Dell Networking: The OPEN NETWORKING Revolution

Gonzalo de Antonio
Mayo 2015
The Dell difference
The forces of cloud, big data, mobile and security are changing the way people live, businesses operate and the world works, just as the PC did. **Now it’s time to do what Dell does best—make these innovations simpler, more affordable and more accessible...**

*Michael Dell*

*September 2013*
Making technology **more accessible**

Giving organizations of any size **the power to do more**
Dell enabling the **Future Ready Enterprise**
Workload ready + virtual infrastructure ready + software-defined & cloud ready

Software-Defined Computing

Software-Defined Storage

Software-Defined Networking
## Why SDx - Agility & Economics of Delivering IAAS

### Deploy Apps in Minutes
- Enables a level of **agility and flexibility** never before seen in IT
- Enables **policy-driven provisioning** of all infrastructure resources to meet application needs
- **Dynamically allocate** existing HW resources to meet current needs

### Change the Economics in IT
- **Reduces OPEX** by dramatically simplifying management and centralizing control
- **Reduces CAPEX** by removing need for expensive specialized HW
- **Increase efficiency** by higher utilization of existing HW resources

### Respond to Real-time Business Needs
- **Programmable interfaces** makes it easy to control & scale through automation
- **Addresses unpredictable growth** by dynamically repurposing existing HW
- **Auto-scale** (up, down or out) by plugging in more hardware
Dell Networking

Modernize & transform your network
Dell solutions enabled by Dell Networking

- **PowerEdge Servers**
  - Scale out architecture for Data Centers and Campus
  - Deployment guides for Rack, Blade servers & networking

- **Converged Solutions**
  - Integrated convergence with 10/40G switching
  - Cloud ready

- **Scale out your Security**
  - Unique Scale out architecture
  - Deployment guides and RA

- **Cloud & Virtualization**
  - SDN backed fabrics
  - Embedded virtualization & automation
  - Pre-packaged & Tested solution RAs

- **Dell Campus Networking**
  - Active Fabric Data Center Network

- **Dell Storage**
  - Fibre Channel/FCoE
  - 1/10GbE iSCSI
  - NAS and Fluid filesystem

- **VDI & Clients**
  - Scalable VDI deployment
  - Lowest power per 40G ports

- **HPC & Big Data**
  - Build Big Data workloads
  - Massive scale platforms
  - Highest density of 10/40G

- **Mobility & BYOD**
  - Clearpass Policy integration
  - W-series 11ac
  - Easy guest access

Dell - Internal Use - Confidential
Dell Networking

The Open Networking Revolution
“Dell has been the most-innovative and most-disruptive mainstream data center networking vendor in the market over the past 12 months... Combined with continued advances in the data center portfolio (high-performance, fixed form factor switches and integrated blade switches), Dell now offers a compelling alternative for many data center use cases.”

Gartner, Data Center report 2015
Compute paradigm shift
How the disaggregated server model changed the landscape

**Mainframe model**
- Proprietary architectures & mgmt tools
- Limited apps
- Proprietary OS (e.g. Solaris, HP-UX, Ultrix)
- Proprietary CPUs (e.g. SPARC, PA-RISC, Alpha)

**X86 Servers model**
- Orchestration / automation for dist computing
- Application ecosystem
- Standard OS — hypervisors
  - Industry standard (X86 CPU)
Now: **Networking paradigm shift**

**Traditional networking**
- Proprietary architectures & mgmt tools
- Hundreds of protocols
- Proprietary networking OS (e.g., Cisco IOS, Juniper OS)
- Proprietary ASICs

**Future of networking**
- Standard orchestration & automation tools
- Optional 3rd party SDN/NVO controller
- Any networking OS
- Open standard hardware
- Merchant silicon
Making the **open networking shift** work for you
Leverage open, innovative and best-of-breed solutions for the data center

- **Standard orchestration & automation tools**
- **Optional 3rd party SDN/NVO controller**
- **Any networking OS**
- **Open standard hardware**
- **Merchant silicon**

**Proven OS that meets enterprise needs**
- Dell Networking OS
- Big Switch OS or Cumulus OS

**Open hardware with enterprise-class features**
- Dell Networking switches for data center
- Broadcom
Imagine - “Androidification” of networking

**Open Source Apps** + **Independent Software Vendor Apps**
Dell Open Networking switches simplified
100% ONIE loading for all OS’s on new ON switches

