Falcon Composable GPU Solution
User Manual

- Falcon 4005
- Falcon 4010
- Falcon 4205
- Falcon 4210

H3

Dear Users

Thank you for choosing our product.

The excellent quality and performance make our products superior in the like product. For you to have the good understanding to Falcon Composable GPU Solutions, please read the user manual and operate according to the suggested steps for each feature.

If you have any questions when using our machine, please feel free to contact us. We are more than happy to serve you constantly.

Technical Support: support@h3platform.com
FAQ: https://www.h3platform.com/

H3 Platform Inc. researches and develops PCIe switch-based technology and solutions.

---- H3 Platform Inc.

Notes, Cautions, and Warning

(i)	Note	A NOTE indicates important information that helps you make better use of your product.
⚠	Caution	A CAUTION indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.
⚠	Warning	A WARNING indicates a potential for property damage, personal injury, or death.

Table of Contents

1. Introduction

1.1 Key Features

- GPU composability
- Device surprise-add and remove
- GPU peer-to-peer
- PCIe port configuration
- Real-time GPU cluster topology
- System performance monitoring
- Role-based authentication and access control

1.2 System Modes

There are two system modes for Falcon GPU solutions. The **Standard mode** is limited to single host connection and does not support device dynamic allocation or host port bifurcation. The **Advanced mode** supports multiple host connection and could allocated devices to hosts dynamically. You could activate the Advanced mode with **Premium License**.

Please contact sales@h3platform.com for license purchase.

Standard mode	Advanced mode
- System monitor - Power control from GUI - Download system performance data from GUI - Firmware update - User management - **Limited to single host**	- System monitor - Power control from GUI - Download system performance data from GUI - Firmware update - User management - **Multiple host** - **Device hot plug** (OS has to support) - **Port configuration** (bifurcation) - **Device dynamic allocation** - **Mode switch**

ⓘ   Advanced mode requires following host BIOS setting:

Host BIOS → Advanced → PCIe/PCI/PnP configuration

- Enable 4G decode
- Set MMIOHBase to 56T (if possible)
- Set MMIO High Size to 512G or higher (if possible)

2. Technical Specification

2.1 Chassis

Falcon 40 Series

Model	Falcon 4005	Falcon 4010
BMC/mCPU	Aspeed AST2500	Aspeed AST2500
PCIe Switch	PEX 88096; PCIe 4.0	PEX 88096; PCIe 4.0
PCIe Slots	4x PCIe4.0 x16 dual-width, FHFL 1x PCIe 4.0x16 FHFL	8x PCIe4.0 x16 dual-width, FHFL 2x PCIe 4.0x16 low-profile
Slot Power	75 W + 225 W (8 pin PCIe)	75 W + 225 W (8 pin PCIe)
Host Interface	SFF-8644 connectors	SFF-8644 connectors
Fan	4x 120x120x38mm; 6700 RPM; hot swap	6x 120x120x38mm; 6700 RPM; hot swap
Operating Temp.	0°C ~ 35°C (32°F ~ 95°F)	0°C ~ 35°C (32°F ~ 95°F)
Dimension	174(H) x 320(W) x 466(D) mm	5U; 219(H) x 435(W) x 450(D) mm
Weight	12.75 Kg	21.7 Kg

Falcon 42 Series

Model	Falcon 4205	Falcon 4210
BMC/mCPU	Aspeed AST2500	Aspeed AST2500
PCIe Switch	PEX 88096; PCIe 4.0	PEX 88096; PCIe 4.0
PCIe Slots	4x PCIe4.0 x16 dual-width, FHFL 1x PCIe 4.0x16 FHFL	8x PCIe4.0 x16 dual-width, FHFL 2x PCIe 4.0x16 low-profile
Slot Power	75 W + 375 W (8 pin PCIe)	75 W + 375 W (8 pin PCIe)
Host Interface	SFF-8644 connectors	SFF-8644 connectors
Fan	4x 120x120x38mm; 6700 RPM; hot swap	6x 120x120x38mm; 6700 RPM; hot swap
Operating Temp.	0°C ~ 35°C (32°F ~ 95°F)	0°C ~ 35°C (32°F ~ 95°F)
Dimension	174(H) x 320(W) x 466(D) mm	5U; 219(H) x 435(W) x 450(D) mm
Weight	12.75 Kg	21.7 Kg

2.2 Accessories

External Cable

Interface	Mini-SAS HD
Connector	SFF-8644 to SFF-8644
Bandwidth	PCIe Gen4 x4 (per cable)
Type	Copper
Length	2m

PSU

PSU	1600 W			2000 W		
AC Input	100-127V	200-240V	100-240V	100-127V	200-240V	100-240V
DC Output	+12V		+12Vsb	+12V		+12Vsb
	84A	132A	3.0A	84A	148A	3.0A
Efficiency	92% at full load			92% at full load		
Lifespan	250,000+ hrs.			250,000+ hrs.		
Operating Env.	0°C ~ 56°C 85% relative humidity (non-condensing)			0°C ~ 56°C 85% relative humidity (non-condensing)		
80 PLUS Certified	Platinum			Platinum		

Host Adapter

Form factor	PCIe Low-profile; MD2; PCIe 4.0 x16
Connector	Quad SFF-8644
PCIe switch	PEX 88032; PCIe 4.0
Dimension	160(L) x 68(H) mm

Host Adapter Guide:

1. SFF-8644 connectors

2. Connection LED

3. PCIe link LED

4. Heartbeat LED

5. Jumpers
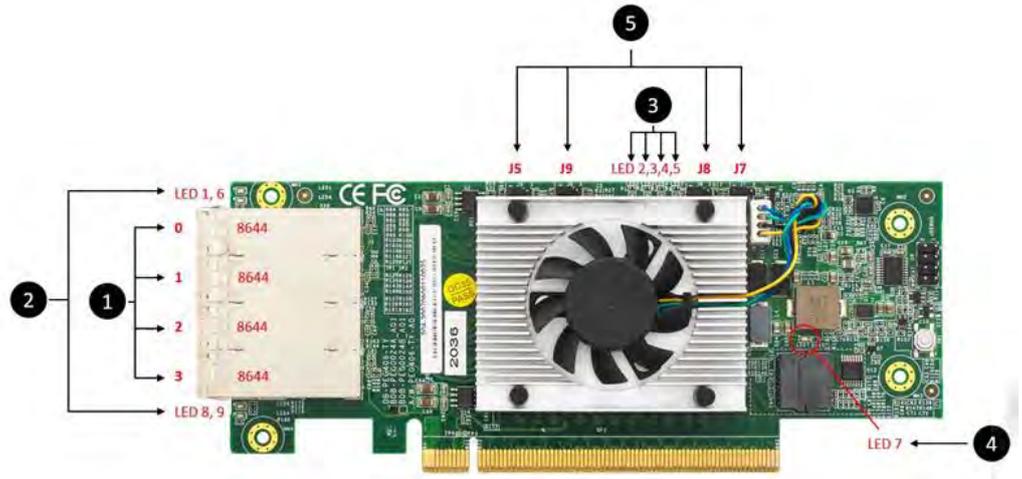
ⓘ Each jumper has 3 pins. Please pay attention to the labels on PCB, ▽sign indicates pin 1.

Image 1 illustrates pin number. *Image 2* illustrates the setting for [Pin 1, 2]

Image 1
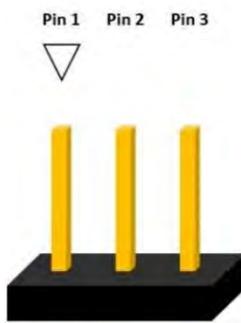
Image 2
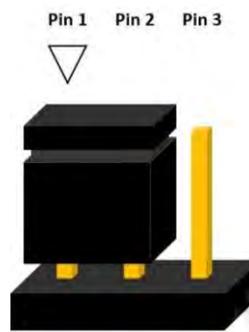
● **LED Signals**

LED No.	Component	Signal indication			
1	SFF-8644 connector 0	● Good	● Incorrect		● No connection
2	PCIe link speed	● PCIe Gen 4		● PCIe Gen 3	
3,4,5	Port configuration	3	4	5	Config.
		●	●	●	1 x16 lanes
		●	●	●	2 x8 lanes
		●	●	●	4 x4 lanes
6	SFF-8644 connector 1	*See LED 1 signal indication.*			
7	PCIe Switch Status	● Good		● Error	
8	SFF-8644 connector 2	*See LED 1 signal indication.*			
9	SFF-8644 connector 3	*See LED 1 signal indication.*			

- **Jumpers**

Jumper	Function	Setting		
J5	Reserved Jumper	--		
J7, J8	PCIe bifurcation	**J7**	**J8**	**Config.**
		Pin 1, 2	Pin 1, 2	1 x16 lanes
		Pin 2, 3	Pin 2, 3	2 x8 lanes
		Pin 1, 2	Pin 2, 3	4 x4 lanes
J9	Mode	**J9**		**Config.**
		Pin 1, 2		Host mode
		Pin 2, 3		Target mode

2.3 Compatible Devices

Devices	Falcon 4005, Falcon 4010	Falcon 4205, Falcon 4210
Accelerator	- Nvidia A100, A30, A16 - Nvidia Tesla® P100, V100 - Nvidia Quadro® RTX 8000, RTX 6000 (Passive) - Nvidia RTX A5000	- Nvidia A100, A40, A30, A16, A10 - Nvidia Quadro® RTX 8000, RTX 6000 (Passive) - Nvidia RTX A6000, A5000 - Nvidia GeForce RTX 3090 (Double-width)
Storage	- Intel® P4500, P4600, P4800X - Samsung PM1725a, PM1725b, PM1733, PM1735	
NIC	Mellanox ConnectX®-4, ConnectX®-5, ConnectX®-6	

ⓘ Devices listed above are devices that have been tested. Standard PCIe devices may also be compatible.

If you can't find your device on the list or is planning to use our products with special PCIe device, please contact sales@h3platform.com for help.

3. Requirements

3.1 CPU

Intel	Xeon E5 V3 family or later.
AMD	EPYC 7001 series or later.

ⓘ Also requires a vacant PCIe x16 slot on the host server for host adapter card installation. (PCIe Gen3 or later)

3.2 Host OS

	Standard Mode	Advanced mode
Ubuntu		16.04 LTS, 18.04 LTS, 20.04 LTS
Windows	No limitations	Build 1903-20H2
Cent OS / RHEL		7.3-8.0

ⓘ Advanced mode is not limited to the OS listed above. The listed OS are recommended as they have been tested to support PCIe device hot plug.

3.3 BIOS

Host BIOS Capability
4G decode   - MMIOBase > 56T   - MMIO High size >512G   - PCI Access Control Services (ACS) disability.

ⓘ Enabling ACS may impact GUP P2P support. However, it does not affect the operation of Falcon GPU solutions.

3.4 Web Browsers

Mozilla Firefox	Please update to the latest version.
Google Chrome	Please update to the latest version.

4. Graphical User Interface

4.1 Log-In

Every time you access the GUI, you will be asked to log in.

Please enter your **Username** and **Password**.
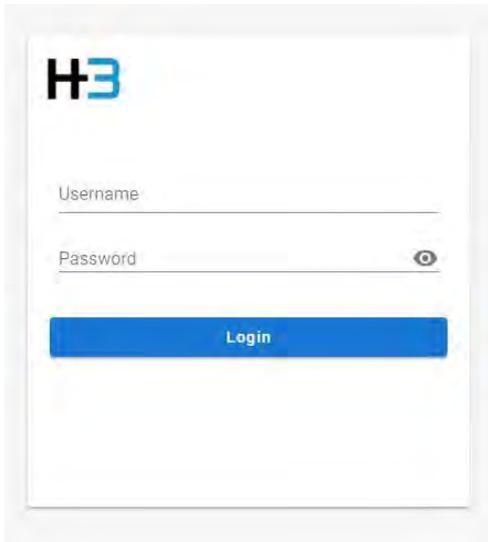
4.2 Functions

The menu at the top (or top-left corner) of the page shows all the available functions.

Please find details of each function in the relative section.
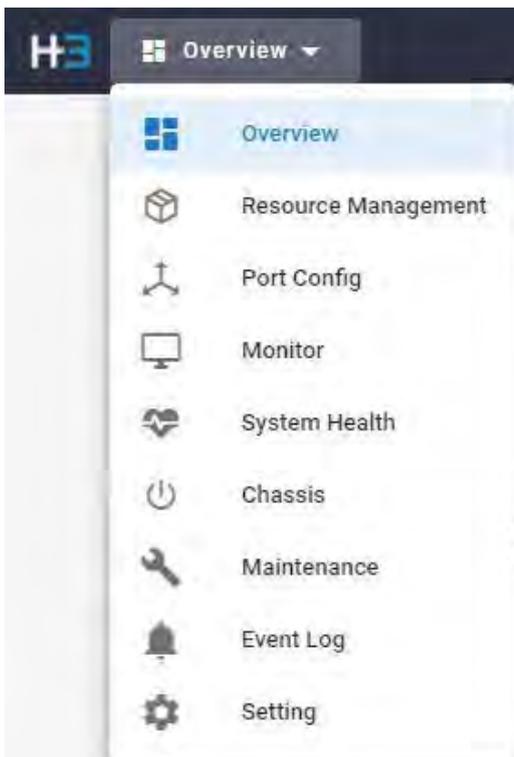
4.2.1 Overview

The Overview page sorts out the basic performance data of the Falcon GPU system.

Resource List
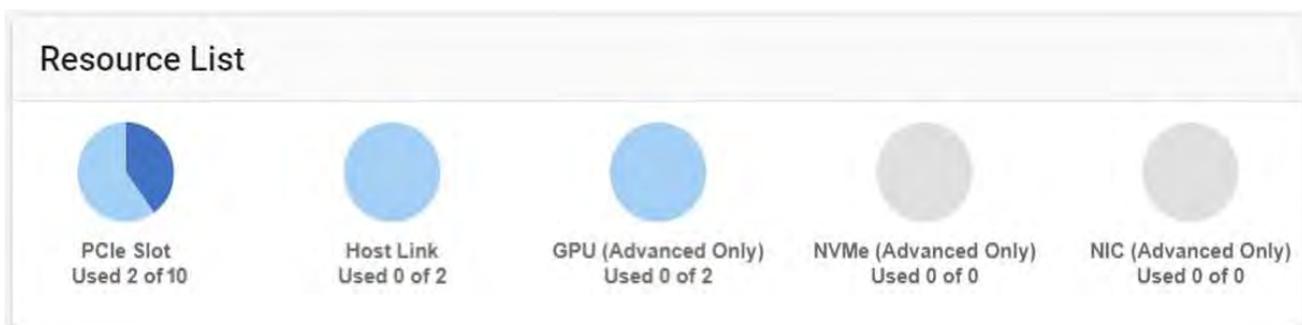
The Resource List provides PCIe device usage and host port usage information.
Usage of specific device types (GPU, NVMe SSD, and NIC) features can be accessed with **Premium License** activated.

