Overviews of Cloud Computing and SDN activities in WIDE Project

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The Univ. of Tokyo / WIDE Project

WIDE Project

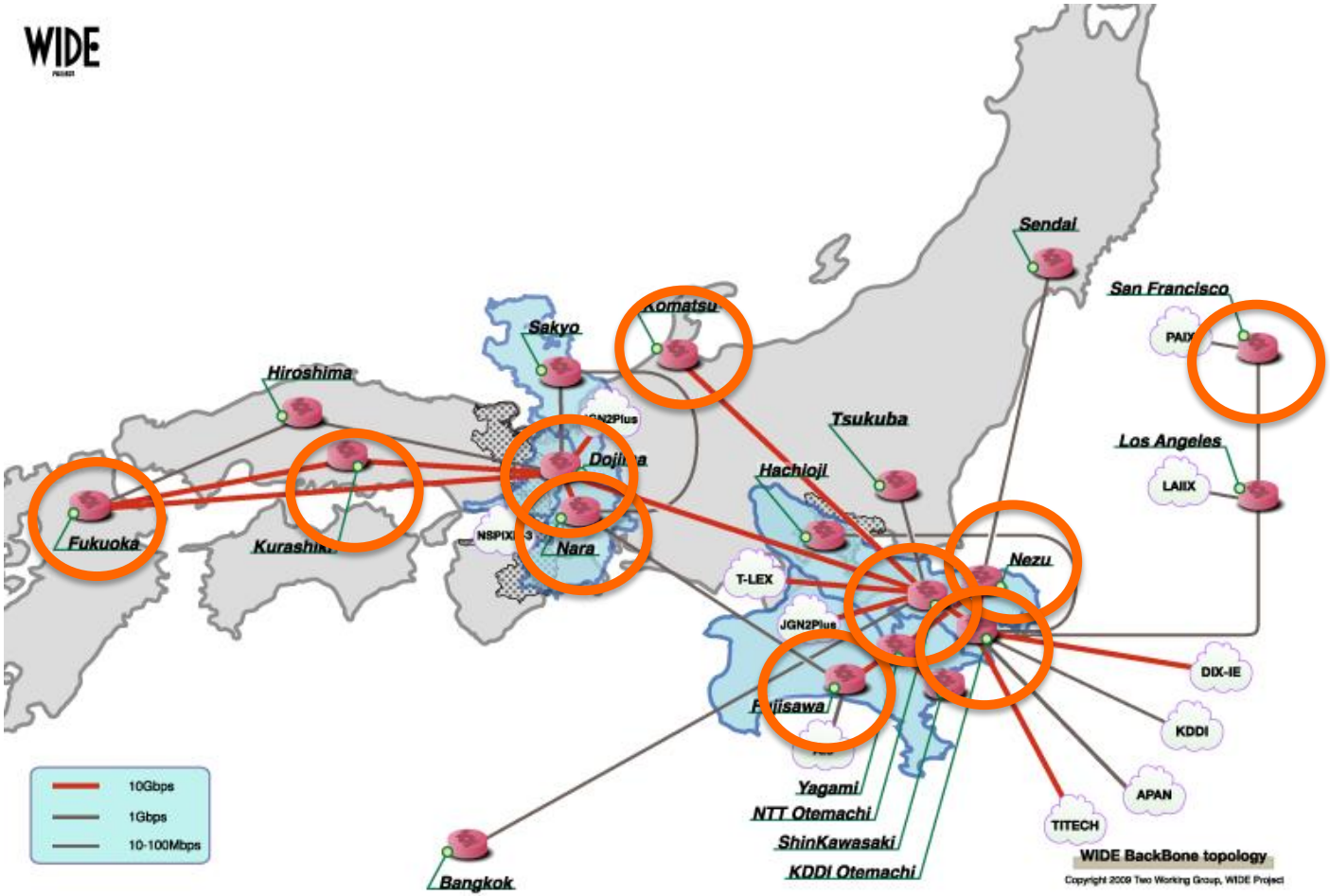
- ✓ Research Consortium
  - http://www.wide.ad.jp/
  - Commercial companies, research institutions, and universities
    - over 50 organizations and over 1,000 people are joined
  - Founder : Prof. Jun Murai
  - Director : Prof. Hiroshi Esaki
- ✓ Researches
  - Activities are in working groups.
  - WIDE workshop is held two times a year (May, December)
  - WIDE camp is held two times a year (March, September)

Cloud Computing Activities in WIDE Project

- ✓ Cloud WG in WIDE Project
  - Started on 2010
- ✓ Targeted to evaluate and develop Fundamental Technologies for Cloud Computing.
  - Distributed Storage
  - Load Balancing of Resources
  - Load Balancing of Applications
  - Distributed Processing for Big Data
- ✓ Actual TestBed
  - The first target is IaaS (Infrastructure as a Service)
  - WIDE Cloud (Inter-University IaaS Cloud)

