WHITE PAPER: OPEN EDGE SOLUTION

BLUEPRINT

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Executive Summary

This document describes the main characteristics of Open edge configurations for both indoor and outdoor installations. Examples of rack configurations, including power feed and networking, are provided.

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Introduction

This document describes different options in configuring Nokia Open edge systems. Nokia Build to Order model (BtO) allows users to configure server, chassis and rack level configurations from pre-validated components, which are selectable in Nokia configurator tool. Configurations can be defined in ways that best fits user requirements. The tool will generate a detailed asset file of the complete system, which the integrating factory will use to build the defined configuration. Servers, switches, power distribution units and the related cabling are all factory integrated and tested, after which the system is packed and delivered to customer site in turnkey mode. The customer only needs to power up the system and use Nokia data center manager (NADCM) to upload device MAC addresses and IP plan from asset file and start automated deployment for the Hardware configuration.

1 Open edge deployment options

A typical Open edge datacenter deployment flow is shown in Figure 1. The process starts with capturing user requirements, such as processing performance, storage needs, space constraints, air flow direction, power feed, as so on. A configurator tool is used to build the needed configuration, which can be a single server sled, a chassis containing several sleds or a rack containing several chassis.

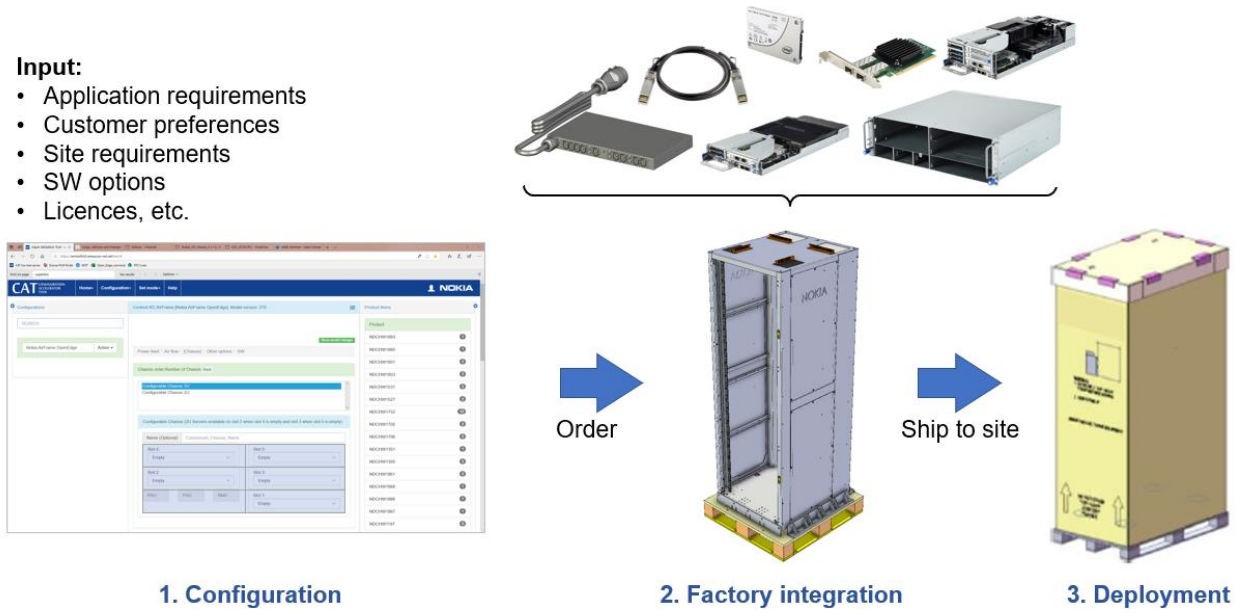

Figure 1 Typical Open edge configuration/order/deployment flow

When the configuration is completed, the tool will generate an asset file that contains a detailed description of the configuration throughout the system hierarchy (sled/chassis/rack) and a detailed bill of materials for the entire system. The asset file documents the system and serves as the assembly instruction for the integration step.

