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EXPERIENCES FROM OCP GEAR DEPLOYMENTS WITH TELCOS

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Topics

- Telco transformation to NFV and typical telco deployments
- Nokia Open Rack solution and Open Rack benefits
- Experiences from Open Rack solution deployments
- Summary

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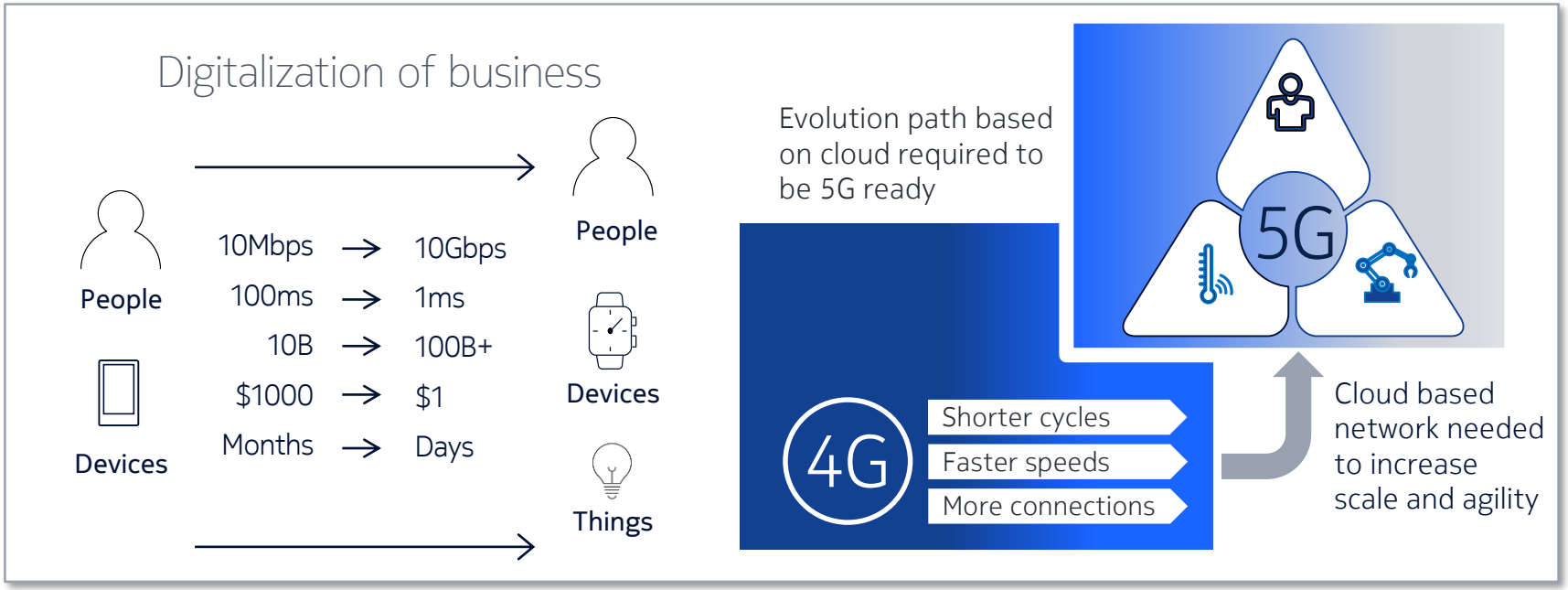
Telco transformation to NFV and typical telco deployments

