Getting started with O3 Project Achievement

～ Innovating Network Business through SDN WAN Technologies ～

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O3 project

(NEC, NTT, NTT Communications, Fujitsu, Hitachi)

Agenda

- *Innovation through O3 User-oriented SDN*
- *O3 Technologies for SDN WAN*
- *SDN Use Cases in O3 Project*
- *Getting started with O3 Project Achievement*

Innovation through O3 User-oriented SDN

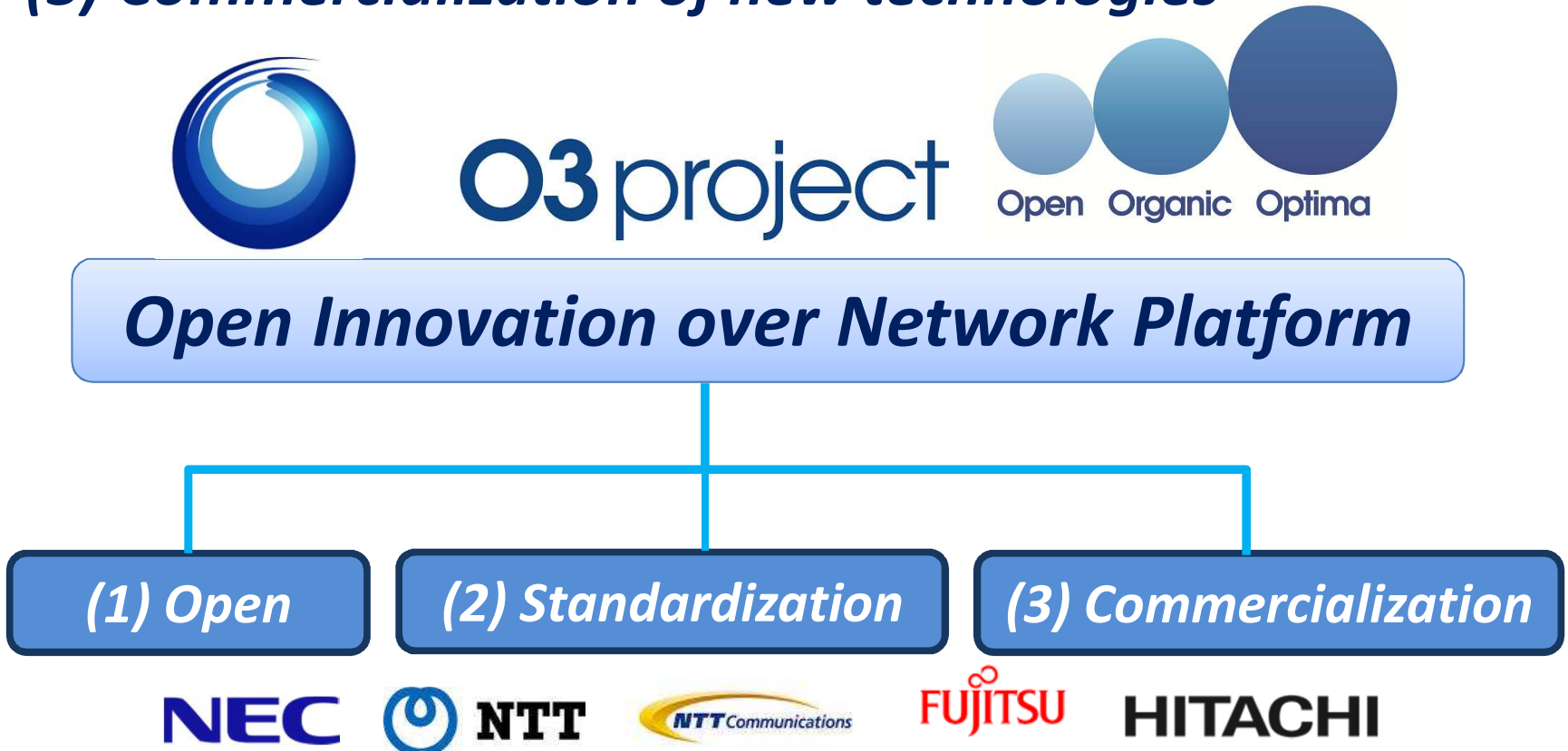
Toward open User-oriented SDN

3 Contributions for User-oriented SDN

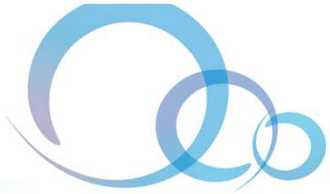
(1) Open development with OSS

(2) Standardization of architecture and interface

(3) Commercialization of new technologies



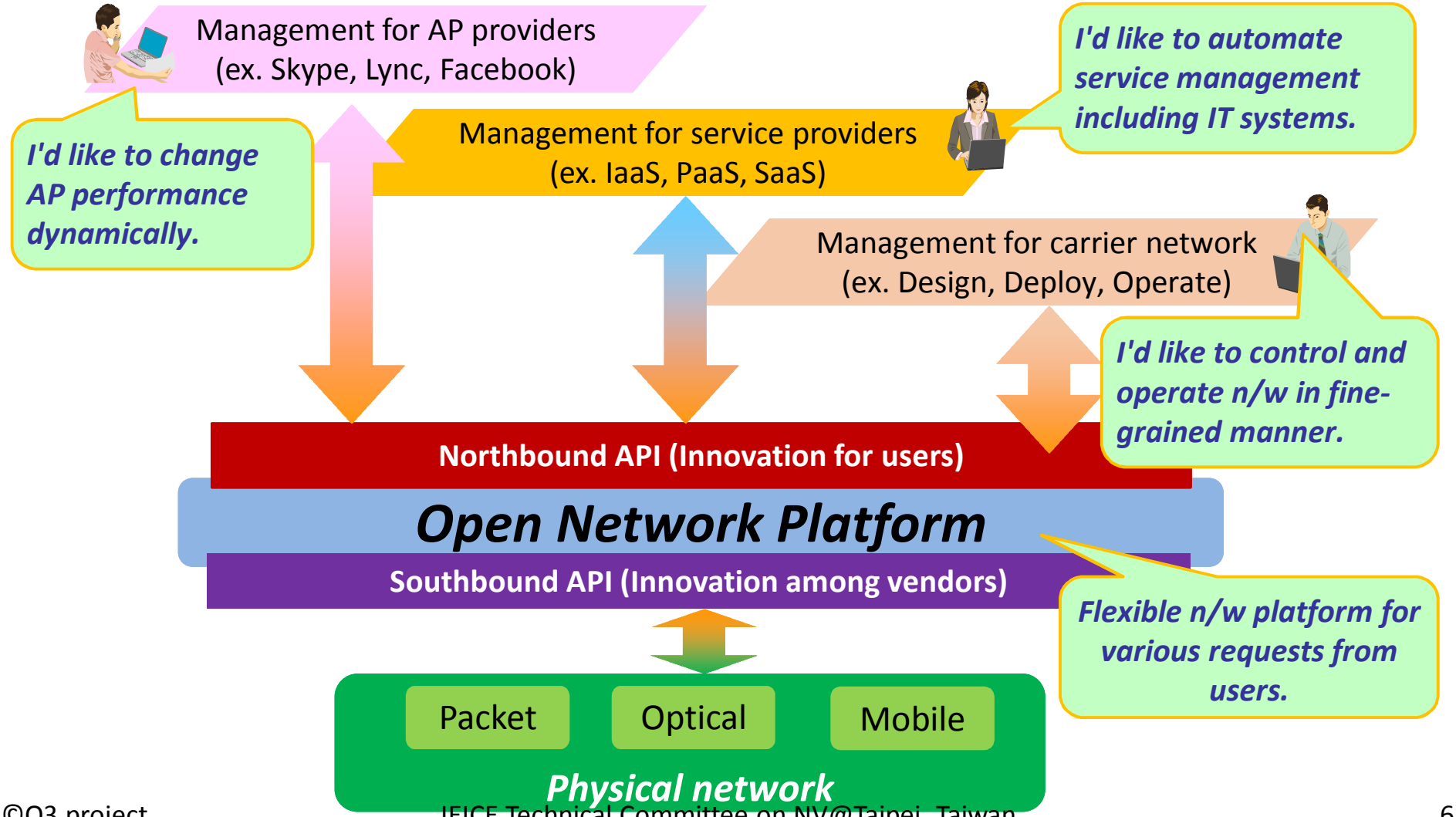
O3 Project Concept, Approach & Goal



- **Open, Organic, Optima**
  - Anyone, Anything, Anywhere
  - Neutrality & Efficiency for Resource, Performance, Reliability, ….
  - Multi-Layer, Multi-Provider, Multi-Service
- **User-oriented SDN for WAN**
  - Softwarization: Unified Tools and Libraries
  - On-demand, Dynamic, Scalable, High-performance
- **Features**
  - Object-defined Network Framework
  - SDN WAN Open Source Software
  - SDN Design & Operations Guideline
- **Accelerates**
  - Service Innovation, Re-engineering, Business Eco-System

