

OpenFlow/SDN activities of NTT Communications

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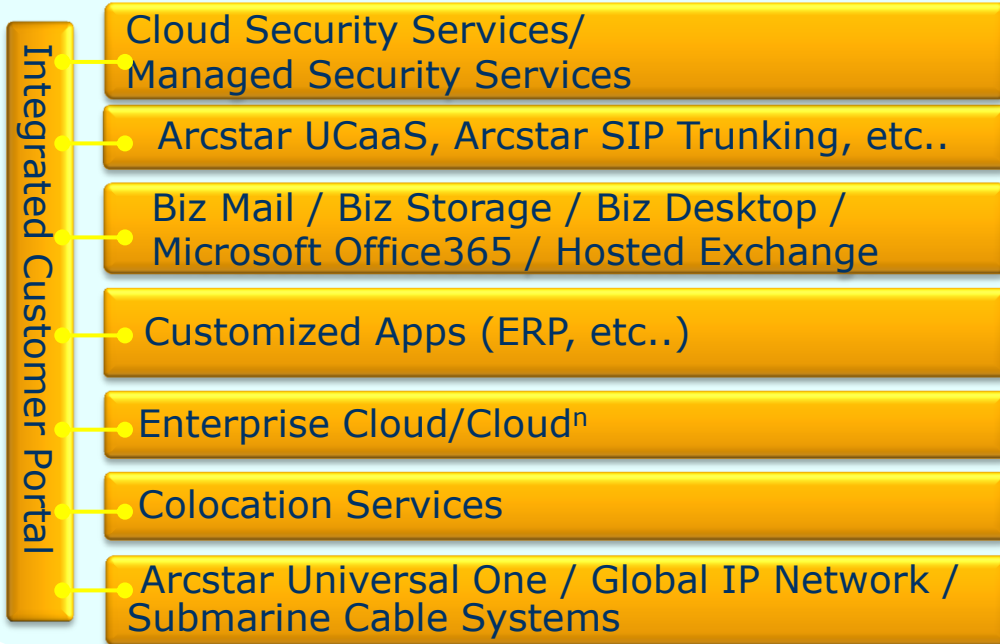
Cloud base, End-to-End, Integrated Services

Customers want...