> "Used" indicates the number of devices that are currently assigned to hosts.
>> e.g.   *Used 2 of 10.*
>>> *There are 10 devices installed in Falcon 4010, 2 of them are assigned to the host(s).*

GPU Utilization Rate(%)
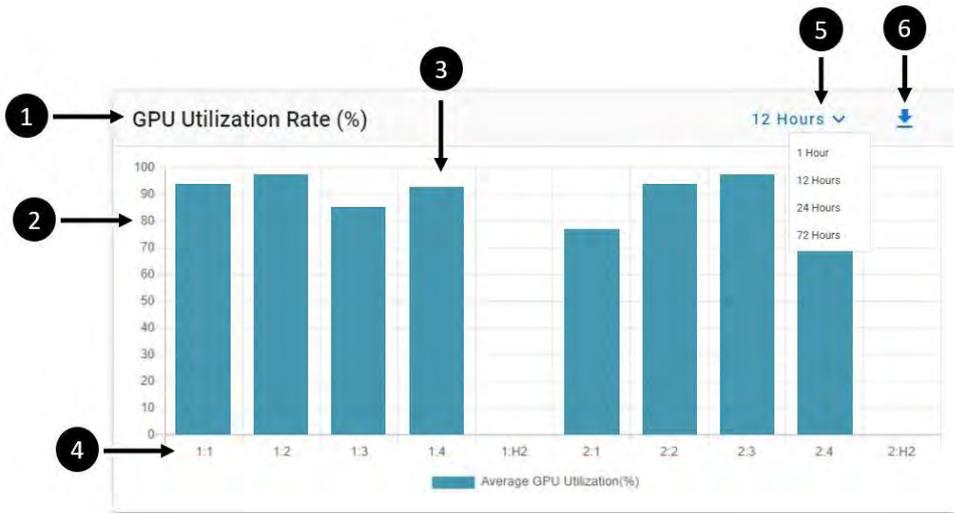
In the GPU utilization chart, users can check the GPU utilization of a specific GPU in a specific period. Y-axis represents the utilization rate and X-axis represents a specific GPU. The data is read from PCIe devices directly, only the compatible devices with the out-band information will be shown here.

1. Graph title:	GPU Utilization Rate (%)
2. Utilization rate:	The average GPU utilization, scaled from 0~100%.
3. Bar graph:	Utilization rate of the GPUs, displayed in bar graphs.
4. Device number:	Displayed as [Drawer #]:[slot#]. E.g., 1:1 represents device on slot 1 of drawer 1
5. Display period:	The graph will display the utilization rate of the GPUs in the past hours. (1-, 12-, 24-, or 72-hours options available)
6. Download:	Download the GPU utilization data (up to the past 72 hours)

PCIe Throughput (MB/s)
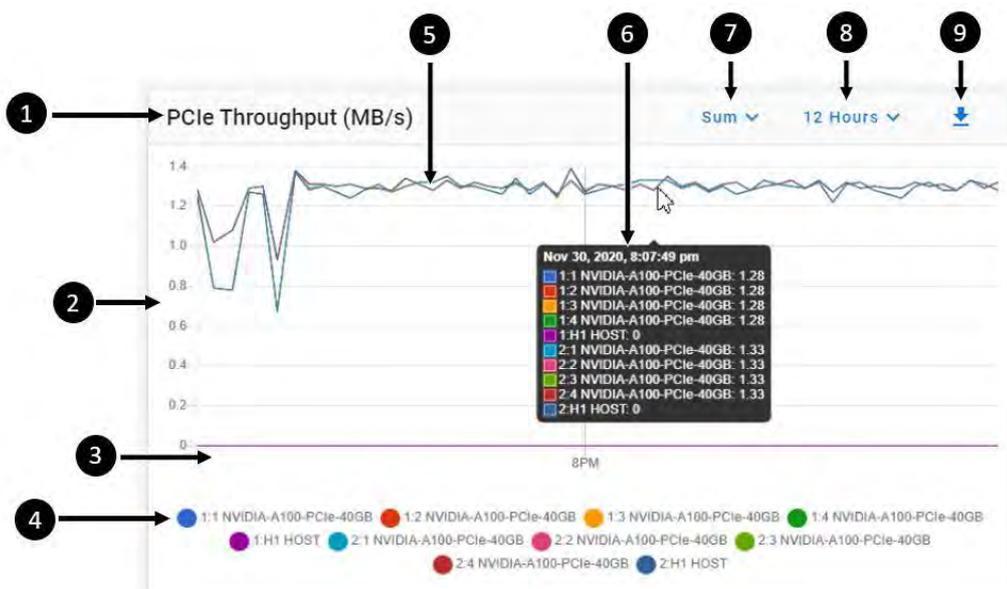
1.	Graph title:	PCIe Throughput (MB/s)
2.	Throughput rate:	The numbers on throughput rate scale (MB/s) will change as throughput changes.
3.	Time:	The X-axis display system times (per hour)
4.	Devices:	List all the devices installed. Every device has a unique color indicator.
5.	Throughput curve:	The curve of PCIe throughput of each device, distinguished by the color.
6.	List down menu:	Displays throughput of each device at a specific time point. Move the mouse over the curve to see this menu.
7.	Traffics:	Select traffic types to display on the throughput graph. There are three types: Ingress, Egress, and Sum.
8.	Display period:	The graph will display the throughput rate of the GPUs in the past hours. (1, 12, 24, or 72-hours options available)
9.	Download:	Download the PCIe throughput data. (Up to the past 72 hours)

PCIe Link Health
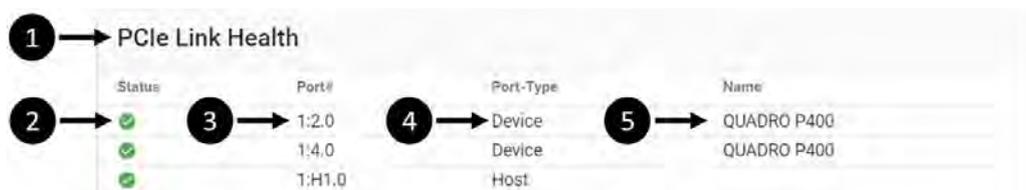
1.	Graph title:	PCIe Link Health
2.	Health status:	Green=healthy, Red=error, Gray=no link.
3.	Port #:	PCIe port number.
4.	Port type:	Indicates whether the PCIe port is a device port or host port.
5.	Device name:	The name of the device linked to the PCIe port.

Thermal

Displays the average temperature of each component (in °C) in the Falcon GPU chassis is displayed.
Green = good, Amber = moderate, Red = overheat

Thermal	
Drawer-1 Board	28 °C
Drawer-1 Device Avg	38 °C
Drawer-1 PCIe Switch	64 °C
Drawer-2 Board	32 °C
Drawer-2 Device Avg	40 °C
Drawer-2 PCIe Switch	58 °C

⚠ Falcon GPU System will shut down automatically when the system detects any device temperature >85°C for over 10 seconds.

This temperature threshold is adjustable, please see Advanced Config → Thermal Control for more detail.

System Profile

The System Profile displays basic system information of the machine.

System Profile

Model
Falcon-4010

Serial Number
504-20060501310073

MAC Address
8C:AE:49:10:00:0C

Firmware
0.2.82-210513

System Up Time
5d:22h:20m:40s

Last Login
10.0.21.68 [admin]

Last Login Time
2 hour 25 minutes ago

Online User
2 user(s) are operating

IP Address
10.0.24.200 (Static)

Model:	Chassis model name.
Serial number:	Serial number of this machine.
Mac address:	Mac address of this machine.
Firmware:	BMC firmware version.
System up time:	Time since the system is powered-on.
Last login:	The last user.
Last login time:	The time of last login
Online user:	The number of users currently online.
IP address:	The IP address of this machine.

4.2.2 Resource Management

There are two tabs under Resource Management, Topology and List. The topology view shows the graph of hosts, devices, and PCIe switch. The list view lists all the devices and hosts in a table.

ℹ️ GPU provisioning can only be done under Topology tab.

Topology View
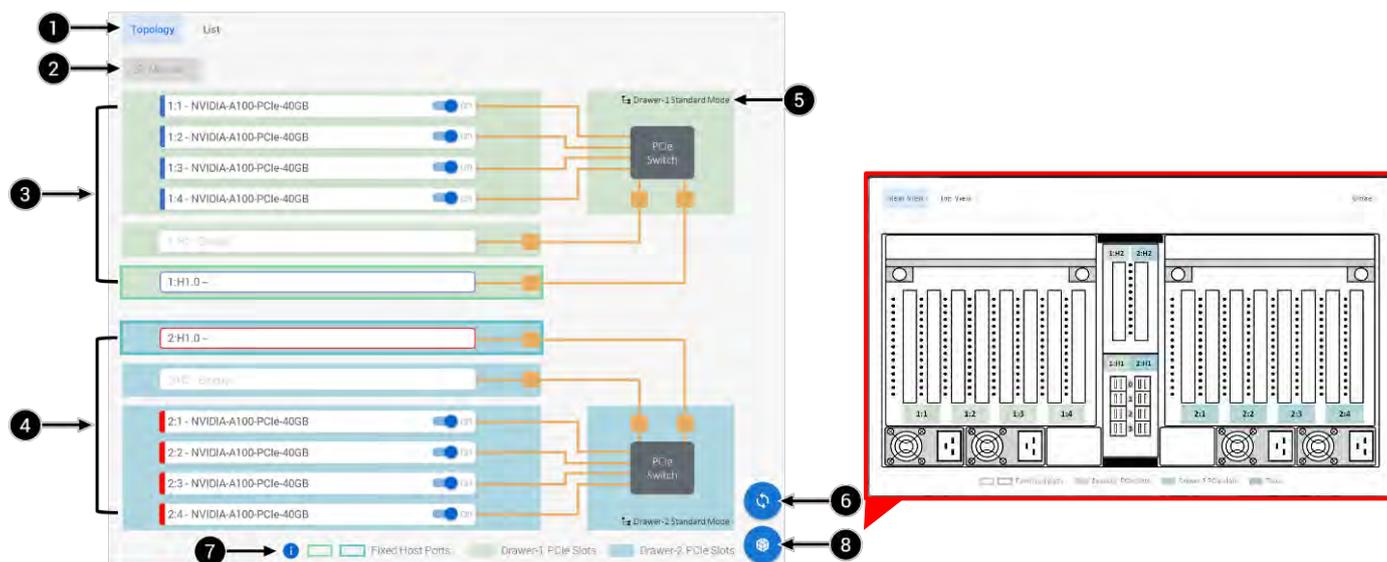
1.	Display mode:	Select Topology or List view for resource management.
2.	Allocate:	This button is used when allocating resources. (See *Device Allocation* section for detail)
3.	Drawer 1 PCIe ports:	PCIe ports topology of drawer 1.
4.	Drawer 2 PCIe ports:	PCIe ports topology of drawer 2. (Falcon 4010, Falcon 4210)
5.	System mode:	Displays the current system mode of the drawer.
6.	Refresh:	Refresh the topology display.
7.	Legends:	Help users to identify components in the topology view.
8.	Port label:	Port label diagram that helps users to identify PCIe ports.

● Port Information
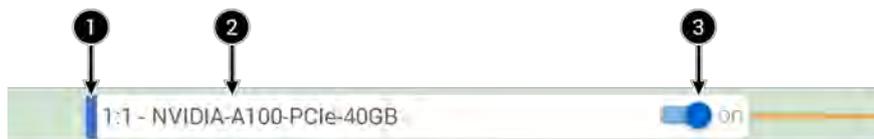
1. **Color tag:** Indicates which host that the device is assigned too. The color is corresponding to the color frame of host port. (E.g., the device is assigned to 1:H1, color=Blue)

2. **Port & device:** Port number and device name.

3. **Slot switch:** Control the power of the slot.

List View

1.	Slot #:	This column shows the slot number.
2.	Status:	The status of the device.
3.	Assigned host:	The host that the device is assigned to.
4.	Device Name:	Model name of the device
5.	Device type:	The type of the device. (GPU, NVMe SSD, NIC…)
6.	Temperature:	The temperature of the device.
7.	Link capability:	Link capability of the device / Link capability of the PCIe slot. Displayed in **[PCIe generation x lanes]**
8.	Device details:	Click on the drop-down icon to show detailed information of the device.
9.	Refresh:	Click to refresh the list.
10.	Port label:	Port label diagram that helps users to identify PCIe ports.

ⓘ   The data is read from PCIe devices directly, only available if the device provides the out-band information.

Assign Devices

Device allocation is only enabled in **Advance mode**.
Select **Topology** view to assign devices.

1. Select the host.

2. Select the available device.

3. Click "Allocate" to assign.
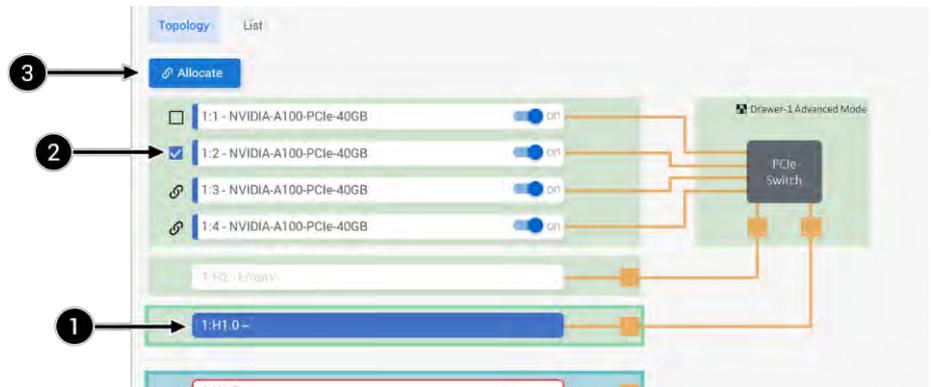
ⓘ   Users could select multiple devices at a time for batch assignment.

