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OCP SUMMIT

SERVER

AirFrame Open Rack Server with Integrated HW Acceleration.

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Nokia is a Platinum Member of the Open Compute Project and an OCP Solution Provider

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AirFrame open rack server with integrated HW acceleration

Update on Nokia AirFrame open rack server with integrated HW acceleration capabilities (continuation to the presentation held in OCP Summit).

Examples of benefits that server integrated accelerator use can bring in system level:

- Application acceleration using crypto processing can close to double application performance with IPSec
- I/O acceleration with integrated packet acceleration increases vCPU capacity and lower packet latency at the same time
- Telco baseband processing acceleration can double server AxC handling capacity and decrease latencies at the same time

Characteristic of typical server in Telco NFV use cases

- Mid/high range CPU’s in use, Intel Xeon Scalable family SKU level is GOLD.
- HW acceleration need varies from iNIC acceleration (e.g. vSwitch HW offloading) to purpose build accelerator add on cards
- Memory need is moderate, configurations mainly below 384MB.
- Networking interface need is high, 100Gb/s per server - often 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/IO addressing over UPI interfaces is not controlled.
- Server power consumption is 250W..300W in normal load (max. over 400W)

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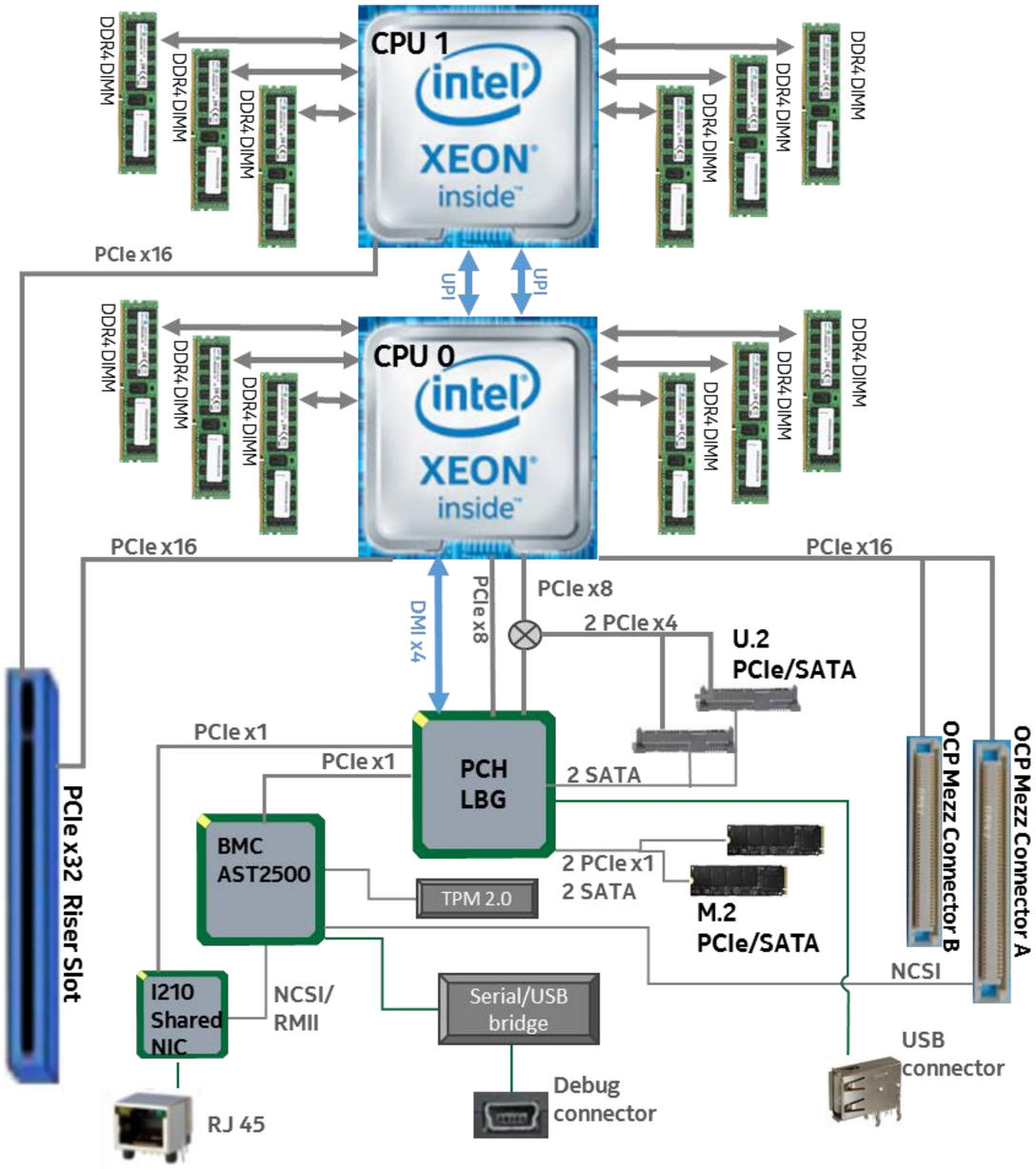
Nokia AirFrame Server Enhancements in Accelerator use

