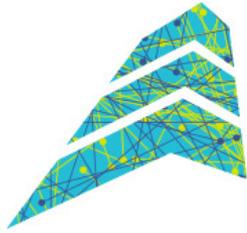




OPEN NETWORKING
FOUNDATION



ATRIUM

Open SDN Distribution

Saurav Das

Principal System Architect, ONF

With contributions from ONF Atrium Management team
and many others ...



Outline

1. Project Atrium today

- Motivation
- Atrium release 15/A

2. Project Atrium next

- What is coming in the next release 15/B?

3. Project Atrium roadmap

- Tentative: projects under discussion

LEARN MORE & JOIN THE COMMUNITY:

<https://groups.opensourcesdn.org/wg/Atrium/dashboard>

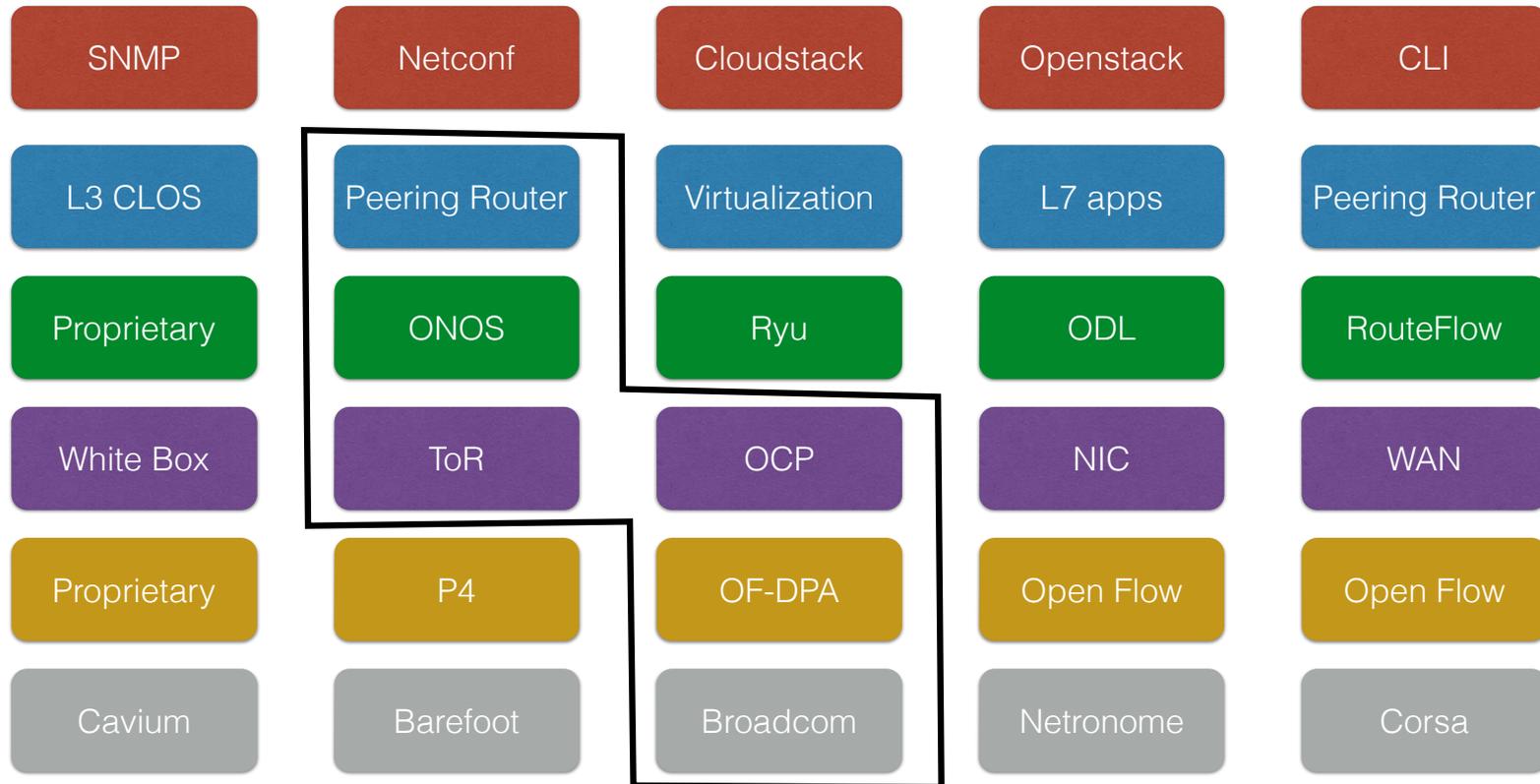


SDN Provides a Lot of Choices

Orchestration	SNMP	Netconf	Cloudstack	Openstack	CLI
Application	Load Bal	Virtualization	L3 CLOS	L7 apps	Peering Router
Controller	Proprietary	ONOS	Ryu	ODL	RouteFlow
Hardware	White Box	ToR	OCF		WAN
HAL	Proprietary	P4	OF-DR		Open Flow
Silicon	Cavium	Barefoot	Broado		Corsa



Solution: Vertically Integrated Stack == SDN Distribution



Project Atrium Goals

1. Integration

- Create vertically-integrated open-source stacks
- From open-source components, OF1.3 & Hardware
- Enable network operators to download distribution from a single location

2. Interoperability

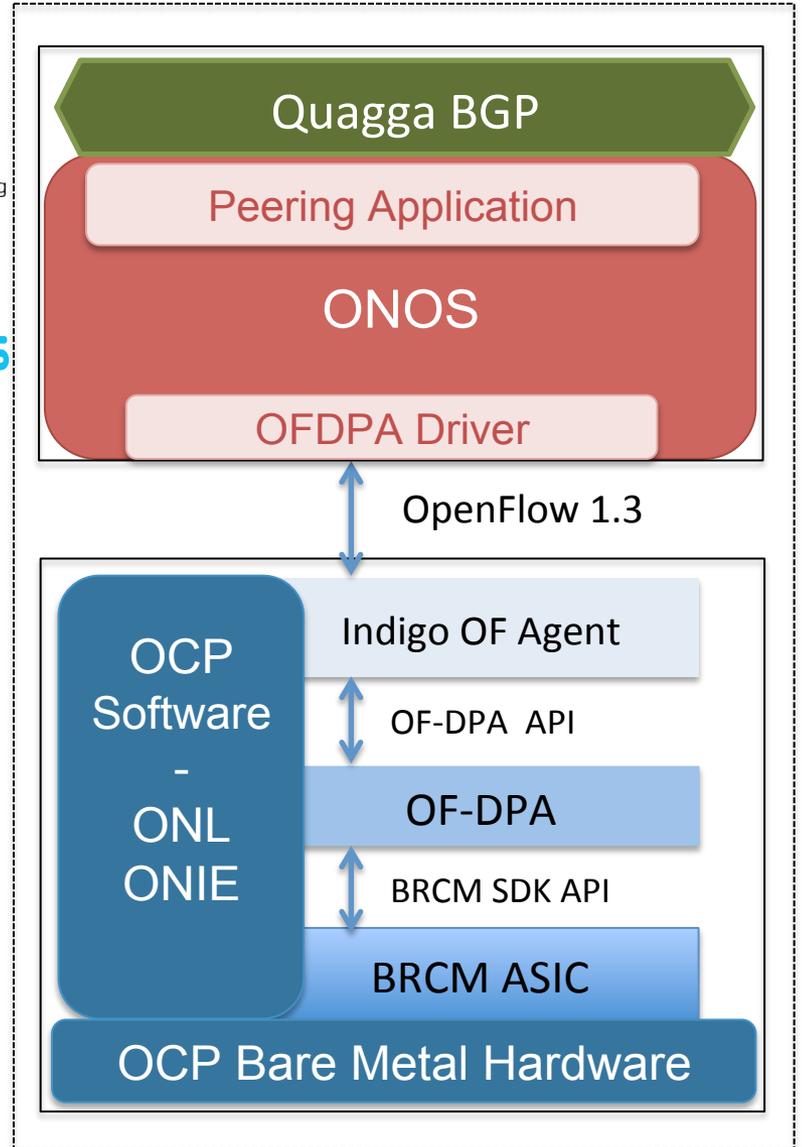
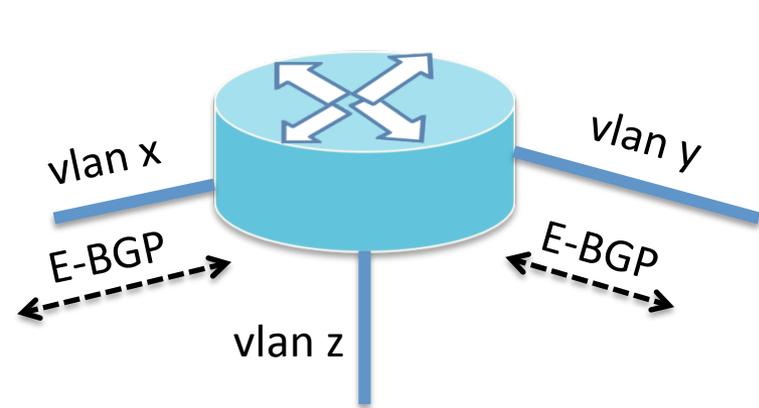
- Enable multiple hardware vendors to plugin to stack
- Allows end-users to select different hardware classes for common use-cases.

