SCTE ISBE CABLE-TEC EXPO® '16

SEPTEMBER 26-29 PHILADELPHIA

SDN is not NFV

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SCTE Society of Cable Telecommunications Engineers

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Essential Knowledge for Cable Professionals™

Agenda

- Introduction SDN & NFV
- Use Case Example: SD-WAN
  - NFV Approach: Virtualizing the PE
  - SDN Approach: Leverage an SDN Controller
  - SDN Extension: Service Chaining & NFV
- Summary

Network Function Virtualization (NFV) and Software-defined Networking (SDN)

NFV is about using virtualization techniques for core network equipment to:

1. Decrease unit cost of possibly any “network function” by :
   - Moving from bespoke hardware & software to COTS
   - Increase utilization of the above thru virtualization (i.e. multiple instance, software based redundancies)
2. Lower management cost of those functions because they are now “IT based” with more standardization & more centralization

SDN is about applying business logic to network behavior in dynamic fashion to:

1. Introduce new services faster, because SDN allows flexible (re)configuration and increased automation
2. Lower management costs of end to end networks, because SDN create an abstraction on which automated (orchestration) management process can be applied (vs. bespoke, per box, proprietary scripts)
3. Eventually lower unit cost of network functions (“commoditization”), because they are now “COTS based”

SDN and NFV are not dependent on each other
But highly complementary and mutually beneficial

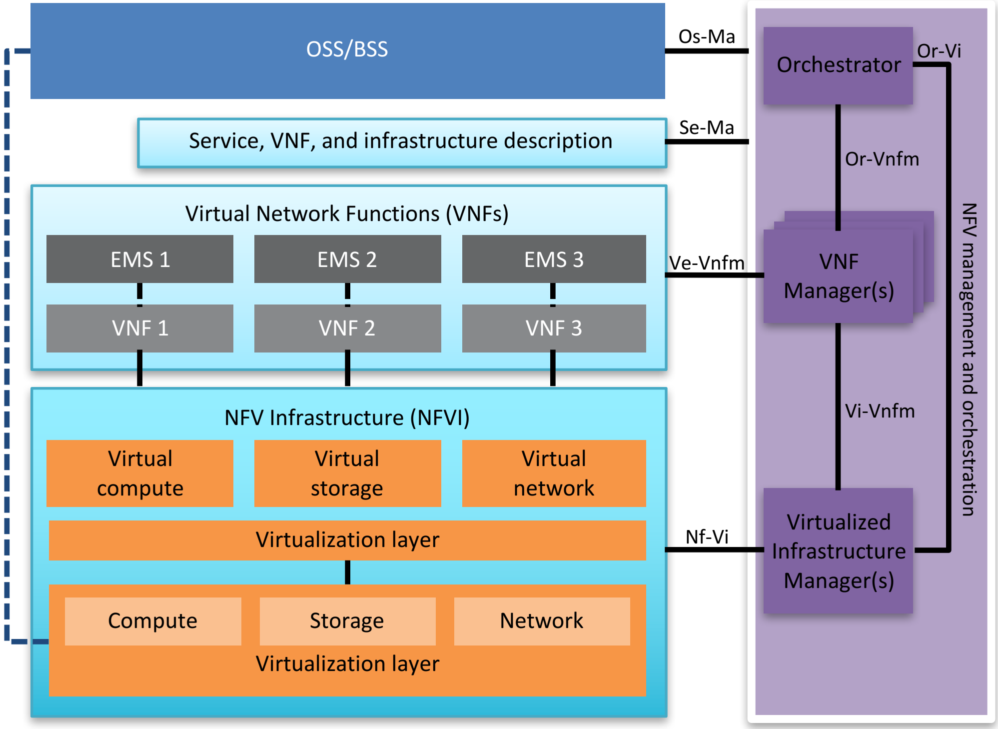
ETSI Reference Architecture

Management and orchestration (MANO)

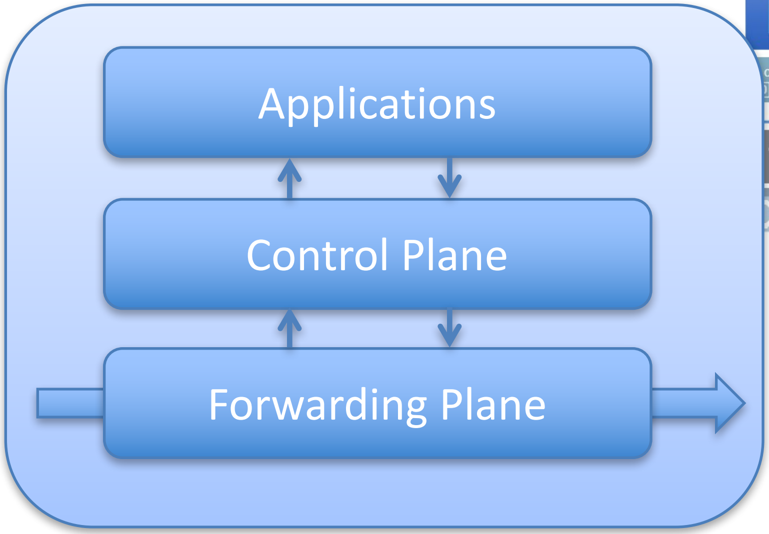
- NFV Orchestrator
- VNF Manager(s)
- Virtualized Infrastructure Manager(s)

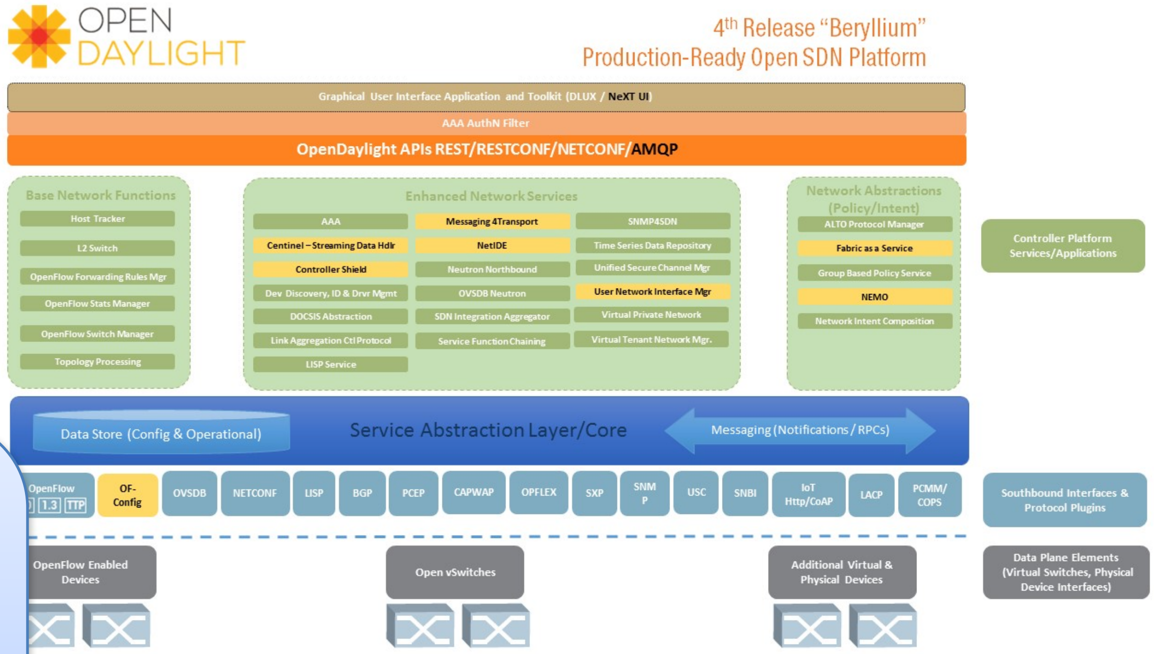
Other

- Operational support systems (OSS)
- Element management system (EMS)