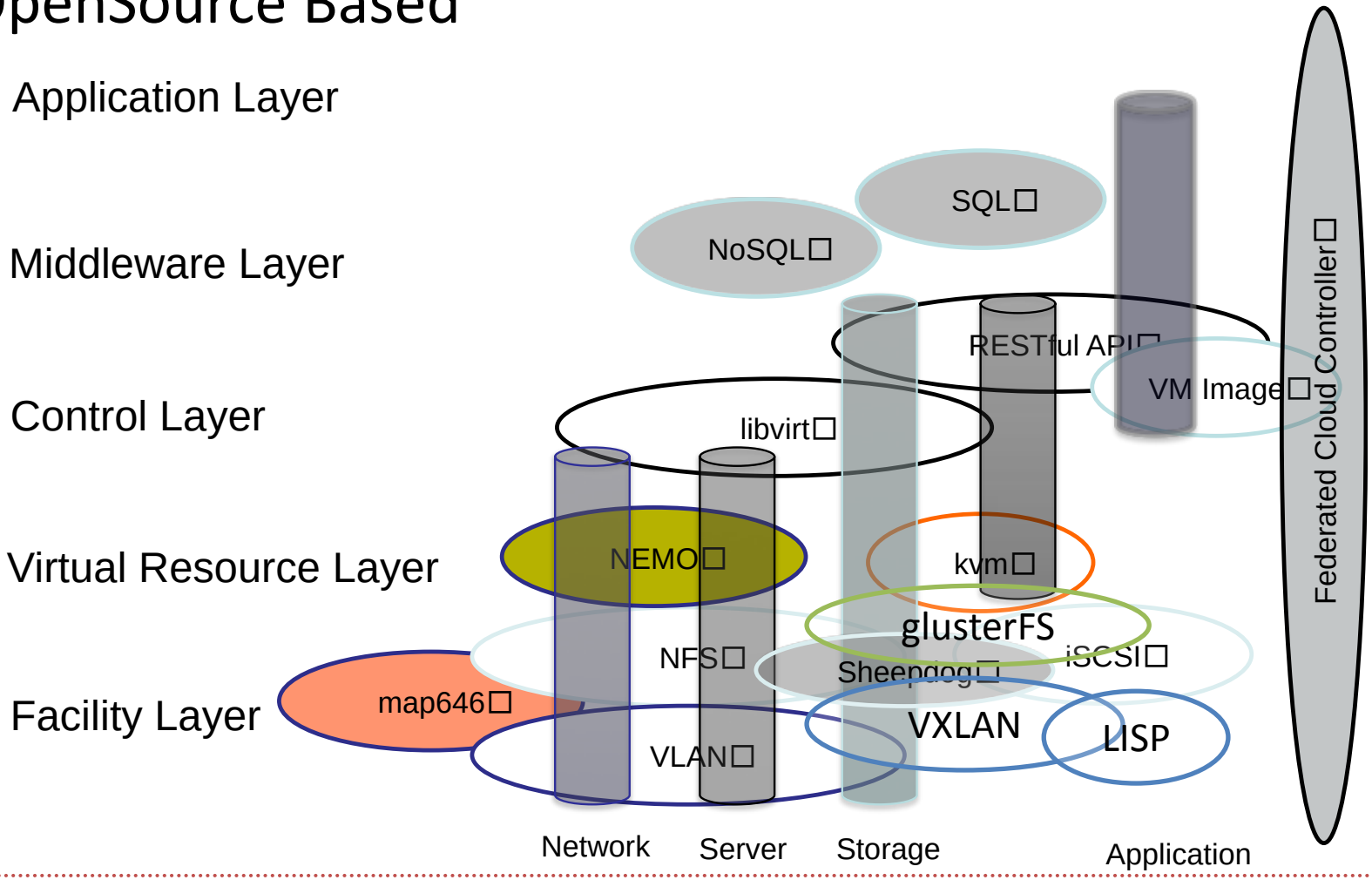
WIDE Cloud

- ✓ Distributed IaaS Cloud



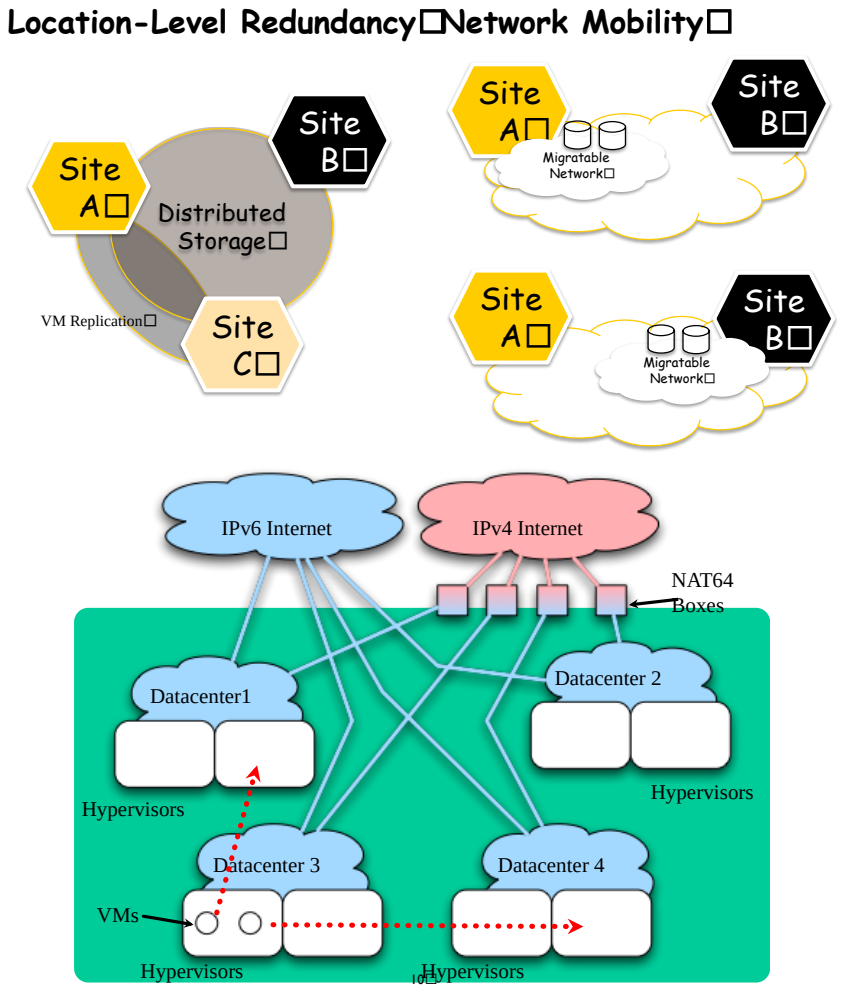
WIDE Cloud Architecture

✓ OpenSource Based



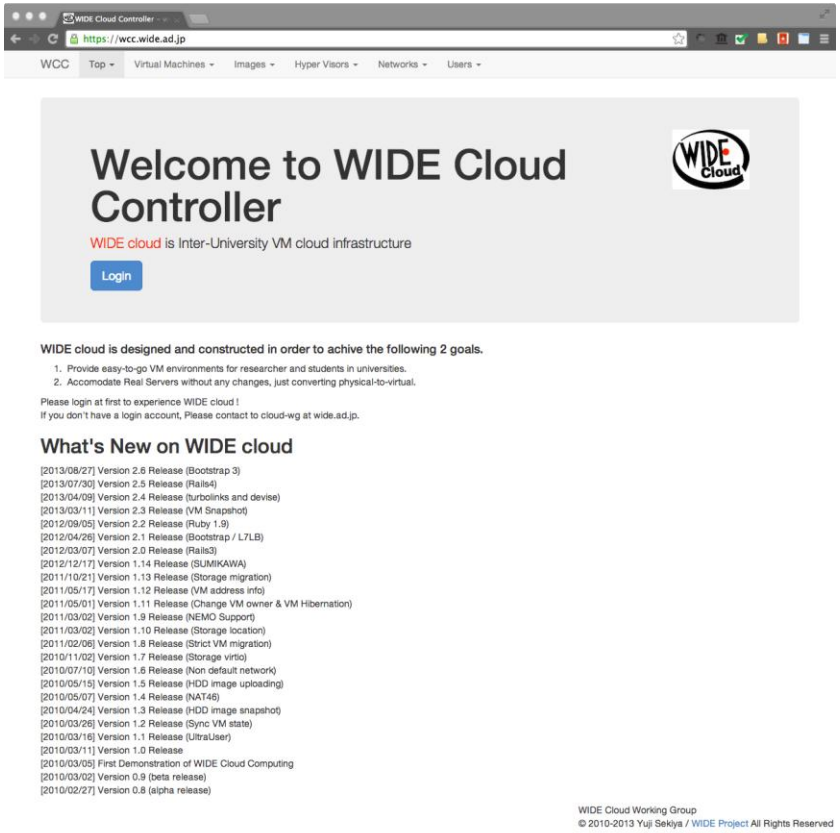
Challenges in WIDE Cloud

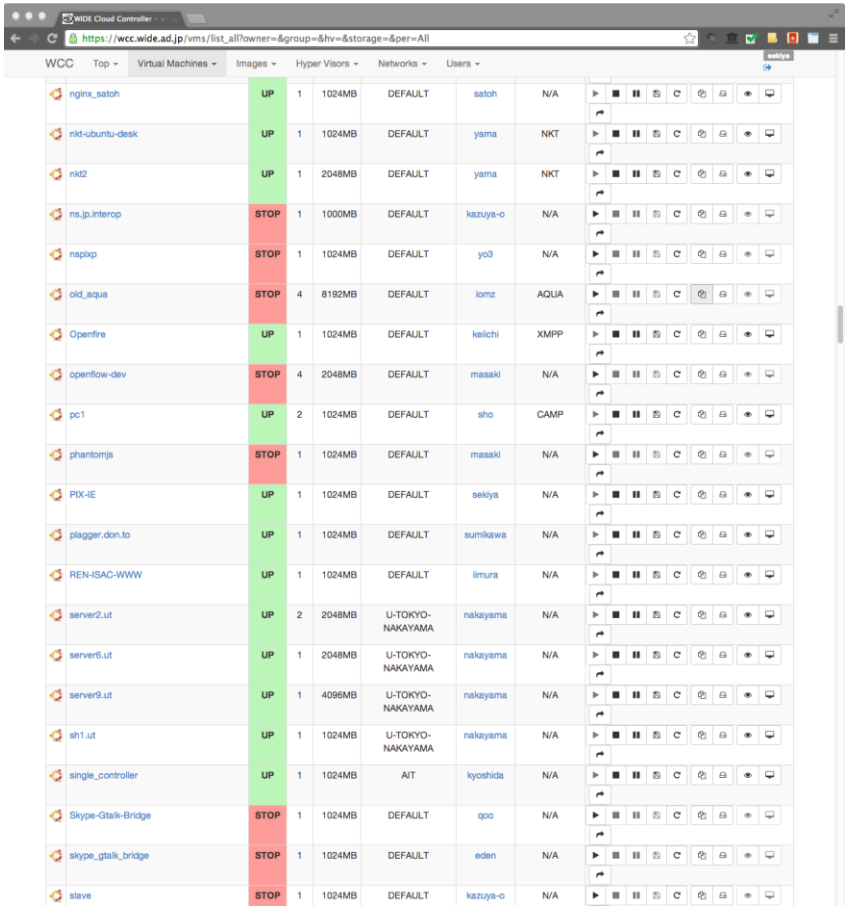
- ✓ Full IPv6 cloud
  - Use map646 for IPv4 translation
- ✓ Distributed Filesystem
  - GlusterFS
  - ukai
- ✓ VM Mobility
  - NEMO (Network Mobility)
  - VXLAN + LISP
- ✓ Resource Management
  - Auto VM migration
  - Cloud Controller (WCC)
- ✓ Not only IaaS
  - Hadoop / Presto clusters are working for NECOMA Project



It's working over four years !!