3. Deployments

- Work hand-in-hand with operators on deployable use cases leading to trials.
- Give operators confidence in pure SDN solutions

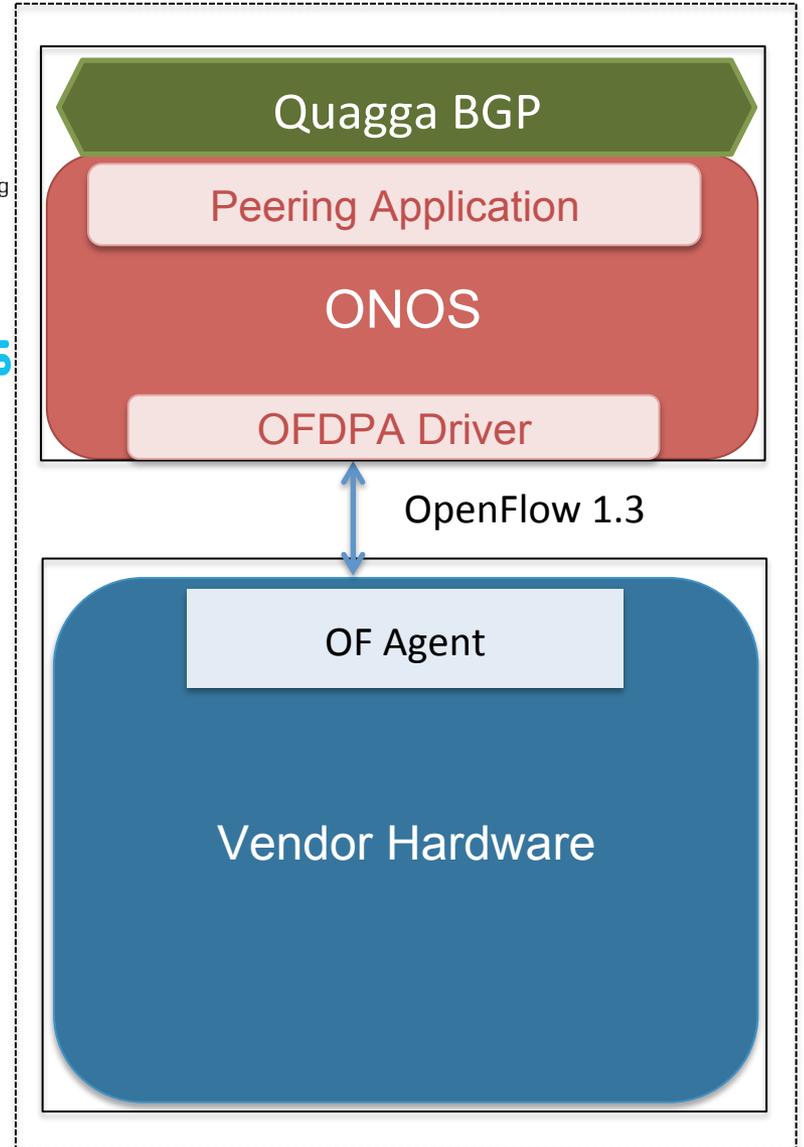
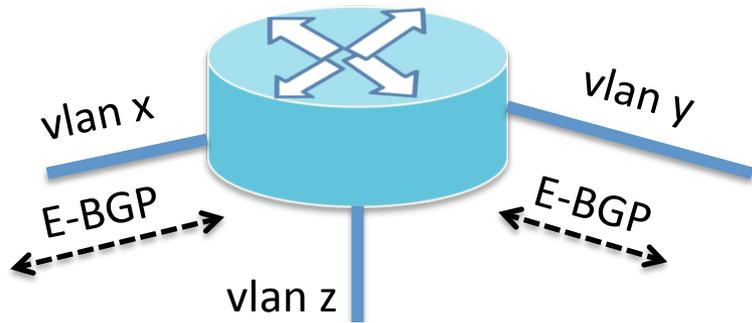


What is Atrium today?

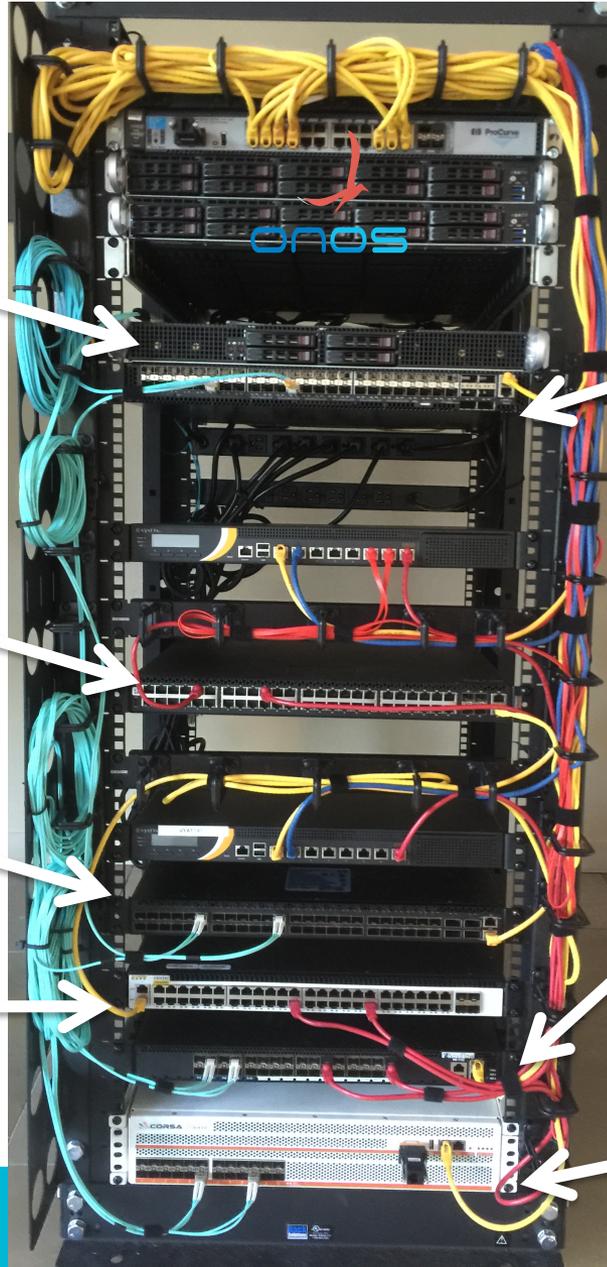


OCP: Open Compute Project; **ONL:** Open Network Linux; **ONIE:** Open Network Install Env; **BRCM:** Broadcom Merchant Silicon ASICs; **OF-DPA:** OpenFlow Datapath Abstraction

What is Atrium today?



