_rcv_data"
  ],
  "influencers_display_names": [
    "Utilization",
    "Port Xmit Data",
    "Port Received Data"
  ],
  "timestamp": "2022-02-21 18:10"
}
```

- Response codes

Status	Description
200	Success
400	Bad request (invalid argument)

4.7.7 Cables Alerts

4.7.7.1 Cable Alerts Summary

- URL

```
GET /cyber-ai/anomalies/cable/summary
```

- Filters

- from
- to
- min_deviation
- max_deviation

- Request Data

```
none
```

- Response

```
{
```

```

'cable_threshold_events': {
  'Critical': 6,
  'Major': 0,
  'Minor': 0,
  'Warning': 0,
  'Suspect': 0,
  'Info': 0,
  'Notice': 0
},
'cable_deviation_events': {
  'Critical': 0,
  'Major': 0,
  'Minor': 0,
  'Warning': 0,
  'Suspect': 0,
  'Info': 5,
  'Notice': 0
}
}

```

- Response Code

Status	Description
200	Success
400	Bad request (invalid argument)

4.7.7.2 Threshold Events

- URL

```
GET /cyber-ai/anomalies/cable/threshold
```

- Filters

- from
- to
- sn
- guid
- severity
- influencers
- port
- channel
- brief

- Request data

```
none
```

- Response

```

"alert_id": 1,
"occurrence": 179,
"node_guid": "0x0010e0000187dce9",
"port": 1,
"link_partner": "0x506b4b0300623360:7",
"source_type": "switch",
"source_role": "tor",
"destination_type": "switch",
"destination_role": "tor",
"sn": "NA",
"speed": "NA",
"cable_info": "850 nm VCSEL",
"description": "Cable Failure for 0x0010e0000187dce9:1:NA regarding tx_bias.1:0.0",
"severity": "Critical",
"influencers": [
  "tx_bias.1"
],
"influencers_values": [
  0
]

```

```

    ],
    "channel": 1,
    "influencers_display_names": [
      "TX Bias"
    ],
    "timestamp": "2022-06-18 00:00"
  }, ...

```

- Response codes

Status	Description
200	Success
400	Bad request (invalid argument)

4.7.7.3 Specific Threshold Event

- URL

```
GET /cyber-ai/anomalies/cable/threshold/<event_id>
```

- Request data

```
none
```

- Response

```

{
  "alert_id": 1,
  "occurrence": 179,
  "node_guid": "0x0010e0000187dce9",
  "port": 1,
  "link_partner": "0x506b4b0300623360:7",
  "source_type": "switch",
  "source_role": "tor",
  "destination_type": "switch",
  "destination_role": "tor",
  "sn": "NA",
  "speed": "NA",
  "cable_info": "850 nm VCSEL",
  "description": "Cable Failure for 0x0010e0000187dce9:1:NA regarding tx_bias.1:0.0",
  "severity": "Critical",
  "influencers": [
    "tx_bias.1"
  ],
  "influencers_values": [
    0
  ],
  "channel": 1,
  "influencers_display_names": [
    "TX Bias"
  ],
  "timestamp": "2022-06-18 00:00"
}

```

- Response codes

Status	Description
200	Success

4.7.7.4 Threshold Event Tachometer

- URL

```
GET /cyber-ai/anomalies/cable/threshold/<event_id>/meter
```

- Request data

none

- Response

```
{
  "high_alarm_range": [8.5, 9],
  "high_warning_range": [8, 8.5],
  "normal_range": [6.1, 8],
  "low_warning_range": [5.5, 6.1],
  "low_alarm_range": [5, 5.5]
}
```

- Response codes

Status	Description
200	Success

4.7.7.5 Deviation Events

- URL

GET /cyber-ai/anomalies/cable/deviation

- Filters

- from
- to
- sn
- guid
- severity
- influencers
- port
- channel
- min_deviation
- max_deviation
- brief

- Request data

None

- Response

```
[
  {
    "alert_id": 1,
    "occurrence": 179,
    "node_guid": "0x0010e0000187dce9",
    "port": 1,
    "link_partner": "0x506b4b0300623360:7",
    "source_type": "switch",
    "source_role": "tor",
    "destination_type": "switch",
    "destination_role": "tor",
    "sn": "NA",
    "speed": "NA",
    "cable_info": "850 nm VCSEL",
    "description": "Cable Failure for 0x0010e0000187dce9:1:NA regarding tx_bias.1:0.0",
    "deviation": 69.14892243,
    "severity": "Critical",
    "influencers": [
      "tx_bias.1"
    ],
    "influencers_values": [

```

```

    ],
    "channel": 1,
    "influencers_display_names": [
      "TX Bias"
    ],
    "timestamp": "2022-06-18 00:00"
  }, ...
]

```

- Response codes

Status	Description
200	Success
400	Bad request (invalid argument)

4.7.7.6 Specific Deviation Event

- URL

```
GET /cyber-ai/anomalies/cable/deviation/<event_id>
```

- Request data

```
none
```

- Response

```

{
  "alert_id": 1,
  "occurrence": 179,
  "node_guid": "0x0010e0000187dce9",
  "port": 1,
  "link_partner": "0x506b4b0300623360:7",
  "source_type": "switch",
  "source_role": "tor",
  "destination_type": "switch",
  "destination_role": "tor",
  "sn": "NA",
  "speed": "NA",
  "cable_info": "850 nm VCSEL",
  "description": "Cable Failure for 0x0010e0000187dce9:1:NA regarding tx_bias.1:0.0",
  "deviation": 69.14892243,
  "severity": "Critical",
  "influencers": [
    "tx_bias.1"
  ],
  "influencers_values": [
    0
  ],
  "channel": 1,
  "influencers_display_names": [
    "TX Bias"
  ],
  "timestamp": "2022-06-18 00:00"
}

```

- Response codes

Status	Description
200	Success

4.8 Link Analysis

4.8.1 Get All Link Failure Predictions

- URL

```
GET /cyber-ai/prediction/link-failure
```

- URL filters:

- From - retrieve alerts triggered within the last given time period:

```
?from=-<time>
```

Supported time units: h (for hours), d (for days), w (for weeks), m (for months). For example: `?from=-6h`.

- Severity - retrieve only alerts with a severity included in the list:

```
?severities=<comma-separated list of severities>
```

Supported severity types: Critical, Major, Minor, Warning, Info.

- Request data

```
none
```

- Response

```
[
  {
    "alert_id": 4001,
    "timestamp": "Mon Sep 7 06:52:17 2020",
    "node_guid": "0x44556677adbf0121",
    "node_name": "k11r2n03 HCA-1",
    "port": 1,
    "port_name": "k11r2n03 HCA-1:1",
    "severity": "Critical",
    "probability": 85,
    "influencers": [
      "infl1",
      "infl2",
      "infl3"
    ],
    "description": "Link failure prediction detected on port k15r1n03 HCA-1"
  }
]
```

- Response codes

Status	Description
200	Success
400	Bad Request

4.8.2 Get Link Failure Prediction History

- URL

```
cyber-ai/prediction/link-failure/<alert_id>
```

- Request data

```
none
```

- Response

```
[
  {
    "alert_id":2,
    "created":1705251000,
    "node_guid":"0x0002c90200428490",
    "port":16,
    "node_name":"Infiniscale-IV Mellanox Technologies",
    "probability":0
  },
  {
    "alert_id":2,
    "created":1705251600,
    "node_guid":"0x0002c90200428490",
    "port":16,
    "node_name":"Infiniscale-IV MellanoxTechnologies",
    "probability":0
  }
]
```

- Response codes

Status	Description
200	Success
400	Bad Request
404	Not Found

4.8.3 Get All Link Anomaly Predictions

- URL

```
GET /cyber-ai/prediction/link-anomaly
```

- URL filters:

- From - retrieve predictions triggered within the last given time period:

```
?from=-<time>
```

Supported time units: h (for hours), d (for days), w (for weeks), m (for months). For example: `?from=-6h`.

Severity - retrieve only predations with a severity included in the list

- Probability - return all predictions with probability equal to, or greater than the given probability

```
?min_probability=<0-100>
```

- Request Data

```
none
```

- Response

```
[
```

```

{
  "alert_id": 4001,
  "timestamp": "Mon Sep 7 06:52:17 2020",
  "node_guid": "0x44556677adbf0121",
  "node_name": "k11r2n03 HCA-1",
  "port": 1,
  "port_name": "k11r2n03 HCA-1:1",
  "severity": "Critical",
  "probability": 85,
  "influencers": [
    "infl1",
    "infl2",
    "infl3"
  ],
  "description": "Link failure prediction detected on port k15r1n03 HCA-1"
}
]

```

- Response codes

Status	Description
200	Success
400	Bad Request

4.8.4 Get Link Anomaly Prediction History

- URL

```
cyber-ai/prediction/link-anomaly/<anomaly_id>
```

- Request Data

```
none
```

- URL filters:

- Severities - retrieves only alerts with a severity included in the list.

```
Severities:<comma separated list of severity>
```

- Response

```

[
  {
    "alert_id":165,
    "created":1704790800,
    "node_guid":"0x08c0eb03002a37fc",
    "port":1,
    "dst_guid":"0xb83fd2030080304e",
    "dst_port":11,
    "type":"link_issues",
    "counter":"port_rcv_errors",
    "counter_value":10922.5,
    "comments":""
  },
  {
    "alert_id":165,
    "created":1704794400,
    "node_guid":"0x08c0eb03002a37fc",
    "port":1,
    "dst_guid":"0xb83fd2030080304e",
    "dst_port":11,
    "type":"link_issues",
    "counter":"port_rcv_errors",
    "counter_value":9362.142857142857,
    "comments":""
  }
]

```

4.8.5 Events Flows

- URL

```
GET /cyber-ai/prediction/link-anomaly/analysis/events_flow
```

- URL filters:
 - from
 - to
 - min_probability
 - max_probability
 - src
 - guid
 - dst
 - guid
 - src_role
 - dst_role
 - dst_type
 - src_type
 - influencer1
 - width
 - cable_type
 - fw_ver
 - rev
 - cable_pn
 - length
 - influencer2
 - influencer3

- Request Data

```
none
```

- Response

```
[[{"src_guid": "0x0c42a1030001f494",  
  "dst_guid": "0xb8599f0300f61696",  
  "src_type": "host",  
  "dst_type": "switch",  
  "count": 8  
}]
```

- Response codes

Status	Description
200	Success
400	Bad request

4.8.6 Elements

- URL

```
GET /cyber-ai/prediction/link-anomaly/analysis/elements
```

- Request data

```
none
```

- Response

```
[{
  "src_type": "host",
  "src_role": "endpoint",
  "dst_type": "switch",
  "dst_role": "tor",
  "length": 1,
  "cable_pn": "0000001PG737",
  "rev": "A1",
  "fw_ver": "NA",
  "cable_type": "Copper cable- unequalized",
  "width": "4x",
  "src_nic_type": "ConnectX-6",
  "count": 2
}]
```

- Response codes

Status	Description
200	Success
400	Bad request

4.8.7 Timeline

- URL

```
GET /cyber-ai/prediction/link-anomaly/analysis/timeline
```

- URL filters:

- from
- to
- src
- guid
- dst
- guid
- src_role
- dst_role
- dst_type
- src_type
- influencer1
- width
- cable_type
- fw_ver

- rev
 - cable_pn
 - length
 - influencer2
 - influencer3
- Request Data

```
none
```

- Response

```
[{
  "time": 1638889200,
  "count": 301
}]
```

- Response codes

Status	Description
200	Success
400	Bad request

4.8.8 Influencers

- URL

```
GET /cyber-ai/prediction/link-anomaly/analysis/influencers
```

- URL filters:

- from
- to
- src
- guid
- dst
- guid
- src_role
- dst_role
- dst_type
- src_type
- influencer1
- width
- cable_type
- fw_ver
- rev
- cable_pn
- length
- influencer2

- influencer3
- Request Data

```
none
```

- Response

```
[{
  "src_role": "core",
  "count": 1,
  "influencer1": "PortFECCorrectableBlockCounter",
  "influencer2": hist2,
  "influencer3": hist3
}]
```

- Response codes

Status	Description
200	Success
400	Bad request

4.9 Resources

4.9.1 Get Link Failure Distribution

- URL

```
GET /cyber-ai/resources/distribution/link-failure
```

- URL Filters:

- `from` - retrieve link failure distribution within the last given time period:

```
?from=-<time>
```

Supported time units: h (for hours), d (for days), w (for weeks), m (for months). For example: `?from=-6h`.

- `to` - retrieve link failure distribution till given time period:

```
?to=<time>
```

Supported time units: h (for hours), d (for days), w (for weeks), m (for months).

- Request

```
none
```

- Response

```
{"switch_switch": 139, "switch_host": 725}
```

- Response codes

Status	Description
200	Success
400	Bad Request (invalid argument)

4.9.2 Get Anomaly Nodes

- URL

```
GET /cyber-ai/resources/nodes/anomaly
```

- URL filters:

- From - retrieve nodes whose triggered alerts within the last given time period:

```
?from=-<time>
```

Supported time units: h (for hours), d (for days), w (for weeks), m (for months). For example: `?from=-6h`.

- Probability - return all alerts with probability equal to, or greater than the given probability

```
?min_probability=<0-100>
```

- Severity - retrieve only alerts with a severity included in the list:

```
?severities=<comma-separated list of severities>
```

- Request

```
none
```

- Response

```
{"nodes": {"anomaly": 328, "normal": 518}, "switches": {"anomaly": 64, "normal": 1}}
```

- Response codes

Status	Description
200	Success

4.9.3 Get Anomaly Cables

- URL

```
GET /cyber-ai/resources/cable/anomaly
```

- URL filters:

- From - retrieve cables whose triggered alerts within the last given time period

```
?from=-<time>
```

Supported time units: h (for hours), d (for days), w (for weeks), m (for months). For example:

```
?from=-6h.
```

- Request

```
none
```

- Response

```
"nodes":
  {
    "anomaly": 473,
    "normal": 1663
  },
"switches":
  {
    "anomaly": 31,
    "normal": 167
  }
}
```

- Response codes

Status	Descriptions
200	Success
400	Bad Request (invalid argument)

4.9.4 Get Tenants Allocation

- URL

```
GET /cyber-ai/resources/tenant/allocation
```

- Request

```
none
```

- Response

```
{
  "allocated": 15,
  "free": 993
}
```

- Response codes

Status	Description
200	Success

4.9.5 Get Tenant Nodes

- URL

```
GET /cyber-ai/resources/tenant/{tenant_id}/nodes
```

- Request

```
none
```

- Response

```
[
  {
    "port_guid": "0xec0d9a03008460a6",
    "port_name": "HCA-2/1",
    "system_name": "nia-m4-bb02",
    "utilization": 15.4
  },
  {
    "port_guid": "0xec0d9a0300845e6a",
    "port_name": "HCA-2/1",
    "system_name": "nia-m4-bb06",
    "utilization": 15.4
  }
]
```

- Response code

Status	Description
200	Success

4.9.6 Get Top Congested Tenants/Applications

- URL

```
GET /cyber-ai/resources/tenant/top-congested
```

- URL filters:

- From - retrieve alerts triggered within the last given time period:

```
?from=-<time>
```

Supported time units: h (for hours), d (for days), w (for weeks), m (for months). For example: `?from=-6h`.

- Count - retrieve specific number of nodes

```
?count=<integer larger than 0>
```

- Request

none

- Response

```
[
  {
    "tenant_id": "0x0001",
    "congestion": 4
  },
  {
    "tenant_id": "0x0003",
    "congestion": 3
  },
  {
    "tenant_id": "0x0005",
    "congestion": 2
  }
]
```

- Response codes

Status	Description
200	Success
400	Bad Request

4.9.7 Get Logical Servers Allocation

- URL

```
GET /cyber-ai/resources/logical-server/allocation
```

- Request

none

- Response

```
{
  "allocated": 15,
  "free": 2131
}
```

- Response codes

Status	Description
200	Success
400	Bad request

4.9.8 Get Top Congested Logical Servers

- URL

```
GET /cyber-ai/resources/logical-server/top-congested
```

- URL filters

- From - retrieve alerts triggered within the latest given time period:

```
?from=-<time>
```

 Supported time units: h (for hours), d (for days), w (for weeks) and m (for months). For example: ?from=-6h.

- Count - retrieve a specific number of nodes

```
?count=<integer larger than 0>
```

- Request

```
none
```

- Response

```
[
  {
    "logical_server": "LS",
    "utilization": 0.0315922587555555
  },
  {
    "logical_server": "LS_test",
    "utilization": 0.0060010954666666
  }
]
```

- Response codes

Status	Description
200	Success
400	Bad request

4.9.9 Get Link Anomalies

- URL

```
GET /cyber-ai/resources/link-anomaly
```

- URL filters:

- Influencers:

```
?influencers=<comma-separated list of influencers>
```

- Request

```
none
```

- Response

```
[ {  
  "name": "vl15_dropped",  
  "description": "Number of incoming VL15 packets dropped due to resource limitations (e.g.,  
  lack of buffers) in the port."  
}]
```

- Response codes

Status	Description
200	Success
400	Bad Request

4.9.10 Get Link Anomalies For influencer

- URL

```
GET /cyber-ai/resources/link-anomaly/{influencer}
```

- Request

```
none
```

- Response

```
{  
  "name": "vl15_dropped",  
  "description": "Number of incoming VL15 packets dropped due to resource limitations (e.g., lack of  
  buffers) in the port."  
}
```

- Response codes

Status	Description
200	Success
404	Not Found

4.10 Telemetry Data

4.10.1 Get the Telemetry Counter List

- URL:

```
GET /cyber-ai/telemetry/counters?type=<type>
```

Allowed Types:

- Link
 - Cable
 - Network
 - Tenant
 - Logical-server
- Request Data:

```
None
```

• Response:

```
{
  "LinkDownedCounterExtended": "Link Downed Counter Extended",
  "MaxRetransmissionRate": "Max Retransmission Rate",
  "PortBufferOverrunErrors": "Port Buffer Overrun Errors",
  "PortDLIDMappingErrors": "Port DLID Mapping Errors",
  "PortFECCorrectableBlockCounter": "Port FEC Correctable Block Counter",
  "PortFECCorrectedSymbolCounter": "Port FEC Corrected Symbol Counter",
  "PortFECUncorrectableBlockCounter": "Port FEC Uncorrectable Block Counter",
  ...
}
```

4.10.2 Get Link Telemetry Data

• URL:

```
GET /cyber-ai/telemetry/link/{node_id}
```

• URL filters:

Filter	Description	Example
from	Retrieve alerts generated during the specified recent time period	?from=-<time>
influencers	Accepted time units: h (hours), d (days), w (weeks), m (months) Example: ?from=-1d	?influencers=<comma-separated list of influencers>
average	Returns average data	?average=["True" "False"]

• Request Data:

```
none
```

• Response:

```
[
  {
    "time": "06:00:00",
    "value": 45
  },
  {
    "time": "07:00:00",
    "value": 55
  }
]
```

4.10.3 Get Link Status Telemetry Data

- URL

```
GET /cyber-ai/telemetry/link-status
```

- URL filters:

Filter	Description	Example
from	Retrieves telemetry data within the last given time period	?from=-<time>

- Request Data:

```
none
```

- Response:

```
{
  {
    "sample_time": 1752998400,
    "node_guid": "0xb83fd20300a6bc84",
    "port_num": 21,
    "port_guid": "0xb83fd20300a6bc84",
    "dow": "Sun",
    "hour": 11,
    "fec_mode_active": "Standard_LL_RS_FEC - RS(271, 257)",
    "status_opcode": "No issue observed",
    "cable_fw_version": "32.30.266",
    "cable_identifier": "QSFP+",
    "length": "15 m",
    "pn": "NA",
    "sn": "NA",
    "transmitter_technology": "0.0",
    "cable_type": "850 nm VCSEL",
    "cable_vendor": "Other",
    "switch_temperature": 62,
    "device_hw_rev": "160",
    "device_id": "Quantum",
    "down_blame": "Unknown",
    "e2e_reason_opcode": "No_link_down_indication",
    "eff_ber": 1.5e-254,
    "phy_effective_errors": "N/A",
    "ExcessiveBufferOverrunErrorsExtended": "N/A",
    "fast_link_up_status": 4,
    "fw_version": "27.2012.2014",
    "hl_retransmission_rate": "NA",
    "hist0": 11417597020.9167,
    "hist1": 0,
    "hist2": 0,
    "hist3": 0,
    "hist4": 0,
    "hist5": 0,
    "hist6": 0,
    "hist7": 0,
    "hist8": 0,
    "hist9": 0,
    "hist10": 0,
    "hist11": 0,
    "hist12": 0,
    "hist13": 0,
    "hist14": 0,
    "hist15": 0,
    "lid": "N/A",
    "link_down_events": 0,
    "LinkDownedCounterExtended": 0,
    "link_partner_description": "MF0;MTL-S-F1-DC-IB-SW214;MQM8700/U1",
    "link_partner_lid": 1143,
    "link_partner_node_guid": "0xb83fd20300a6b644",
    "link_partner_port_num": 40,
    "link_speed_active": 32,
    "link_width_active": 4,
    "LinkErrorRecoveryCounterExtended": 0,
    "local_reason_opcode": "No_link_down_indication",
    "LocalLinkIntegrityErrorsExtended": 0,
    "logical_state": "Active",
    "max_delta_freq_0": 0,
    "max_delta_freq_1": 0,
    "max_freq_0": 0,
    "max_freq_1": 0,
  }
}
```