Confirmation window will pop-up. Click "Yes" to proceed. Then Click "OK" to finish the process.
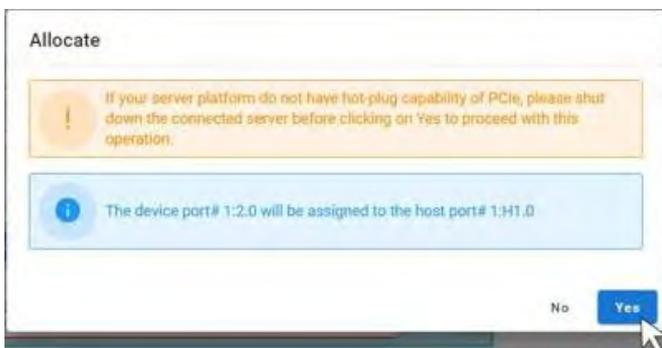
ⓘ   The link icon and color tag should appear when the device is successfully assigned.
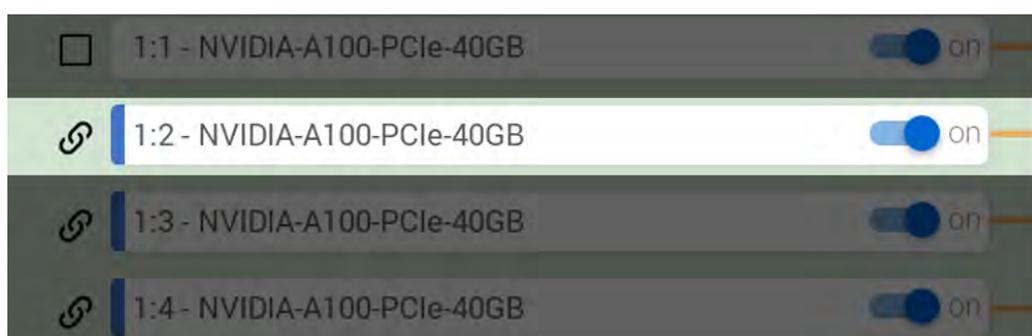
Unassign Device

Release device is only enabled in **Advance mode**.
Select **Topology** view to unassign devices.

1. Click the link icon next to the

   target device.
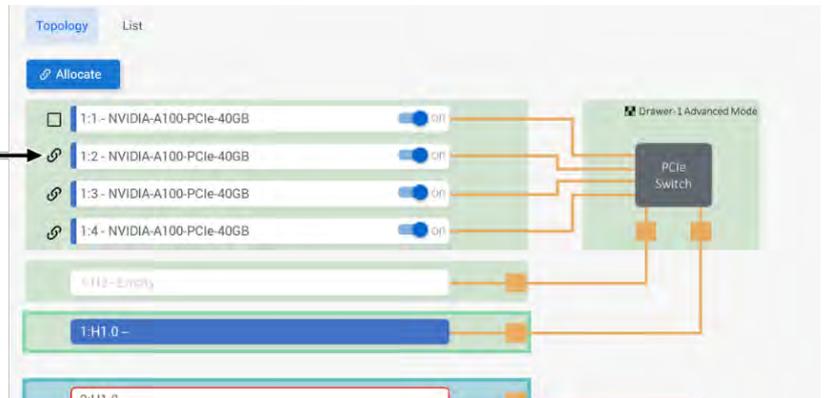
ⓘ   Users can only unassign one device at a time.

Confirmation window will pop-up. Click "Yes" to proceed. Then Click "OK" to finish the process.
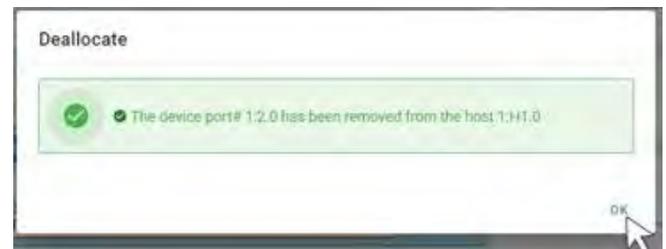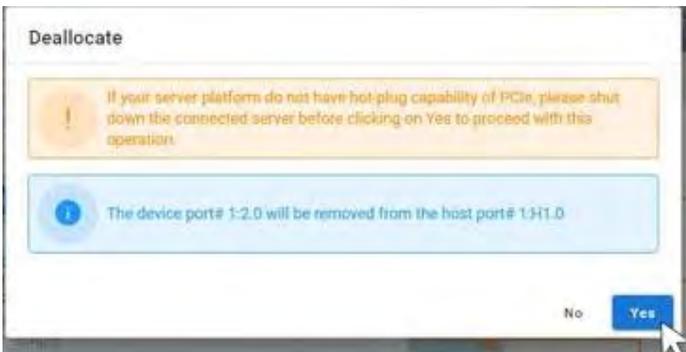
ⓘ   The link icon and color tag should disappear when the device is successfully unassigned.

4.2.3 Port Configuration

Falcon GPU solution allows user defined PCIe port configurations. All PCIe ports are default to 16 lanes (PCIe 4.0). The lanes can be configured into 2x8 lanes or 4x4lanes depending on the custom requirements.
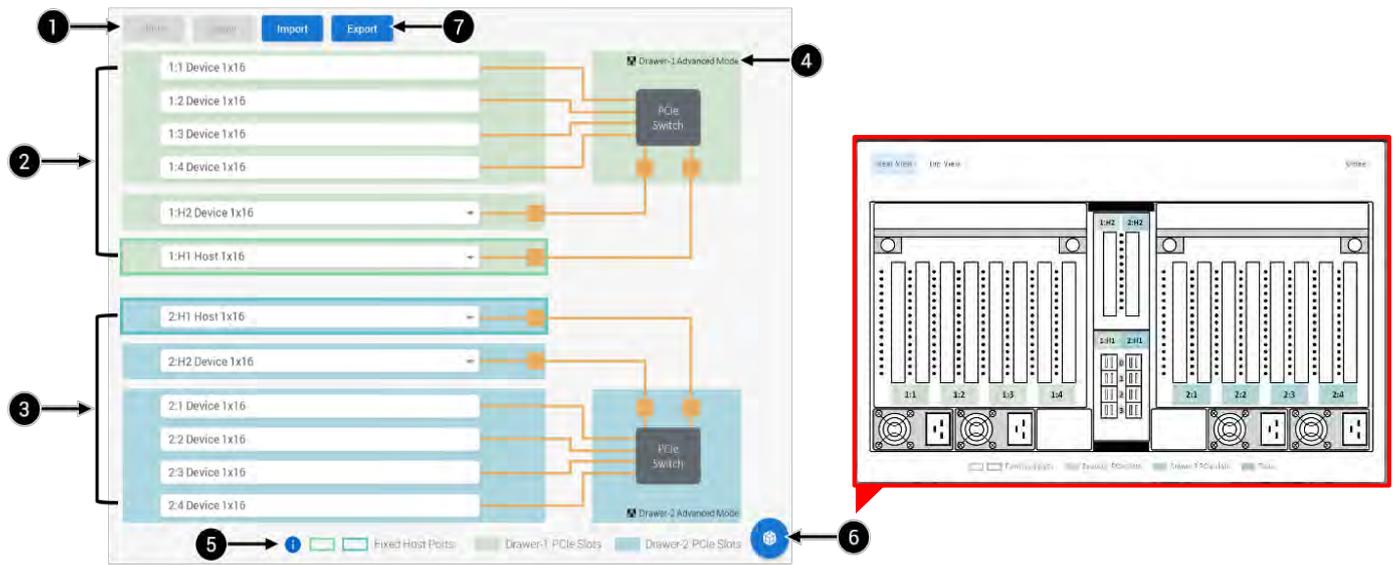
1.	Undo & Apply:	Undo or apply configuration settings. (See *Configure Ports* section for details)
2.	Drawer 1 PCIe ports:	PCIe ports topology of drawer 1.
3.	Drawer 2 PCIe ports:	PCIe ports topology of drawer 2. (Falcon 4010, Falcon 4210)
4.	Legends:	Help users to identify components.
5.	System mode:	Displays the current system mode of the drawer.
6.	Port label:	Port label diagram that helps users to identify PCIe ports.
7.	Import & Export:	Import a past configuration setting or export the current setting. (File format = *.h3reg*)

Configure Ports

Port configuration is only enabled in **Advanced mode**.

Configurable ports include: **1:H1**, **1:H2**, **2:H1** (Falcon 4010, 4210), and **2:H2** (Falcon 4010, 4210)

(i) 1:H1 and 2:H1 are fixed to host ports, users can only modify the bifurcation settings.

2:H1 and 2:H2 can be configured into either device or host ports, bifurcation is only available for host mode.

(Continue to next page)
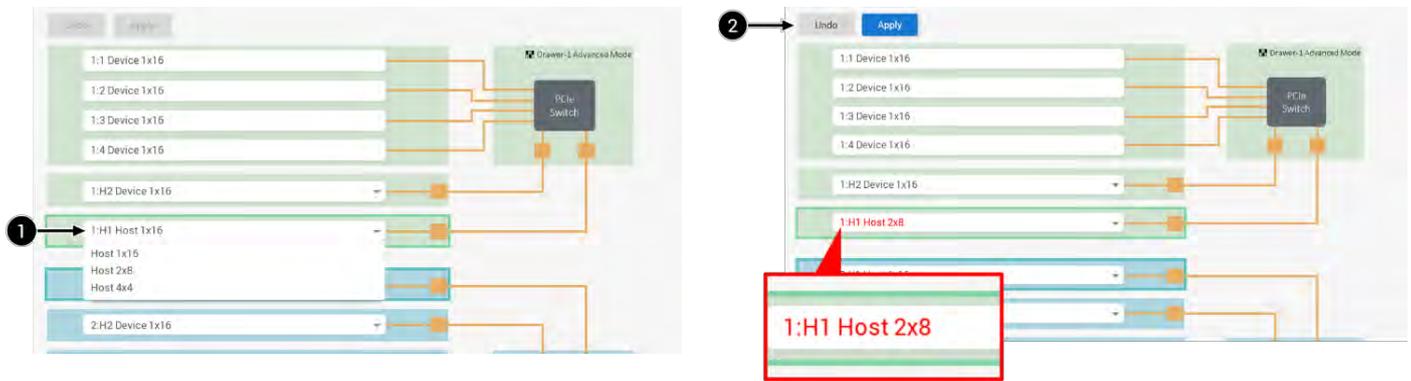
1. Click the drop-down icon of the PCIe port and select the desired configuration.
2. Click "Apply" to apply the configuration, or "Undo" to discard the configuration.

ⓘ The text in Red indicates that the configuration is not yet applied.

Confirmation window will pop-up. Click "Yes" to proceed. Then Click "OK" to finish the process.
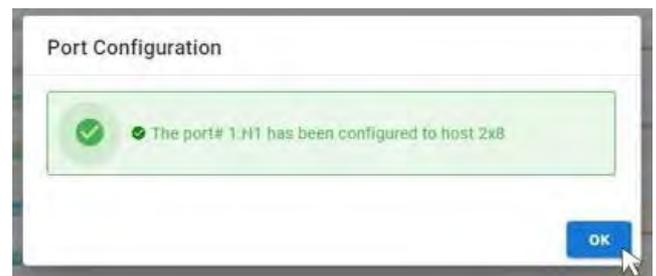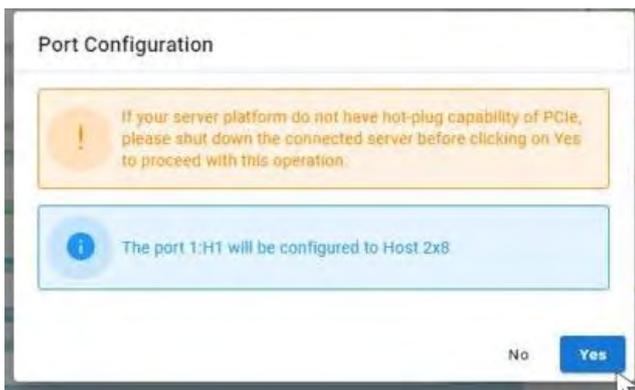
ⓘ The text should turn **Black** when the configuration is successfully applied.
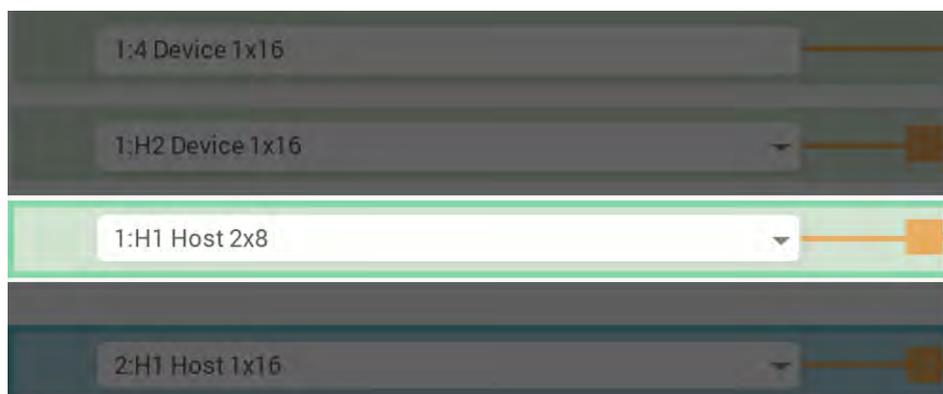
Hardware Setup for Multiple Hosts

Port bifurcation allows more host connections to Falcon GPU Chassis. A x16 host port that have been bifurcated would be divided into two (x8) or four (x4) ports, each given a sub host port number. Please follow the connection guide for the system to recognize the host machines correctly.

ⓘ Please play attention to the direction which the HBA is installed in the following diagrams. If your HBA is installed in a different direction, make sure the right connectors are used.

ⓘ The guide is demonstrated with host port 1:H1. Also applicable to 2:H1 or 1:H2 and 2:H2 host mode.

⚠ Mixing the cabling order may cause system error.