ONF Builds 7 Routers



NETRONOME

Accton
Making Partnership Work

PICAO
OPEN NETWORKING

Quanta

NoviFlow
switching made smarter

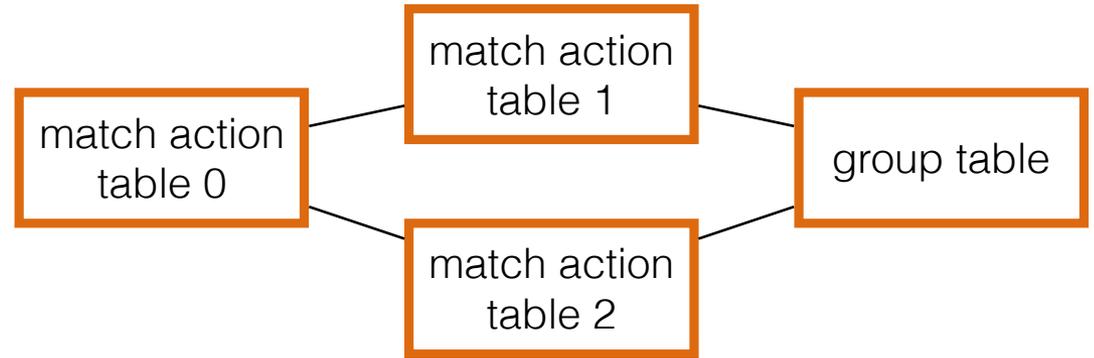
 **centec**
networks

 **CORSA**



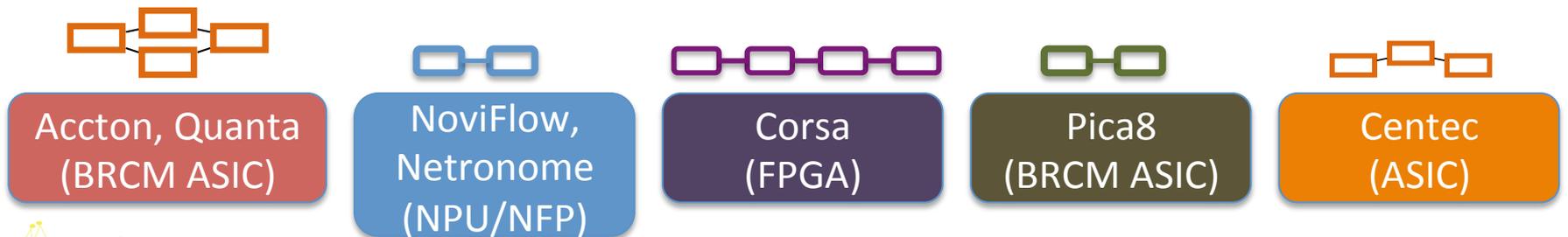
A Closer Look at Interoperability

Different combinations of Match-Action Tables form Different OF 1.3 pipelines

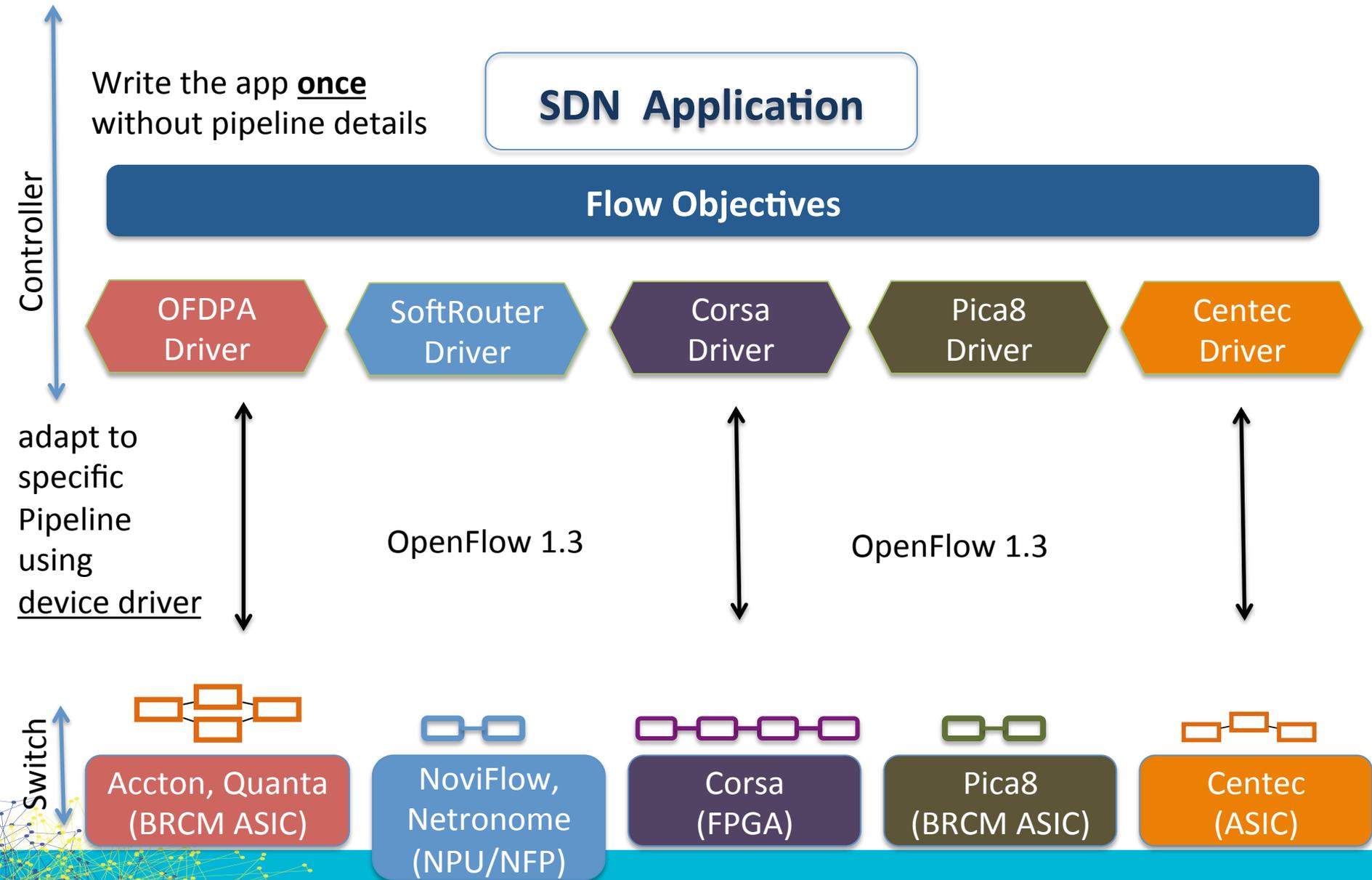


How can a controller manage these differences?

How can an application work across these differences?