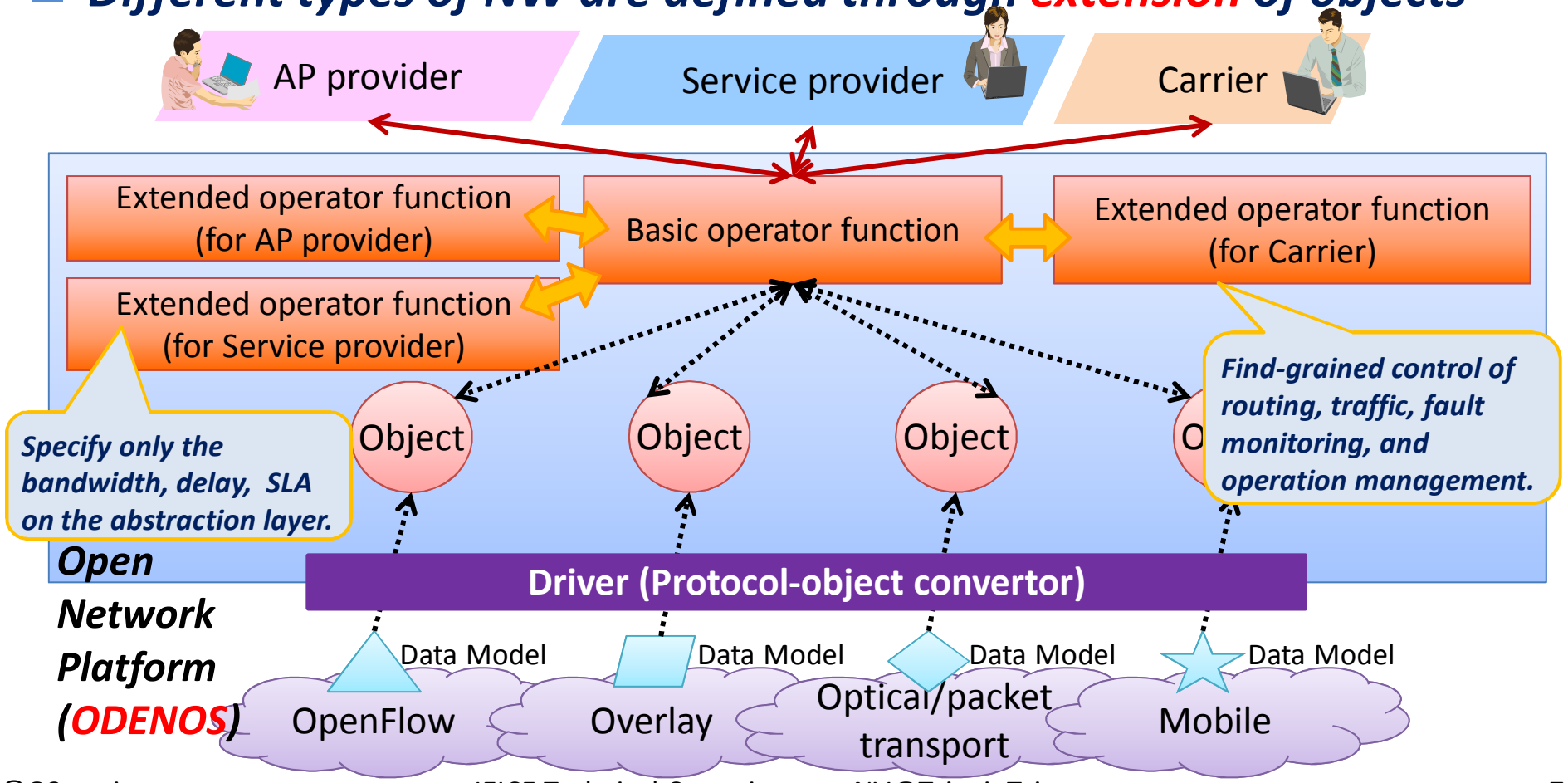
O3 Deliverables: User-oriented SDN

Provides Orchestration for different user requirements



O3 Object-defined Network Platform

- *Network is abstracted as graph of base objects*
- *Control functions are the operators for the objects*
- *Different types of NW are defined through extension of objects*



O3 Technologies for SDN WAN

SDN Design & Operations Guideline

- ***Established the SDN guideline for carrier networks***

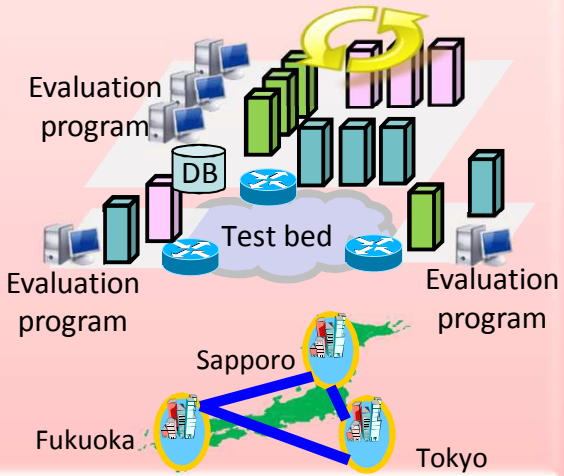
  The guideline is required to design, deploy and operate large-scale SDN in the following steps.

Drafting guideline

Draft includes
- Criteria to select SDN equipment
  - -Capacity
  - -Capability
  - -Reliability etc.
- Criteria for evaluation
  - -Flexibility
  - -Time to deploy SDN, etc.
- Evaluation techniques
  - - Design parameters identification
  - - Testing and reporting templates

Testing & analyzing

Evaluation techniques
- Test bed setup
- HW/SW SDN feature evaluation
- Design parameters certification
- Test results analysis

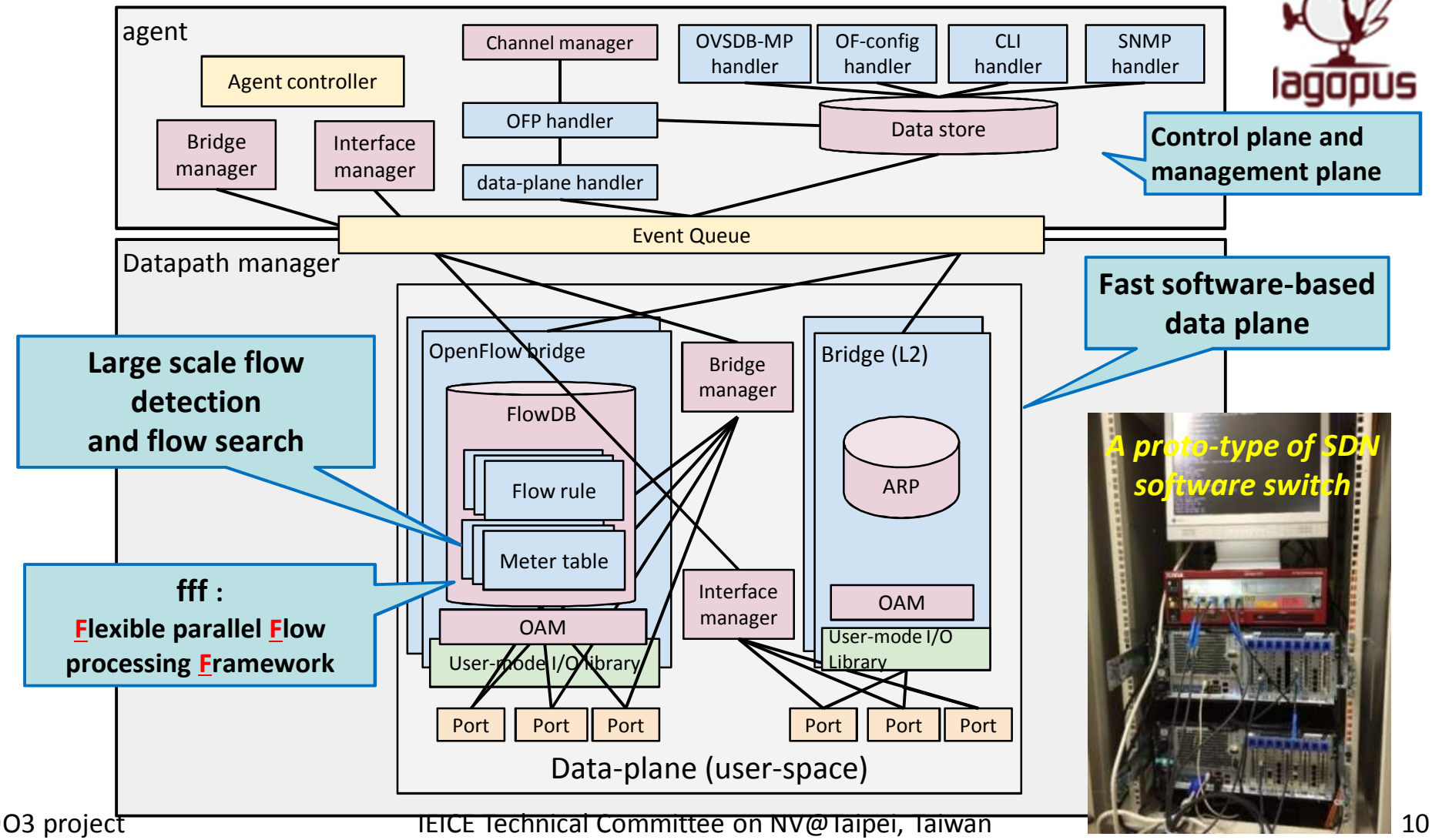


Completed Doc.

