

# Brocade SDN/OpenFlow Update

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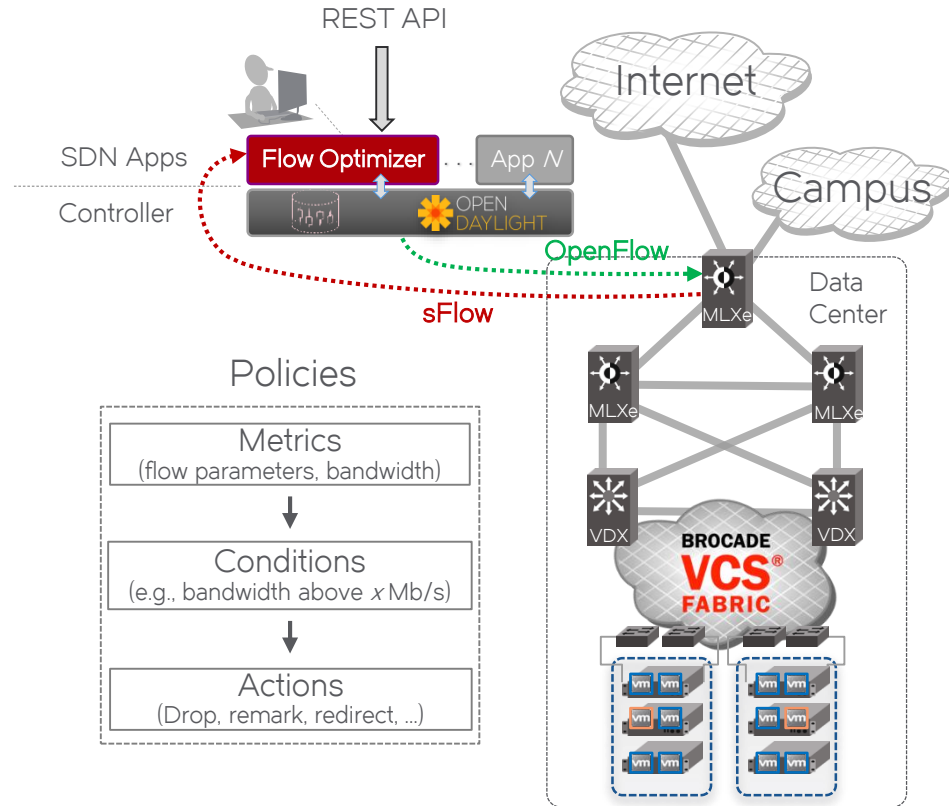
# Agenda

- Brocade Flow Optimizer Application
- Brocade SDN Controller
- New Brocade OpenFlow router features
- Presenter's latest research work



# Brocade Flow Optimizer Application

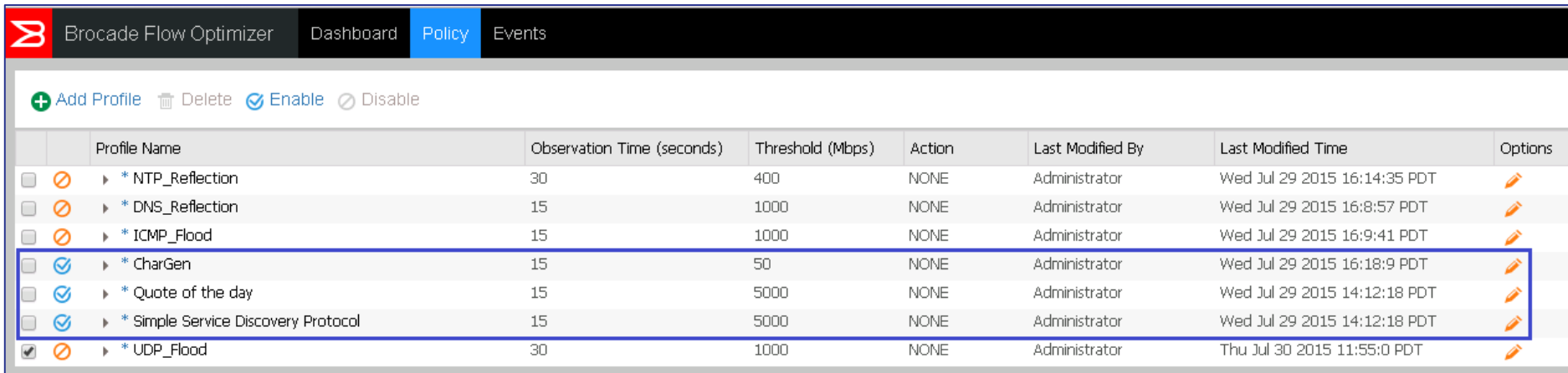
- Integrated sFlow Data Collector
- User-defined traffic policies and actions
  - Custom L2-L4 fields (with wildcards)
  - Actions: Drop; Redirect; Rate Limit; Mirror; QoS Re-Mark
- 7 built-in DDoS attack detection profiles
  - DNS Reflection, ICMP Flood, UDP Flood
  - CharGEN, QOTD, SSDP (new with R1.1\*)
- REST interface for integration with other systems
- Browser based User Interface (UI)
  - Dashboard
  - Real-time and Historical Charts