The next chapters detail the typical configuration options for Open edge sleds, chassis and racks.

Server configuration options

The different configuration options of an Open edge server sled are illustrated in Figure 2.

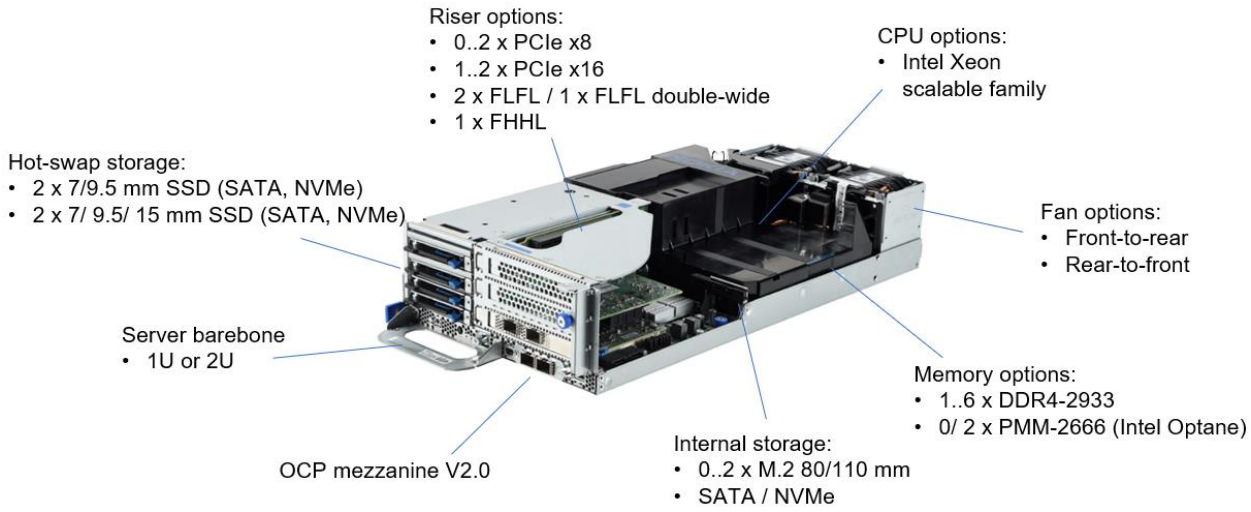

Figure 2 Open edge Server sled configuration options (2U half width server in picture)

Some of the key choices in configuring a sever are described in more detail below.

- Server barebone
    - A 1U half width server sled enables a denser in terms of core count and system memory but has less space for i/o and storage. A 2U half width server provides more storage and I/O options due to increased height. Also, full length, dual width processing units, such as HW accelerators and GGPUs, are supported in the 2U half width sled.
- Riser
    - With different riser options, the i/o connectivity from the CPU to extension cards and SSD drives can be optimized for each use case, for example a choice of connecting more PCIe lanes to NVMe drives or to extension cards.
- CPU and memory
    - The entire Intel Xeon scalable CPU family and a wide range of DDR4 DIMMs are available for selection, allowing optimization of the server performance for the target application.
- Fan unit
    - Front-to-rear and rear-to-front air flow options are available to meet the requirements of the operating environment of the installation site.

Chassis configuration options

Open edge chassis mechanical design is simple, consisting of only few components. The power distribution board, backplane assembly and mounting brackets are attached to a steel enclosure.

The rear wall of the chassis is perforated to allow front-to-rear or rear-to-front cooling air flow. For rack installation, a shelf is needed. The front mounting flanges alone are not capable of carrying the entire weight of a fully populated chassis. A dedicated, adjustable sliding shelf is available for installation the Open edge chassis into a standard 19" rack, but a generic L-bracket is also usable.

The Open edge chassis backplane provides power feed to the sleds and signaling between the sleds and RMC. There is one power connector and one signal connector for interfacing each sled. Sled 1 has an extra power connector for possible future use. A BBU is a planned use for this connector but is currently only reserved.

