Dell Networking

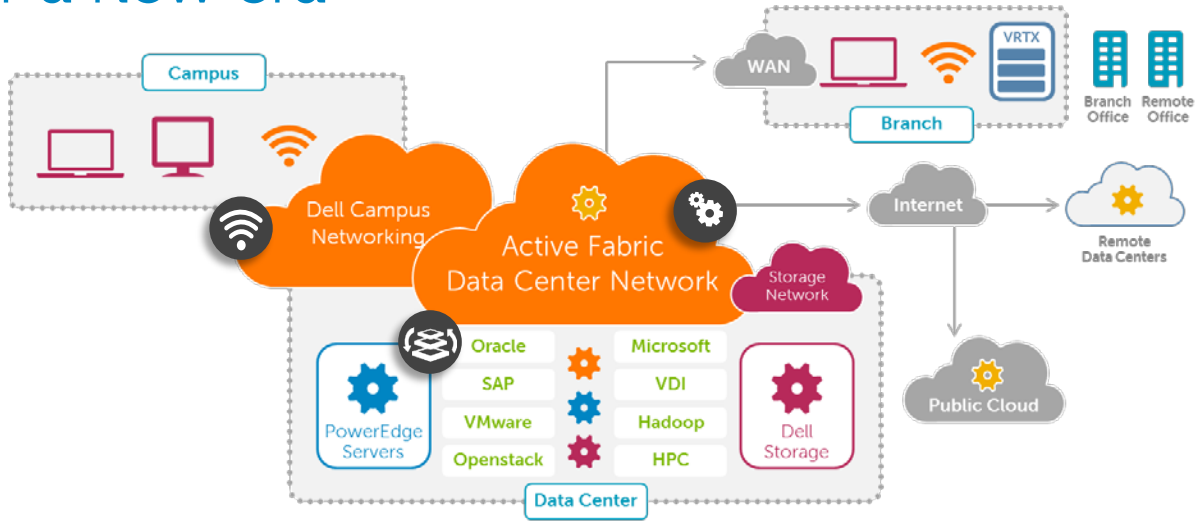
Kevin Corey

Dell Solution Centers

Modernize & transform your network

New solutions for a new era

Modernize & transform on your terms



In-rack solutions for the data center

Transform your data center with high performance 10/40GbE Ethernet platforms

Fabric solutions for the data center

Optimize architectures for east-west traffic & SDN initiatives

Wired/wireless solutions for the campus

Enable more devices and multimedia, less presence, and more remote capabilities

Dell Networking

Dell Networking product portfolio

Campus & Data Center Chassis Switches

C7004/7008

E600/E1200i
Modular

Blade I/O

1G		10GbE	10GbE/FC	10/40GbE
				
M6220	M6348	M8024-k	M8428-k	MXL

Fabric & Access Switches

1G		10GbE	10GbE/FC	10/40GbE	
					
S55/S60	N3000	S4810 / S4820T	S5000	Z9000	S6000
	N2000	N4000			

Wireless & BYOD

Controllers & Access Points

Indoor

Outdoor

Instant access Points w/ built-in controller

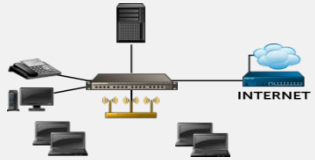
Guest access and BYOD

W-series ClearPass

Reference architectures for any network

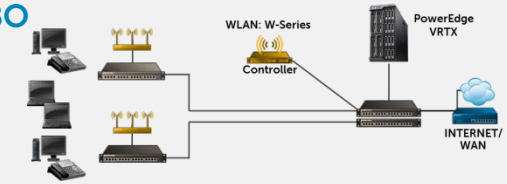
End-user networking

SOHO



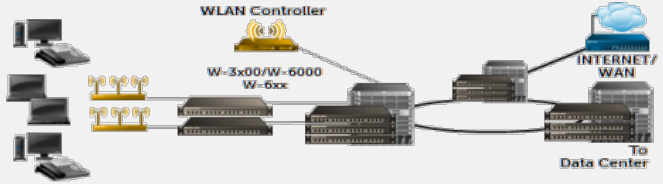
10s
End-users

ROBO



100-1000s
End-users

CAMPUS



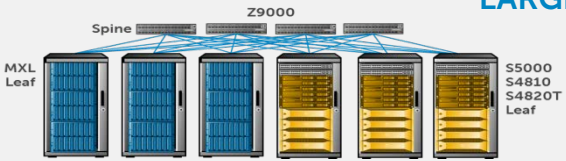
1000s+
End-users

Data center networking

SMALL/ MEDIUM

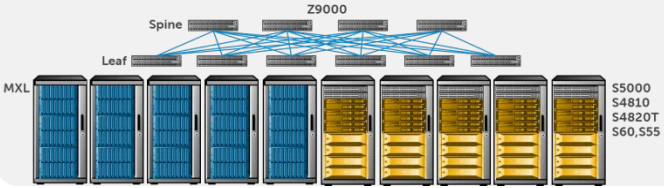
10s-100s
Server/VMs

LARGE



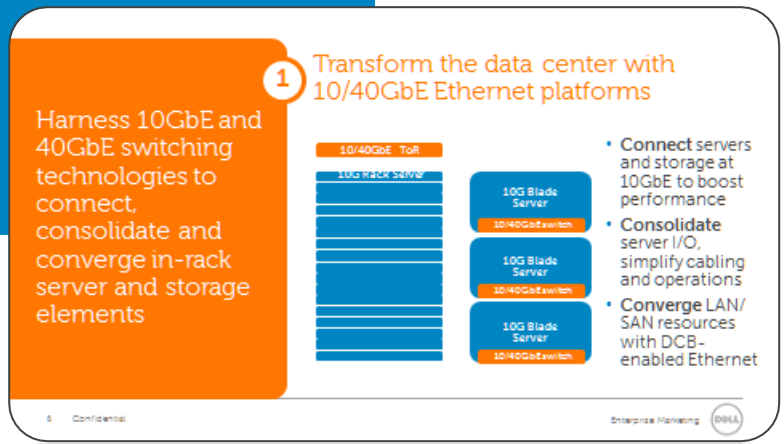
1000s
Server/VMs

EXTRA LARGE



1000s+
Server/VMs

Data center In-rack Solutions

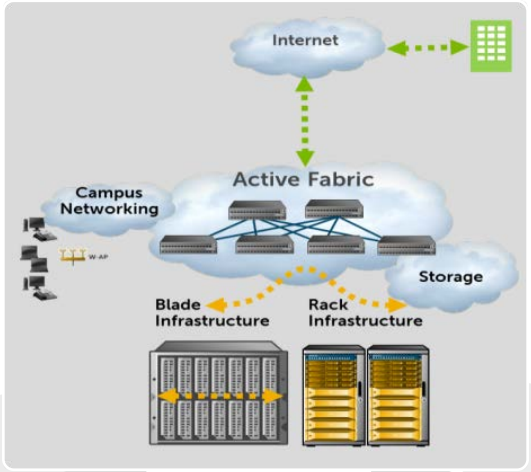


Challenges in the new data center

Changing physical and virtual networks

