Network Automation: Options & Possibilities

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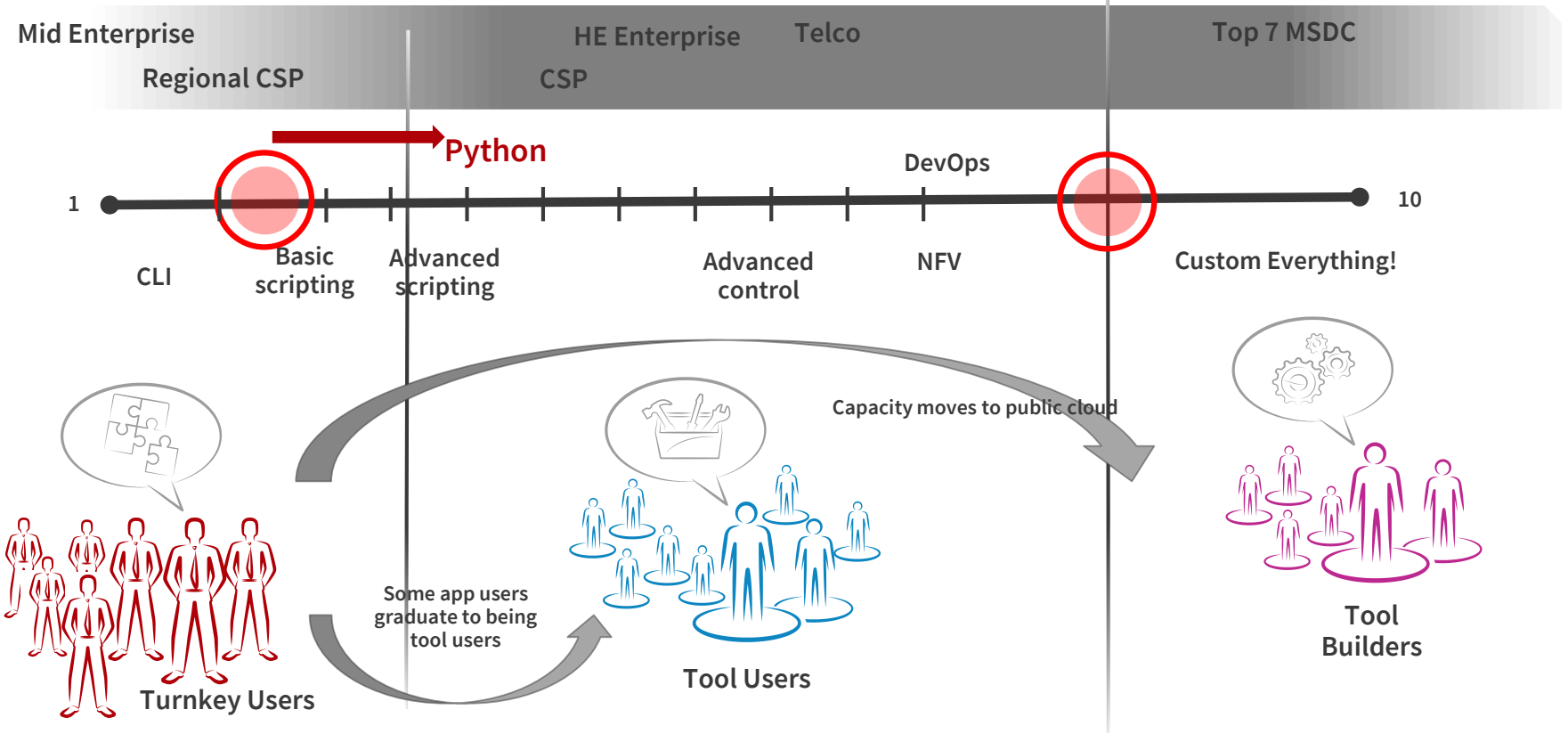
Consumption Model



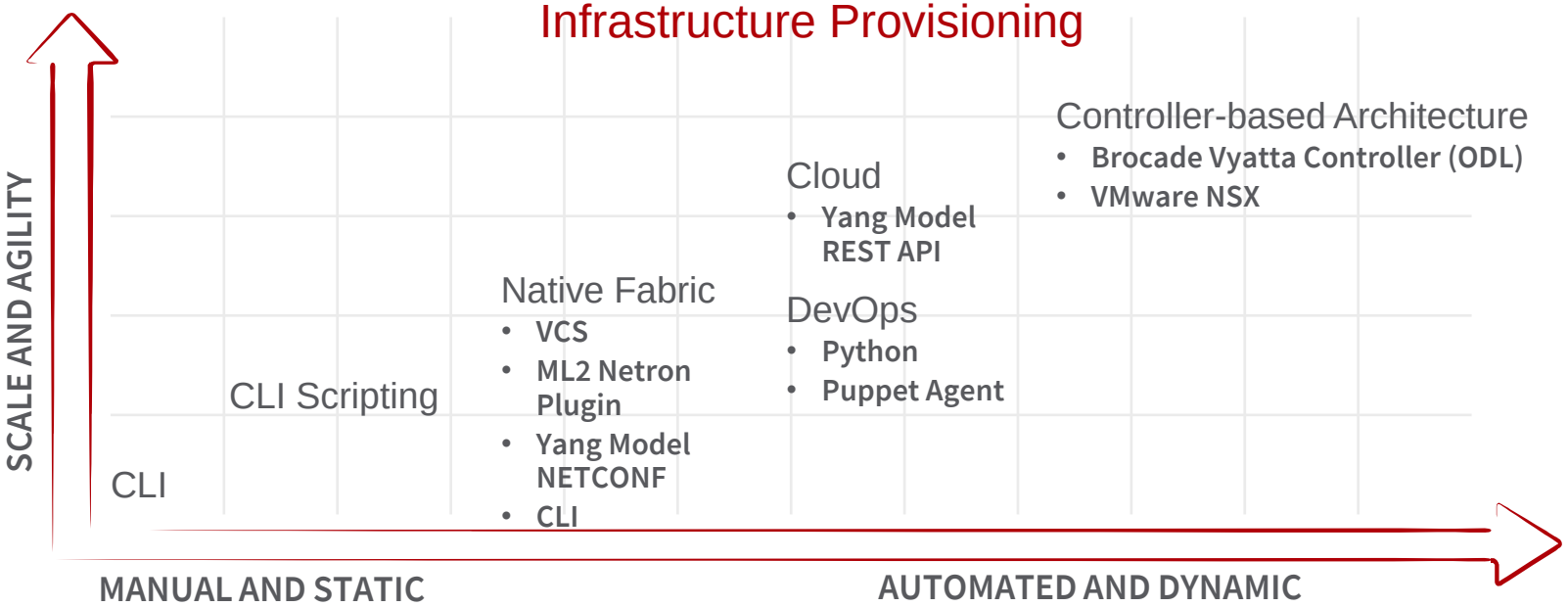
Automation: It's Possible with Physical Infrastructure

- Zero-touch provisioning
- Zero-touch VM discovery, configuration, and mobility
- Self-forming trunks
- Minimal configuration to add links or switches
- Manage many switches as a single logical device

