KREONET SOFTWARIZATION

- KREONET SD-WAN Deployment based on ONOS-

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- KREONET-S* as the Next KREONET
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KISTI, R&D Partner for the Better Society

Provide Research Infrastructures

For the advancement of national scientific, technical, and industrial development

Do the Research

For leading the new research paradigm
And providing better services

As a national institute focused on S&T information, supercomputing, and research networking, KISTI plays a key role in facilitating the national R&D competitiveness

Background of KREONET-S*

≪ Nationwide 17 Regional Centers in Korea (~100Gbps), 3 International Connections to the US and China (~20Gbps), Global Research Network Collaborations (GLIF & GLORIAD), ~200 member institutions, Supercomputing/Advanced Application Services≫

*** 24 x 7 Network Operations Center ***

Toward Software and User driven Virtualized, Dynamic, and Flexible Environment

from Hardware-based Fixed, Closed Network Infra & Services

Map of KREONET & GLORIAD

KREONET (Top 10) Advanced Applications

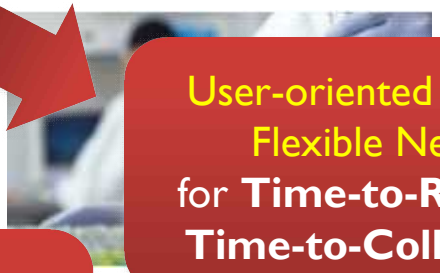
Deterministic Network Performance and QoS for ~100G Data Transfer

Weather & Climate

Education & Collaboration

High Energy Physics

User-oriented Dynamic & Flexible Networks for **Time-to-Research & Time-to-Collaboration**



Medical Science

Future Internet

Astronomy

Very Reliable and Security-guaranteed Networks for Collaborative Research

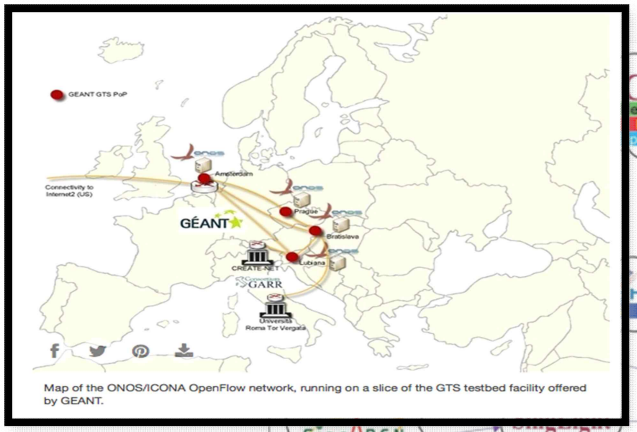
New Medicine/Bio

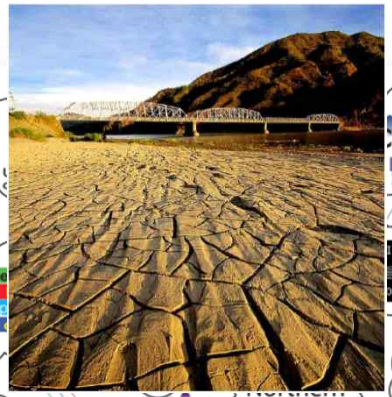
Culture & Art

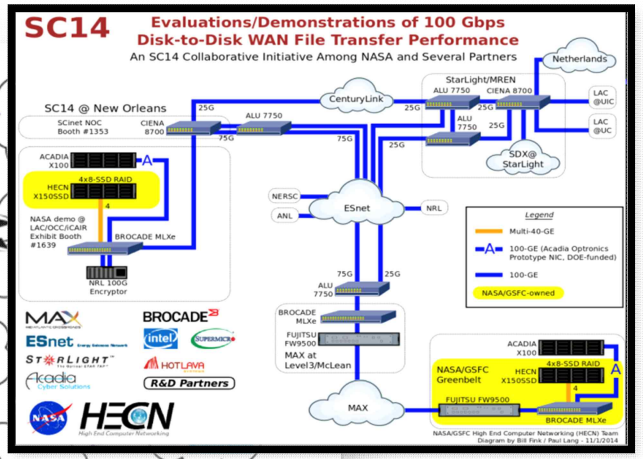
Constructions

Supercomputing

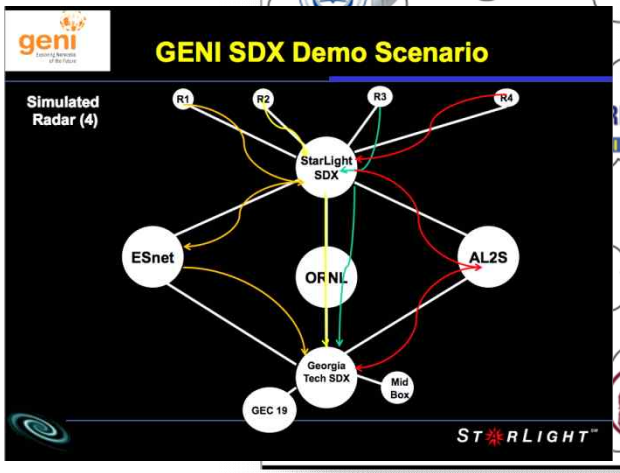
Global Collaborations

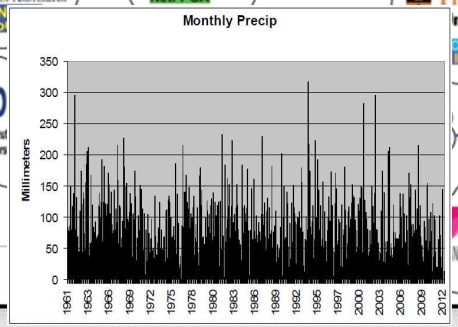


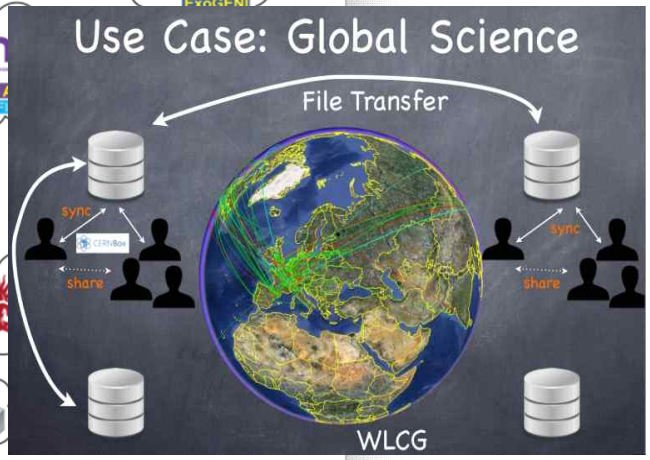




New Network Environment
for Global and Domestic
Experimenters & Researchers







Source: ONOS ICONA Project, SC14 Demos, StarLight's SDX Project

The Next: KREONET-S*

- **KREONET-S*** Main Goals
  - **Carrier-grade Reliable "Public SD-WAN" Operations**
    - Distributed Controls and 24 x 7 Network Operations
  - **New User Interfaces, Services, and Experiences**
  - **Multi-vendor and Multi-layer Network Infrastructure**
- Principal Building Blocks
  - Northbound (Apps & Services): VDN, UoV, vSciZ, etc.
  - Southbound: OpenFlow, TL1, NETCONF, etc.
  - East-Westbound: Distributed Controls
    - KISTI/KREONET - ONOS Affiliate (in a joint effort with KAIST)
    - Service Composition: KREONET COREEN Platform, vSciZ, etc.

