NEC contribution to OpenDaylight: Virtual Tenant Network (VTN)

June. 2013

NEC

Agenda

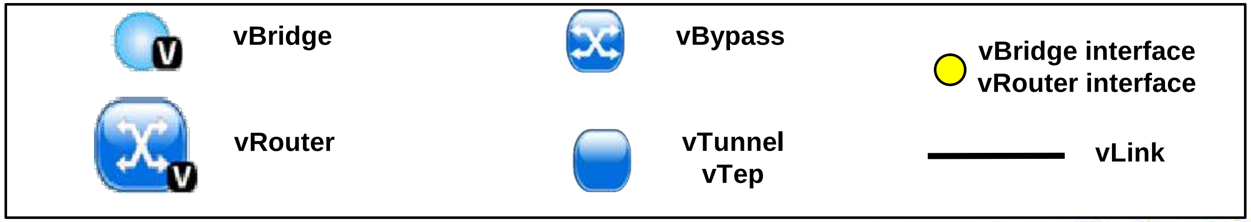
- OpenDaylight Virtual Tenant Network - VTN Model
- Live Demo
- VTN Implementation

OpenDaylight Virtual Tenant Network (VTN)

VTN models

VTN design using the following components

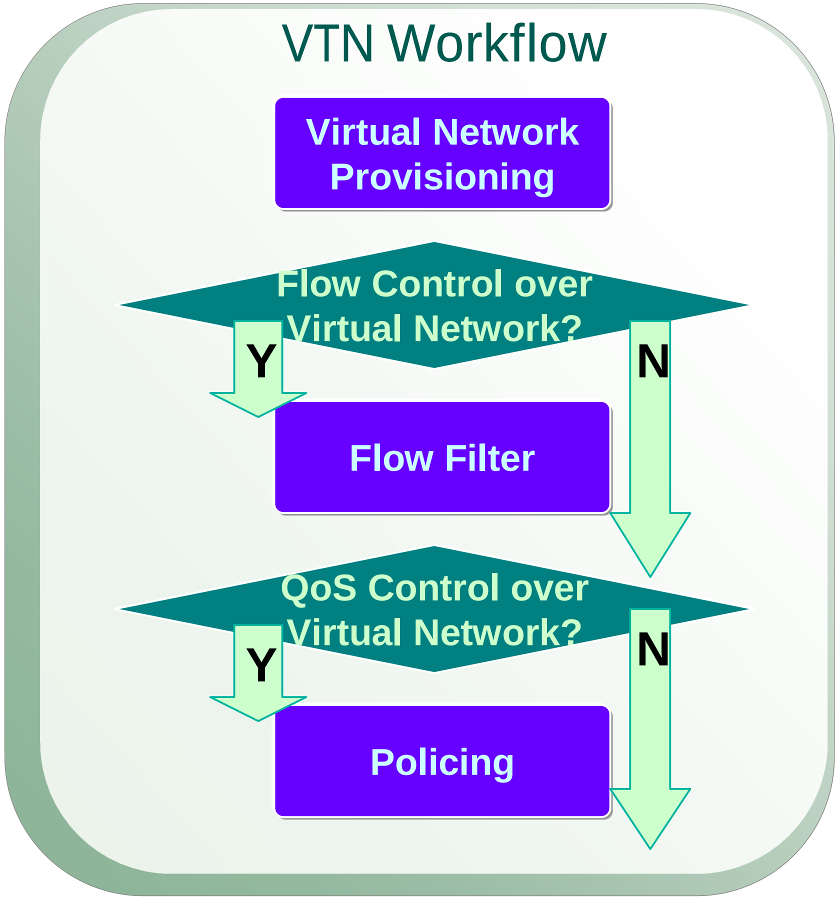
Components		Description
Virtual node (vNode)	vBridge	logical representation of L2 switch function.
	vRouter	logical representation of L3 router function.
	vTep	logical representation of Tunnel End Point - TEP.
	vTunnel	logical representation of Tunnel.
	vBypass	logical representation of connectivity between controlled networks.
Virtual interface	interface	representation of end point on the virtual node.
Virtual Link	vLink	logical representation of L1 connectivity between virtual interfaces.