Host port 2x8 configuration

Host side	Use connector 0&1 on the HBAs
Chassis Side	Connector 0&1 for host 1:H1.0 Connector 2&3 for host 1:H1.1
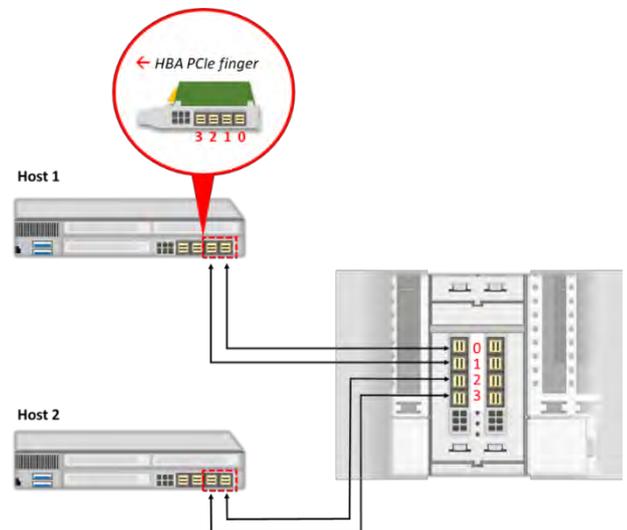
Host port 4x4 configuration

Host side	Use connector 0 on the HBAs
Chassis Side	Connector 0 for host 1:H1.0 Connector 1 for host 1:H1.1 Connector 2 for host 1:H1.2 Connector 3 for host 1:H1.3
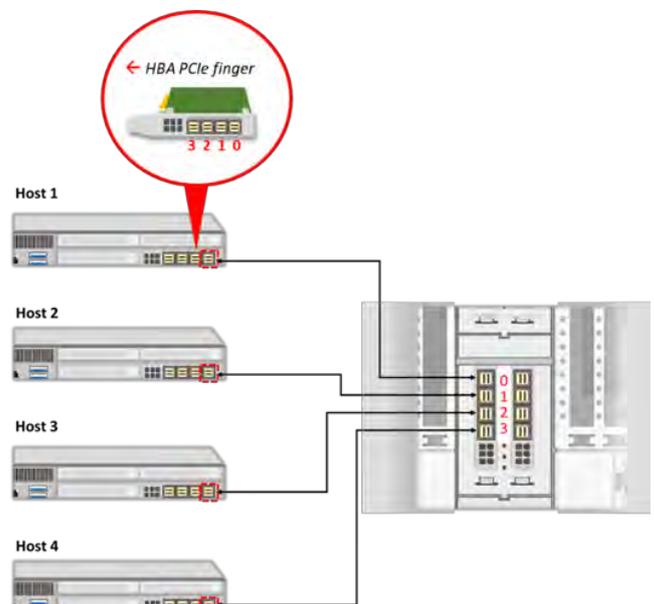
4.2.4 Monitor

Under Monitor page, users can see the real-time **traffic** and **link speed** of each PCIe port.
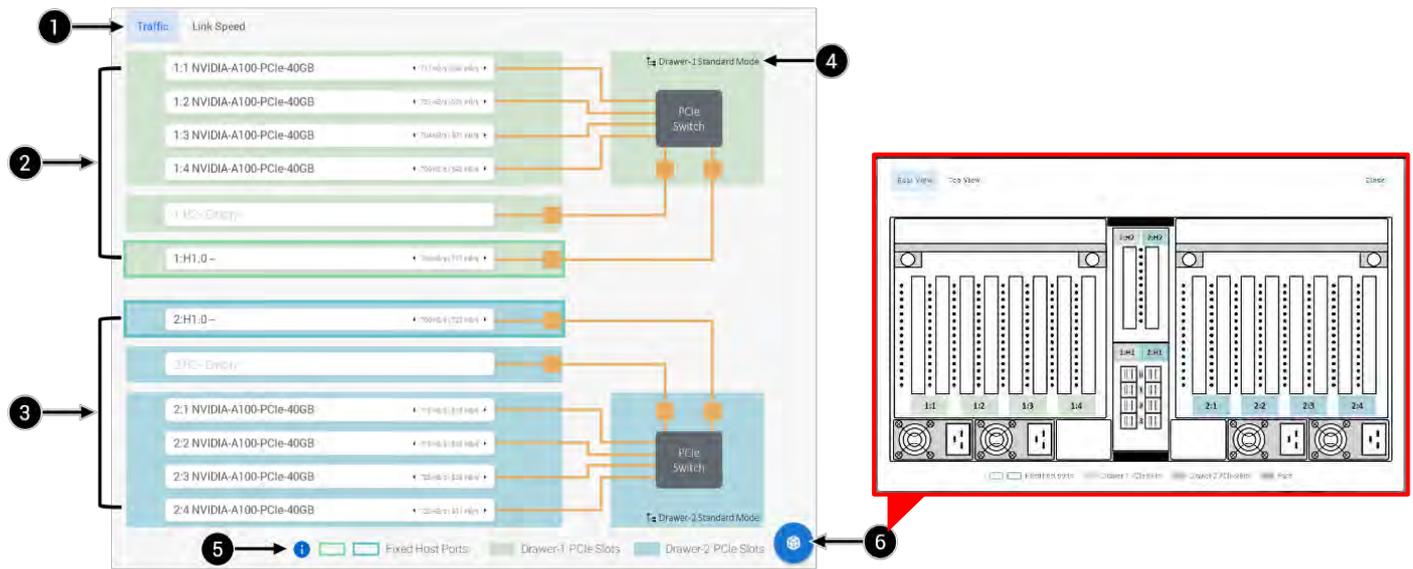
1.	Sub-menu:	Select to display Traffic or Link speed information.
2.	Drawer 1 PCIe port:	PCIe ports topology of drawer 1.
3.	Drawer 2 PCIe port:	PCIe ports topology of drawer 2. (Falcon 4010, 4210)
4.	Legends:	Help users to identify components.
5.	System mode:	Displays the current system mode of the drawer.
6.	Port label:	Port label diagram that helps users to identify PCIe ports.

Traffic

The real-time traffics will show up in the right side of every PCIe port.
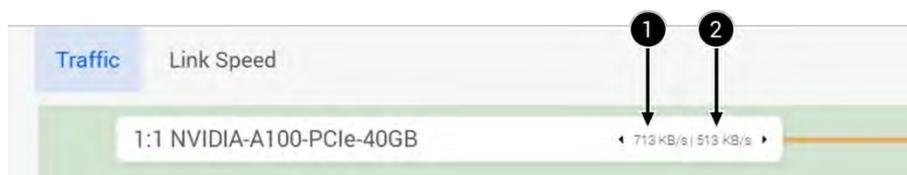
1.	Ingress traffic:	PCIe switch to device traffics.
2.	Egress traffic:	Device to PCIe switch traffics.

Link Speed

The link speed will show up in the right side of every PCIe port.

1. Current link speed:	The current link speed of the device.
2. Maximum link speed:	The maximum link speed of the PCIe port.

ⓘ Link speed display format: **[PCIe generation x Lanes]**

E.g., NVIDIA-PCIe-A100-40G is a PCIe Gen4 x16 device, the **current link speed** should display G4x8.

ⓘ Max link speed should be G4x16, the current link speed is depending on the device.

ⓘ If the link speed does not meet the specification, try power cycle the PCIe slot.

4.2.5 System Health

The System Health page provides consolidated health information of the chassis.
Including **Drawer and Device temperatures**, **Chassis temperature**, **Power consumptions**, and **Fan speeds**.
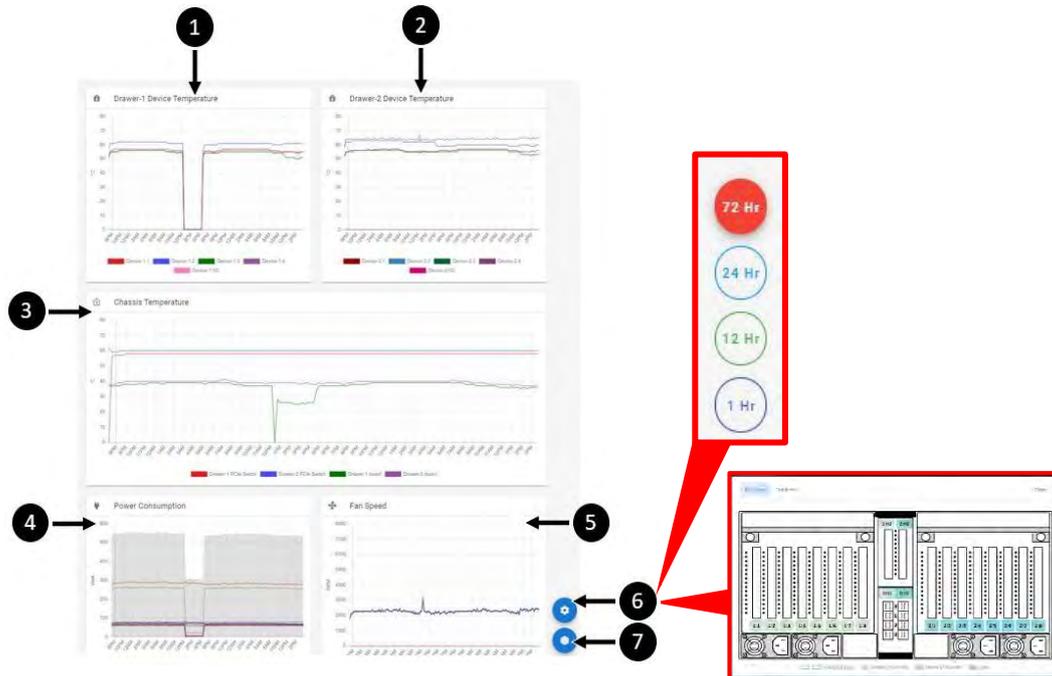
1.	Drawer 1 device temp.:	see **Device Temperature Graph** section for details.
2.	Drawer 2 device temp.:	see **Device Temperature Graph** section for details. (Falcon 4010, Falcon 4210)
3.	Chassis temp.:	see **Chassis Temperature Graph** section for details.
4.	Power consumption:	see **Power Consumption Graph** section for details.
5.	Fan speed:	See **Fan Speed Graph** section for details.
6.	Port label:	Port label diagram that helps users to identify PCIe ports.
7.	Time period:	Select time interval for all graphs.

Device Temperature Graph

1.	Temperature:	Temperature scale in degree Celsius.
2.	Time:	Time scale in hours.
3.	Device:	Devices in the drawer, each given a color tag. (E.g., Device 1:2 = Blue)
4.	Temperature curve:	Temperature curves of the devices, colors are corresponding to the device color tag. (E.g., Blue curve = temperature of device 1:2 in the given time period)
5.	Instantaneous temp.:	Hover the cursor on the graph, the temperature of all devices at the specific time will be shown in the black menu.

Chassis Temperature Graph

1.	Temperature:	Temperature scale in degree Celsius.
2.	Time:	Time scale in hours.
3.	Components:	Components in the chassis, each given a color tag. (E.g., PCIe switch 2 = Blue)
4.	Temperature curve:	Temperature curves of the components, colors are corresponding to the component color tag. (E.g., Blue curve = temperature of PCIe switch 2 in the given time period)
5.	Instantaneous temp.:	Hover the cursor on the graph, the temperature of all components at the specific time will be shown in the black menu.

Power Consumption Graph

(Continue to next page)

1. Power consumption:	Power consumption scale in Watts.
2. Time:	Time scale in hours.
3. Devices:	Devices, each given a color tag. (E.g., Device 2 = Blue)
4. Power consumption curve:	Power consumption curves of the components, colors are corresponding to the component color tag. (E.g., Blue curve = consumption of PCIe switch 2 in the given time period)
5. Instantaneous power consumption:	Hover the cursor on the graph, the power consumption of all components at the specific time will be shown in the black menu.

ⓘ   The grey area represents the overall power consumption. (Sum of all devices)

Fan Speed Graph
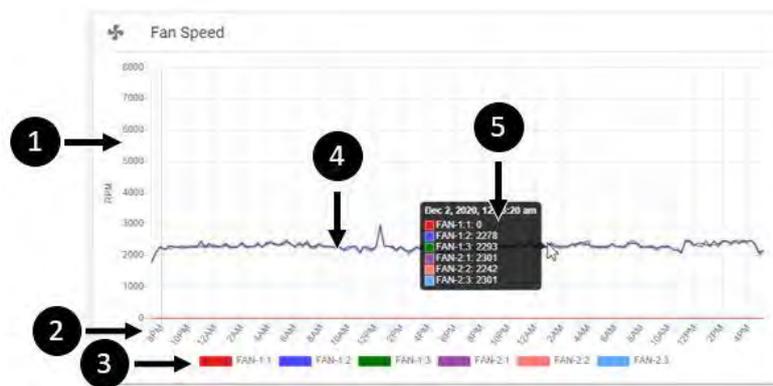
1. Fan speed:	Fan speed scale in RPM.
2. Time:	Time scale in hours.
3. Fans:	Fans, each given a color tag. (E.g., Fan 1:2 = Blue)
4. Fan speed curve:	Fan speed curves of the fans, colors are corresponding to the color tags. (E.g., Blue curve = fan speed of fan 1:2 in the given time period)
5. Instantaneous fan speed:	Hover the cursor on the graph, the fan speed of all fans at the specific time will be shown in the black menu.

ⓘ   Fan numbers:
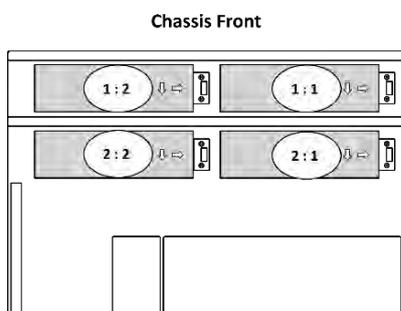
<center>(Falcon 4005, 4205)   (Falcon 4010, 4210)</center>
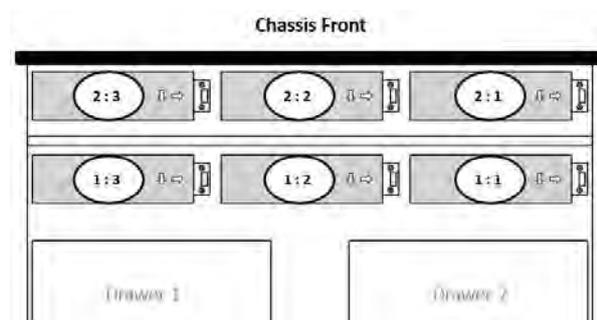
4.2.6 Chassis

Under Chassis page, users can control the power of chassis UID, and the power of the GPU drawers separately. The LCD will blink when Falcon GPU chassis UID is turned on. When you turn the drawer off, only the drawer will be turned off, other components in the chassis (fans, PCIe switch, BMC...) would remain powered on.
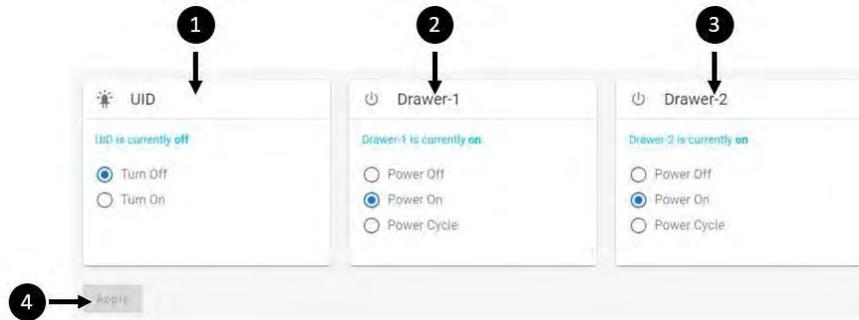
1.	UID power:	Control chassis UID.
2.	Drawer 1 power:	Control the power of drawer 1.
3.	Drawer 2 power:	Control the power of drawer 2. (Falcon 4010, Falcon 4210)
4.	Apply:	Apply power settings.

4.2.7 Maintenance

Users can view the current firmware information of BMC and PCIe switches and/or update the firmware of Falcon GPU System from the Maintenance page.

1.	BMC firmware:	Displays BMC firmware version.
2.	PCIe switch firmware:	Displays PCIe switch firmware version.
3.	Update / Install:	Update firmware. (see P. 26 Firmware Update section for details.)

