

Towards an Operation Architecture for Virtualized Infrastructure



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SPARC, NICT



Outlines

- JGN2plus and SPARC
 - Brief introduction
 - Some recent updates about NWGN R&D activities
- Deployment issues of NWGN technologies
 - In-progress consideration

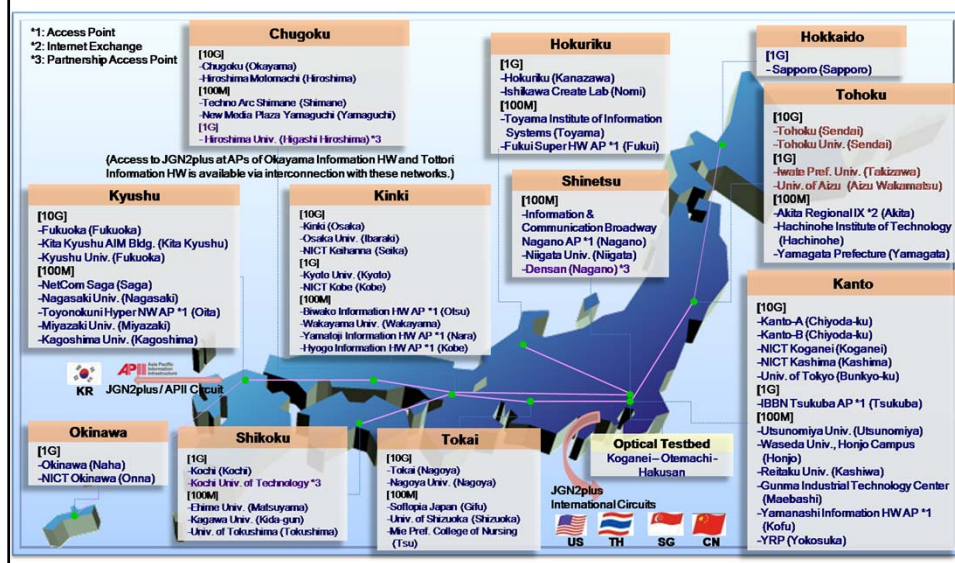
Overview of JGN2plus and SPARC

- JGN2plus is an advanced testbed network operated by NICT
 - NICT: National Institute of Information and Communications Technology
 - A three-year project (started at April 2008)
 - The successor of JGN (1999-2004) and JGN2 (2004-2008)
- SPARC is an organization for promoting R&D activities using JGN2plus
 - SPARC: Service Platform Architecture Research Center
 - Main research theme is operation and management technologies for new generation network