(\*) Roadmap items subject to change

# 7 Built-in Policy Profiles

- DDoS mitigation
  - UDP/ICMP Ping Flood
  - NTP/DNS Reflection
- CharGen, QOTD, and SSDP (R1.1\*)



The screenshot shows the Brocade Flow Optimizer interface with the 'Policy' tab selected. At the top, there are navigation tabs for 'Dashboard', 'Policy', and 'Events'. Below the navigation, there are action buttons: '+ Add Profile', 'Delete', 'Enable', and 'Disable'. The main content is a table listing policy profiles. The table has columns for Profile Name, Observation Time (seconds), Threshold (Mbps), Action, Last Modified By, Last Modified Time, and Options. The profiles listed are: \* NTP\_Reflection, \* DNS\_Reflection, \* ICMP\_Flood, \* CharGen, \* Quote of the day, \* Simple Service Discovery Protocol, and \* UDP\_Flood. The \* CharGen, \* Quote of the day, and \* Simple Service Discovery Protocol rows are highlighted with a blue border, indicating they are the focus of the slide.

	Profile Name	Observation Time (seconds)	Threshold (Mbps)	Action	Last Modified By	Last Modified Time	Options
<input type="checkbox"/>	* NTP_Reflection	30	400	NONE	Administrator	Wed Jul 29 2015 16:14:35 PDT	
<input type="checkbox"/>	* DNS_Reflection	15	1000	NONE	Administrator	Wed Jul 29 2015 16:8:57 PDT	
<input type="checkbox"/>	* ICMP_Flood	15	1000	NONE	Administrator	Wed Jul 29 2015 16:9:41 PDT	
<input checked="" type="checkbox"/>	* CharGen	15	50	NONE	Administrator	Wed Jul 29 2015 16:18:9 PDT	
<input checked="" type="checkbox"/>	* Quote of the day	15	5000	NONE	Administrator	Wed Jul 29 2015 14:12:18 PDT	
<input checked="" type="checkbox"/>	* Simple Service Discovery Protocol	15	5000	NONE	Administrator	Wed Jul 29 2015 14:12:18 PDT	
<input checked="" type="checkbox"/>	* UDP_Flood	30	1000	NONE	Administrator	Thu Jul 30 2015 11:55:0 PDT	

