Smarter technology for all

Servicing the ThinkSystem N1380 Neptune enclosure and SC750 V4 Neptune node

Lenovo

ES72694

March 2025

Prerequisites

- ES42692 – Intel Xeon processor architecture for ThinkSystem V4 servers
- ES52678 – ThinkSystem tools for the ThinkSystem V4 platform
- ES41759C –ThinkSystem problem determination
- ES51757B – Introducing ThinkSystem tools
- ES52374 – ThinkSystem tools for the ThinkSystem V3 platform
- ES42714 – Servicing Neptune Liquid Cooling systems

Lenovo

Objectives

After completing the course, you will be able to:

- Describe the features and specifications of the ThinkSystem N1380 Neptune enclosure and the SC750 V4 Neptune node
- Identify the components of the ThinkSystem N1380 Neptune enclosure and the SC750 V4 Neptune node
- Describe the features and functions of the SMM3
- Describe the specific problem determination steps and explain how to troubleshoot issues with the ThinkSystem N1380 Neptune enclosure and the SC750 V4 Neptune node

ThinkSystem N1380 Neptune enclosure product overview

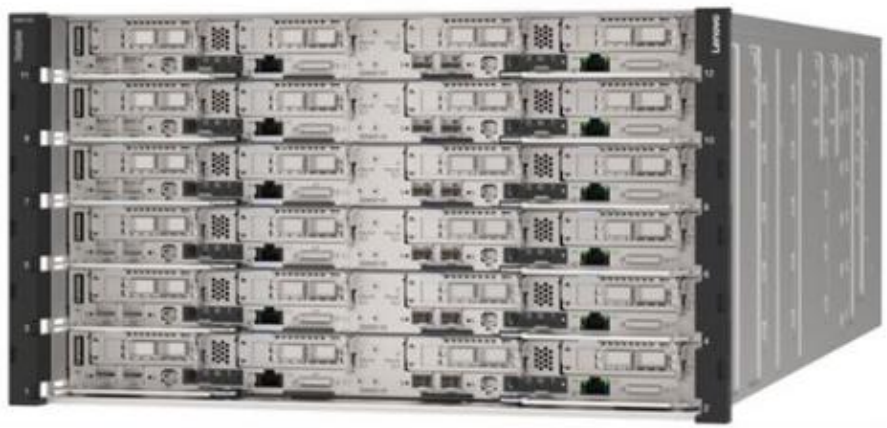
Product description and front, rear, and inside views

Lenovo

ThinkSystem N1380 Neptune enclosure overview

The 13U ThinkSystem N1380 Neptune enclosure (machine type: 7DDH) is a new generation of Lenovo Neptune™ Direct Water Cooling (DWC) chassis. It is designed to provide greater power capacities and water flow rates to support more powerful CPUs and GPUs in ThinkSystem Neptune V4 servers. (The only supported server currently available is the ThinkSystem SC750 V4 Neptune, which does not support GPUs. Other servers with GPU support are due to be launched in 2025.)
Each N1380 Neptune houses up to eight vertically installed ThinkSystem SC-Series Neptune trays. In the older DW612S DWC enclosure, DWC trays are installed horizontally.

A 13U N1380 enclosure with eight SC750 V4 trays



A 13U N1380 enclosure with eight SC750 V4 trays

Features and specifications

Features	Descriptions
Form factor	13U chassis designed for 19-inch rack cabinets Up to three chassis per rack
Technology	Compatible with the ThinkSystem SC-Series (the only supported server currently available is the ThinkSystem SC750 V4 Neptune) Support for general purpose and acceleration compute technologies from Intel, AMD, and NVIDIA
Power management	Advanced power monitoring, management, and power capping capabilities via Lenovo XClarity Energy Manager (LXEM) or Confluent open-source software, paired with Energy Aware Runtime (EAR) for energy optimization
System management	In-chassis SMM3 which supports daisy chaining and BMC pass-through and which integrates with XCC and Confluent
Front access	Compute trays Cable Management
Rear access	Water connection, power supply, and SMM3 Two RJ45 connectors on the SMM for XCC with daisy chain support, USB Type A for SMM FFDC log collection

Note: For the latest specifications, refer to the ThinkSystem N1380 product guide on Lenovo Press

