

APII workshop 2014

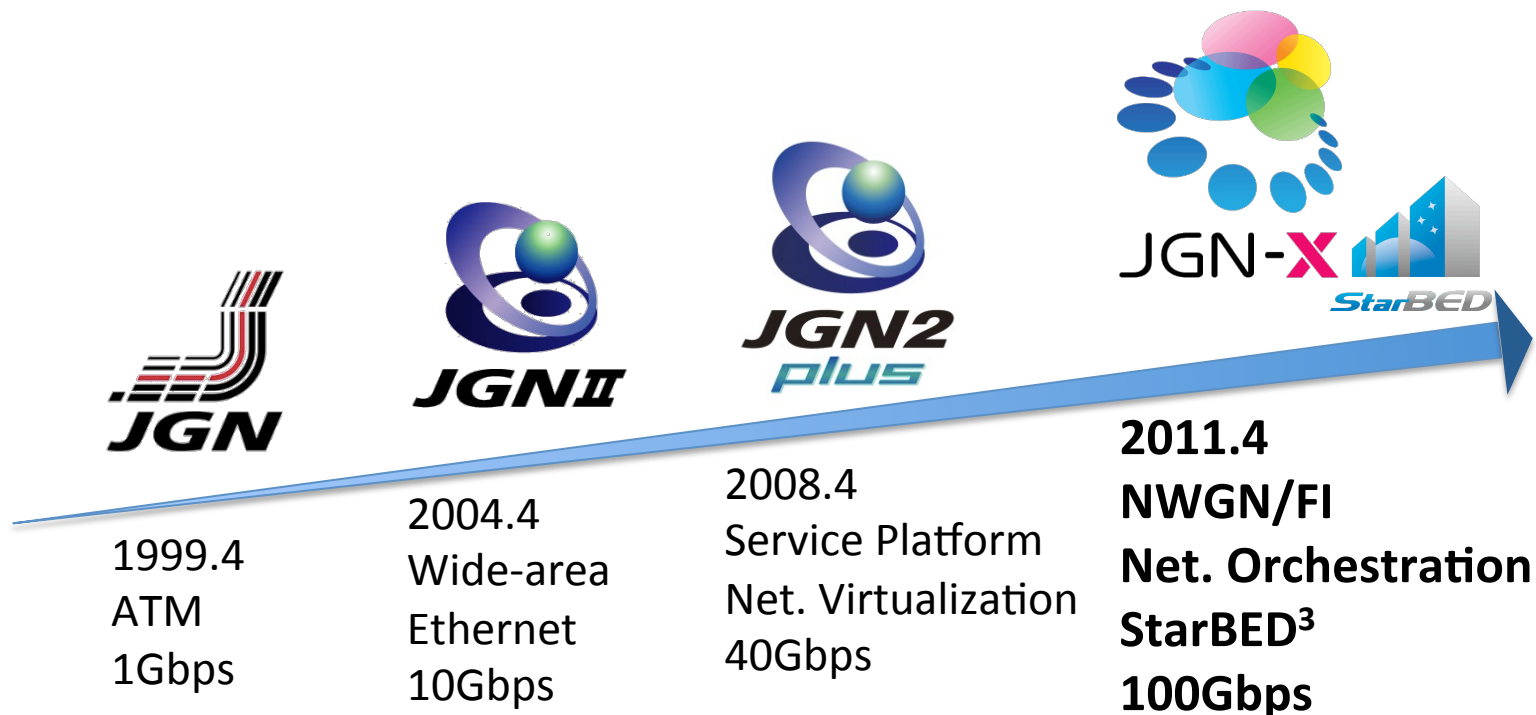
JGN-X update

Seiichi YAMAMOTO

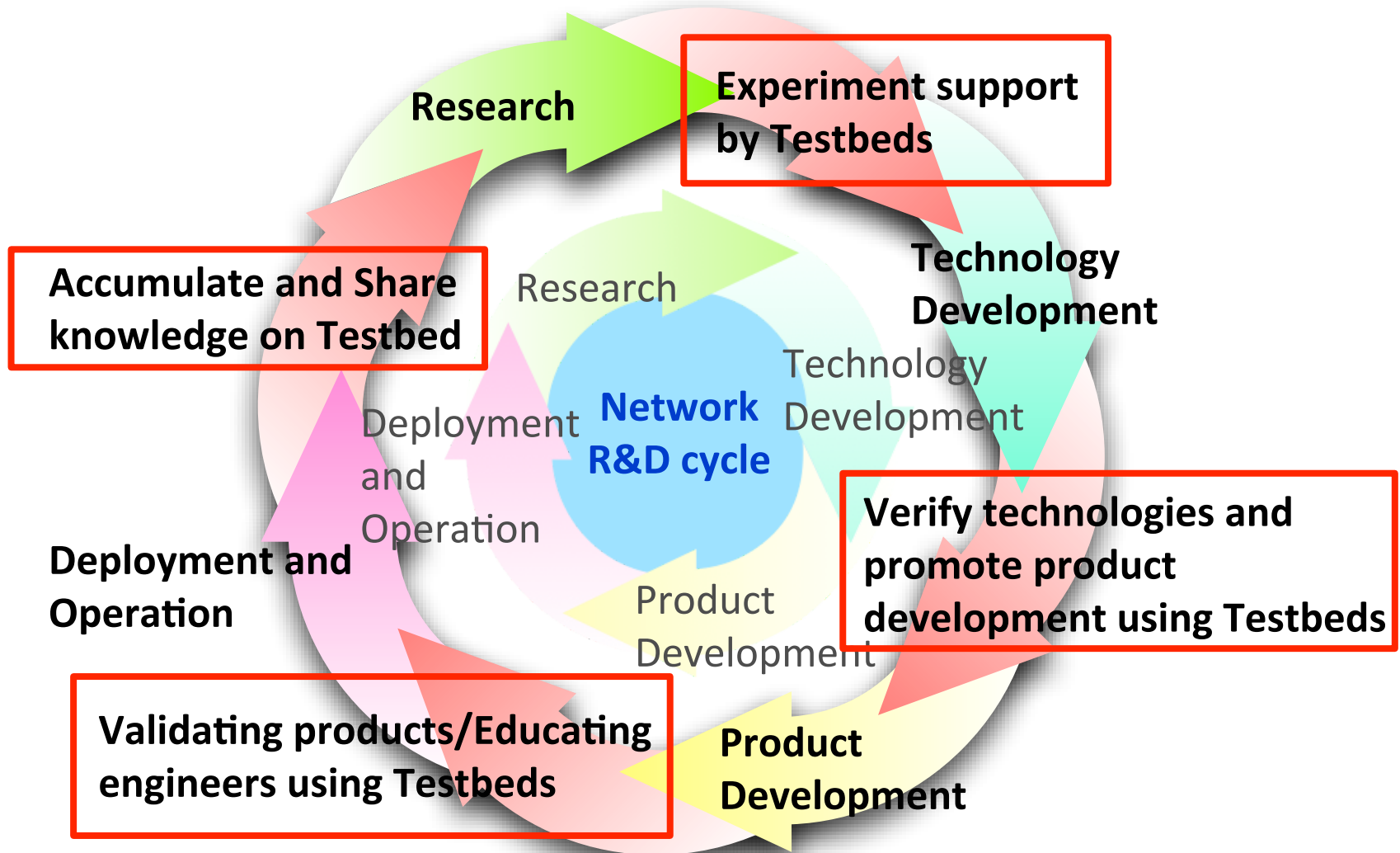
NICT / The University of Tokyo

JGN-X

- JGN-X is a testbed network infrastructure for new-generation network technologies (NWGN)
 - Established in 1999 and operated by TAO (an ancestor of NICT)
 - JGN (1999.4 – 2004.3), JGN2 (2004.4 – 2008.3), JGN2plus (2008.4 – 2011.3), and JGN-X (2011.4 – 2016.3)