SDN Architecture



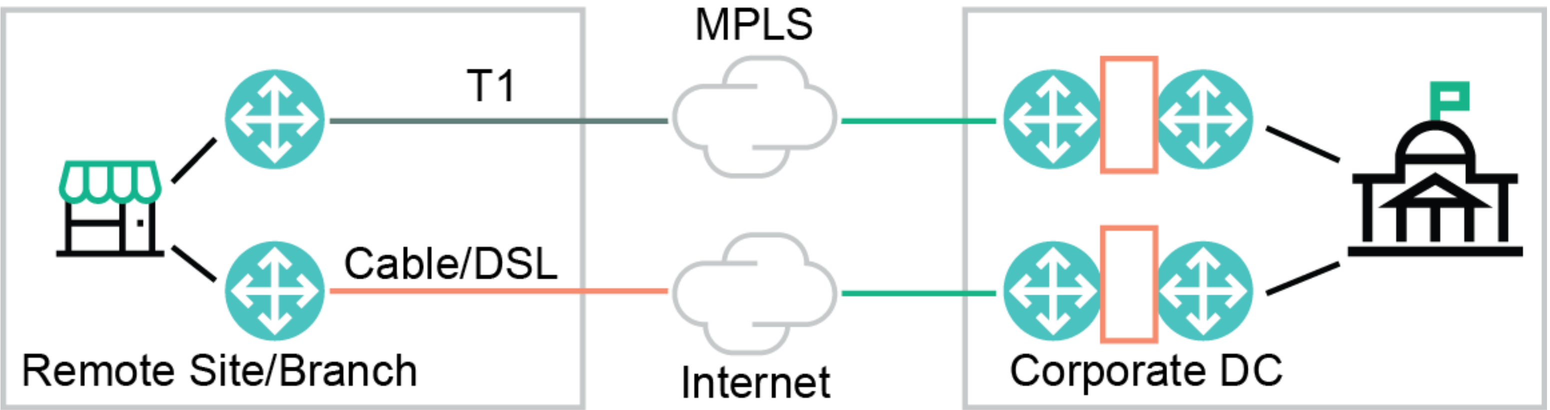


SD-WAN Implementation

NFV vs SDN Approach

SD-WAN Use Cases, Enterprise Perspective

Traditional MPLS with Direct Internet Access/Secondary WAN



Source: ONUG Software Defined WAN Use Case, October 2014

ONUG: SD-WAN Problem Statement

Significant delays and cost in provisioning cycles of remote sites

- Delays in carrier access layer provisioning at remote sites can take weeks to months
- Provisioning of a T1 MPLS circuit can take anywhere from 30 to 90 days

Operational and management complexities, resulting in provisioning and remediation inefficiencies

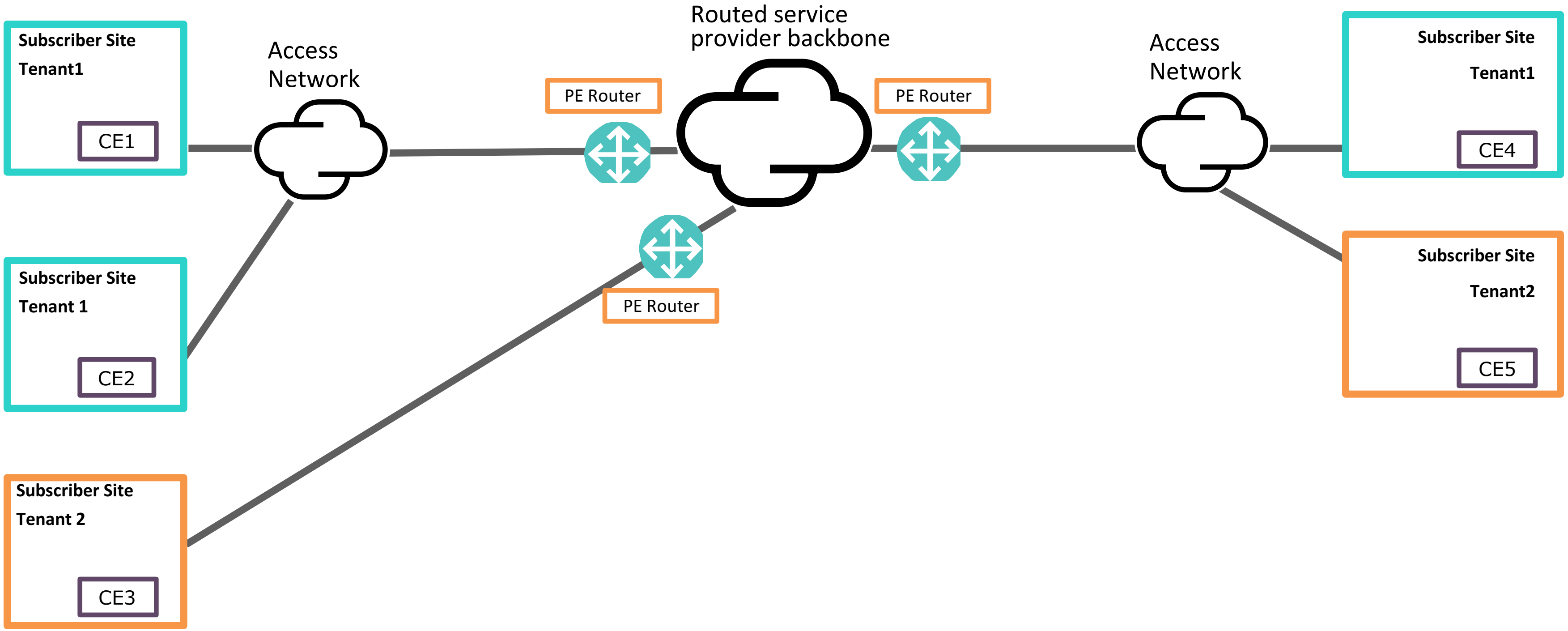
- Complex router/s configuration in order to accommodate features

High cost and low control of the wide area network

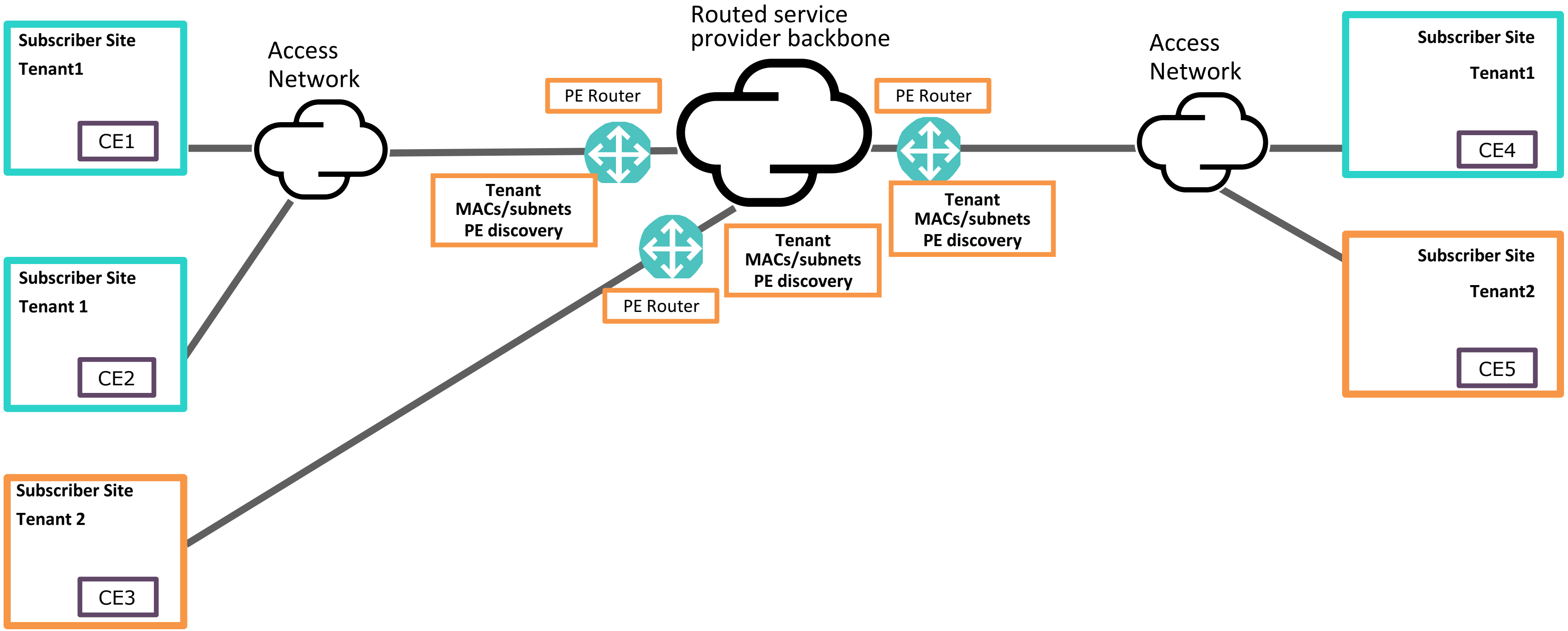
- The costs have simply stacked up
- Enterprises are totally reliant on the carriers and/or MSPs for every little change in the context of their wide area network
- Reliance on the carrier has increased as have the capex and opex costs to build, support and run these large networks

