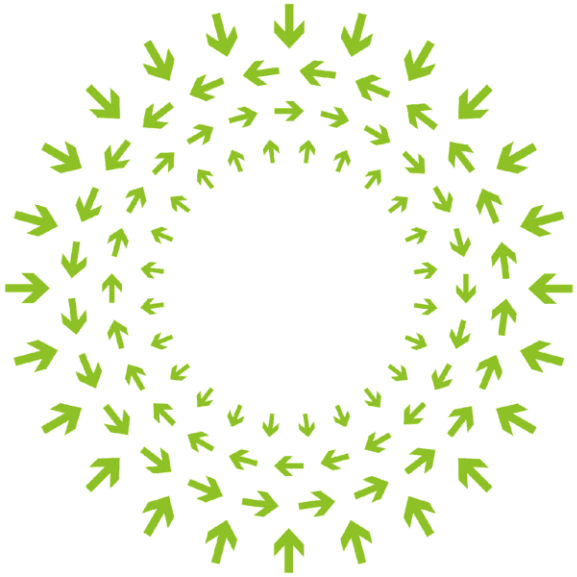


OPEN Compute Project

Open edge server sled,

Intel Xeon scalable, 4th generation

Revision 1.1

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2. Compliance with OCP Tenets

2.1. Openness

This contribution shares openly key design selections and technical characteristics of the Open edge server sled with 4th generation of Intel Xeon Scalable Processor. This way it enables other users to benefit about design effort used for this server design.

In system level also previous generations Open edge solution components specifications are shared openly:

The Open edge Chassis is an open design (OCP accepted)
The Open edge RMC is an open design (OCP accepted)
The Open edge server is an open design (OCP inspired)
The Open edge Chassis specification defines all physical dimensions and interfaces for servers and other sleds.

2.2. Efficiency

The Open edge server is designed to operate in telco site environments with limited power feed capacity and higher thermal requirements, aiming at high efficiency through technology selections. New server generation with 2U variant can increase efficiency by factor of 2 to 3 depending on application and used acceleration hardware.

2.3. Impact

The Open edge server will allow OCP designs to address a new market segment, such as telco. The Open edge contributions will lead to evolved designs that will meet the needs of new adopters which will lead to more contributions.

2.4. Scale

An Open edge system is highly scalable ranging from low end, single server to multi-chassis, multi rack systems. Server design if fully toolless and can be deployed easily to different customer environments with provided supporting documentation.

2.5. Sustainability

The open edge solution physical footprint and material selections target to minimized use of natural resources. New Open edge server sled generation improves significantly single server capacity and enables smaller configurations for certain workload. This allows usage of more energy efficient configuration and savings in material usage.

3. Change Log

Date	Version #	Author	Description
11/2023	0.1	Samuli Toivola	First draft
02/2024	1.0	Samuli Toivola	First version
03/2024	1.1	Samuli Toivola	Final

4. Scope

Nokia and ASUS have jointly developed a new Open edge server sled featuring fourth generation Intel XEON scalable CPU. This document highlights the main technical specifications of this server.

Open edge system consists of a 3U or 2U chassis [1], Open edge RMC [2], PSUs and Open edge sleds [3,4].

5. Overview

The Open edge server sled with Intel Xeon SP 4th generation (the Open edge server sled later in this document) is a major advance over the previous server release 2020. The main enhancement is introducing support for fourth generation of Intel's XEON® scalable family CPU. In addition, new server sled generation introduces 2U sled option that allows additional options for hardware acceleration and increased storage capability.

The new CPU and several other improvements bring significant benefits in running various real-time applications. Improved system cooling specially in 2U sled will enable simultaneous use of higher TDP CPUs and accelerator cards. The main enhancements of the new server generation are listed below.

- Baseline: Open edge server specification with Intel Xeon SP 3rd gen, 2020 [3]
- Latest Intel XEON scalable gen4 support
    - Significant increase in core count in high end CPU SKUs
    - Platform improvements in supporting real-time applications
    - Increased memory bus speed: DDR4 3200 MT/s -> DDR5 4800 MT/s
    - Support for new PCIe® generation: Gen4 -> Gen5
    - Increased number of PCIe® lanes: 64 -> 80



Figure 1 Open edge 2U server sled

5.1 Base Specification

Open edge sled base specification is under development.

Open edge server sled complies with a 3U or 2U chassis [1], Open edge RMC [2], PSUs and other Open edge sleds [3,4].

6. Physical Specifications

The Open edge server sled support single socket Intel XEON 4th generation Scalable Processors. There are two main types of servers, 1U and 2U half-width servers.

The design uses the Intel C741 PCH (Intel chipset), including an integrated SATA3 controller, a USB 3.1 controller, and several low bandwidth buses for connecting to e.g., BIOS flash memories and backplane ethernet. HW management functions are implemented with AST2600 controller.

The block diagram and specification table below describe main technical information for 1U server sled.

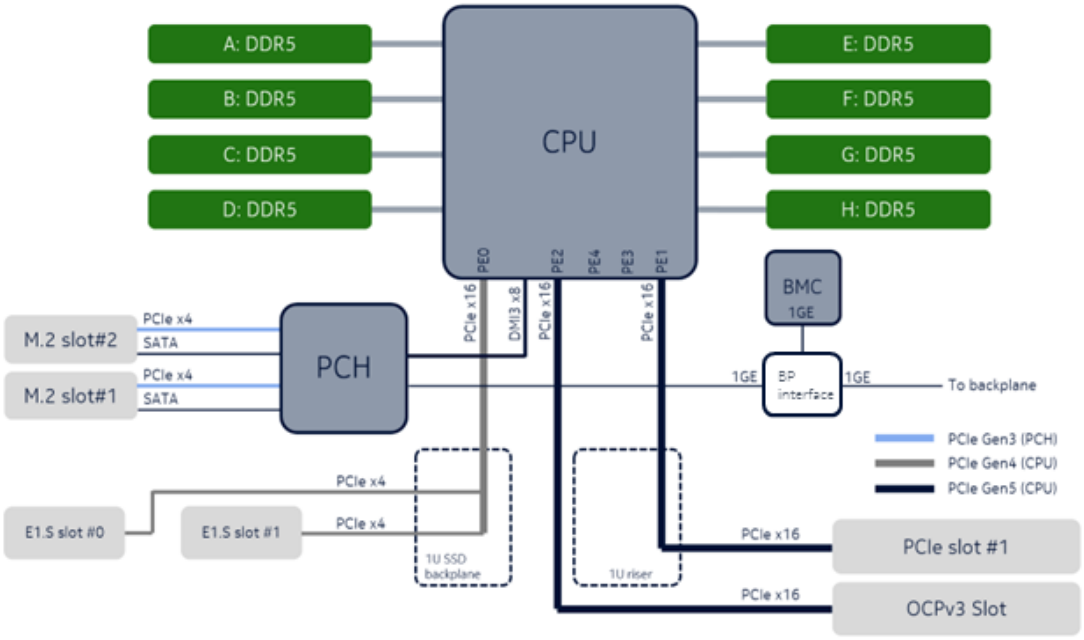


Figure 2 Simplified block diagram of Open edge 1U server sled

The technical specifications of the 1U server sleds are presented in this chapter.