Final document
- test results
- analysis reports

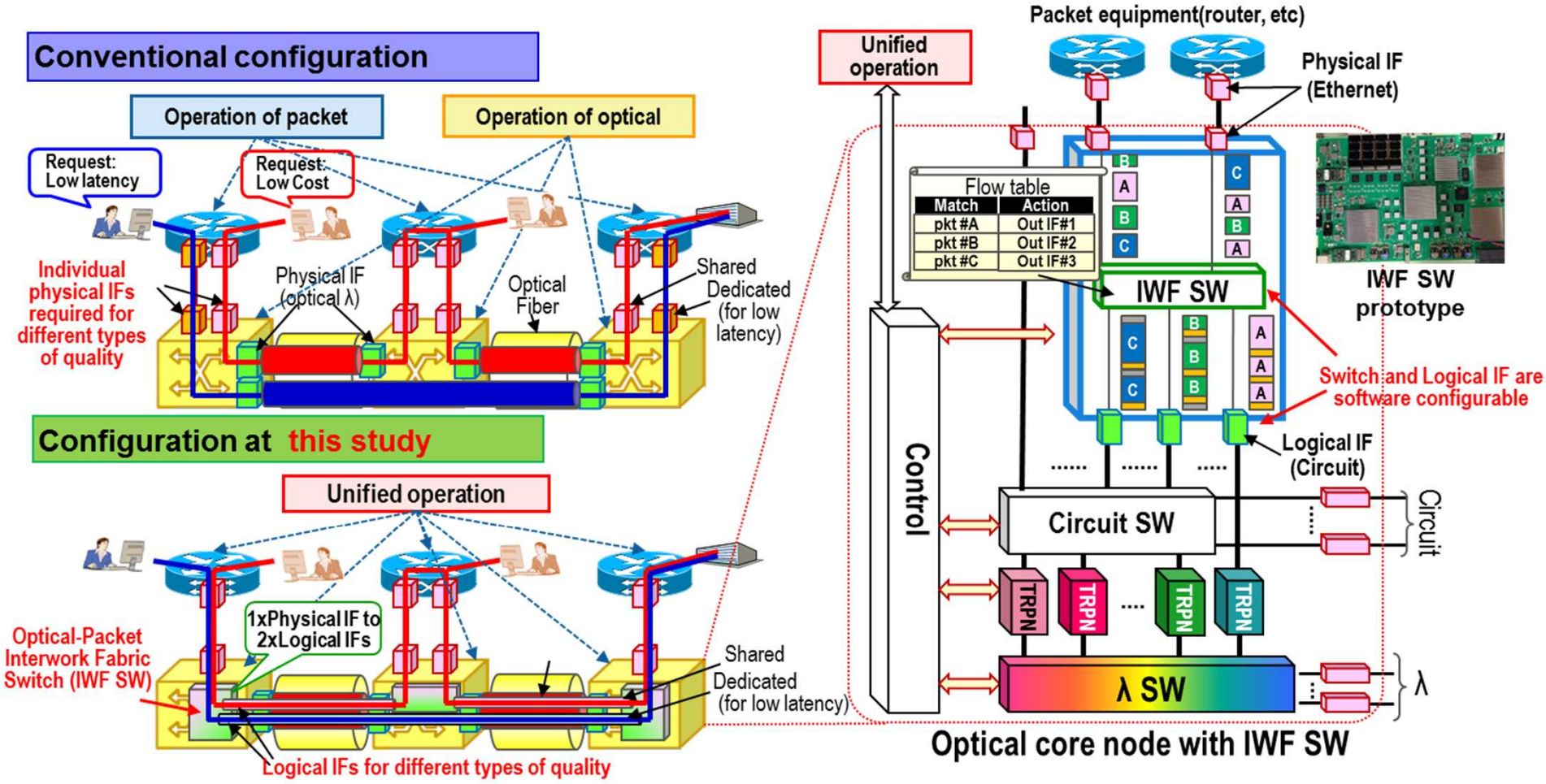
SDN Software Switch: Lagopus

SDN 10Gbps S/W forwarding node with 1M flows



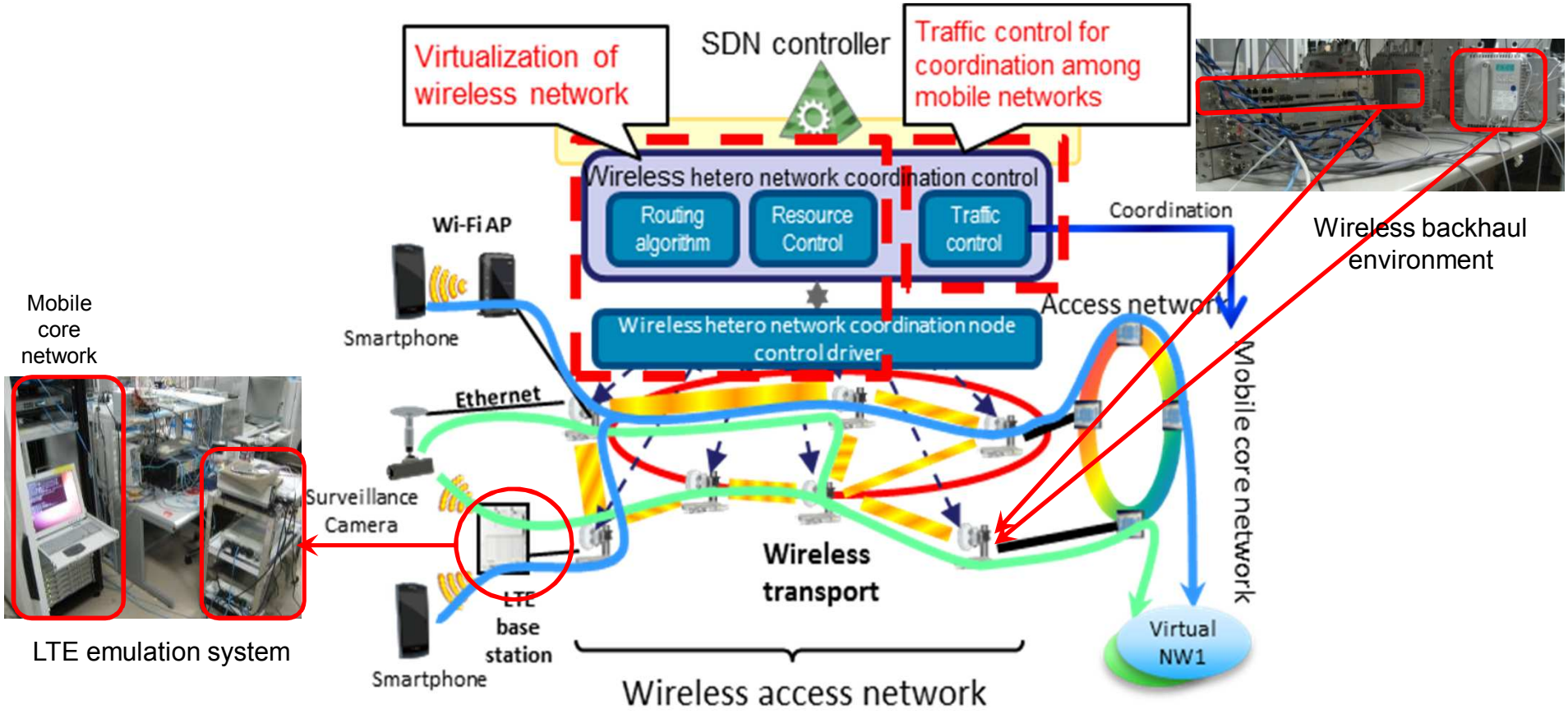
Signal Interwork between Optical & Packet