```

"measured_freq_0": 0,
"measured_freq_1": 0,
"min_freq_0": 0,
"min_freq_1": 0,
"temperature": "52C",
"diag_supply_voltage": 0,
"node_description": "MFO;MTL-S-F1-DC-IB-AGG-02-1:MQM8700/U1",
"num_of_ber_alarms": "N/A",
"phy_mgr_fsm_state": "Active_or_Linkup",
"phy_received_bits": 30002666666666.7,
"phy_state": "Phy_up",
"plr_rcv_code_err": 0,
"plr_rcv_codes": 0,
"plr_rcv_uncorrectable_code": 0,
"plr_sync_events": 0,
"plr_xmit_codes": 0,
"plr_xmit_retry_codes": 0,
"plr_xmit_retry_codes_within_t_sec_max": "NA",
"plr_xmit_retry_events": 0,
"m_label": "NA",
"PortMultiCastRcvPktsExtended": 0.3333333333333333,
"PortMultiCastXmitPktsExtended": 0.8333333333333333,
"PortRcvConstraintErrorsExtended": 0,
"PortRcvDataExtended": 1955276673.66667,
"PortRcvErrorsExtended": 0,
"PortRcvPktsExtended": 1300573.91666667,
"PortRcvRemotePhysicalErrorsExtended": 0,
"PortRcvSwitchRelayErrorsExtended": 0,
"PortSwHOOQLifetimeLimitDiscards": 0,
"PortSwLifetimeLimitDiscards": 0,
"PortUniCastRcvPktsExtended": 1300573.58333333,
"PortUniCastXmitPktsExtended": 3070033.16666667,
"port_xmit_constraint_errors": 0,
"PortXmitDataExtended": 5304247144,
"PortXmitDiscardsExtended": 0,
"PortXmitPktsExtended": 3070033.91666667,
"PortXmitWaitExtended": 0,
"phy_raw_errors_lane0": 0,
"phy_raw_errors_lane1": 0,
"phy_raw_errors_lane2": 0,
"phy_raw_errors_lane3": 0,
"remote_reason_opcode": "No_link_down_indication",
"rq_num_lle": 0,
"rq_num_wrfe": 0,
"rx_cdr_lol": 0,
"rx_los": 0,
"rx_power_lane0": 0,
"rx_power_lane1": 0,
"rx_power_lane2": 0,
"rx_power_lane3": 0,
"rx_power_lane4": 0,
"rx_power_lane5": 0,
"rx_power_lane6": 0,
"rx_power_lane7": 0,
"snr_host_lane0": 0,
"snr_host_lane1": 0,
"snr_host_lane2": 0,
"snr_host_lane3": 0,
"snr_media_lane0": 0,
"snr_media_lane1": 0,
"snr_media_lane2": 0,
"snr_media_lane3": 0,
"sq_num_wrfe": 0,
"status_message": "No issue was observed",
"revision": "AN",
"serial_number": "MT2243XZ0AV7",
"symbol_ber": 1.5e-254,
"phy_symbol_errors": 0,
"SyncHeaderErrorCounter": 0,
"temperature_alarm_and_warning": 0,
"cable_temperature": 52,
"time_since_last_clear": 5,
"time_to_link_up": 0,
"raw_ber": 7e-19,
"tx_cdr_lol": 0,
"tx_los": 0,
"tx_power_lane0": 0,
"tx_power_lane1": 0,
"tx_power_lane2": 0,
"tx_power_lane3": 0,
"tx_power_lane4": 0,
"tx_power_lane5": 0,
"tx_power_lane6": 0,
"tx_power_lane7": 0,
"voltage_alarm_and_warning": 0,
"rev": "NA",
"VL15DroppedExtended": 0,
"source_type": "switch",
"source_role": "core",
"source_model": "N/A",
"source_fw_version": "27.2012.2014",
"destination_type": "switch",
"destination_role": "tor",
"destination_model": "N/A",
"destination_fw_version": "27.2012.2014"
}}

```

4.10.4 Get Link Status Counter Histogram Telemetry Data

- URL:

```
GET /cyber-ai/telemetry/link-status/influncer/histogram
```

- URL filters:

Filter	Description	Example
from	Retrieves histogram telemetry data within the last given time period	?from=-<time>
to	Retrieves histogram telemetry data until given time period	?to=<time>
counter	Retrieve histogram telemetry data for given counters	?counter==<comma separated counters >

- Request Data:

```
none
```

- Response

```
{
  "raw_ber": {
    "0": {
      "total": 8840
    },
    "1.5e-254": {
      "total": 6968
    },
    "7e-19": {
      "total": 24
    },
    "8e-19": {
      "total": 16
    },
    "1e-18": {
      "total": 16
    },
    "3e-18": {
      "total": 16
    },
    "7e-18": {
      "total": 8
    },
    "8e-18": {
      "total": 8
    },
    "1e-17": {
      "total": 8
    },
    "3e-17": {
      "total": 16
    },
    "1e-16": {
      "total": 8
    },
    "3e-15": {
      "total": 8
    },
    "5e-15": {
      "total": 8
    },
    "2e-14": {
      "total": 16
    },
    "3e-14": {
      "total": 8
    },
    "7e-13": {
      "total": 8
    }
  }
}
```

```

    },
    "9e-13": {
      "total": 8
    },
    "1e-12": {
      "total": 8
    },
    "7e-12": {
      "total": 8
    },
    "7e-10": {
      "total": 8
    },
    "8e-10": {
      "total": 8
    },
    "1e-09": {
      "total": 32
    },
    "4e-09": {
      "total": 8
    },
    "2e-08": {
      "total": 8
    }
  },
  "eff_ber": {
    "0": {
      "total": 8840
    },
    "1.5e-254": {
      "total": 7184
    },
    "5e-18": {
      "total": 8
    },
    "1e-17": {
      "total": 16
    },
    "3e-15": {
      "total": 8
    },
    "5e-15": {
      "total": 8
    }
  },
  "symbol_ber": {
    "0": {
      "total": 8840
    },
    "1.5e-254": {
      "total": 7184
    },
    "1e-17": {
      "total": 8
    },
    "2e-17": {
      "total": 8
    },
    "3e-17": {
      "total": 8
    },
    "7e-17": {
      "total": 8
    },
    "1e-16": {
      "total": 8
    }
  },
  "LinkDownedCounterExtended": {
    "0": {
      "total": 16064
    }
  }
}

```

4.10.5 Get Link Status Histogram Attribute Telemetry Data

- URL

```
GET /cyber-ai/telemetry/link-status/attributes/histogram?
```

- URL filters:

Filter	Description	Example
from	Retrieves telemetry histogram data within the last given time period	?from=-<time>

Filter	Description	Example
to	Retrieves telemetry data within the last given time period	?from=-<time>
additional_attributes	Retrieves histogram telemetry data for the added attribute	? additional_attributes=<comma separated attribute>

- Request Data:

```
none
```

- Response:

```
{
  "cable_type": {
    "850 nm VCSEL": {
      "total": 21
    }
  },
  "phy_state": {
    "Phy_up": {
      "total": 21
    }
  },
  "logical_state": {
    "Active": {
      "total": 21
    }
  },
  "phy_mgr_fsm_state": {
    "Active_or_Linkup": {
      "total": 21
    }
  }
}
```

4.11 Alert Filters

4.11.1 Add Alerts Filter

- URL

```
POST /cyber-ai/alerts/filter
```

- Request Data

```
{
  "filter_type": "link_anomaly",
  "filter_elements": "0x35b286a72f6dc42:15",
  "filter_attributes": "hist1, hist2, hist3",
  "enabled": [
    true|false
  ]
}
```

- Response

```
{
  "filter_id": 100,
}
```

- Response codes

Status	Description
201	Created
400	Bad Request (invalid argument)

4.11.2 Delete Alert Filter

- URL

```
DELETE /cyber-ai/alerts/filter/{filter_id}
```

- Request Data

```
none
```

- Response

```
none
```

- Response codes

Status	Description
200	Successful
404	Not found

4.11.3 Enable Alert Filter

- URL

```
PUT /cyber-ai/alerts/filter
```

- Request Data

```
{
  "filter_id": 100,
  "enabled" : [true|false]
}
```

- Response

```
{
  "filter_id": 100,
  "filter_type": "link_anomaly",
  "filter_elements": "0x35b286a72f6dc42:15",
  "filter_attributes": "hist1, hist2, hist3",
  "enabled": [true|false]
}
```

- Response codes

Status	Description
200	Success
404	Not found

4.11.4 Get Alerts Filter

- URL

```
GET /cyber-ai/alerts/filter
```

- URL filters:

- Type - retrieve alerts of specific type (or all types if this filter is not used)

```
?type=<alert_type>
```

Supported types: link_failure_prediction, link_anomaly, cable_event, tenant_alert, network_alert and logical_server_alert

- Request Data

```
none
```

- Response

```
[
  {
    "filter_id": 1,
    "filter_type": "link_anomaly",
    "filter_elements": "0x35b286a72f6dc42:15",
    "filter_attributes": "hist1, hist2, hist3",
    "enabled": true
  },
  {
    "filter_id": 2,
    "filter_type": "link_anomaly",
    "filter_elements": "0x35b286a72f6dc42:16",
    "filter_attributes": "hist1, hist2, hist3",
    "enabled": false
  }
]
```

- Response codes

Status	Description
200	Success
400	Bad request

4.11.5 Get Alert Filter

- URL

```
GET /cyber-ai/alerts/filter/{filter_id}
```

- Request Data

none

- Response

```
{
  "filter_id": 1,
  "filter_type": "link_anomaly",
  "filter_elements": "0x35b286a72f6dc42:15",
  "filter_attributes": "hist1, hist2, hist3",
  "enabled": true
}
```

- Response codes

Status	Description
200	Success
404	Not found

4.11.6 Link Status

- URL

cyber-ai/telemetry/link-status

- Filters

```
From
node_guid
port
port_guid
sample_time
dow
hour
node_description
lid
device_id
phy_mgr_fsm_state
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_lane2
phy_raw_errors_lane3
phy_effective_errors
phy_symbol_errors
time_since_last_clear
hist0
hist1
hist2
hist3
hist4
hist5
hist6
hist7
hist8
hist9
hist10
hist11
hist12
hist13
hist14
hist15
fw_version
switch_temperature
switch_voltage
link_down_events
LinkErrorRecoveryCounterExtended
link_partner
destination_port_node_description
destination_guid
destination_port
source_server_operation_mode
```

```

source_system_name
source_ip
source_fw_version
source_hw_version
source_nic_type
source_port_dname
source_port_node_description
source_host
source_technology
destination_type
destination_role
destination_model
destination_server_operation_mode
destination_system_name
destination_ip TEXT,
destination_fw_version
destination_hw_version
destination_nic_type
destination_port_dname
destination_host
destination_technology

```

- Response

```

[
  {
    "node_guid":"0x0002c90200428490",
    "port":1,
    "port_guid":"0x0002c90200428490",
    "sample_time":1706151600,
    "dow":"Thu",
    "hour":5,
    "node_description":"0",
    "lid":0,
    "device_id":"0.0",
    "phy_mgr_fsm_state":0,
    "phy_state":"Phy_up",
    "logical_state":"Active",
    "link_speed_active":0.125,
    "link_width_active":0.5,
    "fec_mode_active":31.875,
    "raw_ber":0,
    "eff_ber":0,
    "symbol_ber":0,
    "phy_raw_errors_lane0":0,
    "phy_raw_errors_lane1":0,
    "phy_raw_errors_lane2":0,
    "phy_raw_errors_lane3":0,
    "phy_effective_errors":0,
    "phy_symbol_errors":0,
    "time_since_last_clear":0,
    "hist0":0,
    "hist1":0,
    "hist2":0,
    "hist3":0,
    "hist4":0,
    "hist5":0,
    "hist6":0,
    "hist7":0,
    "hist8":0,
    "hist9":0,
    "hist10":0,
    "hist11":0,
    "hist12":0,
    "hist13":0,
    "hist14":0,
    "hist15":0,
    "fw_version":"NA",
    "switch_temperature":0,
    "switch_voltage":0,
    "link_down_events":0,
    "LinkErrorRecoveryCounterExtended":0,
    "link_partner":"NA",
    "destination_port_node_description":"MTL-S-F1-DC-IB-SW10:12",
    "destination_guid":"0xb83fd203008031ce",
    "destination_port":12,
    "pn":"NA",
    "sn":"NA",
    "transmitter_technology":"NA",
    "cable_type":"NA",
    "cable_vendor":"NA",
    "length":"NA",
    "cable_identifier":"NA",
    "rev":"NA",
    "diag_supply_voltage":"NA",
    "temperature":"NA",
    "status_opcode":0,
    "down_blame":"Unknown",
    "local_reason_opcode":"No_link_down_indication",
    "remote_reason_opcode":"No_link_down_indication",
    "e2e_reason_opcode":0,
    "PortRcvRemotePhysicalErrorsExtended":0,
    "PortRcvErrorsExtended":0,
    "PortXmitDiscardsExtended":0,
    "PortRcvSwitchRelayErrorsExtended":0,
    "ExcessiveBufferOverrunErrorsExtended":0,
    "LocalLinkIntegrityErrorsExtended":0,
    "PortRcvConstraintErrorsExtended":0,
    "PortXmitConstraintErrorsExtended":0,
    "PortBufferOverrunErrors":0,
  }
]

```

```

"PortDLIDMappingErrors":0,
"VL15DroppedExtended":0,
"PortXmitWaitExtended":0,
"PortXmitDataExtended":13623112821.5,
"PortRcvDataExtended":77872769279.5,
"PortXmitPktsExtended":27879243.625,
"PortRcvPktsExtended":97167768,
"PortUniCastXmitPktsExtended":27847241.25,
"PortUniCastRcvPktsExtended":95548800.375,
"PortMultiCastXmitPktsExtended":32002.375,
"PortMultiCastRcvPktsExtended":1618967.625,
"SyncHeaderErrorCounter":0,
"PortSwLifetimeLimitDiscards":0,
"PortSwHOQLifetimeLimitDiscards":0,
"PortFECCorrectableBlockCounter":0,
"PortFECCorrectedSymbolCounter":0,
"PortFECUncorrectableBlockCounter":0,
"PortLocalPhysicalErrors":0,
"PortMalformedPacketErrors":0,
"rx_power_1_mw": "NA",
"rx_power_2_mw": "NA",
"rx_power_3_mw": "NA",
"rx_power_4_mw": "NA",
"tx_power_1_mw": "NA",
"tx_power_2_mw": "NA",
"tx_power_3_mw": "NA",
"tx_power_4_mw": "NA",
"source_type": "switch",
"source_role": "tor",
"source_model": "SDR",
"source_server_operation_mode": "Switch",
"source_system_name": "Infiniscale-IV Mellanox Technologies",
"source_ip": "0.0.0.0",
"source_fw_version": "0.0.0",
"source_hw_version": "NA",
"source_nic_type": "NA",
"source_port_dname": "1",
"source_port_node_description": "Infiniscale-IV Mellanox Technologies:1",
"source_host": "0002c902004428490",
"source_technology": "QDR",
"destination_type": "switch",
"destination_role": "tor",
"destination_model": "MQM8700",
"destination_server_operation_mode": "Switch",
"destination_system_name": "MTL-S-F1-DC-IB-SW10",
"destination_ip": "10.60.130.10",
"destination_fw_version": "27.2010.4120",
"destination_hw_version": "NA",
"destination_nic_type": "NA",
"destination_port_dname": "12",
"destination_host": null,
"destination_technology": "HDR"
},
{
"node_guid": "0x0002c9020044ff80",
"port": 1,
"port_guid": "0x0002c9020044ff80",
"sample_time": 1706151600,
"dow": "Thu",
"hour": 5,
"node_description": "0",
"lid": 0,
"device_id": "0.0",
"phy_mgr_fsm_state": 0,
"phy_state": "Phy_up",
"logical_state": "Active",
"link_speed_active": 0.125,
"link_width_active": 0.5,
"fec_mode_active": 31.875,
"raw_ber": 0,
"eff_ber": 0,
"symbol_ber": 0,
"phy_raw_errors_lane0": 0,
"phy_raw_errors_lane1": 0,
"phy_raw_errors_lane2": 0,
"phy_raw_errors_lane3": 0,
"phy_effective_errors": 0,
"phy_symbol_errors": 0,
"time_since_last_clear": 0,
"hist0": 0,
"hist1": 0,
"hist2": 0,
"hist3": 0,
"hist4": 0,
"hist5": 0,
"hist6": 0,
"hist7": 0,
"hist8": 0,
"hist9": 0,
"hist10": 0,
"hist11": 0,
"hist12": 0,
"hist13": 0,
"hist14": 0,
"hist15": 0,
"fw_version": "NA",
"switch_temperature": 0,
"switch_voltage": 0,
"link_down_events": 0,
"LinkErrorRecoveryCounterExtended": 0,
"link_partner": "NA",
"destination_port_node_description": "MTL-S-F1-DC-IB-SW10:11",
"destination_guid": "0xb83fd203008031ce",

```

```

"destination_port":11,
"pn":"NA",
"sn":"NA",
"transmitter_technology":"NA",
"cable_type":"NA",
"cable_vendor":"NA",
"length":"NA",
"cable_identifier":"NA",
"rev":"NA",
"diag_supply_voltage":"NA",
"temperature":"NA",
"status_opcode":0,
"down_blame":"Unknown",
"local_reason_opcode":"No_link_down_indication",
"remote_reason_opcode":"No_link_down_indication",
"e2e_reason_opcode":0,
"PortRcvRemotePhysicalErrorsExtended":0,
"PortRcvErrorsExtended":0,
"PortXmitDiscardsExtended":0,
"PortRcvSwitchRelayErrorsExtended":0,
"ExcessiveBufferOverrunErrorsExtended":0,
"LocalLinkIntegrityErrorsExtended":0,
"PortRcvConstraintErrorsExtended":0,
"PortXmitConstraintErrorsExtended":0,
"PortBufferOverrunErrors":0,
"PortDLIDMappingErrors":0,
"VL15DroppedExtended":0,
"PortXmitWaitExtended":0,
"PortXmitDataExtended":273269961.5,
"PortRcvDataExtended":434894002,
"PortXmitPktsExtended":1866950.125,
"PortRcvPktsExtended":2284998.5,
"PortUniCastXmitPktsExtended":1861369.125,
"PortUniCastRcvPktsExtended":639736.5,
"PortMultiCastXmitPktsExtended":5581,
"PortMultiCastRcvPktsExtended":1645262,
"SyncHeaderErrorCounter":0,
"PortSwLifetimeLimitDiscards":0,
"PortSwHQQLifetimeLimitDiscards":0,
"PortFECCorrectableBlockCounter":0,
"PortFECCorrectedSymbolCounter":0,
"PortFECUncorrectableBlockCounter":0,
"PortLocalPhysicalErrors":0,
"PortMalformedPacketErrors":0,
"rx_power_1_mw":"NA",
"rx_power_2_mw":"NA",
"rx_power_3_mw":"NA",
"rx_power_4_mw":"NA",
"tx_power_1_mw":"NA",
"tx_power_2_mw":"NA",
"tx_power_3_mw":"NA",
"tx_power_4_mw":"NA",
"source_type":"switch",
"source_role":"tor",
"source_model":"SDR",
"source_server_operation_mode":"Switch",
"source_system_name":"Infiniscale-IV Mellanox Technologies",
"source_ip":"0.0.0.0",
"source_fw_version":"0.0.0",
"source_hw_version":"NA",
"source_nic_type":"NA",
"source_port_dname":"1",
"source_port_node_description":"Infiniscale-IV Mellanox Technologies:1",
"source_host":"0002c9020044ff80",
"source_technology":"QDR",
"destination_type":"switch",
"destination_role":"tor",
"destination_model":"MQM8700",
"destination_server_operation_mode":"Switch",
"destination_system_name":"MTL-S-F1-DC-IB-SW10",
"destination_ip":"10.60.130.10",
"destination_fw_version":"27.2010.4120",
"destination_hw_version":"NA",
"destination_nic_type":"NA",
"destination_port_dname":"11",
"destination_host":null,
"destination_technology":"HDR"
}
]

```

4.11.7 Get Histogram for Link Status

- URL:

```
/cyber-ai/telemetry/link-status/ influencer/histogram influencer
```

- Filters:

```
From
To
counter=counters comma separated
```

- Response:

```
{
  "raw_ber":{
    "0":{
      "total":7994
    },
    "1.4999999999999999e-254":{
      "total":6300
    },
    "2e-18":{
      "total":7
    },
    "3e-17":{
      "total":18
    },
    "4e-17":{
      "total":3
    },
    "1e-16":{
      "total":11
    },
    "2e-16":{
      "total":3
    },
    "4e-16":{
      "total":7
    },
    "2e-15":{
      "total":7
    },
    "3e-15":{
      "total":7
    },
    "5e-15":{
      "total":7
    },
    "1e-14":{
      "total":7
    },
    "8e-13":{
      "total":7
    },
    "5e-12":{
      "total":7
    },
    "7e-12":{
      "total":7
    },
    "3e-11":{
      "total":7
    },
    "2e-07":{
      "total":6
    },
    "3e-07":{
      "total":1
    }
  },
  "eff_ber":{
    "0":{
      "total":7994
    },
    "1.4999999999999999e-254":{
      "total":6374
    },
    "3e-17":{
      "total":10
    },
    "4e-16":{
      "total":7
    },
    "3e-15":{
      "total":7
    },
    "5e-15":{
      "total":7
    },
    "2e-07":{
      "total":6
    },
    "3e-07":{
      "total":1
    }
  },
  "symbol_ber":{
    "0":{
      "total":7994
    },
    "1.8749999999999998e-255":{
      "total":6374
    },
    "1.25e-17":{
      "total":10
    },
    "5e-17":{
      "total":7
    },
    "3.75e-16":{
      "total":7
    }
  }
}
```