Source: ONUG Software Defined WAN Use Case, October 2014

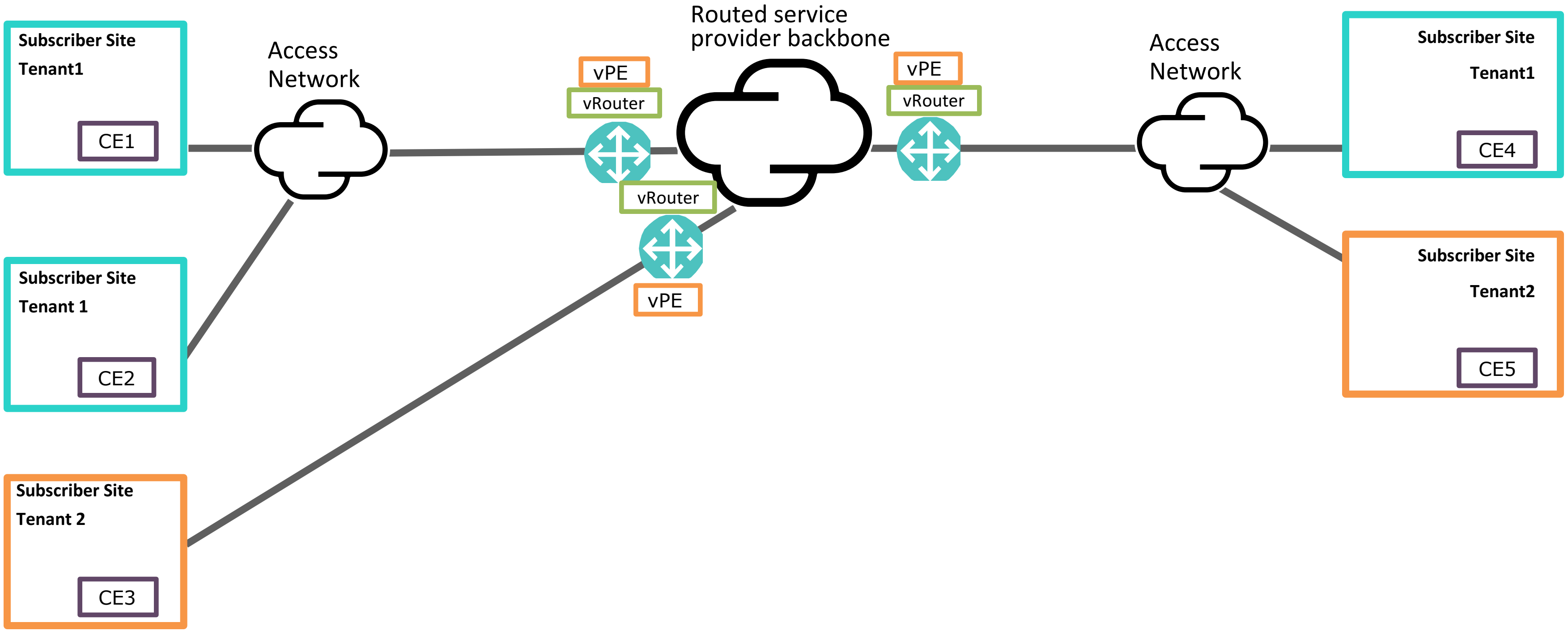
Legacy VPN – Basic Diagram (Step 0)