Each sled in chassis configuration can be independently selected. Configuration can consist of 1U and 2U half width servers, switches and other type of sleds. Every chassis configuration includes an RMC and two PSUs (100-240VAC and -48VDC options are available).

The different configuration options of an Open edge Chassis are illustrated in Figure 3.

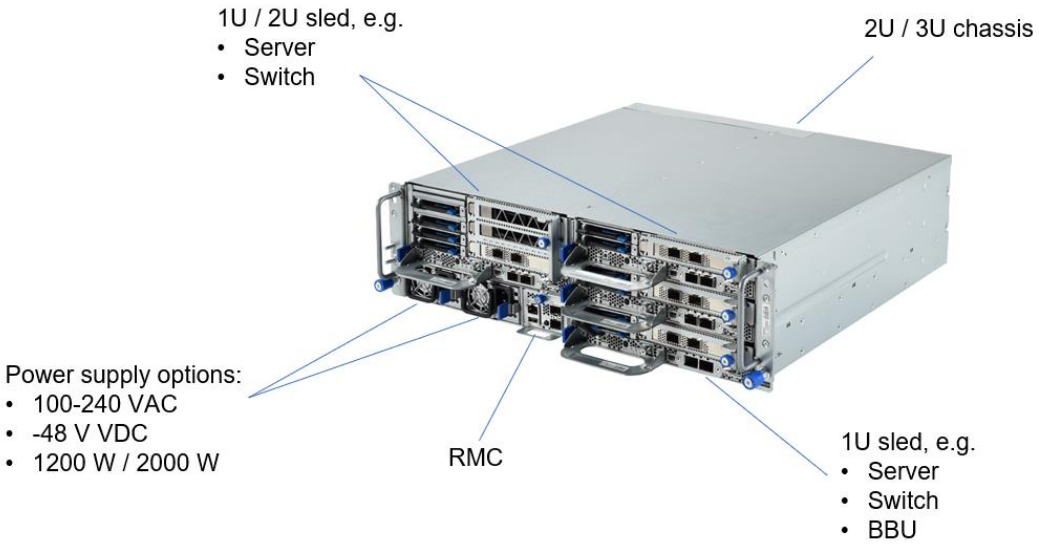

Figure 3 Open edge chassis configuration options

The Open edge chassis supports flexible configuration of two sizes of half width sleds, 1U and 2U. One 2U sled can be installed in place of two 1U sleds. 1U sleds in the top row have support brackets on the inner sides of the chassis. When a 2U sled is installed, the support brackets are removed. Removal and installation are tool-less.

- Supported configurations in 3U chassis are
  - 5x 1U
  - 3x 1U + 1x 2U
  - 1x 1U + 2x 2U
- Supported configurations in 2U chassis are
  - 3x 1U
  - 1x 1U + 1x 2U

The principle of equipping different sled sizes is presented in Figure 4

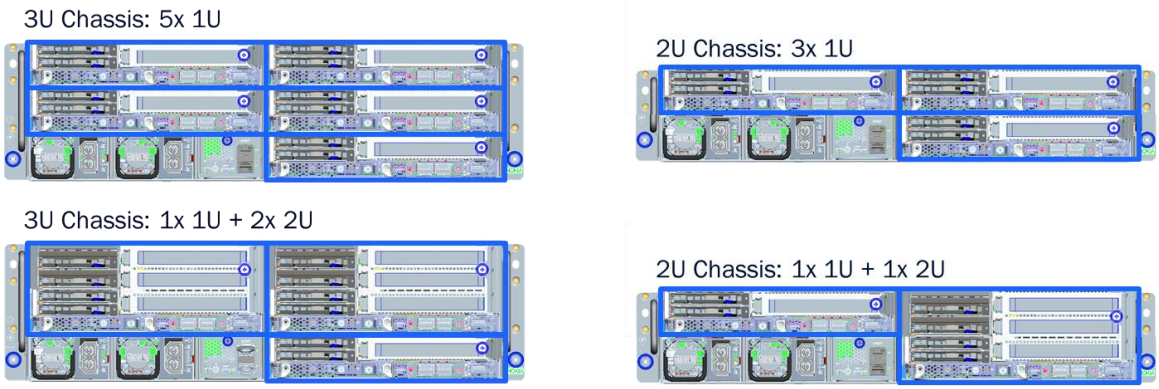

Figure 4 Open edge chassis sled equipping options

Rack configuration options

The different configuration options of an Open edge rack are illustrated in Figure 5.