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



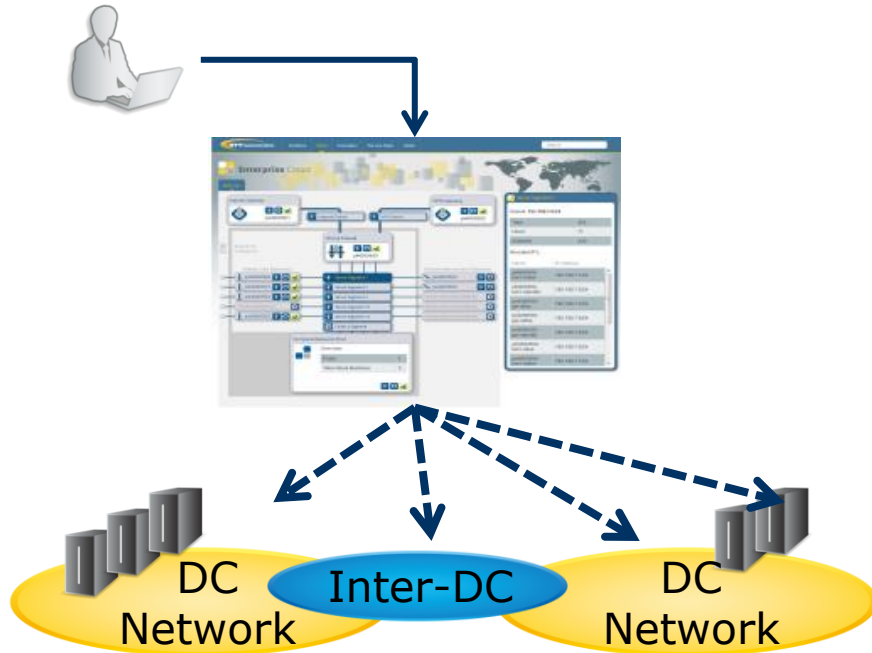
NTT Com's Global Cloud Vision



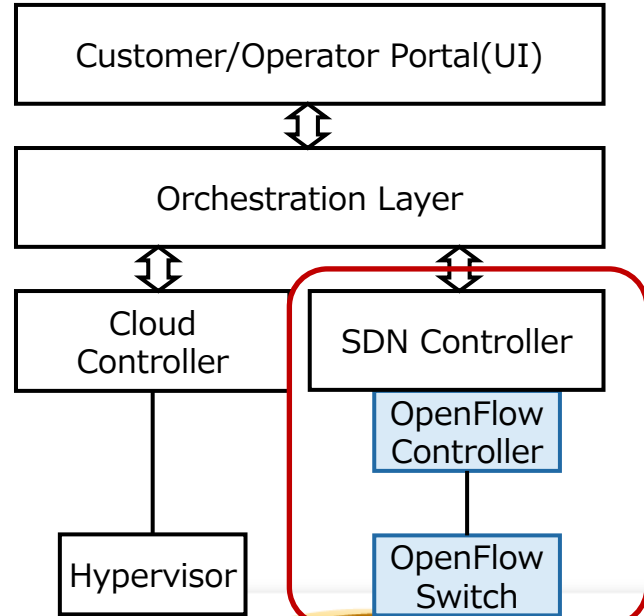
Benefit of Enterprise Cloud

Enterprise Cloud which has already been released in 2012 provides self-provisioning through the portal website.

<Self-Provisioning>



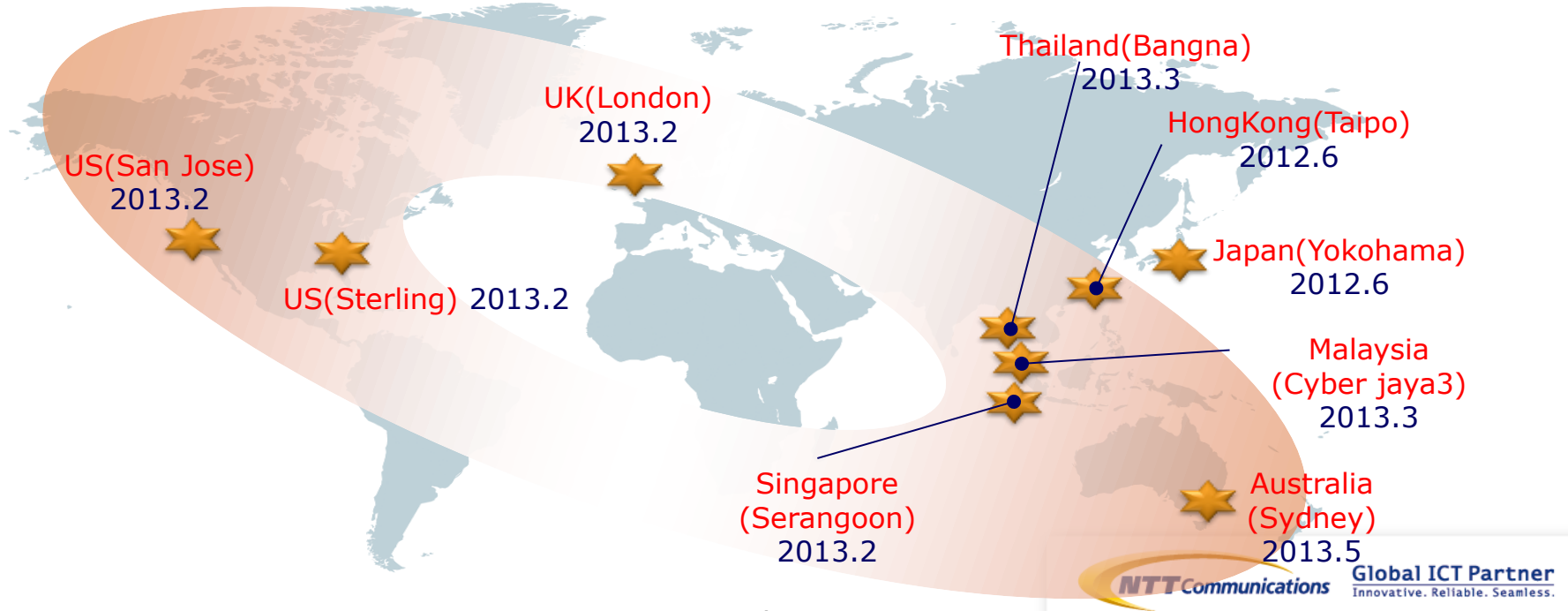
<Mechanism>



Virtualized Data Centers

Virtualized Data Centers connected by OpenFlow/SDN

NTT Communications has already expanded OpenFlow/SDN to inter/intra Global Data Centers.