- **Enables ….**
  a wide variety of service quality & rapid service tune-up



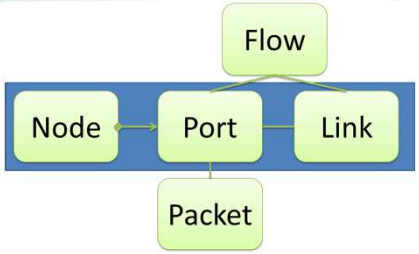
Virtual Wireless Networks

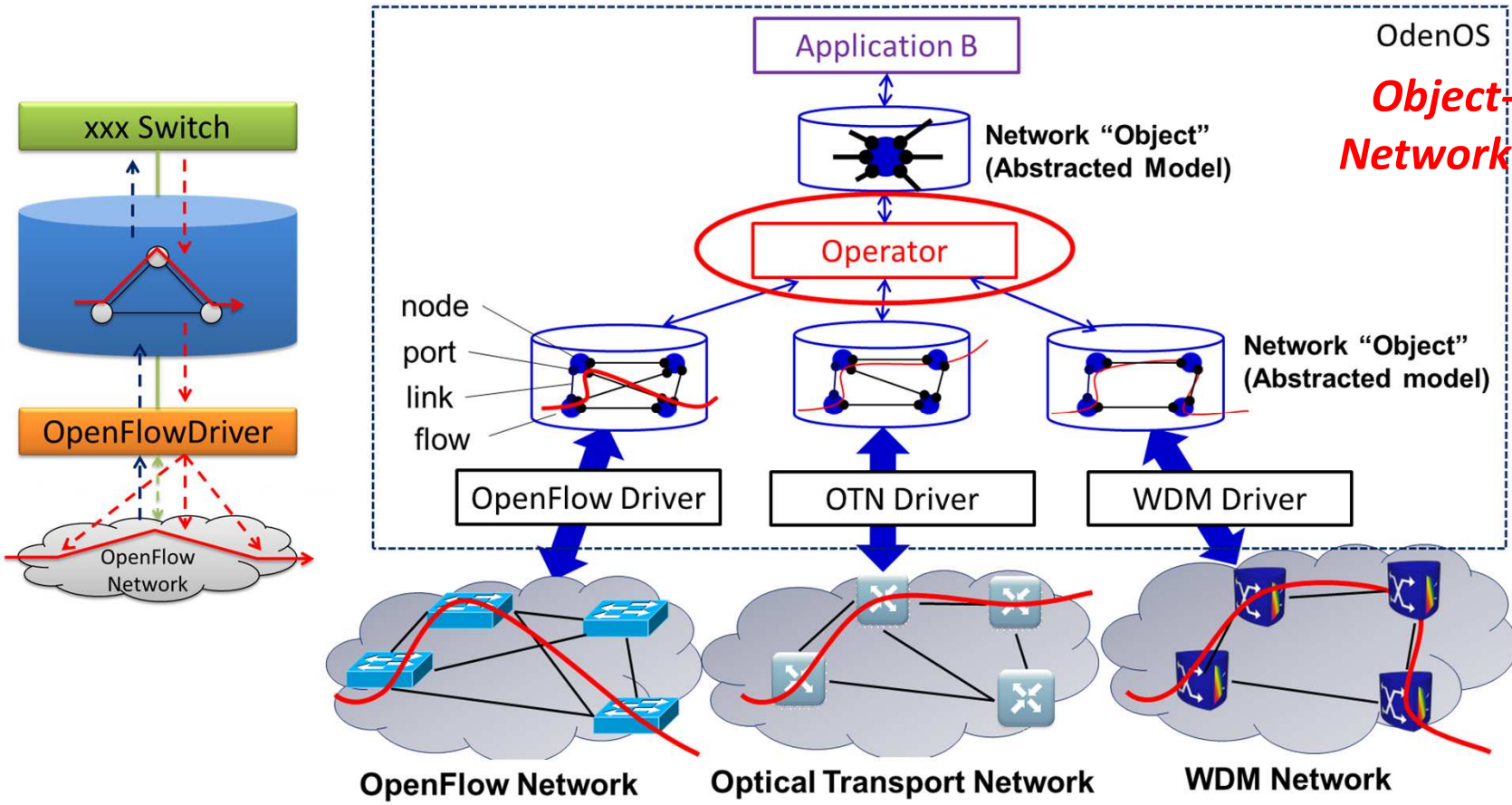
- ***Support multiple virtual networks over wireless networks while avoiding degradation of high priority traffic even when traffic demand and data rate of wireless link changes over time***



SDN Framework: ODENOS

- **Network Abstraction Model: Hierarchical**
  - Node, Port, Link, Flow, and Packet
- **Enables easy extension & customization**

