Dell Networking
校園數據中心與區域網路的安全佈署
One Tier

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Agenda

Start From..............

Security ?!

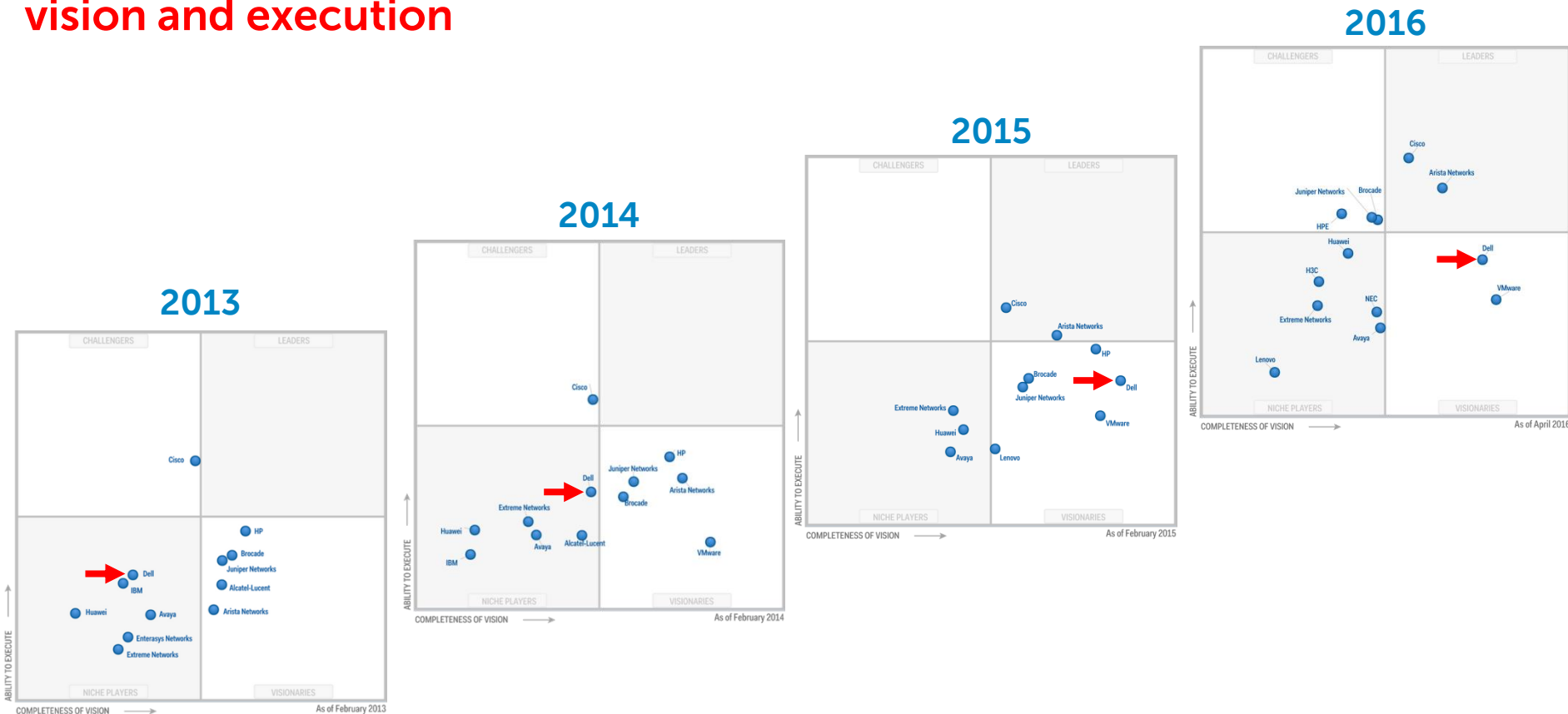## ....in your campus networks

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Where we are !?

Gartner MQ Data Center Networking Progress

Recognized for our
vision and execution

Dell Position in Data Center Networking MQ

- Summary: Dell recognized as *the leading visionary networking company in the industry*, seeing the most positive improvement on the Magic Quadrant YoY versus all competitive vendors.

- Dell recognized as "**the most innovative and disruptive** mainstream data center networking vendor in the market." –as indicated by right-most positioning

- Calls out Dell as a "top-four" player in the data center networking space.

- Additional Dell strengths:
  - Most open, standards-based to meeting customer data center requirements in the industry
  - Dell's ability to provide end-to-end solutions for the complete data center
  - Dell is the number 3 vendor for 40GbE port shipments.

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CHALLENGERS   LEADERS

Cisco

Arista Networks

HP

Brocade

Extreme Networks

Juniper Networks

Dell

Huawei

VMware

Avaya   Lenovo

ABILITY TO EXECUTE

NICHE PLAYERS   VISIONARIES

COMPLETENESS OF VISION

As of May 2015

Source: Gartner (May 2015)

Once again, Gartner placed Dell in the "Visionary" quadrant

Gartner.........
Data center networking continues to evolve, with increasing choices for open and disaggregated network solutions, while other vendors aim for more closed, proprietary systems

" Dell's *Future-Ready Enterprise strategy* offers customers flexibility and investment protection, adding this: "Consider Dell for all data center networking opportunities, especially when an open, flexible solution is desired."

