



NVIDIA DGX VR NVL72 User Guide

NVIDIA Corporation

Oct 07, 2026

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The *NVIDIA DGX Vera Rubin NVL72 User Guide* is also available as a PDF.

This guide describes the hardware and software stack of the DGX Vera Rubin NVL72 rack scale system. Each rack is a 72-GPU NVL domain. The guide applies to single NVL72 racks and to multi-rack deployments such as a SuperPOD (eight NVL72 racks). In the context of this guide, the system is defined as a rack scale solution for GPUs connected by NVIDIA NVLink®.

This rack scale architecture enables the following:

- ▶ Support for higher GPU and module power.
- ▶ Improved serviceability with modular building blocks.
- ▶ Support for a large L1 NVLink domain size.
- ▶ Scalable and non-scalable solutions in a common infrastructure.

Chapter 1. Hardware

DGX Vera Rubin rack scale systems are rack scale solutions for graphics processing units (GPUs) connected by NVLink through the NVLink passive copper cable cartridge backplane. The complete DGX Vera Rubin rack system comprises compute trays with two compute boards, NVLink switch trays, an NVLink passive copper cable backplane, power shelves, a bus bar, and liquid cooling manifolds.

1.1. Rack Configuration

An NVL72 rack is an NVIDIA rack with a 72-GPU NVL domain. Each NVL72 rack contains:

- ▶ 18 compute trays, each 1 RU high, with 2 Vera CPUs and 4 Rubin GPUs.
- ▶ 9 NVLink 6 switch trays, each 1 RU high.
- ▶ 2 top-of-rack (TOR) switches for management.
- ▶ Power shelves for supplying power to all trays and switches.

The rear side of the system provides access to the cable management system, the inlets and outlets to the liquid cooling manifolds and the manifolds themselves, the cable cartridges, and the power bus bar.

1.2. Compute Trays

The compute tray in a DGX Vera Rubin rack system is an enclosure that holds the compute boards and peripheral accessory boards and runs an OS image. The compute trays are cooled by liquid that runs up and down the rack through the inner manifold, then through the cold plates that are attached to the CPUs, GPUs, and various networking and storage components in the tray. The compute trays in a rack are interconnected via NVLink through the connectors at the back of the tray, which enables communication with the other compute trays via the NVSwitch trays.

The following table provides information about the DGX Vera Rubin rack system compute tray configuration.

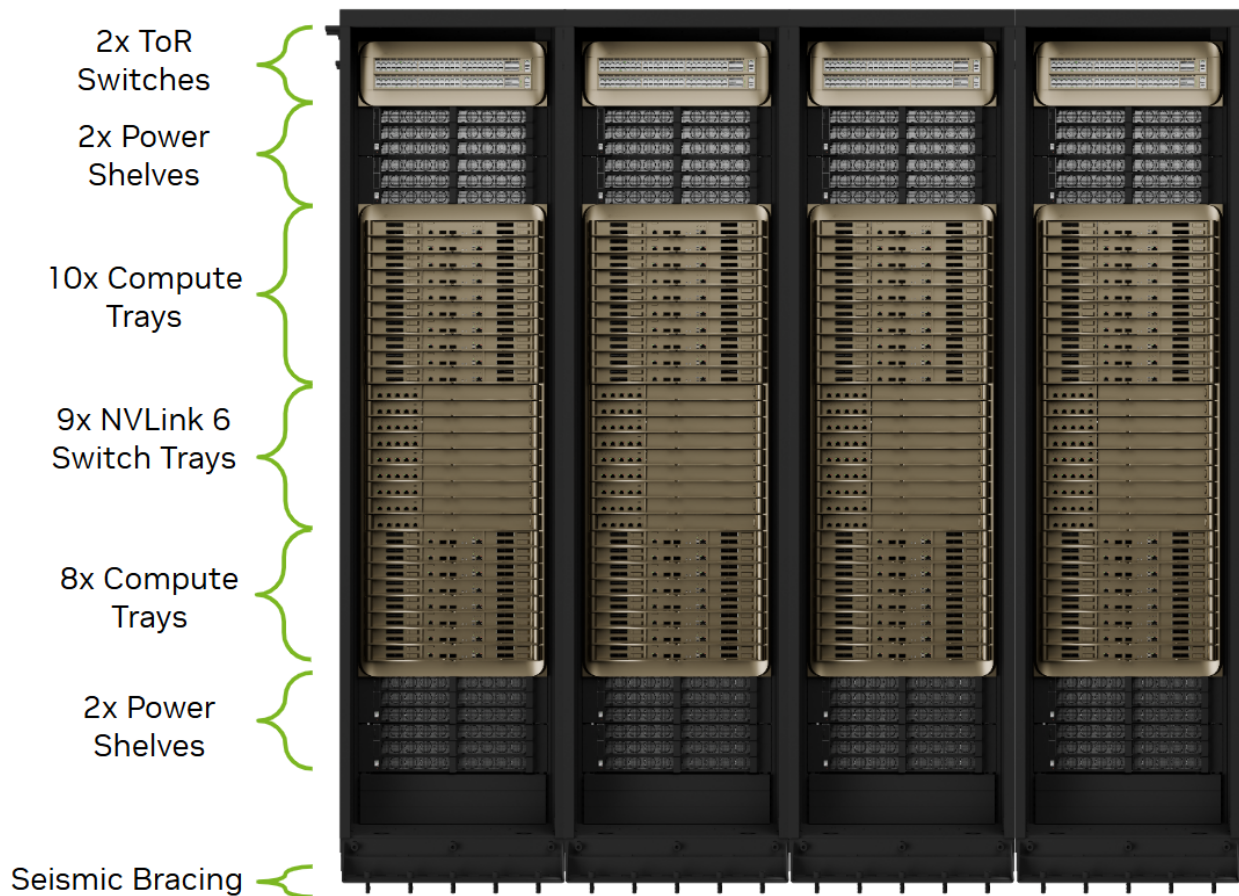


Fig. 1: DGX Vera Rubin NVL72 Rack Configuration

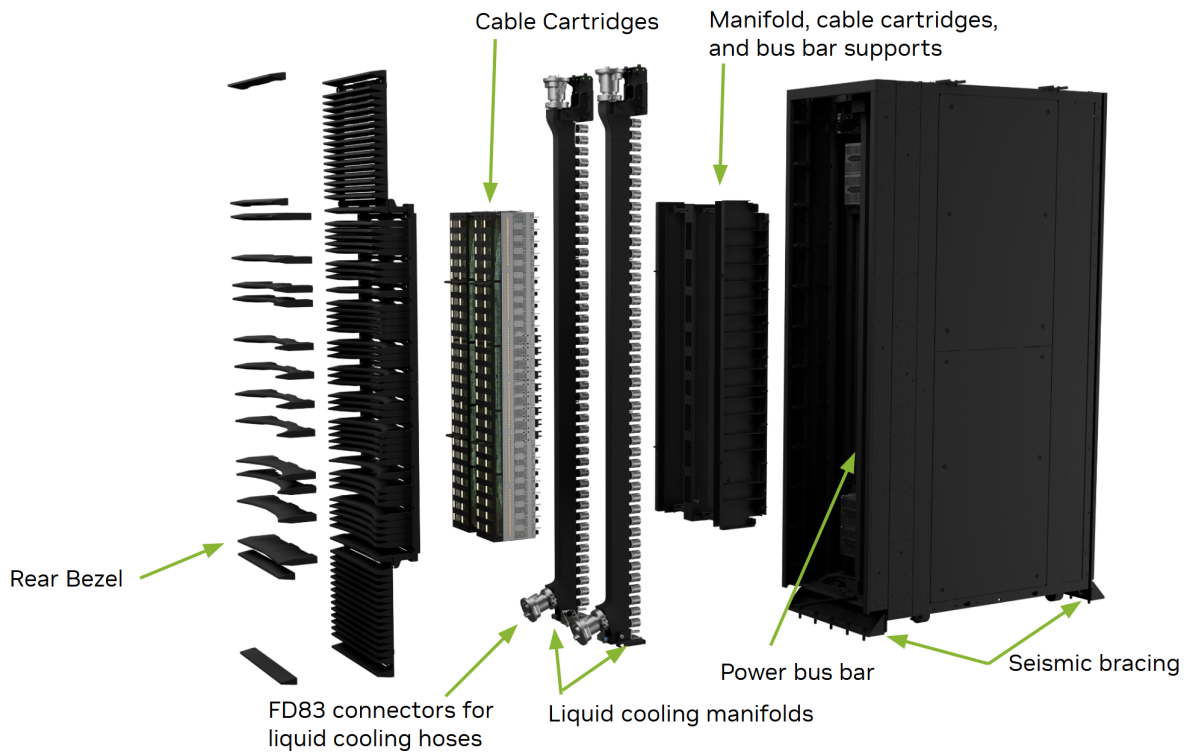


Fig. 2: DGX Vera Rubin NVL72 Rack Rear View



Fig. 3: DGX Vera Rubin Compute Tray

Component	Function	Configuration
Compute	Compute node	2 Vera™ CPUs and 4 Rubin™ GPUs
Networking	Cluster network	2 NVIDIA ConnectX-9 I/O cards for InfiniBand cluster interconnect and multi-rack clustering
Networking	Storage/management network	1 NVIDIA BlueField-4 DPU for Ethernet storage and system management networking
Networking	Out-of-band management network	Host BMC with RJ45
Storage	Data cache	4 E1.S NVMe cache drives per compute tray
Storage	Boot drive	1 E1.S NVMe boot drive

Out-of-band (OOB) management of the compute tray hardware resources is provided by a combination of Board Management Controller (BMC) and Host Management Controller (HMC) microcontrollers. External access is available through standard BMC and console interfaces.

The following figure shows a top view of the DGX Vera Rubin rack system compute tray and identifies the main components.

The following figure shows a front view of the DGX Vera Rubin rack system compute tray and identifies the main components.

1.3. NVLink Switch Trays

Each Vera Rubin NVL72 rack has 9 NVLink 6 switch trays, providing NVLink connectivity to all GPUs in the single 72-GPU L1 domain.

Each switch tray has the following components:

- ▶ 4 NVSwitch ASICs, each with 72 NVLink 6 ports
- ▶ BMC for attestation and recovery
- ▶ CPU ERoT for security

1.4. Power Shelves

The DGX Vera Rubin NVL72 rack system uses a liquid-cooled bus bar structure to distribute power in the rack. AC power whips energize the power shelves from a remote power panel, and the power shelves convert AC power into a 54 V DC output that is distributed through the bus bar to the rack components.

Each rack has 4 power shelves. Each shelf is 3 RU high and rated at 110 kW, with 6 air-cooled 18.3 kW PSUs. Two 100 A whips supply each shelf at 415–480 V AC.

