OpenFlow Network Testbed in TWAREN

NCHC

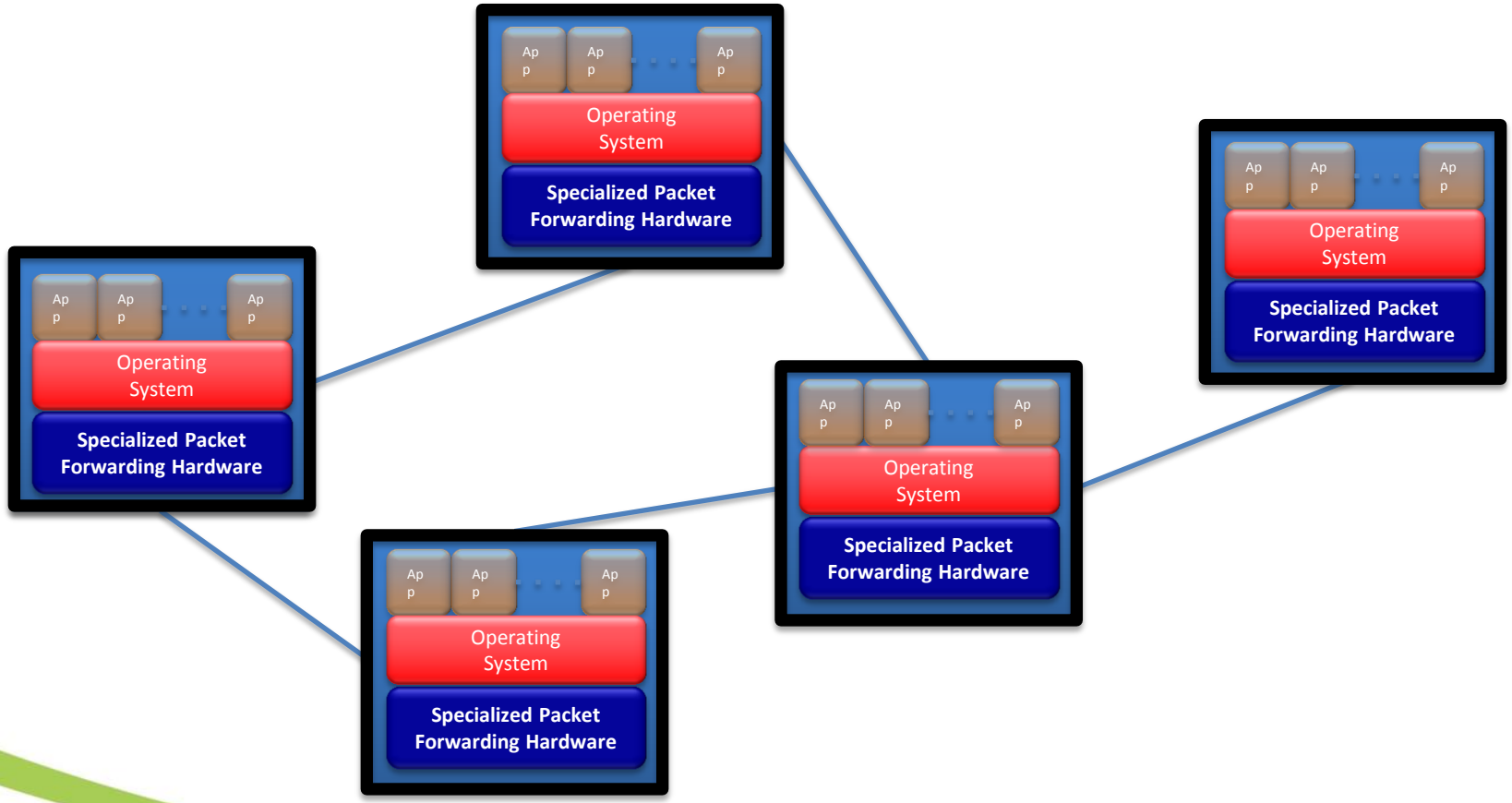
Jen-Wei Hu

Outline

- Software-defined Network
- OpenFlow
- TWAREN OpenFlow Testbed

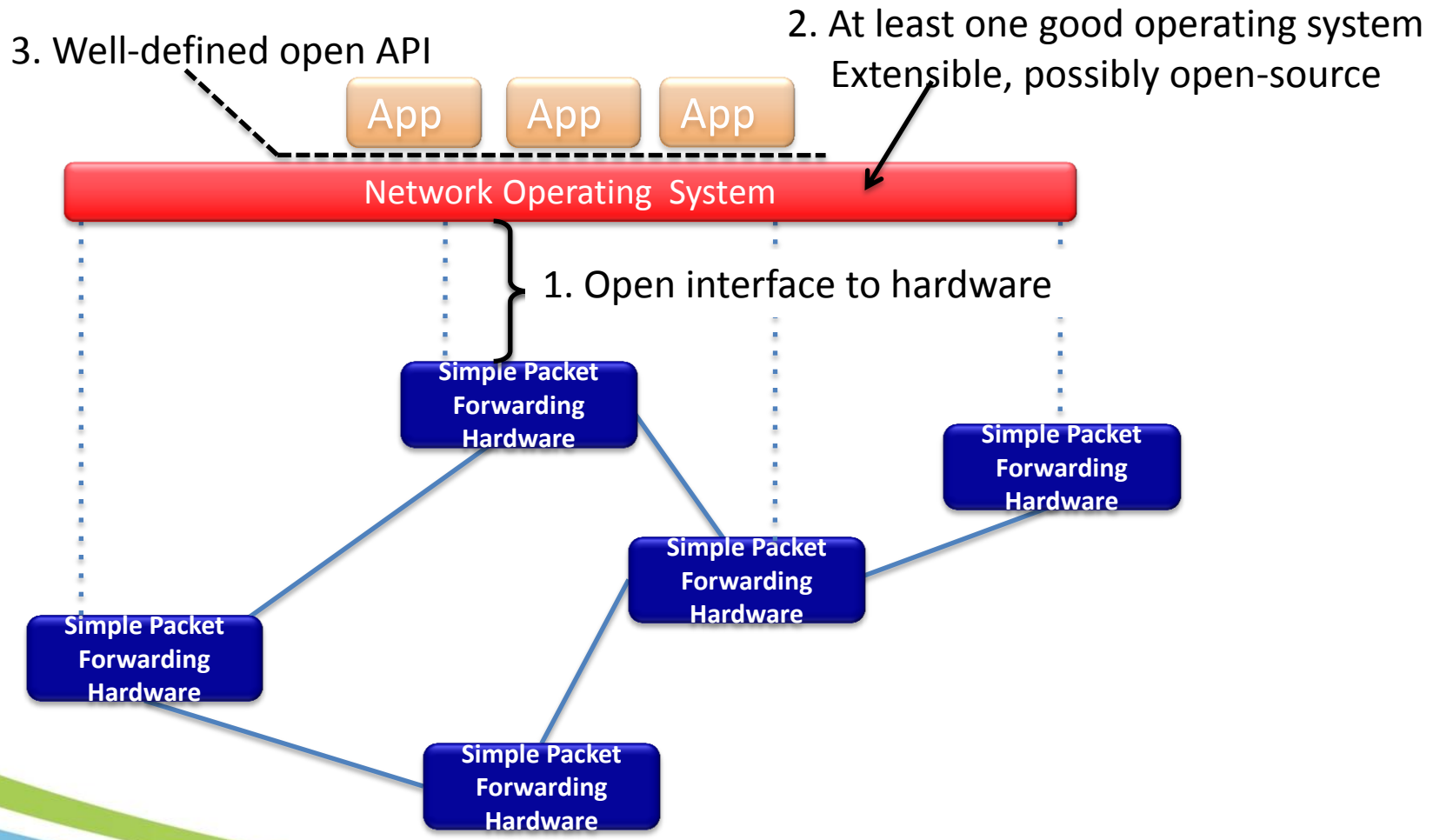
Current Internet

- Closed to innovations in the infrastructure



