

Open edge server sled, Intel Xeon scalable, 3rd generation

Revision 1.0

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Revision Table

Date	Revision #	Author	Description
Jun 30, 2021	0.1	T. Mannikko, M. Huang	First draft
Aug 31, 2021	1.0	T. Mannikko, M. Huang	

References

[1] Nokia Open edge chassis specification, 2018
https://www.opencompute.org/documents/open-edge-chassis-ocp-contribution-v1-3-pdf

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

[3] Nokia Open edge server specification, 2018
https://www.opencompute.org/documents/open-edge-server-ocp-contribution-v1-0-pdf

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

2 Scope

Nokia and ASUS have jointly developed a new, 2nd gen Open edge server sled featuring third 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].

3 Overview

The Gen2 Open edge server is a major advance over the initial server release of 2018. The main enhancement is introducing support for third generation of Intel's XEON scalable family CPU. The new CPU and several other improvements bring significant benefits in running various real-time applications. Improved system cooling will enable simultaneous use of higher TDP CPUs and accelerator cards. The main enhancements of the new server generation are listed below.

- Baseline: Nokia Open edge server specification, 2018 [3]
- Latest Intel XEON scalable gen3 support
    - Significant increase in core count
    - Platform improvements in supporting real-time applications
    - Increased number of memory buses: 6 -> 8
    - Increased memory bus speed: DDR4 2993 MT/s -> 3200 MT/s
    - Support for new PCIe generation: Gen3 -> Gen4
    - Increased number of PCIe lanes: 48 -> 64
- Support for OCP 3.0 SFF
    - Hot-swappable
    - Higher TDP and performance
    - Support for dual-QSFPxx in front panel
- Enhanced thermal performance
    - Increased sled TDP: 400 W -> 500 W
    - Support for 230 W CPU TDP in 1U sled
- Enhanced storage solution

- Support for dense EDSFF E1.S
- Enhanced cooling using heat sink solution
- Forward-looking SSD technology

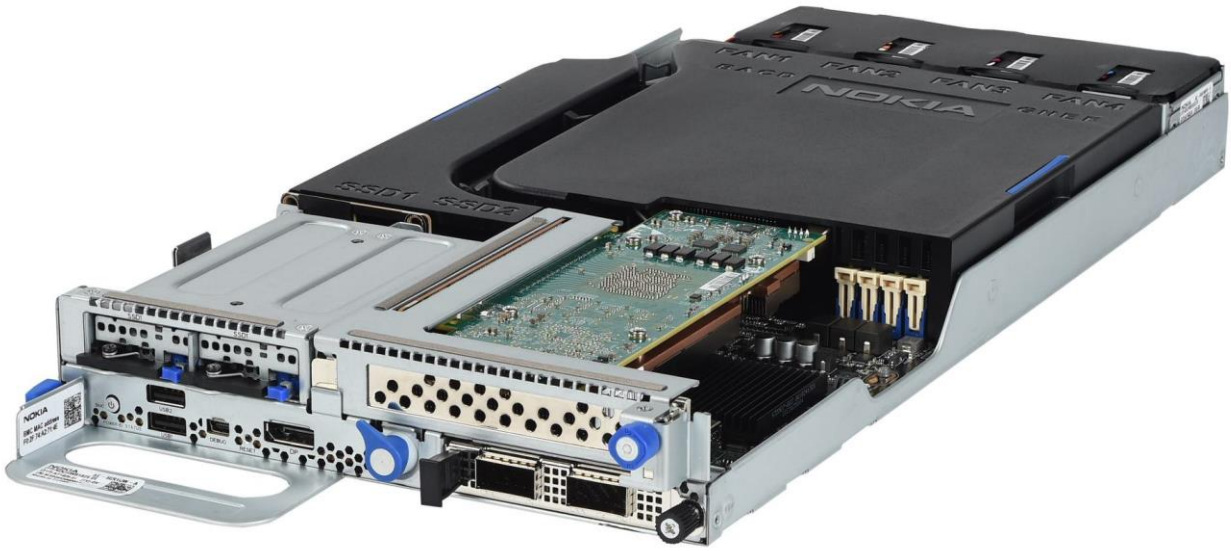


Figure 1 Open edge server sled, 2nd generation

4 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 2 Open edge 3U chassis with sleds

5 Product Architecture Overview

5.1 Technical specifications

The following table lists the major hardware components and their key specifications.

