Big Cloud Fabric
Big Monitoring Fabric
solutions overview

DELL/EMC EVENT

MOSCOW 28TH MARCH 2017

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- Big Switch Networks Solution Overview
- Introduction Big Cloud Fabric
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  - VMware integration
- Introduction Big Monitoring Fabric
  - Monitoring Solution Overview
  - Out-of-band monitoring integration
  - Inline integration

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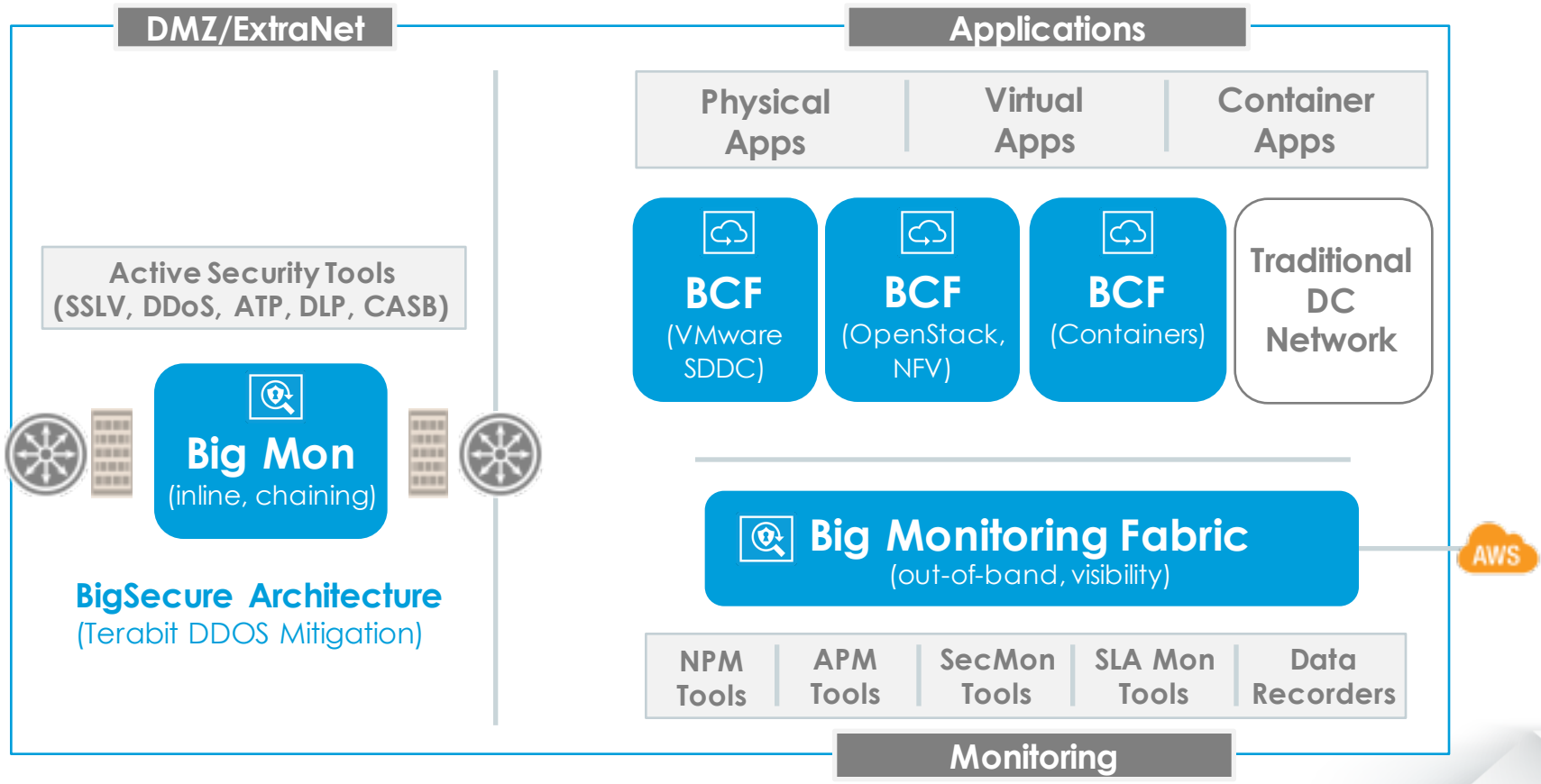
BIG SWITCH DEPLOYMENTS OPTIONS



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FOUR SPECIFIC USE CASES

Big Cloud Fabric

1

Big Cloud Fabric (P+V Edition)

2

Big Cloud Fabric (P Edition)

Big Monitoring Fabric

3

Pervasive Visibility & Security

Big Monitoring Fabric (Out-of-Band)

4

DMZ/ExtraNet Security

Big Monitoring Fabric (Inline)

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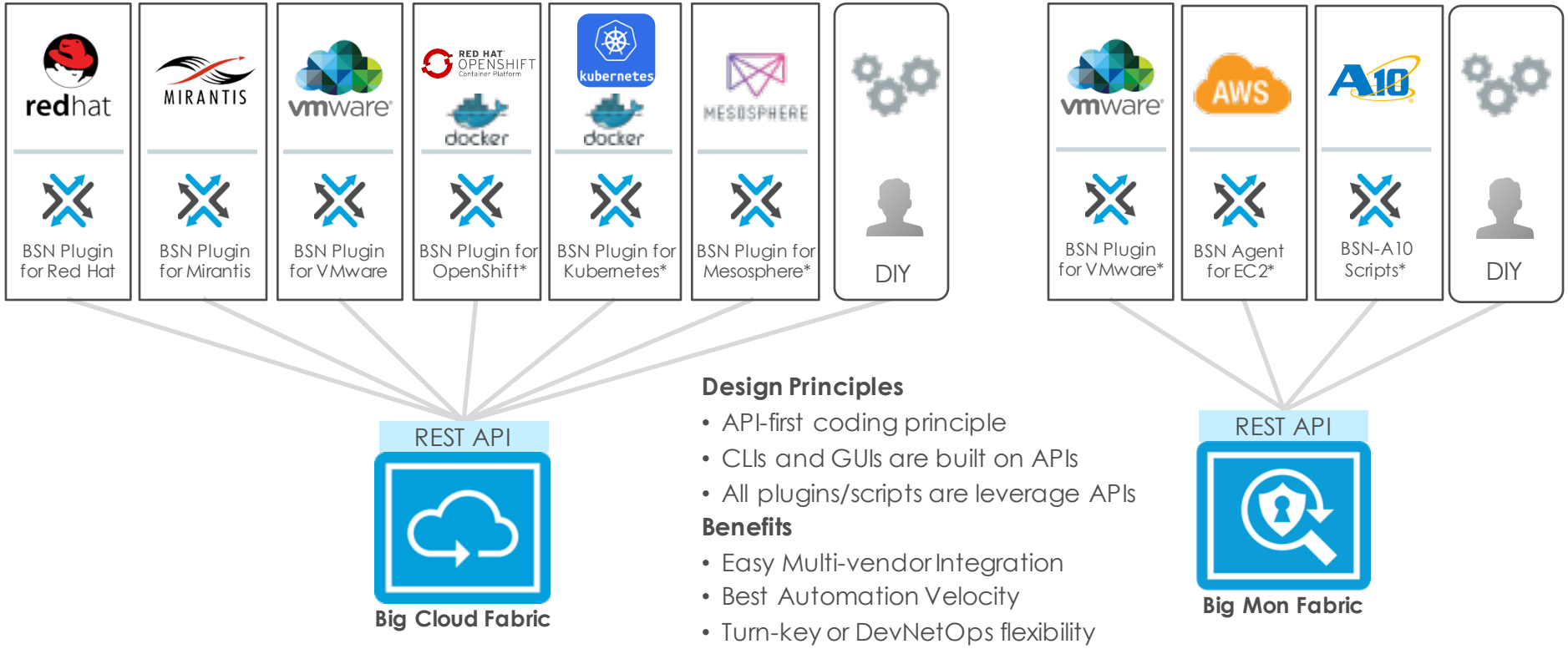
SDN APIs – ACCELERATE AUTOMATION, VISIBILITY

Plug-Ins for Turn-key Solutions, APIs for DevNetOps/Custom Automation



Design Principles

- API-first coding principle
- CLIs and GUIs are built on APIs
- All plugins/scripts are leverage APIs

Benefits

- Easy Multi-vendor Integration
- Best Automation Velocity
- Turn-key or DevNetOps flexibility

*Tech preview
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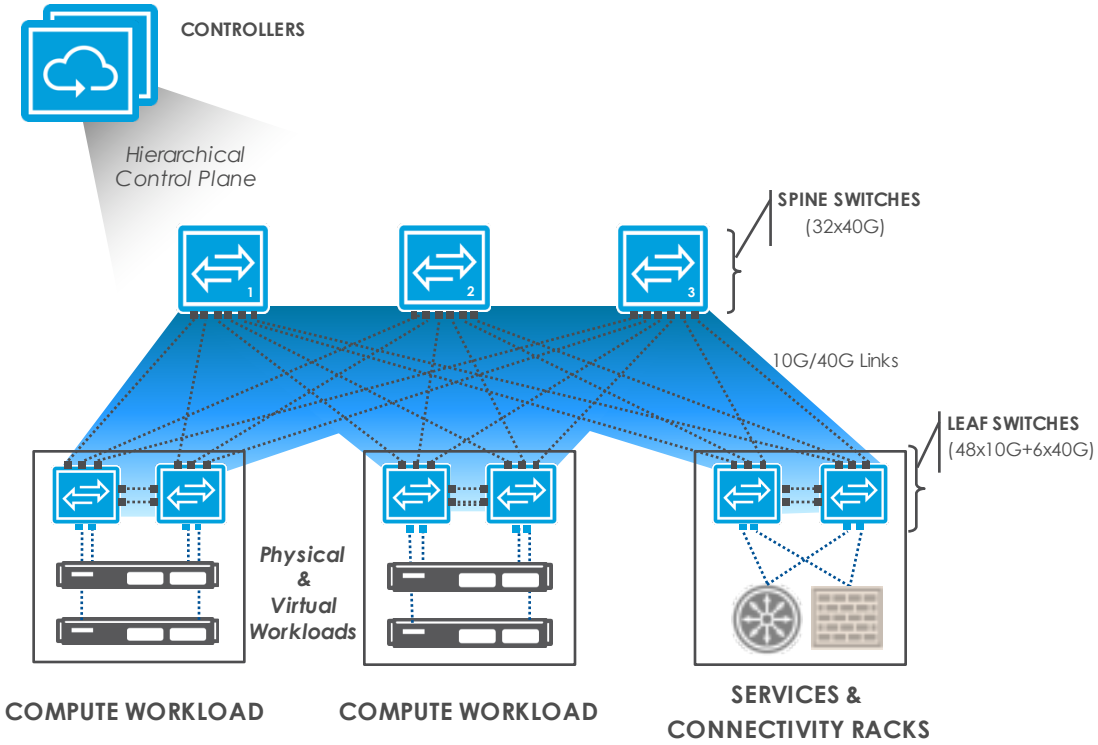
Introduction to Big Cloud Fabric

INTRODUCTION TO BIG CLOUD FABRIC

Overview



Spine/Leaf CLOS Design

- 64 leaf (32 racks), 6 spine
- 1.7:1 oversubscription
- SDN controllers
- Resilient

Simplicity

- Zero touch
- Protocol free
- Jumbo frames (default)
- Interchangeable spine/leaf roles

Capabilities

- Tenant centric
- Service insertion
- Programmable
- Orchestration & Integration

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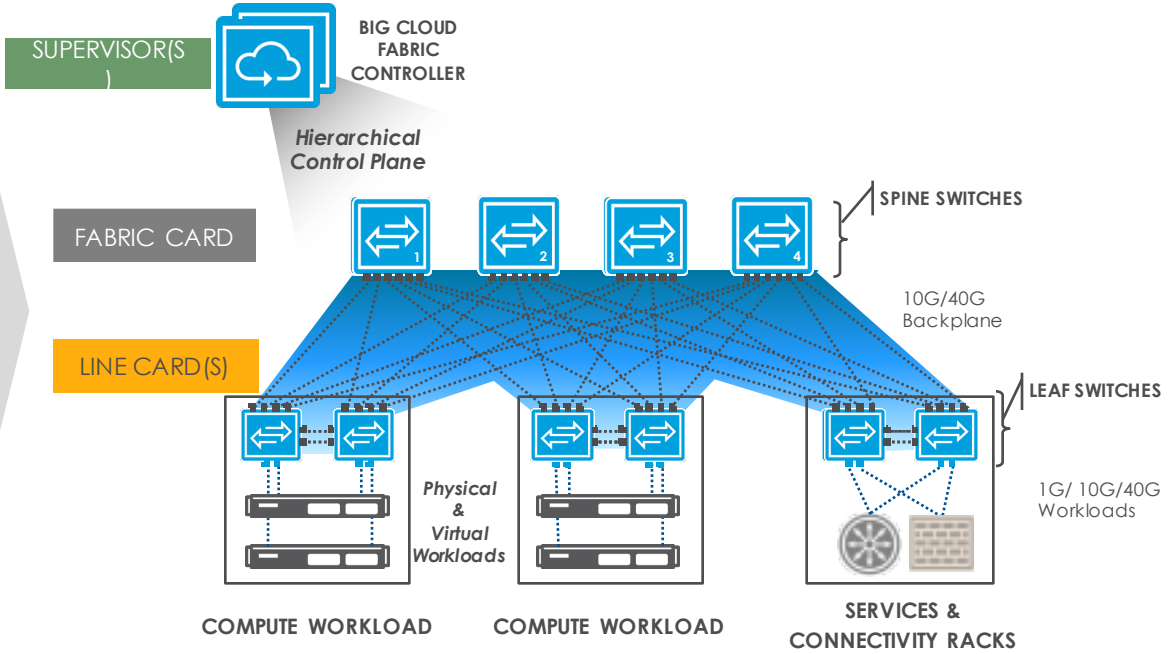
INTRODUCTION TO BIG CLOUD FABRIC

Disaggregation of the "~~Main~~NET Frame"



- Traditional NET frame design
- Single point of management

- Disaggregated NET frame – One "Big Switch"
- Simple, Scalable, SDN – One "Big Switch"

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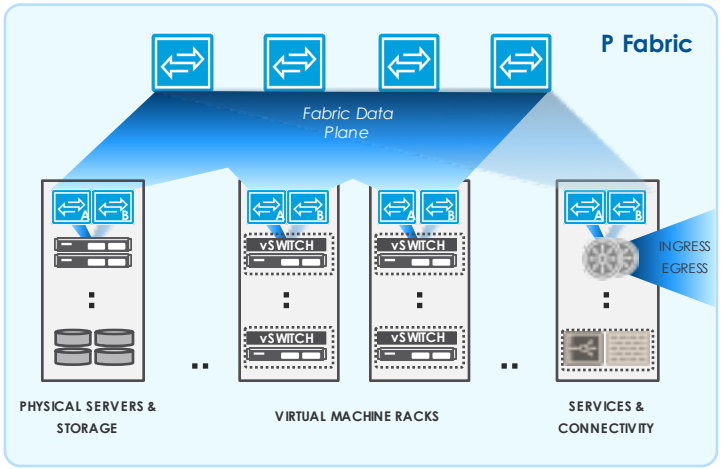
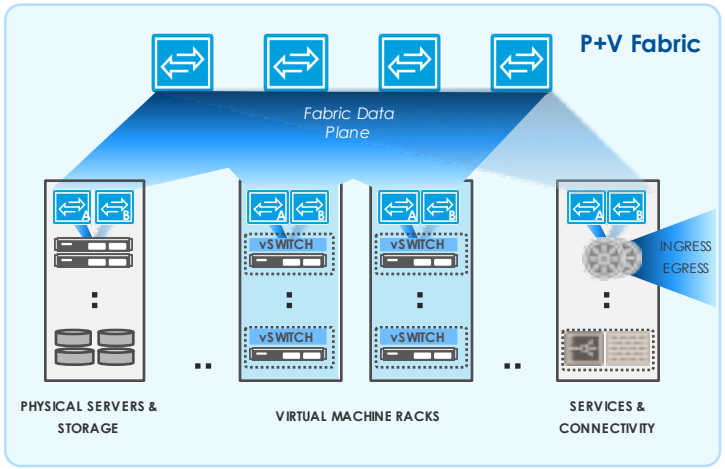
Two Editions



Controller domain: Spine and Leaf switches
Orchestration: vCenter, OpenStack
Workloads: KVM, ESX, …
Use Cases: Big Data, VDI, Storage



Controller domain: Spine, Leaf, and vSwitches
Orchestration: OpenStack
Workloads: KVM
Use Cases: OpenStack Private Cloud