(\*) Roadmap items subject to change

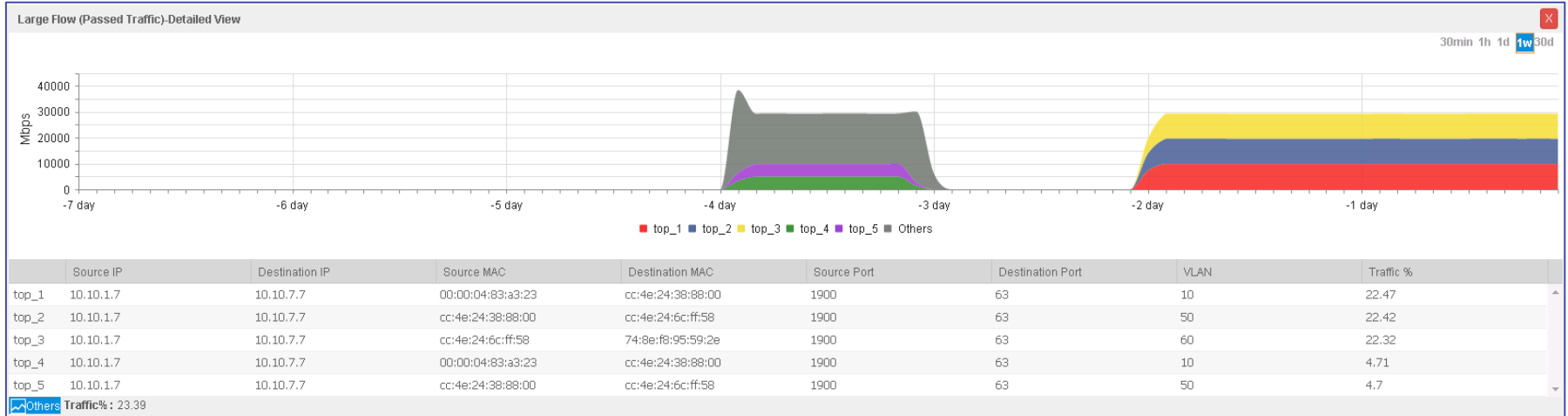


# Historical Data Charts

- Last 30 days (R1.1\*)  
(up to 30 min R1.0)
- Top 5 flows in selected duration

## Chart scale

30 min, 1hr → 1s granularity  
1 day → 1min granularity  
1 week → 5min granularity  
30 Days → 1 day granularity



(\*) Roadmap items subject to change

# Traffic Flow Reporting

- Option to display MPLS and VxLAN attributes (R1.1\*)

- VxLAN

- VxLAN ID (VNI)
- Inner UDP Headers

- MPLS

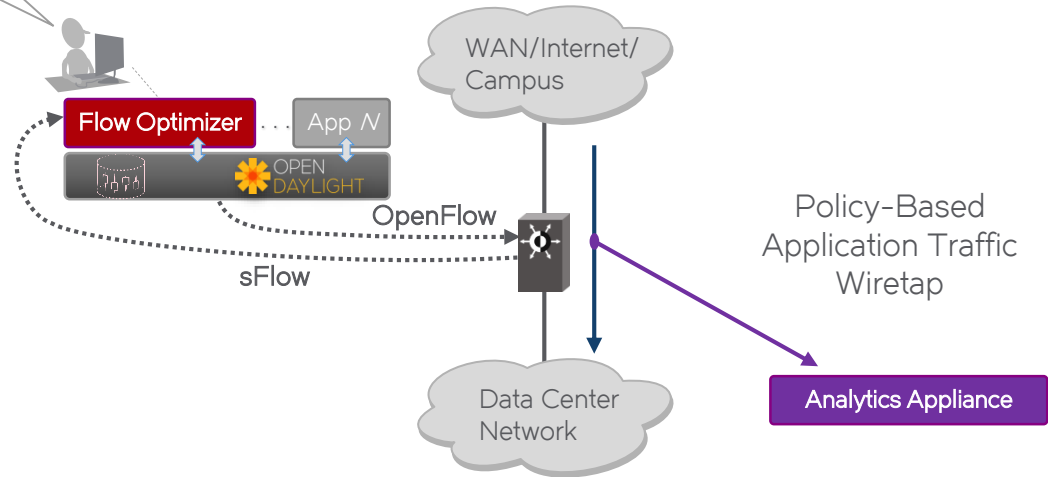
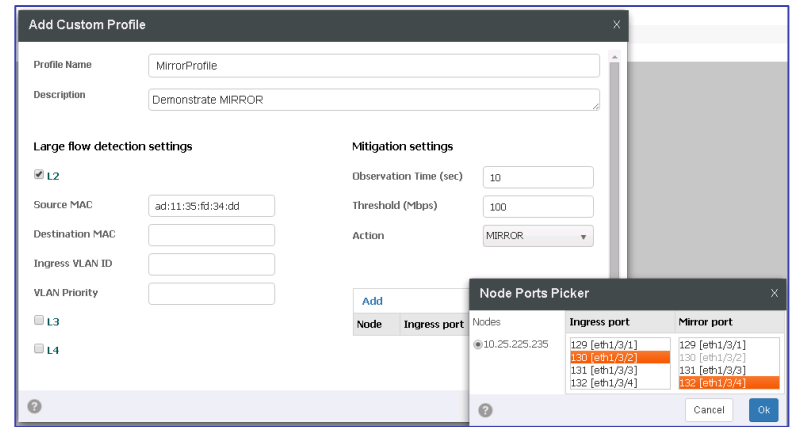
- Label
- TTL
- Label Stack
- Traffic Class