Source: openflow.org

Software-defined Network

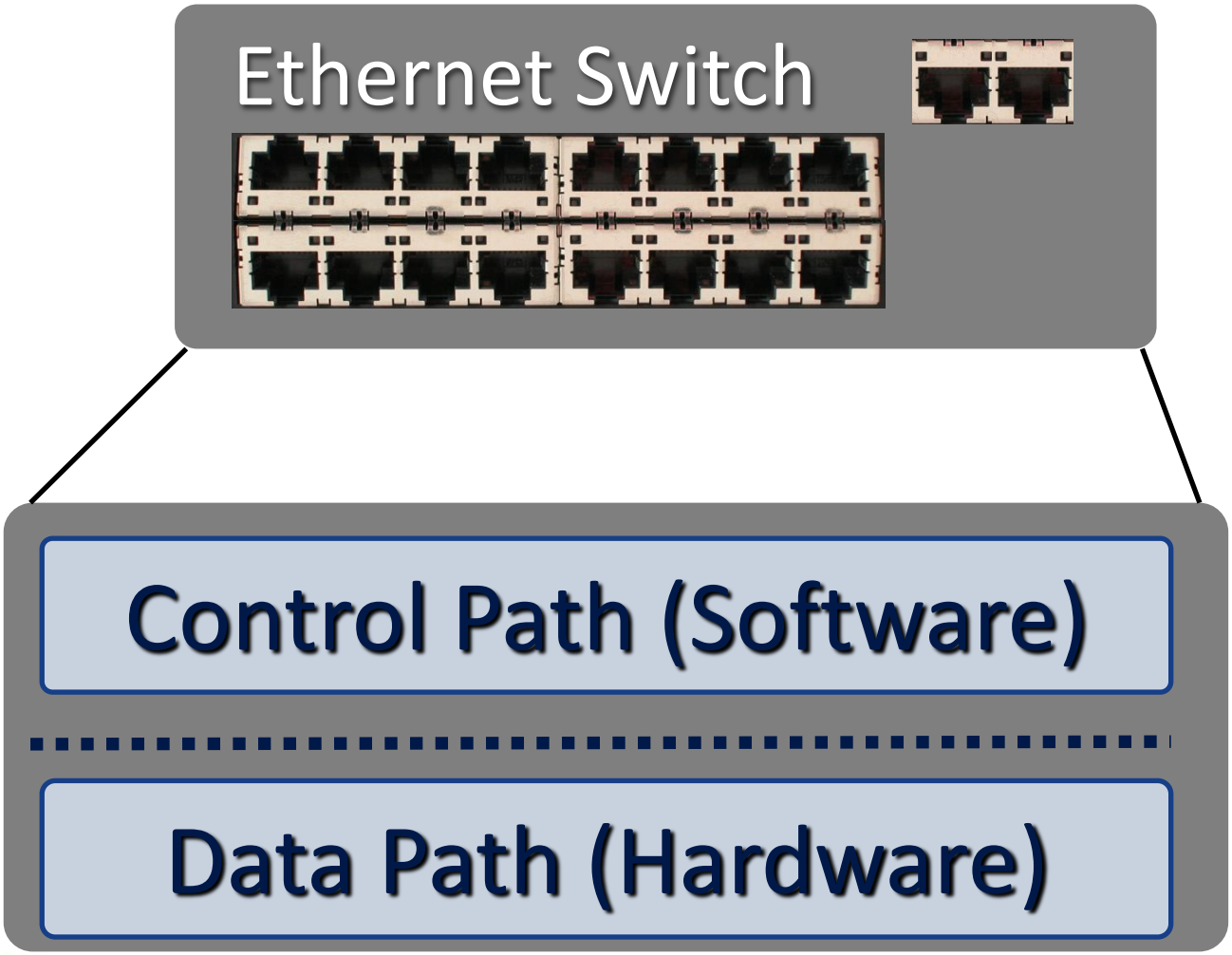


Source: openflow.org

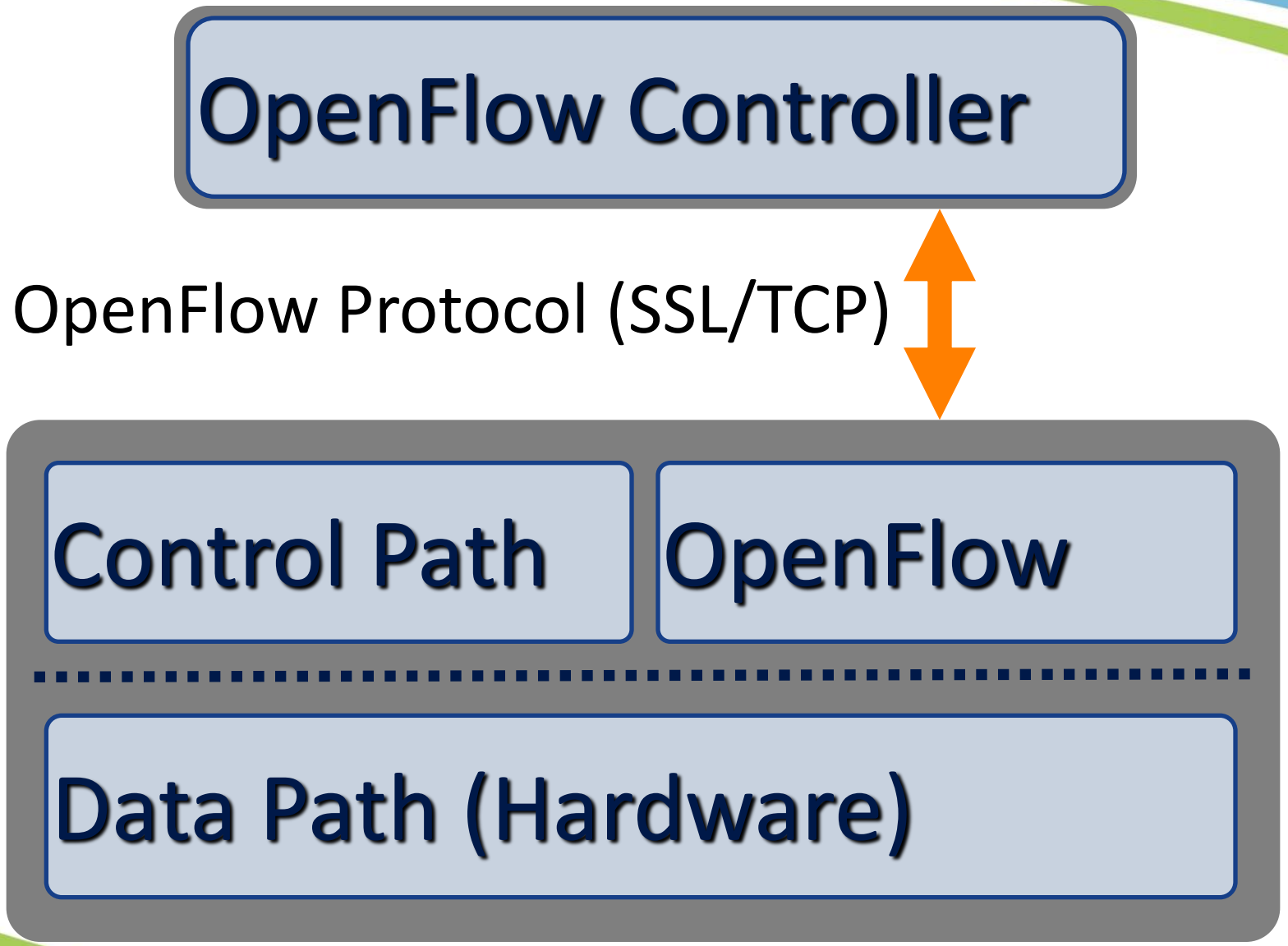
OpenFlow

- OpenFlow is an open interface for remotely controlling the forwarding tables in network switches, routers, and access points developed by Stanford University.
- Standards was released on the website http://openflow.org, now it is maintained by *Open Networking Foundation* since 2011/03 (http://www.opennetworking.org/)

