



Expectation for SDN as Carrier's Network

18th Apr, 2012

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NTT Communications



- ✓ **NTT Communications overview**

- ✓ Expectation for SDN

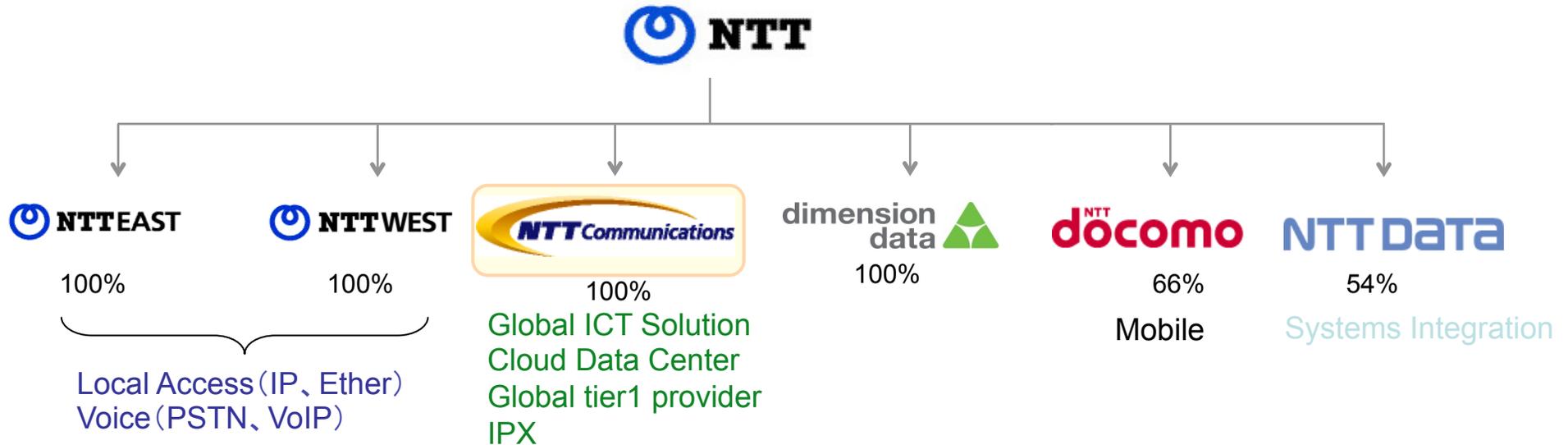
- ✓ Global Cloud Vision

- ✓ What We Do

- ✓ Expectation for OpenFlow/SDN as a telecom carrier

- ✓ Summary

About NTT & NTT Group



- NTT (Nippon Telegraph and Telephone Corporation) is one of the world's largest providers of information and communications services with fixed lines & mobile communications, Internet, and systems integration services capabilities.
- Over 130 years of communications experience.
- Approximately 219,350 full-time employees, over 50 million clients and 756 subsidiaries and affiliates worldwide.

About NTT Communications (NTT Com)



- Established under the NTT Group in 1999
- Provides a broad range of global networks and IT management solutions to customers worldwide, including managed networks, security, hosting, voice, data and IP services
- Connection to major cities around the world via a Global Tier 1 IP Backbone (NTT Communications Global IP network) and secure closed networks with over 100,000 MPLS ports
- Global cloud pioneer and first Tier 1 status provider in Asia

FY2010 Financial Results (ended March 31st, 2011)

Operating Revenues	\$15.4 billion	(1.25trillion yen)
Operating Income	\$1.21 billion	(97.9 billion yen)
Employees	15,500 worldwide	

- Note:
1. Conversion rate of JPN¥80.84 = US\$1 (as of May 31st, 2011).
This conversion is for a reference purpose only.
 2. The figures in the table above represent figures for NTT Communications Group (NTT Communications and its subsidiaries) after adjustments and eliminations for intragroup transactions.

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SDN (Software Defined Network)

- SDN(Software Defined Network): A New concept to realize network function by software
 - Separate control plane and data plane
 - Have flexibility on control plane
 - OpenFlow protocol is an API to program data plane
- Expectation for SDN
 - Shorten Time-to-Market
 - Quickly introduce necessary function for a company by not depending on vendor's development roadmap or schedule
 - Service differentiation
 - Not bounded by commodity specification
 - Hard to differentiate by current Network due to similar equipments
 - CAPEX • OPEX reduction
 - CAPEX reduction by use of commodity hardware
 - OPEX reduction by automation

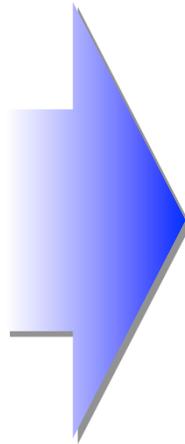
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Toward realizing ICT that enables global management

Deploy comprehensive cloud services around the world that are differentiated as a telecom carrier.

Provide not only the advantage area of NTT Com such as networks and data centers but servers and applications, end-to-end and one-stop basis.

