



# OCP SUMMIT

March 20-21  
2018  
San Jose, CA

**OPEN. FOR BUSINESS.**



# Telco NFV optimized Nokia AirFrame Server

Samuli Toivola

Lead HW Architect

Nokia

**OPEN. FOR BUSINESS.**



**OCP**  
SUMMIT

# Introduction to the challenge

Various Telco NFV use cases and several Telecom operators specific requirements makes “one size fits all” approach not so optimal for system level design. Therefore, the components of the system must be designed to support a large number of different configurations

Main missing items in typical designs compared to telco compute needs are lack of EMI shield, NUMA performance issue caused by limited connectivity to CPU socket 1, limited storage options/redundancy and limitations on PCH connectivity.

In Nokia Open Rack Server design the basic principle has been to create a solution that removes all mentioned limitations and in this way keeps design flexible without compromising performance.

# Characteristic of typical server in Telco NFV use cases

- Mid/high range CPU's in use, Intel® Xeon® Scalable family SKU level is GOLD.
- Memory need is moderate, configurations mainly below 384MB.
- Networking interface need is high, 100Gb/s per server - implemented with 4x 25Gb/s interfaces.
- Storage need is varying from compute server having only boot devices to storage unit with server having local high performance NVMe drives + high disc count JBOD combination.
- NUMA effect is hitting to system performance heavily if memory and PCIe addressing over UPI interfaces is not controlled.
- Server power consumption is 250W..300W in normal load (max. over 400W)

# Nokia Open Rack Server Improvements

# Improvements in EMI shielding and cooling

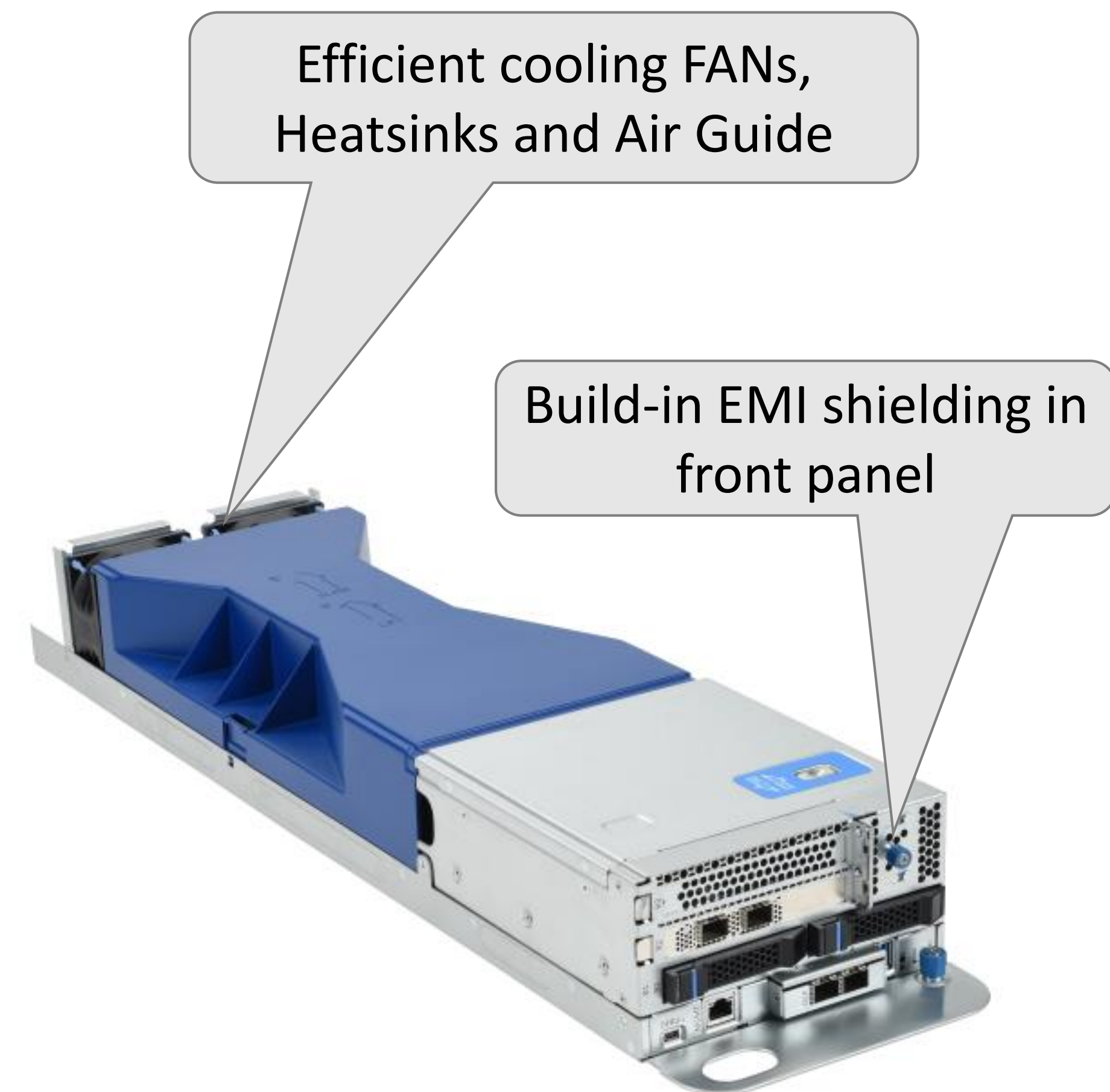
As an enabler to use Open Rack V2 compatible servers in co-located sites Nokia has created easy to maintenance front panel design with full build-in EMI shielding.