NVIDIA DGX Vera Rubin Block Diagram

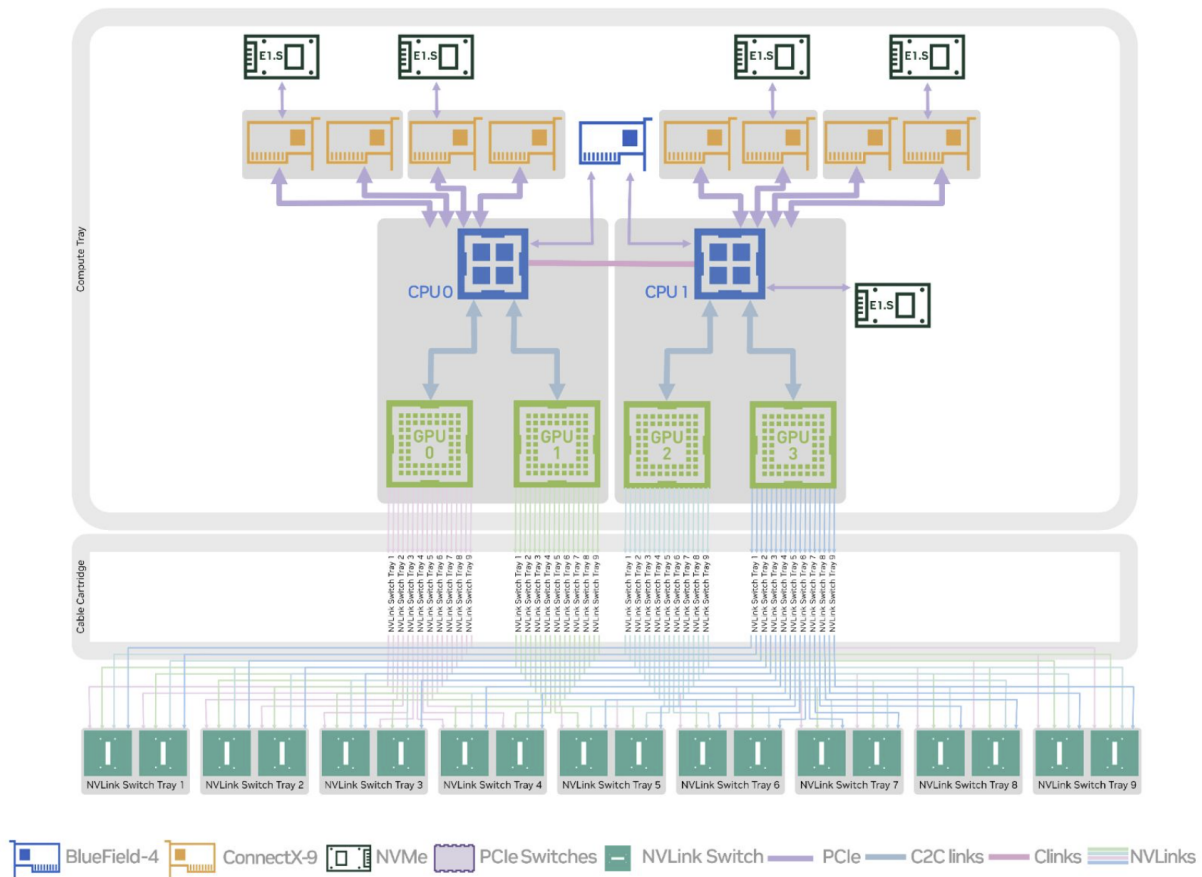


Fig. 4: DGX Vera Rubin Compute Tray Block Diagram

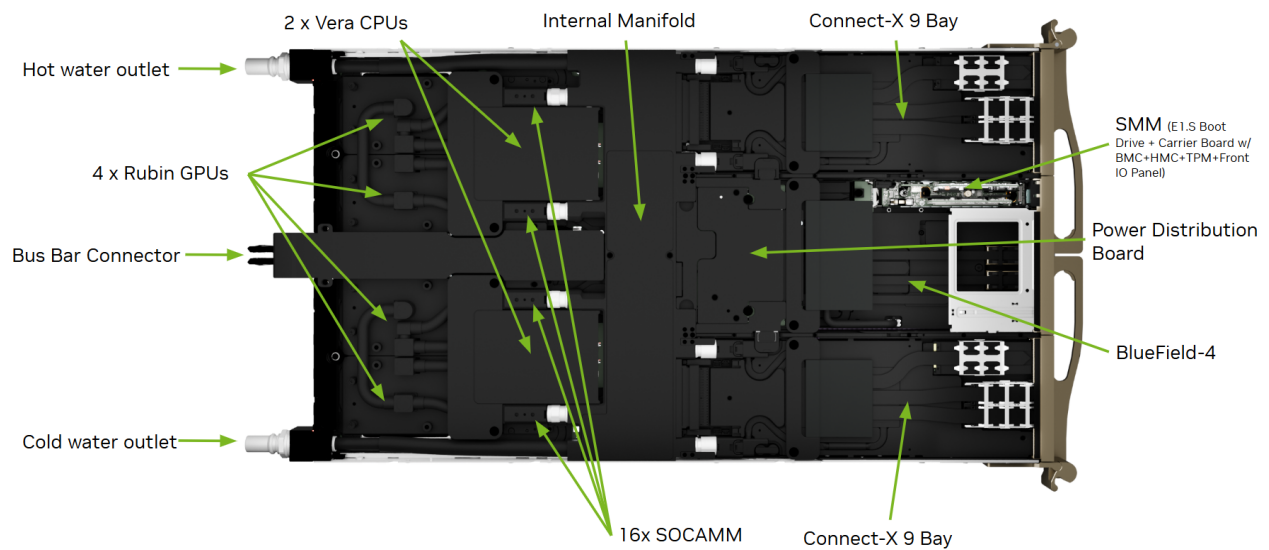


Fig. 5: DGX Vera Rubin Compute Tray Top View

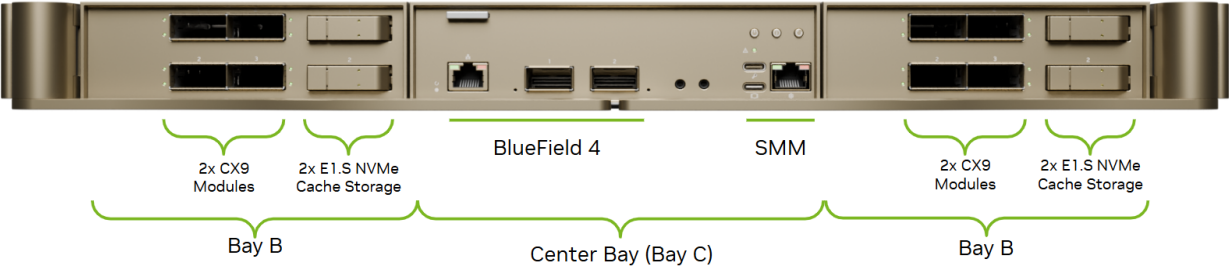


Fig. 6: DGX Vera Rubin Compute Tray Front View

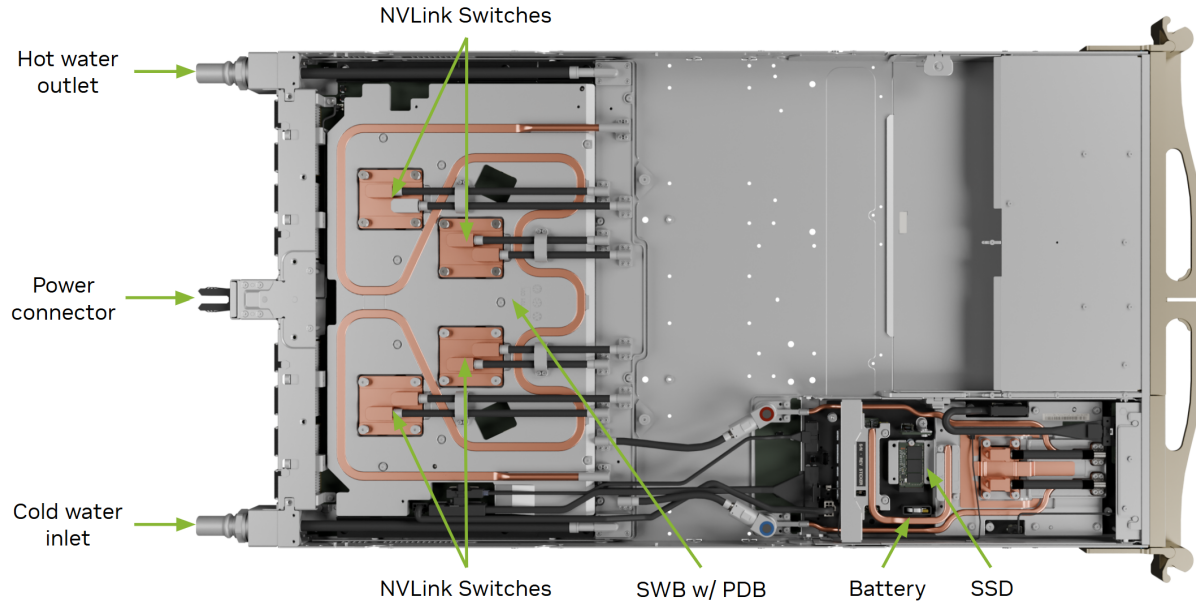


Fig. 7: DGX Vera Rubin NVLink Switch Tray

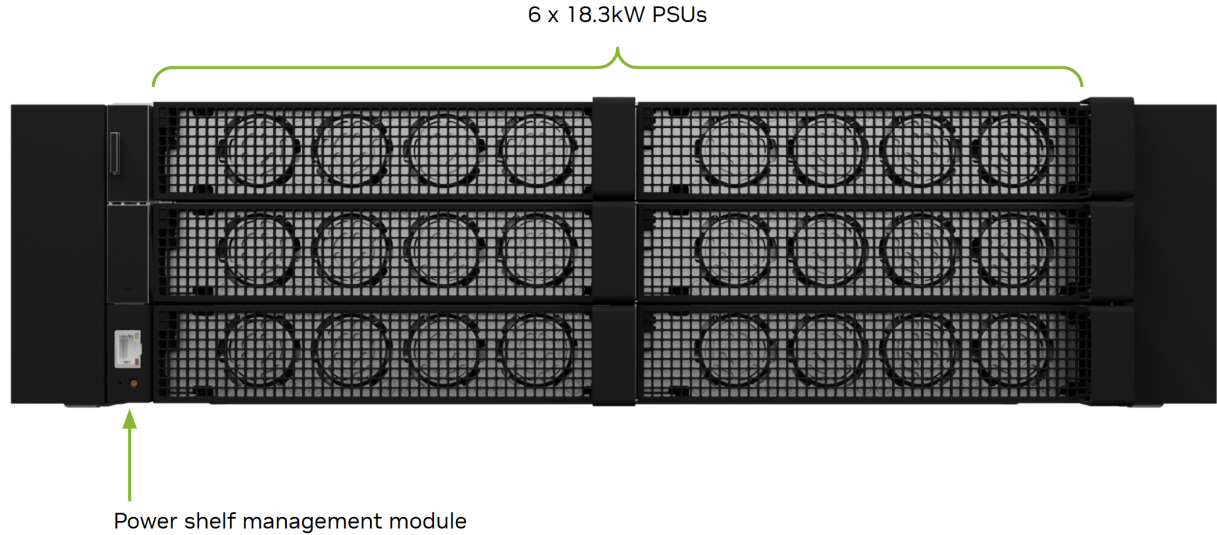


Fig. 8: DGX Vera Rubin Power Shelf

1.5. Top-of-Rack Ethernet Switches

Top-of-rack (TOR) switches are used to connect all BMCs in the compute trays (including BlueField-4 BMCs) and the switch trays to the management network. The following ports are connected to these switches:

- ▶ Out-of-band management BMC from the compute trays
- ▶ BlueField-4 BMCs from the compute trays

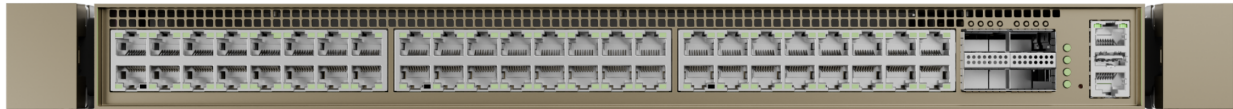


Fig. 9: DGX Vera Rubin Top-of-Rack Ethernet Switch

1.6. Console Access

Each NVLink switch provides an RJ45 interface for serial access. The default serial baud rate is 115200 baud.

1.7. Leak Detection

Leak detection in the DGX Vera Rubin NVL72 rack system's liquid cooling system prevents damage to equipment, ensures system reliability and uptime, protects data integrity, and maintains safety. Early detection helps avoid costly repairs, downtime, and regulatory compliance issues, optimizes the cooling efficiency, and prevents secondary damage to infrastructure.