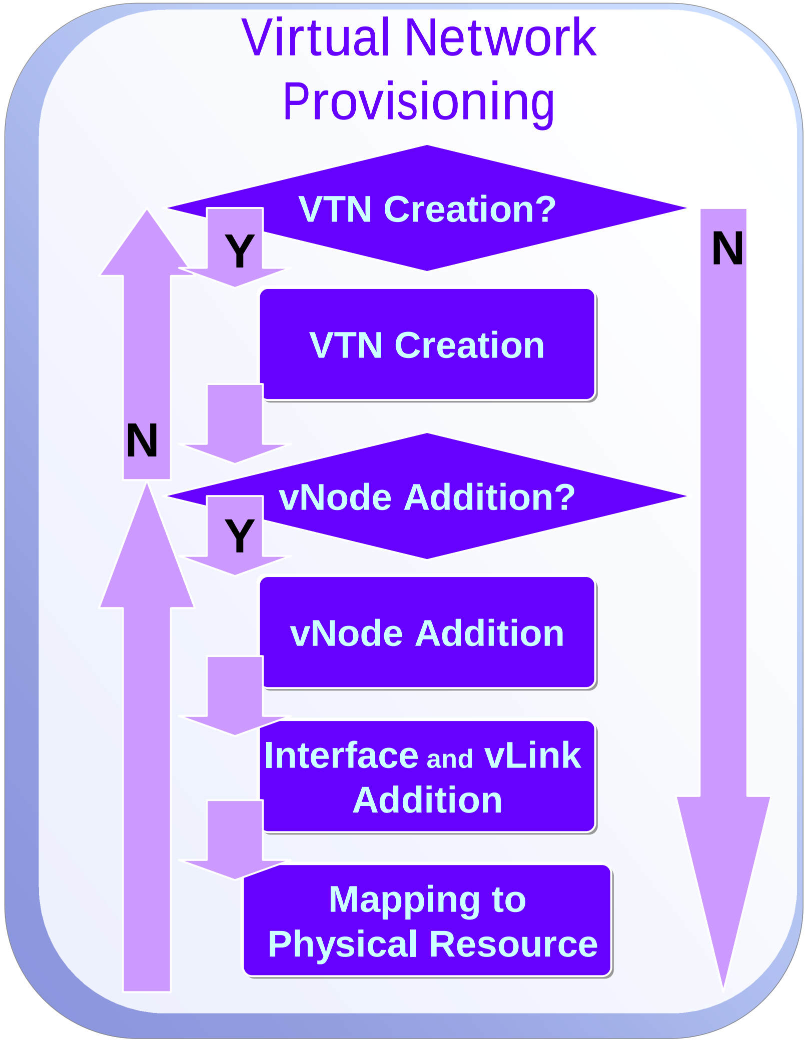


VTN Feature Set

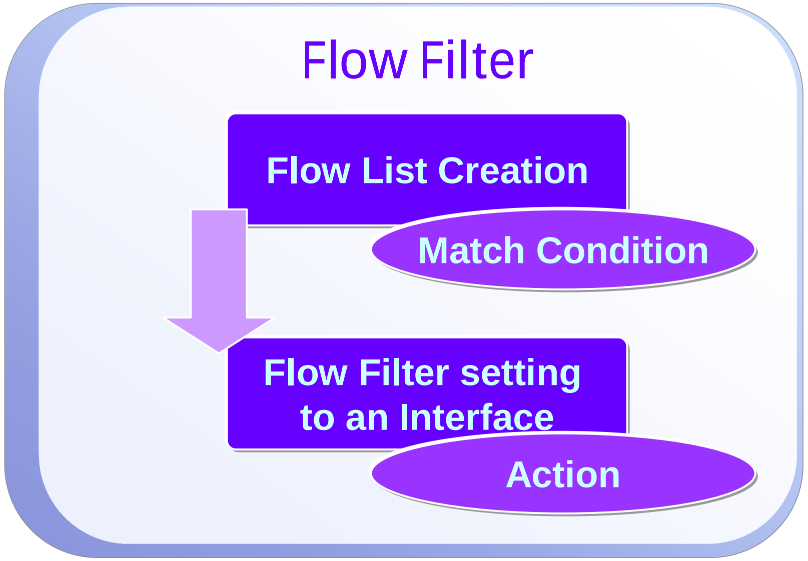
- Virtual Network Provisioning
  - VTN design (Add/Delete/Change)
  - VTN model operation (Add/Delete/Change)
- Flow Control over Virtual Network
  - Flow filter (Forward, Drop, Redirect or Remarking)
- QoS Control over Virtual Network
  - Policing
    - Forward, Drop, Remarking or Drop-precedence for three-color action
- Virtual Network Monitoring
  - VTN information collection
    - Traffic statistics
    - Failure events