Table 1 Open edge server key specifications

Technical specifications of 2nd gen Open edge server, 1U		
Processor		Single Socket Intel Whitley platform **Intel® 3rd gen Xeon® scalable processor** 1 x Socket P+ (4189 pin) Up to 230W
Chipset		Intel® C621A Chipset
Memory	Total Slots	8 x DIMM slots (8-channel per CPU, 8 DIMM per CPU)
	Memory Type	**1DPC:** DDR4 Registered @ 3200 MT/s
Expansion Slots	Total Slots	**1 PCIe** 1 x PCI-E x16 slot (Gen4 x16 link) (Full Height, Half Length) 1 **OCP** 1 x OCP 3.0 (Gen4 x16 link)
Disk Controller	SATA/NVMe Controller	**Intel® C621A Chipset :** 2 x M.2 by M.2 riser (Type 2280/22110 storage devices support both SATA & PCIe mode) * RAID support for 2 M.2 drives (SATA mode) : Intel® RSTe **PCIe from CPU :** 2 x EDSFF by ESDFF riser * RAID support for 2 EDSFF drives (PCIe mode) Intel® Virtual RAID (VROC) support for CPU RAID
Storage	Front Bays Options	2 x EDSFF E1.S NVMe PCIe x4 drives, by direct connections from CPU socket * Support for VROC
	Onboard M.2	2 x M.2 2280/22110 slots with SATA/NVMe * Interfaces are connected to PCH. There is a M.2 riser for M.2 disks.
Graphic	Display port	Aspeed AST2600 64MB (Shared memory 64MB from BMC memory)
GPU Support		FHHL, up to 75 W
Network	Onboard	1 x Intel I210-IS controller (connect to PCH with PCIe x1) 1 x 1GbE management port from ASPEED AST2600 (connect to backplane Airmax connector)
	NIC Options	OCP 3.0 NIC add-on cards FHHL PCIe add-in cards

Front I/O Ports		1 x Display Port from Aspeed AST2600 2 x USB 3.0 port 1 x Mini USB 2.0 (for UART debug)
Rear I/O Ports		Airmax connector (DM LAN, SMBUS, RMC, +12V Power input)
Button/LED	**Front**	1 x Power Button (with identifier blue LED) 1 x Status LED (Tri colored LED for BMC, Green, Orange, Red) 1 x BMC heartbeat LED 1 x Reset Button
	Rear	NA
Power feed		+12V DC, 500 W
Security Options		HW TPM: Onboard TPM
Management Solution		BMC: KVM over IP
BMC		Aspeed AST2600
FAN SPEC		4 x SYSTEM FAN (Dual rotor 4056)
Dimension		215 x 41 x 423 mm (W x H x D)
Environmental		Operating temperature range: -5 °C ~ 45 °C [ETSI EN300 019-1-3 Class 3.2] Short term operating temperature: -5 °C to +55 °C [GR-63-CORE]

5.2 Server Block Diagram

Open edge server is single-socket. The CPU is of the Intel® 3rd gen Xeon® scalable processor product family, supporting 8 DIMMs. The processor supports direct PCIe Gen4 connectivity to

- riser slot (x16)
- OCP 3.0 slot (x16)
- 2 x EDSFF NVMes (x4)

The used C621A PCH provides connectivity to the following devices/interfaces

- 2 x M.2 (SATA, PCIe x4)
- 2 x USB
- ASPEED AST2600 BMC for system management
- 1000 Base-T LOM port to sled backplane

For security, the server sled hardware design supports the BIOS secure boot and a TPM2.0 module.

The figure below shows the simplified block diagram of the server.