ℹ️ There are two PCIe switches for Falcon 4010 and Falcon 4210 model. Users will see two independent PCIe switch firmware information boxes, **PCIe-SW-D1S1** for device drawer 1 and **PCIe-SW-D2-S1** for drawer 2 PCIe switch.

Firmware Update

Users can download the latest firmware from H3 Platform official website.
(https://www.h3platform.com/knowledge-base/document)

Go to **Knowledge Base → Download**
Product type : Composable GPU Chassis
Select your Falcon GPU chassis model, then select **Firmware** for download item.
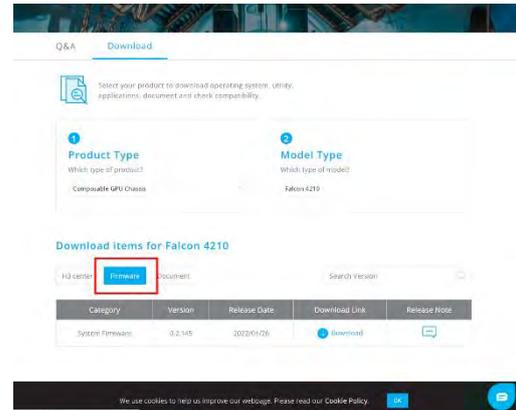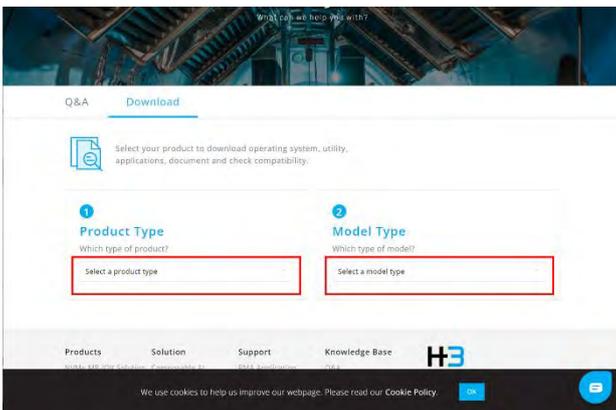
Download the firmware file to your management device. (i.e., your PC)

When the firmware file is downloaded, users can update the firmware from Falcon GPU System GUI.
Go to **Maintenance** page, click **Update/Install** button to upload the file.

Upload the firmware **.img** file. The confirmation message will pop-up, confirm that you have **disconnected all host machines** then click "Yes" to proceed.
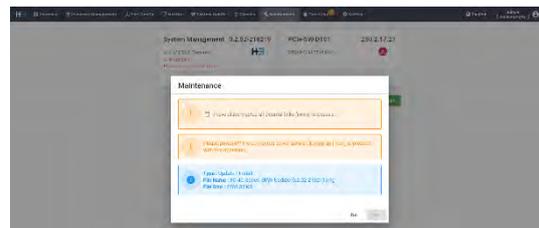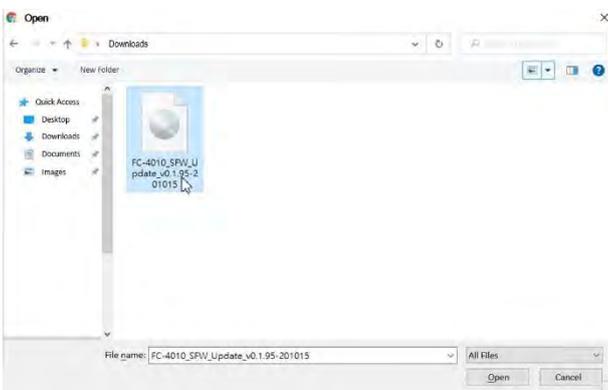
When the update completes, click "restart now" the system will reboot automatically.
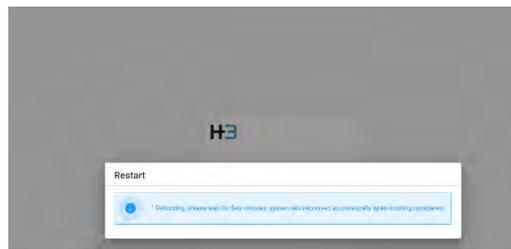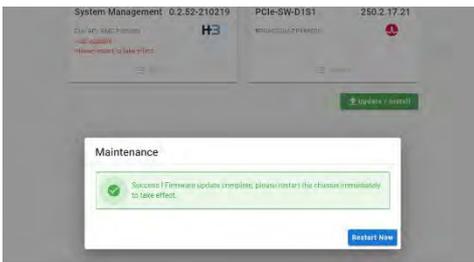
The firmware update is completed after rebooting.

4.2.8 Event Logs

In the Event Logs page, users will find consolidated logs. The logs are filtered by log levels, users can find specific logs by levels or using the search bar.
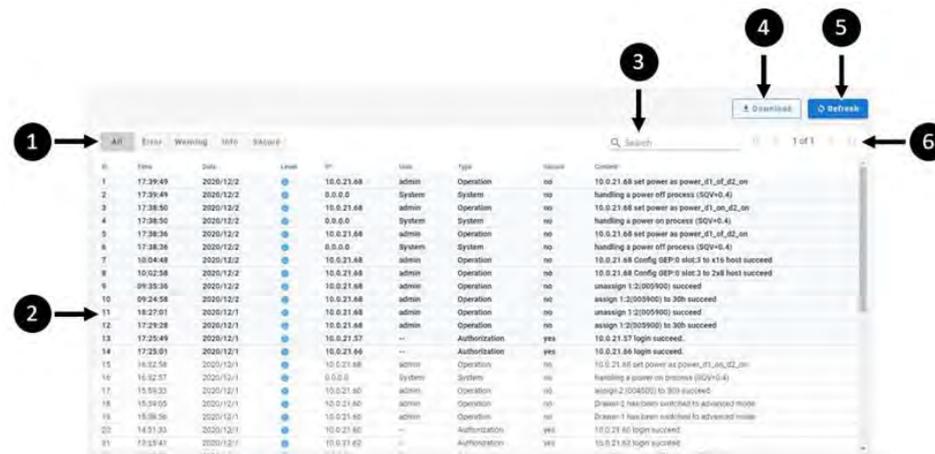
1.	Log Categories:	Filter logs by categories.
2.	Logs:	Event logs ordered from newest to oldest.
3.	Search bar:	Search for specific logs.
4.	Download:	Download all event logs in .csv format.
5.	Refresh:	Refresh the logs.
6.	Page:	Select pages of logs.

ⓘ   Logs in bold text are unread logs.

ⓘ   **Error:**   highest severity, events that may damage the system.

        Warning: moderate severity, events that requires attention.

        Info: regular system events.

        Log-ins: user account related activities.

4.2.9 Setting

System settings includes **Time setting**, **Network setting**, **User Management**, **ELK configuration**, **License management, Advanced config.,** and **Certificate management**.

Time Setting
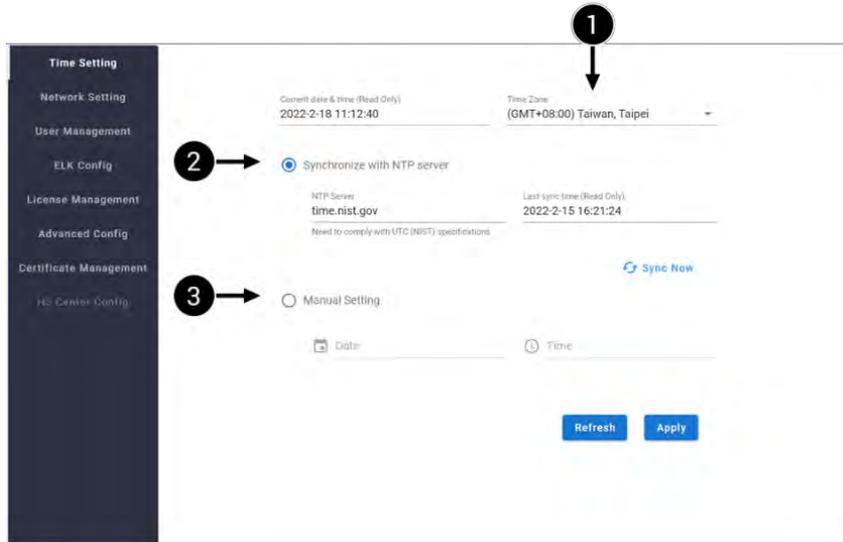
1.	Time zone:	Set / modify system time zone.
2.	Sync. with NTP server:	Sync the system with a NTP server. (Requires NT server IP address)
3.	Manual Setting:	Set / modify date and time with calendar tool.

ⓘ   After modifying NTP server IP, please click "Sync Now", the NTP server IP will be updated immediately.

ⓘ   Please click "Apply" after modifying time settings in order to keep the settings.

Network Setting
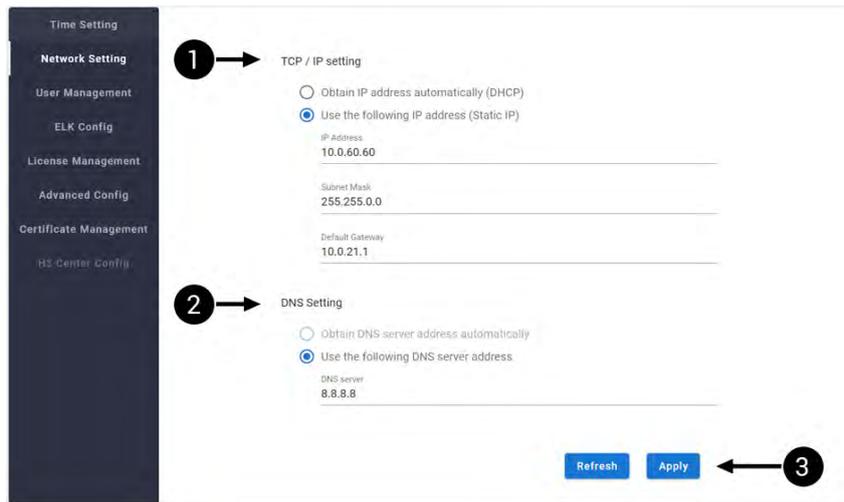
1. TCP/IP Setting:	▪ Obtain IP address automatically. ▪ Use static IP address. (Requires IP address, subnet mask, and default gateway)
2. DNS Setting:	▪ Obtain DNS server address automatically. ▪ Use custom DNS server. (Requires DNS server address)
3. Apply:	Apply the new settings.

User Management
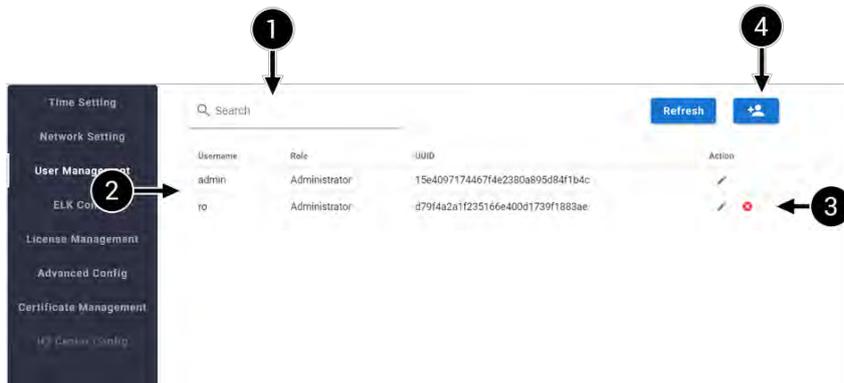
1. Search bar:	Search for specific user account.
2. User accounts:	Shows the username, user role, and UUID of each account.
3. Action:	Edit user account. ✏️ Change password. ❌ Delete user account.
4. Create account	Create new user account.

ⓘ   "admin" account cannot be deleted.

ⓘ   See **User Roles and Authorities** section (P. 27) for user role details.

- **User Roles and Authorities**

	Admin	User_Admin	User	Guest
Read PCIe Resource	O	O	O	O
Read Chassis Info	O	O	O	O
Read System Logs	O	O	O	X
Manage PCIe Resource	O	O	O	X
Change Password	O	O	O	X
Read System Settings	O	O	X	X
Read Maintenance Info	O	O	X	X
Read Security Logs	O	O	X	X
User Account Management	O	O	X	X
Modify System Setting	O	O	X	X
Maintenance Operation	O	O	X	X
Premium License Setting	O	X	X	X

ELK Configuration
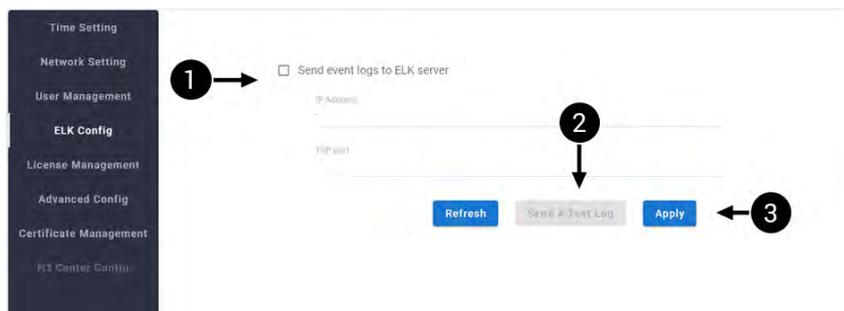
1. Set up ELK server:	Check the box to enable ELK server setting. (Requires ELK server IP and TCP port)
2. Send test log:	Send a test log to the ELK server.
3. Apply:	Apply ELK server setting.

License Management

- ## Software License Details:
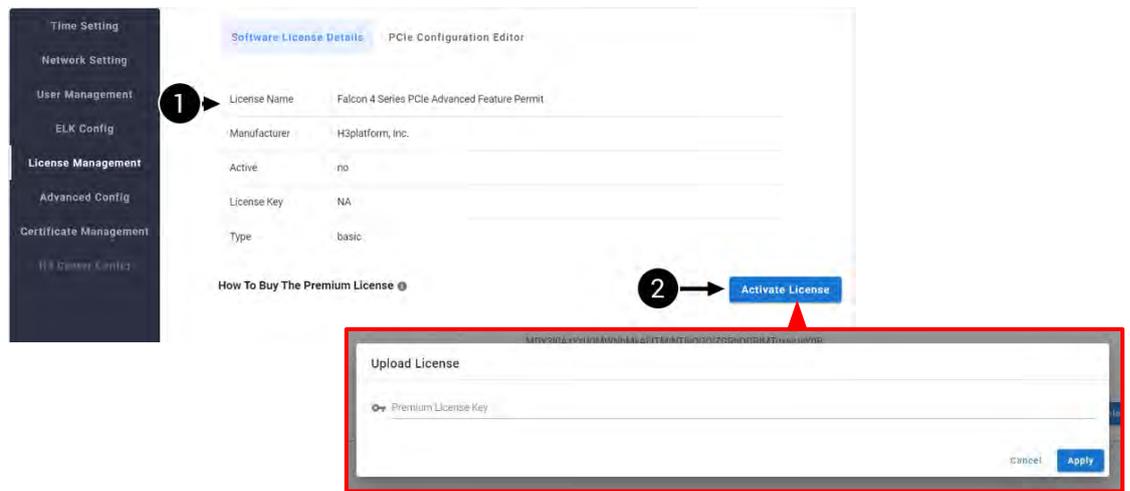
1.	License information:	Current software license details.
2.	Activate License:	Activate premium license key.