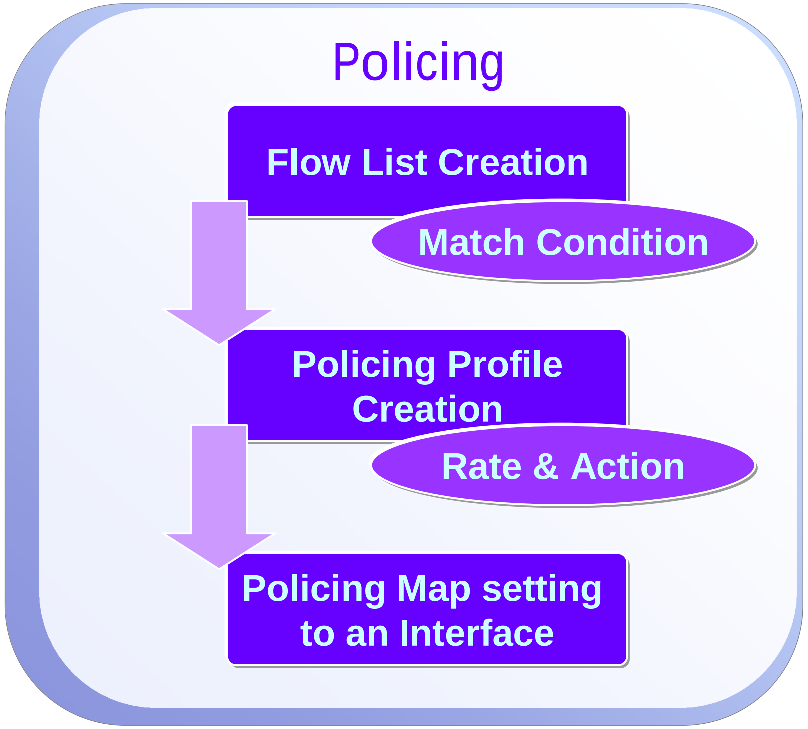
VTN Workflow


VTN Workflow
Virtual Network Provisioning
Flow Control over Virtual Network?
Y
N
Flow Filter
QoS Control over Virtual Network?
Y
N
Policing


Virtual Network Provisioning
VTN Creation?
Y
N
VTN Creation
N
vNode Addition?
Y
vNode Addition
Interface and vLink Addition
Mapping to Physical Resource

VTN Workflow

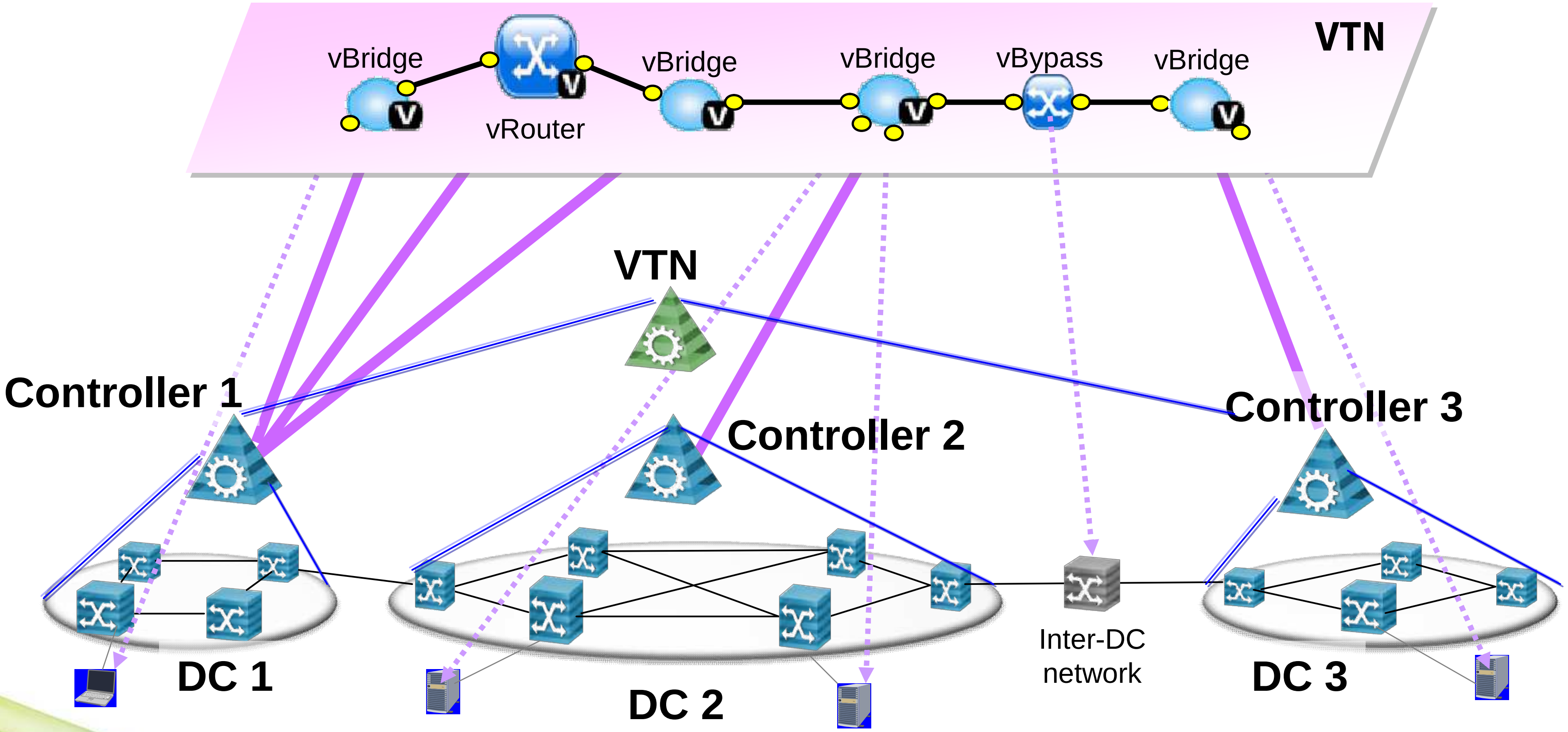



Policing
Flow List Creation
Match Condition
Policing Profile Creation
Rate & Action
Policing Map setting to an Interface