Open Network Install Environment

ONIE Bootloader for all OS’s for Dell Networking ON switches

Zero-touch install of all pre-qualified 3rd party operating systems

ONIE also used for loading Dell Networking OS9

Z9100-ON Multi-rate Fabric Switch
S4048-ON 10/40GbE Switch
S3048-ON 1/10GbESwitch
Dell’s Open Networking vision

Dell is driving a new open ecosystem to speed innovation by offering best of breed, standards based network equipment, network operating systems and network applications to serve customers unique business needs

Helping customers to:
• Embrace the open networking era with best-of-breed solutions
• Simplify network management, orchestration and automation
• Leverage open source standards-based tools & expertise
Why Open Networking

• Enable Choice
• Multiple Operating Systems to Bring Out the Best of the Same Box
• Select the Software for your Needs Instead of Replacing Systems
• End to End Common Hardware
• Unlock New & Broader Capabilities of Network Hardware
• Drive Down the Economics with Standardized Hardware
• Capture Fast Moving Merchant Silicon Innovation
• Simplify Support, Sparing, Logistics and Re-use
• Shortened Time to Market of New Capabilities
Leading the **Open Networking** revolution

“Dell wins this month’s Network Innovation Award from SearchNetworking for its partnership with Cumulus Networks, in which Dell became the first mainstream switch vendor to permit third-party OSes to run on its switches.” - **TechTarget**

“Dell was the first mainstream vendor to support this approach via support for non-Dell networking OS software from Cumulus or Big Switch on its ToR hardware. Dell will load and test the software in its switches and deliver a complete product, including presales and post sales support.” - **Gartner**

“Dell is shaking up the networking market, a stable market that loathes change and optimizes keeping customers from having choice... Dell is clearly firing the first shot over the bows of its competitors, companies like Arista, Cisco Systems, and Hewlett-Packard.” - **Patrick Moorhead**
Dell “Disaggregated OS” Momentum Continues

Offers open, innovative and best of breed solutions along with our Ecosystem

70+ customers!!

<table>
<thead>
<tr>
<th>Supported OS</th>
<th>Open Networking switch</th>
<th>Merchant silicon</th>
</tr>
</thead>
</table>

Today
- 10G: S4810-ON
- 10/40G: S6000-ON
- T2 10G: S4048-ON
- 1Gb: S3048-ON

1H CY 15
- 100G: Z9xxx-ON

2H CY 15
- Richer L2/L3
- Cloud Fabric
- MPLS & Fabric Capabilities

Note: Most of these customer wins are for internal use only
Cumulus Linux OS

- Cumulus Linux OS is the industry’s first, full-featured Linux operating system for networking hardware
  - Resilient Linux modular operating system
  - Broad set of Layer 2 and layer 3 features
  - Support for network virtualization

- Enables users to take full advantage of the latest industry standard networking hardware while enabling the latest Linux applications and automation tools

- Provides a consistent experience between the network and the compute environments helping customers to realize the full extent of a software defined data center
The Cumulus Linux Differentiators

**Independence**
Choice of hardware, choice of applications, no vendor lock-in

**It’s Linux**
Familiarity, community, open source, rapid & simple application integration, customization

**Business Model**
Subscription, pricing transparency, software only

**Operational Efficiencies**
Automated deployment & provisioning

**Workflow Orchestration**
Simple configuration management, workflow orchestration, application centricity

**High Capacity Fabrics**
Modern DC designs, simple integration with overlay, high capacity fabric,
Early adopter Linux-savvy open networking environments

**Components**
- Dell S4040-ON/S6000-ON with Open Network Install Environment (ONIE)
- Cumulus Linux OS

**Benefits**
- Enter the open networking era with best-of-breed solutions
- Gain a consistent view across compute and network resources
- Leverage Linux and open source standards-based tools and expertise
BSN Switch Light™ OS

• Switch Light from Big Switch Networks is an open source, OpenFlow-based thin switching platform for Open Software-Defined Networking (Open SDN)

• Enables a common, OpenFlow-based thin switching feature set that can be centrally provisioned and which automates policy configuration across your entire network fabric

• Enables dramatic reductions in the cost of your network operations and eliminates time consuming, manual procedures

• Operates in coordination with an OpenFlow controller, which provides centralized switch programming and forwarding
BSN Big Tap™ Monitoring Fabric

