

FIRST: Future Internet Research for Sustainable Testbed

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Korea-German WS on Future Internet Research
@ Seoul, Korea

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FIRST (Future Internet Research for Sustainable Testbed) Project Overview

Development of the core technology and virtualized Programmable platform for Future Internet

- **Period : March 2009 ~ February 2014 (3+2 years)**
- **Institutions: ETRI and 4 universities**



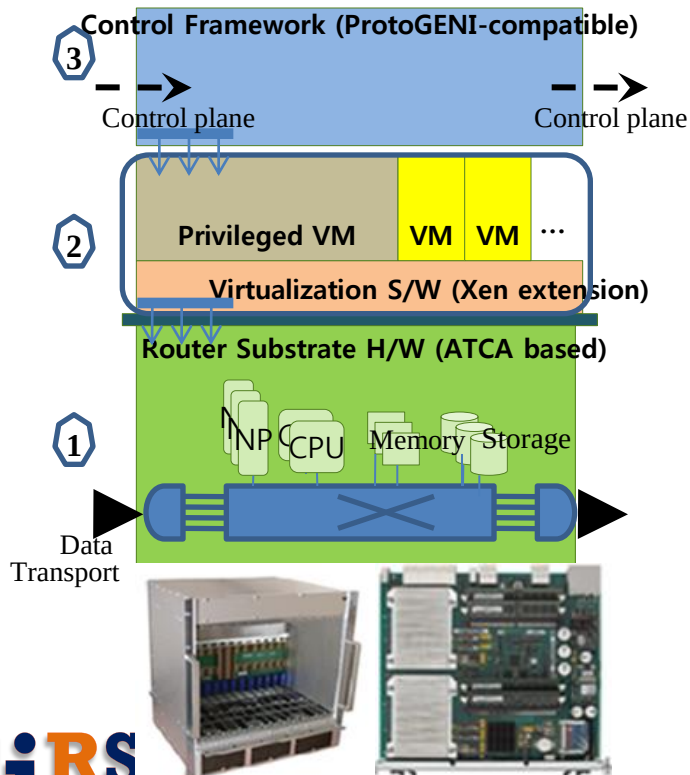
Project Goal

- Research on the core technologies for FI platform realization
 - programmability, network virtualization, and control framework
- Development of the FI platform for experimental infrastructure
 - for network & service architecture researchers
 - with mid-range ATCA platform and PC-based platform

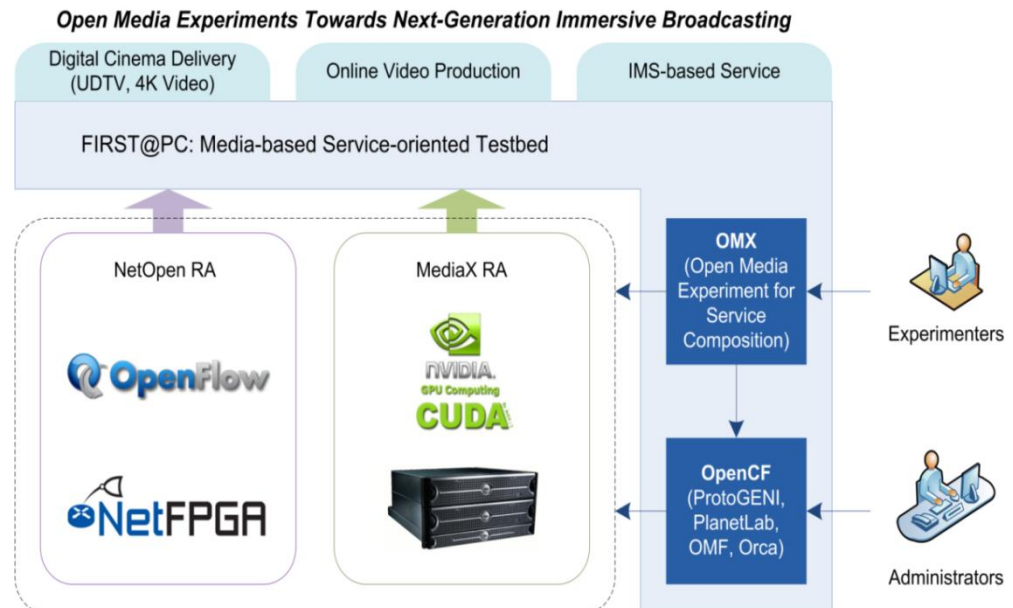
Resource Aggregations for FIRST

Development of the core technology and virtualized
Programmable platform for Future Internet

FIRST@ETRI ATCA-based NP RA



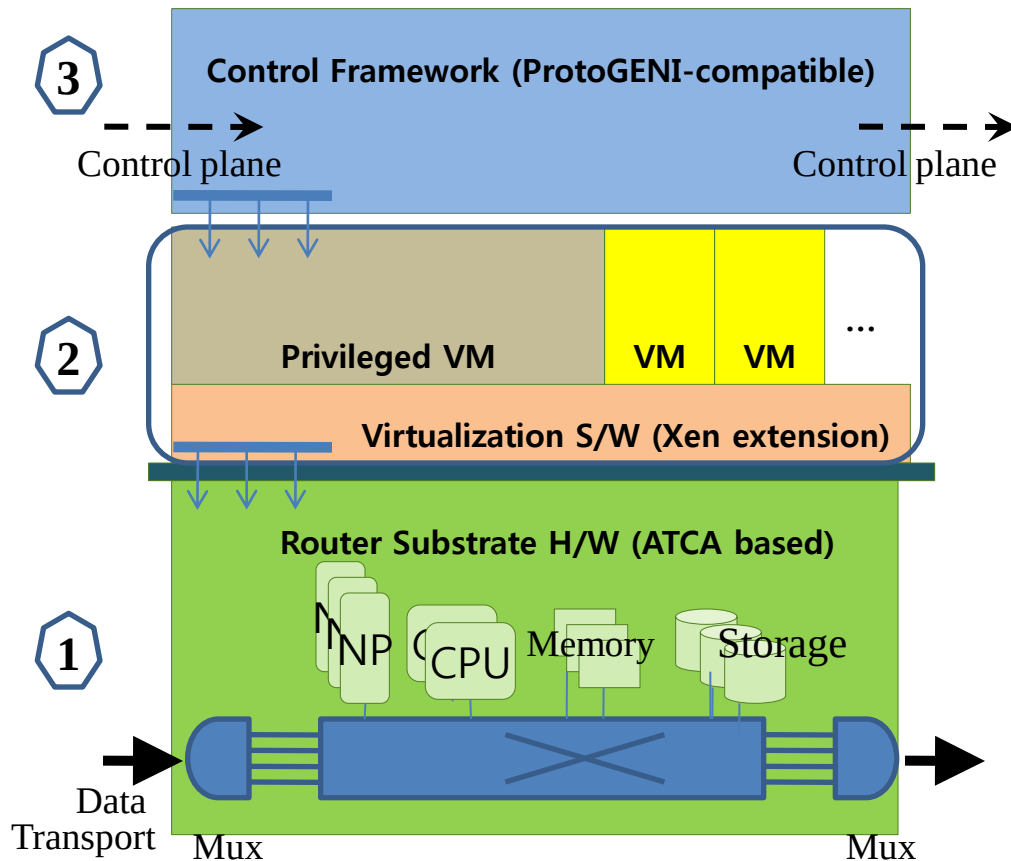
FIRST@PC: PC-based NetOpen RA & MediaX RA



FIRST@ETRI



FIRST@ETRI Platform - Overall Architecture



● Control Framework

- International Federation
- APIs
 - Clearinghouse APIs
 - Slice APIs
 - Node Manager APIs
- Resource Negotiation

● Virtualization

- Number of Max VMs
- Resource Isolation
- Scale-up Virtualization
- Sliver Migration

● Substrate

- Resource Specification
- Resource Allocation
- Resource Monitoring

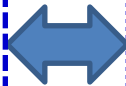
FIRST@ETRI Hardware Platform

- COTS blades – ATCA
- Oction Network Processor for Packet Processing

ATCA Chassis

- Dual Oction NP 5860
- 2 x 10GbE, 10x1GbE

PC Servers
with NetFPGA
(future)



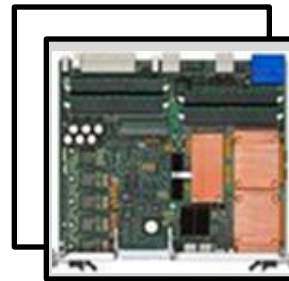
Oction NP based
Line Cards



High-end
FPGA pool (future)