Nokia AirFrame system components have regulatory certifications, CE/FCC and Safety certification.

In addition, the server is designed to meet NEBS requirements.

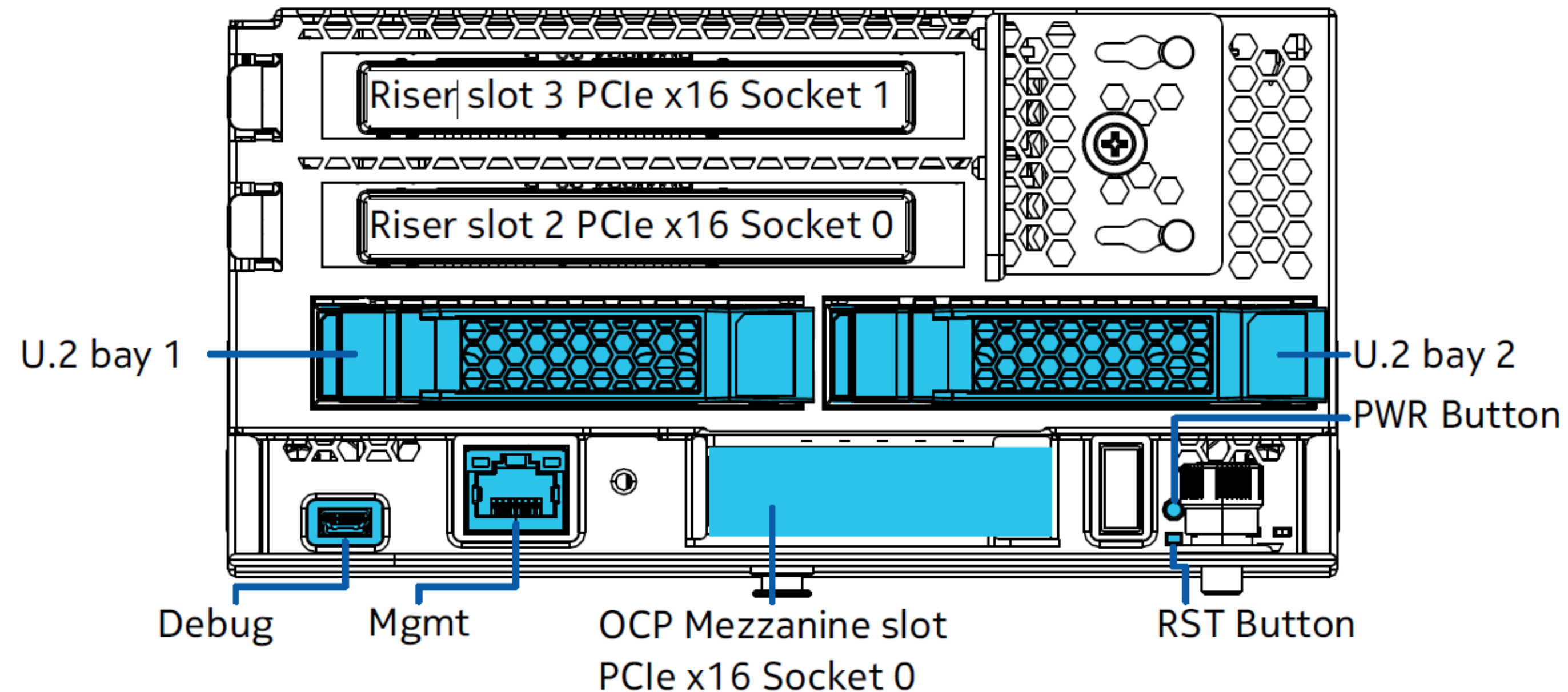
To enable up to 165W TDP processors and possibility to use high performance PCIe accelerator cards cooling fan performance is increased compared to typical Open Rack server designs.

