NTT Communications' Activities/Perspective on SDN/OpenFlow

3rd November 2014

Yukio Ito

NTT Communications
Table of Contents

1. SDN/OpenFlow Implementation to the Commercial Service
2. Update on SDN Common Framework
3. Transport SDN Trial DEMO
4. Activities to Open up SDN
Table of Contents

1. SDN/OpenFlow Implementation to the Commercial Service

2. Update on SDN Common Framework

3. Transport SDN Trial DEMO

4. Activities to Open up SDN
Coverage of Enterprise Cloud

- Germany (Mar. 2014)
- UK (Feb. 2013)
- US [2 locations] (Feb. 2013)
- Australia (May. 2013)
- Singapore (Feb. 2013)
- Malaysia (Mar. 2013)
- Spain (Mar. 2015)
- France (Mar. 2015)
- China [Hong Kong] (Jun. 2012)
- China [Shanghai] (2015)
- Japan
  - [2 locations] + [1 location]
  - (Jun. 2012)
  - (Dec. 2014)
- India (2015)
- Thailand (Mar. 2013)
- + [1 location] (Dec. 2014)

SEAMLESS CLOUD FOR THE WORLD
Configurations inside DC

- On-demand provisioning through customer portal
- Quick delivery
- Automated process

<Before>

Data Centre

Servers

Manual Configuration

L2SW  LB  L2SW  FW

Changes take longer due to complex configurations

VPN, etc.

<After>

Data Centre

Virtual Servers

Network Controller

Virtualized Network

OFSW  LB  FW  OFSW

Network Controller enables immediate changes

Customer Portal

Enterprise Cloud

OFSW: OpenFlow Switch

Global ICT Partner

innovative. Reliable. Seamless.
Connect servers anywhere

- Same IP segment
- Seamless connectivity for Cloud/Colo/On-premise

SDN MPLS

LAN

Cloud-On-premise Connectivity

Virtualized Network

Customer Location

Enterprise Cloud

Neighbor DC (Colo)

Cloud-Colo Connectivity

DC

Enterprise Cloud

Internet

Virtualized Network

• Same IP segment
• Seamless connectivity for Cloud/Colo/On-premise

SEAMLESS CLOUD FOR THE WORLD

Copyright © NTT Communications Corporation. All rights reserved.

5
Cloud-VPN inter-conn automation (before)

✅ Manual operations in inter-connection with VPN
✅ Changes in Cloud create changes in VPN as well
Cloud-VPN inter-conn automation (after)

- Portal and SDN controller through API
- SDN controller for both DC network and VPN
- BGP

Data centre Network

API

Open Flow

eBGP

MPLS-VPN

VLAN

MPLS

Inter-AS option B

SEAMLESS CLOUD FOR THE WORLD
Realize flexible connections without changing the current physical network (March 2014)
Realize flexible connections without changing the current physical network (March 2014)

- **Company A’s System**
  - Arcstar Universal One
  - In-house Locations

- **Overlay Function**
  - Network Controller

- **Virtualize Network**
  - Arcstar Universal One
  - Other VPN
  - Locations acquired by M&A (Company B)

- **Internet**
  - Newly-launched Overseas Locations
  - Arcstar Universal One Virtualized Network Overlay Function

**Virtualized Network**

**Customer Portal**

**SEAMLESS CLOUD FOR THE WORLD**

Copyright © NTT Communications Corporation. All rights reserved.
Network Functions Virtualization (NFV)

✓ Virtualize network appliances on LAN with software over Arcstar Universal One.

Current situation

Customer’s system

Appliances for WAN Acceleration at each location

Firewalls at each location

Network

Customer’s Location A

Customer’s Location B

Application Accelerator

Internet

Customer’s system

Appliances for WAN Acceleration at each location

Firewalls at each location

Network

Customer’s Location A

Customer’s Location B

Application Accelerator

Internet
Network Functions Virtualization (NFV)

✔ Provide NFV by acquisition of Virtela

Realize functions of WA and FW over network

After NFV service

Customer’s system

Network Controller

Customer Portal

Network

Internet

Application Accelerator

SEAMLESS CLOUD FOR THE WORLD
1. SDN/OpenFlow Implementation to the Commercial Service