Chapter 2. Networking

DGX Vera Rubin NVL72 rack scale systems use NVLink, InfiniBand, and Ethernet for communication within and across racks.

- ▶ NVLink forms the ultra-fast, memory-coherent scale-up fabric within each rack, making 72 GPUs act as one.
- ▶ InfiniBand provides the high-bandwidth, low-latency scale-out compute fabric between racks, enabling massive multi-node AI training clusters.
- ▶ Ethernet handles storage, management (in-band and out-of-band), and external connectivity, ensuring all components are integrated and manageable.

2.1. NVLink Networking

NVIDIA NVLink is a high-speed, low-latency interconnect technology designed to overcome PCIe bandwidth limitations in multi-GPU and GPU-to-CPU communication, crucial for HPC and AI platforms. NVLink enables unified memory access across GPUs, simplifying programming, and scales efficiently through NVSwitch chips, which act as non-blocking switches between servers, creating high-bandwidth fabrics.

Connectors at the back of the trays connect to cable cartridges that interconnect the compute and NVLink switch trays along the rear of the system. This fabric is managed by NVIDIA Fabric Manager (or NVLSM), integrated with GPU drivers and the CUDA software stack (like NCCL), which configures the NVSwitch topology and monitors performance. Additionally, NVSwitch incorporates in-network computing (SHARP) to accelerate collective operations, further optimizing distributed AI training by performing computations within the network.

For more information about NVIDIA NMX, refer to the [NVIDIA NMX documentation](#).

2.2. Network Overview

A DGX Vera Rubin NVL72 rack installation uses several discrete networks:

1. `externalnet` - This network provides external communication for the head node to the enterprise network or to the internet, if allowed.
2. `internalnet` - This network provides provisioning capabilities as well as system management to the control plane nodes.
3. `dgxnet` - This network is used to provision and manage the compute trays.

- 4. **ipminet** - This network provides Base Command Manager and the head node access to the out-of-band/BMC interfaces of all the components in the rack, including the compute trays, NVLink switch trays, the power shelves, the top-of-rack switches, and the control plane nodes.
- 5. **compuenet** - This network is used for RDMA communication across racks (east/west traffic).
- 6. **storagenet** - This network provides each node access to storage.
- 7. **failovernet** - This network is used only by head nodes in a redundant failover configuration.

The following image identifies the network ports on the compute and switch trays. Each number corresponds to a network in the preceding list.



Fig. 1: DGX Vera Rubin NVL72 Compute and Switch Trays - Identification of network port locations

The following image describes the port types available in the compute tray.



Fig. 2: DGX Vera Rubin NVL72 Compute and Switch Trays - Identification of network port types

2.3. Compute Tray Network Ports

The following table describes the function and type of each of the compute tray network ports.

Port	Port Type	Network / Switch
ConnectX-9 port	OSFP	computenet (InfiniBand)
BlueField-4 left port	QSFP	storagenet (Ethernet)
BlueField-4 right port	QSFP	storagenet (Ethernet)
BlueField-4 RJ-45 port	RJ45	ipminet (Ethernet)
1 GbE LAN port	RJ45	Not connected
1 GbE BMC port	RJ45	ipminet (Ethernet)

2.4. Network Interface Names

The following table describes the network interface names for each of the ports on the compute tray.

Port	PCIe Bus	Interface	RDMA
C1/C1_1	0001:03:00.0	enP1p3s0f0np0	mlx5_0
Bay_B_L E1.s_Top	0001:06:00.0	N/A	N/A
C1/C1_2	0003:01:00.0	enP3p1s0f0np0	mlx5_4
C3/C3_1	0004:03:00.0	enP4p3s0f0np0	mlx5_8
Bay_B_L E1.s_Bottom	0004:06:00.0	N/A	N/A
C3/C3_2	0006:01:00.0	enP6p1s0f0np0	mlx5_14
C7/C7_1	0009:03:00.0	enP9p3s0f0np0	mlx5_18
Bay_B_R E1.s_Bottom	0009:06:00.0	N/A	N/A
C7/C7_2	000b:01:00.0	enP11p1s0f0np0	mlx5_22
C5/C5_1	000c:03:00.0	enP12p3s0f0np0	mlx5_26
Bay_B_R E1.s_Top	000c:06:00.0	N/A	N/A
C5/C5_2	000e:01:00.0	enP14p1s0f0np0	mlx5_32



Fig. 3: DGX Vera Rubin NVL72 Compute Tray Networking PCIe Labels Front View

Port	PCIe Bus	Interface	RDMA
HPM_L GPU_0	0002:81:00.0	N/A	N/A
Bay_C BMC Bridge	0002:a1:00.0	N/A	N/A
Bay_C BMC	0002:a2:00.0	N/A	N/A
HPM_L GPU_1	0002:c1:00.0	N/A	N/A
Bay_C USB	0002:e1:00.0	N/A	N/A
Bay_C BF4_Socket0	0005:41:00.0	enP5p65s0f0np0	mlx5_12
HPM_R GPU_2	000a:81:00.0	N/A	N/A
Bay_C E1.S_Boot Drive	000a:a1:00.0	N/A	N/A
HPM_R GPU_3	000a:e1:00.0	N/A	N/A
Bay_C BF4_Socket1	000d:41:00.0	enP13p65s0f0np0	mlx5_30

2.5. NVLink Switch Network Ports

The following table describes the function and type of each of the NVLink switch network ports.

Port (from left to right)	Port Type	Network / Switch
RS232 for BMC	RJ45	Not connected
Ethernet port BMC	RJ45	ipminet (Ethernet)
Ethernet for switch management	RJ45	ipminet (Ethernet)
Ethernet for switch management	RJ45	ipminet (Ethernet)
Leakage connector	RJ45	Not connected

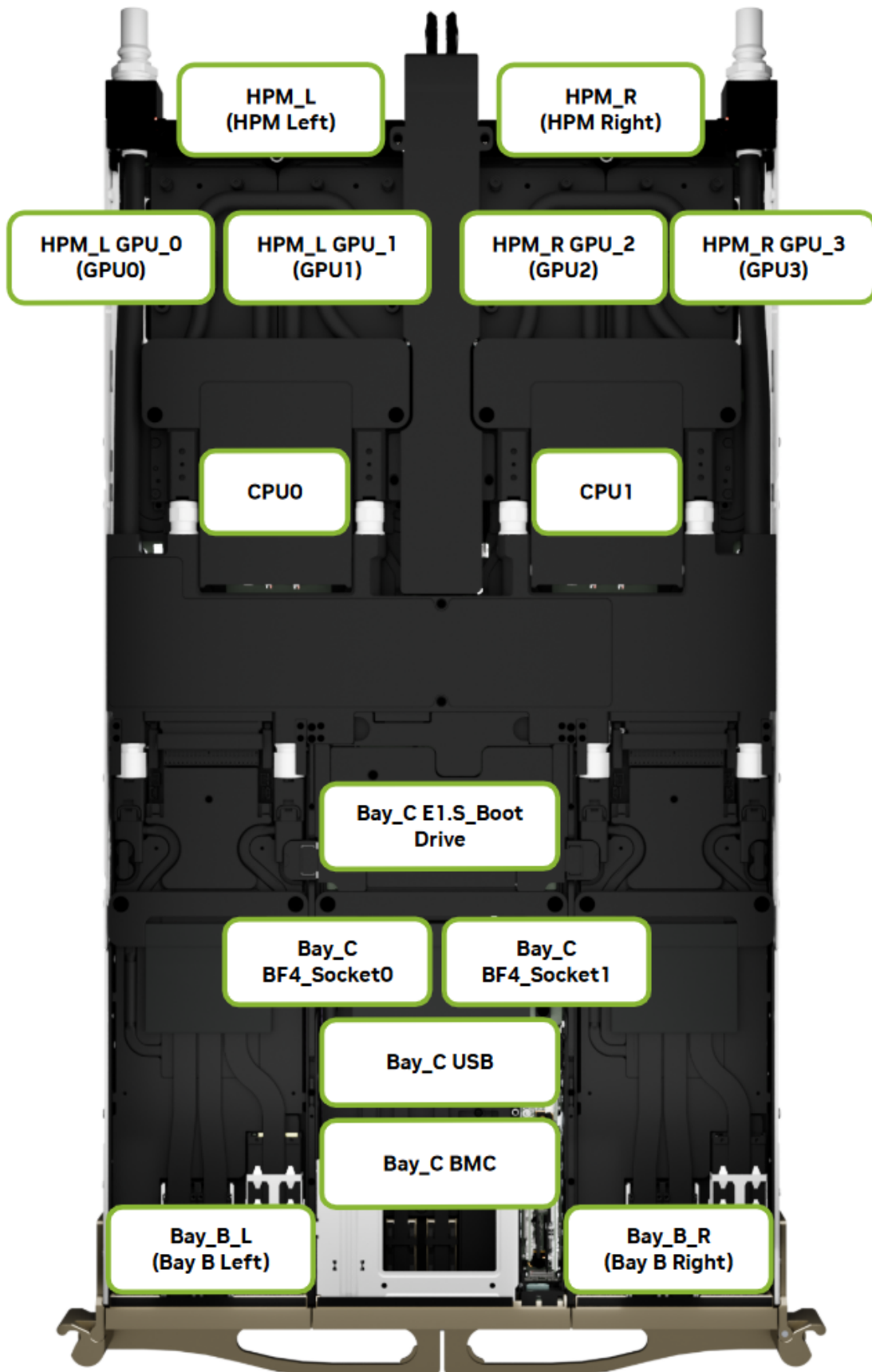


Fig. 4: DGX Vera Rubin NVL72 Compute Tray Networking PCIe Labels Top View

Chapter 3. Storage

DGX Vera Rubin NVL72 rack scale systems are part of SuperPODs designed for massive-scale AI and HPC workloads. Their storage architecture is a critical component for feeding data to the GPUs efficiently. The system uses a multi-tiered storage hierarchy that includes internal storage as well as network-connected storage over a high-speed network.

3.1. Internal Storage

Each DGX compute tray within a DGX Vera Rubin NVL72 rack system is equipped with local E1.S NVMe storage for caching, and an E1.S NVMe drive is used for booting the operating system.

For local caching, the E1.S NVMe drives are configured in RAID 0 as a single volume. During the first read of a dataset from shared storage, the DGX system's software can automatically cache a copy of the data to the local NVMe devices using `cachefilesd`, if configured. For subsequent reads of the same data, applications can then access it from the local NVMe cache, which provides significantly faster access than retrieving it again across the network. This caching process is transparent to users and applications.

Local storage can also be used for checkpointing acceleration. While primary checkpoints typically go to high-performance storage for reliability, local NVMe can be used for temporary, faster checkpointing before being flushed to shared storage, or for smaller, very frequent checkpoints within an epoch.

3.2. External Storage

The primary data source for these systems is a high-performance, shared parallel file system available from partners as described in the SuperPOD reference architecture. This storage is accessed over converged Ethernet by default, although InfiniBand can also be used. The shared storage holds the massive datasets required for AI training and serves as the original data source.

For sizing and performance requirements, refer to [Storage Architecture — NVIDIA DGX SuperPOD](#).

Chapter 4. Software

The software stack for DGX Vera Rubin rack scale systems is composed of software and firmware that runs on the various compute nodes, switch nodes, and the power shelves.

4.1. Mission Control Software

NVIDIA Mission Control combines workload-aware intelligence with full-stack observability (this includes data center facilities integration) to ensure that developer jobs are executed on the right resources, intelligently orchestrated to maximize throughput and uptime so that the infrastructure as a whole is working in concert with the data center facilities supporting it.