- Globalization
- Faster decision-making
- Reinforce Sales
- Productivity Improvement
- Cost reduction
- Business Continuity Plan



NTT Com's Global Cloud Vision

SaaS/Application

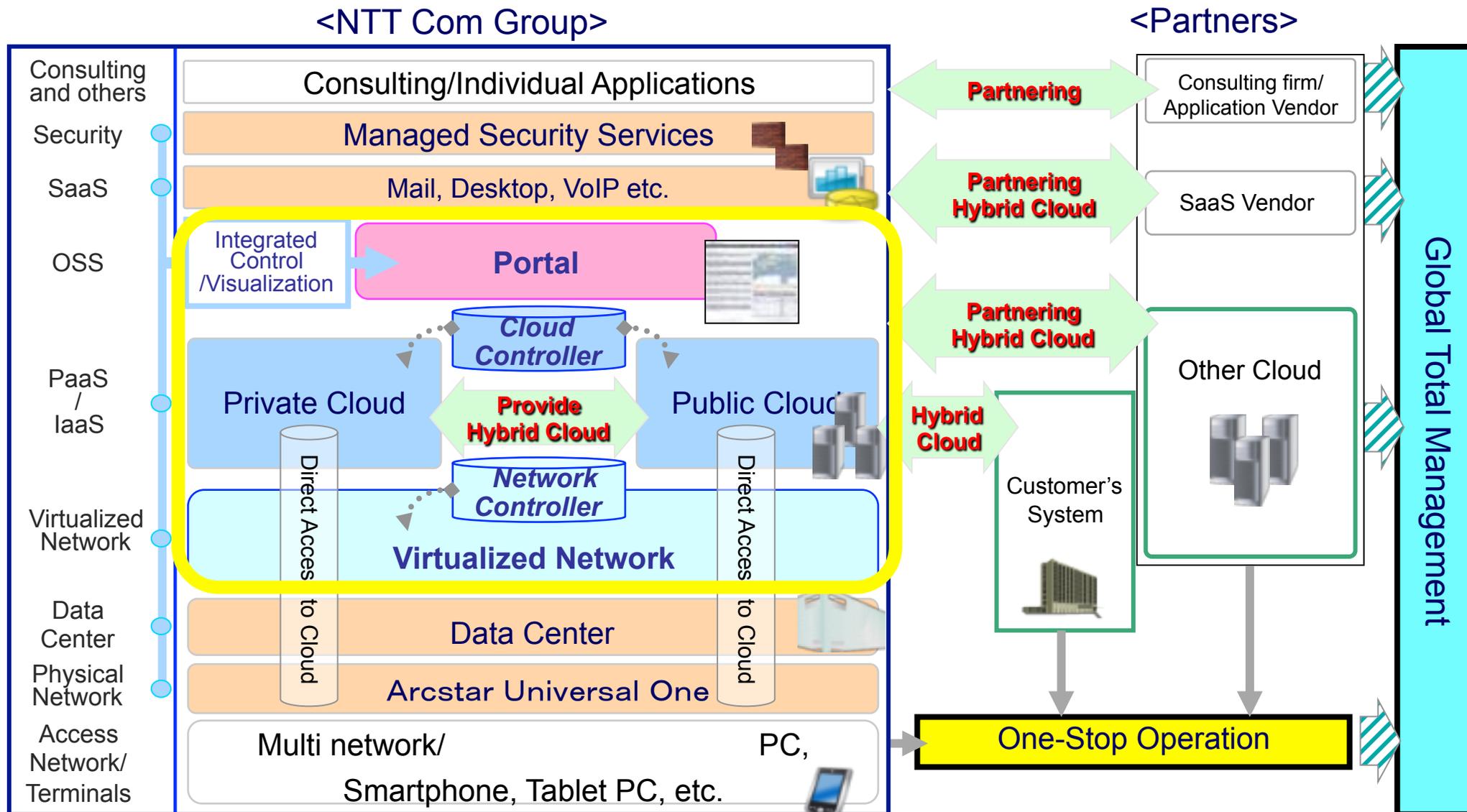
Global virtualized Server

Global Data Center

Global Network

Provide integrated services

Whole picture of the Cloud Vision

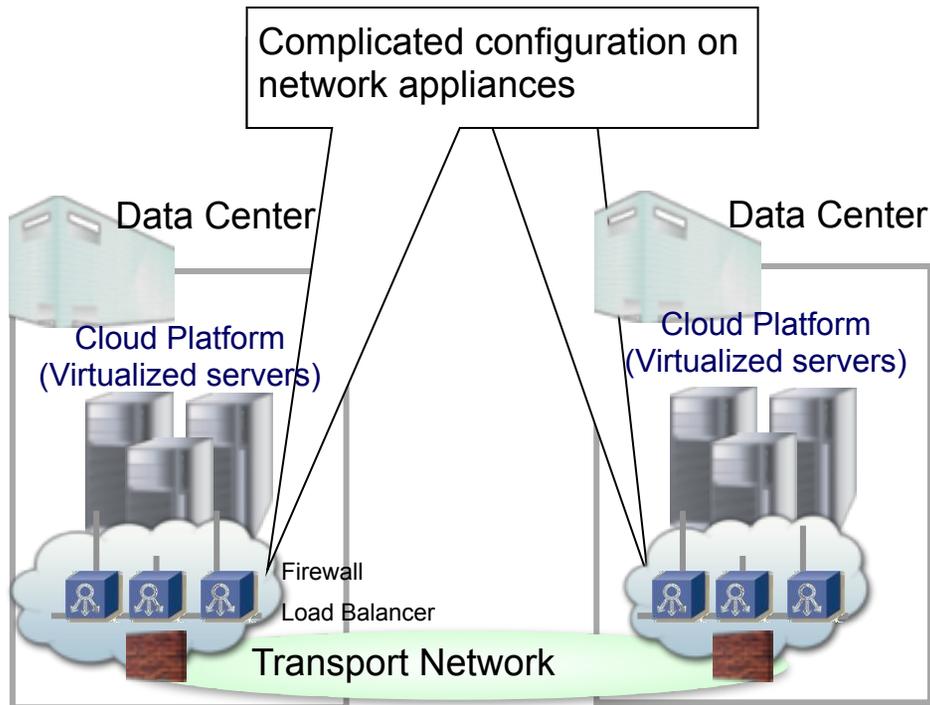


Benefit of Virtualized network

Before

For intra-data center connectivity, system modification requires complicated operation and configuration.