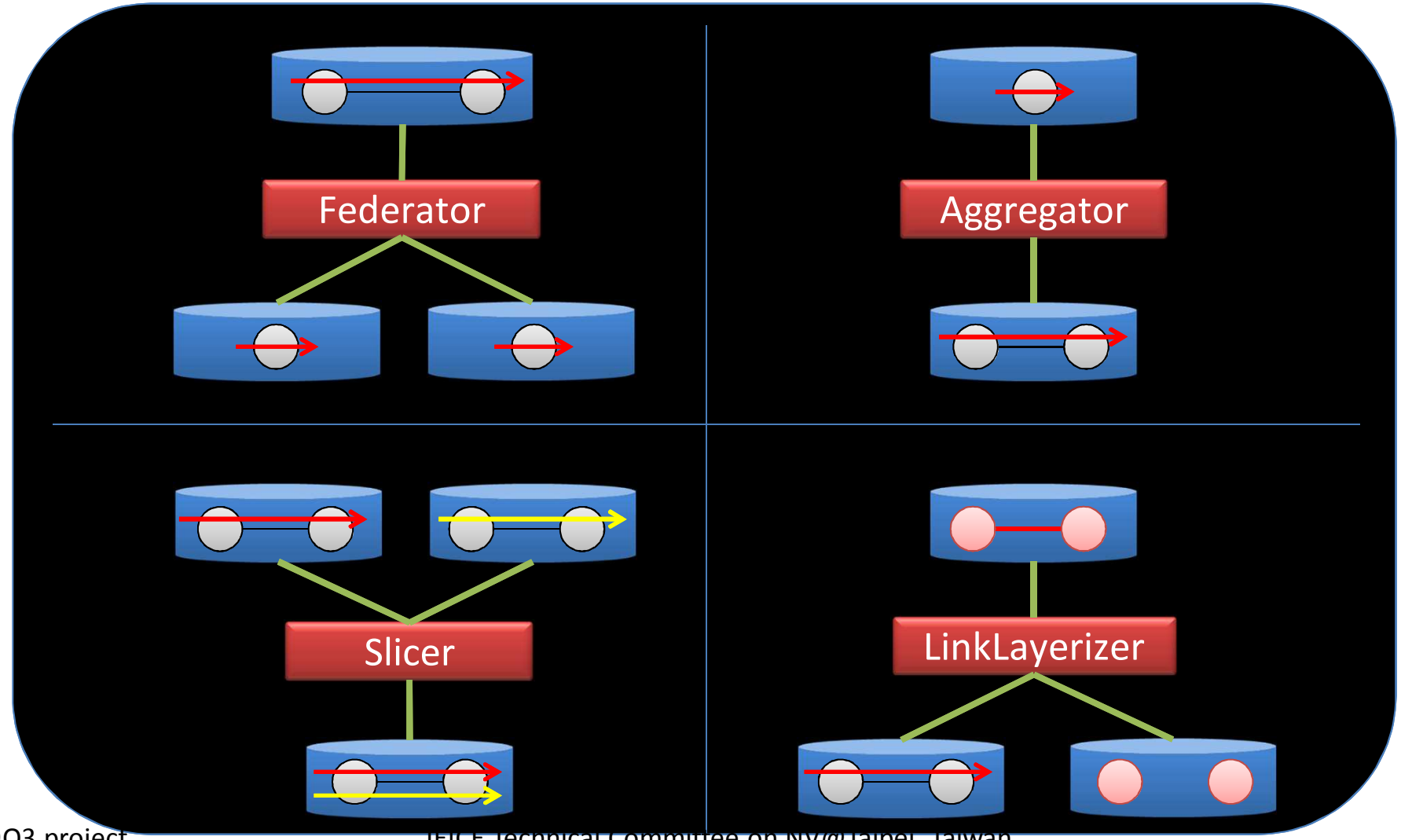




Object-defined Network Platform

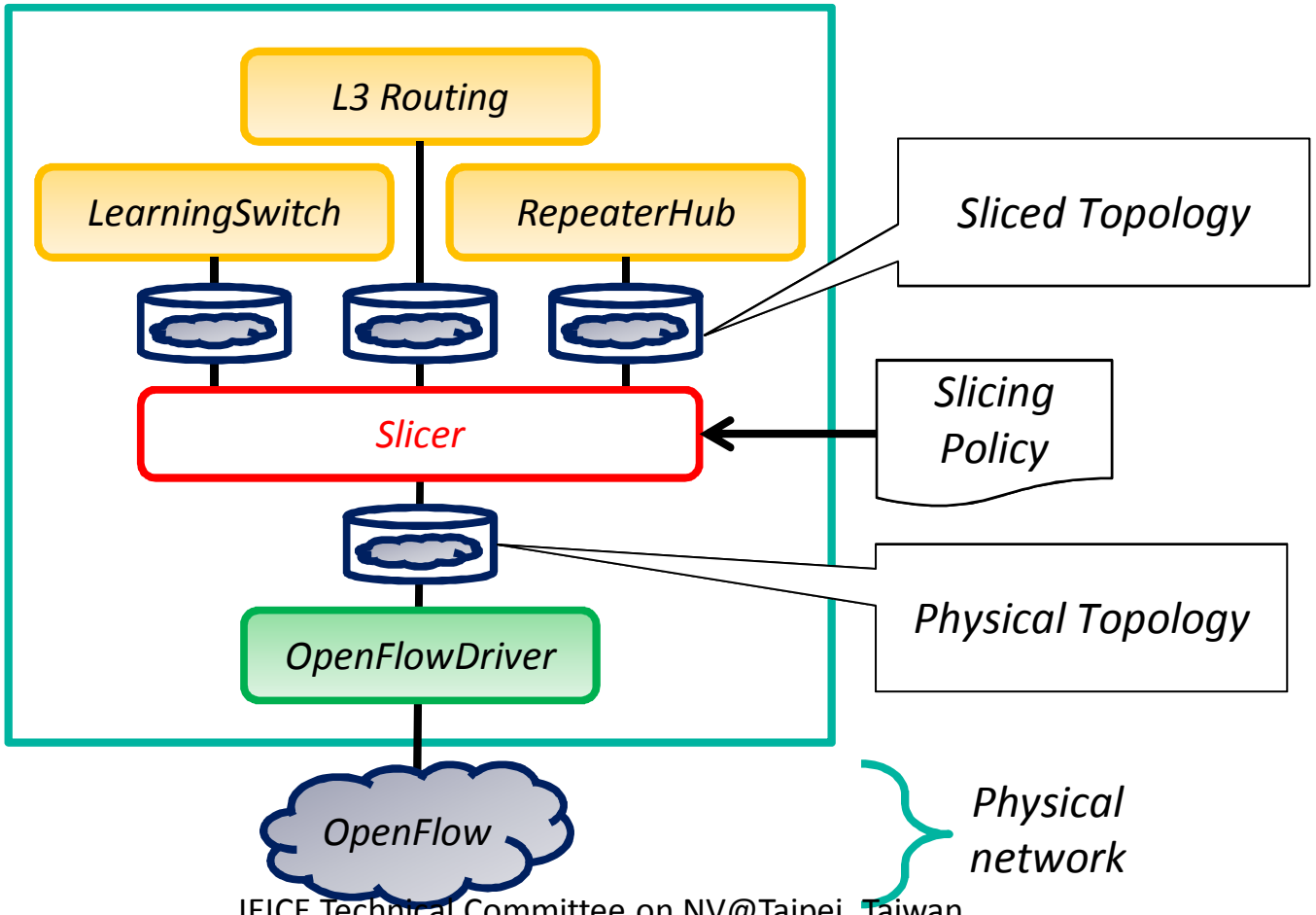
Abstract Network Operators in ODENOS

Slicer, Federator, Aggregator and Link-Layerizer



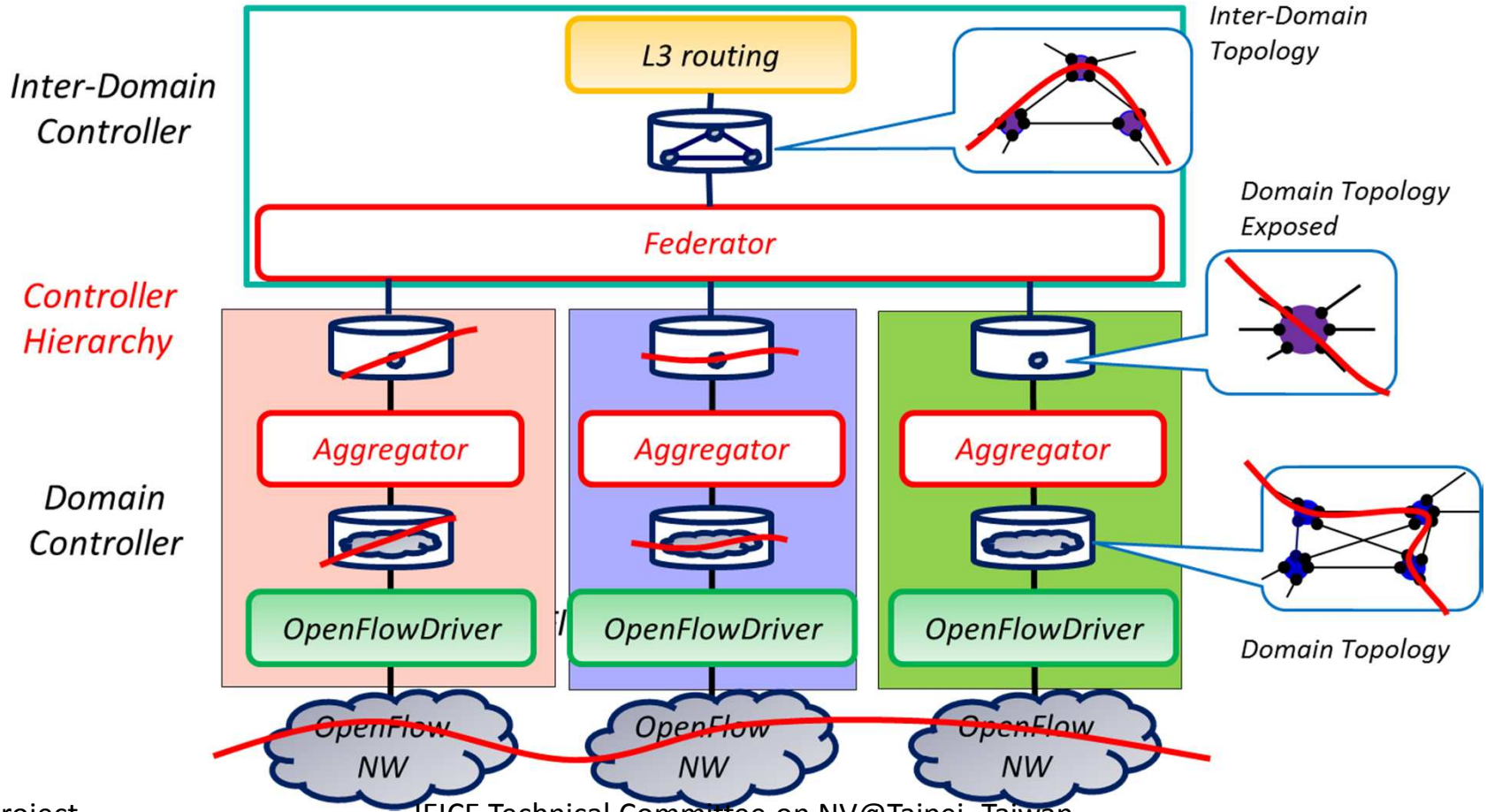
NW Operator: Slicer

- *Slicer: creates copies of the network object based on the given policy: Edge ports, TCP/UDP port number (i.e., application)*
- *Enables multi-tenancy, multiple applications*