Service providers fast having to adapt to demands of digitalized business

Cloud based solutions required for scalability and agility



Cloud infrastructure for telco needs to deliver high performance

Efficient, real-time, low latency, centralized and distributed

Address fast growing capacity demand

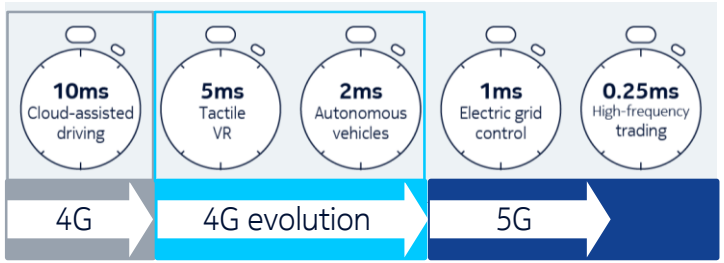
Efficient Scalability

Robust performance

Automated operations

Cloud infra that incorporates webscale best practices

Drive latency reduction to enable new use cases



Cloud infra that delivers low latency

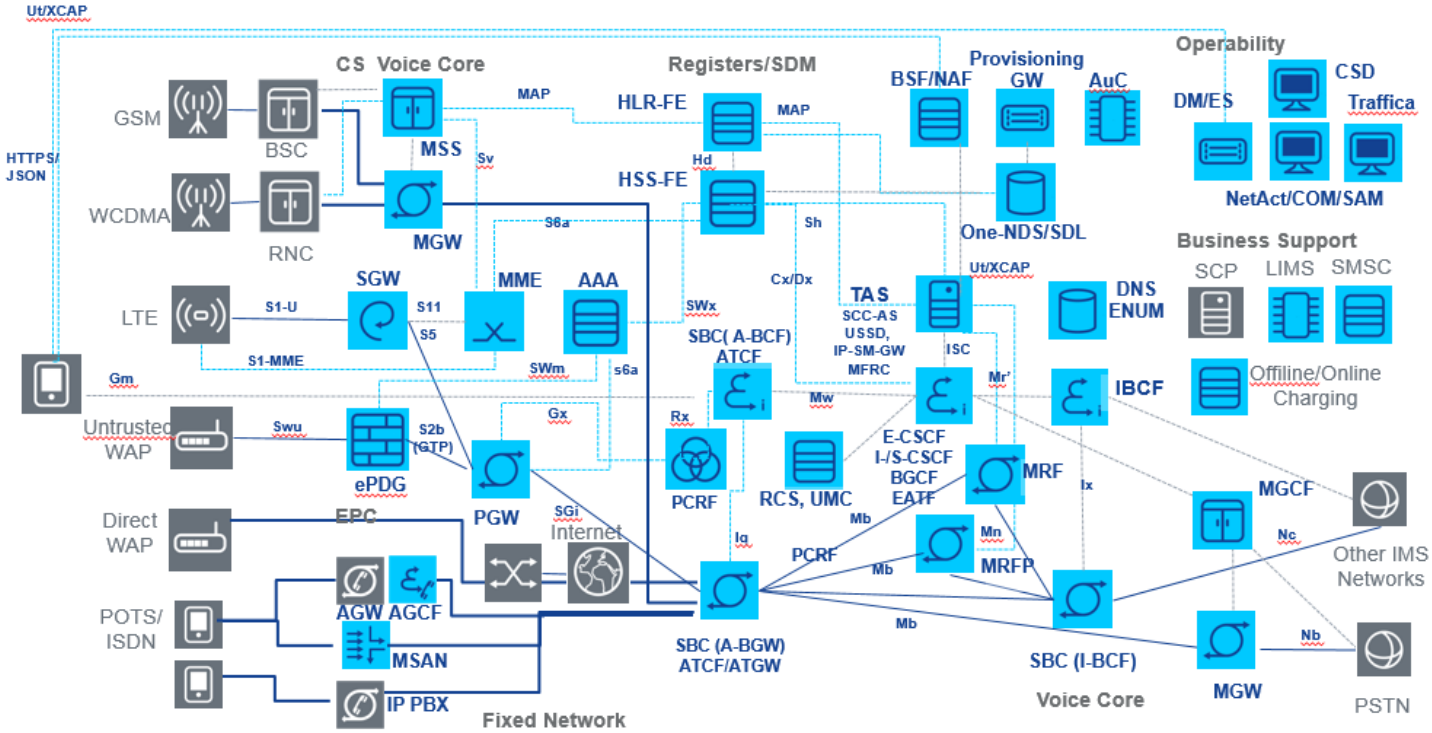
Centralized Data Centers, efficient capacity

- Cloud for highly scalable workloads, no compromise to high availability
- Design for performance with lowest TCO

Distributed Data Centers, low latency

- Cloud at network edge for radio and mobile edge computing apps
- Exploiting cloud infrastructure synergies between distributed and centralized sites