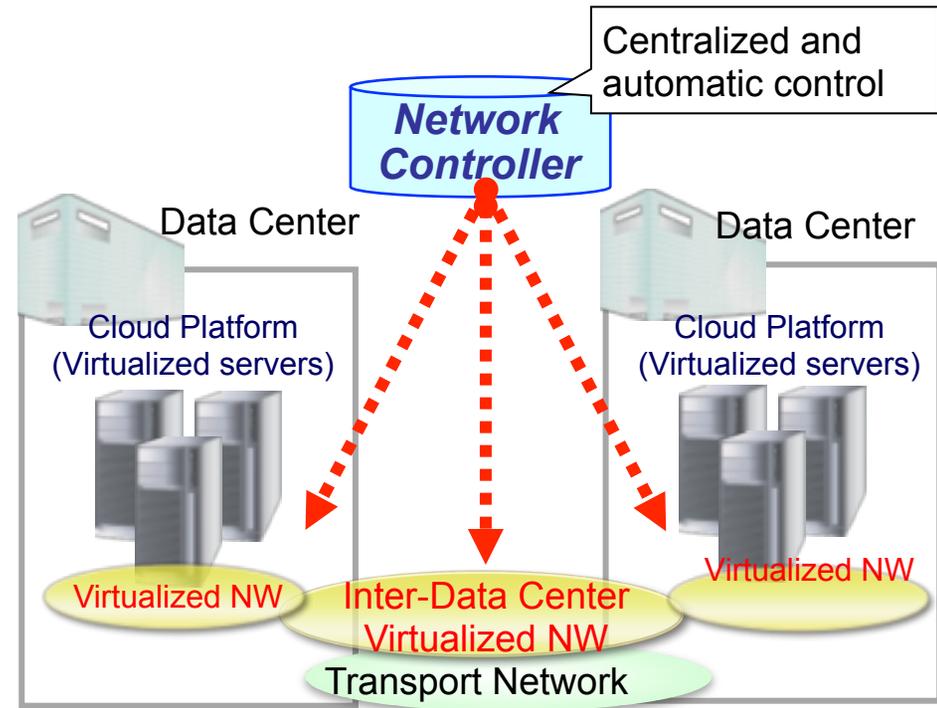
For inter-data center network, setup and configuration is required before an event.



After

On demand and flexible configuration changes. (by utilizing technologies such as OpenFlow).

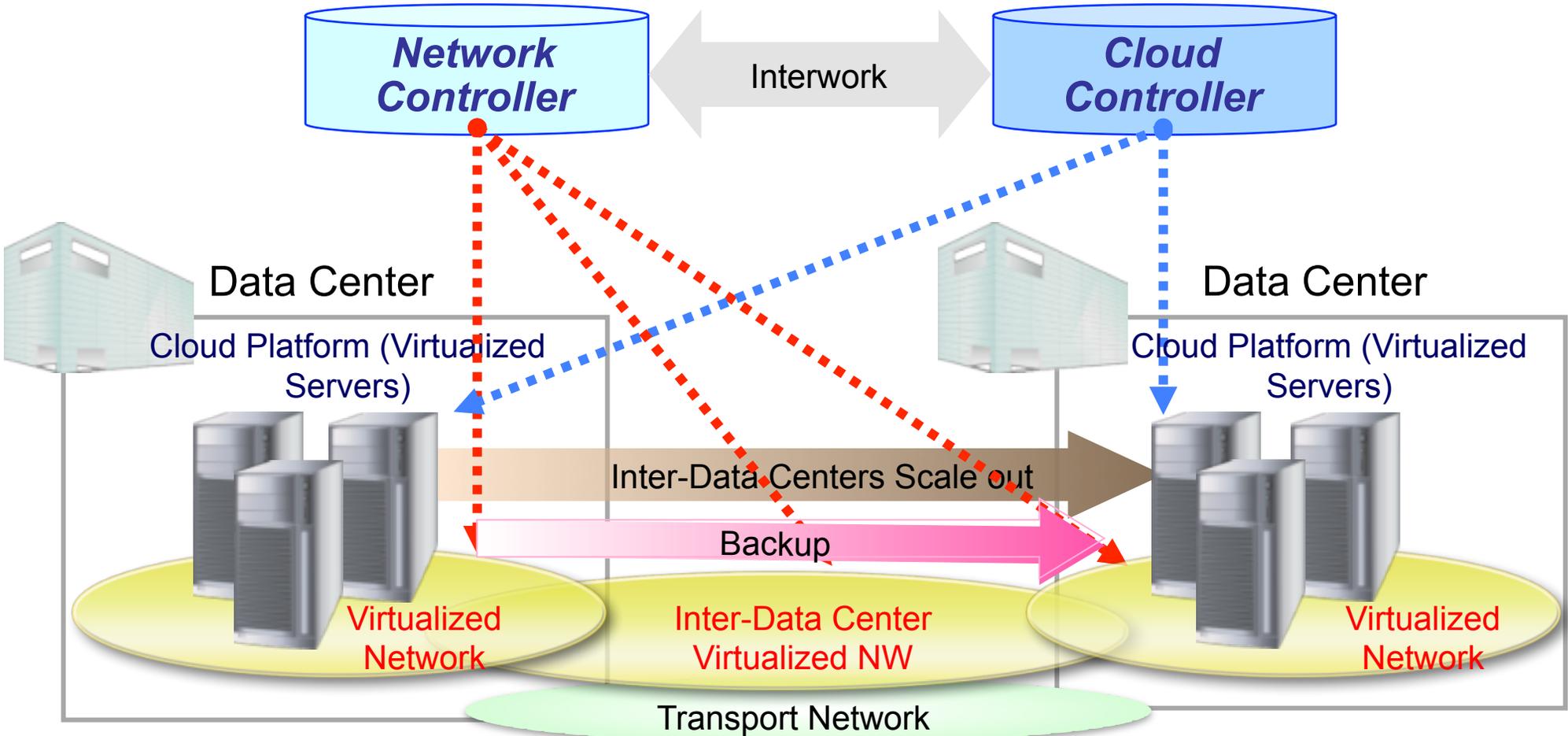
Virtualized network enables automated network configuration changes.



