

# AT&T's SDN Controller Implementation Based on OpenDaylight

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D2.0 SDN-NFV Realization

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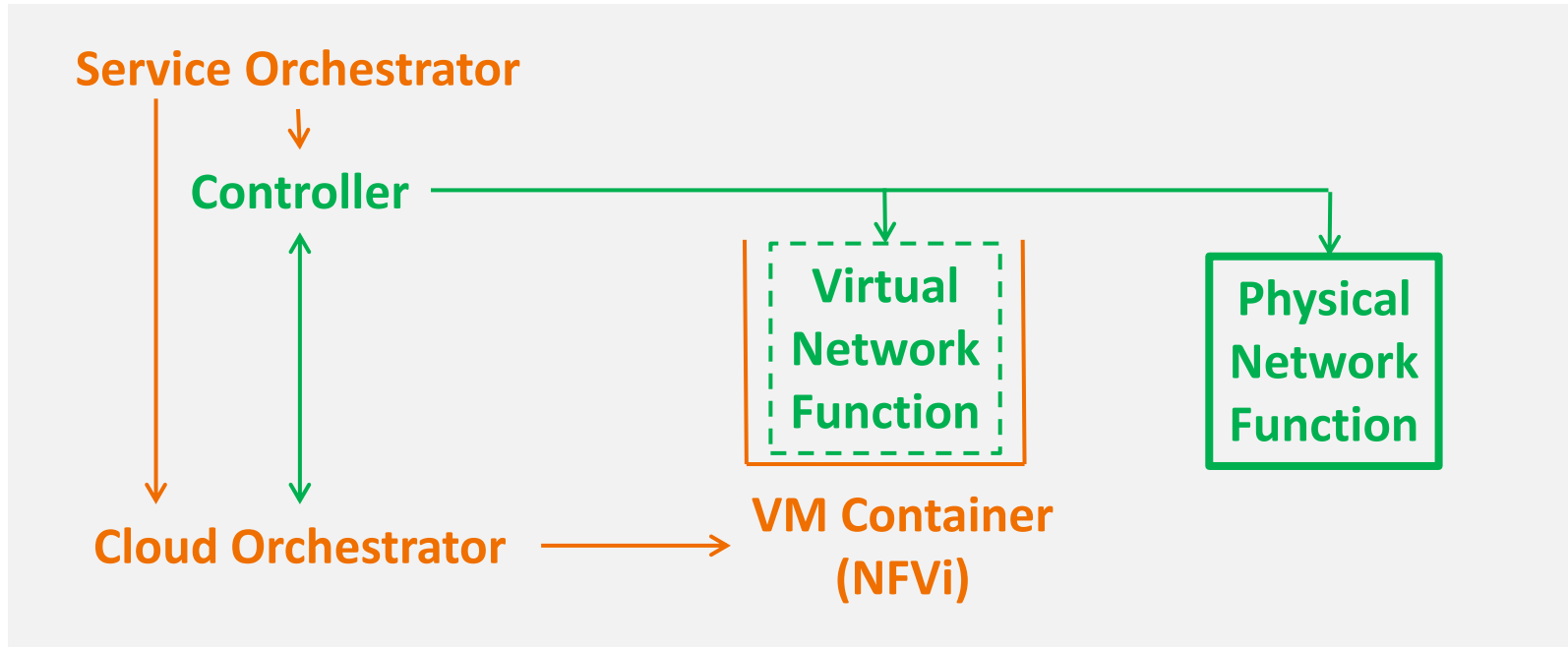


# Agenda

- ❑ **The SDN+NFV Components & Common Use Cases**
- ❑ **Service Provider Use Cases – A Wish List**