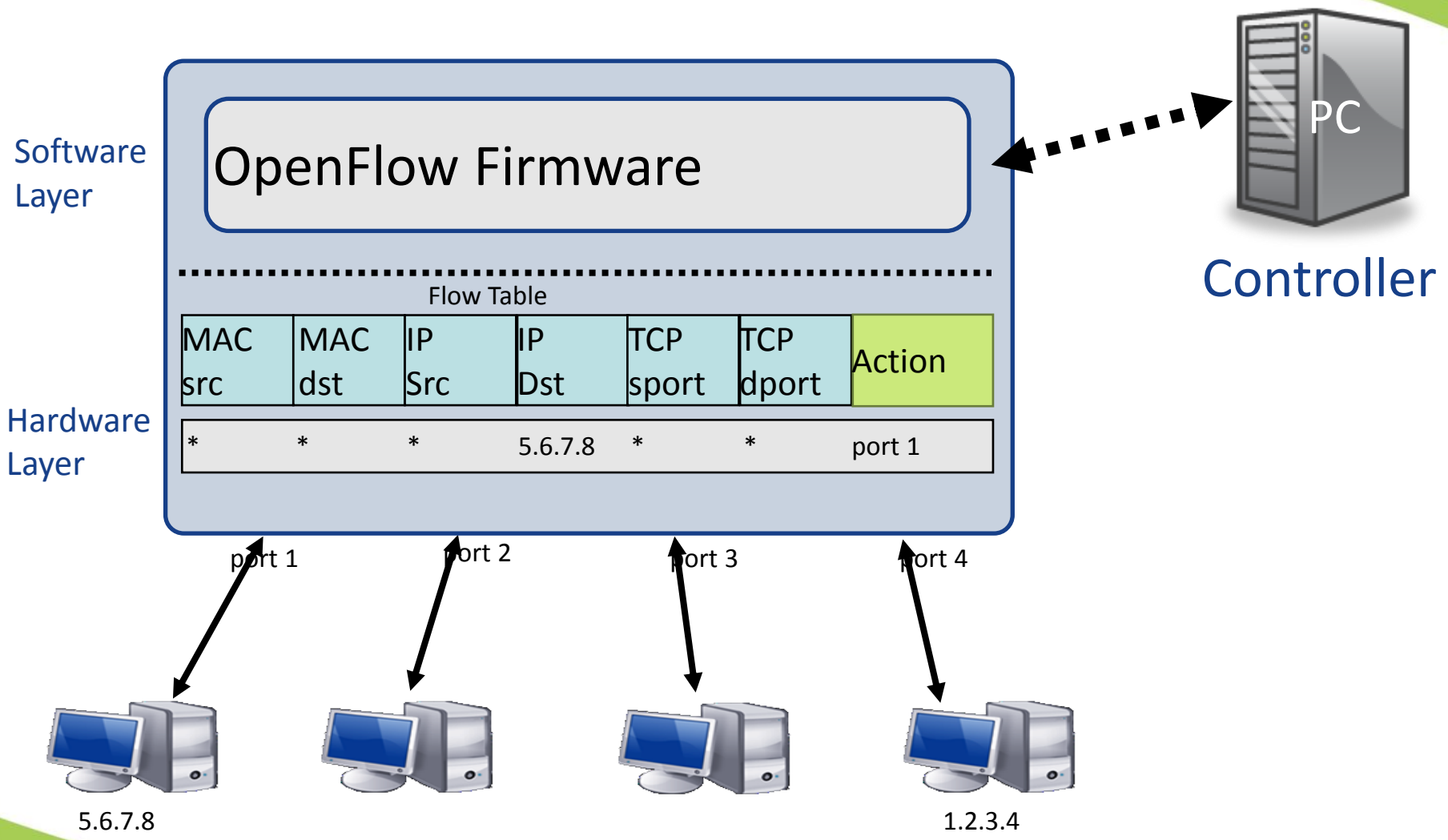
Classic Switch



Source: openflow.org

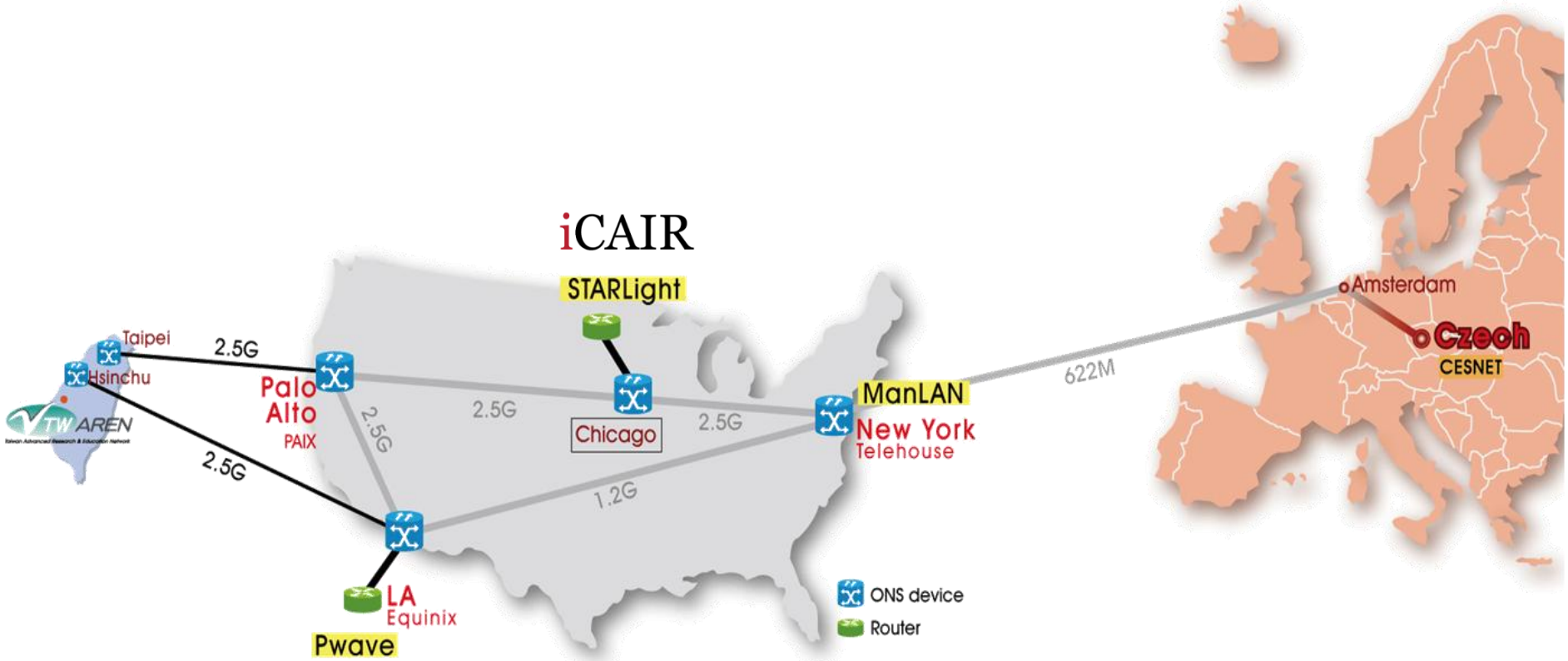


Source: openflow.org

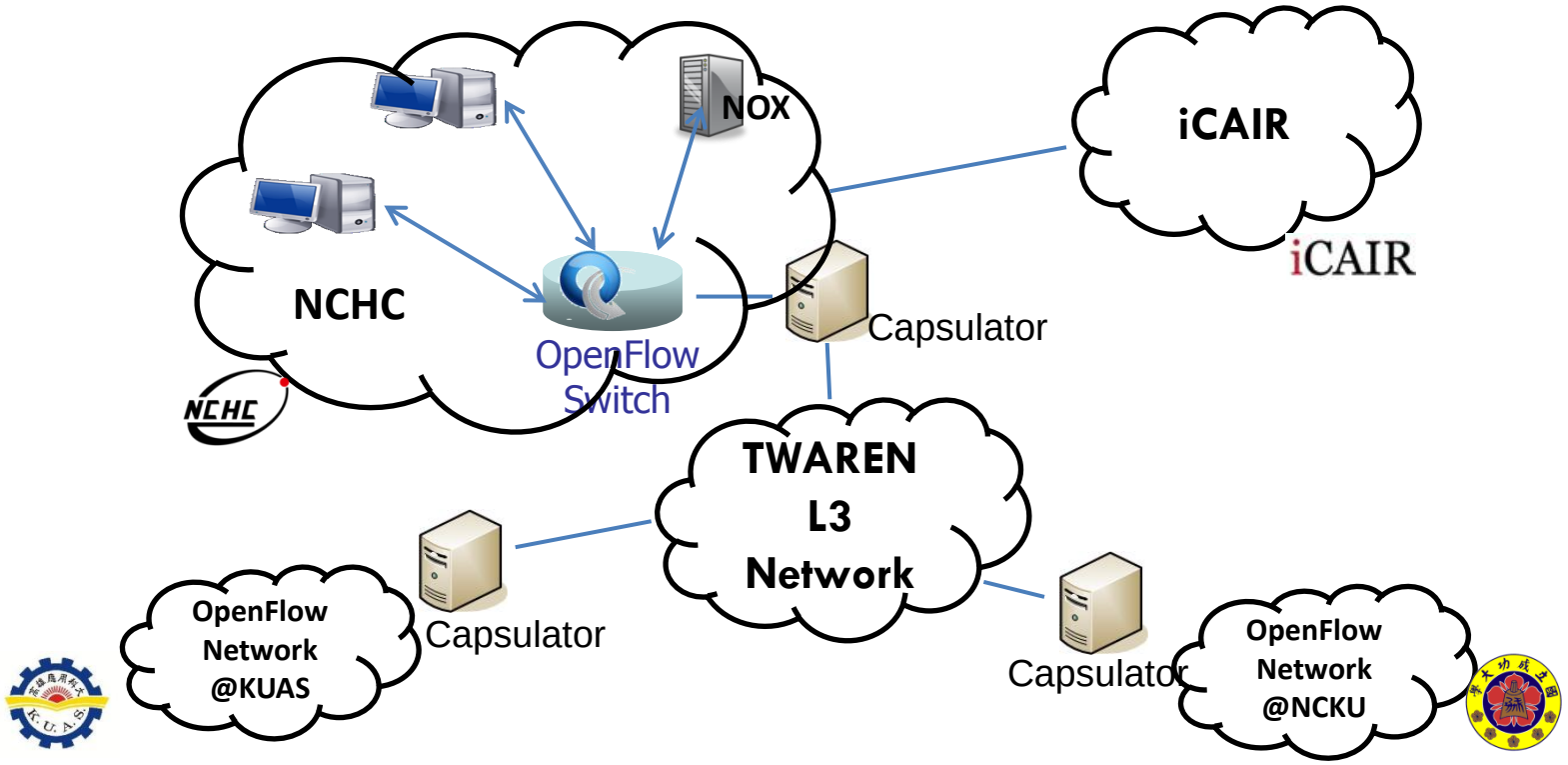