Gartner "Vendor Rating: Dell" May 2016

Source: Gartner (May 2016)

Dell Networking Solution

1 **Data Center**

2 **Campus**

2 **Wireless**

Data Center

SDN

Dell
Open Networking
-ON

X-Series
N-Series
Aerohive
W-Series Instant
OpenManage

Networking

Branch/SMB

Branch Office   Remote Office

N-Series
C-Series
W-Series
Aerohive
OpenManage

Networking

Campus

WAN

Carrier Access

Internet

Cloud Services

Z-Series
S-Series
M-Series
FN-Series
Active Fabric Manager
OpenManage

Enterprise IT services

Compute

Storage   Management

Networking

Data Center

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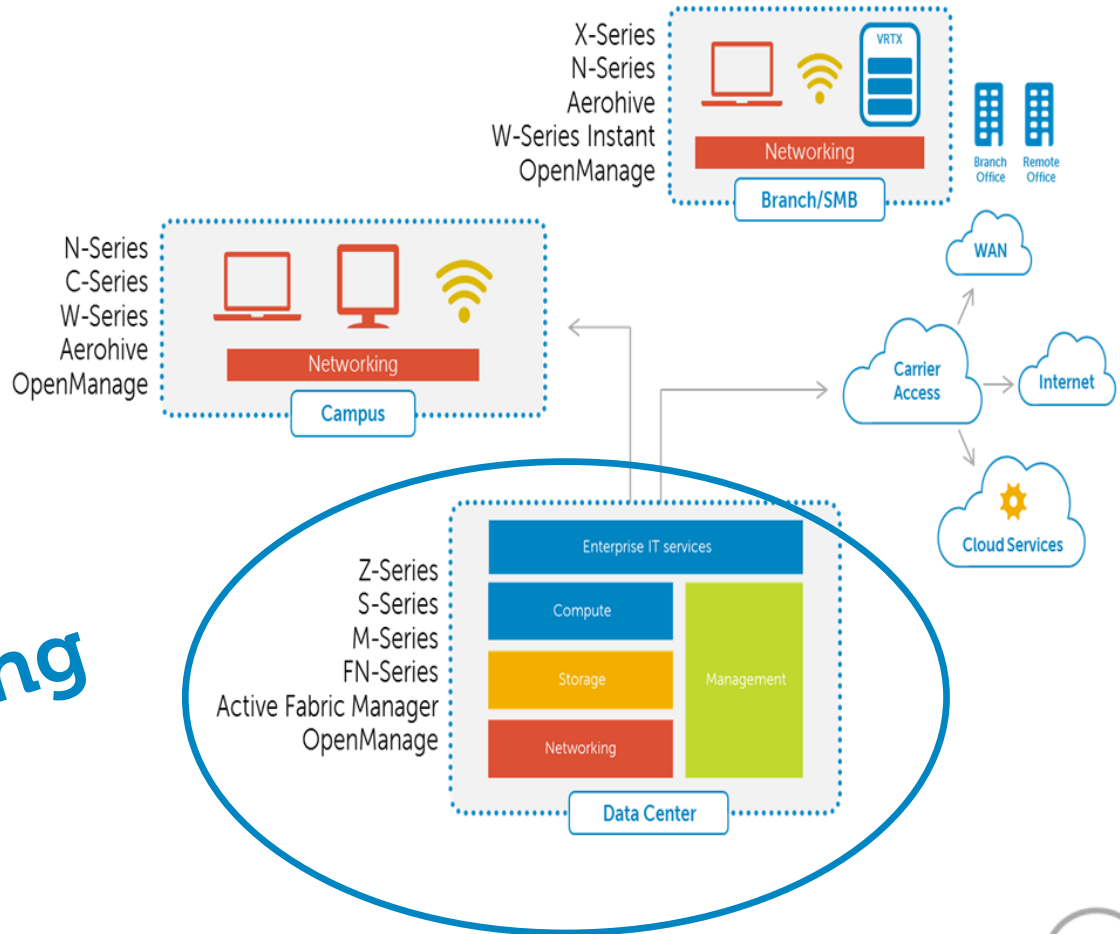
Dell 主動式網路架構

