Open-Source Leveraged Telco Infrastructure
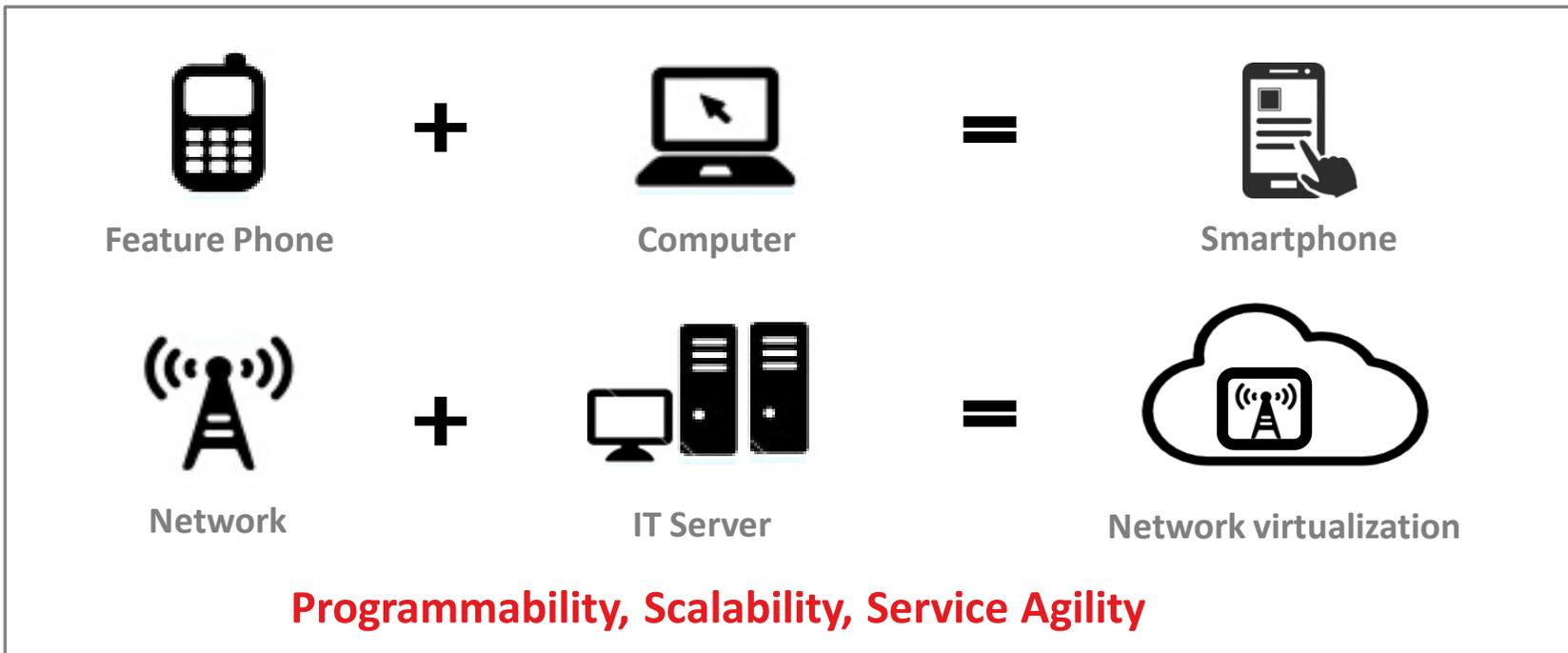
August 2016

Daniel Chang

SK telecom

Network-IT Convergence

Telco infrastructure is evolving to All-IT Network by software defined technology, just as feature phone became smart phone by computer technology.