- Big Tap Monitoring Fabric leverages open standard switches and SDN design principles to monitor traffic everywhere in your network and selectively delivers traffic to your security and monitoring appliances
  - Has a layer of Ethernet switches labeled as “filter” switches - wired to passive optical taps or switch/router/firewall SPAN ports in the production network and are configured as “filter interfaces” in the Big Tap controller software
  - A layer labeled as “delivery” switches. - wired to tools and are configured as “delivery interfaces

- At the core of the Big Tap monitoring network is the centralized Big Tap Controller software
Early adopter SDN-based open networking environments

Components
- Dell S4048-ON/S6000-ON with Open Network Install Environment (ONIE)
- Big Switch Networks Switch Light™ OS
- Big Switch Networks Big Tap™ Monitoring Fabric

Benefits
- Embrace the power of choice with best-of-breed solutions
- Start the transition to SDN with a practical network monitoring solution
- Manage all monitoring fabric components from a central place
Big Switch Cloud Fabric

- High Performance: Dense 10G/40G
- Latest Merchant Silicon HW: Trident II
- Scalable: Max scale of Trident II
- Resilient: Headless Mode Operations
- L4-7 Service Insertion & Chaining
- Hypervisor: ESX, Hyper-V, KVM, Xen
- Orchestration: OpenStack, CloudStack

Value-prop = Single “Logical” Switch (Zero-touch fabric, Dramatic TCO reduction)
Dell’s first disaggregated open networking switches

- Designed for flexibility, performance and support of 3rd party OS
- 1RU high-density 10/40Gbps TOR switches
  - **S4810-ON** with 48 ports 10GbE and 4 ports 4GbE
    Cumulus Linux 2.0.2 GA released on April 18, 2014
  - **S6000-ON** with 32 ports of 40GbE or 96 ports of 10GbE + 8 ports of 40GbE
    Cumulus Linux 2.1.0 GA planned for June 12, 2014
- Supports the open source Open Network Install Environment (ONIE)
- Dell global ProSupport Services
Other vendors doing Open Networking?

**Branded Switching + White-Box Switching = Brite-Box Switching**

**Gartner:** We feel this is an important and disruptive trend in the networking space that can bring a **ton of value** to organizations. Our forecasts indicate that by 2018, non-traditional switching will account for **more than 10%** of global data center port shipments, up from under 4% in 2013. Further, we anticipate that additional mainstream networking vendors will be entering this space.

**Brite Box vs. White Box**

- **BRITE BOX**
  - Fully Supported solution by networking vendor, both HW & SW
  - Quality Service Level Agreements guaranteed by vendor
  - Global Supply Chain
  - One stop shop
  - Make it simple, affordable and accessible

- **White box**
  - Only HW support
  - No solution support
  - Complex model
Dell Networking

The Software Defined Networking Vision
### Why SDN?

#### Shared & Virtualized Infrastructure

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Servers</th>
<th>Networking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provisioning time</td>
<td>Minutes</td>
<td>Days / Weeks</td>
</tr>
<tr>
<td>Cost</td>
<td>Cost-effective</td>
<td>Expensive</td>
</tr>
<tr>
<td>Open &amp; Choice</td>
<td>Yes</td>
<td>Near Monopoly</td>
</tr>
<tr>
<td>Management</td>
<td>Easy/Simple</td>
<td>Complex/Hard</td>
</tr>
<tr>
<td>HW Abstraction</td>
<td>Yes (e.g. VMware ESX)</td>
<td>Very primitive</td>
</tr>
</tbody>
</table>

#### Key Customer Benefits from SDN/Open Networking

- **Programmability & Automation**
- **Network as a Service**
- **Open Standards & Interoperability**
- **Simpler management & control**
We need to be able to deliver a VM in less than one hour. Otherwise, we will lose thousand euros per month.

_Dell Customer_
Dell Software-Defined Networking

Powered by Open Networking—Choice + Capability

Dell Software-Defined Networking

Operating System Solutions
Disaggregating operating system software from hardware

Network Overlay Solutions
Disaggregating virtual networking from physical networking

Control Plane Solutions
Disaggregating network control from forwarding plane

Dell Open Networking
Disaggregating networking technologies to maximize capability and choice
How NVO work?