- 全球 "統一" 架構佈署
- 架構簡單，佈署容易
- 依營運需求擴容

- 分散式備援，及可預測災難影響範圍
- 縮短災難復原時間。
- 研究與實現 SDx/SDN

Dell Active Fabric Topology

Active   Active

10/40/100G

Active - Active
資料數據中心

Active - Active
辦公室網路

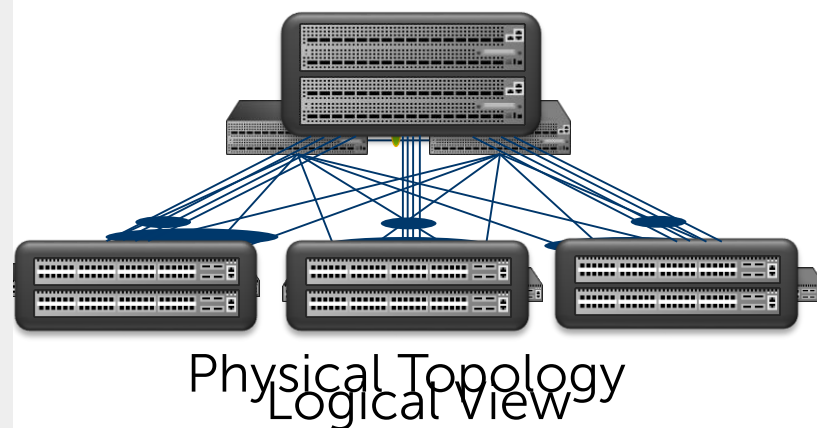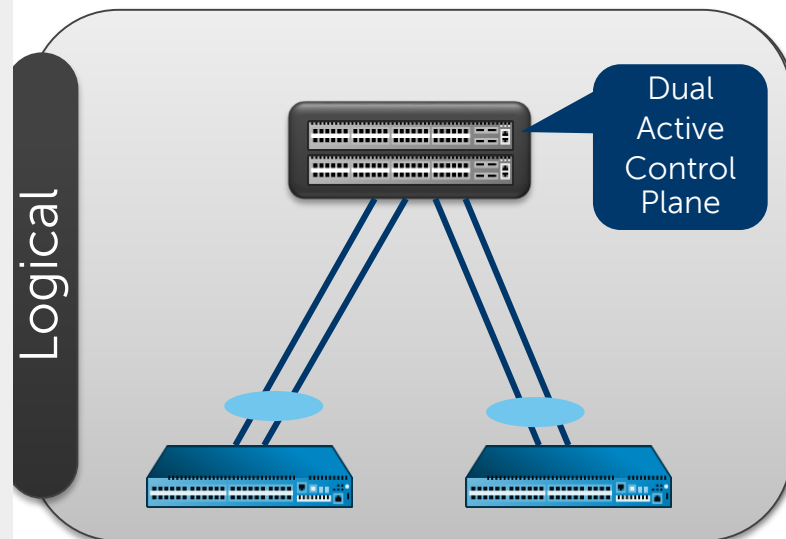Active - Active
分公司網路

