

OPEN

Compute Engineering Workshop

March 9, 2015

San Jose

Refactoring Telco Functions

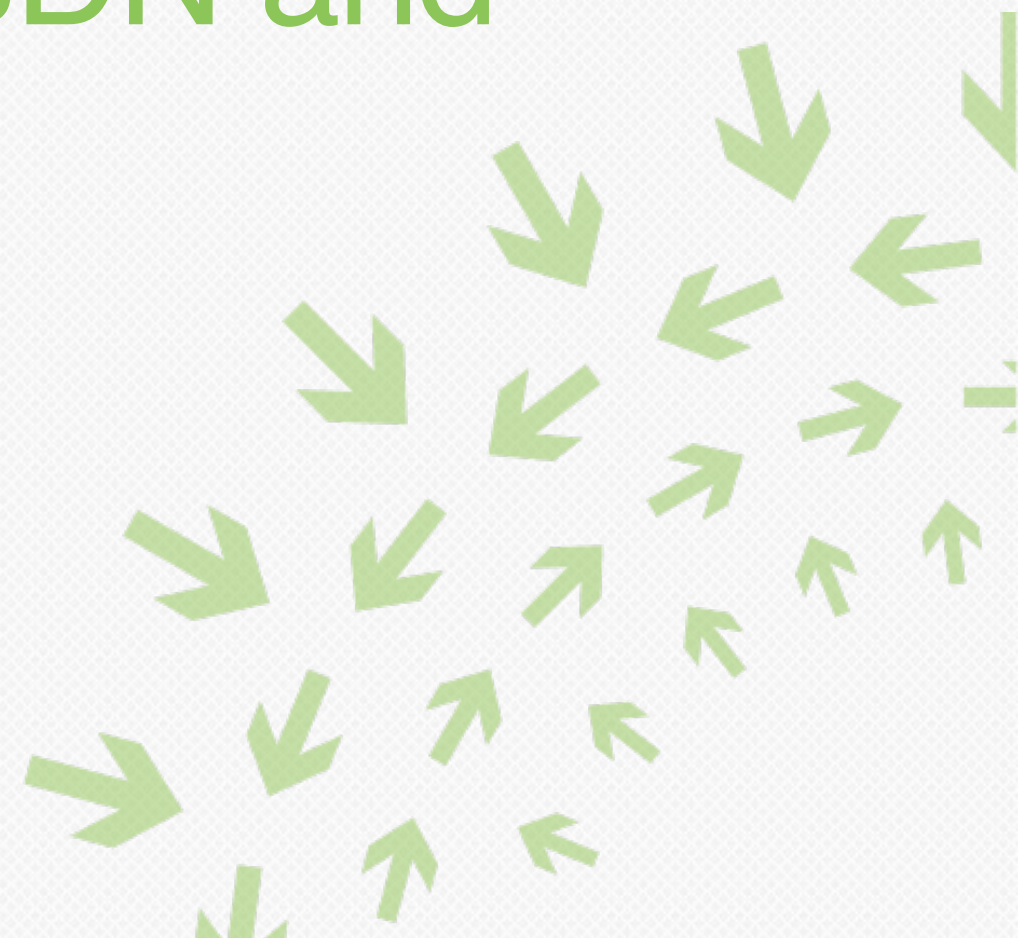
The Opportunity for OCP in Telco SDN and NFV Architecture



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Agenda

- Telco Network Imperatives
- SDN and NFV Technologies
- Refactoring for Virtual Network Functions and Infrastructure
- Virtual GPON OLT Architecture, Project and Demo



AT&T Business Imperatives

Open our Network

Modular

Programmable via robust
Network API's, service
creation and execution

Simplify and Scale

Common NFV Infrastructure

New operational paradigms

*Emergent significant stressors
include Video and Internet of
Everything*

Increase Value

Agile, Elastic, Dynamic

Cost-Performance leadership

Enable new growth services & apps

World class, industry leading security,
performance, reliability

Facilitate new business models and
associated monetization paradigms

Architecture and Technology Directions

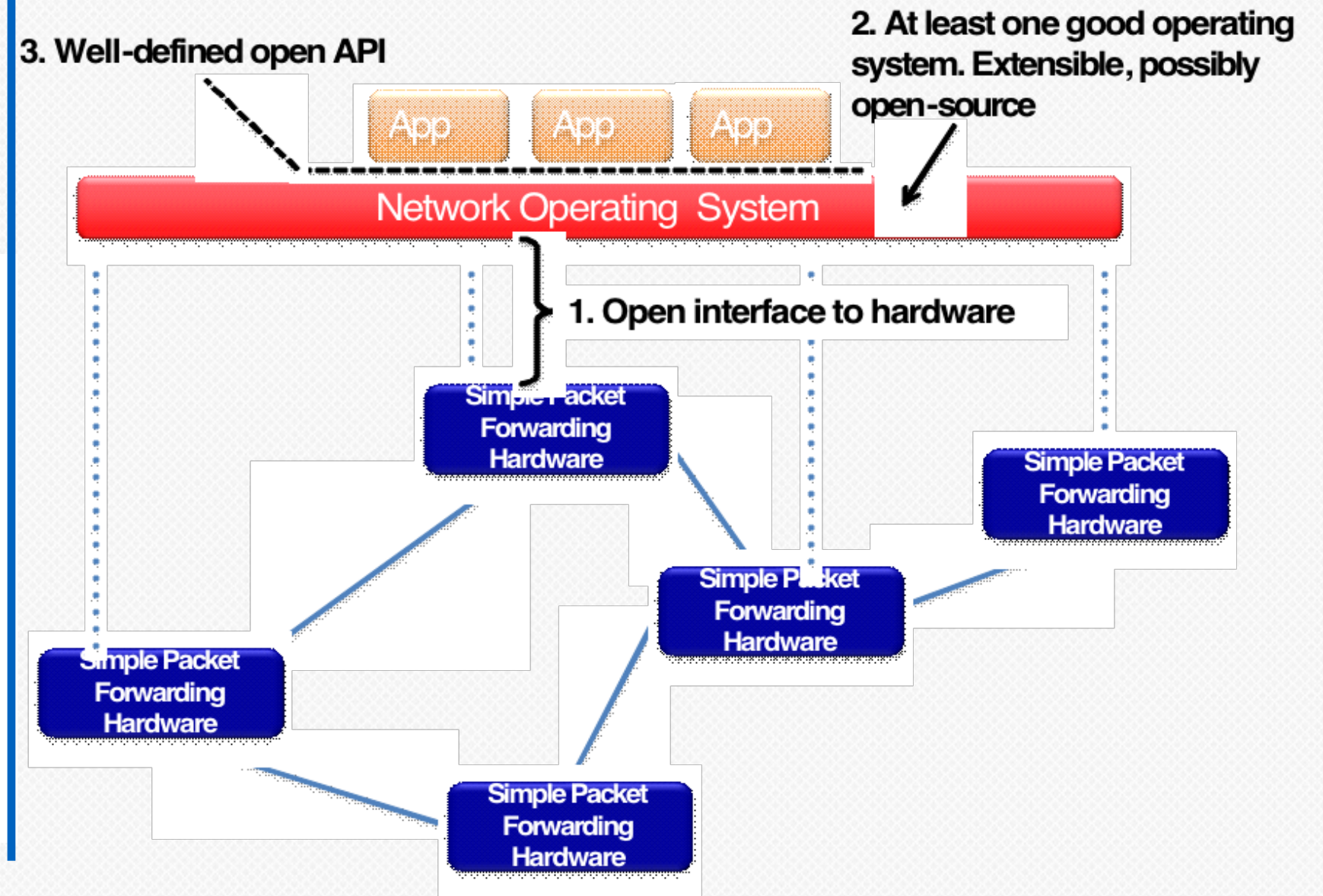
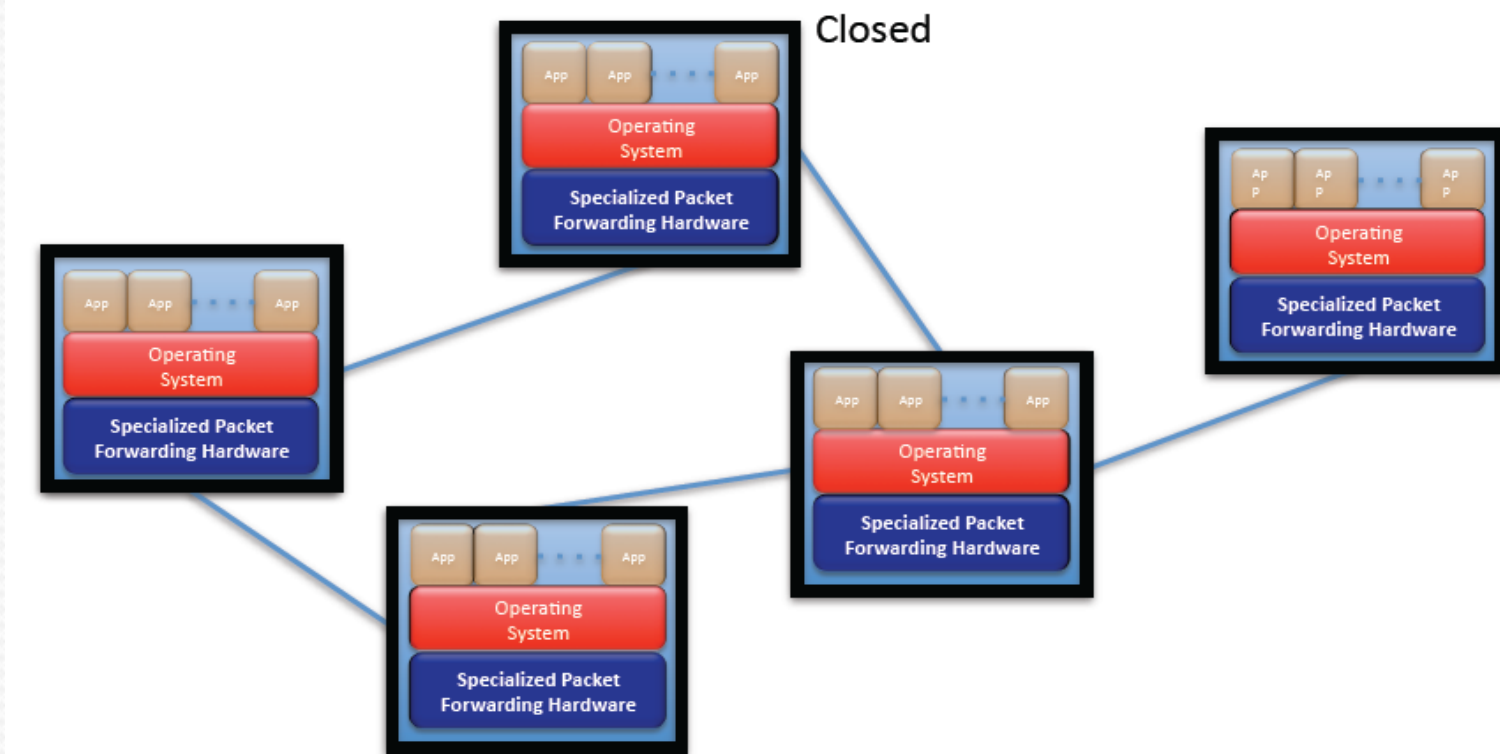
Decouple HW from SW - NFV