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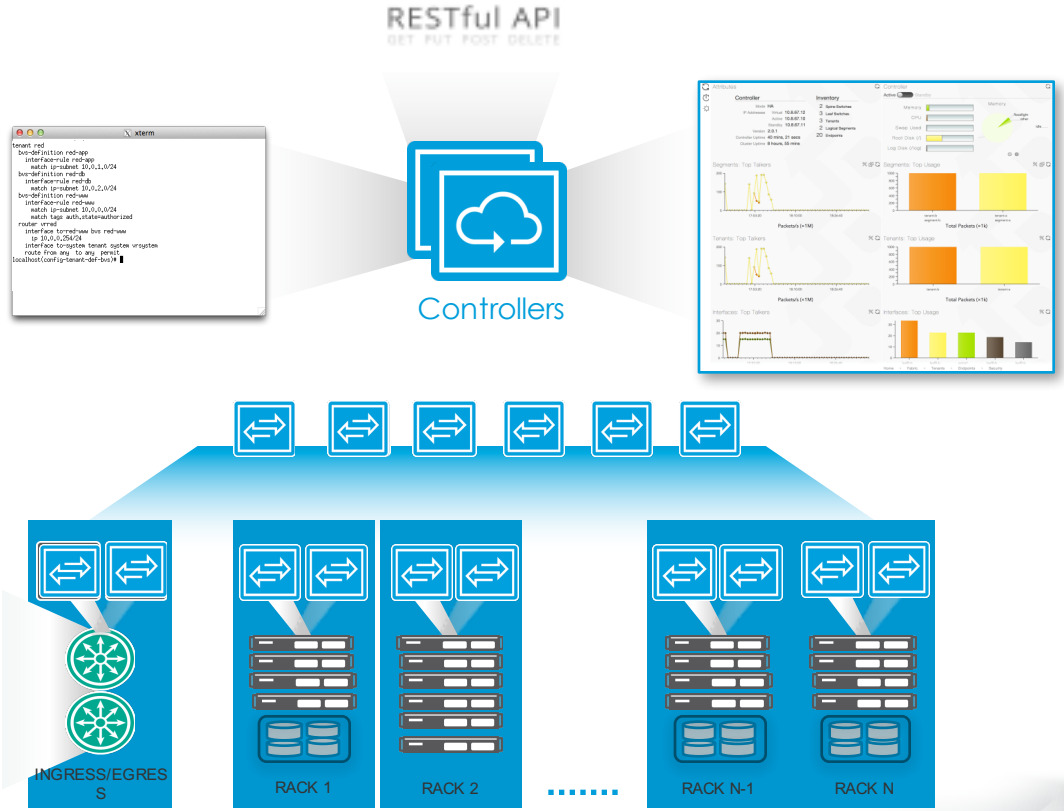
Single pane of glass

- CLI/GUI/REST API
  - CLI/GUI are REST clients
- Over 130 devices
- Configuration
- Monitoring
- Troubleshooting



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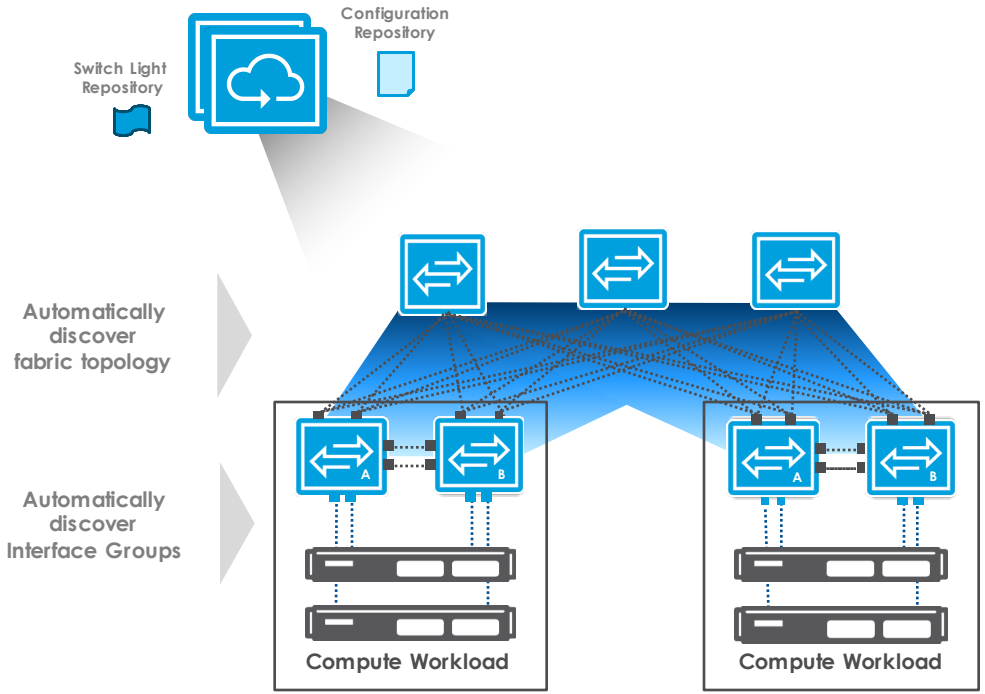
Zero Touch Fabric



BCF Bring-up

- Install and cable switches & controllers
- Perform first-boot configuration on controller
- Configure switch MAC addresses and roles
- Power up switches

- **Auto discover switches**
- **Auto load Switch Light OS**
- **Auto discover fabric links**
- **Auto discover hosts (vCenter & OpenStack)**
- **Auto discover Interface Groups (vCenter & OS)**

No box-by-box bring-up or configurations

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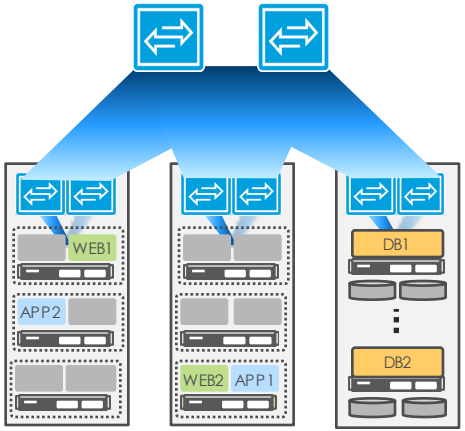
Logical View



Physical View

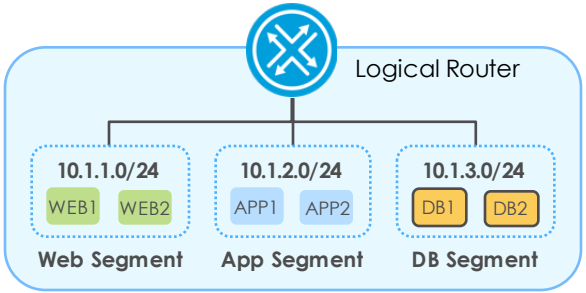
Tenants

Segments

Logical Routers

```
tenant Dev
  logical-router
    interface . . .

  segment web
    member . . .
```



Logical View

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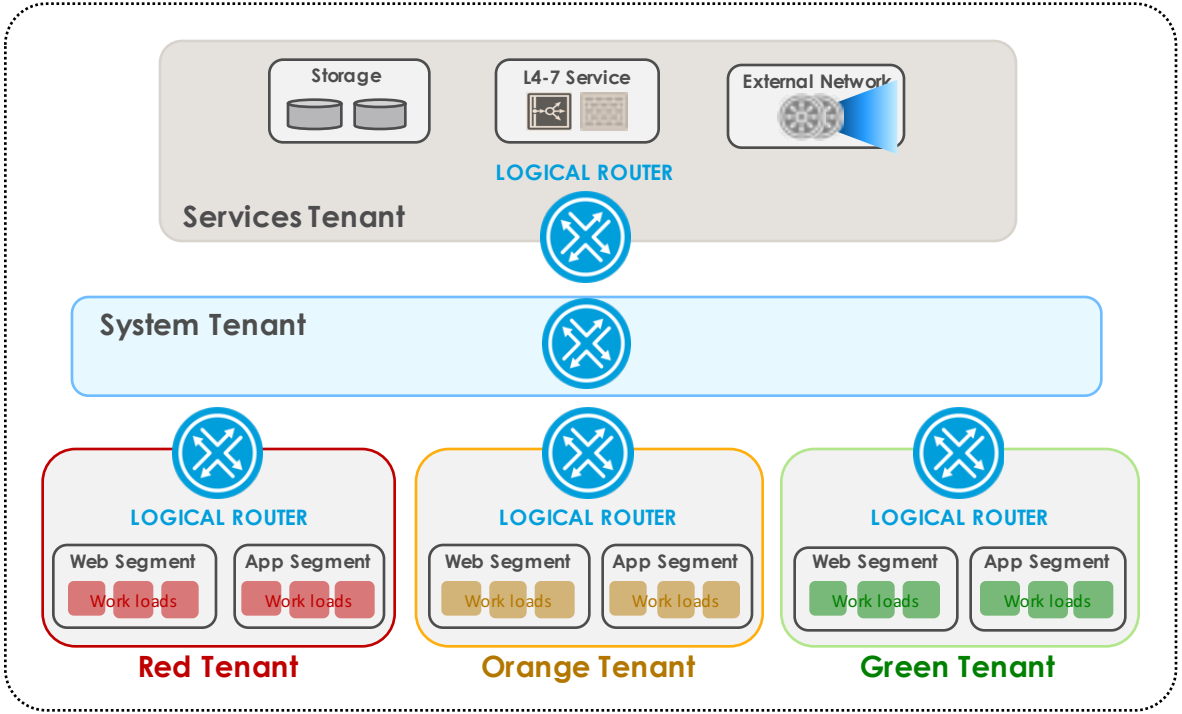
Network Topology



Network Topology

- Multi-tenant configurations
- Shared tenant services
- System tenant for inter-tenant connectivity

Policies

- Granular access control
- Declarative mode (what to do) vs. Imperative mode (how to do it)
- Configurable on all routers

Service Insertion

- Implement security policies
- Redirect traffic using policies

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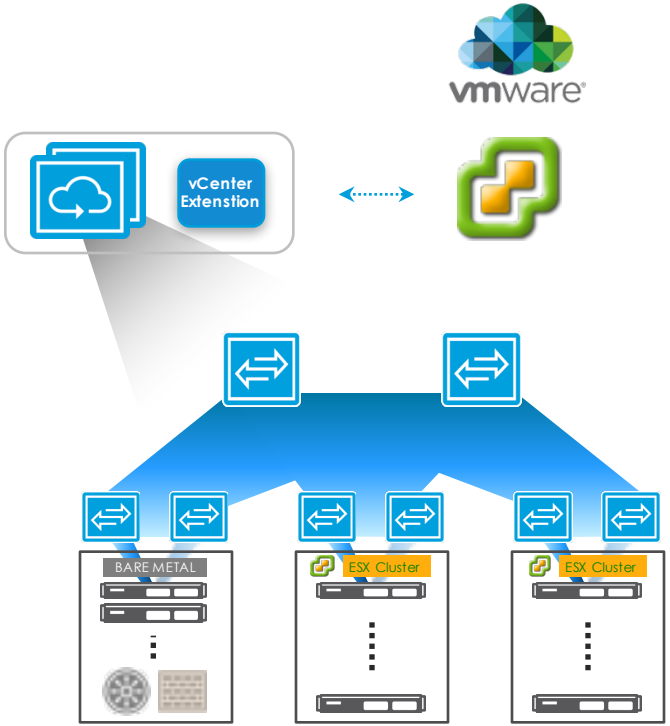
vCenter Integration



vSphere support

- 5.0, 5.5, 6.0

vCenter Integration

- Zero touch fabric
- Auto ESX host detection
- Auto LAG formation
- Auto detect vSwitch/vDS
- Auto L2 segment creation
- Auto policy migrations for vMotion / DRS

VM-to-VM troubleshooting

- Logical connectivity (segment/router/policies)
- Physical connectivity (leaf/spine/leaf)

Easy Integration via CLI/GUI

vCenter Fabric Analytics

- VM Level visibility
- VM Name, vNIC, pNIC, …
- vMotion, vSAN

Unified views across vCenters

- Tenant per vCenter

vCenter GUI Enhancements

- No software installation
- Layer 3 configurations
- Shared tenants across vCenters
- Fabric Test Path

Advanced Network Automation

Visibility without Automation

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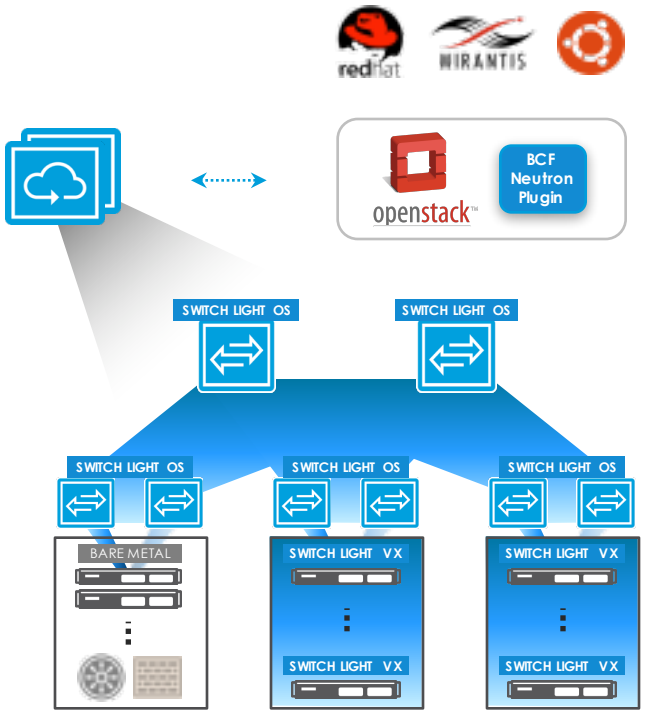
OpenStack Integration



OpenStack Support

- Liberty / Mitaka
- Neutron Plugin
  - BSN ML2 Driver
  - BSN L3 Plugin
- Security Group Visibility
- LBaaS Validated Solution
- Horizon GUI Enhancements
  - Fabric Test Path
  - Heat Templates

Zero Touch P+V Fabric

- Auto Switch OS installation
- Auto vSwitch detection
- Auto Fabric Formation
- Auto Host Detection
- Auto LAG formation
- Auto L2 Creation

Integrated Switch Light Virtual

- Distributed L2/L3
- NAT: Floating IP/PAT
- PM / VM stats visibility
- P+V Troubleshooting

Deep P+V Visibility

- VM-to-VM Path visibility
- Logical Connectivity
- Physical Connectivity

Switch Light OS

- Physical switches

Switch Light VX

- Virtual switches
- KVM servers (Compute Nodes)

P+V Fabric Analytics

P+V Fabric Programmability

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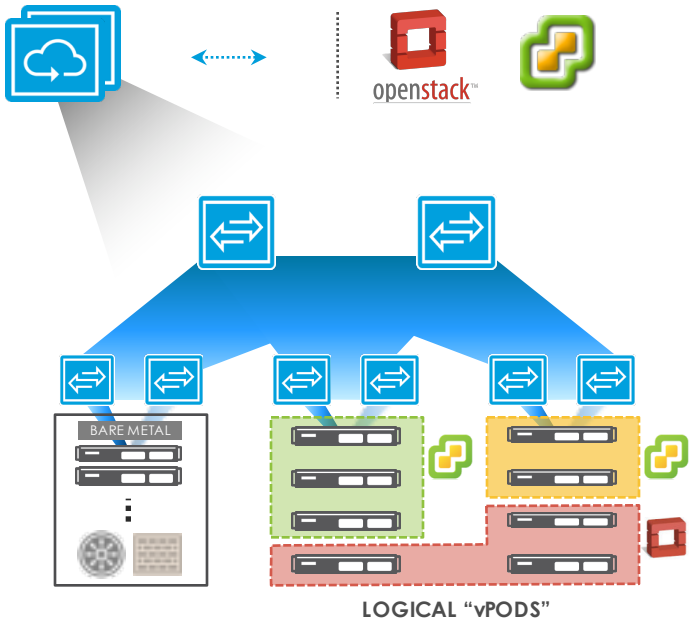
Logical vPODs



Multiple vCenter instances and/or multiple OpenStack instances

- Separate tenant per instance
- Allows use of same IPs and VLANs across vPods
- Distributed logical System Router enables shared services
  - Storage nodes across vCenters
  - Shared external gateway

Use Cases

- Managed Private Cloud
- Dev/Test Cloud

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Analytics

Pre-configured dashboards

- Physical (Controller / Switch)
- Logical (Tenant / Segment / Endpoints / …)

Search logs

- Events, errors, state changes, . . .
- Configuration changes (REST, CLI or GUI)
- Command history