The Next: KREONET-S*

KREONET-S* Applications & Services: ***High Performance, Advanced Security, New User Services & Experiences***

VDN (Virtual Dedicate Network)

UoV (User oriented Visibility)

vSciZ (Virtual Science DMZ)

KREONET COREEN

SDN-IP | Multi-Layer | NFV/NFaaS | NMS, etc.

SD-WAN Technology & NOC

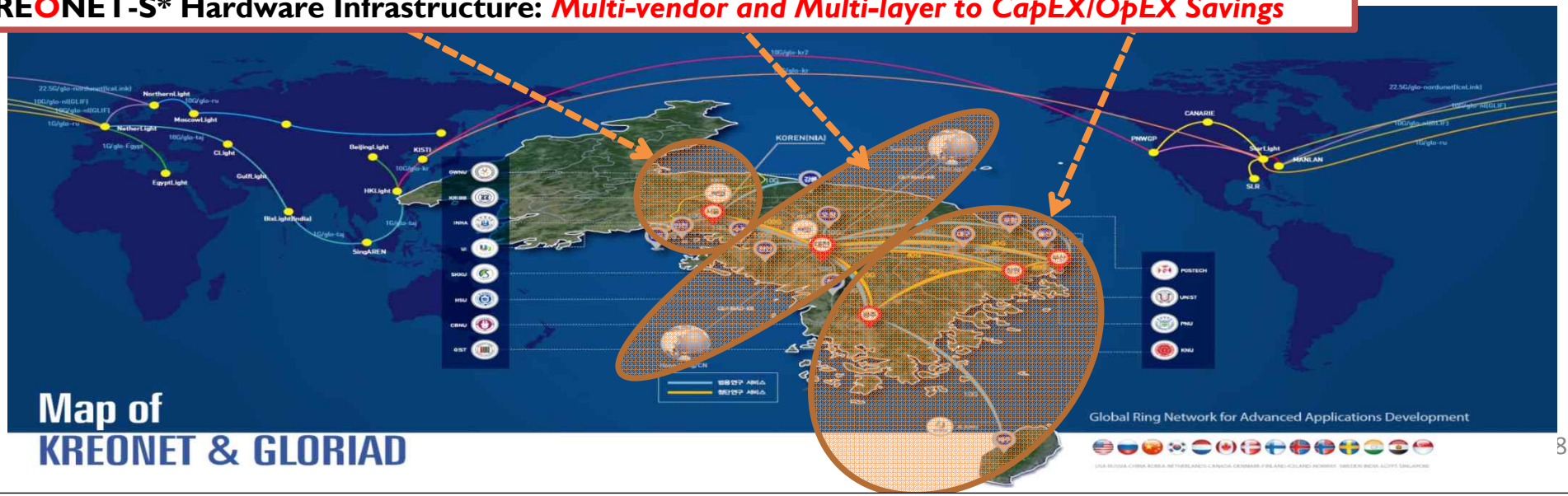
KREONET-S* Controller Infrastructure: ***Carrier-grade High Availability/Failover and Scalability***

Controller Domain

Controller Domain

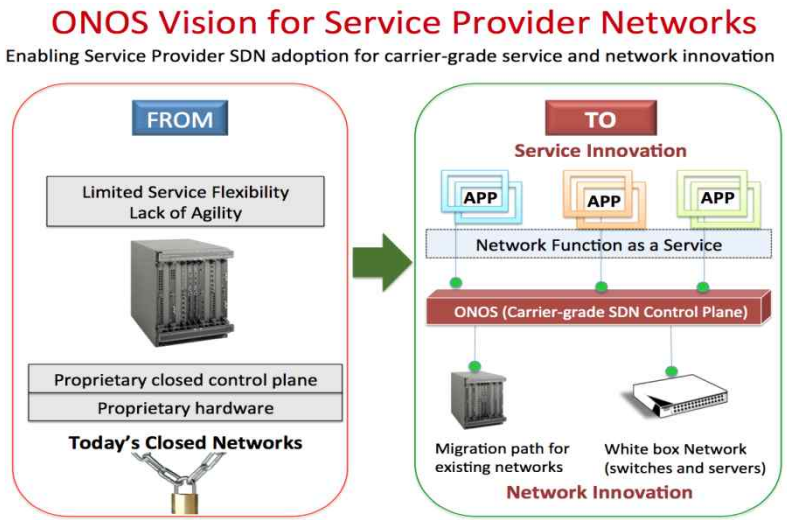
Controller Domain

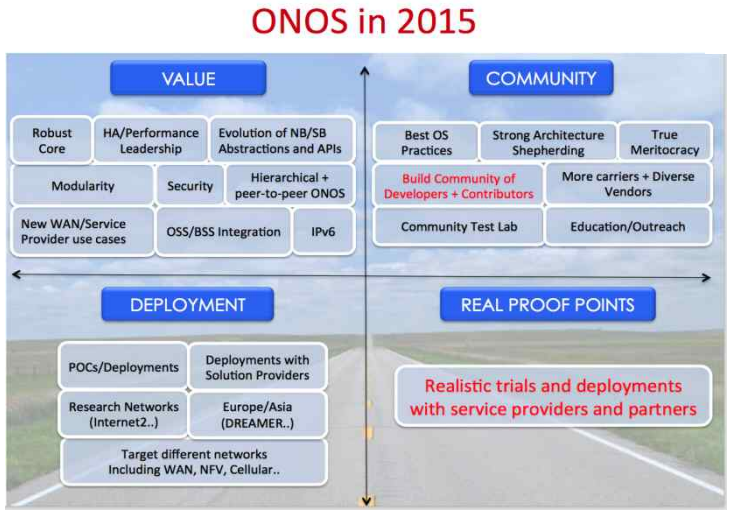
KREONET-S* Hardware Infrastructure: ***Multi-vendor and Multi-layer to CapEX/OpEX Savings***