Block diagram of server

Simplified block diagram of 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

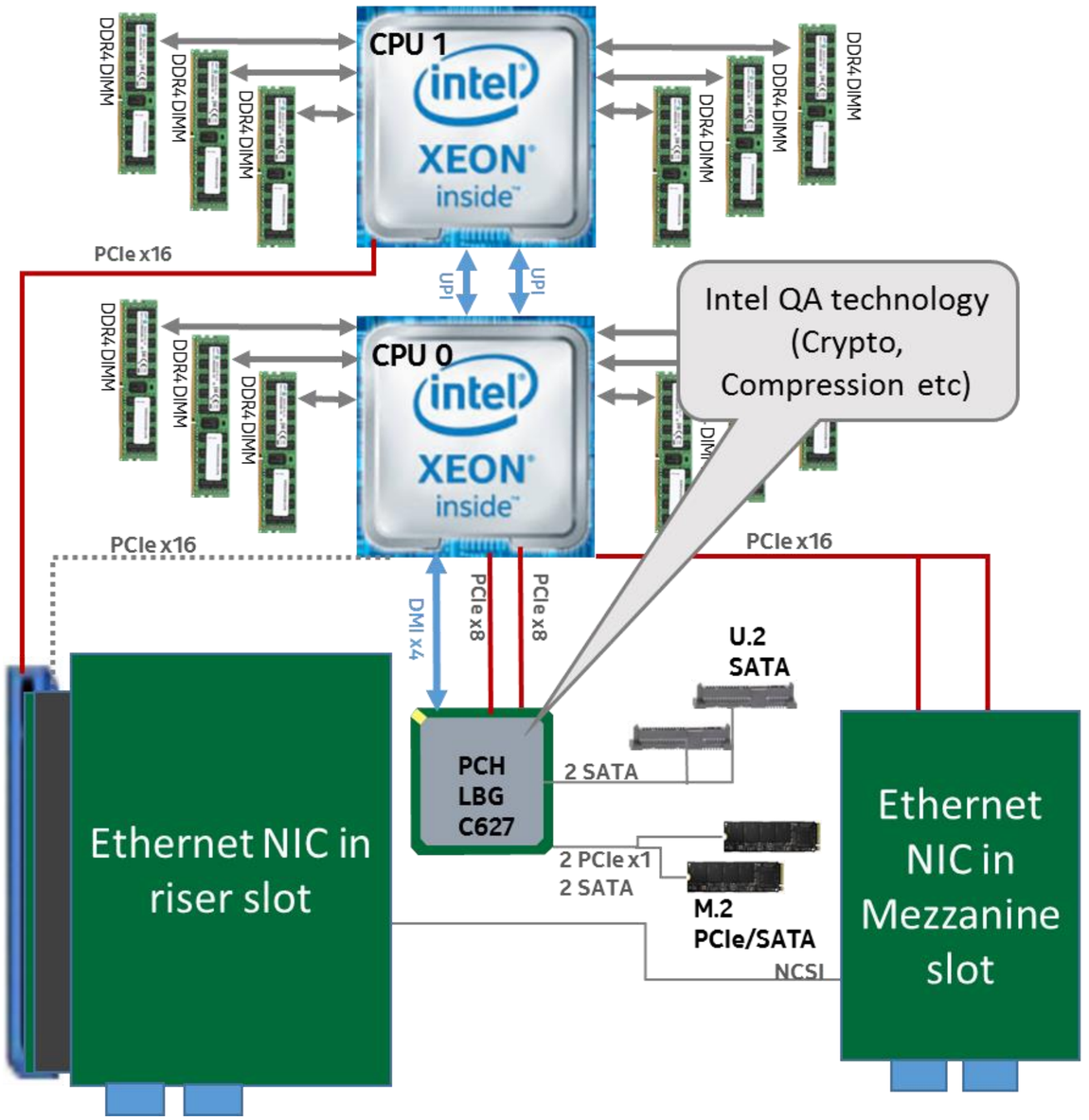
- *Not shown to simplify picture: local flash memories, optional midplane connectors, power and fan interfaces, internal debug connectors etc.*