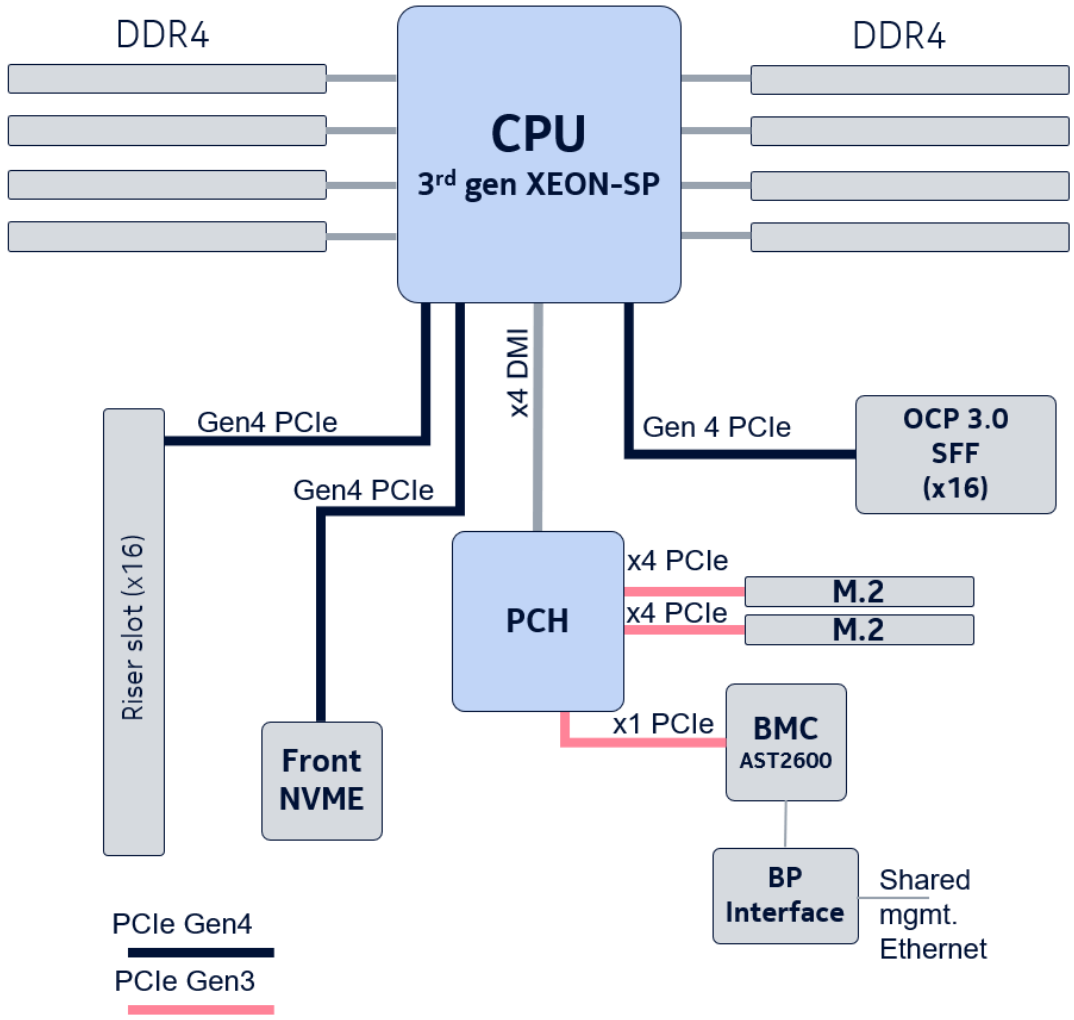


Figure 3 Simplified server block diagram

5.3 Main system components and external interfaces

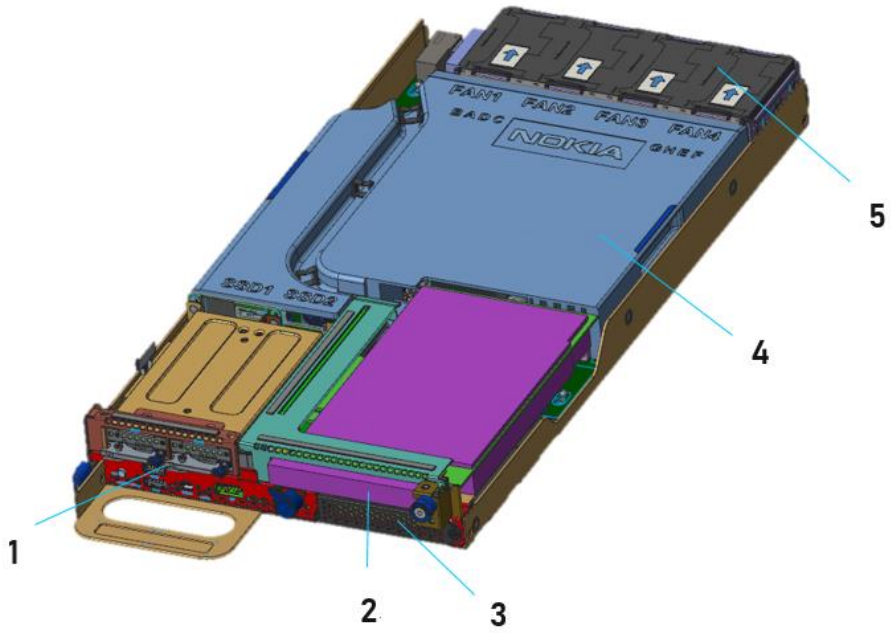


Figure 4 Open edge server sled

Table 2 Open edge server sled components

Item	Description
1	Front disk trays (2 x E1.S NVMe)
2	FHHL PCI-E x16 (Gen4 x16 link) expansion slot
3	OCP 3.0 (Gen4 x16 link) slot
4	Air duct
5	Fan module (4 x 4056 dual-rotor fans)

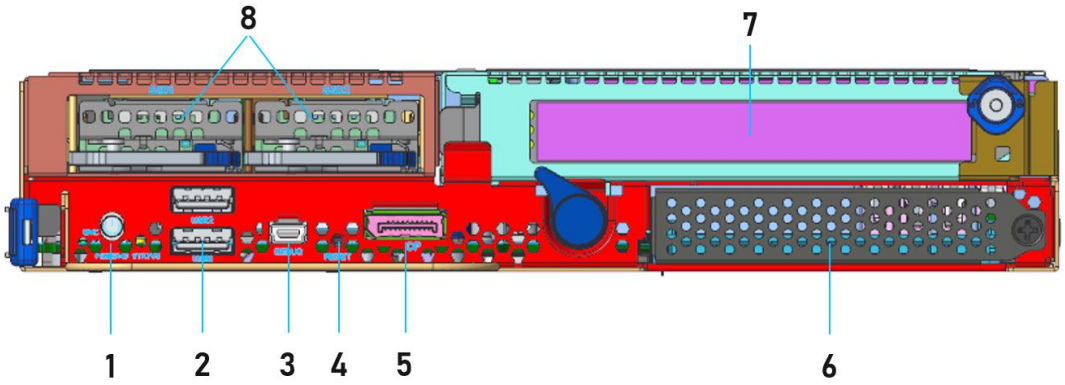


Figure 5 Front view of Open edge server sled

Table 3 Front view of Open edge server sled

Item	Description
1	Power button / ID LED