Features and specifications

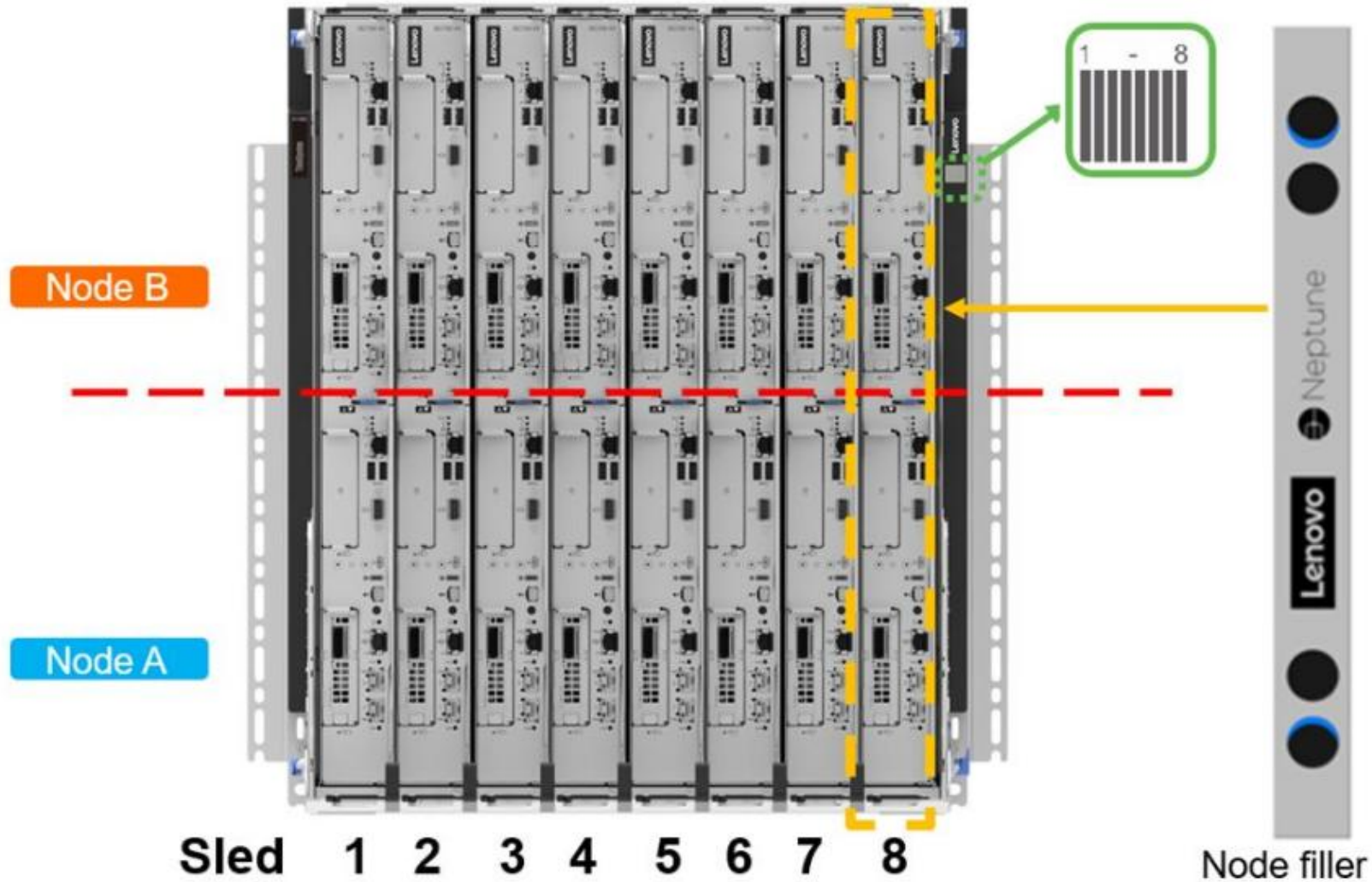
Features	Descriptions
management	(LXEM) or Confluent open-source software, paired with Energy Aware Runtime (EAR) for energy optimization
System management	In-chassis SMM3 which supports daisy chaining and BMC pass-through and which integrates with XCC and Confluent
Front access	Compute trays Cable Management
Rear access	Water connection, power supply, and SMM3 Two RJ45 connectors on the SMM for XCC with daisy chain support, USB Type A for SMM FFDC log collection
Power supply	Up to four hot-swap 15 kW Titanium power conversion stations (PCS) with fully balanced phases, N+1 redundancy Each PCS provides a 32 A, 380-480 V, 3-Phase IEC 60309 3P+N+E IP67 connection to data center power or two PCSs can share a 63 A, 380-480V, 3-Phase IEC 60309 3P+N+E IP67 connection to data center power
Cooling design	Direct water cooling takes place at the heat source with treated clean water supporting inlet temperature from dew point to up to 45°C. Servers are connected through blind mate quick connects to the manifold in the enclosure. Each enclosure provides an inlet and an outlet connection with dual-interlock FD83 ball valves.

Note: For the latest specifications, refer to the ThinkSystem N1380 product guide on Lenovo Press

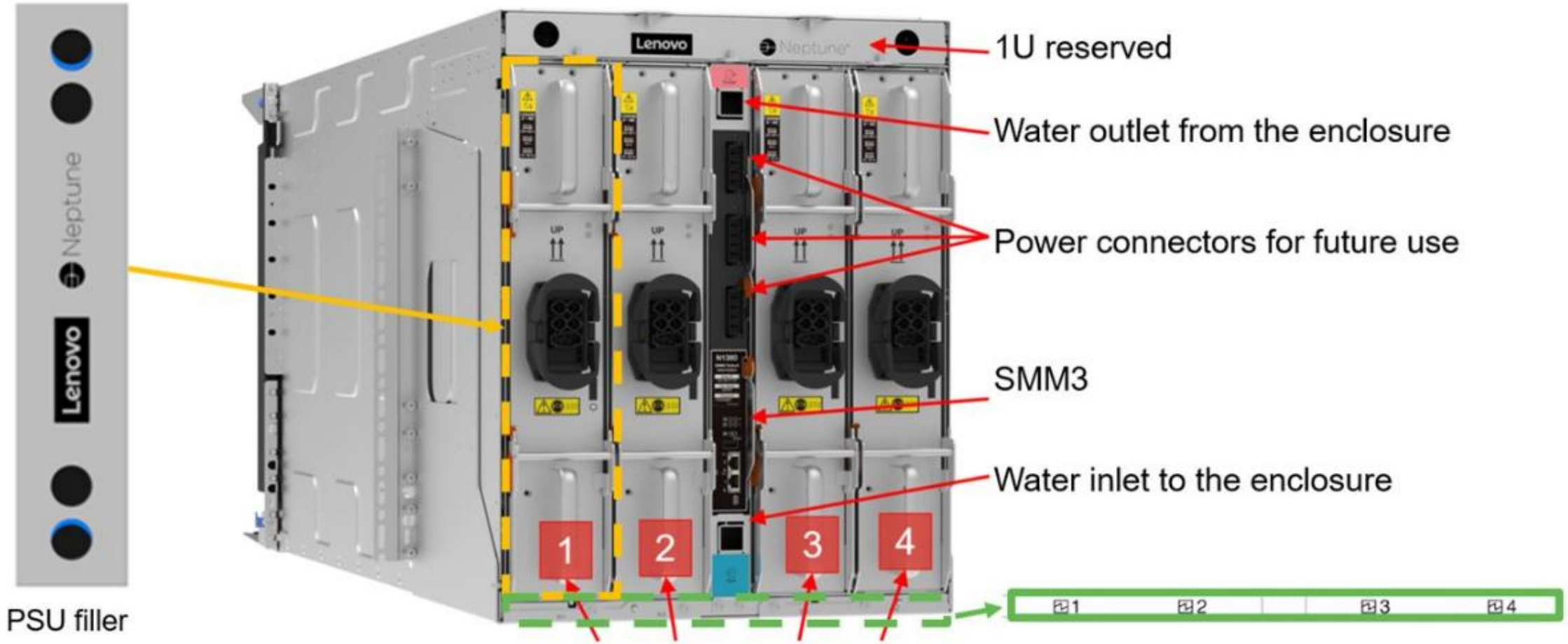
ThinkSystem N1380 Neptune enclosure front view

Front Side:

- Eight vertical 13U trays
  - Each tray contains two nodes
- Front side access

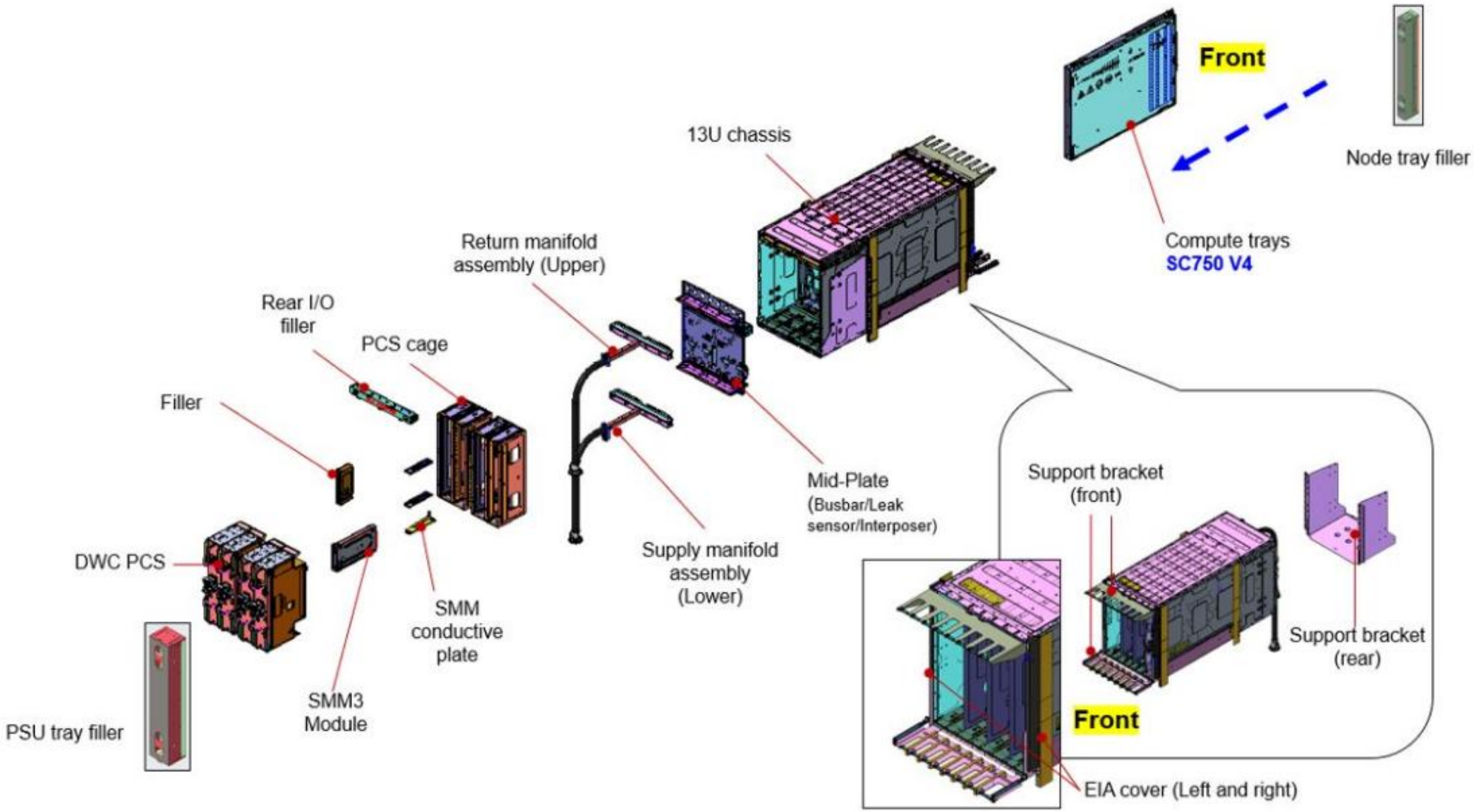


ThinkSystem N1380 Neptune enclosure rear view

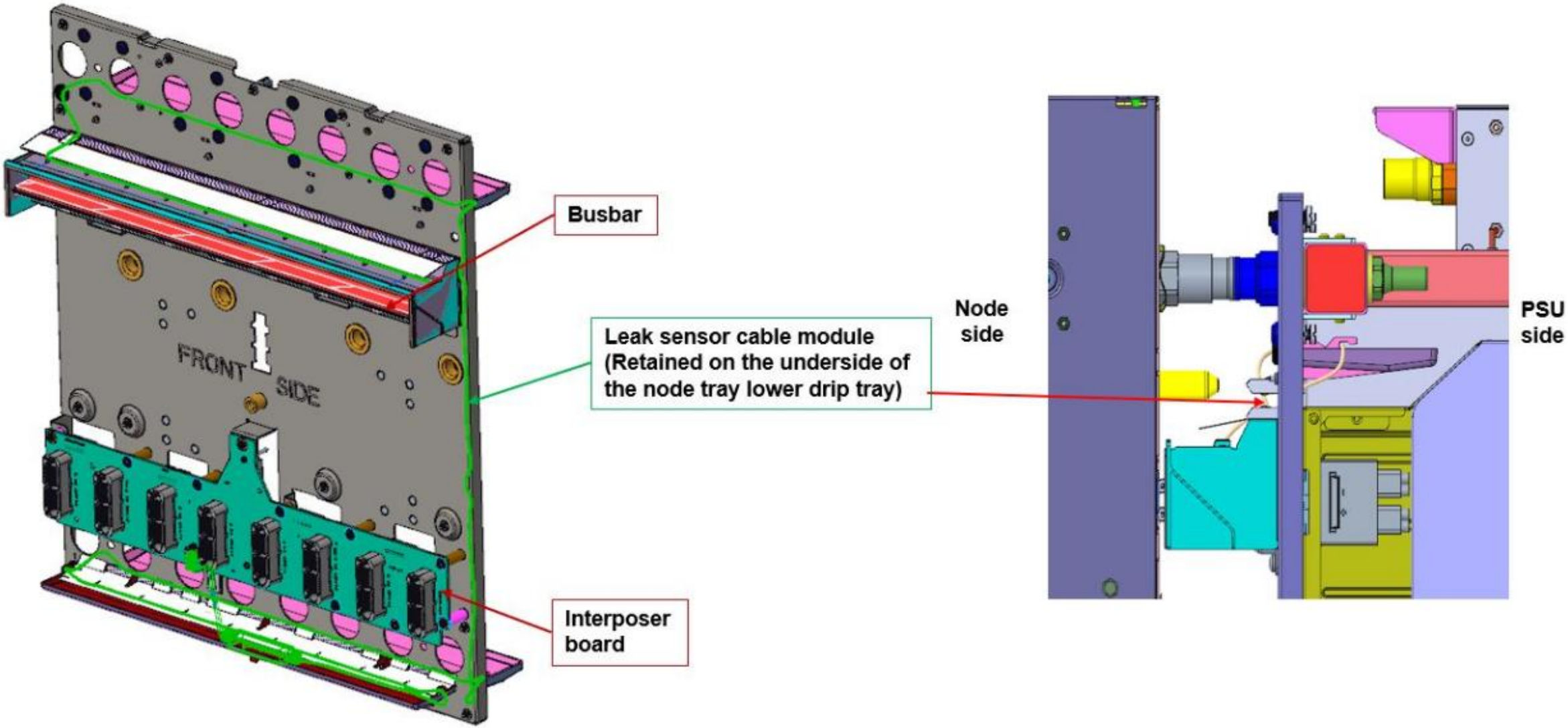


Four 15 kW watered-cooled power conversion stations (PCS)