The Next: KREONET-S*

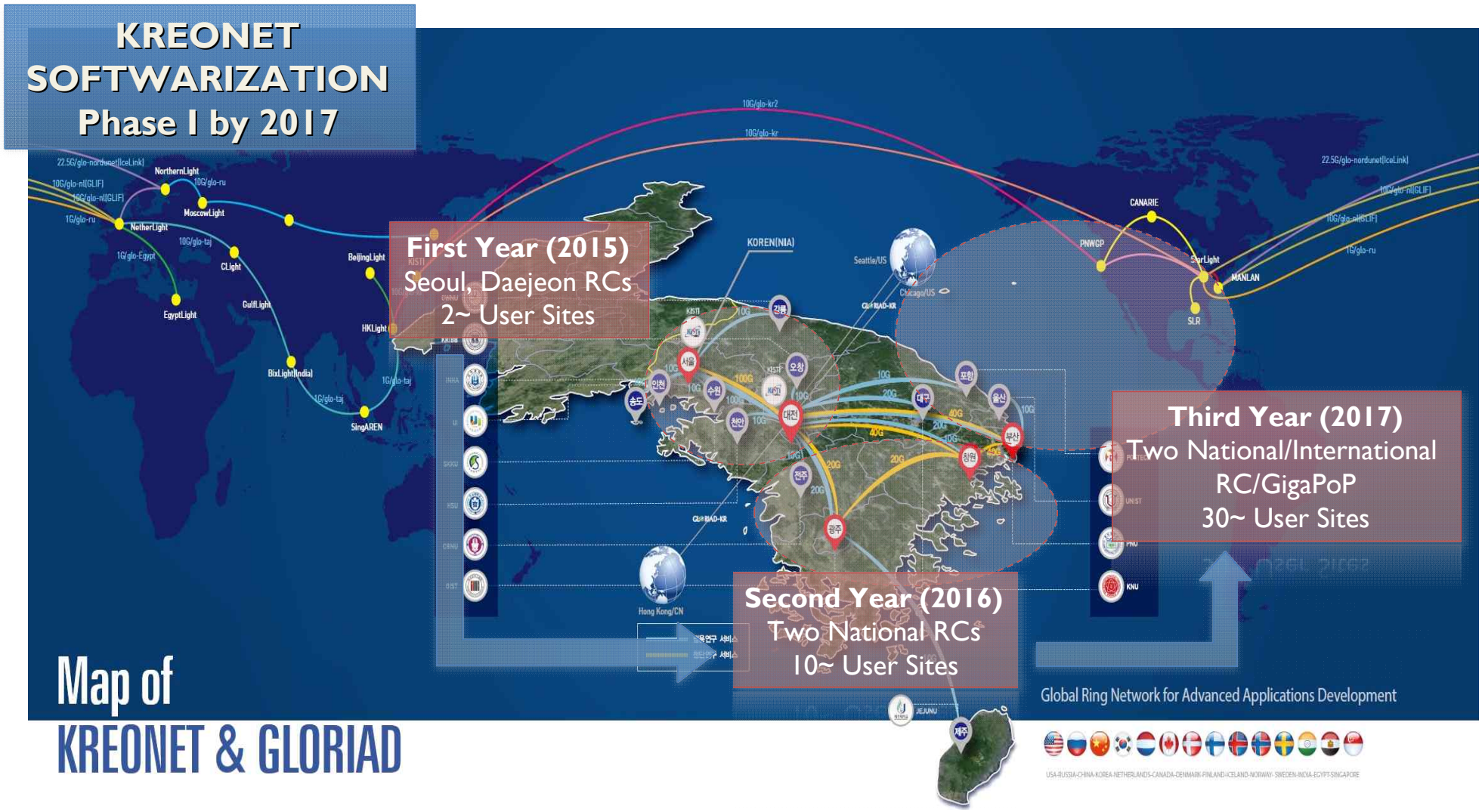
- Embracing Open Technologies
  - OpenFlow, OVS, OPNFV, OpenStack, Many others..
  - **ONOS Affiliate**
    - Technical collaborations for ONOS deployment
    - Setting up discussion channel for operational experiences
    - Applying various SDN applications on KREONET-S*



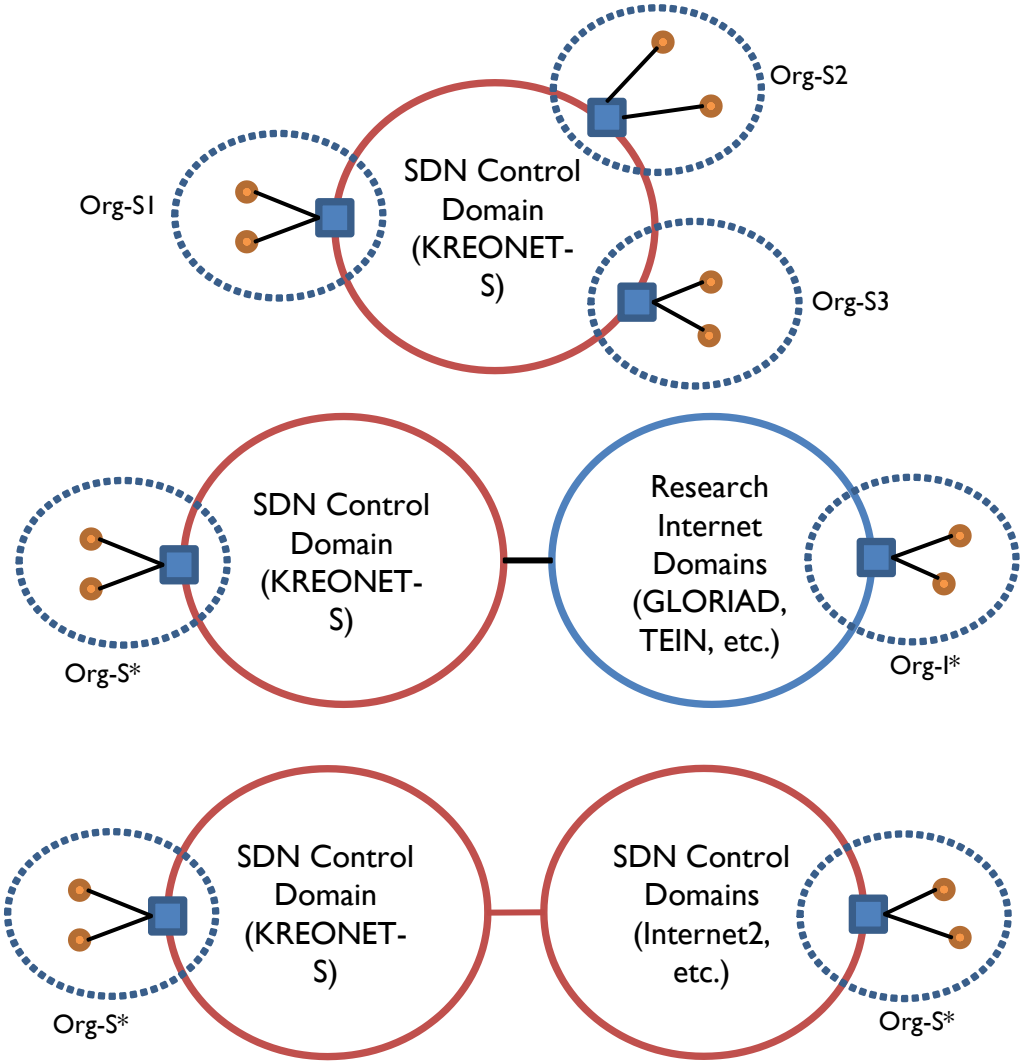


Source: Introducing ONOS, http://onosproject.org/software/

KREONET-S* Roadmap



KREONET-S* Service Types



Pure SDN Services

- Deterministic QoS & Performance
- Virtually Isolated User Group Networks
- Enhanced Security & New User Experiences
- User-centric Open Networking Environment