Auto-scale out among Date Centers

Provide auto-scale out function among Data Centers, and provide services which utilize NTT Com's cloud resources flexibly.

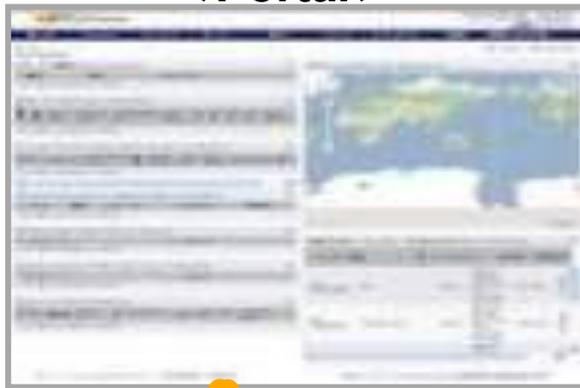
(Normally, auto-scale out function is limited inside of a Data Center)



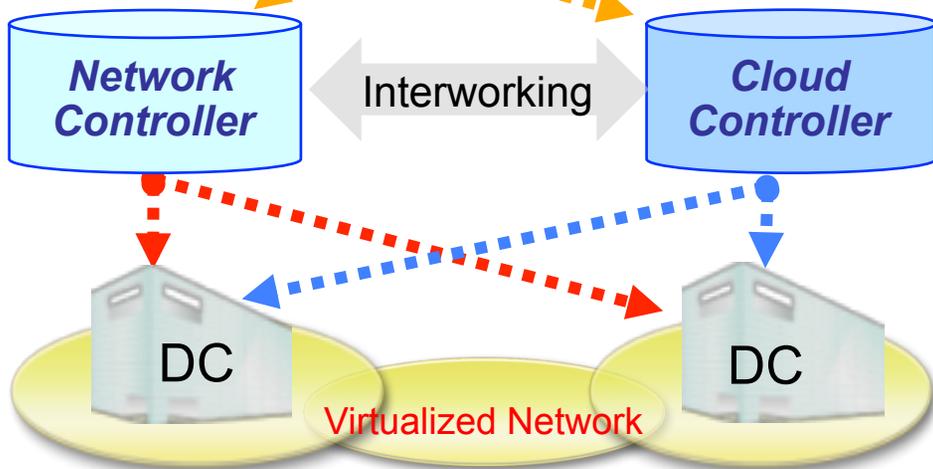
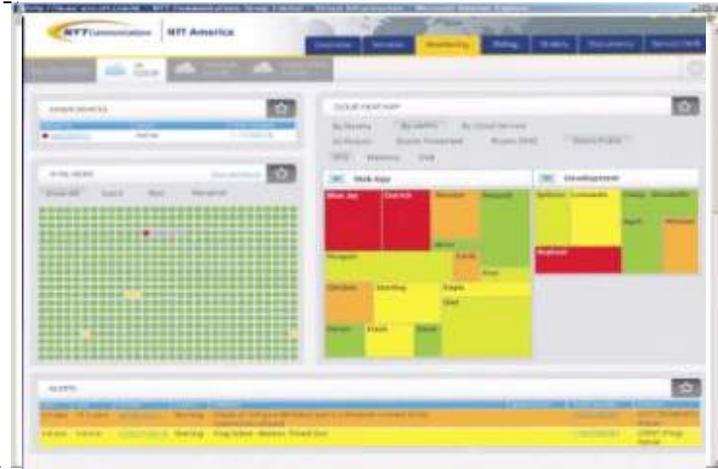
Make Everything from Network to server/application Integrally Visible and Controlled

The Portal Websites provides unified controls from cloud to server/application, such as status visualization, on-demand service order.

< Portal >



Status of Services



Make the status of all services from cloud to network integrally visible and controlled

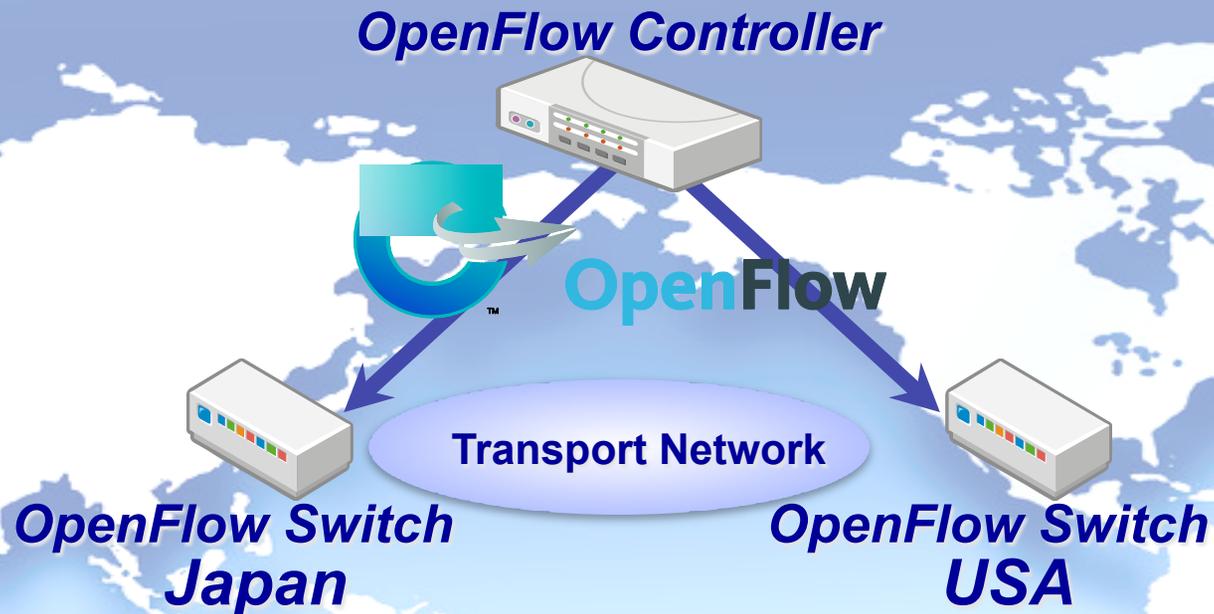
- Visualization of contract or status of services
- Centralized management and control (on-demand service order etc)

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What we do #1

~OpenFlow test between Japan and USA~

We are testing OpenFlow Switch and OpenFlow Controller between Japan and USA.