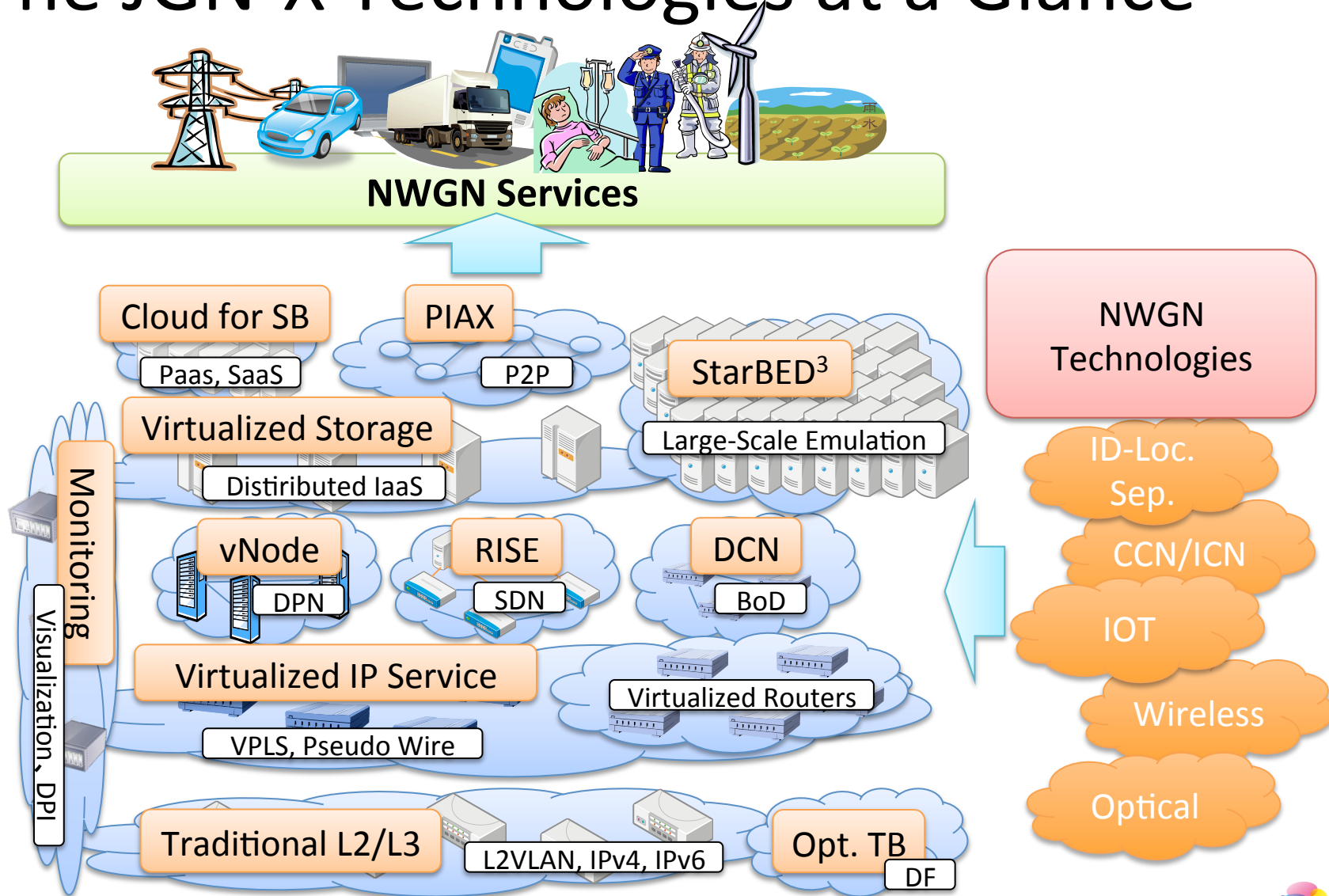


Grand Goal: Network R&D process innovation



Innovating Network R&D process using **StarBED³ & JGN-X**

The JGN-X Technologies at a Glance

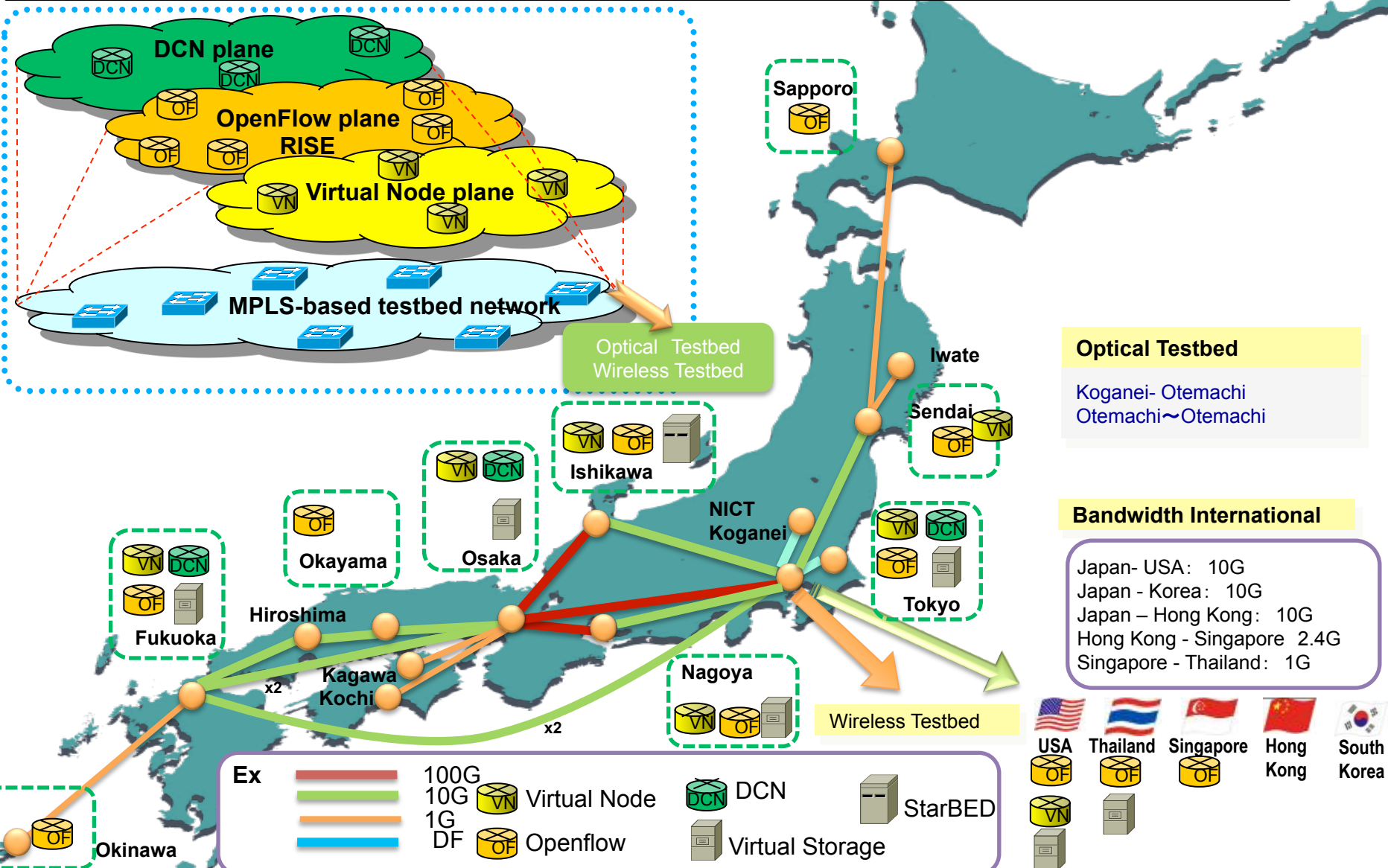


JGN-X update

- Physical reconstruction
 - Circuits
 - Installed 100GbE
 - Added redundant path
 - Access points
 - Moved into new location
 - Devices
 - Installed 100GbE Available Router/Switches/Transponder/Monitoring System
 - Added “Virtual Storage”, etc

JGN-X Network (as of Oct. 2014)

Realizing multiple New Generation Network (NWGN) planes on virtual JGN-X networks and their global interconnection with other testbeds.