The Evolution of Data Center Network Automation

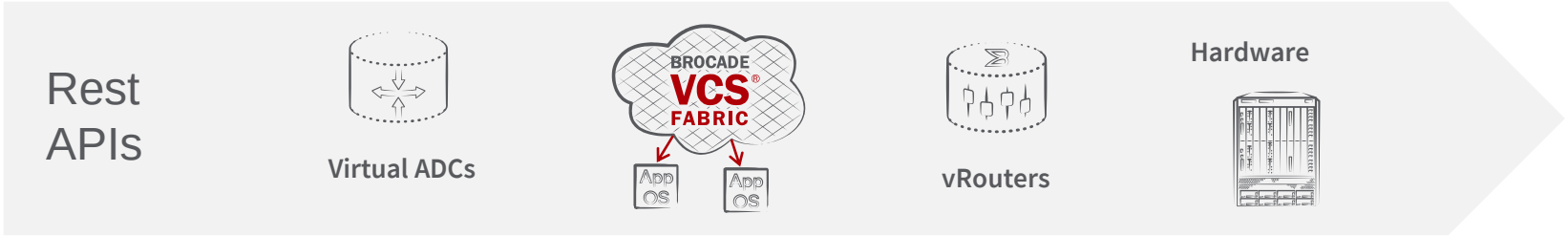
Cloud Management Platform (Tenant Provisioning)

OpenStack | CloudStack | Homegrown Scripting | Vendor Provided Solutions



Programmability and SDN Readiness

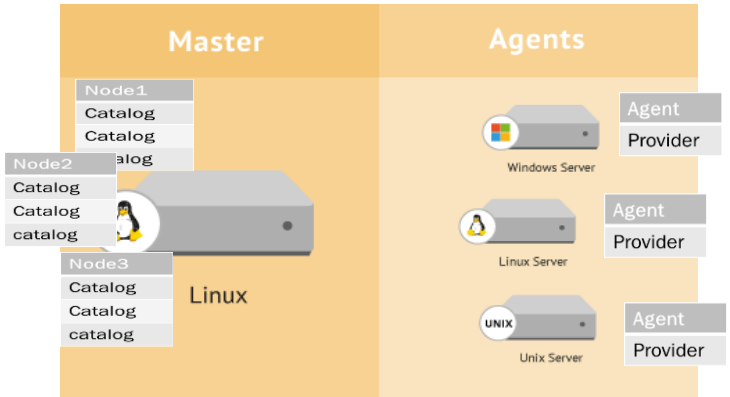
- Faster, more elegant integration with in-house and third-party management and orchestration tools
  - Robust REST API, fully documented YANG model, and tools for developers
  - Simpler to write and maintain network applications using the fabric-level API
  - DevOps integration for Puppet and Python scripting
- Efficient orchestration integration without loss of administrative control
  - Fabric- and node-level programmability and troubleshooting
  - Integrating with SDN Controller and third-party OpenDaylight-compliant controllers through OpenFlow 1.3
- Self-tuning fabric in response to management-level changes

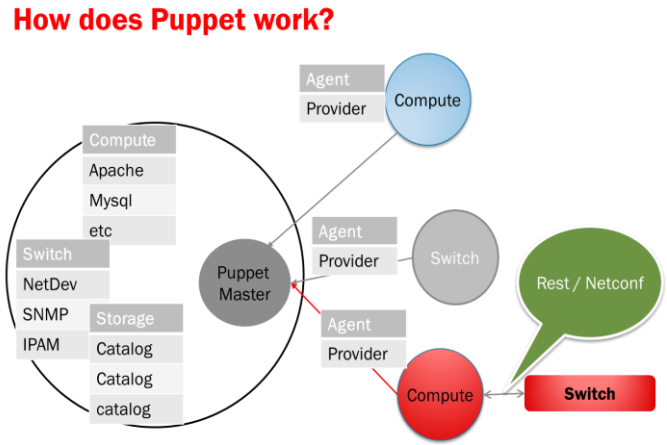


Programmability

PUPPET INTEGRATION FOR DEVOPS

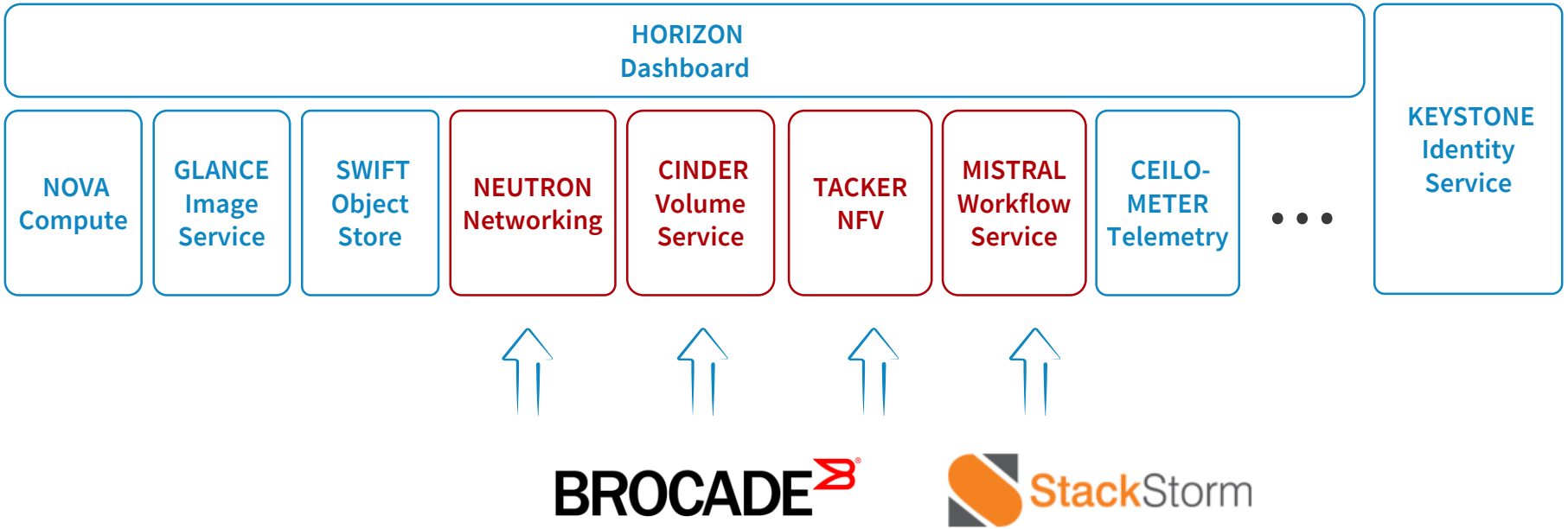
- Puppet is IT Automation software for DevOps
  - Puppet automates and manages infrastructure (servers, network and storage) lifecycle, from provisioning and configuration to orchestration and reporting





Main OpenStack Projects

Brocade Focus: Networking(Neutron, Tacker), Storage(Cinder) & Workflow(Mistral)



Open Stack Plugin Types

- ML2 (VLAN) plugins for
  - Routing and switching devices
  - OpenDaylight SDN Controllers
  - Ironic Baremetal Services
- L3 SVI Service plugin for switching and routing devices
- Data Center networks and IP Fabrics
  - Layer 2 & Layer 3 Scale Out
  - VXLAN off-load from OpenvSwitch to VDX
- L2 Gateway Service
  - VXLAN to VLAN Gateway
- Edge VPN Service
  - VPLS DC – DC
- vRouter FWaaS, VPNaaS, L3aaS
- Storage (Cinder)
  - Plugin for Fibre Channel devices