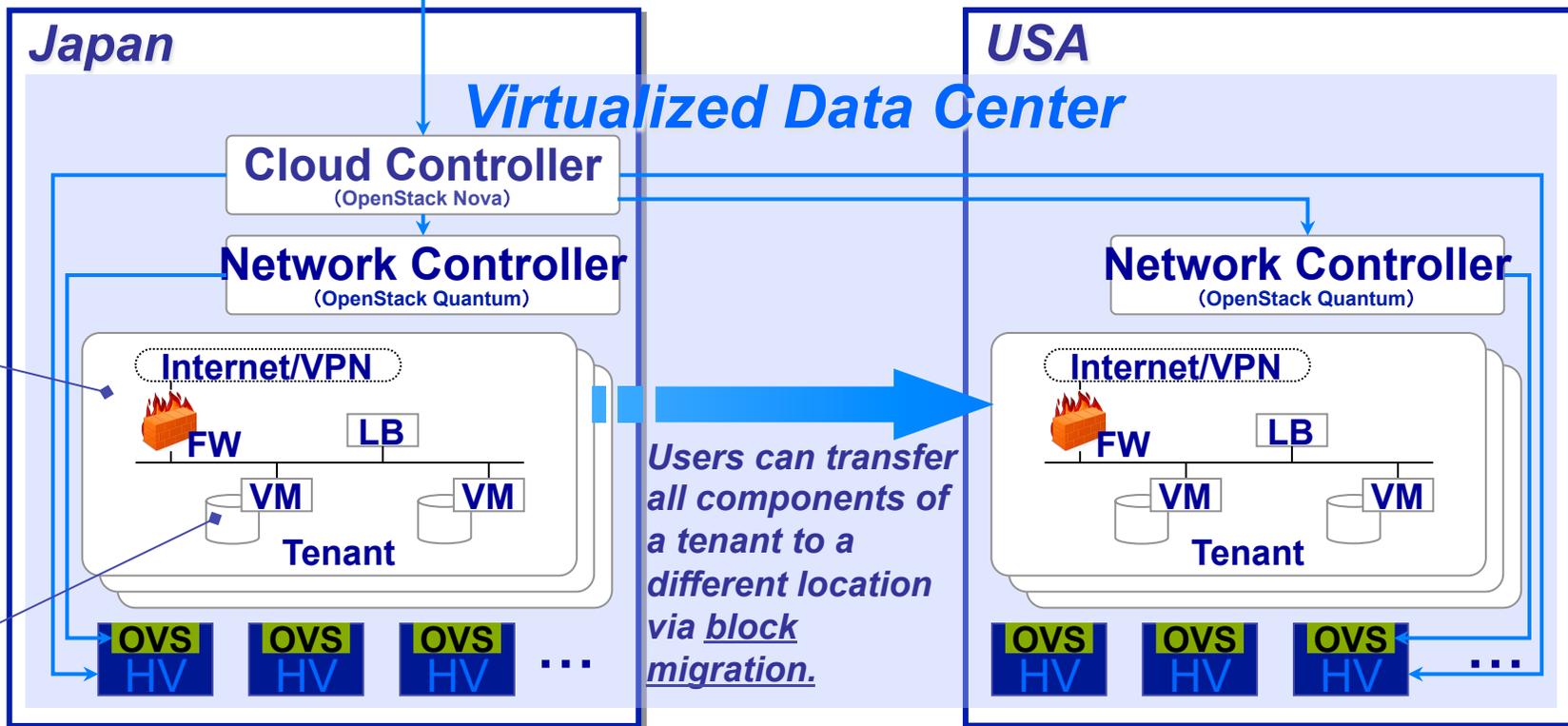


What we do #2

~ Collaboration with NW CTL and Cloud CTL ~



Web Portal

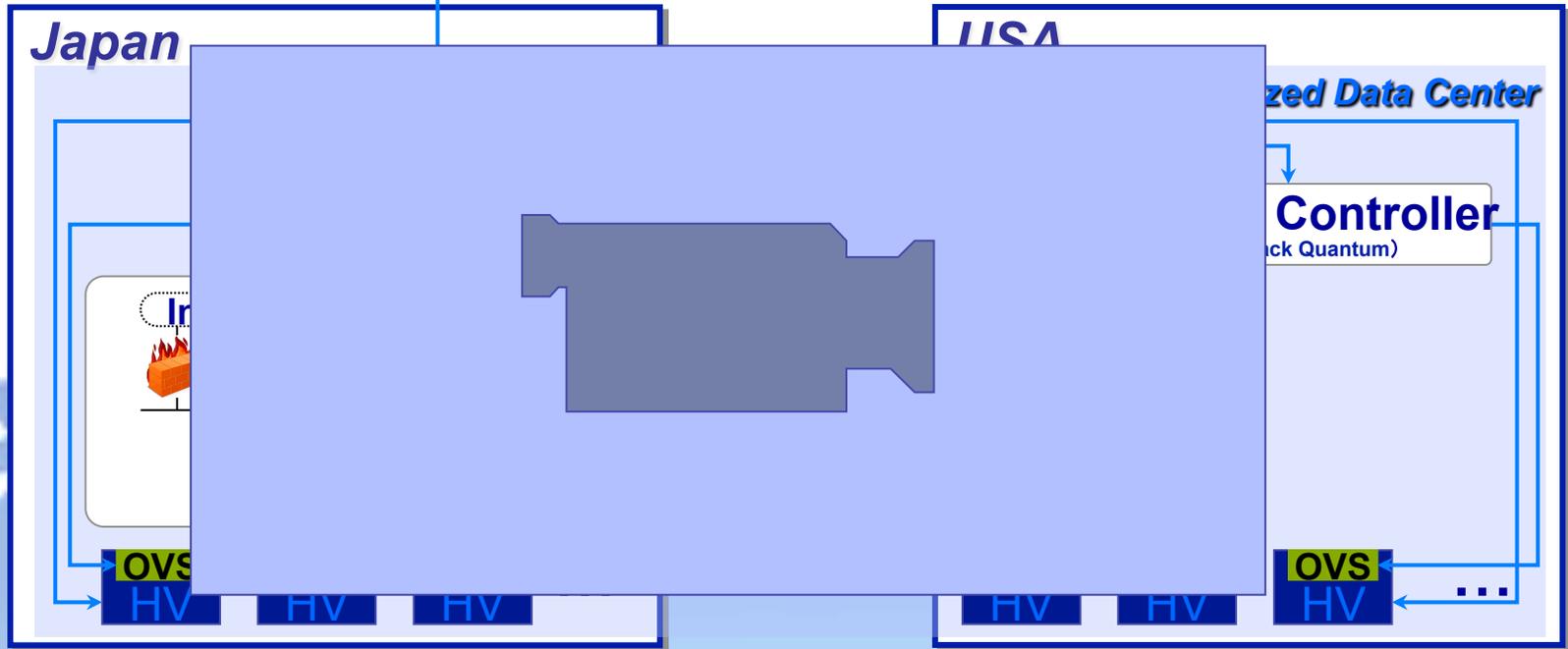
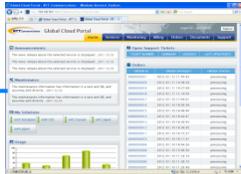


Users can create a tenant at an arbitrary site on demand.

Users can add VMs to a tenant or change resources on a VM on demand.