Optical Testbed

Koganei- Otemachi
Otemachi~Otemachi

Bandwidth International

Japan- USA: 10G
Japan - Korea: 10G
Japan - Hong Kong: 10G
Hong Kong - Singapore: 2.4G
Singapore - Thailand: 1G











Ex

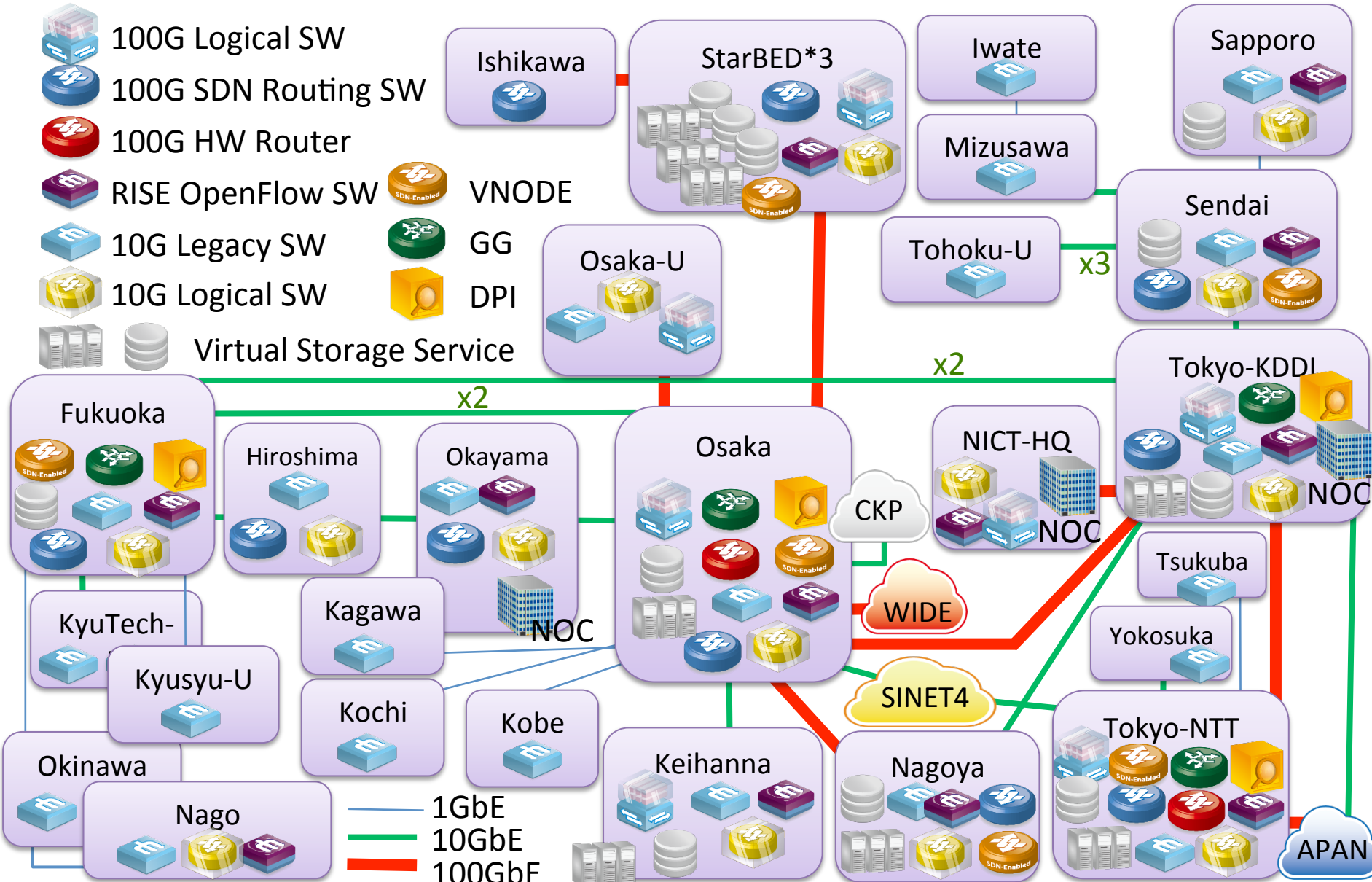
100G
10G
1G
DF

Virtual Node
Openflow
DCN
StarBED