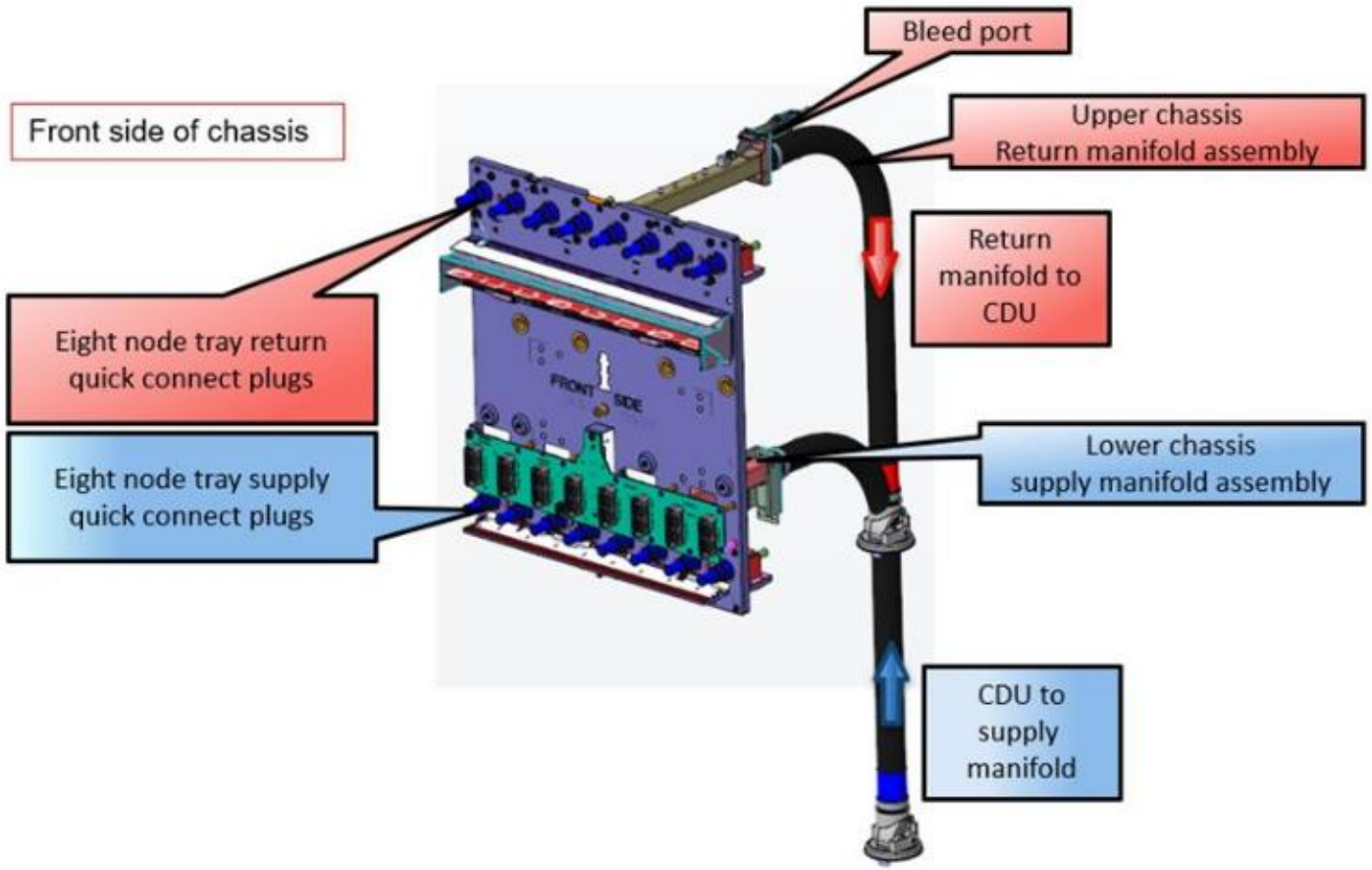
ThinkSystem N1380 Neptune enclosure inside view

