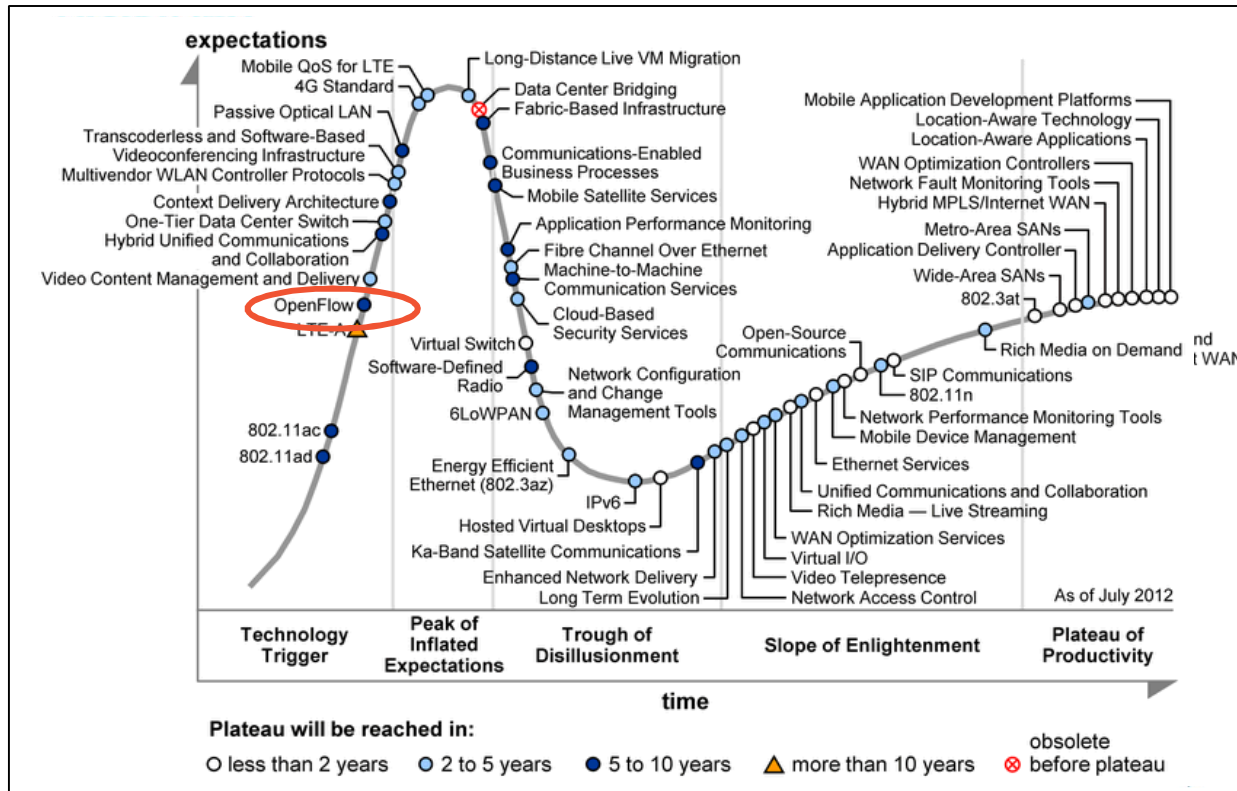# New Virtual Application Networks Innovations Advance Software-defined Network Leadership

Simplifying, Scaling and Automating the Network

Gartner Hype Cycle

10 Year Cycle

2008

2011

2012

Source:
Gartner

Software-defined Network Drivers and Impact

Private cloud is not just about cost reduction. Agility will be a key benefit[1]

By 2020, 50 billion devices will be connected to wireless networks[2]

SDN/OpenFlow market will grow to almost $2 billion by 2016 … driven by the growing need for scalability & network programmability[3]

HUMAN MIDDLEWARE

DEVICE SECURITY

PROGRAMMABILITY

[1] Gartner G00238288, Five Things That Private Cloud Is Not, 3 August 2012,Thomas J. Bittman

[2] Ericsson white paper, "More Than 50 Billion Connected Devices," February 2011

[3] IDC #235074, "Technology Assessment: The Impact of OpenFlow on Data Center Network Architectures" June 2012
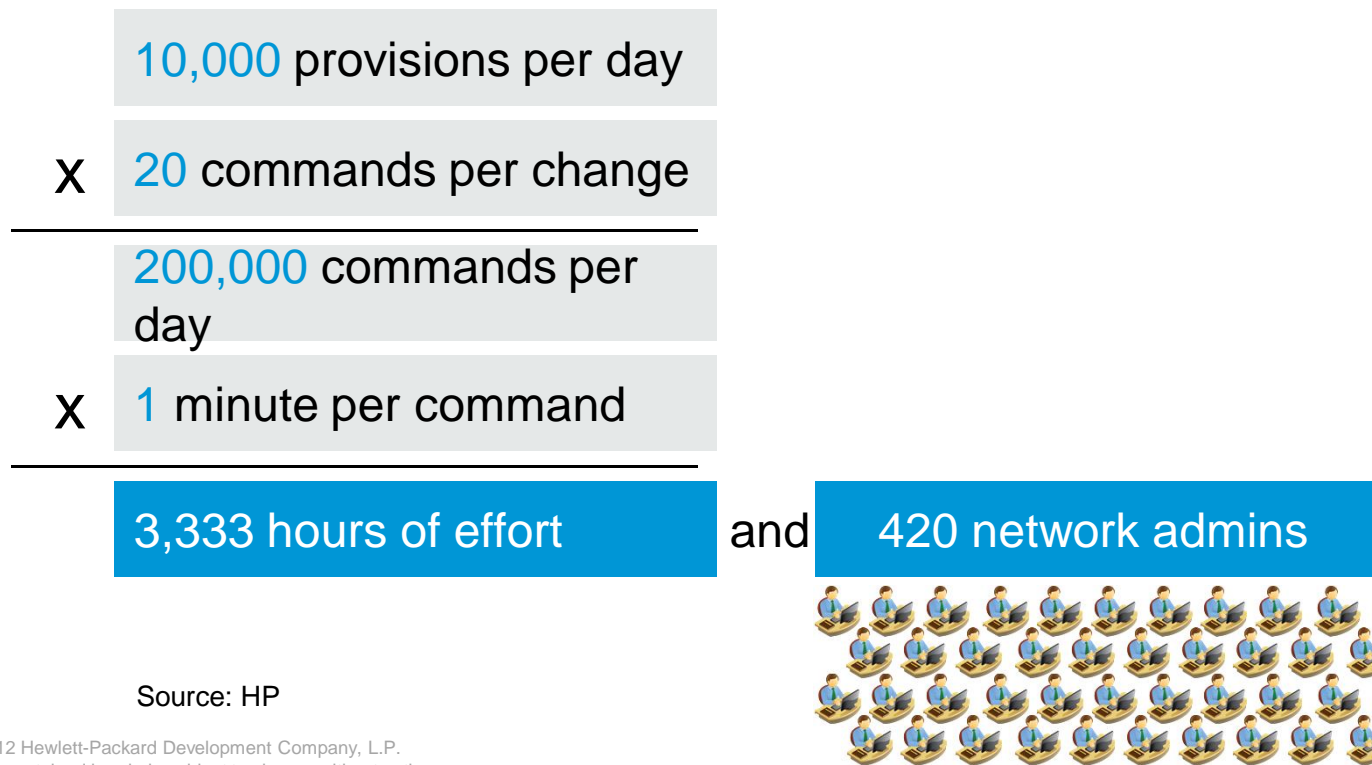
Legacy Network Human Middleware Can't Scale for Cloud