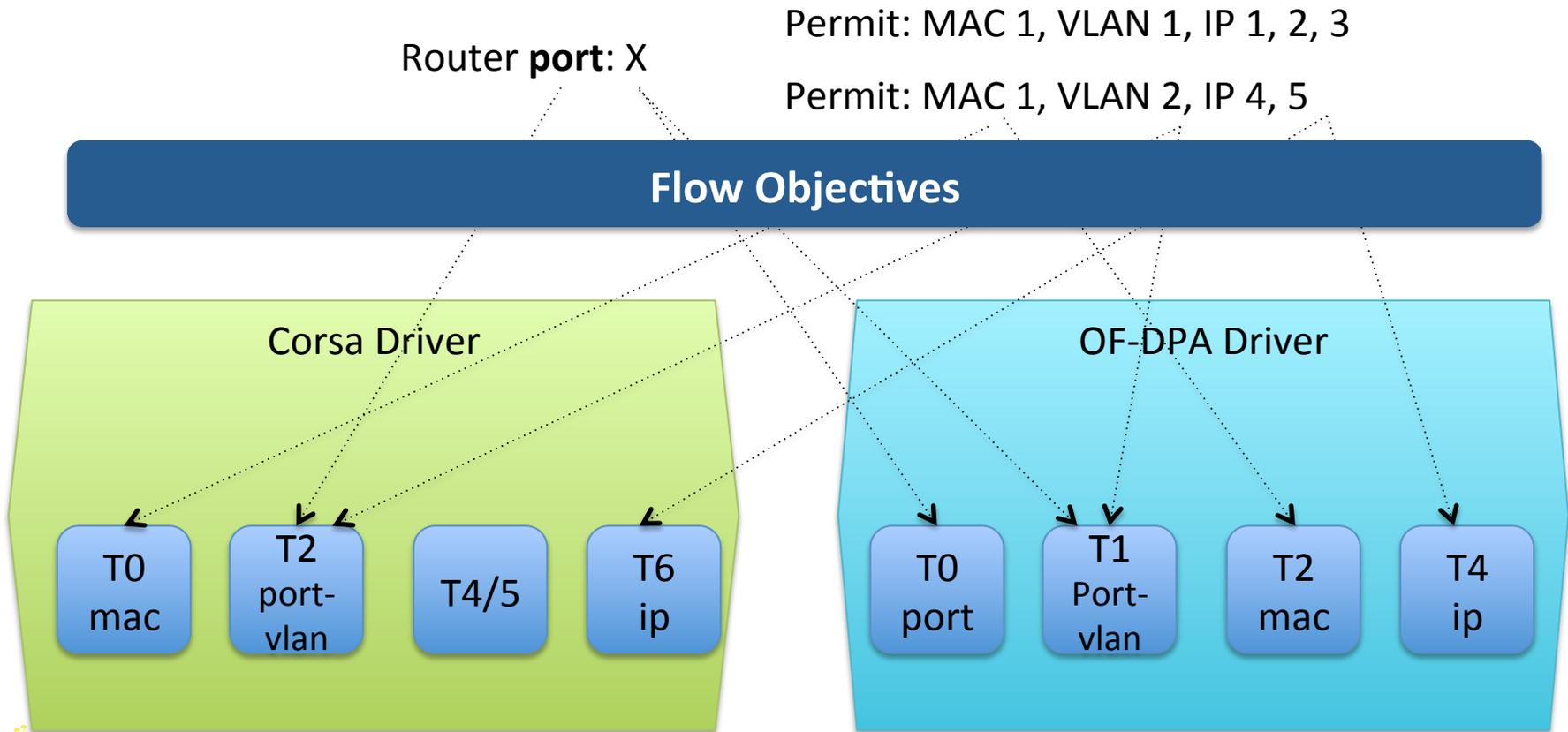


Solution: Flow Objectives API



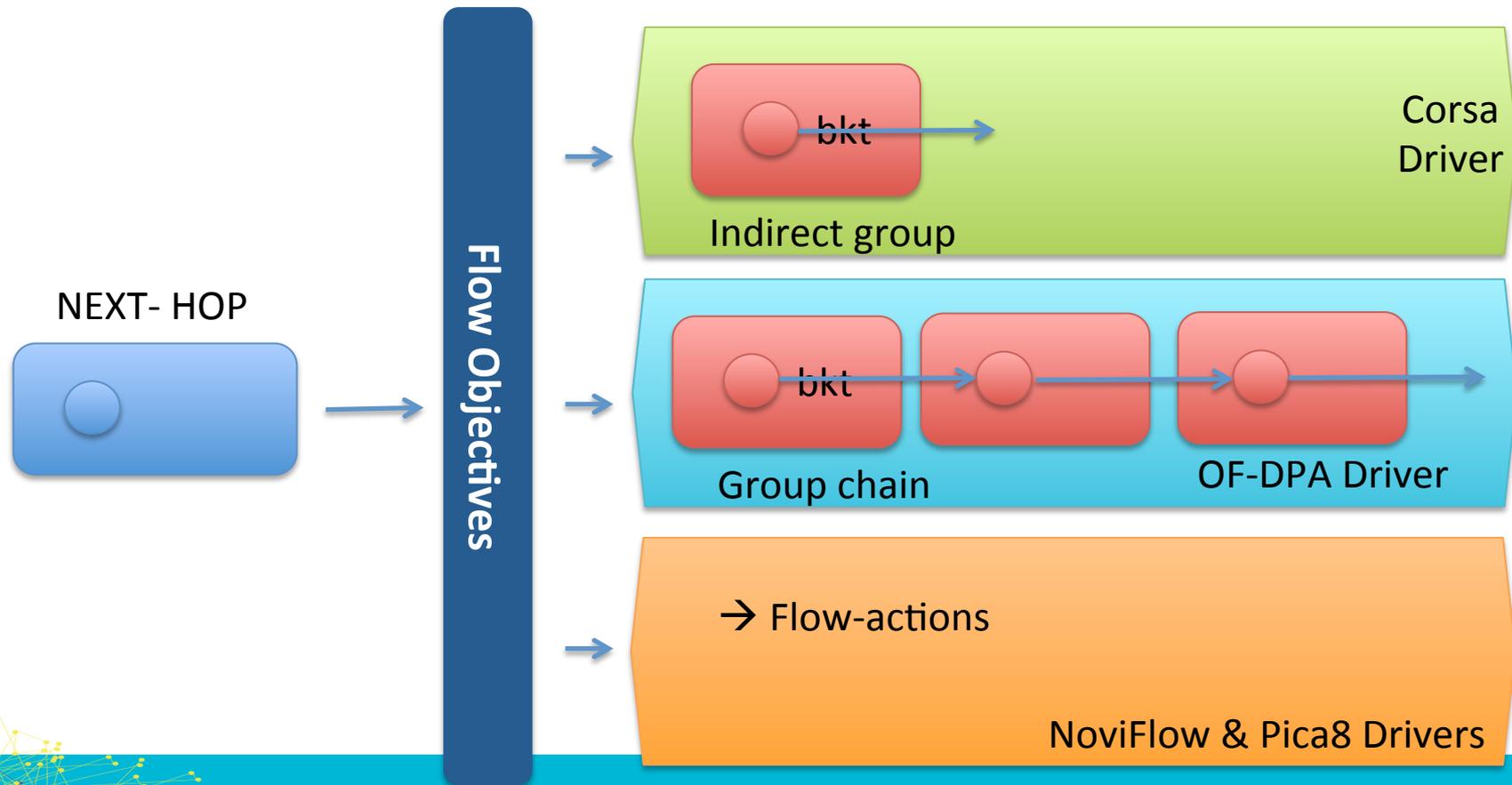
Example: Filtering Objective

- Filter → only Permit or Deny options
- On match fields of packet header

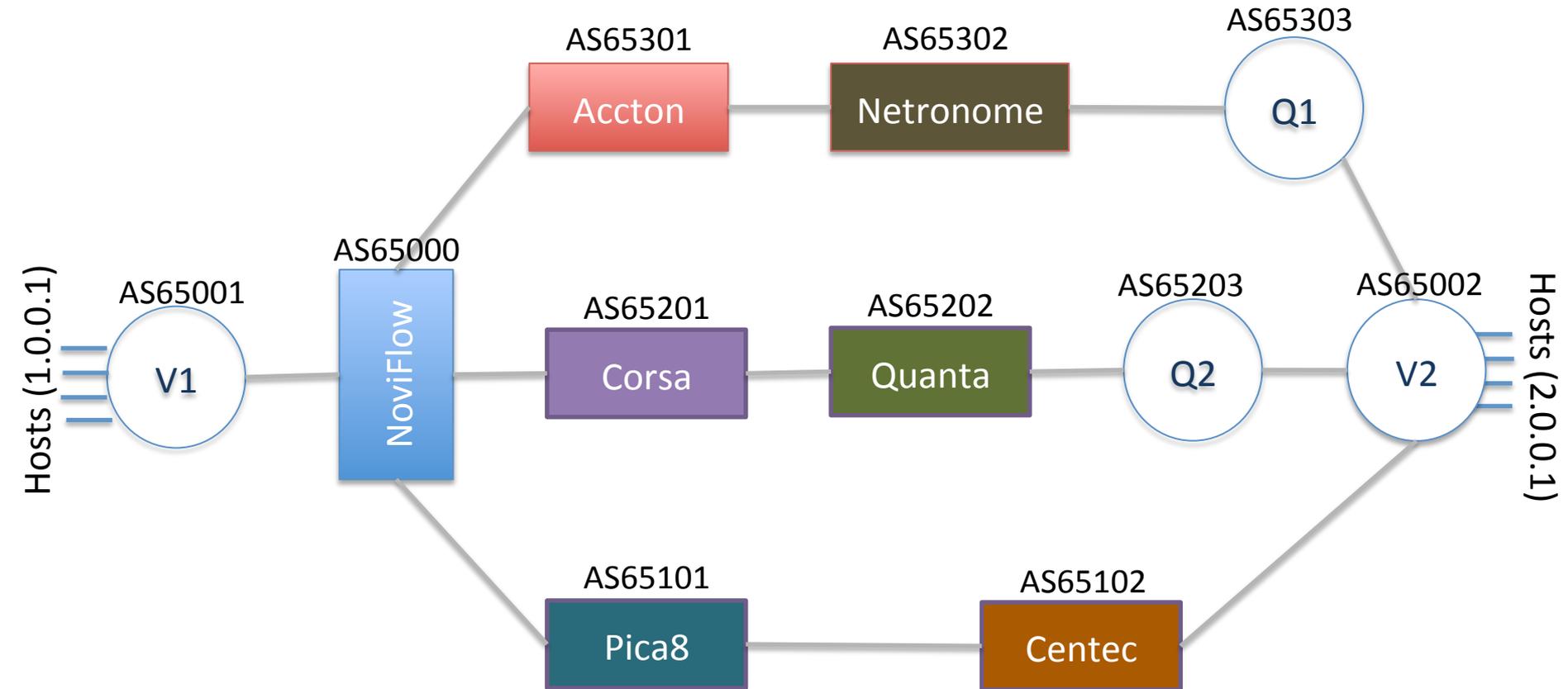


Example: Next Objective

- Next → next hop for forwarding
- Similar to OF 1.3 group, but ...



Atrium Demo @ SDN Solution Showcase



```

bgp1> sh ip bgp
BGP table version is 0, local router ID is 192.168.10.101
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, R Removed
Origin codes: i - IGP, e - EGP, ? - incomplete
  
```

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 1.0.0.0/24	192.168.10.1	1			0 65001 i
* 2.0.0.0/24	192.168.22.1				0 65201 65202 65203 65002 i
*	192.168.13.1				0 65301 65302 65303 65002 i
*>	192.168.11.1				0 65101 65102 65002 i

Total number of prefixes 2

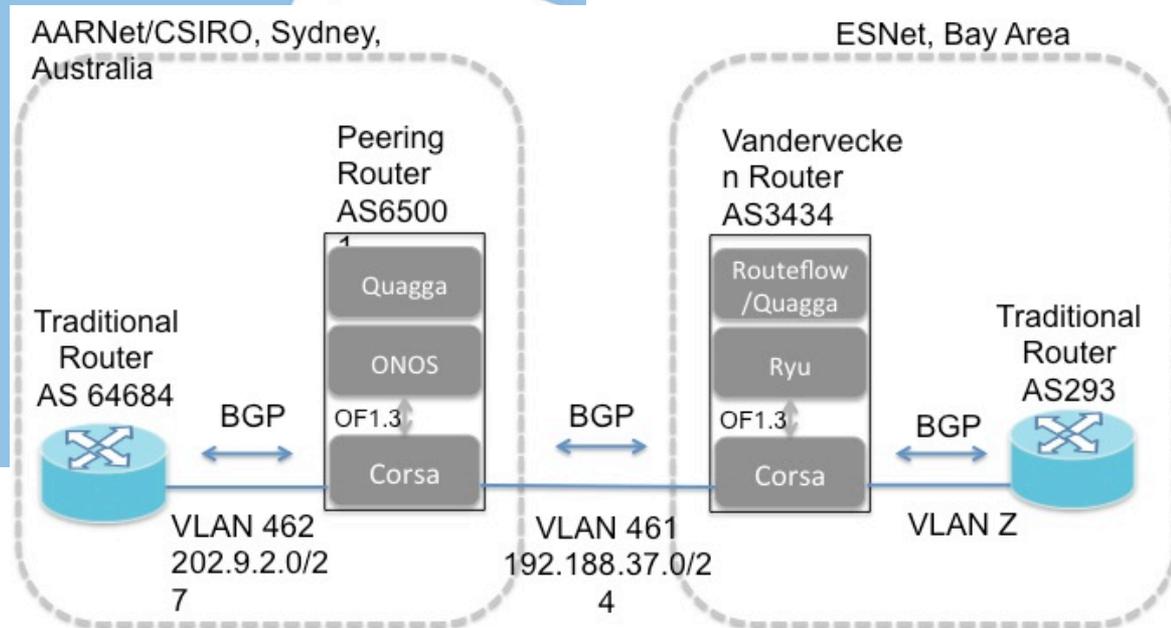
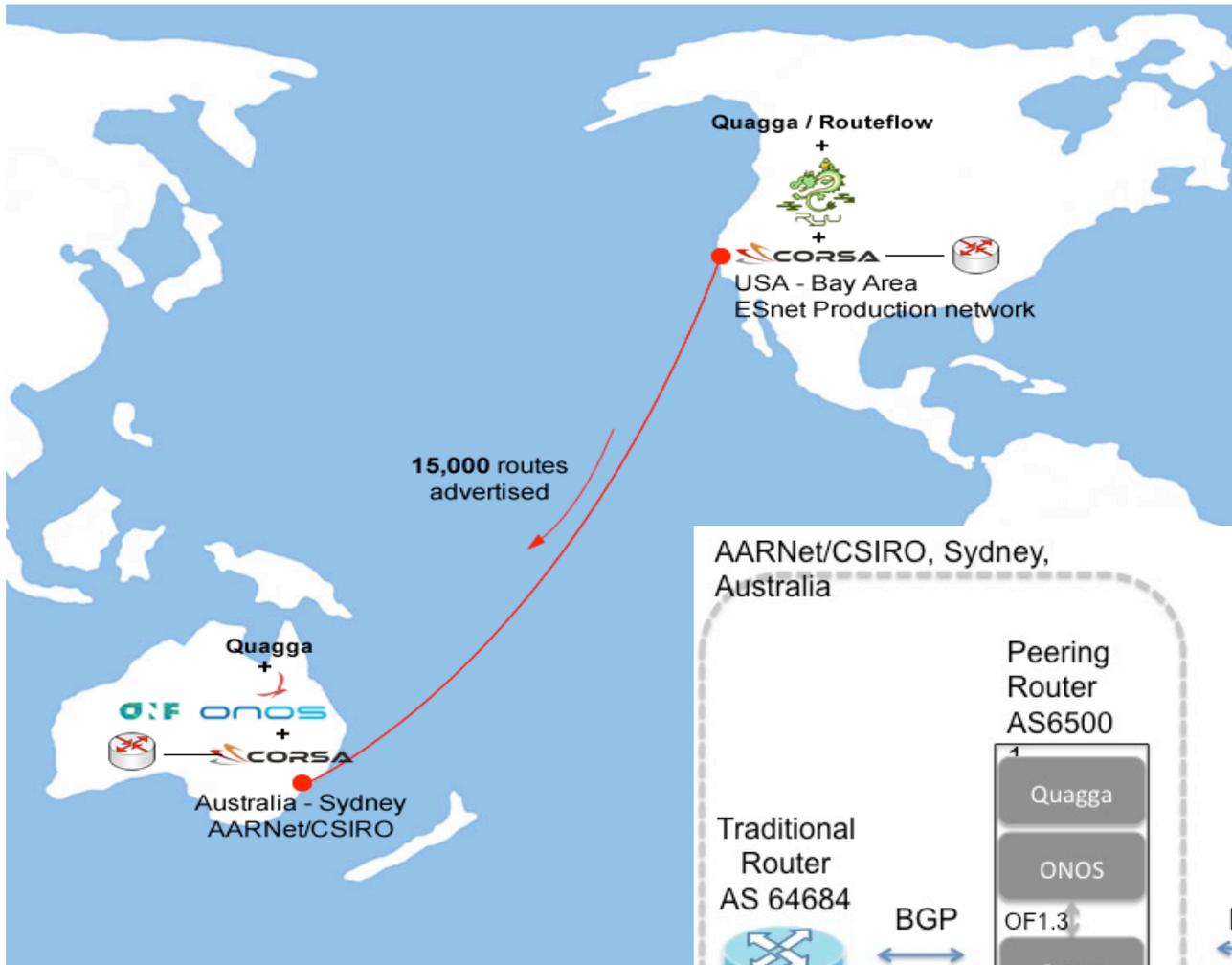
```

bgp1> sh ip bgp summary
BGP router identifier 192.168.10.101, local AS number 65000
RIB entries 3, using 336 bytes of memory
Peers 5, using 22 KiB of memory
  