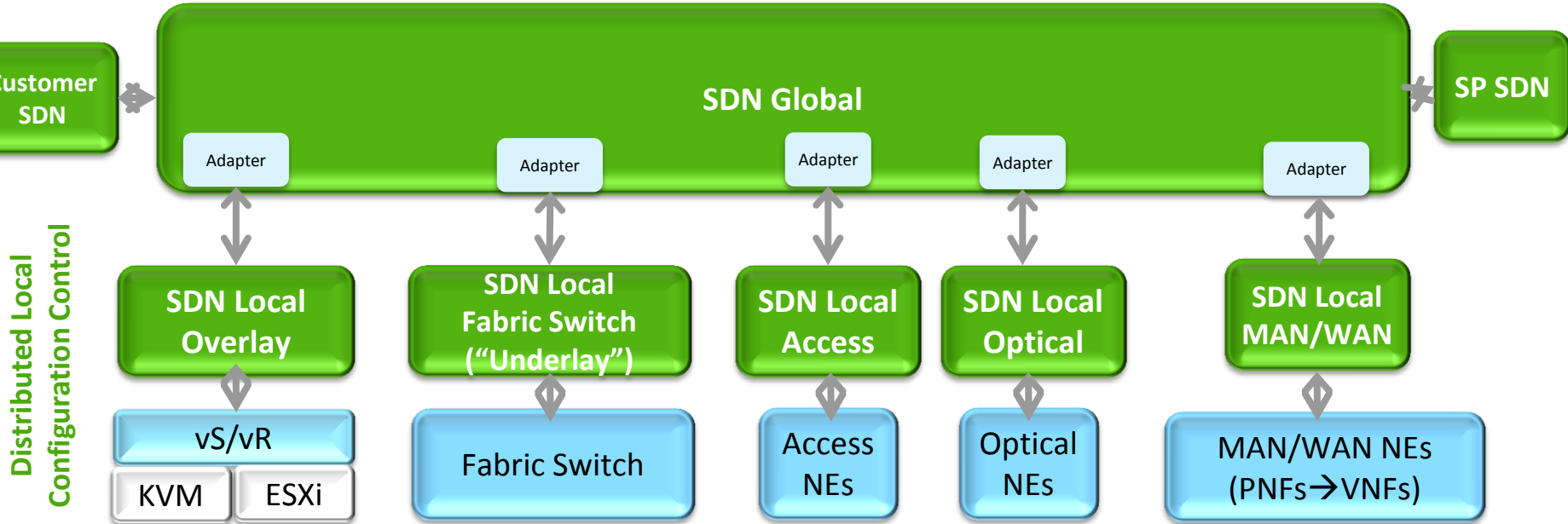


# SDN in a Virtualized World

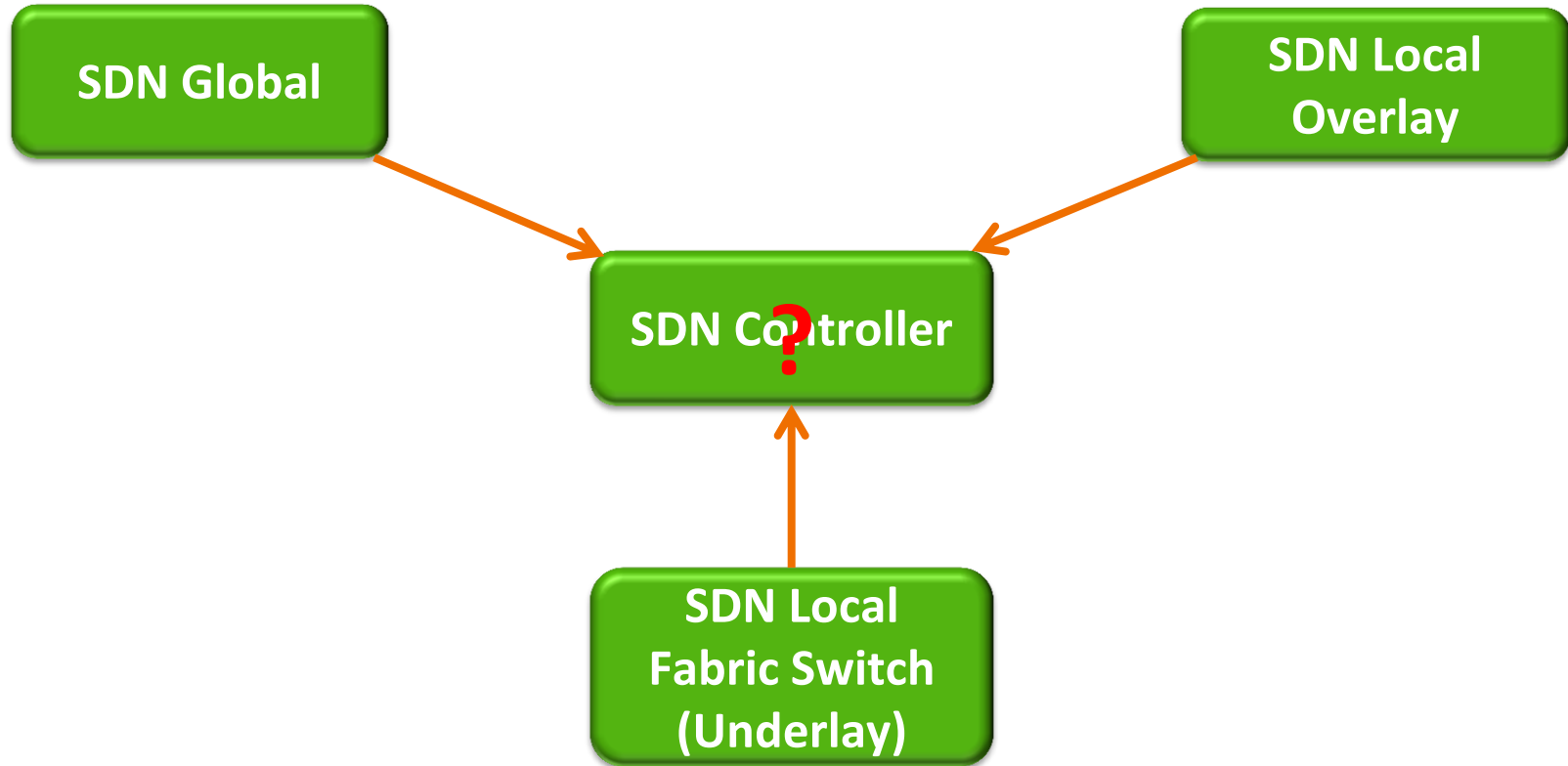


# Controllers – How They Fit Together

Application/Service-aware  
End-to-end Service Configuration  
& Global Resource Optimization Controls



# THE Controller?



# Common Use Cases

Virtualize Function

Server Failover

Site Failover

Scale out/in/up/down VF – in one location or multiple locations based on time or traffic