AI practitioners can manage jobs and select power profiles based on workload type and power and performance goals. Topology-aware scheduling aligns the job at multiple layers, ensuring the entire rack functions like one big GPU. Fast checkpointing and tiered restart reduce the amount of work lost when a job fails.

Mission Control rapidly checkpoints jobs. When errors or faults occur, the software isolates the problems and restarts the job without manual intervention. Using integrated telemetry, the software identifies faulty components, cordons off affected infrastructure, and moves workloads to healthy nodes while accounting for the system topology.

The infrastructure relies on the facilities that support it. This software monitors power and cooling, and can even detect leaks, to ensure the proper functioning of the facilities' power and cooling systems, such as those supplying power to a rack or providing liquid cooling.

Mission Control provides end-to-end observability for the AI factory, addressing the challenge of not only deploying but also maintaining complex systems. This software offers cluster-scale control and visibility, improving infrastructure resiliency. It supports scaling and management of your cluster, simplifies the balancing of performance and power efficiency, and enables regular health checks to validate hardware and performance throughout the infrastructure lifecycle.

NVIDIA Mission Control also provides the following software benefits:

- ▶ *Simplified cluster setup and provisioning:* New automation and standardized application programming interfaces to accelerate time to deployment with integrated inventory management and visualizations.
- ▶ *Seamless workload orchestration:* Simplifies Slurm and Kubernetes workflows.
- ▶ *Energy-optimized power profiles:* Balances power requirements and tunes GPU performance for various workload types with developer-selectable controls.
- ▶ *Autonomous job recovery:* Identifies, isolates, and recovers from inefficiencies without manual intervention to maximize developer productivity and infrastructure resiliency.

- ▶ *Customizable dashboards*: Tracks key performance indicators with access to critical telemetry data about clusters.
- ▶ *On-demand health checks*: Validates hardware and cluster performance throughout the infrastructure lifecycle.
- ▶ *Building management integration*: Provides enhanced coordination with building management systems to provide more control for power and cooling events, including rapid leakage detection.

4.2. CUDA Software Platform

NVIDIA CUDA® allows applications to use GPUs for accelerated computing and provides more than 150 libraries to create high-performance applications across programming languages and use cases. Here are some additional benefits:

- ▶ CUDA provides the tools to optimize and debug your GPU-accelerated application.
- ▶ CUDA-enabled applications run on Vera Rubin Superchips and leverage the NVLink network to provide distributed processing across every GPU in the DGX VR rack system.

Refer to the [NVIDIA CUDA documentation](#) for more information about CUDA.

4.3. Internode Memory Exchange Service

The NVIDIA Internode Memory Exchange/Management (IMEX) is a secure service that facilitates the mapping of GPU memory over NVLink between the GPUs in an NVLink domain across the OS/node boundary using memory export and import operations. The service is started on all nodes in the NVLink domain during system startup or during the launch of the CUDA job.

Here are the key features:

- ▶ Facilitates memory sharing across compute nodes.
- ▶ Manages the lifecycle of the shared memory.
- ▶ Registers for the memory import/unimport events with the GPU driver.
- ▶ Does not directly communicate with CUDA or user applications.
- ▶ Communicates across nodes using the compute node's network.
- ▶ Runs exclusively on compute nodes.

IMEX domain vs. IMEX channel

- ▶ An IMEX domain is an OS instance or a group of securely connected OS instances that use the IMEX service daemon in a multi-node system. *On single-node systems, the IMEX daemon is not required.*
- ▶ An IMEX channel is a communication path exposed by the GPU driver within an IMEX domain to allow sharing memory securely in a multi-user environment.
 - ▶ An IMEX channel is a logical entity that is represented by a `/dev` node.
 - ▶ The IMEX channels are global resources within the IMEX domain.
 - ▶ When exporter and importer CUDA processes have been granted access to the same IMEX channel, they can securely share memory.

4.4. NVIDIA Switch Tray Software

With the fifth generation of NVSwitches, NVIDIA has implemented a unified architecture that spans across NVLink, InfiniBand, and Ethernet switches. The NVSwitch trays that implement these fifth-generation NVSwitches have an NVOS image installed on them.

4.4.1. NVIDIA Switch OS

The NVLink switch tray comes with the NVIDIA operating system (NVOS) that enables the management and configuration of NVIDIA's switch system platforms. NVOS provides management options that include an industry-standard command-line interface (CLI) and OpenAPI (Swagger).

NVOS includes the NVLink Subnet Manager (NVLSM), the Fabric Manager (FM), NMX services such as NMX-Controller and NMX-Telemetry, and the NVSwitch firmware.

4.4.2. NMX-Controller

The NMX-Controller is a cluster application for fabric software-defined networking (SDN) services. In DGX VR rack systems the SDN services include SM and FM.

The NVOS cluster infrastructure includes the cluster applications package file in the NVOS image. The packages are installed automatically during NVOS image installation and upgrades.

4.4.3. Fabric Manager

FM configures the NVSwitch memory fabrics to form a large memory fabric among the participating GPUs and monitors the NVLinks that support the fabric. At a high level, FM has the following responsibilities:

- ▶ Configures routing among NVSwitch ports.
- ▶ Sets up the GPU-side routing/port map if applicable.
- ▶ Coordinates with the GPU driver to initialize the GPUs.
- ▶ Monitors the fabric for NVLink and NVSwitch errors.

4.4.4. NVLink Subnet Manager

NVLink Subnet Manager (NVLSM) originated from InfiniBand networking and added additional logic to manage the NVSwitch and NVLinks in the switch trays. At a high level, the NVLSM provides the following functionalities in NVSwitch-based systems:

- ▶ Discovers the NVLink network topology.
- ▶ Assigns a logical identifier (LID) to the GPU and NVSwitch NVLink ports.
- ▶ Calculates and programs the switch forwarding table.
- ▶ Programs the Partition Key (PKEY) for NVLink partitions.
- ▶ Monitors the changes in the NVLink fabric.

4.4.5. NMX-Telemetry

NMX-T is a subsystem that collects, aggregates, and transmits telemetry data from various devices, applications, and platforms. In the context of this guide, it collects and aggregates telemetry data from all the NVLink switches in an NVLink domain.

4.5. DOCA Software Framework

The DOCA framework unlocks the potential of the NVIDIA® BlueField® networking platform by enabling the rapid creation of applications and services that offload, accelerate, and isolate data center workloads. It lets developers create software-defined, cloud-native, DPU- and SuperNIC-accelerated services with zero-trust protection, which addresses the performance and security demands of modern data centers. DOCA-Host includes the host drivers and tools for BlueField and ConnectX® devices in the rack.

4.6. NVIDIA Collective Communication Library

GPU communication libraries like NVIDIA Collective Communications Library (NCCL), NVIDIA NVSHMEM, and Unified Communication X (UCX) provide a framework for efficient and scalable inter-GPU communication. Communication performance is crucial for the overall deep learning (DL) performance and HPC applications that run on multi-node racks and large clusters. They support a variety of interconnect technologies including PCIe, NVLink, NVLink Network (known as NVLink Multi-node), InfiniBand, RoCE, and so on.

NCCL provides inter-GPU communication primitives that are topology-aware, removing the need for developers to optimize their applications for specific systems. NCCL implements collective communication and point-to-point send/receive primitives for intra- and inter-node data transfers. Refer to the [NCCL documentation](#) for more information.

NVSHMEM provides a partitioned global address space (PGAS) for data that spans the memory of multiple GPUs. In addition to the CPU and CUDA stream communication APIs, NVSHMEM also provides device APIs for communication. These APIs enable low-latency communication between GPUs and allow applications to do fine-grained and/or fused overlap of compute and communication from the CUDA kernel. Refer to the [NVIDIA NVSHMEM documentation](#) for more information.

UCX is a framework that provides a common set of CPU-initiated tag-matching, active-messaging, and remote memory access APIs over a variety of network protocols and hardware, which enhances scalability and performance in distributed computing systems. Refer to [NVIDIA UCX documentation](#) for more information.

4.7. Data Center GPU Manager

NVIDIA Data Center GPU Manager (DCGM) is a suite of tools that manage and monitor NVIDIA data center GPUs and NVSwitches in cluster environments. It includes active health monitoring, comprehensive diagnostics, system alerts, and governance policies including power and clock management. The suite can be used as a standalone option by infrastructure teams and easily integrates into cluster management tools, resource scheduling, and monitoring products from NVIDIA partners. Refer to the NVIDIA DCGM documentation for more information.

4.8. NVIDIA Firmware Tools (MFT)

The MFT package, which is a set of network ASIC firmware management tools, supports the following tasks:

- ▶ Generating a standard or customized firmware image.
- ▶ Querying for firmware information.
- ▶ Flashing a firmware image.

The MFT package for DGX VR rack systems can be found in the accompanying software release.

Chapter 5. Safety

This section provides information about how to safely use the NVIDIA DGX Vera Rubin NVL72 system.

5.1. Safety Information

To reduce the risk of bodily injury, electrical shock, fire, and equipment damage, read this document and observe all warnings and precautions in this guide before installing or maintaining your server product.

In the event of a conflict between the information in this document and information provided with the product or on the website for a particular product, the product documentation takes precedence.

Your server should be integrated and serviced only by technically qualified persons.

You must adhere to the guidelines in this guide and the assembly instructions in your server manuals to ensure and maintain compliance with existing product certifications and approvals. Use only the described, regulated components specified in this guide. Use of other products or components will void the UL Listing and other regulatory approvals of the product and may result in noncompliance with product regulations in the region(s) in which the product is sold.

5.2. Safety Warnings and Cautions

To avoid personal injury or property damage, before you begin installing the product, read, observe, and adhere to all of the following safety instructions and information.

The following safety symbols may be used throughout the documentation and may be marked on the product and the product packaging.

- ▶ **CAUTION:** Indicates the presence of a hazard that may cause minor personal injury or property damage if the CAUTION is ignored.
- ▶ **WARNING:** Indicates the presence of a hazard that may result in serious personal injury if the WARNING is ignored.

Indicates potential hazard if indicated information is ignored.



Indicates shock hazards that result in serious injury or death if safety instructions are not followed.



Indicates hot components or surfaces.



Indicates do not touch fan blades, may result in injury.



Shock hazard: The product might be equipped with multiple power cords.

- ▶ To remove all hazardous voltages, disconnect all power cords.
- ▶ High leakage current ground (earth) connection to the Power Supply is essential before connecting the supply.



Recycle the battery.



The rail racks are designed to carry only the weight of the server system. Do not use rail-mounted equipment as a workspace. Do not place additional load onto any rail-mounted equipment.

5.3. Intended Application Uses

This product was evaluated as Information Technology Equipment (ITE), which may be installed in offices, schools, computer rooms, and similar commercial type locations.

The suitability of this product for other product categories and environments (such as medical, industrial, residential, alarm systems, and test equipment), other than an ITE application, may require further evaluation.

5.4. Site Selection

Choose a site that is:

- ▶ Clean, dry, and free of airborne particles (other than normal room dust).
- ▶ Well-ventilated and away from sources of heat including direct sunlight and radiators.
- ▶ Away from sources of vibration or physical shock.

- ▶ In regions that are susceptible to electrical storms, we recommend you plug your system into a surge suppressor and disconnect telecommunication lines to your modem during an electrical storm.
- ▶ Provided with a properly grounded wall outlet.
- ▶ Provided with sufficient space to access the power supply cord(s), because they serve as the product's main power disconnect.

5.5. Equipment Handling Practices

To reduce the risk of personal injury or equipment damage, do the following:

- ▶ Conform to local occupational health and safety requirements when moving and lifting equipment.
- ▶ Use mechanical assistance or other suitable assistance when moving and lifting equipment.