未來擴充
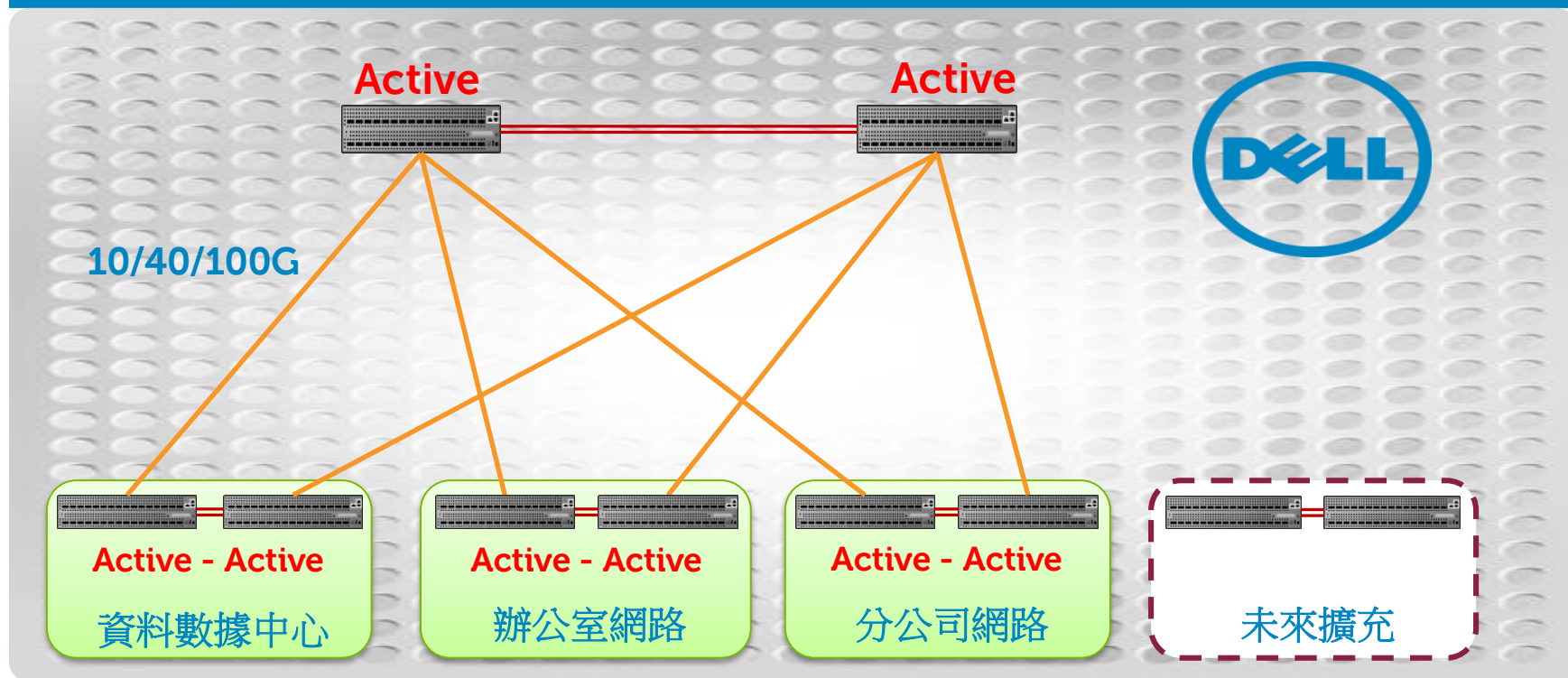
VLT- Virtual Link Trunking

VLT/mVLT: Feature Overview

VLT: Multipath LAG

✓ VLT is a key ingredient of Active Fabric that enables multiple L2 paths in the fabric.

✓ Unlike stacking, VLT is Dual Active Control Plane

✓ Works with any standard LACP implementation to form VLT LAG – No Vendor Lockup

mVLT: Interconnecting multi domain

✓ Interconnect multiple VLT domains by simple VLT LAGs

✓ Create Hierarchical VLT by interconnecting multiple VLT domains

✓ Build scale out Clos network with increased port density

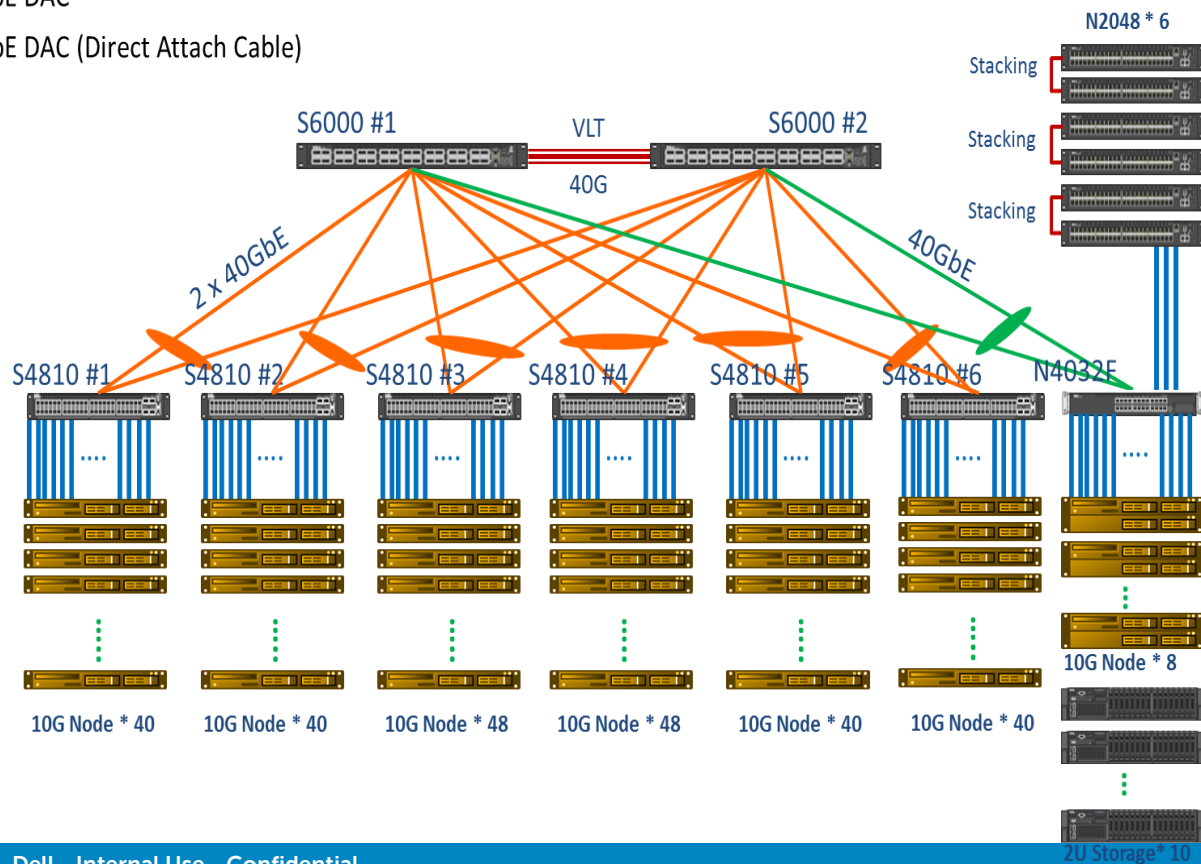✓ VLT proxy gateway to stretch L2 VLAN across DC and avoid traffic trombone