- ✓ WCC : http://wcc.wide.ad.jp/
- ✓ Over 400 VMs are working !

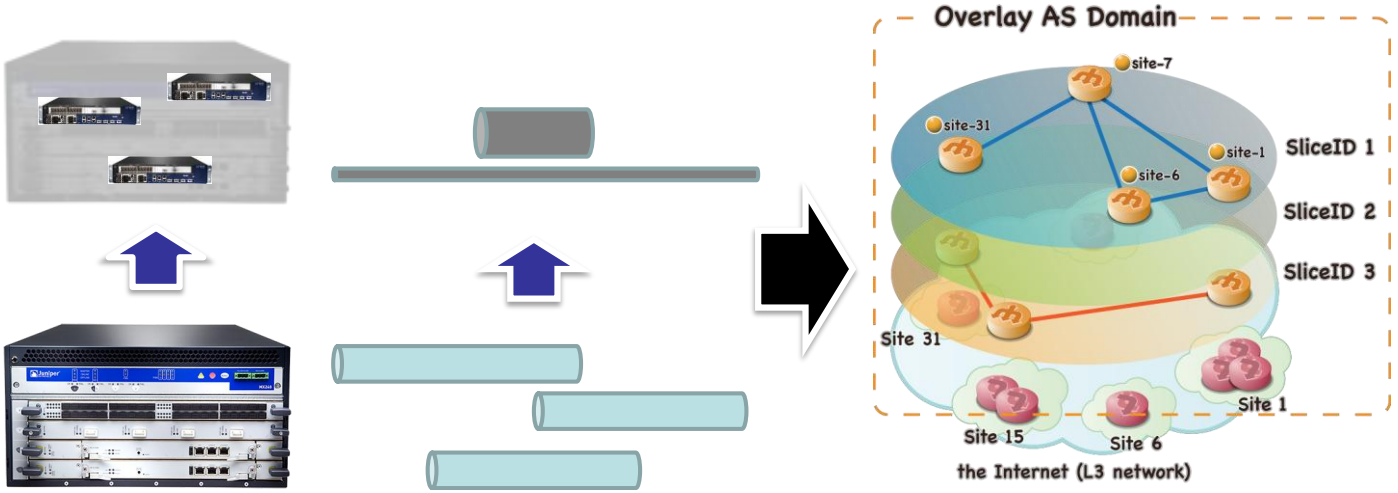




SDN Activities in WIDE Project

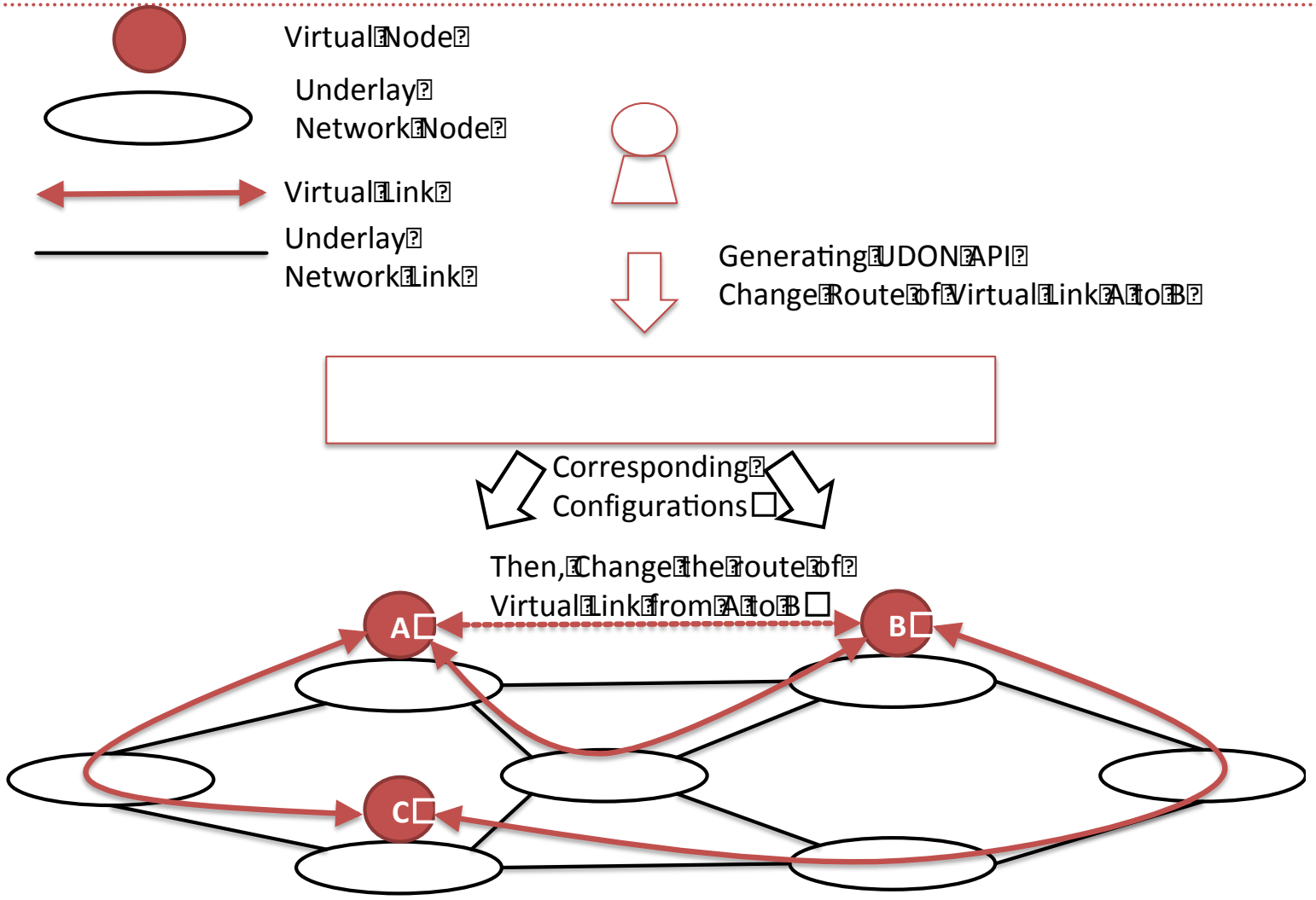
✓ GINEW Project

- Joint Research with NICT
- Provide virtual “SLICE” to users on JGN-X testbed

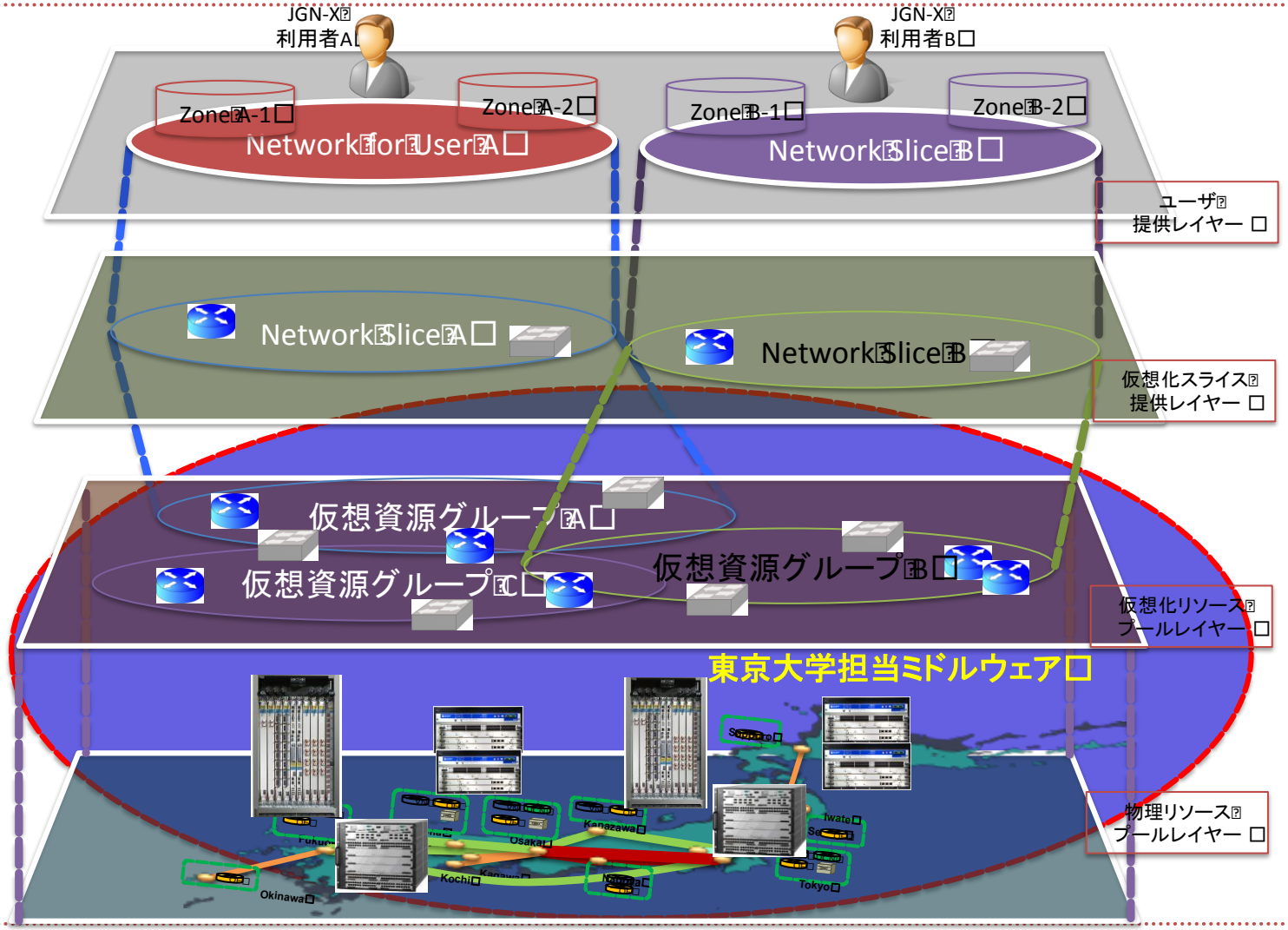


✓ SDN-IX by NECOMA / NSPIXP Project

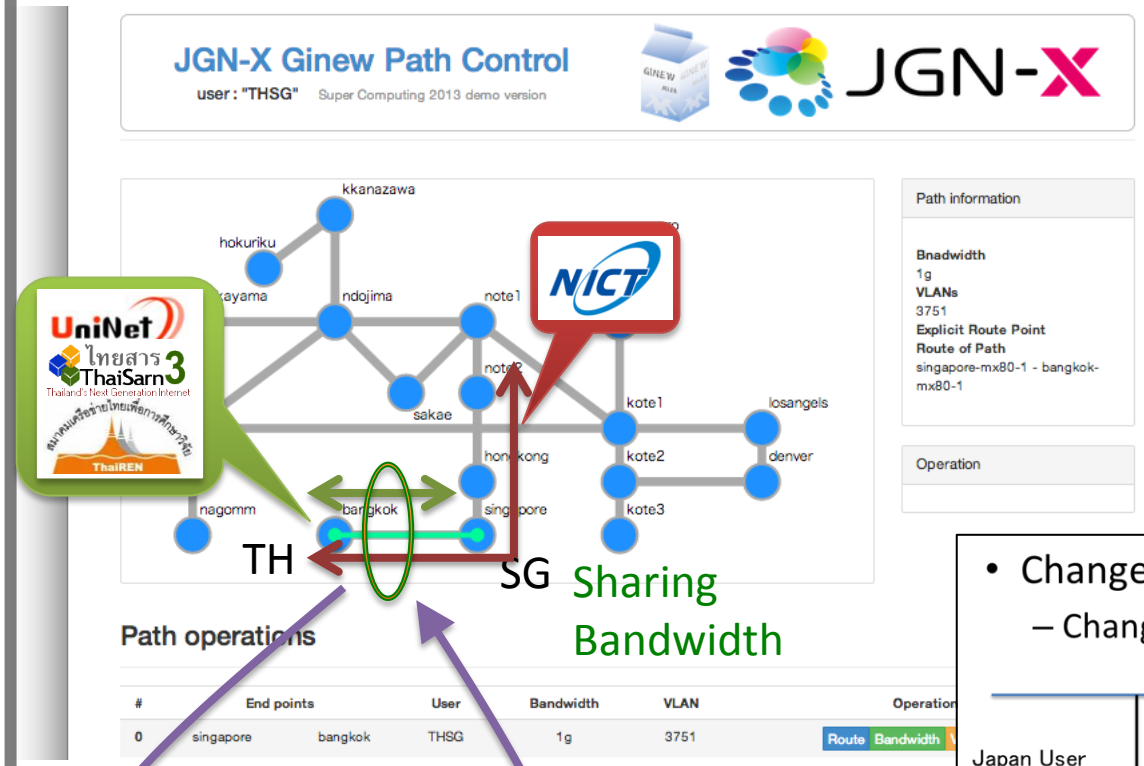
Basic Idea of User Defined and Organized Network