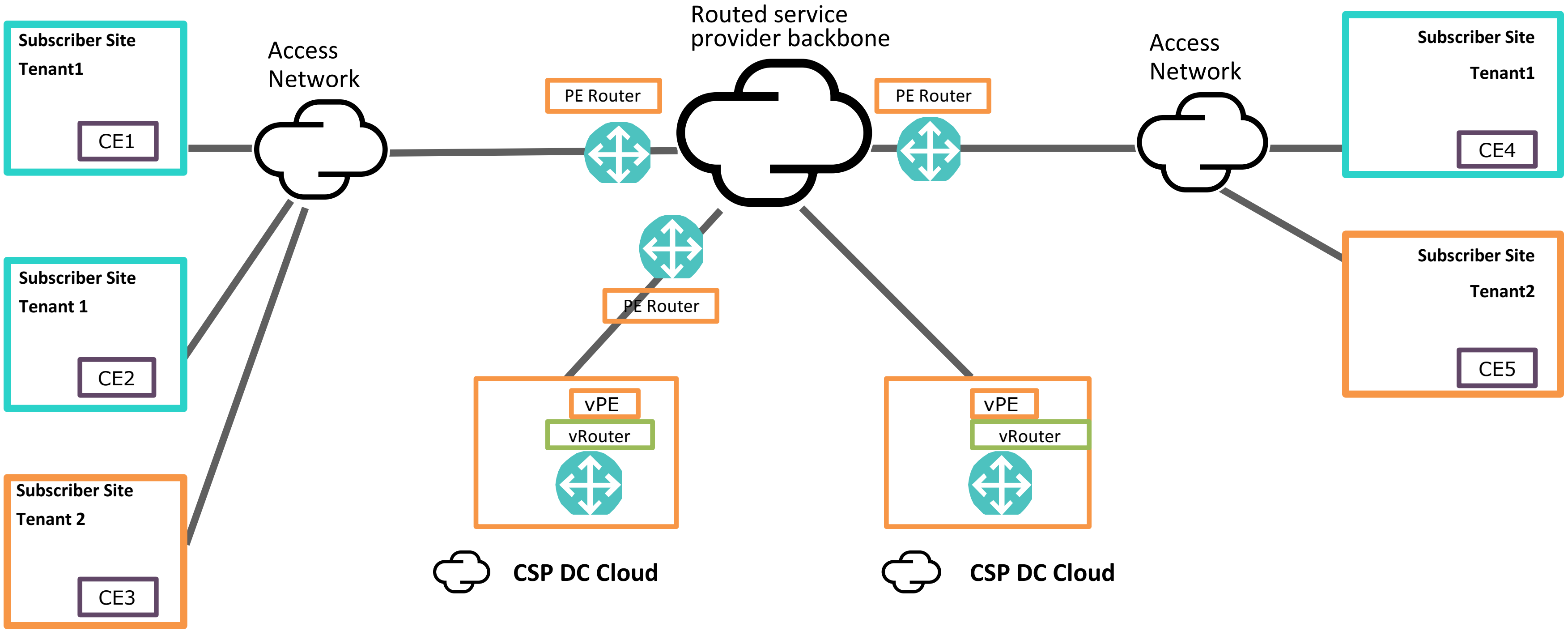
Legacy VPN – The Challenges



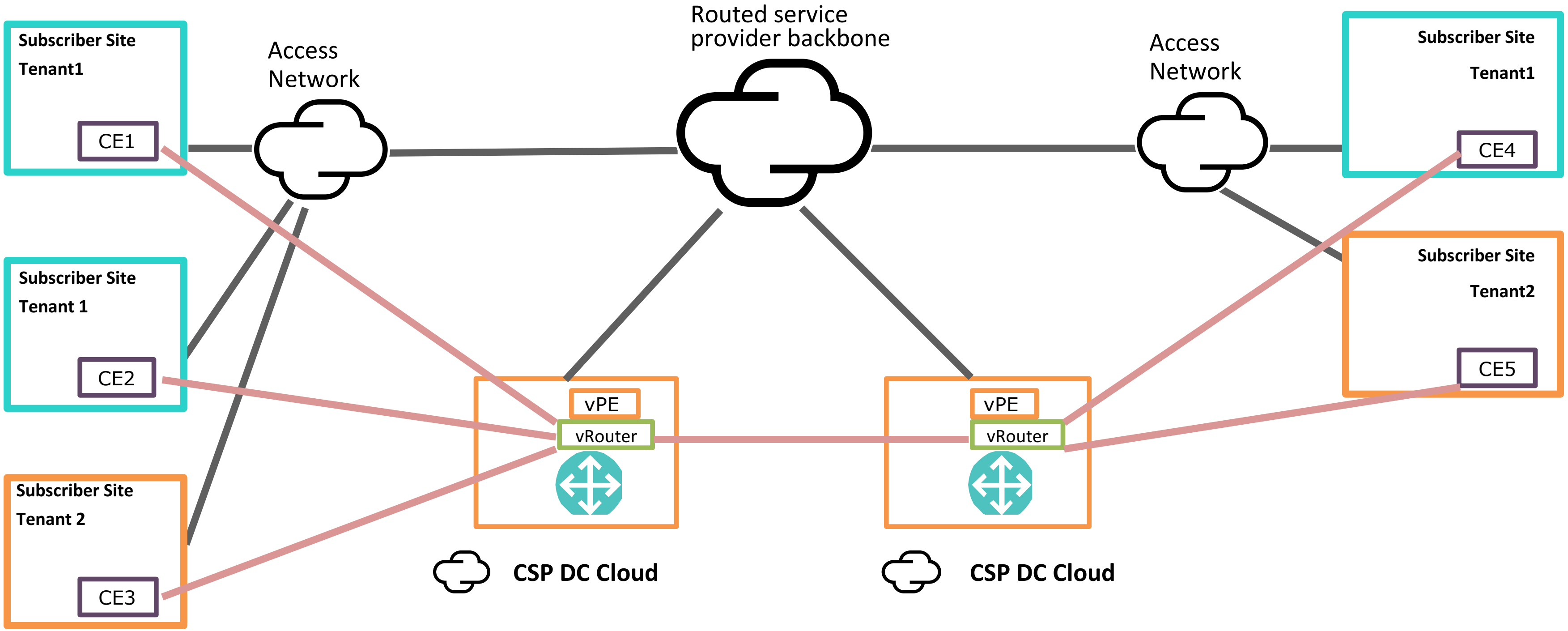
Revolutionizing VPN Approach 1 – NFV



Step 2 – Datacenter Cloud



Step 3 – Use Overlay Tunnels