```

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
1.1.1.1	4	65000	30090	31109	0	0	0	1d01h43m	0
192.168.10.1	4	65001	31095	31114	0	0	0	1d01h43m	1
192.168.11.1	4	65101	30775	30784	0	0	0	21:07:07	1
192.168.13.1	4	65301	28322	28339	0	0	0	18:11:55	1
192.168.22.1	4	65201	25959	25974	0	0	0	21:23:24	1

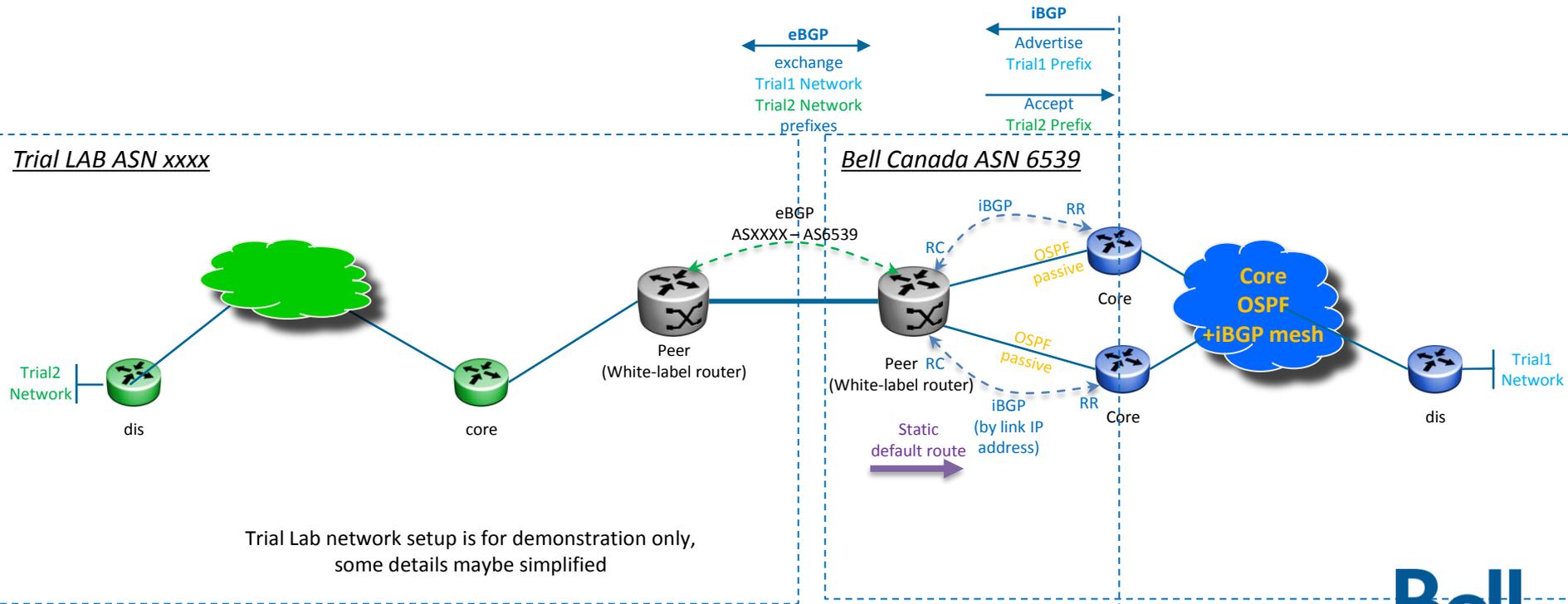
Total number of neighbors 5

Atrium Pre-release Deployment



Atrium Post-release Operator Engagements

phase 1 – Trial Lab (white-label box) <--> Trial AS6539 (white-label box)



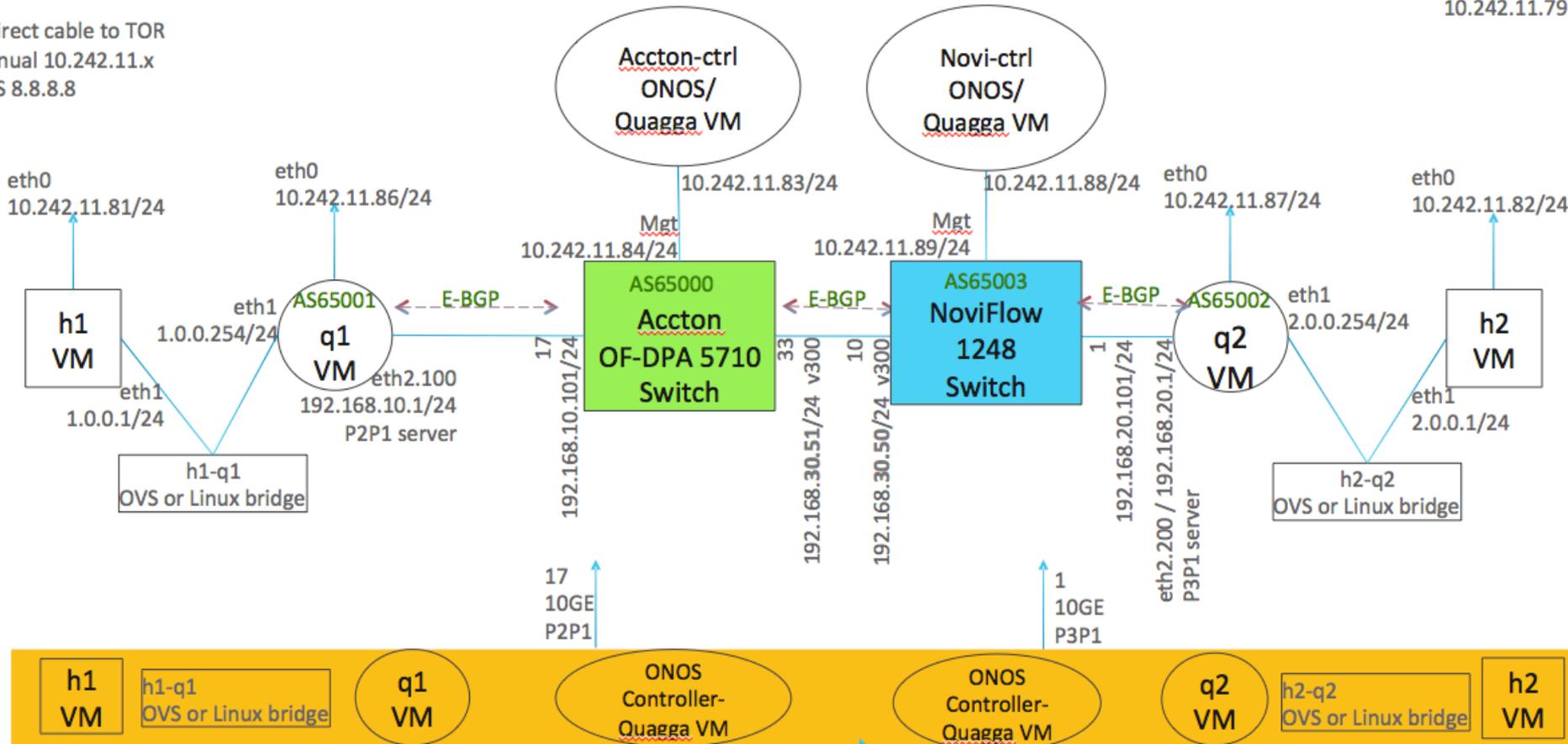
Atrium Post-release Operator Engagements

AT&T Foundry BGP Routing / Peering App Bootstrap Config

skipio
10.242.11.79

vmuser
vmpassword

If direct cable to TOR
Manual 10.242.11.x
DNS 8.8.8.8



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What's Coming in the 15/B Release?

1. Continued Improvements on the 15/A release (ONOS based)
 - Hardening & Stability
 - Performance
 - Missing features: untagged, runtime-config, static-routes
 - Hardware Automated Test Infrastructure

2. Atrium Router on OpenDaylight
 - Porting from ONOS to ODL
 - ODL will also use FlowObjectives and device drivers
 - Community contributions: Wipro & Criterion

LEARN MORE & JOIN THE COMMUNITY:

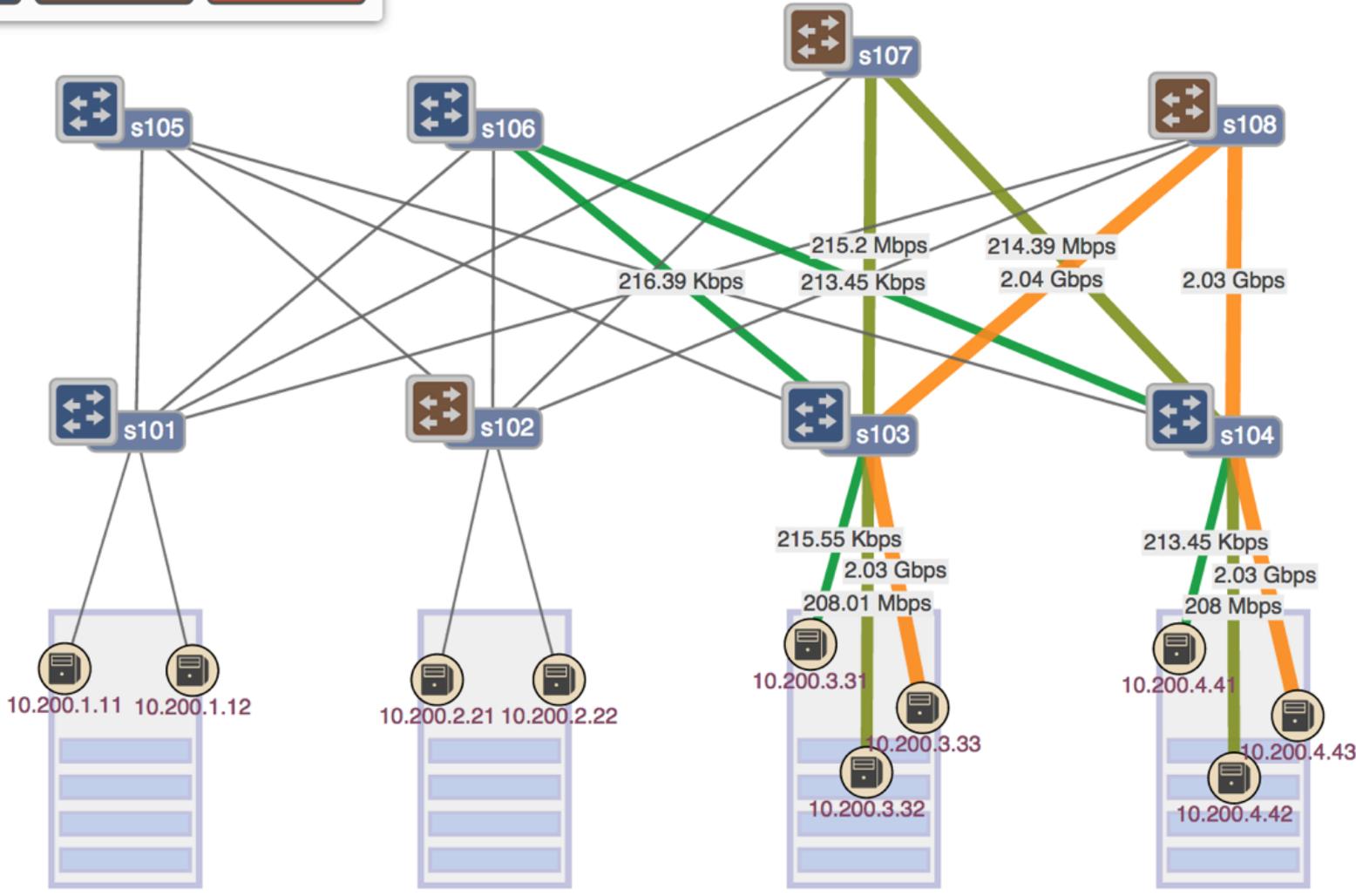
<https://groups.opensourcesdn.org/wg/Atrium/dashboard>



Open-Source Leaf-Spine Fabric (L3 Clos)

 192.168.0.101 192.168.0.101 # Switches: 5	 192.168.0.102 192.168.0.102 # Switches: 3	 192.168.0.103 192.168.0.103 # Switches: 0
---	---	---

Internally the Fabric uses MPLS Segment Routing

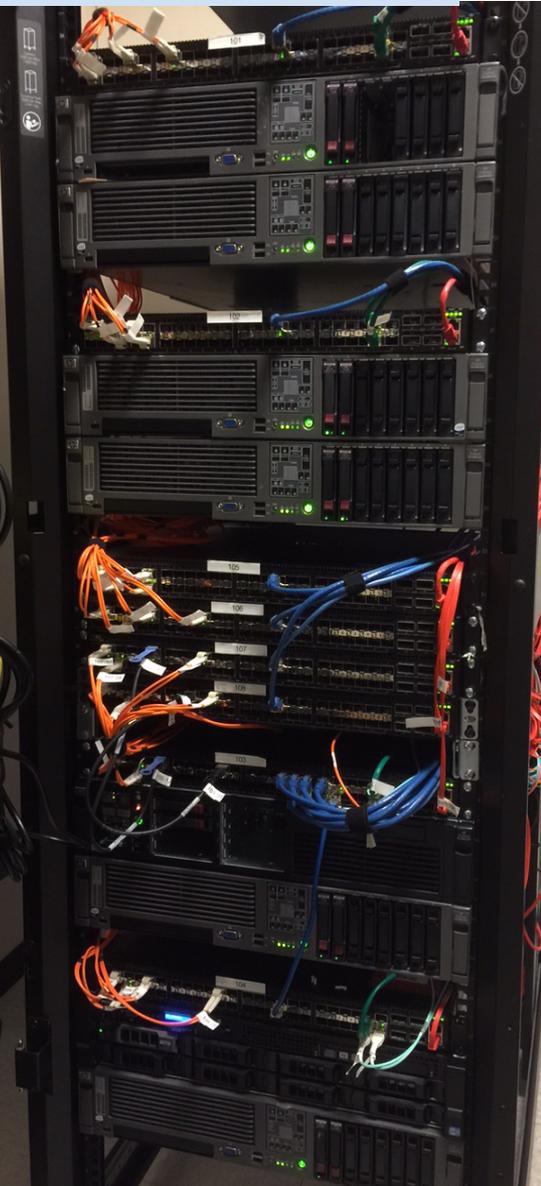
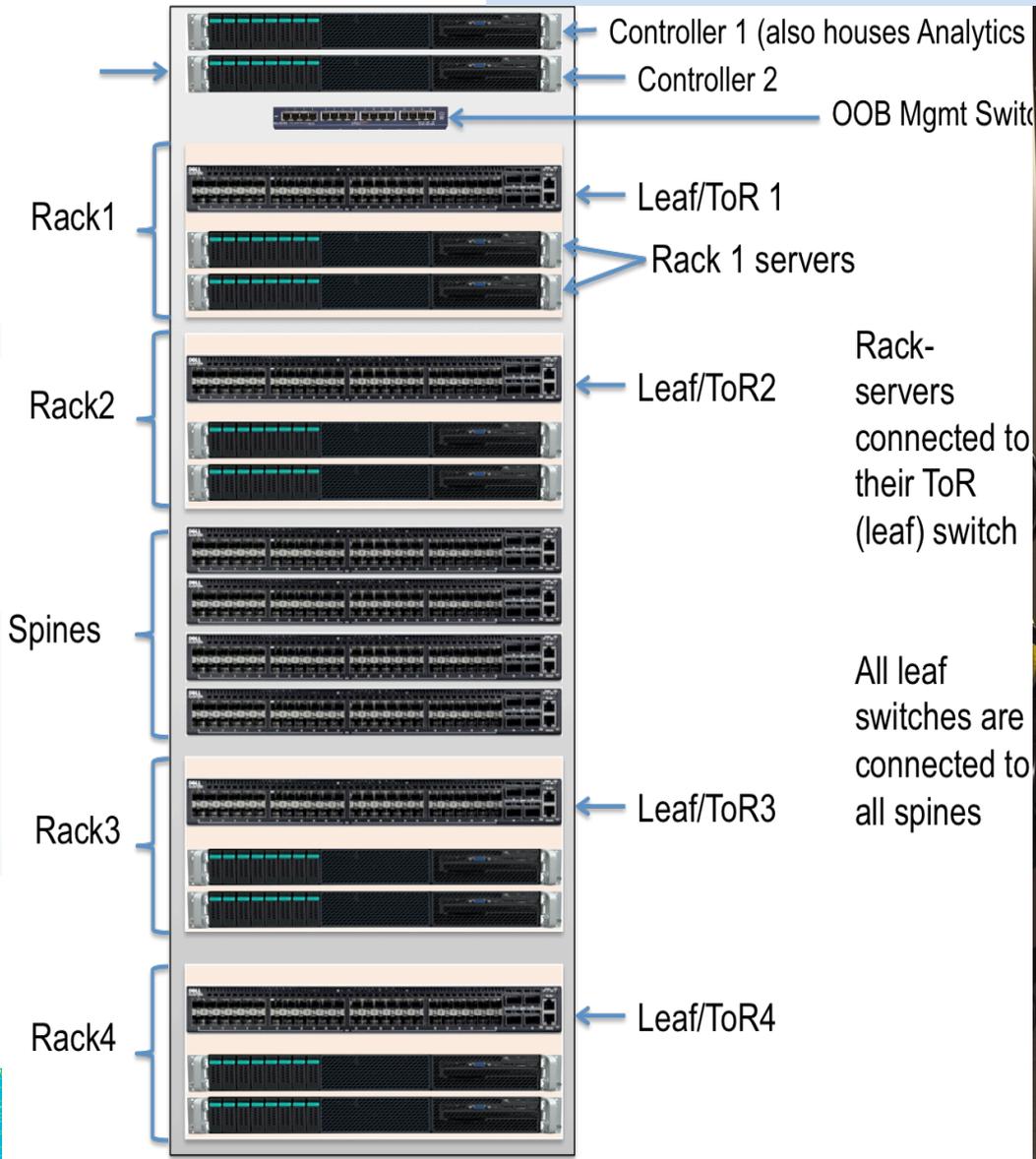
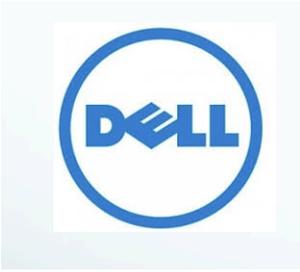


Open-Source Leaf-Spine Fabric (L3 Clos)