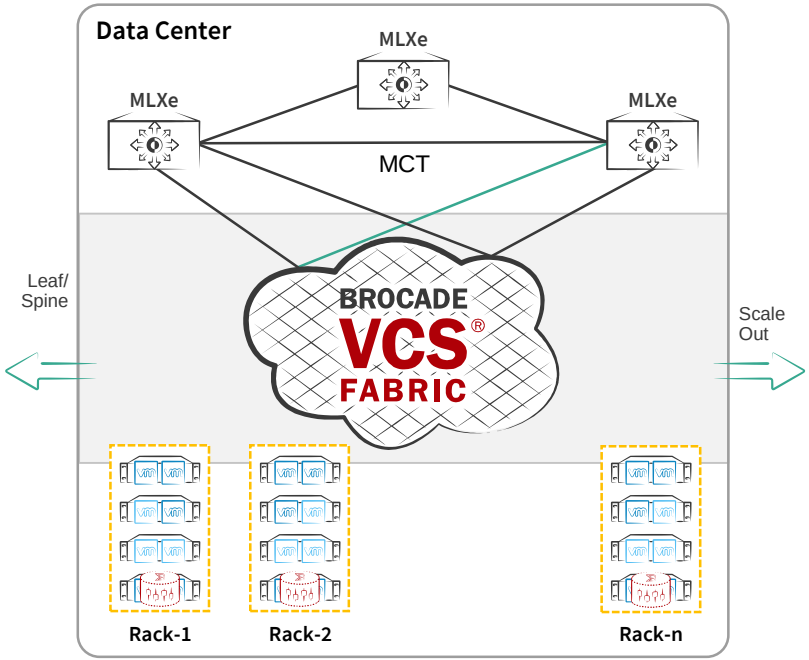
DC/Cloud Architecture

Physical and virtual network

openstack™

VDX ML2 Plugin	VDX SVI Plugin	VCS Fabric Plugin

- Scale out non-disruptively
- Fabric-based Multi-tenancy at scale
- VLAN isolation
- Inter-VLAN routing
- VRRP support
- FWaaS (ACL support)



- Flat topology, east-west optimized
- Performance, resiliency, and scale via load balanced L1/2/3 multipathing
- Fabric managed as one logical switch
- VM-aware

Data Center/Cloud Architecture

Physical, virtual, and DC interconnect network

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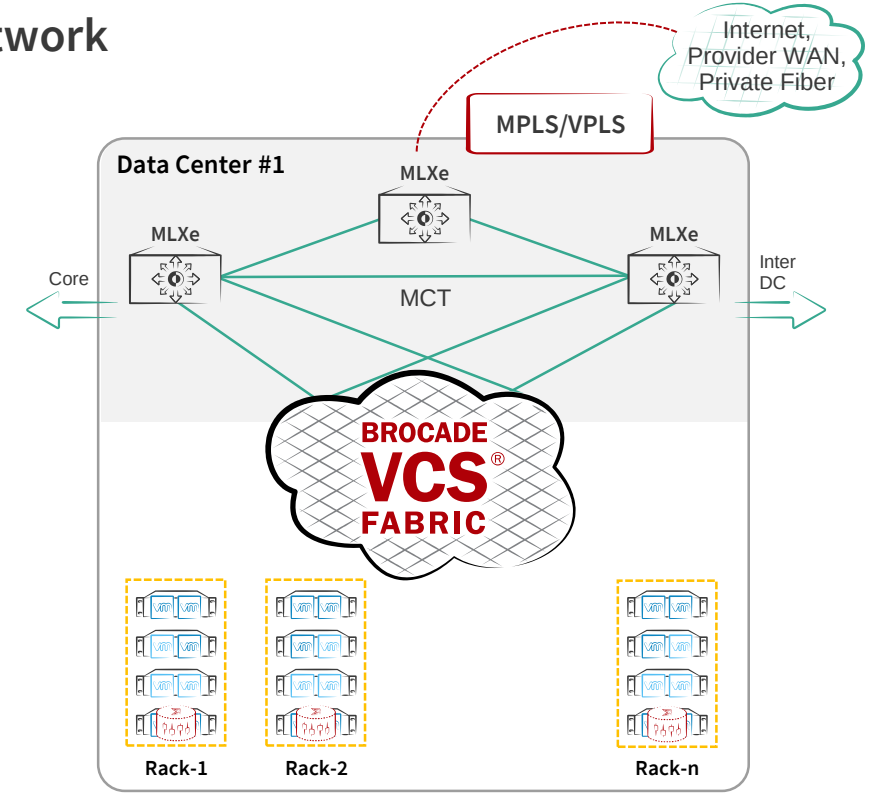
MLX ML2 Plugin | MLX SVI Plugin | MLX Edge VPN Plugin

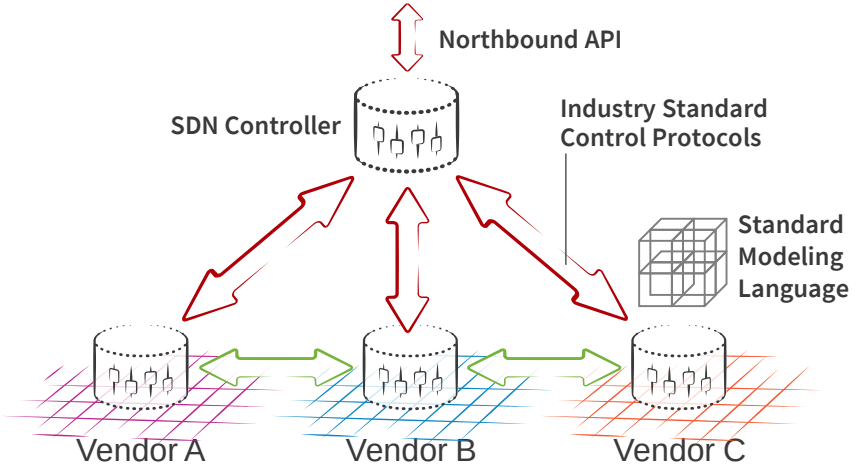
- Multitenant support
- VLAN isolation
- Inter-VLAN routing
- DC Interconnect



A New Network Architecture

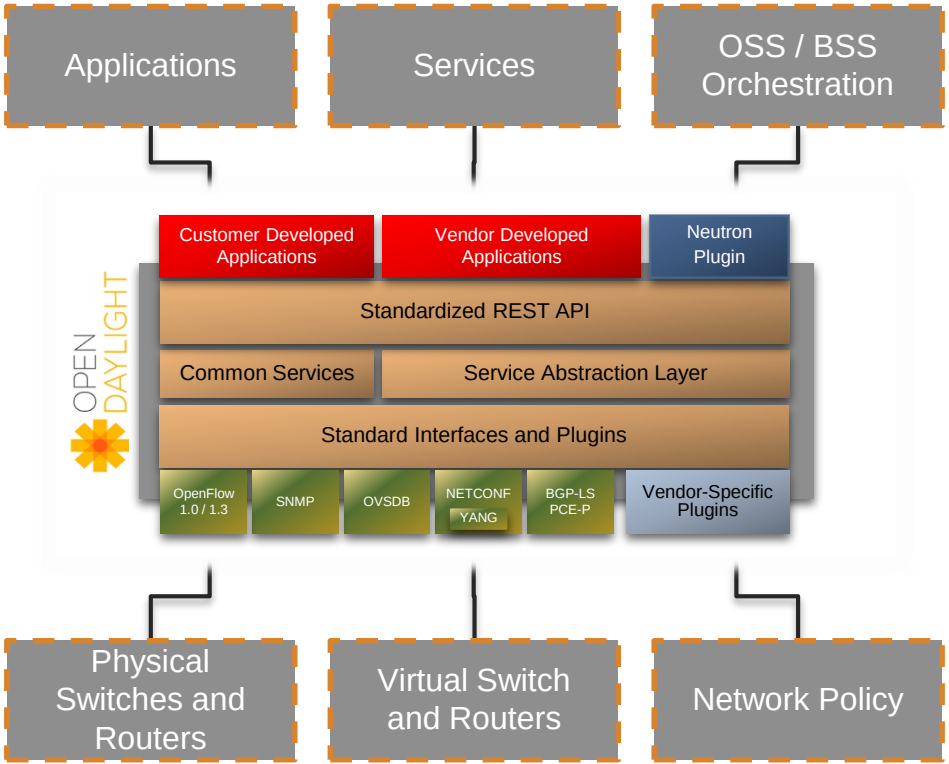
SDN logically centralizes the control plane