2	2 x USB 3.0 connector, type A
3	Mini USB 2.0 (for UART debug)
4	Reset button
5	Display port connector
6	OCP 3.0 (Gen4 x16 link) slot (small form-factor)
7	FHHL PCI-E x16 (Gen4 x16 link) expansion slot (Slot #1)
8	2 x EDSFF E1.S, NVMe, hot swap

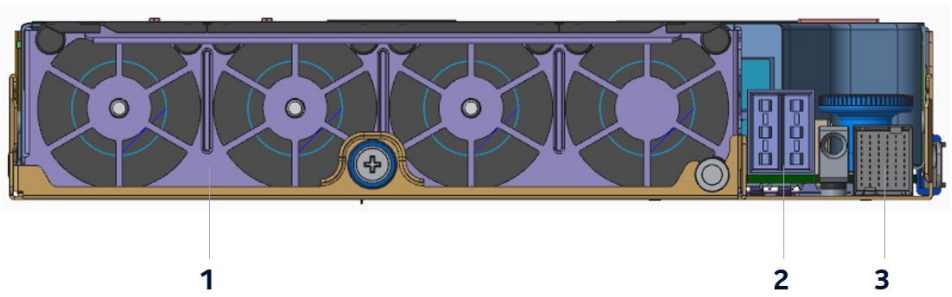


Figure 6 Rear view of Open edge server sled

Table 4 Rear view of Open edge Open edge server sled

Item	Description
1	Fan module, front to rear and rear to front air flow options
2	Backplane power connector
3	Backplane signal connector

5.4 Server Board Dimensions

The size of the server motherboard PCB is 16.26 * 8.2 inch (413 * 207.8 mm).