Internally the Fabric uses MPLS Segment Routing



ON.LAB



Rack-servers connected to their ToR (leaf) switch

All leaf switches are connected to all spines

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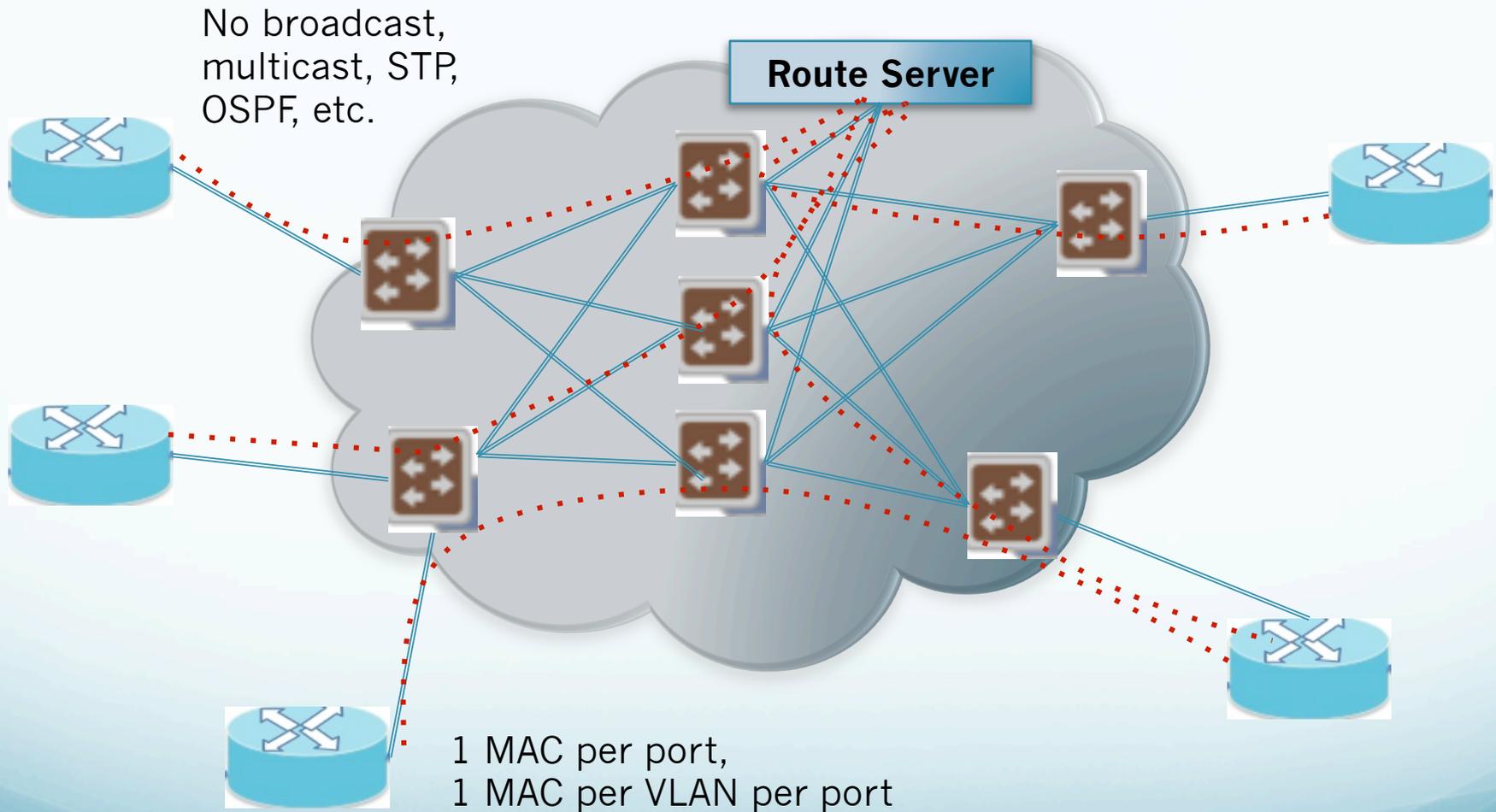
- Tentative: projects under discussion

LEARN MORE & JOIN THE COMMUNITY:

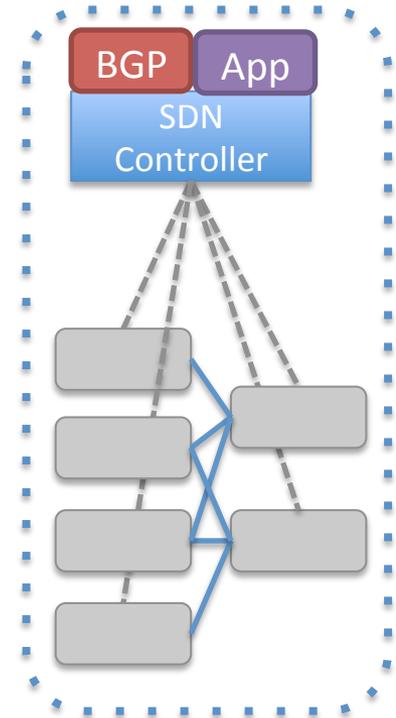
<https://groups.opensourcesdn.org/wg/Atrium/dashboard>



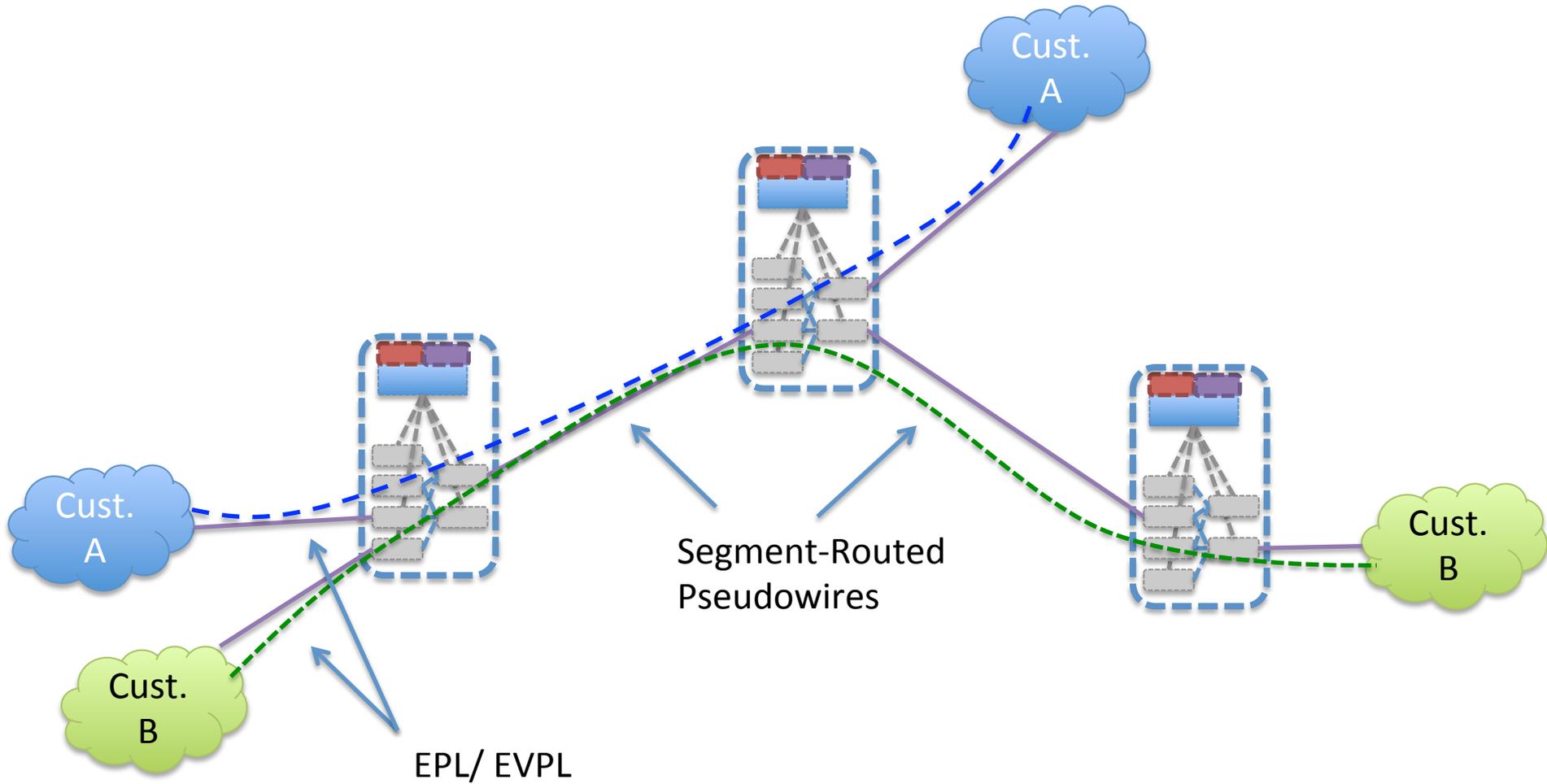
L2 IXP Fabric



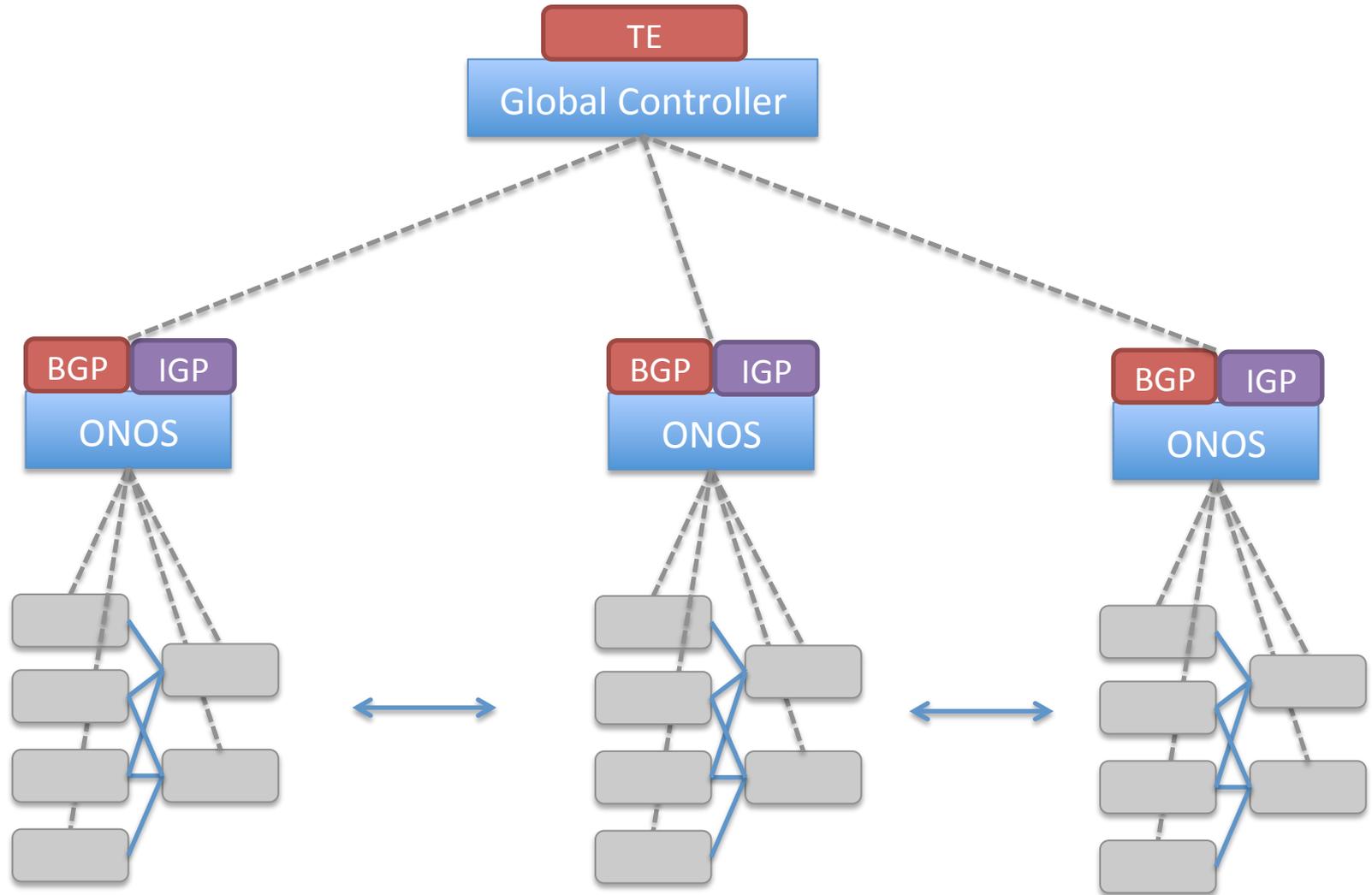
Atrium Router Stack
+
L3 Clos Fabric
=
Chassis Routers