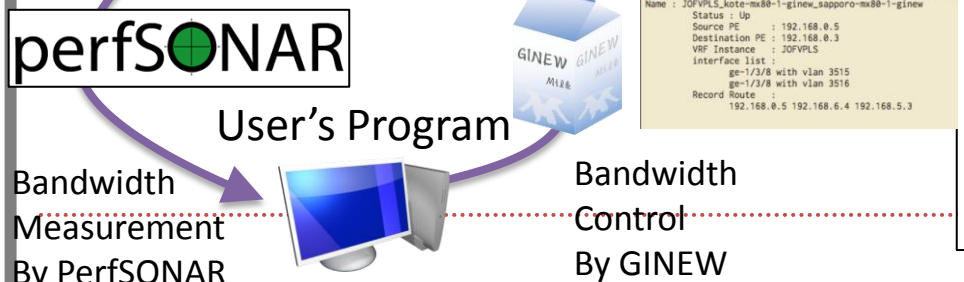
Network Virtualization on JGN-X

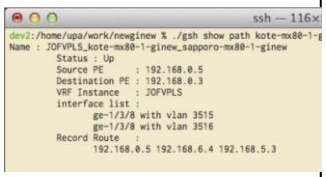


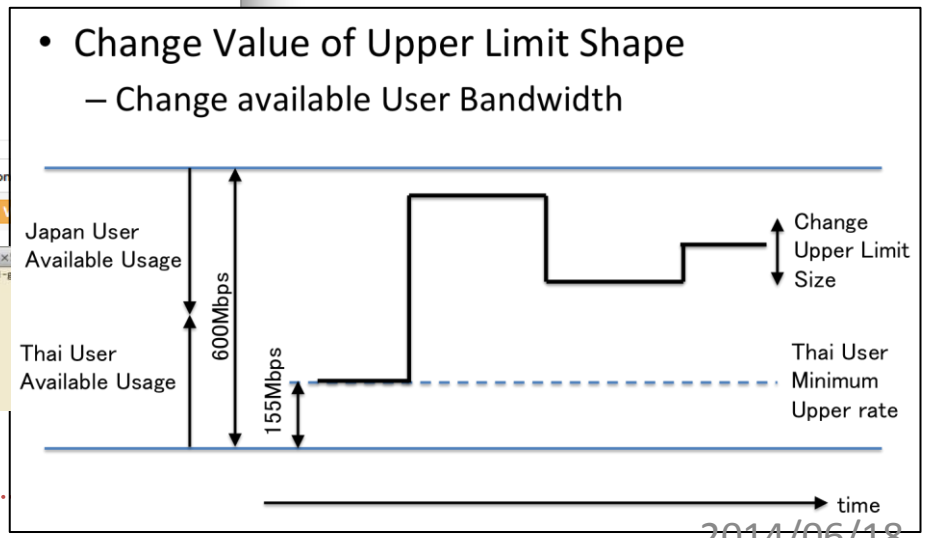
Demonstration on SC13



- Adaptive Bandwidth Control
  - ***Application of GINEW API***
  - Collaboration w/ PerfSONAR
- User's Program manage shared bandwidth,
  - Measuring by PerfSONAR
  - Controlling by GINEW
- Already prepared, Will be applied soon. => DONE