Time and Resource Intensive, Not Suited for Cloud Scale

	10,000 provisions per day
x	20 commands per change

	200,000 commands per day
x	1 minute per command

3,333 hours of effort   and   420 network admins

Source: HP

HP SDN Innovations

HP Delivers SDN to Achieve Agility

Ability to Apply Business Logic to Network Behavior in Dynamic Fashion

SDN Architecture		
Application Layer	→	Deliver open programmable interfaces to automate orchestration of network services
Control Layer	→	Separate control and data plane; abstract control plane of many devices to one
Infrastructure Layer	→	Open standard-based programmatic access to infrastructure

HP Delivers SDN to Achieve Agility

Ability to Apply Business Logic to Network Behavior in Dynamic Fashion

SDN Architecture

- Application Layer
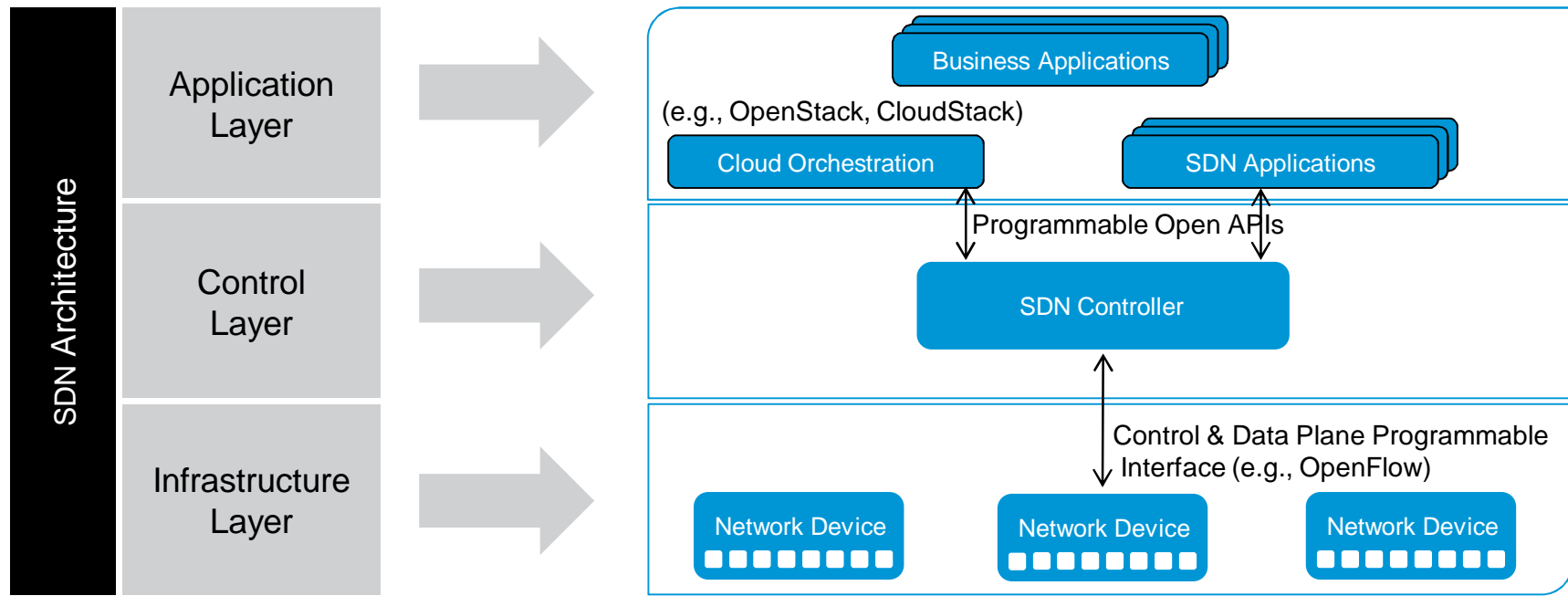- Control Layer
- Infrastructure Layer

Business Applications

(e.g., OpenStack, CloudStack)