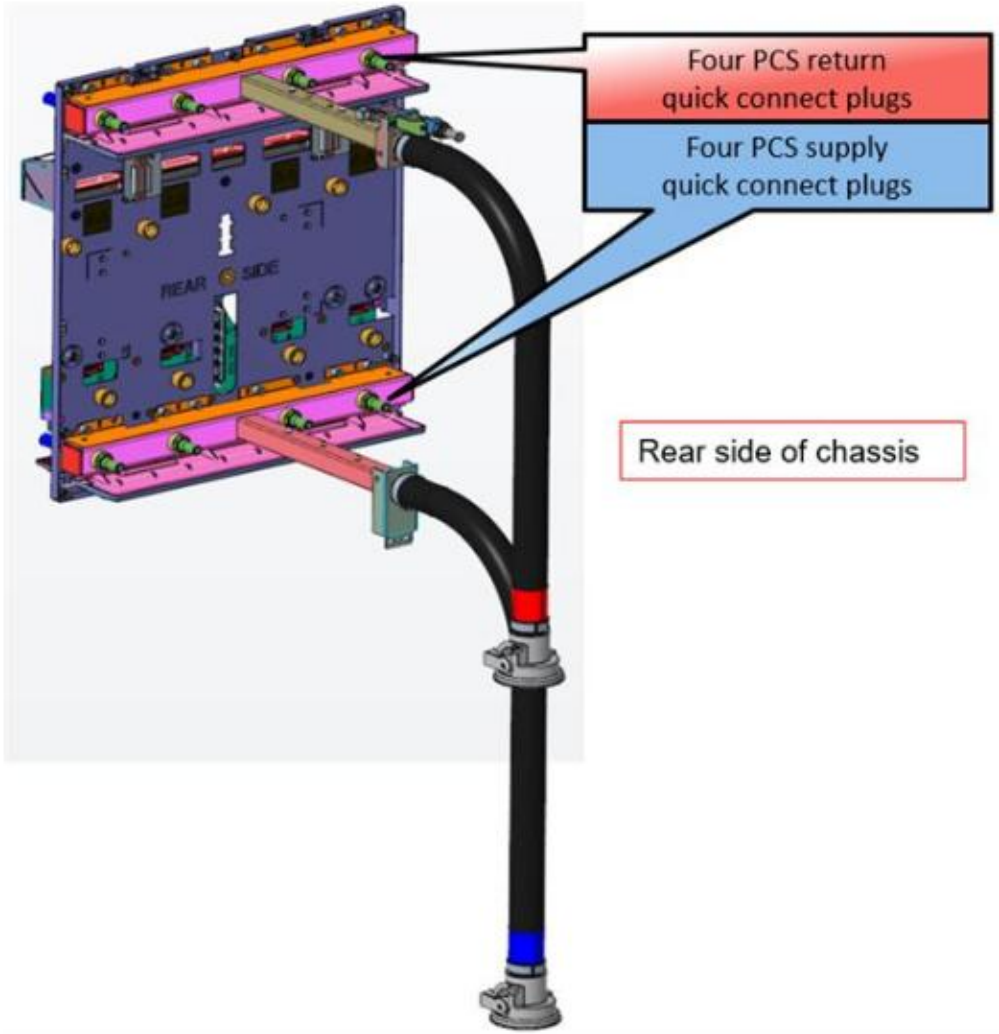


Mid-plate assembly and leakage sensor cable module

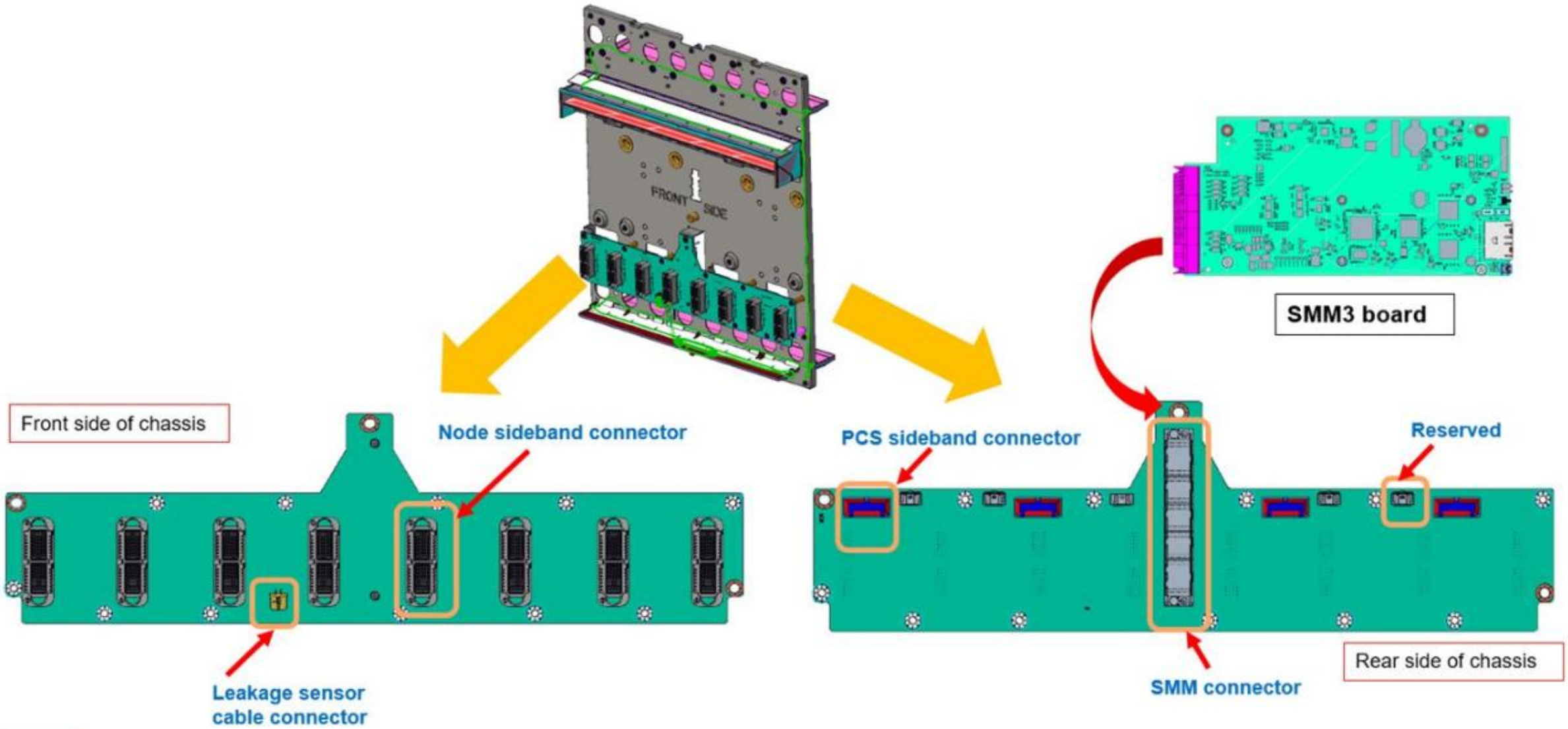


Mid-plate assembly and chassis manifolds

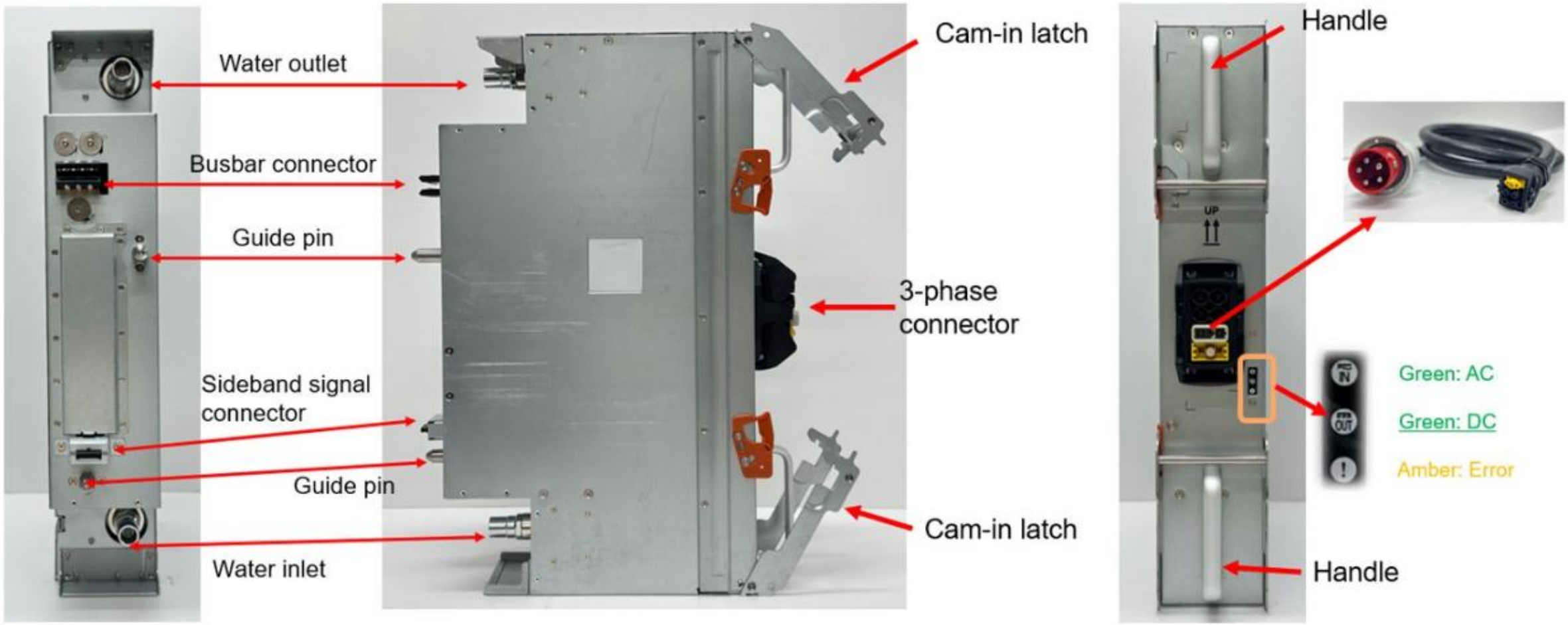