```

    },
    "6.25e-16":{
      "total":7
    },
    "2.5e-08":{
      "total":5
    },
    "3.75e-08":{
      "total":1
    },
    "6.25e-08":{
      "total":1
    }
  }
}

```

4.11.8 Get Properties for Link Status

- URL:

```
/cyber-ai/telemetry/link-status/ properties
```

- Filters:

```
From
To
```

- Response:

```

{"phy_state": [
  "Phy_up"
],
"logical_state": [
  "Active"
],
"link_speed_active": [
  0.0909090909090909,
  2.909090909090909,
  1.4545454545454546,
  0.3636363636363636
],
"link_width_active": [
  0.3636363636363636
],
"fec_mode_active": [
  23.181818181818183,
  0.2727272727272727,
  0,
  0.0909090909090909
],
"raw_ber": [
  0,
  1.4999999999999999e-254,
  7e-13,
  4e-12,
  1e-15,
  4e-15,
  6e-12,
  2e-18,
  1e-14,
  1e-12,
  2e-15,
  1e-16,
  5e-12,
  2e-17,
  4e-17,
  5e-17
],
"eff_ber": [
  0,
  1.4999999999999999e-254,
  4e-12,
  1e-15,
  4e-15,
  1e-17,
  3e-17
],
"symbol_ber": [
  0,
  1.3636363636363634e-255,
  3.636363636363636e-13,
  9.090909090909091e-17,
  3.63636363636364e-16,
  1.8181818181818186e-18,
  9.090909090909089e-18
]
}

```

4.12 Pagination

The Pagination REST API is used for retrieving large datasets in manageable pages. Pagination works by restricting the quantity of items returned in each response, thus reducing server load and minimizing content download time.

- Supported URLs:

```
GET /cyber-ai/anomalies/network
GET /cyber-ai/alerts/filter
GET /cyber-ai/anomalies/tenant
GET /cyber-ai/anomalies/logical-server
GET /cyber-ai/telemetry/link-status
GET /cyber-ai/prediction/link-anomaly
GET /cyber-ai/prediction/link-failure
GET /cyber-ai/anomalies/cable/threshold
GET /cyber-ai/anomalies/cable/deviation
```

- URL Filters:

- Page Number - the requested page number:

```
?page_number=<number>
```

Example: `?page_number=1` .

- Page Size - the requested page size:

```
?rpp=<size>
```

Example: `?rpp=10` .

- Filter - column filter:

```
?filter=<column name>[<filter type>]<value>
```

Example: `?filter=timestamp[eq]2024` .

The filter supports the following types:

- Equals: eq
- Not equal: neq
- Contains: con
- Not contains: ncon
- Starts with: sw
- Ends with: ew
- Multi equals: eqm

To filter multiple columns, send each column in a separate filter. For example: `?filter=timestamp[eq]2024&filter=node_guid[con]n` .

- Sorting - column sorting:

```
?sorting=<column name>[<asc|desc>]
```

Example: `?sorting=timestamp[desc]` .

To sort multiple columns, send all columns in the same filter separated by commas. For example: `?sorting=timestamp[asc],node_guid[asc]` .

- Request Data

none

- Response

```
{
  "data": [
    {
      "alert_id":106782,
      "occurrence":2,
      "severity":"Warning",
      "description":"PortXmitWaitExtended is 130.05% above the average",
      "influencers": [
        "PortXmitWaitExtended"
      ],
      "percentage":130.05,
      "influencers_display_names": [
        "Port Xmit Wait Extended"
      ],
      "timestamp":1709773200
    }
  ],
  "filtered_resources":1,
  "first_index":1,
  "last_index":1,
  "num_of_pages":1
}
```

 If successful, the page is returned in JSON format.

- Response codes

Status	Description
200	Success
400	Bad Request (invalid argument)

5 CLI Tools

In addition to the REST API used for Cyber AI management, Cyber AI software provides several command-line tools (CLI) for managing the Cyber AI system.

The CLI tools are installed on the Cyber AI host and can communicate with the Cyber AI containers.

5.1 ufm-cai-sanity

This tool is helpful for testing that cyberai is running and the suitable containers were loaded:

5.1.1 Tests

- Checks ufm-cyberai service is running
- Checks Cyber AI images are loaded

```
"cyberai_worker" "cyberai_web" "cyberai_plm" "mellanox/ufm-telemetry"
```

- Check containers are running

```
cyberai-web" "cyberai-plm" "ufm-telemetry"
```

- Checks that REST services are running

5.1.2 Usage

```
ufm-cai-sanity
```

5.2 ufm-cai-jobs

This script manages Cyber AI analytics jobs. Commands:

Command	Usage
dump	Dump status of a job if provided, otherwise dump status for all jobs (in json format)
list	List all job names
run	Runs given job
enable	Enables given job (Requires restart to take effect)
disable	Disables given job (Requires restart to take effect)
reset-stats	Resets all previous status (run times)

5.2.1 Usage

```
ufm-cai-jobs [-h] | [-c (dump|list|run|enable|disable|reset-stats) [-j <job-name>]]
```

5.3 ufm-cai-ufm-params

This script configures and shows the UFM connection info.

5.3.1 Usage

```
ufm-cai-ufm-params (update|show) <option>
```

5.3.1.1 Update

Updates UFM configuration.

Option	Description
<code>-i --ip</code>	UFM server IP
<code>-p --port</code>	UFM REST API connection port
<code>-U --username</code>	UFM username
<code>-P --password</code>	UFM password
<code>-s --site</code>	UFM site name
<code>-t --protocol</code>	UFM Rest API connection protocol

5.3.1.2 Show

Shows current UFM configuration (except password).

5.4 ufm-cai-status

This script checks the Cyber AI status, prints it or sends an email. The script runs once a day, using the Linux cron-job.

5.4.1 Usage

```
usage: ufm-cai-status [-h] [-m] [-p {none,plain,simple,html,json}]
optional arguments:
  -h, --help            show this help message and exit
  -m, --mail            Send an email with the status report
  -p {none,plain,simple,html,json}, --print-report {none,plain,simple,html,json}
                        Specify how to print the status report to console
```

5.4.2 Configuration

The configuration file is located in: `/opt/ufm/cyber-ai/conf/status_report_config.yaml`

It should be configured properly in order for Cyber AI to run:

```

site_name: <site>

mail_server:
    # To use local smtp server set server to 127.0.0.1
    server: <server>
    port: <port>
    use_tls: true
    sender: <sender>
    username: <username>
    password: <password>

# report_type: ( html | text )
report_type: html

recipient_list:
# - <name@example.com>

```

5.4.3 Cron Job

```

# crontab -l
30 7 * * * /usr/local/bin/ufm-cyberai_status -m

```

5.5 ufm-cai-sysdump

This script collects data and logs from Cyber AI and saves it into a zipped file to be used for debugging and troubleshooting.

5.5.1 Usage

```
ufm-cai-sysdump <options>
```

5.5.1.1 Options

Option	Description
<code>-v --verbose</code>	explain what is being done

Option	Description
-n --network	collect network counters files
-c --cables	collect cable counters files
-z --archived	collect archived counter files when associated with [-n] or [-c]
-g --aggregated	collect aggregated files
-d --database	collect database file(s)
-t --topology	collect topology files
-m --model	collect model files
-l --log	collect log files
-f --conf	collect configuration files
-a --all	collect all above

5.5.1.2 Output

Output file is in tgz format:

```
cyberai-sysdump-<date and time>.tgz
```

5.6 ufm-cai-weekly-alerts-report

This script generates a csv file for each type of alerts in Cyber-AI according to the given interval and saves it to the specified output directory.

5.6.1 Usage

```
ufm-cai-weekly-alerts-report [-h] [-i IP] [-t TIME] [-o OUT_DIR]
```

5.6.1.1 Options

Option	Long option	Description
-i	--ip	Cyber-AI IP address
-t	--time	Interval to get the data for. (1 2 3...)(h d w m)
-o	--out-dir	output directory to save the data to

6 High Availability

6.1 Overview

UFM HA supports High-Availability on the host level for UFM products (UFM Enterprise/UFM Appliance/UFM CyberAI) The solution is based on pacemaker to monitor services and DRBD to sync file-system states. The HA package can be used with both bare-metal and Dockerized UFM products.

UFM HA should be installed on two machines, master and standby.

6.1.1 Supported Platforms

1. Ubuntu
2. Centos Master

6.1.2 Prerequisites

6.1.2.1 Pacemaker packages

1. pacemaker
2. pcs
3. corosync

6.1.2.2 DRBD Package

- DRBD utils 8.4 or up.

6.2 Configuration

6.2.1 ufm_ha_cluster usage

```
ufm_ha_cluster --help
Usage: ufm_ha_cluster [-h|--help] <command> [<options>]
This script manages ufm HA cluster.

OPTIONS:
  -h|--help          Show this message

COMMANDS:
  config             Configure HA cluster
  set-password      Change hacluster password
  status            Check HA cluster status
  failover          Master node failover
  takeover         Standby node takeover
  start            Start HA services
  stop            Stop HA services
  attach          attach new standby node from cluster
  detach         detach the old standby to cluster

For more help about each command, type:
ufm_ha_cluster <command> --help
```

6.2.2 Configuring Pacemaker and DRBD

```
ufm_ha_cluster config --help
```

```
Usage: ufm_ha_cluster config [<options>]

The config command configures ha add-on for ufm server.

OPTIONS:
-r | --role <node role>          Node role (master or standby)
                                mandatory.
-n | --peer-node <node-hostname> Peer node name.
                                mandatory.
-s | --peer-sync-ip <ip address> Peer node sync ip adreess
                                mandatory.
-c | --sync-interface            Local interface to be used for drbd sync
                                mandatory.
-i | --virtual-ip <virtual-ip>   Cluster virtual IP.
                                mandatory.
-f | --ha-config-file <file path> HA configuration file.
                                default: ufm-ha.conf
-p | --hacluster-pwd <pwd>      hacluster user password
                                default: default password
-h | --help                      Show this message
```



1. You must run configuration script on the standby machine, then on the master machine.
2. Running config command will not start UFM services, you have to run it directly from the master machine.
3. Initial file system sync between master and standby may take few minutes, depending on your sync interface speed.
4. You must wait for the sync process before starting the services. You may use the status command for monitoring the sync.
5. If you are using high-availability for both UFM Cyber-AI and UFM Enterprise you have to change the following line in `/usr/bin/ha_utils/ufm-ha-conf.sh` file:
 From `PACEMAKER_SYSTEMD_SERVICES=(ufm-cyberai)` to
`PACEMAKER_SYSTEMD_SERVICES=(ufm-cyberai ufm-ha-watcher ufm-enterprise)`

6.2.3 Stopping UFM Services

You may stop UFM services using the following stop command.

```
ufm_ha_cluster stop
```

6.2.4 Takeover Services

Takeover command can be executed on the standby machine so it will be the master.

```
ufm_ha_cluster takeover
```

6.2.5 Master Failover

Failover command can be executed on the master machine so it will be the standby.

```
ufm_ha_cluster failover
```

6.2.6 Replace HA Node

To replace old standby, detach the old standby, then configure the new standby, and attach it to the cluster.

On the master, run the detach command:

```
ufm_ha_cluster detach
```

On the new standby, run the config command, for more information, refer to [ufm-cai-jobs](#).

On the master node, run the attach command:

```
Ufm_ha_cluster -n <peer_node> -s <peer_sync_ip> -p <hacluster-pwd> -c <sync-interface>
```

7 UFM Cyber-AI OS Upgrade

This section provides a step-by-step guide for UFM Cyber-AI Operating System upgrade.

Each UFM Cyber-AI Appliance software has an additional tar file with a `-omu.tar` suffix (OMU stands for OS Manufacture and Upgrade).

This tar file can be used to re-manufacture the server and to upgrade the operating system/software on the server.

7.1 Hardware Platform Support:

Starting with version 2.14.1, UFM Cyber-AI provides different OMU files for different hardware platforms.

For older UFM 4.0 appliance hardware based on ubuntu 18, use : `ufm-cyberai-appliance-<version>-<revision>-omu.tar`

For new UFM 4.5 appliance hardware based on ubuntu 24, use: `ufm-cyberai-appliance-4.5-<version>-<revision>-omu.tar`

7.2 Important Notes:

Hardware Compatibility**: Ensure you download and use the correct OMU tar file that matches your hardware platform (UFM 4.0 or UFM 4.5)

- Version Requirements**: UFM 4.5-specific OMU files are available starting from Cyber-AI version 2.14.1

- Using the incorrect OMU file for your hardware may result in installation failures or operational issues.

-To determine whether the hardware is UFM 4.5 or UFM 4, you can check the operating system version. Run the command `cat /etc/os-release`:

If the OS is Ubuntu 18, it indicates UFM 4.

If the OS is Ubuntu 24, it indicates UFM 4.5.

7.3 Extracting the Software

1. Copy the `OMU` tar file to a temporary directory on the server.

```
CyberAI - ufm-cyberai-appliance<version>-<revision>-omu.tar
```

2. Extract the contents of the tar file to `/tmp`:

```
tar xf ./ufm-cyberai-appliance-<version>-<revision>-omu.tar -C /tmp/
```

3. Change to the extracted directory:

```
cd /tmp/ufm-cyberai-appliance-<version>-<revision>-omu
```

4. An upgrade script and an ISO file are included in the extracted directory:

```
ls -l ./# ls -l ./
ufm-os-upgrade.sh
ufm-cyberai-appliance-<version>-<revision>.iso
```

The following flags are available in the upgrade script help.

```
# ufm-os-upgrade.sh --help
ufm-os-upgrade.sh will upgrade and install OS packages.

IMPORTANT!!! a reboot is mandatory after the finalization of this script,
kernel and kernel models will not work properly until the server is rebooted.

Additional SW installations will be automatically invoked after reboot,
a message will pop on all open terminals with the installation status:
"UFM-OS-FIRSTBOOT-FAILURE" - if installation is failed.
"UFM-OS-FIRSTBOOT-SUCCESS" - if installation succeeded.

additional info will be available in "/var/log/ufm_os_upgrade_<UFM-OS-VERSION>.log" log file.

syntax: ufm-os-upgrade.sh [options]

options
--appliance-sw-upgrade upgrade ufm_appliance SW as well, default is to upgrade OS only, P.S. only
applicable for StandAlone installations.

-d,--debug debug info will be visible on the screen.

-r,--reboot Automatically reboot the server when upgrade is finished.
P.S. if secure boot is enabled and a new certificate is enrolled
the server will not automatically reboot even if this flag is set.

-y,--yes wont prompt for user acknowledgements.

-h,--help print this help message.
```



IMPORTANT!!! System reboot is mandatory once the upgrade procedure is completed. The `-r` flag can be used to automatically reboot the server at the end of the upgrade. Note that some kernel modules may not work properly until server reboot is performed.

7.3.1 Upgrading in Standalone Mode

1. Stop UFM and CyberAI services.

```
systemctl stop ufm-enterprise.service
systemctl stop ufm-cyberai.service
```

2. Run the upgrade script:



System reboot is mandatory once the upgrade procedure is completed. The `-r` flag can be used to automatically reboot the server.

To bypass user prompts, use the `-y` flag when executing the command, but note that this flag alone will not trigger an automatic server reboot. If a reboot is desired, use the `-r` flag in combination with `-y`. Additionally, the `--appliance-sw-upgrade` flag can be used to upgrade both the UFM Enterprise Appliance SW and Cyber-AI SW, but this upgrade is not enabled by default. In the provided example, the server will automatically reboot after the upgrade process is completed.

```
./ufm-os-upgrade.sh -y -r
```

The below is an example with the `--appliance-sw-upgrade` flag. Note that the UFM Enterprise appliance SW will also be upgraded.

```
./ufm-os-upgrade.sh -y -r --appliance-sw-upgrade
```

3. After the reboot procedure is complete, a systemd service (`ufm-os-firstboot.service`) runs the remainder of the upgrade procedure. Once completed, a message is prompted to all open terminals including the status:

"UFM-OS-FIRSTBOOT-FAILURE" - if installation is failed.

"UFM-OS-FIRSTBOOT-SUCCESS" - if installation succeeded.

Example:

```
root@ufm-ai03:~#  
root@ufm-ai03:~#  
Broadcast message from root@ufm-ai03 (somewhere) (Fri Dec 30 18:47:32 2022):  
UFM-OS-FIRSTBOOT-SUCCESS, installation succeeded additional info is available in /var/log/ufm-os-firstboot.log
```

To manually check the status, run `systemctl status ufm-os-firstboot.service`. If it is already completed, an error message is prompted stating that there is no such service. In that case, the log `/var/log/ufm-os-firstboot.log` can be checked instead.

```
systemctl status ufm-os-firstboot.service
```

Example:

```
root@ufm-ai03:~# systemctl status ufm-os-firstboot  
Unit ufm-os-firstboot.service could not be found.  
root@ufm-ai03:~#
```

7.3.2 Upgrade in High-Availability Mode

Upgrade on HA should be done first on the stand-by node and after that on the master node, each node upgrade is similar to the SA instructions.

In case the Standby node is unavailable, the upgrade can be run on the Master node only, however, some additional steps will be required after the appliance is upgraded.

1. [On the standby Node]: Copy and extract the OMU tar file to a temporary directory, refer to [Extracting the Software](#).
2. [On master Node]: Run the upgrade script.



System reboot is mandatory once the upgrade procedure is completed. The `-r` flag can be used to automatically reboot the server.

The `--appliance-sw-upgrade` flag CAN NOT !!! be supplied to upgrade the UFM Enterprise Appliance SW in HA and the upgrade will not be performed if provided.

The `-y` flag can be supplied to skip user questions (the flag does not automatically reboot the server on its own. For auto reboot, combine with the `-r` flag).

In the following example the server auto reboots once the upgrade procedure is completed:

```
cd /tmp/ufm-cyberai-appliance-<version>-<revision>-omu
./ufm-os-upgrade.sh -y -r
```

3. In case the `-r` flag was not included, the server must be manually rebooted if the user selects "No" when prompted with a question on whether to reboot after the script finishes.

```
reboot now
```

4. After the reboot procedure is complete, a systemd service (`ufm-os-firstboot.service`) runs the remainder of the upgrade procedure. Once completed, a message is prompted to all open terminals including the status:

"UFM-OS-FIRSTBOOT-FAILURE" - if installation is failed.

"UFM-OS-FIRSTBOOT-SUCCESS" - if installation succeeded.

Example:

```
root@ufm-ai03:~#
root@ufm-ai03:~#
Broadcast message from root@ufm-ai03 (somewhere) (Fri Dec 30 18:47:32 2022):
UFM-OS-FIRSTBOOT-SUCCESS, installation succeeded additional info is available in /var/log/ufm-os-firstboot.log
```

To verify the status manually, execute "`systemctl status ufm-os-firstboot.service`". If the service has already completed, an error message will be displayed indicating that the service does not exist. In such a scenario, refer to the log file located at `/var/log/ufm-os-firstboot.log` for checking the status.

```
systemctl status ufm-os-firstboot.service
```

Example:

```
root@ufm-ai03:~# systemctl status ufm-os-firstboot
Unit ufm-os-firstboot.service could not be found.
root@ufm-ai03:~#
```

5. After the stand-by node have finished the upgrade check the HA cluster status

```
ufm_ha_cluster status
```

```

root@swx-ufm3-11:~# ufm_ha_cluster status
Cluster name: ufmcluster
WARNING: corosync and pacemaker node names do not match (IPs used in setup?)
Stack: corosync
Current DC: swx-ufm3-11 (version 1.1.18-2b07d5c5a9) - partition with quorum
Last updated: Thu Mar 16 18:45:19 2023
Last change: Mon Feb 27 12:40:22 2023 by root via crm_resource on swx-ufm3-11

2 nodes configured
5 resources configured

Online: [ swx-ufm3-09 swx-ufm3-11 ]

Full list of resources:

Master/Slave Set: ha_data_drbd_master [ha_data_drbd]
Masters: [ swx-ufm3-09 ]
Slaves: [ swx-ufm3-11 ]
Resource Group: ufmcluster-grp
  ha_data_file_system (ocf::heartbeat:Filesystem): Started swx-ufm3-09
  ufm-ha-watcher (systemd:ufm-ha-watcher): Started swx-ufm3-09
  ufm-enterprise (systemd:ufm-enterprise): Started swx-ufm3-09

Daemon Status:
corosync: active/enabled
pacemaker: active/enabled
psed: active/enabled
DRBD_RESOURCE: ha_data
DRBD_CONNECTIVITY: Connected
DISK_STATE: UpToDate
DRBD_ROLE: Secondary
PEER_DISK_STATE: UpToDate
PEER_DRBD_ROLE: Primary

```

Every node within the cluster is expected to be operational while the present node remains in a stand-by mode (designated as Secondary in DRBD_ROLE).

6. [On the Master Node]: Initiate a fail-over of UFM to the stand-by node, which will result in the upgraded node taking over as the master and the current node transitioning to a stand-by state.