Global Data Backup Function

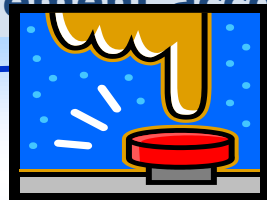
- Realize resource correlation among Global Data Centers by using Open Flow
- Real-time bandwidth management according to amount of traffic data

Manage traffic bandwidth from customer portal by OpenFlow



Primary Storage
(Japan DC)

Important data



Boost! "Boosting up to 500Mbps"

Normal 10Mbps

Additional charge/time

Fixed charge per month

Virtualized Network

Backup Storage
(HKG DC)

Advantages:

- ✓ Integrated provisioning for Cloud and Network
 - Service Order automation
 - Bandwidth change
 - Network configuration
- ✓ Easy and Topology-free design
- ✓ Overcome 4k VLAN limitation using OpenFlow technology

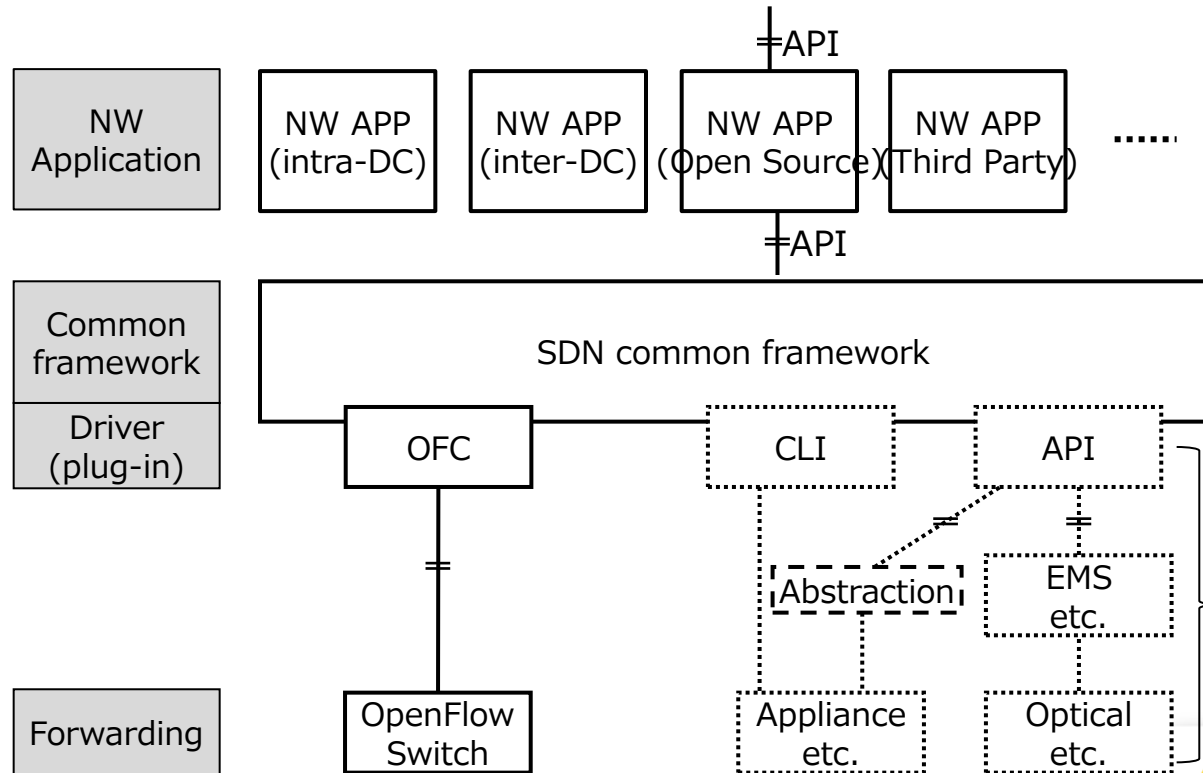
Issues:

- ✓ Lack of specification (OpenFlow v1.0)
 - Controller redundancy, Matching field, and action , etc.
- ✓ Switch Chip limitation
 - Flow table shortage:
Common issues for OpenFlow Switch Hardware
- ✓ Less programmability than our expectation
 - Limitation of commercial product