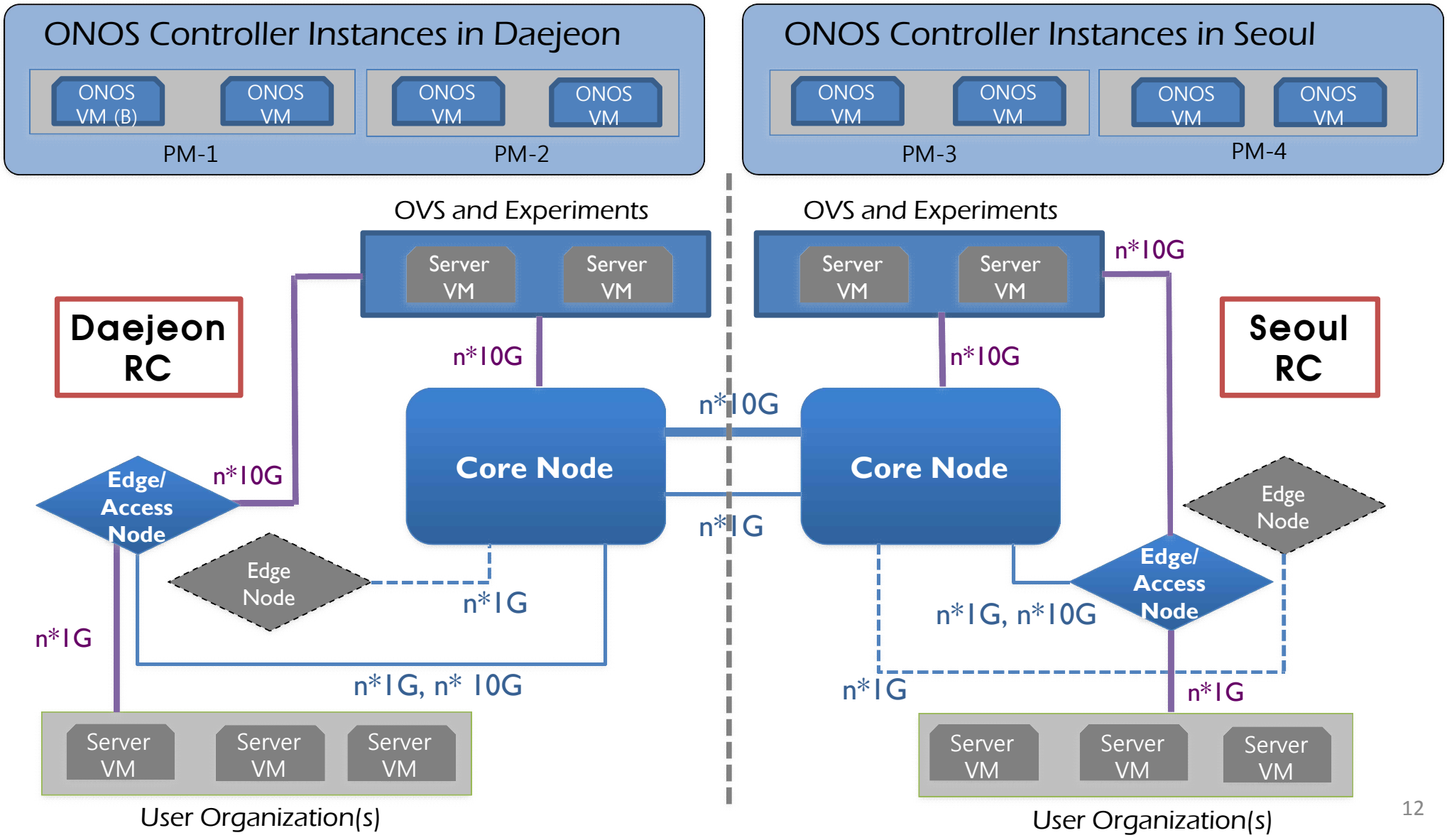
SDN-IP Services

- SDN-to-Internet Extended Connectivity
- Traffic-engineered AS Transit (DC to DC)
- Partial Guarantee of QoS & Performance
- Partial Security, but still New User Experiences

Federated SDN Services

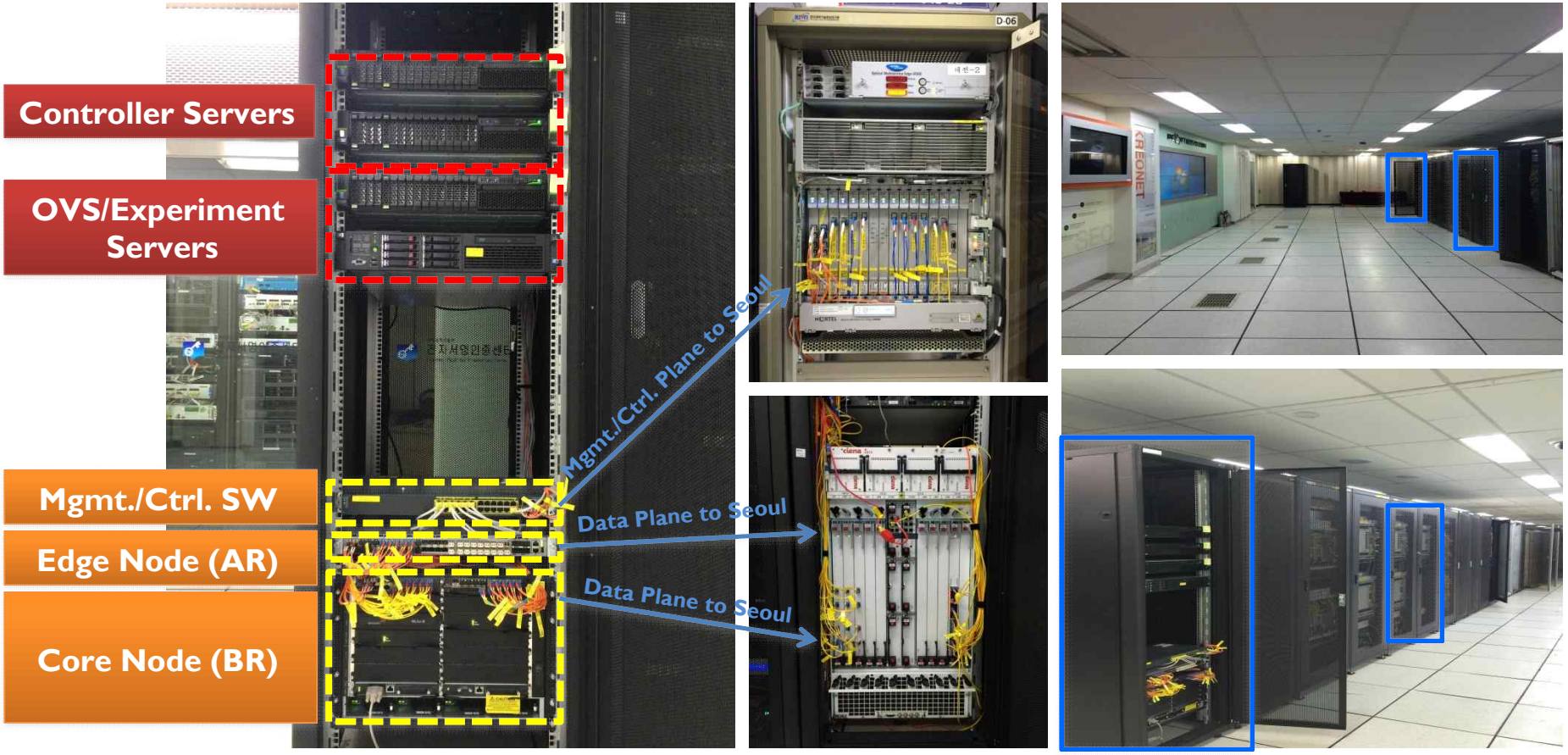
- Inter-SDN Connectivity & Federated Resources
- Virtually Isolated Networks on Inter-Cluster SDN
- Deterministic Guarantee of QoS & Performance
- Enhanced Security & New User Experiences
- Extended Connectivity with SDN-IP