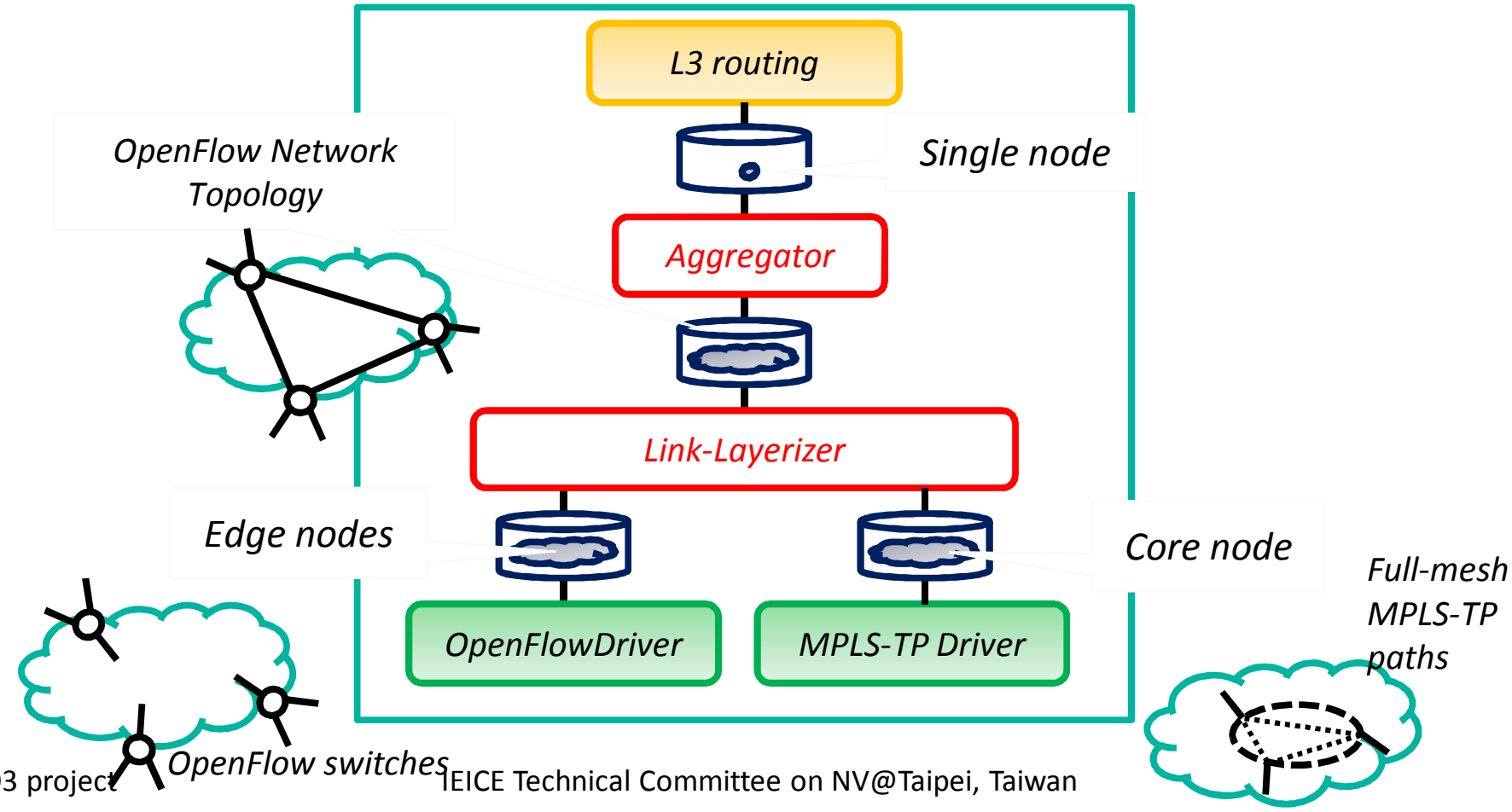
NW Operator: Aggregator & Federator

- *Aggregator: creates single big-switch abstraction*
- *Federator: connects multiple networks*
- *Use Case: multi-domain controller (with controller hierarchy)*



NW Operator: Link-Layerizer

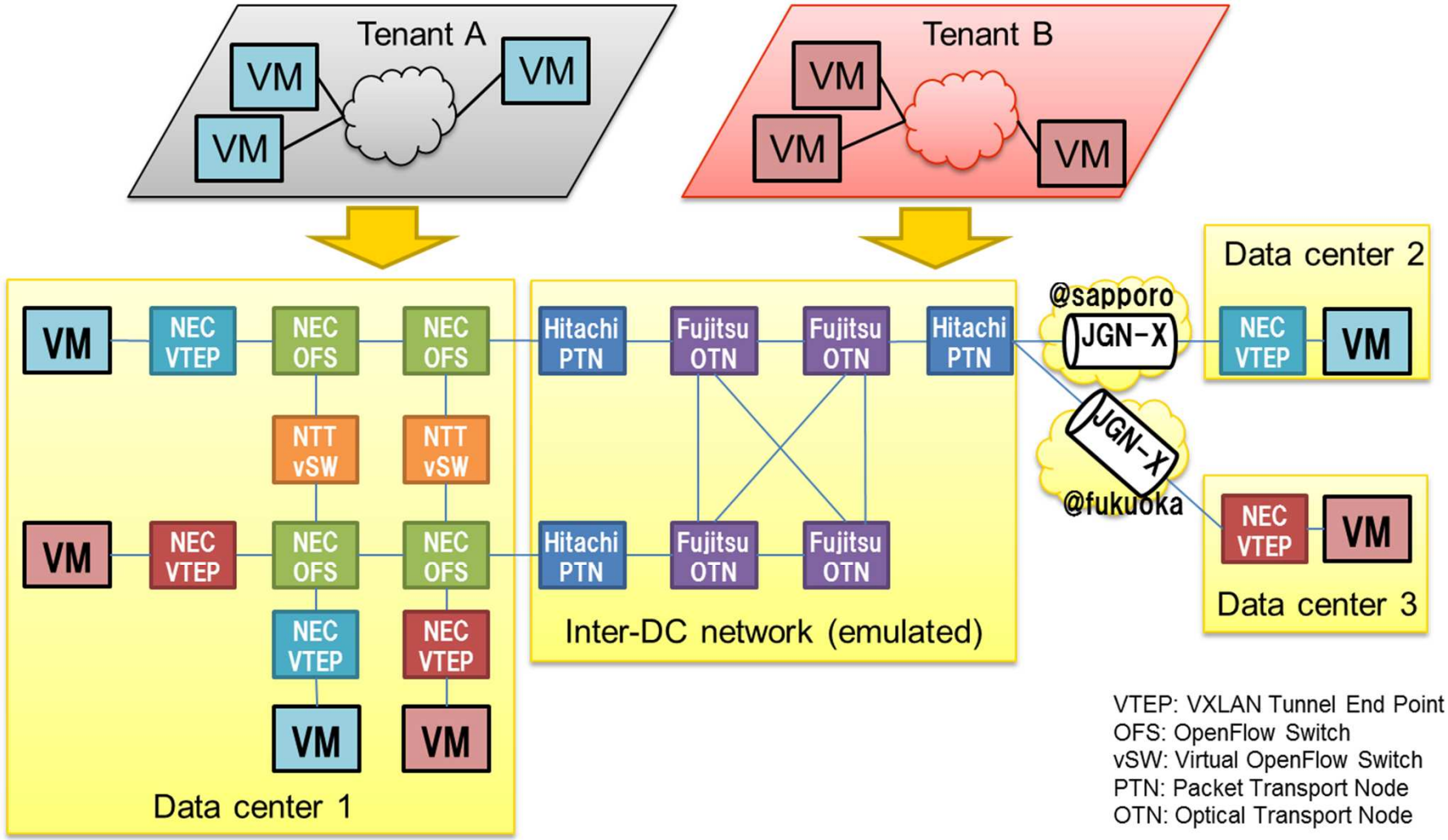
- *Link-Layerizer: creates a network from the upper-layer nodes and lower-layer "paths" (flows)*
- *Use Case: unified control of multi-layer networks*