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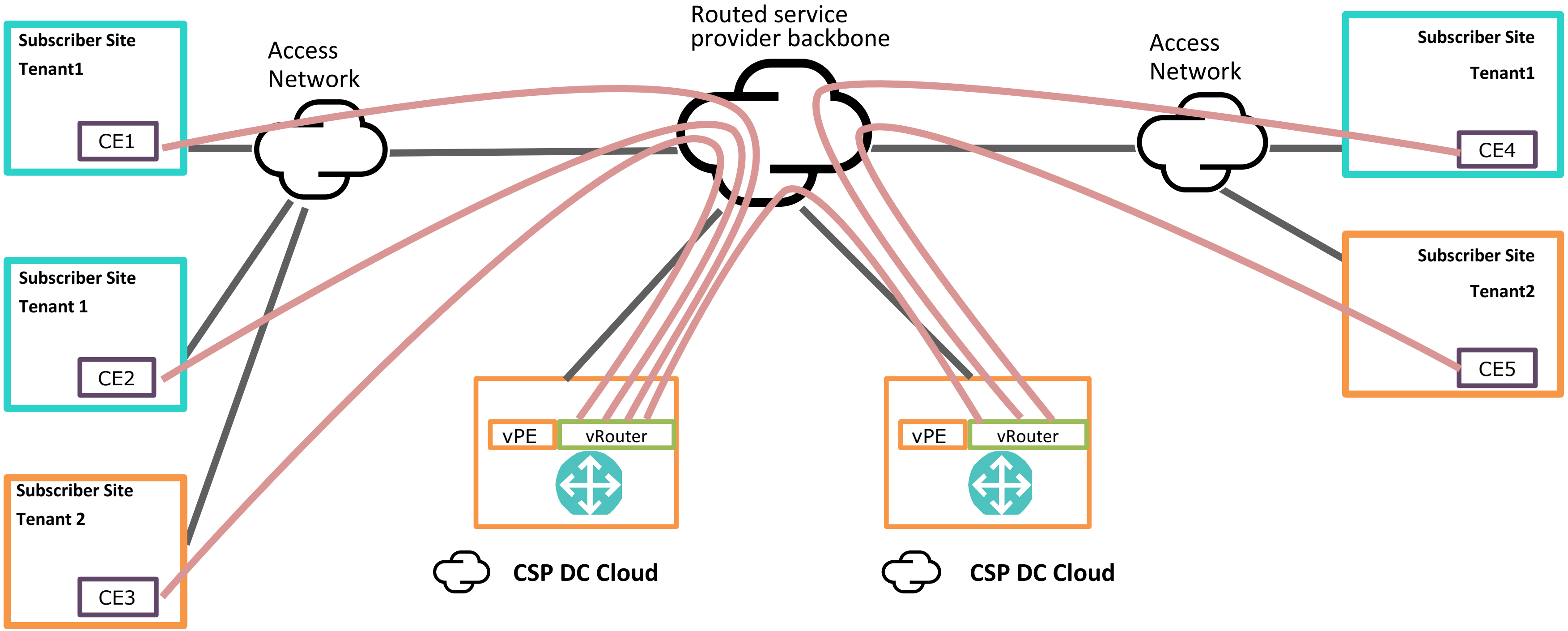
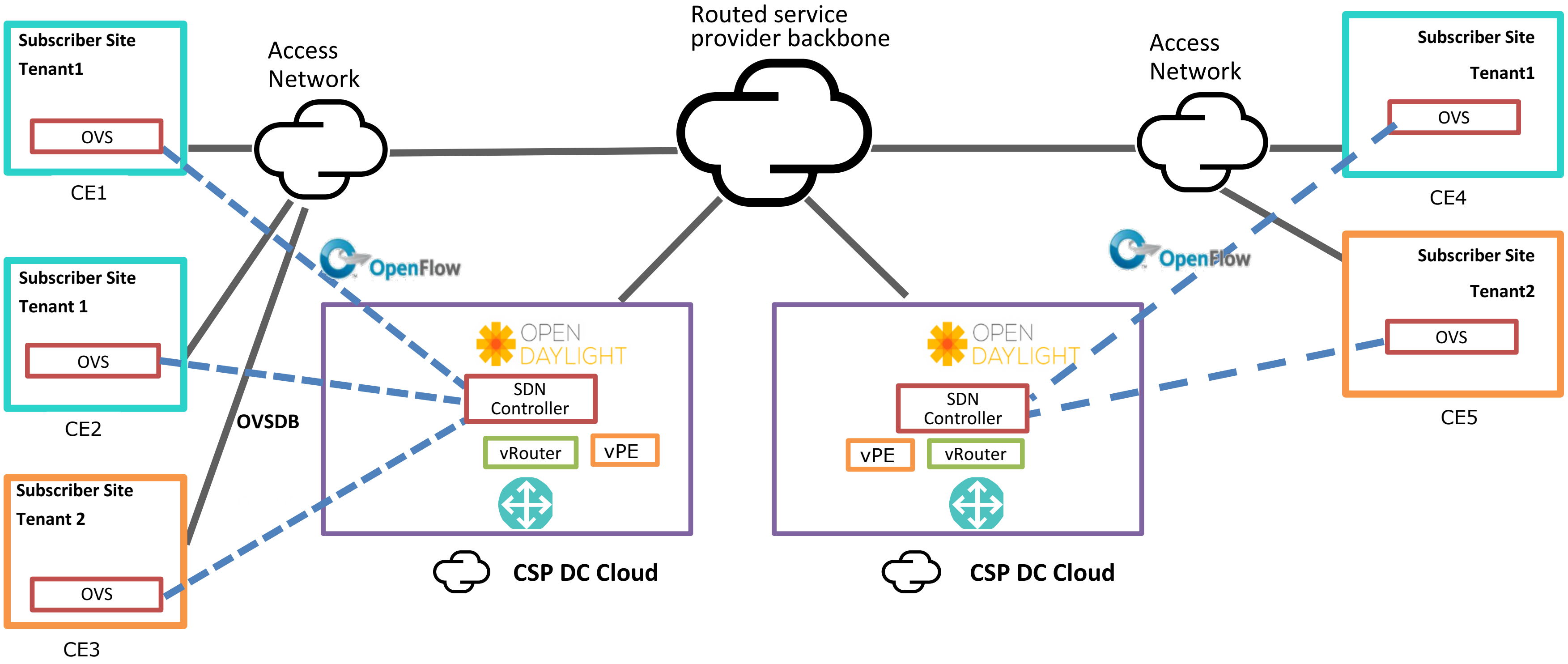
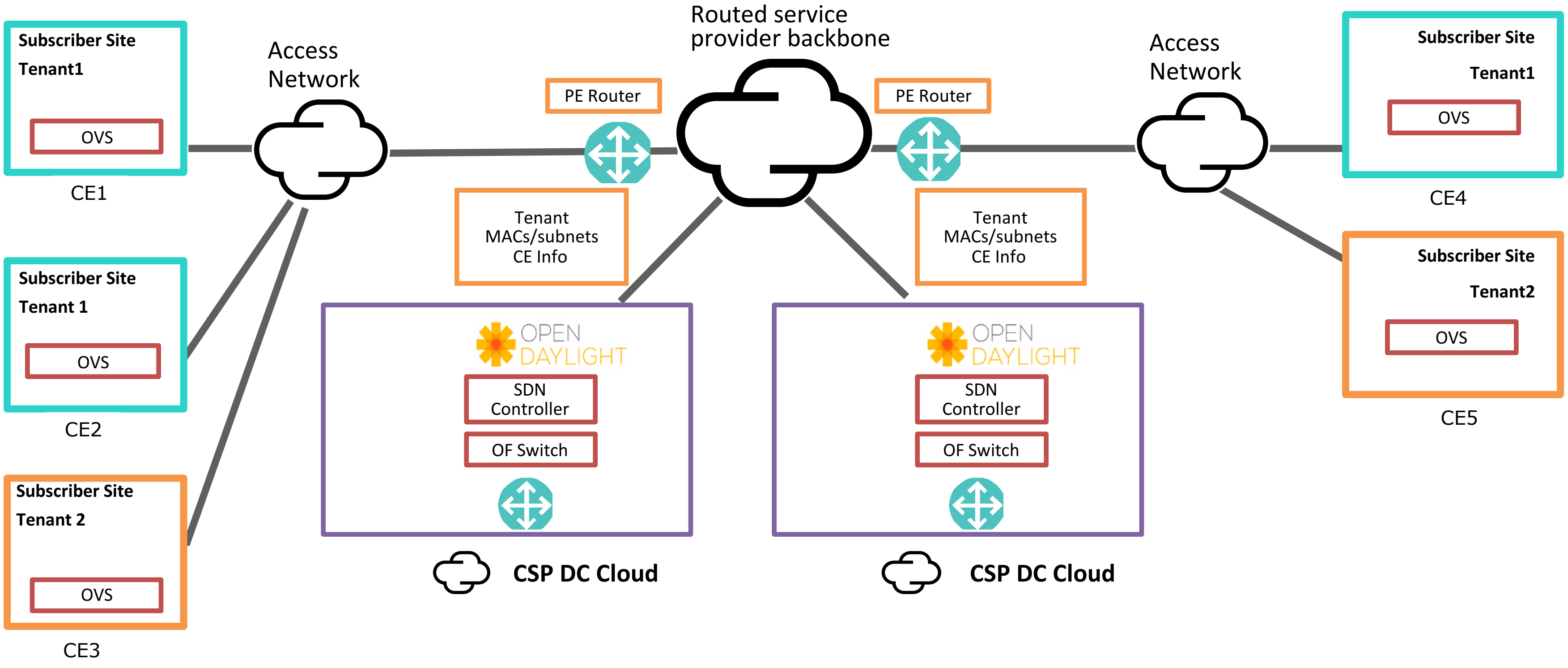


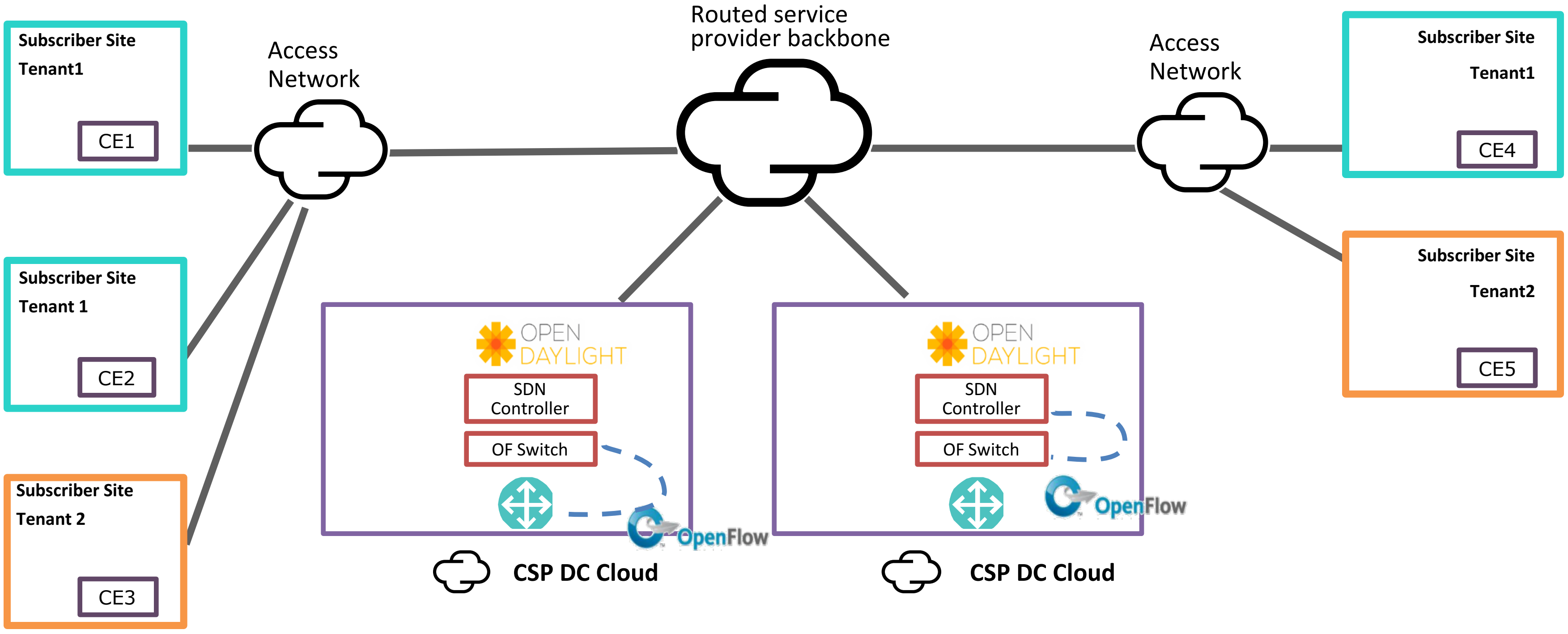
SDN1: SDN Controller Configures CPE ports/tunnels