Feature Phone + Computer = Smartphone

Network + IT Server = Network virtualization

Programmability, Scalability, Service Agility

All-IT network by software defined technology

Starting at Data Center

Expansion to Mobile Network

C O S M O S

Composable, Open, Scalable, Mobile Oriented System

Ground Rules

Composable, Open, Scalable

SKT Next Gen Infrastructure: COSMOS

Applications

Telecom Services
LTE-A   5G
LoRa

Platform Services
T-Phone   oksusu
Smart Home
Summer   T Life
Smart Factory

IT Services
BSS   ERP
OSS   Big Data

Open Software
(Virtual Infrastructure)

openstack
CLOUD SOFTWARE
Virtual Machine

docker
Container

ONOS
Open Network Operating System
SDN

Unbundled

Open Hardware
(Physical Infrastructure)

OPEN
Compute Project

Server   **Network**   **Storage**

Orchestration

ETSI
World Class Standards
NFV MANO

Provisioning
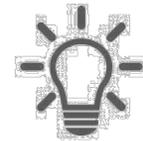
CHEF

Monitoring

elasticsearch.
logstash
Kibana

Telco needs to clearly define the requirements for open infrastructure
to be extensively used for network function virtualization.

Optimized Performance for Telco Workload

- ✓ Hardware Accelerator
- ✓ Intel Xeon+FPGA

Novel Architecture for 5G Era

- ✓ All-flash JBOF Storage
  (e.g. Facebook Lightning, SKT NV-Array)
- ✓ Rack Scale Design
  (e.g. Ericsson HDS8000)

Design for Smaller and More Distributed Data Center

- ✓ Central Office Re-architecting
- ✓ Reuse of Legacy Facility
  (Power Distribution, Cooling System, etc.)

Telco Grade Reliability and Safety

- ✓ Environment guideline (e.g. NEBS)
- ✓ Seismic Tolerance

AF-Media is a high-performance / high-density all-flash storage server optimized for media streaming, delivering maximized throughput, capacity and response speed.

SCube AF-Media
All-flash Media Server

Optimized for UHD/VR Streaming

- Ultra-high throughput
- Minimum footprint, maximum density
- Hot swap SSD, dual power/network
- Minimal hardware cost
- Low power consumption

AF-Media (Xeon-D or ATOM)

Features

Ultra High Throughput

High I/O Performance, 40GbE Ethernet

Ultra Small Footprint

16 SSDs in 1U size, 16TB High Capacity

(only 1/20 size of HDD-base servers)

Ultra Low Power

Under 150W per System Module

(1/20 power consumption than HDD-base servers)

OCP contribution as a open hardware

SK telecom SK hynix

All-flash storage product

NV-Array is an all-flash storage array (JBOF) that accommodates 20 NVMe SSD's for the next-generation storage solution.
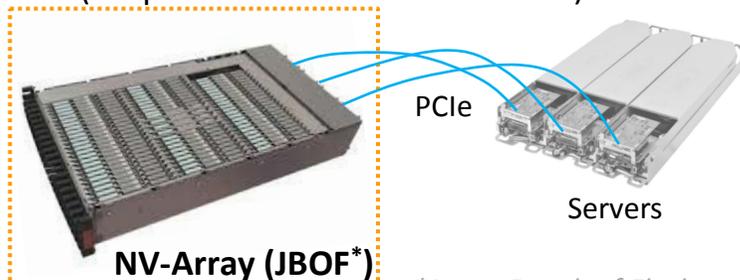
SCube NV-Array
All-flash NVMe JBOF

Designed for 5G Storage

- High IOPs, Low Latency, Low cost per GB
- High scalability, Flexible allocation
- Continuous operation
- PCIe direct link from CPU to NVMe SSD
  (No protocol transition overhead)

PCIe

Servers

NV-Array (JBOF*)

Just a Bunch of Flash

Key Features of NV-Array

High Density

20 NVMe SSD's in 1U size
High Capacity (over 80TB)

High Bandwidth

High IO Performance
Millions of IOPS

Reliability & Availability

SSD Drive Hot-Swap Support
OpenBMC Support

Multi Host Connection

6 Host Connection with
8GB/s Throughput per each

OPEN Compute Project

OCP Contribution as a open hardware

facebook. **(intel)**

Co-development with "Lightning"

7

T-CAP is a converged network appliance,
which integrates high performance Xeon server with data center switch.