Separate Control from Forwarding - SDN

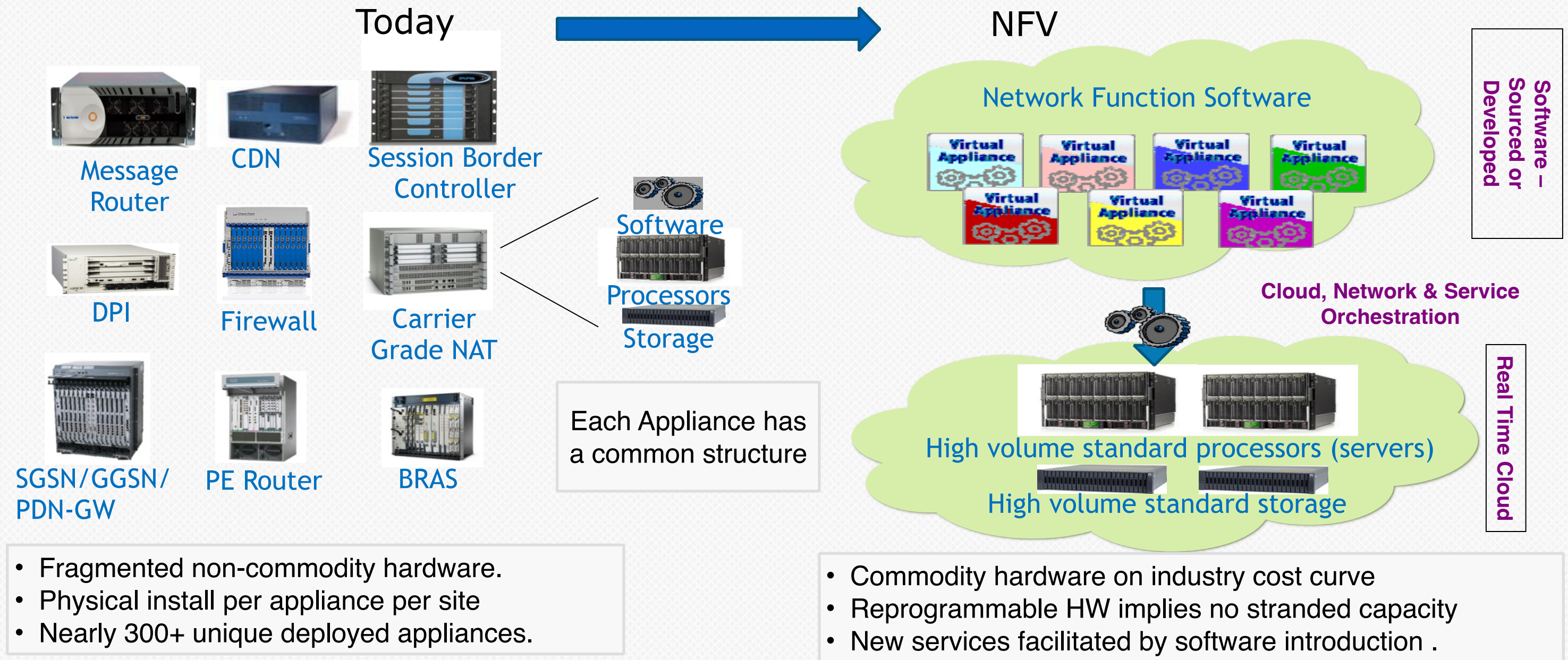
Combining NFV and SDN, enables a real time
network cloud, distributed and integrated through
the WAN, optimized for packet