Users can transfer all components of a tenant to a different location via block migration.

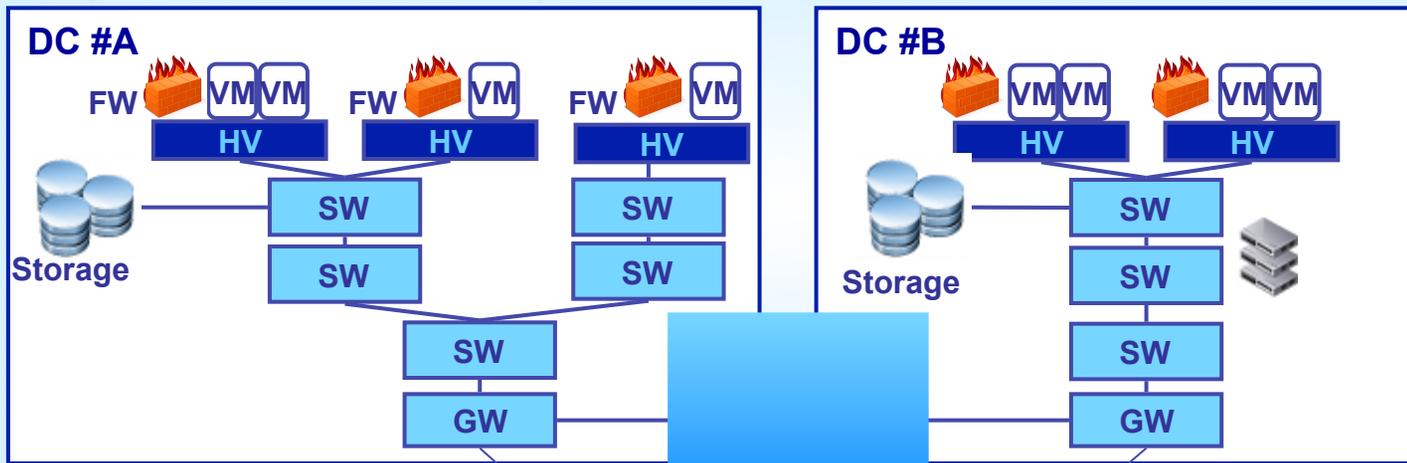
Migration between Japan and USA



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WAN Expansion

Cloud (Inside DC, DC to DC)