Interposer board



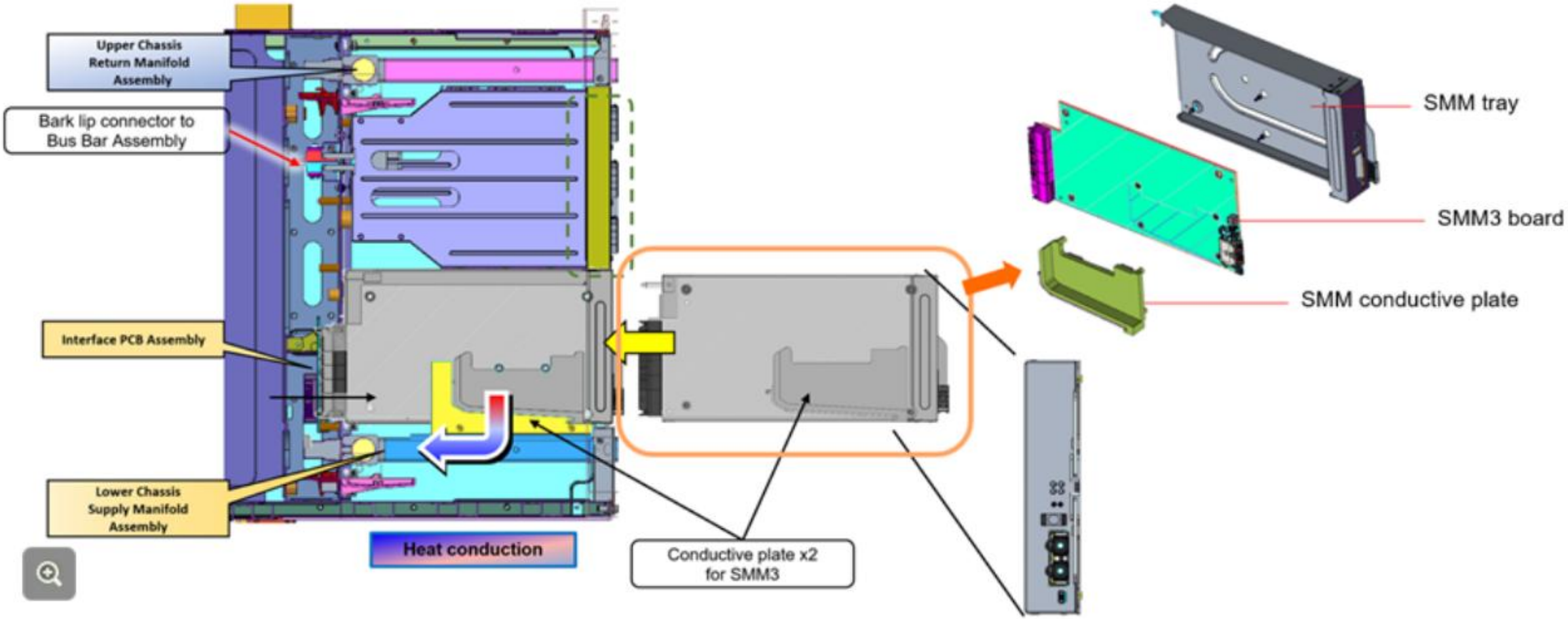
Power conversion station (PCS)



Note: Each PCS weighs 23 kg. For your safety, use a lift tool to remove a PCS from an enclosure.