From bare metal hardware to cloud data centers

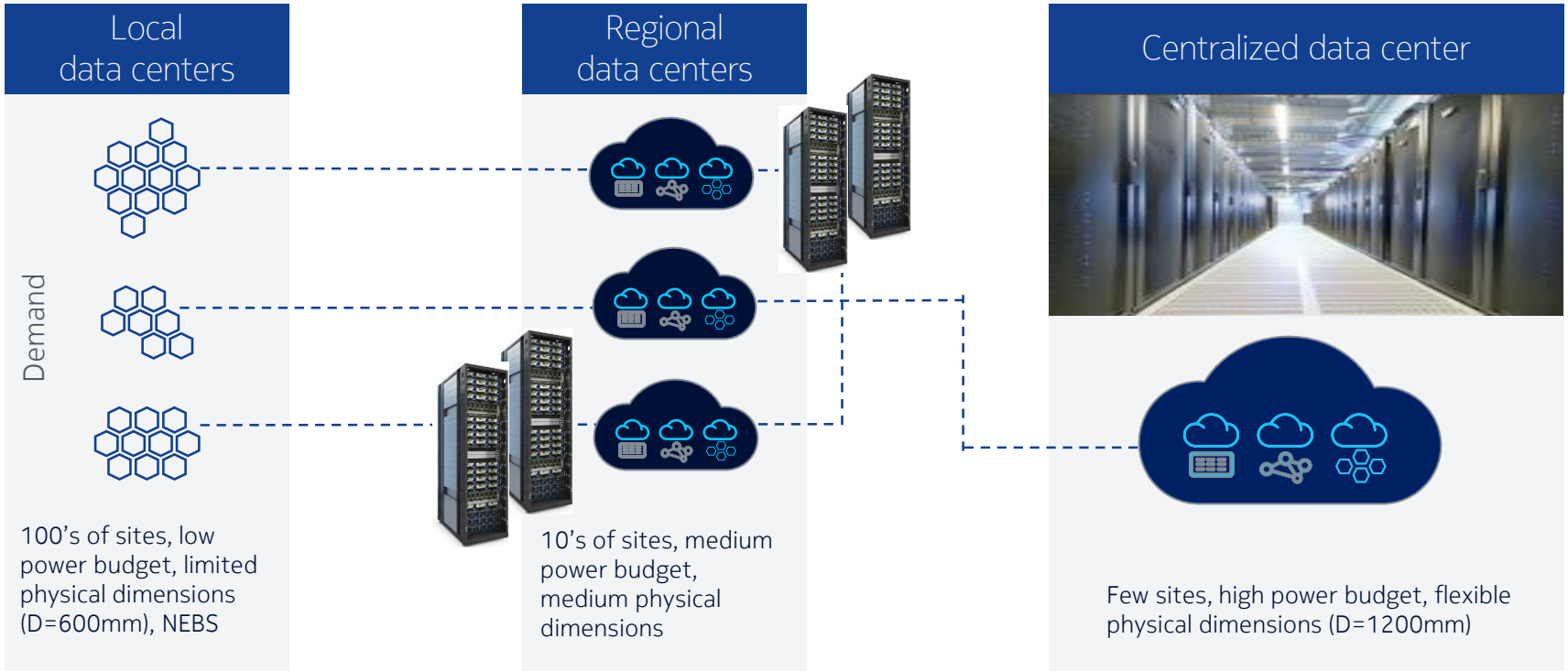


Network functions today run on purpose built bare metal hardware → huge effort to operate and maintain networks where almost every box runs on a different platform.

Network functions (Network elements) today have very different kinds of requirements related to real time behavior (latency, jitter etc.), computing performance, storage, network connectivity, traffic throughput, high availability, etc. → Big challenge for the telco cloud.