- EMS, NMS, CLI, and APIs specific to the switch or router vendor
- Proprietary control plane per device
- Communication protocols standardized for interoperability



- Logically centralized open control plane, non-vendor specific
- Normalized programming interface
- Standard control protocols and modeling language

OpenDaylight Project—Operated by the Linux Foundation

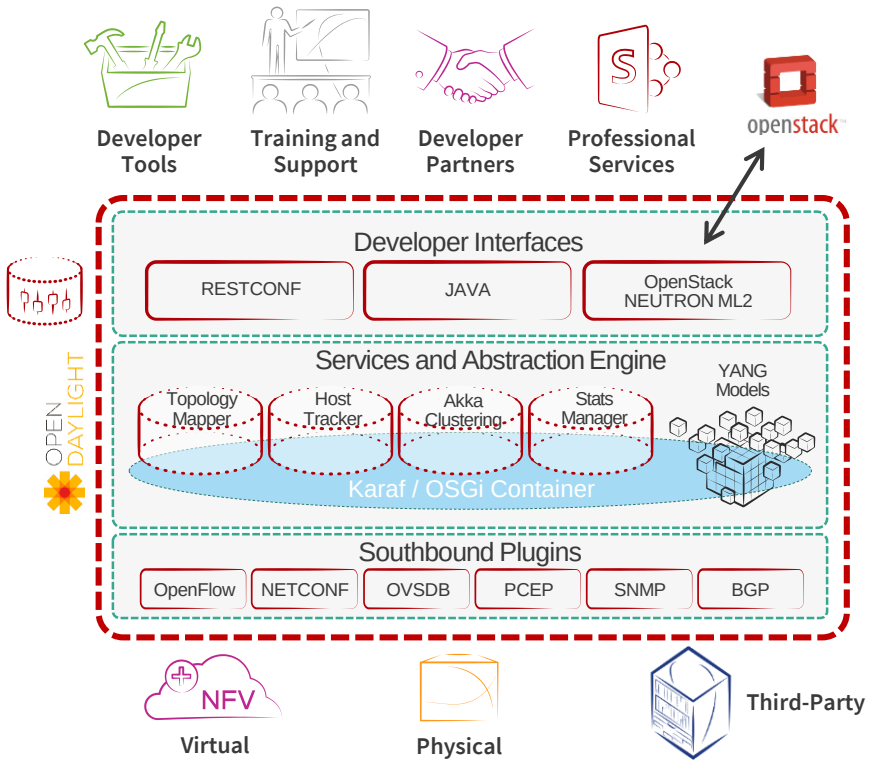


- The leading open-source SDN controller
  - More than 200 developers from 41 member companies AND individuals from user organizations
  - 1.7+ million lines of code
- Open industry forum: most networking providers, many SDN ecosystem firms
- Addresses service provider & enterprise needs
- Platform-independent “narrow waist”—standardization point that allows for optimization and innovation above and below

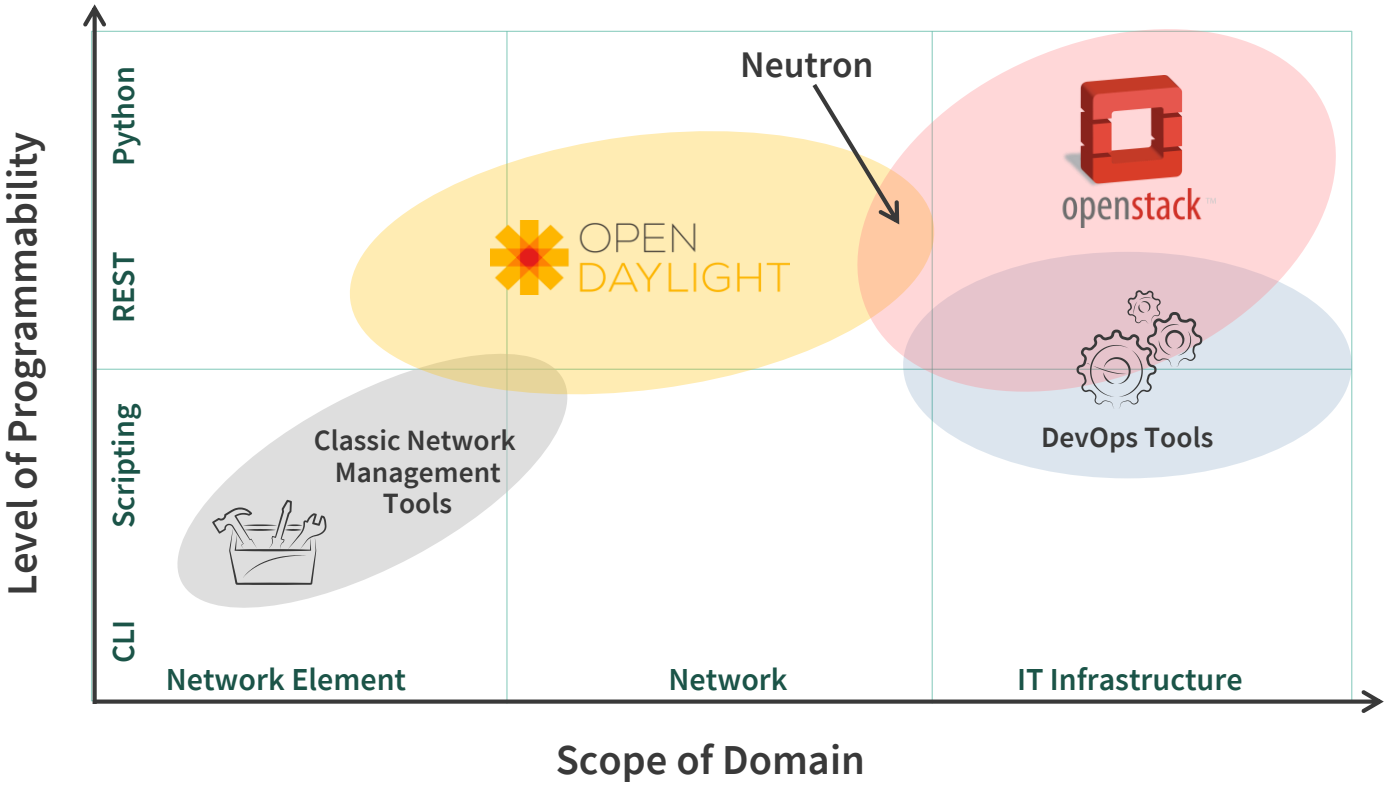
Open SDN Controller

Part of open, modular portfolio

- **Designed for an open, multivendor world**
  - Each layer can be selected independently
  - No platform or northbound dependencies
- **Simple on-ramp to SDN**
  - Low-risk investment protection
  - Smooth installation and maintenance
- **Collaborative innovation**
  - Joint and custom app development
  - Bridge to OpenDaylight community



SDN Controllers within Data Center Management



SDN Controller Use Cases

Software that connects the network to your business processes

Custom Analytics and Compliance

Big Data

Security

QoS and Traffic Management

Service Configuration and Policy

Research and New Protocols

Fault and Disaster Recovery

WAN Optimization

Common Use Cases of SDN

Traffic Monitoring & Metering

- Network flow visibility; Flow control to not exceed provisioned bandwidth
- Brocade: Flow Optimizer, SDN Controller, MLXe

Flow Tapping

- SDN-based troubleshooting tool eliminates physical taps in the network
- Brocade: Flow Optimizer, SDN Controller, MLXe, ICX

SDN is deployable, today

Network Attack Mitigation

- Proactively detect and mitigate L2-L4 attacks cost efficiently
- Brocade: Flow Optimizer, SDN Controller, MLXe, ICX