Logical

Dual Active Control Plane

Physical Topology
Logical View
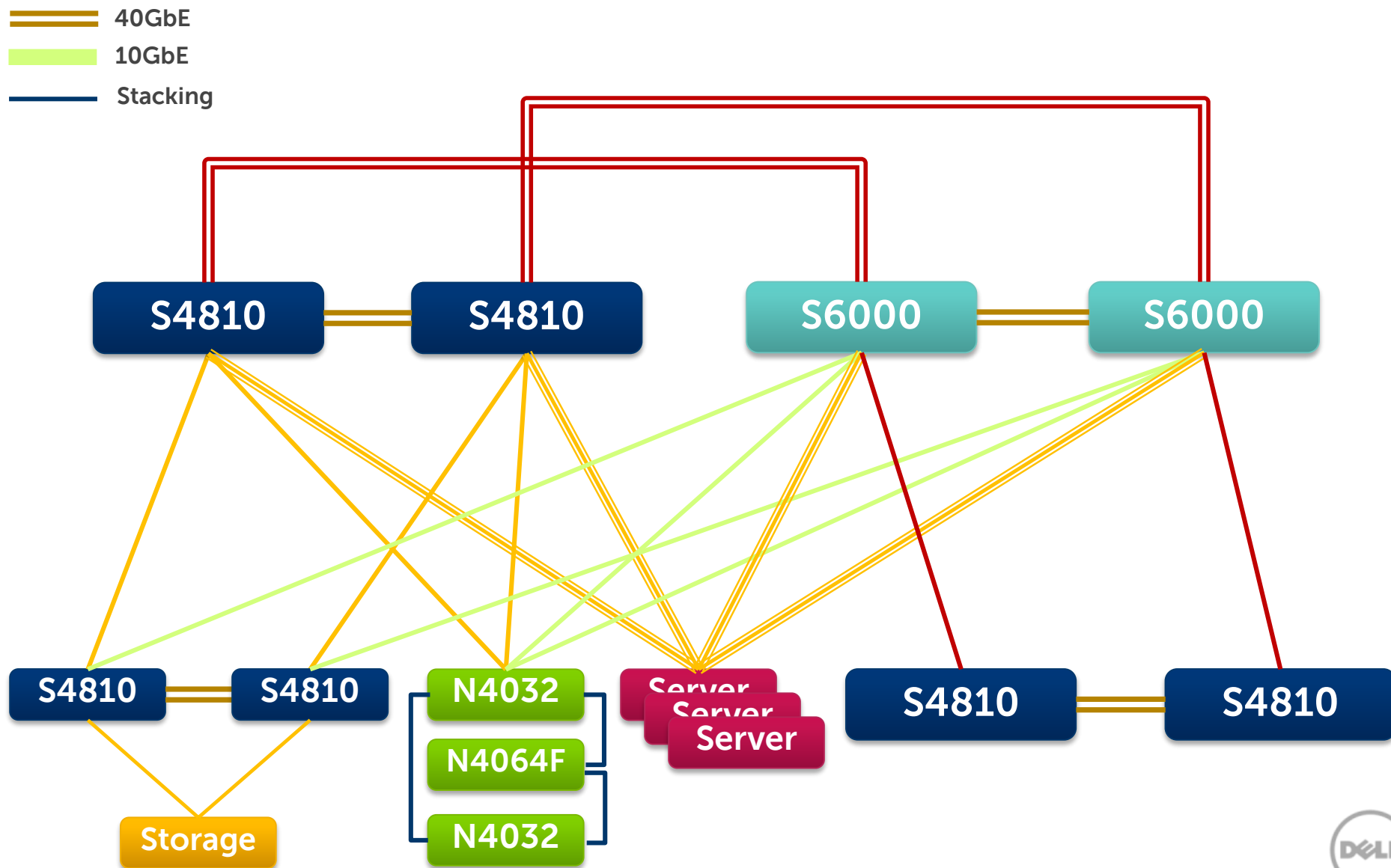
TW Case- HPCC S6000/S4810P

採用二台DELL S6000實現Active-Active 保護與6台S4810P 形成Spine/Leaf 故具備HPCC 所需高密度高容量外，且達到 快速擴充需求及Low-Latency能力，故選用直連40/10G Fiber Ports 交換機彼此相互直連。本架構需運行HPCC 高速 運算效能外並需具有iSCSI能力完成大量料儲存兼容。

佈建理由:
- 實現**HPCC** 架構及達到 低延遲與快速佈署需求
- 捨棄**ECMP**應用但需實現 **D.C**所需**Active-Active**

競爭對手:
Cisco, InfiniBand, HP

致勝關鍵:
- **Active-Active**主動式備 援架構 **&ECMP**
- **Full Ethernet feature**
- **L2 Spine-Leaf 架構**
- **mVLT實現消除STP**
- **1U 32 40G 高密度佈屬**
- **Low-Latency (<600ns)**

— 40GbE MTP Fiber Cable
— 40GbE DAC
— 10GbE DAC (Direct Attach Cable)

N2048 * 6

Stacking

S6000 #1   VLT   S6000 #2
                40G

Stacking

Stacking

2 x 40GbE   40GbE

S4810 #1   S4810 #2   S4810 #3   S4810 #4   S4810 #5   S4810 #6   N4032F

....