Intel® Quick Assist technology based integrated acceleration

Server motherboard design allows usage of Accelerated Lewisburg PCH SKU:

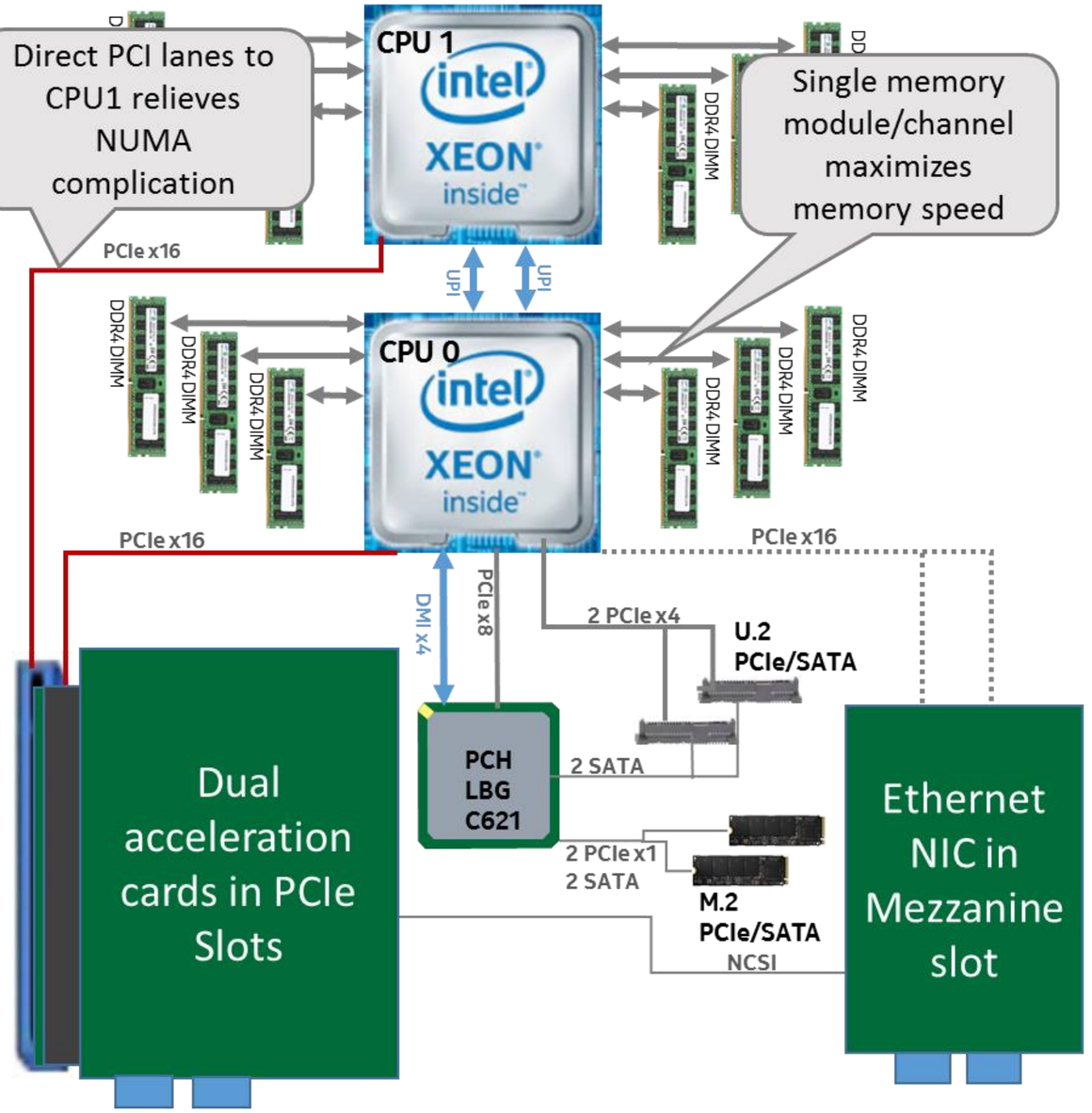
- Nokia AirFrame server have optional SKU supporting Intel® QA technology by using PCH version C627.
- Capacity values for PCH C627:
  - *Compression 100 Gb/s*
  - *Encryption 100 Gb/s*
  - *RSA (Public-key cryptography) 100k Ops/s*
- Additional x8 PCIe connectivity to PCH C627 is implemented using BOM switch