Table 1 Technical specifications for Open edge 1U server sled

Technical specifications for Open edge 1U server sled	
Form factor	1U, 19” half-width sled
Processor	• Intel Xeon 4th generation Scalable Processor • Thermal Design Power (TDP): max. 230 W • Single socket
Chipset (PCH)	Intel C741
Memory	• 8 x DIMM slots for DDR5 with ECC • DDR5 speed up to 4800 MT/s • DDR5 capacity up to 1 TB (8 x 128 GB)
I/O expansion slots	• 1 x PCIe® Gen5 x16 FHHL slot • 1 x PCIe® Gen5 x16 OCP 3.0 slot (small form factor)
Storage	Front hot-plug disk tray options • 2 x E1.S 9.5/ 15 mm, NVMe® drives (PCIe® Gen4 x4) Internal non-hot-plug drive options • 2 x M.2, 2280/22110, SATA / NVMe® drives (PCIe® Gen3 x4)
Power supply	• +12 VDC, 46 A, max @10.8 V • Power consumption 500 W, max
Cooling	Front to rear and rear to front air flow options
HW management	Integrated HW management controller (AST2600) supporting • miniUSB serial port for debug (to BMC and CPU) • 1000BASE-T in server front panel • 1000BASE-T in RMC front panel (via backplane) • Mini Display port (to BMC) • Redfish® • NADCM
TPM	TPM 2.0
Operating conditions	Server sled • Operating temperature range: -5 C …+45 C *) [ETSI EN300 019-1-3 Class 3.1E] • Short term operating temperature *): -5 C to +55 C [GR-63-CORE] *) At temperatures above +40 C, there may be restrictions to server configurations, e.g. CPU SKUs
Weight	Barebone: 2,4 kg (barebone + fan module)
Dimensions	215 mm x 41.0 mm x 427.5 mm (W x H x D)

The block diagram and specification table below describe main technical information for 2U server sled.

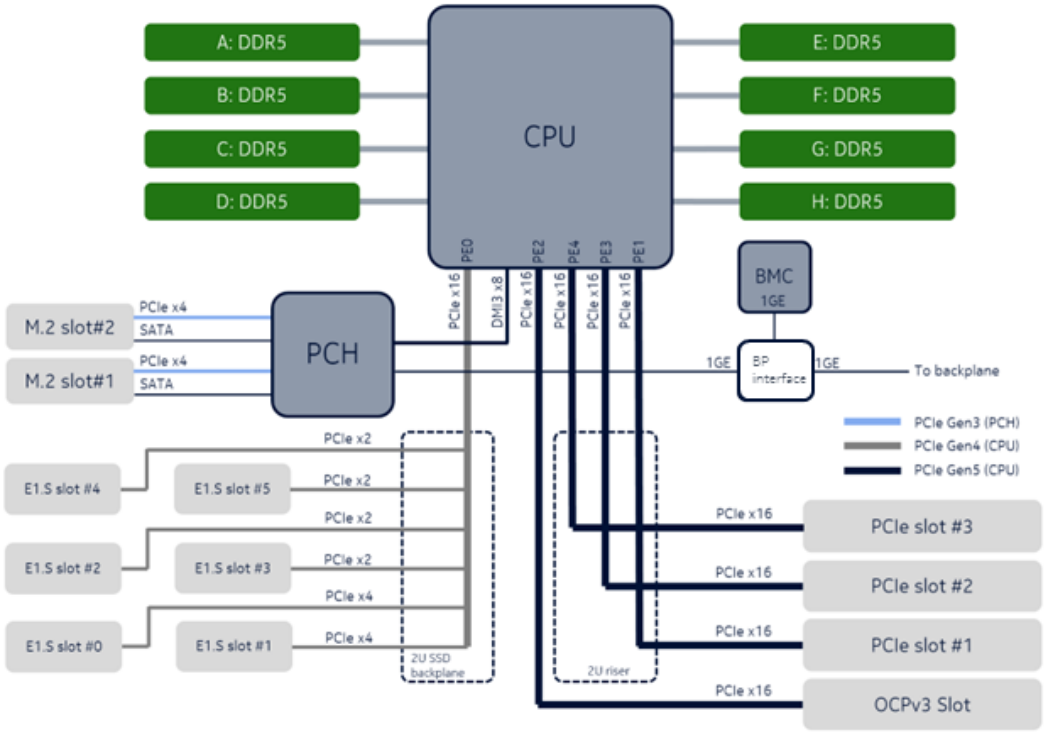


Figure 3 Simplified block diagram of Open edge 2U server sled

Table 2 Technical specifications for Open edge 2U server sled

Technical specifications for Open edge 2U server sled	
Form factor	2U, 19” half-width sled
Processor	• Intel Xeon 4th generation Scalable Processor • Thermal Design Power (TDP): max. 300 W • Single socket
Chipset (PCH)	Intel C741
Memory	• 8 x DIMM slots for DDR5 with ECC • DDR5 speed up to 4800 MT/s • DDR5 capacity up to 1 TB (8 x 128 GB)
I/O expansion slots	• 1 x PCIe® Gen5 x16 FHHL slot • 2 x PCIe® Gen5 x16 FHFL slots (or one FHFL double-wide slot) • 1 x PCIe® Gen5 x16 OCP 3.0 slot (small form factor)
Storage	Front hot-plug disk tray options • 2 x E1.S 9.5/ 15 mm, NVMe® drives (PCIe® Gen4 x4) • 4 x E1.S 9.5/ 15 mm, NVMe® drives (PCIe® Gen4 x2) Internal non-hot-plug drive options • 2 x M.2, 2280/22110, SATA / NVMe® drives (PCIe® Gen3 x4)
Power supply	• +12 VDC, 74 A, max @10.8 V • Power consumption 800 W, max
Cooling	Front to rear and rear to front air flow options
HW management	Integrated HW management controller (AST2600) supporting • miniUSB serial port for debug (to BMC and CPU) • 1000BASE-T in server front panel • 1000BASE-T in RMC front panel (via backplane) • Mini Display port (to BMC) • Redfish® • NADCM
TPM	TPM 2.0
Operating conditions	Server sled • Operating temperature range: -5 C …+45 C *) [ETSI EN300 019-1-3 Class 3.1E] • Short term operating temperature *): -5 C to +55 C [GR-63-CORE] *) At temperatures above +40 C, there may be restrictions to server configurations, e.g. CPU SKUs
Weight	Barebone: 4,7 kg (barebone + fan module)
Dimensions	215 mm x 83.6 mm x 427.5 mm (W x H x D)

6.1 Mechanical

This chapter illustrates mechanical dimensions of server motherboard and 1U/2U server sleds, mechanical illustrations of key modules and main component placements of server sleds.