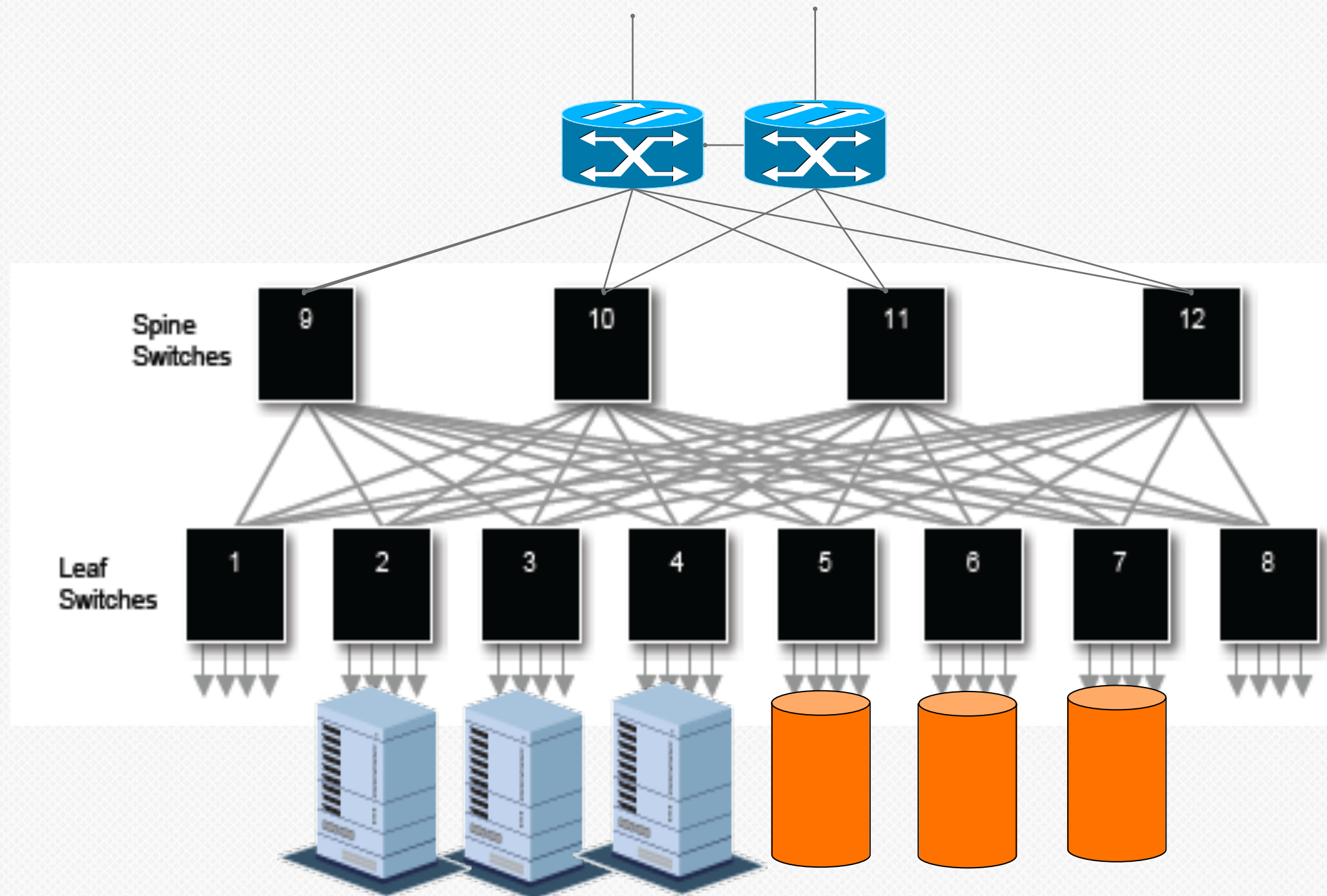
Basic Principle of SDN



Basic Principle of NFV



NFV Infrastructure



WAN Network Links

WAN Routers

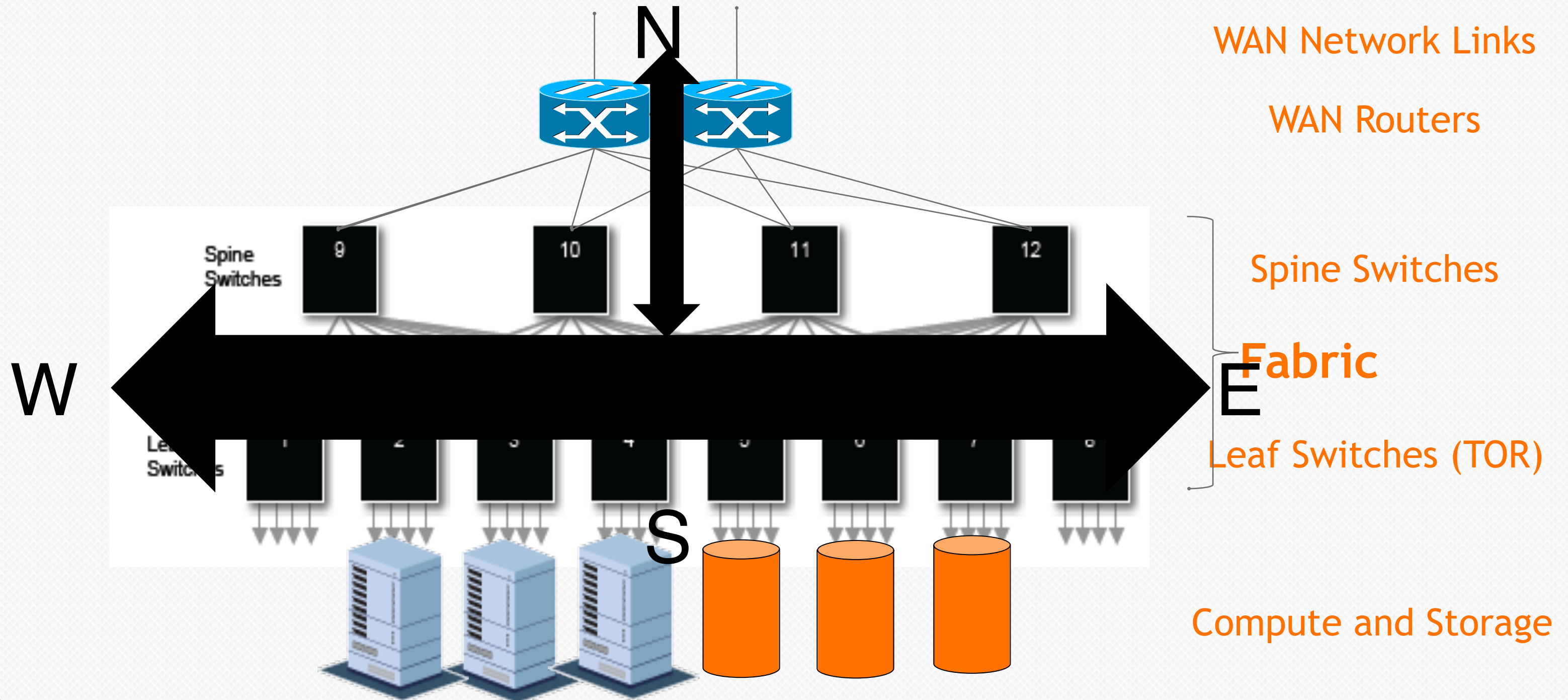
Spine Switches

Fabric

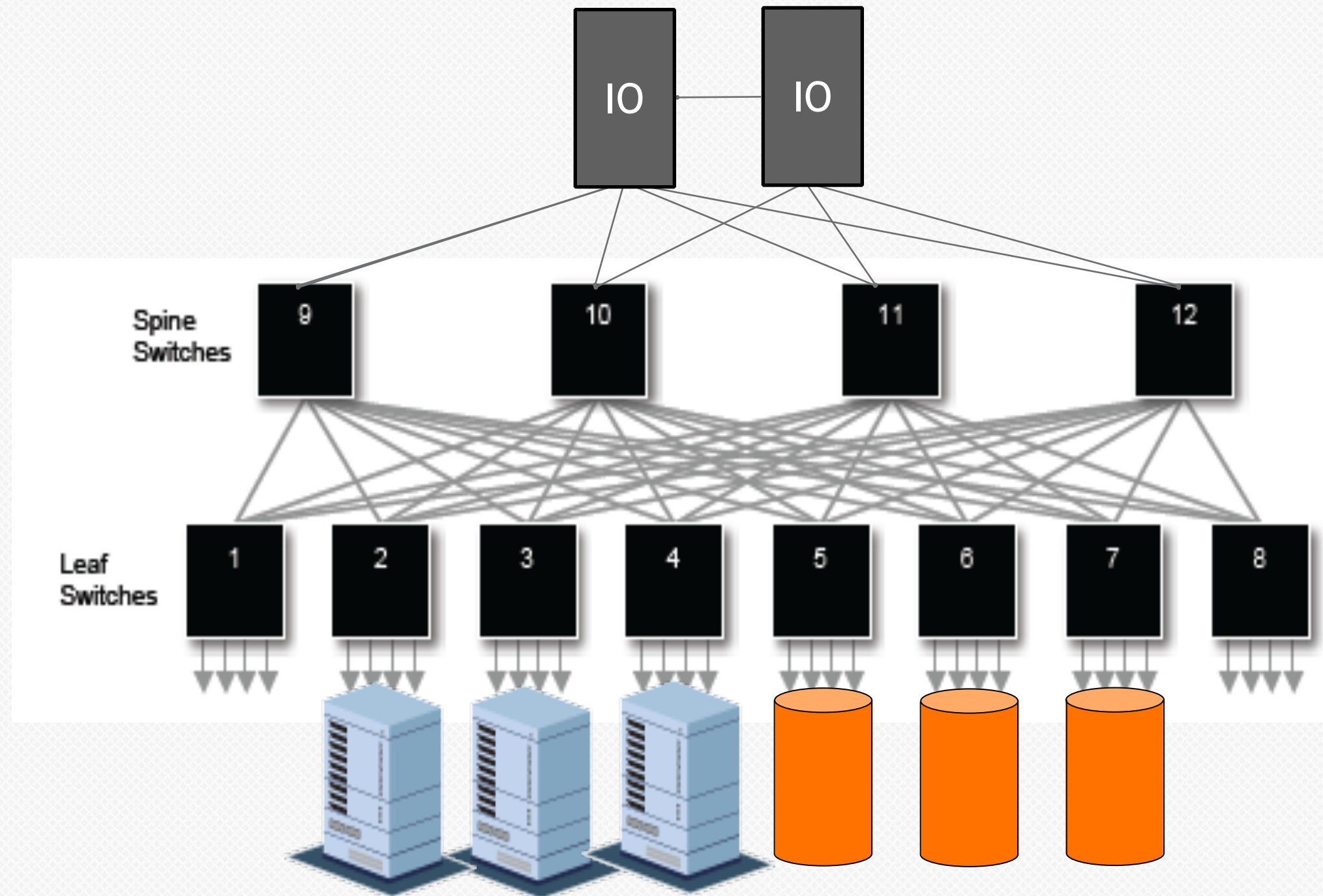
Leaf Switches (TOR)

Compute and Storage

But There's a Small Gotcha



So Let's Fix It for WAN IO



WAN Network Links

WAN Routers

Spine Switches

Fabric

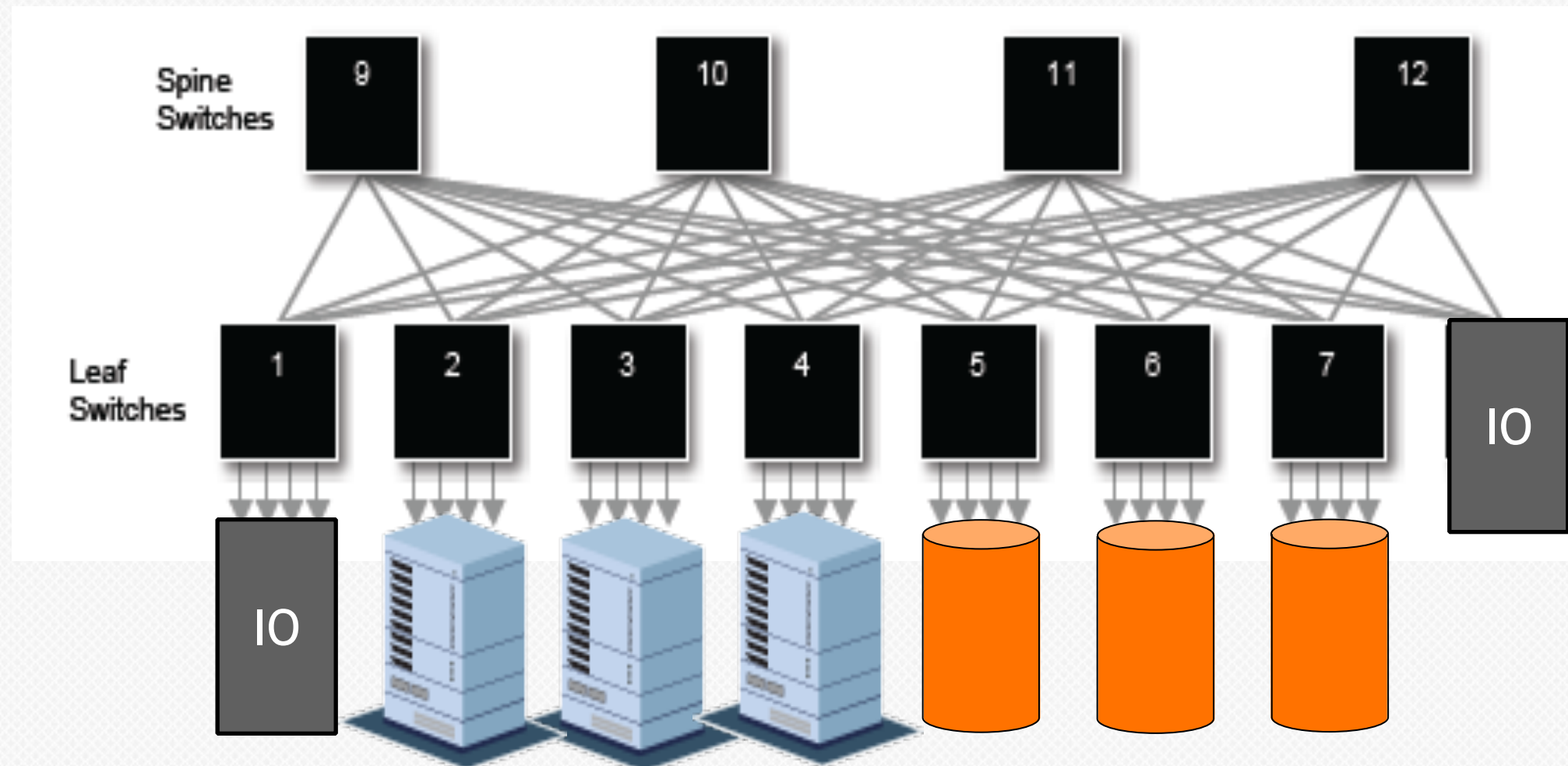
Leaf Switches (TOR)