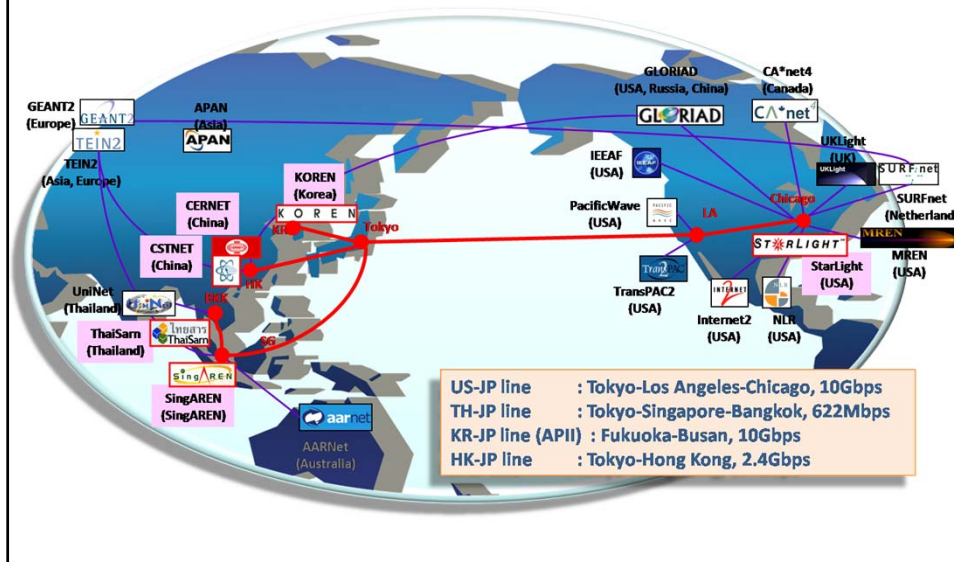


<http://www.jgn.nict.go.jp/>

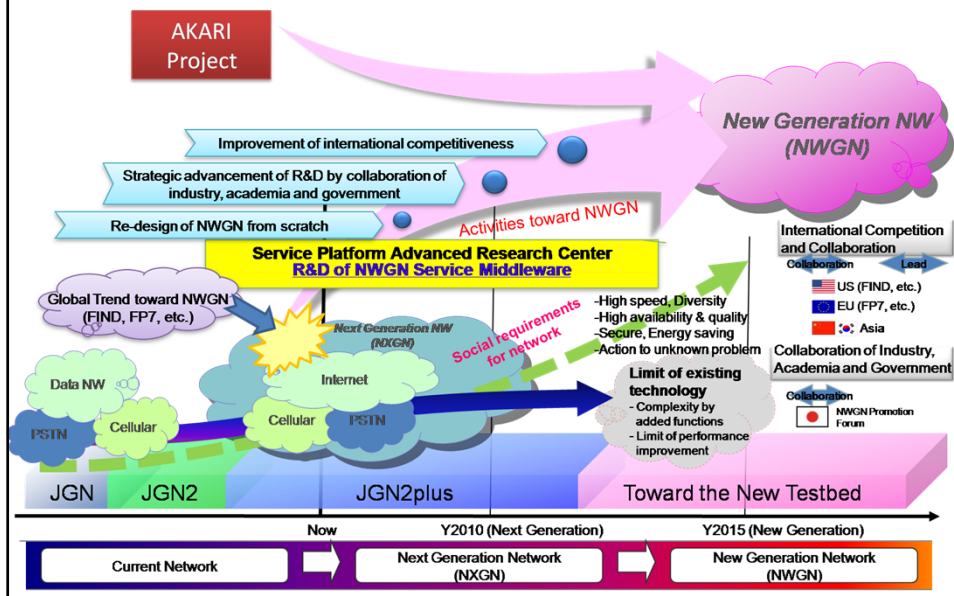
JGN2plus Networks (domestic)



JGN2plus Networks (international)



Towards New Generation Network



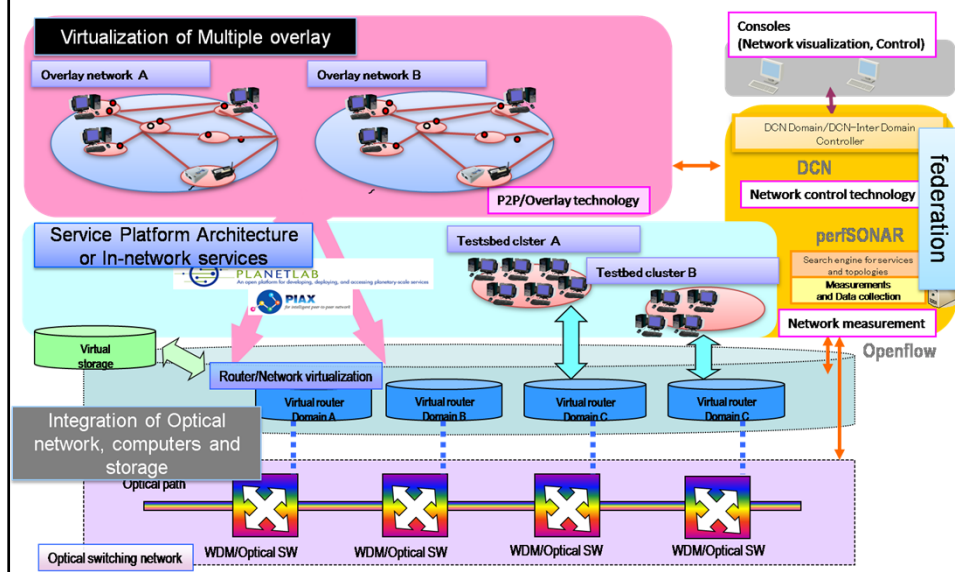
Our Position in NWGN R&D activities

- Strong emphasis on real-world deployment
 - Wide-area testbed network infrastructure
 - Encourage to introduce cutting-edge NWGN technologies into JGN2plus
 - Great opportunities for lab-level technologies to obtain proof of their concepts
 - Also our opportunities for facing operational issues of NWGN deployment
 - Neither limited to academic projects, nor limited to domestic projects
 - Support for experiments in commissioned research
 - Coordination of international collaboration
- Service-level viewpoint
 - Service Platform Architecture Research Center