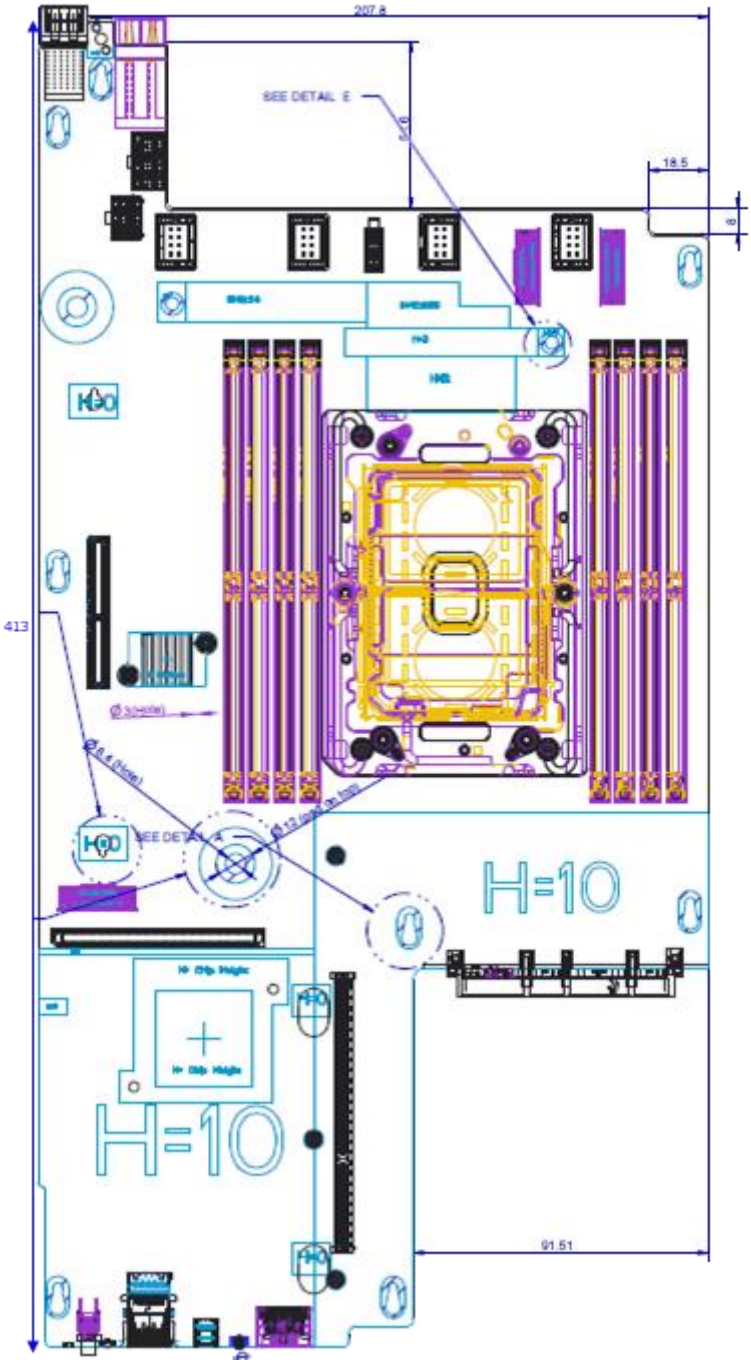


Figure 7 Dimensions of server motherboard

5.5 Processor

The Intel® 3rd gen Xeon® scalable processor is the next generation of 64-bit, multi-core server processor built on 14-nm process technology. The processor socket type is LGA4189-P4 SMT. Processor package size is 56.5x77.5 mm

- Enhanced processor and platform performance
- Enhanced memory support
    - Up to 8 channels of memory with support for up to 3200 MT/s
    - Support for Intel Optane persistent memory 200 series
- Enhanced I/O
    - Up to 64 lanes of PCI Express 4.0
- Processor TDP up to 230W.

5.6 PCH

The Intel® C620 Series Chipset PCH provides extensive I/O support. Functions and capabilities include:

- PCI Express 3.0
- Serial ATA host controller, up to 6 Gb/s
- xHCI USB controller with SuperSpeed USB 3.0 ports
- Direct Media Interface
- Low Pin Count interface, interrupt controller, timer functions
- System Management Bus Specification, Version 2.0
- Integrated Clock Controller/Real Time Clock Controller

5.7 Memory

The server supports eight memory channels. Population of up to 8 DDR DIMMs is supported, that is, one DIMM per channel. Intel® Optane™ Persistent Memory 200 series Barlow Pass (BPS) DIMM technology is also supported.

The supported memory configurations are shown in the table below.