Customer request causing VF spin up

Customer bandwidth on demand

Multi-tenancy to application

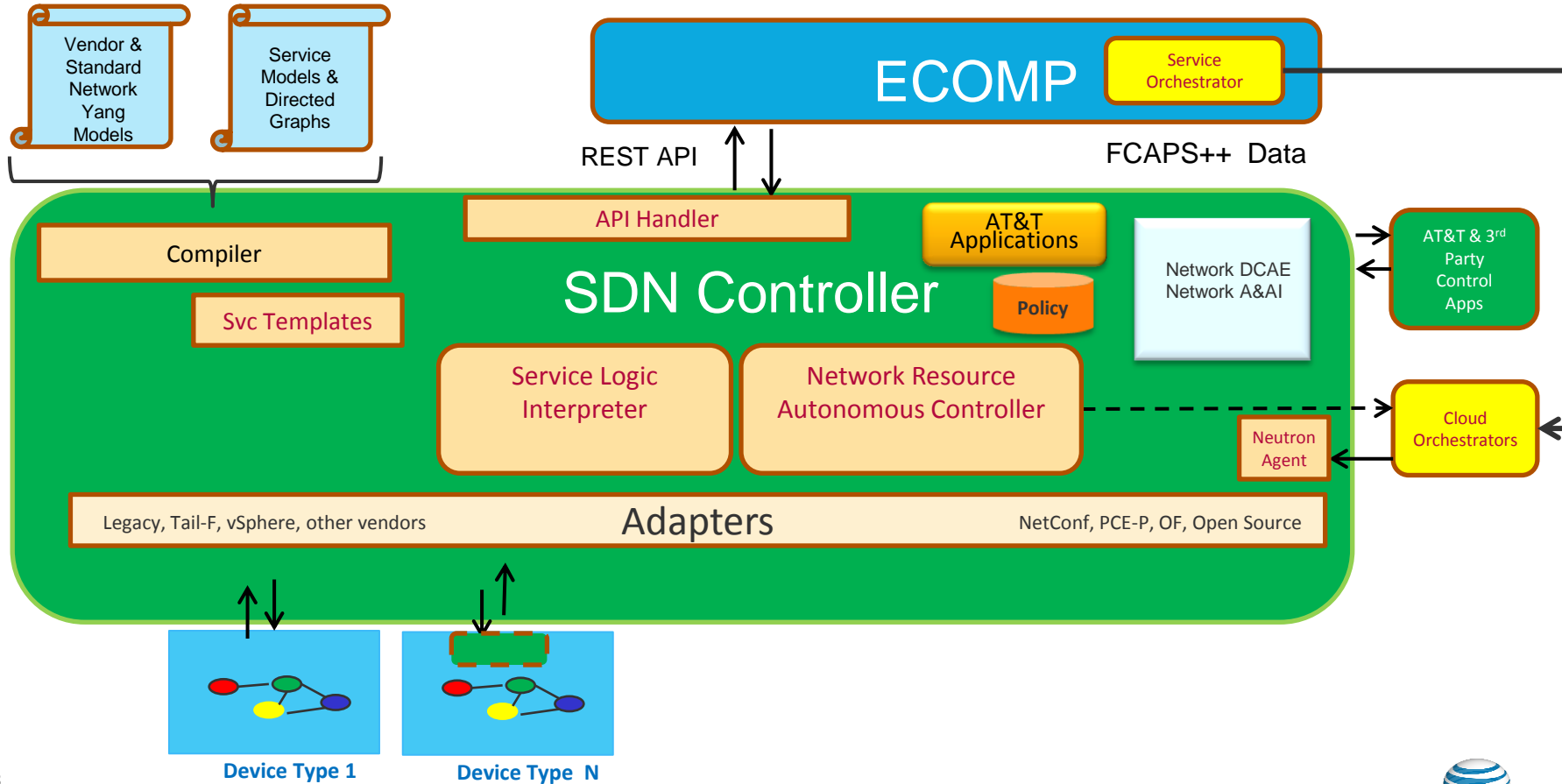


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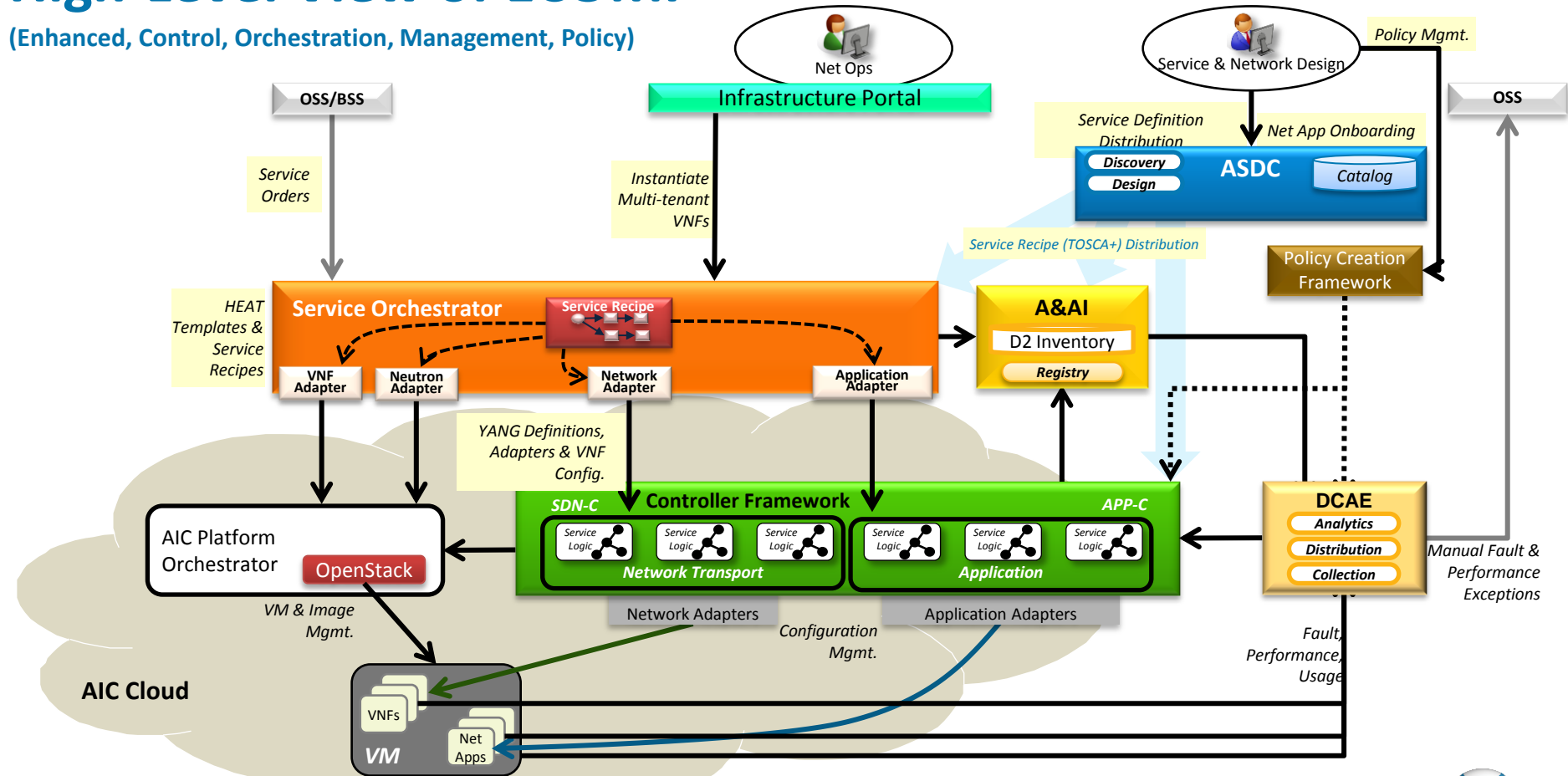