Backplane

CPU Boards



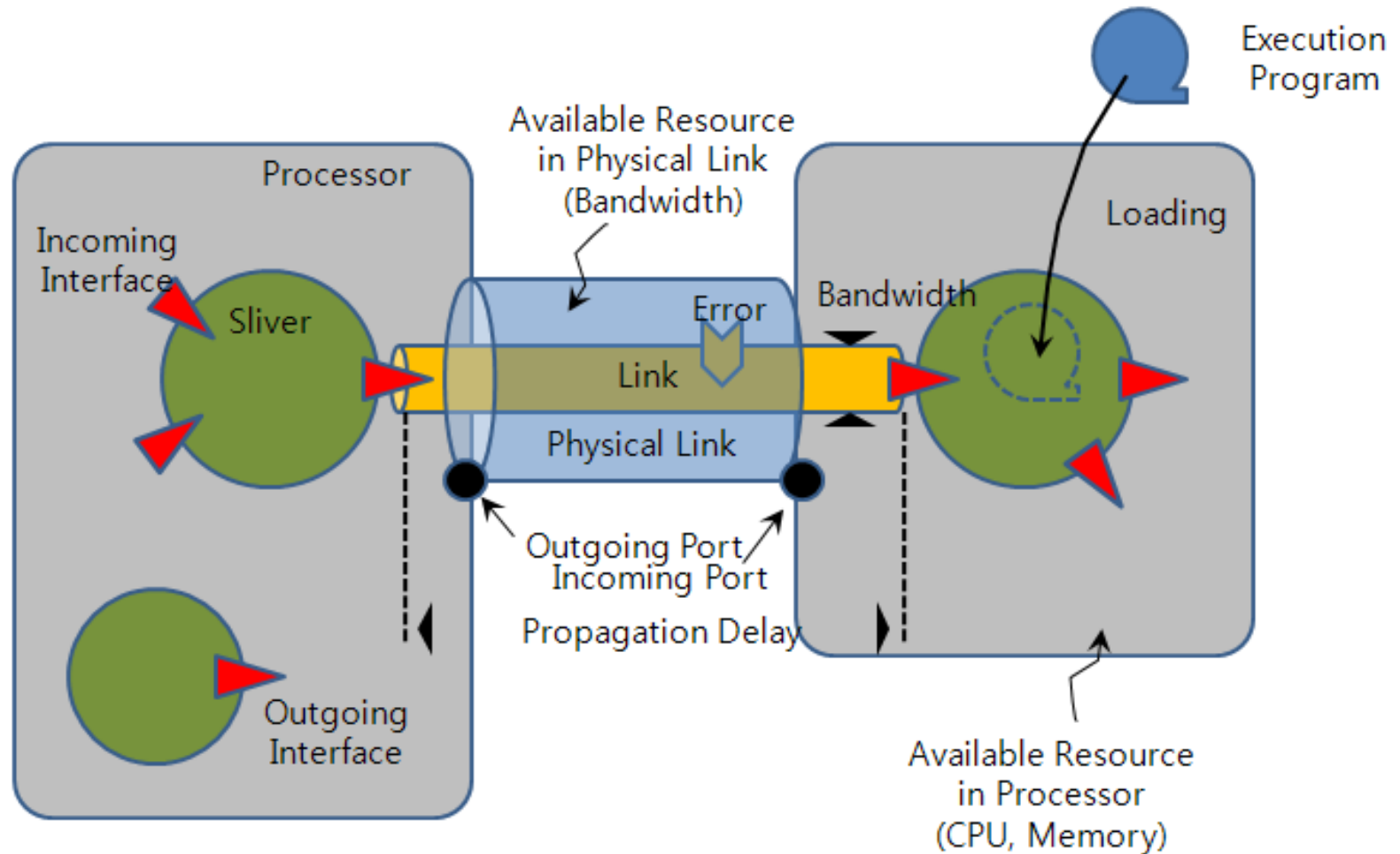
10 GbE Switch

- Intel Xeon dual core
- Dual 1GbE Ethernet Controller
- 2 x 10/100/1000 Base-T
- 16-slot 10 GbE and 100/1000 Base-T fabric switch
- More than 100 Gbps of external connectivity
- Non-blocking Layer 2 switching

Optical Lambda Switch (future)



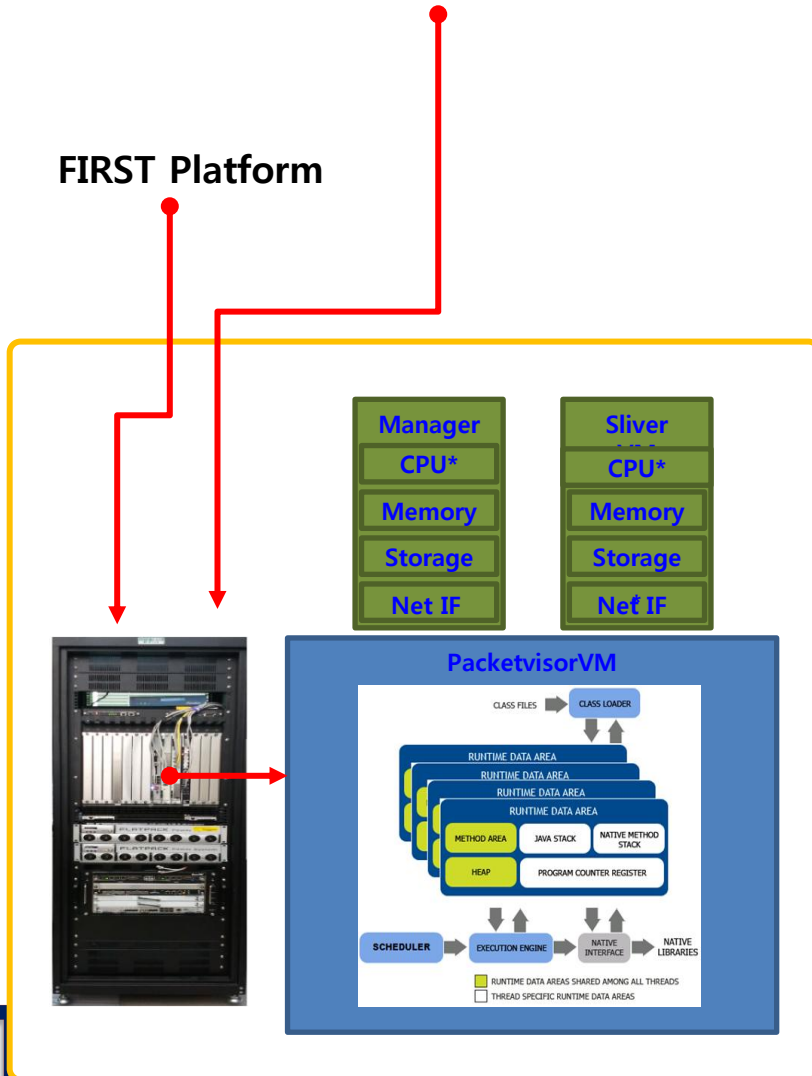
FIRST@ETRI Platform - Substrate Architecture Model



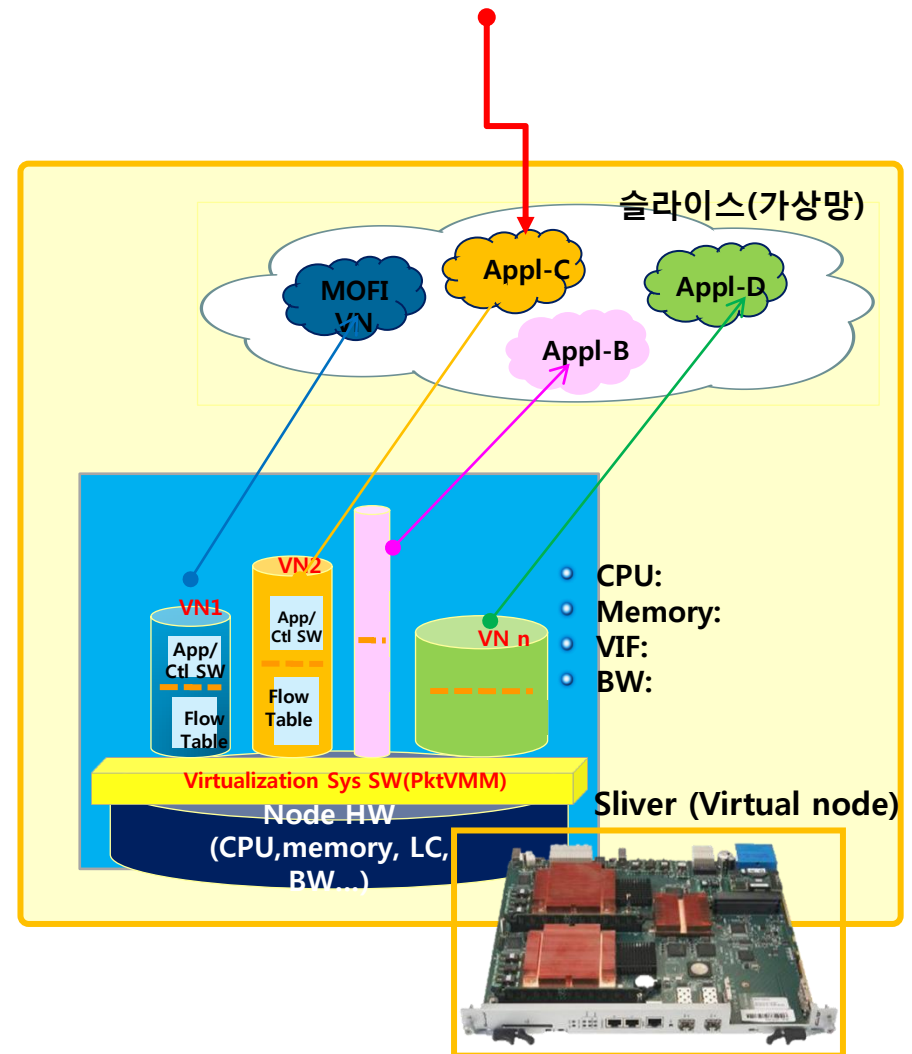
FIRST@ETRI Platform – Virtualization & Programmability