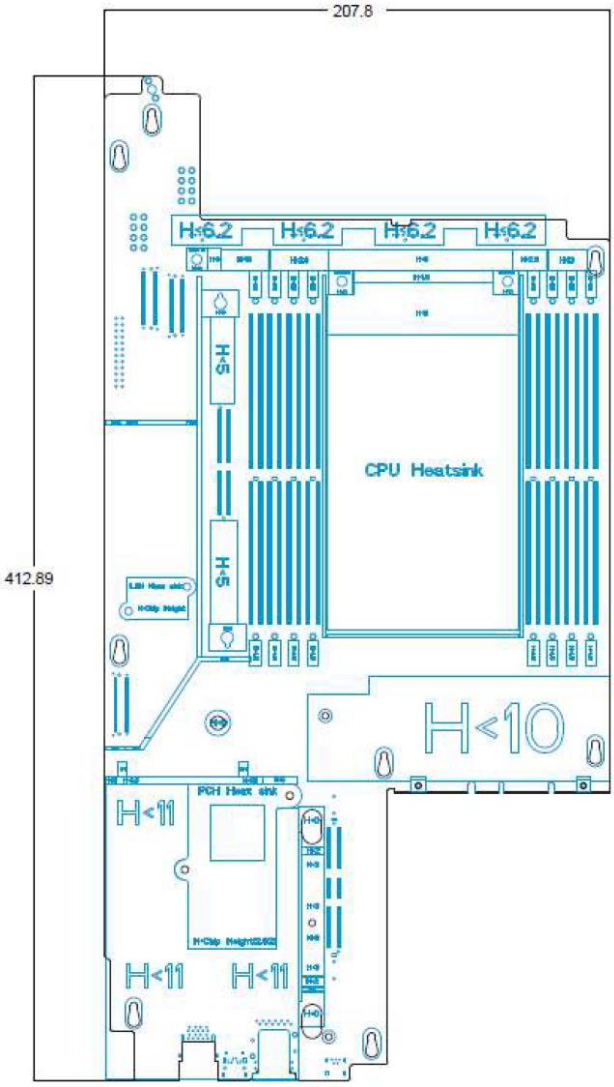


Figure 4 Server main board dimension

The mechanical implementation of the 1U server sleds are presented in drawings and tables below.

The 1U Open edge server sled dimensions are: 419.8 x 215 x 41.3 mm (DxWxH) without handle and 469.8 x 215 x 41.3 mm (DxWxH) with handle.

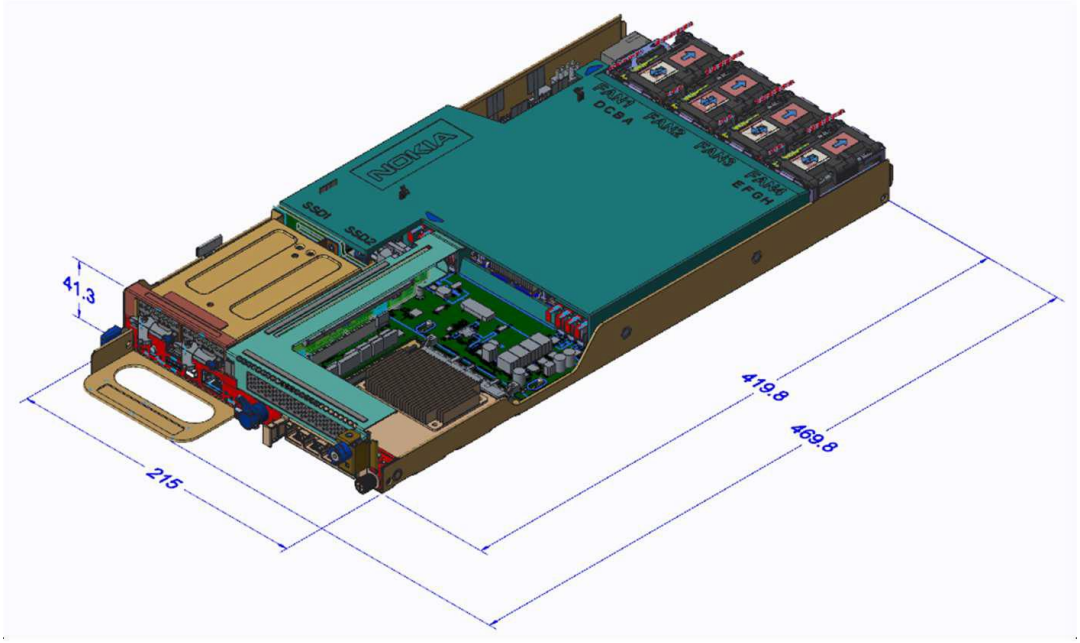


Figure 5 1U Open edge server sled dimensions

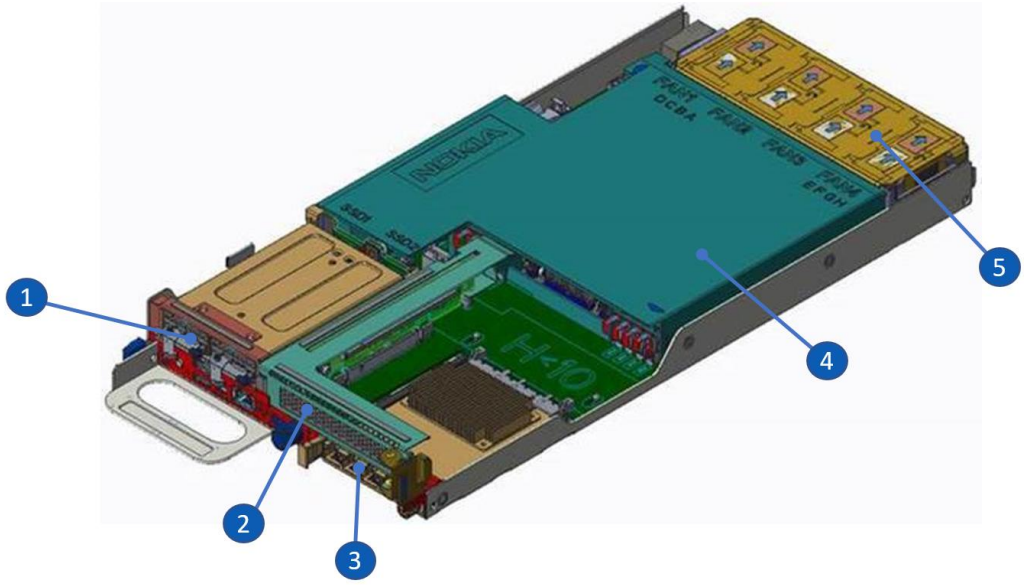


Figure 6 1U Open edge server sled main component locations

Table 3 Open edge 1U server sled's main components

Item	Description
1	Front disk trays (2 x E1.S NVMe® Gen4 x4, 9.5 /15 mm)
2	FHHL PCIe® x16 expansion slot
3	OCP 3.0 PCIe® x16 slot (small form factor)
4	Air duct
5	Fan module (4 x 4056 dual-rotor fans)