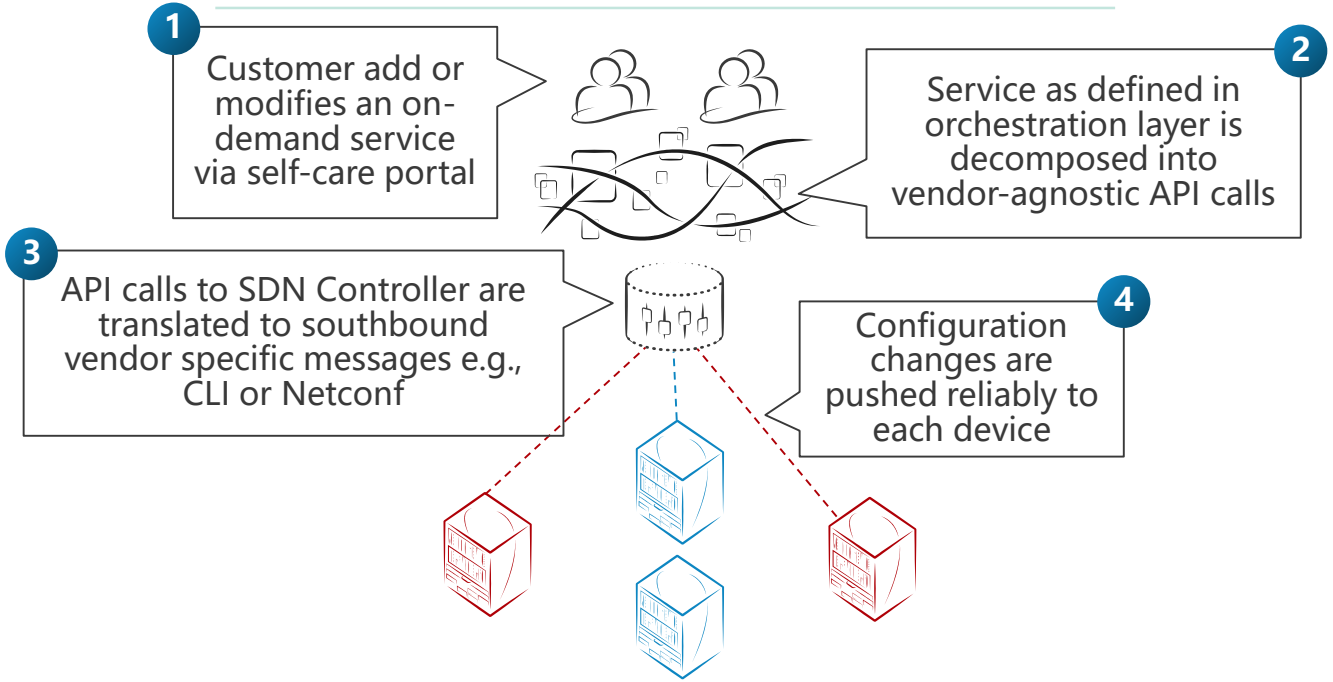
Intelligent Firewall Bypass

- Intelligently move trusted traffic to bypass expensive firewalls
- Brocade: Flow Optimizer, SDN Controller, MLXe

SDN Controller Use Case

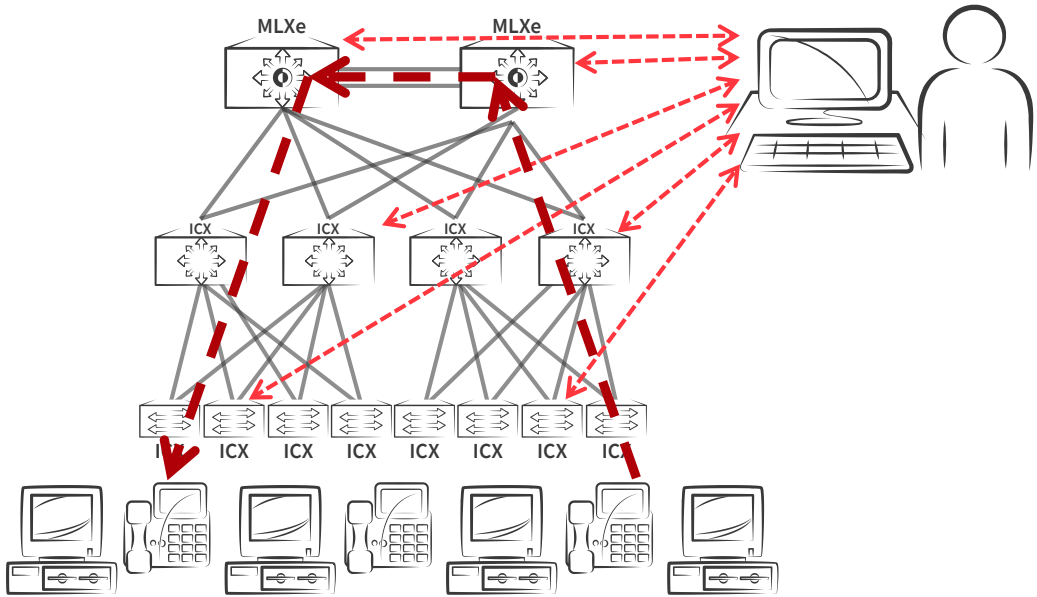
Project Reference : Customer self service portal

Automated Provisioning Solution with SDN Controller



Deploying Delay-Sensitive Apps on Legacy Networks

Traffic engineering and QoS is complex to deploy and breaks easily

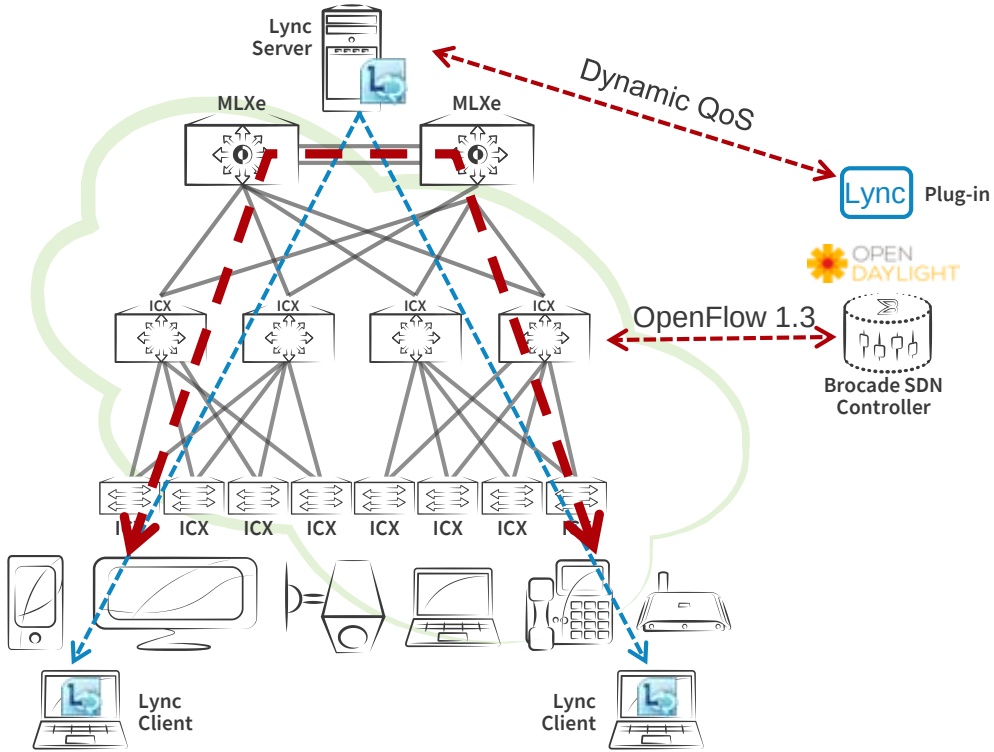


Challenges

- The user desktop is unreliable for QoS tagging
- Manual provisioning of QoS and security policies is required on every switch
- Staff with costly expertise in proprietary technologies is required
- Multiple devices on a single port with different QoS needs
- Multivendor platform management presents challenges