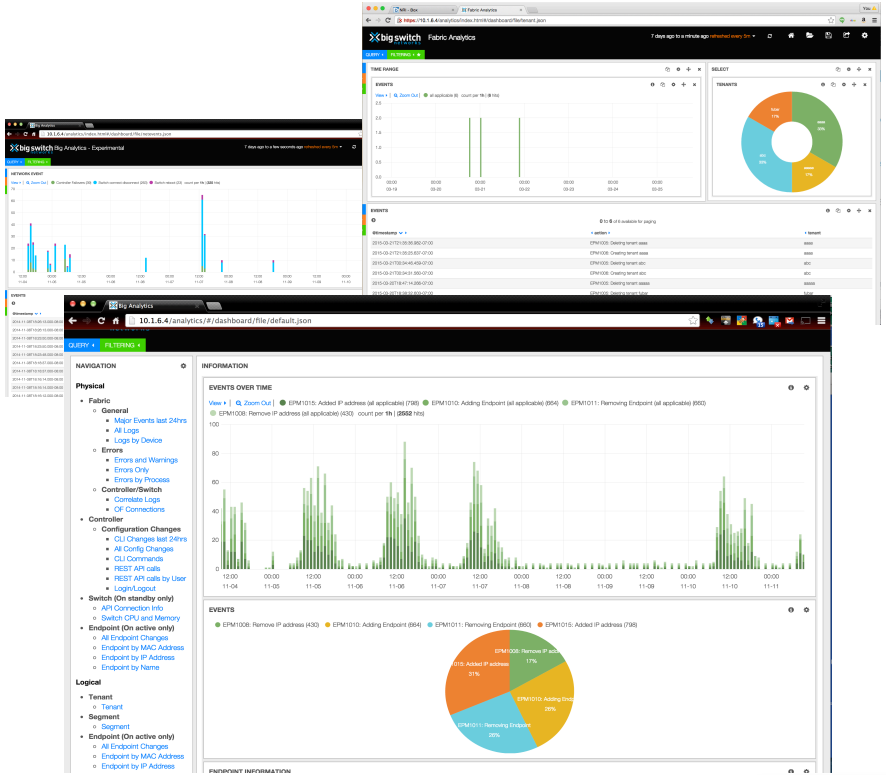
Visualize Data

- Switch / Interface / Tenant utilization
- Perform trend analysis

Powerful query language

- Drill down data sets using simple mouse clicks
- Write your own query strings

Build new and custom dashboards



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High Availability

Switch Redundancy

- Redundant Spine
- Redundant TOR Leaf Switch

Link Redundancy

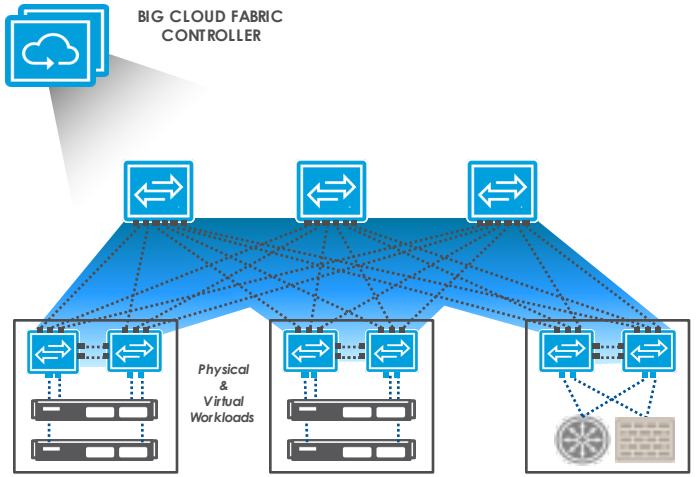
- Every Leaf to every spine
- TOR inter-switch links
- Dual server uplinks
- Dual external connectivity links

Controller Redundancy

- Active / Standby
- Headless Mode
  - Network continues to forward traffic
  - Both controller down
  - Management network down
  - Controller to management link failures

Distributed Routing

- Tenant logical router on every leaf switch



Comprehensive HA

No single point of failure

More resilient than a traditional network

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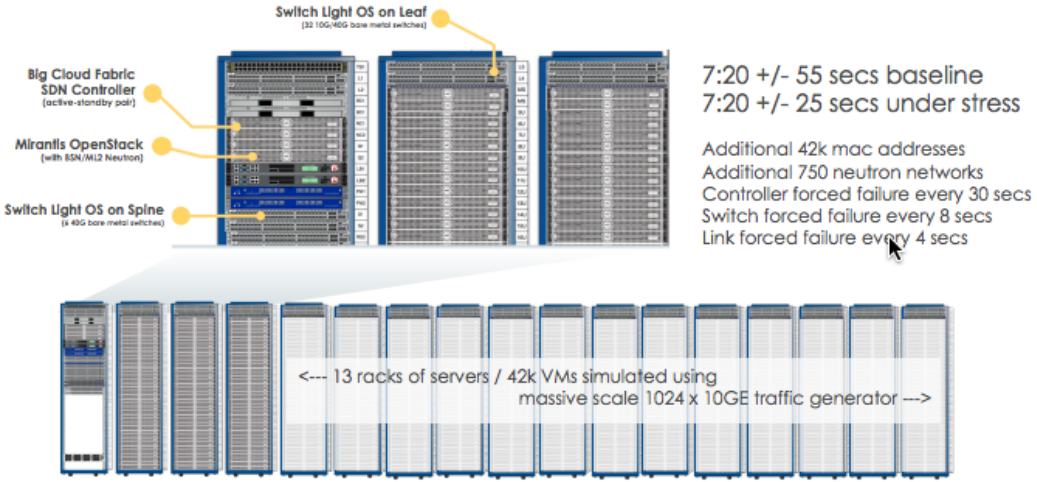
Resiliency

Chaos Monkey Testing: 42k simulated End-points/VMs of background load and 640+ forced component failures during the "under stress" test runs

- 32 leaf / 6 spine / 16 rack pod
- Controller fail-over every 30 seconds
- Switch fail-over every 8 seconds
- Link fail-over every 4 seconds



Conclusion: 640 component failures in 30 minutes with no impact on application performance

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Controllers

Controller	Platform	Configuration	Deployment
VM	ESX 6.0 Ubuntu 14.04	12 vCPU (min 1 GHz) 56 GB RAM, 300 GB HDD 4 vNIC	Lab
VM	RHEL 7.2	12 vCPU (min 1 GHz) 56 GB RAM, 300 GB HDD 4 vNIC	Production (3 Racks, 120 Servers)
HW – Standard	Dell R430	12 Cores 64 GB RAM, 2TB HDD 4x1G, 2x10G NIC	Production (P Fabric)
HW – Large	Dell R430	24 Cores 64 GB RAM, 2TB HDD 4x1G, 2x10G NIC	Production (P+V Fabric)

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Ethernet Switches

Dell Models	Configuration	Processor	CPU	Role
S4048-ON	48x10G, 6x40G	Trident II	x86	Spine / Leaf
S6000-ON	32x40G	Trident II	x86	Spine / Leaf
S4048T-ON	48x10GT, 6x40G	Trident II+	x86	Spine / Leaf
S6010-ON	32x40G	Trident II+	x86	Spine / Leaf
S6100-ON	16x40G (x4)	Tomahawk	x86	Spine

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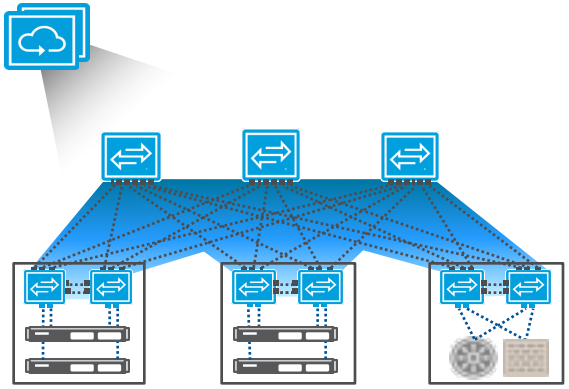
Innovations & Summary



SDN Controller	▪ Protocol free fabric ▪ Hierarchical control plane
Zero Touch Fabric	▪ Auto switch discovery ▪ Auto fabric formation
Tenant Aware Fabric	▪ Tenant centric configurations ▪ Fine-grained inter-tenant access control
Distributed Logical Routing	▪ Tenant router in every leaf switch ▪ System tenant router in every spine switch
Service Aware Fabric	▪ Service insertion at Inter-segment and inter-tenant level ▪ Insertion of physical or virtual services for physical or virtual workloads
Headless Mode	▪ Resiliency during double failure ▪ No state timeouts or expunged programming
Fabric LAG	▪ ECMP like L2 LAG ▪ Load balances across spine & leaf switches
Fabric View	▪ Advanced Multi-node Troubleshooting, Analytics & Telemetry ▪ VM to VM visibility

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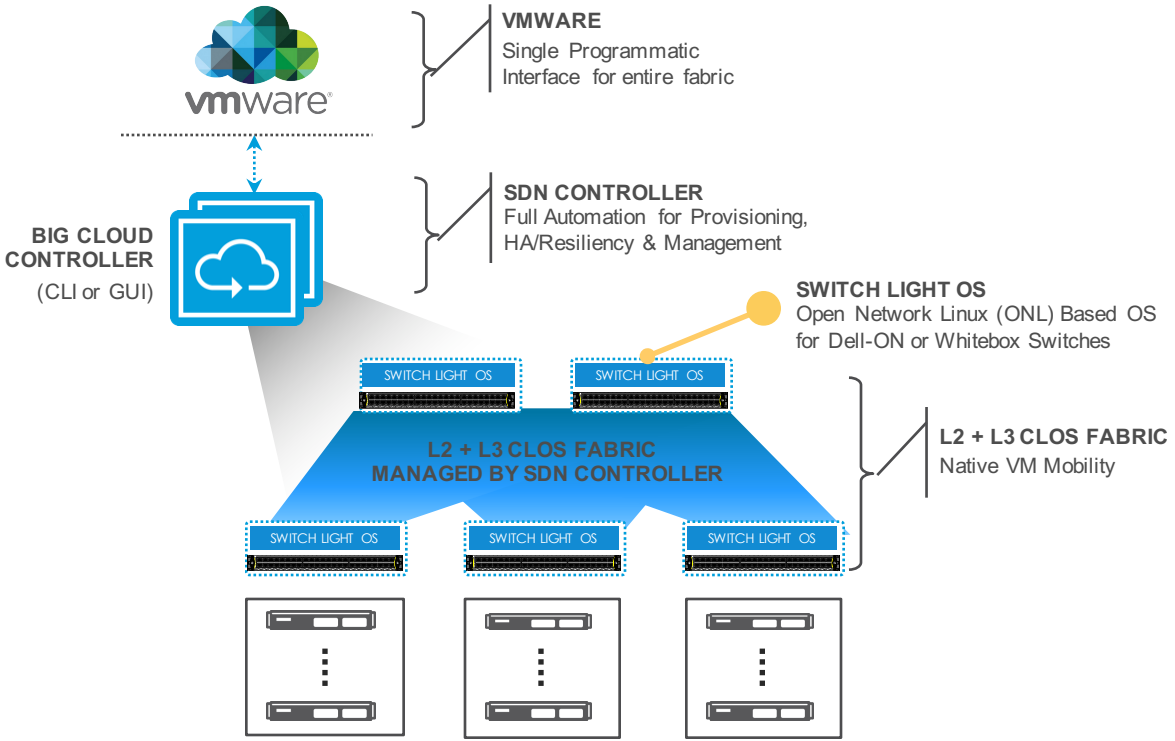
Big Cloud Fabric VMware integration

BIG CLOUD FABRIC

Ideal Leaf-Spine Fabric for VMware SDDC



vmware

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DELL or Other Open Networking Switches

ESXi Servers
Storage

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EXTENSIVE SUPPORT FOR VMWARE

	Integration	Visibility	Troubleshooting
vSphere	✓ Fabric Automation	✓ VM, Host Visibility	✓ VM-to-VM
NSX	✓ HW VTEP Tech Preview @VMworld	✓ Overlay Visibility	✓ VTEP-to-VTEP
vSAN	✓ vSAN Transport Network Automation	✓ Node Visibility	✓ Node-to-Node
vSphere Web Client (for VM admin)	✓ vCenter GUI Plug-in	✓ Fabric Visibility	✓ VM-to-VM
vRealize Log Insight (for VM admin)	✓ Content Pack	✓ Fabric Visibility	✓ Log Correlation

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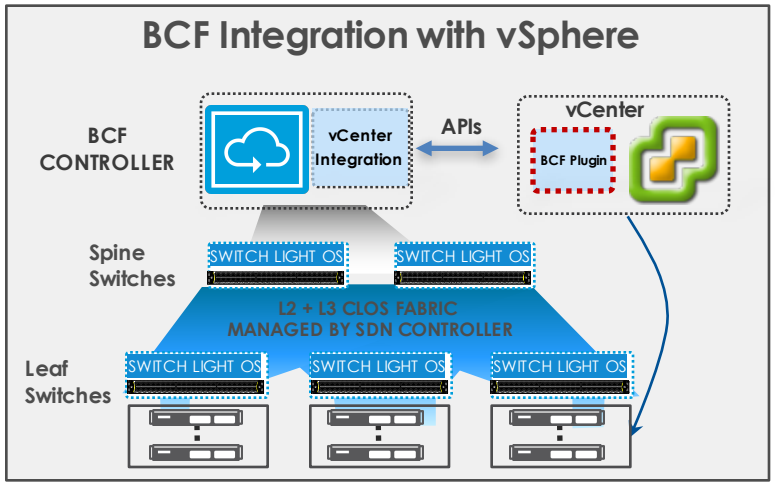
BCF INTEGRATION WITH VMWARE VSPHERE

Automation, Visibility and Troubleshooting



Fabric Automation for vSphere

- Auto Host Detection & LAG Formation
- Auto L2 Network Creation & VM Provisioning
- Network policy migration for vMotion/DRS

	Network Admin	VM Admin
Console	**BCF CLI / GUI / REST API**	**BCF Plug-in for vSphere Web Client**
Visibility	VM / ESXi Node Compute State	VM / ESXi Node Network State
Troubleshooting	VM-VM / vmk-vmk Path Tracing Virtual – physical networking error detection	VM-VM / vmk-vmk Path Tracing Virtual – physical networking error detection

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LOGICAL "VPODS" WITH A SINGLE FABRIC

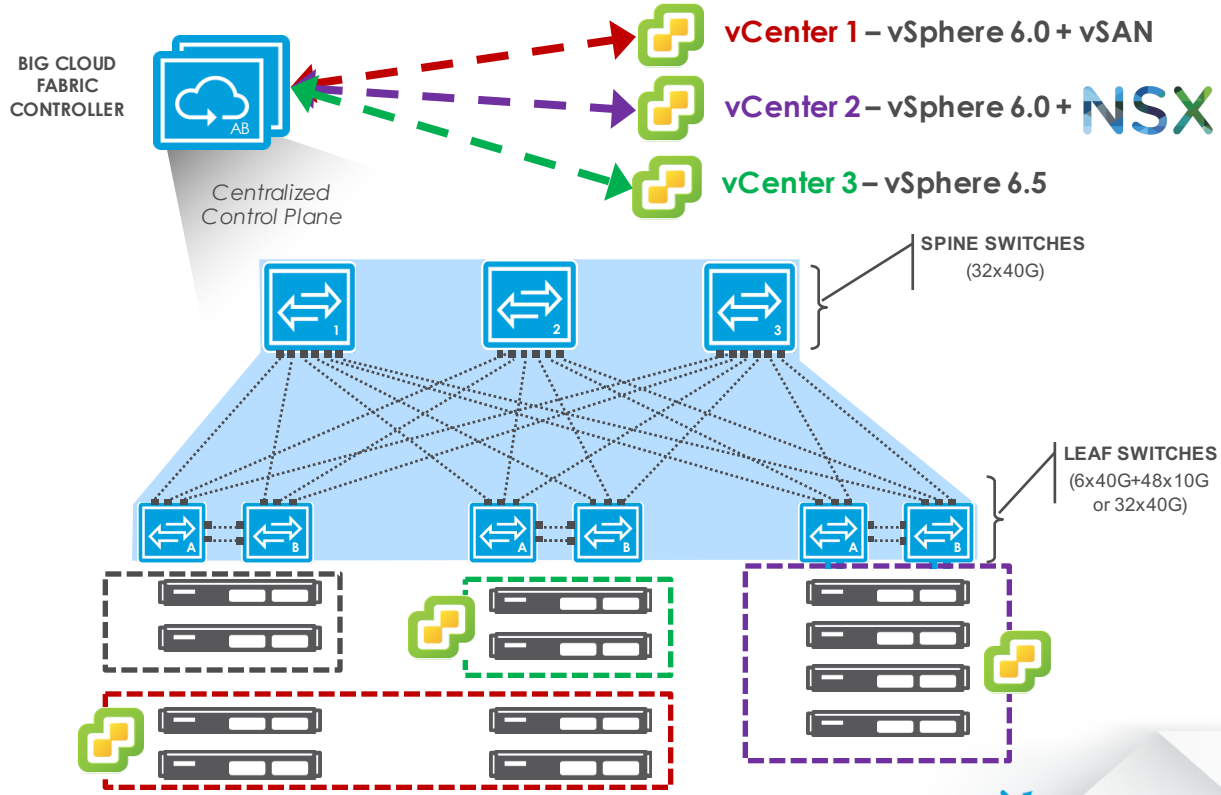
Multiple vCenters Connected to BCF

Features:

- Overlapping VLANs / IPs across vCenters
- Data / Control / Admin Plane Separation

Use-cases:

- Dev/Test Cloud
- Private Cloud
- Migration



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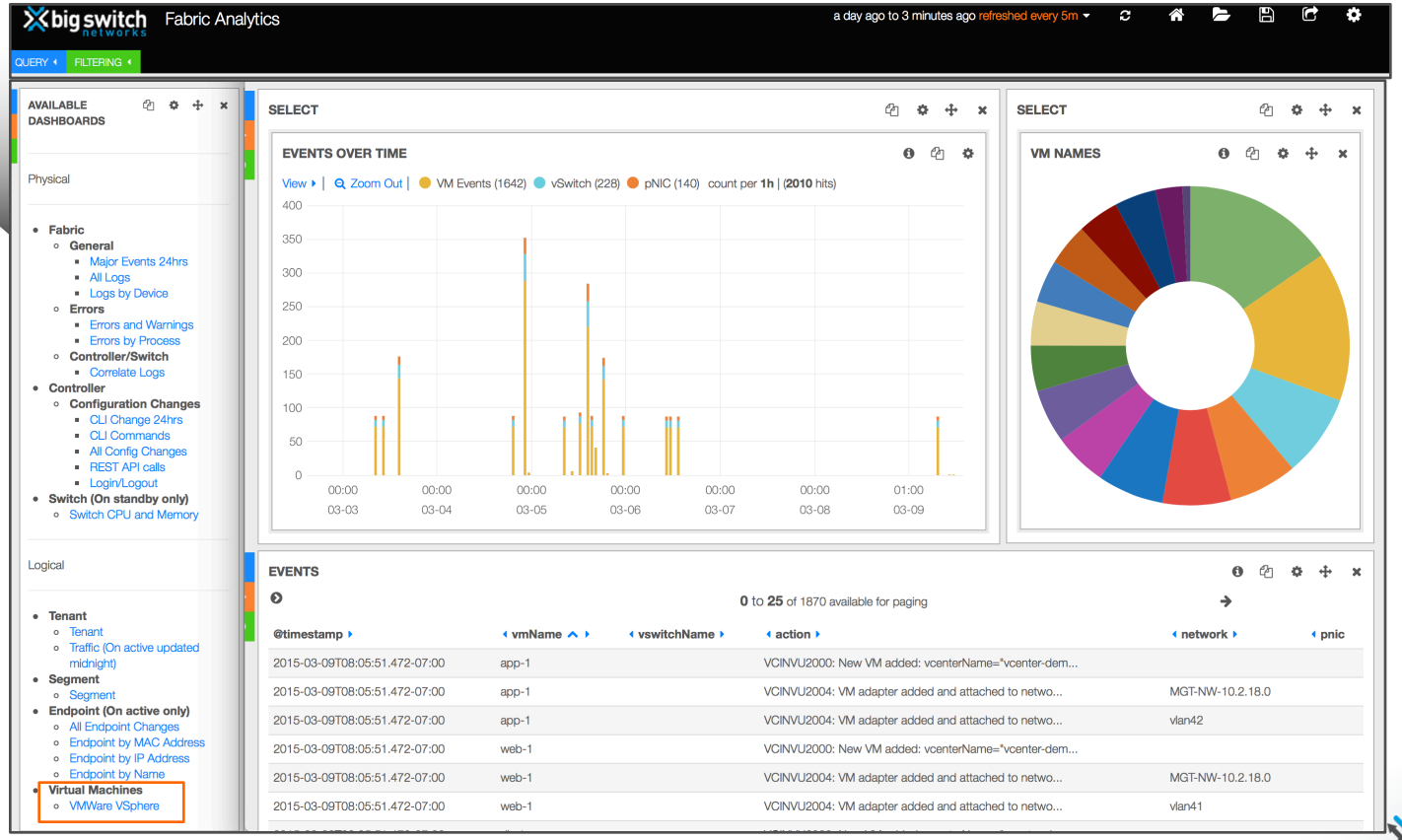
BIG CLOUD FABRIC - VCENTER INTEGRATION

Fabric Analytics for Troubleshooting

BCF Controller



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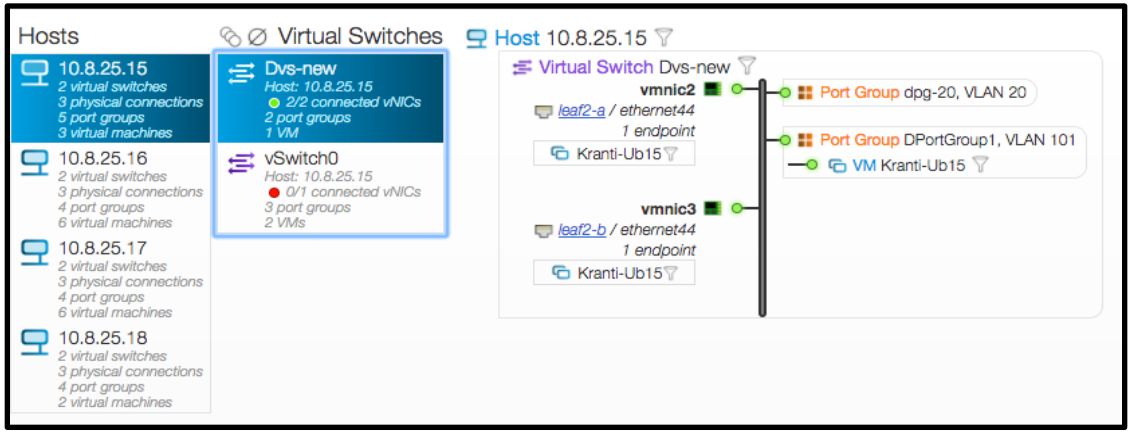
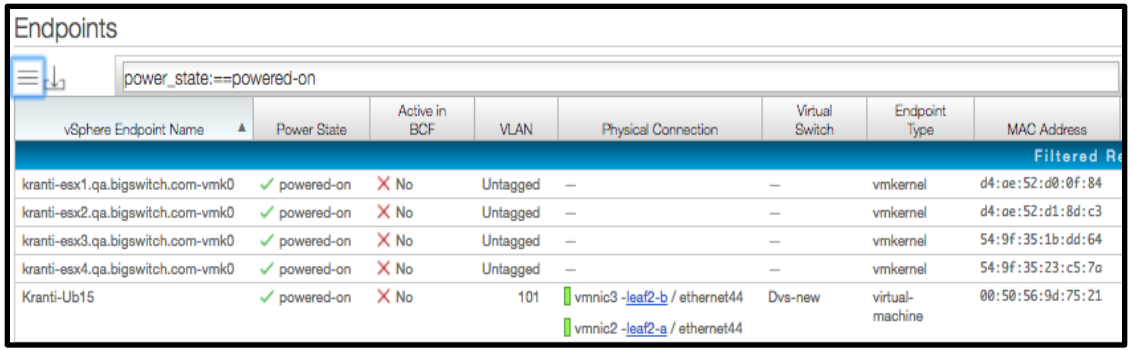
BIG CLOUD FABRIC - VCENTER INTEGRATION

vSphere Visibility for Network Admin

BCF 4.0





vSphere Endpoint Name	Power State	Active in BCF	VLAN	Physical Connection	Virtual Switch	Endpoint Type	MAC Address
							Filtered Re
kranti-esx1.qa.bigswitch.com-vmk0	✓ powered-on	✗ No	Untagged	–	–	vmkernel	d4:ae:52:d0:0f:84
kranti-esx2.qa.bigswitch.com-vmk0	✓ powered-on	✗ No	Untagged	–	–	vmkernel	d4:ae:52:d1:8d:c3
kranti-esx3.qa.bigswitch.com-vmk0	✓ powered-on	✗ No	Untagged	–	–	vmkernel	54:9f:35:1b:dd:64
kranti-esx4.qa.bigswitch.com-vmk0	✓ powered-on	✗ No	Untagged	–	–	vmkernel	54:9f:35:23:c5:7a
Kranti-Ub15	✓ powered-on	✗ No	101	vmnic3 -leaf2-b / ethernet44 vmnic2 -leaf2-a / ethernet44	Dvs-new	virtual-machine	00:50:56:9d:75:21

- Troubleshooting information for:
  - ESXi hosts
  - VM / VMkernel
  - Virtual switches and virtual networks

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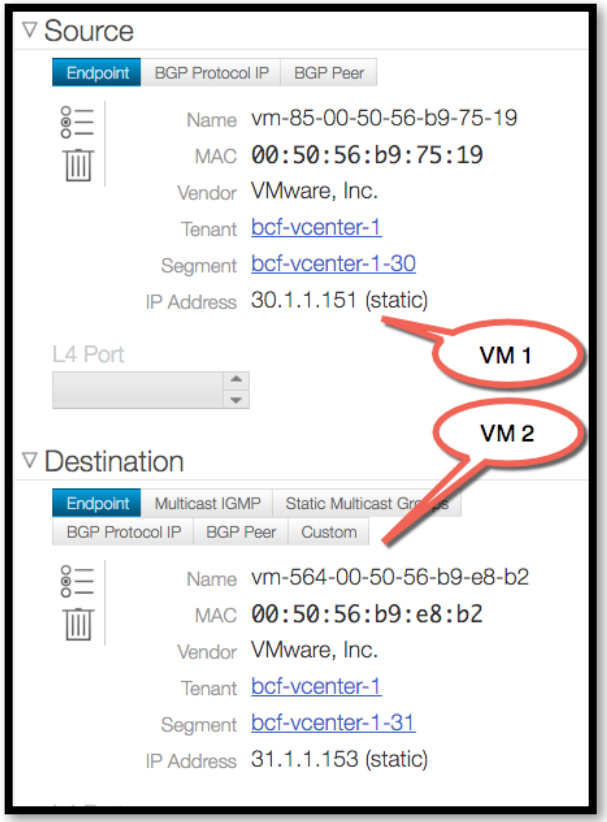
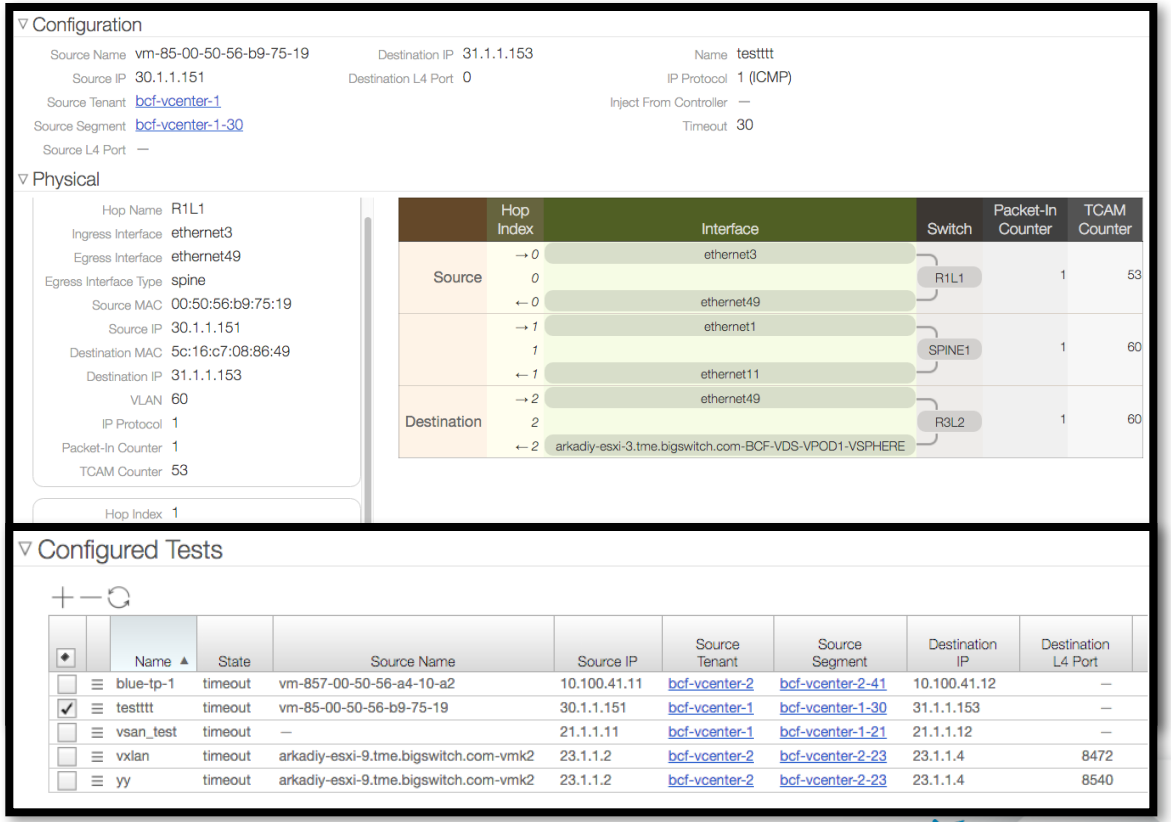
BCF PATH TRACE FOR NETWORK ADMIN

VM– VM / VTEP – VTEP / vSAN node – vSAN node





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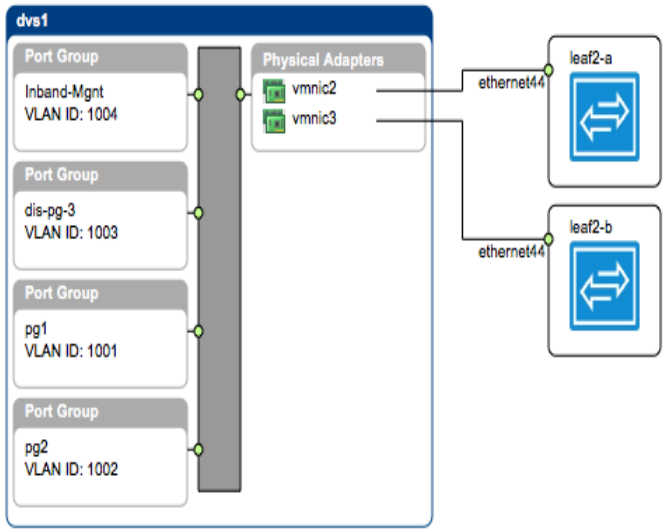
BCF PLUG-IN FOR VSPHERE WEB CLIENT

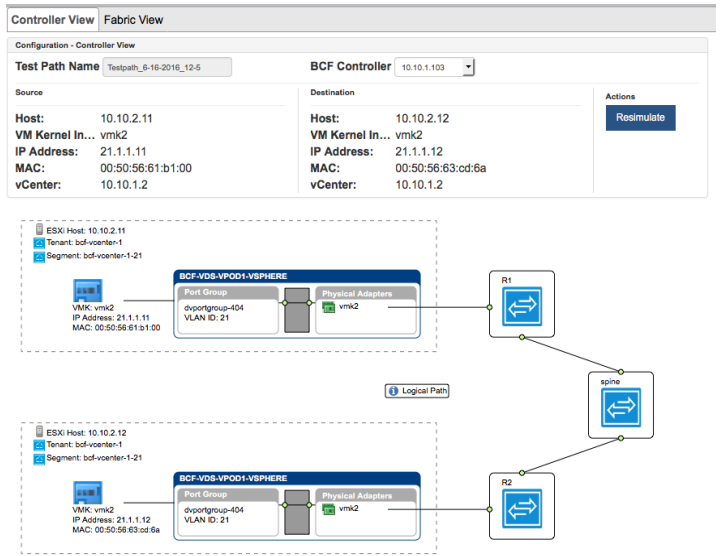
Powerful Capabilities for VM Admins

VMware vSphere Web Client Partner

Virtual ←→ Physical Network Visibility



VM ←→ VM Path Troubleshooting



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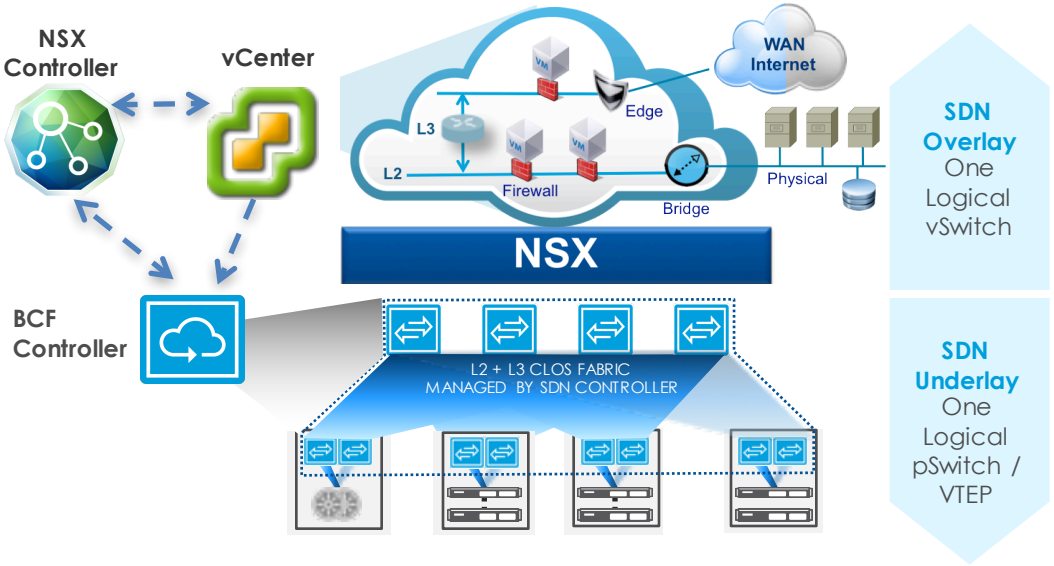
BCF FOR NSX-V