Virtual Storage











USA
Thailand
Singapore
Hong Kong
South Korea

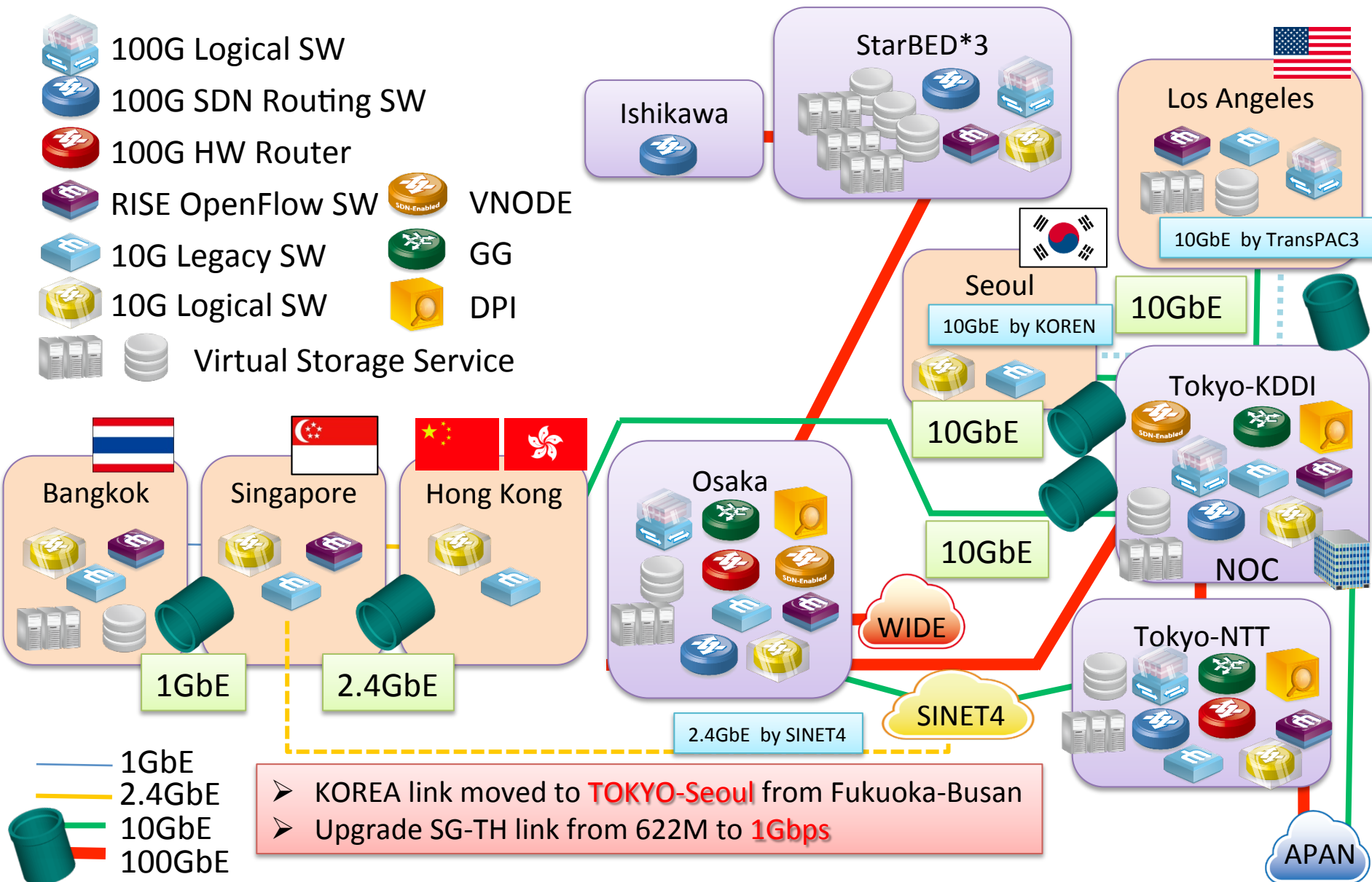
JGN-X Domestic 100GbE upgrade

-  100G Logical SW
-  100G SDN Routing SW
-  100G HW Router
-  RISE OpenFlow SW
-  10G Legacy SW
-  10G Logical SW
-  Virtual Storage Service
-  VNODE
-  GG
-  DPI