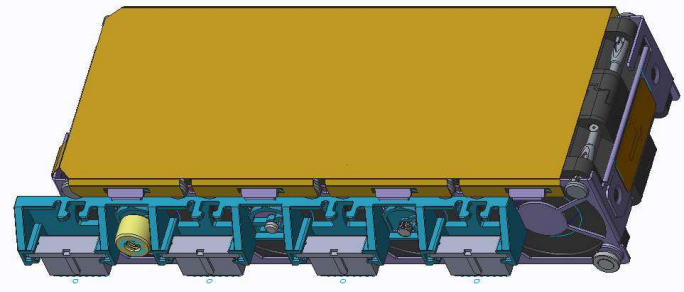


Figure 7 1U Open edge server sled FAN module

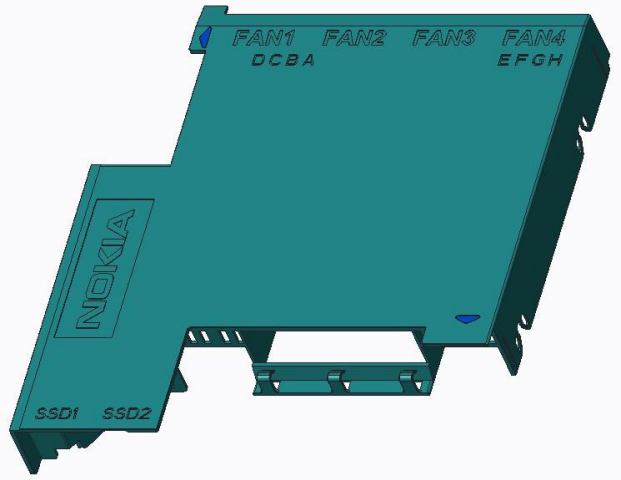


Figure 8 1U Open edge server sled Air Duct

The mechanical implementation of the 2U server sleds are presented in drawings and tables below.

The 2U Open edge server sled dimensions are: 419.8 x 215 x 83.95 mm (DxWxH) without handle and 469.8 x 215 x x 83.95 mm (DxWxH) with handle.