Network Virtualization: PacketvisorVM

FIRST Platform



Data Plane Programmability: PacketvisorWorks



FIRST@ETRI Demonstration @ GEC6 (Nov. 2009)

FiRST@ETRI Future Internet Virtualized Programmable Platform

ETRI is developing the high performance Future Internet Virtualized Programmable Platform based on Network Processors.
It has the ProtoGENI compatible Control Framework and the functions of dynamic resource management, dynamic topology management and program download.

Platform Hardware

- ATCA (7440)
- Outbox NP based Line Cards
- CPU Boards
- 10-Gbit 10 GbE and 100/1000 Base-T fabric switch
- More than 100 Gbps of external connectivity
- Non-blocking Layer 2 switching

Resource Specification

Model of Open Substrate Architecture

List of Op

- allocateS
- allocateP
- allocateL
- allocateP
- getSilverS
- getPortSt
- getLinkSt

Demo System Configuration

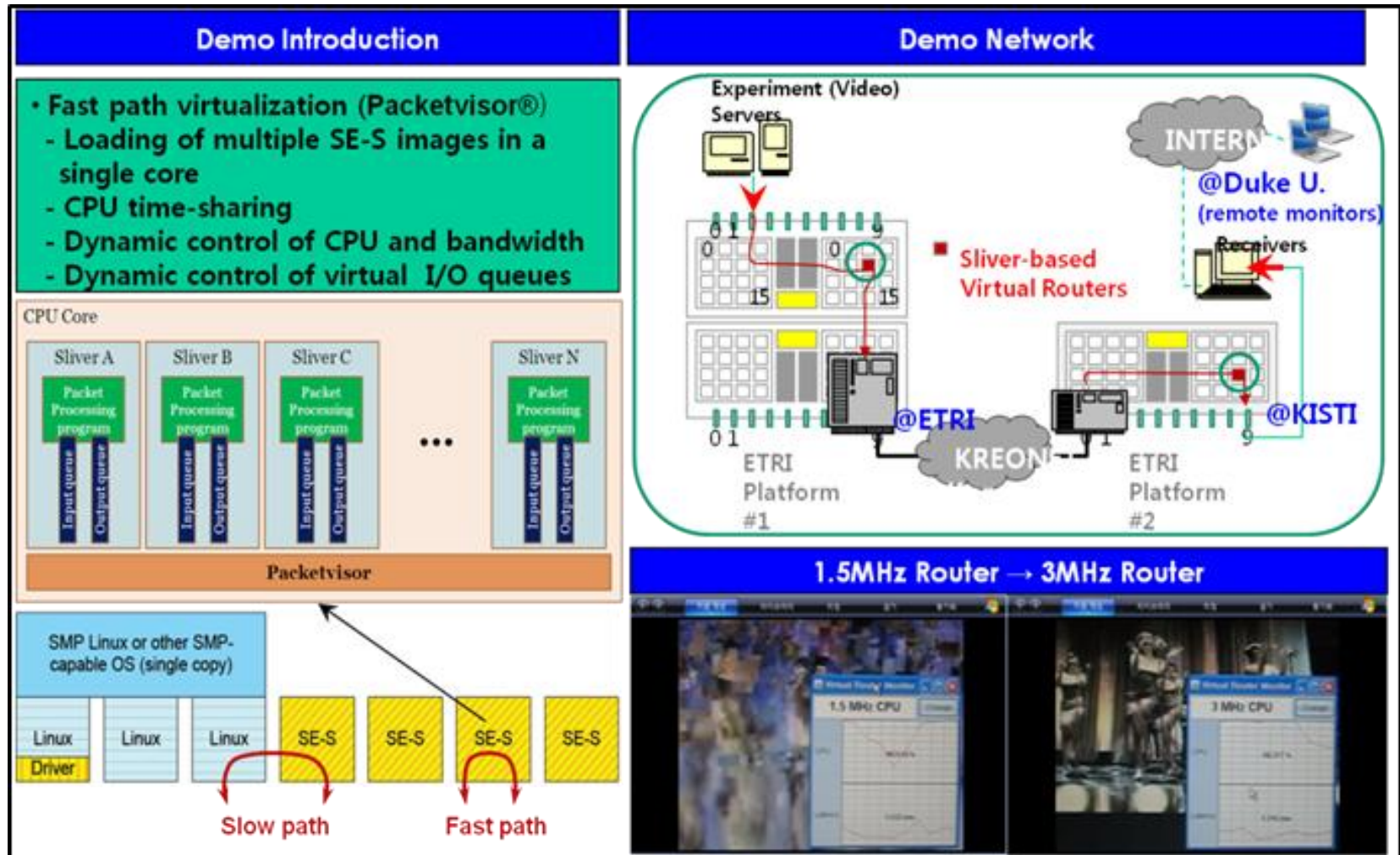
Example of Experiment

Demonstration Procedures

- Create Experiment Topology
- Allocate components to Virtualized Resources
- Allocate Specs to Sliver and Link
- Modify Experiment Topology during Operation
- Change Specs during Operation
- Create more than 2 slivers in a single CPU
- Download Network Program into Sliver
- Query CPU, Link Utilization Status

FIRST: Future Internet Research for Sustainable Testbed
 ETRI: Electronics and Telecommunications Research Institute in Korea

FIRST@ETRI Demonstration @ GEC7 (Mar. 2010)