```
ufm_ha_cluster failover
```

Wait until all the resources of UFM are up and functioning correctly on the upgraded node.

7. Perform the same process on the inactive node that has not been upgraded, and is currently functioning as a standby.

8 Morpheus Integration

NVIDIA Morpheus is an open AI application framework that provides cybersecurity developers with a highly optimized AI developer framework and pre-trained AI capabilities that, for the first time, allows them to inspect all IP traffic across their data center fabric instantaneously. Bringing a new level of security to data centers, Morpheus provides development capabilities around dynamic protection, real-time telemetry, adaptive policies, and cyber defenses for detecting and remediating cybersecurity threats.

The Morpheus Developer Kit allows developers to quickly and easily set up an example pipeline to run inference models provided by NVIDIA and experiment with the features and capabilities available within the Morpheus framework to address their cybersecurity and information security use cases.

8.1 Features

- Built on RAPIDS™
 - Built on the RAPIDS™ libraries, deep learning frameworks, and NVIDIA Triton™ Inference Server, Morpheus simplifies the analysis of logs and telemetry to help detect and mitigate security threats.
- AI Cybersecurity Capabilities
 - Deploy your models using common deep-learning frameworks. Or get a jump-start in building applications to identify leaked sensitive information, detect malware, and identify errors via logs by using one of NVIDIA's pre-trained and tested models.
- Real-Time Telemetry
 - Morpheus can receive rich, real-time network telemetry from every NVIDIA® BlueField® DPU-accelerated server in the data center without impacting performance. Integrating the framework into a third-party cybersecurity offering brings the world's best AI computing to communication networks.
- DPU-Connected
 - The NVIDIA BlueField Data Processing Unit (DPU) can be used as a telemetry agent for receiving critical data center communications into Morpheus. As an optional addition to Morpheus, BlueField DPU extends static security logging to a sophisticated dynamic real-time telemetry model that evolves with new policies and threat intelligence.

8.2 Prerequisites

1. A Cyber AI machine with T4 or V100 GPU, at least 64GB RAM, eight cores CPU, and 100 GB storage.
2. Morpheus tarball which contains Morpheus AI Engine Docker image.
3. Installing Docker engine.

The Integration involves installing and starting the Morpheus AI Engine.

8.3 Installing Morpheus AI Engine

Morpheus tarball is available through [this link](#).

Morpheus tarball Components:

- Installer and Uninstaller Scripts.
- The configuration file contains the Morpheus docker image details.
- Morpheus docker image.
- Machine Learning models files.

To Integrate Morpheus with CyberAI, follow the next steps:

- Decompress the morpheus-22.06.tar
- Run the installer script sh.
- Installer script loads the Morpheus docker image and enables Morpheus in cfg
 - a. Load Morpheus docker image morpheus-22.06.tar.gz
 - b. Set [Morpheus] enabled = true inside cfg
 - c. Enable Telemetry GPU counters collection by setting [data_prep_telemetry::gpu_counter] skip_collection = false
 - d. Copy the models' files under the volumes created for Morpheus.

```
/opt/ufm/cyber-ai/scripts/e2e_model_script.py  
/opt/ufm/cyber-ai/datastore/morpheus/output/random_forest_model_crypto_resnet.pkl
```

8.4 Starting Morpheus AI Engine

After installing the Morpheus AI Engine, restarting Cyber AI creates a Morpheus docker container, which stores GPU Telemetry in a shared volume accessed by the Morpheus docker container, where you can run the ML model and inference Crypto-Mining activities and generate output files with events.

9 List of Supported Events

UFM Cyber AI tab	Elements	Counters
Link anomaly/Link Failure Prediction	Node+Port	symbol_error_counter

UFM Cyber AI tab	Elements	Counters
		local_link_integrity_errors LocalLinkIntegrityErrorsExtended
		SymbolErrorCounterExtended
		UnknownBlockCounter
		SyncHeaderErrorCounter
		phy_symbol_errors
		ErrorDetectionCounterLane.[1-12]
		FECCorrectableBlockCounterLane. [1-12]
		FECCorrectedSymbolCounterLane. [1-12]
		PortFECCorrectableBlockCounter
		PortFECCorrectedSymbolCounter
		phy_corrected_bits
		phy_raw_errors_lane*
		raw_ber_coef
		raw_ber_magnitude
		raw_ber
		FECUncorrectableBlockCounterLane .[1-12]
		PortFECUncorrectableBlockCounter
		effective_ber_coef
		effective_ber_magnitude
		eff_ber
		port_xmit_discard
		port_rcv_switch_relay_errors
		excessive_buffer_errors ExcessiveBufferOverrunErrorsExtended
		PortMalformedPacketErrors
		PortDLIDMappingErrors
		PortBufferOverrunErrors
		PortVLMappingErrors
		PortNeighborMTUDiscards
		PortInactiveDiscards
		PortSwHOQLifetimeLimitDiscards
		PortSwLifetimeLimitDiscards
		port_xmit_wait
		PortXmitWaitExtended

UFM Cyber AI tab	Elements	Counters
		LinkDownedCounterExtended link_down_counter
		LinkErrorRecoveryCounterExtended link_error_recovery_counter
		port_rcv_constraint_errors
		PortRcvConstraintErrorsExtended
		port_rcv_data
		PortRcvDataExtended
		port_rcv_errors
		PortRcvErrorsExtended
		port_rcv_pkts
		PortRcvPktsExtended
		port_rcv_remote_physical_errors
		PortRcvRemotePhysicalErrorsExtended
		PortRcvSwitchRelayErrorsExtended
		PortUniCastRcvPktsExtended
		PortUniCastXmitPktsExtended
		port_xmit_constraint_errors
		PortXmitConstraintErrorsExtended
		port_xmit_data
		PortXmitDataExtended
		PortXmitDiscardsExtended
		port_xmit_pkts
		PortXmitPktsExtended
		phy_received_bits
		RetransmissionPerSec
		hist0
		hist1
		hist2
		hist3
		vl15_dropped
		VL15DroppedExtended
		link_error_recovery_counter
		ExcessiveBufferOverrunErrorsExtended
		GradeID
		Lane0Grade

UFM Cyber AI tab	Elements	Counters
		Lane1Grade Lane2Grade Lane3Grade MaxRetransmissionRate PortLocalPhysicalErrors PortLoopingErrors PortMultiCastRcvPktsExtended PortMultiCastXmitPktsExtended
Network Alerts	NW	raw_ber eff_ber port_xmit_discard port_rcv_switch_relay_errors PortDLIDMappingErrors PortVLMappingErrors PortNeighborMTUDiscards PortInactiveDiscards port_xmit_wait PortXmitWaitExtended LinkDownedCounterExtended LinkErrorRecoveryCounterExtended port_rcv_data port_rcv_errors port_rcv_pkts port_rcv_remote_physical_errors PortRcvSwitchRelayErrorsExtended PortUniCastRcvPktsExtended PortUniCastXmitPktsExtended port_xmit_constraint_errors port_xmit_data PortXmitDiscardsExtended port_xmit_pkts phy_received_bits RetransmissionPerSec

UFM Cyber AI tab	Elements	Counters
Tenant/Application Alerts	Pkey	raw_ber
		eff_ber
		port_xmit_discard
		port_rcv_switch_relay_errors
		PortDLIDMappingErrors
		PortVLMappingErrors
		PortNeighborMTUDiscards
		PortInactiveDiscards
		port_xmit_wait
		PortXmitWaitExtended
		LinkDownedCounterExtended
		LinkErrorRecoveryCounterExtended
		port_rcv_data
		port_rcv_errors
		port_rcv_pkts
		port_rcv_remote_physical_errors
		PortRcvSwitchRelayErrorsExtended
		PortUniCastRcvPktsExtended
		PortUniCastXmitPktsExtended
		port_xmit_constraint_errors
		port_xmit_data
		PortXmitDiscardsExtended
		port_xmit_pkts
phy_received_bits		
RetransmissionPerSec		
Cable Events	Node+Port	temperature_low_th
		temperature_high_th
		voltage_low_th
		voltage_high_th
		rx_power_low_th
		rx_power_high_th
		tx_power_high_th
		tx_bias_low_th
		tx_bias_high_th

10 Settings and Configuration

the directory `/opt/ufm/cyber-ai/conf` contains the configuration files for the UFM Cyber-AI application. The files `cyberai.cfg` and `scheduler_settings.cfg` are the main configuration files.

10.1 CyberAI.cfg Basic Configuration Parameters

The basic configurations of `cyberai.cfg` are listed in the following table:

Section	Key	Type	Default	Description
JobSettings	<code>retries</code>	Integer	2	the number of retries to run the analytics jobs when its failed or timedout
	<code>check_interval</code>	Interval	120 (seconds)	the interval for running health for checking jobs if its get timeout
GRPC	<code>host</code>	String	cyberai-plm	name of the docker network that will be used to communicate between plm and worker
	<code>grpc_port</code>	Integer	50051	the port that used for communication
	<code>max_workers</code>	Integer	10	max number of worker that can be run in parallel
Cleanup	<code>cleanup_run_interval</code>	Integer	24	This parameter sets how often (in hours) the cleanup process runs. The system will automatically trigger cleanup operations every 24 hours to remove old files and data
	<code>files_days_to_keep</code>	Integer	28	This controls retention for hourly files. The system will keep these files for 28 days before automatically deleting them.
	<code>files_hours_to_keep</code>	Integer	24	This specifically controls retention for topology hourly files. These files are kept for only 24 hours before being cleaned up,
SecondaryParams	<code>ip</code>	String	172.17.0.1	the IP address of the secondary endpoint/server that will be used. to fetch the telemetry data
	<code>port</code>	Integer	9002	The port number on the secondary endpoint where the service is listening
	<code>url</code>	String	csv/xcset/cyberai_telemetry	The URL path or endpoint

10.2 Scheduler Settings Configuration File

The `scheduler_settings.cfg` file defines configuration parameters for three categories of tasks: UFM data preparation tasks, telemetry collectors, and analytics jobs.

Section	Key	Description
data_prep_ufm::<task_name>	<code>interval</code>	Interval between task runs
	<code>delay</code>	Delay before the first run
	<code>skip_collection</code>	Enable/Disable task
	<code>json_collection</code>	Collect data from a JSON file or from a REST API
data_prep_telemetry::<task_name>	<code>interval</code>	Interval between task runs
	<code>delay</code>	Delay before the first run
	<code>timeout</code>	Maximum execution time before the job times out
	<code>skip_collection</code>	Enable/Disable task
analytics_job::<job_name>	<code>interval</code>	Interval between job runs
	<code>delay</code>	Delay before the first run
	<code>max_input</code>	Maximum number of input files to process in a single run
	<code>standard_timeout</code>	Maximum execution time before the job times out
	<code>enabled</code>	Enable/Disable task

10.3 UFM-Telemetry Main Configuration File

Inside the `ufm-telemetry` container, the `/config` directory contains all configuration files for UFM-Telemetry. The primary configuration file is `launch_ibdiagnet_config.ini`.

The table below lists the basic configuration options available in `launch_ibdiagnet_config.ini`:

Section	Key	Type	Default	Description
ibdiagnet	<code>ibdiagnet_enabled</code>	Boolean	true	Enable or disable the ibdiagnet process
	<code>data_dir</code>	String	/data	Directory where UFM Cyber-AI data is stored
	<code>ibdiag_output_dir</code>	String	/tmp/ibd	Directory where ibdiagnet stores output files
	<code>sample_rate</code>	Integer	-	Frequency for collecting port counter data

Section	Key	Type	Default	Description
	hca	String	mlx5_2	Host Channel Adapter (HCA) to use
	app_name	String	/opt/collectx/bin/ibdiagnet	Full path to the ibdiagnet application
	topology_mode	String	discover	Topology discovery mode
	topology_discovery_factor	Integer	0	Run topology discovery every “n” iterations; if set to 0 or 1, use the last run’s results
retention	retention_enabled	Boolean	true	Enable or disable the retention service
	retention_interval	Time	1d	Time interval between retention operations
	retention_age	Time	100d	Retention period for collected data
compression	compression_enabled	Boolean	true	Enable or disable the compression service
	compression_interval	Time	6h	Time interval between compression operations
	compression_age	Time	12h	Retention period for compressed data
cable_info	cable_info_schedule	csv	-	Schedule for collecting cable information (format: weekday/hr:min,hr:min)

11 Appendixes

- [Appendix - Supported Counters](#)
- [Appendix - Cable Information](#)
- [Appendix - Cyber-AI Appliance OS Remanufacture](#)
- [Appendix - Deploying UFM Cyber-AI from an ISO File](#)

11.1 Appendix - Supported Counters

11.1.1 Supported InfiniBand Counters

- Counter
- ExcessiveBufferOverrunErrorsExtended
- GradeID
- Lane0Grade
- Lane1Grade
- Lane2Grade
- Lane3Grade
- LinkDownedCounterExtended
- LinkErrorRecoveryCounterExtended
- LocalLinkIntegrityErrorsExtended
- MaxRetransmissionRate
- PortBufferOverrunErrors
- PortDLIDMappingErrors
- PortFECCorrectableBlockCounter
- PortFECCorrectedSymbolCounter
- PortFECUncorrectableBlockCounter
- PortInactiveDiscards
- PortLocalPhysicalErrors
- PortLoopingErrors
- PortMalformedPacketErrors
- PortMultiCastRcvPktsExtended
- PortMultiCastXmitPktsExtended
- PortNeighborMTUDiscards
- PortRcvConstraintErrorsExtended
- PortRcvDataExtended
- PortRcvErrorsExtended
- PortRcvPktsExtended
- PortRcvRemotePhysicalErrorsExtended
- PortRcvSwitchRelayErrorsExtended
- PortSwHOQLifetimeLimitDiscards
- PortSwLifetimeLimitDiscards
- PortUniCastRcvPktsExtended
- PortUniCastXmitPktsExtended
- PortVLMappingErrors
- PortXmitConstraintErrorsExtended

- PortXmitDataExtended
- PortXmitDiscardsExtended
- PortXmitPktsExtended
- PortXmitWaitExtended
- QP1DroppedExtended
- RetransmissionPerSec
- SymbolErrorCounterExtended
- SyncHeaderErrorCounter
- UnknownBlockCounter
- VL15DroppedExtended
- ber_threshold
- eff_ber
- effective_ber_coef
- effective_ber_magnitude
- excessive_buffer_errors
- link_down_counter
- link_error_recovery_counter
- load_avg
- local_link_integrity_errors
- node_guid
- phy_corrected_bits
- phy_raw_errors_lane0
- phy_raw_errors_lane1
- phy_raw_errors_lane2
- phy_raw_errors_lane3
- phy_received_bits
- phy_symbol_errors
- port_guid
- port_num
- port_rcv_constraint_errors
- port_rcv_data
- port_rcv_errors
- port_rcv_pkts
- port_rcv_remote_physical_errors
- port_rcv_switch_relay_errors
- port_xmit_constraint_errors
- port_xmit_data
- port_xmit_discard
- port_xmit_pkts
- port_xmit_wait
- raw_ber
- raw_ber_coef
- raw_ber_magnitude
- symbol_error_counter
- threshold_type
- time_since_last_clear
- vl15_dropped

11.1.2 Supported Per-lane Counters

- ErrorDetectionCounterLane.<1-12>
- FECCorrectableBlockCounterLane.<1-12>
- FECCorrectedSymbolCounterLane.<1-12>
- FECUncorrectableBlockCounterLane.<1-12>

11.2 Appendix - Cable Information

Type	Field
power	mw
	dbm
cable	port
	lid
	port_name
	vendor
	oui
	pn
	sn
	rev
	length
	type
	supportedspeed
	temperature
	powerclass
	nominalbitrate
	cdrenabletxrx
	inputeq
	outputamp
	outputemp
	fw_version
	attenuation_2.5_5_7_12
	rx_power_type
	rx_power.1.mw
	rx_power.1.dbm
rx_power.2.mw	
rx_power.2.dbm	
rx_power.3.mw	
rx_power.3.dbm	

Type	Field
	rx_power.4.mw
	rx_power.4.dbm
	tx_bias.1
	tx_bias.2
	tx_bias.3
	tx_bias.4
	tx_power.1.mw
	tx_power.1.dbm
	tx_power.2.mw
	tx_power.2.dbm
	tx_power.3.mw
	tx_power.3.dbm
	tx_power.4.mw
	tx_power.4.dbm
	cdr_tx_rx_loss_indicator
	adaptive_equalization_fault
	tx_rx_lol_indicator
	temperature_alarm_and_warning
	voltage_alarm_and_warning
	rx_power_alarm_warning
	tx_bias_alarm_and_warning
	diag_supply_voltage
	transmitter_technolog
	eth_com_codes_ext
	datacode
	lot
	tx_adaptive_equalization_freeze
	rx_output_disable
	tx_adaptive_equalization_enable

11.3 Appendix - Cyber-AI Appliance OS Remanufacture



This section provides a step-by-step guide for deploying Cyber-AI (CAI) from an ISO file in case of unrecoverable issues. This guide provides instructions on how to remanufacture the Cyber-AI appliance and OS.

11.3.1 Step 1: Extract the TAR file to a temporary directory

Run the following command to extract the `ufm-cyberai-appliance-<version>-omu.tar` to a temporary directory:

```
tar xzf /path/to/ufm-cyberai-appliance-<version>-omu.tar -C /tmp
```

An ISO file and an upgrade script will be present inside the directory.

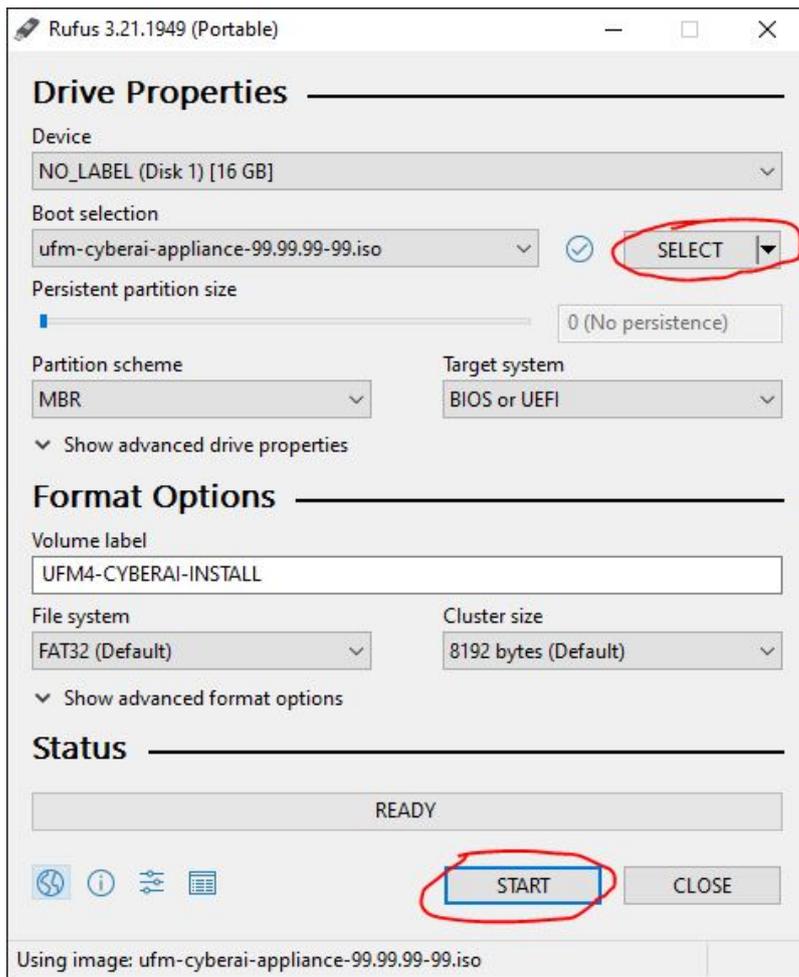
```
ls -ltrh /tmp/ufm-cyberai-appliance-<version>-omu/  
-rw-r--r-- 1 root root 7.5G Dec 31 17:49 ufm-cyberai-appliance-<version>.iso  
-rwxr-xr-x 1 root root 11K Dec 31 17:49 ufm-os-upgrade.sh
```

11.3.2 Step: 2 - Burn ISO to USB

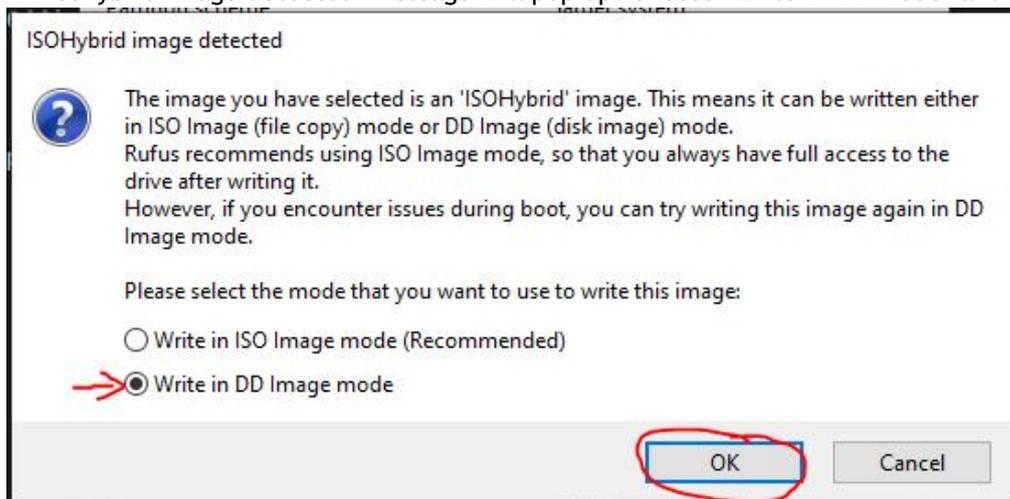
Burning ISO can be performed on Windows or Linux operating systems. Based on the desired installation method, follow the below instructions.

11.3.2.1 Windows

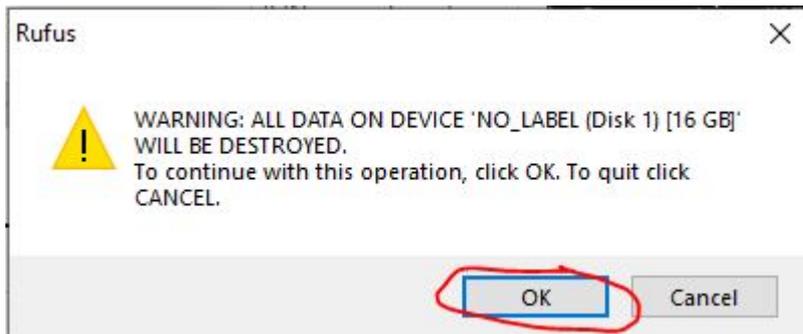
1. Download and open Rufus. Refer to [Rufus - Create bootable USB drives the easy way.](#)
2. Download and open the tar file `ufm-cyberai-appliance-<version>-omu.tar`.
3. On Rufus, click on "SELECT" and from the drop-down menu, select the `ufm-cyberai-appliance-<version>.iso`, then click "START".



4. An "isohybrid image detected" message will pop up. Choose "Write in DD mode" and click "OK".



5. A message will appear stating that all data on the usb device will be lost, click "OK and continue".



6. Wait for Rufus to finish.
7. Unplug the USB device.

11.3.2.2 Linux

1. Identify the USB drive by running the following command:

✘ IMPORTANT!!! Ensure you are NOT running the following commands on a hard drive device but only on the USB (in the examples below it will be `/dev/sdb`).

⚠ The USB drive is mapped to `sdb` in the following command snippet.