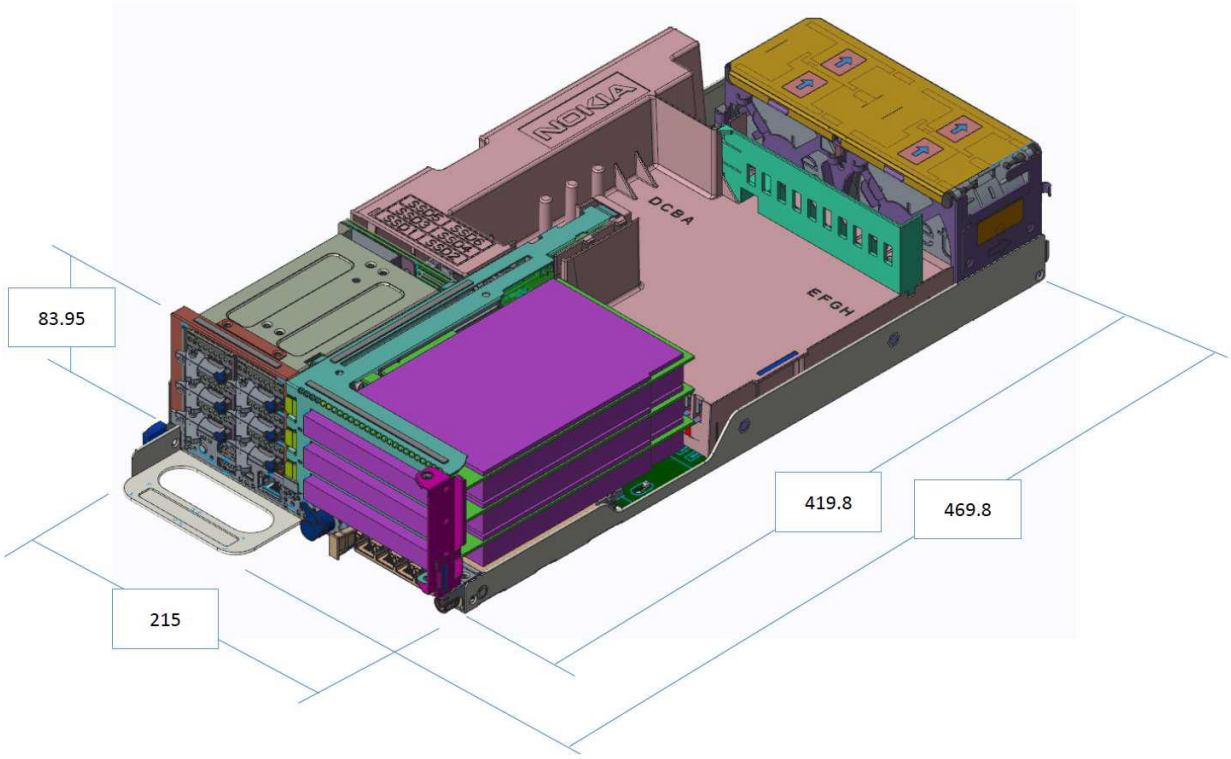


Figure 9 2U Open edge server sled dimensions

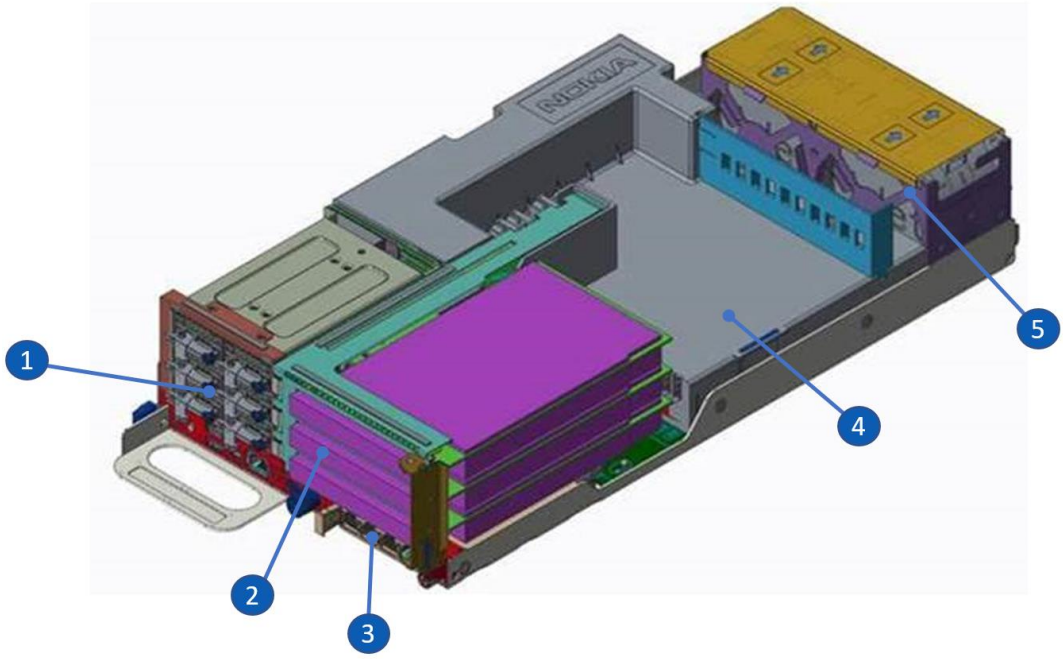


Figure 10 1U Open edge server sled main component locations

Table 4 Open edge 2U server sled's main components

Item	Description
1	Front disk trays (6 x E1.S NVMe®, PCIe® Gen4 x2/4, 9.5 /15 mm)
2	FHHL PCIe® Gen5 x16 expansion slot (bottom) FHFL PCIe® Gen5 x16 expansion slot (middle) FHFL, double-wide PCIe® Gen5 x16 expansion slot (top)
3	OCP 3.0 PCIe® x16 slot (small form factor)
4	Air duct
5	Fan module (2 x 8056 dual-rotor fans)

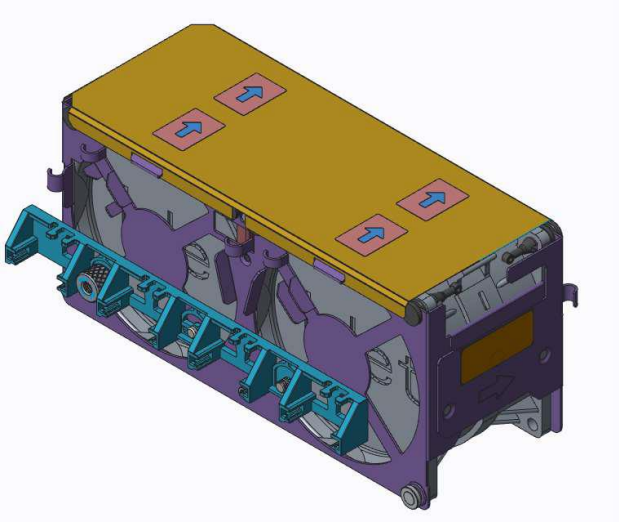


Figure 11 2U Open edge server sled FAN module

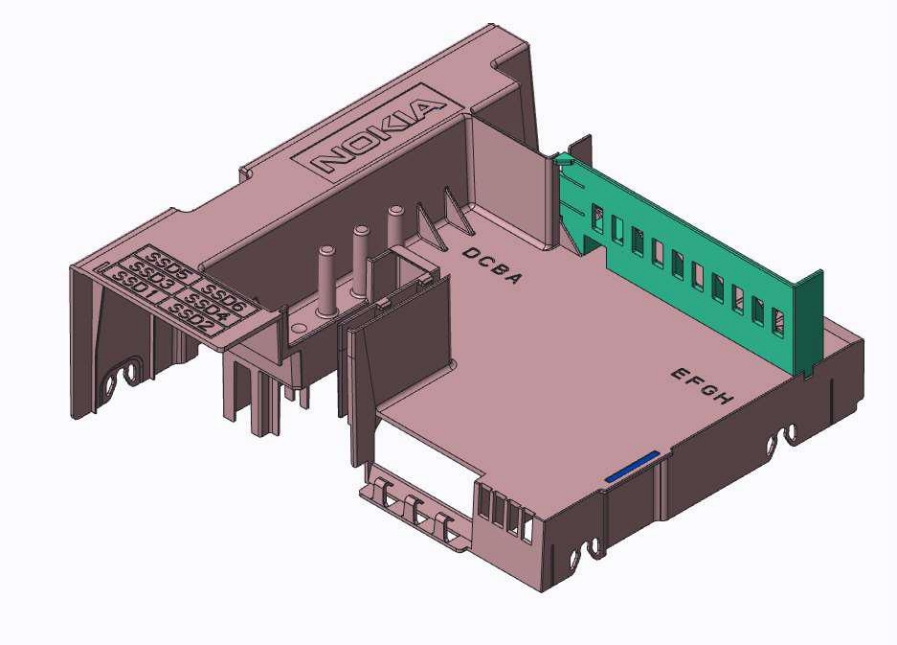


Figure 12 2U Open edge server sled Air Duct

6.2 Rack Compatibility

An Open edge sled is installed into an Open edge chassis [1].

The Open edge chassis is compatible with standard 19” four-post racks (EIA-310-D). The chassis occupies 2 or 3 rack units (RU). The practical minimum depth for a rack is 600 mm.

Installation is done using a shelf. An adjustable shelf solution supports installation to racks having various depths. The distance between rack’s front and rear posts can vary in the range of 450 mm to 750 mm.

The Open edge chassis has front cabling, requiring 100 to 150 mm of space in front side of the rack. Depending on the site installation requirements, front posts of rack may need be recessed accordingly.



Figure 13 Open edge 3U chassis with sleds

7. Interfaces

This chapter illustrates front panel interfaces and add-in card locations/types and also information about FAN types and backplane connectors.

The positions of main interfaces of the 1U server sleds is presented in drawings and tables below.

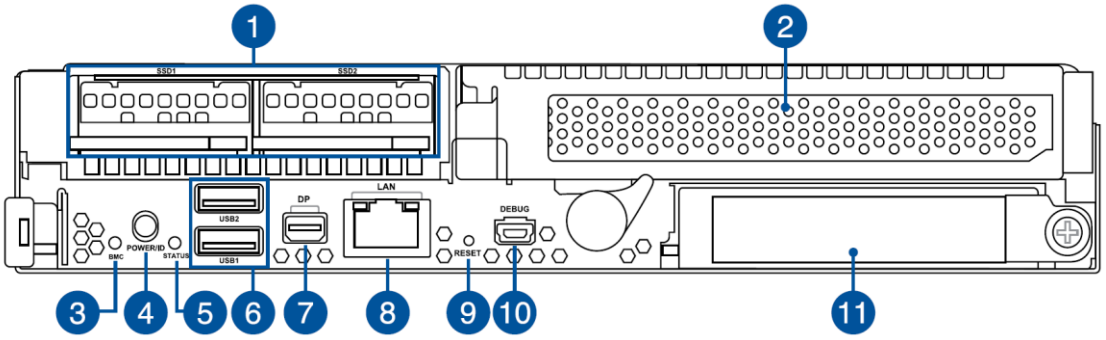


Figure 14 Front view of Open edge 1U server sled

Table 5 Front view of Open edge 1U server sled

Item	Description
1	Front disk trays (2 x E1.S NVMe®, PCIe® Gen4 x4, 9.5 /15 mm)
2	FHHL PCIe® x16 expansion slot
3	BMC Heartbeat LED (green)
4	Power button / ID LED (blue)
5	BMC status LED (amber)
6	2 x USB 3.0 connector, type A (for e.g., firmware updates)
7	Mini Display port connector (to BMC)
8	Management Ethernet port, 1000BASE-T, RJ45
9	Reset button
10	Mini USB debug connector (serial port for BMC)
11	OCP v3.0 PCIe® x16 slot (small form-factor)