Source: openflow.org

TWAREN International Circuit

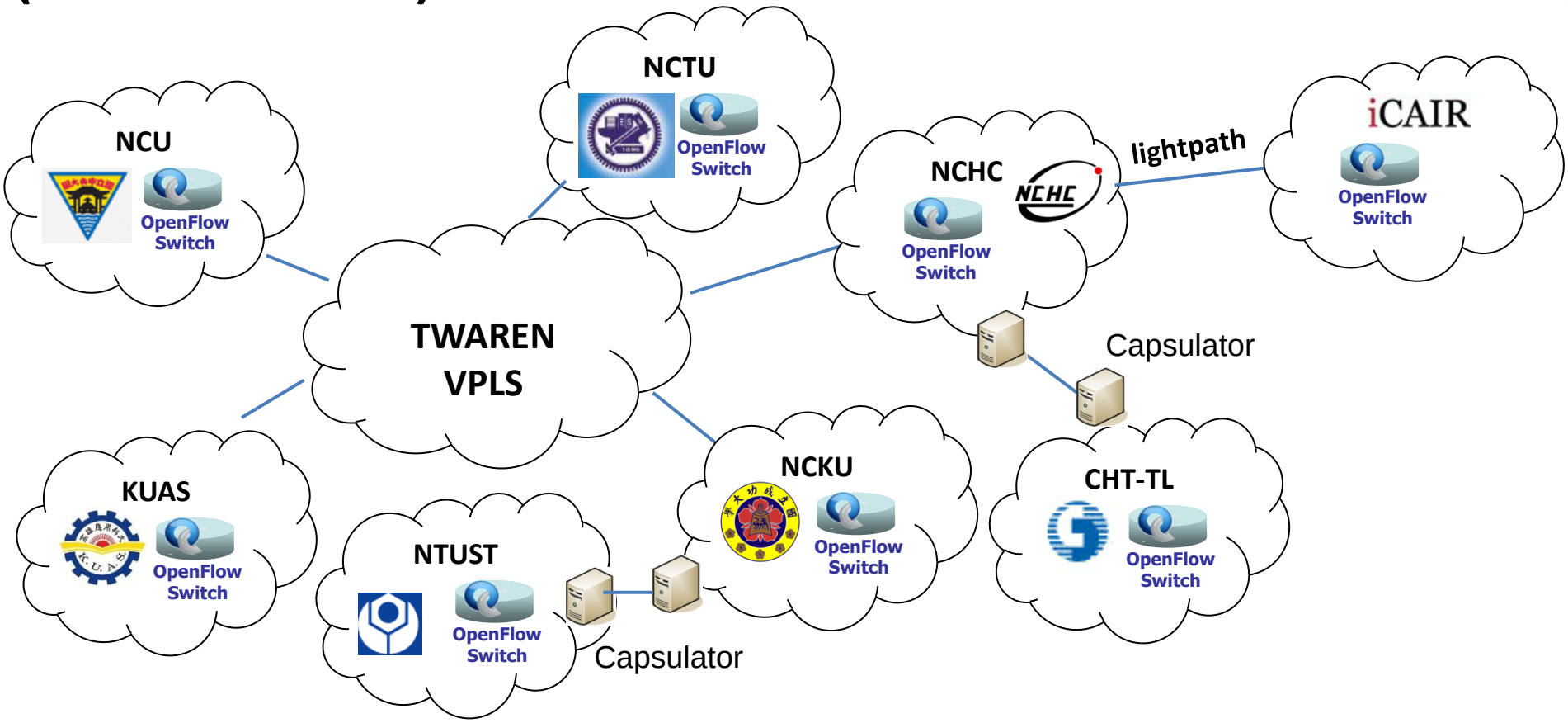


TWAREN OpenFlow Testbed (2010)



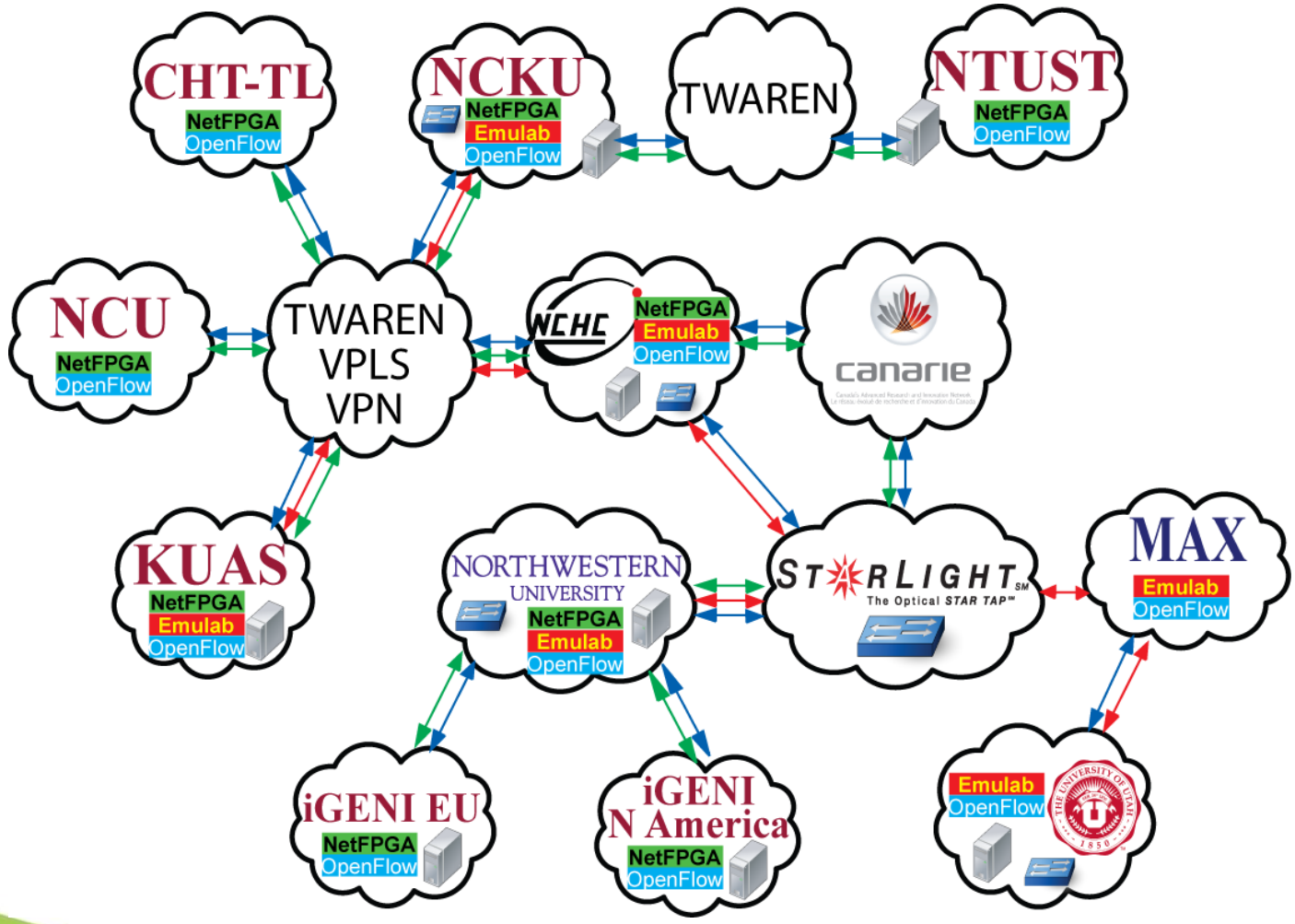
- NCKU and KUAS are pilot universities that connected with the Testbed
- The OpenFlow Testbed is extended to iGENI@iCAIR
- Capsulator (Ethernet-in-IP tunnel) is used to emulate pure L2 network for OpenFlow