```
root@ubuntu18:~# ls -ltrh /dev/disk/by-id/usb*
lrwxrwxrwx 1 root root 9 Jan 2 13:44 /dev/disk/by-id/usb-SanDisk_Cruzer_Glide_3.0_4C530000040724111091-0:0 -> ../../sdb
lrwxrwxrwx 1 root root 10 Jan 2 13:44 /dev/disk/by-id/usb-SanDisk_Cruzer_Glide_3.0_4C530000040724111091-0:0-part1 -> ../../sdb1
```

2. Copy the `ufm-cyberai-appliance-<version>.iso` to the USB using the following `dd` command:

⚠ The USB drive is mapped to `/dev/sdb`.

```
dd if=/path/to/ufm-cyberai-appliance-<version>.iso of=/dev/sdb bs=4M status=progress oflag=sync
```

3. Verify that the USB is bootable:

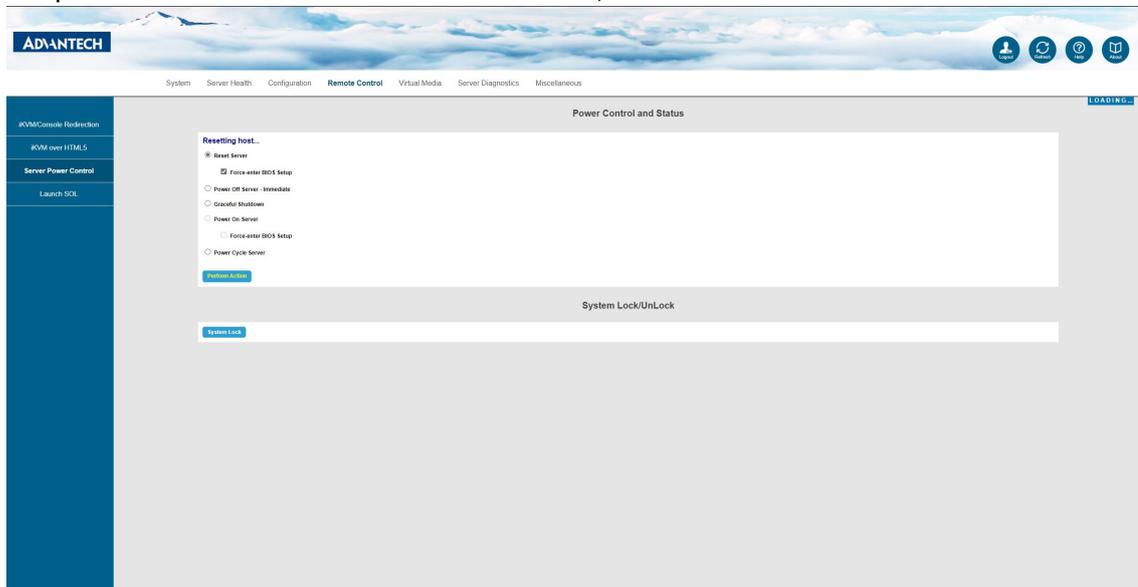
```
root@ubuntu18:~# fdisk -l /dev/sdb
Disk /dev/sdb: 14.9 GiB, 16005464064 bytes, 31260672 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0x594ec03e

Device     Boot Start      End  Sectors  Size Id Type
/dev/sdb1  *         64 15679439 15679376  7.5G 17 Hidden HPFS/NTFS
```

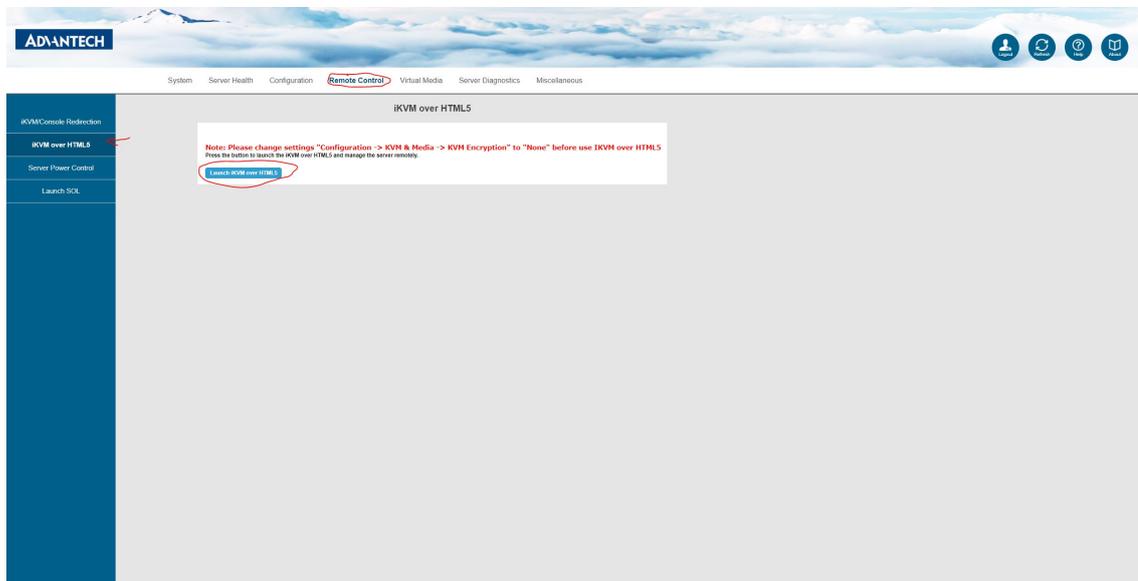
4. Unplug the USB.

11.3.3 Step: 3 - Manufacture Cyber-AI from USB

1. Plug the USB (prepared in the previous step) to one of the Cyber-AI server back USB ports.
2. Login to BMC web UI: https://<BMC_IP_ADDRESS>.
3. Navigate to "Remote Control" → "Server Power Control" and check the "Force-enter BIOS Setup" checkbox under the "Restart Server". Then, click "Perform Action".

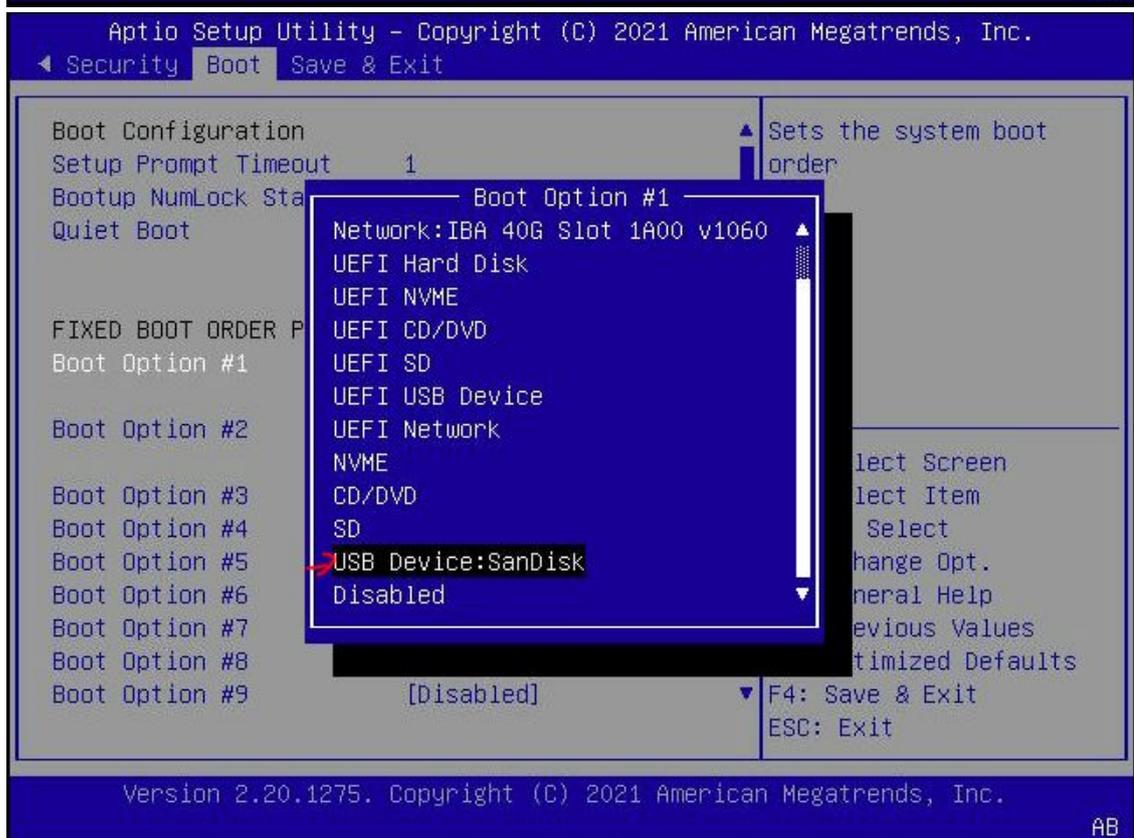
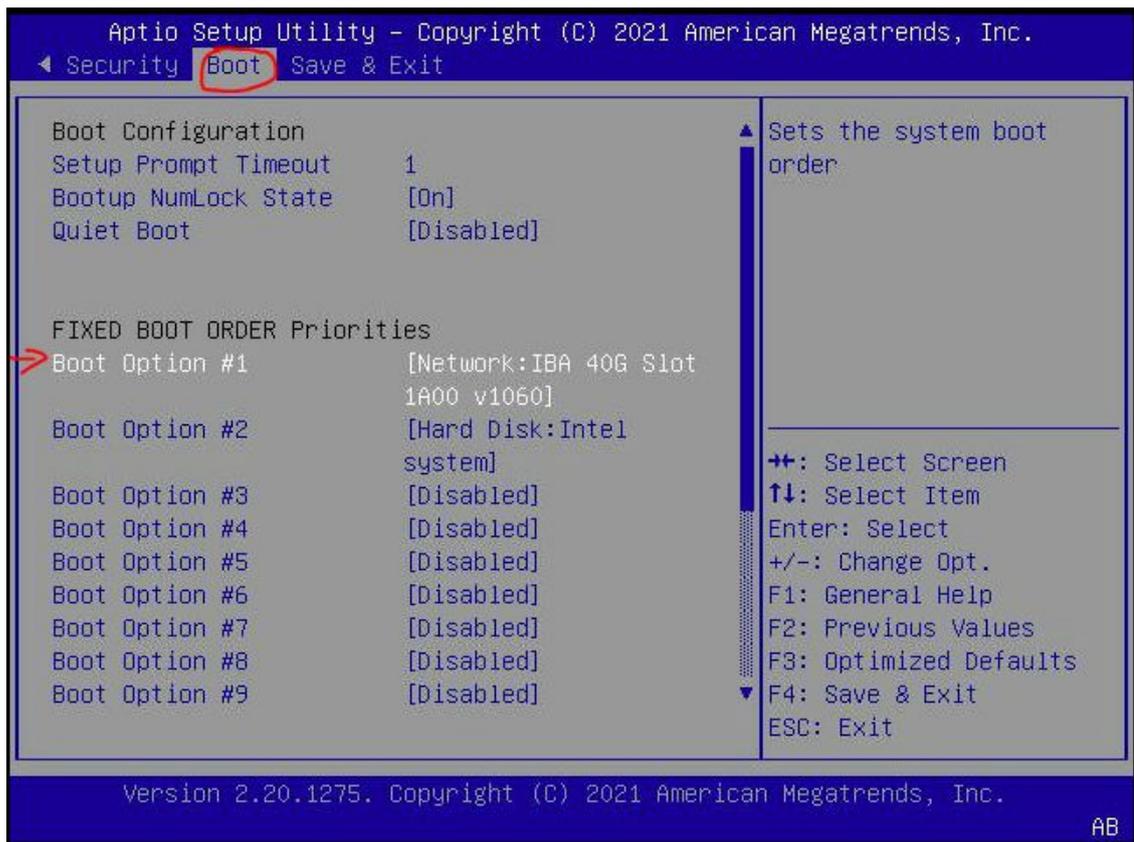


4. Navigate to "Remote Control" → "iKVM over HTML5" and click "Launch iKVM over HTML5" button.

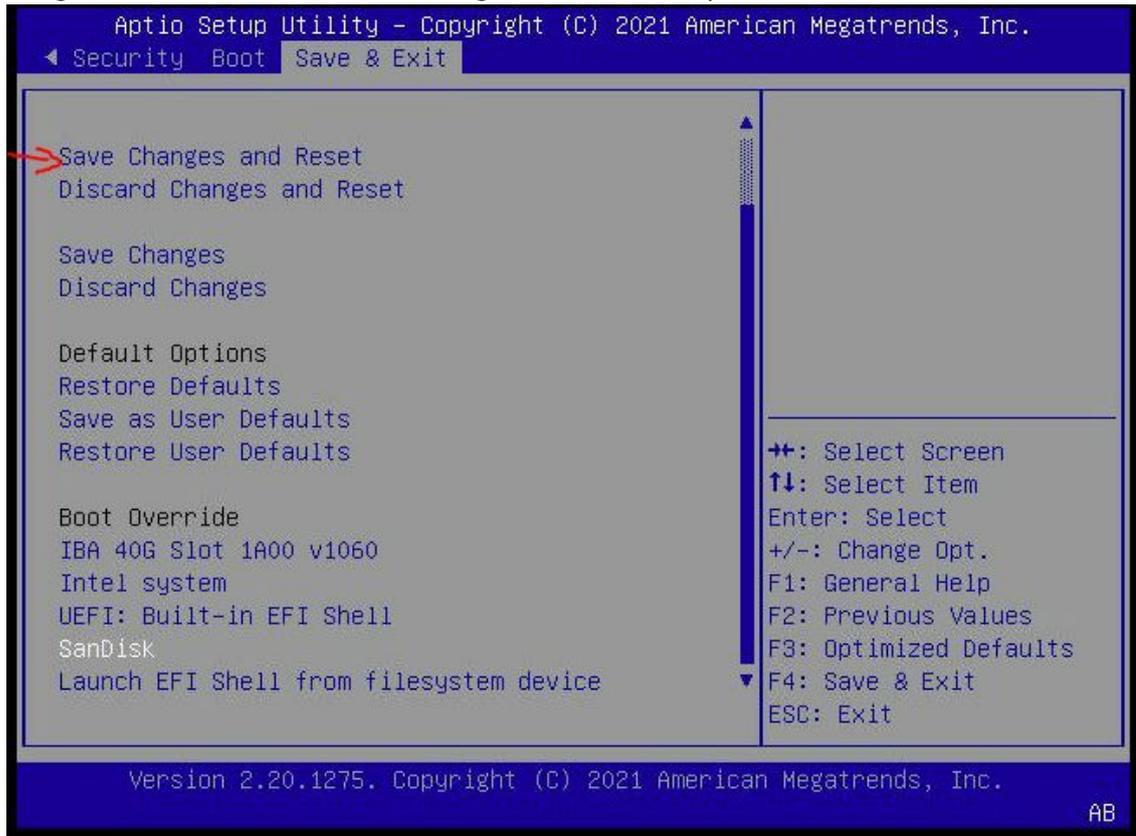


A new window will open.

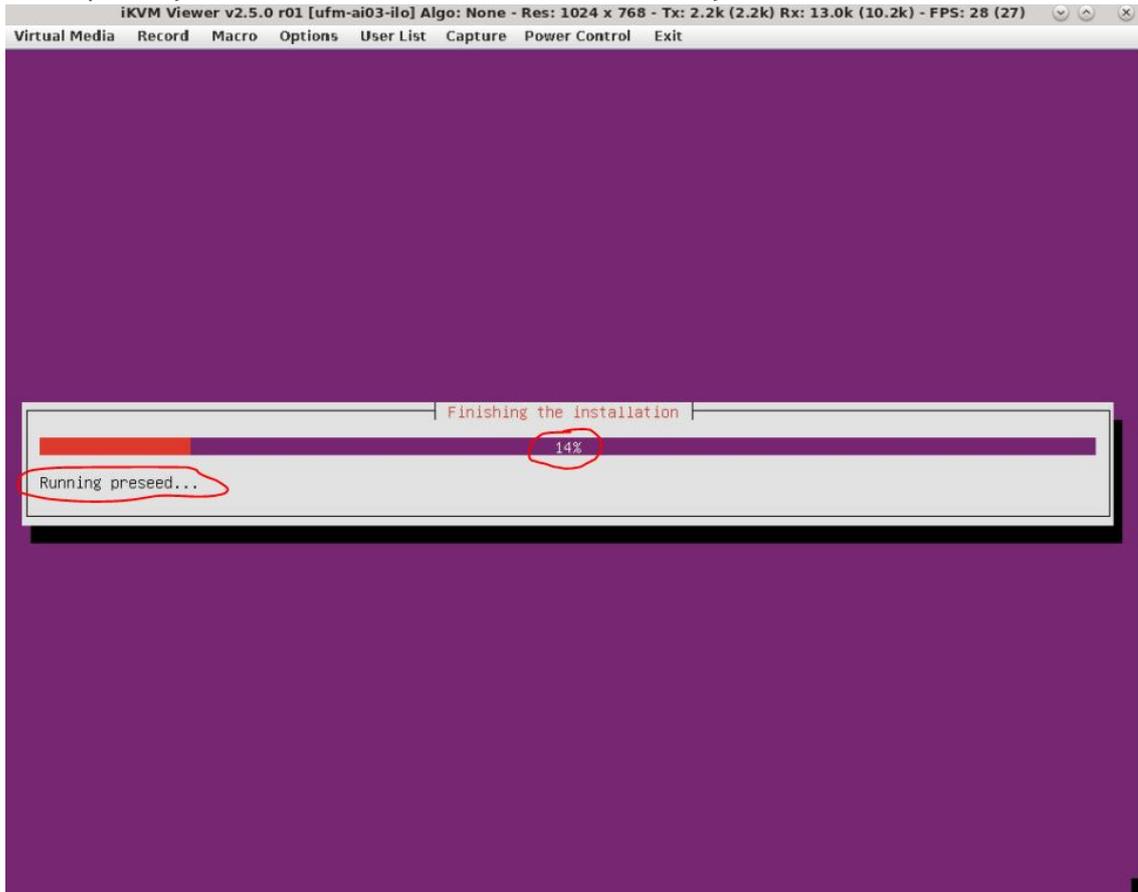
5. In the BIOS menu, navigate to BOOT → "Boot Option #1" and check "USB Device:<NAME OF USB DEVICE>".



6. Navigate to "Save & Exit" → "Save Changes and Reset" and press enter.



7. At this point Cyber-AI installation should start automatically.



8. The process takes ~50 minutes, "Running preseed..." will show ~14-16 percent and will remain on this percentage for most of the time. This does not mean that the process is stuck. The preseed file runs in the background and will take ~35-40 minutes to complete. a log can be viewed by switching to tty4 by click on "Virtual Media" → "Virtual Keyboard"