Compute and Storage

So Let's Fix It for WAN IO

WAN Network Links

WAN Routers



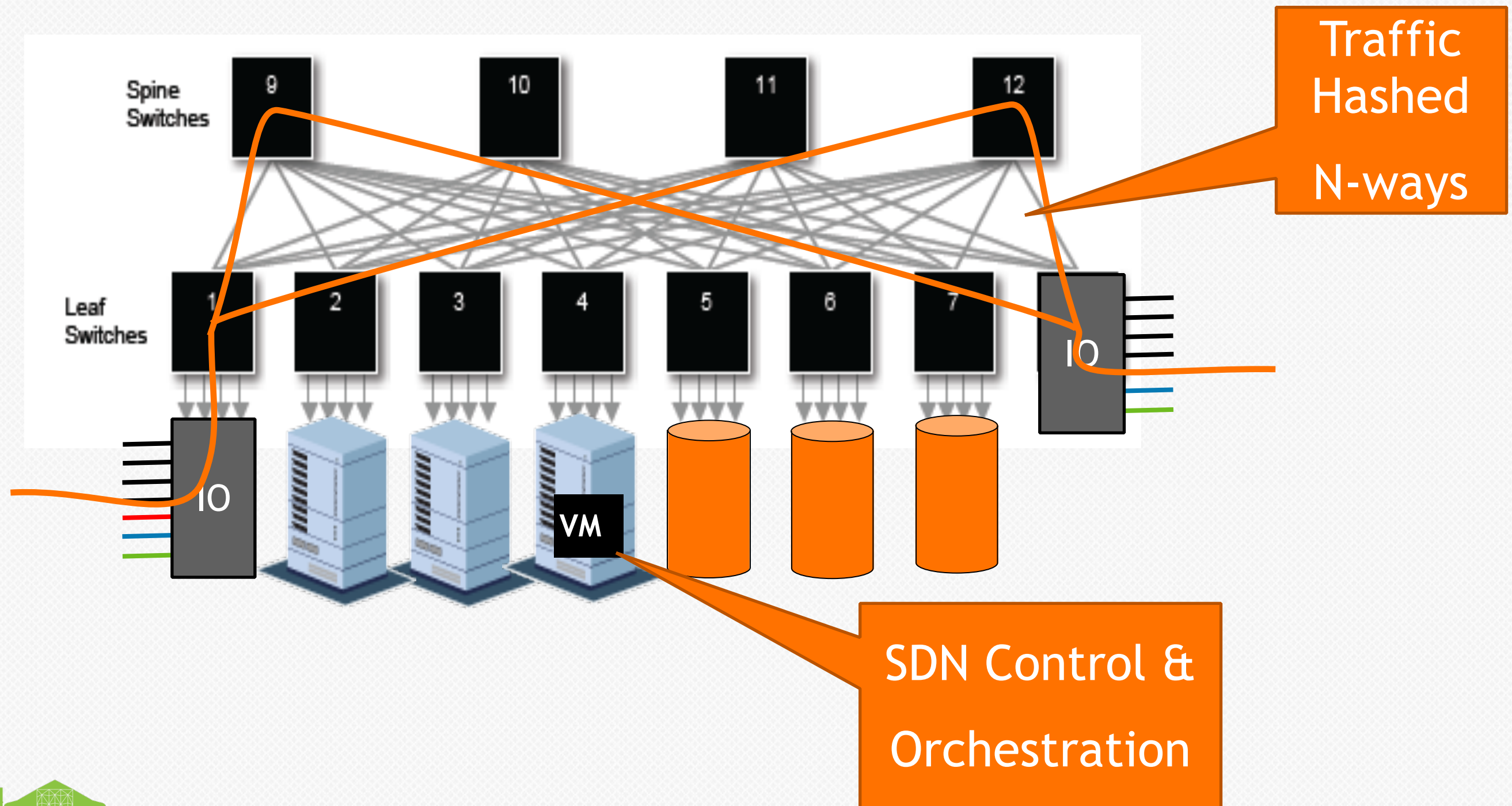
Spine Switches

Fabric

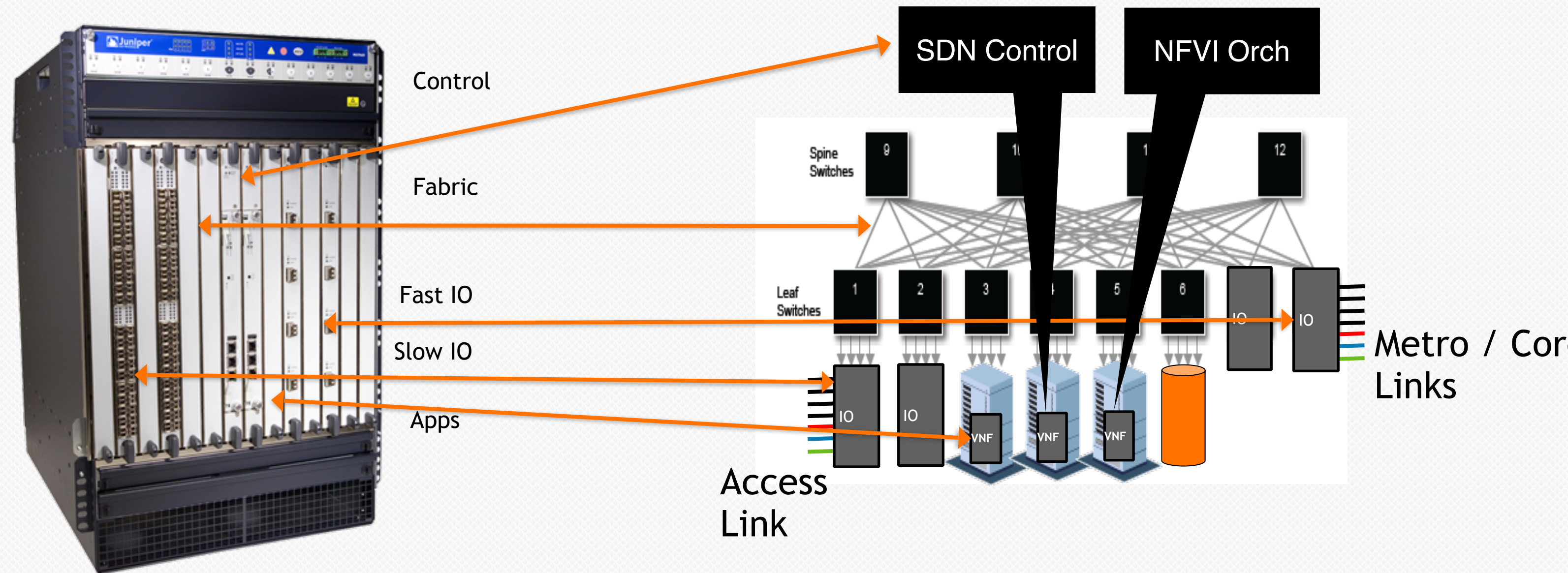
Leaf Switches (TOR)

Compute and Storage

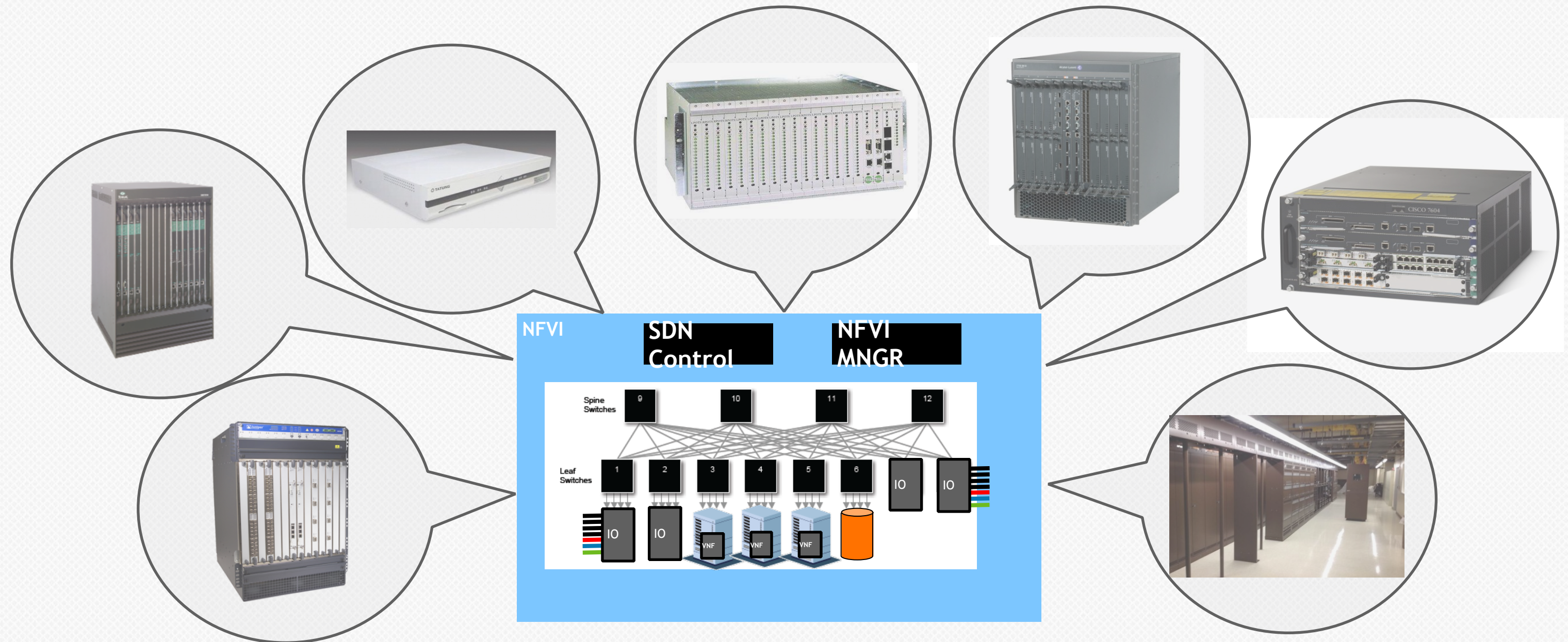
Using NFVI to [Re]Construct Routers



Mapping Then to Now



Unifying Hardware in NFV Infrastructure



The Sum is More Than the Parts

NFV

Conversion of network functions from dedicated HW to SW on shared infrastructure leveraging COTS, generic servers

SDN

Separation of control and forwarding with programmability of network including recipes (abstractions) of network functionality



NFV + SDN

NFV and SDN are complimentary technologies. They can be introduced individually, but together provide greater value.