Deployment 2015 - Overall Design



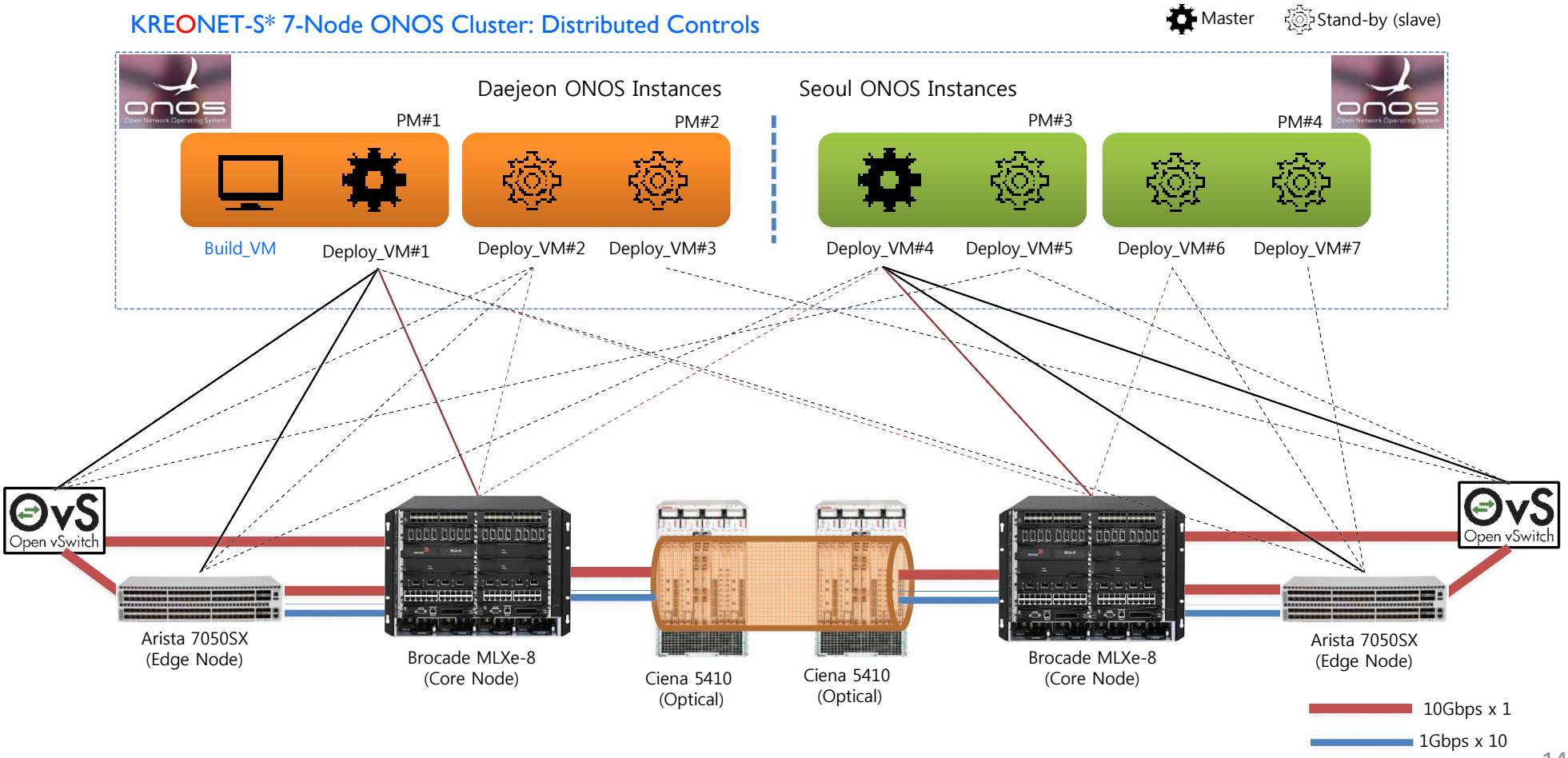
Deployment 2015

- Softwarization of KREONET: Daejeon and Seoul Centers

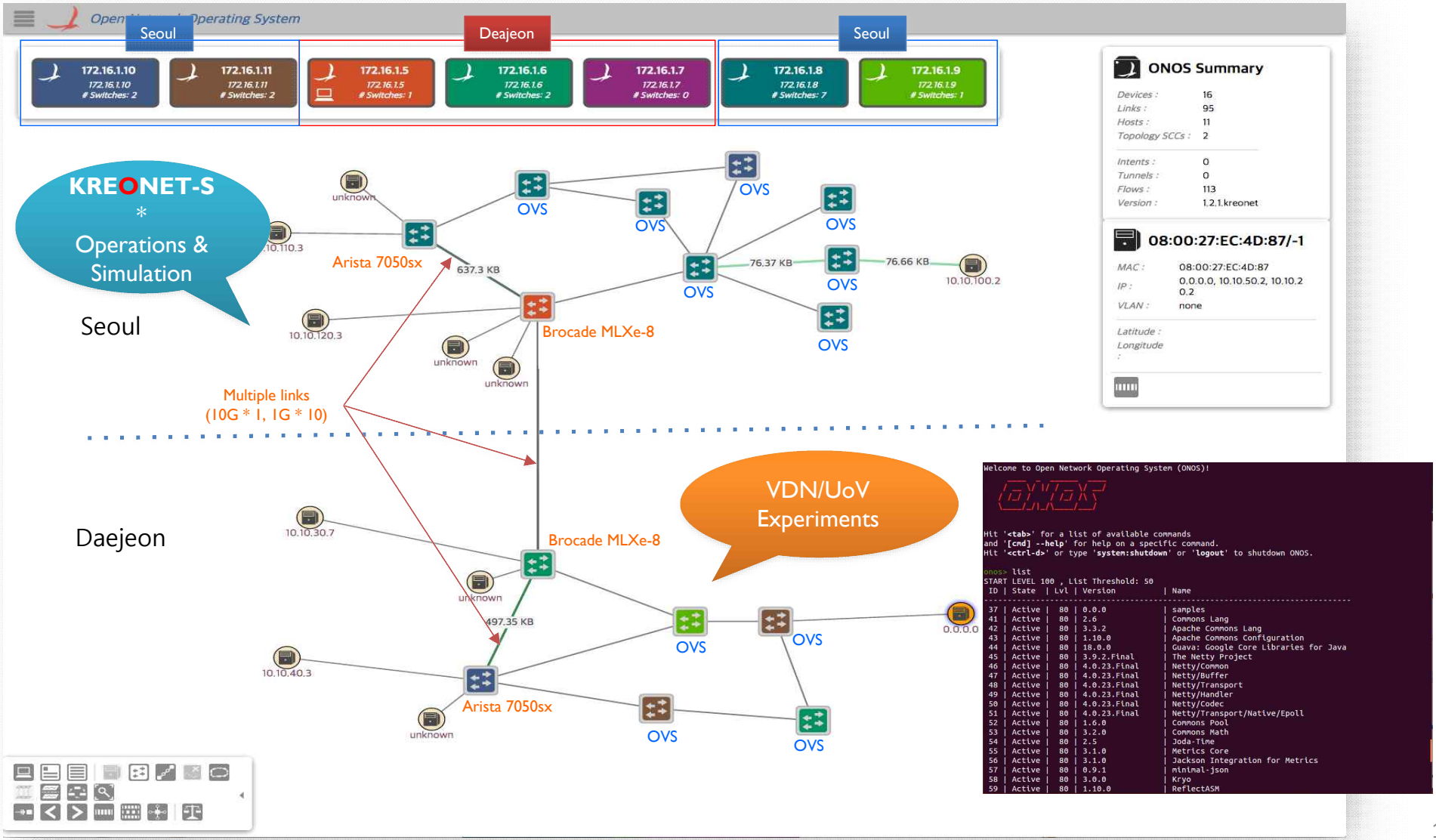


Deployment 2015

- Deployment Status as of Today



Deployment 2015 – ONOS GUI

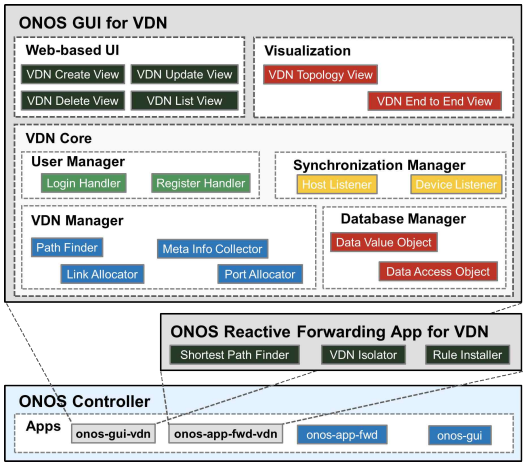


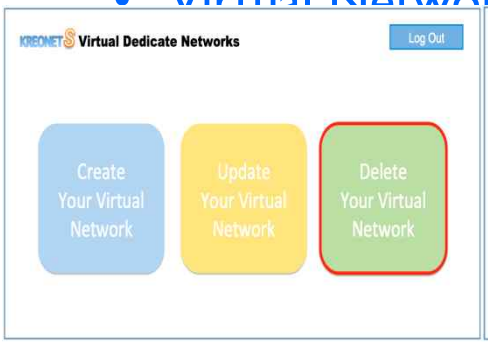
KREONET-S* Applications

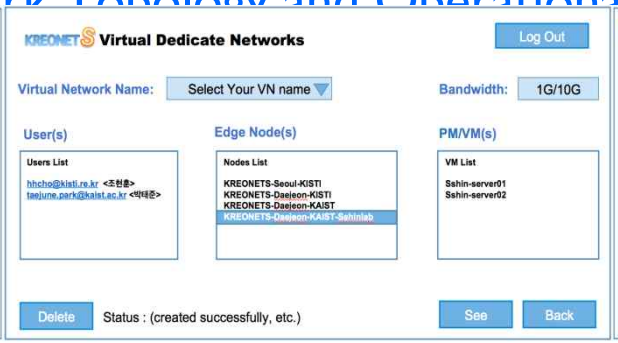
- **Virtual Dedicate Network (VDN) & User-oriented Visibility (UoV)**
  - VDN: OpenFlow/ONOS-based Dedicate Bandwidth Provisioning Network for User Groups on Demand
  - UoV: Virtual Network Visualization & Monitoring