SDN-IX

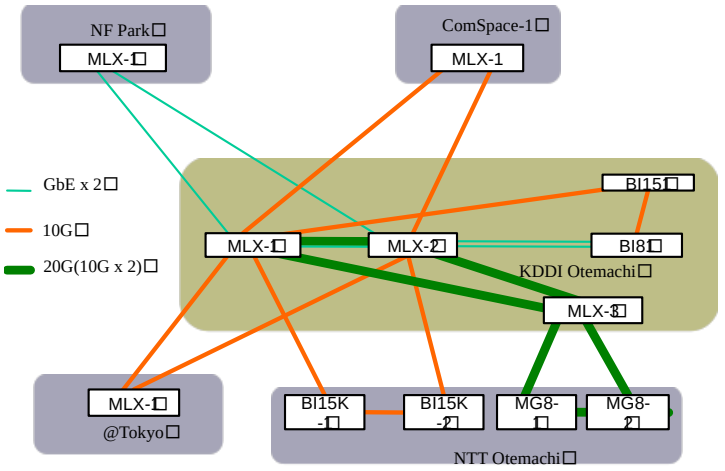
- ✓ Developing and Deploying SDN-IX (PIX-IE)
  - PIX-IE : Programmable Internet eXchange in EDO
  - Technology is developed in NECOMA Project

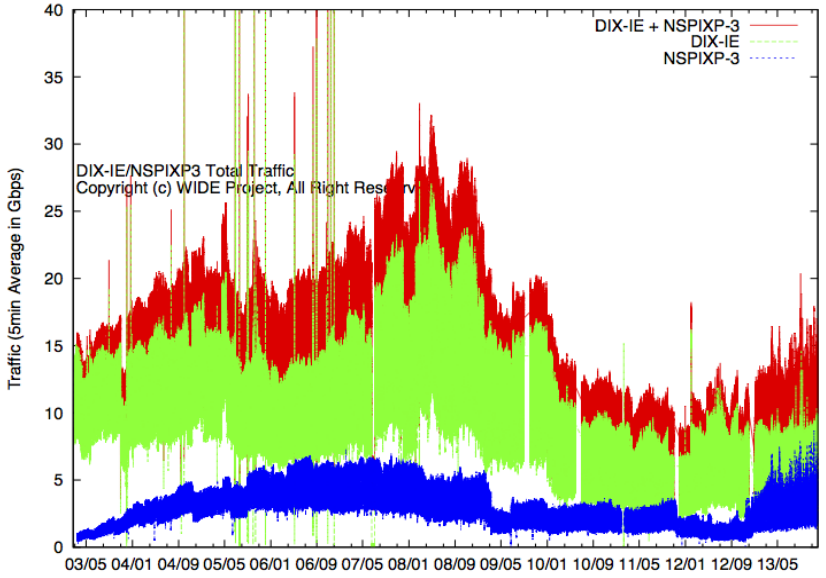
NECOMA
Nippon-European Cyberdefense-Oriented Multilayer Threat Analysis

- ✓ Current roles of Internet Exchanges
  - Layer-3 IX / Layer-2 IX
  - Exchanging “Internet Traffic” following BGP information
- ✓ Need more **GRANULARITY** ?
  - The granularity of TE (Traffic Engineering) is BGP prefix.
    - BGP granularity is /24 (IPv4) and /48 (IPv6) prefixes
- ✓ Need more **SECURITY** ?
  - DDoS is one of the most serious problem in the Internet
    - An ISP wants to prevent or mitigate the traffic at the edges of ingress
- ✓ Need more **FLEXIBILITY** ?
  - Path exchanges between Ases
    - The index is not only VLAN.
    - Using dst address and/or src address, dst port, TOS, MPLS label, VXLAN…

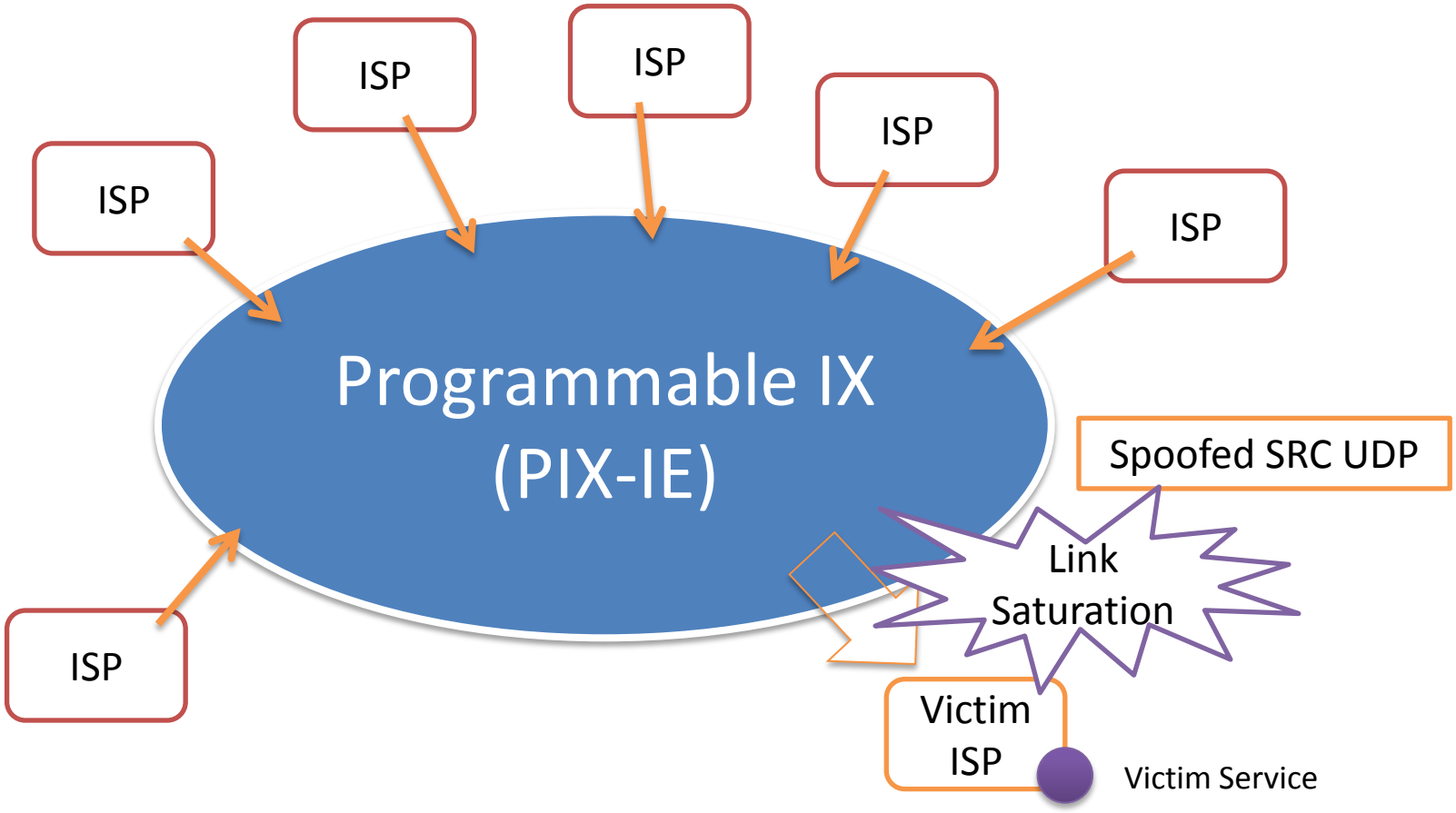
NSPIXP Project

- ✓ Operated by WIDE Project
  - Research IX
- ✓ 2 IXs in Tokyo and Osaka
  - DIX-IE (Tokyo) : 53 ASes
  - NSPIXP3 (Osaka) : 13 Ases
- ✓ Activities
  - IPv4/IPv6 native dual stack
  - Connected between Tokyo = OSAKA (NSPIXP23)
- ✓ More Research =>
  - SDN-IX (Programmable IX)