Cloud Orchestration

SDN Applications

Programmable Open APIs

SDN Controller

Control & Data Plane Programmable Interface (e.g., OpenFlow)
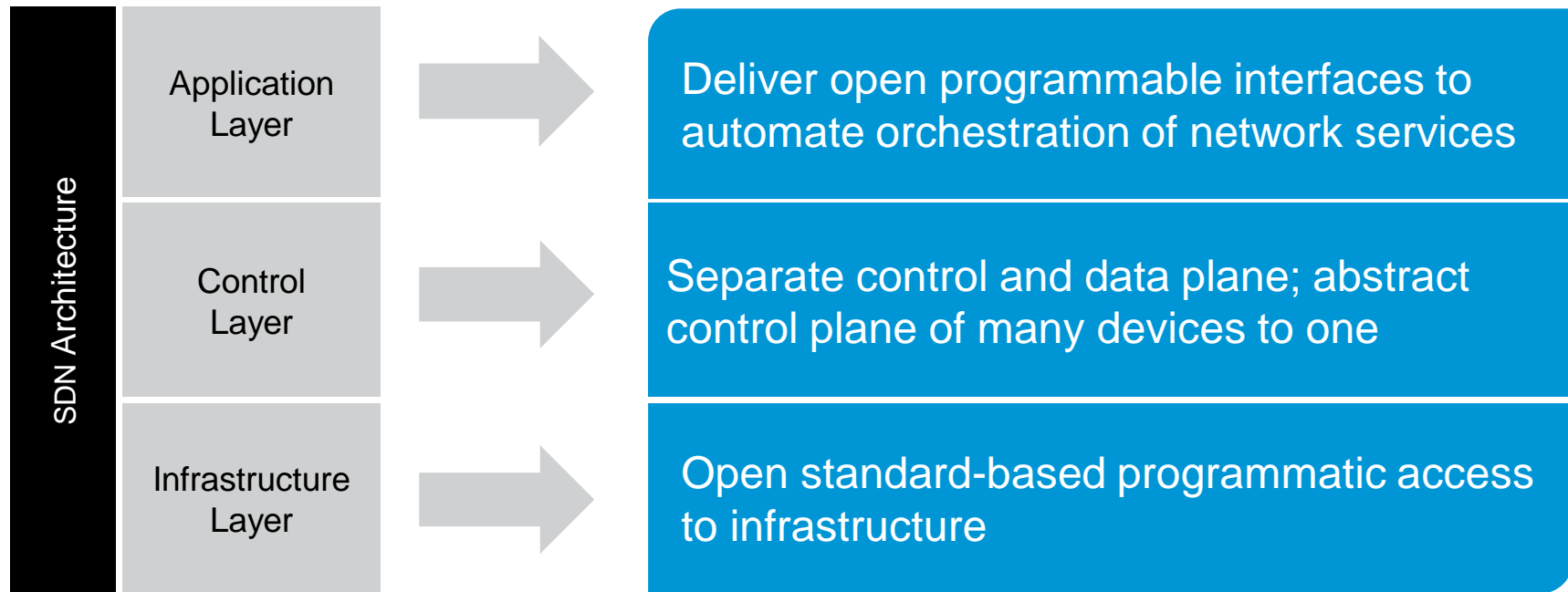
Network Device

Network Device

Network Device

Virtual Application Networks Framework delivering SDN
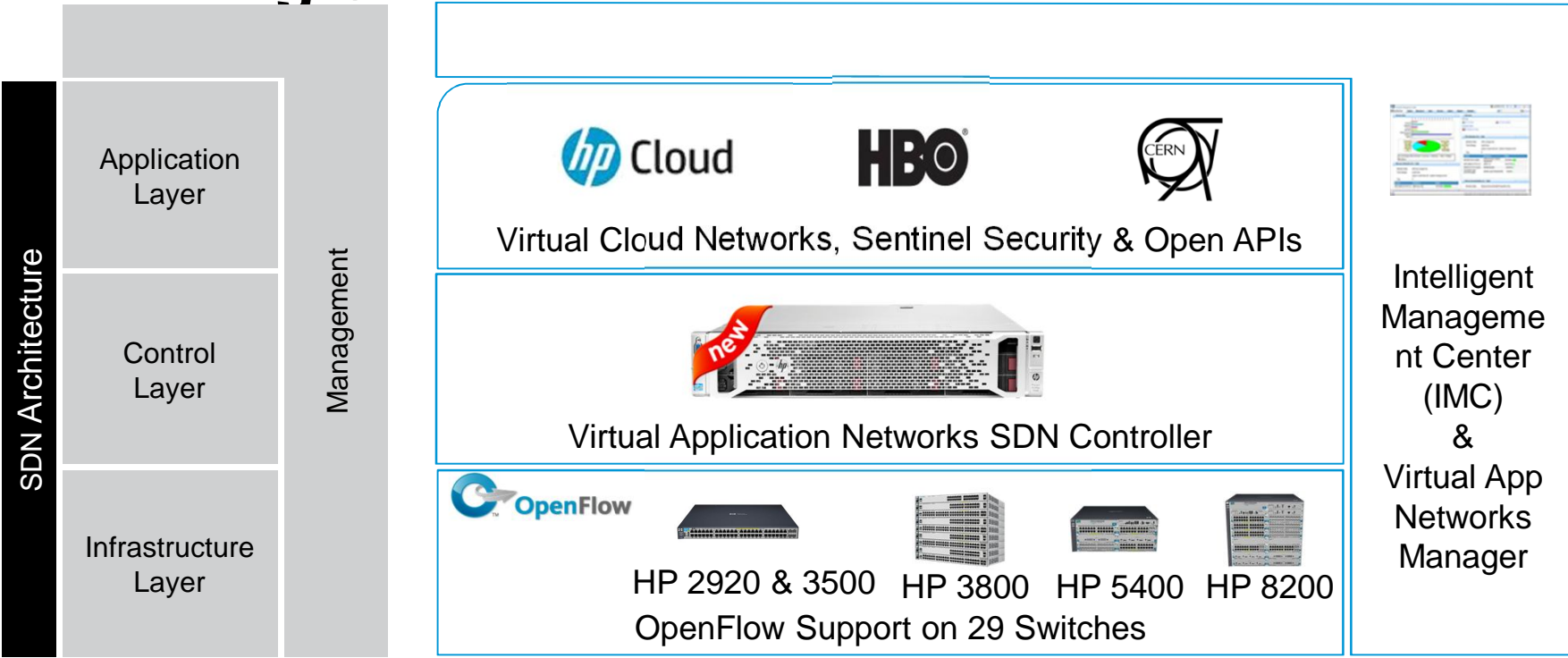
SDN Architecture