Optimal SDN Architecture across Overlay and Underlay



BCF Support for VMware NSX-v

Fabric Automation

- Auto Host Detection & LAG Formation
- Auto Transport Network Creation for VTEP, vMotion, and Storage port groups

Monitoring & Troubleshooting

- NSX Analytics for network admin
- VTEP-to-VTEP, VM-VM, VM-host fabric trace

HW VTEP (Tech Preview)

- Fabric as a single HW VTEP
- VNI-VLAN binding

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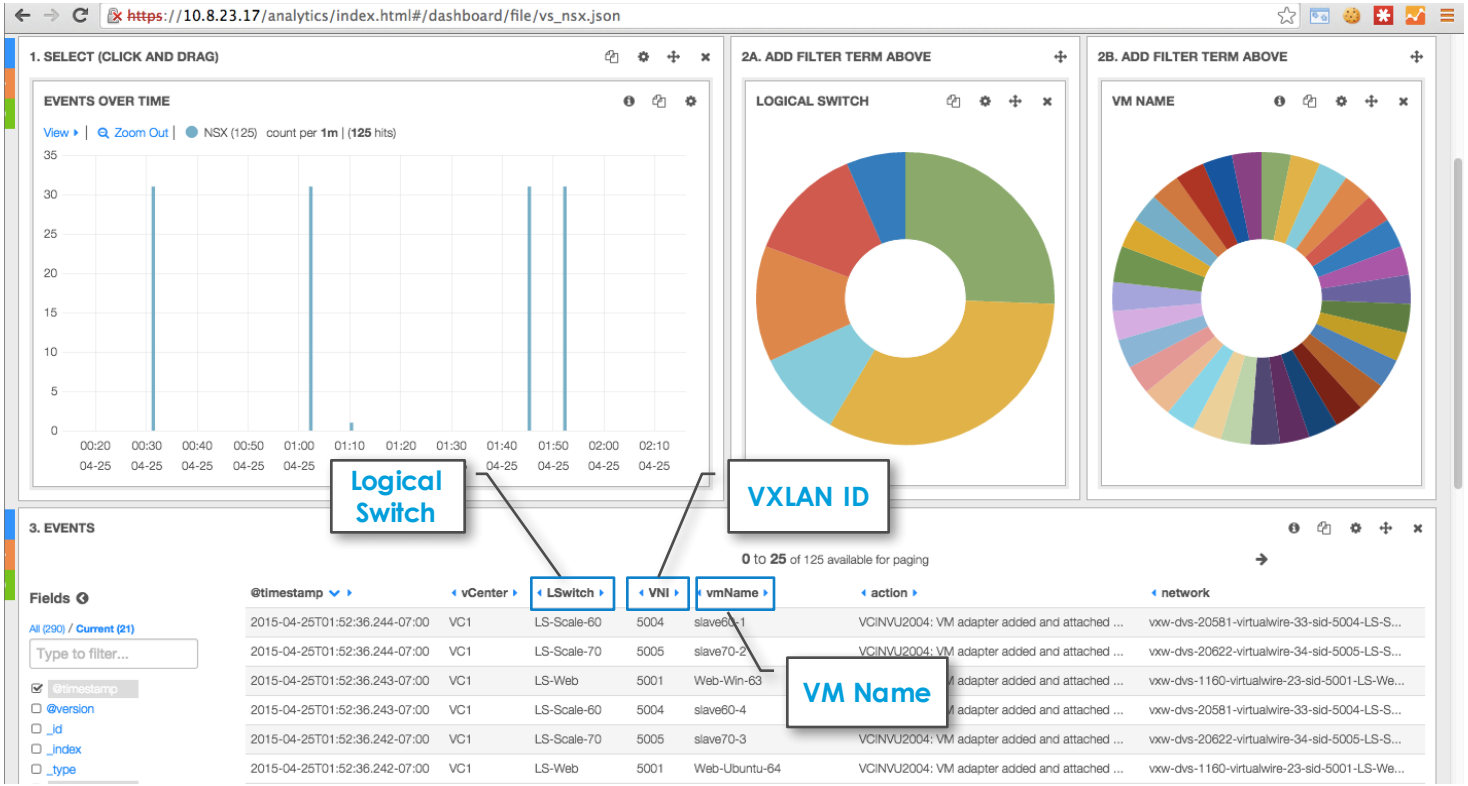
FABRIC ANALYTICS FOR NSX-V

Overlay Visibility for Network Admin



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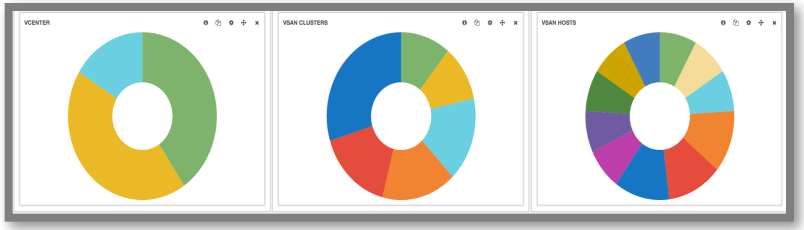
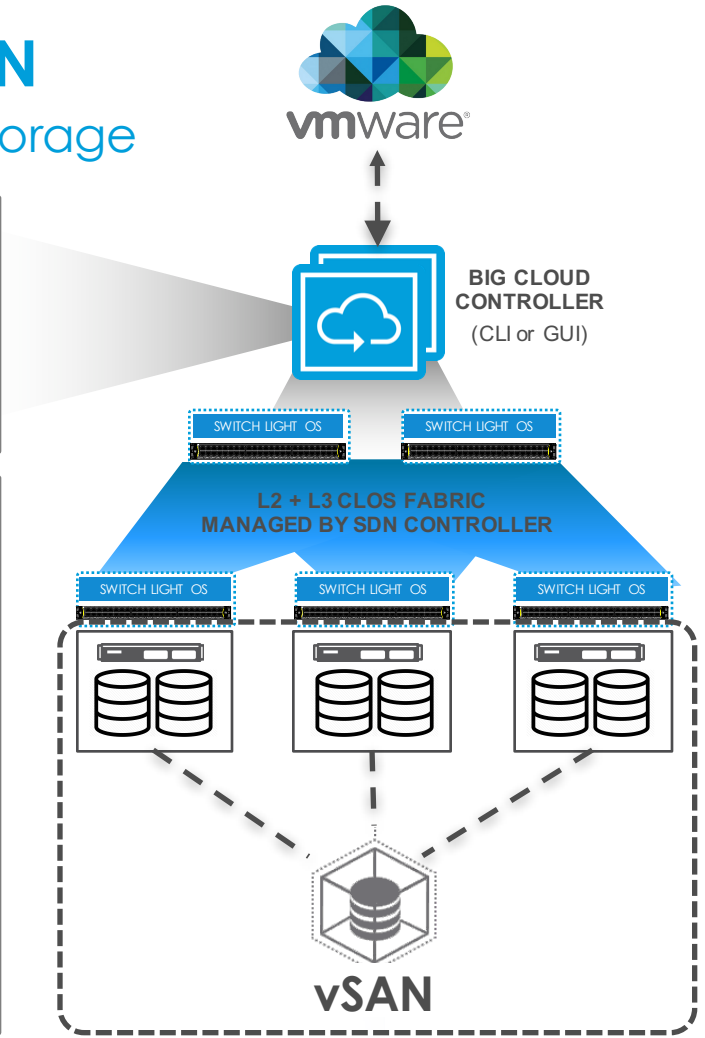
BIG CLOUD FABRIC & VMWARE vSAN

Architectural Synergy with Software Defined Storage

BCF vSAN Analytics



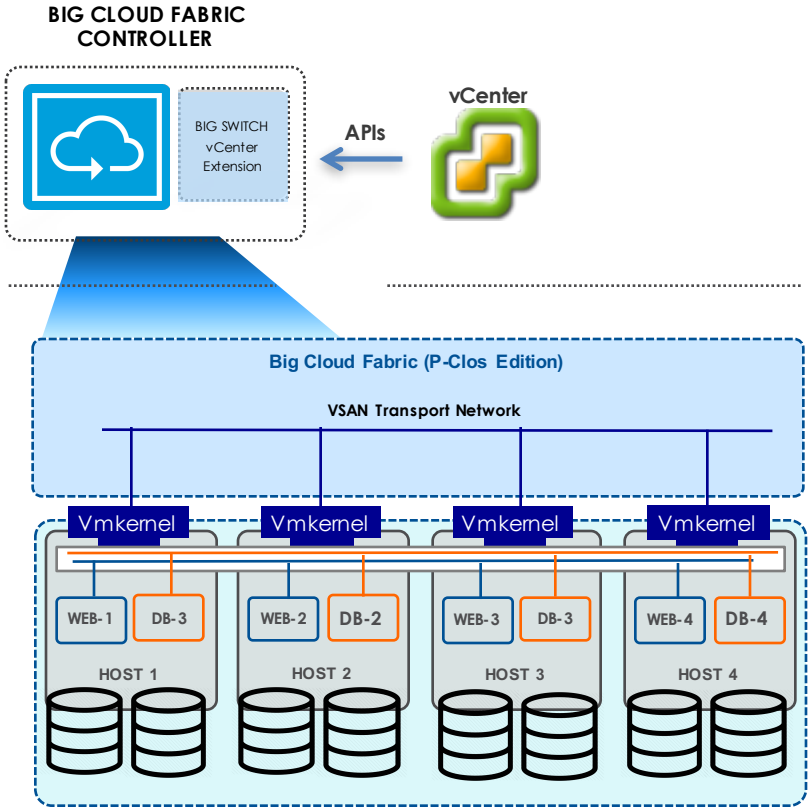
- One Logical Switch architecture
- Choice of switch hardware
- Auto-configuration for vSAN networking
- Simple multicast deployment
- Visibility and Troubleshooting



BCF WITH VMWARE vSAN

Best Fabric for VMware HCI

Validated with BCF 3.6



Fabric Automation for vSAN

- Auto Host Detection & LAG Formation
- **Auto vSAN Network Creation for VMkernel communication**
- **Simplified L2 or L3 multicast deployment**

VSAN Network Troubleshooting

- VM Analytics for network admin
- Cluster troubleshooting for **unicast** and **multicast** using test path

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VMWARE vSAN AND BIG CLOUD FABRIC

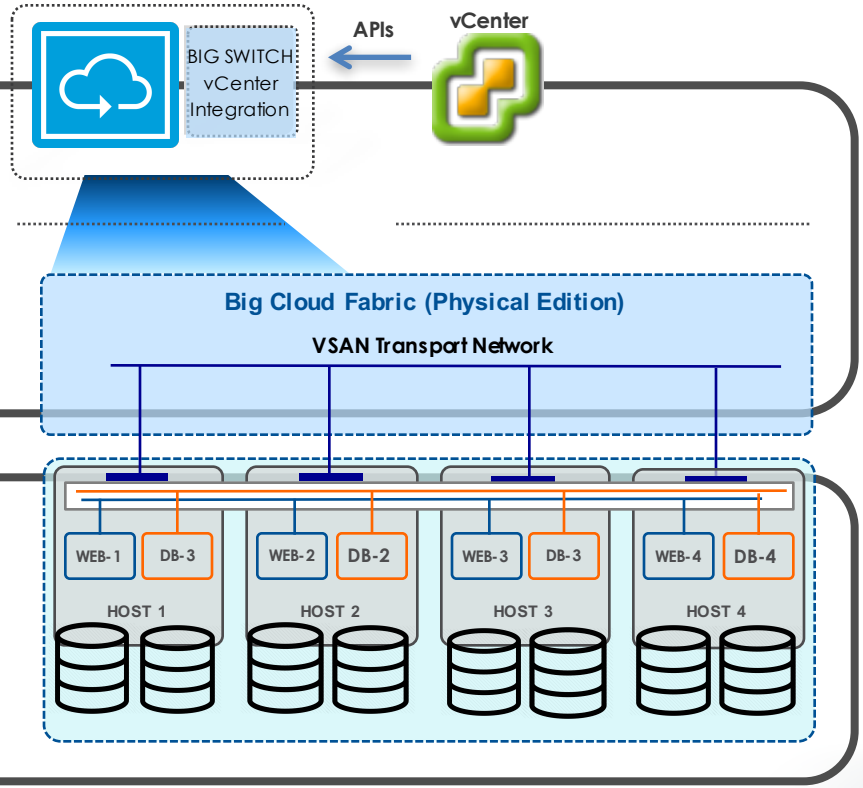
Better Together: SDS + SDN

Big Cloud Fabric

One Logical Switch
- Network HW Choice
- Zero Box-by-Box Configuration
- End-to-end visibility

VMware vSAN

One Logical Datastore
- Integrated with hypervisor
- Disk / vSAN Ready Node choice
- Per-VM storage policies



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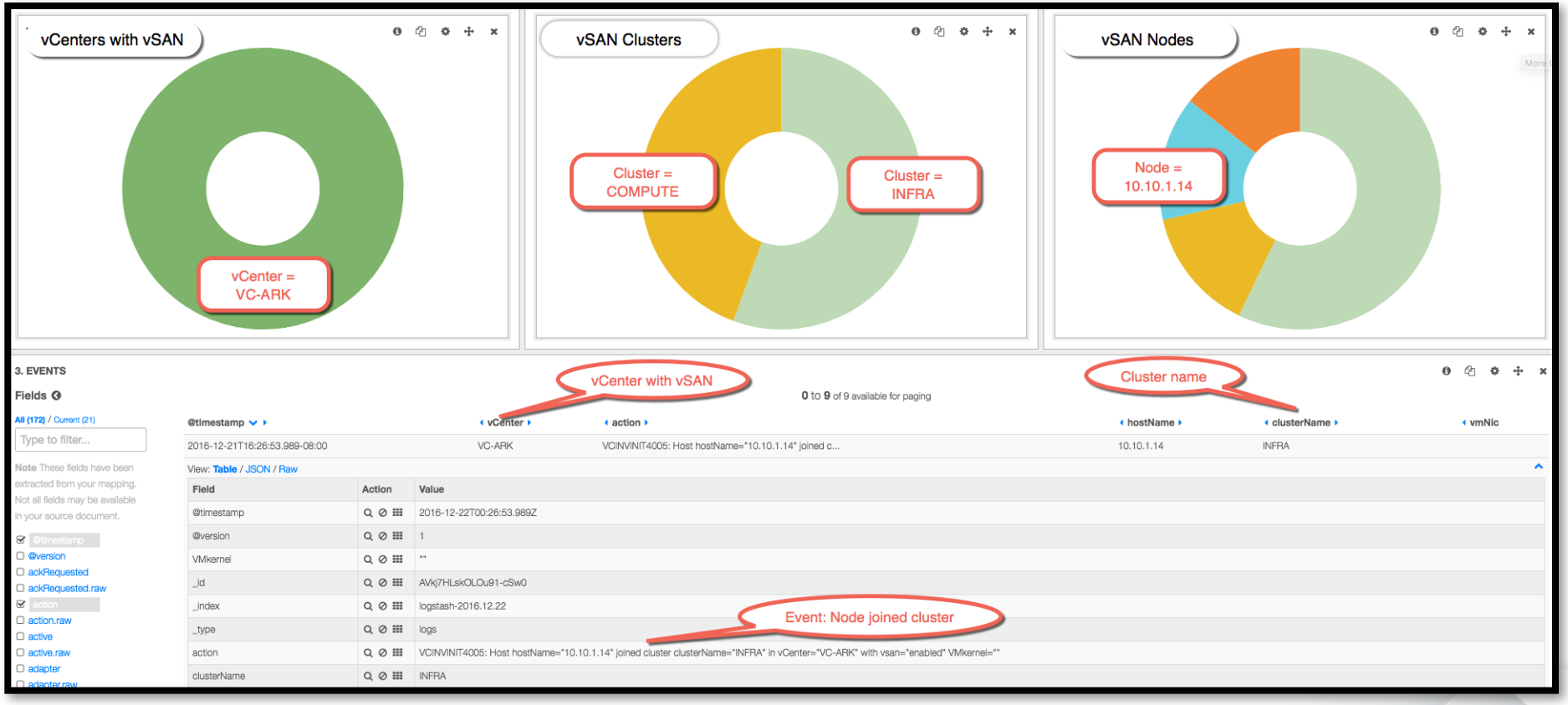
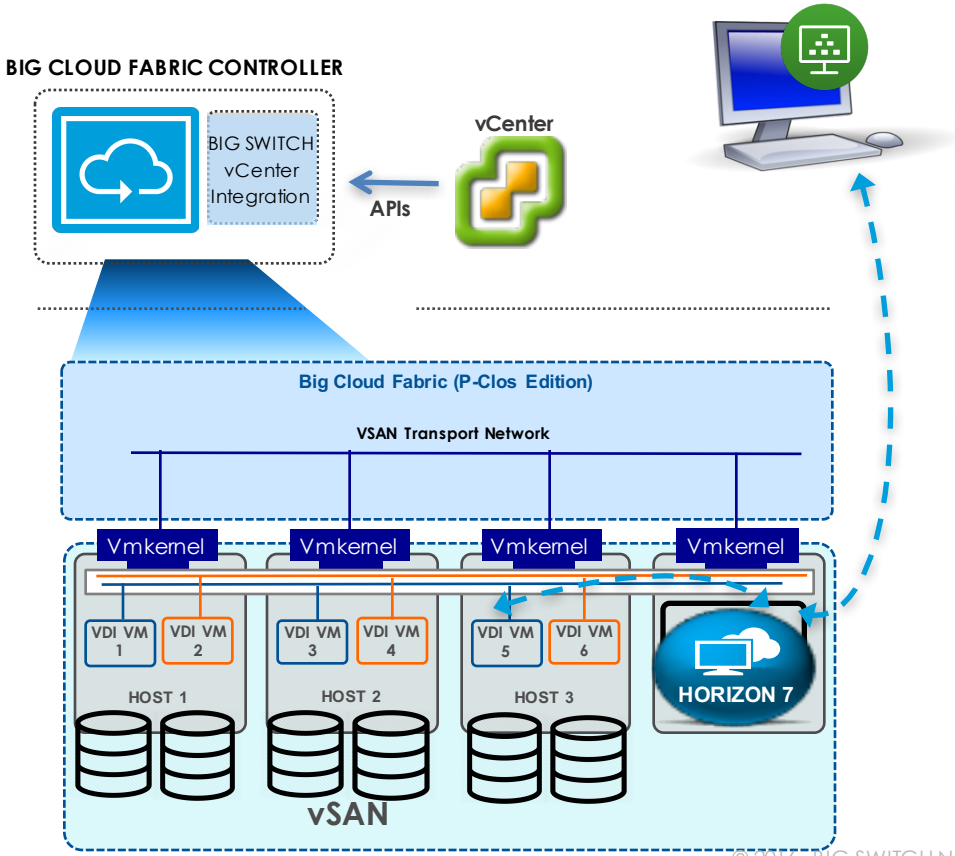
BCF ANALYTICSFOR vSAN