Multi-layer cloud architecture driven by performance and facility requirements

Scalable data center architecture from hyper-scale DC to the local edge



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Nokia Open Rack solution and Open Rack benefits

Nokia AirFrame releases provided in two form factors

Serving differing operator use cases and needs

Rackmount systems

- Easy downward scalability for distributed datacenters
- 19” rack-mount form factor
- Full-width 1U/2U server, or 2U storage servers

Intel® Xeon® Scalable Processor (Skylake)

OCP hyperscale systems

- Higher density and lower energy consumption
- 3 servers in 2OU in OpenRackv2
- Superior serviceability: one person manages 25k+ servers

Intel® Xeon® Scalable Processor (Skylake)

Enhancements for telco

Enhanced Open Rack v2 with

- EMI shielding, CE/FCC certification
- 48V and 400V DC power feed options
- Single-rack seismic tolerance
- Power capacity increase
- Extended lifetime

Combined innovation from telecom, IT and Open Source HW

Nokia AirFrame Open Rack building blocks

2. Server nodes

- Dual-socket 2 OU and 1/3 shelf server node
- Intel Xeon Scalable CPUs, up to 165W SKUs
- 12x DDR4 RDIMM modules
- OCP mezzanine slot for dual-port 1/10/25G NIC

4. Switches

- AirFrame maintenance switch (48+6 port 1RU management switch)
- AirFrame 10/25/40/50/100GbE 1RU high-density switch (32x100G / 32x40G / 128x10/25G ports)

1

2

3

4

5

6

1. Rack

- 42 OU / 21" rack (external width 600mm, similar to 19" rack)
- Open Rack v2 specification
- Two power zones with own power shelves
- 12,5 VDC bus bar for power distribution

3. Storage nodes

- 2 OU and full width unit
- JBOD supporting up to 45 hot swappable 3,5"/2,5" HDD drives
- Fully redundant

5. Power shelf

- 6 PSU's, 12,5 kW load capacity

Input:

- Dual 3P 208/415 VAC 50/60 Hz
- Dual negative 40 – 72 VDC

Output:

- 12,5 VDC busbar

6. Server shelf

- 2OU (96mm) shelf with three bays for server nodes
- Open Rack V1 and V2 compatible

OCP design for serviceability

Top serviceability benefits of OCP based design:

1. 4x faster completion of required HW tasks
2. 65% more servers handled per operational person*
3. 61% less of productive employee time lost*
4. 38% less time needed to resolve unplanned downtime*

* Source:IDC OCP study

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Experiences from Open Rack solution deployments

Typical Installations

- Number of racks in one installation is typically less than 10 per site.
- No greenfield installations, installations are done to existing brownfield sites.
  - Requirement to adapt to existing environment.
- Everything is redundant in order to guarantee high availability for the service.
  - Switches, NICs, cabling, HDDs/SSDs, …
- Telco requirements like NEBS are still mandatory in many cases.
- Installations are customer specific.
  - No common blueprint, customized configurations are required.
- Installation use cases vary from bare metal applications to NFV telco cloud IaaS platform.

Transportation

- Rack and stack on site is typically not allowed.
  - Pre-installed racks are preferred.
- Installation sites are all over the world and due to long transportation lead times sea cargo is not possible.
  - Air freight is used for pre-installed racks.
- Current Nokia Open Rack v2 height is 42 OU
  - Height x width x depth: 2258 mm x 600 mm x 1067 mm.
  - Palleted rack crate height is ~2500 mm which creates challenges for air freight.
- Transportation tolerance according to NEBS in required.

Anything can happen in transportation

Before shipping

Arrival

Site Physical Limitations

- Fully equipped Open Rack v2 weight is >800 kg → >1200 kg/m2
  - Floor load capacity sometimes limits the configurations.
- Rack depth is limited in many locations
  - Old telco central office sites can limit rack depth to 800 mm
  - Edge sites are typically existing radio sites where rack depth is max 600 mm
- Old sites typically also have limitations due to
  - Elevator capacity
  - Delivery path height (door openings)
- Site surveys have to be done before shipping.
  - Colo Facility Guidelines for OCP racks defined in OCP Data Center Facility project is providing good framework.