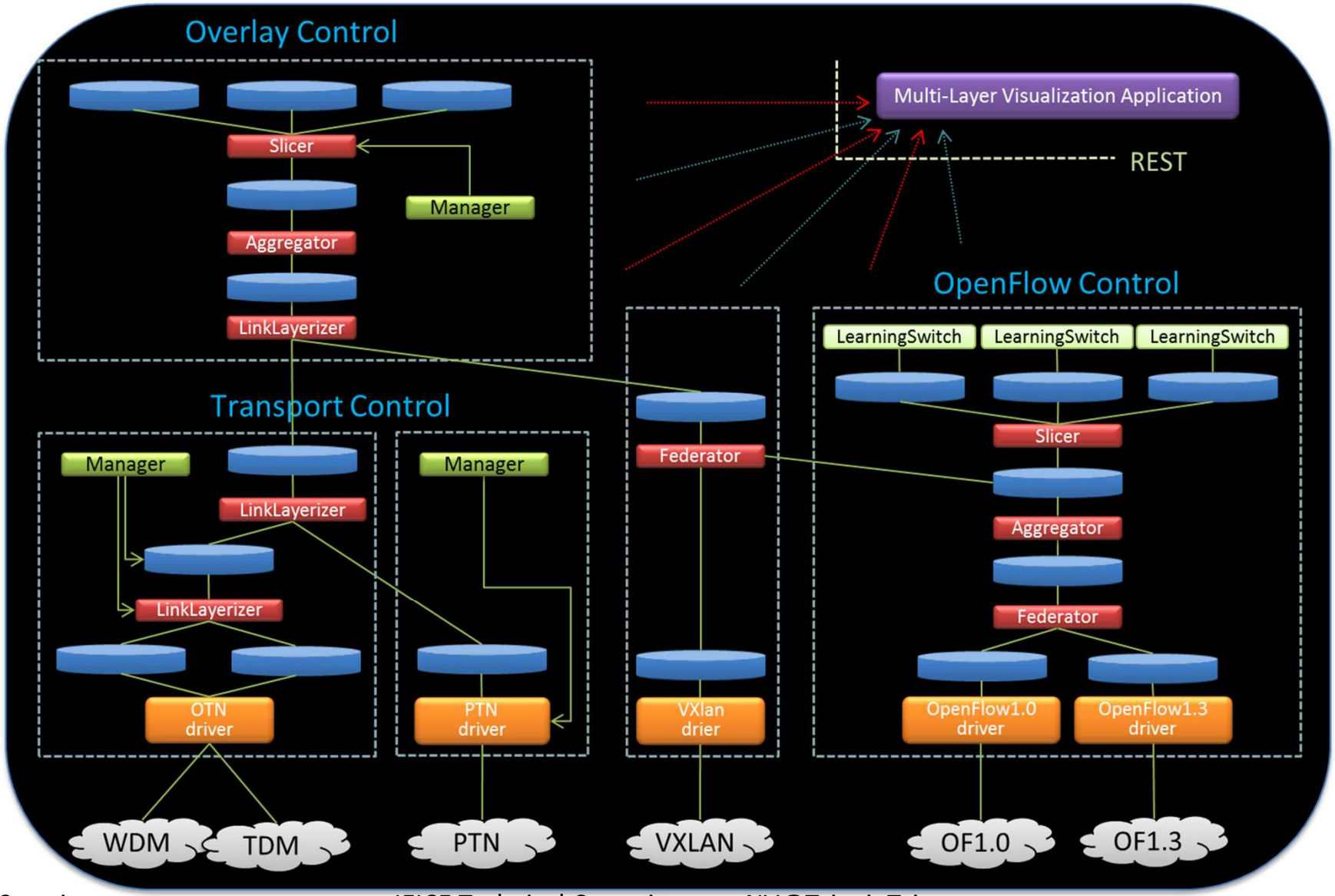
SDN Use Cases in O3 Project

Proof-of-Concept: Physical Configuration

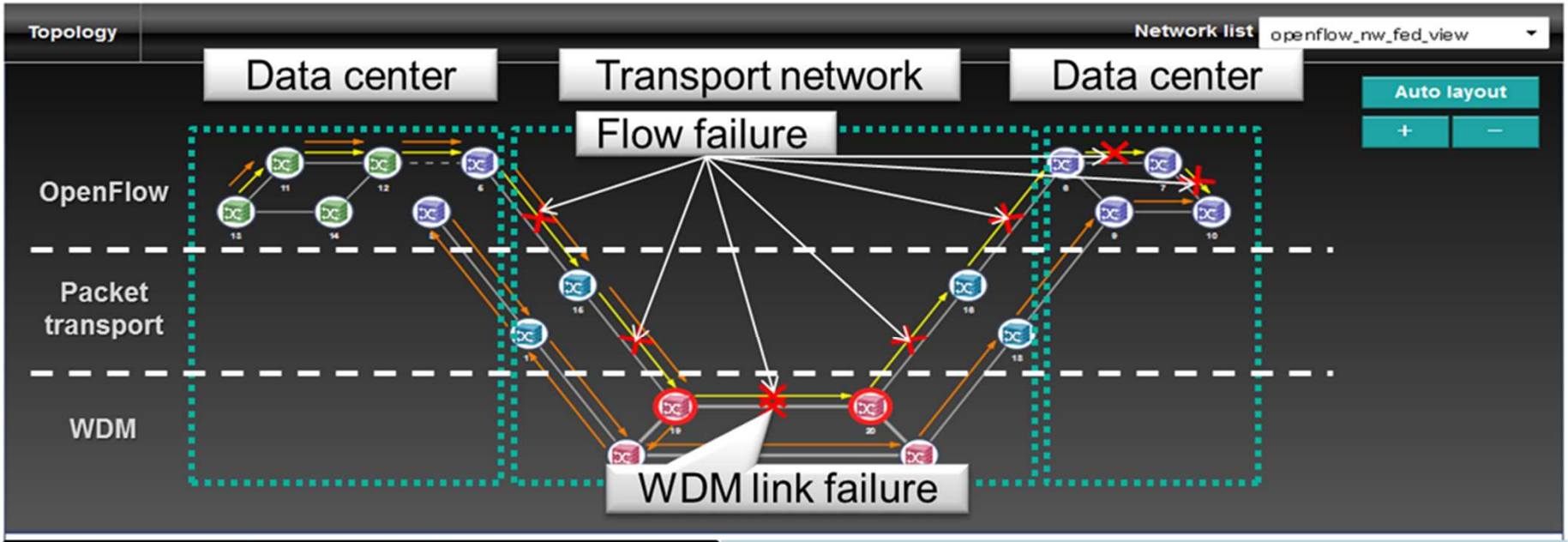
- WAN experiments with multi-vendor equipment

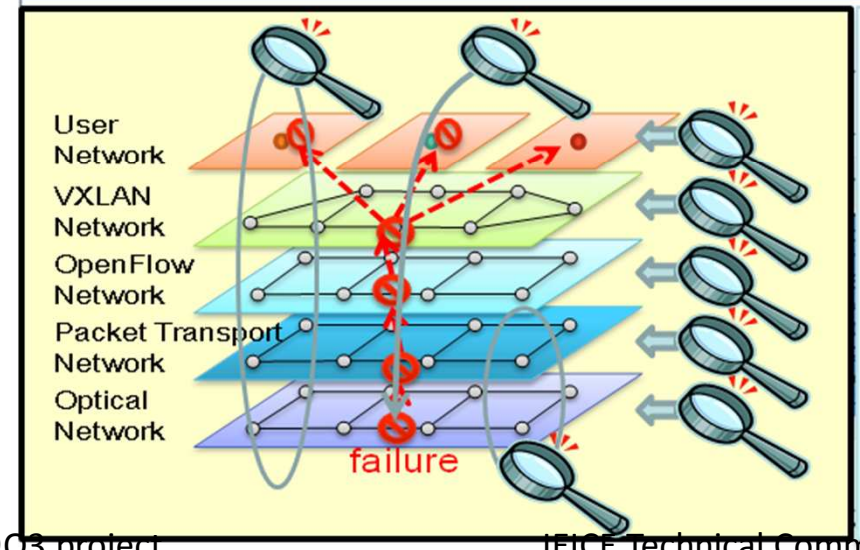


PoC on Multi-Layer & Domain Control



PoC on Network Visualization

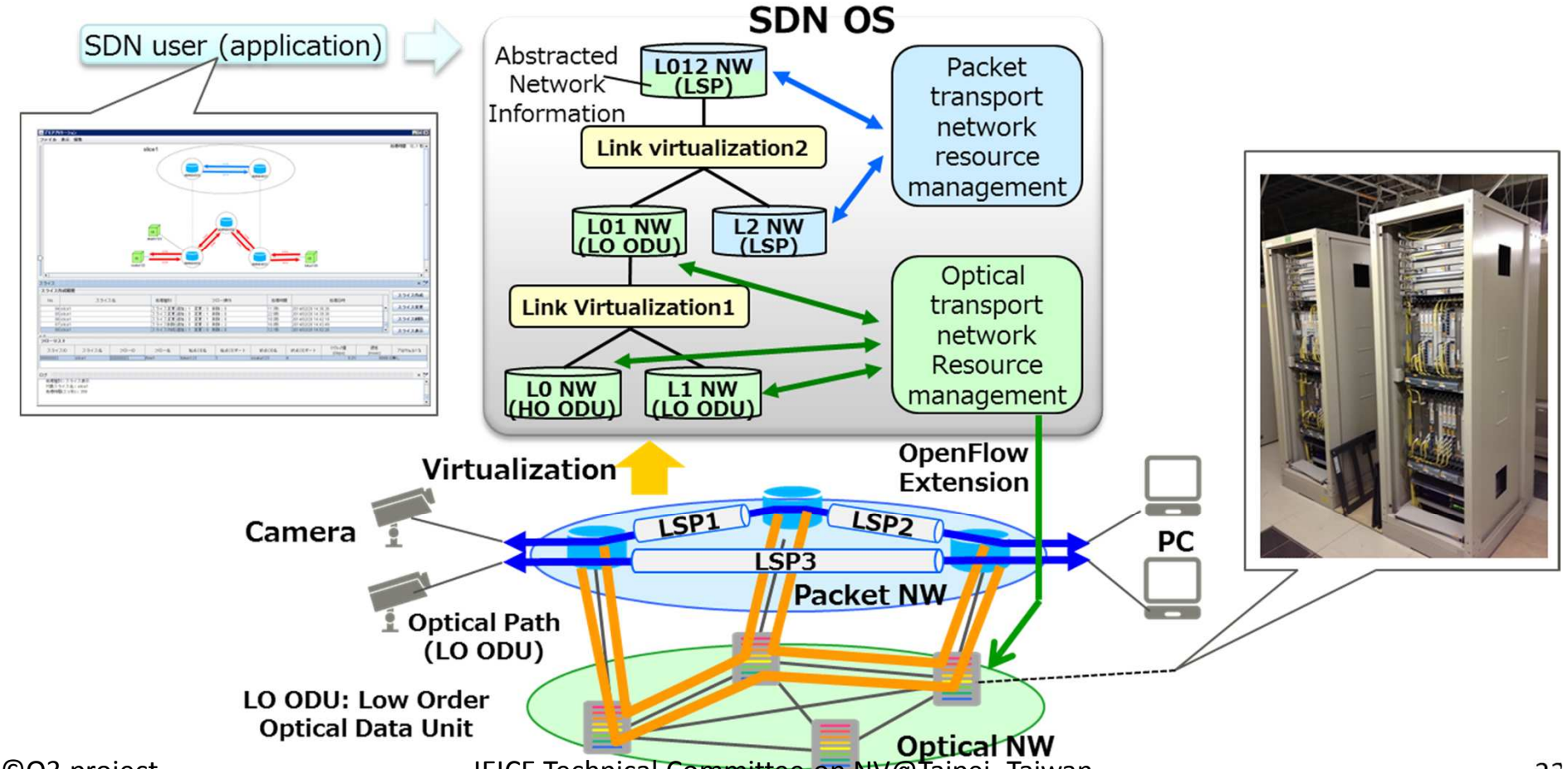




- Multi-layer topology visualization from logical network instances
- Inter-layer correlation mapping through operators
- Trouble shooting, failure analysis, etc.