NUMA optimized PCIe
Dual accelerator configuration

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

- Server design allows to connect Accelerator cards from both CPU's using PCIe x16 lanes
  - This allows software optimization that reduces significantly memory and IO addressing over UPI links
  - Design allows dual 80W or single high power (150W) accelerator cards in single Open Rack Server



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Telco Acceleration Use Cases

Telco acceleration use cases

- In traditional telco many functionalities are done with special purpose HW using
  - FPGAs
  - DSPs
  - Network / packet processors
  - ASICs

- Acceleration is becoming a must for
  - Radio baseband processing
  - Packet processing
  - Security
  - AI/ML
  - Etc.

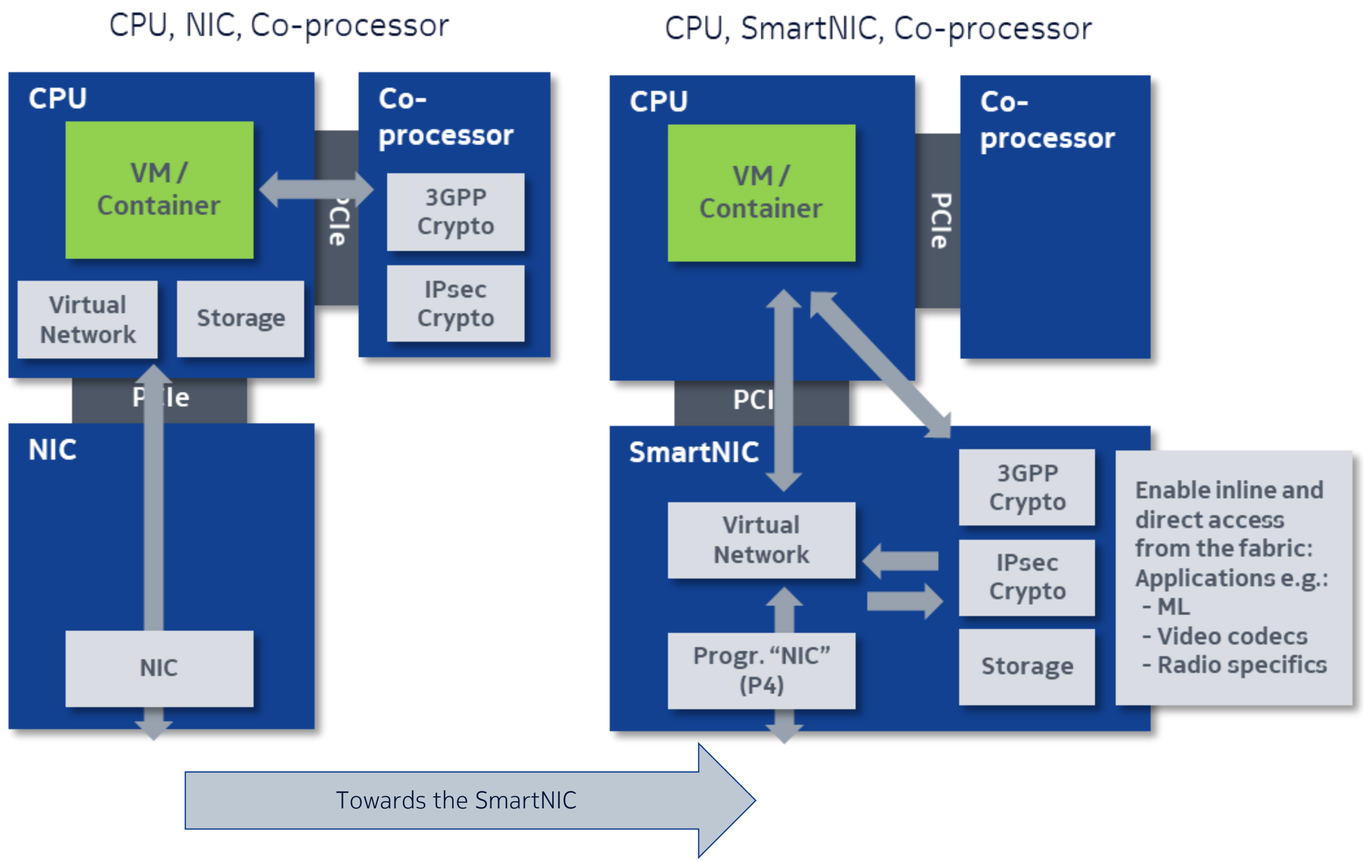
Server accelerator deployment models

Lookaside co-processor model

- Most generic
- Typically used for:
  - Motherboard QAT
  - GPGPU
  - Lookaside FPGA

Inline streaming model

- More efficient (Bandwidth, Low latency, real-estate savings)
- Typically used for:
  - iNIC/ SmartNIC
  - Telco acceleration FPGA's/SOC's