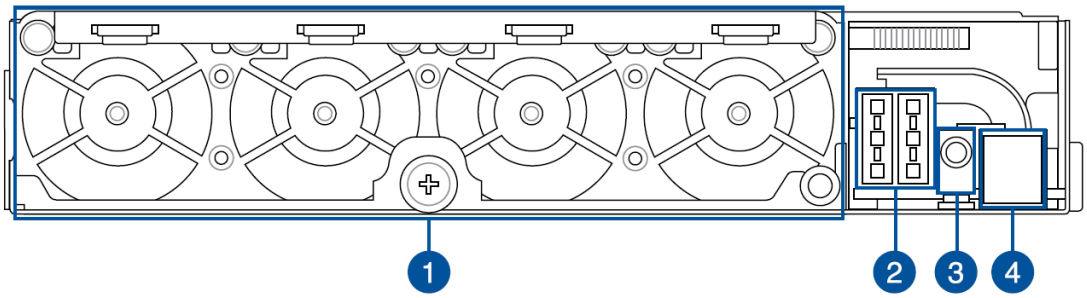


Figure 15 Rear view of Open edge 1U server sled

Table 6 Rear view of Open edge 1U server sled

Item	Description
1	Fan module, front to rear and rear to front options
2	Backplane power connector
3	Guide pin receptable
4	Backplane signal connector

The positions of main interfaces of the 2U server sleds is presented in drawings and tables below.

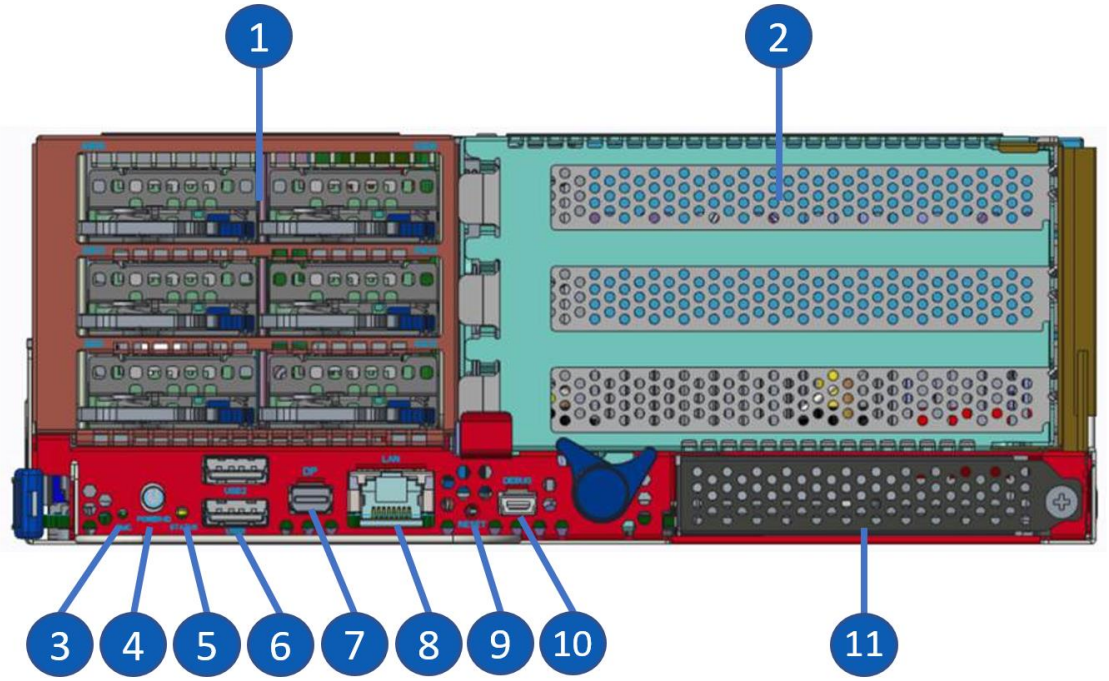


Figure 16 Front view of Open edge 2U server sled

Table 7 Front view of Open edge 2U server sled

Item	Description
1	Front disk trays (6 x E1.S NVMe®, PCIe® Gen4 x2/4, 9.5 /15 mm)
2	FHHL PCIe® Gen5 x16 expansion slot (bottom) FHFL PCIe® Gen5 x16 expansion slot (middle) FHFL, double-wide PCIe® Gen5 x16 expansion slot (top)
3	BMC Heartbeat LED (green)
4	Power button / ID LED (blue)
5	BMC status LED (amber)
6	2 x USB 3.0 connector, type A (for e.g., firmware updates)
7	Mini Display port connector (to BMC)
8	Management Ethernet port, 1000BASE-T, RJ45
9	Reset button
10	Mini USB debug connector (serial port for BMC)
11	OCP v3.0 PCIe® x16 slot (small form-factor)

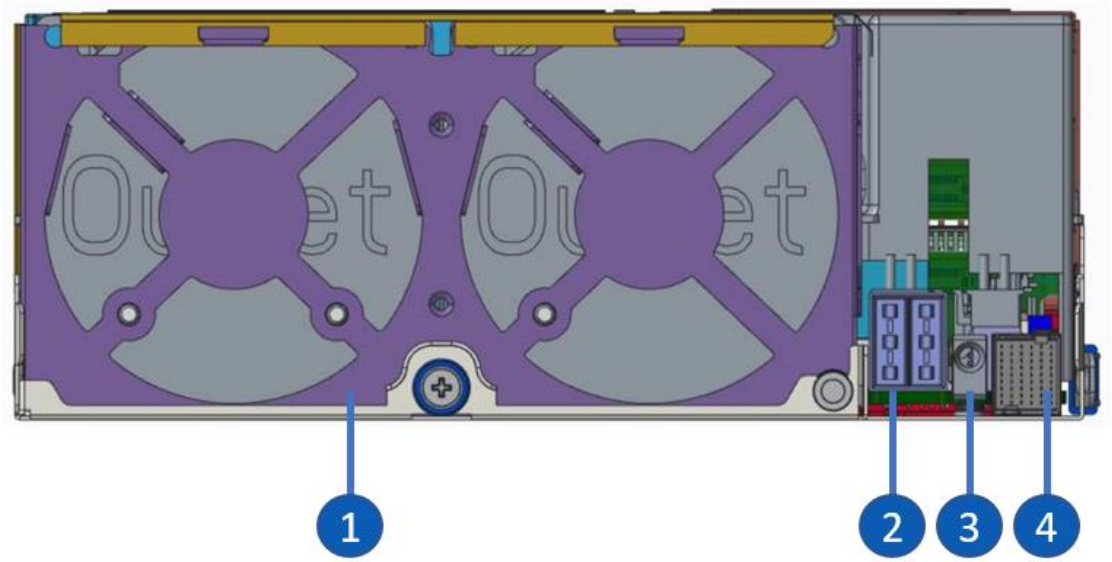


Figure 17 Rear view of Open edge 2U server sled

Table 8 Rear view of Open edge 2U server sled

Item	Description
1	Fan module, front to rear and rear to front options
2	Backplane power connector
3	Guide pin receptable
4	Backplane signal connector