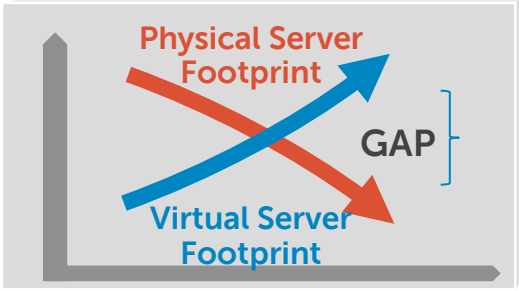
Changing infrastructure

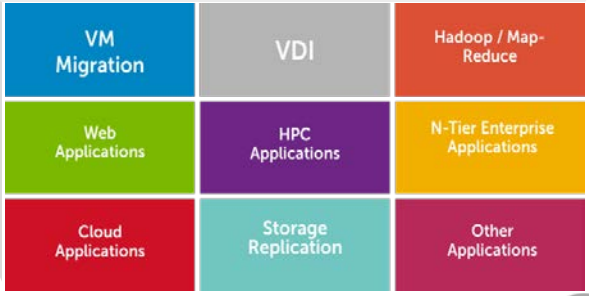
- Less physical
- More virtual
- More interfaces
- **How do you address the gap?**



New workloads

- More east-west traffic
- More physical consolidation
- More network bottlenecks
- **How do you optimize?**





Award-winning platforms across the data center

Automation, SDN & simplified management combine with highest performance

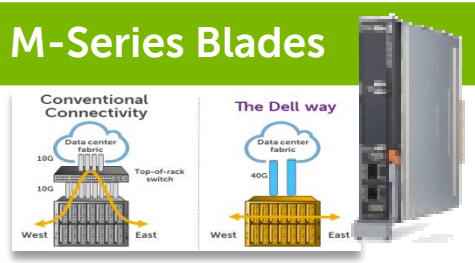
Z-Series Core and Fabric

- Purpose-built fabric switches for modern data centers
- Integrated automation and management built in
- Unique hybrid OpenFlow agent for SDN environments

S-Series Fabric & ToR

- 1/10/40GbE & 8G FC options
- Designed for virtualized & cloud environments
- Fresh Air™-capable models lets you run hotter and save costs

M-Series Blades



- First 10/40GbE switch for blade environments
- Local switching for highest performance
- Support for Dell Active Fabric™ solutions and today's east-west traffic

Introducing Z9500

Fabric switch

the Data Center super spine

2x
Density per RU
vs Cisco Nexus 9K

1\2
Power consumption
vs Cisco Nexus 6K

More performance and density, less space and less power

10 Tbps of blazing performance with up to 528 10GbE or 132 40GbE ports all in in 3RU!

Scale performance easily and cost-effectively

Customer friendly 'pay-as-you-grow' licensing enables performance on demand today and for the future

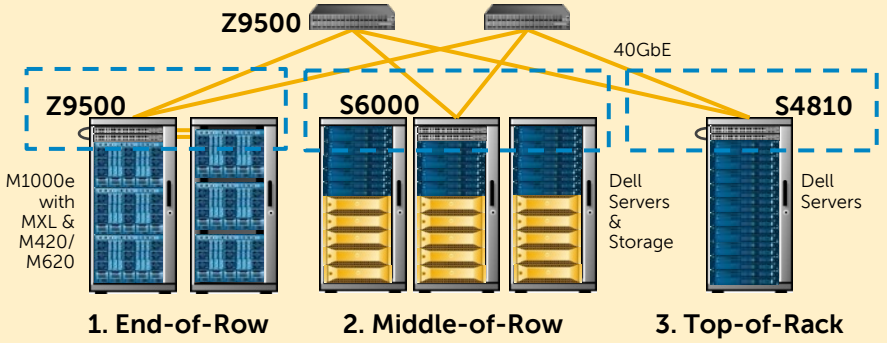
Simplify with integrated automation & programmability

OpenFlow, embedded automation tools, and REST APIs for a complete software-defined experience