Table 5 Supported memory configurations

Channel	B	A	D	C	G	H	E	F
Slot	DIMM_B1	DIMM_A1	DIMM_D1	DIMM_C1	DIMM_G1	DIMM_H1	DIMM_E1	DIMM_F1
DDR4+BPS (6+1)	DDR4	DDR4	BPS	DDR4	DDR4		DDR4	DDR4
	BPS	DDR4	DDR4	DDR4	DDR4	DDR4	DDR4	
	DDR4	DDR4		DDR4	DDR4	BPS	DDR4	DDR4
		DDR4	DDR4	DDR4	DDR4	DDR4	DDR4	BPS
	DDR4	DDR4	DDR4	BPS		DDR4	DDR4	DDR4
	DDR4	BPS	DDR4	DDR4	DDR4	DDR4		DDR4
	DDR4	DDR4	DDR4		BPS	DDR4	DDR4	DDR4
	DDR4		DDR4	DDR4	DDR4	DDR4	BPS	DDR4

5.8 PCIE Lanes

The use of PCIe controllers and lanes are shown the following tables.

Table 6 The use of PCIe controllers of the CPU

PCIe controllor	PCIe lane width	Lane assignment
PEG 1	Lane [7:0]	EDSFF x2
PEG 2	Lane [15:0]	RISER CARD
PEG 3	Lane [15:0]	OCP 3.0

Table 7 The use of PCIe ports of the PCH

PCIe port	PCIe lane width	Lane assignment
PORT 0	Lane [0]	Intel i210s LAN
PORT 3	Lane [3]	BMC AST2600
PORT 4	Lane [4:7]	EDSFF1
PORT 8	Lane [8:11]	EDSFF2

5.9 USB

The board has one external Standard-A, Dual port right angle USB3.0/2.0 on the front panel.

5.10 VIDEO

The server supports a DisplayPort 1.1a output from BMC chip. The Display port connector is located in the front panel. The features include

- 2-lane main link with data rate of 2.7 or 1.62 Gbps per lane.
- AUX Channel transceiver.

5.11 LOM

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)].

5.12 Sled Power connector

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.

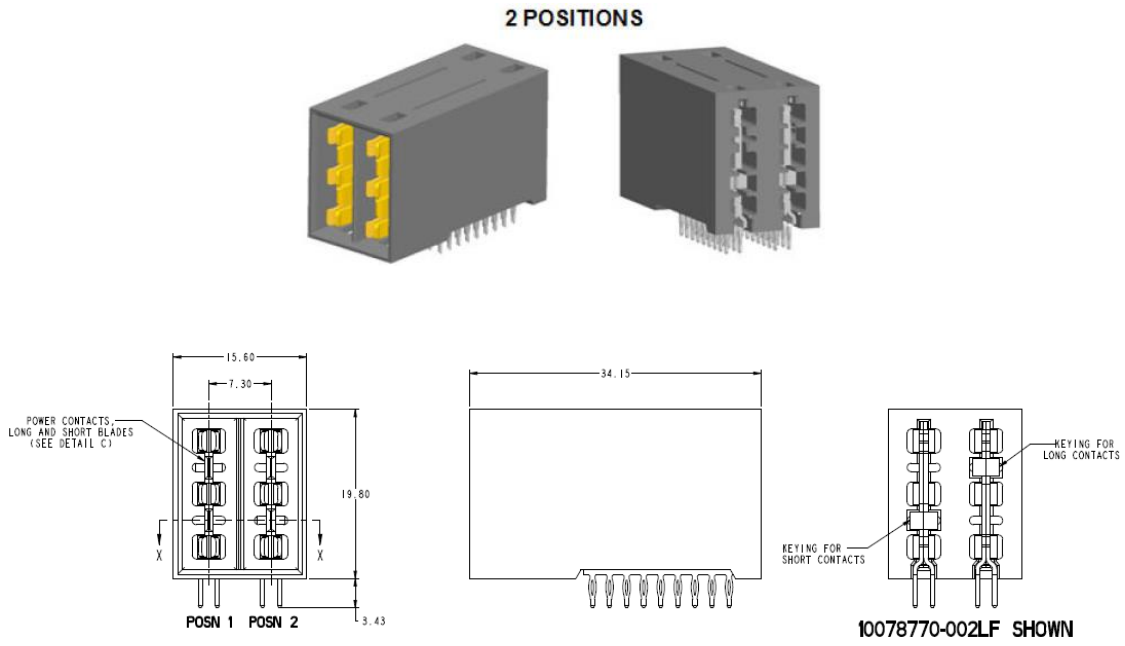


Figure 8 Power connector of Open edge sled

5.13 Thermal design

The key components of the thermal solution are briefly introduced in this chapter. The cooling solution supports front-to-rear and rear-to-front air flow options.