The screenshot shows the Brocade Flow Optimizer interface. At the top, there are navigation tabs: Dashboard, Flows (selected), Profiles, and Events. Below the navigation, there are tabs for 'Learned & Programmed Flows', 'Learned Flows', and 'User Defined Flows'. A search bar is present with the text 'Showing 20 search results' and a 'Clear filter' link. Below the search bar, there are filter fields for Traffic (Mbps), L2 (Source MAC, Destination MAC, Ingress VLAN ID, VLAN Priority), L3 (Source IP, Destination IP, IP Protocol, DSCP), and L4 (Source Port, Destination Port). A 'Search' button and a 'Clear Filter' button are located below the filter fields. Below the filter fields, there is a section for 'Display Additional Data:' with checkboxes for 'MPLS' and 'VXLAN', both of which are checked. A red dashed oval highlights this section. Below this section, there is a table with columns for 'Port' (Source, Destination), 'Actions', 'MPLS' (Label, TTL, Label stack, Traffic Class), and 'VXLAN' (Network ID, Source MAC, Destination MAC, Source IP, Destination IP, Protocol). A red arrow points from the 'Display Additional Data:' section to the table. The table contains 12 rows of data. At the bottom of the table, there is a 'Show 10 flows per page' option and a pagination control showing '1 2'.

Port		Actions	MPLS				VXLAN					
Source	Destination		Label	TTL	Label stack	Traffic Class	Network ID	Source MAC	Destination MAC	Source IP	Destination IP	Protocol
11	21	Select Action ▼	16	250	250	100	1	001B.EDB1.8B00	001B.EDB1.8B01	10.24.112.156	10.24.112.156	TCP
11	21	Select Action ▼	16	250	250	101	1	001B.EDB1.8B00	001B.EDB1.8B01	10.24.112.156	10.24.112.156	TCP
11	21	Select Action ▼	16	250	250	100	1	001B.EDB1.8B00	001B.EDB1.8B01	10.24.112.156	10.24.112.156	TCP
11	21	Select Action ▼	16	250	250	101	1	001B.EDB1.8B00	001B.EDB1.8B01	10.24.112.156	10.24.112.156	TCP
11	21	Select Action ▼	16	250	250	100	1	001B.EDB1.8B00	001B.EDB1.8B01	10.24.112.156	10.24.112.156	UDP
11	21	Select Action ▼	16	250	250	101	1	001B.EDB1.8B00	001B.EDB1.8B01	10.24.112.156	10.24.112.156	UDP
11	21	Select Action ▼	16	250	250	100	1	001B.EDB1.8B00	001B.EDB1.8B01	10.24.112.156	10.24.112.156	UDP
11	21	Select Action ▼	16	250	250	101	1	001B.EDB1.8B00	001B.EDB1.8B01	10.24.112.156	10.24.112.156	UDP
11	21	Select Action ▼	16	250	250	100	1	001B.EDB1.8B00	001B.EDB1.8B01	10.24.112.156	10.24.112.156	UDP
11	21	Select Action ▼	16	250	250	101	1	001B.EDB1.8B00	001B.EDB1.8B01	10.24.112.156	10.24.112.156	TCP
11	21	Select Action ▼	16	250	250	100	1	001B.EDB1.8B00	001B.EDB1.8B01	10.24.112.156	10.24.112.156	TCP