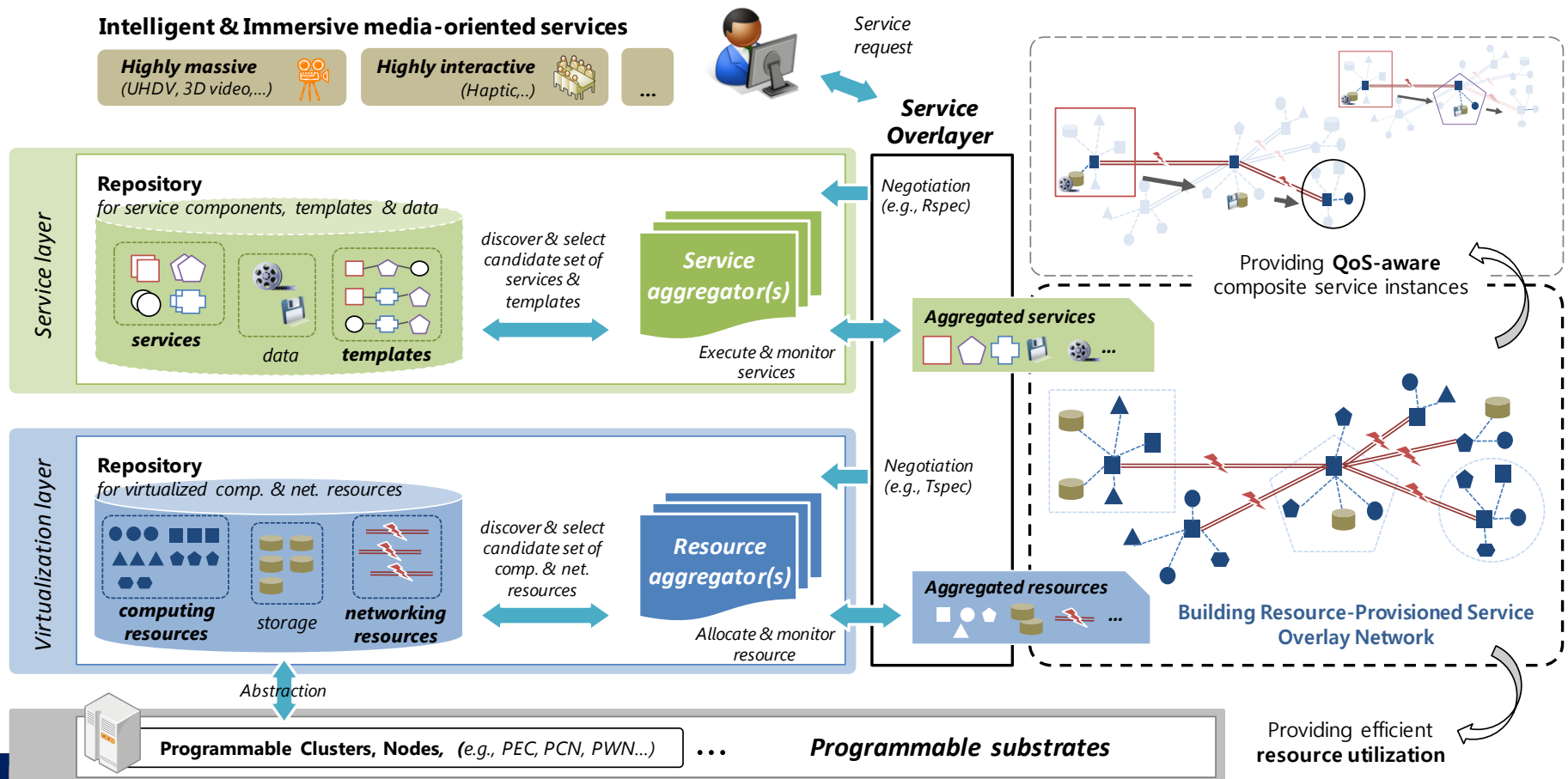
FIRST@PC

PC-based Testbed for Media-centric Service
Composition

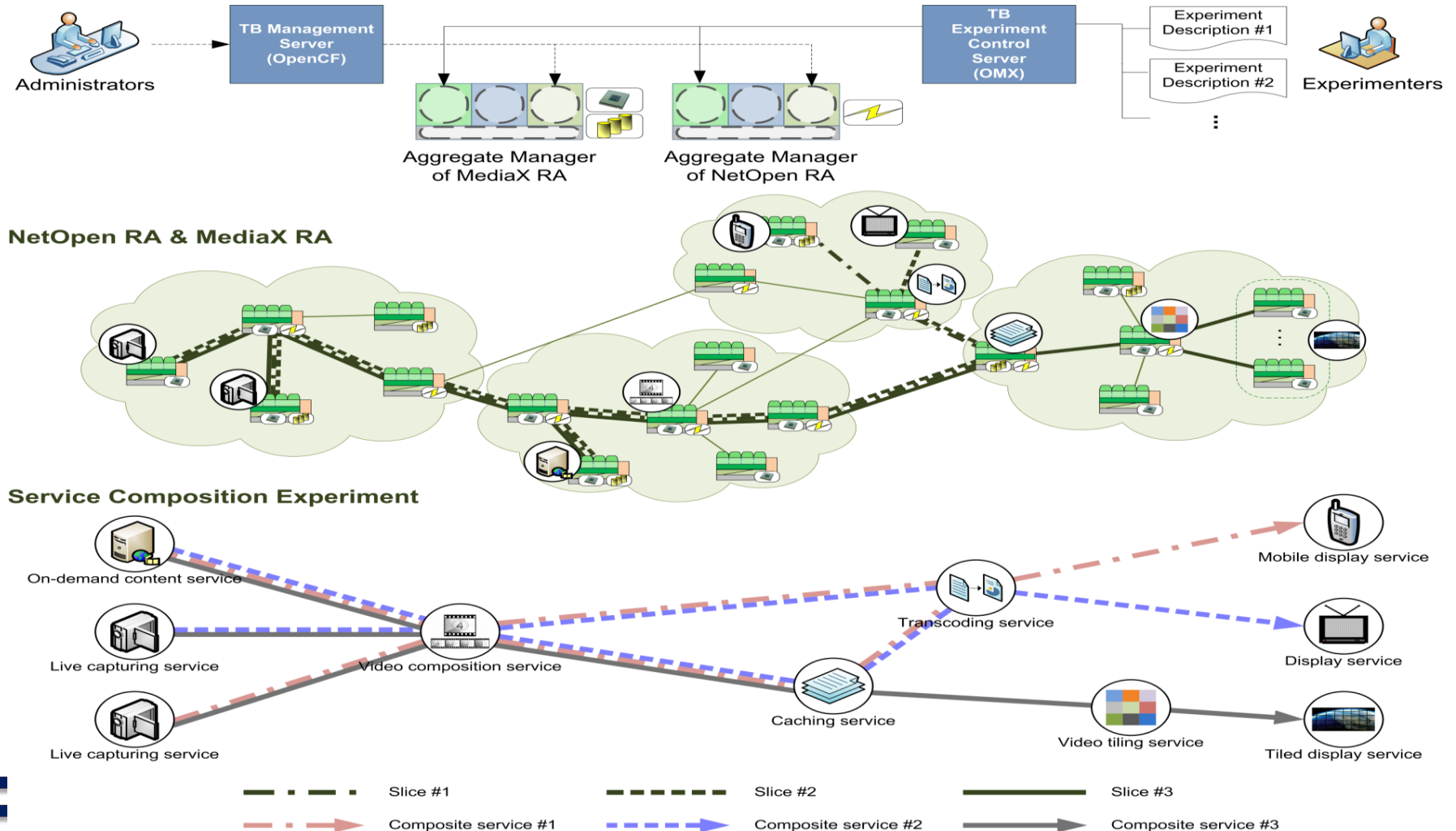


A Tentative Model for Dynamic Media-Oriented Service Composition

- One possible (evolutionary) direction?

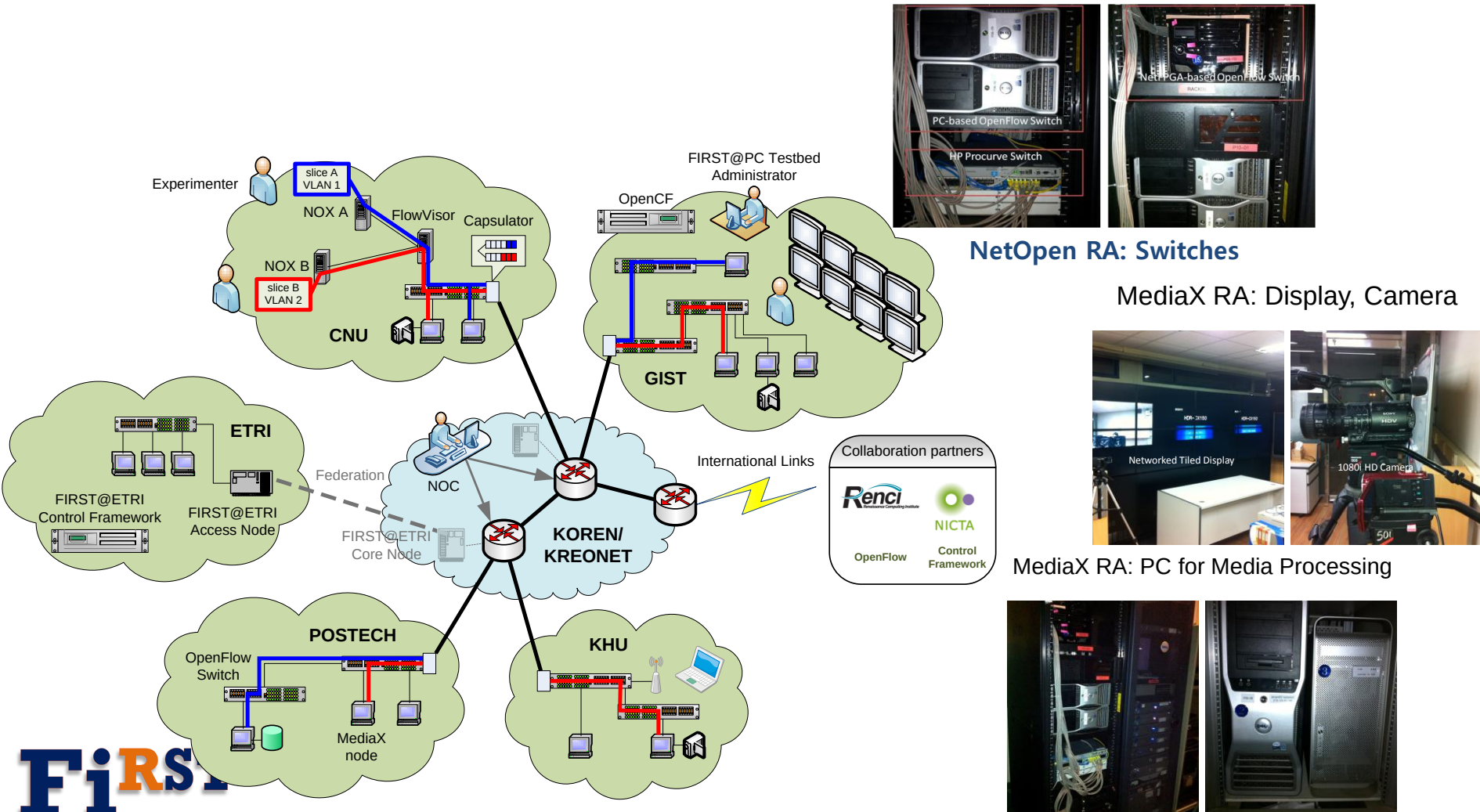


Service Operation & Control for Media-centric Service Composition Experiments (Design)