```
Res:1024x768 FPS:26 KB/s - Work - Microsoft Edge
https://ufm-ai03-ilo/cgi/url_redirect.cgi?url_name=man_ikvm_html5_auto
Keyboard
Virtual Keyboard 1:25 in-target: amount /opt/ssd_data || true
Keyboard Macro 3:25 in-target: + amount /opt/ssd_data
3:25 in-target:
Jan 2 10:43:25 log-output: POST INSTALL FINISHED.
Jan 2 10:43:25 finish-install: info: Running /usr/lib/finish-install.d/07speakup
Jan 2 10:43:25 finish-install: info: Running /usr/lib/finish-install.d/10apt-cdrom-setup
Jan 2 10:43:25 finish-install: info: Disabling CDROM entries in sources.list
Jan 2 10:43:25 finish-install: info: Running /usr/lib/finish-install.d/10clock-setup
Jan 2 10:43:25 clock-setup: not setting hardware clock
Jan 2 10:43:25 finish-install: info: Running /usr/lib/finish-install.d/10open-iscsi
Jan 2 10:43:25 finish-install: info: Running /usr/lib/finish-install.d/10update-initramfs
Jan 2 10:43:25 /bin/in-target: warning: /target/etc/mtab won't be updated since it is a symlink.
Jan 2 10:43:25 finish-install: info: Running /usr/lib/finish-install.d/15cdrom-detect
Jan 2 10:43:25 cdrom-detect: Unmounting and ejecting '/dev/sd11'
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/20final-message
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/30hw-detect
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/50config-target-network
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/55netcfg-copy-config
Jan 2 10:43:26 /bin/in-target: warning: /target/etc/mtab won't be updated since it is a symlink.
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/60cleanup
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/60remove-live-packages
Jan 2 10:43:26 /bin/in-target: warning: /target/etc/mtab won't be updated since it is a symlink.
Jan 2 10:43:26 in-target: Reading package lists...
Jan 2 10:43:26 in-target:
Jan 2 10:43:26 in-target: Building dependency tree...
Jan 2 10:43:26 in-target:
Jan 2 10:43:26 in-target: Reading state information...
Jan 2 10:43:26 in-target:
Jan 2 10:43:26 in-target: 0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/65partman-md
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/70ntab
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/90base-installer
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/90console
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/94random-seed
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/94save-logs
Jan 2 10:43:27 finish-install: info: Running /usr/lib/finish-install.d/95umount
Jan 2 10:43:27 finish-install: umount: can't umount /target: Device or resource busy
Jan 2 10:43:27 finish-install: umount: can't umount /dev/pts: Device or resource busy
Jan 2 10:43:27 finish-install: umount: can't umount /dev: Device or resource busy
Jan 2 10:43:27 finish-install: umount: can't umount /sys: Device or resource busy
Jan 2 10:43:27 finish-install: umount: can't umount /proc: Device or resource busy
Jan 2 10:43:27 finish-install: umount: can't umount /run: Device or resource busy
Jan 2 10:43:27 finish-install: umount: can't umount /: Invalid argument
Jan 2 10:43:27 finish-install: info: Running /usr/lib/finish-install.d/97release-dhcp-lease
Jan 2 10:43:27 finish-install: info: Running /usr/lib/finish-install.d/98exit-installer
Jan 2 10:43:27 finish-install: warning: /usr/lib/finish-install.d/98exit-installer returned error code 1
Jan 2 10:43:27 finish-install: info: Running /usr/lib/finish-install.d/99reboot
https://ufm-ai03-ilo/cgi/url_redirect.cgi?url_name=man_ikvm_html5_auto#
```

On the virtual keyboard that appears, press ALT+F4 (do this on the virtual keyboard to switch to tty4, otherwise the window will close).

9. When the OS installation is complete (if still on tty1 (purple screen)) the screen will be black and a "Sent SIGKILL to all processes" message will appear.

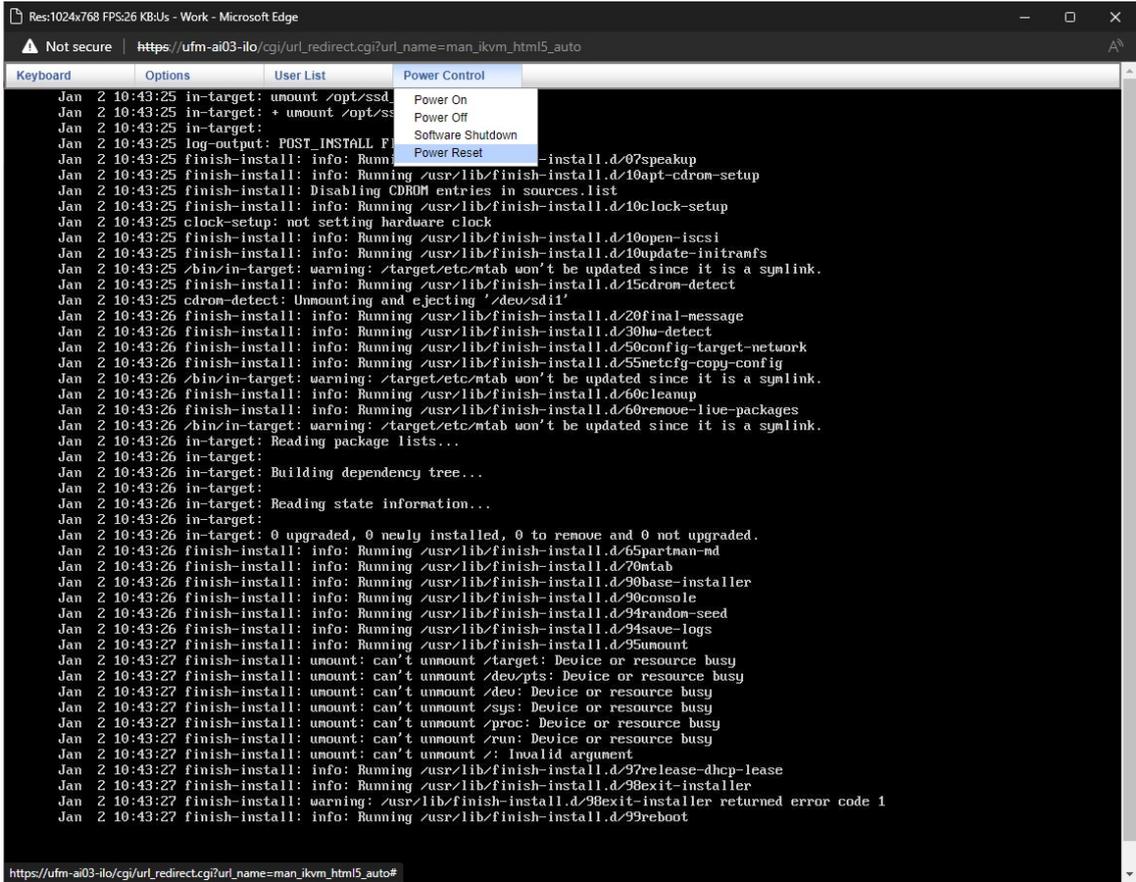


On the tty4 (log screen), a messages with "finish-install:" will appear.

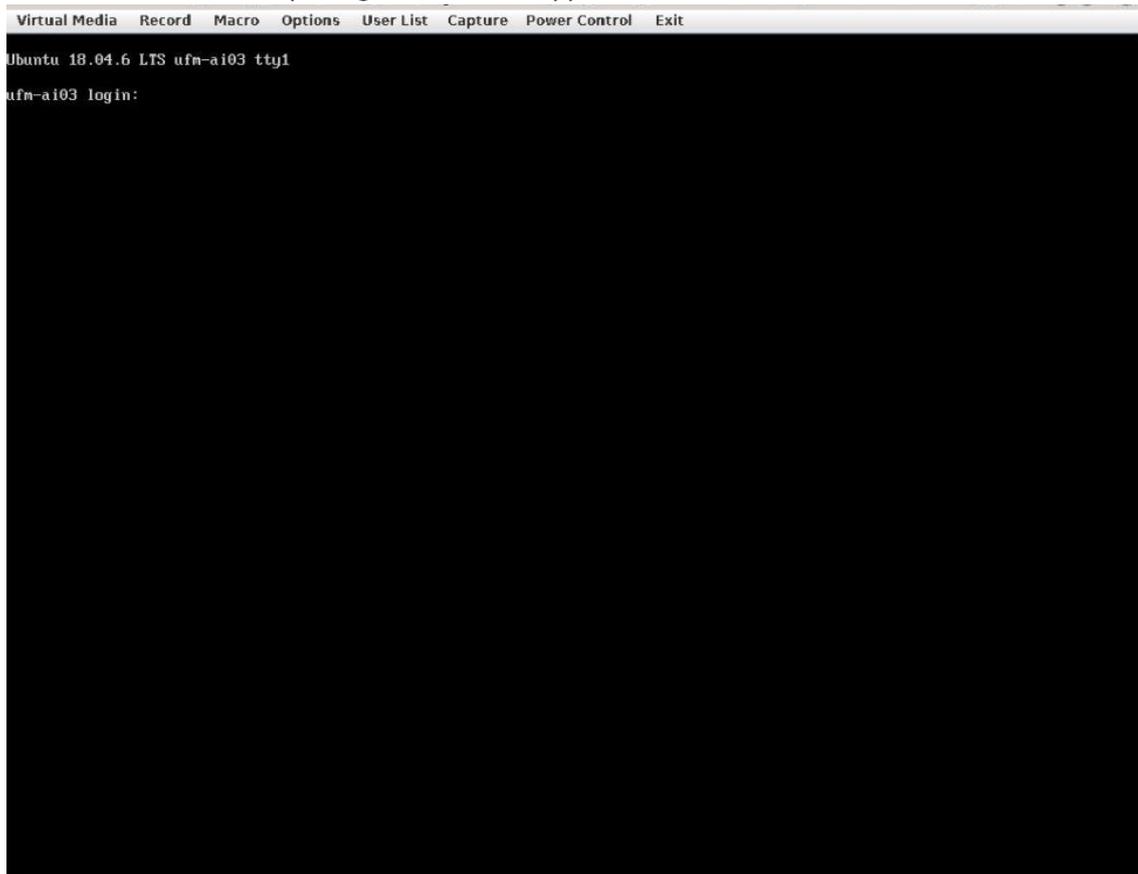
```
Res:1024x768 FPS:25 KB/s - Work - Microsoft Edge
https://ufm-ai03-ilo/cgi/url_redirect.cgi?url_name=man_ikvm_html5_auto
Keyboard Options User List Power Control
Jan 2 10:43:25 in-target: mount /opt/ssd_data || true
Jan 2 10:43:25 in-target: + umount /opt/ssd_data
Jan 2 10:43:25 in-target:
Jan 2 10:43:25 log-output: POST_INSTALL FINISHED.
Jan 2 10:43:25 finish-install: info: Running /usr/lib/finish-install.d/07speakup
Jan 2 10:43:25 finish-install: info: Running /usr/lib/finish-install.d/10apt-cdrom-setup
Jan 2 10:43:25 finish-install: Disabling CDRON entries in sources.list
Jan 2 10:43:25 finish-install: info: Running /usr/lib/finish-install.d/10clock-setup
Jan 2 10:43:25 clock-setup: not setting hardware clock
Jan 2 10:43:25 finish-install: info: Running /usr/lib/finish-install.d/10open-iscsi
Jan 2 10:43:25 finish-install: info: Running /usr/lib/finish-install.d/10update-initramfs
Jan 2 10:43:25 /bin/in-target: warning: /target/etc/mtab won't be updated since it is a symlink.
Jan 2 10:43:25 finish-install: info: Running /usr/lib/finish-install.d/15cdrom-detect
Jan 2 10:43:25 cdrom-detect: Unmounting and ejecting '/dev/sd11'
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/20final-message
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/30hw-detect
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/50config-target-network
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/55netcfg-copy-config
Jan 2 10:43:26 /bin/in-target: warning: /target/etc/mtab won't be updated since it is a symlink.
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/60cleanup
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/60remove-live-packages
Jan 2 10:43:26 /bin/in-target: warning: /target/etc/mtab won't be updated since it is a symlink.
Jan 2 10:43:26 in-target: Reading package lists...
Jan 2 10:43:26 in-target:
Jan 2 10:43:26 in-target: Building dependency tree...
Jan 2 10:43:26 in-target:
Jan 2 10:43:26 in-target: Reading state information...
Jan 2 10:43:26 in-target:
Jan 2 10:43:26 in-target: 0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/65partman-md
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/70mtab
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/90base-installer
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/90console
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/94random-seed
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/94save-logs
Jan 2 10:43:27 finish-install: info: Running /usr/lib/finish-install.d/95umount
Jan 2 10:43:27 finish-install: umount: can't umount /target: Device or resource busy
Jan 2 10:43:27 finish-install: umount: can't umount /dev/pts: Device or resource busy
Jan 2 10:43:27 finish-install: umount: can't umount /dev: Device or resource busy
Jan 2 10:43:27 finish-install: umount: can't umount /sys: Device or resource busy
Jan 2 10:43:27 finish-install: umount: can't umount /proc: Device or resource busy
Jan 2 10:43:27 finish-install: umount: can't umount /run: Device or resource busy
Jan 2 10:43:27 finish-install: umount: can't umount /: Invalid argument
Jan 2 10:43:27 finish-install: info: Running /usr/lib/finish-install.d/97release-dhcp-lease
Jan 2 10:43:27 finish-install: info: Running /usr/lib/finish-install.d/98exit-installer
Jan 2 10:43:27 finish-install: warning: /usr/lib/finish-install.d/98exit-installer returned error code 1
Jan 2 10:43:27 finish-install: info: Running /usr/lib/finish-install.d/99reboot
```

10. At this point, remove the USB from the Cyber-AI server (or reboot to BIOS as seen in step #3 and change the "Boot option #1" which was set to USB earlier to "disabled").

11. Reboot the server. Click the "Power Control" menu and select "Power Reset".

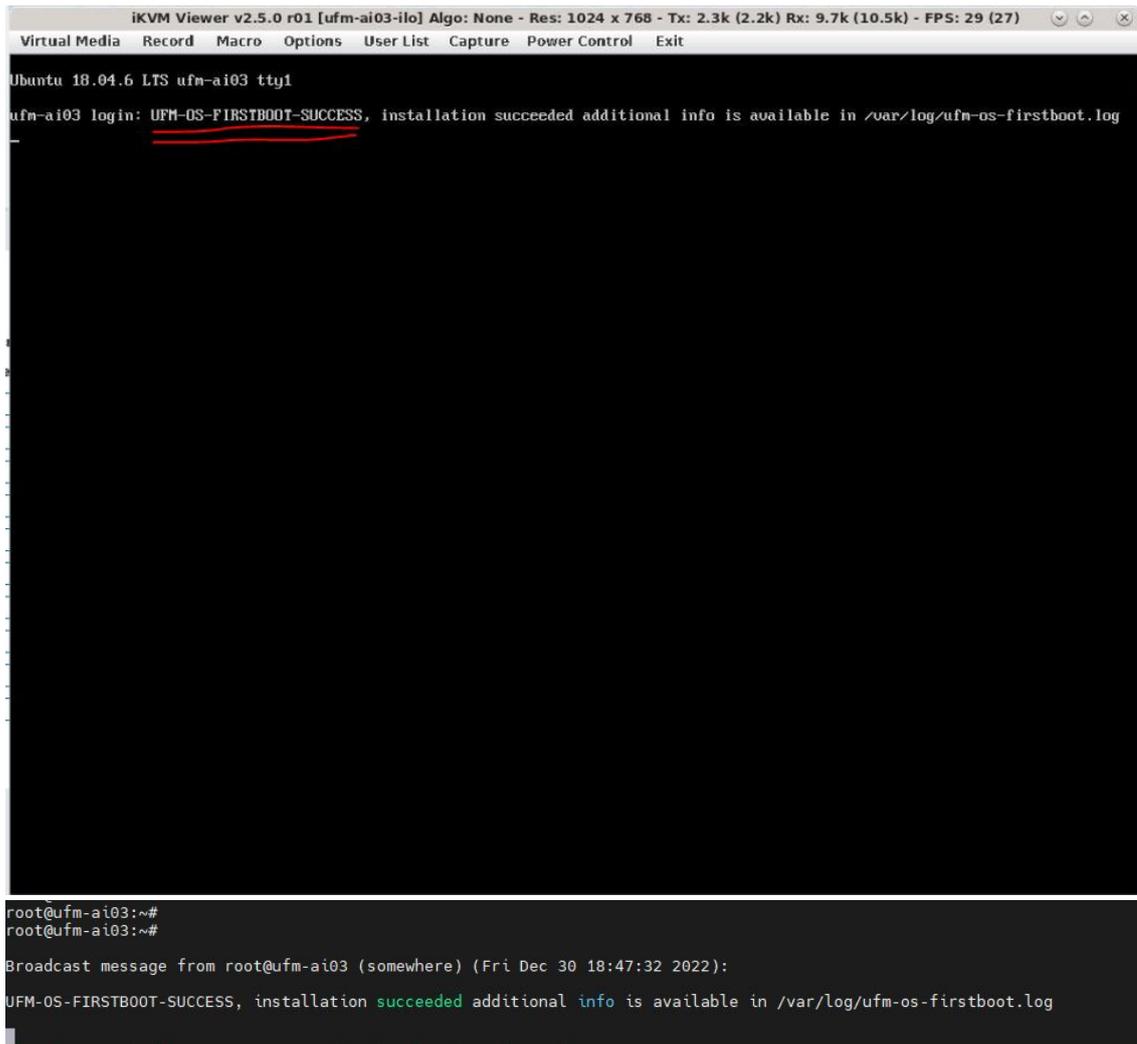


12. After the server boots up a login screen will appear.



You can now log in to the server, however, the installation is not finished yet and Cyber-AI cannot be started.

13. Additional software installation is triggered on the server's first boot. Once complete, a message will appear on all the connected terminals "UFM-OS-FIRSTBOOT-SUCCESS" in case of success, and FAILED in case the process failed.



```
iKVM Viewer v2.5.0 r01 [ufm-ai03-ilo] Algo: None - Res: 1024 x 768 - Tx: 2.3k (2.2k) Rx: 9.7k (10.5k) - FPS: 29 (27)
Virtual Media Record Macro Options User List Capture Power Control Exit
Ubuntu 18.04.6 LTS ufm-ai03 tty1
ufm-ai03 login: UFM-OS-FIRSTBOOT-SUCCESS, installation succeeded additional info is available in /var/log/ufm-os-firstboot.log

root@ufm-ai03:~#
root@ufm-ai03:~#
Broadcast message from root@ufm-ai03 (somewhere) (Fri Dec 30 18:47:32 2022):
UFM-OS-FIRSTBOOT-SUCCESS, installation succeeded additional info is available in /var/log/ufm-os-firstboot.log
```

14. To manually check the status, run:

```
systemctl status ufm-os-firstboot
```

if the installation is still running, the output provides a status.

if the installation finished, `ufm-os-firstboot` will not be found and the log at `/var/log/ufm-os-firstboot.log` can be viewed.

```
root@ufm-ai03:~# systemctl status ufm-os-firstboot
Unit ufm-os-firstboot.service could not be found.
root@ufm-ai03:~#
```

15. Cyber-AI is now successfully installed and can be started.

11.4 Appendix - Deploying UFM Cyber-AI from an ISO File

This section provides a step-by-step guide for deploying Cyber-AI from an ISO file.

11.4.1 Step 1: Extract the TAR file to a temporary directory

Extract the `ufm-cyberai-appliance-<version>-omu.tar` file to a temporary directory.

Extract TAR file

```
tar xzf /path/to/ufm-cyberai-appliance-<version>-omu.tar -C /tmp
```

There is both an ISO file and an upgrade script located in the directory.

Extract TAR file

```
ls -ltrh /tmp/ufm-cyberai-appliance-<version>-omu/  
-rw-r--r-- 1 root root 7.5G Dec 31 17:49 ufm-cyberai-appliance-<version>.iso  
-rwxr-xr-x 1 root root 11K Dec 31 17:49 ufm-os-upgrade.sh
```

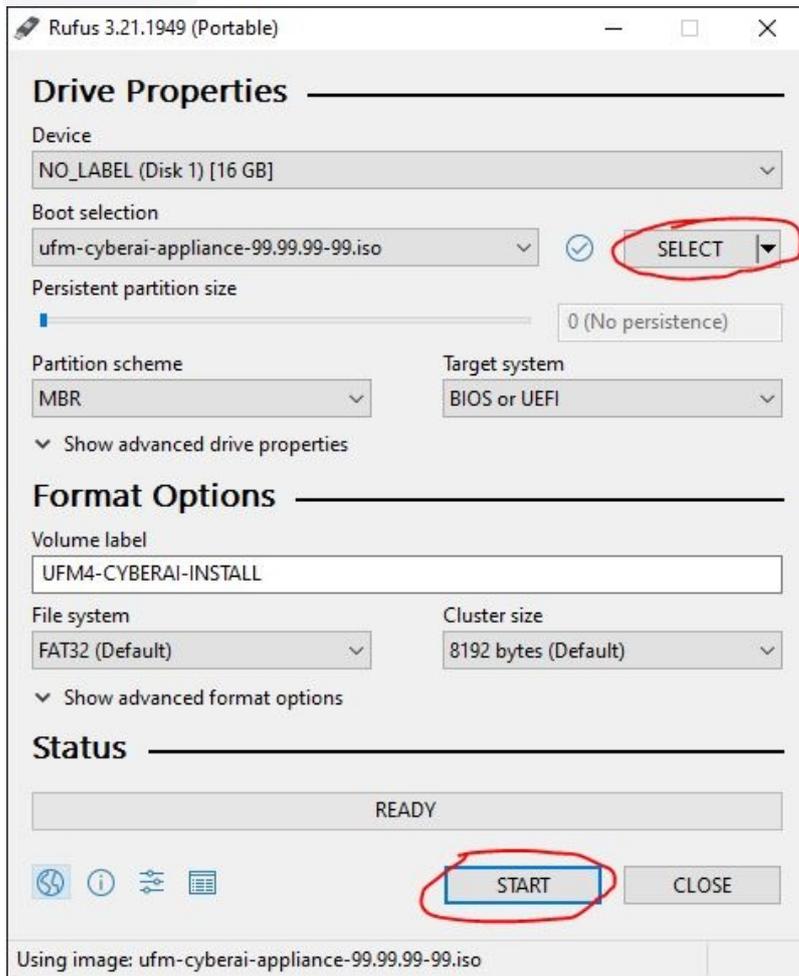
11.4.2 Step: 2 - Burn ISO to USB

To burn the ISO onto a USB device, you can use either a Windows or Linux operating system. Follow the instructions below depending on your preferred installation method.

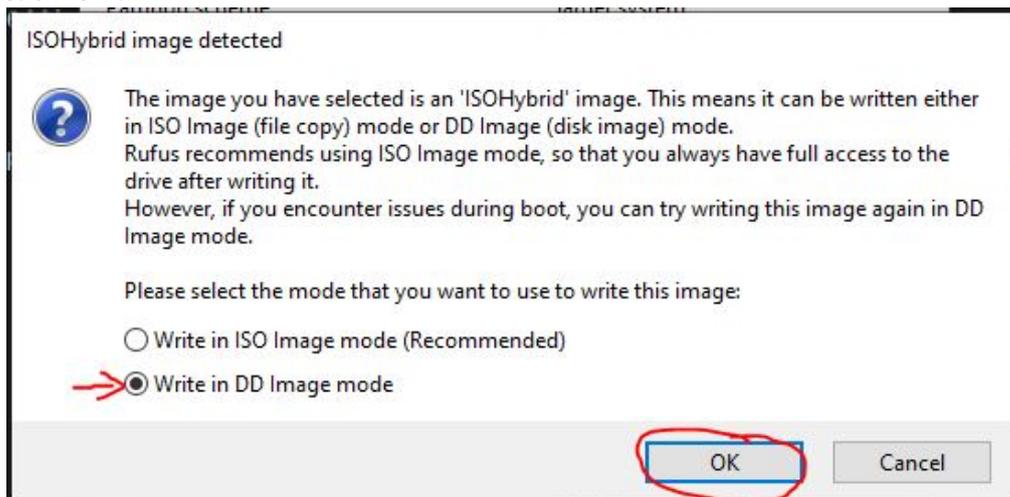
11.4.2.1 Windows

1. Download and open Rufus. Refer to [Rufus - Create bootable USB drives the easy way.](#)
2. Download and open the tar file `ufm-cyberai-appliance-<version>-omu.tar`.

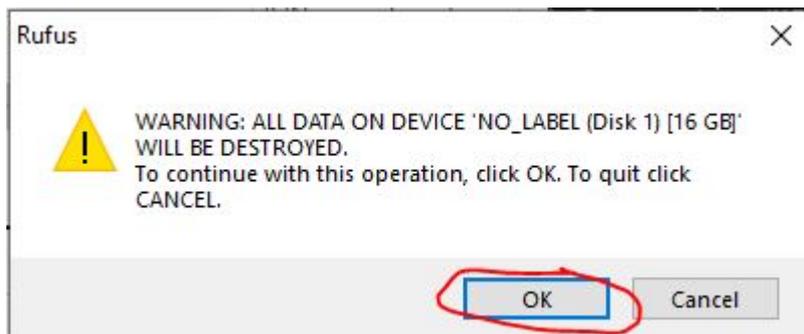
3. Click on "SELECT" and from the drop-down menu, select the `ufm-cyberai-appliance-
<version>.iso`, then click "START".



4. When the "ISOHybrid image detected" message appears, select "Write in DD mode" and then click "OK".



5. You will see a message indicating that all data on the USB device will be erased. Click "OK and continue" to proceed.



6. Wait for Rufus to finish.
7. Unplug the USB device.

11.4.2.2 Linux

1. Identify the USB drive by running the following command:

✘ **IMPORTANT!!!** Ensure you are NOT running the following commands on a hard drive device but only on the USB (in the examples below it will be /dev/sdb).

⚠ The USB drive is mapped to sdb in the following command snippet.