10G Node * 40 10G Node * 40 10G Node * 48 10G Node * 48 10G Node * 40 10G Node * 40

10G Node * 8

2U Storage* 10

設備部屬:
S6000*2
S4810P*6
N4032F*1
N2048*6

TW Case – S4048-ON VLT

透過Active-Active架構解決多層式架構來簡化STP 運算，並可達到快速的橫向擴充(Scale-out) 來實現快速佈署，而利用DELL S4048-ON 低延遲能力可加速Server與 Storage資料存取。
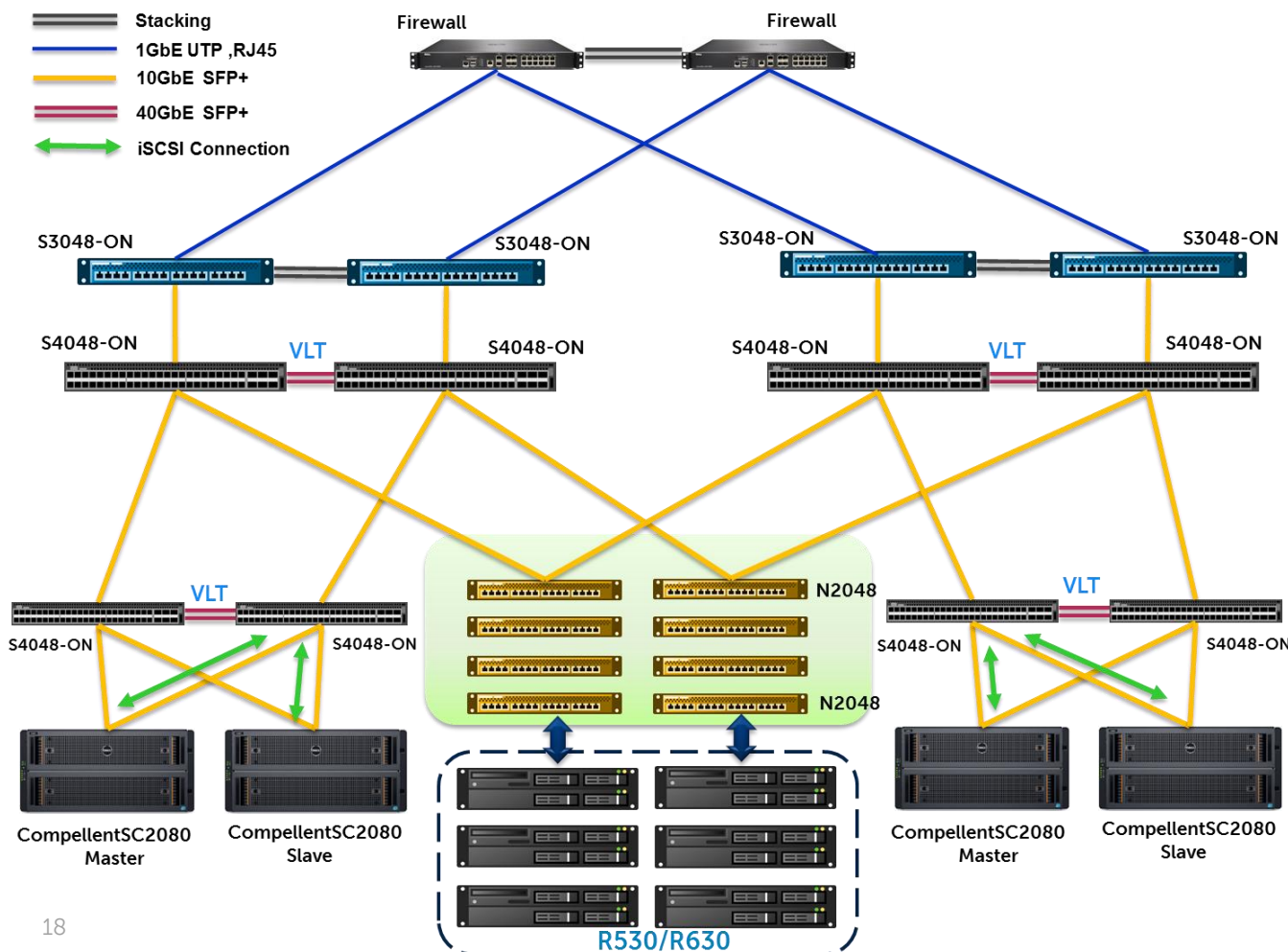
佈建理由:
- 需可依需求自由靈活的擴充服務，實現橫向擴充(Scale-out)架構
- 簡化STP達成Active-Active 雙活保護重要服務不中斷

競爭對手:
Cisco, HPE, Brocade, Extreme

致勝關鍵:
- **Scale-out**
- **Active-Active/ON**
- **Pro Support Plus Service**

設備部屬:
S4048-ON*8
N2048*25
S3048-ON*4
SC2080*4
R530*24
R630*24

Stacking
1GbE UTP ,RJ45
10GbE SFP+
40GbE SFP+
iSCSI Connection

Firewall   Firewall

S3048-ON   S3048-ON   S3048-ON   S3048-ON

S4048-ON   VLT   S4048-ON   S4048-ON   VLT   S4048-ON

S4048-ON   VLT   S4048-ON   N2048   VLT   S4048-ON   S4048-ON

N2048

R530/R630

CompellentSC2080 Master   CompellentSC2080 Slave   CompellentSC2080 Master   CompellentSC2080 Slave