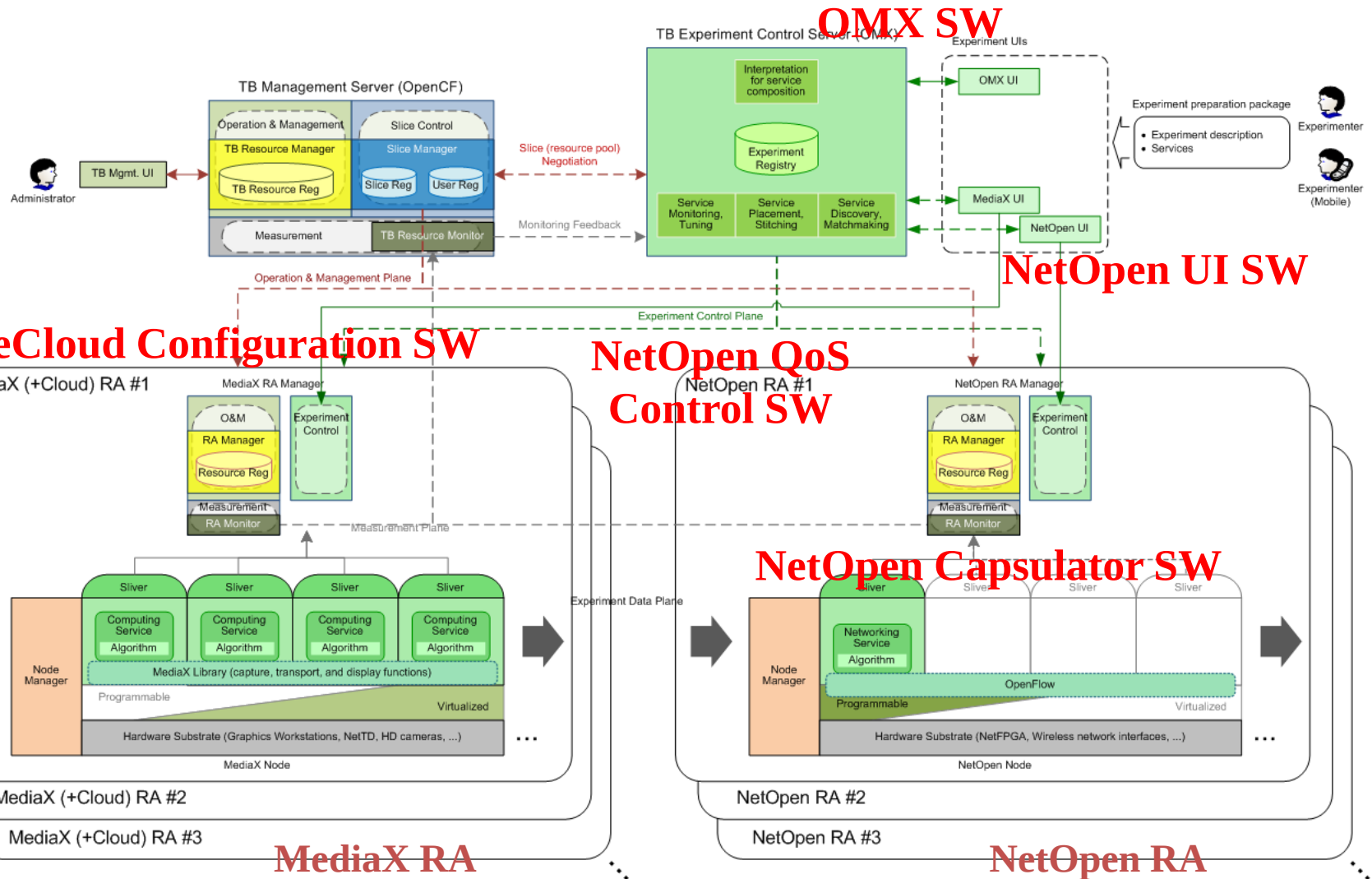


FIRST@PC TB: Early Integrated Testbed

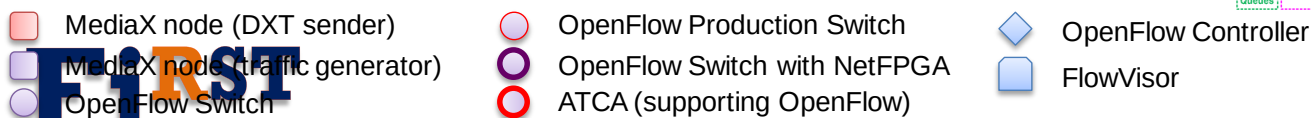
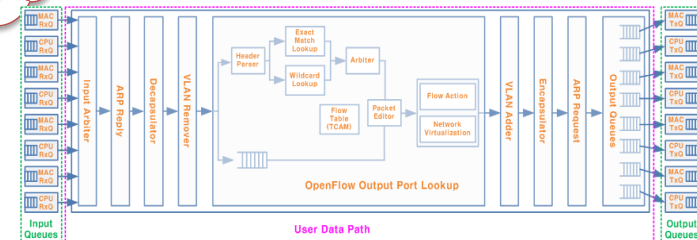
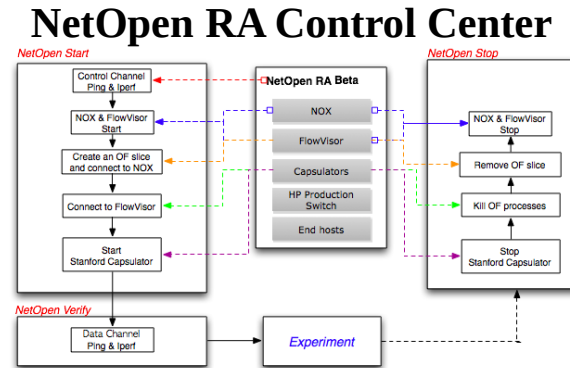
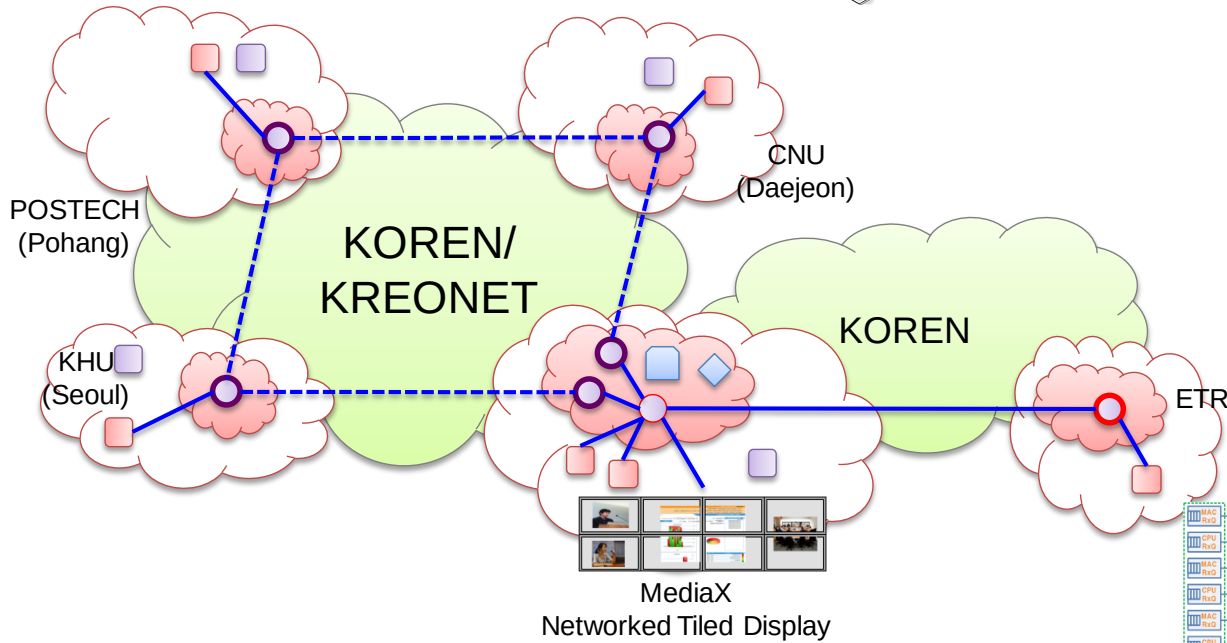
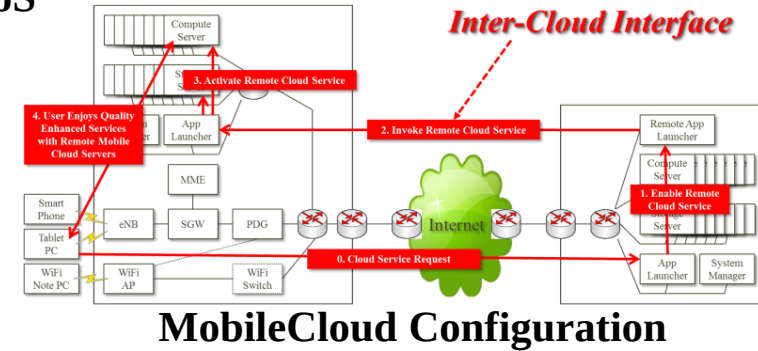
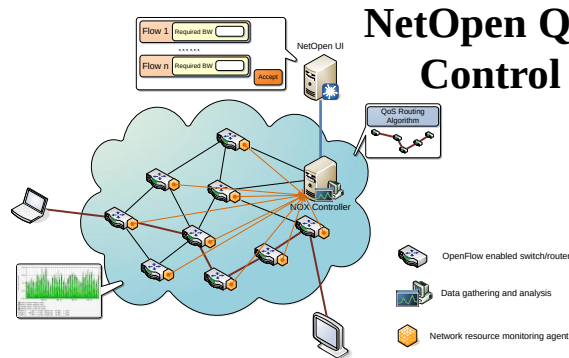
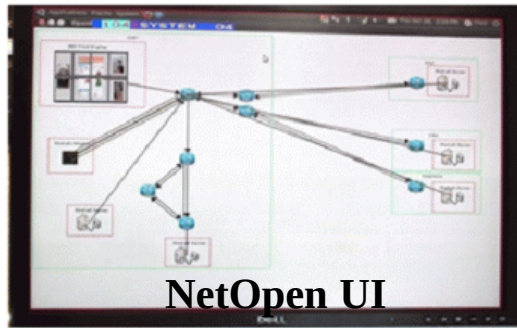
(NetOpen RA v0.2 + MediaX RA v0.1 + OMX Service Control v0.2 + OpenCF O&M v0.0)