TWAREN OpenFlow Testbed (2011~now)



- NTUST, NCU, NCTU and CHT-TL joined the Testbed.
- For TWAREN connectors (NCTU, NCKU, KUAS and NCU), a dedicated VPLS VLAN is allocated for better transmission performance.

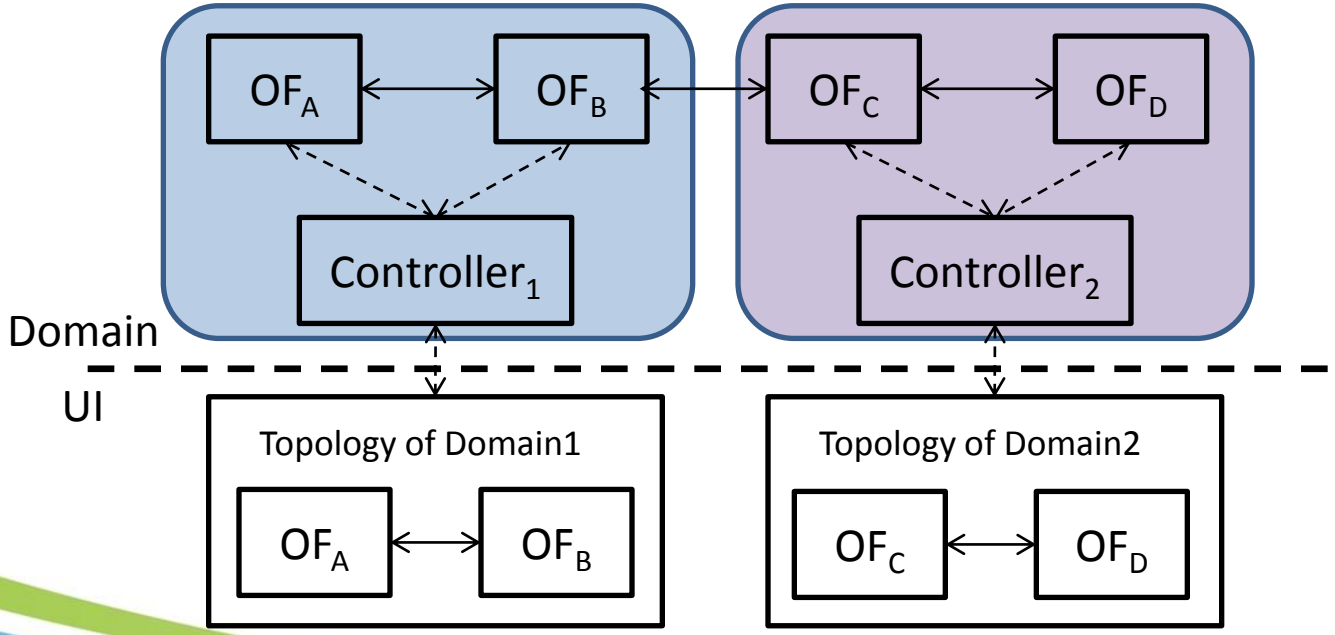
iGENI-Taiwan Integrated Research Network



Source: iCAIR

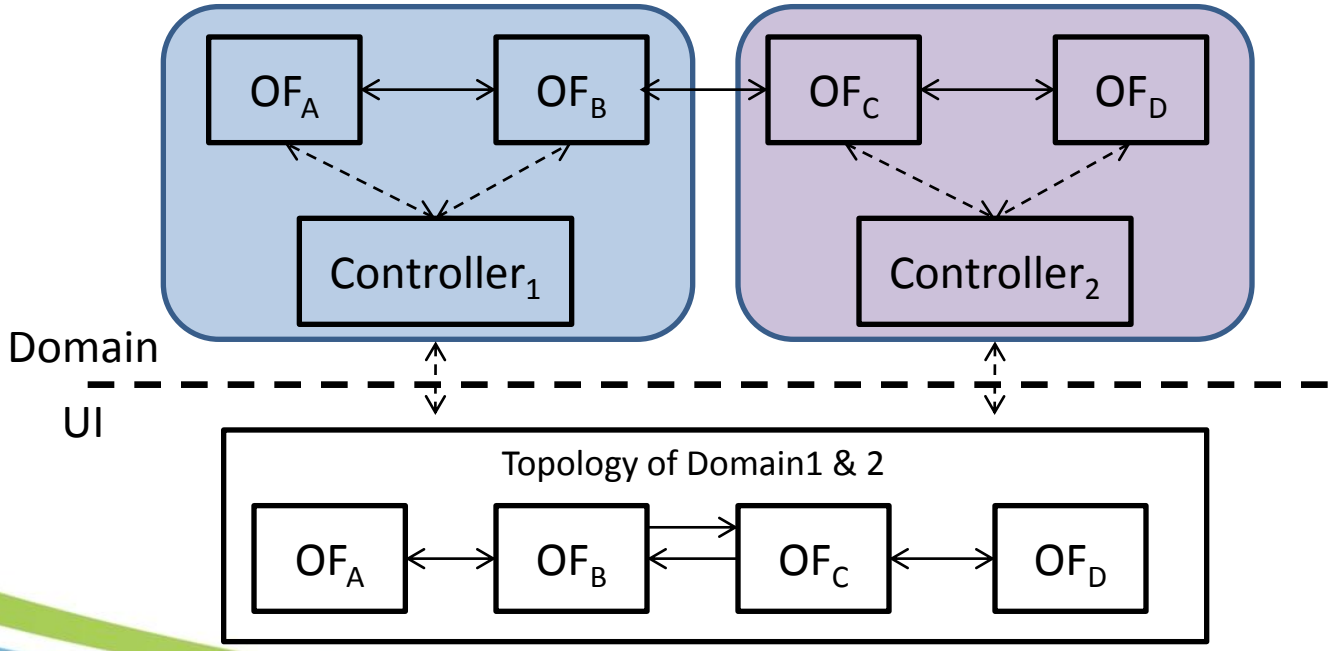
Inter-domain Connection (1/3)