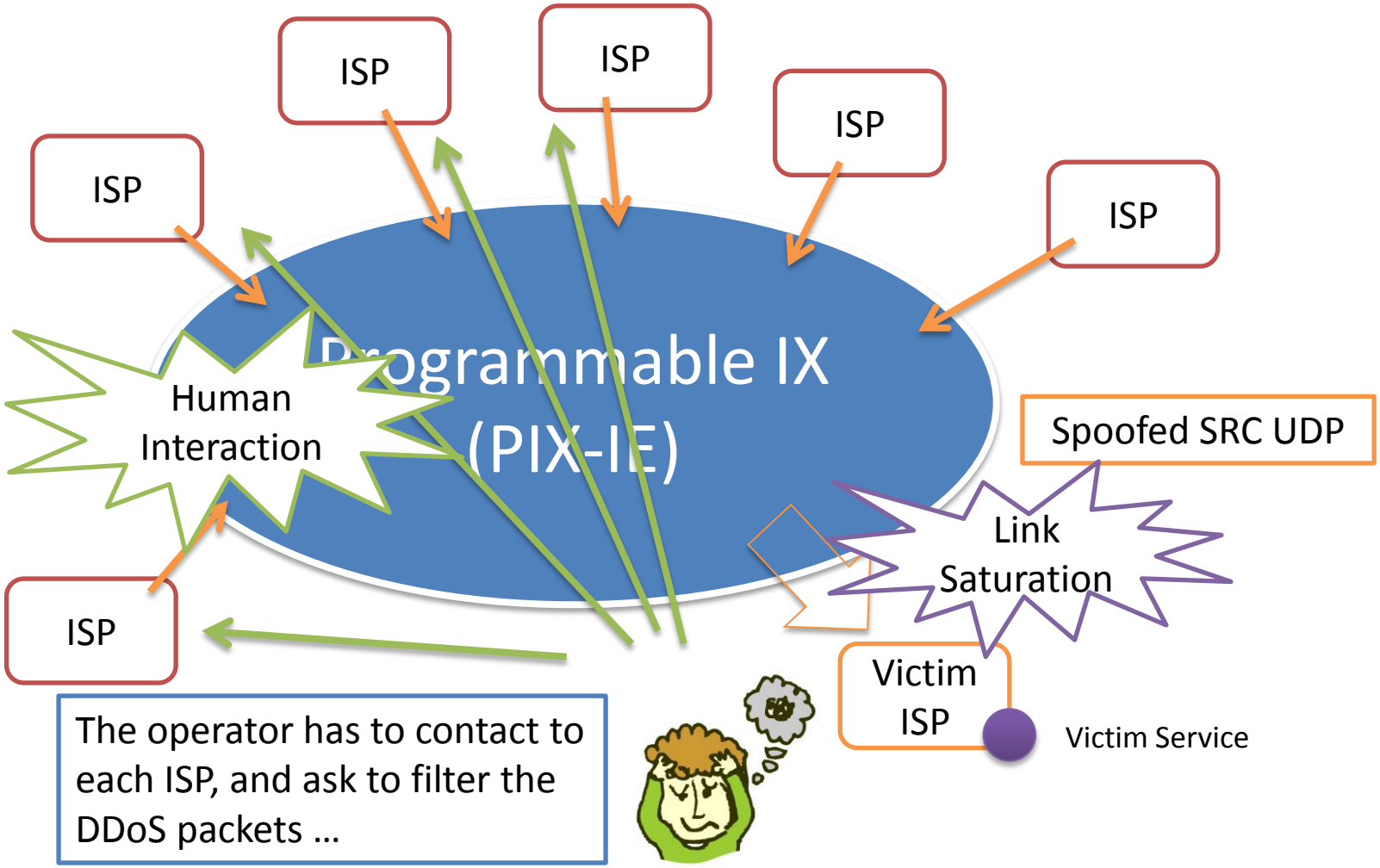




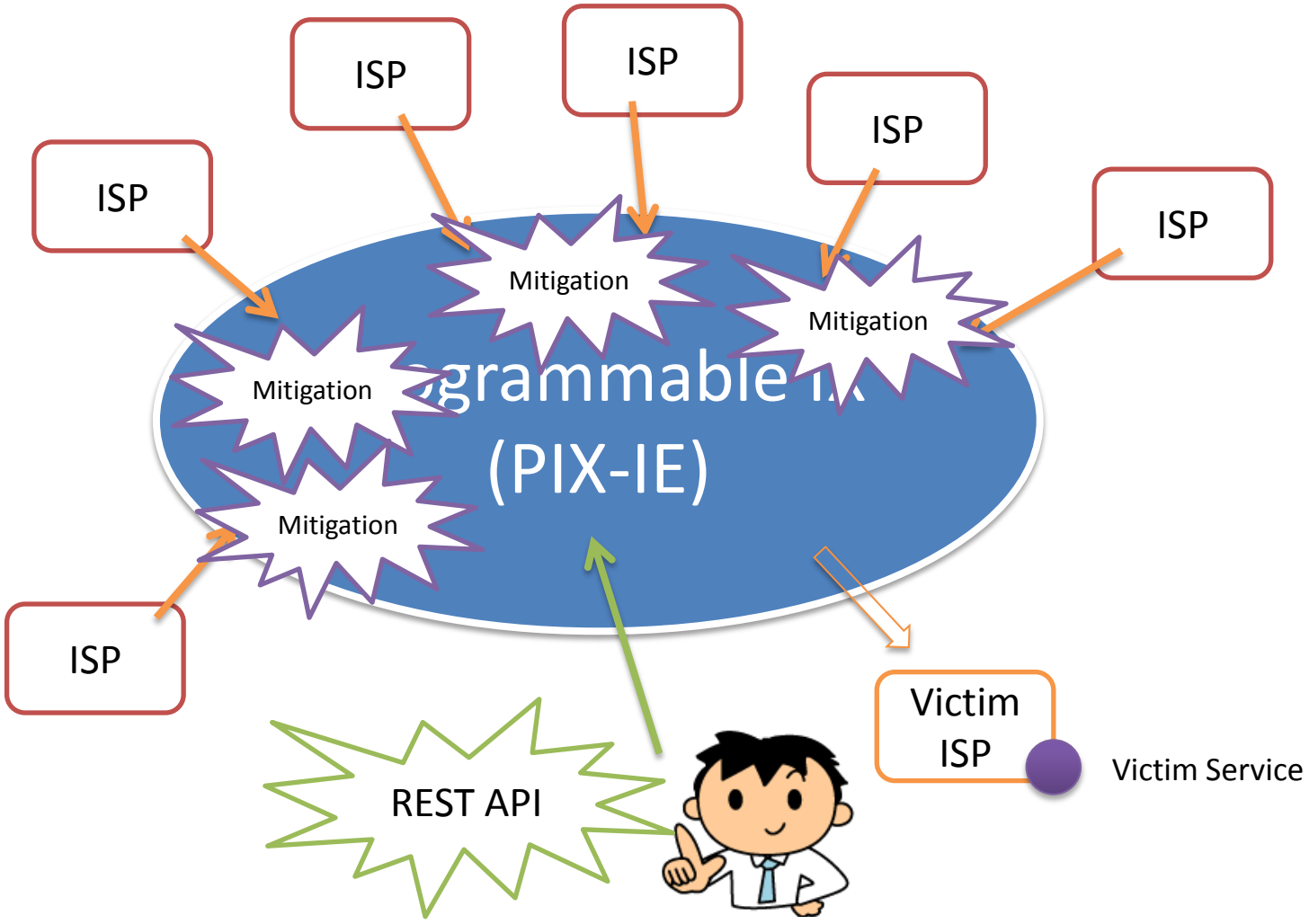
1) DDoS Prevention and Mitigation on IX



Current Solution



Solution by SDN

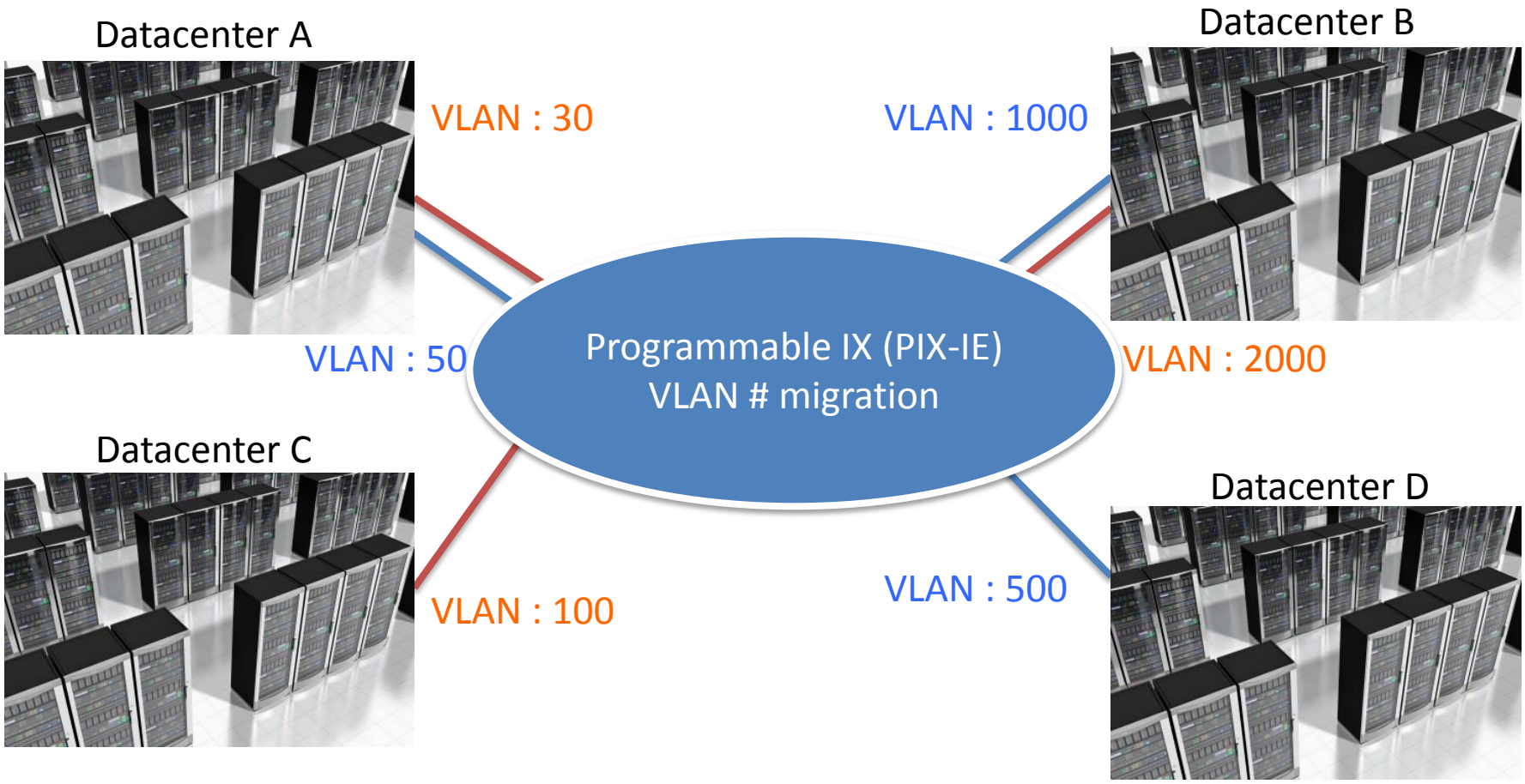


2) Flexible Path Exchanges

- ✓ The demand for extend own local network into other Autonomous Systems
  - Event : Temporally use (e.g. experiments at SC)
  - Connect to colocation hosts at Data Centers
  - IaaS Cloud
    - Equinix serves their customers with private wires that are connected to Amazon EC2
- ✓ Existing way to extend
  - VPN (including Overlay Networks): They have encapsulation and encryption overhead...