Multiple SDN Controller Orchestration

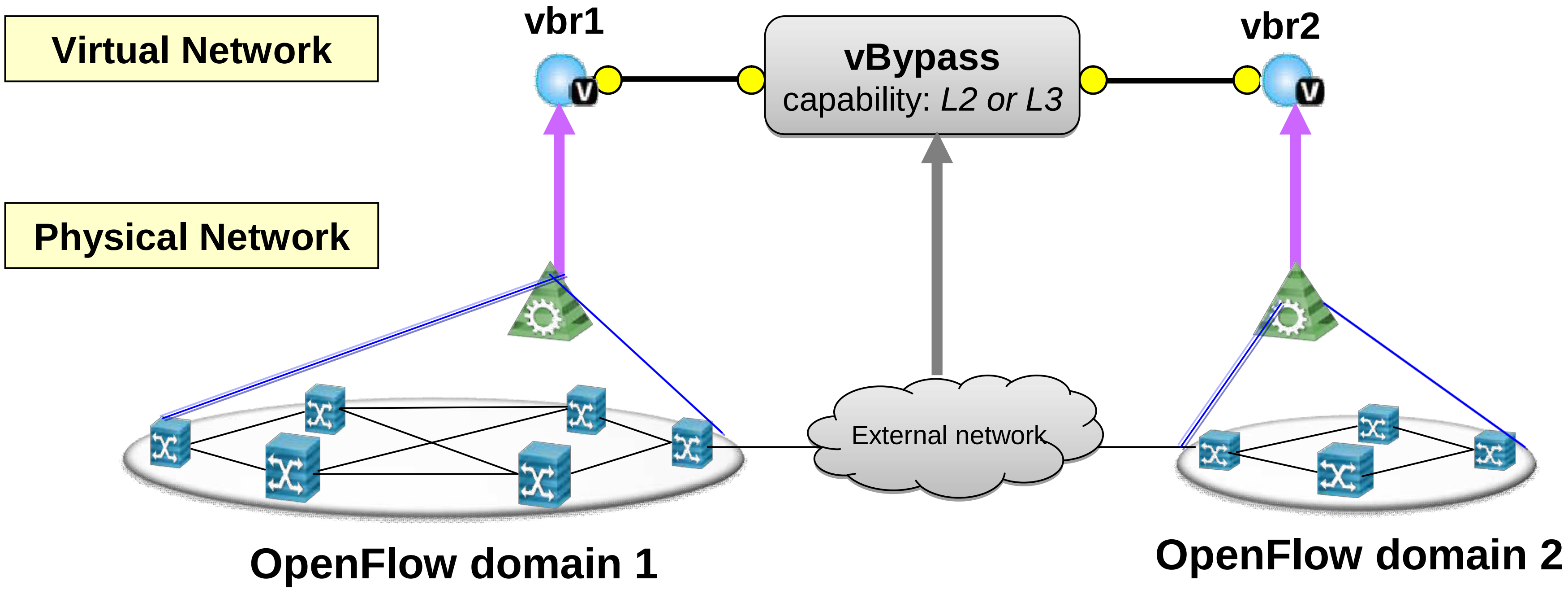
Enables to construct virtual networks in data centers and over interconnects between them.

- Easy to add and delete SDN controllers dynamically.



vBypass

- Represents external network domain not controlled by SDN controller.
- Enables to deploy VTNs cross the external network (e.g. WAN) which SDN controller does not control.



Mapping of Physical Network Resources

Mapping between virtual network and physical network

- According to three mapping configuration, physical network is sliced and mapped to virtual networks.