→ **Expediting NTT Com's own development to resolve these issues**

NTT Com's own development

SDN Architecture



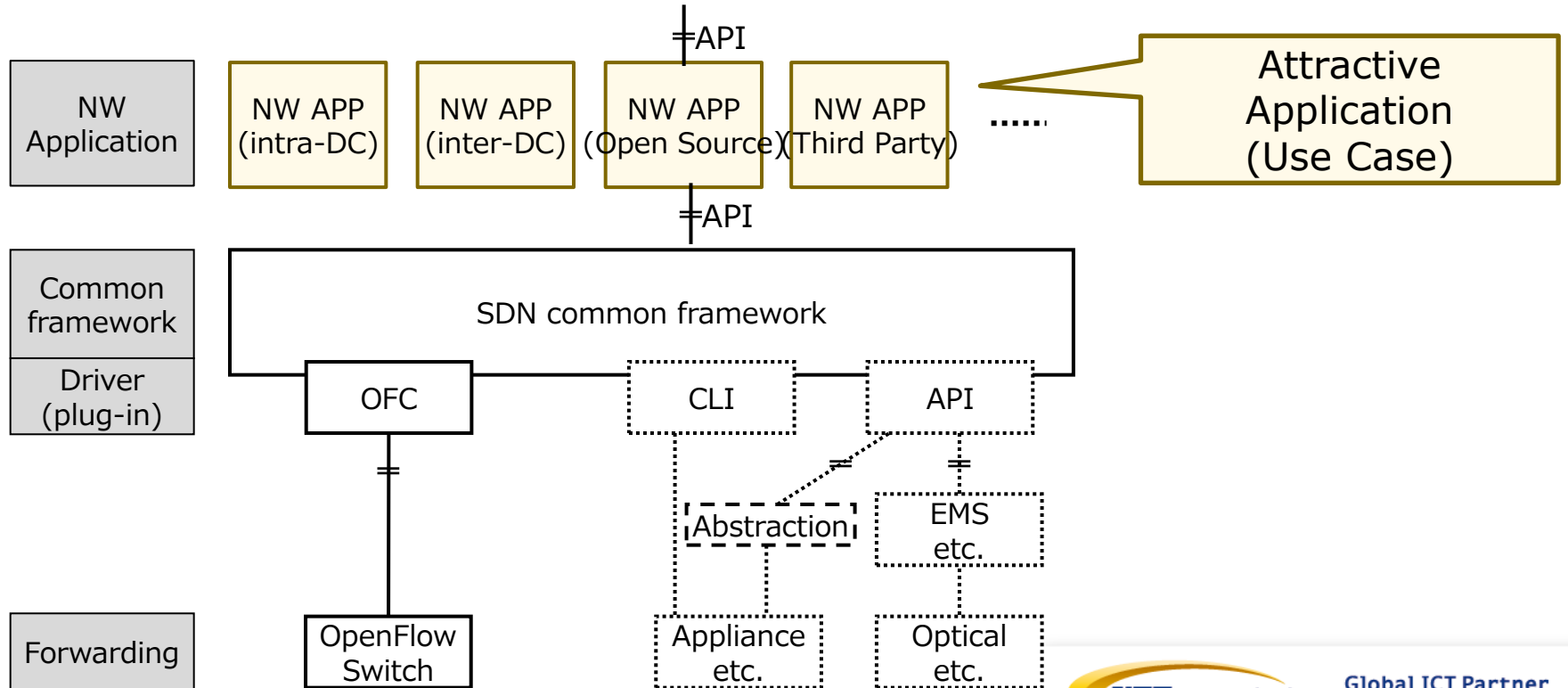
Realize carrier desired function

Provide common framework for Northbound & Southbound