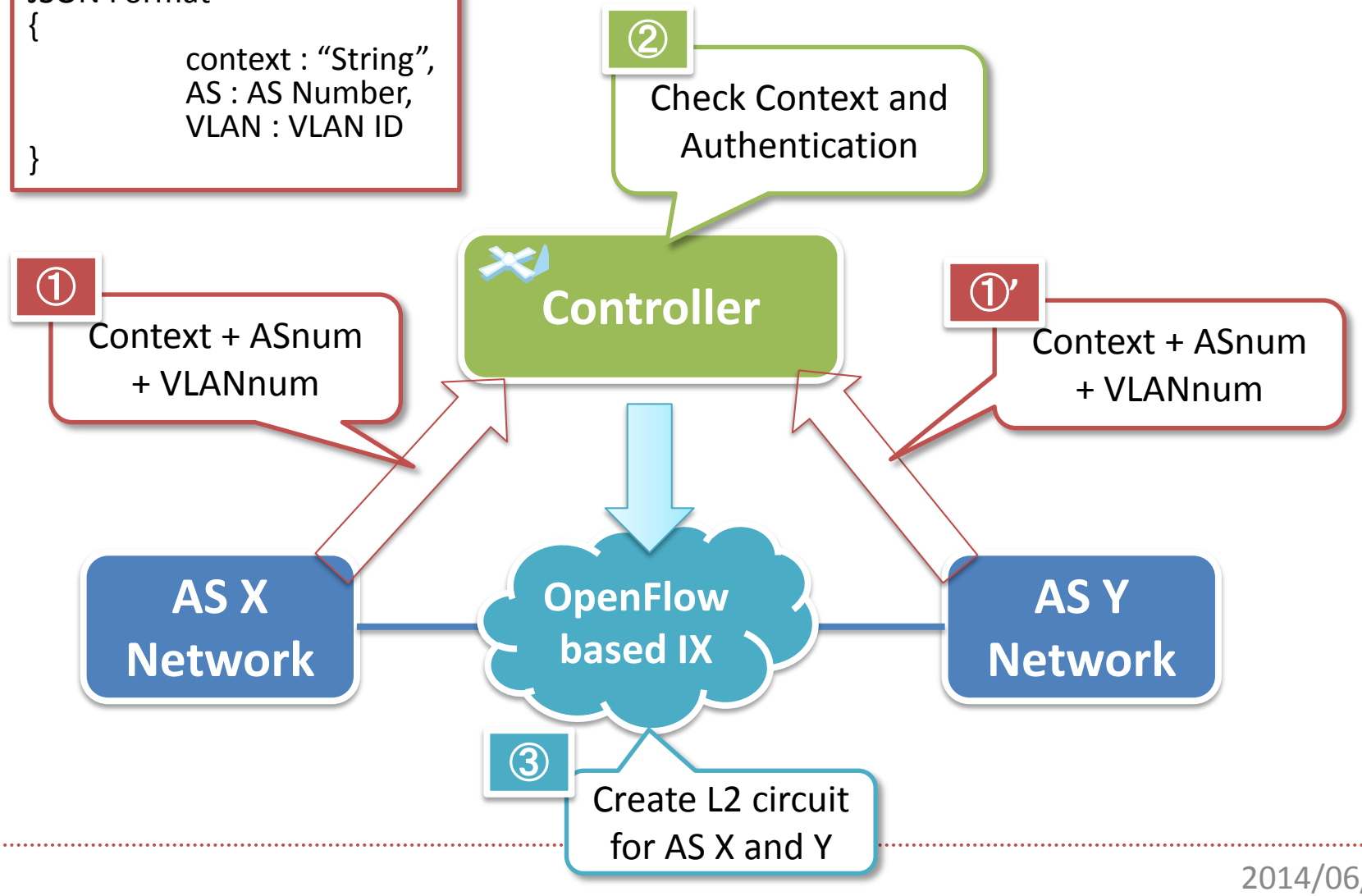
2) Flexible Path Exchanges

✓ Interconnection of VLAN, VXLAN, MPLS, Application…



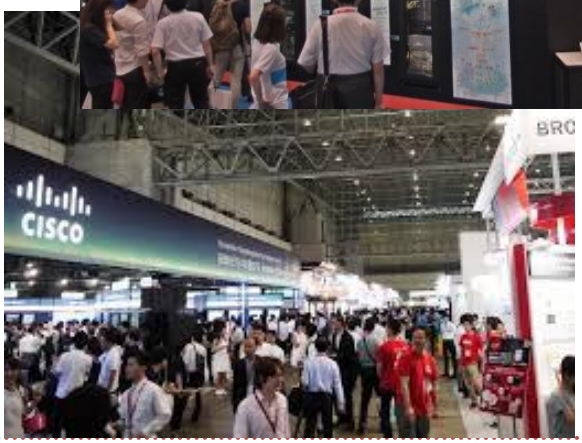
Current Implementation

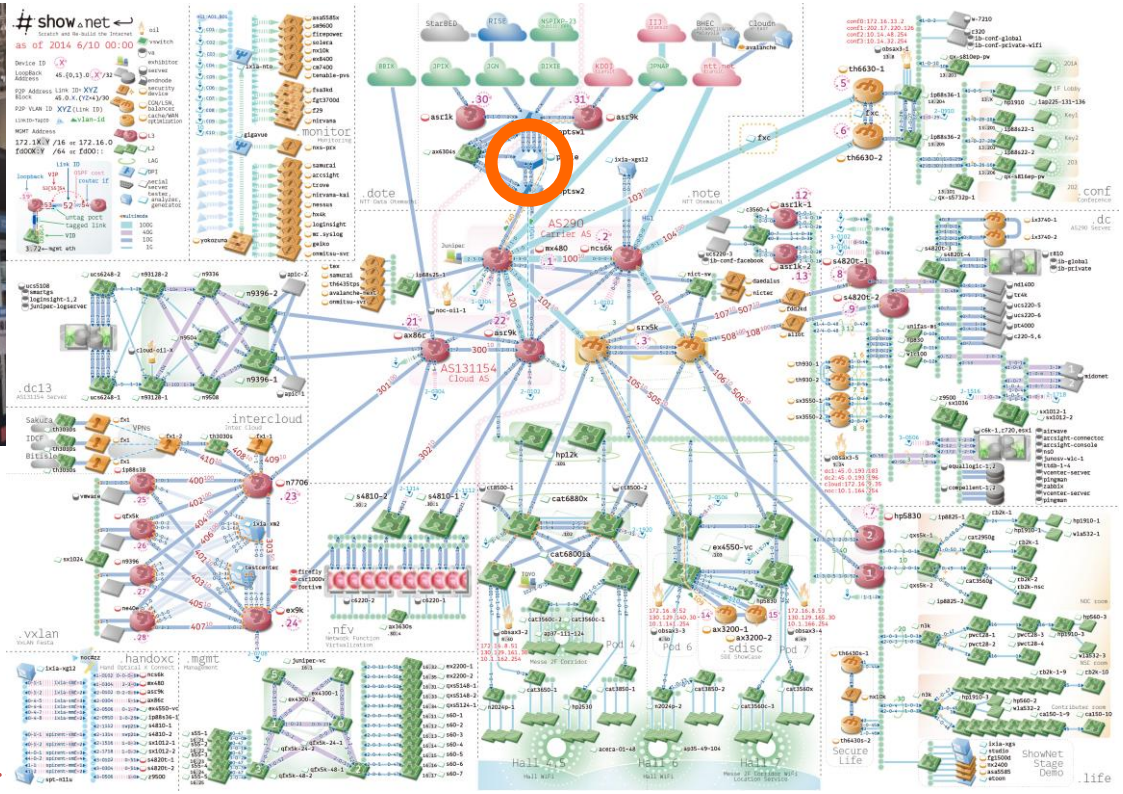
JSON Format
{
context : “String”,
AS : AS Number,
VLAN : VLAN ID
}