SDN-Based Adaptive and Automated QoS

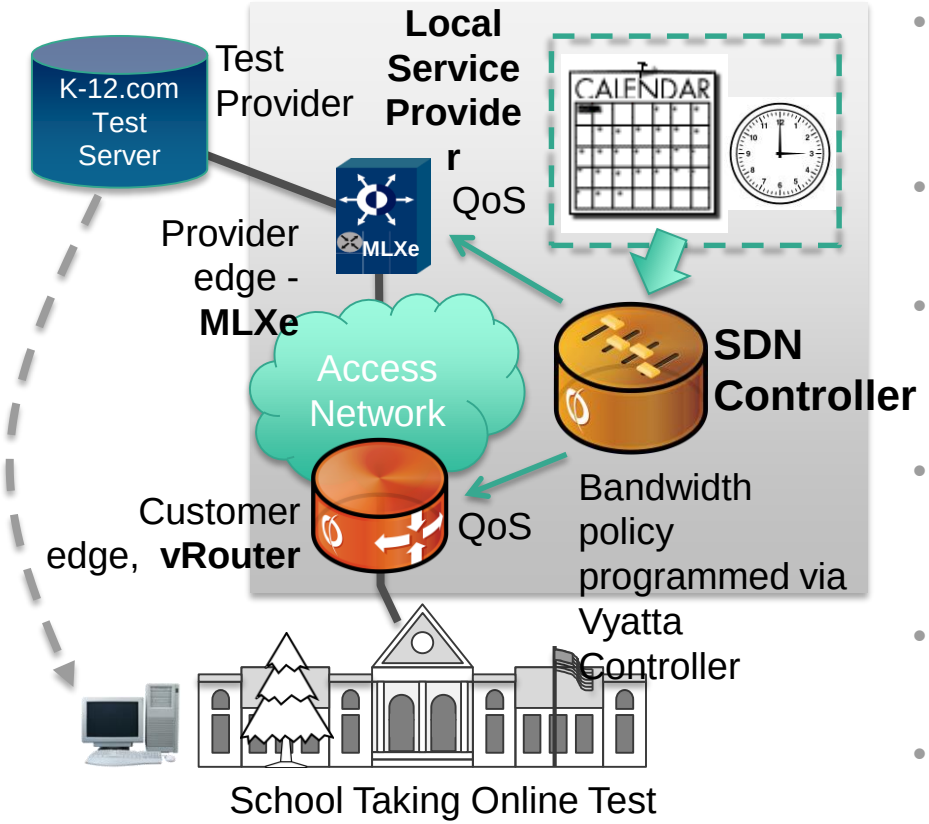
Application detects voice/video delays and dynamically requests prioritization



Benefits

- Fully automated and adaptive call admission and control
- Single trusted source of QoS management
- Eliminates the need to QoS tag at the port level
- Dynamic replacement of manual switch-by-switch provisioning of static QoS policies

Bandwidth Calendaring – How it Works

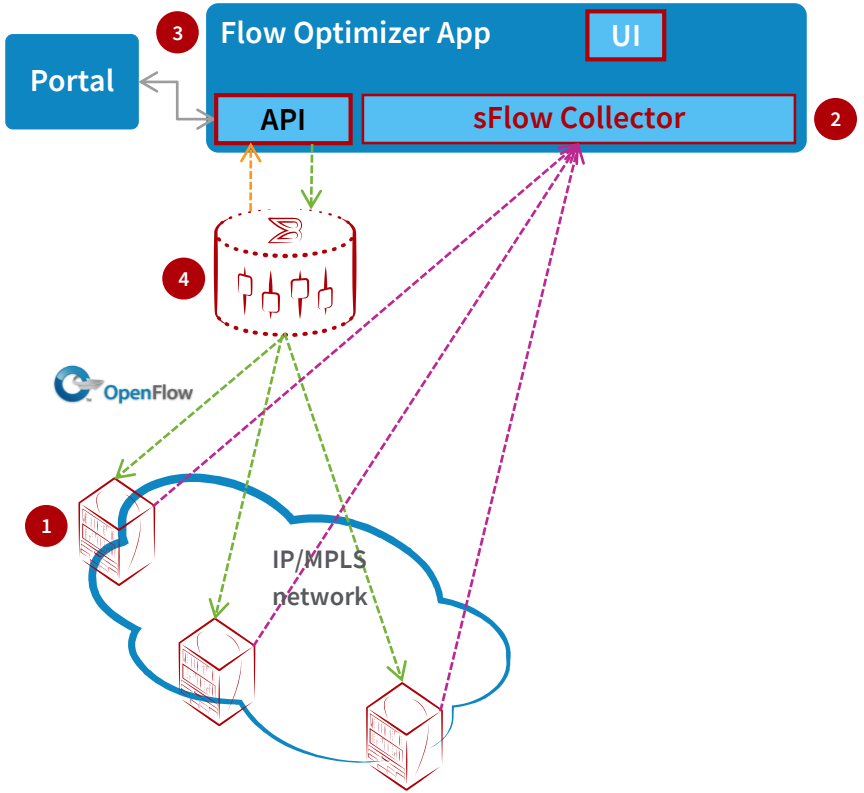


- K-12.com test provider buys a pay-to-use bandwidth reservation service from the local service provider
- School reserves its timeslot for the tests
- K-12.com notifies the service provider of the reserved timeslots by customer number
- The local service provider's OSS/BSS system programs the time-based policy into the SDN Controller
- The SDN Controller programs the QoS policy into the PE and CE routers
- The PE and CE routers automatically prioritize test-related traffic according to the policy for the duration of the test period

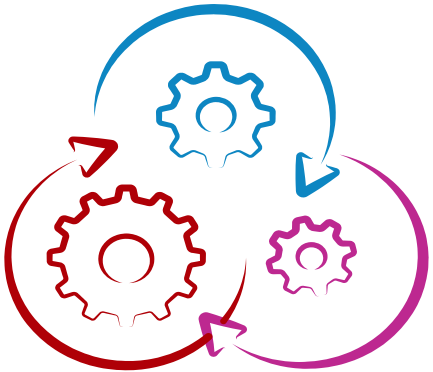
SDN Application: Automated Traffic Manipulation

Solution Components

1. **Network Devices**
   - Send sFlow samples
2. **sFlow Collector(s)**
   - Collect flow sample data
3. **Flow Optimizer Application**
   - Analyzes and manages flows
   - Policy-based UI and REST APIs
4. **SDN Controller**
   - Programs OpenFlow 1.3 rules
   - OpenDaylight Controller