FIRST@PC Platform Design (v0.9)



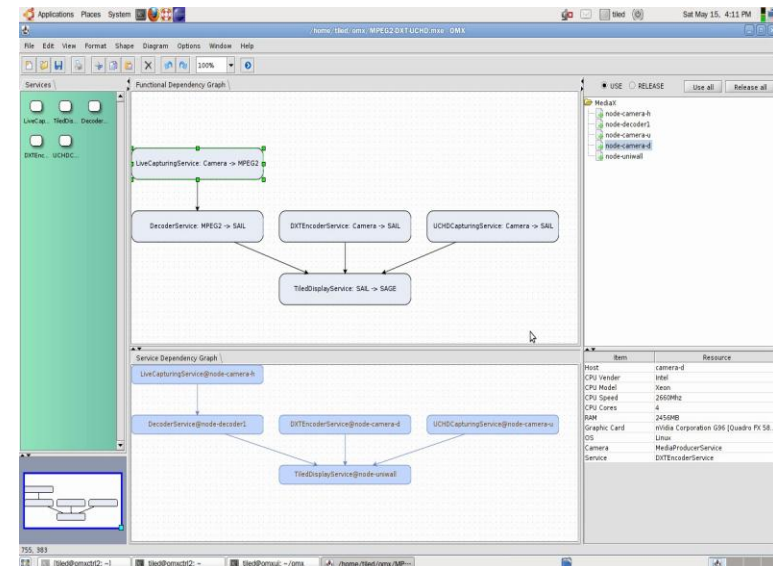
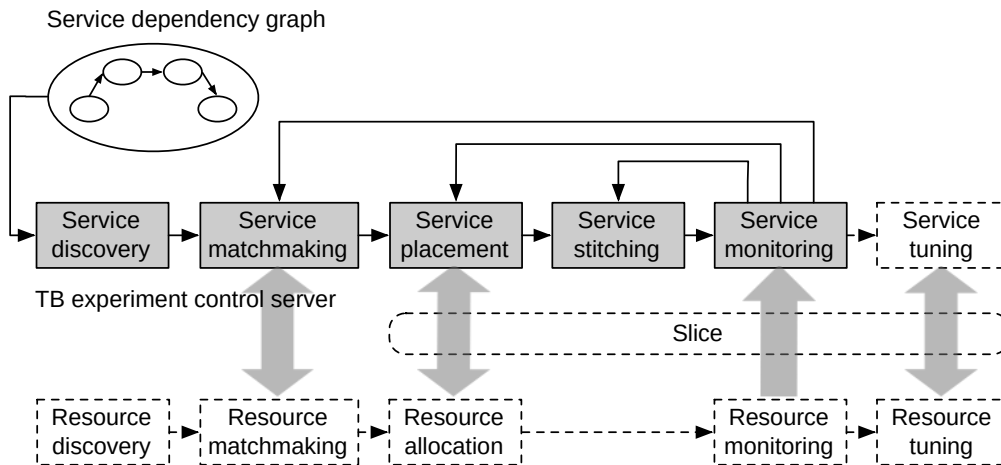
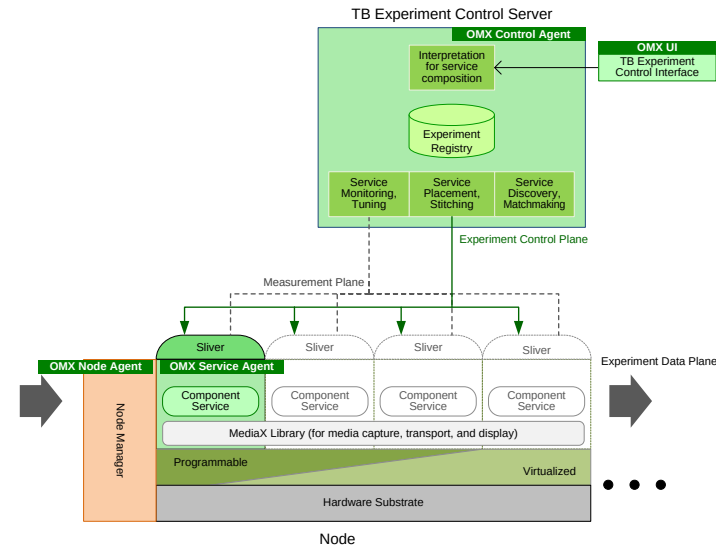
FIRST@PC Platform Components (v0.2)