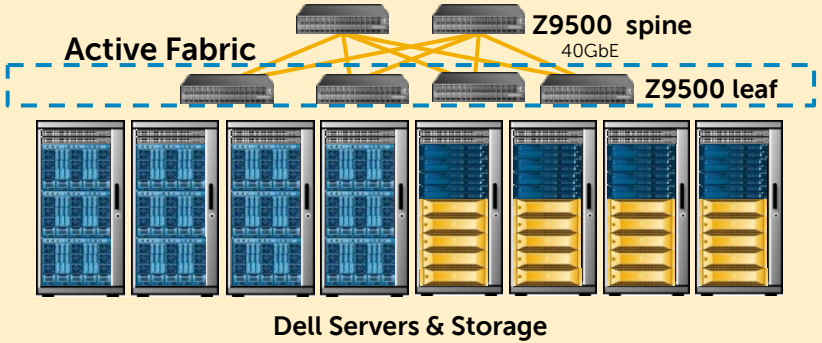
** Embargo until March 25, 2014 **

Simplified Data Center Infrastructure

10/40GbE EoR and Core switching



Active Fabric leaf and spine node



Simplify data center infrastructure

- High port densities consolidate networking functions at end-of-row with blade server systems
- Reduction in number of switches simplifies management

Accelerate data center infrastructure

- Active Fabric configuration for high-performance, low-latency fabric switching
- Accelerate East-West traffic, optimize application performance

** Embargo until March 25, 2014 **

Dell Z9000 fabric switch

High-density 10/40G in a rack-optimized fixed form factor

Scaling the data center core up, down and out

Read the report

Distributed Core Architecture

www.marketing.dell.com/force10-tolly-core-fabric-wp-f10

Product of the year award

Internet Telephony

Dell Networking Z9000

- 2.5Tbps in 2RU footprint
- High-density networking
  - 32 line rate 40GbE or
  - 128 line rate 10GbE
- Low power consumption
  - 800 Watts Max (6.25W per 10GbE)
  - 600 Watts Typical (4.68W per 10GbE)

Dell Networking S4810/20T switch

1/10/40GbE top-of-rack switch

Accelerate 1G to 10GbE migration

- **Dell Networking Operating System 9 powered** Top of Rack switch
  - 48 x 1/10G
  - 4 x 40G fabric uplinks (or 16 x 10G)
- **Built-in** virtualization support (VMware, Citrix)
- **DCB support** for SAN/LAN convergence (iSCSI, FCoE)
- Integrated **Open Automation**, scripting and programmatic management

Dell S4810

ITPRO INNOVATION AWARD
www.itpro.co.uk

Dell 4820T

Works with:

vmware CITRIX

+

Great with Dell servers & storage

Dell Networking S5000 unified switch

Dell's first fully modular 1RU top-of-rack and fabric switch

- **Pay-as-you-grow,** customizable modular unified switch
  - 10GbE; 40GbE
  - 2, 4, 8G Fibre Channel
- **Future-ready**, multi-stage design for next-gen I/O without rip & replace
- **Unified storage networking,** with complete support for iSCSI, RoCE, and FCoE with FC fabric services
- **Reduced management complexity,** Integrated automation, scripting and software programmability
- **Easy integration,** strong interoperability with major adapter, switch, & storage solutions

Dell Networking S5000

Up to 1.3X
higher port density/RU than
Cisco Nexus 5548

Up to 2.6X
higher port density/RU than
Brocade VDX 6720-24 or 6730-32

Dell Networking S6000 high-density switch

Purpose-built for the Virtual Era

- **High-throughput low-latency performance** for demanding workloads
- **Built-in virtualization** features to scale virtual machine deployment
- **Integrated** automation, scripting and programmatic management with **Open Automation Framework**
- **Energy-efficient**, low power solution, Fresh Air capable for chiller-less operation

Dell Networking S6000

- 2.56Tbps throughput
- DCB-enabled & SDN ready
- 32 x 40GbE or 96 x 10GbE + 8 x 40GbE, in breakout mode
- Designed for end-of-row; middle-of-row; top-of-rack; fabric switching

*Winner:

- 2013 Innovative Products & Solutions' award – China Network World
- 2013 Product of the Year' award - It168.com

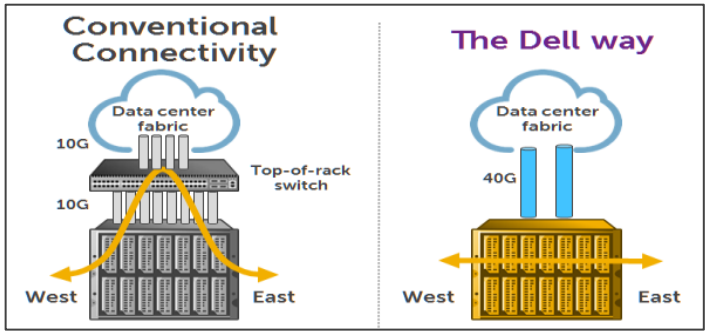
Dell MXL 10/40GbE blade switch

High performance full-featured 1/10/40GbE Layer 2/3 switch blade

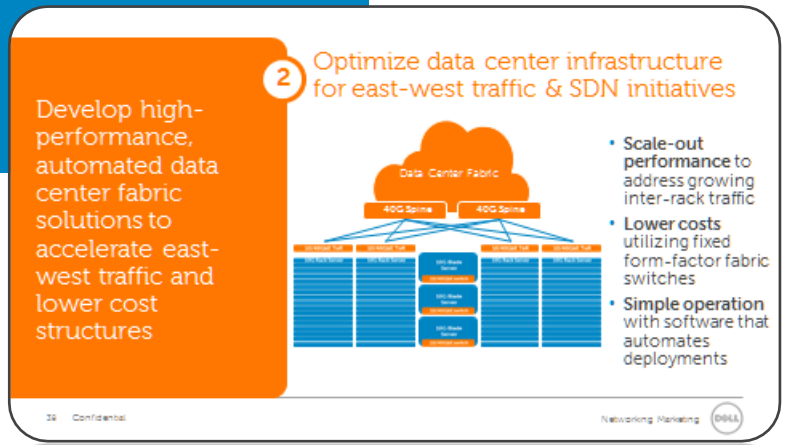
Designed for end-to-end converged networks