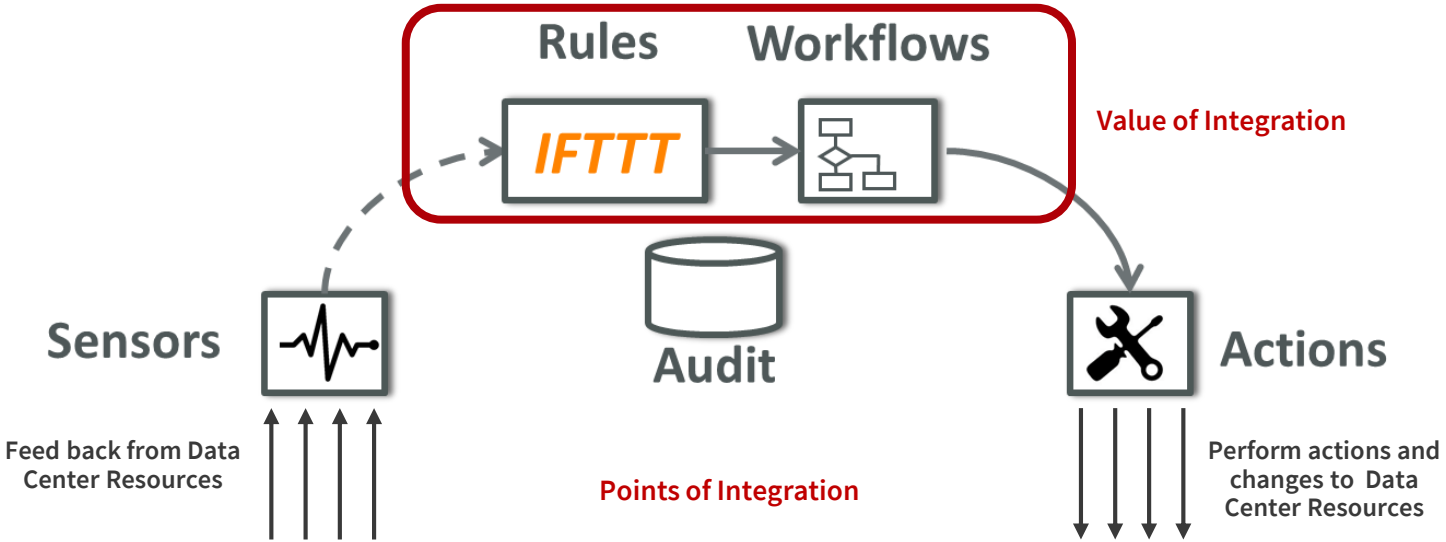


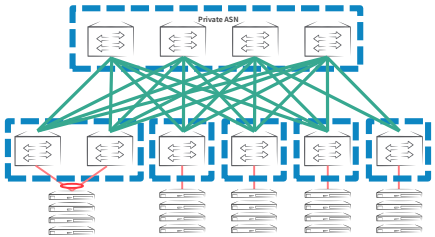
Automation Platform: Leveraging on Workflows



NETWORK AUTOMATION PLATFORM THAT AUTOMATES THE ENTIRE NETWORK LIFE CYCLE AND INTEGRATES WITH CROSS-DOMAIN WORKFLOWS TO IMPROVE BUSINESS AGILITY

Automation & Integration





Network Infrastructure

vmware vSphere
openstack
docker
CLOUD FOUNDRY
NUTANIX

Data Center Compute Infrastructure

Microsoft
amazon web services

Cloud Infrastructure

EMC² SCALEIO
NetApp

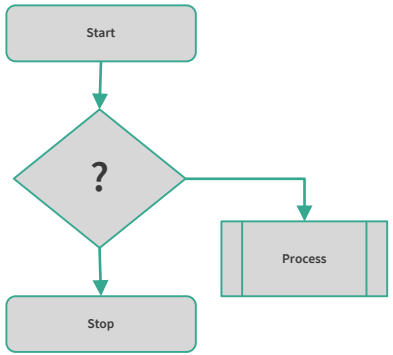
Storage

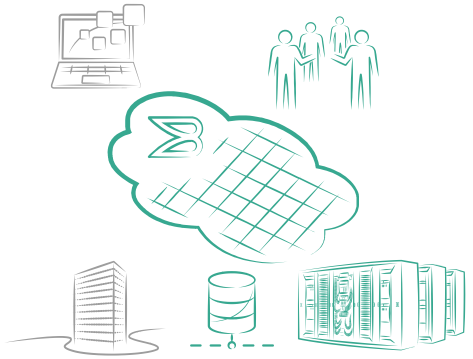
JIRA
PAGERDUTY

Operations Support Services

What is a Workflow?

A workflow is a sequence of tasks executed to accomplish a business or technical objective. Workflows are what drive efficient and predictable IT operations.





Beyond the Network!

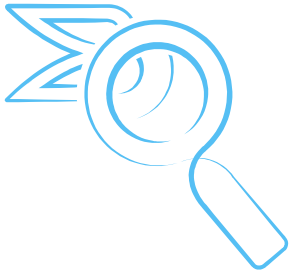
Workflows are not just limited to networks. The very purpose of the network is to provide cross-domain connectivity between compute and storage elements.

A true “workflow centric” approach encompasses all of these elements and focuses on delivering complete services.