Host A

Host B

Host C

NVO Gateway

Baremetal Servers

Baremetal Servers

Legacy L4-7 appliances

NVO ignorant End Points

Virtual Infrastructure

Physical Infrastructure

VM

VM

VM

VM

vSwitch

vSwitch

vSwitch

vSwitch

NVO Controller (NSX, SCVMM, NVP)
Logical Topology – Overlay Networks
VMWare NSX +Dell
Compelling alternative to Cisco HDDC

✓ VMware for NVO solutions
✓ Distributed Controller Logical Switching, Distributed Logical Routing, L4 Load Balancing
✓ Distributed virtual firewall, Kernel Integrated
✓ NSX for vSphere (NSX 6.x) –
✓ NSX for MH (mixed hypervisor) (NSX 4.x)
✓ Dell Networking OS set up with AFM.
✓ Cumulus Linux on Dell switches for server centric management
Midokura Network Virtualization

- Alternative to VMware for NVO solutions
- More **cost-effective** compared to VMware NSX
- Any customer seeking open-source/ KVM/Openstack
- For DNOS and Cumulus Linux deployments (HW GW)
- Distributed Controller with centralized database
- Logical Switching, Distributed Logical Routing, L4 Load Balancing
- Distributed virtual firewall, Kernel Integrated
- Integration with CloudStack, Vmware and OpenStack
Dell Software-Defined Networking

*Powered by Open Networking—Choice + Capability*

**Dell Software-Defined Networking**

- **Operating System Solutions**
  - Disaggregating operating system software from hardware

- **Network Overlay Solutions**
  - Disaggregating virtual networking from physical networking

- **Control Plane Solutions**
  - Disaggregating network control from forwarding plane

**Dell Open Networking**

Disaggregating networking technologies to maximize capability and choice
Big Switch Cloud Fabric

- High Performance: Dense 10G/40G
- Latest Merchant Silicon HW: Trident II
- Scalable: Max scale of Trident II
- Resilient: Headless Mode Operations
- L4-7 Service Insertion & Chaining
- Hypervisor: ESX, Hyper-V, KVM, Xen
- Orchestration: OpenStack, CloudStack

Value-prop = Single “Logical” Switch (Zero-touch fabric, Dramatic TCO reduction)
NEC Solution Overview

✔ Offers a commercial OpenFlow solution
✔ NEC is a pioneer in SDN controller based solution
✔ Multi-Tenant network and VM provisioning
✔ TAP solution with OpenFlow
✔ OpenFlow network aggregates all packets. Operators can set flow filters within controller
✔ Integration with Dell networking: OS 9.4 and beyond; OF 1.0 + extensions to Dell

Any customer who wants an OpenFlow solution
Microsoft Hyper-V customers who want P+V solution
Last Frontier?
Dell Networking

NFV – The Next Frontier
What is NFV
Network Functions Virtualization

The virtualization of a wide range of different hardware-based telecom service functions

Executed as virtual network functions on software-defined x86 infrastructure

Benefits

• Improve service delivery cost structures
• Accelerate service innovation and creation
Functional comparison
Legacy service deployment vs. NFV service deployment

**Before**

- Single Function Appliances
  - Proprietary management
  - Proprietary Software
  - Runtime OS
  - Appliance Hardware

- Service Silos
  - Router/Packet Gateway
  - Proprietary OS
  - Proprietary ASICs

**After**

- Virtual Network Functions (VNFs)
- VNF Foundational Software
- NFVI Foundational Software
- OS & Virtualization Layer
- Open, standards-based hardware
- Management & Orchestration (MANO)
- Server
- Storage
- Networking
Dell NFV deployment options

Mobile
Dell NFV
3G
4G/LTE

Home
Dell NFV
xDSL
FTTH
Cable

Branch/Small Office
Dell NFV
Metro Ethernet
VPLS/MPLS over metro DWDM

Enterprise
Dell NFV
TDM
Ethernet

Carrier cloud/
data center

Other carrier,
metro

Carrier Core
IP/MPLS over long-haul DWDM

Internet/
Web

Unstaffed PoP
Central Office
Regional Data Center
Hyperscale Data Center

VRTX
HQ

Dell NFV

Public
cloud

Hosted private
cloud

Internet/
Web
Dell NFV Solution for Telco

To be continued......
Summary
Why Dell Networking – Open and Innovative

1. **Open Networking** First vendor to offer disaggregated networking model and leading the industry disruption in software defined compute, storage and networking.

2. **Leading Edge Innovation** Rapid execution model with rich product pipeline and industry first in delivering networking systems with state of art technology.

3. **End-to-End Solutions** Leading end-to-end solutions encompassing best in class servers, storage and networking products with global services and reach.

The Power To Do More
¡Muchas gracias por su atención!