- 10/40GbE switching in the chassis
  - 32 x 10Gb internal ports
  - Up to 6 x 40Gb external ports/uplinks
  - FlexIO modules provides flexible “pay as you grow” capability
- Integrated automation, scripting and programmatic management

30-40%
CapEx savings



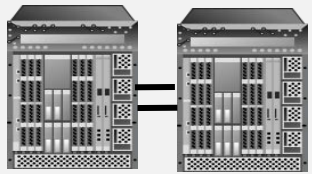
Data center Software Defined Fabric Solutions



Dell Active Fabric solutions

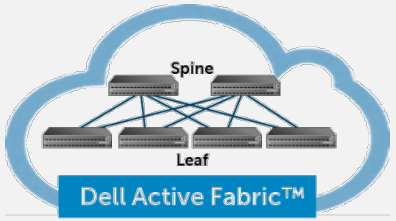
Simple SDN-enabled fabrics optimized for performance & cost savings

Conventional Core



- Traditional chassis-based architectures drive power, cooling and cost up
- Traffic is forced into a multi-tier pattern, adding latency

Dell Active Fabric



Gartner recommends fixed-form-factor switches "as an alternative to chassis-based switch architectures"*

- Reduce capital costs up to 70%, operational expense by up to 30%

- **77%** less power consumption than traditional networks
- **59%** average savings with Active Fabric™
- **86%** less time to design & deploy over manual installation

Gartner **Download** the report at Dell.com

**Rightsizing the Enterprise Data Center Network, 3/20/13
http://www.dell.com/Learn/us/en/uscorp1/secure/gartner-enterprise-data-center-network

Featuring

Active Fabric Manager

software-defined fabrics

Network Virtualization 2013 Product of the Year

SVC awards 2013 WINNER

APIs

for **OMNM, VMware & OpenStack**

86%

Less time to deploy over manual installation

✓ **Scale out performance to address growing inter-rack traffic**

Plan for the future with fabric solutions SDN-ready out of the box with flexible options based on your needs

✓ **Lower costs utilizing fixed form-factor fabric switches**

Reduce costs up to 59% using fixed form factor switches versus expensive large chassis legacy switches

✓ **Automate deployments and simplify management**

Take advantage of over 100 pre-defined layer 2/3 fabric designs quick-and-easy configuration and deployment

Accelerate the design and deployment of network fabrics

- **NEW! Manage multiple fabric environments through a single pane of glass**
  - One console to Design, Build and Monitor a fabric
- **Reduce the time required for designing and deploying fabric installations by 86%**
  - 1/8 the time for deploying a fabric
  - **New!** Discover existing installed fabrics
  - **New!** Northbound API's for integration with OMNM, VMware vSphere and OpenStack Neutron
- **NEW! Take advantage of 100+ pre-defined, validated templates for layer 2 and layer 3 fabric designs** Layer 3 Fabrics
  - Layer 2 Fabrics – VLT
  - **NEW!** Layer 2/3 Fabrics – Routed VLT
  - **NEW!** LAN/SAN Fabrics

Dell Active Fabric™ Manager

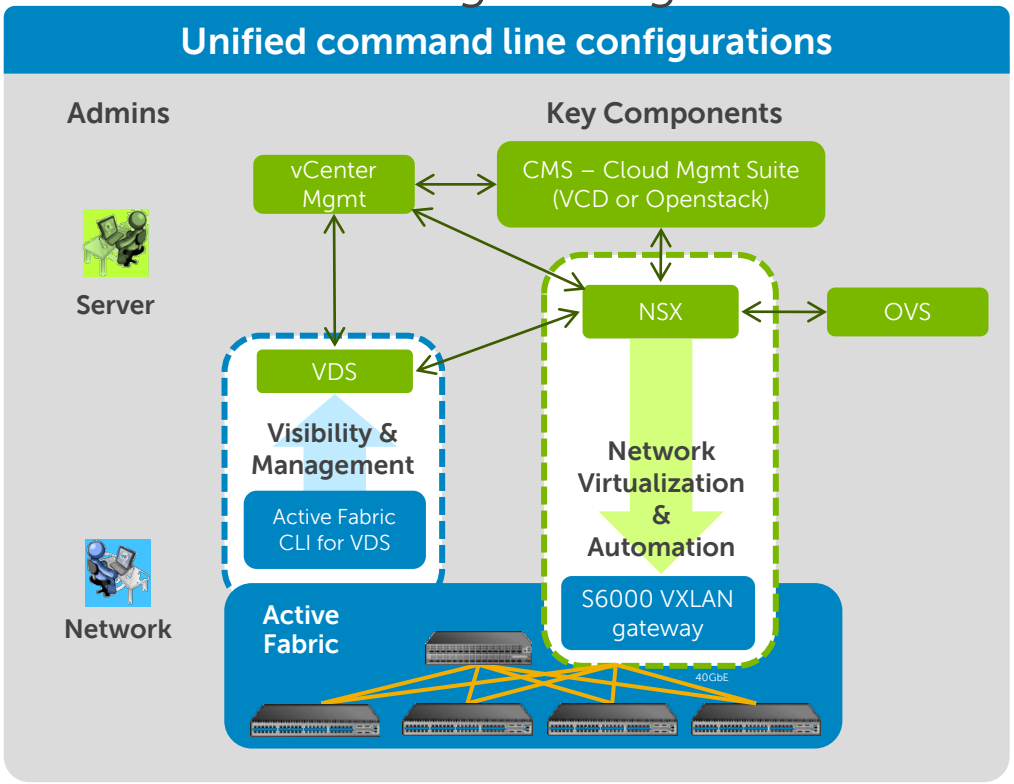
Industry Leading Power, Cooling & Density:

- 77% Less Power*
- 79% Less Heat Output*
- 59% Less Racks Units*

*Versus comparable Cisco Nexus 7k/5k solutions

Tools for network virtualization

Active Fabric Manager Integration for VMware vDS



VMware vDS support in AFM 2.0

- Enables common design templates and command line syntax between physical and virtual fabric switches
- Provide familiar CLI interface to manage virtual switches

Common management

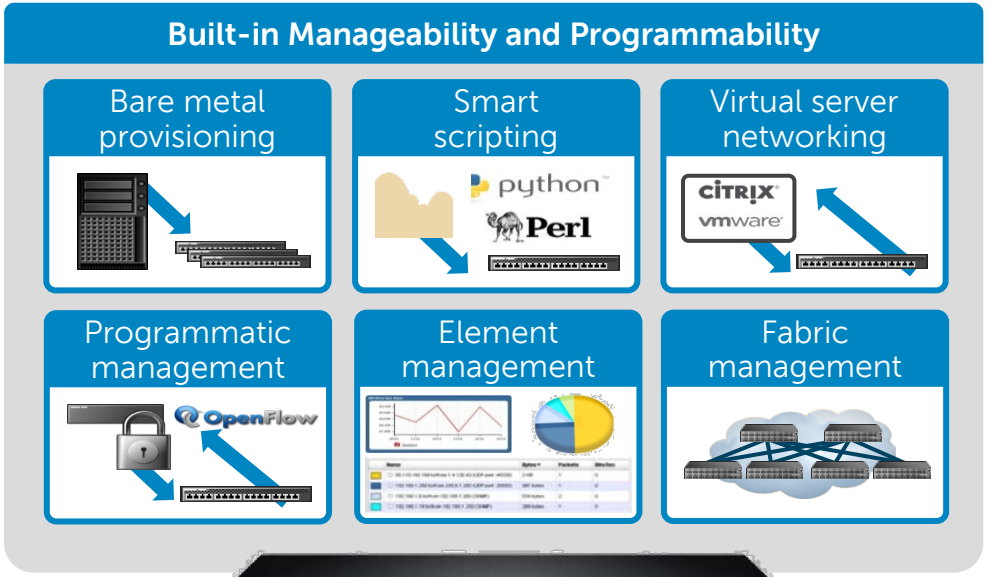
- Provide a single view into data center fabric design, configuration, and monitoring across physical and virtual switches
- Leverage to simplify operations and optimize performance

Common practices

- Leverage industry-standard command line syntax across physical and virtual switches
- Establish common procedures, save time

Streamline network operations with Open Automation

Built-in management, automation, energy-efficiency features



Dell Networking

Built-in automation features

- Deploy systems faster; automate VM mobility/VLAN configuration

Integrated DevOps features

- Leverage common scripting environments and tools across compute and networking

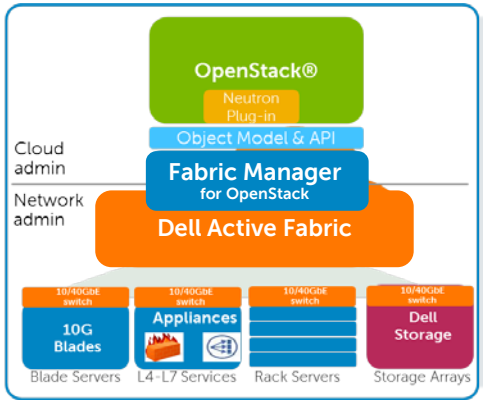
Energy Efficient

- Fresh Air® Advanced power and thermal characteristics to operate at higher temperatures, lowering CAPEX and OPEX

Introducing Active Fabric Manager for OpenStack

Zero Touch
Virtual Fabric deployments

Secure
SonicWALL firewall integration



Simplify network virtualization with automated setup
✓ Automated topology design, bare-metal provisioning & configuration simplifies deployment and scaling

Deliver adaptive security customized for each application
✓ Inherent VM awareness & real-time policy changes ensure persistent security

Transform IT service delivery with lower cost and greater agility
✓ OpenStack-adopted application & policy processes eliminates complex, redundant & error prone manual configurations

** Embargo until March 25, 2014 **

Dell Networking Operating System 9

Reliable Operation

Industry hardened modular design

- **VLT multi-path**
- **Advanced switching & Routing**
- **Multi-tier authentication**
- **Industry standard command syntax**

Automation

Integrated orchestration & automation

- **Bare metal provisioning**
- **Automation of repetitive tasks with scripts**

Scalable Performance

Tested and verified from cloud to enterprise

- **Architected for feature-rich operation at scale**
- **Proven in the largest most-demanding environments**