| Application Layer |
| Control Layer |
| Infrastructure Layer |

Management

hp Cloud   **HBO**   **CERN**

Virtual Cloud Networks, Sentinel Security & Open APIs

new

Virtual Application Networks SDN Controller

OpenFlow

HP 2920 & 3500   HP 3800   HP 5400   HP 8200

OpenFlow Support on 29 Switches

Intelligent Management Center (IMC)
&
Virtual App Networks Manager

← New Innovations →

OpenFlow Enabled on 29 Switches

Industry's largest OpenFlow-enabled switch portfolio

29

Largest portfolio with 25 switches

0   0   0   1

CISCO   JUNIPER NETWORKS   BROCADE   IBM   hp
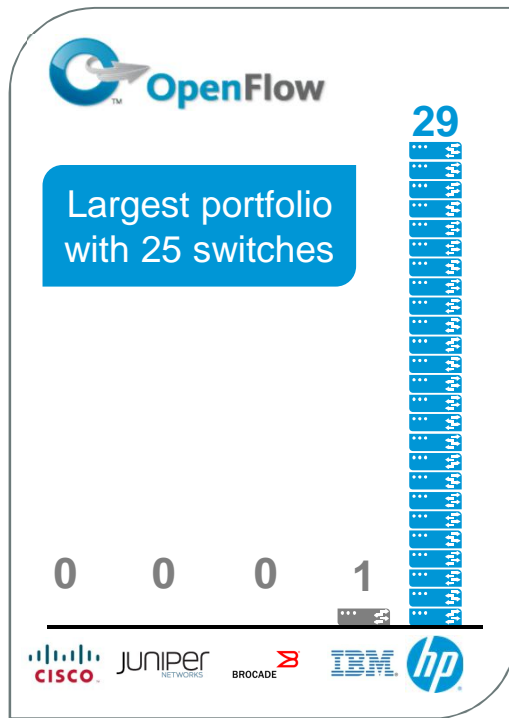
HP 2920
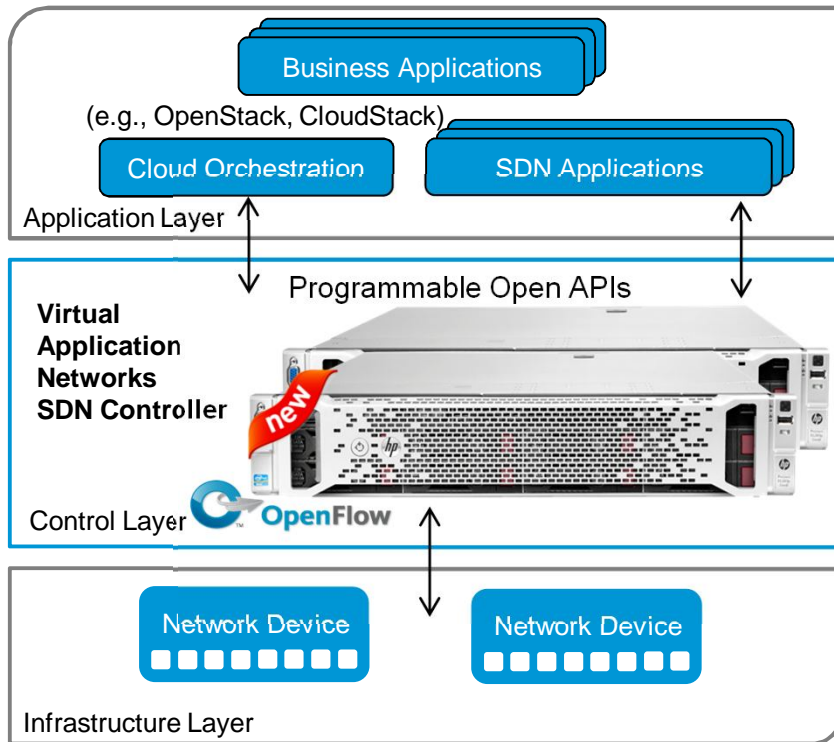
HP 3500

HP 3800

HP 5400

HP 8200

- **1st Tier-one Vendor**

- **Modular, stackable and fixed switches**

- **Over 15 Million OpenFlow Ports**

- **Committed to OpenFlow-enabling FlexNetwork portfolio**

Virtual Application Networks SDN Controller

HP Delivers Industry's First Open, Complete Hardware & Software SDN Solution

Business Applications

(e.g., OpenStack, CloudStack)

Cloud Orchestration

SDN Applications

Application Layer

Programmable Open APIs

Virtual
Application
Networks
SDN Controller

new

OpenFlow

Control Layer

Network Device

Network Device

Infrastructure Layer

- **Software or Appliance**

- **OpenFlow enabled**

- **HP SDN Applications**

- **Open APIs Enable Third-party Apps**

- **Extensible, Scalable, Resilient, Architecture**

hp Cloud   HBO   CERN

HP Virtual Cloud Network Application

Enables Scalable, Programmable Clouds, Eliminates Human Middleware

Zero
Network Admin

One
Minute

1,000s
Cloud Users

**Virtual Application
Networks
SDN Controller**
OpenFlow

- **Automates Network Provisioning Enabling Self-service Cloud**

- **Limits Provisioning Actions to Low Risk Infrastructure Elements**

- **Enables Scaling Beyond Traditional Hardware Limits**

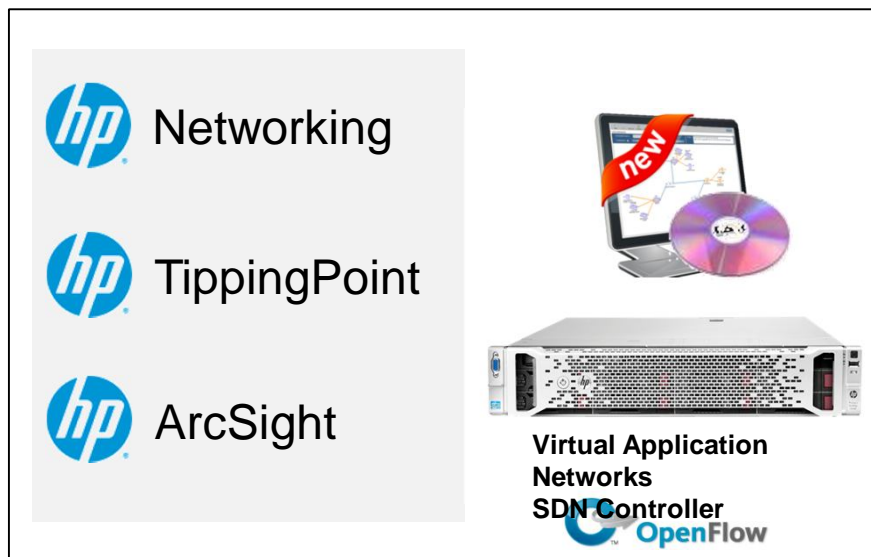- **Delivers Virtual Networking for Openstack Public & Private Clouds**