NetOpen Capsulator for NetFPGA

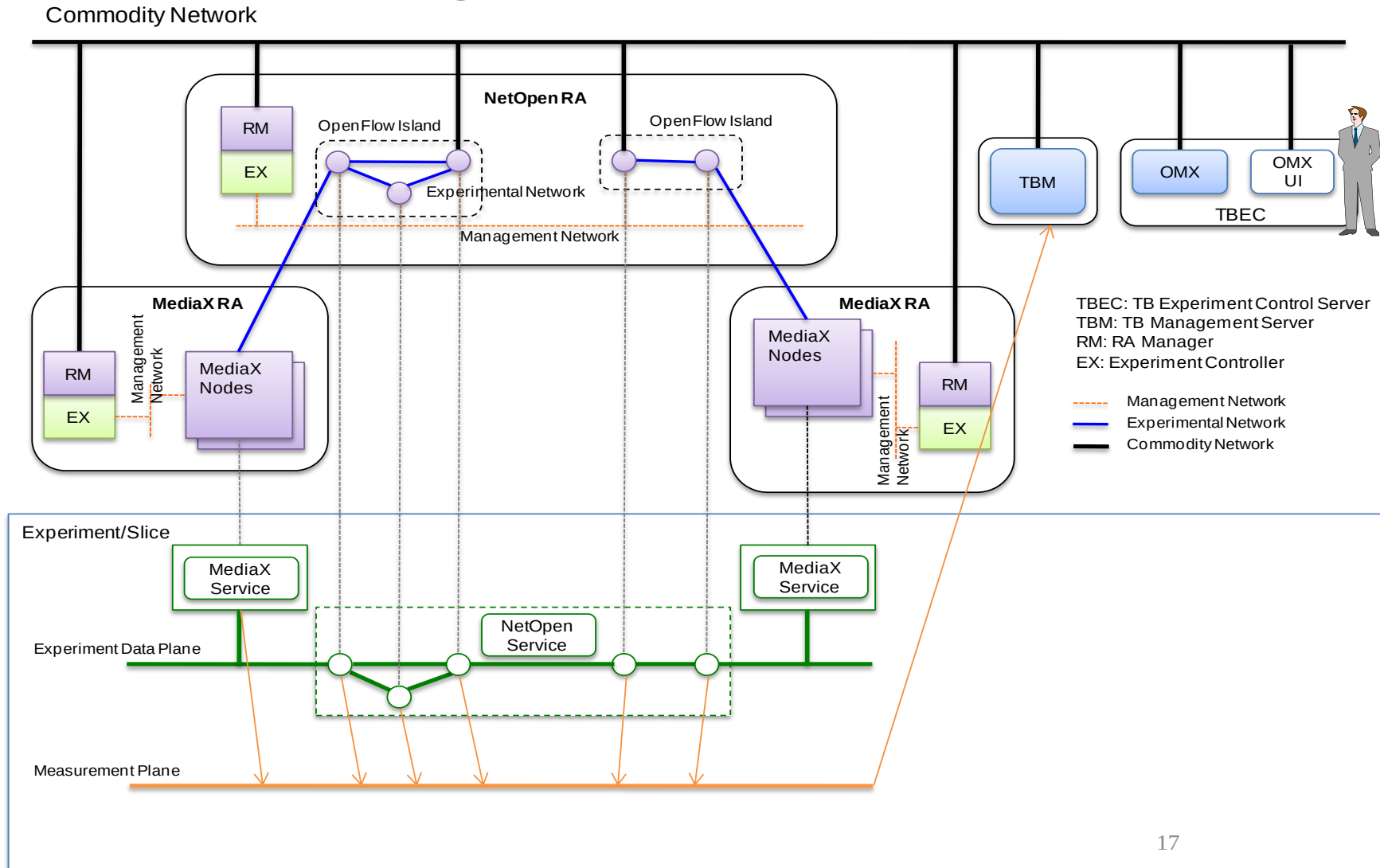
FIRST@PC OMX Experiment Control Software (v0.2)

- FIRST@PC OMX (Open Media Experiment for Service Composition) Experiment Control Software
 - Operate and control distributed media-centric services based on user-defined experiment description
 - Designed OMX-enabled service interfaces such as DP (data port), TP (tuning point), and MP (measurement point)



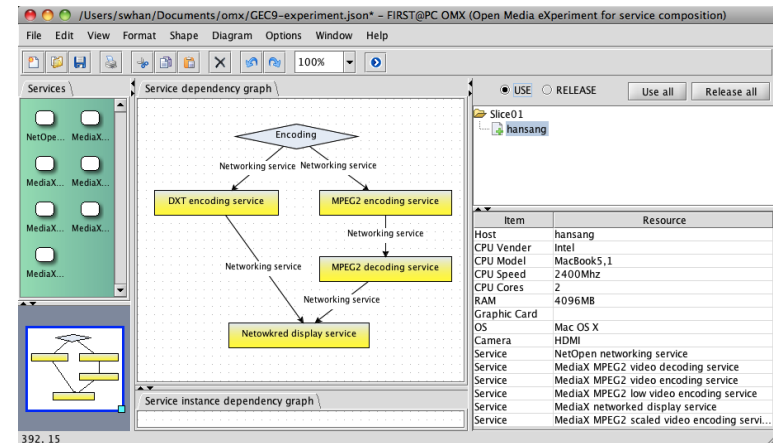
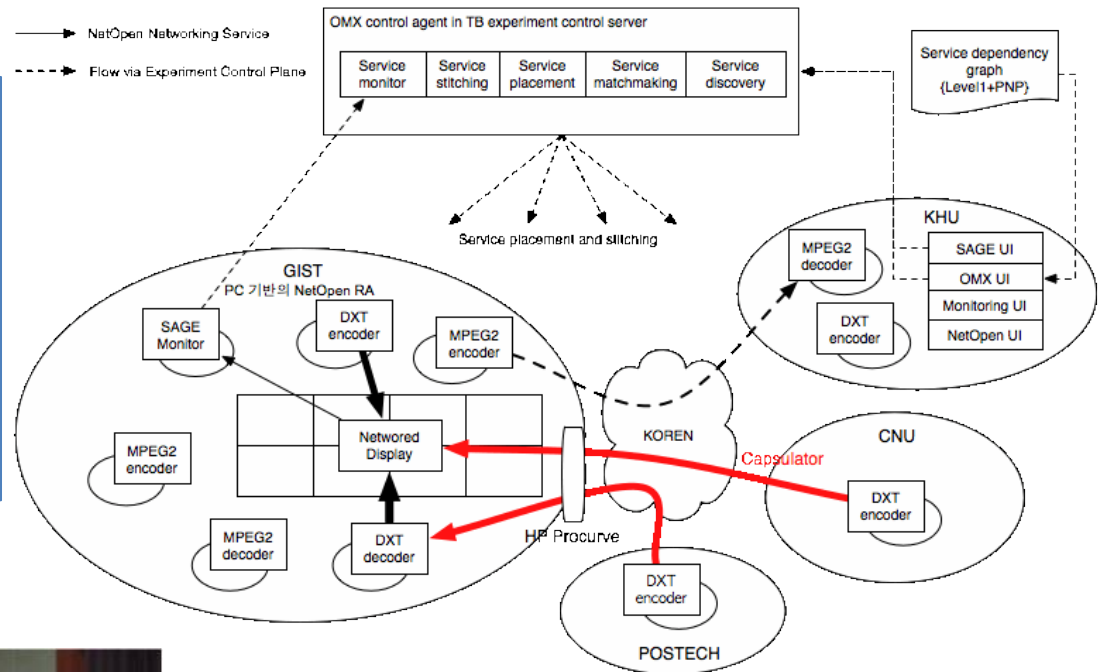
FIRST@PC Basic-level Service Composition Experiments