- ## PCIe Configuration Editor
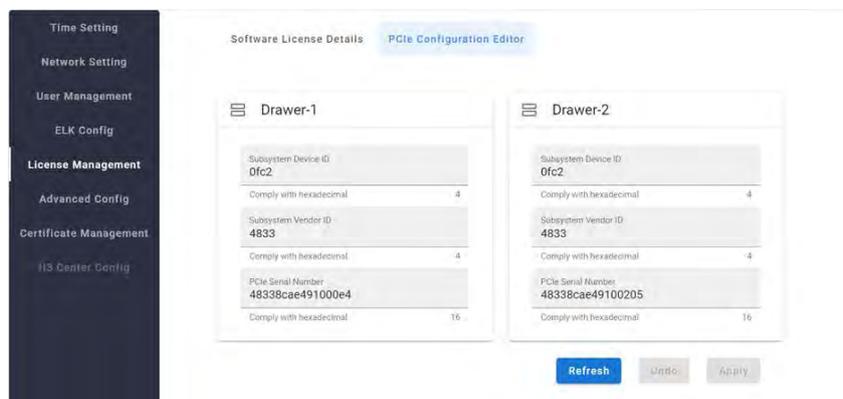
This feature allows user to apply the subsystem device ID, subsystem vendor ID, and PCIe serial number to the Atlas (the PCIe switch that controls a drawer). Above information would be shown on the PCIe tree (depend on the OS) to help users identifying PCIe switches when there are multiple of them.

ⓘ Drawer-2 option does not exist for Falcon 4005 and Falcon 4205.

ⓘ This feature is for advanced users with higher-level of knowledge and familiarity to PCIe. Incorrect setting may cause system error.

Advanced Config

- ## Mode Switch
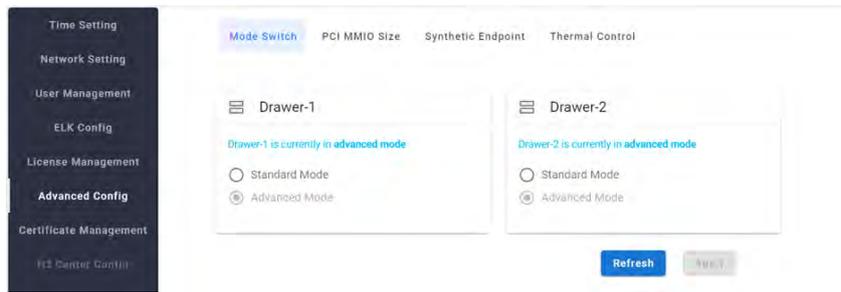
Modify Falcon GPU system modes. Must click "Apply" for mode switch to take effect.

ⓘ   Drawer-2 option does not exist for Falcon 4005 and Falcon 4205.

- ## PCIe MMIO Size
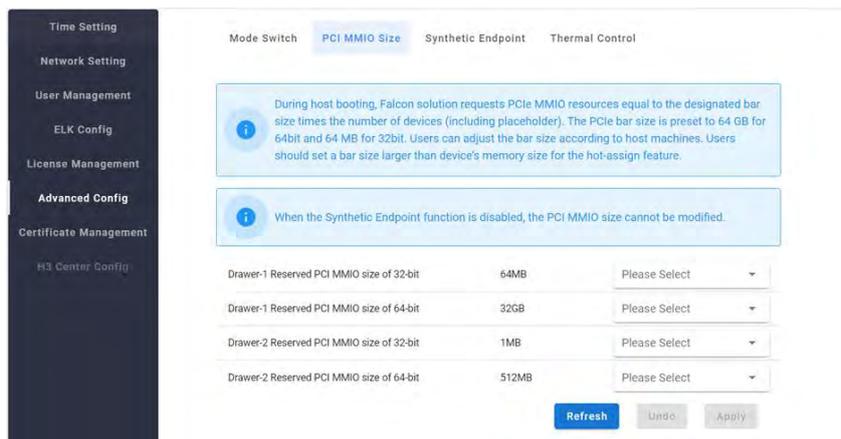
This feature only takes effect when the **synthetic endpoint** is enabled. (See **Synthetic Endpoint** section P. 31 for more information)

Users can set the MMIO size that each device is able to reserve from host machines. The set MMIO size refers to the MMIO size that every device can reserve. The MMIO size should be equal or greater than the memory size of your PCIe device.

ⓘ   E.g., If the MMIO size for drawer 1 is set to be 64GB, the total MMIO size that drawer 1 reserves from the host will be 64GB x 4devices=256GB (assuming that the drawer is fully equipped with devices).

- ## Synthetic Endpoint
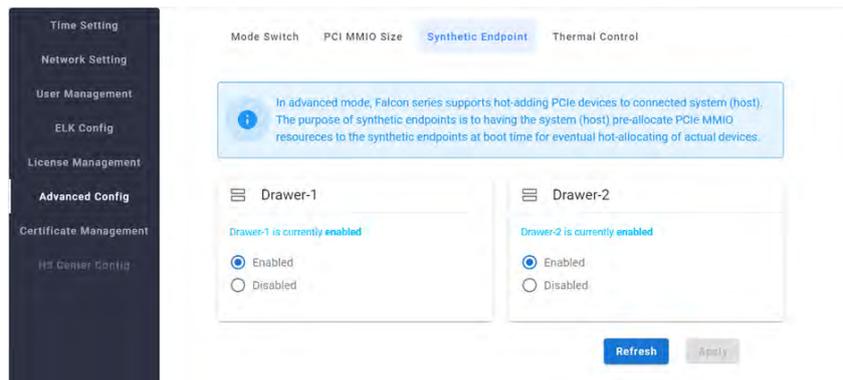
When synthetic endpoint is enabled, the Falcon GPU chassis will reserve PCIe MMIO resources from host machines (at boot up phase) for successful device hot plug.

When synthetic endpoint is not enabled, users would have to restart the host machines every time for PCIe scan after re-allocating devices.

- ## Thermal Control
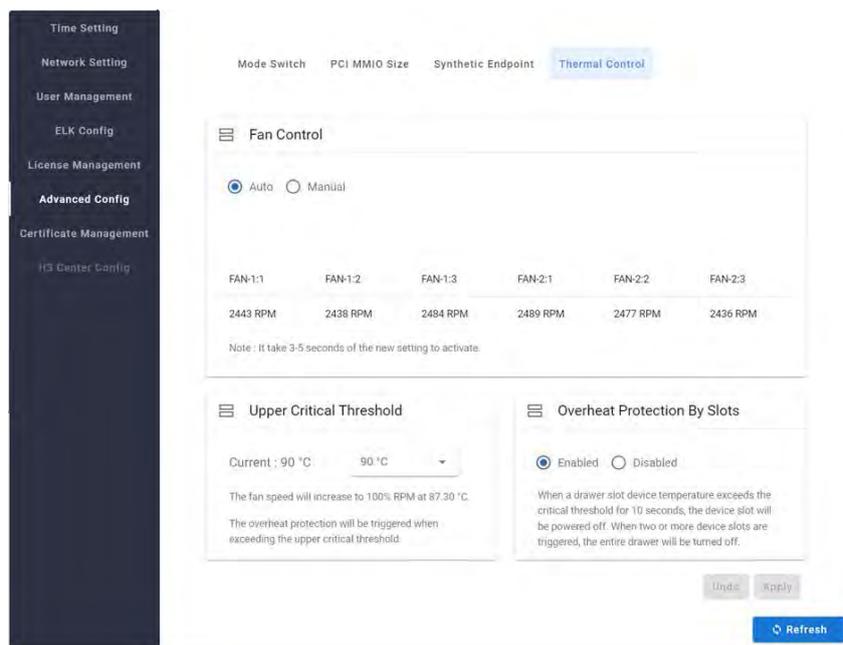
Users can set the fan speed and temperature threshold for Falcon GPU system. Please set a number that suits your devices' spec. This number effects the overheat protection mechanism explained as following:

⚠ Please monitor device and chassis temperature closely when setting the parameters. Any damage caused by overheating due to inappropriate fan speed setting is not warranted.

Fan Control

Users can set the fan speed. Select "Manual" to set custom fan speed.
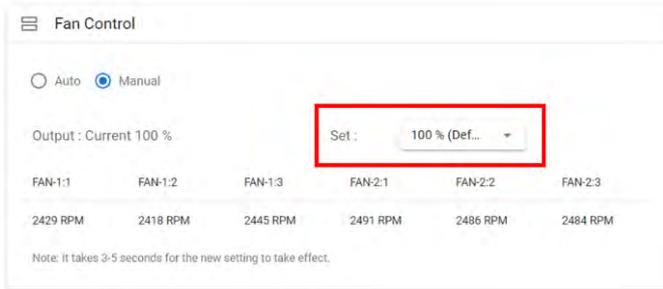
ⓘ   The output limit applies to all fans together. The value in percentage relative to the max performance of the fan. The minimum fan speed users can set is 20%.

Temperature threshold:

When a device reaches the set threshold for over 10 seconds, the drawer will be turned off automatically.

Overheat Protection by Slot:

When a device/component reaches the threshold for over 10 seconds, the **specific slot** will be turned off instead of the entire drawer. However, when two or more devices/components reach the threshold for 10 seconds simultaneously, the entire drawer will be turned off.

⚠   There will always be a **Fatal threshold** (equal to the critical threshold +3°C). When any device/component reaches the fatal threshold, the entire drawer will shut down <u>immediately</u>.

Certificate Management

- **Current Information**
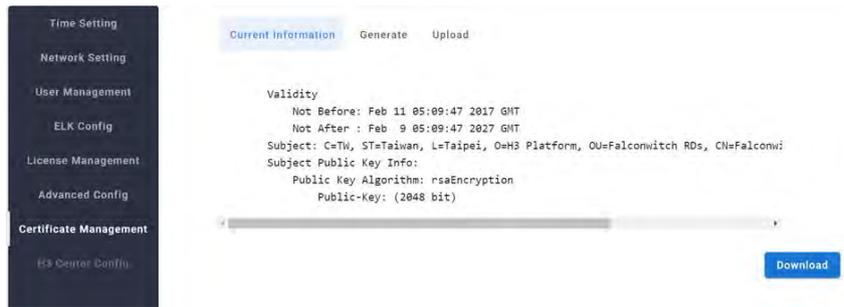
Shows the current SSL certificate information

- **Generate**
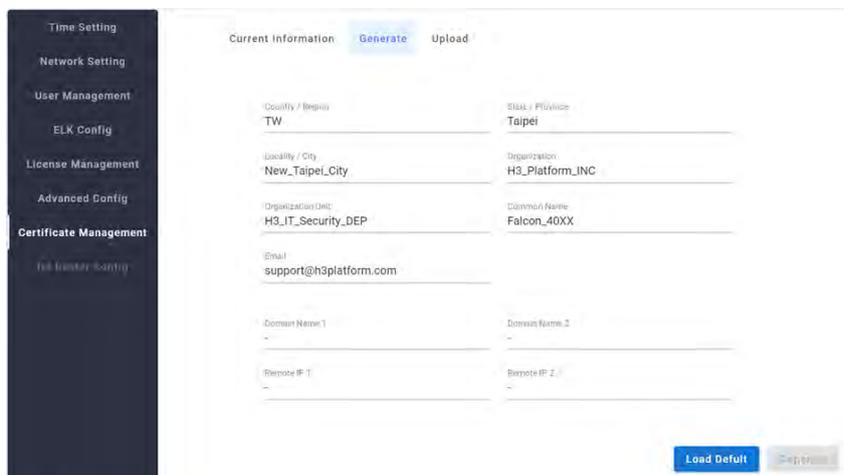
Generate a self-trusted SSL certificate. This certificate is only legitimate to the installed machines and will not be recognized by others on public network (the IP/domain will be recognized as unsafe site). This certificate will expire when IP or domain of this machine changes.

(i)   Users will have to install the certificate on every machine that needs to access the Falcon GUI via public internet.

- **Upload**

Upload an SSL certificate for this machine.

(i)   To allow Falcon GUI to be accessed via open network, it is recommended to register an SSL certificate from a certification authority, so that the certificate is trusted by any visitor's browser automatically.

5. LCD

Users can control the chassis with the LCD module on the chassis.

↵   Wake LCD / Enter sub-menu / Select.

▷   Right / Enter sub-menu.

◁   Left / Back.

△   Up

▽   Down.

5.1 Operation
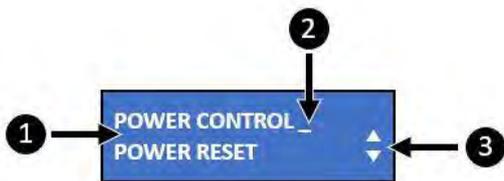
1.	Functions:	List of functions accessible from LCD module.
2.	Cursor:	Indicating which function is being selected. Press ▷ button to enter the sub-menu.
3.	Scrollbar:	Use △ and ▽ button to scroll up and down.

5.2 Menu

Falcon GPU Chassis LCD – Menu

	Layer 1	Layer 2	Layer 3
Model name (IP address)	Power control	Drawer 1 on/off	-
		Drawer 2 on/off (Falcon 4010, Falcon 4210)	
	Power reset	Drawer 1 reset	-
		Drawer 2 reset (Falcon 4010, Falcon 4210)	
	System	Serial number	-
		Firmware version	
		System mode	
	Slot	Drawer 1 device ports	-
		Drawer 1 host ports	
		Drawer 2 device ports (Falcon 4010, Falcon 4210)	
		Drawer 2 host ports (Falcon 4010, Falcon 4210)	
	Devices	Drawer 1 device ports	Traffics Status Device name Temperature
		Drawer 2 device ports (Falcon 4010, Falcon 4210)	
	Hosts	Drawer 1 host ports	Attached devices
		Drawer 2 host ports (Falcon 4010, Falcon 4210)	
	Health	PSU	PSU status
		Fan	RPM
	Temperature	PCIe switch temperature	-
		Device temperature	
	Network	IP address	-
		Subnet mask	
		Gateway	
		DNS	
		Network setting	Static / DHCP
	Reset to default	-	-

5.2.1 Power control

Power control turns the selected drawer either on or off.

| DR 1   ON > OFF | → | CONFIRM TO OFF
YES ↵   NO |

Select a drawer to power on or off, press ↵ to proceed.
Select "Yes" to confirm, "No" to decline.