- **Virtual ScienceDMZ**
  - Very High Performance Distributed Science Cloud & Advanced Experimental Environment (being designed)
- **ONOS SDN Apps & Use Cases**
  - SDN-IP (being experimented & deployed)
  - Packet-Optical, Segment routing (planning)

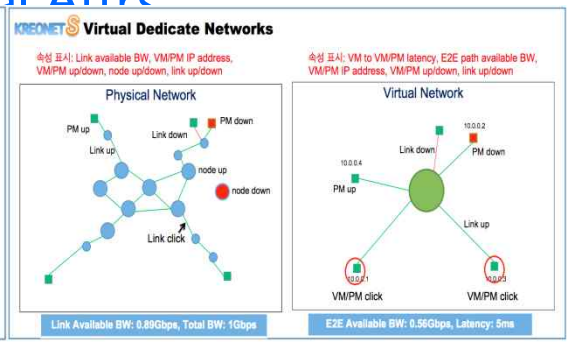
Virtual Dedicate Network

- Design Principles
  - **User-Group based Authentication/Authorization**
    - Root user *controls*, General users *use*
  - **Easy-to-Use User Interface**
    - Simple and Rapid: *several-click* Easy, *ms* Fast
  - **User-oriented Network Visualization and Monitoring**
    - Virtual Network Topology and Operational Attrs