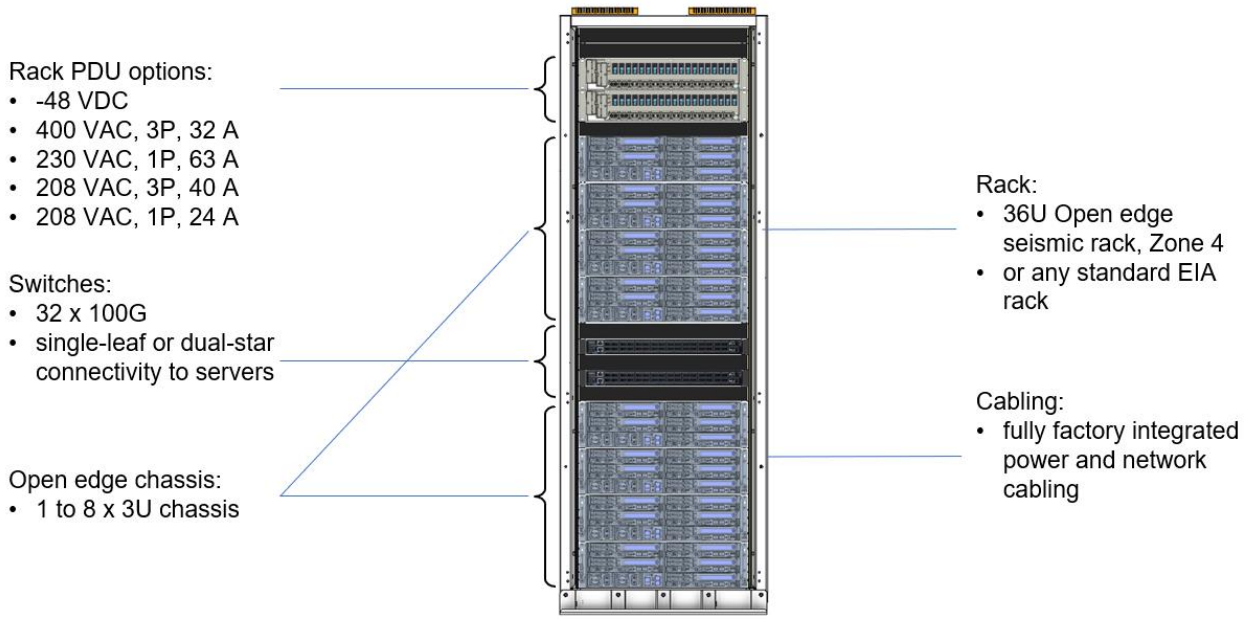

Figure 5 Open edge rack configuration options

There are currently various blueprint rack configurations available for Open edge. The rack used in indoor blueprint configurations is the Open edge 36RU seismic rack. The rack includes doors, casters, levelling feet, floor mounting brackets and lifting hooks.

The dual-leaf rack configuration is scalable from 1 to 8 chassis. The configuration includes the following items:

- Redundant PDUs (two DC PDUs or four AC PDUs)
- Power feed cables for chassis and switches (cabling included for 8 chassis)
- Two leaf switches
- Network cables between servers and switches (cabling included for 8 chassis)
- Blank panels
- PDU air blocker units
- Cable manager units

All units listed above have pre-defined positions in the rack. Power cables are routed in the front left corner of the rack (except switch power cables that routed in the rear side of the rack) and network cables in the front right corner. There are cable management units above and below the switches to allow more space for network cables and to help organize them.