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TW Case – S4810P mVLT

採用六台DELL S4810P來置換既有兩部Chassis Core – Nortel 8600 ，並坐落於兩棟不同的建物。應用mVLT架構來實現多重Active-active連接下行Edge Switch 於兩棟建物之間。同時雙鏈路接入Data center Server/Storage 互連達到雙備援目的。
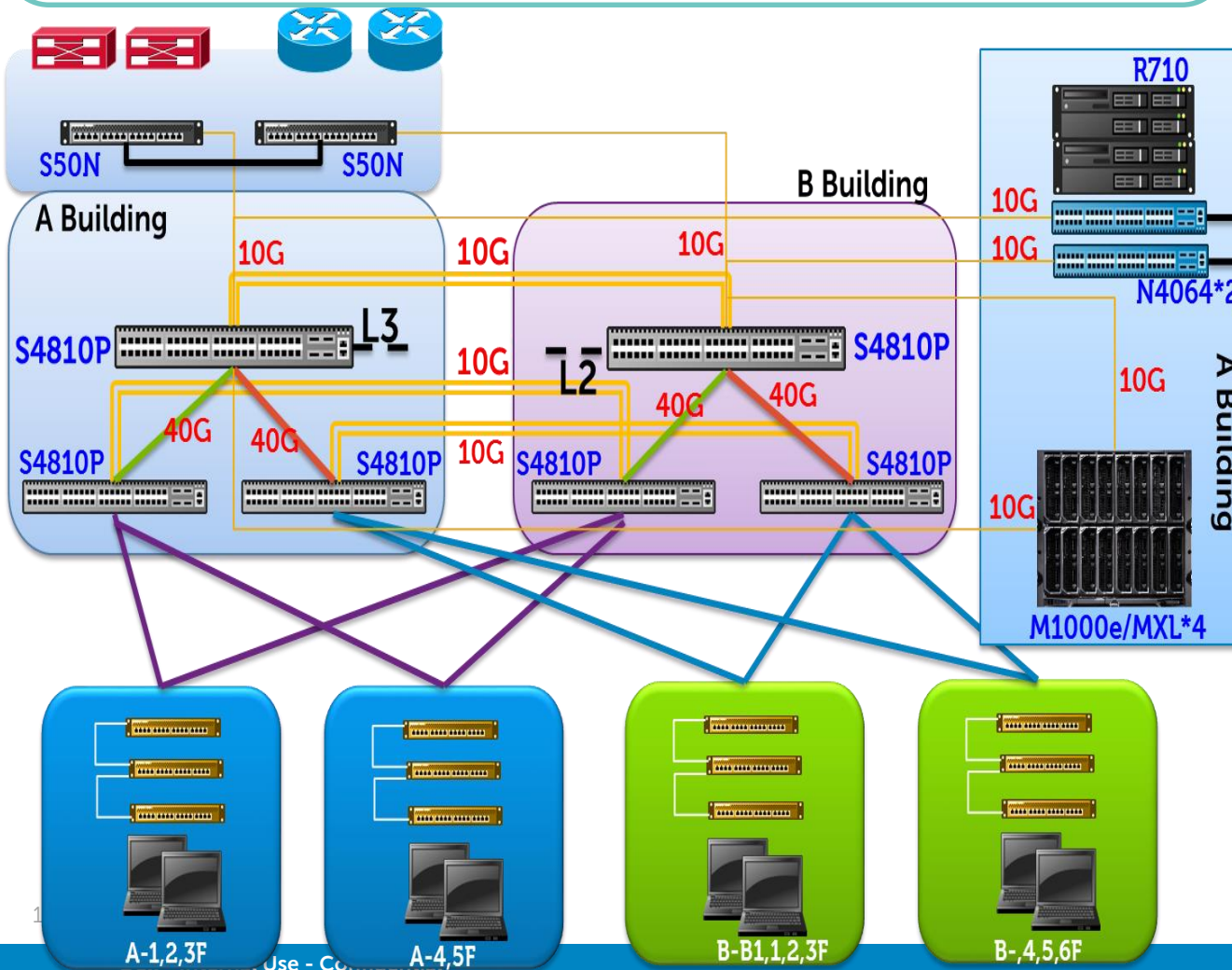
汰換理由:
- 設備老舊,速率過慢導致延遲久無法即時傳送大資料的影像或數據
- 能跨棟實現異地備援