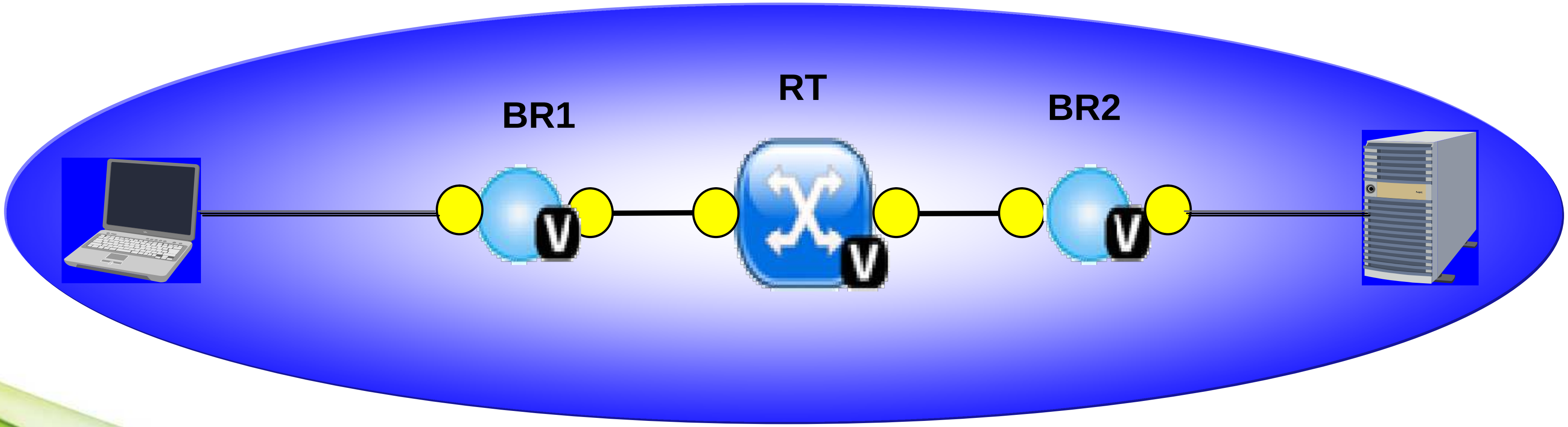
Mapping	Mapping Key		Note
	Physical	Virtual	
Port mapping	Switch ID, Port ID (VLAN ID option)	vBridge interface	Untagged frame mapping is also supported.
VLAN mapping	VLAN ID (Switch ID option)	vBridge	
MAC mapping	MAC address	vBridge	Will be supported in the future release.

Flow Filter Functions

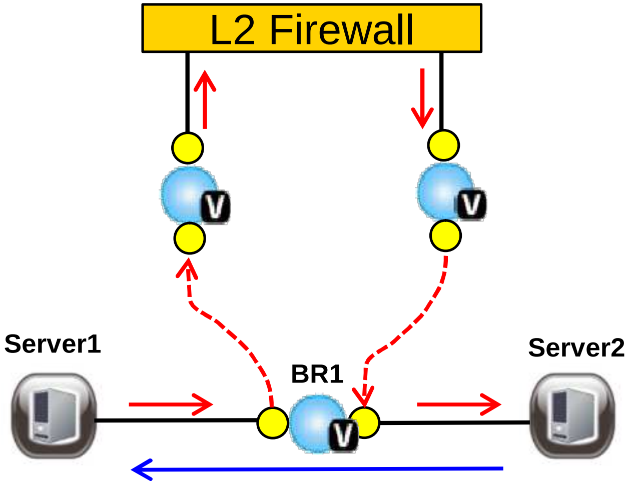
- Flow filter defines action to specific matching conditions.
  - Flow Filter can be applied to ***any*** virtual interface.
- Matching conditions
  - Source/Destination MAC address
  - Ether Type
  - VLAN Priority
  - Source/Destination IP address
  - DSCP
  - IP Protocol
  - TCP/UDP source/destination port
  - ICMP type
  - ICMP code
- Action
  - Forward, Drop, Redirect or Remarking