FPGA Acceleration Architecture

Programmable

- Custom,
- Configurable HW
- Customizable memory architecture

Configuration

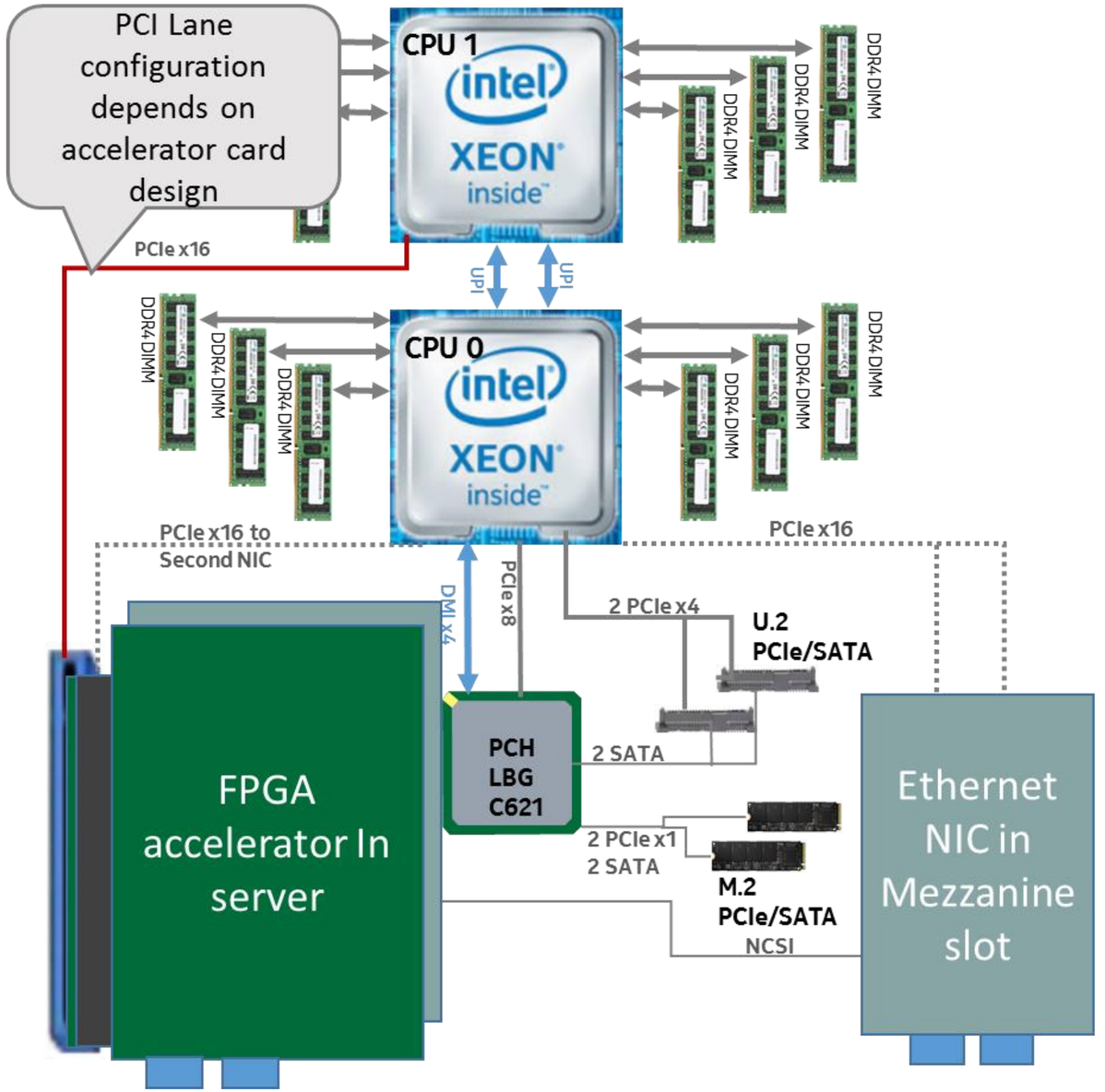
- Inline
- Lookaside
- With or without NIC

Acceleration

- Intensive task of SW
- Ciphering, DSP algorithms, scheduling

FPGAs

- Meets stringent latency requirement for 5G Radio



FPGA acceleration
Summary

- Offload computation from Server CPU’s
- Can yield huge savings on
  - Cost (FPGA’s are cheaper than server CPU’s, much less servers needed) [Capex]
  - Power (the operations are much more power efficient) [Opex]
  - Space (less space for datacenter needed) [Opex/Capex]
- Nokia targets 2x performance improvement by using FPGA based acceleration in server
- Nokia focuses on
  - Solutions in Telecom, 2G/3G/4G/5G
  - Enablers in Edge cloud: Video transcoding, Augmented Reality, Neural Networks, Machine Learning and Security, for example.

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Summary

Summary

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

Server have optional SKU having Intel Quick Assist support implemented using Intel® C627 PCH that allows high bandwidth Compression, Encryption and RSA cryptosystem usage

Improvement to NUMA performance issue by PCIe routing to CPU1 from riser slot that improves performance in dual PCIe accelerator card use case.

PLAN for Nokia Open Rack Server is to contribute the spec and apply for OCP Inspired recognition. Target timeline for spec contribution is 4th quarter 2018 and target to have product available on OCP marketplace in early 2019

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Thank You!

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