HP Cloud : Virtual Cloud Network Application Use Case
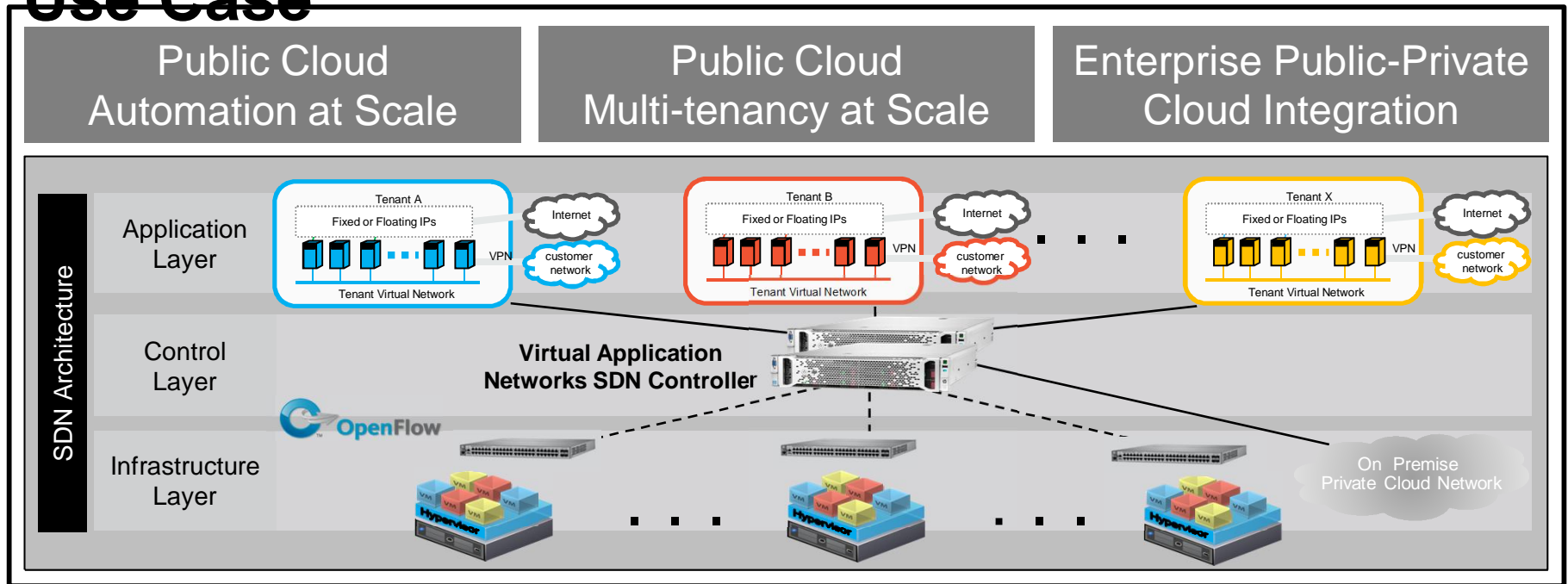
Sentinel Security Application

Delivering Real-time Network Threat Protection

Networking

TippingPoint

ArcSight

Virtual Application Networks SDN Controller

- **Delivers Real-time Threat Characterization with HP TippingPoint DVLabs Database**

- **Protects from over 700,000+ Botnet, Malware & Spyware Malicious Sites**

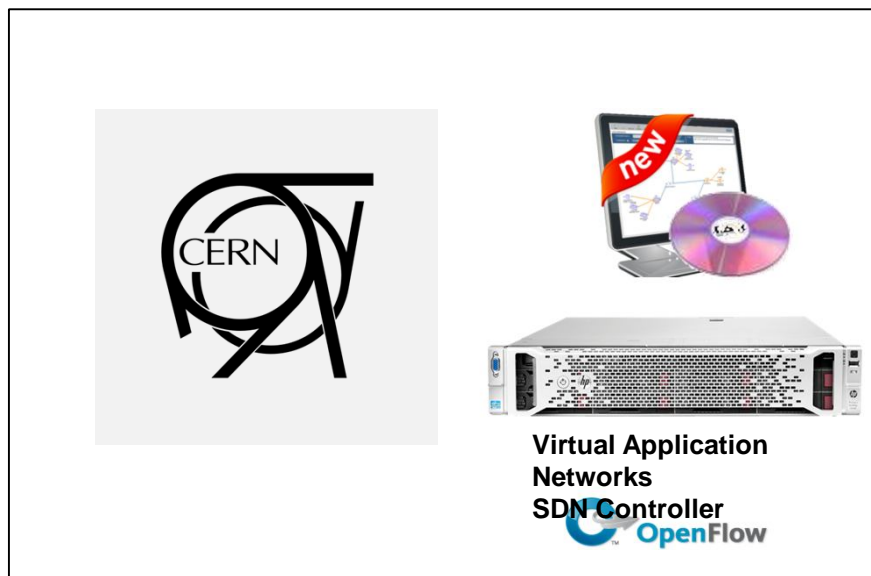- **Improved Visibility & Accuracy with ArcSight Integration**

HBO: Sentinel Security Application Use Case
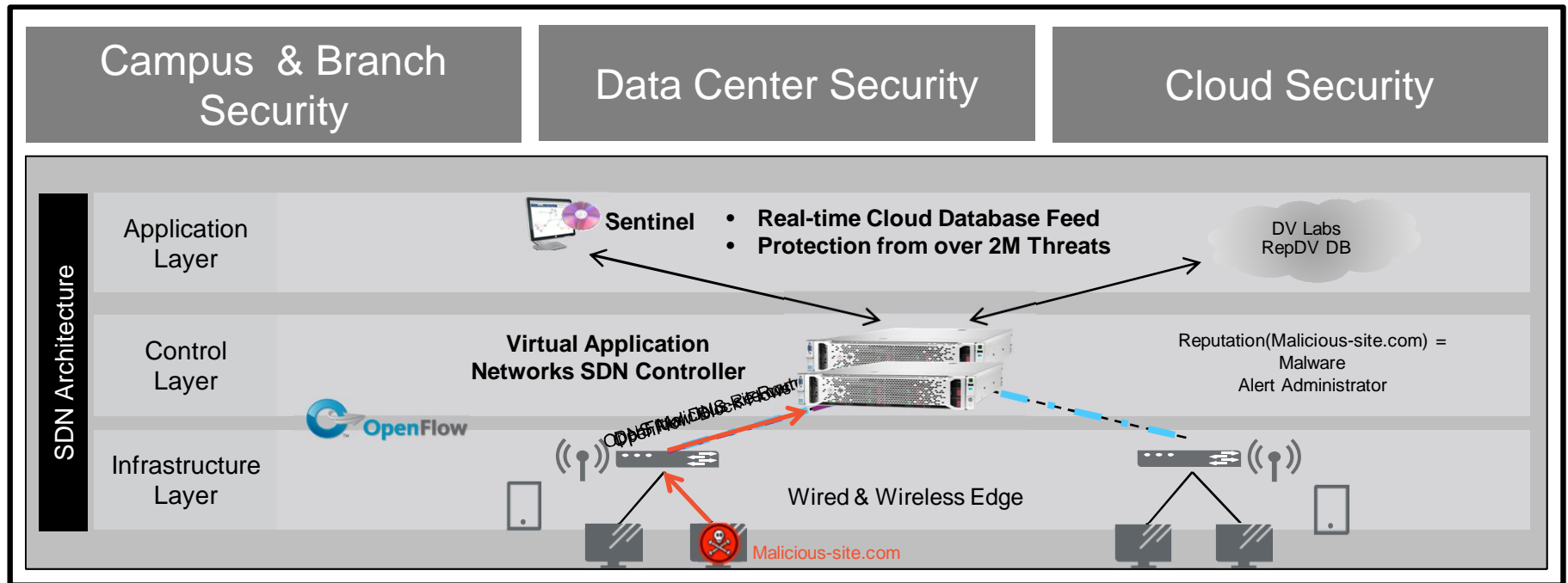
CERN: Distributed Load Balancing Application

