SYMPHONY- Controller Architecture for Hybrid Software Defined Networks

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Current state of Legacy Networks

• Internet Routing Table:
  2008 : 256k routes
  2014 : 512k routing entries

• Total Internet traffic:
  2007 : 2000 GBps
  2014 : 16,144 GBps

Then why SDN?

- Zero flexibility on how networks operate.
- Management-per-box, hectic and error-prone.

What does SDN offer?

- Programmability → faster innovation
  - eg: real-time network feedback loops to compute better flow paths
- Separation of control and data plane → better management
  - eg: elimination of multiple points of configuration
Deploying SDN?

- Complete overhaul of existing network
- Partial adoption of SDN

Incremental deployment

Brownfield network
Benefits of co-existence legacy and SD-networks (Hybrid SDN deployment)

- Retaining desirable features of legacy networks
- Opening new ways of operating networks.
  - eg1: single plane of management
  - eg2: creating newer data plane to legacy devices
  - eg3: real-time traffic analysis and feedback + eg2
- Layer8 – up skilling
- Return of Investment
What are the requirements for deploying Hybrid SDN?

- Route validity and path visibility
- Simplified management
- Fault tolerance, detection and rectification
- Planning testing and deployment
what are the challenges to be addressed?

- Handling of legacy control plane traffic.
- Optimal route selection by selecting better egress node
- Invalid routes due to ill-transformed policies
  - Deny ACLs / PBRs
  - No end to end policy visibility
  - Forwarding loops

Can be addressed if controller knows what is happening in the legacy world
SYMPHONY
Connectivity between LRS and SDN controller
Controller’s view of topology

Edge nodes

OFswitches

Remote Network

R1

O1

O3

O2

R2

H3

H1

H2

H4

Edge nodes
controller

- If unicast destination is valid (Y):
  - a unique target OF switch, set of intermediate OF switches

- If unicast destination is not valid (N):
  - next hop (LRS provided)
  - a set of OF switches and corresponding intermediate switches
Experimental topologies

SDN island $\rightarrow$ initial topology

Distributed OF nodes
Use case

Intercommunication between OpenFlow enabled and legacy nodes
Use case-W.I.P

demonstrate policy application, congestion control on legacy nodes