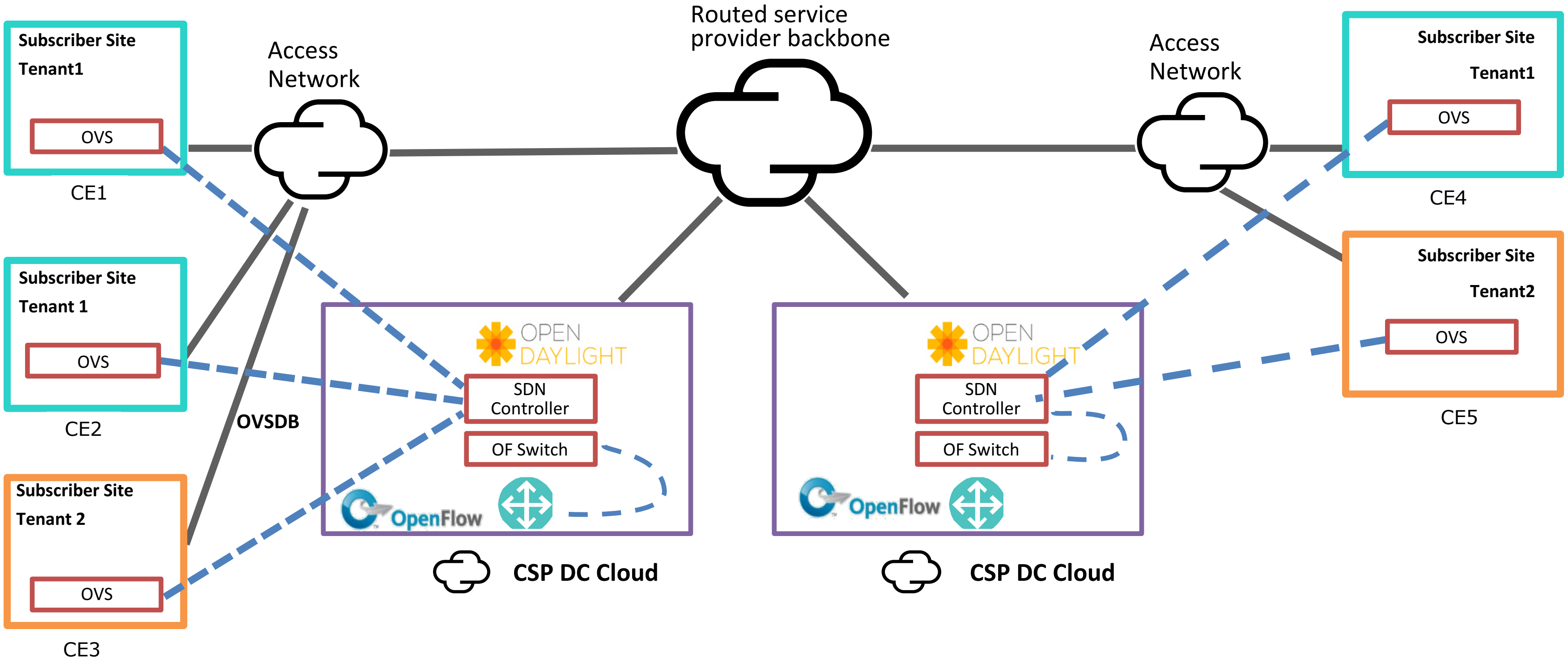
SDN2: Move the Logic & Data to the DC Cloud



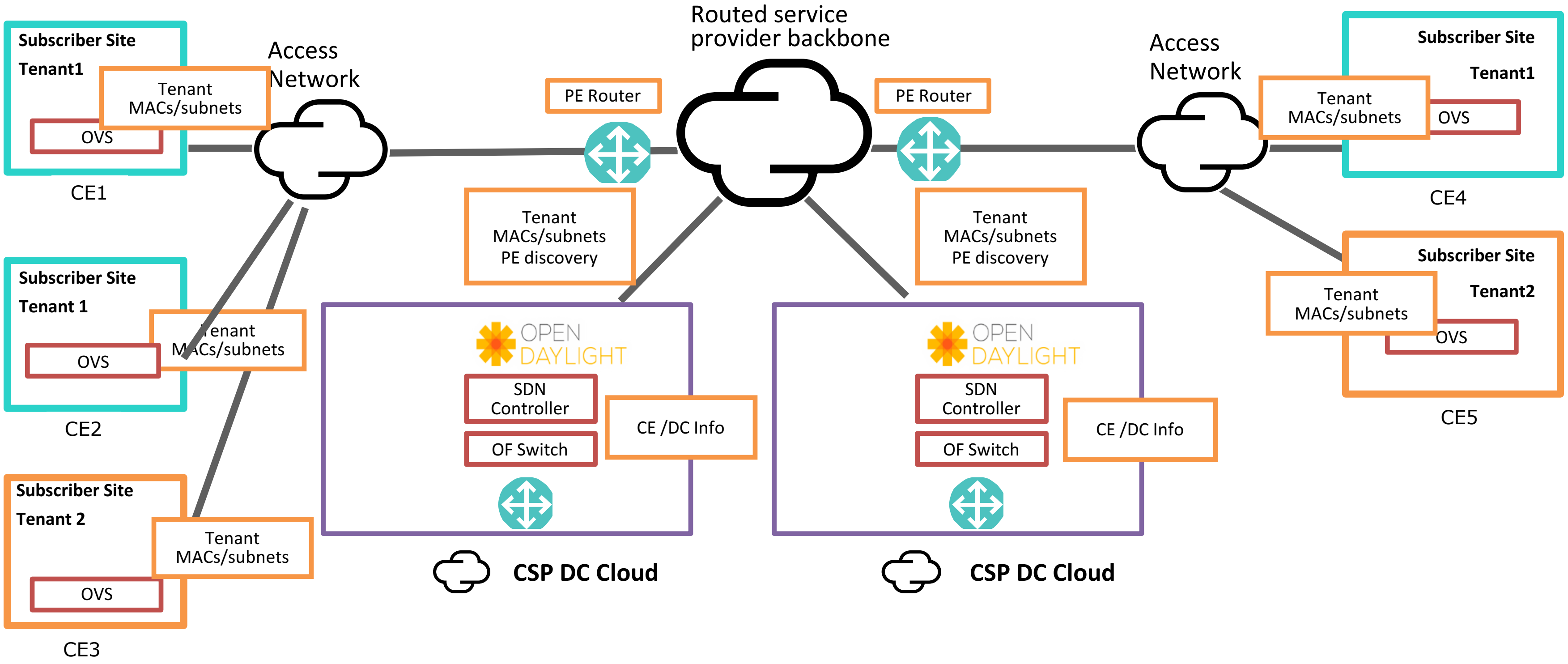
SDN2: Replacing the vPE with an SDN Switch