BCF WITH VMWARE HORIZON VIEW

Ideal Fabric for VMware VDI

Validated with BCF 4.0



Fabric **Automation**

- Auto VDI VM network creation & VM provisioning
- Auto VSAN Network Creation for VMkernel communication
- Network policy migration for vMotion / DRS

Network **Troubleshooting**

- VM Analytics for network admin
- VDI VM - Horizon Connection Server path troubleshooting

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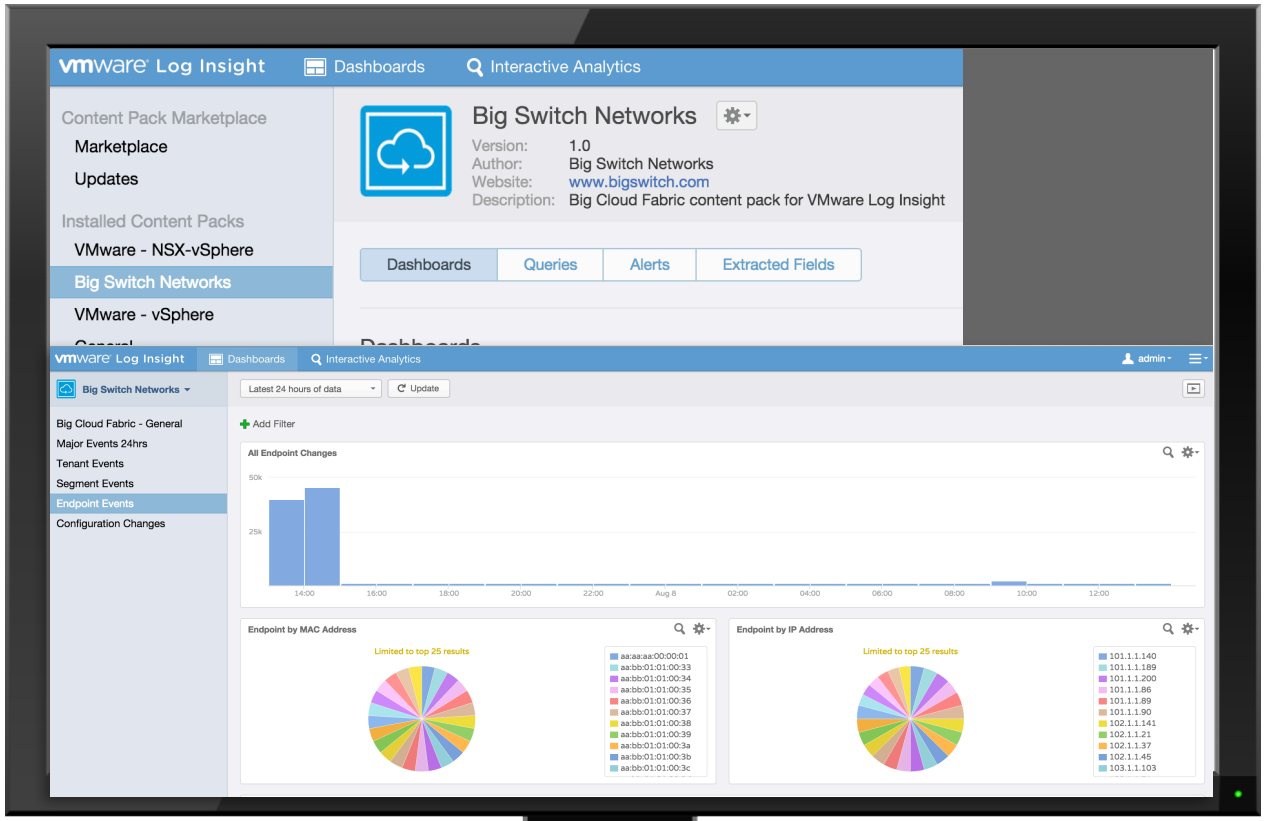
vREALIZE LOG INSIGHT INTEGRATION

Deep visibility available to VM Admin



- BCF plug-in for vRealize Log Insight (vR-LI)
- Export events, statistics, CLI changes to vR-LI
- Consistent view across network and virtualization admins for rapid debugging
- Log correlation with other content packs

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Introduction to Big Monitoring Fabric

NETWORK MONITORING

TOOLS

Application Performance Monitoring

riverbed
ca technologies
ExtraHop
See IT run.

Network Performance Monitoring

riverbed
ca technologies
WIRESHARK

Security Monitoring

BLUE COAT
FireEye
CYPHORT

Customer Experience Monitoring

Polystar
ZETTICS
IBM

Traffic Analytics / Recorders

splunk>
LogRhythm
NEXT COMPUTING

KEY TRENDS

DCs continue to grow

- More, Larger DCs
- 1G/10G → 10G/40G

Increase in East-West Traffic

~70% of traffic is now east-west

Increased Cyber Attacks

42.8M detected Incidents in 2014 (up by **50%** over 2013)

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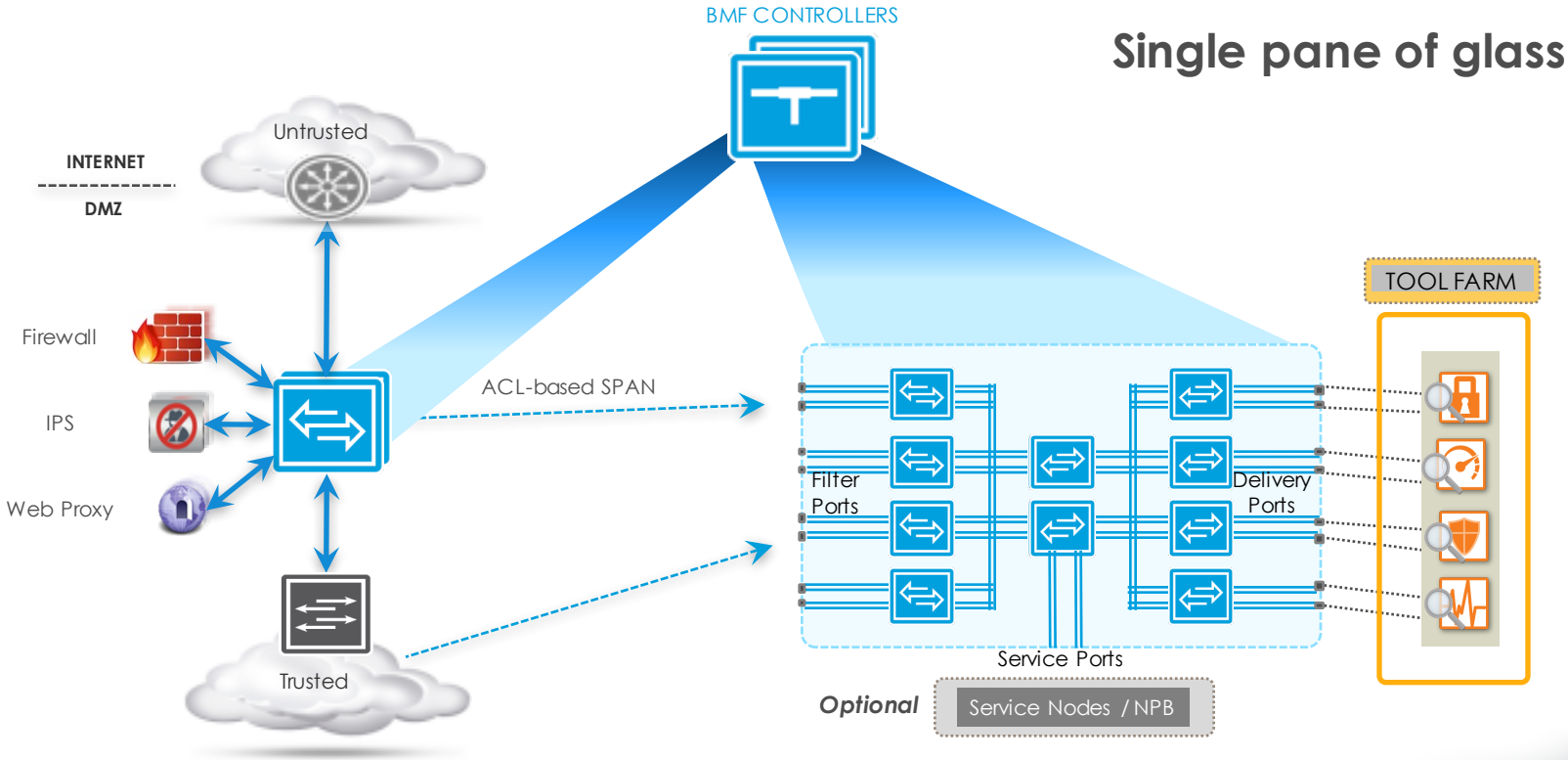
BMF DEPLOYMENT

Out-of-Band and Inline



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BMF DEPLOYMENT

Out-of-Band vs Inline

	Out-of-Band	In-line
Deployment	Adjacent to production network. Connects to TAP / SPAN ports	In-line to the production network
Traffic	Works on copy of production traffic	Works on production traffic
Traffic Flow	Unidirectional; Filter ports to delivery ports	Bidirectional; Same as production traffic
Mode	Detection mode only; Production traffic unaffected	Detection and Prevention modes; Can affect production traffic.

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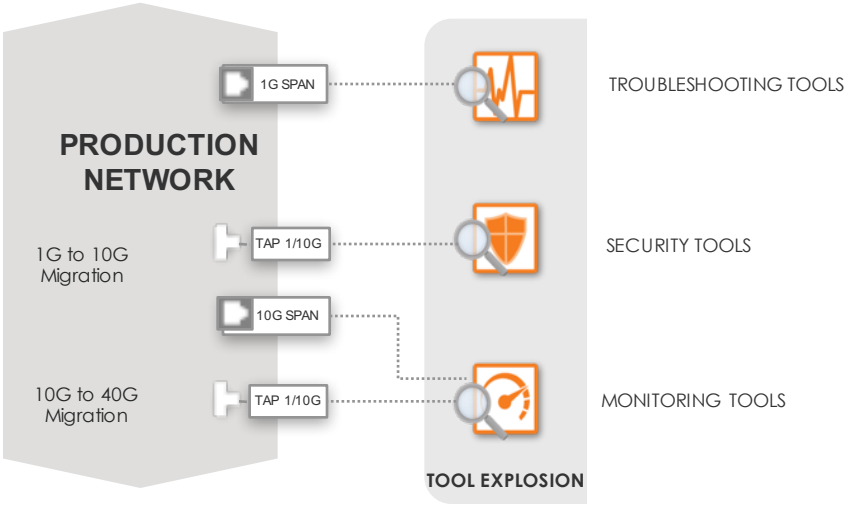
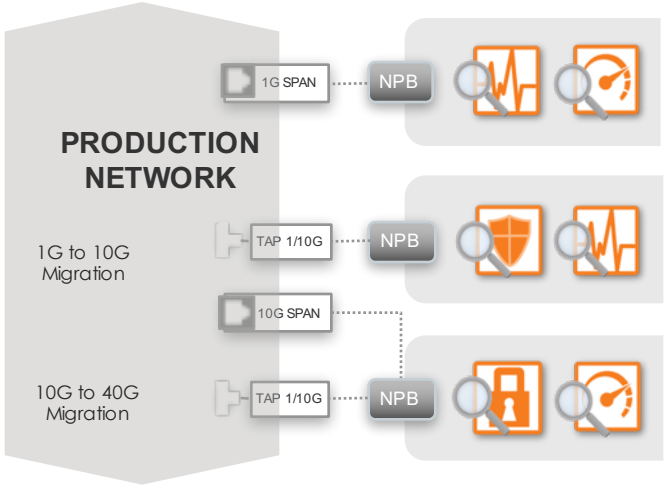
Big Monitoring Fabric Out-of-Band Deployment

NETWORK MONITORING



FIRST GENERATION ARCHITECTURE

INDIVIDUAL TAPS AND TOOLS



SECOND GENERATION ARCHITECTURE

TAP AND TOOL SILOS WITH NPB

NPB: Network Packet Brokers

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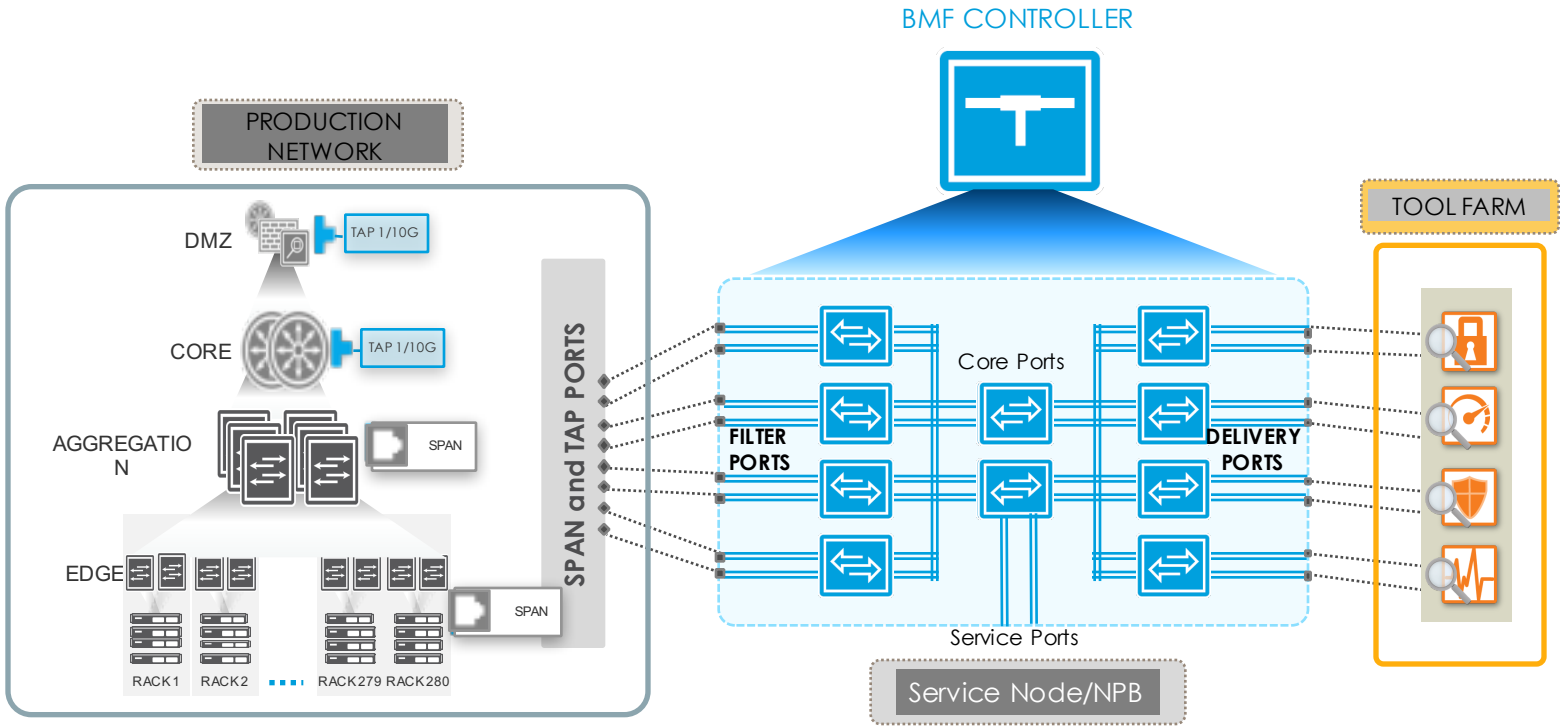
BMF OUT-OF-BAND