2. Update on SDN Common Framework

3. Transport SDN Trial DEMO

4. Activities to Open up SDN
Management Framework for SDN Services

Goals

✓ Multi-vendor
✓ Avoid redundant development
✓ Simplify system cooperation

Portal

Business Portal

Orchestrator

NTT Com Orchestrator

Virtual resources control

Cloud controller
SDN controller
AP controller

Common Controller

System Collaboration API

© NTT Communications Corporation. All rights reserved.
Update on SDN Architecture Image

Remarks;

SDN Controllers
SDN Controller to look after entire NW

Cloud/Virtualized DC

Service NW

OpenFlow SW

Next Gen PTN/Optical

SEAMLESS CLOUD FOR THE WORLD
**SDN-WAN**

✔ SDN application to Wide Area Network

**Example of Issue List:**

- Migration from existing network
- OAM functions for multi-tuple flows
- Multi-grade redundancy
- Emulated L2/L3 networks for legacy services
- Multi-layer optimization etc......
SDN-WAN Migration Image – Step 1 –

✓ Build SDN virtualized network by overlay
SDN-WAN Migration Image – Step 2 –

✓ Migrate to SDN-NW at the timing of existing NW EOL
✓ Existing NW functions replaced by SDN-NW slices

Cloud

Datacenter

GW

SDN-NW

VoIP

VPN

Internet

Optical/Transport

Edge

Virtualized NW on SDN

Simplified NW

SEAMLESS CLOUD FOR THE WORLD
High value-added NW functions by NFV
- Security
- Scalability
- Traffic control

SDN-NW

Optical/Transport

Cloud
Datacenter

GW

Hypervisor

VM

FW

DPI

VNO/MVNO

VoIP

VPN

Internet

SDN-NW

Edge

NFV

FW

OS

Bare Metal

OS

DPI

Internet

VM

Cloud

SEAMLESS CLOUD FOR THE WORLD

Copyright © NTT Communications Corporation. All rights reserved.
Table of Contents

1. SDN/OpenFlow Implementation to the Commercial Service

2. Update on SDN Common Framework

3. Transport SDN Trial DEMO

4. Activities to Open up SDN
Transport SDN

✓ Introduce SDN to transport network
  ✓ STEP1: Constructing 100G-PTS (using MPLS-TP)
  ✓ STEP2: Control multi layer/multi domain using SDN

✓ Demo scenario

 Scenario1: Virtual resource visualization
  Scenario2: End-to-end path computation & provisioning
  Scenario3: Global repair
  Scenario4: Data for analytical use
Knowledge From the Trial

Applying SDN to the transport NW reduce OPEX in the long term and create new services.

- SDN agility
- Easy to treat virtual resource
- Importance of common modeling
- Absorption of a performance difference
- Practical use of API with high convenience
- Flexible arrangement of software
- Fusion to Big Data
- New Use Case
Table of Contents

1. SDN/OpenFlow Implementation to the Commercial Service

2. Update on SDN Common Framework

3. Transport SDN Trial DEMO

4. Activities to Open up SDN
OKINAWA OPEN LABORATORY

NTTCom, NEC, Iiga, CTC and FUJITSU founded “OKINAWA OPEN LABORATORY” in May 2013

✓ Research regarding to SDN and cloud computing
✓ Collaborate with industry and academics, invite engineers to do researches
✓ Release research output in public
✓ R&D/ DC Complex

http://www.okinawaopenlab.org/en/
For rapid and simple network deployment and withdraw

O₃ realizes

(1) Integrated operation and management of multi-layer network
(2) Rapid physical network status reflection to VN OAM
(3) Rapid VN status reflection to physical network

by providing

(1) Network operating platform software
(2) Virtualized network design, deployment and operation software
(3) Network equipment optimized for network virtualization
Summary

• What NTT Com has done / are doing / will do?
  (Done) : Provided Enterprise Cloud with SDN/OpenFlow
  (Doing) : Testing cloud interconnection with VPN, NFV, SDN
  (Will do): Com Orchestrator, Expand to all layers of network

• Aggressively working on SDN controller development to realize “unique differentiated service” and “quick delivery”

• Contribute to lead ONF and new communities for propagation and commercialization of SDN technology
Thank You!

Global ICT Partner

SEAMLESS CLOUD FOR THE WORLD