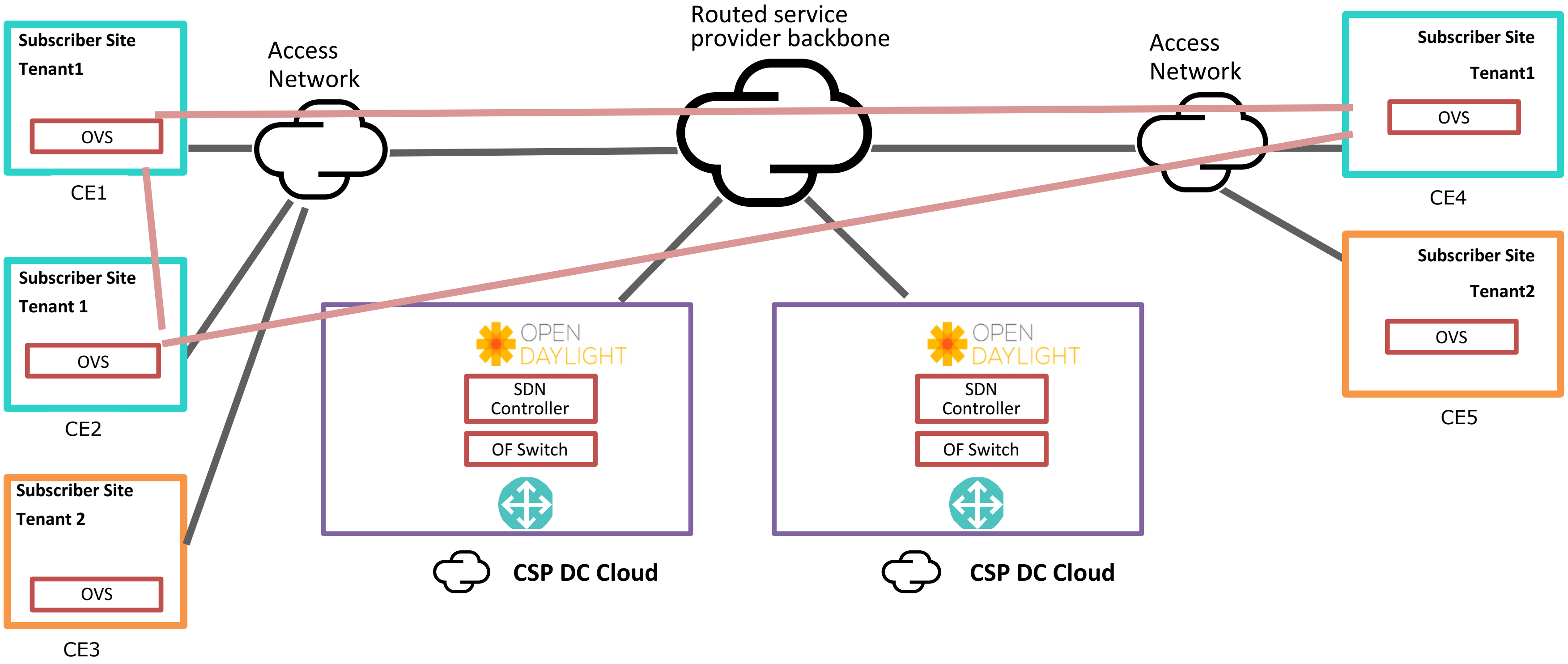
SDN3: SDN Controller Configures CPE & SDN Switch



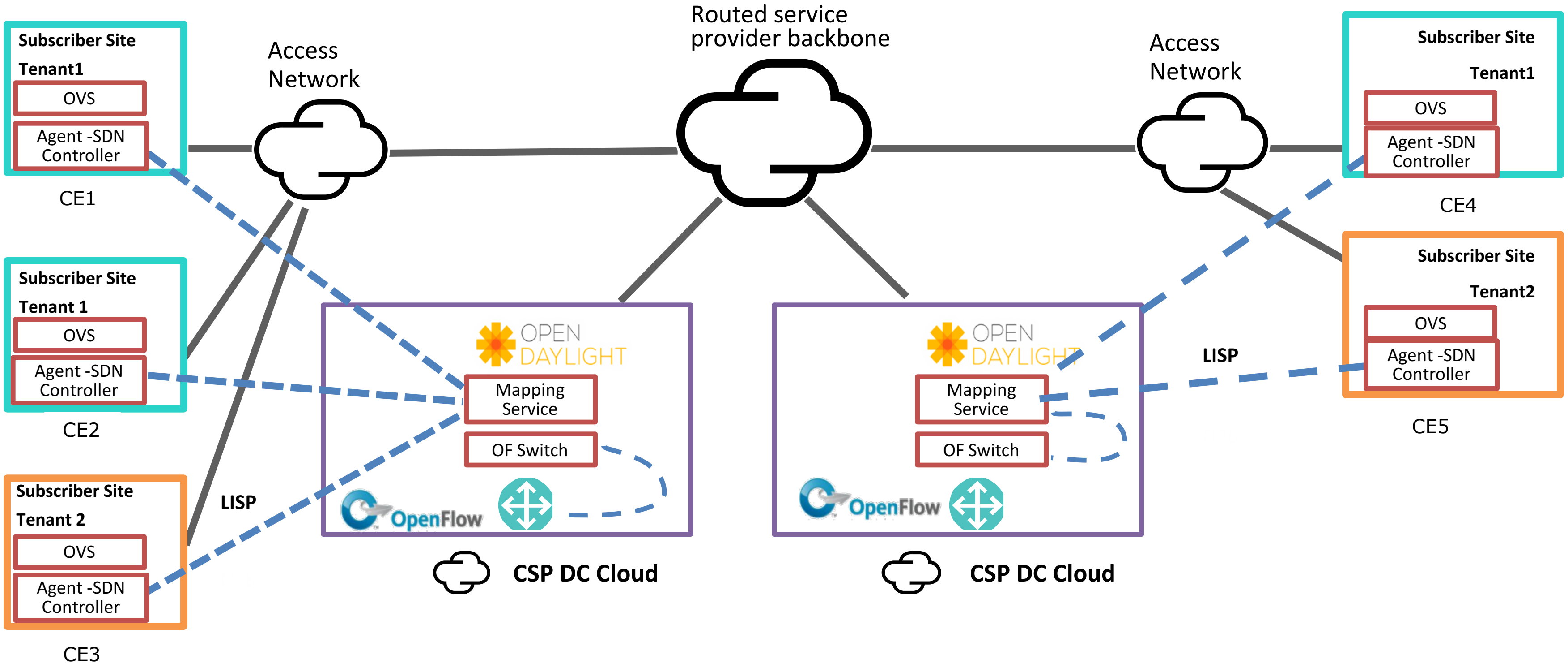
SDN4: Move the Forwarding Logic to the CE