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BMF OUT-OF-BAND

Overview

- Works on a copy of the production traffic
  - Cannot control or impact production traffic
  - Logically sits adjacent to production network
  - Selectively allow traffic to enter the fabric
- Any TAP to any tool
  - Forward traffic from any filter interface to any one or many tools in the tool farm
- Passively process traffic
  - De-duplication, packet slicing, packet timestamps, . . .
- Capture traffic
- Detect threats
- Single pane of glass
- Programmable fabric

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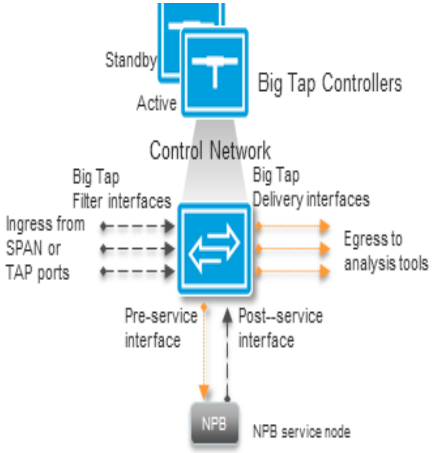
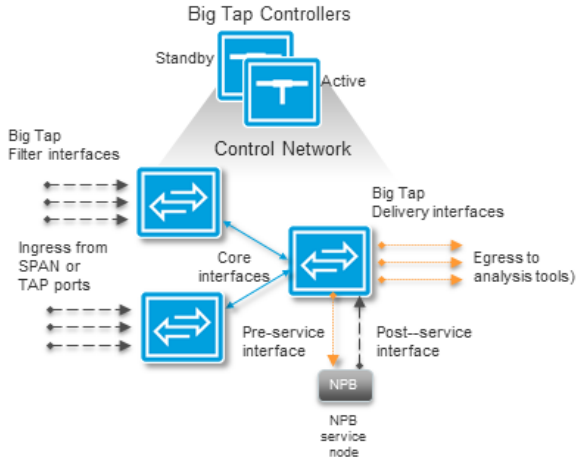
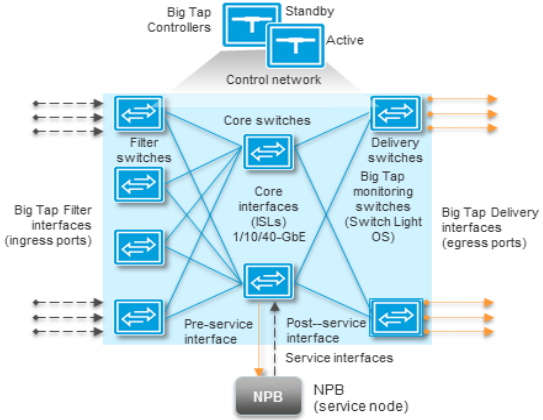
BMF OUT-OF-BAND

Topologies

- Single switch, Two-tier or Multi-tier topologies







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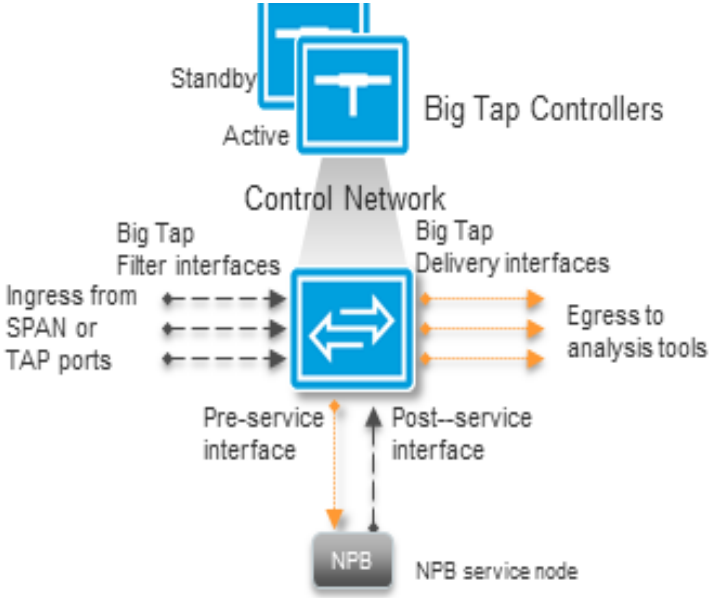
BMF OUT-OF-BAND

Topologies

- Most basic design
- One switch provides all the required ports
  - Filter, delivery, and service
- Scale as you grow
- Provides packet manipulation operations
  - Deduplication
  - Packet Slicing



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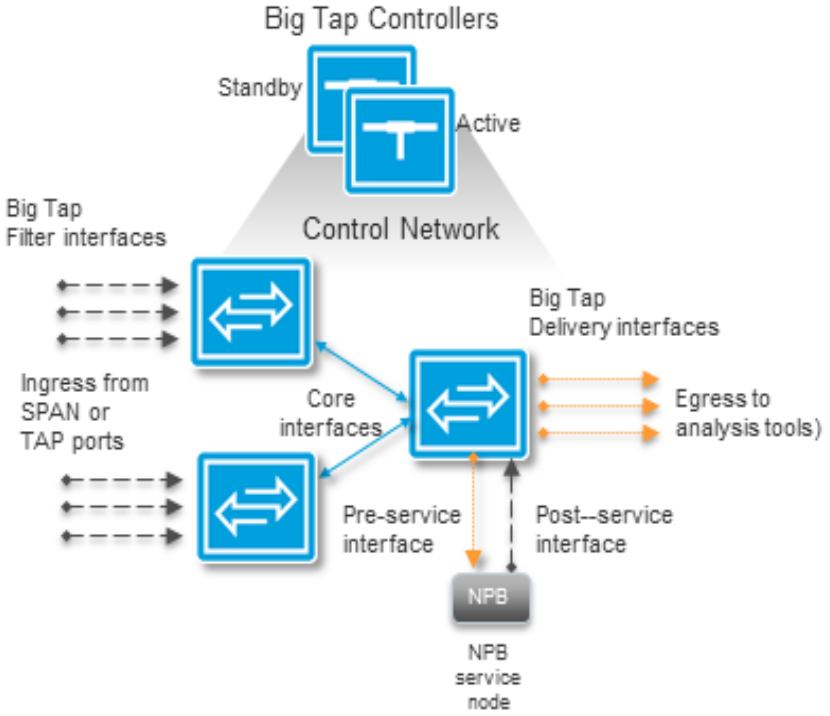
BMF OUT-OF-BAND

Two-Tier Topology

- One switch does not provide enough ports
  - Filter, delivery, and service
- Medium-to-high port scalability
- TAPs dispersed across the datacenter and require aggregation
- Tool farm is physically consolidated in a single location



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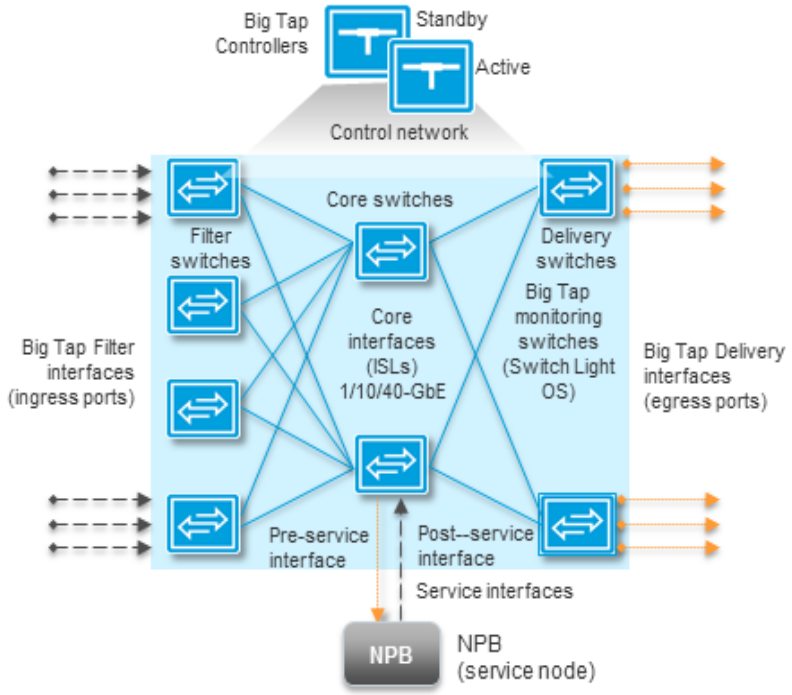
BMF OUT-OF-BAND

Multi-Tier Topology

- Large scale deployments
  - TAP every rack
- Large number of filter ports
- TAPs dispersed across the datacenter
- TAPs at large number of remote sites
- Tool farm not consolidated in a single location



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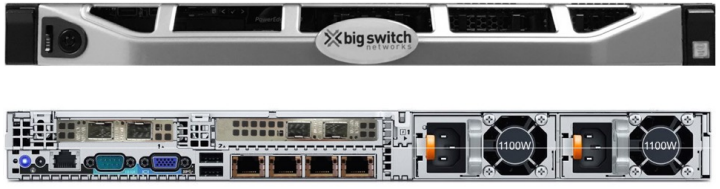
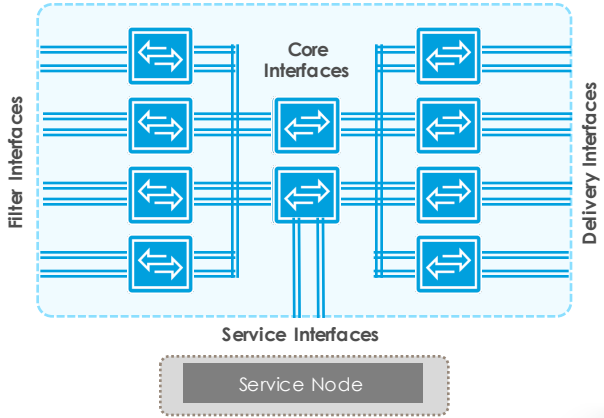
BMF OUT-OF-BAND

BSN Service Node

- 1 RU x86 DPDK appliance
- Supported services
  - De-duplication, Packet Slicing
  - Regex Pattern Matching / dropping
  - Netflow, Header stripping,
- 4x10G bidirectional interfaces
- 1 service per interface
- Configured from controller
  - Part of monitoring fabric





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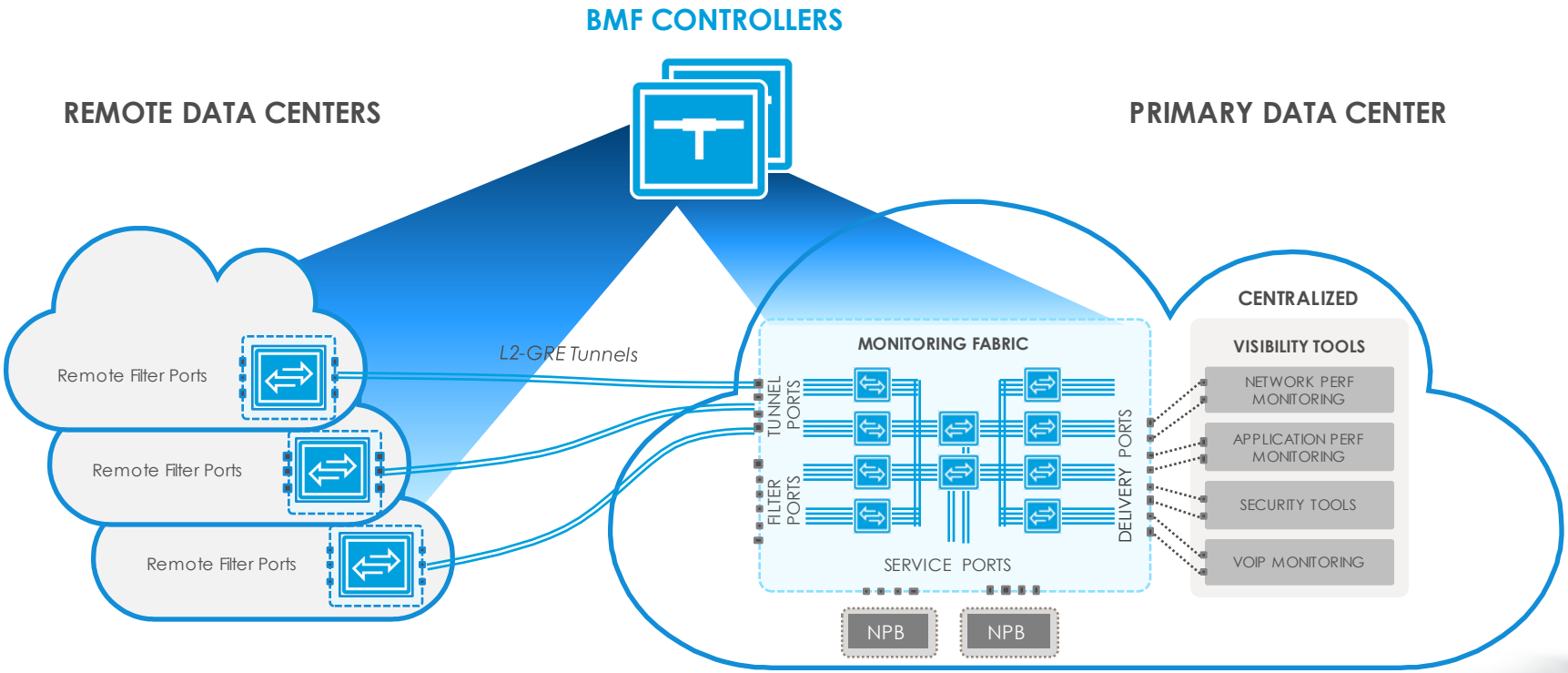
BMF OUT-OF-BAND

Use-case – Remote Data Center Monitoring



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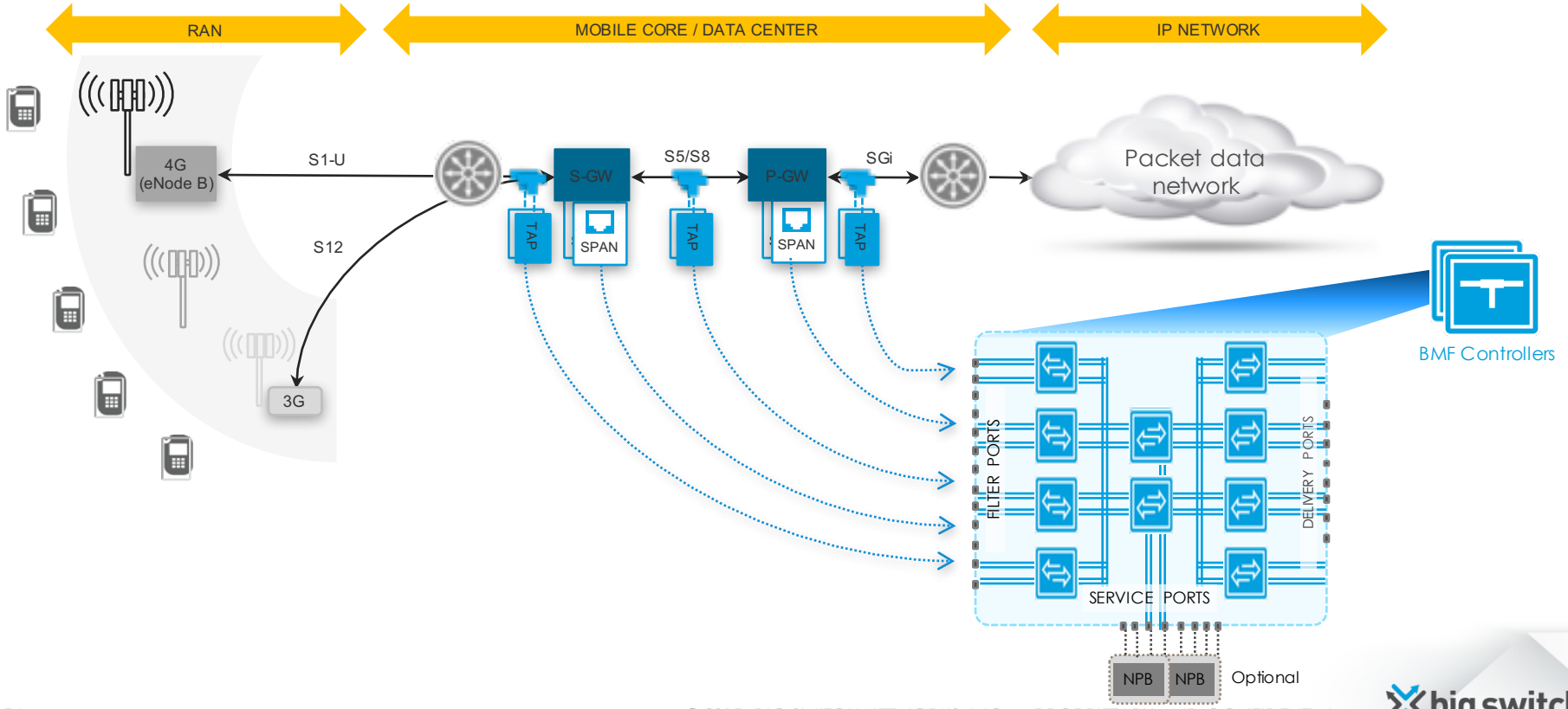
BMF OUT-OF-BAND