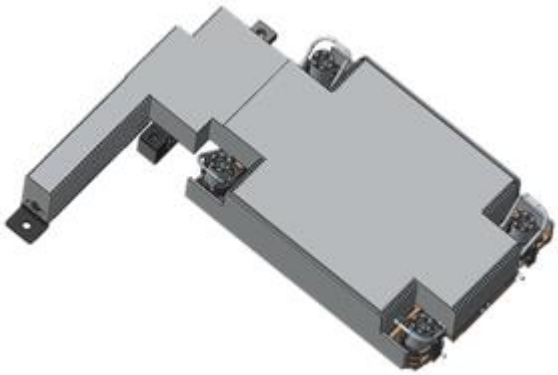


Figure 9 Heat sink of CPU, EVAC (Enhanced Volume Air Cooling)

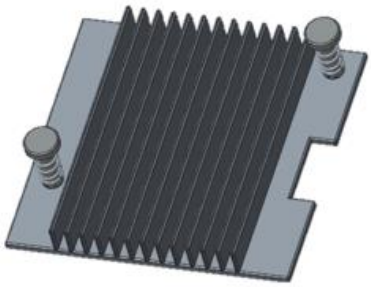


Figure 10 Heat sink of PCH (C620 series)

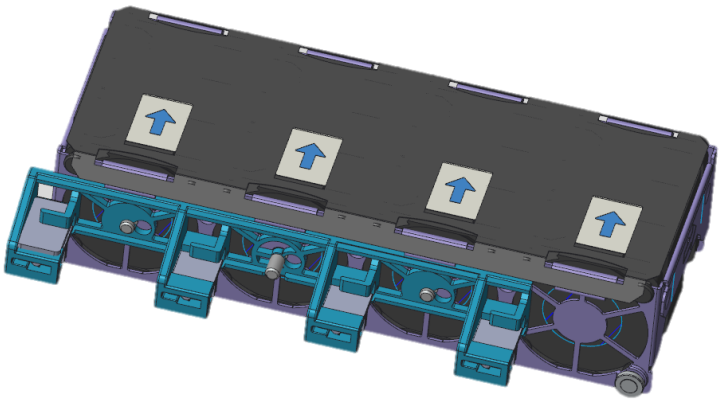


Figure 11 Fan module with four 4056 dual-rotor fans

5.14 System LEDs

The Open edge server has three LEDs. Their functions are described in the following table.

Table 8 Description of LEDs

LEDs	Color	LED Status	Description
Status LED (Fault LED)	Amber	Off	Normal status
		Blinking (4Hz)	eSW update on-going Critical event occurs
Power/ID LED	Blue	Off	System is OFF
		Solid ON	System is ON
		Blinking	Identify the system
Heartbeat LED	Green	Off	BMC is not ready
		On	BMC is not ready
		Blinking	BMC is ready

6 Mechanics

The key mechanical parts of the system are briefly introduced in this chapter.