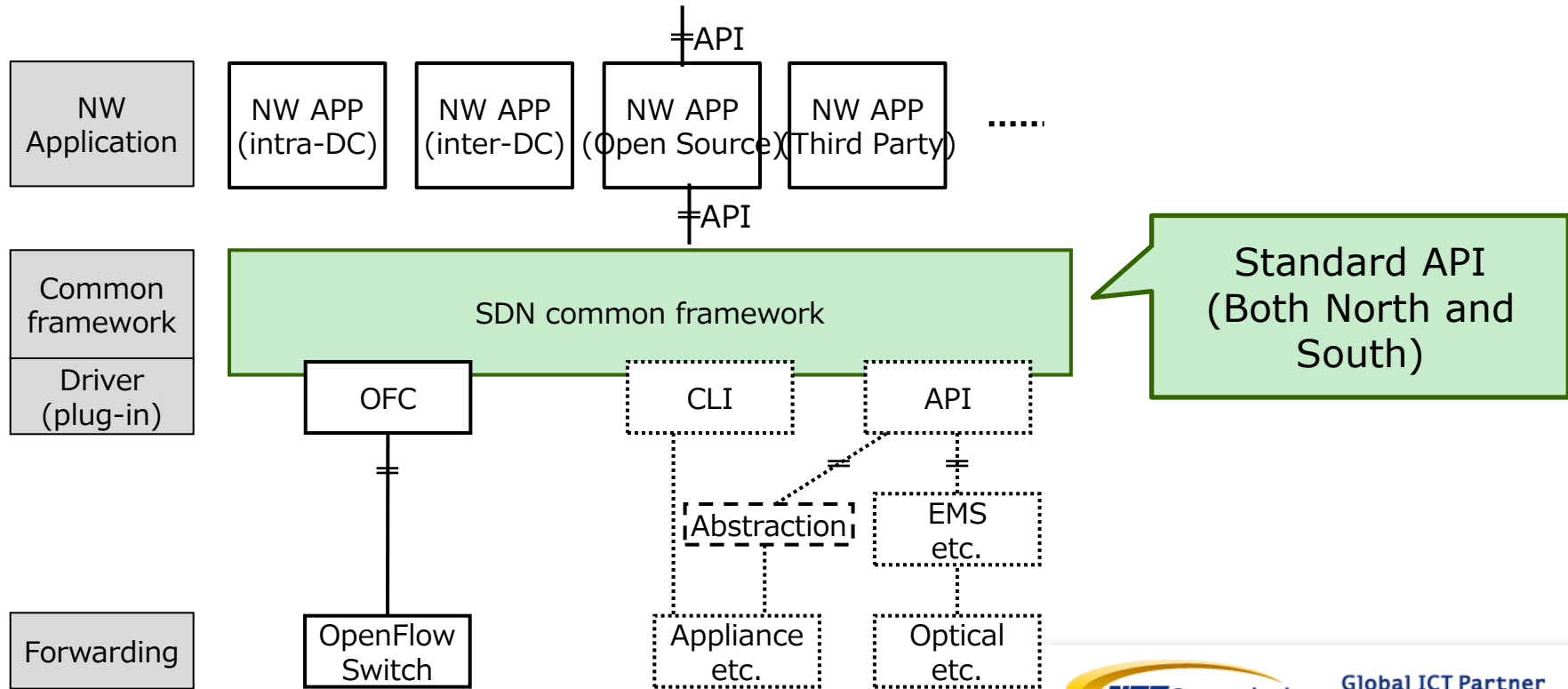
Standard Interface

Applicable device deployment

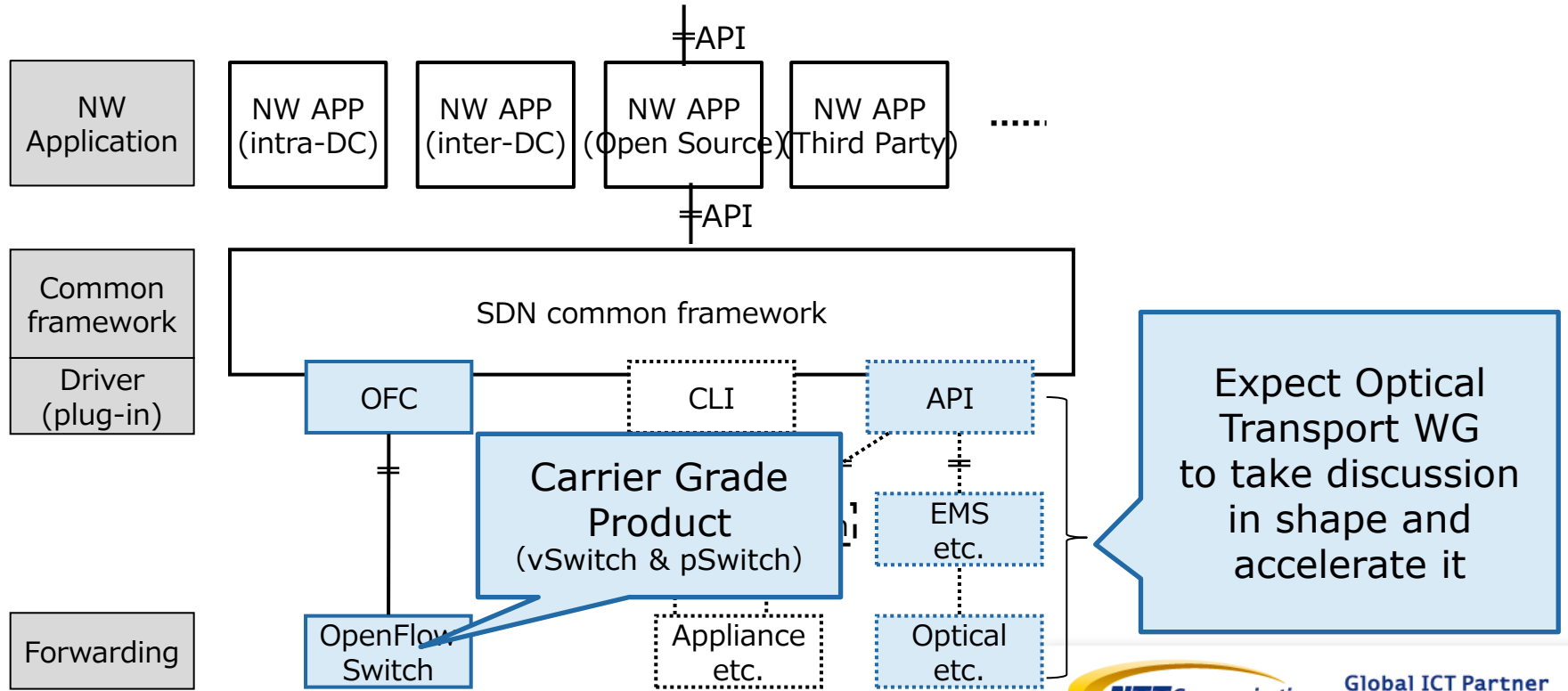
Key of SDN Architecture 1/3



Key of SDN Architecture 2/3



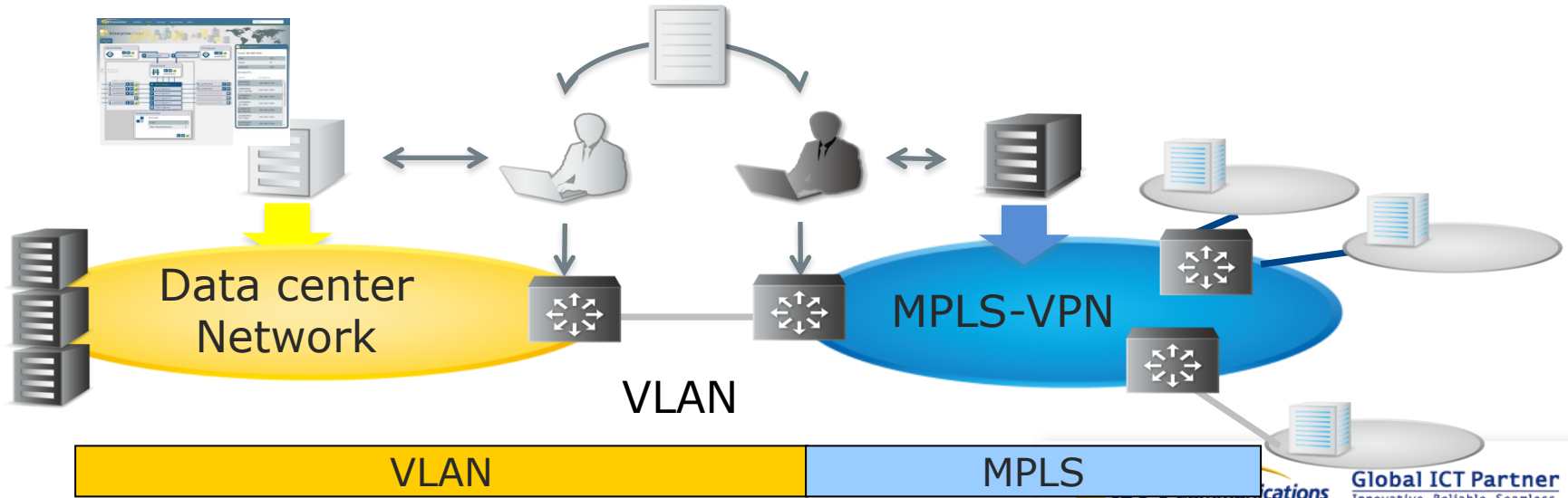
Key of SDN Architecture 3/3



Use Case -Automation of GW interconnection- 1/2

Issues :

- Automated in Cloud / Manual in interconnection with VPN
- Addition / deletion in Cloud creates extra PE router configuration