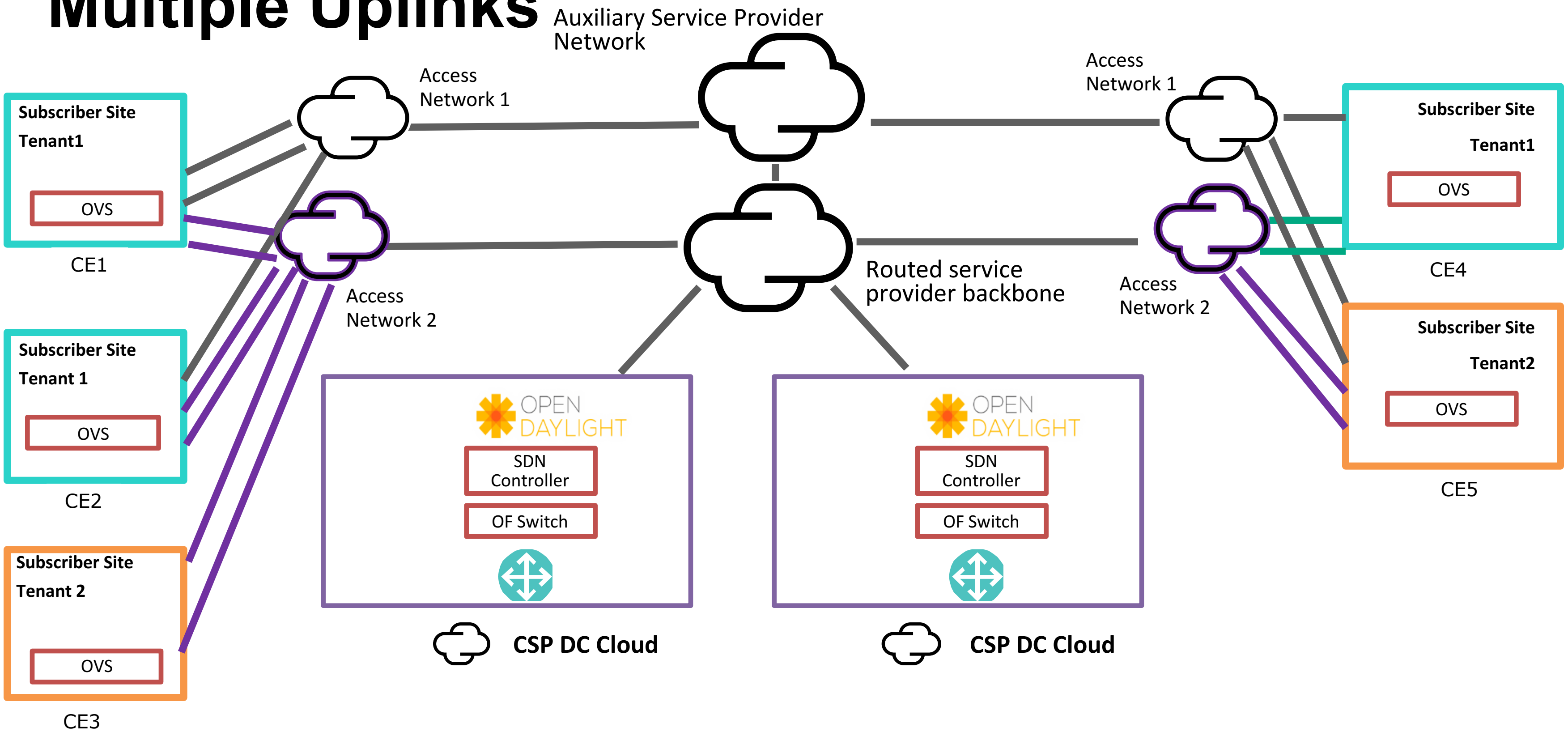
SDN4: Direct CE-CE tunnels



SDN5: SDN Controller agent on CPE



Multiple Uplinks



The Technology Journey: the four stages of NFV

Maximize profitability through continued innovation

Speed & Innovation

Decouple	Innovation comes from more efficient operations	Network functions separated from underlying hardware
Virtualize	Capacity to scale rapidly and respond to customer demand variations	Network functions deployed on hypervisor-driven, virtualized infrastructure resources
Cloudify	Innovation comes from radically streamlined delivery, elasticity and agility	WAN operated as part of the cloud aligns with compute and storage pools
Decompose	Dynamically compose and modify services for seamless integration of network	Monolithic network functions are decomposed

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Summary

- NFV: Focused on using virtualization techniques
- SDN: Applying Business Logic to Network Behavior
- Independent but Complimentary
- Use the Right Tool for the Job

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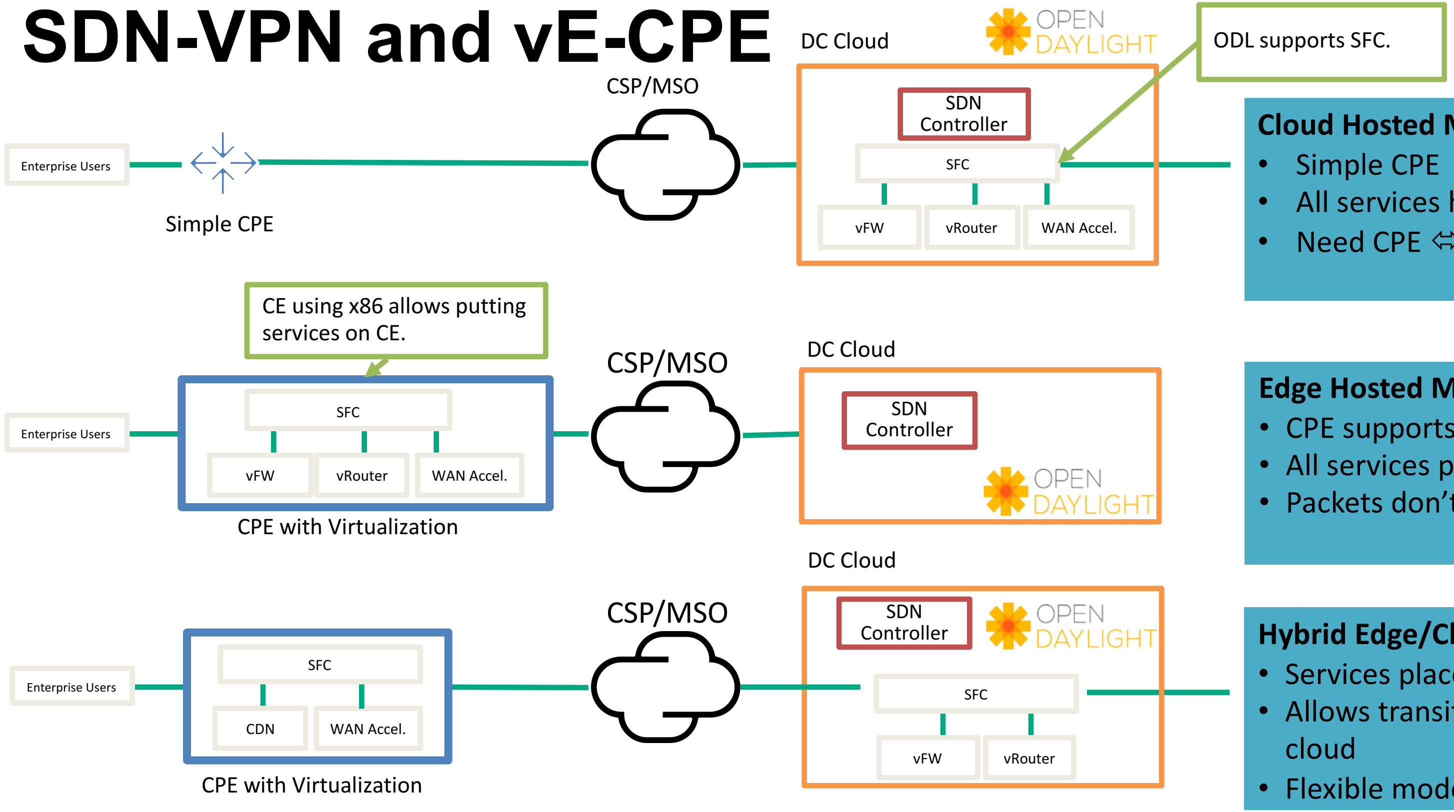
SDN-VPN and vE-CPE



Cloud Hosted Model

- Simple CPE
- All services hosted in the cloud
- Need CPE ⇔ DC cloud tunnel

Edge Hosted Model

- CPE supports virtualization
- All services placed in customer site
- Packets don’t need to go through DC

Hybrid Edge/Cloud Model

- Services placed both in CPE/DC cloud
- Allows transitioning from edge to cloud
- Flexible model

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