Delivering Advanced Traffic Characterization & Orchestration

**Virtual Application
Networks
SDN Controller**

- **Characterizes & load balances for increased scalability**

- **Optimized traffic distribution with sychronization across load balancers**

- **Adaptive load balancing based on application feedback**

- **Eliminate the need for dedicated hardware**

CERN: Distributed Load Balancing Use Case

Traffic Classification & Load Balancing	Network Resource Scaling (Firewall/IPS)	Efficient Multipathing

SDN Architecture

Application Layer

Distributed Load Balancing Application

Control Layer

OpenFlow

Virtual Application Networks SDN Controller

Infrastructure Layer

HP OpenFlow Switches

Network

Servers

FW/IPS

Routers
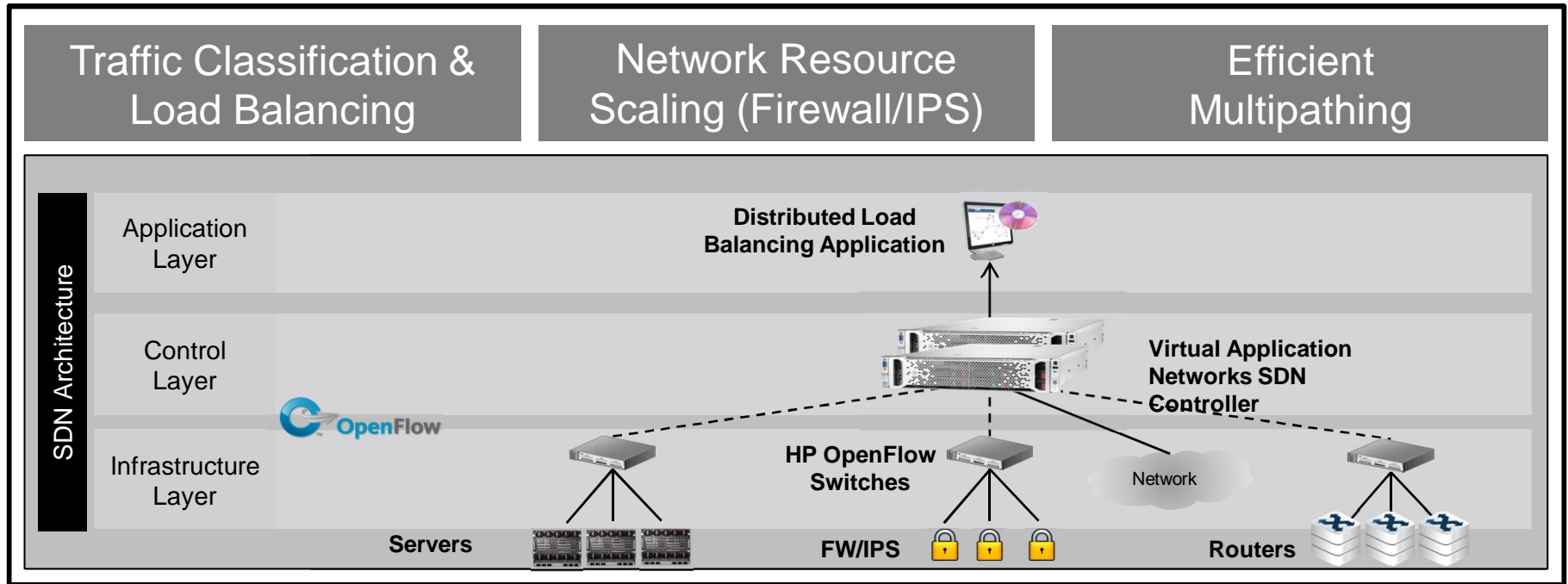
SDN Services – Strategize & Assess

| Transformation Experience Workshop | | • **Achieve Enterprise/IT Alignment, Save Hundreds of Hours of Meetings & Research Time** |

Transformation Experience Workshop

• **Achieve Enterprise/IT Alignment, Save Hundreds of Hours of Meetings & Research Time**
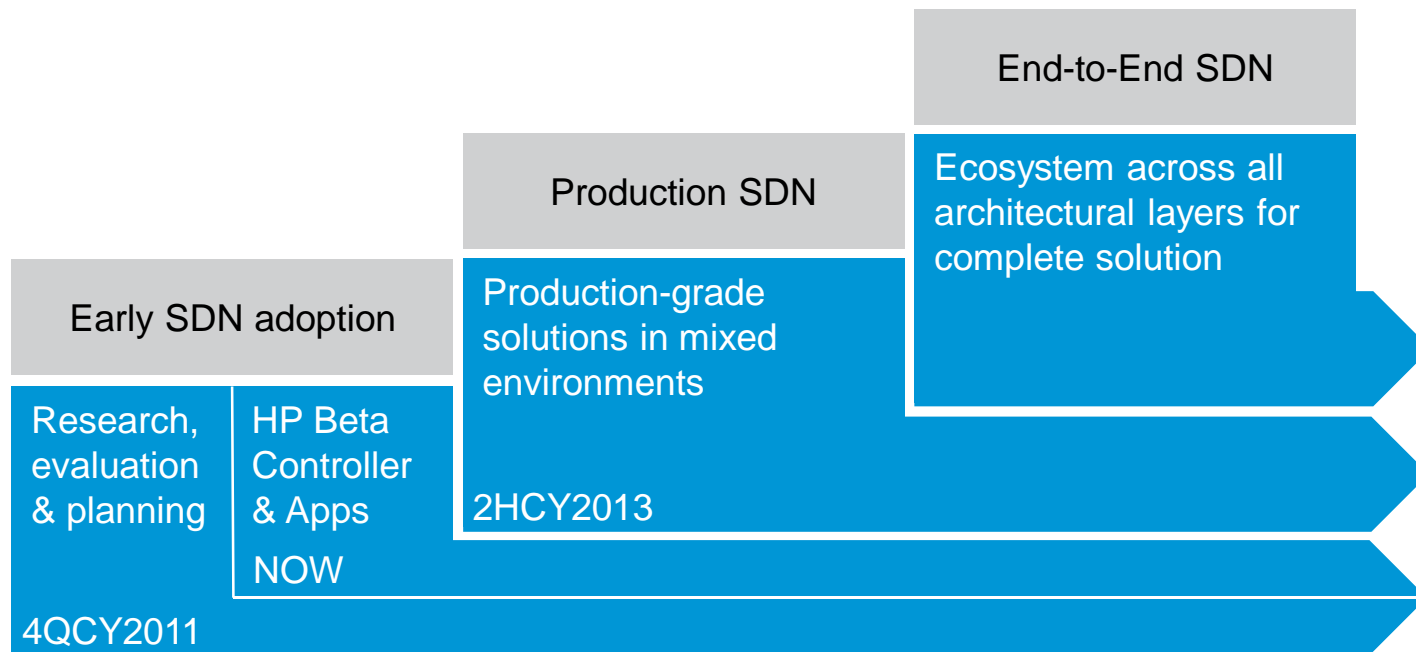
Network Provisioning Baseline Assessment