SDN can enhance performance, improve utilization, harmonized with existing deployments, introduce agile operation & maintenance procedures, and enable new service paradigms.

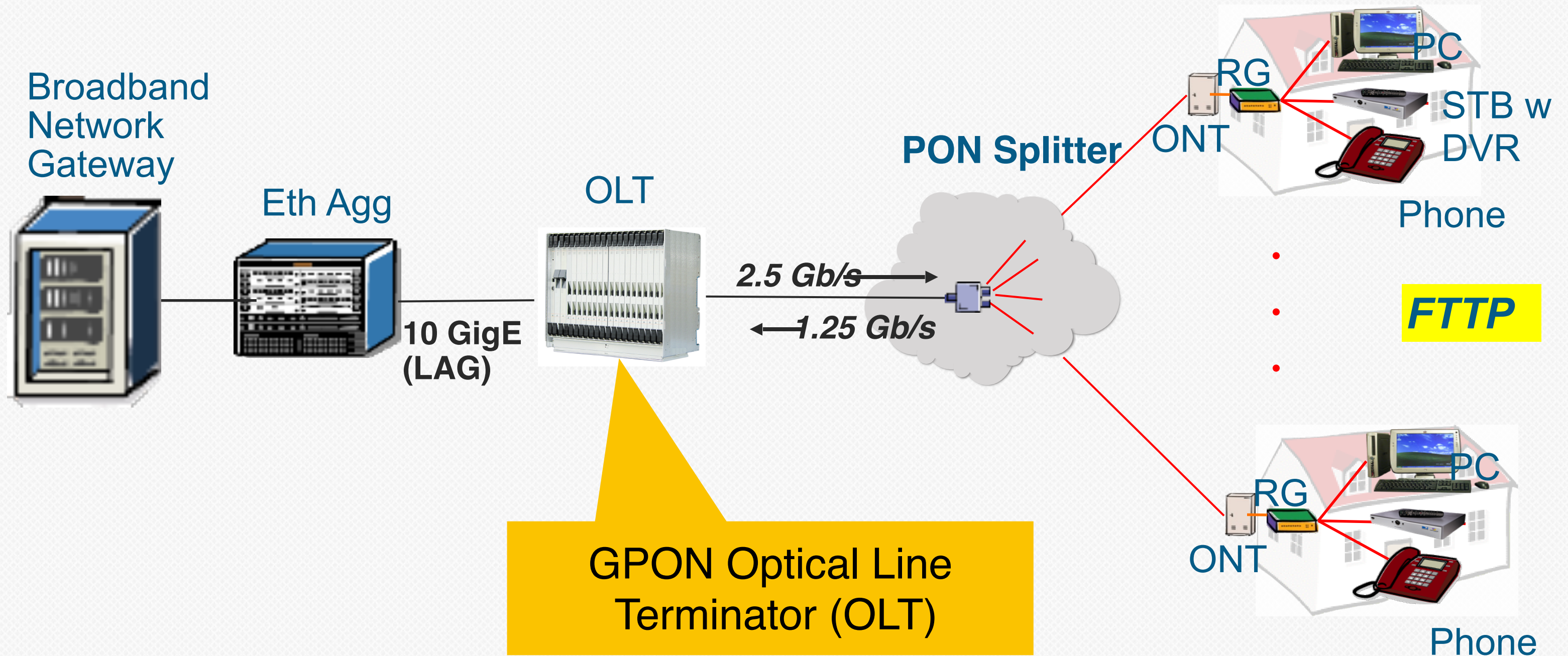
NFV can further support SDN by providing the COTS infrastructure upon which SDN software can run. NFV also provides the “new” unit of compute, storage, and networking that hosts many existing and new network functions.



Reconstructing GPON

(Gigabit Passive Optical Network)

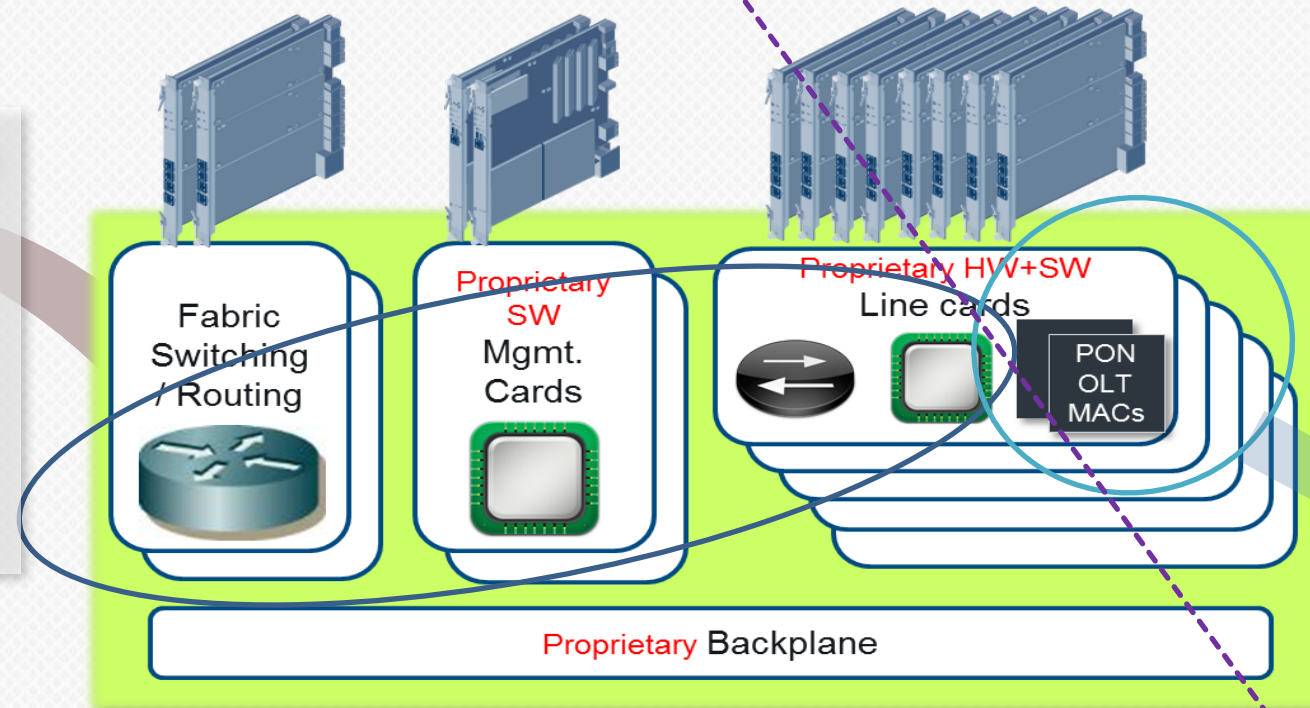
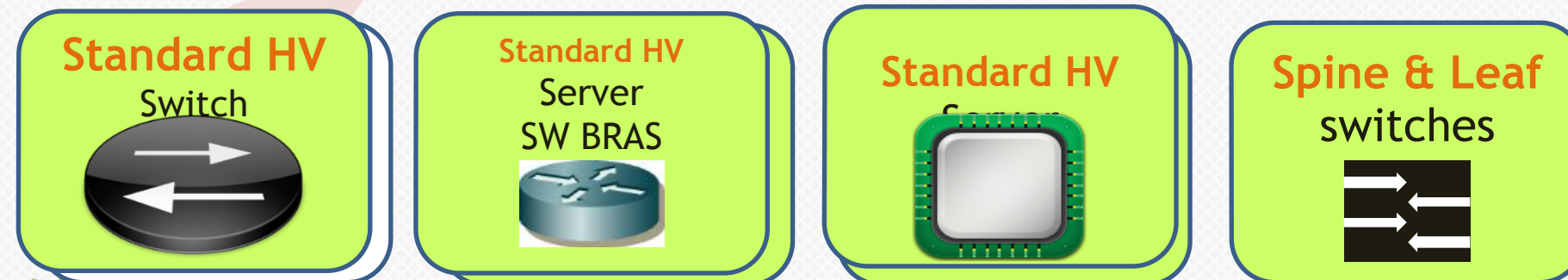
Legacy GPON Access Architecture



Virtual OLT (vOLT)

Everything but the MACs can be virtualized and moved to NFVI running over standard:

- Fabric Switches
- Storage
- Servers



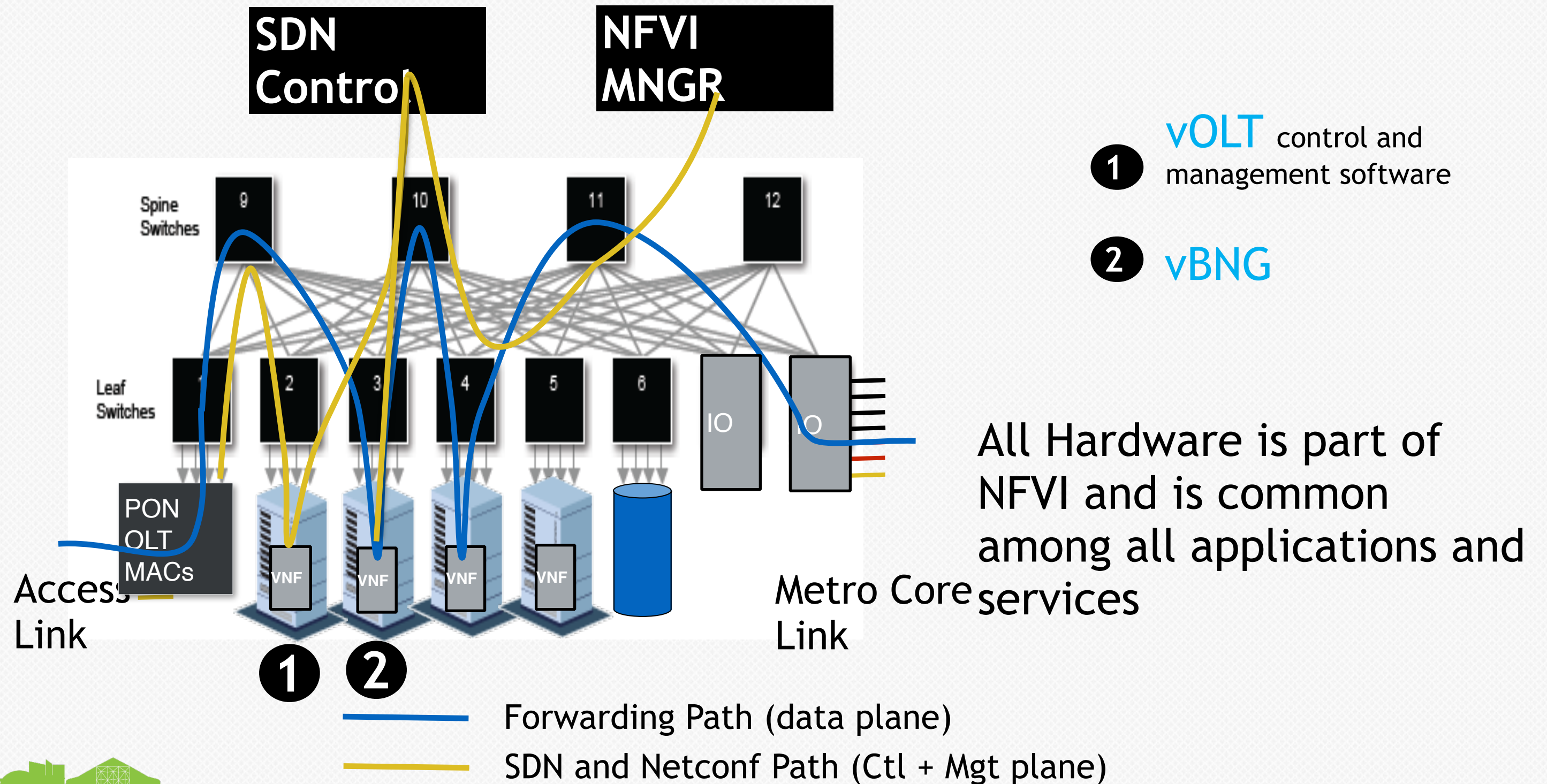
PON MACs is moving to standalone HW



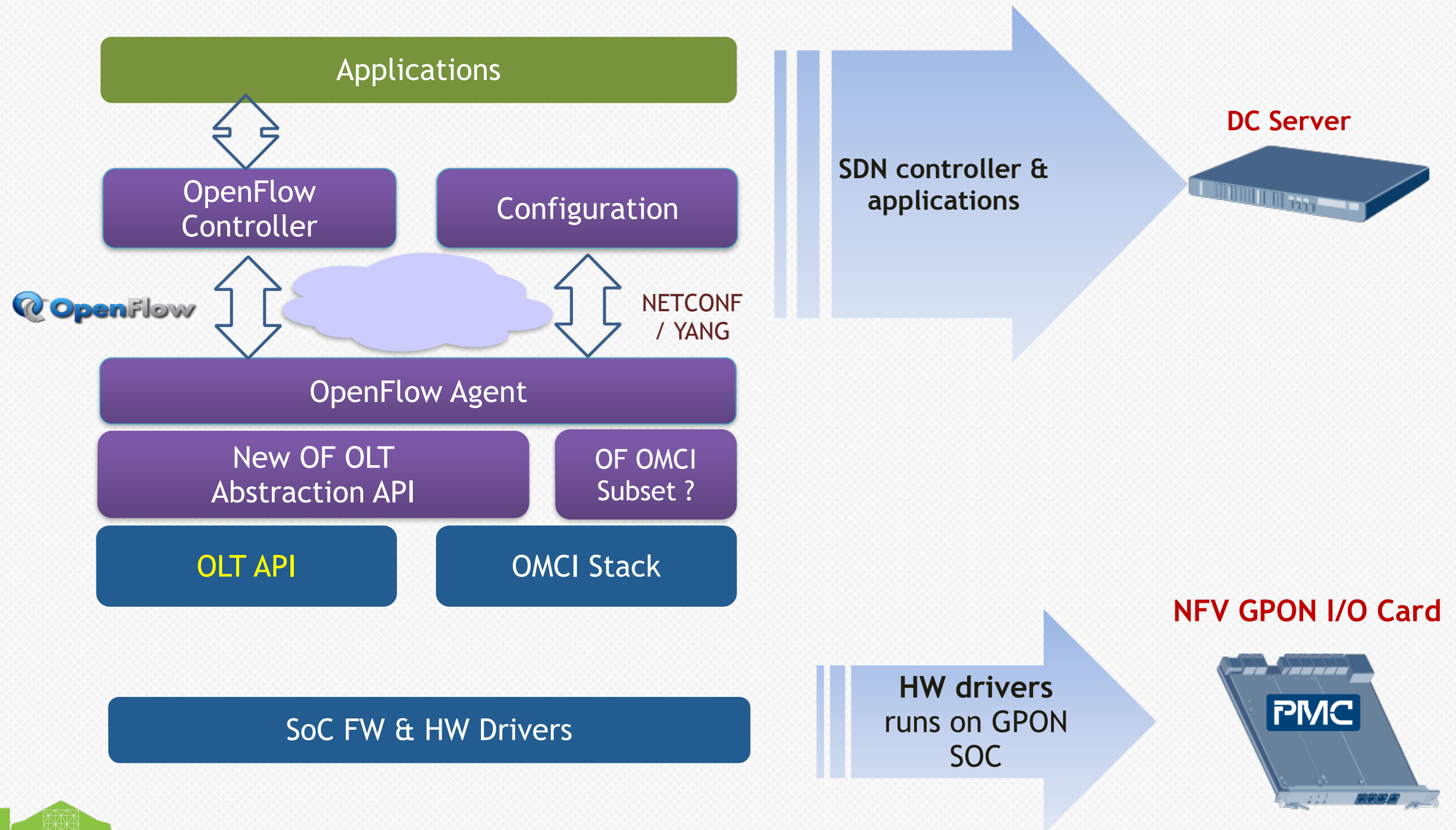
NFV OLT

Standard Equipment

vOLT in NFVI



Virtual OLT Software Architecture



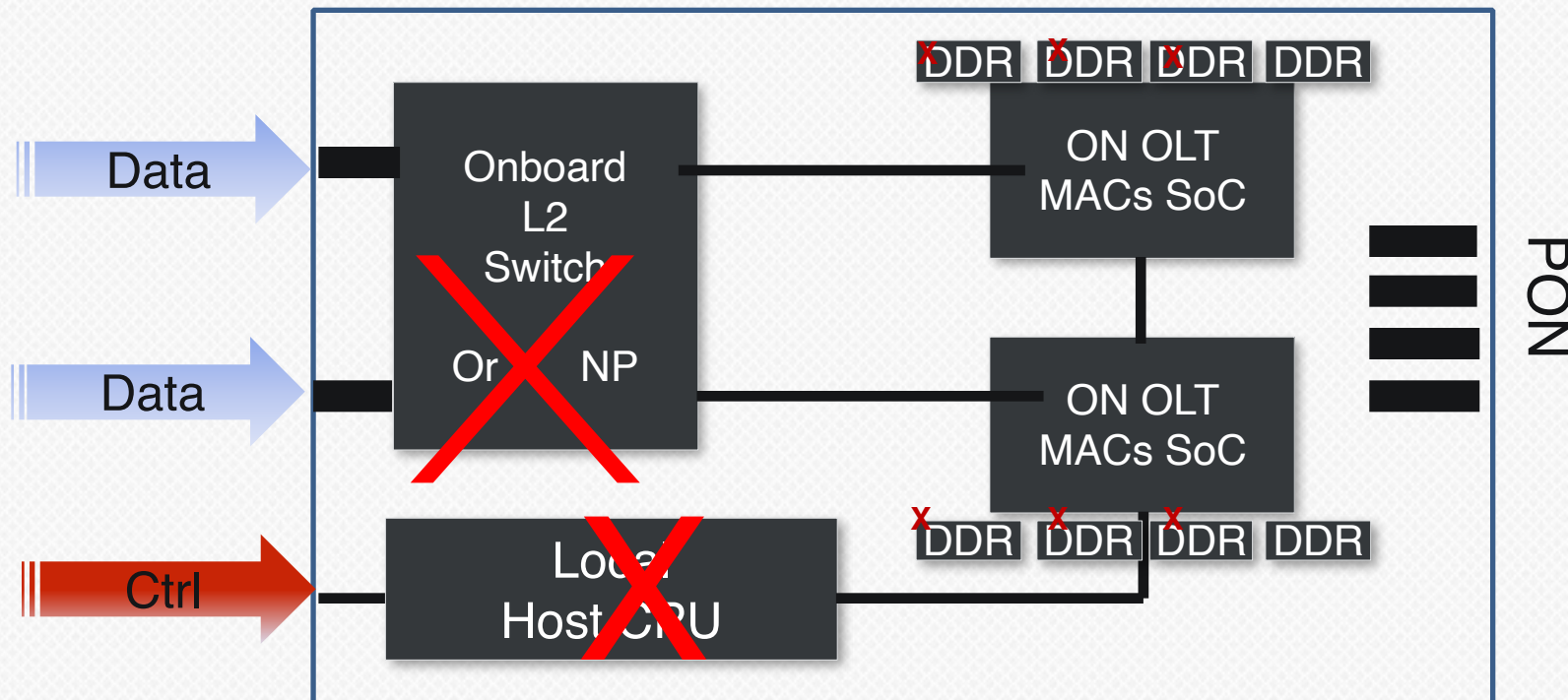


OCP GPON OLT IO Blade

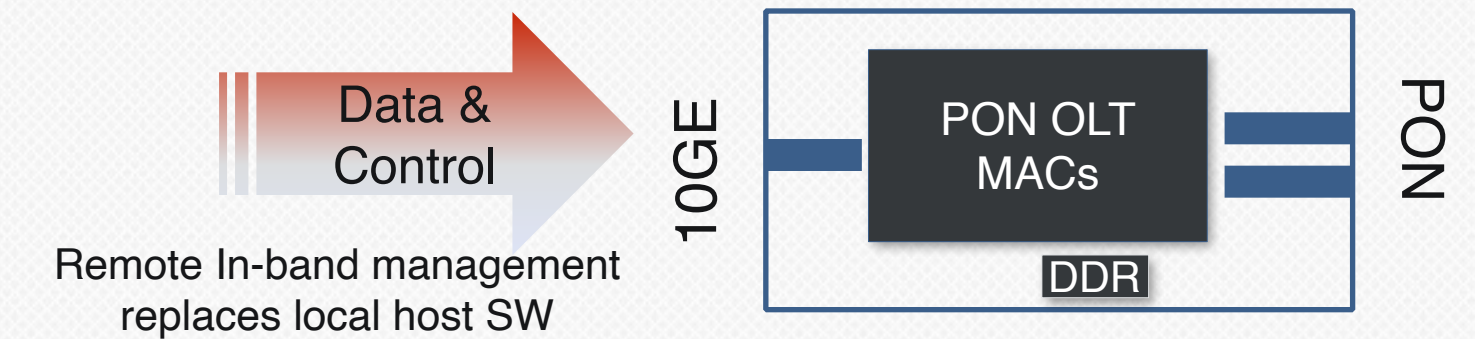
(Gigabit Passive Optical Network)