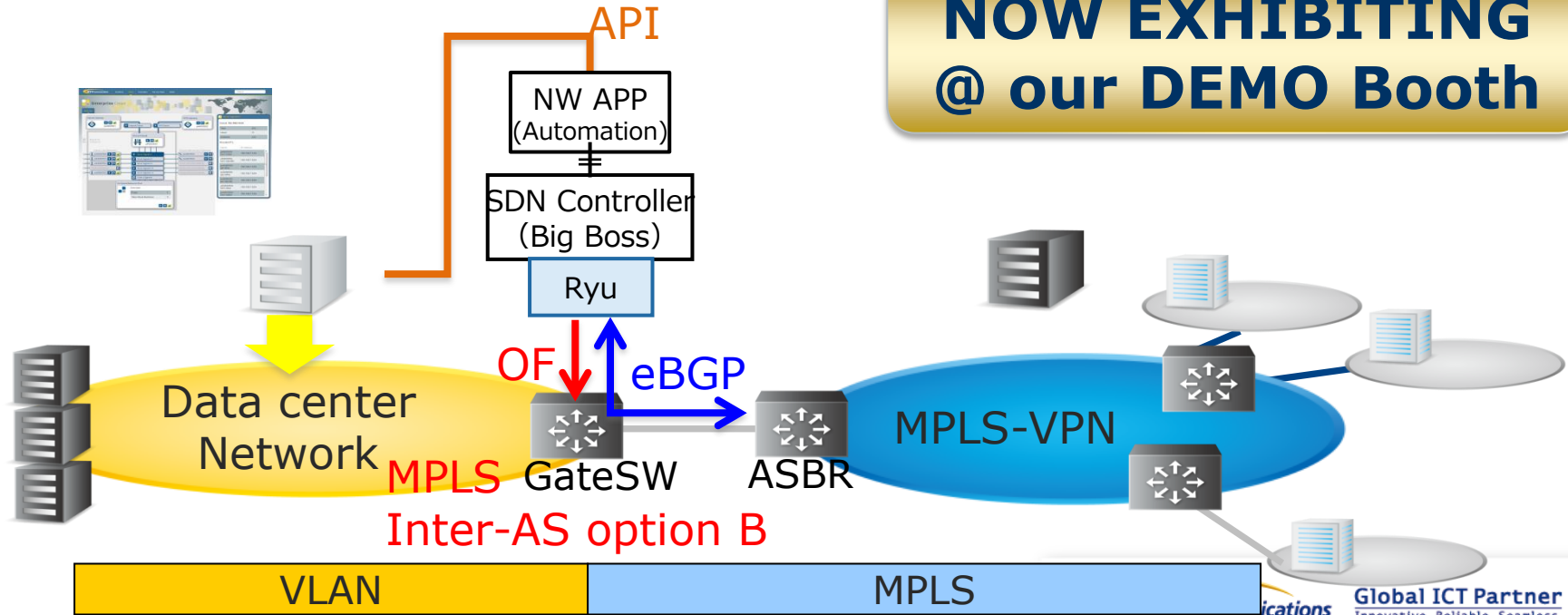


Use Case -Automation of GW interconnection- 2/2

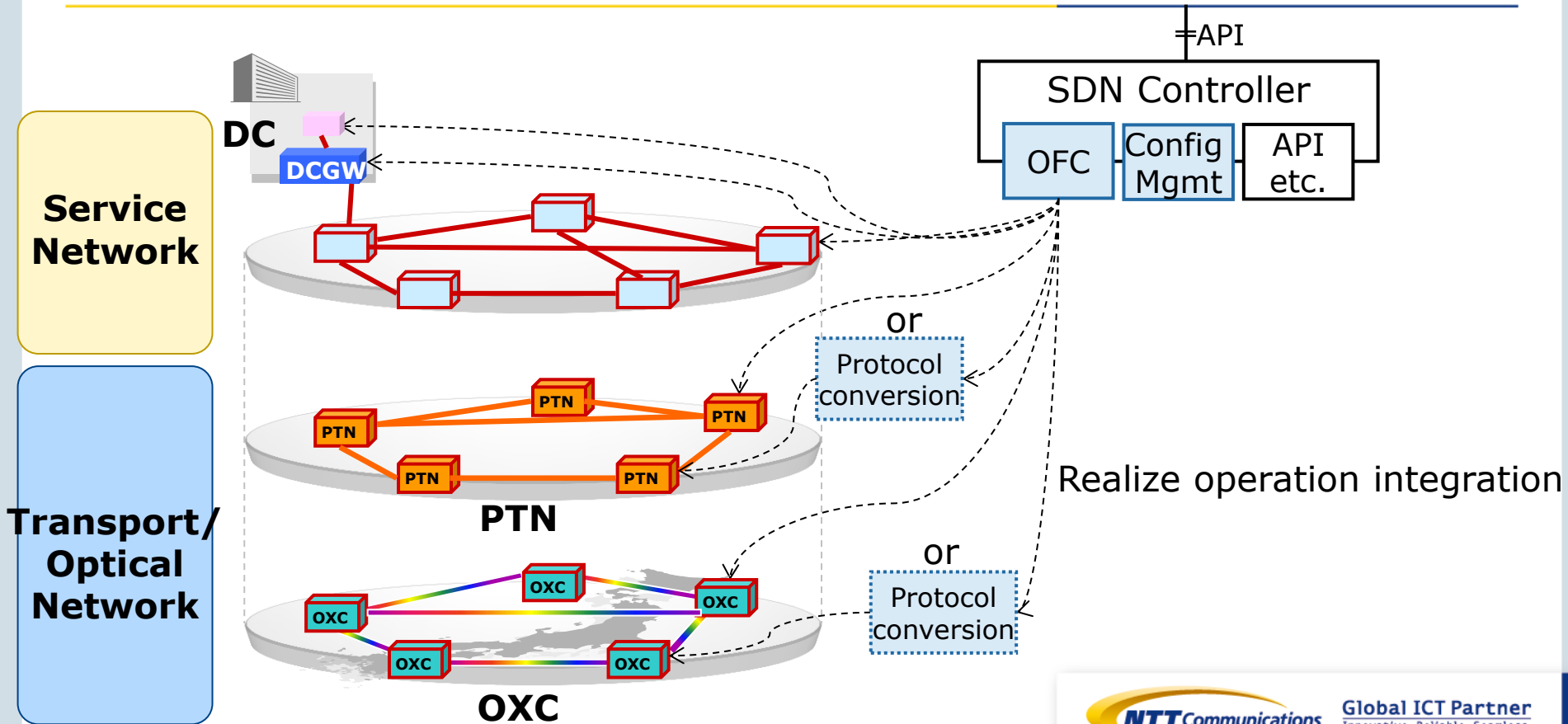
Solution by SDN :