- OpenFlow Controller just only knows its directly connected switches.
- It will be inconvenient when the environment has more than one OpenFlow domain.

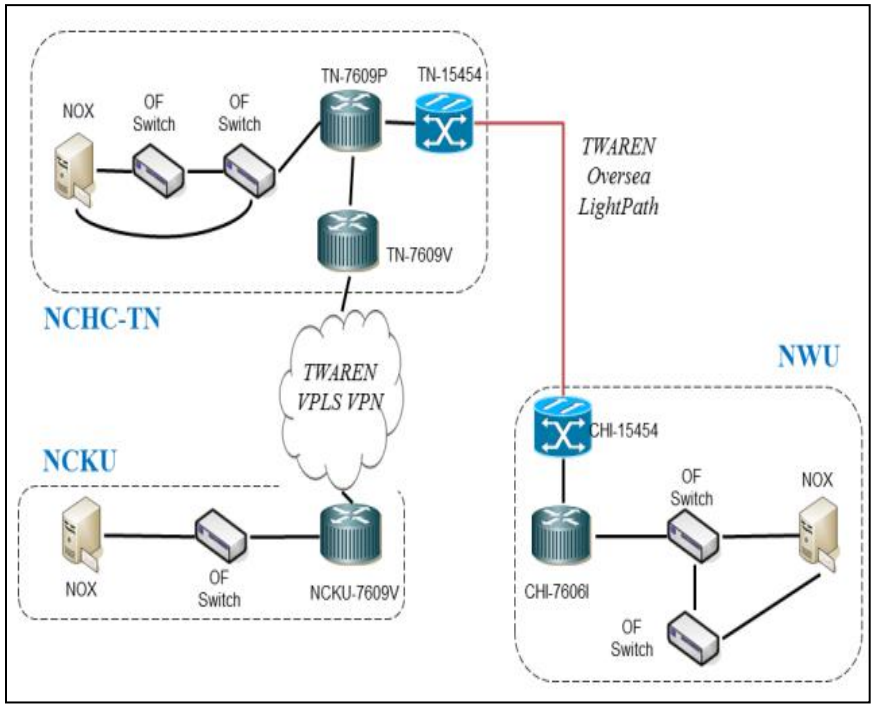


Inter-domain Connection (2/3)

- We add additional contents in LLDP packet to let directly connected Controllers have its neighbors' topology.

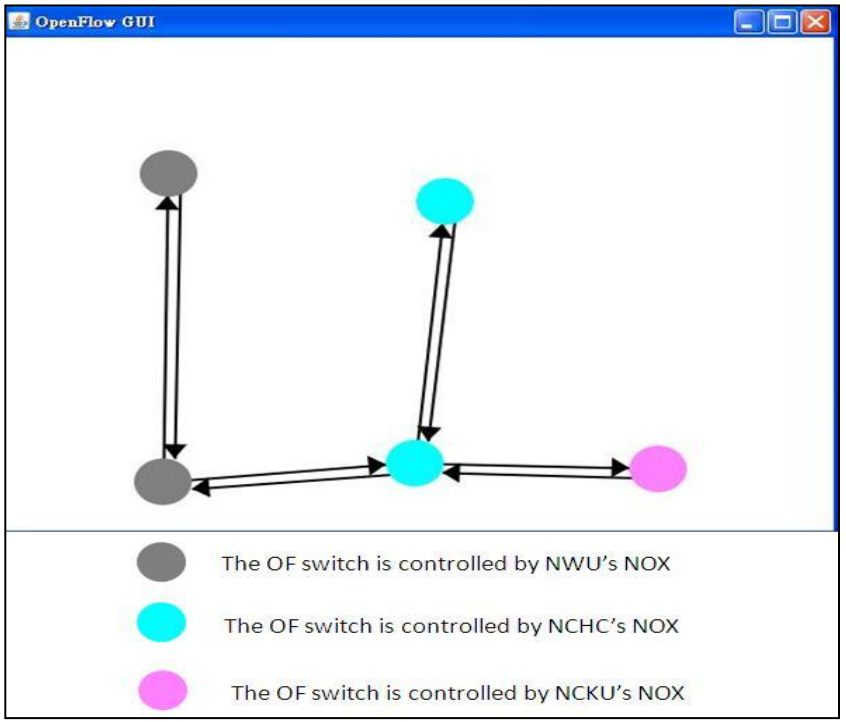


Inter-domain Connection (3/3)



Physical OpenFlow Network Topology

Multi-Domain Network Topology shown in GUI



What You Can Do

- 教學
  - 網路概念與實作
- 研究
  - 由模擬到真實
  - 實現創新想法
- 應用
  - 與應用層軟體整合

How to Connect to NCHC

- SSLVPN/VPLS
- Tunneling Software
  - Open vSwitch, Capsulator

THANK YOU!