# AT&T Global SDN Controller Software Architecture





# High-Level View of ECOMP

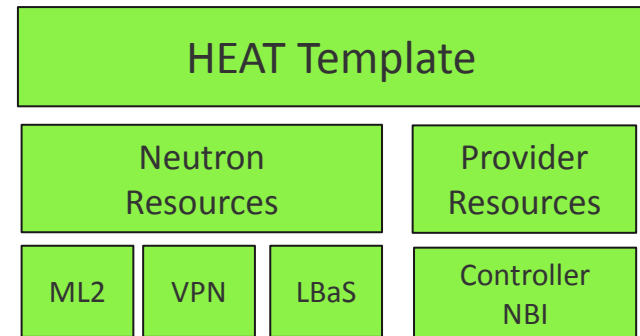
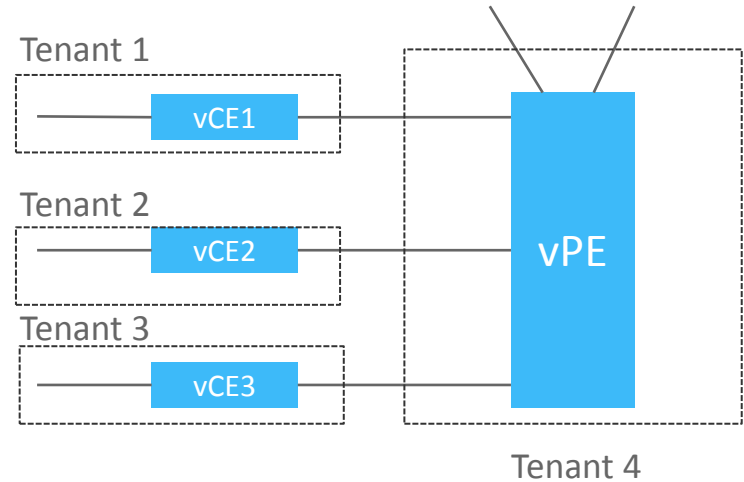
(Enhanced, Control, Orchestration, Management, Policy)