Minimize Complexity in Hardware

Traditional OLT Line Card



GPON OLT IO Blade

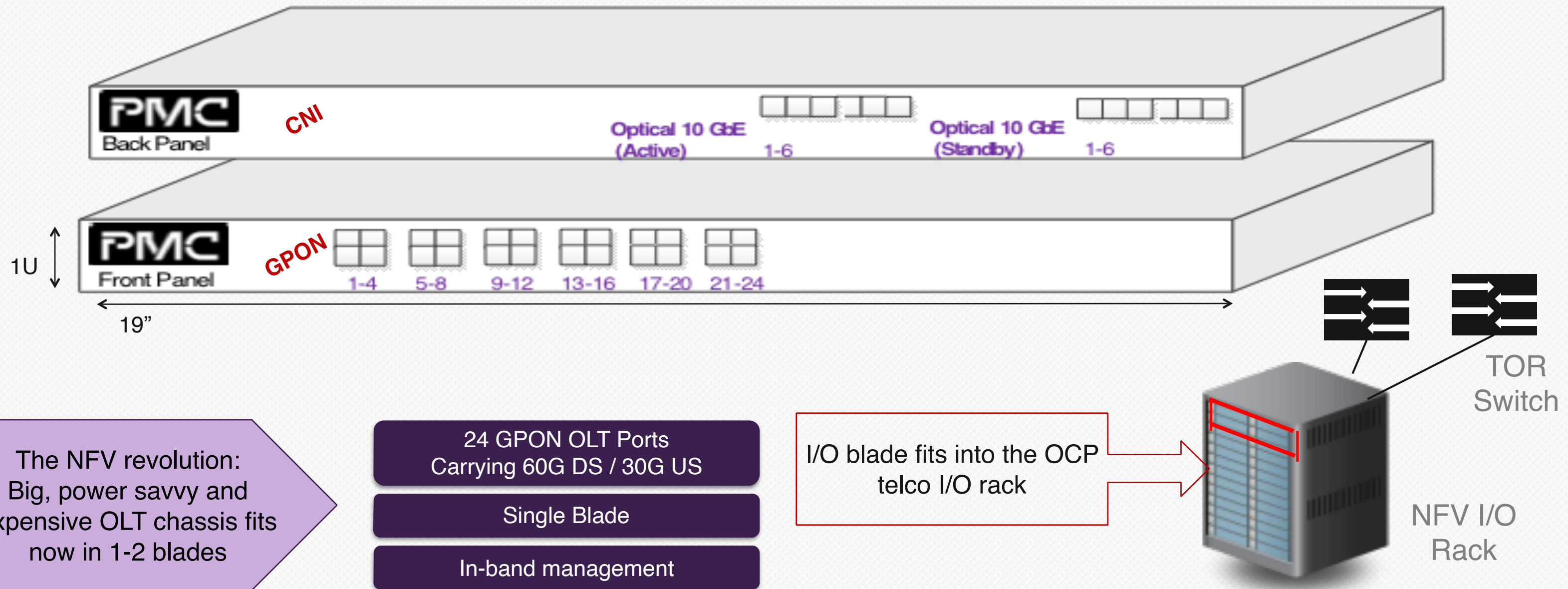


GPON I/O card doesn't require dedicated management port, external host CPU, TM & PP and associated memory.

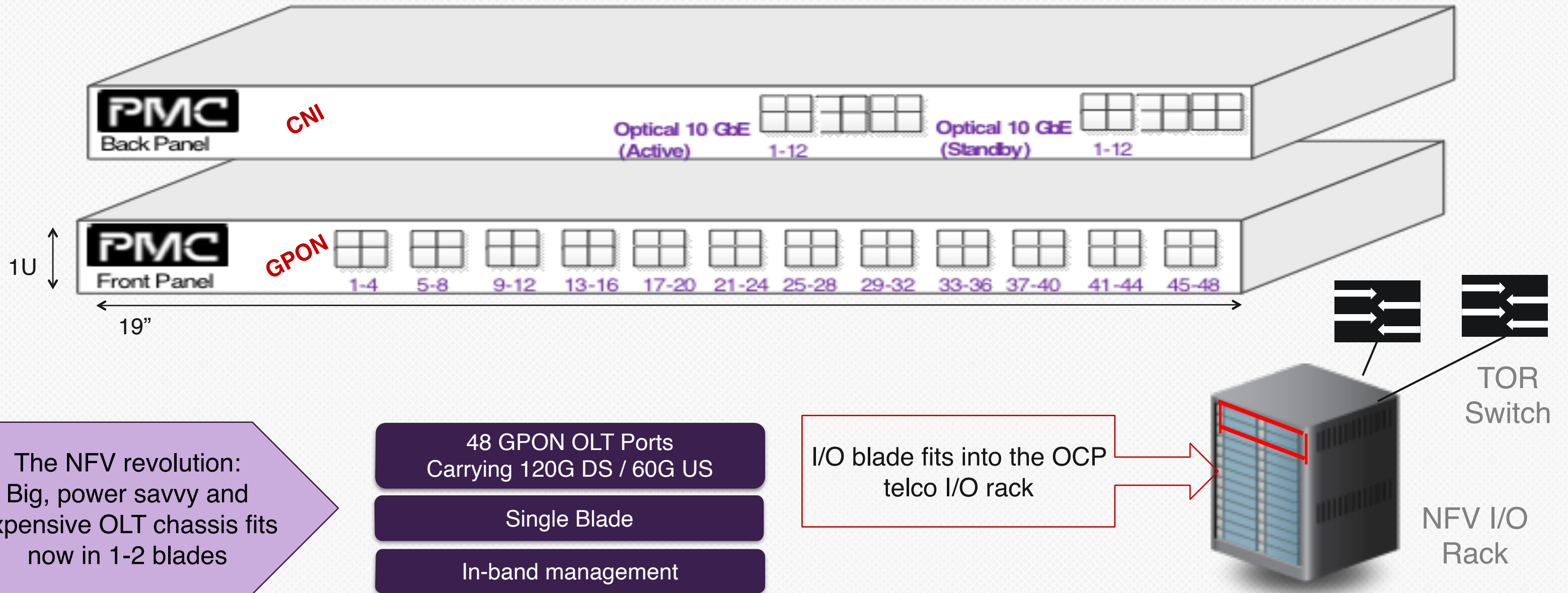
The result is higher PHY density with low power, lower cost and significantly lower TCO