5.2.2 Power reset

Power reset runs a full power cycle (restart) on the selected drawer.

| DR 1   RESET | → | CONFIRM TO RESET
YES ↵   NO |
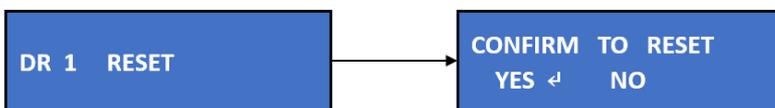
Select a drawer to power reset, press ↵ to proceed.
Select "Yes" to confirm, "No" to decline.

5.2.3 System

View system information, including **Serial number**, **Firmware version**, and **System mode**.

| S/N: 123-456789
1011121314   ▼ |

S/N	Chassis serial number
FW VER.	Firmware version
D1	Drawer 1
D2	Drawer 2

| BMC FW VER.:
1.2.345-678910-   ▲▼ |

| D1-ADVANCED
D2-ADVANCED   ▲ |

5.2.4 Slot

Device Port

View device slot information, including **Link speed** and **Availability**.

Device port includes **drawer 1**, **1:1~1:4**, and **drawer 2**, **2:1~2:4** (Falcon 4010, Falcon 4210)

```
1:1     G4x16 / AVL     ▲
1:2     G4x16 / ATT     ▼
```

Display:

[Drawer : slot]   [PCIe Gen x Lanes] / [Status]

Status:

AVL	The device is available.
ATT	The device is attached to a host.
MTY	The device slot is empty.
ERR	Device error.
OFF	The device slot is turned off.

Host Port

View how many host machines are connected to each host port.

Host port includes **1:H1**, **1:H2**, and **2:H1**, **2:H2** (Falcon 4010, Falcon 4210)

```
1:H1    1 Host          ▲
1:H2    1 Host          ▼
```

Display:

[Host port number]   [number of host machines]

5.2.5 Devices

View device performance, including **Traffics**, **Status**, **Device name**, and **Temperature**.

Device slot includes **drawer 1**, **1:1~1:4**, and **drawer 2**, **2:1~2:4** (Falcon 4010, Falcon 4210)

```
1:1     G4x16 / AVL_         Tx :    715.00 kB/s
1:2     G4x16 / AVL    ▼     Rx :    538.00 kB/s    ▼
```

```
GPU            GEN4x16    ▲
NVIDIA-A100-40GB          ▼
```
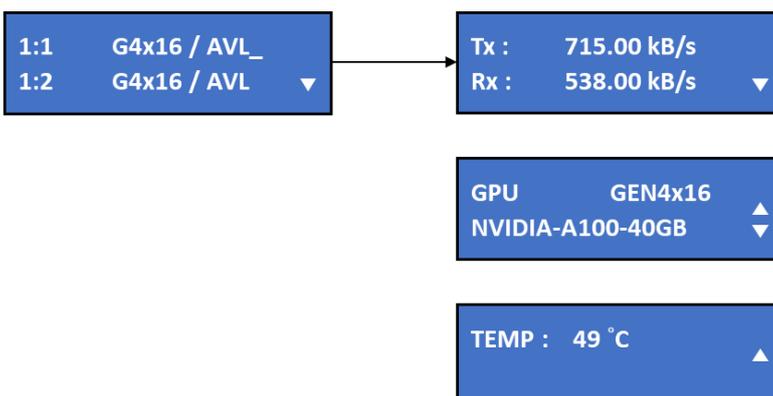
Tx   Transport speed of data.

Rx   Receive speed of data.

```
TEMP :   49 °C           ▲
```

5.2.6 Hosts

View host port information, including **Link speed**, **Status**, and **Attached devices**.

Host port includes **1:H1**, **1:H2**, and **2:H1**, **2:H2** (Falcon 4010, Falcon 4210)

```
1:H1.0  G4x16 / LINK_          ATT :    D1-12
1:H2.0  G4x16 / UNLK  ▼
```

Host port display:

[Host port]   [PCIe Gen x Lanes] / [Status]

Status:

LINK	The device is available.
UNLK	The device is attached to a host.

Attached devices display:

[Drawer]   [Slot(s)]

ATT   Attached devices.

ⓘ   There is **no space between** two slot numbers when multiple devices are attached.

E.g., "**D1-12**" indicates that **device 1** and **device 2** of **drawer 1** are both attached.

5.2.7 Health

PSU

```
PSU_                           PSU 1     PWR GOOD
FAN                            PSU 2     PWR EMPTY
```

Display:

[PSU]   [PCIe Gen x Lanes] / [Status]

Status:

GOOD	PSU working well.
EMPTY	PSU socket empty or not detected.

ⓘ   PSU numbers:
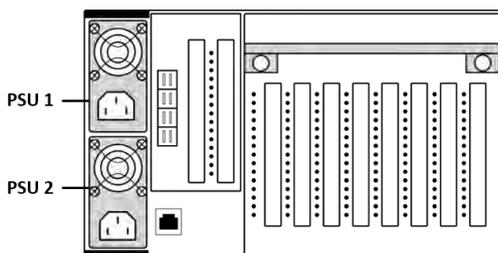
(Falcon 4005, 4205)   (Falcon 4010, 4210)
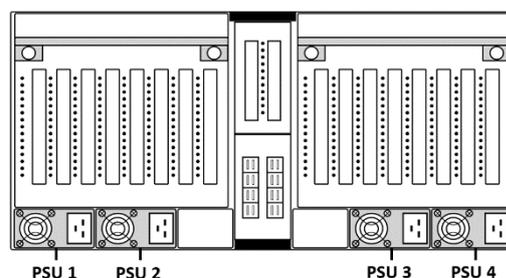
Fan

Display:

[Fan]　[RPM]

 Fan numbers:
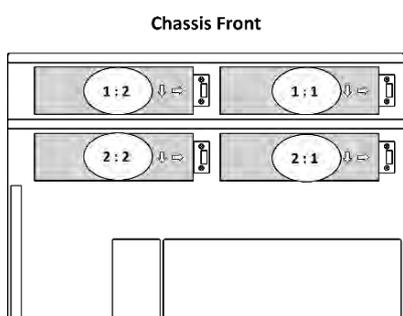
(Falcon 4005, 4205)   (Falcon 4010, 4210)
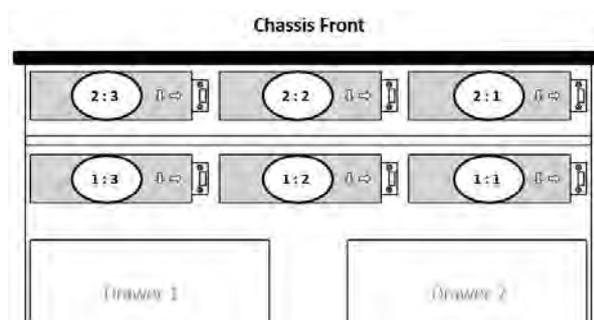
5.2.8 Temperature

View temperature (in °C) of PCIe switches and devices.

Switch including **PCIe switch 1** and **PCIe switch 2** (Falcon 4010, Falcon 4210).

Device slot includes **drawer 1**, **1:1~1:4**, and **drawer 2**, **2:1~2:4** (Falcon 4010, Falcon 4210)

SW　PCIe switch

5.2.9 Network

View system network setting, including **IP address**, **Subnet mask**, **Gateway**, DNS. (Read only)

Setting IP address of the system

```
NETWORK  SETTING              NETWORK  SETTING
                   ▲    →→     STATIC ↵   DHCP
```

When selecting "Static", users have to key in the IP address manually. (Adjust each digit with △ and ▽)
When selecting DHCP, the system will generate an IP address automatically.

5.2.10 Reset to default

Reset Falcon system **IP address**, **Gateway,** and **GUI Log-in account** to default.

```
SURE  TO  RESET?
    YES ↵     NO
```

Select "Yes" to start reset, "No" to decline.

ⓘ   Default **IP address**, **Gateway**, and **Log-in account** as below:

Default IP address	169.254.100.100
Default gateway	0.0.0.0
Log-in username	admin (lower case)
Log-in password	admin (lower case)

6. Part Replacement

If any of your fans or PSU is out of order, it is recommended to order the parts from H3 Platform directly. Please visit https://www.h3platform.com/ for details.

6.1 Fans

Please use the suitable fans for replacement, damages caused by incompatible fan installation are not warranted. (See **Hardware Specification** for details)

Remove the top cover to replace fans. (Front cover for Falcon 4010, Falcon 4210)
The fans can be hot plugged. User Simply remove the fan that is out of order.

ⓘ   Fan numbers:
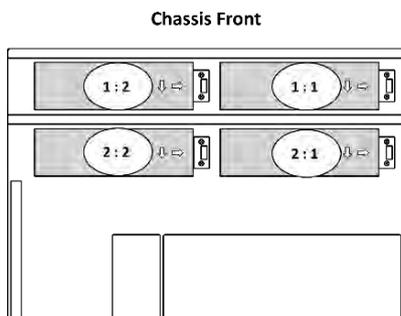
(Falcon 4005, 4205)   (Falcon 4010, 4210)
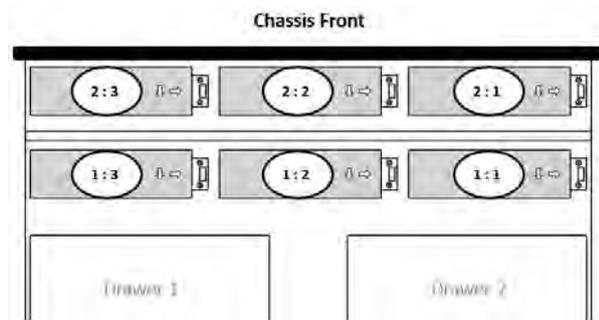
6.2 Power Supply Unit

Please select the suitable power supply units for replacement, damages caused by incompatible power supply units are not warranted.

Lift the handle and press the release button to unlock the PSU.
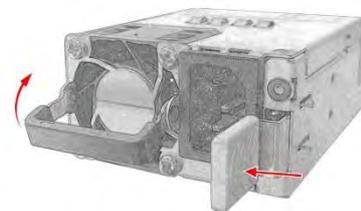
ⓘ   PSU numbers:
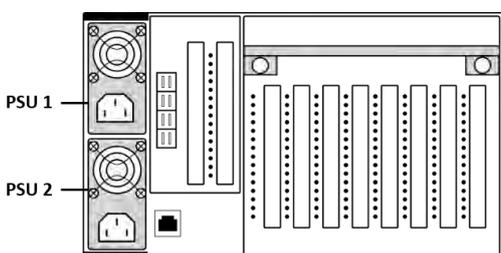
(Falcon 4005, 4205)   (Falcon 4010, 4210)
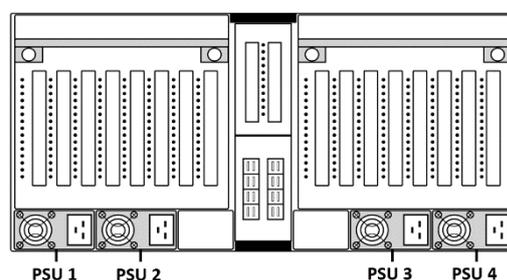
7. Operational Safety

Please power-off the entire chassis before opening the top cover. Especially when installing/replacing devices for the riser slot.

(Falcon 4005, 4205)   (Falcon 4010, 4210)
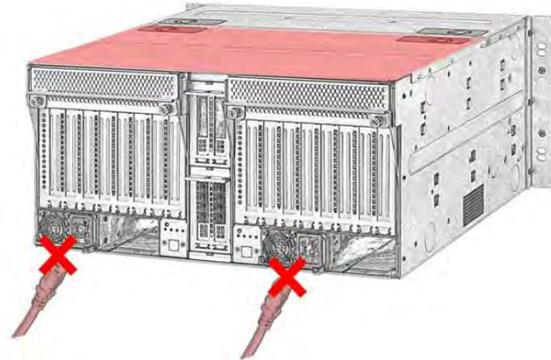
Please power-off the drawer before you draw them out of the chassis.
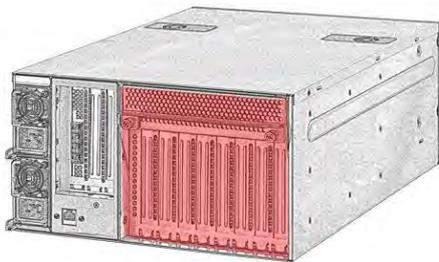
(Falcon 4005, 4205)   (Falcon 4010, 4210)
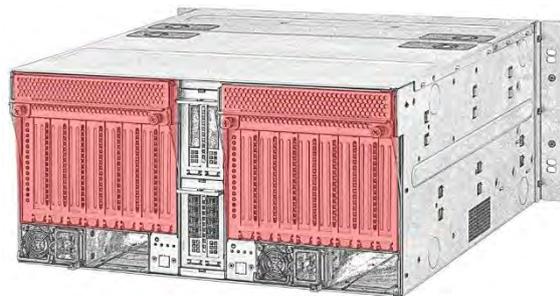
Power off the drawer from **GUI-Chassis** (see P. 25) or from **LCD-Power control** (P. 35).

8. Trouble Shooting

PCIe out of resource

When PCIe out of resource occurs, following message may appear during POST causing the server to halt.

Error Messages:
▪ PCIe out of resource.
▪ PCIe resource error.
▪ Insufficient PCI resources detected.
▪ There is not enough available PCI memory.

Resolution

Disconnect Falcon chassis from the host, go to the **host BIOS → Advanced settings**
Enable 4G decoding, set **MMIO High Size** to **512G** or higher.
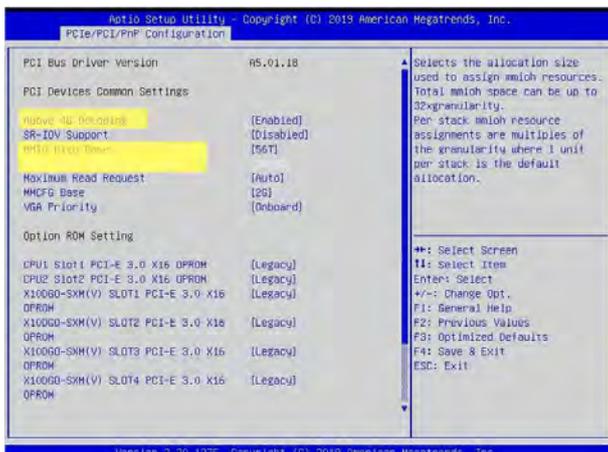
● **Example 1: SuperMicro Server**

1. Temporarily remove the connection of GPU expansion chassis. (unplug the cable)
2. Go to the BIOS **Advanced**
   a. Advanced->PCIe/PCI/PnP configuration-> Above 4G Decoding to **Enabled.**
   b. Advanced->PCIe/PCI/PnP Configuration->MMIOHBase to **56T.**
   c. Advanced->PCIe/PCI/PnP Configuration->MMIO High Size to **512G** or higher.
3. Connect the GPU expansion chassis to the server and see if the server boots properly.