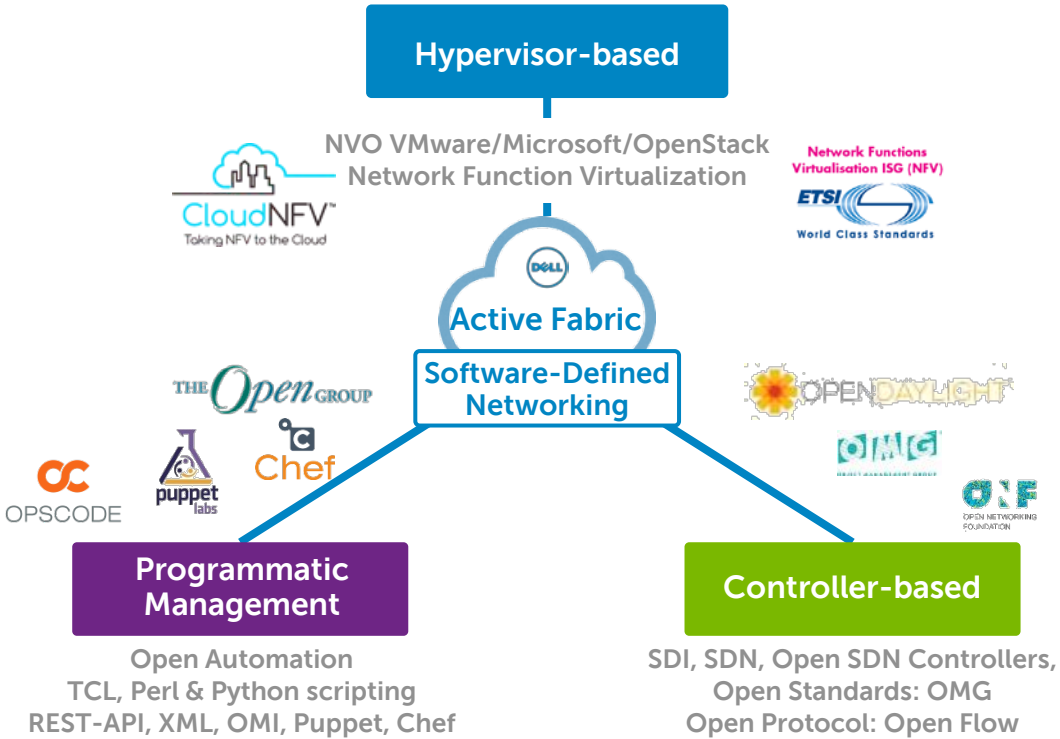
Software Defined Networking

OpenFlow & Industry standard APIs

- **Industry standards**
- **OpenFlow support**
- **RESTful APIs for programming the forwarding plane**

Comprehensive SDN strategy

Hypervisor-based, controller-based, programmatic management



Hypervisor-based

- Hypervisor-agnostic solutions for network virtualization and network function virtualization

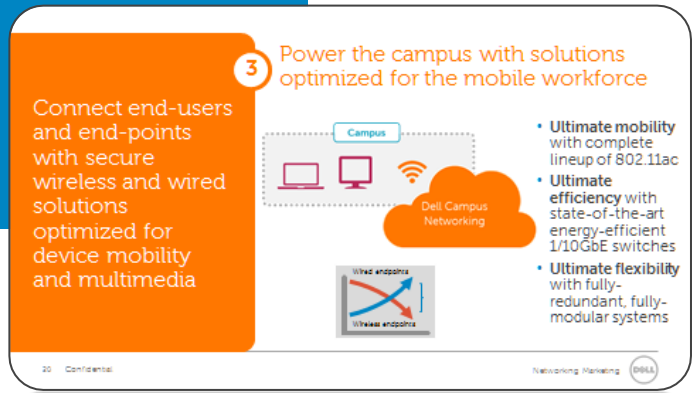
Controller-based

- OpenFlow solutions based on open standards and open source innovations

Programmatic management

- Legacy programmability using standard management interfaces and scripting languages

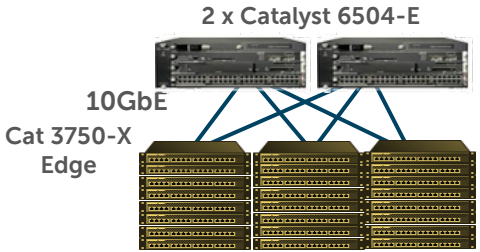
Dell Networking solutions



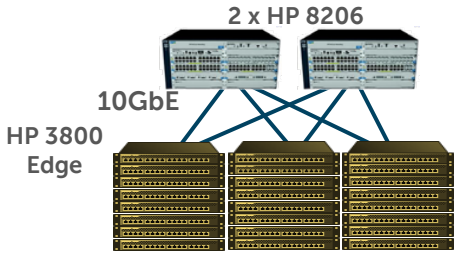
Redefining campus LAN economics

For 3072 PoE+ port Campus design, The Dell 8100 consumes **1/4th the power**, is **1/2 the price** and delivers **3x more headroom**, versus Cisco and HP.