ETSI temperature limits (up to 45 °C / 113 ° F) can be met with CPU SKU's used in typical blueprint telco NFV configurations.



# Configuration options of Nokia Open Rack Server

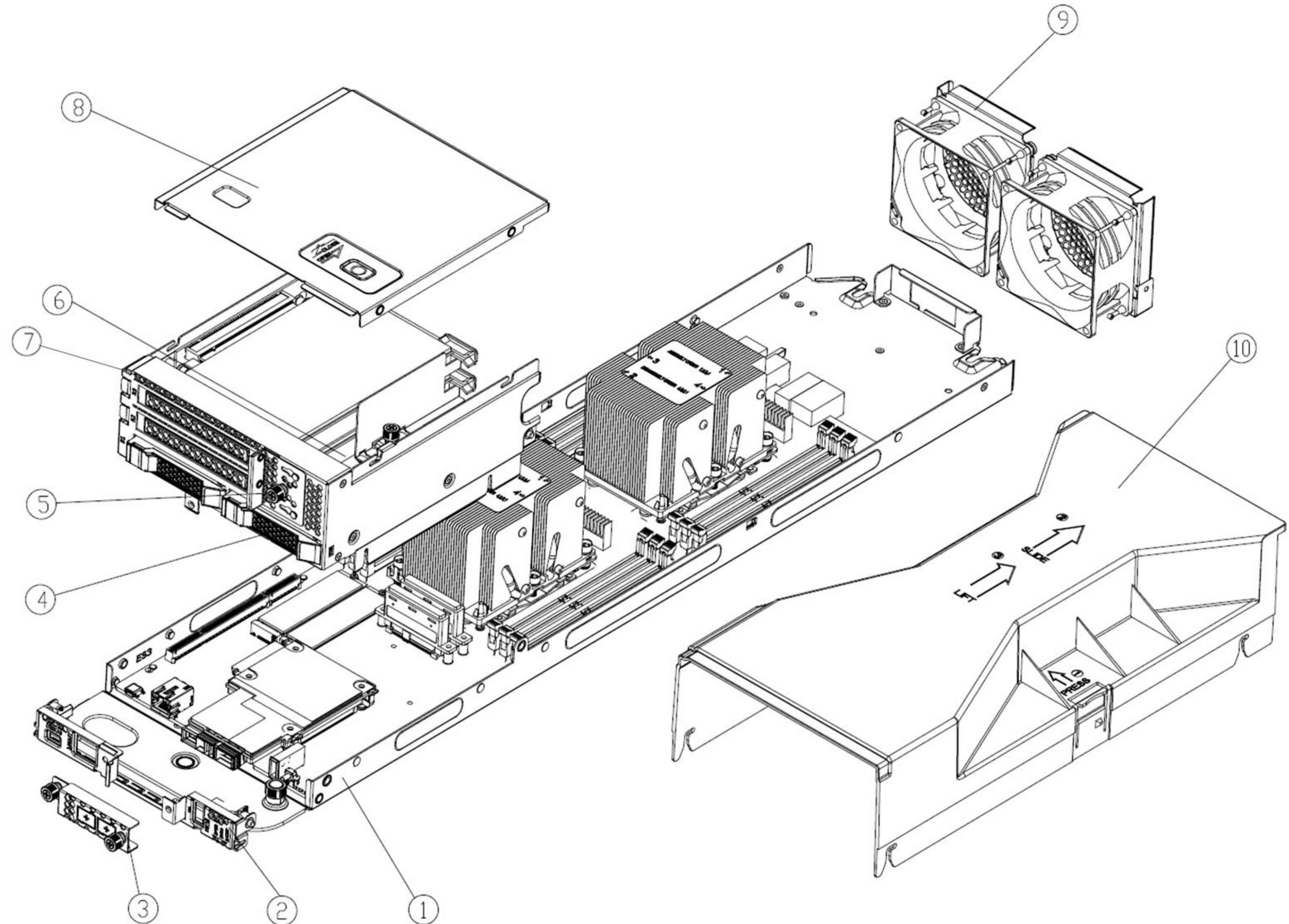
- Skylake processors from 6 to 28 cores (up to 165W TDP)
- Memory from 96GB to 768GB (8GB to 64GB DIMMs)
- Ethernet connectivity from 10GbE to 100+GbE
- Storage with 2.5" U.2 and M.2 NVMe/SATA devices
- Storage interface HBA/RAID options
- In-band / Out-of-band management HW management connectivity