5.6. Electrical Precautions

5.6.1. Power and Electrical Warnings

Caution

The power button, indicated by the stand-by power marking, DOES NOT completely turn off the system AC power; standby power is active whenever the system is plugged in. To remove power from system, you must unplug the AC power cord from the wall outlet. Make sure all AC power cords are unplugged before you open the chassis, or add or remove any non hot-plug components.

Do not attempt to modify or use an AC power cord if it is not the exact type required. A separate AC cord is required for each system power supply.

Some power supplies in servers use Neutral Pole Fusing. To avoid risk of shock use caution when working with power supplies that use Neutral Pole Fusing.

The power supply in this product contains no user-serviceable parts. Do not open the power supply. Hazardous voltage, current and energy levels are present inside the power supply. Return to manufacturer for servicing.

When replacing a hot-plug power supply, unplug the power cord to the power supply being replaced before removing it from the server.

To avoid risk of electric shock, turn off the server and disconnect the power cords, telecommunications systems, networks, and modems attached to the server before opening it.

5.6.2. Power Cord Warnings

Caution

To avoid electrical shock or fire, check the power cord(s) that will be used with the product as follows:

- ▶ Do not attempt to modify or use the AC power cord(s) if they are not the exact type required to fit into the grounded electrical outlets.
- ▶ The power cord(s) must meet the following criteria:
 - ▶ The power cord must have an electrical rating that is greater than that of the electrical current rating marked on the product.
 - ▶ The power cord must have safety ground pin or contact that is suitable for the electrical outlet.
 - ▶ The power supply cord(s) is/are the main disconnect device to AC power. The socket outlet(s) must be near the equipment and readily accessible for disconnection.
 - ▶ The power supply cord(s) must be plugged into socket-outlet(s) that is/are provided with a suitable earth ground.

5.7. System Access Warnings

To avoid personal injury or property damage, the following safety instructions apply whenever accessing the inside of the product:

- ▶ Turn off all peripheral devices connected to this product.
- ▶ Turn off the system by pressing the power button to off.
- ▶ Disconnect the AC power by unplugging all AC power cords from the system or wall outlet.
- ▶ Disconnect all cables and telecommunication lines that are connected to the system.
- ▶ Retain all screws or other fasteners when removing access cover(s). Upon completion of accessing inside the product, refasten access cover with original screws or fasteners.
- ▶ Do not access the inside of the power supply. There are no serviceable parts in the power supply.
- ▶ Return to manufacturer for servicing.
- ▶ Power down the server and disconnect all power cords before adding or replacing any non hot-plug component.
- ▶ When replacing a hot-plug power supply, unplug the power cord to the power supply being replaced before removing the power supply from the server.

Caution

If the server has been running, any installed processor(s) and heat sink(s) may be hot. Unless you are adding or removing a hot-plug component, allow the system to cool before opening the covers. To avoid the possibility of coming into contact with hot component(s) during a hot-plug installation, be careful when removing or installing the hot-plug component(s).

Caution

To avoid injury do not contact moving fan blades. Your system is supplied with a guard over the fan; do not operate the system without the fan guard in place.

5.8. Rack Mount Warnings

The following installation guidelines are required by UL to maintain safety compliance when installing your system into a rack.

The equipment rack must be anchored to an unmovable support to prevent it from tipping when a server or piece of equipment is extended from it. The equipment rack must be installed according to the rack manufacturer's instructions.

Install equipment in the rack from the bottom up with the heaviest equipment at the bottom of the rack.

Extend only one piece of equipment from the rack at a time.

You are responsible for installing a main power disconnect for the entire rack unit. This main disconnect must be readily accessible, and it must be labeled as controlling power to the entire unit, not just to the server(s).

To avoid risk of potential electric shock, a proper safety ground must be implemented for the rack and each piece of equipment installed in it.

Elevated Operating Ambient - If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient. Therefore, consideration should be given to installing the equipment in an environment compatible with the maximum ambient temperature (Tma) specified by the manufacturer.

Reduced Air Flow - Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised.

Mechanical Loading - Mounting of the equipment in the rack should be such that a hazardous condition is not achieved due to uneven mechanical loading.

Circuit Overloading - Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading of the circuits might have on overcurrent protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.

Reliable Earthing - Reliable earthing of rack-mounted equipment should be maintained.

Particular attention should be given to supply connections other than direct connections to the branch circuit (for example, the use of power strips).

5.9. Electrostatic Discharge

Caution

ESD can damage drives, boards, and other parts. We recommend that you perform all procedures at an ESD workstation. If one is not available, provide some ESD protection by wearing an antistatic wrist strap attached to chassis ground (any unpainted metal surface) on your server when handling parts.

Always handle boards carefully. They can be extremely sensitive to ESD. Hold boards only by their edges. After removing a board from its protective wrapper or from the server, place the board component side up on a grounded, static free surface. Use a conductive foam pad if available but not the board wrapper. Do not slide board over any surface.

5.10. Other Hazards

5.10.1. CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL

Perchlorate Material - special handling may apply. See www.dtsc.ca.gov/perchlorate.

Perchlorate Material: Lithium battery (CR2032) contains perchlorate. Please follow instructions for disposal.

5.10.2. NICKEL



NVIDIA Bezel. The bezel's decorative metal foam contains some nickel. The metal foam is not intended for direct and prolonged skin contact. Please use the handles to remove, attach or carry the bezel. While nickel exposure is unlikely to be a problem, you should be aware of the possibility in case you are susceptible to nickel-related reactions.

5.10.3. Battery Replacement

Caution

There is the danger of explosion if the battery is incorrectly replaced. When replacing the battery, use only the battery recommended by the equipment manufacturer.

Dispose of batteries according to local ordinances and regulations. Do not attempt to recharge a battery.

Do not attempt to disassemble, puncture, or otherwise damage a battery.

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5.10.4. Cooling and Airflow

Caution

Carefully route cables as directed to minimize airflow blockage and cooling problems. For proper cooling and airflow, operate the system only with the chassis covers installed.

Operating the system without the covers in place can damage system parts. To install the covers:

- ▶ Check first to make sure you have not left loose tools or parts inside the system.
- ▶ Check that cables, add-in cards, and other components are properly installed.
- ▶ Attach the covers to the chassis according to the product instructions.

The equipment is intended for installation only in a Server Room/Computer Room where both these conditions apply:

- ▶ Access can only be gained by SERVICE PERSONS or by USERS who have been instructed about the reasons for the restrictions applied to the location and about any precautions that shall be taken.
- ▶ Access is through the use of a TOOL or lock and key, or other means of security, and is controlled by the authority responsible for the location.

Chapter 6. System Control and Configuration

6.1. System Operations

To bring a DGX Vera Rubin NVL72 rack system online, power on and configure the NVSwitch trays first to establish the NVLink fabric, then power on the compute trays. This sequence ensures high-bandwidth GPU-to-GPU communication is active from the start, preventing potential inter-node communication issues and avoiding the need for compute node restarts.

Before bringing the system online, ensure all infrastructure components are operational: power shelves are energized, top-of-rack switches are active, and NMX-M services are available. You can verify these components are operational through Base Command Manager (BCM).

BCM manages all system components. Use BCM to power on the NVLink switch trays first, followed by the compute trays. Each NVLink switch tray boots with rack-specific configuration, enabling direct GPU communication across all compute trays via NVLink.

After the switch trays are operational, power on the compute trays. As they boot, BCM confirms that the latest updates and configurations are installed in the operating system. The compute trays establish communication with the NVLink switch trays and other resources such as storage and additional compute trays.

Power operations are orchestrated through NVIDIA Mission Control. Refer to the [Administration Guide](#) for a complete list of available system operations.

6.2. Operating System Updates

The operating system comes pre-installed on each tray but is managed by Base Command Manager. When a compute tray boots, it checks for updates over the network. If updates are available, they are installed before booting; otherwise, the tray boots quickly from local storage. This ensures each compute tray boots with the correct operating system and latest configuration.

You can install additional software and system configurations directly to the software images on the Base Command Manager head node. These changes become persistent once assigned to a specific compute tray, providing a single point of management for all operating systems needed in the cluster.

For details on customizing software images configured to boot on system trays, refer to the *NVIDIA Mission Control Administration Guide*.

6.3. Firmware Updates

Compute and switch trays require periodic firmware updates. Firmware update procedures are released with specific instructions for each release, as different components may require specific actions. Not all components need updates in every release, so always review the firmware release notes for the complete recipe (firmware packages and version numbers).

While firmware can be applied to individual components, it is typically released as a recipe to update all applicable components simultaneously. NVIDIA Mission Control provides features to perform firmware updates efficiently instead of manually updating components one at a time.

6.4. Health Checks

NVIDIA Mission Control continuously monitors system health, verifying the functionality of compute and switch trays. It also monitors critical factors such as potential system leaks that may require immediate operator attention.

Health check issues are highlighted on the NVIDIA Mission Control dashboards, allowing system administrators to investigate the source of problems. Issues may stem from software misconfiguration, hardware problems, or data center conditions such as air temperature or liquid cooling system issues.

6.4.1. Redfish Commands for Compute Tray

The following Redfish commands can be used to manage power operations for compute trays. You can use these commands in two ways:

1. **Using environment variables:** Set the BMC IP address as an environment variable before running the command (replace the IP address with your BMC's IP address):

```
export bmcip="192.168.1.100"
```

Then run the `curl` commands in the following examples.

2. **Manual substitution:** Alternatively, you can manually replace `${bmcip}` with your BMC's IP address in each command.

The following examples use the environment variable approach. Replace the example credentials with your BMC credentials.

For advanced troubleshooting and support, refer to the [Debug Log Collection](#) section at the end of this document.

6.4.1.1 Power Control Operations

This section provides commands for remotely controlling host power states and behaviors using Redfish and `curl`.

6.4.1.1.1 Virtual A/C Cycle

Simulates a power drop (like pulling and reinserting the power cord) without physically disconnecting the power.

```
curl -k -u "root:openBmc" \
  -H "Content-Type: application/json" \
  -X POST \
  -d '{"ResetType": "AuxPowerCycleForce"}' \
  https://${bmcip}/redfish/v1/Chassis/BMC_0/Actions/Oem/NvidiaChassis.
  ↪AuxPowerReset
```

6.4.1.1.2 Graceful Shutdown

Initiates a clean shutdown of the host system, allowing the operating system to properly terminate all services and processes.

```
curl -s -k -u "root:openBmc" \
  -X POST \
  -d '{"ResetType": "GracefulShutdown"}' \
  https://${bmcip}/redfish/v1/Systems/System_0/Actions/ComputerSystem.Reset
```

6.4.1.1.3 Force Power Off

Immediately cuts power to the host without waiting for the OS to shut down.

```
curl -s -k -u "root:openBmc" \
  -X POST \
  -d '{"ResetType": "ForceOff"}' \
  https://${bmcip}/redfish/v1/Systems/System_0/Actions/ComputerSystem.Reset
```

6.4.1.1.4 Power On Host

Turns the host on.

```
curl -s -k -u "root:openBmc" \
  -X POST \
  -d '{"ResetType": "On"}' \
  https://${bmcip}/redfish/v1/Systems/System_0/Actions/ComputerSystem.Reset
```

6.4.1.1.5 Power Cycle Host

Performs a full power cycle (off and then back on).

```
curl -s -k -u "root:openBmc" \
  -X POST \
  -d '{"ResetType": "PowerCycle"}' \
  https://${bmcip}/redfish/v1/Systems/System_0/Actions/ComputerSystem.Reset
```

6.4.1.1.6 Set Power Restore Policy: Always Off

After power loss, the system will remain off when power is restored.

```
curl -s -k -u "root:openBmc" \
  -X PATCH \
```

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```
-d '{"PowerRestorePolicy": "AlwaysOff"}' \
https://$${bmcip}/redfish/v1/Systems/System_0
```

6.4.1.1.7 Set Power Restore Policy: Last State

After power loss, the system will return to its previous state (on or off) when power is restored.