T-CAP
Converged Network Appliance

Convergence of switch and server

- Open hardware
- High computing on a switch
- Lower cost due to convergence
- Simpler deployment and operation

Server (Dual E5 Xeon)

Switch (10/40/100G)

Storage
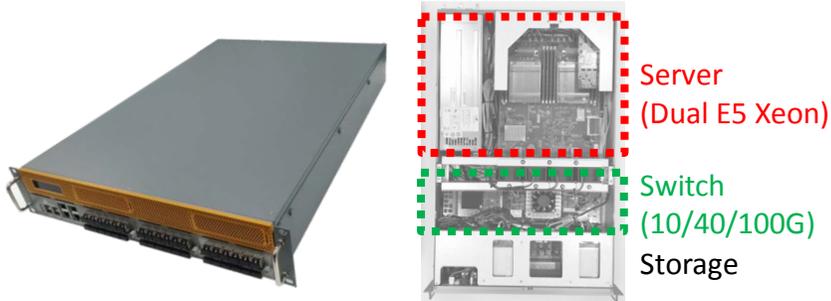
T-CAP Use Cases

Network Applications on ToR Switch

Load Balancing, Firewall, 3rd Party Applications

Data Backup & Network Analytics

Network Traffic Backup and Monitoring

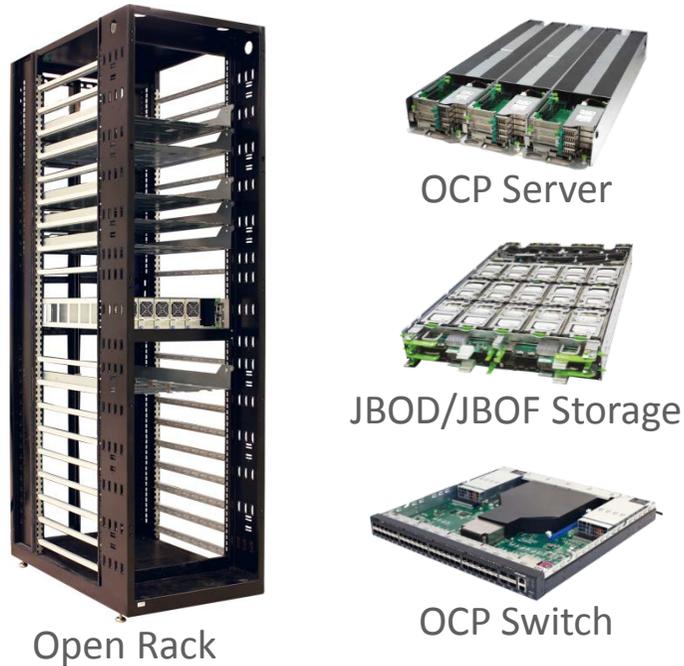**Overlay Gateway for Virtual Network**

VTEP(VxLAN Tunnel End Point) Node

OPEN Compute Project

OCP Contribution as a open hardware

(intel)

Co-operation with high performance N/W Controller

Open Compute Project

Rack scale OCP trial will be conducted in two phases,

and its results and experiences will be shared in OCP Telco Project.

OCP Server

JBOD/JBOF Storage

OCP Switch

Open Rack

| SKT Central Office (Boramae) | SKT Central Office (Bundang) | SKT Central Office (Pangyo) |

Phase 1: PoC for OpenStack & Big Data

- **Verify OCP benefits**
  - power saving, better cooling, higher density, cost reduction, etc.

- **Deploy in Telco data center**
  - Limit on power supply (~30A / rack → 60A), coexistence with traditional racks, etc.