# Mechanical structure of Nokia Open Rack Server

## Server sled main mechanical parts:

1. Bottom mechanics
2. I/O front panel
3. Mezzanine cover
4. HDD carrier
5. PCIe card locking clamp
6. Expansion slots
7. Front assembly
8. Top cover
9. Rear EMI cover
10. Air duct

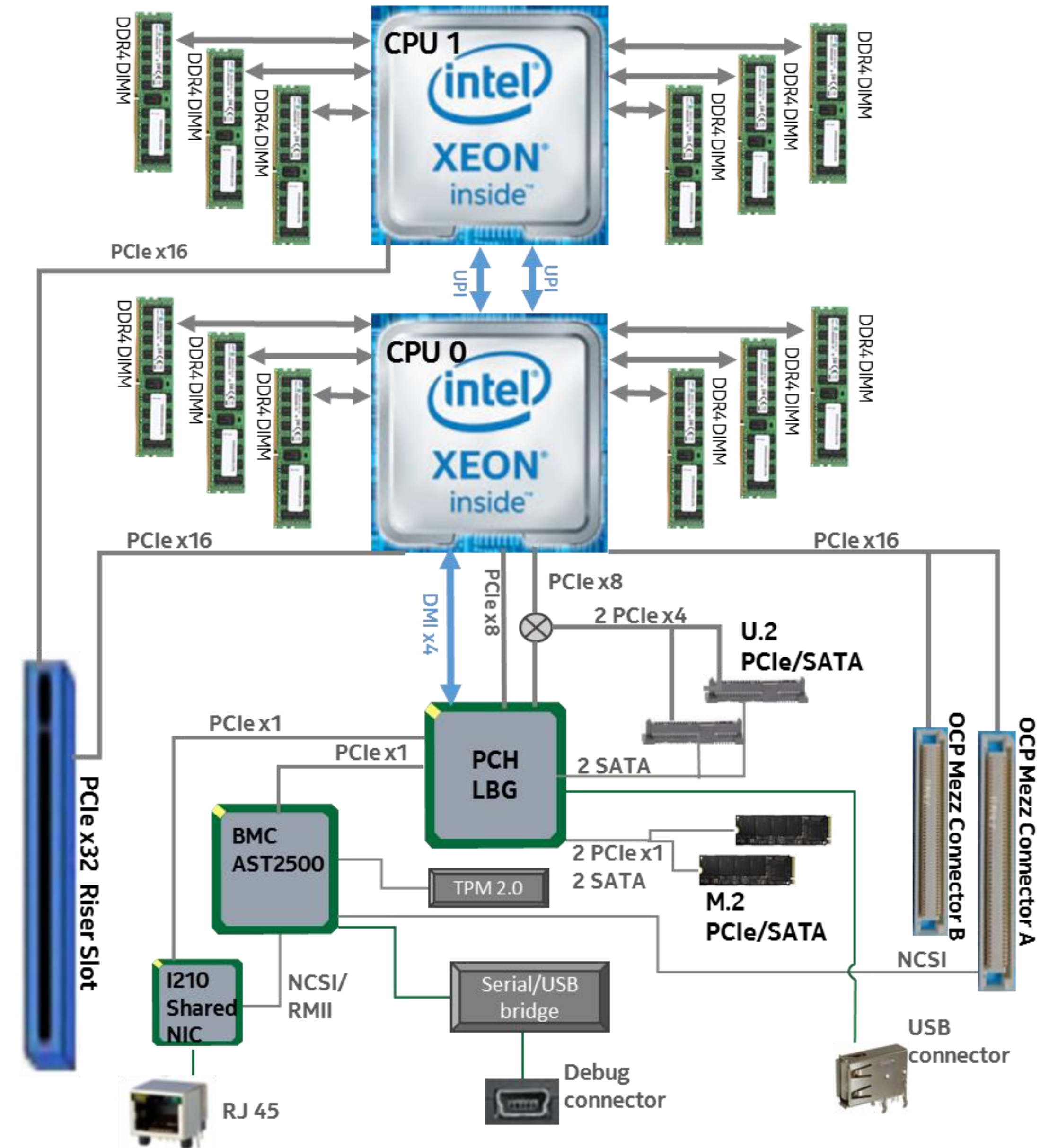




# Block diagram of server

Simplified block diagram of Nokia AirFrame server illustrates:

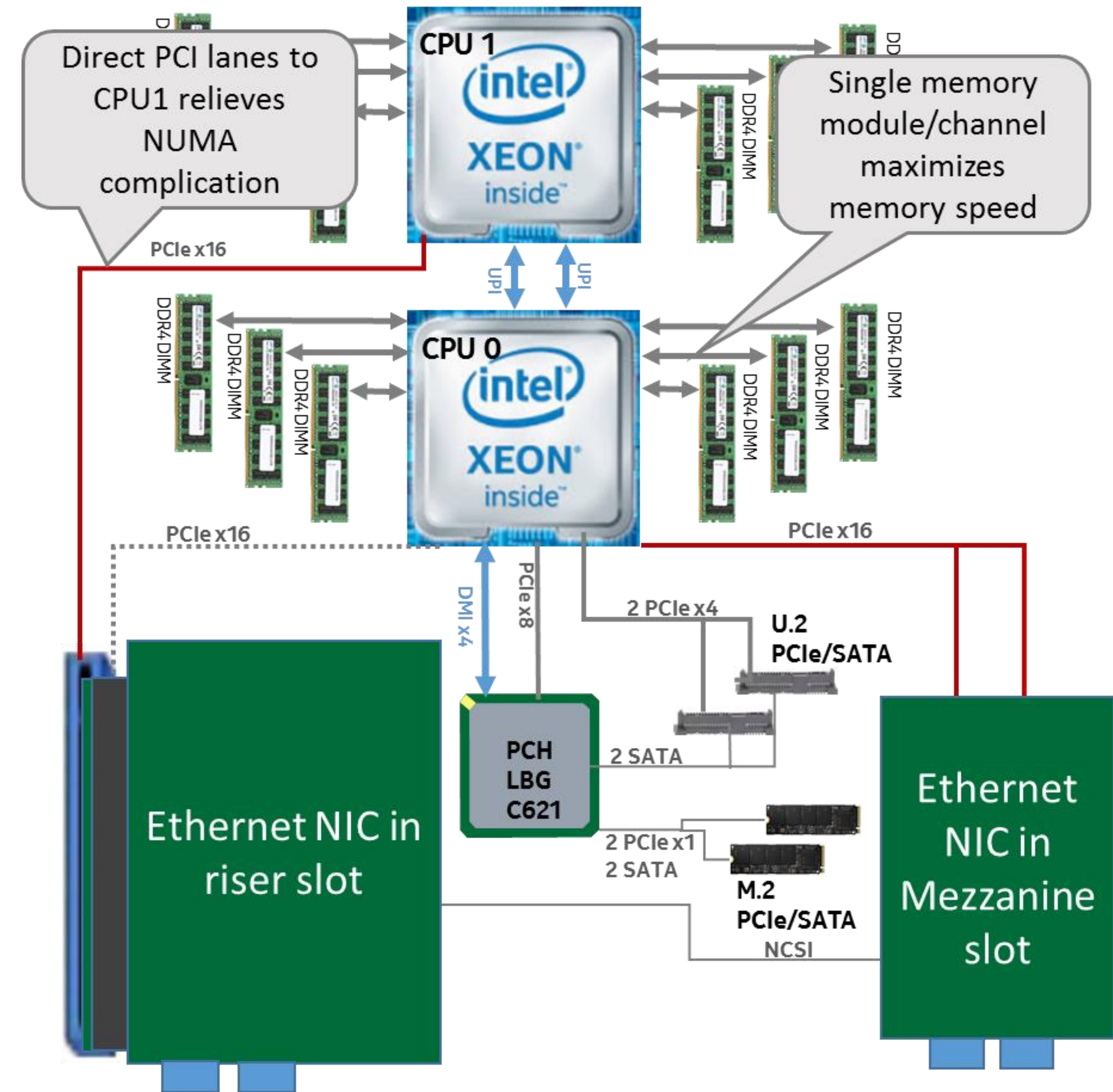
- PCIe connectivity in system
- Memory channel topology
- Storage device connectivity (PCIe/SATA)
- In-band / Out-of-band management options
- Front panel I/O
- *Not shown to simplify picture: local flash memories, optional midplane connectors, power and fan interfaces, internal debug connectors etc.*



# NUMA optimized NIC configuration

Most common challenge in Telco NFV use cases is performance reduction caused by NUMA effect:

- Nokia server design allows to connect NIC (or accelerator) cards to both CPU's using PCIe x16 lanes
- *This allows software optimization that reduces significantly memory addressing over UPI links*
- Single memory module/ memory channel maximizes memory speed