```
root@ubuntu18:~# ls -ltrh /dev/disk/by-id/usb*
lrwxrwxrwx 1 root root 9 Jan 2 13:44 /dev/disk/by-id/usb-SanDisk_Cruzer_Glide_3.0_4C530000040724111091-0:
0 -> ../../sdb
lrwxrwxrwx 1 root root 10 Jan 2 13:44 /dev/disk/by-id/usb-SanDisk_Cruzer_Glide_3.0_4C530000040724111091-0:
0-part1 -> ../../sdb1
```

2. Copy the `ufm-cyberai-appliance-<version>.iso` to the USB using the following `dd` command:

```
dd if=/path/to/ufm-cyberai-appliance-<version>.iso of=/dev/sdb bs=4M status=progress oflag=sync
```

3. Verify that the USB is bootable:

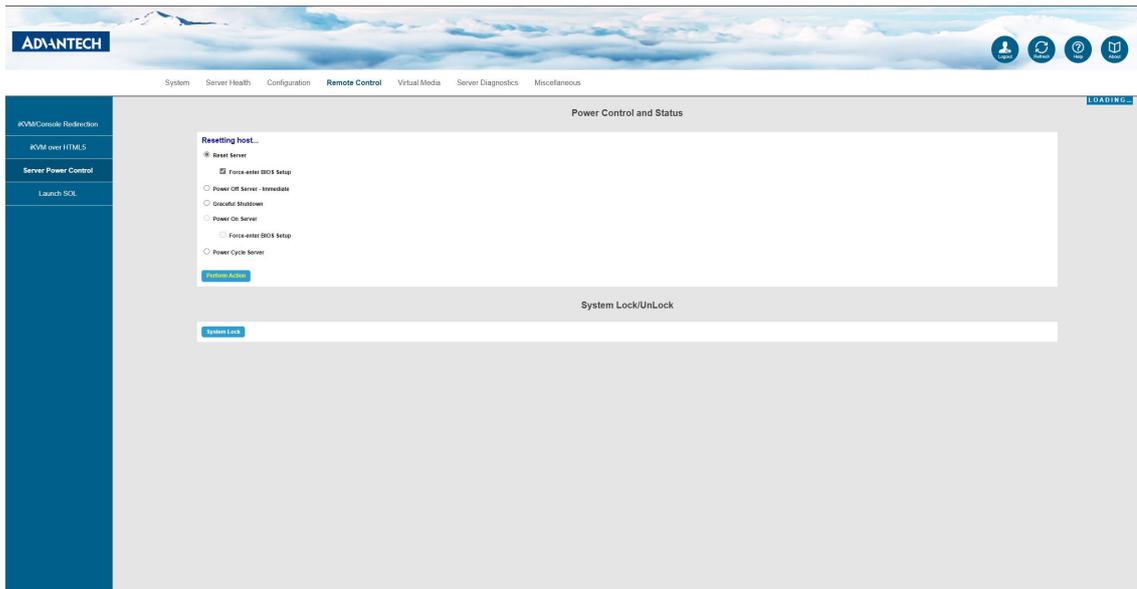
```
root@ubuntu18:~# fdisk -l /dev/sdb
Disk /dev/sdb: 14.9 GiB, 16005464064 bytes, 31260672 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0x594ec03e

Device     Boot Start      End  Sectors  Size Id Type
/dev/sdb1  *          64 15679439 15679376  7.5G 17 Hidden HPFS/NTFS
```

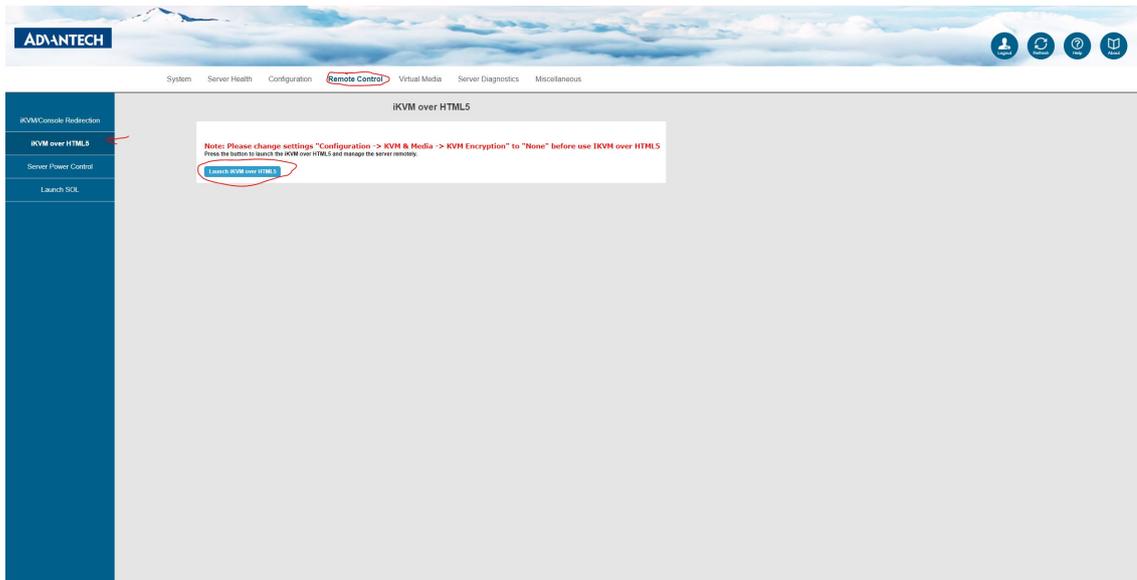
4. Unplug the USB.

11.4.3 Step: 3 - Manufacture Cyber-AI from USB

1. Plug the USB (prepared in the previous step) to one of the Cyber-AI server USB ports on its rear panel.
2. Log in to BMC web UI: `https://<BMC_IP_ADDRESS>`.
3. Navigate to "Remote Control" → "Server Power Control" and check the "Force-enter BIOS Setup" checkbox under the "Restart Server". Then, click "Perform Action".



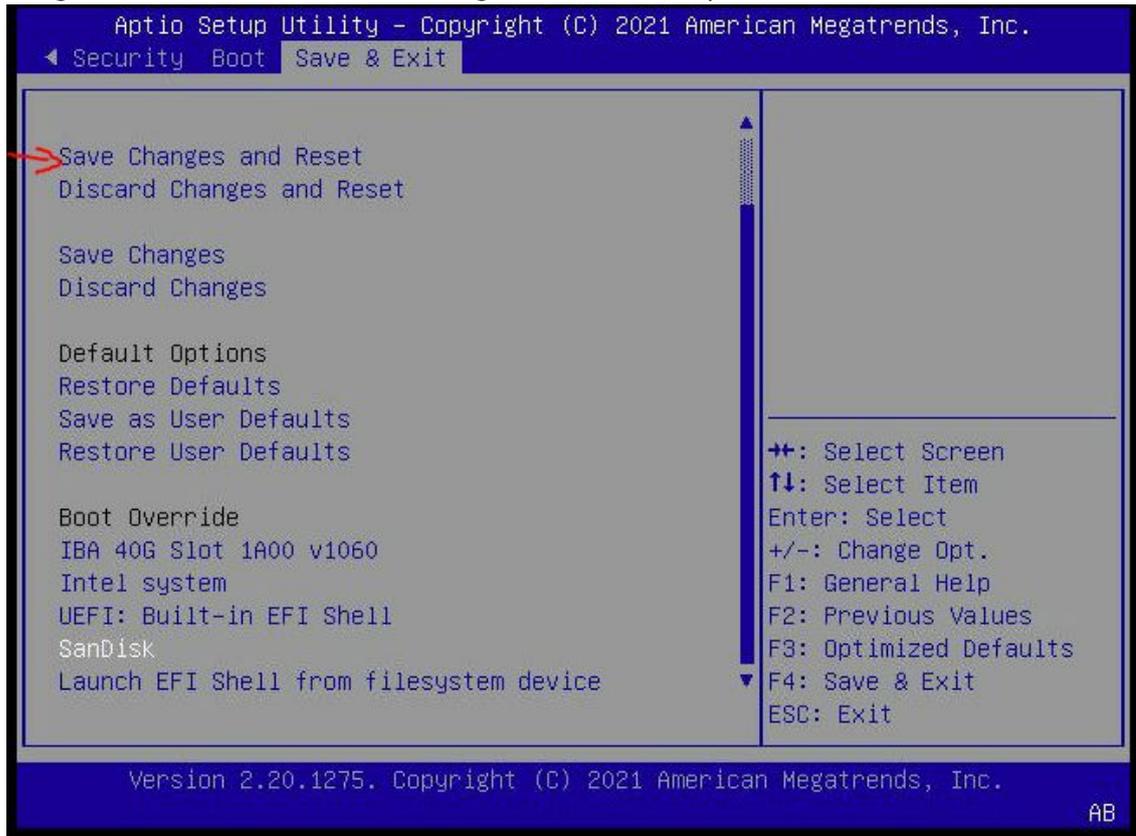
4. Navigate to "Remote Control" → "iKVM over HTML5" and click "Launch iKVM over HTML5" button.



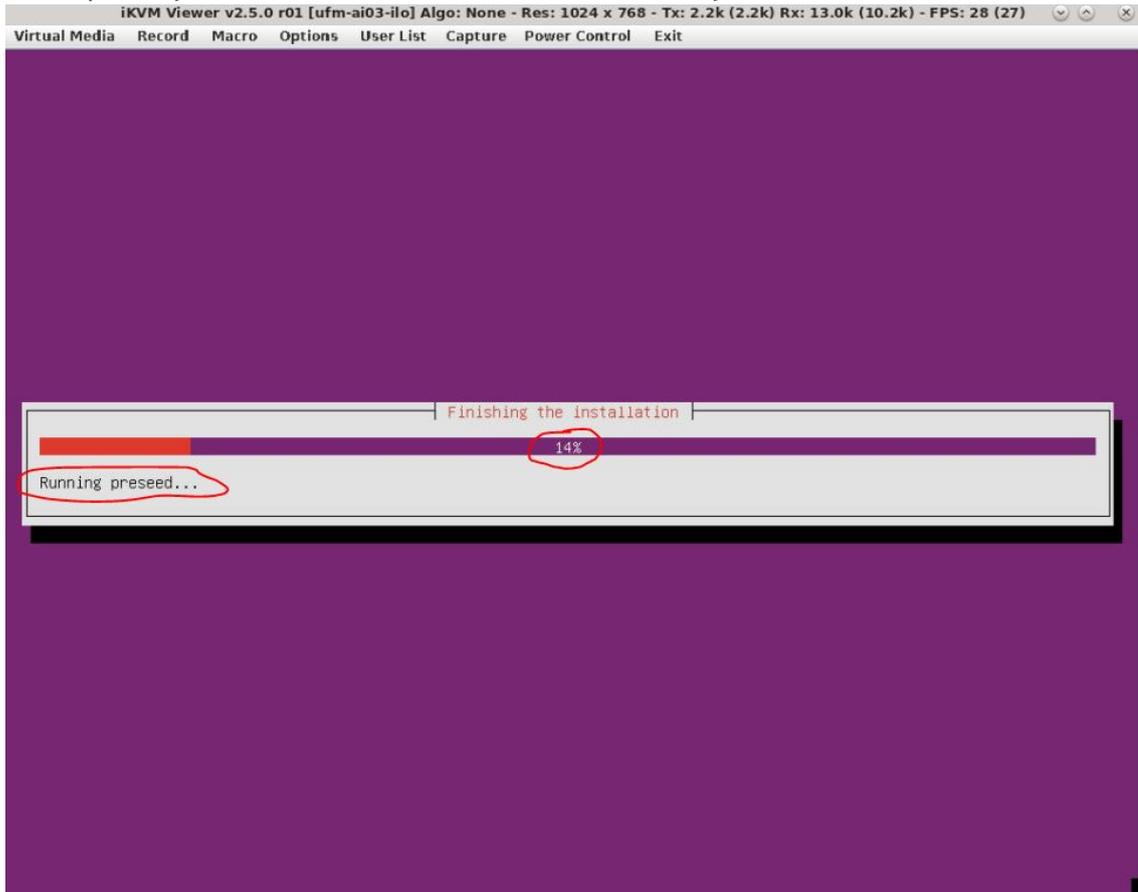
A new window will open.

5. In the BIOS menu, navigate to BOOT → "Boot Option #1" and check "USB Device:<NAME OF USB DEVICE>".

6. Navigate to "Save & Exit" → "Save Changes and Reset" and press enter.



7. At this point Cyber-AI installation should start automatically.



8. The process takes ~50 minutes, "Running preseed..." will show ~14-16 percent and will remain on this percentage for most of the time. This does not mean that the process is stuck. The preseed file runs in the background and will take ~35-40 minutes to complete. a log can be viewed by switching to tty4 by click on "Virtual Media" → "Virtual Keyboard"

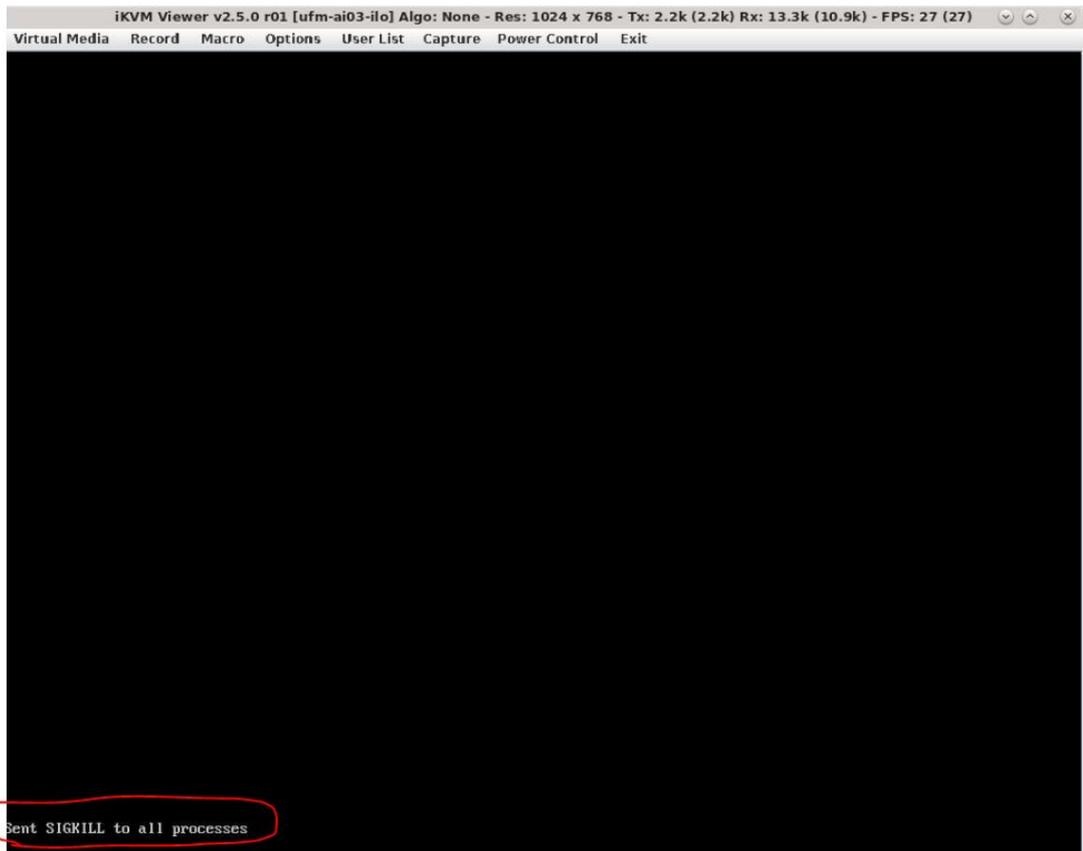
```