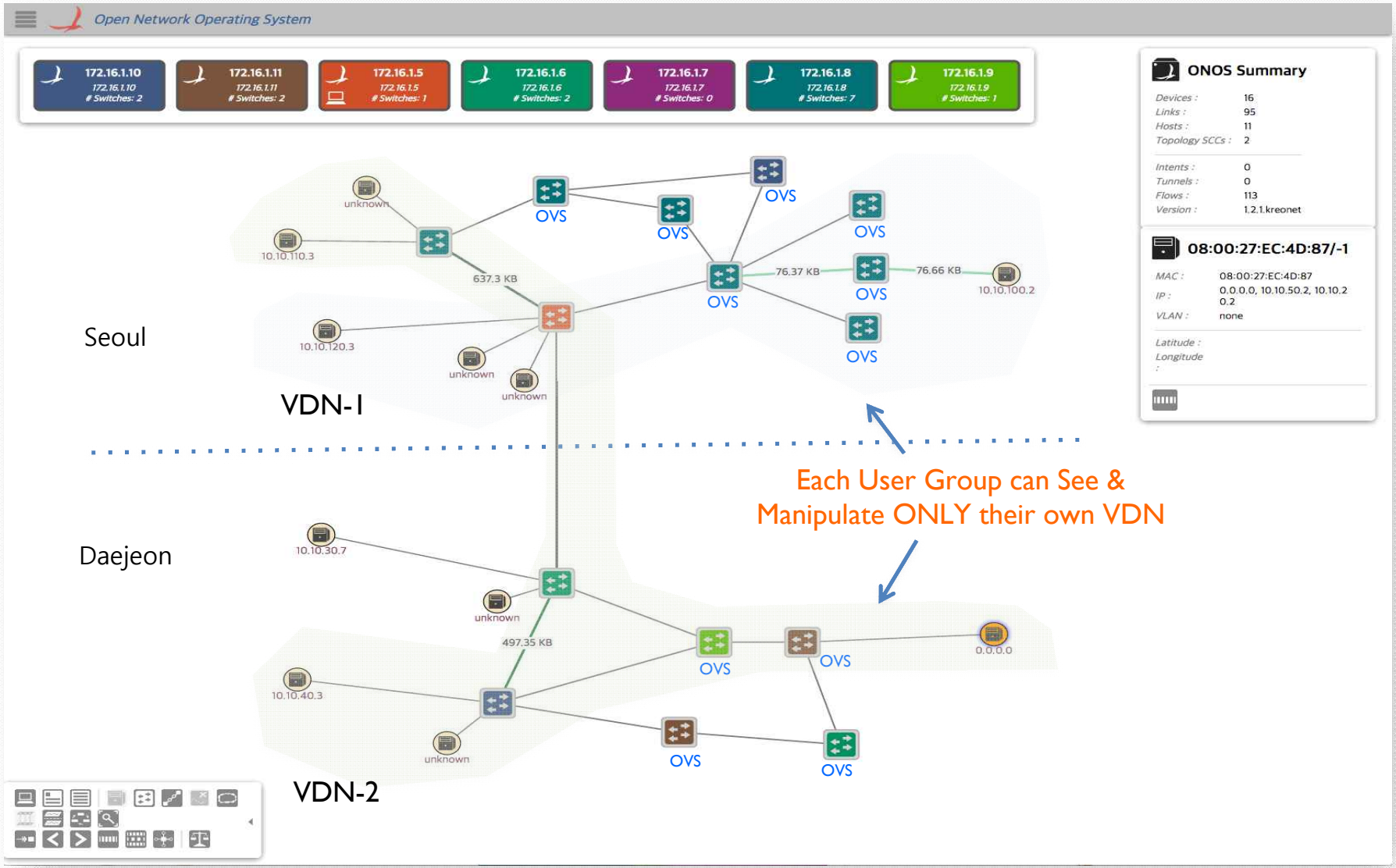






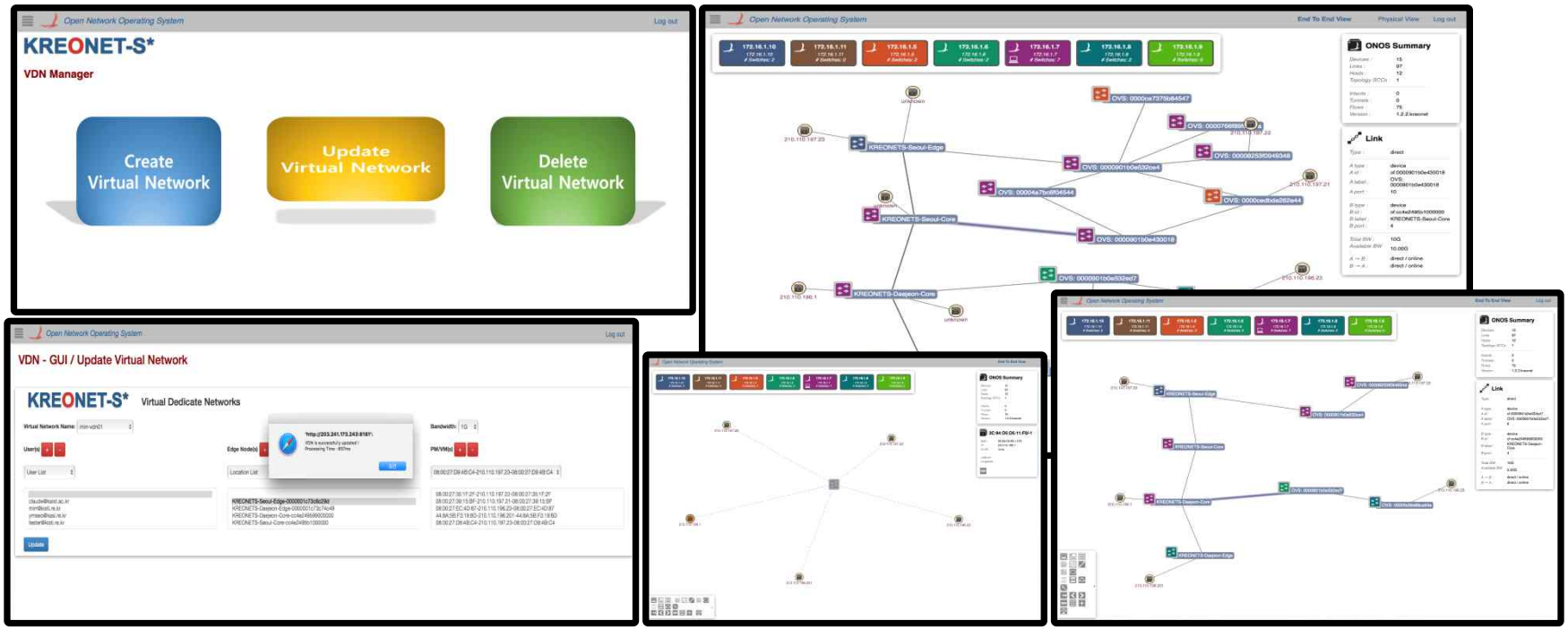


Virtual Dedicate Network



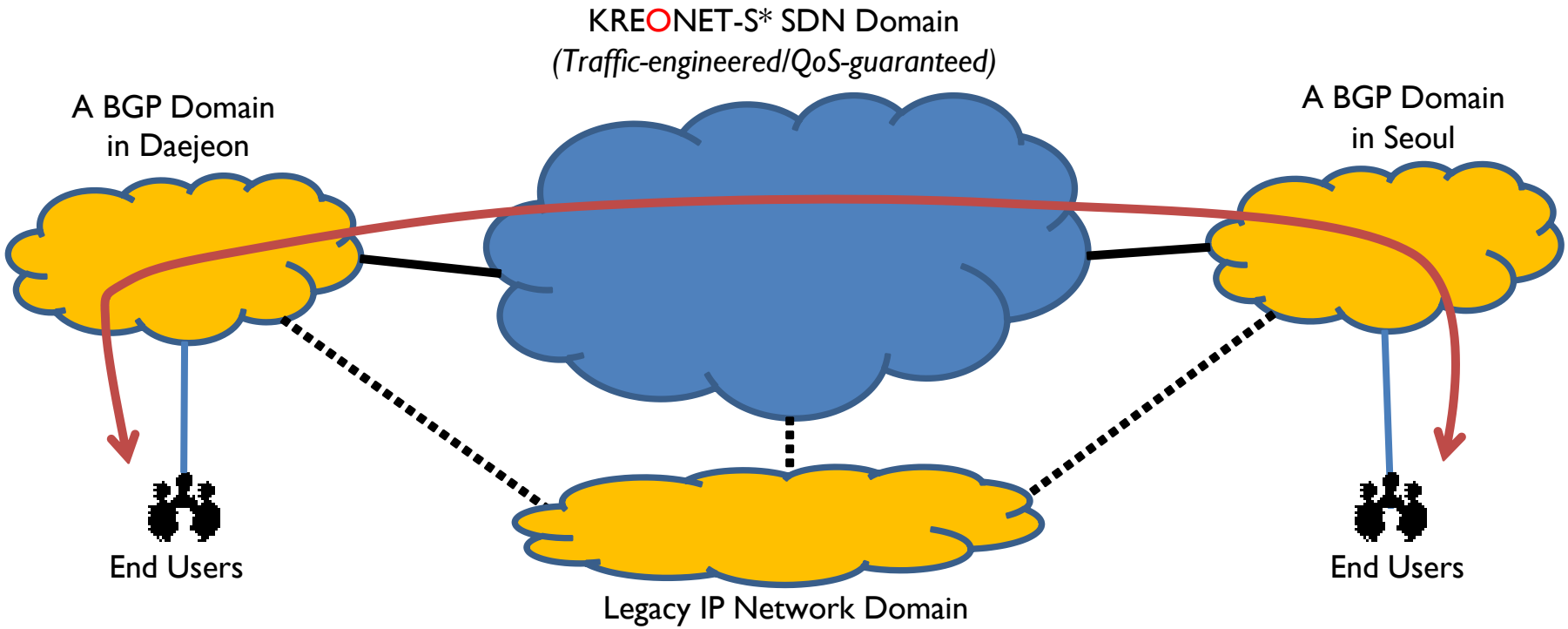
Virtual Dedicate Network

- KISTI-KAIST Joint Development
  - VDN Prototype I Design and Implementation (2015)
  - VDN management modules, dedicate & isolated network allocation: being applied to KREONET-S*