```
curl -s -k -u "root:openBmc" \
-X PATCH \
-d '{"PowerRestorePolicy": "LastState"}' \
https://$${bmcip}/redfish/v1/Systems/System_0
```

6.4.1.1.8 Set Power Restore Policy: Always On

After power loss, the system will automatically power on when power is restored.

```
curl -s -k -u "root:openBmc" \
-X PATCH \
-d '{"PowerRestorePolicy": "AlwaysOn"}' \
https://$${bmcip}/redfish/v1/Systems/System_0
```

6.4.1.2 HMC/BMC Reset Operations

This section provides commands for remotely resetting the Host Management Controller (HMC) and BMC using Redfish and `curl`. These operations are useful for troubleshooting, applying firmware updates, or recovering from certain system faults. Use these commands with caution, as some reset types may impact system availability or trigger a host restart.

Note

Use these reset commands with care. For most scenarios, prefer a graceful restart. Forced resets should only be used if the controller is unresponsive or as directed by support documentation.

6.4.1.2.1 HMC Graceful Restart

Performs a controlled restart of the HMC, allowing it to shut down services cleanly before rebooting. This is the preferred method for most maintenance scenarios.

```
curl -k -u "root:openBmc" \
-X POST \
-d '{"ResetType": "GracefulRestart"}' \
https://$${bmcip}/redfish/v1/Managers/HGX_BMC_0/Actions/Manager.Reset
```

6.4.1.2.2 HMC Force Restart

Immediately restarts the HMC without waiting for services to shut down gracefully.

Warning

This is not recommended except in emergency situations, as it may lead to a host restart or data loss.

```
curl -k -u "root:openBmc" \
  -X POST \
  -d '{"ResetType": "ForceRestart"}' \
  https://${bmcip}/redfish/v1/Managers/HGX_BMC_0/Actions/Manager.Reset
```

6.4.1.2.3 BMC Reset

Performs a forced reset of the BMC. This operation is typically used after firmware updates or if the BMC becomes unresponsive.

```
curl -k -u "root:openBmc" \
  -X POST \
  -d '{"ResetType": "ForceRestart"}' \
  https://${bmcip}/redfish/v1/Managers/BMC_0/Actions/Manager.Reset
```

6.4.1.3 Firmware and Image Management

This section provides Redfish and curl commands for managing firmware updates and querying firmware image information on the compute tray. These operations are essential for keeping your system up to date and verifying the integrity and type of installed firmware.

6.4.1.3.1 Firmware Bundle Update

Uploads and applies a firmware bundle to the system. Set FILENAME to the path of the firmware bundle. The following command uses a multipart form upload to send the update file to the BMC.

```
curl -k -u "root:openBmc" --header 'Expect:' --location --request POST \
  "https://${bmcip}/redfish/v1/UpdateService/update-multipart" \
  -F 'UpdateParameters={"Targets":["/redfish/v1/Chassis/HGX_Chassis_0"],' \
  -F '"ForceUpdate":true};type=application/json' \
  -F UpdateFile="@${FILENAME}"
```

6.4.1.3.2 Get Firmware Versions (with expand)

Retrieves detailed firmware version information for all components, using the \$expand query with \$levels=1 to include nested inventory data. The dollar signs are escaped (\\$) so the shell does not treat them as variables.

```
curl -k -u "root:openBmc" -X GET \
  "https://${bmcip}/redfish/v1/UpdateService/FirmwareInventory?\$expand=.(\" \
  -F '$levels=1)' \
  | jq -r '.Members[] | [.Id, .Version] | @tsv' | column -t
```

6.4.1.3.3 Check BMC Firmware Signing Type

Checks the signing type of the BMC firmware image, which helps confirm the authenticity and security of the installed firmware.

Note

Replace <active image slot> with the active slot ID. To find it, read the ActiveSlotId property from /redfish/v1/Chassis/ERoT_BMC_0/Oem/NvidiaRoT/RoTProtectedComponents/BMC_0.

```
curl -k -u "root:openBmc" -X GET \
  "https://${bmcip}/redfish/v1/Chassis/ERoT_BMC_0/Oem/NvidiaRoT/
  ↪RoTProtectedComponents/BMC_0/ImageSlots/<active image slot>" \
  | grep SigningType
```

6.4.1.3.4 Check HMC Firmware Signing Type

Checks the signing type of the HMC firmware image.

Note

Replace <active image slot> with the active slot ID. To find it, read the ActiveSlotId property from /redfish/v1/Chassis/HGX_ERoT_BMC_0/Oem/NvidiaRoT/RoTProtectedComponents/HGX_BMC_0.

```
curl -k -u "root:openBmc" -X GET \
  "https://${bmcip}/redfish/v1/Chassis/HGX_ERoT_BMC_0/Oem/NvidiaRoT/
  ↪RoTProtectedComponents/HGX_BMC_0/ImageSlots/<active image slot>" \
  | grep SigningType
```

6.4.1.4 Write Protection

This section provides commands for managing hardware write protection on the system using Redfish and curl. Write protection helps prevent unauthorized changes to critical system components.

6.4.1.4.1 Enabling Global Write Protect

Enables hardware write protection for the system.

```
curl -s -k -u 'root:openBmc' -X PATCH \
  -d '{ "Oem": {"Nvidia": {"HardwareWriteProtectEnable": true}}}' \
  https://${bmcip}/redfish/v1/Chassis/Chassis_0
```

6.4.1.4.2 Disabling Global Write Protect

Disables hardware write protection for the system.

```
curl -s -k -u 'root:openBmc' -X PATCH \
  -d '{ "Oem":{"Nvidia":{"HardwareWriteProtectEnable":false}}}' \
  https://${bmcip}/redfish/v1/Chassis/Chassis_0
```

6.4.1.4.3 Reading Global Write Protect

Reads the current hardware write protection status.

```
curl -s -k -u 'root:openBmc' -X GET \
  https://${bmcip}/redfish/v1/Chassis/Chassis_0 | jq '.Oem.Nvidia.
  ↪HardwareWriteProtectEnable'
```

Note

Enabling write protection is recommended after firmware updates or configuration changes to prevent accidental or unauthorized modifications.

6.4.1.5 Account Management

This section provides commands for managing user accounts on the BMC using Redfish and curl. You can create new accounts or update passwords for existing accounts.

6.4.1.5.1 Creating a New Account

Creates a new user account with the specified username, password, and role.

```
curl -s -k -u "root:openBmc" \
  -X POST \
  -H "Content-Type: application/json" \
  -d '{"UserName": "newuser", "Password": "newPassword", "RoleId":
  ↪"Operator"}' \
  https://${bmcip}/redfish/v1/AccountService/Accounts
```

Note

You can set RoleId to Administrator, Operator, or ReadOnly based on the required access level for the user.

6.4.1.5.2 Updating Password for an Existing Account

Updates the password for an existing account, such as the root user.

```
curl -k -X PATCH -H "Content-Type: application/json" \
  -u root:CURRENT_PASSWORD \
  https://${bmcip}/redfish/v1/AccountService/Accounts/root \
  --data '{"Password": "NEW_PASSWORD"}'
```

Note

Replace CURRENT_PASSWORD with the current password for the account, and NEW_PASSWORD with the desired new password.

6.4.1.6 Event and Log Management

This section provides commands for clearing event logs and managing system logs using Redfish and curl. These operations help maintain log clarity and support troubleshooting.

6.4.1.6.1 Clear HMC Event Log

Clears all entries from the HMC event log. Use this command after reviewing or archiving log data to maintain log clarity and free up space.

```
curl -k -u "root:openBmc" -X POST \
  https://${bmcip}/redfish/v1/Systems/HGX_Baseboard_0/LogServices/EventLog/
  ↪Actions/LogService.ClearLog
```

6.4.1.6.2 Clear BMC Event Log

Removes all entries from the BMC event log. This is useful for resetting the log after resolving issues or before starting new troubleshooting steps.

```
curl -k -u "root:openBmc" -X POST \
  https://${bmcip}/redfish/v1/Systems/System_0/LogServices/EventLog/
  ↪Actions/LogService.ClearLog
```

6.4.1.7 Reset and Factory Defaults

This section provides commands for restoring system components to their factory default state. These operations are useful for recovery, troubleshooting, or preparing a system for redeployment.

6.4.1.7.1 Reset BMC to Factory Defaults

Restores the BMC to its original factory settings. All user configurations and custom settings will be lost. Use this if the BMC is unresponsive or you need to clear all settings.

```
curl -k -u "root:openBmc" -X POST \
  https://${bmcip}/redfish/v1/Managers/BMC_0/Actions/Manager.
  ↪ResetToDefaults \
  -d '{"ResetType": "ResetAll"}'
```

6.4.1.7.2 Reset HMC to Factory Defaults

Resets the Host Management Controller (HMC) to its factory default configuration. This will remove all custom settings and user data from the HMC.

```
curl -k -u "root:openBmc" -X POST \
  https://${bmcip}/redfish/v1/Managers/HGX_BMC_0/Actions/Manager.
```

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```
→ResetToDefaults \
  -d '{"ResetType": "ResetAll"}'
```

6.4.1.7.3 Clear the eMMC (This Will Clear the Journal)

Securely erases the eMMC storage, including the system journal. Use this operation with caution, as it will permanently delete all data stored on the eMMC.

```
curl -k -u "root:openBmc" -X POST \
  https://${bmcip}/redfish/v1/Managers/HGX_BMC_0/Actions/Oem/eMMC.
→SecureErase
```

6.4.1.7.4 Reset SBIOS to Defaults

Restores the system BIOS (SBIOS) settings to their factory defaults. This can help resolve configuration issues or prepare the system for a fresh deployment.

```
curl -k -u "root:openBmc" -X POST \
  https://${bmcip}/redfish/v1/Systems/System_0/Bios/Actions/Bios.ResetBios
```

6.4.1.8 Serial Over LAN and Host Console Access

This section provides commands for accessing the host system console remotely using Serial Over LAN (SOL) or SSH. These methods are useful for troubleshooting, remote management, and system recovery.

6.4.1.8.1 IPMI - Host SOL Access

Establishes a Serial Over LAN (SOL) session to the host using IPMI. This allows you to interact with the system console remotely, even if the OS is not running.

```
ipmitool -C 17 -H ${bmcip} -U root -P OpenBmc -I lanplus sol activate
```

To exit the SOL session, use ~. (tilde followed by a period).

6.4.1.8.2 SSH - Host SOL Access

Provides SSH access to the host's SOL interface. This is an alternative to IPMI SOL for remote console access.

```
ssh root@${bmcip} -p 2200
```

6.4.1.9 Network Controls

This section provides commands for managing network protocol access on the BMC, including enabling or disabling IPMI and understanding credential behavior after a factory reset.

6.4.1.9.1 Disable IPMI

Disables the IPMI protocol on the BMC. This is recommended for enhanced security if IPMI remote management is not required.

```
curl -s -k -u 'root:openBmc' -X PATCH \
  https://${bmcip}/redfish/v1/Managers/BMC_0/NetworkProtocol \
  -d '{ "IPMI": {"ProtocolEnabled": false} }'
```

6.4.1.10 BMC Credentials After Factory Reset

After a BMC factory reset, the default username and password are admin/admin. You will be prompted to change the username and password at the first login to the system. Any BMC factory reset will restart this sequence.

Note

For security, always change the default credentials immediately after a factory reset.

6.4.1.11 Debug Log Collection

When troubleshooting complex issues or working with NVIDIA support, it is often necessary to collect detailed debug logs from the compute tray. The preferred method for capturing and packaging these logs is to use the NVDEBUG tool, which gathers all relevant system, firmware, and event logs into a single archive for analysis.