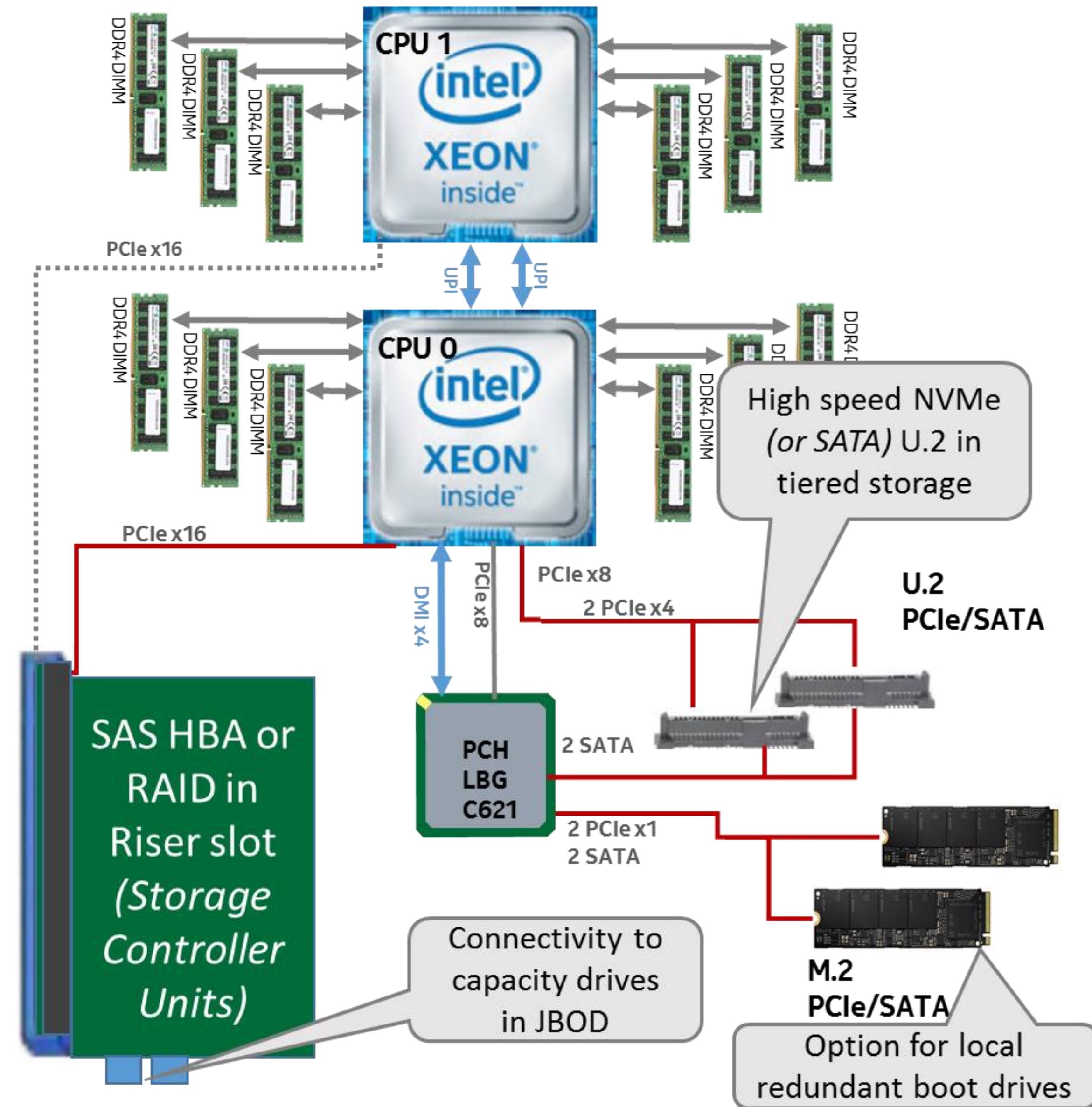
# Tiered storage configuration

To optimize storage solution server design allows several storage options:

- 2x M.2 slots SATA/NVMe (e.g. for redundant boot drive)
- 2x 2.5" U.2 Storage bays SATA / NVMe
- PCIe JBOD interface (HBA or RAID)

In tiered storage hierarchy implementation levels fits well to this architecture:

1. Internal - Processor
2. Main – System RAM
3. On-line mass storage – NVMe U.2 SSD's
4. Off-line Bulk Storage – HDD's or SSD's on JBOD



**NOKIA**

# Summary

# Summary

Nokia has designed OCP Openrack V2 compatible server variant optimized to telco NFV use cases.

New server design solves challenges to meet various customers CO site specific requirements like EMI shielding and ETSI environmental requirements.

Server design enables flexible and effective configurations for various networking and storage focused use cases.

Improvement to NUMA performance issue by PCIe routing to CPU1 from riser slot and to storage performance with redundant NVMe SSD's

*PLAN for Nokia Open Rack Server is to contribute the spec and apply for OCP Inspired recognition. Target timeline for spec contribution is 3<sup>rd</sup> quarter 2018 and target to have product available on OCP marketplace 4<sup>th</sup> quarter 2018*

**NOKIA**

**Thank You!**

**NOKIA**

# Come and visit us at Nokia booth B6

World's first telco grade Open Rack v2 solution



# OCP SUMMIT