FIRST@PC Service Composition Experiment: Target Environment



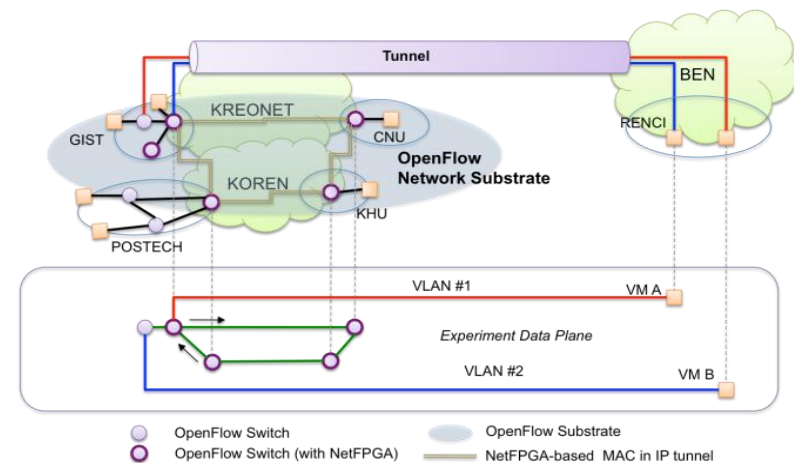
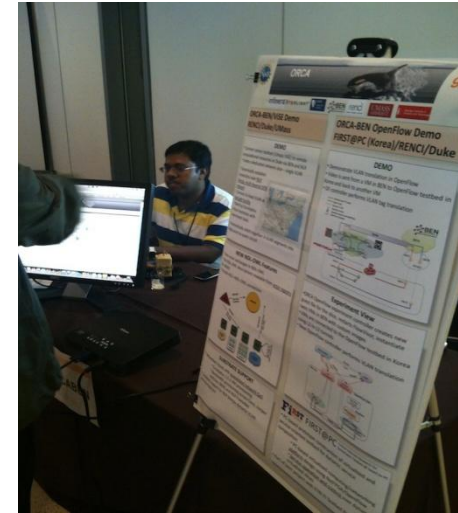
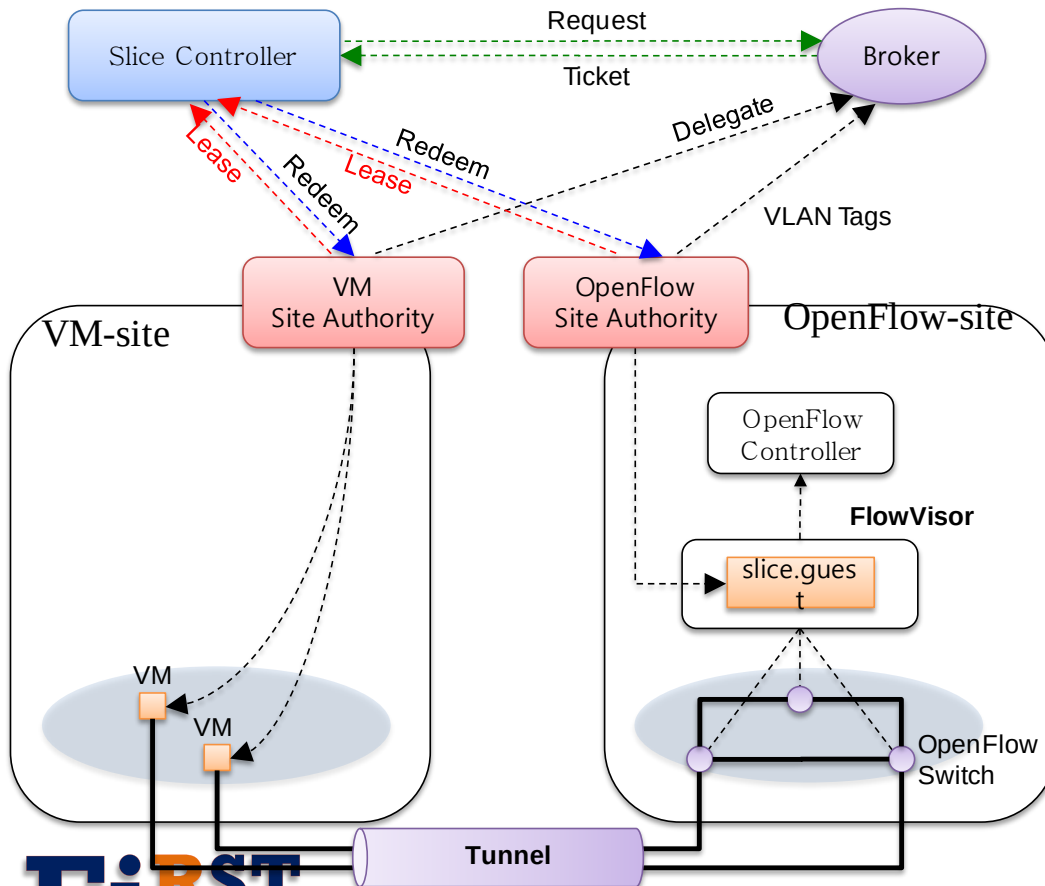
FIRST@PC Service Composition Experiment: Multi-party Visual Sharing

Basic-level Media-centric
service composition
experiments driven by
OMX for multi-party
visual sharing scenario

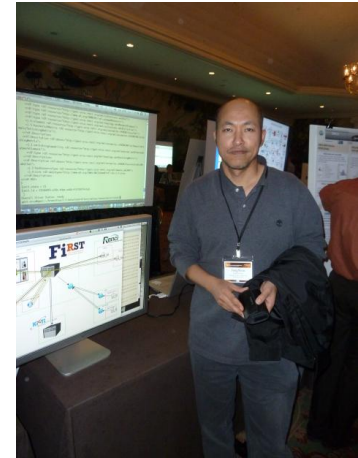
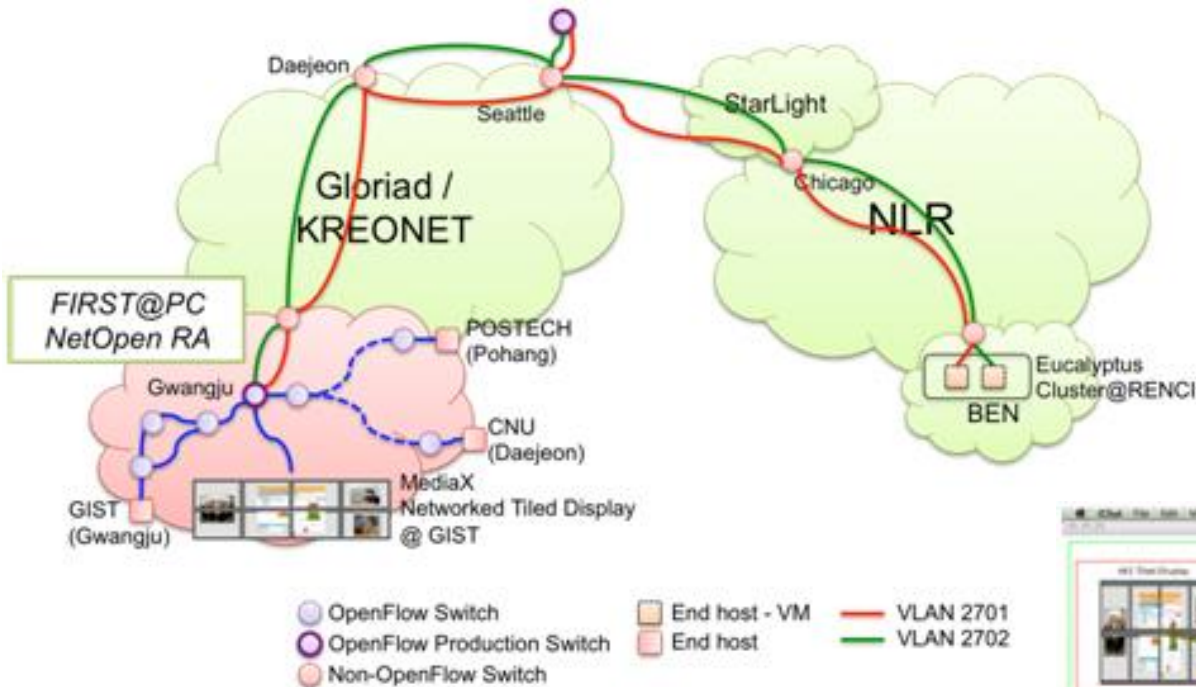


FIRST@PC NetOpen RA + ORCA Control Framework (RENCI) – GEC8 Joint Demo (July 2010)

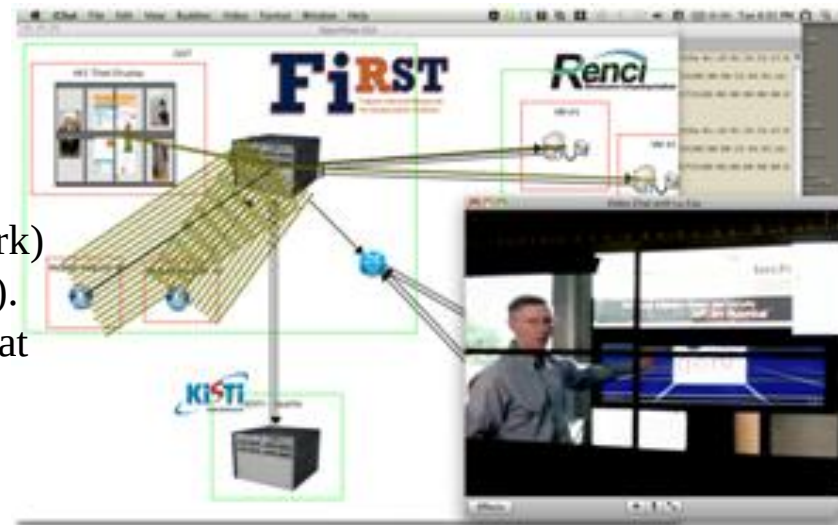
- OpenFlow Network Substrate (VLAN tunneled) for ORCA Control Framework



FIRST@PC {NetOpen+MediaX} RA + ORCA Control Framework (RENCI) – GEC9 Demo (Nov 2010)



Integration of OpenFlow into ORCA CF (Control Framework) over FIRST@PC NetOpen RA (OpenFlow-enabled devices). FIRST@PC NetOpen RA connects five video sources (two at Renci as VMs and the others at GIST, CNU, POSTECH in Korea) to Networked Tiled Display (NeTD) in Korea.





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Thank you!

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