6.4.1.11.1 Capturing Debug Logs with NVDEBUG

1. **Access the BMC or host system** where NVDEBUG is available. Ensure you have the necessary permissions to run diagnostic tools.
2. **Run the NVDEBUG tool** according to your system's documentation. The typical command is:

```
nvdebug --collect --output /path/to/save/debug-logs.tar.gz
```

Replace `/path/to/save/debug-logs.tar.gz` with your desired output location.

3. **Transfer the log archive** to your support contact or upload it as instructed by NVIDIA support.

Note

NVDEBUG automatically collects a comprehensive set of logs, including BMC event logs, firmware versions, hardware inventory, and system health data. This is the recommended approach for efficient and complete log collection.

Chapter 7. Rack Reboot Sequence

To ensure that software is in a known-correct state, running a cold or warm reboot sequence may be required. This topic describes the general reboot and verification process. However, to safeguard system integrity, use NVIDIA Mission Control to perform the reboot sequence. Refer to the [Mission Control documentation](#) for more information.

7.1. Cold Reboot Sequence

The cold rack reboot sequence should be executed for the following use cases:

- ▶ **After** the initial software installation and setup and **before** running a workload for the first time.
- ▶ **After** firmware upgrades and **before** re-running workloads.
- ▶ **Before** running the full rack diagnostics.
- ▶ Maintenance or service operations, including compute tray, switch tray, trunk link, or cable cartridge replacement.

Use the method that is most appropriate to complete the following procedure. You need the IP addresses of all BMCs, hosts, and power shelves.

Note

The sequence diverges at step 9 for NMX-C provisioning, depending on whether you plan to run a multi-node workload or L11 diagnostics. The diagnostics start the NMX-C services during deployment. For regular software workloads, you must start these services manually after a cold reboot.

1. Turn off AC power to all power shelves in the rack to turn off all PSUs.
The shelves can be powered off in parallel.
2. Wait three to five minutes for the capacitors in all PSUs to discharge.
3. Ping all compute/switch tray BMCs and OS IPs to ensure that they are not reachable on the network.

Note

Steps 1-3 are not applicable when you power up the rack for the first time.

4. Turn on AC power to all power shelves in the rack to turn on all PSUs.

The shelves can be powered on in parallel.

5. Wait for two minutes for the compute tray and switch tray BMCs to power up.
6. Ping all compute/switch tray BMC IPs to ensure they are reachable on the network.
7. Allow the switch trays to continue booting to NVOS.
8. Wait for two more minutes for the switch trays to boot to NVOS.
9. To provision the switch tray, complete the following tasks:
 - ▶ To run the L11 diagnostics, log in to each switch tray and verify the system health check (refer to [Switch Tray Health Check](#)).
 - ▶ To run a multi-node workload:
 1. Manually repeat the entire cluster provisioning (refer to [Cluster Provisioning flow](#)).
 2. Set up and start the NMX-C services followed by the health checks (refer to [Switch Tray Verification](#)).
10. Power on all compute nodes from the compute tray BMC.
11. Wait five minutes.
12. Ping the compute nodes to ensure that they are reachable.
13. Run the verification checks for the compute tray (refer to [Post-reboot Verification](#) for more information).

7.2. Warm Reboot Sequence

The cold rack reboot sequence takes a long time. For workarounds to certain issues that are usually documented in the associated release notes, the following warm rack reboot procedure ensures that the GPUs, NVLinks, and the switch ASICs come up in the correct state.

1. Power off all compute trays through the BMC using IPMI, Redfish APIs, or other supported APIs. Here is an example using IPMI commands:

```
$ ipmitool chassis power off
$ ipmitool power off
```

2. Stop the NMX-C service on the switch node that is running the service.

```
$ nv action stop cluster app nmx-controller
```

3. Start the NMX-C on the selected switch node.

```
$ nv action start cluster app nmx-controller
```

The cluster must already be in the enabled state before you restart the NMX-C.

4. Verify that NMX-C is running and its status is ok.

```
$ nv show cluster apps running
```

Name	Status	Reason	Additional Information
nmx-controller	ok		CONTROL_PLANE_STATE_CONFIGURED
nmx-telemetry	ok		

5. Power up all the compute trays through BMC using IPMI, Redfish APIs, or other supported APIs. Here is an example using IPMI commands:

```
ipmitool chassis power on  
ipmitool power on
```

6. Run all the verification checks for the compute tray (refer to [Post-reboot Verification](#) for more information).

7.3. Post-reboot Verification

Complete the following verification checks when a GPU is reset, the compute tray is rebooted, or the entire rack is cold or warm rebooted. For detailed instructions on performing each verification step, refer to the [MNNVL User Guide Verification section](#).

1. Verify that `nvidia-persistenced` is running and is in a good state.
Refer to [Checking the nvidia-persistenced Service](#) for more information.
2. Verify that the `nvidia-imex` service is active and running.
Refer to [Checking the nvidia-imex Service](#) for more information.
3. Verify that all the links are active.
Refer to [Checking the NVLink status](#) for more information.
4. Verify fabric state to make sure all GPUs have a Completed state and a Success status.
Refer to [Checking the fabric health](#) for more information.
5. Verify peer-to-peer topology to ensure all GPUs show OK.
6. If a GPU does not show OK, reset the GPU and return to step 1.
Refer to [Checking the p2p topology](#) for details.

Chapter 8. System Health Check

NVIDIA provides customers a diagnostics and management tool called NVIDIA System Management, or NVSM. The `nvsm` command can be used to determine the system's health, identify component issues and alerts, or run a stress test to ensure all components are in working order while under load.

The following instructions show how to perform a health check on a DGX Vera Rubin NVL72 rack system.

1. Establish an SSH connection to the rack.
2. Run a basic system check.

```
sudo nvsm show health
```

3. Verify that the output summary shows that all checks are Healthy and that the overall system status is Healthy.

For more information about the `nvsm` command, refer to the [NVIDIA System Management User Guide](#).

Chapter 9. Compliance

The NVIDIA DGX™ Vera Rubin NVL72 Server is compliant with the regulations listed in this section.

9.1. United States

Federal Communications Commission (FCC) FCC Marking (Class A)

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including any interference that may cause undesired operation of the device.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

California Department of Toxic Substances Control: Perchlorate Material - special handling may apply. See www.dtsc.ca.gov/perchlorate.

9.2. United States/Canada

TÜV Rheinland of North America is accredited as a Nationally Recognized Testing Laboratory (NRTL), by OSHA (The Occupational Safety and Health Administration) in the United States, and as a Product Certification Body by SCC (Standards Council of Canada) in Canada. Refer to <https://www.tuv.com/usa/en/ctuvus-certification.html>

cTUVus Mark



9.3. Canada

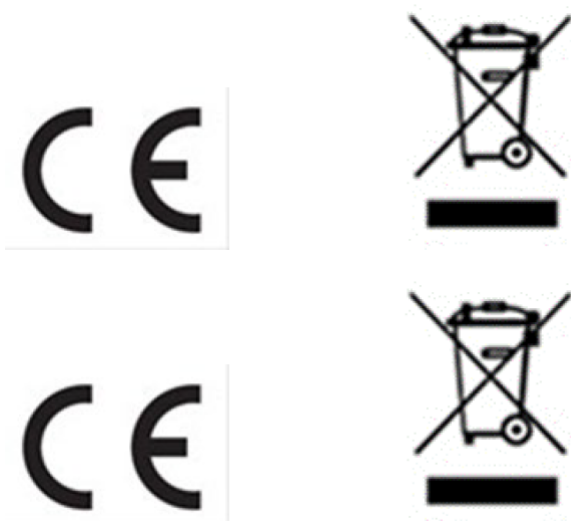
Innovation, Science and Economic Development Canada (ISED) CAN ICES-3(A)/NMB-3(A)

The Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulation.

Cet appareil numérique de la class A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

9.4. CE

European Conformity; Conformité Européenne (CE)



This is a Class A product. In a domestic environment this product may cause radio frequency interference in which case the user may be required to take adequate measures.

This device bears the CE mark in accordance with Directive 2014/53/EU. This device complies with the following Directives:

- ▶ EMC Directive A, I.T.E Equipment.
- ▶ Low Voltage Directive for electrical safety.
- ▶ RoHS Directive for hazardous substances.
- ▶ Energy-related Products Directive (ErP).

The full text of EU declaration of conformity is available at the following URL: <http://www.nvidia.com/support>

A copy of the Declaration of Conformity to the essential requirements may be obtained directly from NVIDIA GmbH (Bavaria Towers – Blue Tower, Einsteinstrasse 172, D-81677 Munich, Germany).

9.5. Australia and New Zealand

Australian Communications and Media Authority



This product meets the applicable EMC requirements for Class A, I.T.E equipment.

9.6. Brazil

INMETRO



9.7. Japan

Voluntary Control Council for Interference (VCCI)



この装置は、クラスA機器です。この装置を住宅環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

VCCI — A



この装置は、クラスA機器です。この装置を住宅環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

VCCI — A

This is a Class A product.

In a domestic environment this product may cause radio interference, in which case the user may be required to take corrective actions. VCCI-A.

2008年、日本における製品含有表示方法、JISC0950が公示されました。製造事業者は、2006年7月1日以降に販売される電気・電子機器の特定化学物質の含有に付きまして情報提供を義務付けられました。製品の部材表示に付きましては、以下をご覧ください。¶

A Japanese regulatory requirement, defined by specification JIS C 0950, 2008, mandates that manufacturers provide Material Content Declarations for certain categories of electronic products offered for sale after July 1, 2006.¶

To view the JIS C 0950 material declaration for this product, visit¶

¶

Japan RoHS Material Content Declaration

日本工業規格 JIS C¶
0950:2008により、2006年7月1日以降に販売される特定分野の電気および電子機器について、製造者による含有物質の表示が義務付けられます。¶

機器名称: リノバD

主な分類□	特定化学物質記号□					
	Pb□	Hg□	Cd□	Cr(VI)□	PBB□	PBDE□
筐体□	除外項目□	0□	0□	0□	0□	0□
プリント基板□	除外項目□	0□	0□	0□	0□	0□
プロセッサ□	除外項目□	0□	0□	0□	0□	0□
マザーボード□	除外項目□	0□	0□	0□	0□	0□
電源□	除外項目□	0□	0□	0□	0□	0□
システムメモリ□	除外項目□	0□	0□	0□	0□	0□
ハードディスクドライブ□	除外項目□	0□	0□	0□	0□	0□
機械部品 (ファン、ヒートシンク、ベゼル、)□	除外項目□	0□	0□	0□	0□	0□
ケーブル/コネクタ□	除外項目□	0□	0□	0□	0□	0□
はんだ付け材料□	0□	0□	0□	0□	0□	0□
フラックス、クリームはんだ、ラベル、その他消耗品□	0□	0□	0□	0□	0□	0□

注: ¶

1. 「0」は、特定化学物質の含有率が日本工業規格 JIS C 0950:2008 に記載されている含有率基準値より低いことを示します。¶

2. 「除外項目」は、特定化学物質が含有マークの除外項目に該当するため、特定化学物質について、日本工業規格 JIS C 0950:2008 に基づく含有マークの表示が不要であることを示します。¶

¶

3. 「0.1wt%超」または「0.01wt%超」は、特定化学物質の含有率が日本工業規格 JIS C 0950:2008 に記載されている含有率基準値を超えていることを示します。□

A Japanese regulatory requirement, defined by specification JIS C 0950: 2008, mandates that manufacturers provide Material Content Declarations for certain categories of electronic products offered for sale after July 1, 2006.						
Product Model Number: P3687 Server						
Major Classification	Symbols of Specified Chemical Substance					
	Pb	Hg	Cd	Cr(VI)	PBB	PBDE
Chassis	Exempt	0	0	0	0	0
PCA	Exempt	0	0	0	0	0
Processor	Exempt	0	0	0	0	0
Motherboard	Exempt	0	0	0	0	0
Power supply	Exempt	0	0	0	0	0

System memory	Exempt	0	0	0	0	0
Hard drive	Exempt	0	0	0	0	0
Mechanical parts (fan, heat sink, bezel...)	Exempt	0	0	0	0	0
Cables/Connectors	Exempt	0	0	0	0	0
Soldering material	0	0	0	0	0	0
Flux, Solder Paste, label and other consumable materials	0	0	0	0	0	0
Notes: 1. "0" indicates that the level of the specified chemical substance is less than the threshold level specified in the standard, JIS C 0950:2008. 2. "Exempt" indicates that the specified chemical substance is exempt from marking and it is not required to display the marking for that specified chemical substance per the standard, JIS C 0950: 2008. 3. "Exceeding 0.1wt%" or "Exceeding 0.01wt%" is entered in the table if the level of the specified chemical substance exceeds the threshold level specified in the standard, JIS C 0950: 2008.						