- **Define the requirements of Telco OCP**

Phase 2: Telco Workload

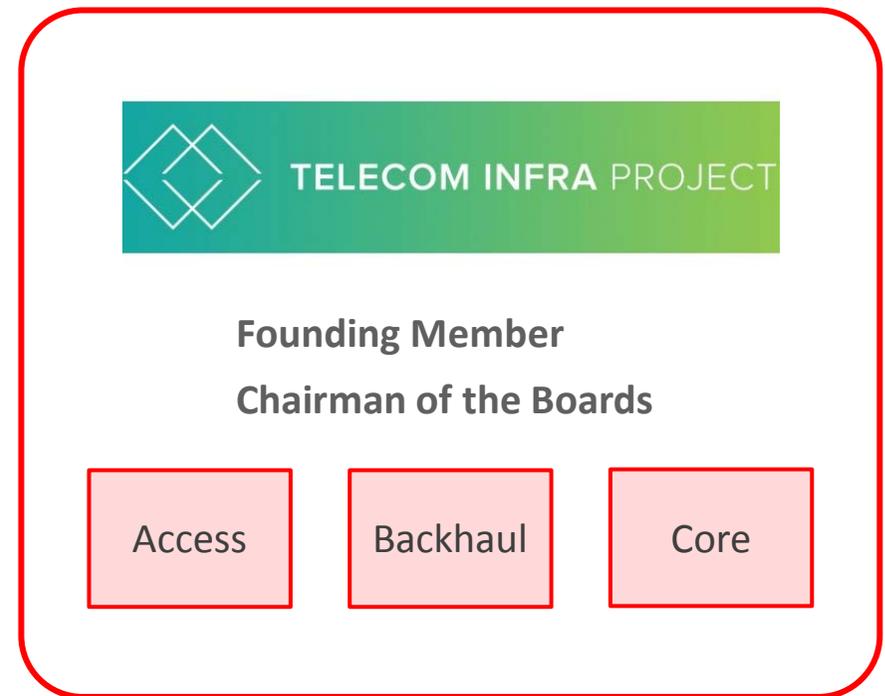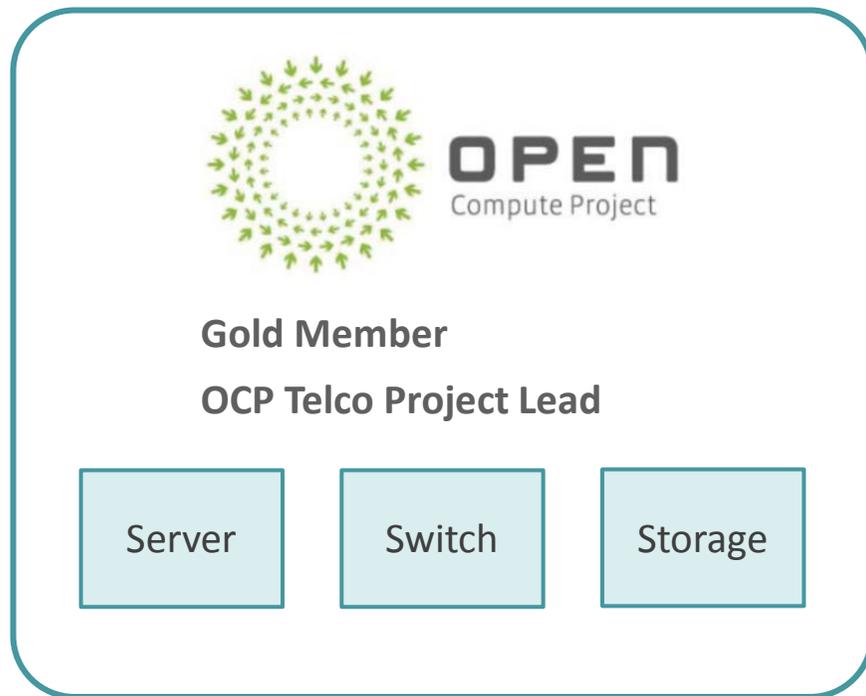- Run VNF on OCP hardware

- Identify further requirements on Telco workload

Open Infrastructure

SKT joined Open Compute Project (OCP) and Telecom Infra Project (TIP)
to share and lead the open architecture for telco infrastructure.

OPEN Compute Project

Gold Member

OCP Telco Project Lead

| Server | Switch | Storage |

TELECOM INFRA PROJECT

Founding Member

Chairman of the Boards

| Access | Backhaul | Core |

All-IT Network

Data Center

Telco Network

Conclusion

❖ SKT is now co-leading with Verizon in OCP Telco project group.

❖ SKT's next generation infrastructure "COSMOS" is based on open source hardware and software.

❖ SKT will open and contribute its storage and network products (NV-Array, AF-Media, T-CAP).

❖ An OCP trial is under way to get a firsthand experience before massively applying to SKT infrastructure.

❖ Telco project group should be active in leading OCP community and defining Environmental/Physical requirements for Telco Datacenters, as well as for Management S/W and more.

Thank you

Questions?