7.1 Signal List

The Open edge server sled is supported high-speed signal interface.

Memory:

8 DIMM slots for DDR5 with ECC. DDR5 speed can reach up to 4800 MT/s, and the total DDR5 capacity is up to total 1 TB.

PCIe® Slot:

One PCIe® Gen5 x16 FHHL slot.
Two PCIe® Gen5 x16 FHFL slots (or one FHFL double-wide slot)
One PCIe® Gen5 x16 OCP 3.0 slot (small form factor)
Two PCIe® Gen4 x4 E1.S 9.5/ 15 mm, NVMe® drives.
Four PCIe® Gen4 x2 E1.S 9.5/ 15 mm, NVMe® drives.

Storage:

Two SATA x1/PCIe® Gen3 x4 M.2 2280/22110, NVMe® drives.

LAN:

One 1000BASE-T RJ45 in server front panel.

Display:

One mini display port 1.1a output

USB:

Two USB3.2 Gen 1 USB Type-A port

7.2 Rear Side Power, I/O, Expansion Board and Midplane Subsystems

The Open edge server sled Rear side I/O is compatible with the Open edge chassis specification.

The block diagram of Open edge chassis is shown in Figure 18. Power supplies (PSUs) connect to the system through a power distribution board (PDB). Sleds are connected through a 3U backplane (BP). A rack management controller (RMC) has the task of managing the PSUs and providing management Ethernet connectivity to the sleds.

Each sled has a hard-coded physical address [1…5] assigned to it through the backplane connector.

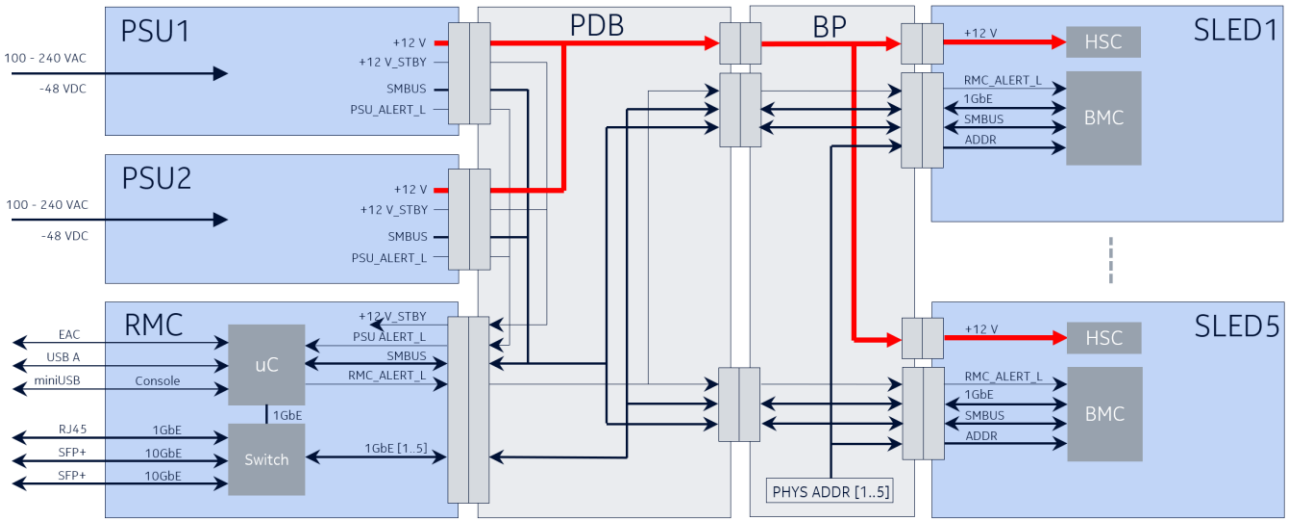


Figure 18 Block diagram of Open edge chassis

The signal connector between backplane and sled is a 6 x 9 pin AirMax VS2 connector in chassis (FCI 10130665-102LF, or equivalent). The corresponding signal connector on the sled is FCI 10124149-102LF, or equivalent. The backplane connector is shown in *Figure 19*.

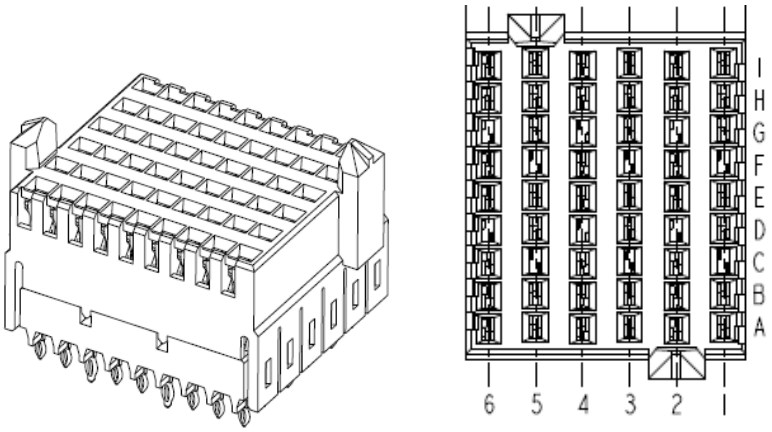


Figure 19 Backplane signal connector with pin map

Table 9 Pin assignment of backplane signal connector (connector for sled 1 shown)

6	5	4	3	2	1	
PD_SLED1_PRSNT_RETURN	GND	NC	GND	LAN_SLED1_MDIN3	GND	I
PD_BBU_A0	SMB_SLED_BUF_SDA	PD_SLED1_CHASSIS_INTRUSION	FM_BMC_SLED1_READY_N	LAN_SLED1_MDIP3	LAN_SLED1_MDIN2	H
GND	SMB_SLED_BUF_SCL	GND	FM_RMC_GPIO_2	GND	LAN_SLED1_MDIP2	G
FM_BBU_PRSNT_N	GND	NC	GND	NC	GND	F
SMB_BBU_ALERT_R_N	NC	NC	FM_RMC_GPIO_1	SB_SLED1_ADDR_2	LAN_SLED1_MDIN1	E
GND	NC	GND	FM_RMC_GPIO_0	GND	LAN_SLED1_MDIP1	D
SMB_PMBUS_BBU_SDA	GND	NC	GND	SB_SLED1_ADDR_1	GND	C
SMB_PMBUS_BBU_SCL	NC	NC	FM_SLED1_PRSNT_N	SB_SLED1_ADDR_0	LAN_SLED1_MDIN0	B
GND	P3V3_SLED1	GND	IRQ_RMC_ALERT_N	GND	LAN_SLED1_MDIP0	A
6	5	4	3	2	1	

The power connector of the server sled is of type 1X2P BLK R/A DIP AMPHENOL/10078770-002LF. The current rating is 83A per contact. The drawing of the connector is shown as below.