JGN-X International upgrade

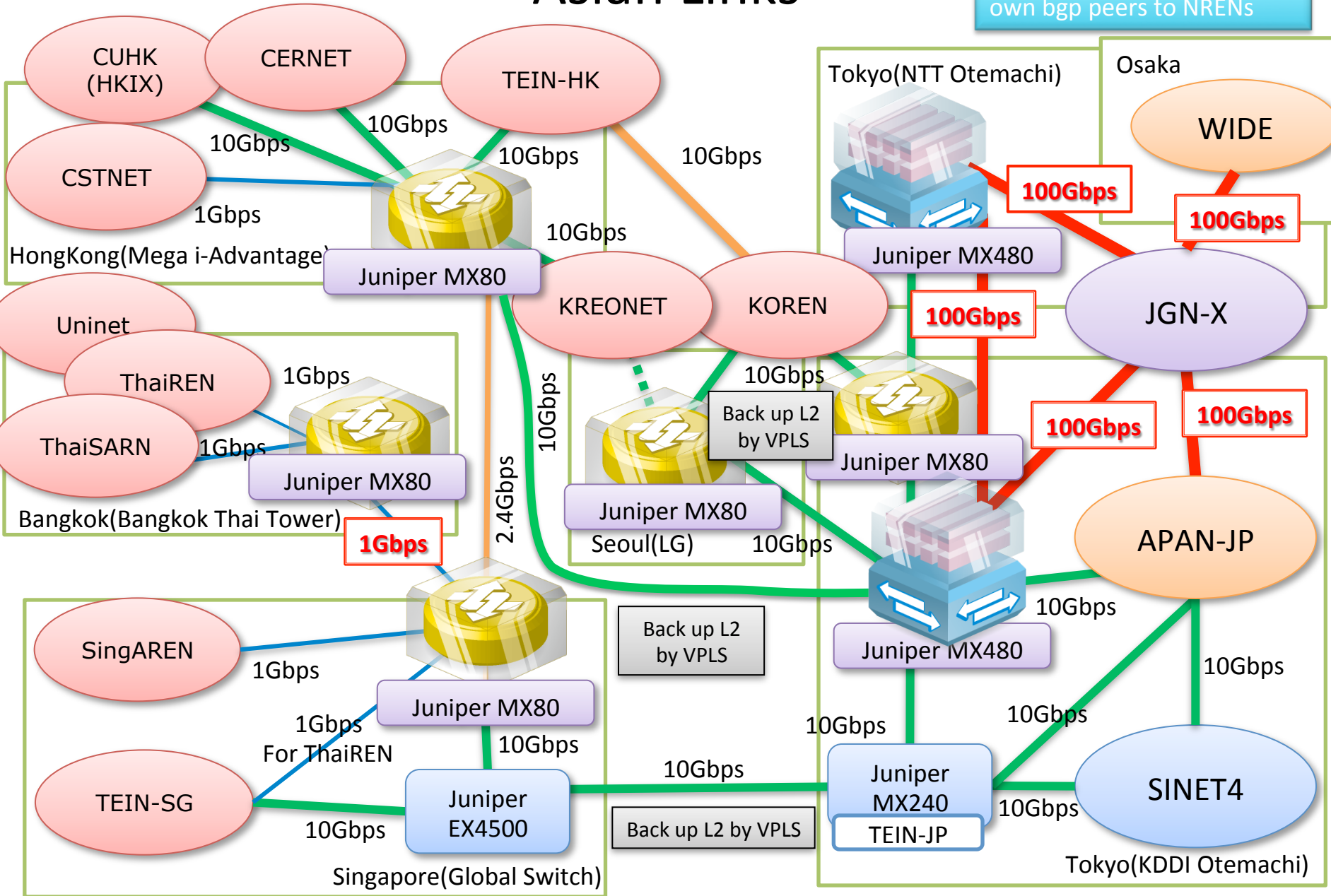
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-  10G Legacy SW
-  10G Logical SW
-  Virtual Storage Service
-  VNODE
-  GG
-  DPI



➤ KOREA link moved to **TOKYO-Seoul** from Fukuoka-Busan
 ➤ Upgrade SG-TH link from 622M to **1Gbps**

Asian Links

JGN-X(AS17943) are making own bgp peers to NRENs

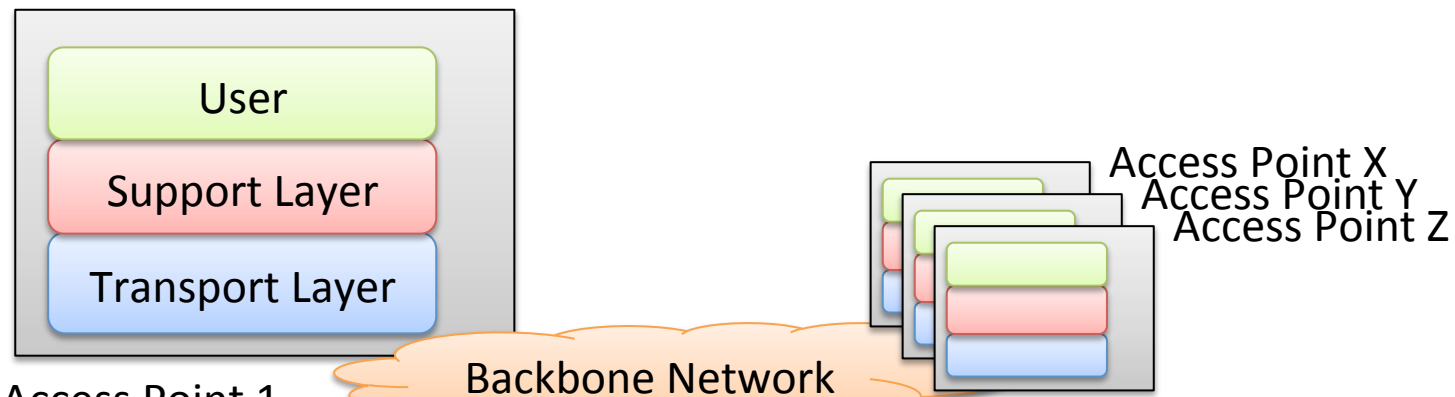


JGN-X update (cont')