# Traffic Wiretap

Wiretap on the traffic matching this profile ... (R1.1\*)

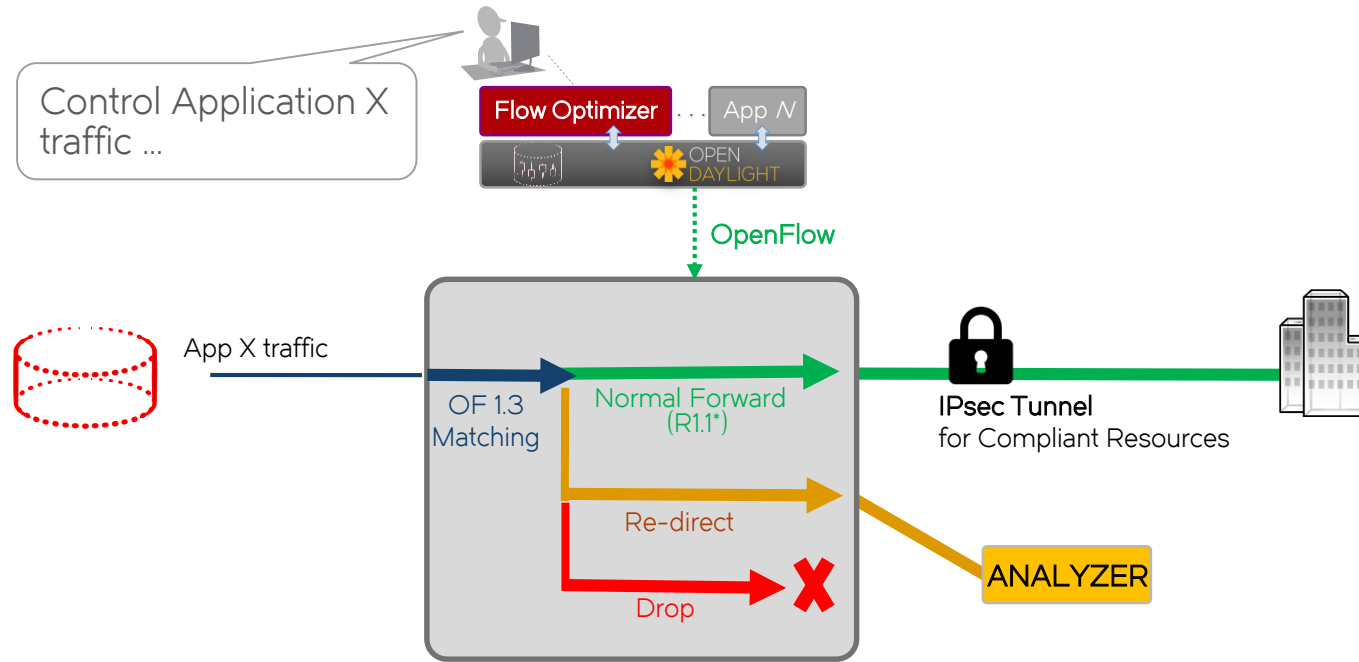


(\*) Roadmap items subject to change



# Internal Traffic Control

## Network access control and security



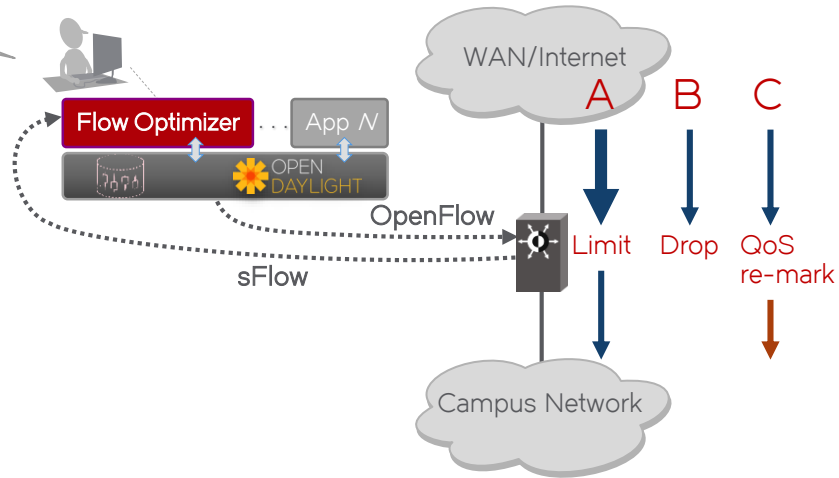
- Access based on MAC / IP addresses
- Redirect or Drop Traffic