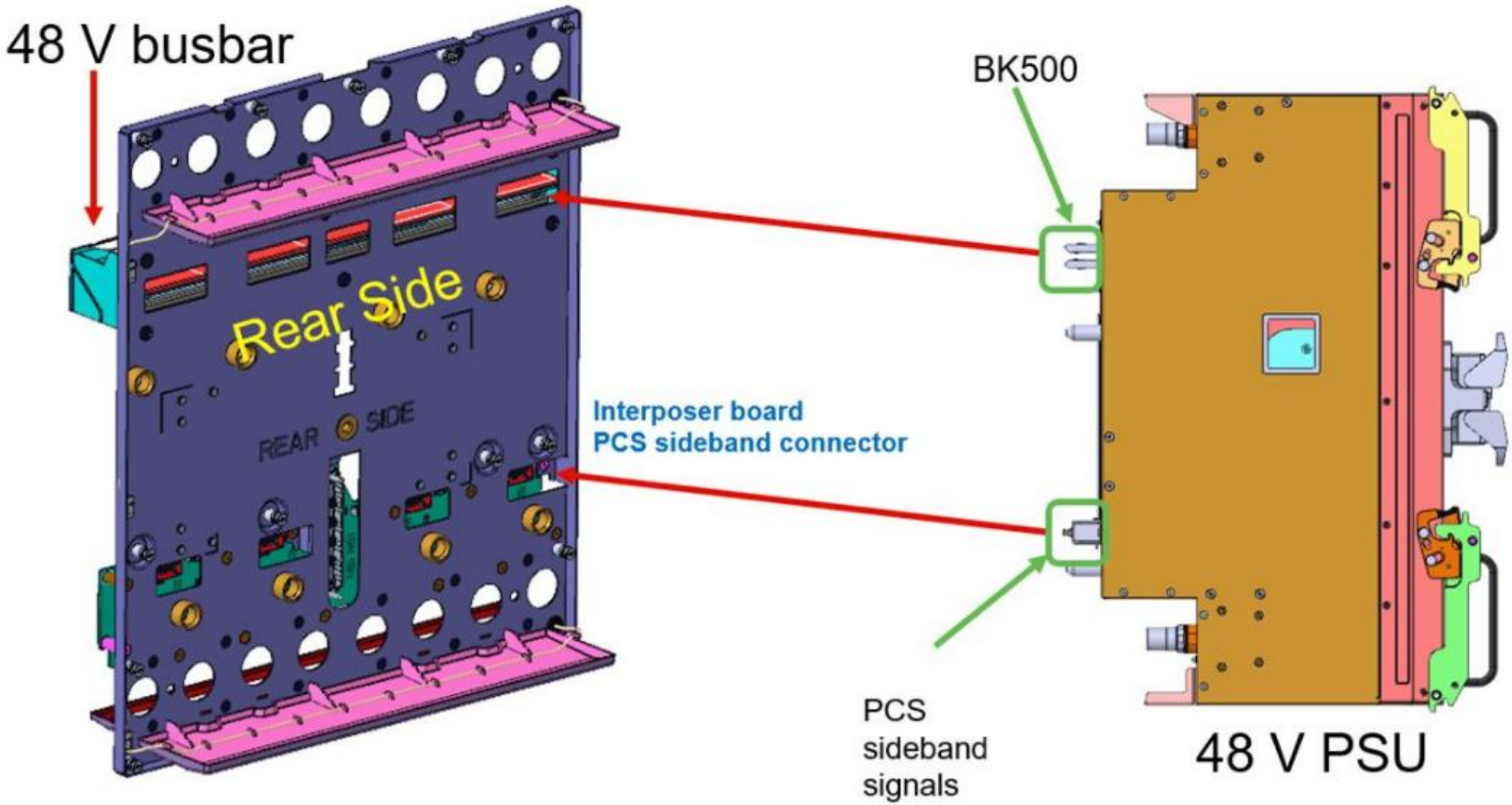
SMM3 cooling

The water loop goes through the SMM3 conductive plates to cool the components.



Note: In the DW612S, only air cooling was supported for the SMM2.

Mid-plate assembly and PCS



Power policies and power output

Four DWC PCSs can be configured in accordance with the following power policies: N+0, N+1, N+N with OVS (oversubscription). OVS allows for a more efficient use of the available system power. For more information, refer to the Power policies and power output section of the ThinkSystem SC750 V4 Neptune product guide on Lenovo Press.

Power policies and power output

The following table lists the enclosure power capacity based on the power policy and the number of power modules installed.

Table 16. Power capacity based on power policy selected

	No redundancy (N+0)		N+N redundancy		N+1 redundancy	
Number of PCS units in Nominal State	N+0 Policy (Note 1)	Chassis capacity (DC)	N+N Policy (Notes 2,4,5)	Chassis capacity (DC)	N+1 Policy (Notes 3,4,5)	Chassis capacity (DC)
1	1+0	15 KW	-	-	-	-
2	2+0	30 KW	Use 1+1 instead →		1+1	18 KW (15 KW)*
3	3+0	45 KW	-	-	2+1	36 KW (30 KW)*
4	4+0	(Note 6)	2+2	36 KW (30 KW)*	3+1	54 KW (45 KW)*

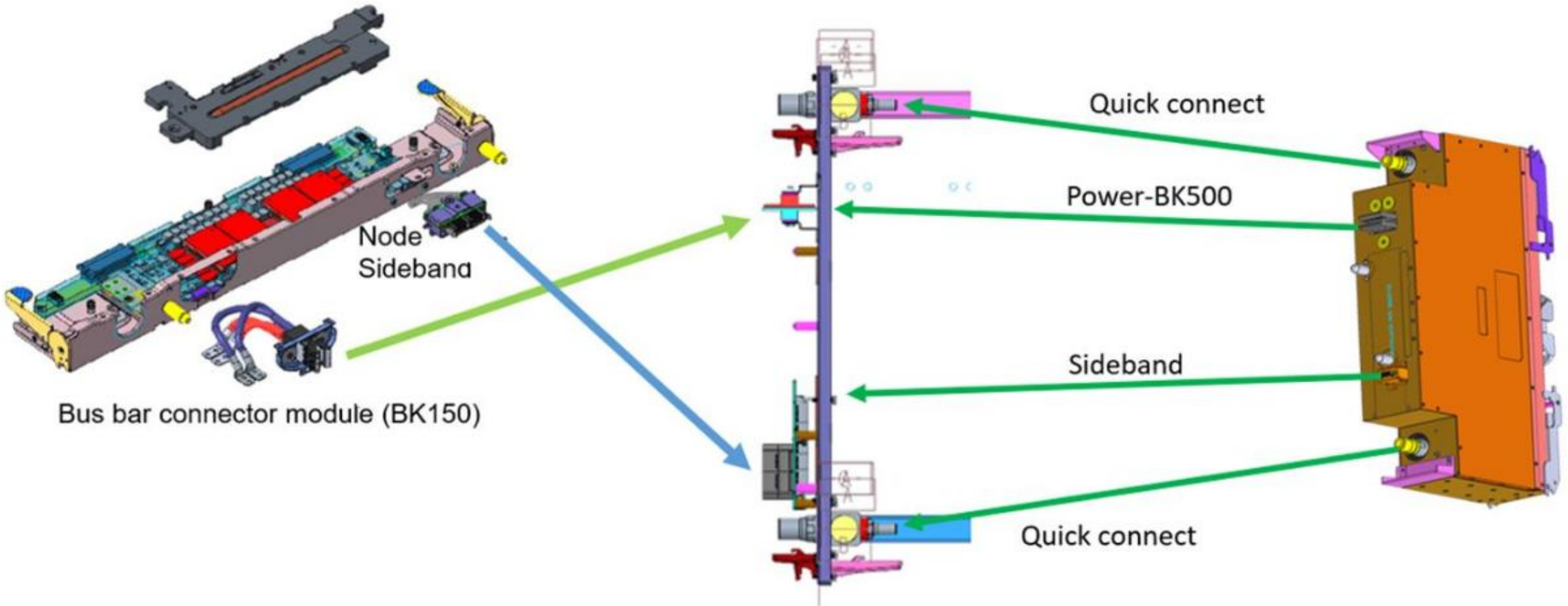
* The numbers in parentheses are the chassis power capacity if no throttling is required when the redundancy is degraded (e.g. 3+1 and 1 PSU fails)