Support MEF E-Line Services



This is just the starting point!



Summary

Integration, Interoperability & Deployments

- Atrium 1st release brings together ONOS, Quagga, OCP components (ONL, ONIE) and OFDPA with white-boxes + vendor equipment
- Open SDN Distribution (2015/A release: June 30th)
- ONF builds 7 routers!
- Key architectural contribution: Flow Objectives & Device Drivers
- Pre release deployment in Sydney.
- More coming as we engage operators

Atrium 15/B release

- Improved 15/A router built around ONOS
- ODL based Atrium router
- Atrium leaf-spine L3 Clos fabric

Many more projects in the horizon



ONOS Architecture

Applications
(distributed)



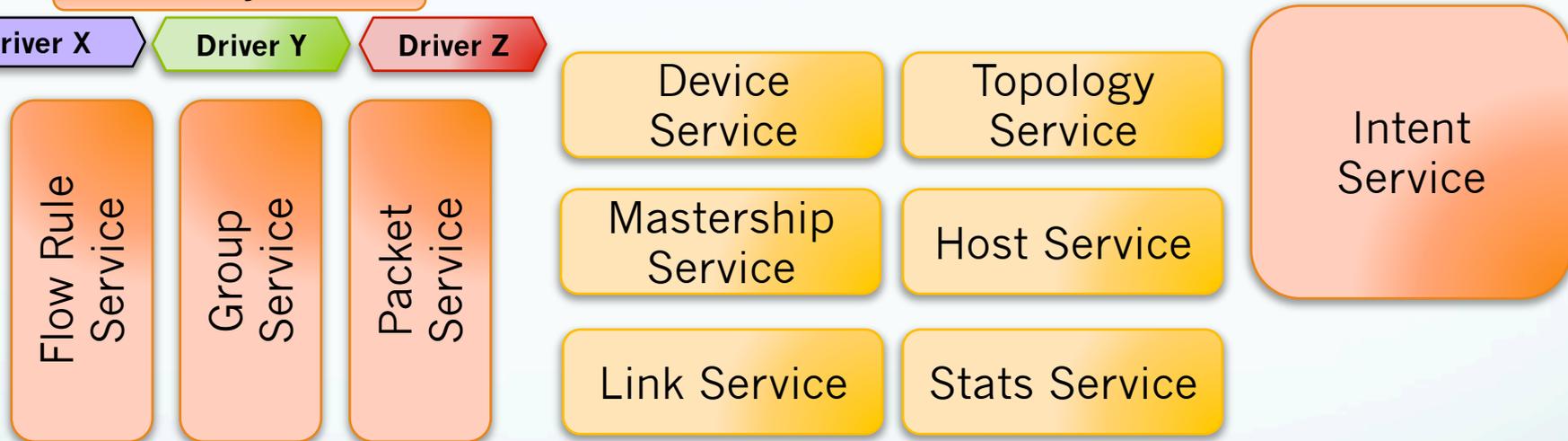
Flow Objectives

Driver X

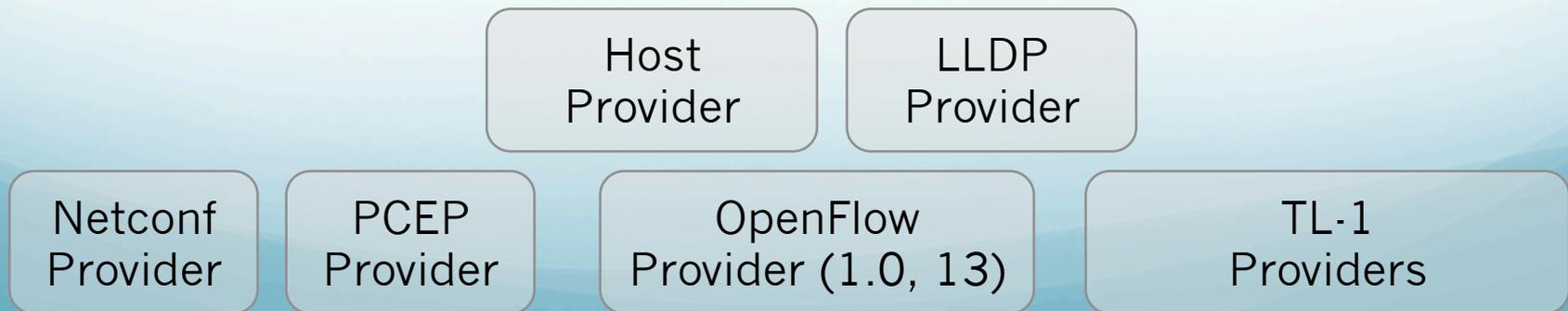
Driver Y

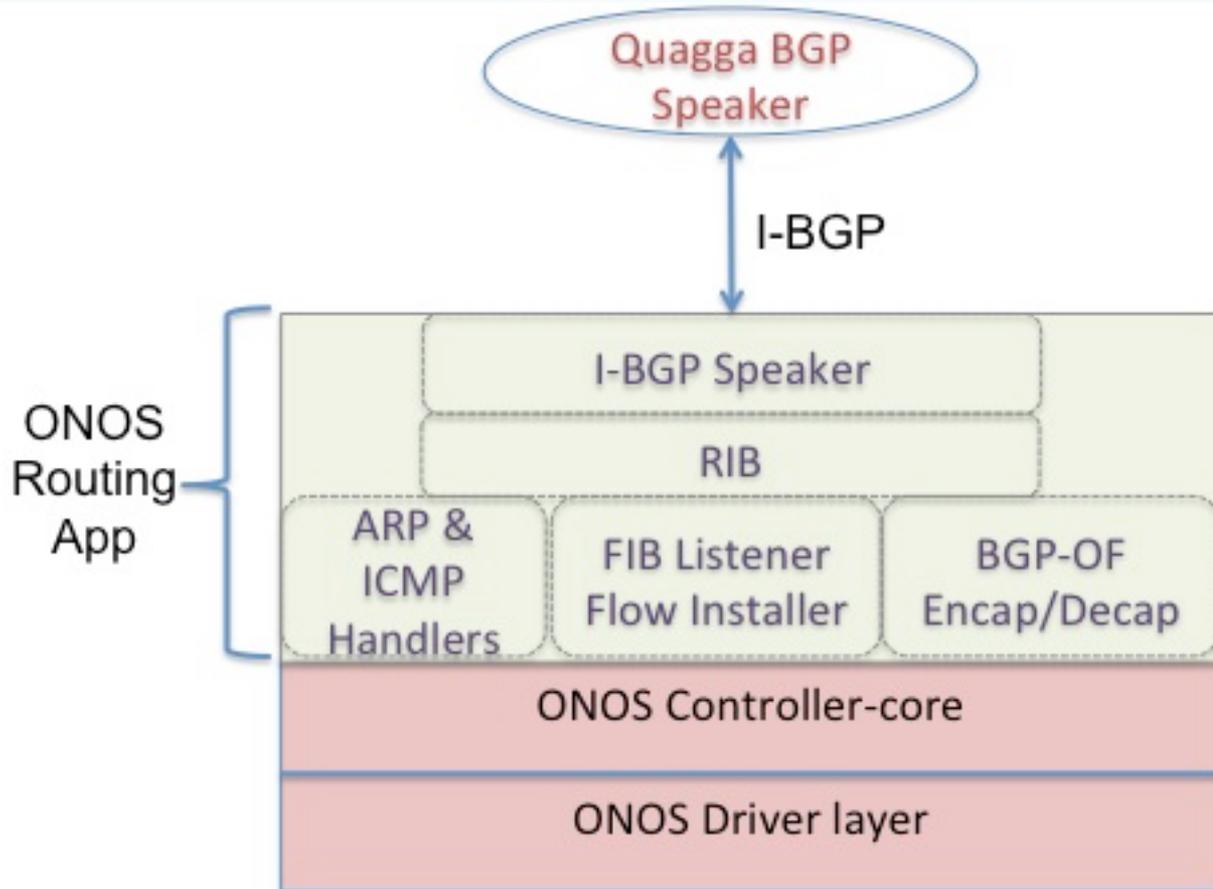
Driver Z

Core Services
(distributed)



Providers





Control Plane VM