Wide Area Network



Customer Premises/ Mobile Terminal

User DC



User Building



User Premises



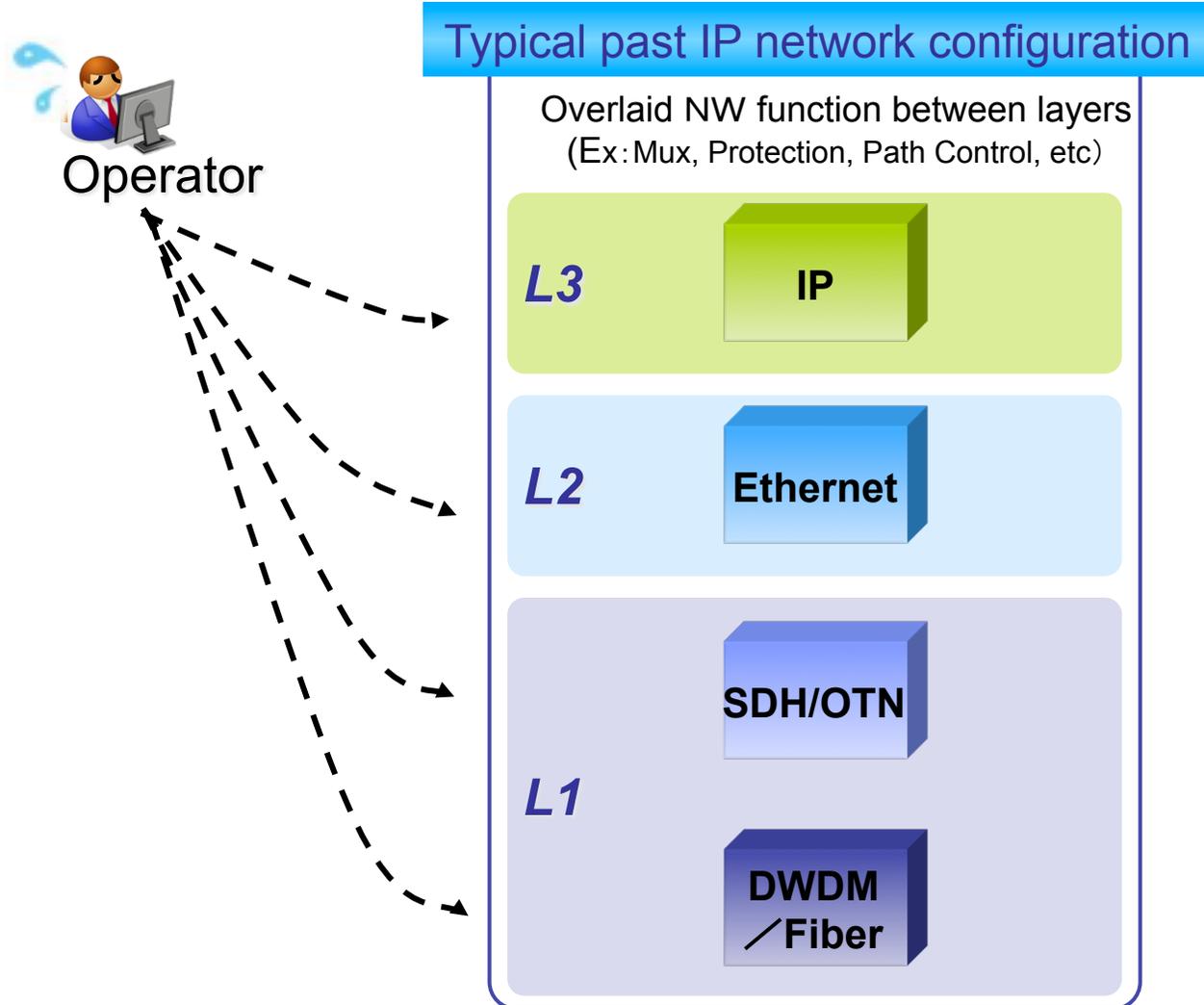
■ Discussion point

- Simplification of Network
- Efficient Operation
- Distributed Controllers (Information synchronization)
- Scalability (Flow Aggregation, etc)
- Cost Control
- End-to-End QoS control
- Fault Management



Simplification of Network

- Important issue on how to take control of increased management targets by virtualization