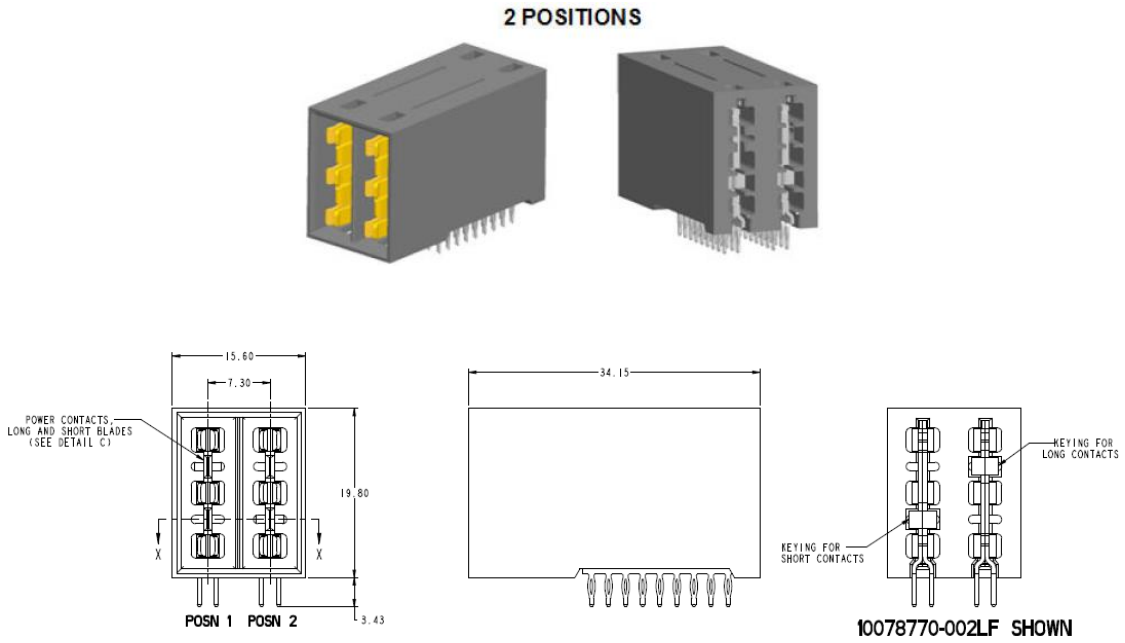


Figure 20 Power connector of Open edge sled

8. Onboard Power System

The open edge server includes a hot swap controller that manages the over current protect feature's limit at 75A for 1U sleds and 78 A for 2U sleds.

9. Prescribed Materials

The open edge server designs with the max CPU TDP of 300W. Select a suitable CPU SKU with a TDP that is under 300W.

10. System Firmware

Open edge server HW is managed with Redfish® specified by Distributed Management Task Force. DMTF's Redfish® is a standard designed to deliver simple and secure management for Open edge. Both human readable and machine capable, Redfish® leverages common Internet and web services standards to expose information directly to the modern tool chain.

In Open edge system, all sled BMCs communicate to the higher layer management entity via the RMC (Rack Management Controller). RMC provides a single point communication interface to all sleds and the RMC itself, via an Ethernet port. RMC is also responsible for managing PSUs on Open edge.

The Open edge server is managed through a BMC (Baseboard Management Controller) on the server. This provides full HW management of the individual server including:

- Configuration, settings, sensor reading, fan control, power and reset control.
- HW health and status information. This information is also available via logs and events.
- BMC is used for all Open edge server embedded SW updates. The BMC itself, BIOS, and commodities Firmware.
- Virtual Media mount for installing an Operating system or software to the open edge server payload.
- SSL Certification management for HTTPS connections.

BMC software on the server will provide a HTML5 WebUI with Virtual KVM for redirection of Video, Keyboard and Mouse signals for graphical node management.

To ensure the Open edge HW management security only secure protocols with strong encryption algorithms are in use, like HTTPS, TLS, SHA2, LDAP.

BMC software can be built using open source OpenBMC or commercial Industry standard solutions.

For Automated & autonomic management, Redfish® interface is offered to the upper-layer open edge automation manager to increase efficiency in provisioning and troubleshooting.

11. Hardware Management

Open server sled fully supports out-of-band manageability where connectivity towards management network is implemented via Open edge chassis and Open edge RMC.

Integrated LOM component used in Open edge server sled is the Intel® Ethernet Controller I210 (I210) is a single port, compact, low power component that supports GbE designs. The I210 offers a fully integrated GbE Media Access Control (MAC), Physical Layer (PHY) port and a SGMII/SerDes port that can be connected to an external PHY. The I210 supports PCI Express [PCIe® v2.1 (2.5GT/s)].

12. Security

The PCH's SPI supports for TPM with SPI interface. The PCH's SPI flash controller supports a discrete TPM 2.0 on the platform.
That open edge server supports Intel Trusted Execution Technology or Intel Boot Guard.

13. References (recommended)

[1] Nokia Open edge chassis specification, 2020
open-edge-chassis-ocp-contribution-v1-4-pdf (opencompute.org)

[2] Nokia Open edge RMC specification, 2019
https://www.opencompute.org/documents/open-edge-rmc-ocp-contribution-v0-2-2-pdf

[3] Open edge server sled, Intel Xeon scalable, 3rd generation
open-edge-server-sled-specification-w-intel-xeon-sp-3rd-gen-v1-0-pdf

[4] Nokia Open edge switch specification, 2020
https://www.opencompute.org/documents/open-edge-switch-specification-v0-5-2-pdf

Appendix A - Checklist for IC approval of this Specification (to be completed by contributor(s) of this Spec)

Complete all the checklist items in the table with links to the section where it is described in this spec or an external document.

Item	Status	Link to detailed explanation
Has this contribution been presented to an OCP Project group during a project call or engineering workshop?	Yes	
Approval by Project Leads	Yes	
Is this contribution entered into the OCP Contribution Portal?	Yes	
Was it approved in the OCP Contribution Portal?	Yes	