- Functional reconstruction
 - Modular Backbone Structure
 - Transport/Support Layer
 - Preparation to operate 100GbE
 - 100G Monitoring
 - Redundant L3 routing

Modular Backbone Structure

- Transport / Support Layer
 - Separate “Backbone” and “Edge” technology
 - Modular Structure
 - Use virtualized technology (logical router / VPN / ...)
 - Also separate physical device
 - Easy to adapt/re-configure/install new technology/box



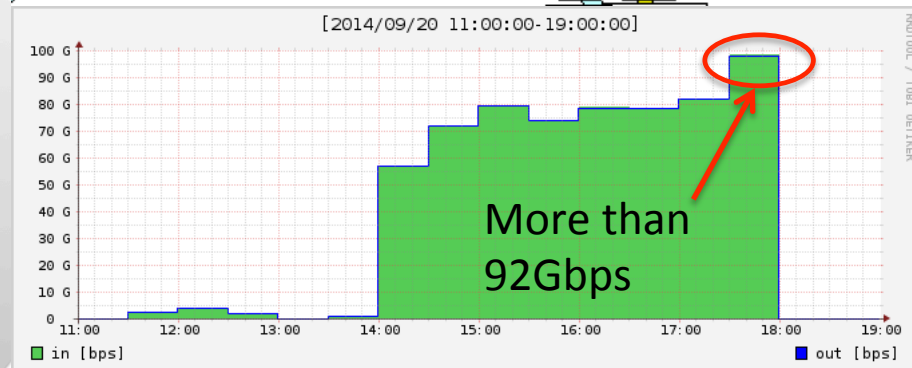
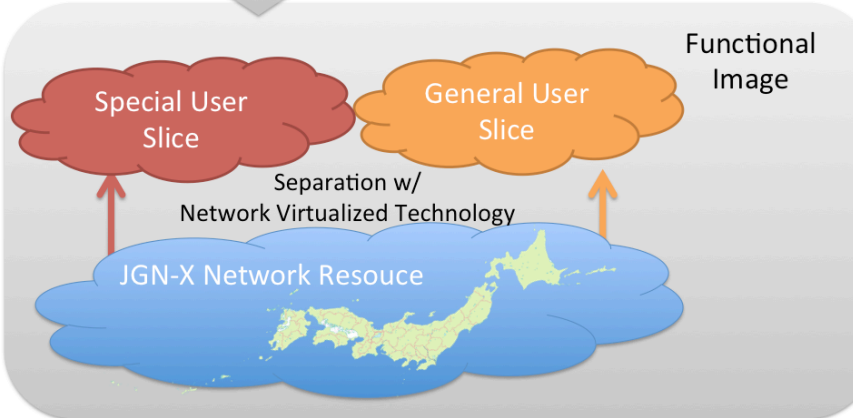
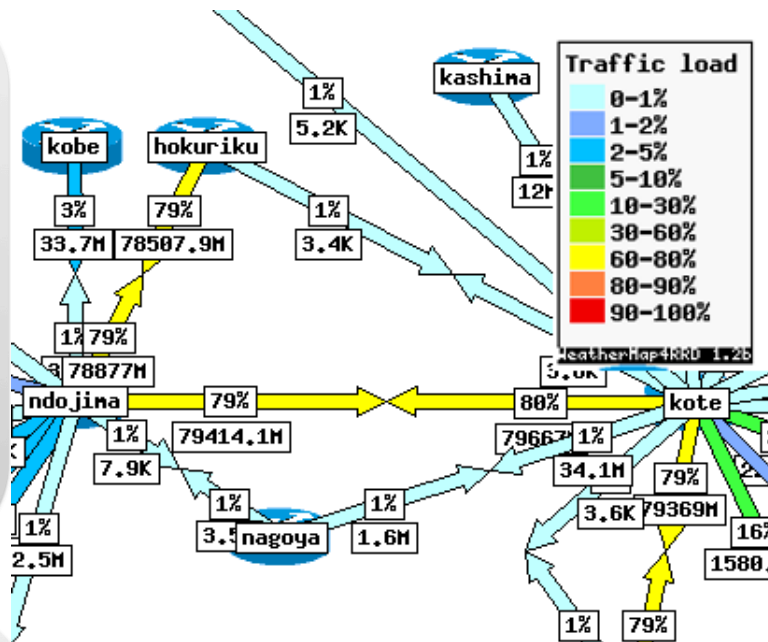
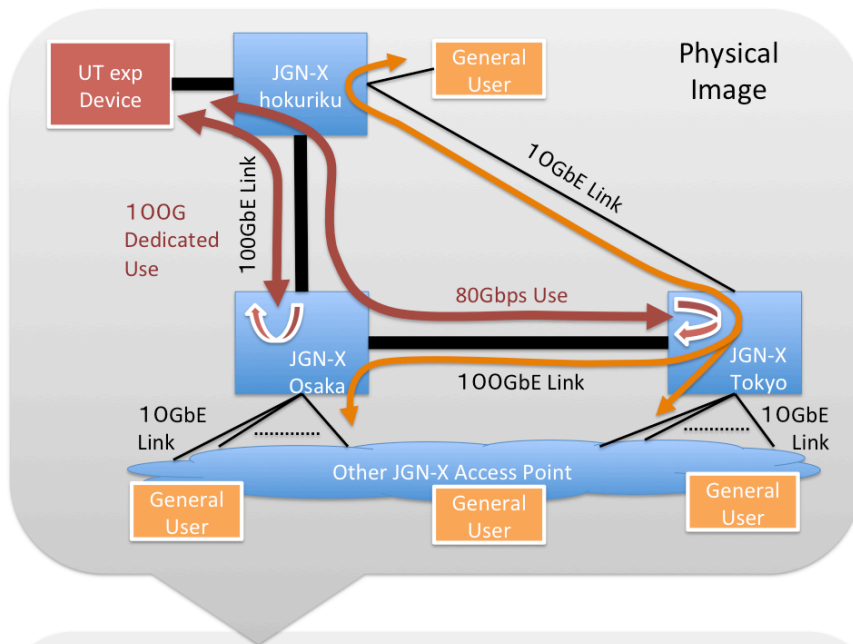
Modular Backbone Structure (cont')