Power and Cooling

- Old telco sites typically have -48VDC power feed infrastructure with battery rooms
- Several AC power feed options for global use cases are needed, e.g.
  - 110VAC, 208VAC, 230VAC, 380VAC, single phase, three phase, 50/60 Hz, different wattages, different connectors, …
- Power cabling from top and bottom both need to be supported.
- Site power budgets quite often limit size of installations
  - Limitation can be as low as 4 kW per rack
- Site cooling capacity often limits rack configurations
  - Limitation can be as low as 4 kW per rack
- Integrated BBUs are not in use in telco installations
  - Difficult to manage due to lithium (transportation limitations)

Compliance

Standard telco equipment environmental requirements are still mandatory in most cases. For example:

- **Safety:** IEC 62368-1:2014, EN60950-1: 2006 + A2:2013 and IEC 60950-1 for safety, including national deviations, GR-1089-CORE.
- **EMI/EMC:** EN300386 (v1.6.1), CFR 47, FCC 15, class A, CISPR 22 Class A and CISPR 24, TEC/EMI/TEL-001/01/FEB-09 and TEC/IR/SWN-2MB/07/MAR-10, GR-1089-CORE
- **Temperature tolerance:** ETSI EN300 019-1-3 Class 3.1, ETSI EN300 019-1-3 Class 3.2, GR-63-CORE, section 4.1.
- **Seismic tolerance:** GR-63-CORE, section 4.4 Zone 4
- **Transportation and storage:** ETSI EN 300 019-1-2 v.2.2.1 class 2.2, EN 300 019-1-1 [20] Class 1.2, EN 300 019-1-2 [21] Class 2.3
- **RoHS:** EU RoHS directive 2011/65/EU Article 7b (EN 50581 (2012))
- **WEEE:** EU WEEE (Waste Electrical & Electronic Equipment) Directive 2002/96/EC and recast WEEE Directive 2012/19/EU
- **REACH:** EU REGULATION (EC) No 1907/2006
- **Fire resistance:** ANSI T1.307-2007 and the requirements specified in GR-63-CORE chapter 4.2.3, GR-63-CORE chapter 4.2.2 Shelf-Level Fire-Resistance Criteria.
- **Energy efficiency:** ATIS-0600015
- **Acoustic noise:** GR-63-CORE, section 4.6

Concerns:

- Busbar safety is raising concerns.

Networking

- Installations typically have very complex networking requirements.
  - ONL based switch implementations do not have required features related to redundancy and millisecond level recovery times.
- All kinds of NICs and transceivers are in use
  - Customer specific configurations required.
- 4 x 25GbE or 6 x 10GbE from servers requires a lot of cables and cabling space.
  - Open Rack does not have too much room for cable management.
- Switches from different vendors need to be supported.
- Uplink cabling from top and bottom have be supported.

Front view

Software Support

- Certifications for commercial software products are needed, e.g.
  - Red Hat Linux
  - Canonical Linux
  - VMware
  - Oracle
- Open source software is gaining interest, e.g.
  - Open Stack, Kubernetes, OPNFV, etc.
- Onboarding of 3rd party applications is required in many cases.

Security

- Security is taken very seriously by telcos
- A huge effort has been spent on security testing and hardening of the OCP gear.
- Main challenges are related to firmware and networking security

Acceleration

- 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.

Data Center Management

- In open ecosystem support for multivendor environment is a mandatory requirement.
  - This requires open APIs between different layers
  - RSD defines a good framework for data center gear management architecture
- Server management interface standardization is needed
  - IPMI is too low level and too much vendor specific extensions.
  - DMTF Redfish is doing good work in this area but it is not yet ready.
- Switch management is typically done using SNMP and CLI
  - No common way to manage switches today.
  - BMC in switches simplifies HW management of switches.
- A lot of integration effort is needed to adapt to customer specific configurations.

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Summary

Call to Action

Get Involved in the OCP Rack & Power Project Group to participate in the Central Office applications of Open Rack.

http://www.opencompute.org/projects/rack-and-power/

Find out more about Nokia's OCP products via the OCP Marketplace or at Nokia.com.

Summary

- Nokia started to use OCP Open Rack compatible designs in telco NFV infrastructure deployments in 2017.
- Many traditional telco requirements are still mandatory in NFV telco cloud environment.
- Experiences are showing that OCP Open Rack design can work very well in telco use cases with enhancements that are needed to fulfill telco requirements.

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Thank You!

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Come and visit us at Nokia booth B6

World’s first telco grade Open Rack v2 solution

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