Trends and Challenges for SDN and NFV
-- From a Carrier Perspective

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Software Defined Networking (SDN) Expanding Everywhere

- Server
- Network within Data Center
- WAN
- LAN

NTT Com Group Global Network

SDx

- Multi-Cloud Connect
- SD-WAN (overlay)
- Transport SDN (underlay)
- SD-LAN

Expanding the Scope

Fixed Services and Equipment
SDN Triggering Disaggregation

All-in-one

Switch

Switch

C/U-Plane

Disaggregation

Switch

SDN Controller

NW OS

Switch

white-box Switch

U-Plane

U-Plane

○: Reducing OPEX via centralized management and automation
○: User-centric development
○: Vendor-free

×: Huge OPEX caused by customized system and manual configuration
×: Development heavily dependent on Vendors
×: Vendor lock-in
Hybrid IT, Edge, Cloud Native

Managed IT infrastructure

Managed Security

Functions

Edge Computing

WAN accelerator

Security

Proxy

Networks

Overlay NW

SD-WAN

SSL-VPN

MPLS

Internet

LTE

Inter-DC Network

Flexible Interconnect

Locations

CPE

Client

Telco POP

Cloud, Data Center

SD-WAN Box

Client Device

NTT Com VxF PF

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Challenge 1: Multi-Service Orchestration

- **Network orchestration**
  - SD-WAN, SSL-VPN, MPLS, LTE, Multi-cloud connect

- **Location orchestration**
  - On-demand function deployment on cloud, network edge and CPE

- **Function orchestration**
  - Network functions, IoT functions, upper layer functions including data management and business process

A unified data distribution platform that supports data collection, data processing and data utilization!
Challenge 2: Standardization

Domain-independent APIs
- Hide domain-specific details
- Facilitate adding new technologies and solutions

Inter-domain Open APIs
- Accelerating end-to-end services deployment
- Realization of global service orchestration

Standardization to reduce CAPEX and OPEX!
# Challenge 3: Open Source Development

## Expectation on Maturity Level
- **Enhancement**
  - Enhancement on functions, usability, operability, performance, quality…
  - From community activities to production deployment

## Expectation on Integrated Solutions
- **Existing communities are focused on each specific target**

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<th>Requirement</th>
<th>PoC</th>
<th>Reference</th>
<th>Production</th>
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<td>Easy install, Documents</td>
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Large deployment of Open Source to achieve customizability, faster time to market, and interoperability
Challenge 4: In-House Development

New style of development process
- Agile function addition according to user’s priority
- Dev & Ops members in one team
- Deploy automation, test automation

New development tools
- Utilization of virtual environment
- Utilization of SaaS
- Utilization of CI tools

Change the existing development style to speed up the in-house development!