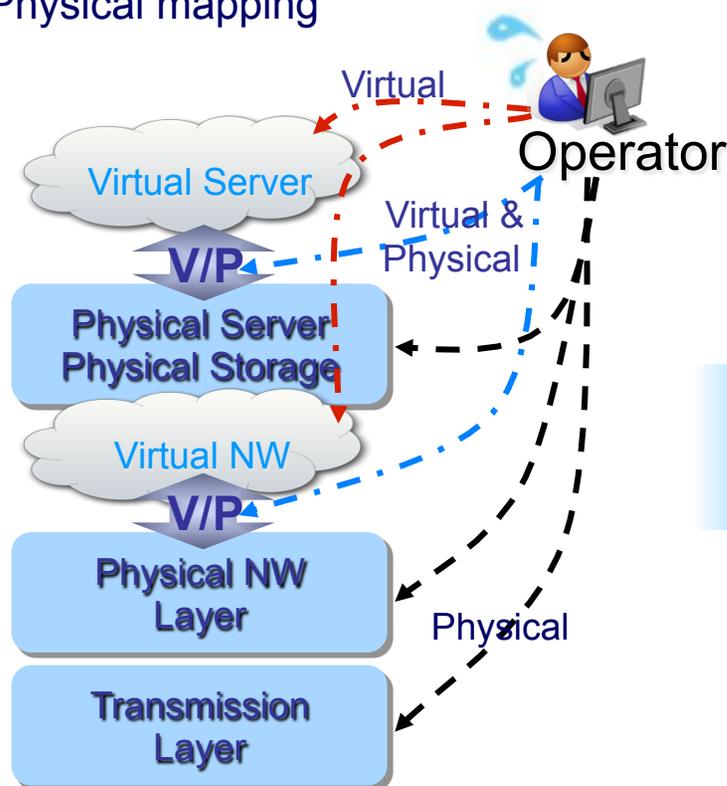


Efficient Operation

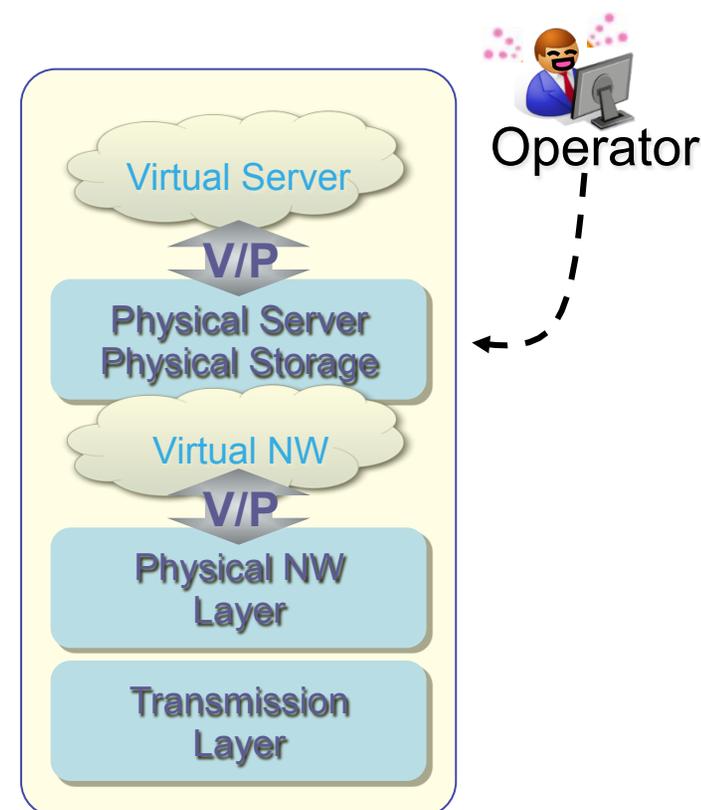
- It is important issue that how to control increasing management targets by virtualization

Difficult to manage...

- Physical equipment management
- Virtual instance management
- Logical and Physical mapping

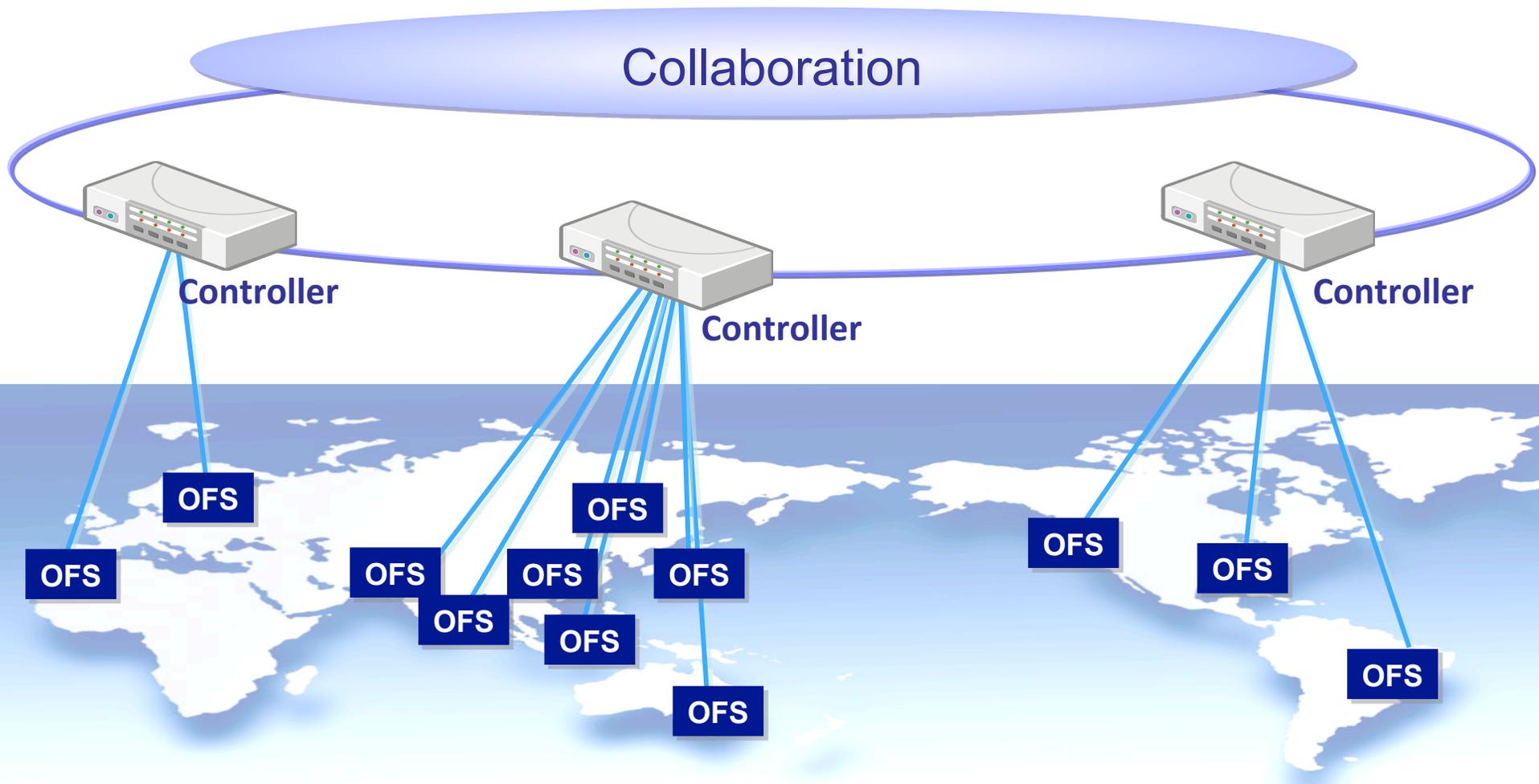


One-stop-control & operation



Distributed Controllers (Information synchronization) Scalability

- Distributed Controllers (Information synchronization) for WAN expansion
- Scalability



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- SDN(Software Defined Network):
 - A New concept to realize network function by software
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 - Shorten Time-to-Market
 - Service differentiation
 - CAPEX•OPEX reduction

and there are more comes through our discussions, I think. So,

We would like to keep making a great effort for the development of OpenFlow/SDN. We would like to have more discussion with all of you.

Thank You!



NTT Communications' Advantages