SPARC
Service Platform Architecture Research Center

JGN2plus as a Service Platform



Multi-domain Operations

- Common issues
 - Many NWGN technologies partially have succeeded in working well inter-domain
 - PerfSONAR, DCN (Dynamic Circuit Network), PlanetLab, etc.
 - Overlay approaches
 - Their operations often cost high and scale poorly
 - How to set information access policies inter-domain?
 - How to allocate resource fairly inter-domain?
 - How to tackle operational troubles inter-domain?
- Possible Solution:
An **architecture** for inter-domain operations

Architecture

- Architecture: a specification of an **interface** and the **logical behavior of resources** manipulated via the interface (J. E. Smith and R. Nair, “Virtual Machines”, 2005)
 - We need well-defined interfaces to decouple functions in a complicated system
- Virtualization never succeeds without well-defined interfaces
 - Virtualization is a technique to mimic the users via the well-defined interfaces
 - Links, Routers, Nodes, File Systems, DB, P2P, HTTP, Mail, etc.



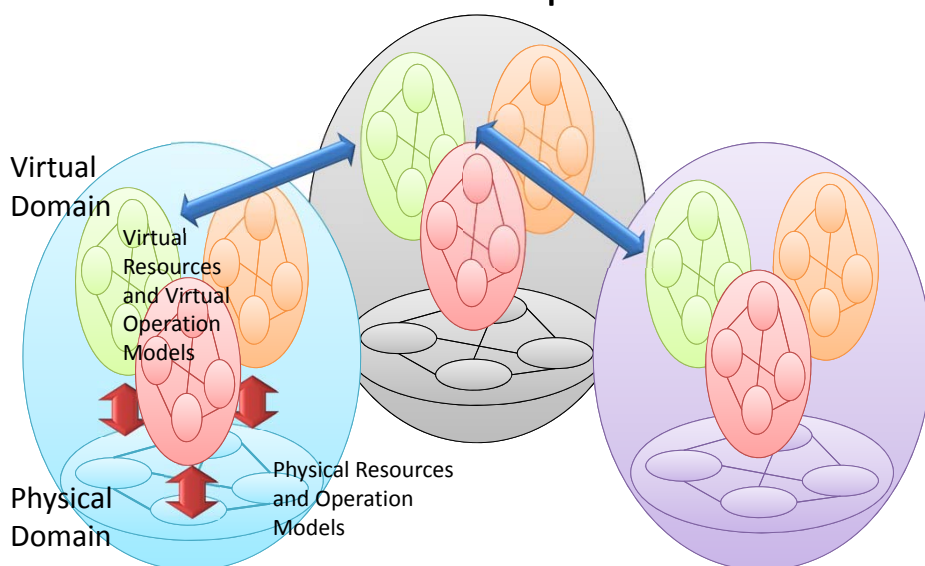
What should we tackle next?

Operation Virtualization

- Inter-domain operations require virtualization
 - We often know desirable logical behavior of resources
 - Private path establishment
 - Communication quality
 - Customized forwarding/routing
 - Data management
 - Load balancing
 - We rarely know the interfaces to manipulate the resources beyond domains
 - Well-defined interfaces!!



Vertical Operations and Horizontal Operations



Towards an Operation Architecture for Virtualized Infrastructure

- Open Issue
 - Real-world operations do not fit in a simple layered architecture such as the OSI reference model
 - Many kinds of resources mean many kinds of operation models
 - Installation, configuration, monitoring, debugging, ...
 - Their combinations are highly complicated
 - Service models, resource management models, security models, business models, human networks, politics, ...
 - We need in-depth OPR (Operation Process Re-engineering)

Call for collaborations

- We have just started trials and discussions...
 - Technology development from a blended viewpoint of researchers and operators is highly important
 - Collaborations are welcome!

Thank you!