PoC on Packet & Optical Integrated Mgmt

- *Control of transport network based on simple requirements from users such as transmission speed and response time*
- *Flexible multilayer resource utilization to meet user requirements*



Getting started with O3 Project Achievement

Conclusion & Future Work

- *We have released the following O3-project deliverbles on line.*

Doc ● *SDN Design, Deployment & Operations Guideline**

**Currently only the Japanese version is available.*

OSS ● *SDN Framework: ODENOS*

- ◆ *Object-defined Network Platform*
- ◆ *Network Abstractions and Programming Model*

OSS ● *SDN-enabled WAN nodes*

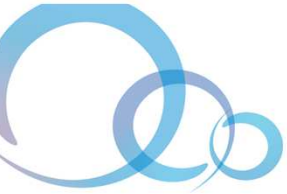
- ◆ *SDN Software Forwarding and Control (Lagopus)*
- ◆ *Optical core resource driver and Packet transport*

For Japanese Language :http://www.o3project.org/ja/download/index.html

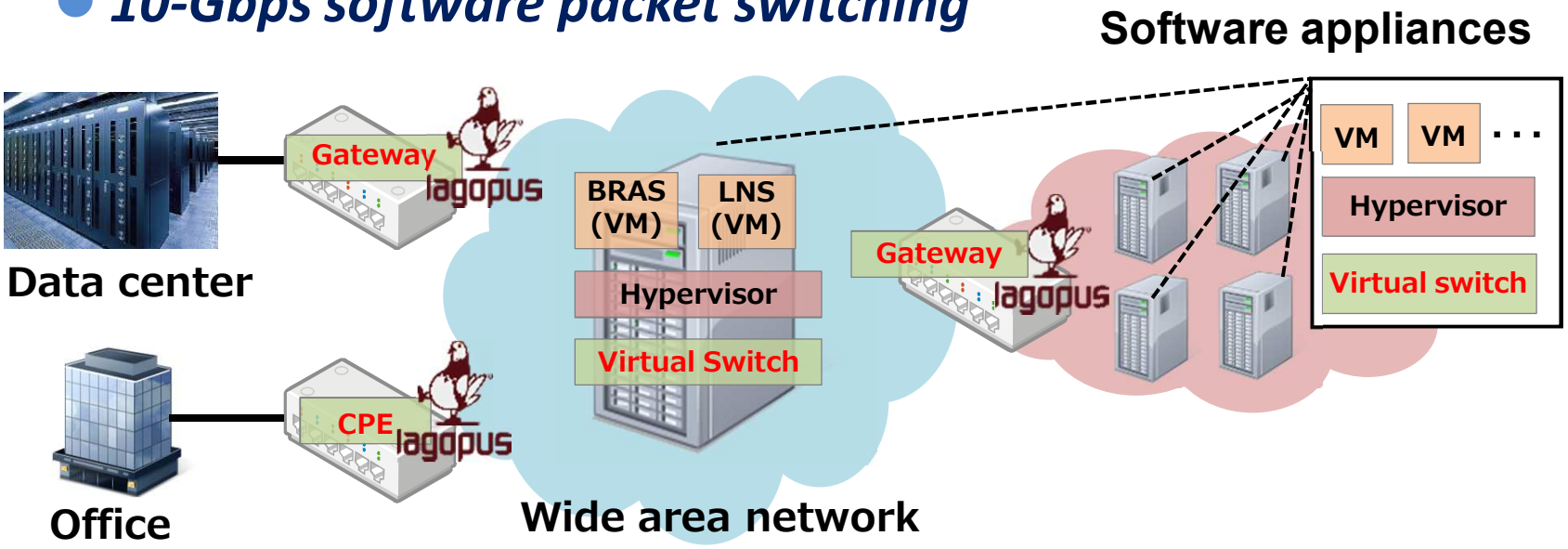
For English language: http://www.o3project.org/en/download/index.html

Tomorrow's Hands-on Tutorial

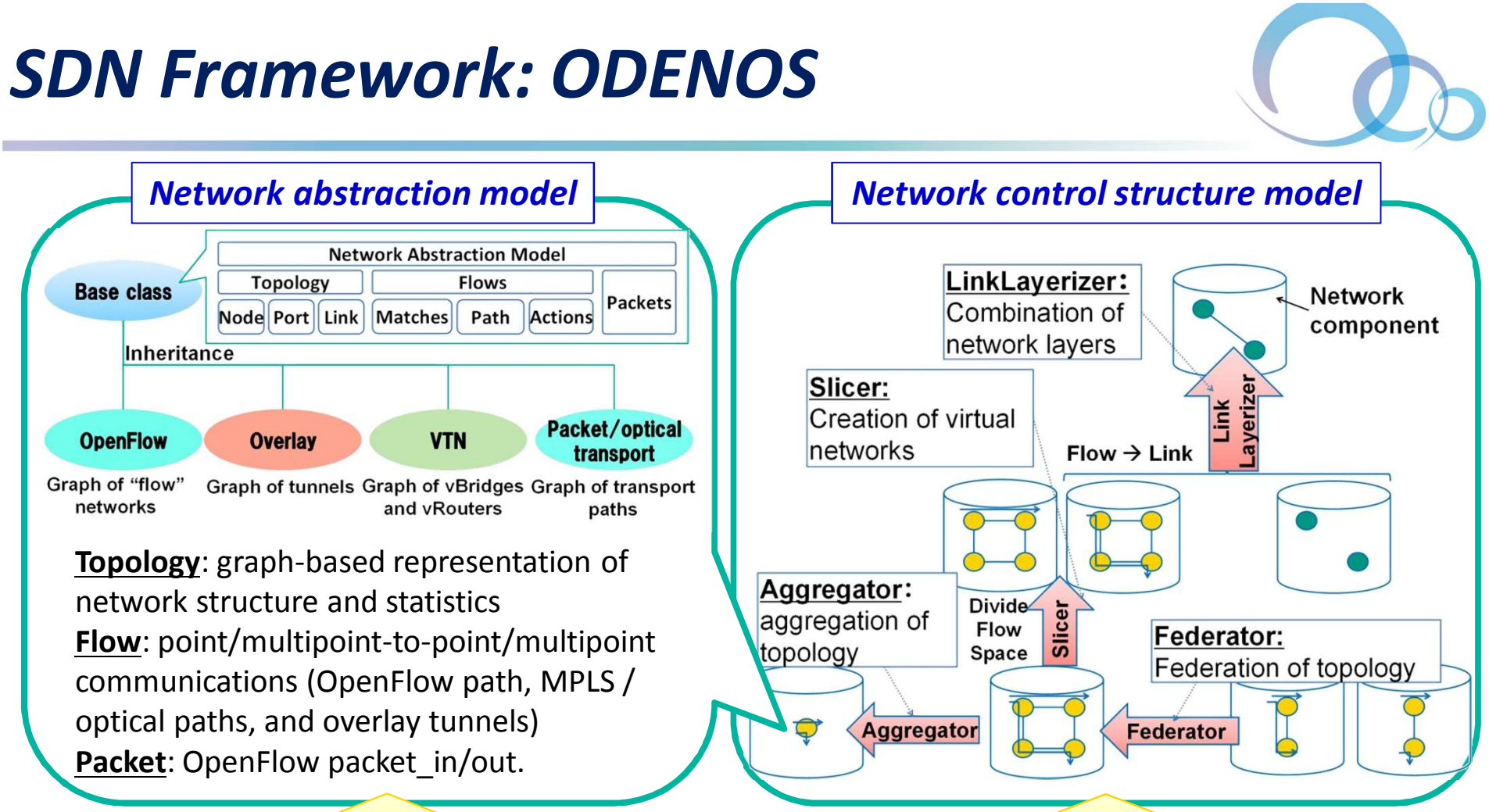
Software Switch: Lagopus



- **Supported protocols/interfaces**
  - OpenFLow 1.3.4 (latest stable version)
  - WAN protocols (MPLS, PBB, and QinQ)
  - OF-CONFIG, OVSDB, CLI, SNMP, and Ethernet OAM
- **High-performance packet processing**
  - Large-scale 1-M flow entries
  - 10-Gbps software packet switching



SDN Framework: ODENOS



Thank you for your attention!

O3 project

www.o3project.org/en

This research is executed under a part of a "Research and Development of Network Virtualization Technology" program commissioned by the Ministry of Internal Affairs and Communications.