# Service Provider Use Cases

## Working with cloud orchestration

- Closed User Group Networks
  - vCE to vPE network
  - vPE is an internal tenant
  - vCE is an external tenant per customer
  - The network between them crosses tenant boundaries
  - Its not shared across all tenants that might be on that node
  - Need better support for sets of tenants that can access a shared network (a form of extra-net in our parlance)
- HEAT templates are HOT for us !
  - We already use HEAT templates for our controller NBI and are increasing the number and variety of HEAT resources we will use.
  - Beside Neutron ML2, we think there may need to be resources defined both within Neutron and outside of Neutron to meet our needs in advance of OpenStack releases.



# Service Provider Use Cases (1)

South West Cluster

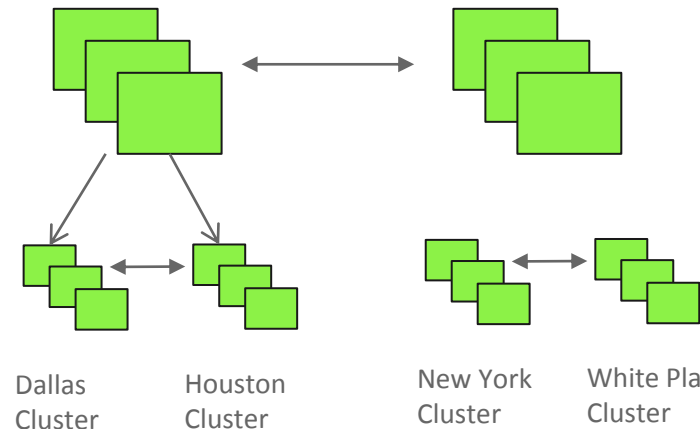
North East Cluster

## Clustering

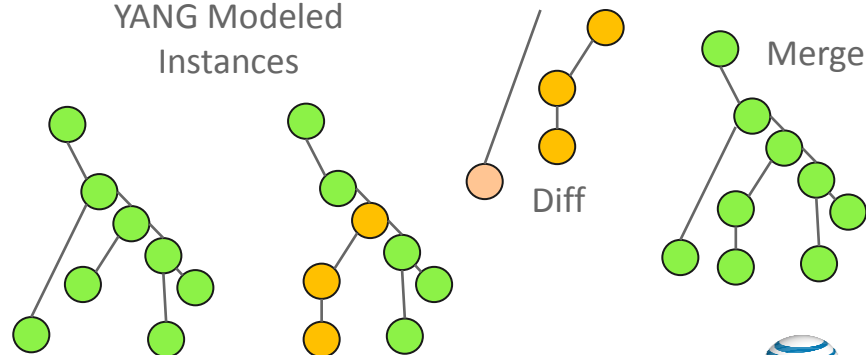
- Controllers will be in more than one site
- Local, Regional, National
- N-way cluster within a site is sufficient for HA but not disaster recovery
- Need cluster to cluster replication/synchronization

## MD-SAL Utilities

- We have an application called the Service Logic Interpreter (SLI) that makes heavy use of MD-SAL and YANG Tools
- The SLI updates the config and operational trees depending on the service, feature and external system interactions (east/west).
- Need support for better “diff” and “merge” of the tree
  - Compare config to operational
  - Merge operational into config (sync from , synch to)
  - Merge this branch into the similar branch in another part of the tree
- Need support for “on data commit” so we can do things before the response goes back.