● **Example 2: Intel Xeon Phi Server**

1. Temporarily remove the connection of GPU expansion chassis (unplug connected cable).
2. Update the BIOS and firmware to the latest revision.
3. Go to **Advanced > PCI Configuration**
   a. Set Maximize Memory below 4 GB to **Disabled.**
   b. Set Memory Mapped I/O above 4 GB to **Enabled.**
   c. Set Memory Mapped I/O Size to **512 G** or higher.
4. Connect the GPU expansion chassis to the server and see if the server boots properly.

GPU P2P underperforming

Make sure that your GPU supports peer-to-peer function.
Disable the **PCI Access Control Services** (ACS).

IO virtualization (VT-d for Intel platform, or IOMMU for AMD platform) can interfere with GPU Direct by redirecting all PCI point-to-point traffic to the CPU root complex, causing a significant performance reduction or even a hang. You can check whether ACS is enabled on PCI bridges by executing following commands:

 # sudo lspci -vvv | grep ACSCtl

If it shows "**SrcValid+**", then ACS might be enabled. Looking at the full output of lspci, one can check if a PCI bridge has ACS enabled.

If PCI switches have ACS enabled, it needs to be disabled. On some systems this can be done from the BIOS by disabling IO virtualization or VT-d and ACS.

Disabling IO virtualization

Host BIOS → **IO** or **Advanced**
    Disable VT for Direct IO (VT-d) for Intel platforms.
    Disable IOMMU for AMD platforms.

ⓘ   Other platforms may have different name for the IO virtualization function. Please ask your server vendor if the function cannot be found.

PCIe link health error

If you find the status of PCIe link health showing "Error", there may be Physical signal issue or PCIe TLP(Transaction Layer Packet) error between the PCIe slot and your PCIe device. It may have an impact on performance (e.g., latency and bandwidth), but no data/information is lost and PCIe fabric remains reliable. Such errors are corrected by hardware and no software intervention is required. You may try the following steps to improve it:

Re-install the PCIe device – The error may be caused by incorrection installment of the PCIe device card. Please unplug the card and plug it again.

Change a slot – The PCIe signal is slight varied due to different internal length within PCB board. Please install the card on another slot to check whether it is improved.

ⓘ   Make sure that the device is on the compatible list of your Falcon model.

Failure to assign/remove a device

Users might encounter failure to assign or remove devices.

Error Messages:
▪ The device port# {slot} failed to assign to the {host} ▪ The device port# {slot} failed to remove from the {host}

These errors may be due to the following reasons:

- Incompatible device or improper operation.
- Host OS does not process device hot-plug fast enough.
- High frequency operations that cause temporary PCIe switch lag.
- The firmware of the device did not initiate properly.
- Other electronic or signal issue.

ⓘ There are many hardware and software components included, a tiny error occurred in any of them may cause failure to assign/remove devices. However, this issue can usually be solved with retries.

Resolution

Make sure that the device is on the compatible list.

Wait for a minute then retry assigning/ removing the device.

● **If it still fails, please check your hardware:**

<u>Make sure the device is in good condition.</u>

- Make sure that the power cable is properly connected
- Make sure that the device is properly plugged into the PCIe slot
- Clean the PCIe slot and the gold finger of the device
- Power-cycle the device

<u>Make sure that the host is properly linked to Falcon chassis.</u>

- Make sure that the mini-SAS HD cables are properly connected (see cabling guide)
- Make sure that the HBA is properly installed on the host machine
- Reboot the host machine

<u>Retry assigning/removing the device.</u>

If it still fails, try rebooting the whole system.

Information does not display properly on GUI

Try refreshing the page with the refresh button on the page.

Update the browser to the latest version.

Supported Browsers
▪ Google Chrome
▪ Mozilla Firefox

If the above steps do not fix the issue, try rebooting the Falcon GPU system.

Failure to access GUI

Make sure that the management port is connected to your network.

(i) The ethernet port on the Falcon GPU chassis is the management port. For Falcon 4005 and Falcon 4205, the management port is at the tail side of the chassis. For Falcon 4010 and Falcon 4210, the management port is at the face side of the chassis.

Make sure that the client and the Falcon system are under the same domain.
- ▪ If the LCD on the chassis is functioning, please check your network.
- ▪ If the LCD is not functioning, the BMC of Falcon system may have hanged, try rebooting the system.

Forget the IP address of Falcon GPU system or GUI log-in identity.
- ▪ Check the LCD on the chassis for the IP address.
- ▪ If that does not help, Try reset Falcon GPU system to default. (See Reset to default section P. 39).

Device Link Down

When device links are not detected by the Falcon GPU system, the link speed data will not display on the **GUI-Monitor** page.

Please check if the device is on the **Compatible List** (P. 6) of your Falcon GPU solution model.
If so, try rebooting the Falcon GPU system.

Host Link Down

Host link down can happen when there is **improper cable connection** or when the system is **booted in incorrect sequence**.

Please check the connection of external cables on both host adapter and Falcon chassis.
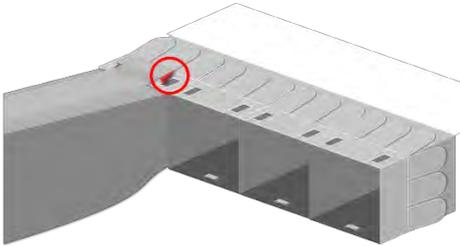
(i) Make sure the teeth are hooked into the openings, so that the SFF-8644 connectors are properly connected.

● **Booting sequence**

After connecting the host machines to the Falcon GPU chassis, please boot up the Falcon GPU system first. Only boot up the host machines after Falcon GPU system is ready.

(i) The Falcon system is ready when the LCD displays Falcon **model name** and the **IP address**.

FALCON MODEL
IP ADDRESS
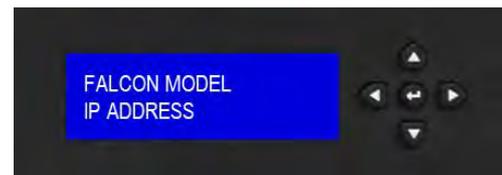
Please visit FAQ: https://www.h3platform.com/knowledge-base/faq

Or contact sales@h3platform.com if you have any question.

Warranty

H3 Platform offers free 2-year limited warranty service on our products. If the standard warranty period is not enough, H3 Platform offers optional purchase extended warranty service coverage that will provide warranty for 1, 2, or 3 additional years.

Limited Warranty

H3 Platform warrants its products against defects in material and workmanship. Under normal use and service, every hardware portion of the products will be free from physical defects in material and workmanship during the warranty period, or the product will be repaired or replaced as determined solely by H3 Platform. H3 Platform provides a limited warranty for its products only to the person or entity that originally purchased the product from H3 Platform or its authorized distributor or retailer. H3 Platform's products are PCI switches, and H3 Platform makes no warranty of the devices installed, or warranty on compatibility of all PCIe devices. H3 Platform will not be liable in any way for the loss of data stored on H3 Platform products and any damage caused by this.

Extra warranty period might be provided by H3 Platform's worldwide dealers/distributors. Please contact dealers/distributors to purchase the extended warranty.

If a product does not operate as warranted above during the applicable warranty period, H3 Platform shall, at its option and expense (except for shipping cost), repair the defective product or part, deliver to the customer an equivalent product or part to replace the defective item. All products that are replaced will become the property of H3 Platform. Replacement products may be new or reconditioned.
Warranty does not apply, if:

1. The warranty period is expired,
2. The warranty label is broken or removed,
3. The serial number label is missing or unrecognizable,
4. The product has been modified or repaired by any unauthorized service center or personnel.
5. The defect was subject to abuse, improper use not conforming to product manual instructions, or environment conditions more severe than those specified in the manual and specification.
6. The defect was subject to Force Majeure, such as acts of God, flood, lighting, earthquake, war, vandalism, theft, brownouts or sags (damage due to low voltage disturbances)
7. Consumables, such as batteries
8. Routine cleaning, or normal cosmetic and mechanical wear
9. Damage caused by misuse, abuse, or neglect
10. Damage caused by parts that were not manufactured or sold by H3 Platform
11. Damage caused by installing devices not on the compatible list
12. Damage caused when warranted parts were repaired or replaced by an organization other than H3 Platform or by a service provider not authorized by H3 Platform.

If the customer's product is not covered under warranty, H3 Platform may offer Repair Services under the customer's payment.

Software Limited Warranty

Except as provided in the applicable software end-user license or program license agreement, including any software products or the operating system preinstalled by H3 Platform are provided "as is" and with all faults, and H3 Platform hereby disclaims all other warranties and conditions, either express, implied, or statutory, including, but not limited to, warranties of title and non- infringement, any implied warranties, duties or conditions of merchantability, of fitness for a particular purpose, and of lack of viruses. Some states/jurisdictions do not allow exclusion of implied warranties or limitations on the duration of implied warranties, so the above disclaimer may not apply to you in its entirety. To the maximum extent permitted by applicable law, in no event shall H3 Platform or its suppliers be liable for any special, incidental, indirect, or consequential damages whatsoever (including, but not limited to, damages for loss of profits or confidential or other information, for business interruption, for personal injury, for loss of privacy arising out of or in any way related to the use of or inability to use the software product, even if H3 Platform or any supplier has been advised of the possibility of such damages and even if the remedy fails of its essential purpose. H3 Platform is not responsible for any interoperability or compatibility issues. Some states/jurisdictions do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

H3 Platform warrants all pre-installed H3 Platform software will execute its programming instructions when all files are properly installed. H3 Platform does not warrant that the software will be uninterrupted or error free. In the event H3 Platform software fails to execute its programming instructions during the warranty period, the customer's remedy will be either (1) replacement of the H3 Platform software or (2) a refund upon return of the product and all copies of software as well as installation instructions.

Compatibility

We have tested and verified the compatibility of third-party products and peripherals on the H3 Platform Compatibility List. Please note that the tests conducted in H3 Platform labs may not have covered every aspect and that changes to firmware or hardware may affect device compatibility and stability. H3 Platform does not guarantee the compatibility with third-party products and peripherals on the List and reserves the right to update the List at any time without prior notice.

Repair Service

Warranty and out of warranty service should be obtained by contacting the system integrator/dealer/retailer/e-retailer or distributor where the customer purchased the product. When requesting for service, the proof of purchase and the product serial number must be provided. The return of the defective product should be strictly through the original route of purchase, and the customers shall pack the product appropriately to prevent the returned product from suffering in the transportation.

There are no user serviceable parts inside the product. Do not allow any unauthorized service center or personnel to repair or modify the product. If the original channel is no longer in business or unavailable, the customer may contact H3 Platform Technical Support for international RMA services. In this case, the customer will be charged for handling fee, $50 (USD), and all fees incurred, including two ways freight, duties, taxes and brokerage fee.

It is customer's sole responsibility to back up his/ her data. Before allowing any service from H3 Platform or its service provider, including remote login check and repairing service, the customer must back up the data and remove any of the customer's confidential, proprietary or personal information. Neither H3 Platform nor its service provider will be liable for any damage, loss and exposure of confidential or private information or data contained in any product, hardware, software or media.

Notice of Warranty Claims

All warranty claims must be made during the applicable warranty period. Any claim made after that time will not be eligible for warranty service but may be serviced under a separate H3 Platform support contract covering the product.

DISCLAIMER OF WARRANTY

H3 Platform does not warrant uninterrupted or error-free operation of an H3 Platform product. If the customer transfers an H3 Platform product to another user, warranty service is NOT available to that user for the remainder of the warranty period. Consumables, such as batteries and PCIe power cables have no warranty. The above warranties will not apply to products from which serial numbers have been removed or to defects resulting from misuse (including operation of a H3 Platform product without covers and incorrect input voltage), unauthorized modification, operation or storage outside the environmental specifications for the product, in-transit damage, improper maintenance, or defects resulting from use of third-party software, accessories, media, supplies, consumables, or such items not designed for use with the product. The H3 Platform Software Product Limited Warranty does not apply to software used with products not covered by any of the H3 Platform limited warranties offered as part of your purchase of an H3 Platform product.

TO THE EXTENT ALLOWED BY LOCAL LAW, THE ABOVE WARRANTIES ARE EXCLUSIVE AND NO OTHER WARRANTY OR CONDITION, WHETHER WRITTEN OR ORAL, IS EXPRESSED OR IMPLIED AND H3 PLATFORM SPECIFICALLY DISCLAIMS ANY IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY, SATISFACTORY QUALITY, AND FITNESS FOR A PARTICULAR PURPOSE.

Some Countries, states or provinces do not allow limitations on the duration of an implied warranty, so the above limitation or exclusion might not apply to you. The warranty gives you specific legal rights and you might also have other rights that vary from country to country, state to state or province to province.

Limitation of liability and Remedies.

In no event will H3 Platform or its affiliates, subcontractors, or suppliers be liable for any of the following:

1. Damages for loss of data, or software restoration;
2. Damages relating to Customer's procurement of substitute products or services (i.e., "cost of cover");
3. Incidental, special, or consequential damages (including lost profits, loss of use, Customer downtime, cost of data recovery/re-creation), even if H3 Platform is informed of their possibility;
4. Third-party claims against Customer for losses or damages.
5. H3 Platform PCIe Switches are not specifically designed, manufactured or intended for sale as parts, components or assemblies for the planning, construction, maintenance, or direct operation of a nuclear facility. Customer is solely liable if Products or Support purchased by Customer are used for these applications.

TO THE EXTENT ALLOWED BY LOCAL LAW, THE REMEDIES IN THIS WARRANTY STATEMENT ARE CUSTOMER'S SOLE AND EXCLUSIVE REMEDIES. EXCEPT AS INDICATED ABOVE, IN NO EVENT WILL H3 PLATFORM OR ITS SUPPLIERS BE LIABLE FOR LOSS OF DATA OR FOR DIRECT, SPECIAL, INCIDENTAL, CONSEQUENTIAL (INCLUDING LOST PROFIT OR DATA), OR OTHER DAMAGE, WHETHER BASED IN CONTRACT, TORT, OR OTHERWISE.

Some countries, states or provinces do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

THE WARRANTY TERMS CONTAINED HERE, EXCEPT TO THE EXTENT LAWFULLY PERMITTED, DO NOT EXCLUDE, RESTRICT OR MODIFY AND ARE IN ADDITION TO THE MANDATORY STATUTORY RIGHTS APPLICABLE TO THE SALE OF THIS PRODUCT TO YOU.