• **Define the Delta Between Compute & Storage vs. Network Provisioning Timelines**
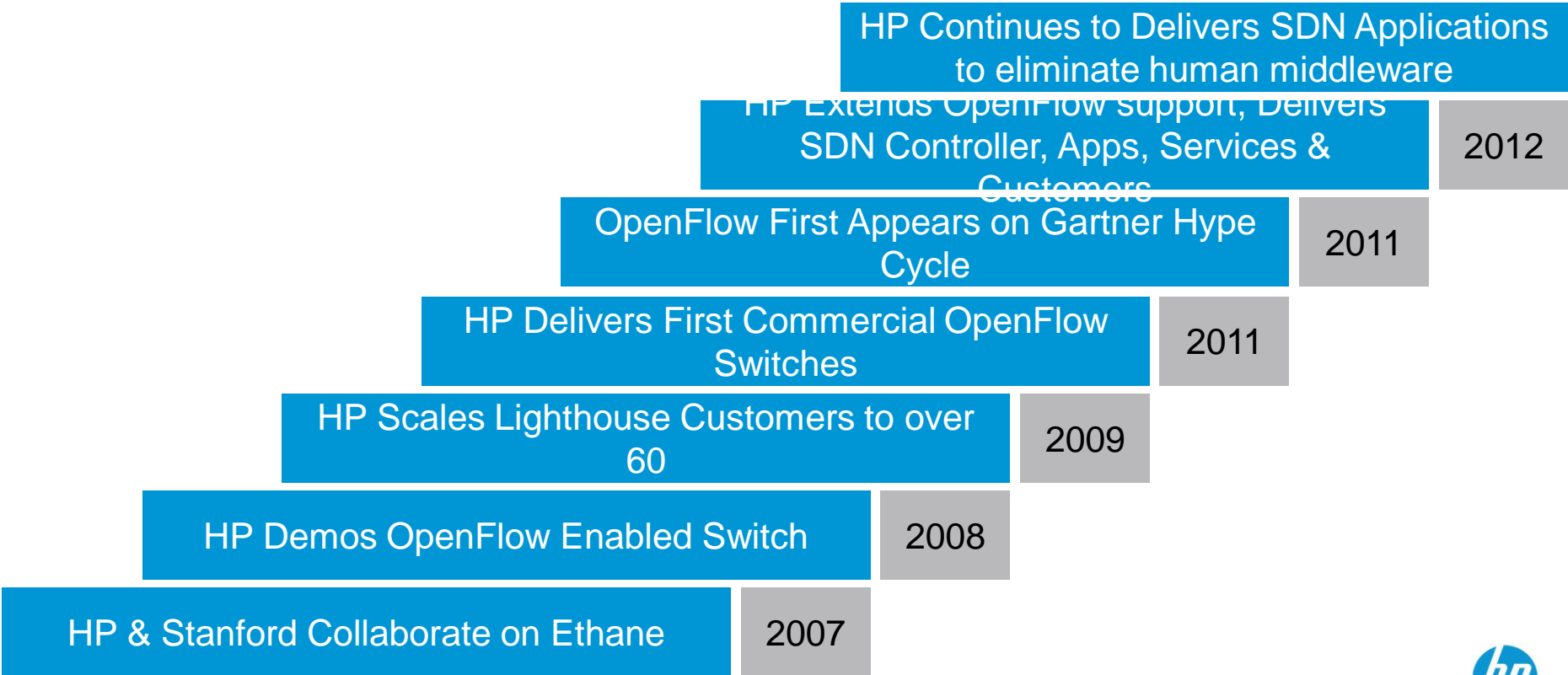
Virtual App Network Proof of Concept

VAN

• **Prove SDN Value Proposition (Months to Minutes) against Baseline Assessment**

Virtual App Networks Delivers Phased Approach to SDN

Incremental Journey

End-to-End SDN

Ecosystem across all architectural layers for complete solution

Production SDN

Production-grade solutions in mixed environments

2HCY2013

Early SDN adoption

Research, evaluation & planning

HP Beta Controller & Apps

NOW

4QCY2011

SDN Innovations Leading the Industry

HP Continues to Delivers SDN Applications to eliminate human middleware

HP Extends OpenFlow support, Delivers SDN Controller, Apps, Services & Customers — 2012

OpenFlow First Appears on Gartner Hype Cycle — 2011

HP Delivers First Commercial OpenFlow Switches — 2011

HP Scales Lighthouse Customers to over 60 — 2009

HP Demos OpenFlow Enabled Switch — 2008

HP & Stanford Collaborate on Ethane — 2007
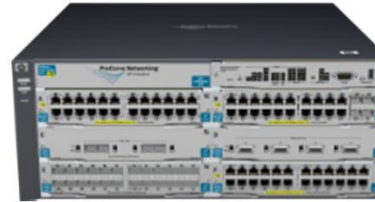
HP OpenFlow Product Details

OpenFlow Portfolio Support

HP 3800 Series
Campus/Branch Access

HP 2920 Series
Campus/Branch Access

HP 5400 Series
*Campus/Branch
Access & Core*

HP 8200 Series
Campus Core

HP 3500 Series
Campus/Branch Access

HP 6600, 6200 Series
Campus/Branch Access

All Products Support OpenFlow v1.0 with K.15.10 or KA.15.10 or WB.15.12

Openflow 1.0 features

Hardware support

Support for 3800 switches in KA_15_10

Openflow for 2920 switches planned March 2013

Features

Egress to LAG i.e. Openflow traffic can be sent out of trunks

Honor flow priority - across flows in hardware and software

Support HA in 8200 with dual management module

Non-IP L2 address match in hardware for v2 modules and 3800

Support for LOCAL action

Supportability

Support communication with controller over OOBM on the 6600 switches.