- Automatic VPN connection via API from portal site

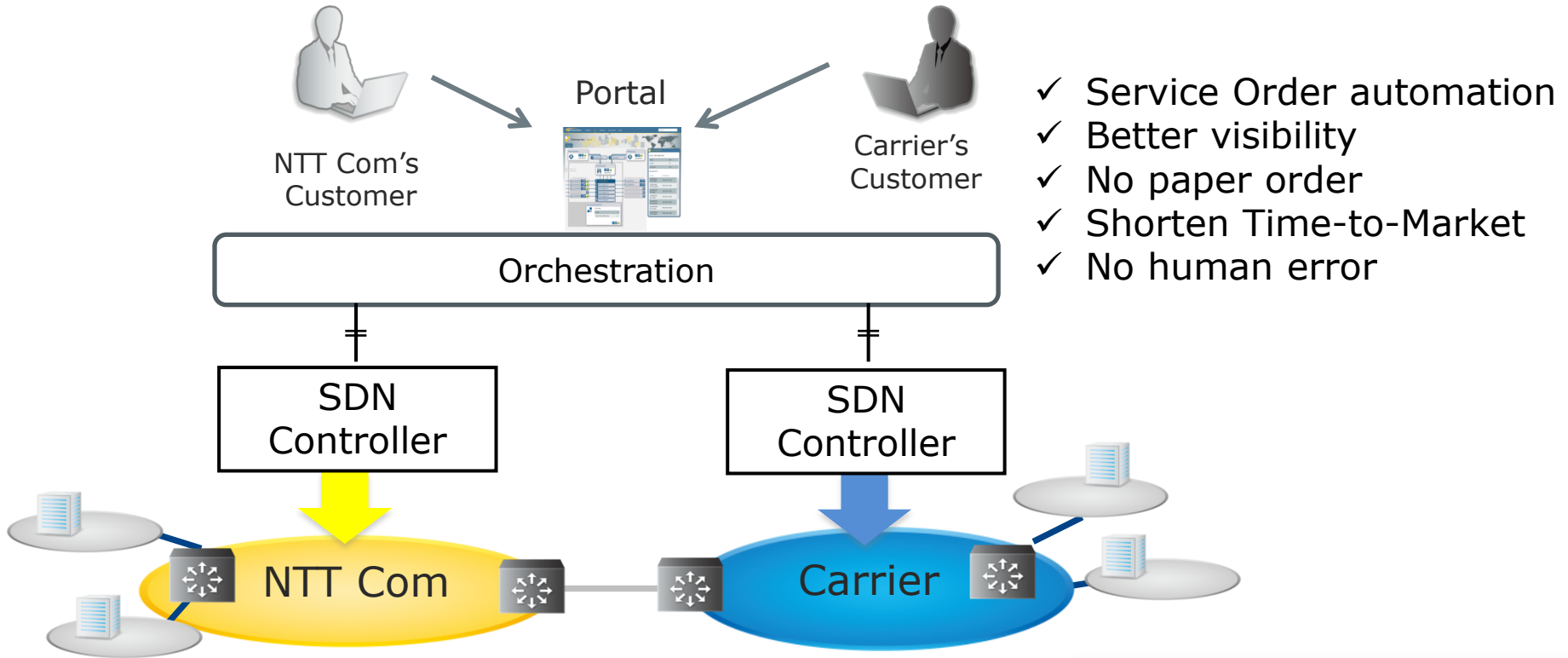
**NOW EXHIBITING
@ our DEMO Booth**



ToBe Model Image -Expansion to all layers of Network (Concepts)-



ToBe Model Image -Carrier Collaboration (Concepts)-



Conclusion

- What NTT Com has done / are doing / will do?
 - Done : Provided Enterprise Cloud with OpenFlow/SDN
 - Doing : Testing cloud interconnection with VPN
 - Will do : Expand to all layers of network
- Aggressively working on SDN controller development to realize use cases
- Contribute to SDN development by providing use cases and NTT Com requirement for implementation

COME WITH US TO CHANGE THE WORLD !!

Thank You!