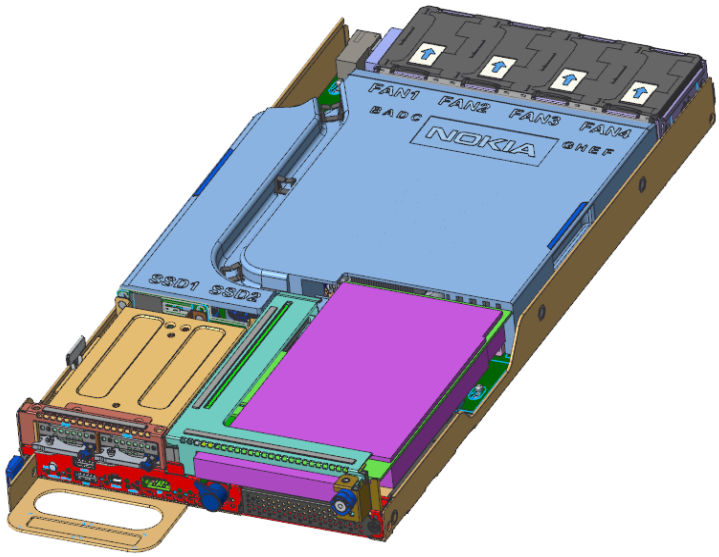


Figure 12 Open edge sled with air duct

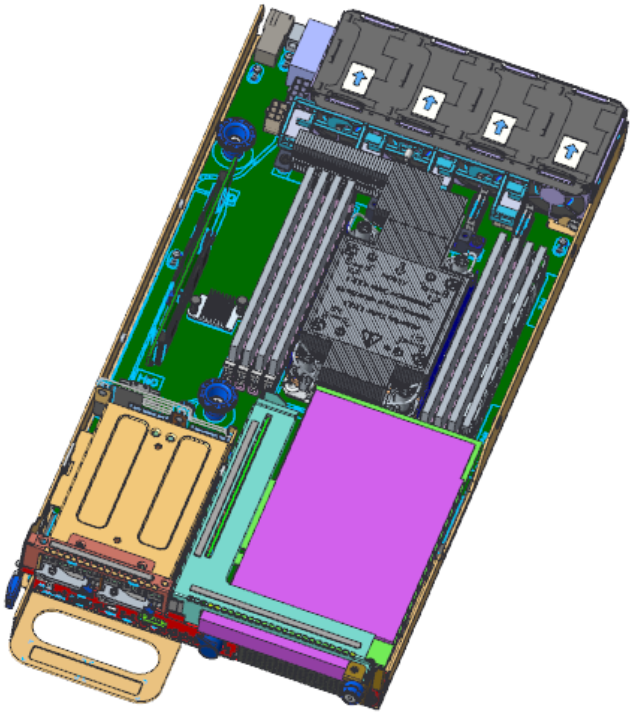


Figure 13 Open edge sled without air duct

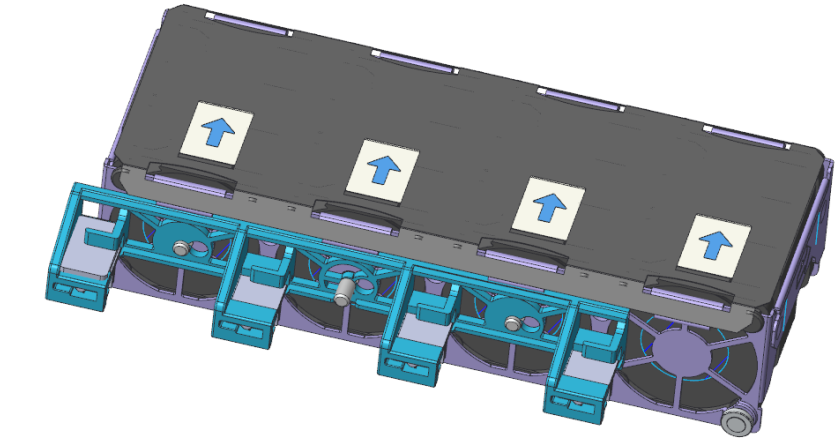


Figure 14 Fan module with four dual-rotor fans

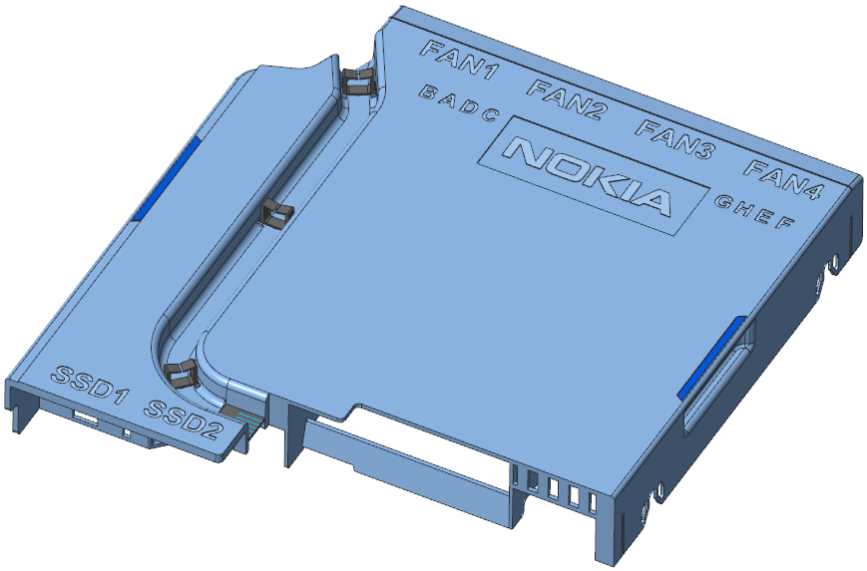


Figure 15 Air duct