Ability to turn off software flow processing i.e. a hardware-only mode where only flows that can be programmed into hardware get accepted.

Troubleshooting – Additional display commands, debug log and event log support.

Table Size

1500 entries* for 3500, 6xxx, and v1 5400/8200 modules

2000 entries* for v2 5400/8200 modules and 3800

Additional 3,000 software-based flows**

* There are other features (e.g., ACL, security features) that use the same TCAM, so the actual max number of Openflow entries can be less

** Approximate numbers, depends on switch configuration

HP differentiation

Openflow 1.0 version specific:

Passive mode – One way communication from the controller for adding flows. New flows coming into the switch are not sent to the controller but handled normally.

Enhancement Investigation

Support for OpenFlow 1.3

Support for re-mark and drop capability in hardware meters

Number of software tables in the Openflow pipeline is user configurable

Openflow version agnostic

Aggregate or per VLAN mode – All the VLANs become part of one Openflow "aggregate" instance except controller VLAN . -OR- Each VLAN is associated with its own Openflow instance

Policy engine resources management – Users can set a maximum limit on the policy engine resources i.e. TCAM that can be used for Openflow.

HW-only mode (15-10) – Only flows that can be hardware accelerated are accepted into the switch. An error is sent to the controller for other flows.

HA (15_10) – Flow table is synced across the AMM and the SMM. Traffic that matches hardware flows is not interrupted across a failover.
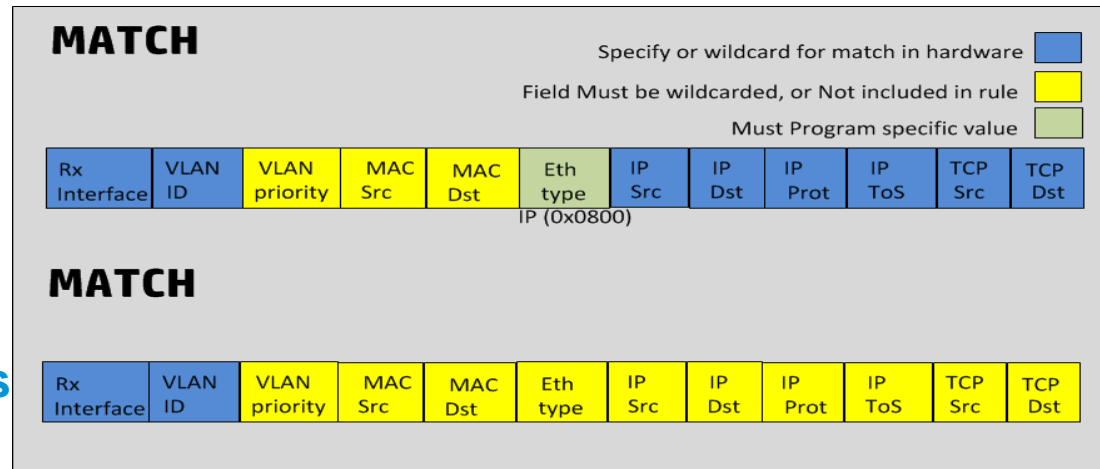
Openflow to native domain forwarding - Ability to forward Openflow traffic from an Openflow domain/VLAN to a non-Openflow domain/VLAN.

Per flow Rate Limiting

Hardware Rules (V1, Current release)

V1 modules for 5400, 8200 and 3500, 6200, 6600 switches

MATCH

Specify or wildcard for match in hardware ▮ (blue)

Field Must be wildcarded, or Not included in rule ▮ (yellow)

Must Program specific value ▮ (green)

Rx Interface	VLAN ID	VLAN priority	MAC Src	MAC Dst	Eth type	IP Src	IP Dst	IP Prot	IP ToS	TCP Src	TCP Dst

IP (0x0800)

MATCH

Rx Interface	VLAN ID	VLAN priority	MAC Src	MAC Dst	Eth type	IP Src	IP Dst	IP Prot	IP ToS	TCP Src	TCP Dst

FORWARD ACTION

The Following Forwarding Actions can be taken based on above Match: DROP, NORMAL, OUT_PORT (1 port, including LAG, or NORMAL)

SET ACTION

Setable Fields ▮ (purple)

Cannot alter Fields ▮ (red)

Must set fields to specific value ▮ (teal)

Tx Interface	VLAN ID	VLAN priority	MAC Src	MAC Dst	Eth type	IP Src	IP Dst	IP Prot	IP ToS	TCP Src	TCP Dst

At most 1 interface can be specified (LAG, NORMAL, or a physical interface)
If no interface is specified, action is DROP

Hardware Rules (V2, Current release)

V2 modules for 5400, 8200, and 3800, 2920 stackable switches

MATCH

Specify or wildcard for match in hardware
Field Must be wildcarded, or Not included in rule
Must Program specific value

Rx Interface	VLAN ID	VLAN priority	MAC Src	MAC Dst	Eth type	IP Src	IP Dst	IP Prot	IP ToS	TCP Src	TCP Dst

IP (0x0800)

MATCH

Rx Interface	VLAN ID	VLAN priority	MAC Src	MAC Dst	Eth type	IP Src	IP Dst	IP Prot	IP ToS	TCP Src	TCP Dst

NOT IP, any other

MATCH

Rx Interface	VLAN ID	VLAN priority	MAC Src	MAC Dst	Eth type	IP Src	IP Dst	IP Prot	IP ToS	TCP Src	TCP Dst

FORWARD ACTION

The Following Forwarding Actions can be taken based on above Match:
DROP, NORMAL, OUT_PORT (1 port, including LAG, or NORMAL),
HP QoS extensions to support per flow rate limiters

Setable Fields
Cannot alter Fields
Must set fields to specific value

SET ACTION

Tx Interface	VLAN ID	VLAN priority	MAC Src	MAC Dst	Eth type	IP Src	IP Dst	IP Prot	IP ToS	TCP Src	TCP Dst

At most 1 interface can be specified (LAG, NORMAL, or a physical interface)
If no interface is specified, action is DROP

Thank you