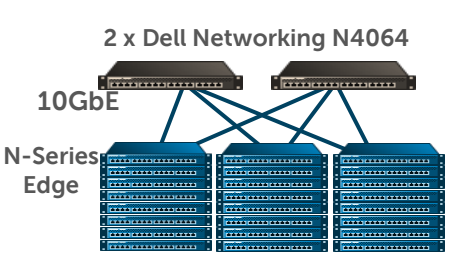
Cisco Catalyst



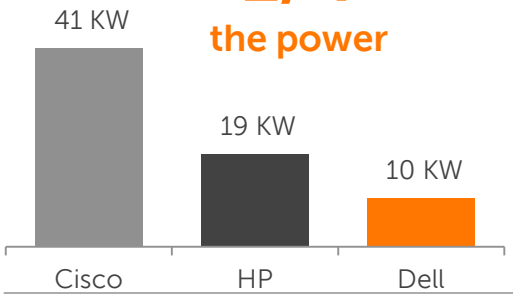
HP ProCurve



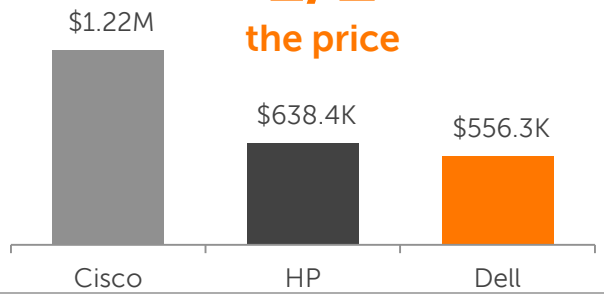
Dell 4000



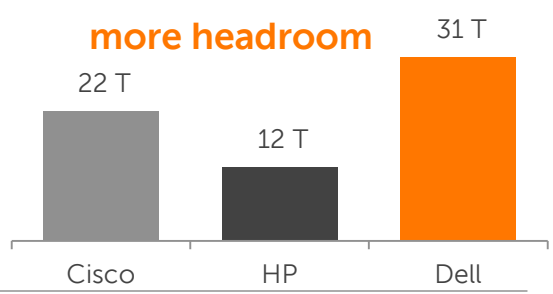
1/4 the power



1/2 the price



3x more headroom



Modern campus solutions for a modern enterprise

Unlock the network and empower productivity your way

802.11ac wireless

Wireless
W-Series

Ultimate mobility

Wireless access utilizing 802.11ac gigabit wireless for unprecedented performance and scale

1/10GbE switches

Access
N-Series

Ultimate efficiency

Energy-efficient 1/10GbE switches designed for modernizing and scaling campus networks

Space-optimized chassis

Chassis
C-Series

Ultimate versatility

Fully redundant, fully modular 1/10/40GbE switching system for high availability and resiliency

- ✓ **Scalable**
  Up to 30% more performance*
- ✓ **Simple**
  Familiar tools and practices for easier deployment & management
- ✓ **Flexible**
  TCO lowered by up to 60%**

*compared to Cisco Catalyst 6500-E series

** www.miercom.com/2013//05/dell-networking-7000-8100-switch-series/

Dell W-Series Wireless platform

Pervasive mobility across the enterprise

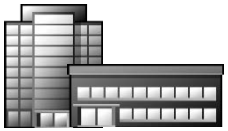
Guest Access & BYOD – ClearPass

- Centralized Visitor & Employee Management
- Automated BYOD
- Multi-vendor

Enterprise

Virtual Controllers

- Rapid Deployment
- Easily Scalable



Branch Office

Virtual or Controller-Based

- Maximum Flexibility
- Controlled Scalability

Controller-Based

- Centralized Management
- Maximum Security

Home / Remote

Wireless network scale

Wireless network complexity

Dell Networking N2000 Series

1 Gigabit Ethernet with Layer 2+ capabilities

Key features and innovations

- Up to 220 Gbps switch fabric capacity.
- Supports up to 48 line-rate 1GbE ports per switch and up to 600 1GbE ports in a twelve-unit stack
- Standard N-Series stacking cables and built-in ports for cost-effective high-performance stacking at up to 84 Gbps
- Advanced Layer 2+ functionality with up to 256 static routes and Routing Information Protocol (RIP) included supporting up to 256 interfaces
- Advanced network security including highly configurable ACLs
- USB Rapid deployment expedites switch configuration
- Energy Efficient Ethernet (EEE) and lower power PHYs reduce power to inactive ports and idle links
- Fresh Air® compliant for higher temperature environments

Energy efficient and cost effective

A powerful and economical 1/10 Gigabit Ethernet switching solution for efficient Layer 2+ access for end user devices, entry-level servers, and network devices. Up to twelve switches can be stacked and managed with a single IP address to deliver reliable network performance.

Products

Model	Port configuration
N2024	24x RJ45 10/100/1000 Mb ports, 2x SFP+ ports, 2 stacking ports
N2024P	24x RJ45 10/100/1000 Mb PoE+ ports, 2x SFP+ ports, 2x stacking ports
N2048	48x RJ45 10/100/1000 Mb ports, 2x SFP+ ports, 2 stacking ports
N2048P	48x RJ45 10/100/1000 Mb PoE+ ports, 2x SFP+ ports, 2x stacking ports

Dell Networking N3000 Series

1 Gigabit Ethernet with advanced Layer 3 capabilities

Key features and innovations

- Up to 260 Gbps switch fabric capacity
- Supports up to 48 line-rate 1GbE ports per switch and up to 624 1GbE ports in a twelve-unit stack
- Hot swap expansion module supporting dual SFP+ and dual 10GBaseT
- Standard N-Series stacking cables and built-in ports for cost-effective high-performance stacking at up to 84 Gbps.
- Advanced Layer 3 functionality included
- Dual 80PLUS-certified hot swappable power supplies, Energy Efficient Ethernet & lower power PHYs reduce power to inactive ports and idle links
- Tool-less ReadyRails™ significantly reduce rack installation time

Power efficient density for campus or small-scale data center deployments

A power efficient and resilient 1/10 Gigabit Ethernet switching solution for advanced Layer 3 distribution and dense PoE+. Dual hot-swappable 80Plus-certified power supplies add resiliency and the capacity to provide up to 48 ports of PoE+ (up to 30.8 watts) in a 1RU footprint.

Products

Model	Port configuration
N3024	24x RJ45 10/100/1000 Mb ports, 2x SFP+ ports, 2 combo media ports, 2x stacking ports, 1x hot swap expansion module bay
N3024F	24x SFP 1000 Mb ports, 2x SFP+ ports, 2x combo media ports, 2x stacking ports, 1x hot swap expansion module bay
N3024P	24x RJ45 10/100/1000 Mb PoE+ ports, 2x SFP+ ports, 2x combo media ports, 2x stacking ports, 1x hot swap expansion module bay
N3048	48x RJ45 10/100/1000 Mb ports, 2x SFP+ ports, 2x combo media ports, 2x stacking ports, 1x hot swap expansion module bay
N3048P	48x RJ45 10/100/1000 Mb PoE+ ports, 2x SFP+ ports, 2x combo media ports, 2x stacking ports, 1x hot swap expansion module bay