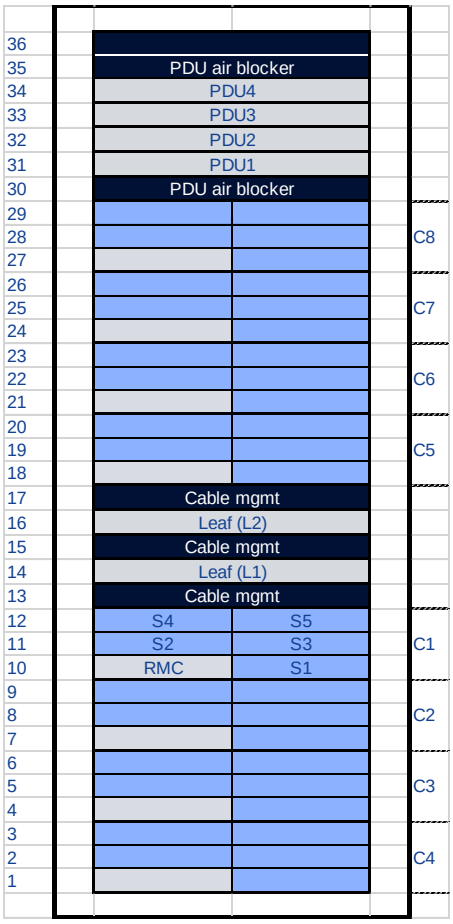

Figure 6 Open edge rack location options

The installation order of OE chassis in a rack is shown on the right side of the racks in Figure 6. The first chassis (C1) is installed in rack position U10, the second chassis (C2) in rack position U7, and so on.

Open edge rack configurations support both AC and DC power feed. Redundant, rack level power distribution is implemented using PDUs. Note that the DC PDU has redundant power feed built into a single unit, whereas two AC PDUs are required for redundant power feed.

A suitable PDU is selected based on geographical region and the type of power feed supported at the installation site. The supported rack power feed options are

- -48 VDC
- 400 VAC, 3P, 32 A
- 230 VAC, 1P, 63 A
- 208 VAC, 3P, 40 A
- 208 VAC, 1P, 24 A

OE chassis requires 2000 W PDU output capacity, switches 500 W output capacity. Most PDUs can feed up to 6 OE chassis or alternatively up to 5 OE chassis and 4 leaf switches.

Empty rack positions are equipped with blank panels that prevent circulation of air between front and rear sides of the rack. There are also specific air blocker units that are installed above and below PDUs. PDUs are installed deeper in the rack, which creates an opening for unwanted air flow between front and rear sides of the rack. PDU air blocker prevents this air flow.

Outdoor configuration options

Outdoor configurations are specific use case for Open edge. Configurator shall consider the targeted environmental conditions and site installation limitations such as ambient temperature of installation location, allowed maximum weight of solution, cabling limitations etc. Open edge configurator tool can build optimized solutions based on the known conditions and restrictions.

- Outdoor cabinet for 3U open edge chassis
- Heat exchanger cooling, closed internal airflow
- Roof-top, pole-mount installation options
- NEBS compliant, incl.
  - GR-63 Zone 4
  - GR-3108 Class 4, -40 C .. +46 C + solar load (GR-487)

Figure 7 Open edge outdoor installation example

2 Conclusion

Edge data center deployments come in large variety of use cases and system requirements. A good degree of flexibility is mandatory in configuring the HW for optimized TCO, performance, site environmental conditions and overall competitiveness. The configurator tool allows scaling the system from a single server to multiple racks, while allowing tailoring of the HW configuration of each server according to customer needs.

3 Glossary

BBU: Battery Backup Unit

BtO: Built to Order

NADCM: Nokia AirFrame Data Center Manager

OCP: Open Compute Project

OE: Open edge

PDU: Power Distribution Unit

PSU: Power Supply Unit

RMC: Rack Management Controller

TCO: Total Cost of Ownership

4 References

1. Open edge server specification: http://files.opencompute.org/oc/public.php?service=files&t=3e9592bad04e28742669d1958fad20e7&download
2. Open edge chassis specification: http://files.opencompute.org/oc/public.php?service=files&t=14f2dd0ce7533e070e38ec077d7a4f72&download

5 License

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