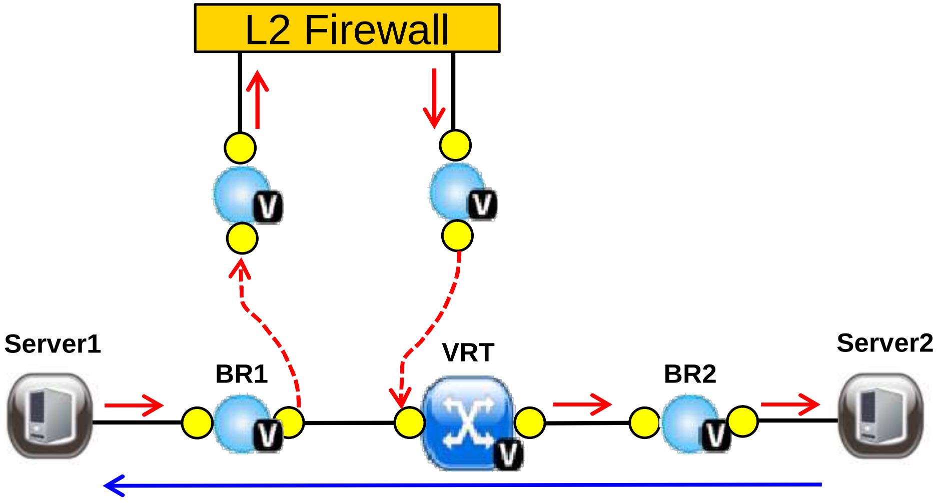
Flow Filter Functions

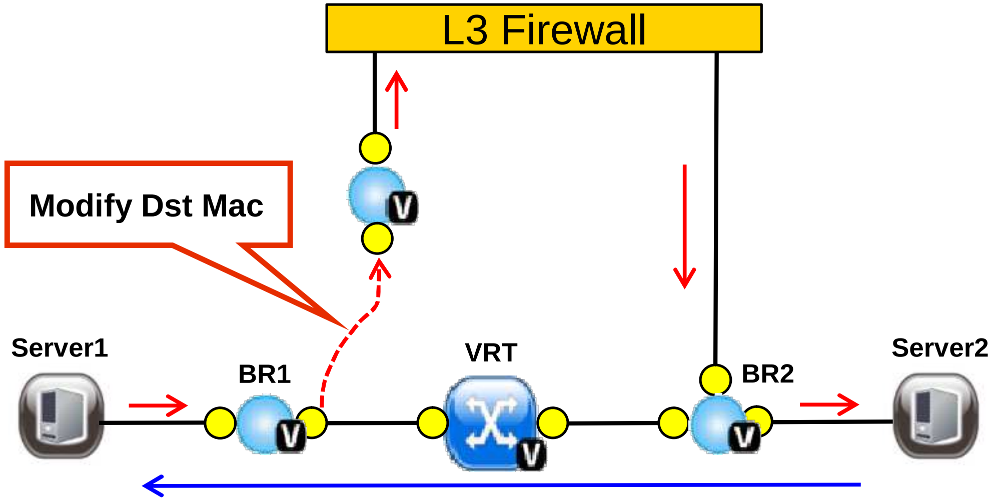
Action		Description
ACL	Pass	Passes particular packets matching the specified conditions
	Drop	Discards particular packets matching the specified conditions
Redirection - WayPoint routing		Redirects packets to a desired virtual interface. ● Changing source/destination MAC (e.g. for routed firewall) ● Not changing source/destination MAC (e.g. for transparent firewall)
Remarking		Remarks VLAN priority and/or DSCP fields