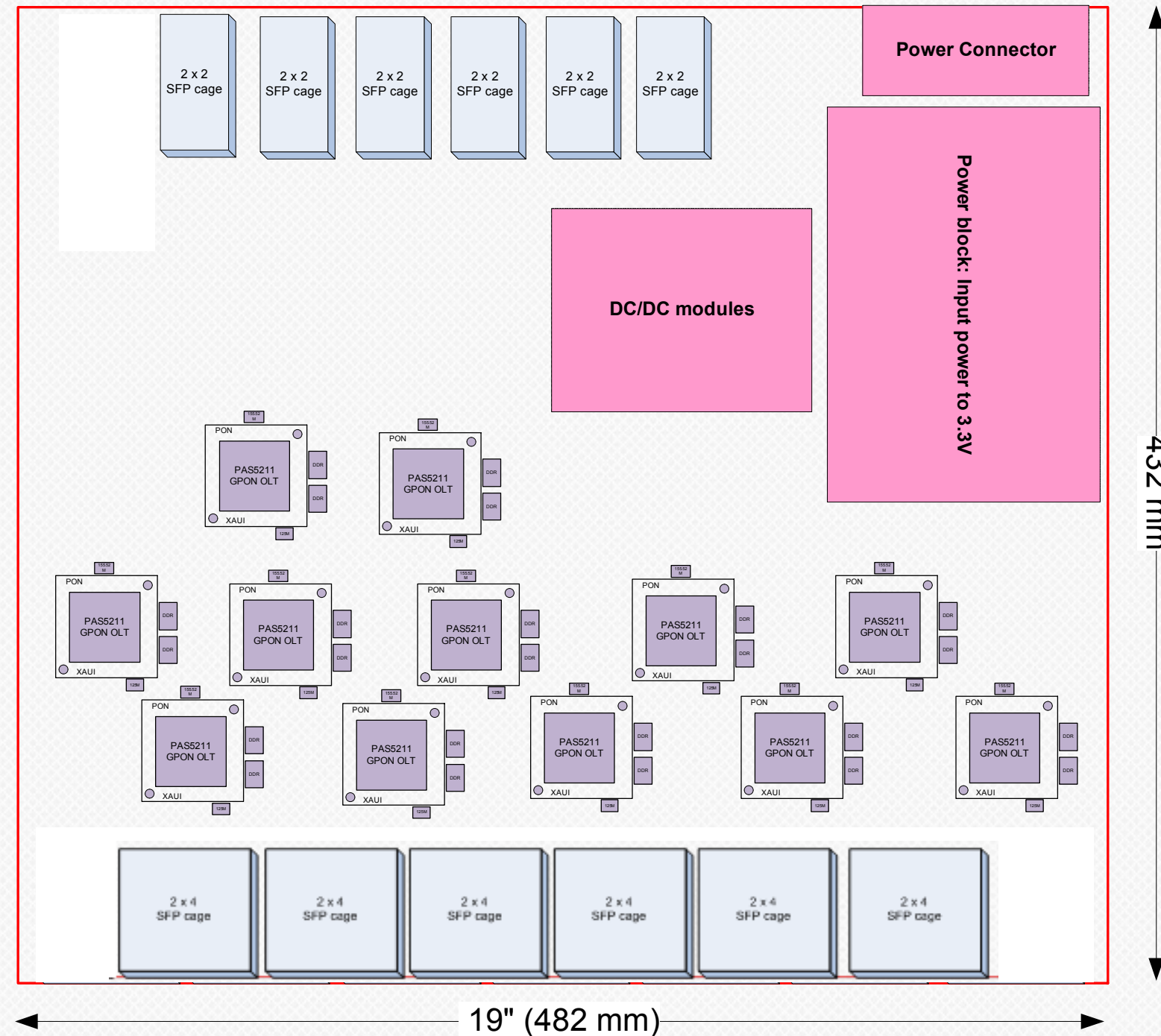
Example 90G GPON OLT IO Blade



Example 180G GPON OLT IO Blade



Example 48 PON Layout in 19" 1RU

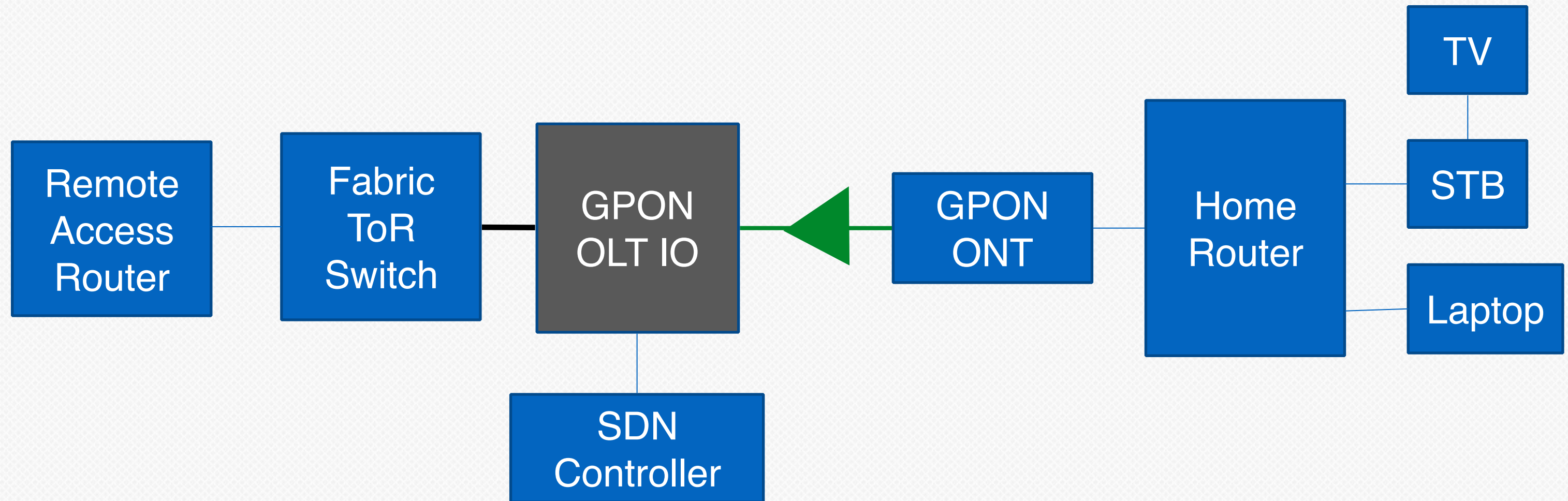


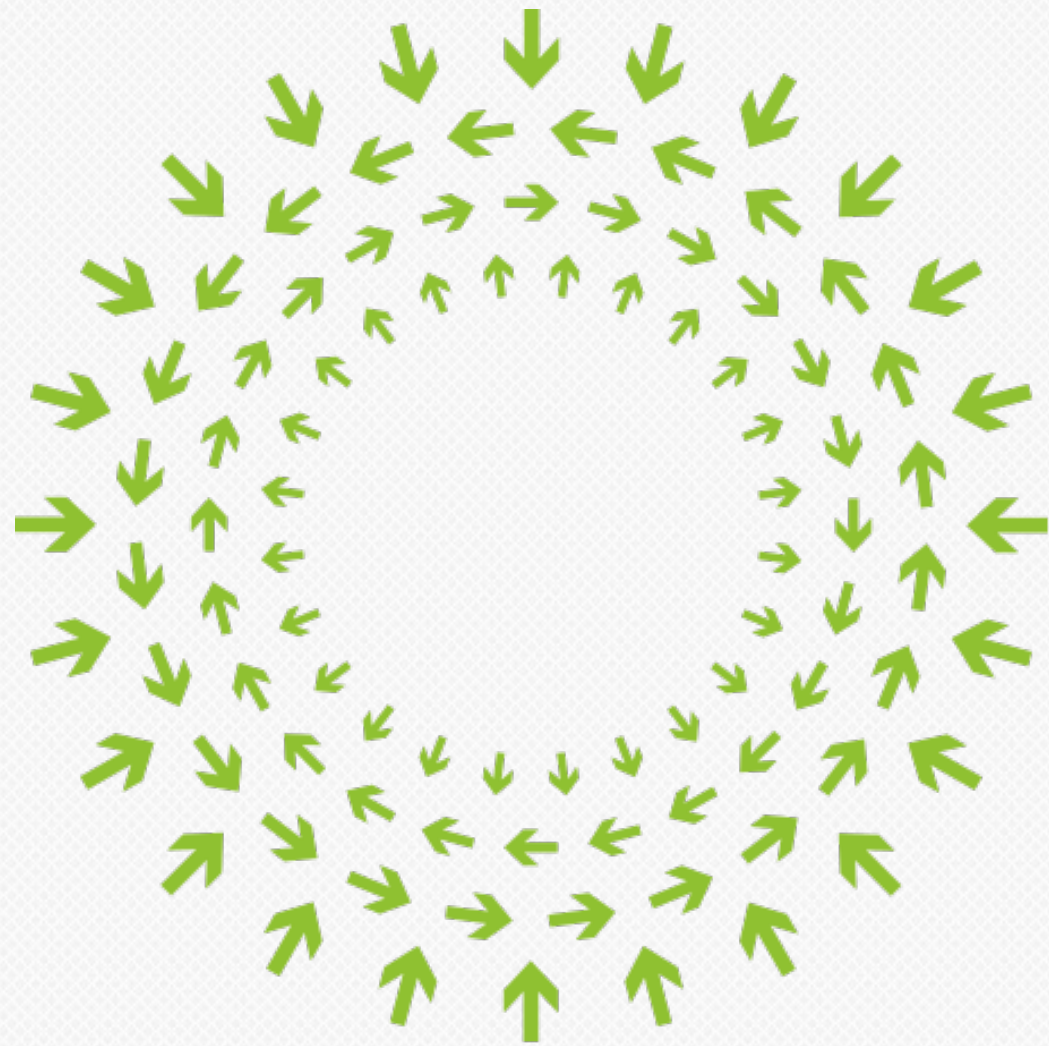


Concept Demonstration

(AT&T U-Verse IPTV and Internet Access)

Demo Components





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