Res:1024x768 FPS:26 KB/s - Work - Microsoft Edge
https://ufm-ai03-ilo/cgi/url_redirect.cgi?url_name=man_ikvm_html5_auto
Keyboard
Virtual Keyboard 4:25 in-target: umount /opt/ssd_data || true
Keyboard Macro 3:25 in-target: + umount /opt/ssd_data
3:25 in-target:
Jan 2 10:43:25 log-output: POST INSTALL FINISHED.
Jan 2 10:43:25 finish-install: info: Running /usr/lib/finish-install.d/07speakup
Jan 2 10:43:25 finish-install: info: Running /usr/lib/finish-install.d/10apt-cdrom-setup
Jan 2 10:43:25 finish-install: info: Disabling CDROM entries in sources.list
Jan 2 10:43:25 finish-install: info: Running /usr/lib/finish-install.d/10clock-setup
Jan 2 10:43:25 clock-setup: not setting hardware clock
Jan 2 10:43:25 finish-install: info: Running /usr/lib/finish-install.d/10open-iscsi
Jan 2 10:43:25 finish-install: info: Running /usr/lib/finish-install.d/10update-initramfs
Jan 2 10:43:25 /bin/in-target: warning: /target/etc/mtab won't be updated since it is a symlink.
Jan 2 10:43:25 finish-install: info: Running /usr/lib/finish-install.d/15cdrom-detect
Jan 2 10:43:25 cdrom-detect: Unmounting and ejecting '/dev/sd11'
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/20final-message
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/30hw-detect
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/50config-target-network
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/55netcfg-copy-config
Jan 2 10:43:26 /bin/in-target: warning: /target/etc/mtab won't be updated since it is a symlink.
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/60cleanup
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/60remove-live-packages
Jan 2 10:43:26 /bin/in-target: warning: /target/etc/mtab won't be updated since it is a symlink.
Jan 2 10:43:26 in-target: Reading package lists...
Jan 2 10:43:26 in-target:
Jan 2 10:43:26 in-target: Building dependency tree...
Jan 2 10:43:26 in-target:
Jan 2 10:43:26 in-target: Reading state information...
Jan 2 10:43:26 in-target:
Jan 2 10:43:26 in-target: 0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/65partman-md
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/70ntab
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/90base-installer
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/90console
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/94random-seed
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/94save-logs
Jan 2 10:43:27 finish-install: info: Running /usr/lib/finish-install.d/95umount
Jan 2 10:43:27 finish-install: umount: can't unmount /target: Device or resource busy
Jan 2 10:43:27 finish-install: umount: can't unmount /dev/pts: Device or resource busy
Jan 2 10:43:27 finish-install: umount: can't unmount /dev: Device or resource busy
Jan 2 10:43:27 finish-install: umount: can't unmount /sys: Device or resource busy
Jan 2 10:43:27 finish-install: umount: can't unmount /proc: Device or resource busy
Jan 2 10:43:27 finish-install: umount: can't unmount /run: Device or resource busy
Jan 2 10:43:27 finish-install: umount: can't unmount /: Invalid argument
Jan 2 10:43:27 finish-install: info: Running /usr/lib/finish-install.d/97release-dhcp-lease
Jan 2 10:43:27 finish-install: info: Running /usr/lib/finish-install.d/98exit-installer
Jan 2 10:43:27 finish-install: warning: /usr/lib/finish-install.d/98exit-installer returned error code 1
Jan 2 10:43:27 finish-install: info: Running /usr/lib/finish-install.d/99reboot
https://ufm-ai03-ilo/cgi/url_redirect.cgi?url_name=man_ikvm_html5_auto#

```

On the virtual keyboard that appears, press ALT+F4 (do this on the virtual keyboard to switch to tty4, otherwise the window will close).

9. When the OS installation is complete (if still on tty1 (purple screen)) the screen will be black and a "Sent SIGKILL to all processes" message will appear.

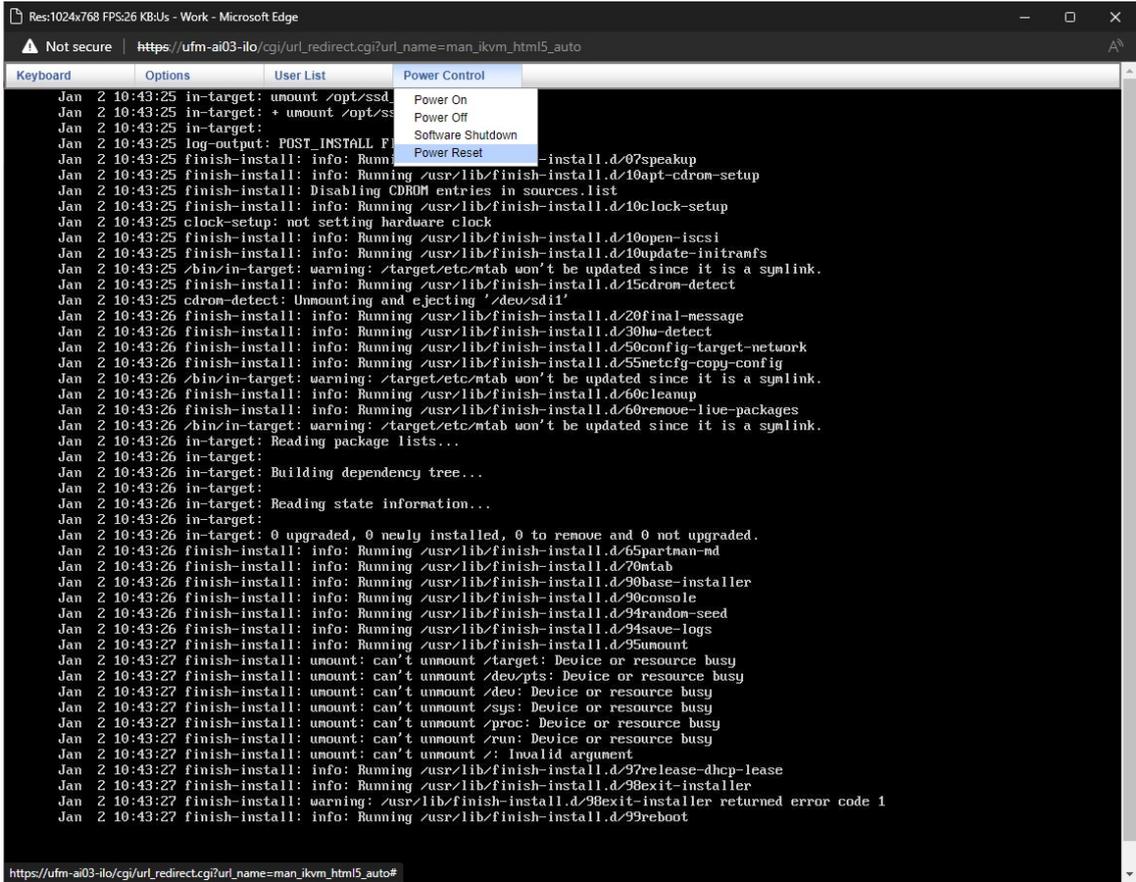


On the tty4 (log screen), a messages with "finish-install:" will appear.

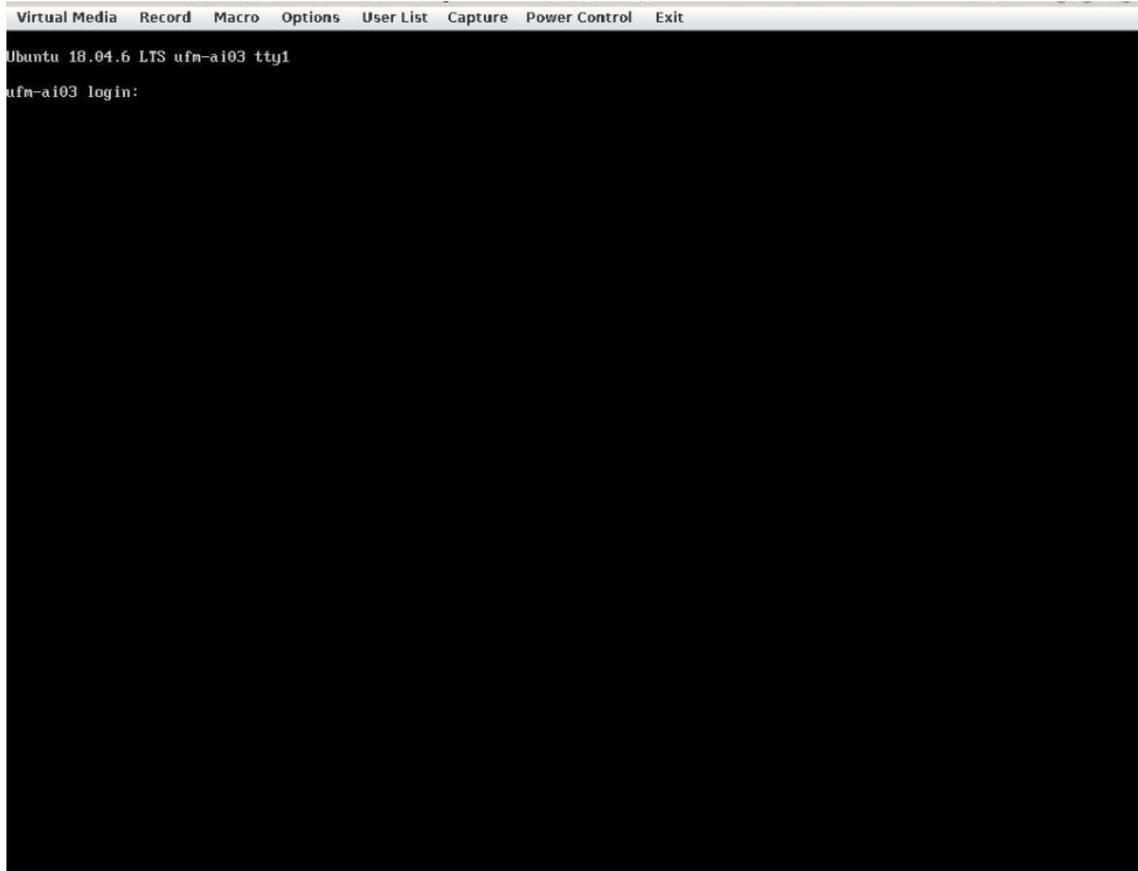
```
Res:1024x768 FPS:25 KB/s - Work - Microsoft Edge
https://ufm-ai03-ilo/cgi/url_redirect.cgi?url_name=man_ikvm_html5_auto
Keyboard Options User List Power Control
Jan 2 10:43:25 in-target: umount /opt/ssd_data || true
Jan 2 10:43:25 in-target: + umount /opt/ssd_data
Jan 2 10:43:25 in-target:
Jan 2 10:43:25 log-output: POST_INSTALL FINISHED.
Jan 2 10:43:25 finish-install: info: Running /usr/lib/finish-install.d/07speakup
Jan 2 10:43:25 finish-install: info: Running /usr/lib/finish-install.d/10apt-cdrom-setup
Jan 2 10:43:25 finish-install: info: Disabling CDROM entries in sources.list
Jan 2 10:43:25 finish-install: info: Running /usr/lib/finish-install.d/10clock-setup
Jan 2 10:43:25 clock-setup: not setting hardware clock
Jan 2 10:43:25 finish-install: info: Running /usr/lib/finish-install.d/10open-iscsi
Jan 2 10:43:25 finish-install: info: Running /usr/lib/finish-install.d/10update-initramfs
Jan 2 10:43:25 /bin/in-target: warning: /target/etc/mtab won't be updated since it is a symlink.
Jan 2 10:43:25 finish-install: info: Running /usr/lib/finish-install.d/15cdrom-detect
Jan 2 10:43:25 cdrom-detect: Unmounting and ejecting '/dev/sd11'
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/20final-message
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/30hw-detect
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/50config-target-network
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/55netcfg-copy-config
Jan 2 10:43:26 /bin/in-target: warning: /target/etc/mtab won't be updated since it is a symlink.
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/60cleanup
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/60remove-live-packages
Jan 2 10:43:26 /bin/in-target: warning: /target/etc/mtab won't be updated since it is a symlink.
Jan 2 10:43:26 in-target: Reading package lists...
Jan 2 10:43:26 in-target:
Jan 2 10:43:26 in-target: Building dependency tree...
Jan 2 10:43:26 in-target:
Jan 2 10:43:26 in-target: Reading state information...
Jan 2 10:43:26 in-target:
Jan 2 10:43:26 in-target: 0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/65partman-md
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/70mtab
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/90base-installer
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/90console
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/94random-seed
Jan 2 10:43:26 finish-install: info: Running /usr/lib/finish-install.d/94save-logs
Jan 2 10:43:27 finish-install: info: Running /usr/lib/finish-install.d/95umount
Jan 2 10:43:27 finish-install: umount: can't umount /target: Device or resource busy
Jan 2 10:43:27 finish-install: umount: can't umount /dev/pts: Device or resource busy
Jan 2 10:43:27 finish-install: umount: can't umount /dev: Device or resource busy
Jan 2 10:43:27 finish-install: umount: can't umount /sys: Device or resource busy
Jan 2 10:43:27 finish-install: umount: can't umount /proc: Device or resource busy
Jan 2 10:43:27 finish-install: umount: can't umount /run: Device or resource busy
Jan 2 10:43:27 finish-install: umount: can't umount /: Invalid argument
Jan 2 10:43:27 finish-install: info: Running /usr/lib/finish-install.d/97release-dhcp-lease
Jan 2 10:43:27 finish-install: info: Running /usr/lib/finish-install.d/98exit-installer
Jan 2 10:43:27 finish-install: warning: /usr/lib/finish-install.d/98exit-installer returned error code 1
Jan 2 10:43:27 finish-install: info: Running /usr/lib/finish-install.d/99reboot
```

10. At this point, remove the USB from the Cyber-AI server (or reboot to BIOS as seen in step #3 and change the "Boot option #1" which was set to USB earlier to "disabled").

11. Reboot the server. Click the "Power Control" menu and select "Power Reset".



12. After the server boots up a login screen will appear.



You can now log in to the server, however, the installation is not finished yet and Cyber-AI cannot be started.

13. Additional software installation is triggered on the server's first boot. Once complete, a message will appear on all the connected terminals "UFM-OS-FIRSTBOOT-SUCCESS" in case of success, and FAILED in case the process failed.

```
iKVM Viewer v2.5.0 r01 [ufm-ai03-ilo] Algo: None - Res: 1024 x 768 - Tx: 2.3k (2.2k) Rx: 9.7k (10.5k) - FPS: 29 (27)
Virtual Media Record Macro Options User List Capture Power Control Exit
Ubuntu 18.04.6 LTS ufm-ai03 tty1
ufm-ai03 login: UFM-OS-FIRSTBOOT-SUCCESS, installation succeeded additional info is available in /var/log/ufm-os-firstboot.log

root@ufm-ai03:~#
root@ufm-ai03:~#
Broadcast message from root@ufm-ai03 (somewhere) (Fri Dec 30 18:47:32 2022):
UFM-OS-FIRSTBOOT-SUCCESS, installation succeeded additional info is available in /var/log/ufm-os-firstboot.log
```

14. To manually check the status, run:

```
systemctl status ufm-os-firstboot
```

if the installation is still running, the output provides a status.

if the installation finished, `ufm-os-firstboot` will not be found and the log at `/var/log/ufm-os-firstboot.log` can be viewed.

```
root@ufm-ai03:~# systemctl status ufm-os-firstboot
Unit ufm-os-firstboot.service could not be found.
root@ufm-ai03:~#
```

15. Cyber-AI is now successfully installed and can be started.

12 Documentation History

- [Document Revision History](#)
- [Release Notes History](#)

12.1 Document Revision History

Version	Date	Link
Rev 2.14.1	Nov 10, 2025	Added Installation Notes Updated: <ul style="list-style-type: none">• Changes and New Features in This Release• Bug Fixes in This Release
Rev 2.13.2	Sep 5, 2025	Documentation History in v2.13.2
Rev 2.13.0	Aug 7, 2025	Documentation History in v2.13.0
Rev 2.12.0	May 5, 2025	Documentation History in v2.12.0
Rev 2.11.1	Feb 12, 2025	Documentation History in v2.11.1
Rev 2.11.0	Feb 10, 2025	Documentation History in v2.11.0
Rev 2.10.0	Nov 5, 2024	Documentation History in v2.10.0
Rev 2.9.1	Aug 27, 2024	Documentation History in v2.9.1
Rev 2.9.0	Aug 12, 2024	Documentation History in v2.9.0
Rev 2.8.0	May 5, 2024	Documentation History in v2.8.0
Rev 2.7.0	Feb 8, 2024	Documentation History in v2.7.0
Rev 2.6.1	Dec 12, 2023	Documentation History in v2.6.1
Rev 2.6.0	Nov, 2023	Documentation History in v2.6.0
Rev 2.5.1	Aug, 2023	Documentation History in v2.5.1
Rev 2.5.0	Aug, 2023	Documentation History in v2.5.0

12.2 Release Notes History

- [Changes and New Features History](#)
- [Bug Fixes History](#)
- [Known Issues History](#)

12.2.1 Changes and New Features History

Version	Date	Description
2.13.2	Sep 5, 2025	Changes and New Features History in v2.13.2
2.13.0	Aug 7, 2025	Changes and New Features History in v2.13.0
2.12.0	May 5, 2025	Changes and New Features History in v2.12.0
2.11.1	Feb 12, 2025	Changes and New Features History in v2.11.1

Version	Date	Description
2.11.0	Feb 10, 2025	Changes and New Features History in v2.11.0
2.10.0	Nov 5, 2024	Changes and New Features History in v2.10.0
2.9.1	Aug 27, 2024	Changes and New Features History in v2.9.1
2.9.0	Aug 12, 2024	Changes and New Features History in v2.9.0
2.8.0	May 5, 2024	Changes and New Features History in v2.8.0

12.2.2 Bug Fixes History

Version	Date	Link
Rev 2.13.2	Sep 5, 2025	Bug Fixes History in v2.13.2
Rev 2.13.0	Aug 7, 2025	Bug Fixes History in v2.13.0
Rev 2.12.0	May 5, 2025	Bug Fixes History in v2.12.0
Rev 2.11.1	Feb 12, 2025	Bug Fixes History in v2.11.1
Rev 2.11.0	Feb 10, 2025	Bug Fixes History in v2.11.0
Rev 2.10.0	Nov 5, 2024	Bug Fixes History in v2.10.0
Rev 2.9.1	Aug 27, 2024	Bug Fixes History in v2.9.1
Rev 2.9.0	Aug 12, 2024	Bug Fixes History in v2.9.0
Rev 2.8.0	May 5, 2024	Bug Fixes History in v2.8.0
Rev 2.7.0	Feb 8, 2024	Bug Fixes History in v2.7.0
Rev 2.6.1	Dec 12, 2023	Bug Fixes History in v2.6.1
Rev 2.6.0	Nov, 2023	Bug Fixes History in v2.6.0
Rev 2.5.1	Aug, 2023	Bug Fixes History in v2.5.1
Rev 2.5.0	Aug, 2023	Bug Fixes History in v2.5.0

12.2.3 Known Issues History

Version	Date	Link
2.13.2	Sep 5, 2025	Known Issues History in v2.13.2
2.13.0	Aug 7, 2025	Known Issues History in v2.13.0
2.12.0	May 5, 2025	Known Issues History in v2.12.0
2.11.1	Feb 12, 2025	Known Issues History in v2.11.1
2.11.0	Feb 10, 2025	Known Issues History in v2.11.0
2.10.0	Nov 5, 2024	Known Issues History in v2.10.0
2.9.1	Aug 27, 2024	Known Issues History in v2.9.1
2.9.0	Aug 12, 2024	Known Issues History in v2.9.0
2.8.0	May 5, 2024	Known Issues History in v2.8.0

Version	Date	Link
2.7.0	Feb 8, 2024	Known Issues History in v2.7.0
2.6.1	Dec 12, 2023	Known Issues History in v2.6.1
2.6.0	Nov, 2023	Known Issues History in v2.6.0
2.5.1	Aug, 2023	Known Issues History in v2.5.1
2.5.0	Aug, 2023	Known Issues History in v2.5.0

Notice

This document is provided for information purposes only and shall not be regarded as a warranty of a certain functionality, condition, or quality of a product. Neither NVIDIA Corporation nor any of its direct or indirect subsidiaries and affiliates (collectively: “NVIDIA”) make any representations or warranties, expressed or implied, as to the accuracy or completeness of the information contained in this document and assumes no responsibility for any errors contained herein. NVIDIA shall have no liability for the consequences or use of such information or for any infringement of patents or other rights of third parties that may result from its use. This document is not a commitment to develop, release, or deliver any Material (defined below), code, or functionality.

NVIDIA reserves the right to make corrections, modifications, enhancements, improvements, and any other changes to this document, at any time without notice. Customer should obtain the latest relevant information before placing orders and should verify that such information is current and complete.

NVIDIA products are sold subject to the NVIDIA standard terms and conditions of sale supplied at the time of order acknowledgement, unless otherwise agreed in an individual sales agreement signed by authorized representatives of NVIDIA and customer (“Terms of Sale”). NVIDIA hereby expressly objects to applying any customer general terms and conditions with regards to the purchase of the NVIDIA product referenced in this document. No contractual obligations are formed either directly or indirectly by this document.

NVIDIA products are not designed, authorized, or warranted to be suitable for use in medical, military, aircraft, space, or life support equipment, nor in applications where failure or malfunction of the NVIDIA product can reasonably be expected to result in personal injury, death, or property or environmental damage. NVIDIA accepts no liability for inclusion and/or use of NVIDIA products in such equipment or applications and therefore such inclusion and/or use is at customer’s own risk.

NVIDIA makes no representation or warranty that products based on this document will be suitable for any specified use. Testing of all parameters of each product is not necessarily performed by NVIDIA. It is customer’s sole responsibility to evaluate and determine the applicability of any information contained in this document, ensure the product is suitable and fit for the application planned by customer, and perform the necessary testing for the application in order to avoid a default of the application or the product. Weaknesses in customer’s product designs may affect the quality and reliability of the NVIDIA product and may result in additional or different conditions and/or requirements beyond those contained in this document. NVIDIA accepts no liability related to any default, damage, costs, or problem which may be based on or attributable to: (i) the use of the NVIDIA product in any manner that is contrary to this document or (ii) customer product designs.

No license, either expressed or implied, is granted under any NVIDIA patent right, copyright, or other NVIDIA intellectual property right under this document. Information published by NVIDIA regarding third-party products or services does not constitute a license from NVIDIA to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property rights of the third party, or a license from NVIDIA under the patents or other intellectual property rights of NVIDIA.

Reproduction of information in this document is permissible only if approved in advance by NVIDIA in writing, reproduced without alteration and in full compliance with all applicable export laws and regulations, and accompanied by all associated conditions, limitations, and notices.

THIS DOCUMENT AND ALL NVIDIA DESIGN SPECIFICATIONS, REFERENCE BOARDS, FILES, DRAWINGS, DIAGNOSTICS, LISTS, AND OTHER DOCUMENTS (TOGETHER AND SEPARATELY, “MATERIALS”) ARE BEING PROVIDED “AS IS.” NVIDIA MAKES NO WARRANTIES, EXPRESSED, IMPLIED, STATUTORY, OR OTHERWISE WITH RESPECT TO THE MATERIALS, AND EXPRESSLY DISCLAIMS ALL IMPLIED WARRANTIES OF NONINFRINGEMENT, MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE. TO THE EXTENT NOT PROHIBITED BY LAW, IN NO EVENT WILL NVIDIA BE LIABLE FOR ANY DAMAGES, INCLUDING WITHOUT LIMITATION ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, PUNITIVE, OR CONSEQUENTIAL DAMAGES, HOWEVER CAUSED AND REGARDLESS OF THE THEORY OF LIABILITY, ARISING OUT OF ANY USE OF THIS DOCUMENT, EVEN IF NVIDIA HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. Notwithstanding any damages that customer might incur for any reason whatsoever, NVIDIA’s aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the Terms of Sale for the product.

Trademarks

NVIDIA, the NVIDIA logo, and Mellanox are trademarks and/or registered trademarks of NVIDIA Corporation and/or its



affiliates in the U.S. and in other countries. Other company and product names may be trademarks of the respective companies with which they are associated.

Copyright

© 2025 NVIDIA Corporation & affiliates. All Rights Reserved.