Notes in the table:

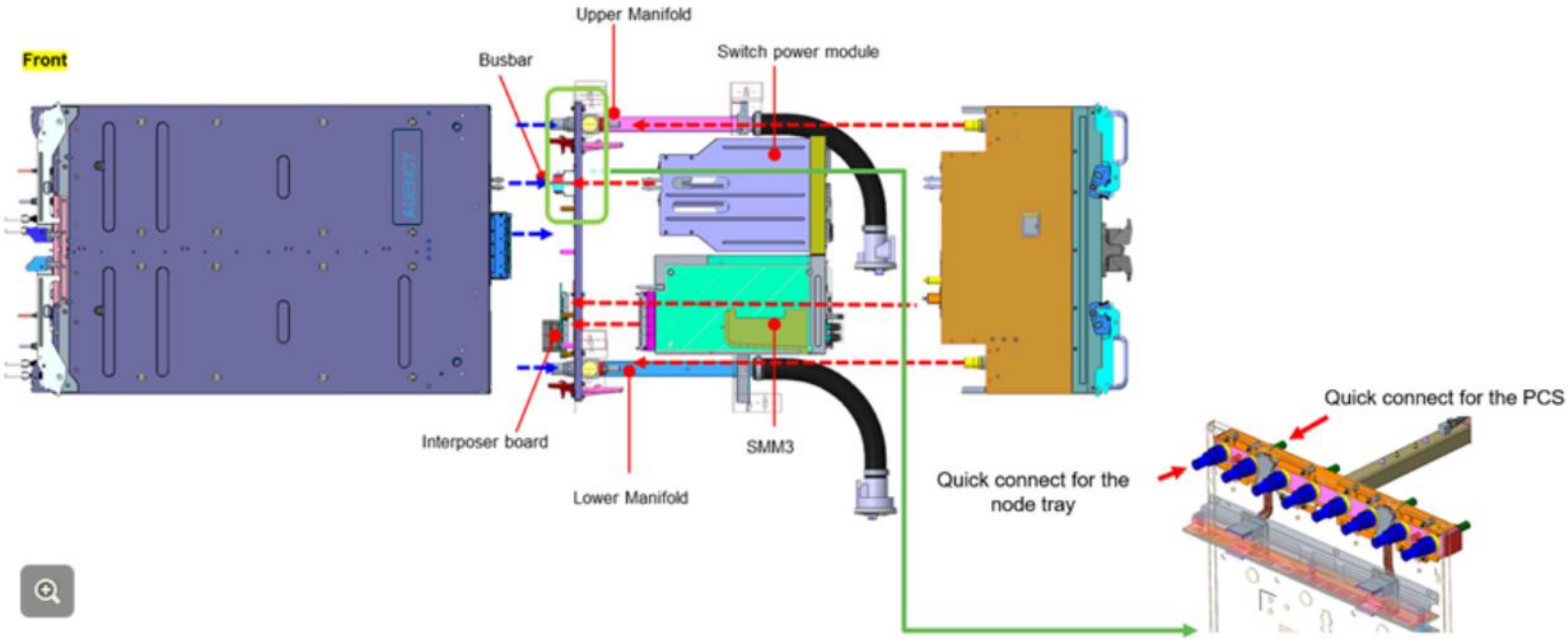
1. N+1+OVS (oversubscription) is the default if >1 PSU is installed. N+0 is the default with 1 PSU installed.
2. If N+N is selected and there is an AC domain fault (2 PSUs go down), the power capacity is reduced to the value shown in parentheses within 1 second. Example: If 2+2 policy is selected & all 4 PSUs are operational, the power capacity is 36KWDC. If an AC domain faults, 2 PSU go down, and the power is reduced to 30KW within 1 second
3. If N+1 is selected and there is a PSU fault, the power capacity is reduced to <= the value shown in parentheses within 1 second. Example: If 3+1 policy is selected & all 4 PSUs are operational, the power capacity is 54KWDC. If a PSU faults, the power is reduced to <=45KW within 1 second. GPU trays are hard throttled w PWRBRK#. Intel trays are proprotionally throttled with Psys power capping
4. If the chassis is in the degraded redundancy state, due to 1 or more PSU faults, and an additional PSU fails, the chassis will attempt to stay alive by hard-throttling the trays (via PROCHOT# & PWRBRK#), but there is no guarantee. There is risk that the chassis could power off if the PSU rating is exceeded
5. For the redundant power policies, only OVS modes are selectable in SMM (ie. OVS is always enabled). When a user creates a hardware config in DCSC, a chassis max power estimate is completed, via an LCP API call. If the chassis DC max power is in between the chassis degraded power capacity shown in parentheses and the chassis normal power capacity, a warning is displayed stating that the server could be throttled if a PSU fails. If the customer doesn't want potential throttling, they either need to reduce their config or select a different combo of PSUs/policy to achieve a higher power budget
6. Possible future feature

Floating connections

Floating connections are designed to protect board-to-board (B2B) connectors, which can be damaged by shocks and vibrations.



Node tray connection side view



DW612S and N1380 feature comparison

	DW612S	N1380
Power supply	12 V	48 V
Max power	23 kW with 8+1/OVS	54 kW with 3+1/OVS
Power delivery (output)	Midplane (PCBA)	Busbar
Power delivery (input)	200~240 VAC With external PDU	3-phase 200 ~ 480 VAC PCS with integrated PDU
Operating water temperature	45°C (113°F)	45°C (113°F)
System management	SMM2 (12 nodes and nine PSUs), air cooling	SMM3 (32 nodes and four PCSs), water cooling
Manifold	Separated manifold for nodes and PSUs	• One manifold per chassis for both nodes and PCSs • SMM3 with water cooling to contact the inlet manifold
Leakage detection	Yes	Yes
Size and weight	• 6U	• 13U

DW612S and N1380 feature comparison

	DW612S	N1380
	With external PDU	
Operating water temperature	45°C (113°F)	45°C (113°F)
System management	SMM2 (12 nodes and nine PSUs), air cooling	SMM3 (32 nodes and four PCSs), water cooling
Manifold	Separated manifold for nodes and PSUs	• One manifold per chassis for both nodes and PCSs • SMM3 with water cooling to contact the inlet manifold
Leakage detection	Yes	Yes
Size and weight	• 6U • Six horizontal trays • 108 cm^3 (92*45*26.2) • 220 kg, 485 lb	• 13U • Eight vertical trays • 261 cm^3 (111*45*57) • 476 kg, 1050 lb
Innovation		**Floating connection** on sideband, power connector to protect the B2B connector from damage due to shocks and vibrations