- Support Layer
 - Edge function (i.e. customer accommodation)
 - Keep traditional VLAN interface
 - Provide Ethernet/VLAN function
 - Tag translate
 - Loop guard / BPDU filter
 - Broadcast rate limit (If need)
- Transport Layer
 - Backbone function
 - MPLS based VPN (VPLS)
 - LDP Plane: Dynamic Path Management
 - RSVP Plane: Customize Path/Bandwidth
 - High Speed Topology Change Convergence
 - BFD (Bidirectional Forwarding Detection)
 - “MPLS” is one of choice, We can change NEW technology easily.

100G Class Transport Experiment

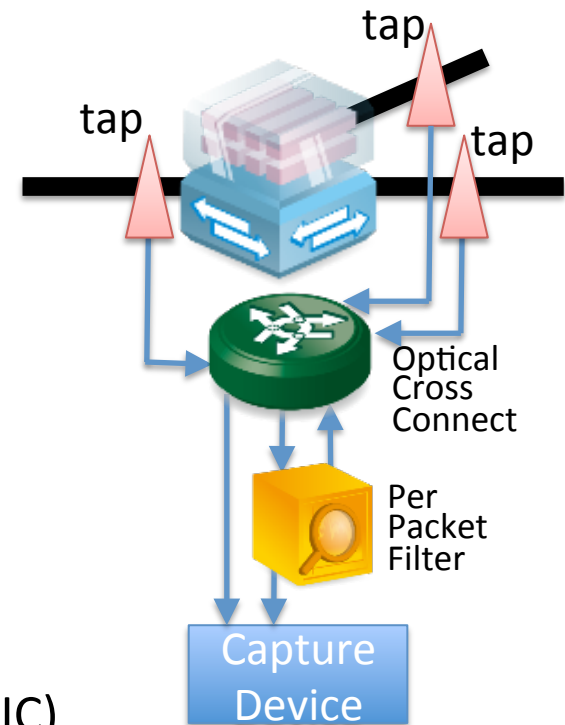
- Prof. Hiraki (U-Tokyo) and his team held 100Gbps Transport Experiment w/ NICT.
- JGN-X NOC support w/ Network Virtual Technology, such as,
 - Separate Slice (General/Special)
 - Adapt Different Policy
 - Bandwidth Limit
 - Available Path

100G Class Transport Experiment (cont')



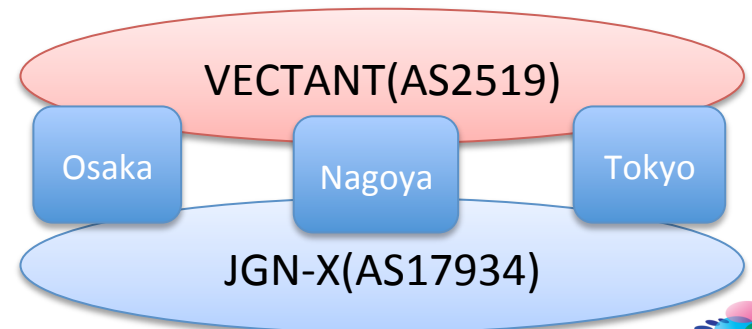
100G Monitoring

- To get accurate data (not to use switch monitor)
 - Inter Frame Gap, Order of pkt, etc
- Monitoring Unit
 - Optical tap
 - Already Installed ** Every ** BB Link
 - Optical Cross Connect
 - Select Input/Output
 - Per packet filtering device
 - Filter out/ find specific packet
 - 5 tuple or specific pattern
 - Support 100G/40G
 - Capture device
 - Presta (Customized Linux Box w/ 10G NIC)



Redundant Layer3 routing

- JGN-X(AS17934) BGP routing
 - Geographically separated upstream
 - 1Gbps @ Tokyo/Nagoya/Osaka
 - VECTANT(AS2519)
 - Internal backup route
 - Also available Traffic Engineering



Conclusion

- JGN-X overview
- JGN-X update
 - Physical/Functional reconstruction
 - Available 100GbE Use
- 100G class transport experiment
 - Successfully finished by network virtualization technology w/ JGN-X operation knowledge