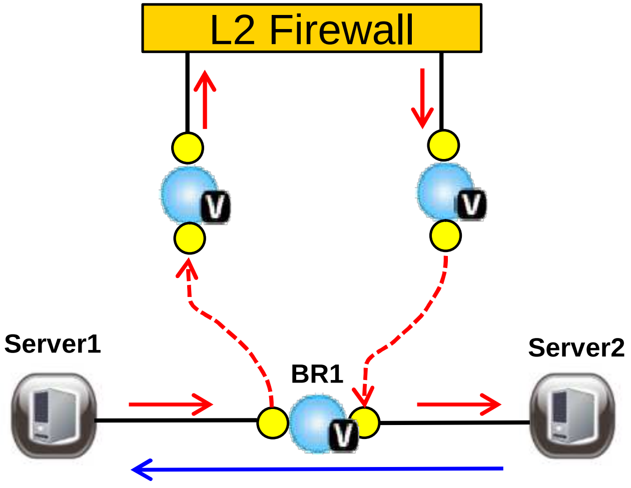
Flow Filter Redirect Use Cases

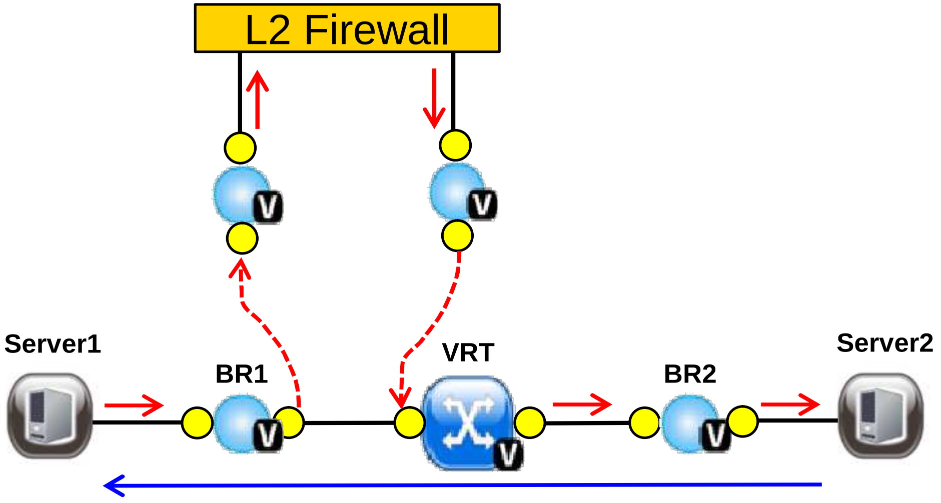


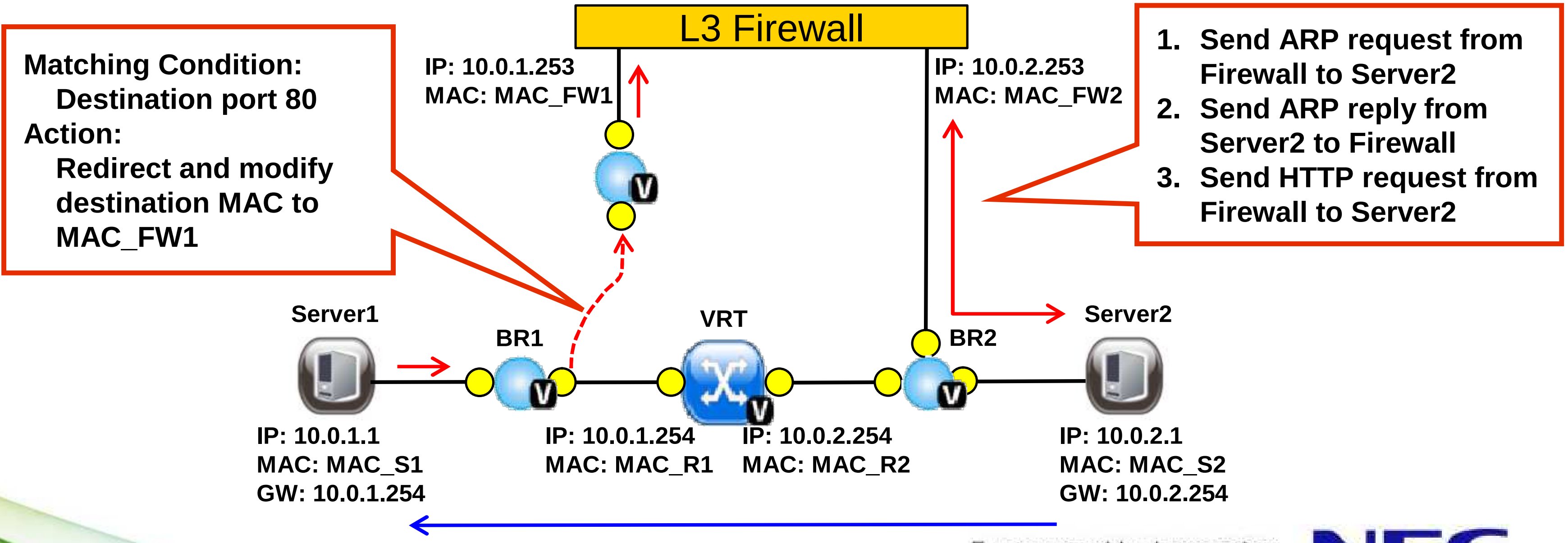




Flow Filter Redirect Use Cases







Matching Condition:
Destination port 80
Action:
Redirect and modify destination MAC to MAC_FW1

1. Send ARP request from Firewall to Server2
2. Send ARP reply from Server2 to Firewall
3. Send HTTP request from Firewall to Server2

APIs for VTN

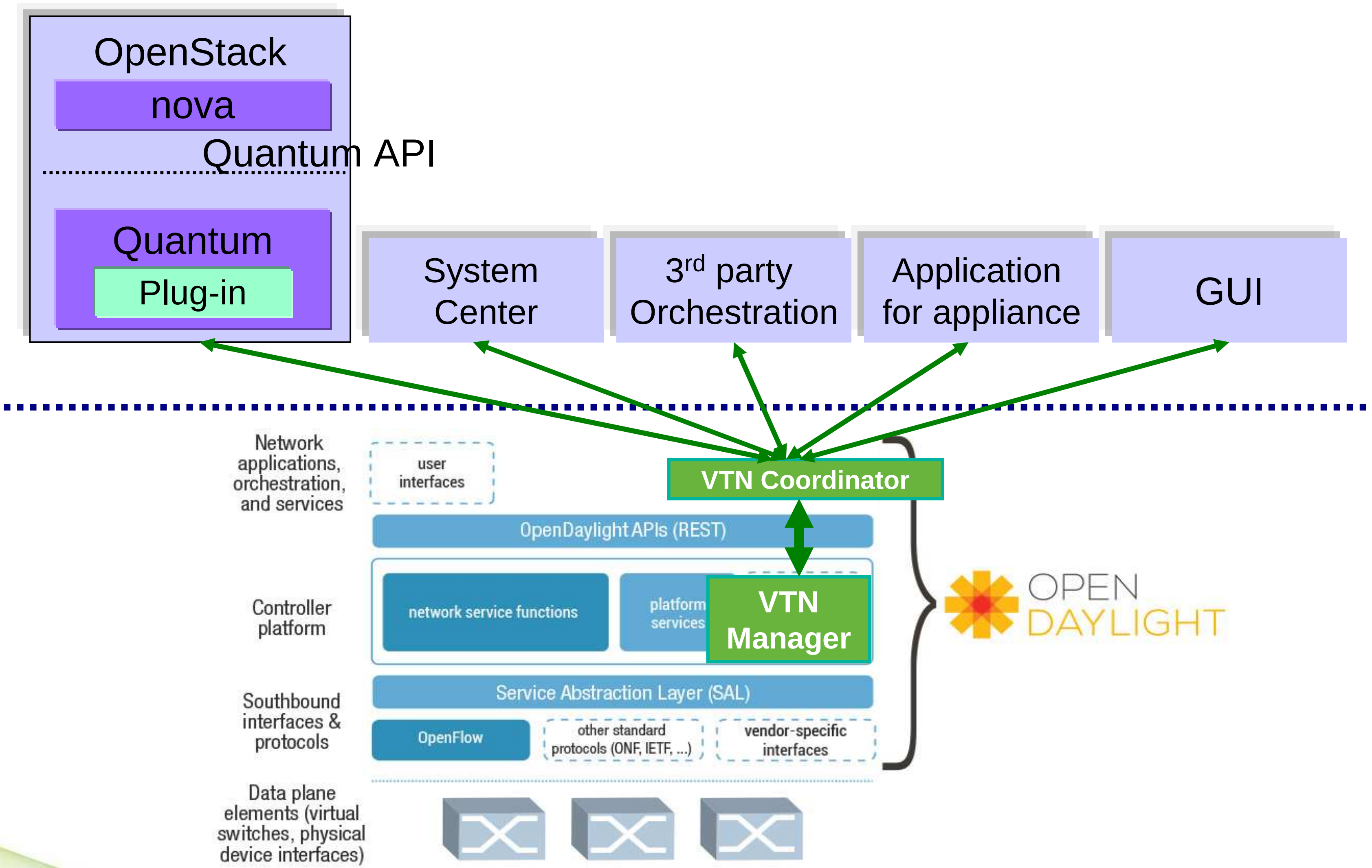
Provides Web API (REST)