Use-case – Mobile / LTE Network Monitoring



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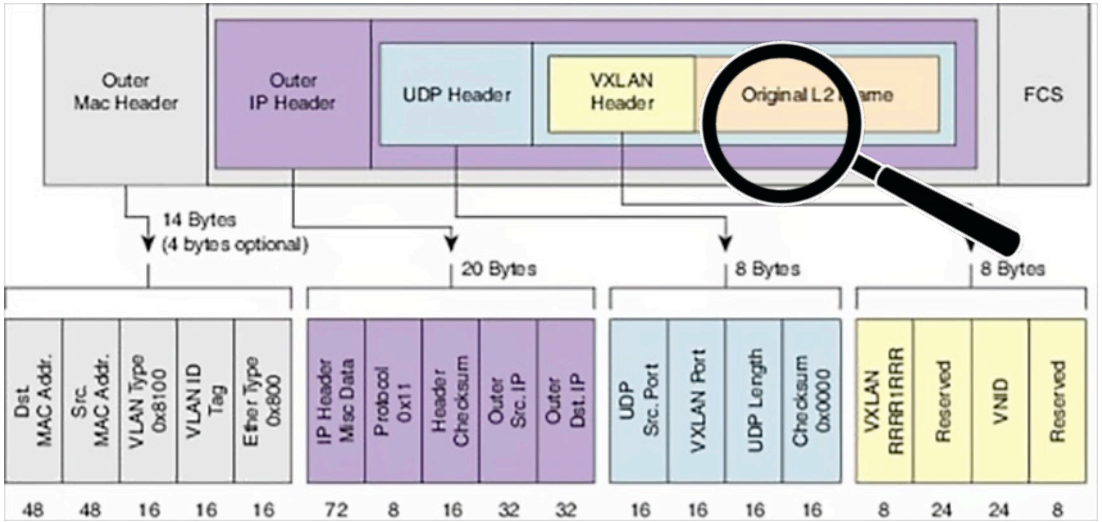
BMF OUT-OF-BAND

Use-case – Deep Packet Monitoring

Lookup up to 128 bytes inside the packet



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BMF OUT-OF-BAND

Use-case – Production Network Visibility

HOST TRACKER

- View inventory of all hosts (current and past) in the production network
- Track dead Hosts, IP address spoofing, host movements

TAP TRACKER

- Enables cabling verification by showing the connectivity between the TAP interfaces and the Big Monitoring Fabric switches.

SUBNET TRACKER

- View IP subnets and VLANs in use in the production network.

DHCP/DNS TRACKER

- View real-time list of DHCP/DNS servers
- Discover Rogue DHCP/DNS servers

PACKET CAPTURE

- Capture filtered traffic on the controller hardware appliance.

sFlow GENERATION

- Provides visibility to the activities in the production network

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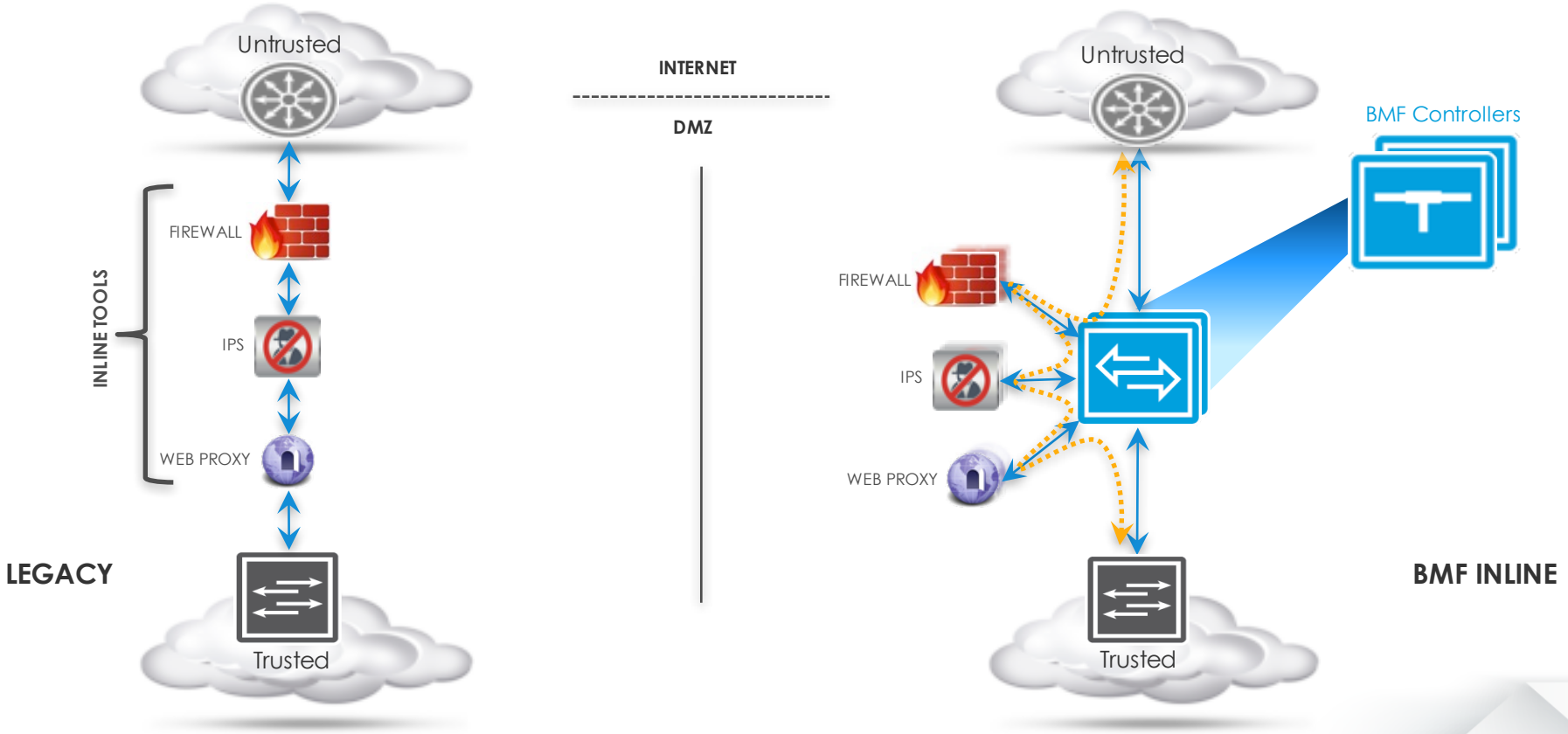
Big Monitoring Fabric Inline Deployment

BMF INLINE



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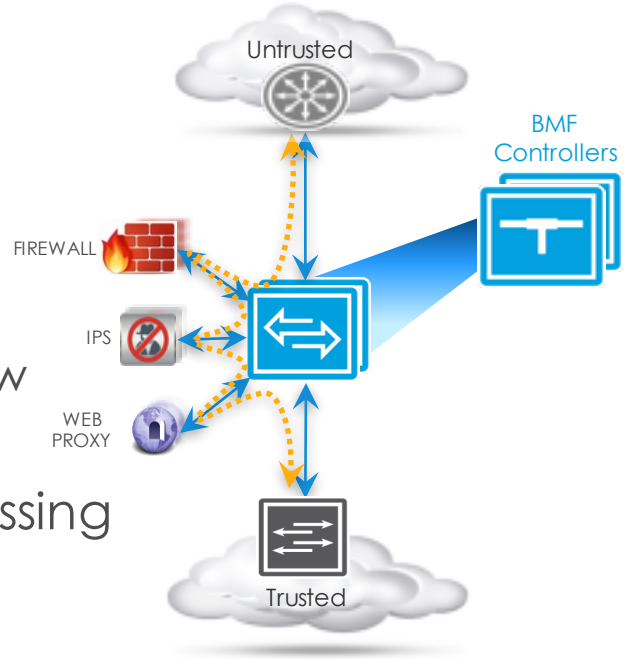
BMF INLINE

Overview

- Operates on production traffic
- Detect and prevent threats
- Policy based tool chaining
  - Selectively parse traffic through multiple tools
  - Tool outage does not have to impact traffic flow
  - Drop or SPAN unmatched traffic
- Symmetrical and Asymmetrical service processing
- Health checks
- High availability configuration
- Role separation between network and security admins



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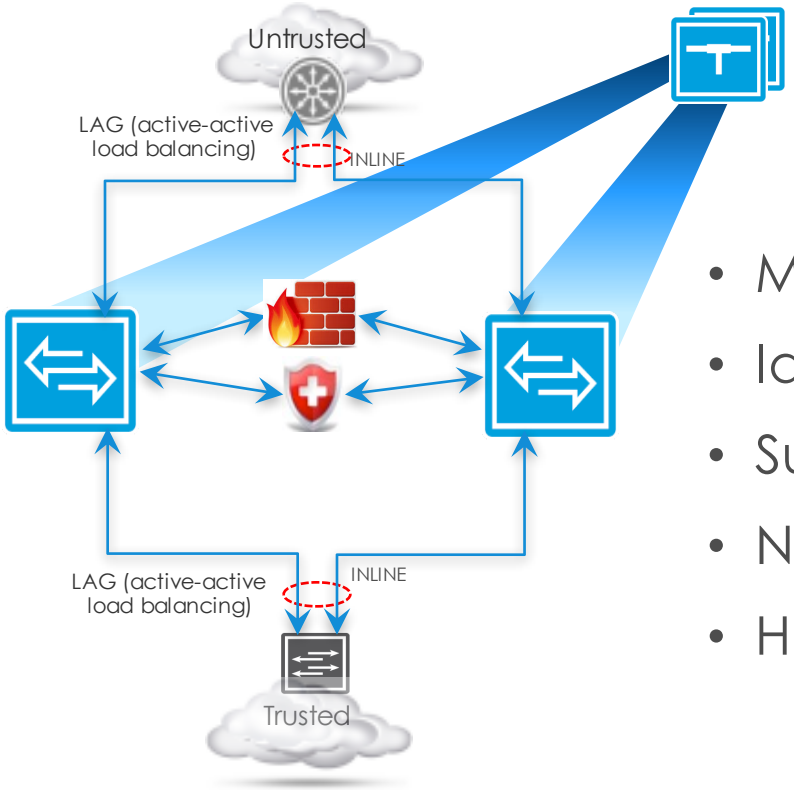
BMF INLINE

High Availability



- Multiple paths for HA
- Identical configuration on both switches
- Supports up to 24 Tool Instances
- No state synchronization on switches
- Headless mode operation

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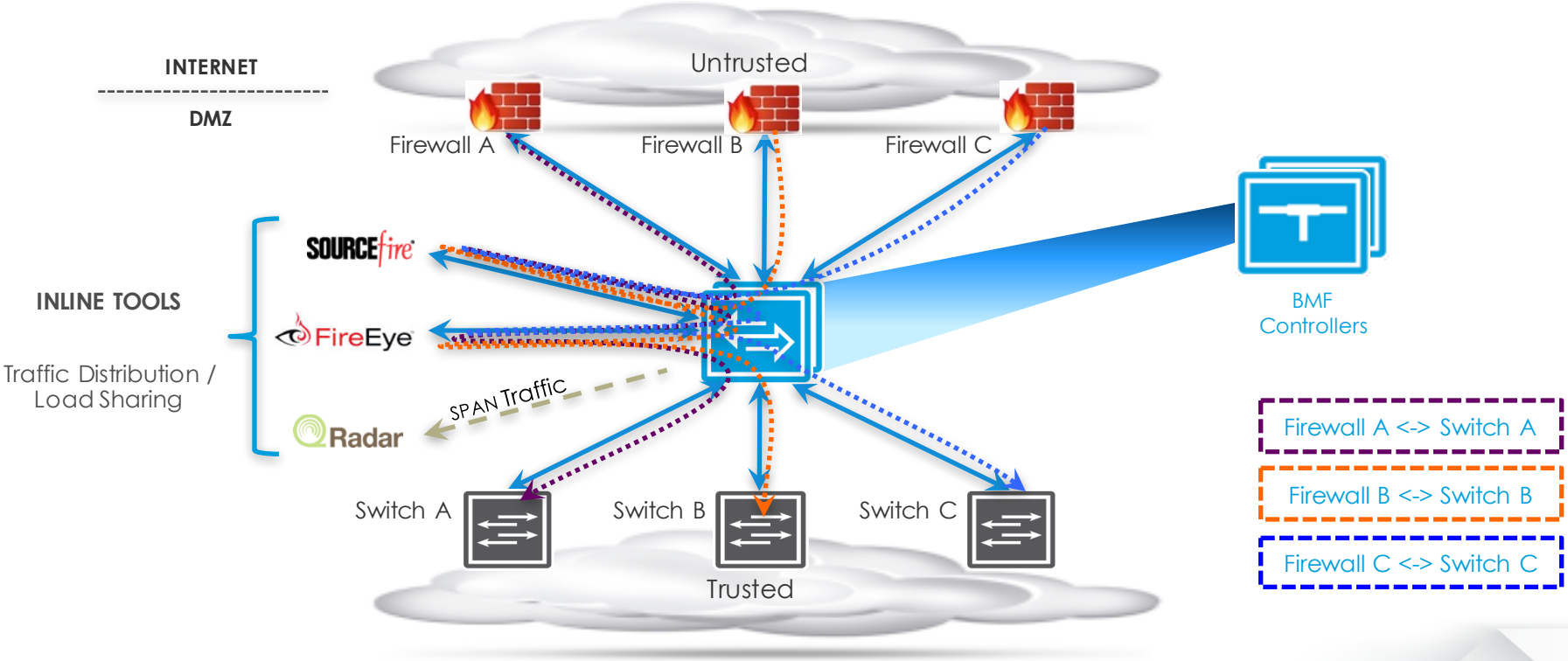
BMF INLINE

Use-case – Pervasive Security



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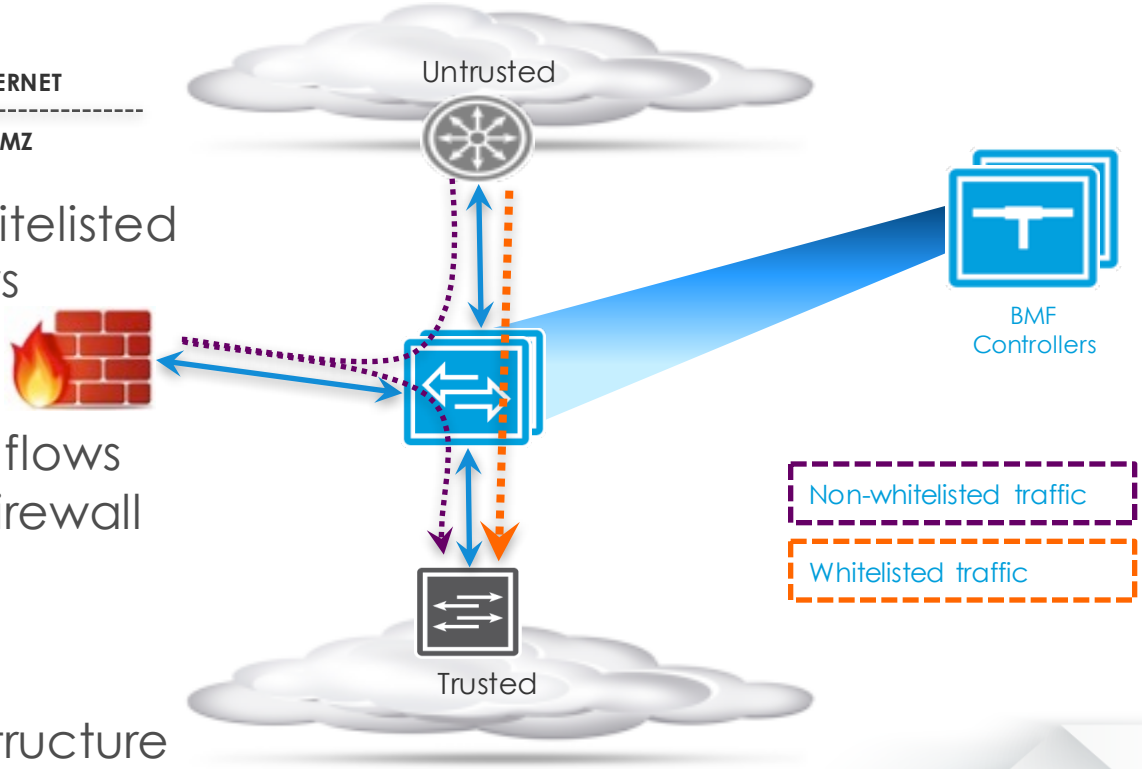
BMF INLINE

Use-case – Science DMZ

- Traffic segregated to whitelisted and non-whitelisted flows
- Allow trusted large data flows (whitelisted) to by-pass firewall
- Improve performance
- Reduce load on IT infrastructure



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