## YANG Modeled Instances



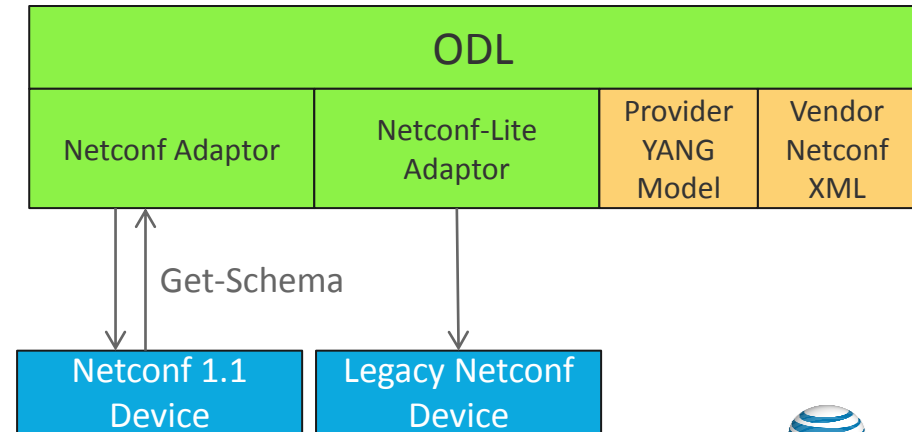
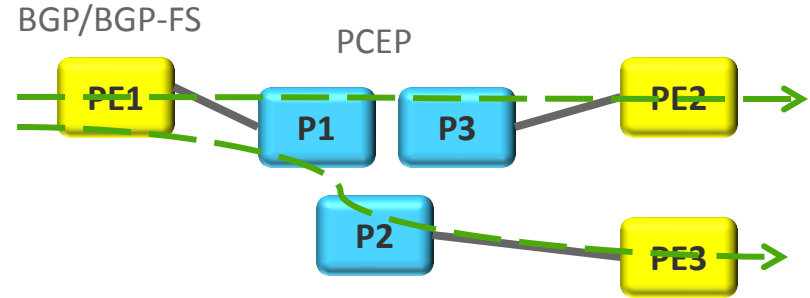
# SDN Controller South-Bound Interfaces/Protocols

## Traffic Routing Control with BGP & PCEP

- Use BGP/BGP-Flow-Spec for flow redirection (selection of egress point “BGP-Next-Hop” for a targeted flow) at ingress PE
  - Need extension of BGP Flow-spec for support of address families (AFI/SAFI) other than IPv4/v6
  - Need controller logic for support of multiple simultaneous “best paths” (BGP Add-Path)
- Use PCEP for optimal routing/re-routing of MPLS LSPs
  - Need extension for use with Segmented-Routing

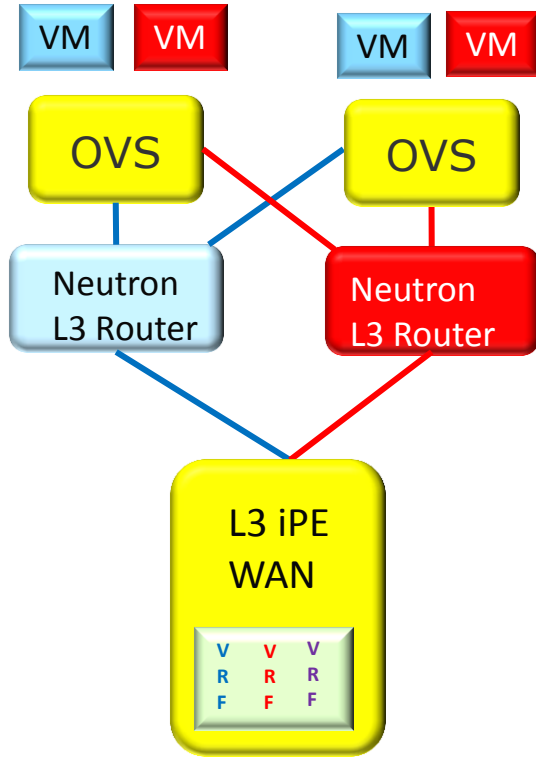
## Service Control with NETCONF

- Too stringent to use get-schema
- Need a lighter weight NETCONF integration when vendor supports Netconf but doesn't have a YANG model