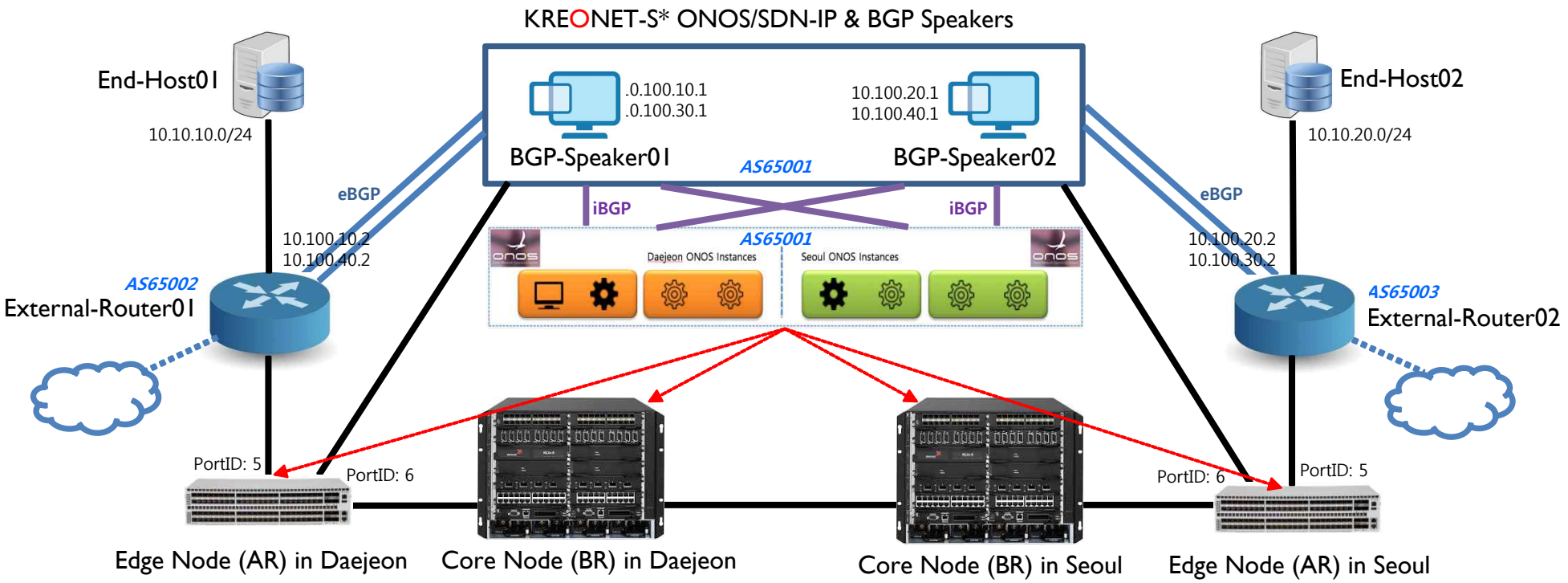
SDN-IP

- KISTI-ON.Lab Joint Deployment & Experiment
  - Daejeon-Seoul Experimental Testbed (2015)
  - End-to-End Communications via KREONET-S SDN and BGP Network Domains

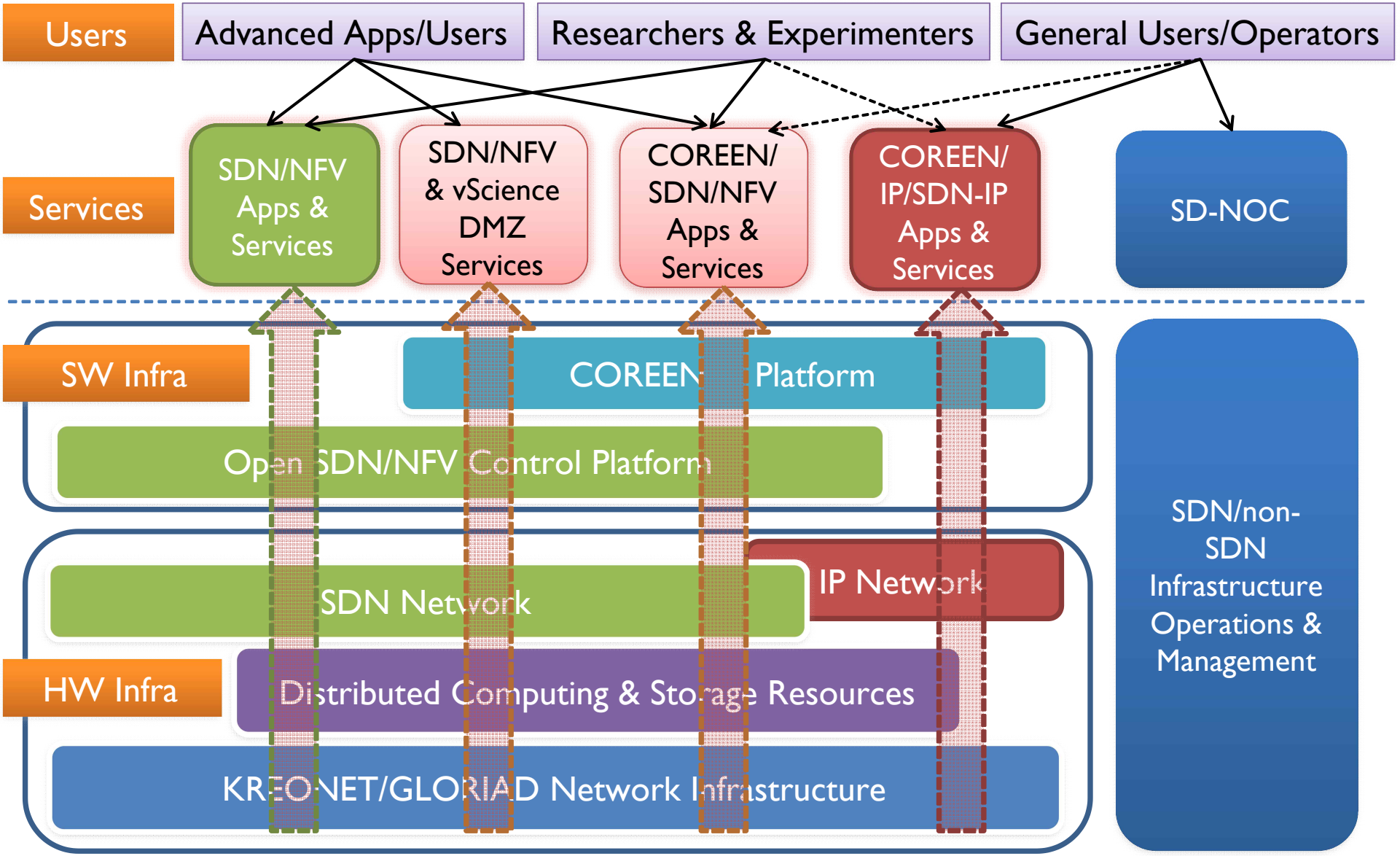


SDN-IP Testbed

- Testbed Configurations in Detail
  - eBGP and iBGP peerings between BGP speakers, external routers & ONOS SDN-IP applications



KREONET-S* (Plan)



Conclusions

- **KREONET-S* Making HAPPEN**
  - New SDN Service Provider Network Deployment
  - Distributed Controls and Resilient SDN Operations
  - VDN & UoV for New User Services and Experiences
- **Further Work**
  - Keep Testing and Experimenting on Distributed Controls
    - Failover & Operational Issues, Performance, etc.
  - VDN & UoV Enhancement: UI, Performance, Stability
  - New Technology Deployment & Experiments with ON.Lab
  - Global Project & Testbed Participations with KAIST, PRP, etc.

Thank You!

Questions and/or Comments to
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