9.8. South Korea

Korean Agency for Technology and Standards (KATS)



R-R-WT1-P3687

A급 기기 (업무용 방송통신기자재)	이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.
------------------------	---

Class A Equipment (Industrial Broadcasting & Communication Equipment). This equipment Industrial (Class A) electromagnetic wave suitability equipment and seller or user should take notice of it, and this equipment is to be used in the places except for home.

Korea RoHS Material Content Declaration

확인 및 평가 양식은 제품에 포함 된 유해 물질의 허용 기준의 준수에 관한			
문 준비	상호:	엔비디아홀딩스 리미티드(영입소)	법인등록번호
	대표자성명	카렌테레사번즈	사업자등록번호:
	주소	서울특별시 강남구 영동대로 511, 2101호 (삼성동,	
제품 내용			
제품의 종류	해당없음	제품명(규격)	해당없음
세부모델명(번호)	해당없음	제품출시일	해당없음
제품의 종량	해당없음	제조, 수입업자	엔비디아
엔비디아의 그래픽 카드제품은 전기 전자제품 및 자동차의 자원순환에 관한 법률 시행령 제 11조 제 1항에 의거한 별 시행령규칙 제 3조에따른 유해물질 함유 기준을 확인 및 평가한 결과, 이를 준수하였음을 공표합니다.			
구비서류 : 없음 작성방법			
① 제품의 종류는 “전기 전자제품 및 자동차의 자원순환에 관한 법률 시행령” 제 8조 제 1항 및 제 2항에 따른 품목별로 구분하여 기재합니다.			
② 전기 전자 제품의 경우 모델명 (번호), 자동차의 경우, 차량관리번호를 기재합니다.			
③ 해당제품의 제조업자 또는 수입업자를 기재합니다.			

Confirmation and Evaluation Form Concerning the Adherence to Acceptable Standards of Hazardous Materials Contained in Products			
Statement Prepared by	Company Name:	Nvidia HongKong Holding Ltd.Korea branch	Corporate Identification Number:
	Name of Company Representative:	Karen Theresa Burns	Business Registration Number:
	Address	2788 San Tomas Expressway, Santa Clara, CA 95051	
Product Information			
Product Category:	N/A	Name of Product:	N/A
Detailed Product Model Name (Number):	N/A	Date of first market release:	N/A
Weight of Product:	N/A	Manufacturer and/or Importer:	NVIDIA Corporation
This is for publicly certify That NVIDIA Company has undergone the confirmation and evaluation procedures for the acceptable amounts of hazardous materials contained in graphic card according to the regulations stipulated in Article 3 of the 'Status on the Recycling of Electrical and Electronic Products, and Automobiles' and that company has graphic card adhered to the Enforcement Regulations of Article 11, Item 1 of the statute.			
Attachment: None			
* Preparing the Form			
① Please indicate the product category according to the categories listed in Article 8, Items 1 and 2 of the ' Enforcement Ordinance of the Statute on the Recycling of Electrical, Electronic and Automobile Materials'			
② For electrical and electronic products, please indicate the Model Name (and number). For automobiles, please indicate the Vehicle Identification Number.			
③ Please indicate the name of manufacturer and/or importer of the product.			

9.9. China

China Compulsory Certificate

No certification is needed for China. The NVIDIA DGX Vera Rubin NVL72 system is a server with power consumption greater than 1.3 kW.

China RoHS Material Content Declaration



产品中有毒物质的名称及含量

The Table of Hazardous Substances and their Content

根据中国《电器电子产品有害物质限制使用管理办法》

as required by China's Management Methods for Restricted of Hazardous Substances Used in Electrical and Electronic Products

部件名称 Parts	有害物质 Hazardous Substances					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴联苯醚 (PBDE)
机箱 Chassis	X	0	0	0	0	0
印刷电路部件 PCA	X	0	0	0	0	0
处理器 Processor	X	0	0	0	0	0
主板 Motherboard	X	0	0	0	0	0
电源设备 Power supply	X	0	0	0	0	0
存储设备 System memory	X	0	0	0	0	0
硬盘驱动器 Hard drive	X	0	0	0	0	0
机械部件 (风扇、散热器、面板等) Mechanical parts (fan, heat sink, bezel...)	X	0	0	0	0	0
线材/连接器 Cables/Connectors	X	0	0	0	0	0

焊接金属 Soldering material	0	0	0	0	0	0
助焊剂, 锡膏, 标签及其他耗材 Flux, Solder Paste, label and other consumable materials	0	0	0	0	0	0
本表格依据SJ/T 11364-2014 的规定编制 The table according to SJ/T 11364-2014 0 : 表示该有害物质在该部件所有均质材料中的含量均在GB/T 26572-2011 标准规定的限量要求以下。 0: Indicates that this hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in GB/T 26572-2011. X : 表示该有害物质至少在该部件的某一均质材料中的含量超出GB/T 26572-2011 标准规定的限量要求。 X: Indicates that this hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in GB/T 26572-2011. 此表中所有名称中含 "X" 的部件均符合欧盟 RoHS 立法。 All parts named in this table with an "X" are in compliance with the European Union's RoHS Legislation. Note: The referenced Environmental Protection Use Period Marking was determined according to normal operating use conditions of the product such as temperature and humidity.						

9.10. Taiwan

Bureau of Standards, Metrology & Inspection (BSMI)



警告使用者:
此為甲類資訊技術設備, 於居住環境中使用時, 可能會造成射頻擾動, 在此種情況下, 使用者會被要求採取某些適當的對策

報驗義務人:

香港商輝達香港控股有限公司台灣分公司 · 統一編號: 80022300

臺北市內湖區基湖路8號.

Taiwan RoHS Material Content Declaration

使用物质含有情况标示说明						
Declaration of the presence condition of the Restricted Substances Marking						
设备名称: DGX 服务器 Equipment Name: DGX Server						
部件 Parts	使用物质及其化学符号 Restricted substances and its chemical symbols					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
机箱 Chassis	-	0	0	0	0	0
印制电路组件 PCA	-	0	0	0	0	0
处理器 Processor	-	0	0	0	0	0
主板 Motherboard	-	0	0	0	0	0
电源设备 Power supply	-	0	0	0	0	0
存储设备 System memory	-	0	0	0	0	0
硬盘驱动器 Hard drive	-	0	0	0	0	0
机械部件 (风扇、散热器、轴承等) Mechanical parts (Fan, heat sink, bearing...)	-	0	0	0	0	0
线材/连接器 Cables/Connectors	-	0	0	0	0	0
焊接金属 Soldering material	0	0	0	0	0	0
助焊剂、锡膏、焊锡及其辅助材料 Flux, Solder Paste, solder and other consumable materials	0	0	0	0	0	0
说明 1: 0: 表示该物质在材料中的含量不超过参考值。 Note 1: 0: Indicates that the percentage content of the restricted substance does not exceed the percentage of reference value of presence.						
说明 2: -: 表示该物质在材料中的含量为零。 Note 2: -: Indicates that the restricted substance corresponds to the exemption.						
此表中所有名称中含“-”的部件均符合欧盟 RoHS 指令。 All parts named in this table with an “-” are in compliance with the European Union's RoHS Legislation.						
注: 环境标志使用限制由本设备制造商决定, 且符合正常工作温度及湿度条件。 Note: The reference Environmental Protection Use Period Marking was determined according to normal operating use conditions of the product such as temperature and humidity.						

9.11. Russia/Kazakhstan/Belarus

Customs Union Technical Regulations (CU TR)



This device complies with the technical regulations of the Customs Union (CU TR)

ТЕХНИЧЕСКИЙ РЕГЛАМЕНТ ТАМОЖЕННОГО СОЮЗА О безопасности низковольтного оборудования (ТР ТС 004/2011)

ТЕХНИЧЕСКИЙ РЕГЛАМЕНТ ТАМОЖЕННОГО СОЮЗА Электромагнитная совместимость технических средств (ТР ТС 020/2011)

Технический регламент Евразийского экономического союза “Об ограничении применения опасных веществ в изделиях электротехники и радиоэлектроники” (ТР ЕАЭС 037/2016)

Federal Agency of communication (FAC)

This device complies with the rules set forth by Federal Agency of Communications and the Ministry of Communications and Mass Media.

Federal Security Service notification has been filed.

9.12. Israel

SII

ודא שלמות ותקינות כבל החשמל והתקע אין להכניס או להוציא את התקע מרשת החשמל בידים רטובות . אין לפתוח את המכשיר , במקרה של בעיה כלשהי יש לפנות למעבדת השירות הקרובה. יש להרחיק את המכשיר מנוזלים . במקרה של ריח מוזר, רעשים שמקורם במכשיר , יש לנתקו מיידית מרשת החשמל ולפנות למעבדת שירות המכשיר מיועד לשימוש בתוך המבנה , ולא לשימוש חיצוני ולא לשימוש בסביבה לחה. אין לחתוך, לשבור, ולעקם את הכבל החשמל. אין להניח חפצים על הכבל החשמל או להניח לו להתחמם יתר על המידה , שכן עלול לגרום לנזק, דליקה או התחשמלות . יש להקפיד לחזק את התקן הניתוק במצב תפעולי מוכן לשימוש. אזהרה: אין להחליף את כבל הזינה בתחליפים לא מקוריים, חיבור לקוי עלול לגרום להתחשמלות המשתמש. בשימוש על כבל מאריך יש לוודא תקינות מוליך הארקה שבכבל .

9.13. India

Bureau of India Standards (BIS)



Authenticity may be verified by visiting the Bureau of Indian Standards website at <http://www.bis.gov.in>.

India RoHS Compliance Statement

This product, as well as its related consumables and spares, complies with the reduction in hazardous substances provisions of the “India E-waste (Management and Handling) Rule 2016”. It does not contain lead, mercury, hexavalent chromium, polybrominated biphenyls or polybrominated diphenyl ethers in concentrations exceeding 0.1 weight % and 0.01 weight % for cadmium, except for where allowed pursuant to the exemptions set in Schedule 2 of the Rule.

9.14. South Africa

South African Bureau of Standards (SABS)

This device complies with the following SABS Standards:

SANS 2332: 2017/CISPR 32:2015 SANS 2335:2018/ CISPR 35:2016

National Regulator of Compulsory Specification (NRCS)

This device complies with following standard under VC 8055:

SANS IEC 60950-1

9.15. Great Britain (England, Wales, and Scotland)

UK Conformity Assessed



This device complies with the following Regulations:

- ▶ SI 2016/1091: Electromagnetic Compatibility (EMC)
- ▶ SI 2016/1101: The Low Voltage Electrical Equipment (Safety)
- ▶ SI 2012/3032: The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (As Amended)

A copy of the Declaration of Conformity to the essential requirements may be obtained directly from NVIDIA Ltd. (100 Brook Drive, 3rd Floor Green Park, Reading RG2 6UJ, United Kingdom)

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