Demonstration in Interop Tokyo 2014

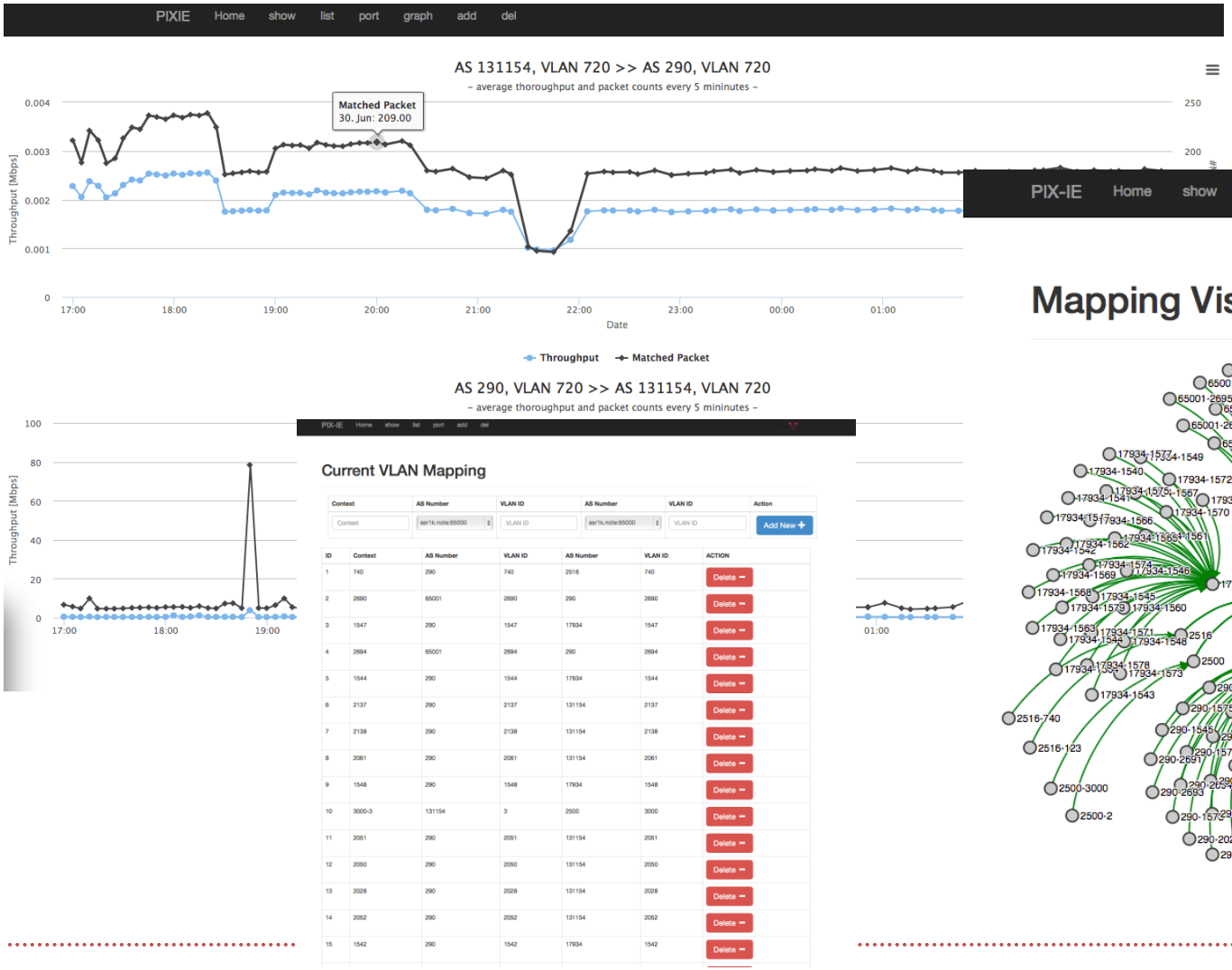
- ✓ Interop Tokyo 2014
  - The largest ITC events in Japan
  - Over 130,000 people are visited

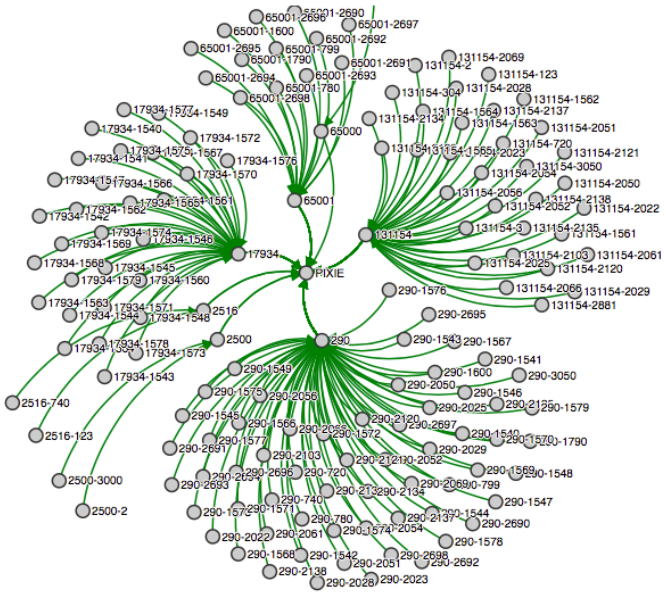




2014/06/18

Screenshots





Thank You

We believe the power and capability of SDN