*(\*) Roadmap items subject to change*

- Suitable for user access, service and application entitlement level policies

# External Traffic Control

Limit traffic from specific addresses (by name/IP)



Policy-Based Application Traffic Control (e.g., rate limit, drop, QoS re-mark)

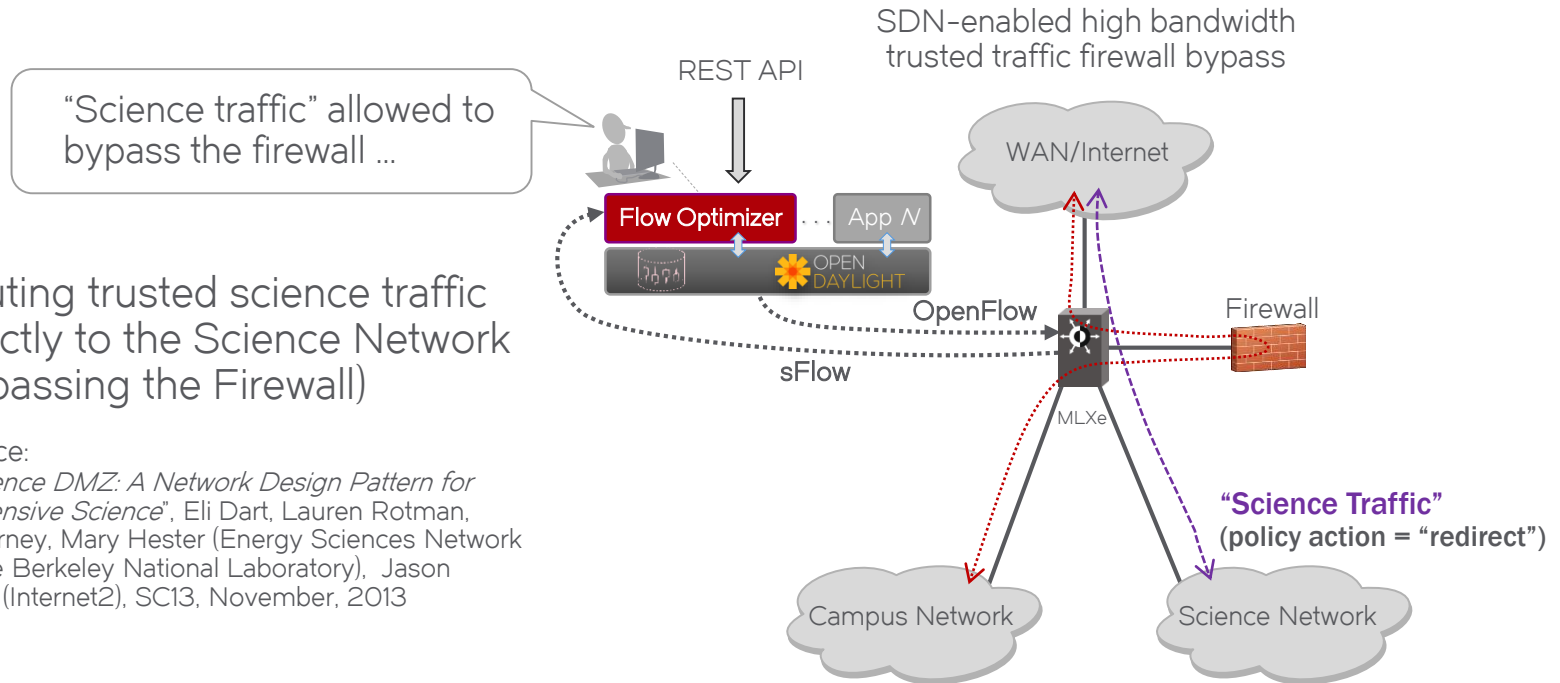
# High Bandwidth Traffic Firewall Bypass