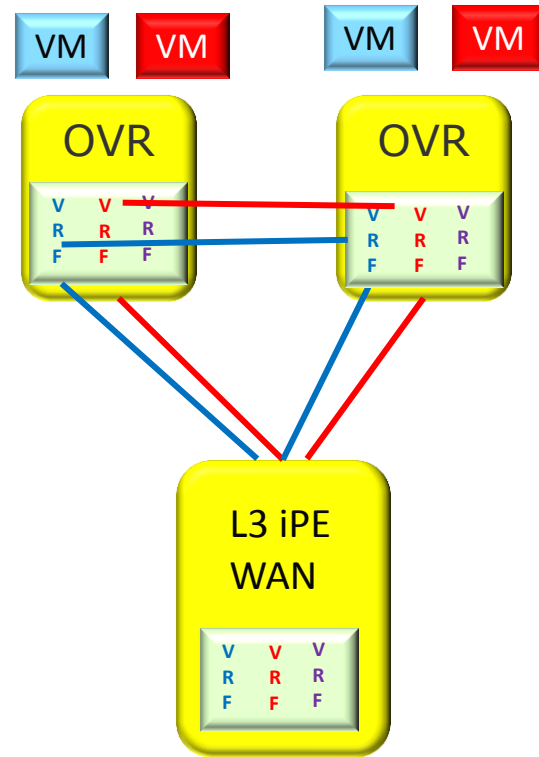


# L3 Multi-Tenancy Models

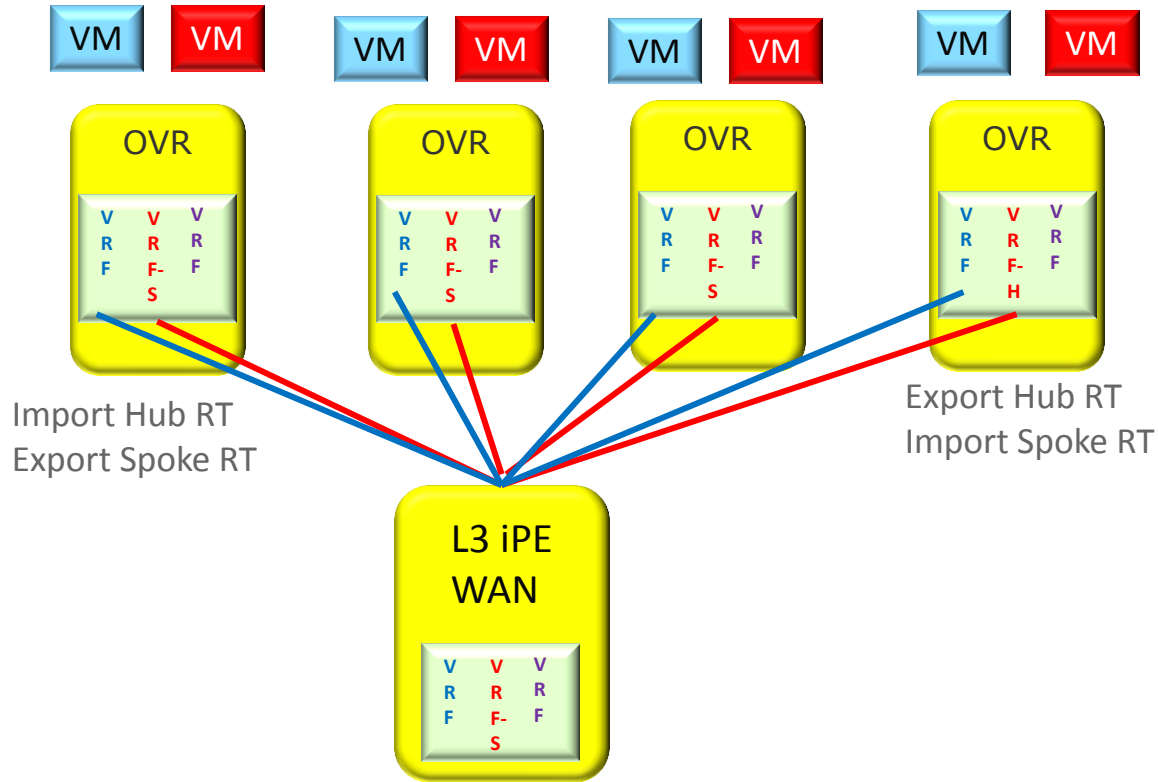
TODAY



TARGET



# L3 Hub-Spoke Model



# Q&A