- GET/PUT/POST/DELETE to virtual network resources
- XML or JSON format

Accessible Resources via API

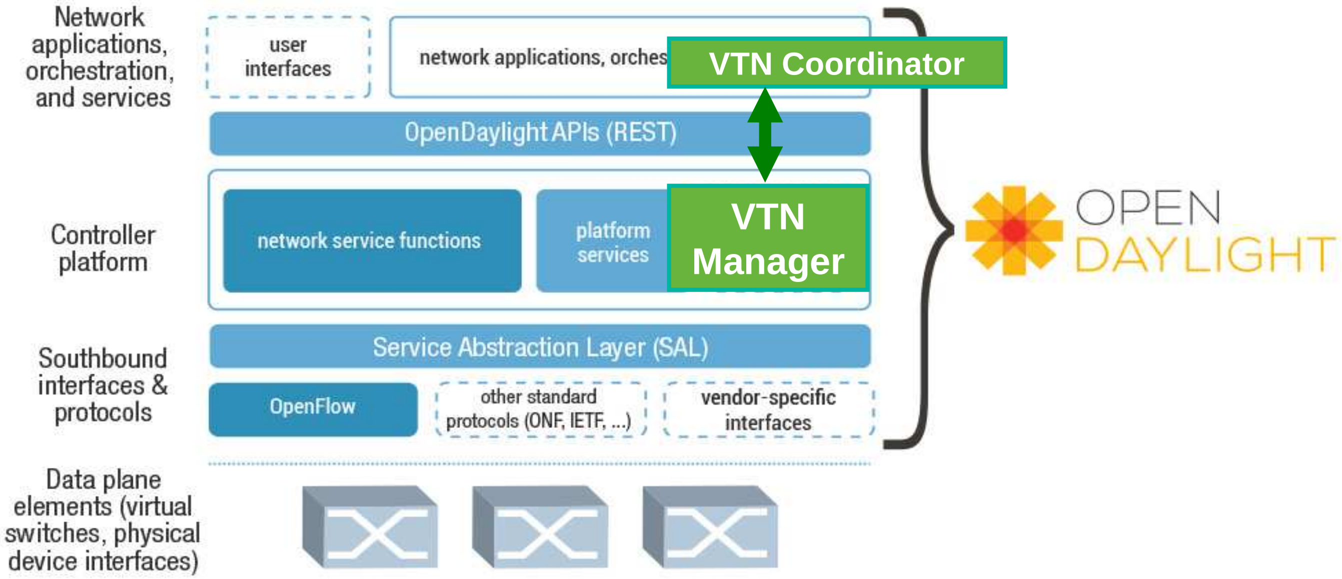
- VTN
- vBridge
- vRouter
- vTep
- vTunnel
- vBypass
- vLink
- Interface
- Port mapping
- VLAN mapping
- Flow Filter
- Controller
- Physical Switch / Port / Link (Read only)
- Alarm (Read only)

VTN API Use case


OpenStack
nova
Quantum API
Quantum
Plug-in
System Center
3rd party Orchestration
Application for appliance
GUI
VTN Coordinator
Network applications, orchestration, and services
user interfaces
OpenDaylight APIs (REST)
Controller platform
network service functions
platform services
VTN Manager
Service Abstraction Layer (SAL)
Southbound interfaces & protocols
OpenFlow
other standard protocols (ONF, IETF, ...)
vendor-specific interfaces
Data plane elements (virtual switches, physical device interfaces)
OPEN DAYLIGHT

Proposed NEC Contributions

1. VTN Coordinator (code is available)
   - Provide API of VTN for users
   - Use OpenDaylight APIs to realize VTN models
   - Coordinate VTNs across multiple SDN controllers
2. VTN Manager (to be developed)
   - Provide virtual nodes functions
   - Provide virtual packets forwarding functions


Network applications, orchestration, and services
user interfaces
network applications, orches
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