“Science DMZ”

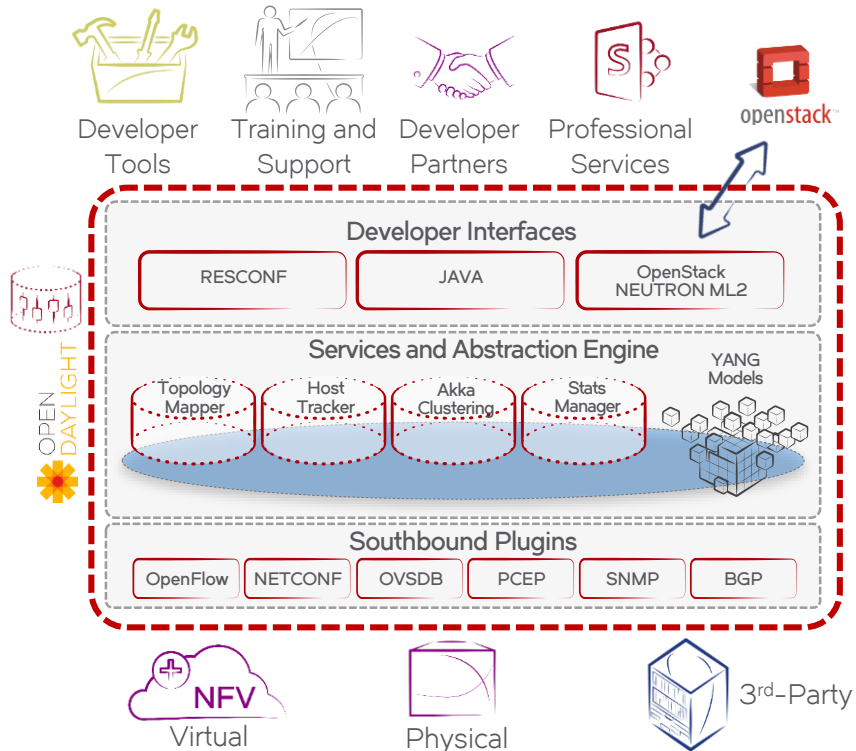
- Routing trusted science traffic directly to the Science Network (bypassing the Firewall)

Reference:

“*The Science DMZ: A Network Design Pattern for Data-Intensive Science*”, Eli Dart, Lauren Rotman, Brian Tierney, Mary Hester (Energy Sciences Network Lawrence Berkeley National Laboratory), Jason Zurawski (Internet2), SC13, November, 2013



# The Brocade SDN Controller



- Quality-assured controller built continuously from the OpenDaylight project
- All Brocade enhancements contributed back to the community - minimizes vendor lock-in
- Technical assistance center with SLA-based support and defect resolution
- Support for Brocade MLX, VDX, ICX and vRouter families
- Support for popular 3<sup>rd</sup>-party switches/routers
- Comprehensive developer support program for training, application testing, and repo access
- Professional services offers for app development and integration