Dell Networking N4000 Series

10 Gigabit Ethernet with advanced Layer 3 capabilities

Key features and innovations

- Up to 1.2Tbps switch fabric capacity
- Supports up to 64 line-rate 10GbE ports per switch and up to 672 10GbE ports in a twelve-unit stack with user port stacking at up to 320 Gbps
- Hot swap expansion module supporting dual QSFP+ (8 x 10GbE), Quad 10GBaseT, and Quad SFP+
- Plug-and-Play configuration with Dell EqualLogic™ and validated with Dell Compellent™ iSCSI storage arrays
- Dual 80PLUS-certified hot swappable power supplies
- Energy Efficient Ethernet (EEE) and lower power PHYs reduce power to inactive ports and idle links
- Tool-less rails significantly reduce rack installation time

Deliver more bandwidth in the campus core

A high density, power efficient, and flexible 1/10/40 Gigabit Ethernet switching solution for simple scalability and high density. Resilient stacking architecture delivers reliable network performance and amazing density for demanding network environments. Helps future-proof investments as enterprises migrate from 10GbE core deployments to 40GbE.

Products

Model	Port configuration
N4032	24x 10GBASE-T ports, 1x hot swap expansion module bay
N4032F	24x SFP+ 1Gb/10Gb ports, 1x hot swap expansion module bay
N4064	48x 10GBASE-T ports & 2x 40Gb QSFP, 1x hot swap expansion module bay
N4064F	48x SFP+ 1Gb/10Gb ports & 2x 40Gb QSFP, 1x hot swap expansion module bay

High density C-series managed chassis switches

Fully redundant, modular 1/10/40GbE switching system for high availability and resiliency

Scale the network easily

- Resilient switches for Aggregation & Campus
- 192 to 384 ports GbE or, up to 64 10GbE or 48 40GbE ports
- Fast Recovery, High Availability, cost-effective 10GbE trunking
- TAA-ready for government installations

Model	Port configuration
C7008/ 300	13RU 8-slot chassis, up to 384 line-rate GbE or 64 line-rate 10GbE, PoE+
C7004/ 150	9RU, 4-slot chassis, up to 192 line-rate GbE or 32 line-rate 10GbE, PoE+

Wire-speed Performance & Reliability

- Switch Fabric capacity up to 1.536Tbps and up to 952Mpps L2/L3 packet forwarding capacity
- High availability with 1+1 Route Processor Module design

Optimized iSCSI operation

- Plug-and-play configuration with iSCSI arrays such as Dell EqualLogic™ PS-Series

Efficient operation

- Intelligent power management features provide automatic sensing, provisioning and management of PoE power

Flexibility of connectivity with line cards

- 4, 8, 16 port 10GbE
- 48 port GbE, PoE, PoE+ options
- 36 port FlexMedia
- 6 port 40GbE

New Dell Networking Campus software

Operating Systems

Advanced software with a familiar CLI for skilled administrators

- **L2 multi-path (VLT/MLAG)**
- **Advanced switching & Routing L3**
- **Multi-tier authentication**

Automation

Zero touch provisioning and automation for your campus network

- **OpenManage™ Network Manager**
- **USB rapid deployment**
- **Bare metal provisioning**
- **Automation of repetitive tasks with scripts**

Reliability

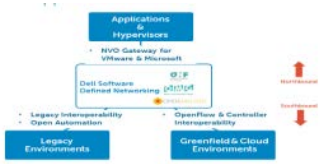
Assured traffic flow in campus networks

- **No traffic interruption during platform upgrades**
- **Non-stop forwarding**
- **Loop free networking**
- **OS based on Linux kernel**

Software Defined Networking

Unbiased & complete approach to software defined infrastructures.

- **Industry standards**
- **OpenFlow support**
- **APIs for programming the forwarding plane**



Dell Networking ecosystem

Dell Networking: Driving greater value through partnership

Partners, standards, open initiatives

Load Balancing	WAN Optimization	Hypervisors	SDN & Alternative OS
f5	Silver Peak riverbed	vmware Microsoft CITRIX	NEC Empowered by Innovation cumulus

Chairperson
IEEE high-speed working group

Chairman
ethernet alliance

Founding member
Open Networking Foundation

Board of Directors
OMG WE SET THE STANDARD

Summary

FY15 Key Networking Introductions*

Released

Fibre Channel Flex IO

Changes your m1000e chassis into a converged server solution, adding FCoE & Fibre Channel services

Launched

Open Networking

Dell leads the industry in offering industry standard Linux distribution support for select Dell switches

Launched

Z9500 fabric switch

With over 10 Tbps & 132 x 40GbE or 528 x 10GbE, the Z9500 delivers unparalleled scalability & flexibility

Dell Active Fabric™ Manager

Now available with over 100 customizable templates and automated deployment

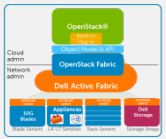
W-series 802.11ac Access Points

Building out coverage and capacity for wired performance at the wireless edge

X-series

Revolutionary user design & actionable monitoring in a smart-managed family of Ethernet switches

Active Fabric™ controller for OpenStack



A complete virtualized & zero-touch deployment activated fabric for OpenStack environments

Stay Tuned…

… There is more to come in FY15 from Dell Networking!

*planned; schedules & plans subject to change

Networking momentum continues throughout 2013

Dell is the **ONLY** networking provider to outpace the market for the past 12 consecutive quarters

#3 in Ethernet **Blade Switching** with the fast growing Dell MXL 10/40GbE blade interconnect

12 consecutive quarters of year over year growth

#3 in **40 Gigabit Ethernet** switching

#4 Market Leader in overall Ethernet switching

#3 in **overall fixed form factor** Ethernet switches

Source: Dell'Oro Q3CY13 Report

Thank You