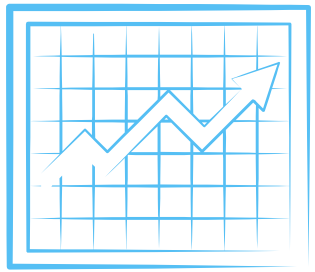
Operational Workflow Categories

Infrastructure, Service Provisioning, Validation

Troubleshooting & Remediation



Data Collection



Operations & Management

Infrastructure Service Provisioning

DC Fabrics

1. ZTP process registers the switch to the inventory service through the registration sensor

2. Registration triggers the “IP Fabric Leaf” Workflow

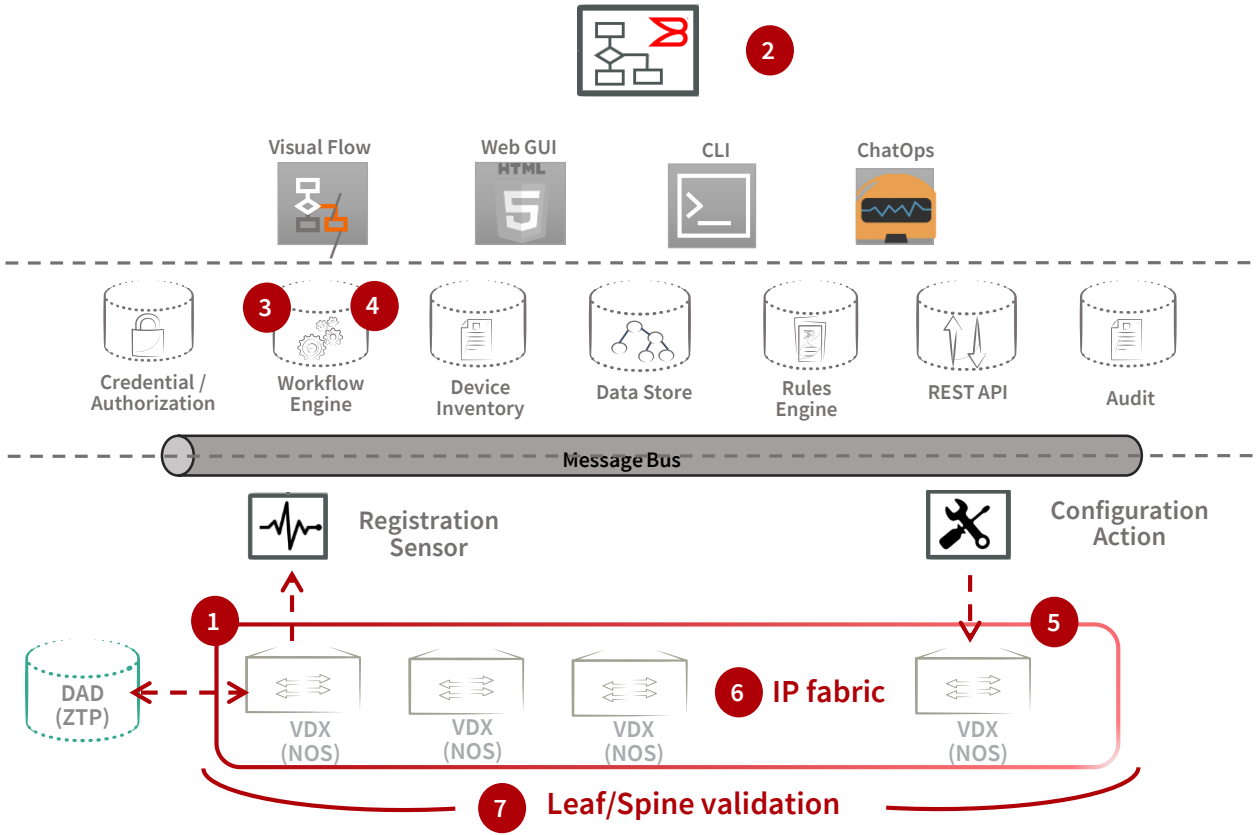
3. Workflow engine models the IP fabric

4. BWC walks through the steps in the workflow

5. Configuration is executed through the appropriate “Action”

6. IP Fabric provision complete

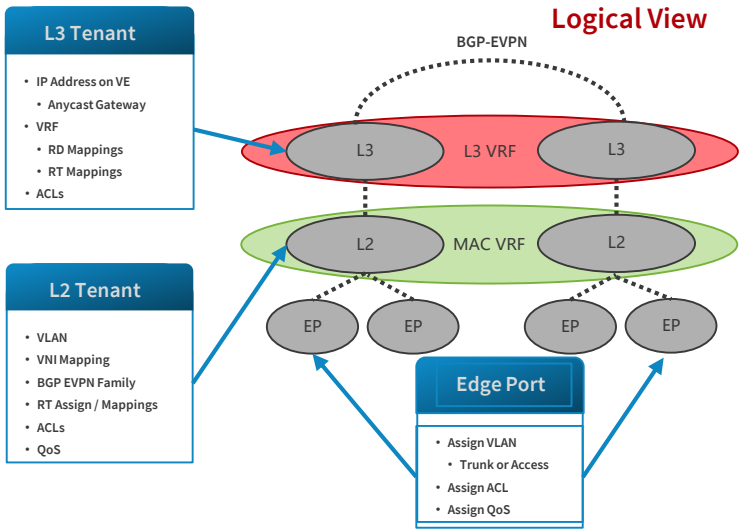
7. Validation workflow begins



What is it?

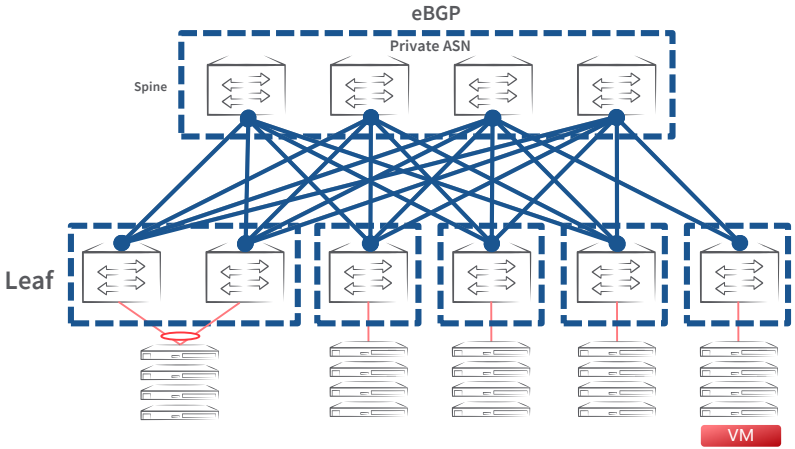
Workflow: Tenant Provisioning

- Users need to be able to create mappings of Edge Ports across an IP Fabric topology and provide connectivity between hosts in the same groups.
- Tenants include:
  - Edge Ports
    - Members of L2 Groups
    - Apply ACL and QoS Policy
  - Layer 2 Groups
    - VLANs
    - VLAN / VNI Mapping
  - Layer 3 Groups
    - Bind IP to VLANs



Create New Tenant

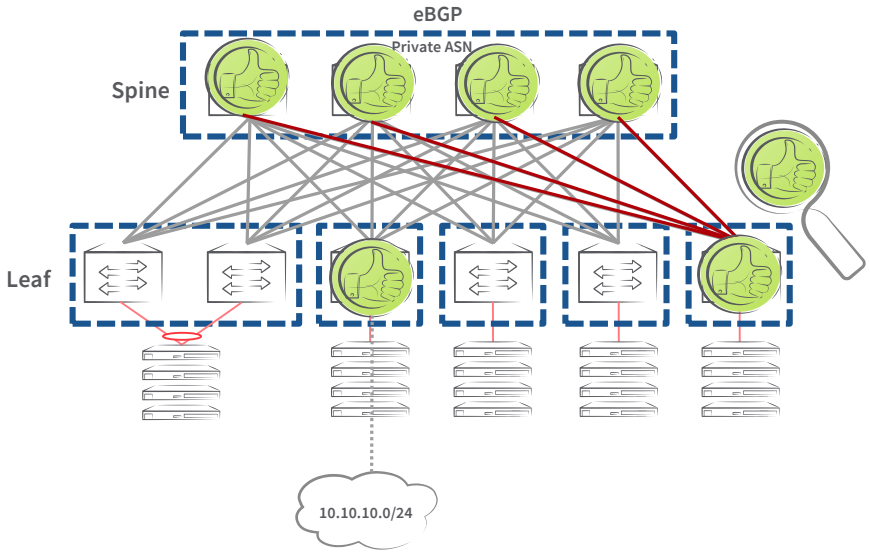
Workflow: Tenant Provisioning



- Create L2
  - Create EVPN Instance
  - Configure New VLAN on switch
  - Map VLAN/VNI to EVPN Instance
  - Configure ACL Policy on VLAN
- Create L3
  - Create new L3VNI VRF on Leaf Node
    - Address Family ipv4 unicast
    - Assign VNI, RD and RT
    - Add L3VNI Interface
  - Configure VE Interface
    - Assign VE to VRF
    - Create new Configure Anycast Gateway Address
- Add L3VNI to BGP Peers
  - “address family unicast vrf XYZ”
  - Set “redistribute connected”

Workflow: BGP Validation

What are you trying to do?



New Peer Config

1. Configure new BGP Peer on Leaf Switch 4
    - Validate BGP is running on switch
    - Alert on failure
2. Configure new BGP Peer on Spine Switch
    - Validate BGP is running on switch
    - Alert on failure
3. Validate that BGP Peer state is established on both switches
    - Alert on failure

New Subnet Config

1. Configure new BGP Advertisement on Leaf Switch 2
    - Validate BGP is advertising route
    - Alert on failure
2. Validate that Leaf Switch 4 receives new route:
    - Validate that route_exists
    - Validate the route is learned via BGP
    - Validate correct number of next-hops for ECMP

Full Workflow Life Cycle Automation

Architecture	Provision	Validation	Troubleshooting
IP Fabric	• 3-Stage IP Fabric • EVPN Management • Super Spine Support • Firmware Management • DC Tenant Management	• BGP Peering State • Route Advertisements • Physical Connectivity • VLAG State Checks	• Fabric Trace IP Address • Fabric Trace MAC Address • Remediate BGP Issues • EVPN Path Discovery
IXP	• VPLS Circuits • VLL Circuits • ACL Control • MAC Change	• Validate VPLS Sessions • Validate VLL Sessions • Validate ACLs are applied on Circuits	• Troubleshoot MPLS Tunnel Paths • Map Customers to Devices/Circuits • Identify changed customer MAC
VCS	• VF Extension • DC Tenant Management • Layer 3 Configuration • VLAG Management • Firmware Management	• VLAG State Checks • VCS Membership State • ISL Trunk State	• VF Extension Trace • ACL Consistency Across Fabrics • Tenant to Fabric Mapping

Summary Slide

- Network infrastructure with built-in automation reduces operational and management efforts
- Ensure network equipment opened to automation platforms
- Plan to move towards a more automated environment with software integration
- Learn new skills in areas of software networking and automation

BROCADE

Thank you