# Brocade OpenFlow-Enabled Products

## Campus and Data Center Networks

- MLXe
- CES/CER
- ICX 6610, 7250, 7450, 7750



# New OpenFlow Features

## MLXe/CES/CER Highlights (SW Rel. 5.9)

- **Layer 2** support with Hybrid Port Mode\* (MLXe)
  - L2 VLAN switching, MAC learning, MSTP, RSTP, ERP, LLDP, LACP, L2 MCT, and VPLS MCT
- **VRF Lite (IPv4/v6)** support with Hybrid Port Mode\* (MLXe)
  - VLAN-VE, VPLS-VE
- **MPLS Label** support (MLXe)
  - Push one or two labels, set EXP
  - Modify outer label, modify outer label and push label
  - Match outer label and BoS bit
  - etc.
- **Flow timeout** (MLXe and CES/CER)
  - Idle and hard timeouts

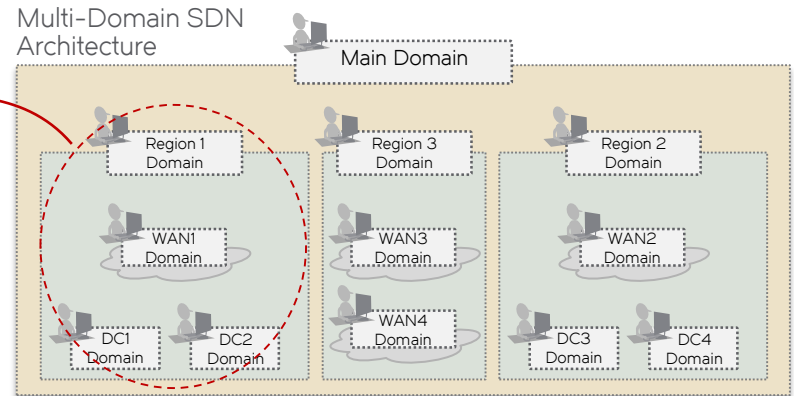
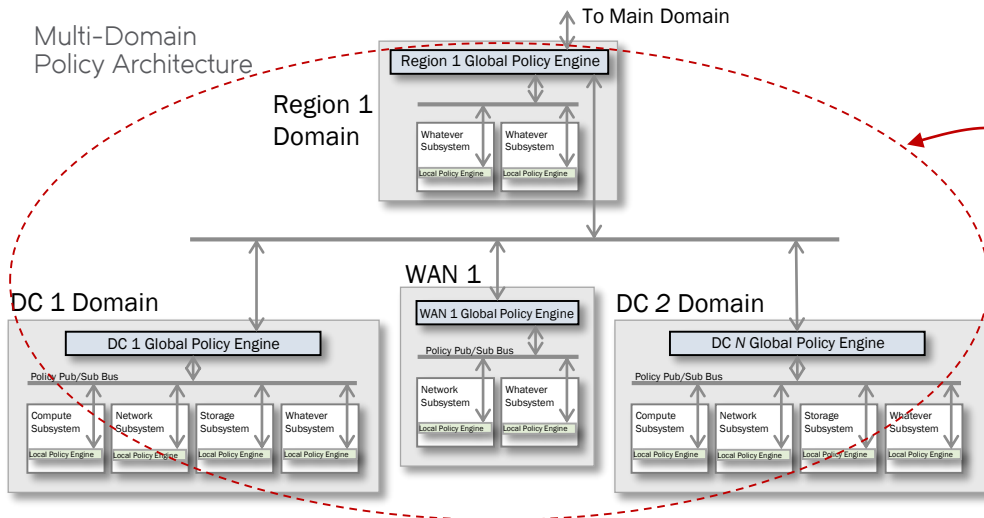
## ICX highlights (SW Rel. 8.0.40)

- **Flow timeout**
  - Idle and hard timeouts
- **Flood and All** actions
- **Normal mode** with output port, metering, and priority
- Support for OpenFlow on a **stack of ICX units**

# Presenter's Latest Research Work

- “Policy Architecture and Framework for NFV Infrastructures”  
<https://datatracker.ietf.org/doc/draft-irtf-nfvrg-nfv-policy-arch/>

- “SDN Multi-Domain Orchestration and Control: Challenges and Innovative Future Directions”, IEEE ICNC 2015, Feb 2015



Thank you