競爭對手:
Cisco, Extreme ,Juniper, Brocade

致勝關鍵:
- **40GbE骨幹頻寬及10G**傳送效能
- 兩層式雙主動備援架構
- **10G RJ-45/SFP+** 共存應用

設備部屬:
S4810P*6
S50N*2
N3048*30
N3048P*10
MXL*4
N4064*2
OMNM*1

S50N   S50N
A Building
B Building
R710
10G
10G
N4064*2
10G
10G
10G
S4810P   L3
10G
L2
10G
S4810P
40G   40G
A Building
S4810P
40G   40G
S4810P   10G   S4810P
S4810P
10G
10G
M1000e/MXL*4
A-1,2,3F   A-4,5F   B-B1,1,2,3F   B-,4,5,6F

And now for a pop quiz… define the following

|	
SDN	An approach to computer networking that allows network administrators to manage network services through abstraction of lower-level functionality. (*Wikipedia*)
NVO	Reproduces the L2-L7 network services necessary to deploy the application's virtual network at the same software virtualization layer hosting the application's virtual machines – the hypervisor kernel and its programmable virtual switch. *(Brad Hedlund)*
Open Flow Controller	Is an application that manages flow control in a software-defined networking (SDN) environment. (*Techtarget*)
Hybrid Mode	The controller uses a combination of the OpenFlow pipeline and traditional forwarding pipeline within a single OpenFlow instance. *(Open Daylight Shaun Wackerly)*
"-ON"	A Dell switch which is capable of a 3rd party Operating System to be loaded onto it instead of the Dell OS.
White Box	The ability to use 'generic,' off-the-shelf switching and routing hardware, in the forwarding plane of a Software-Defined Network (SDN). *(Wikipedia)*
Brite Box	A branded switch vendor let their software run on white-box hardware or let other vendors' software run on their hardware. *(Gartner analyst Andrew Lerner)*

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Why used SDN in Data Center

*Performance, Scalability, Flexibility, Ease of Operation for Security*
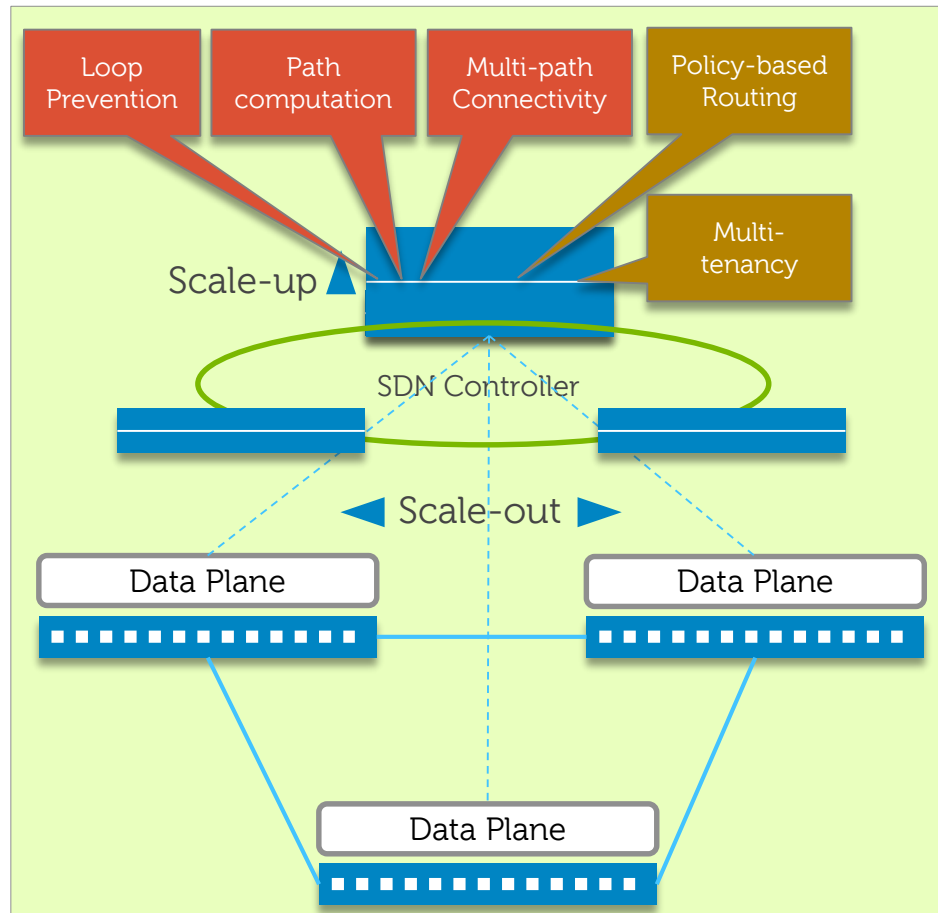
- Control plane performance and scalability can be increased independent of CPU and memory limitations of network devices

  - Scale-up
  - Scale-out

- In-line control protocols can be eliminated entirely, and replaced with centralized control logic

- Sophisticated traffic management and network control can be implemented more easily

- Network device operations are made simpler, and easier to manage

- The network devices potentially become less expensive to build

BSN Big Cloud Fabric

- Big Cloud Fabric from Big Switch Networks is the industry's first data center leaf-spine Clos fabric solution built using Dell's open networking switches.

- Uses Big Switch Networks SDN designs inspired by hyperscale data center architectures to provide significant cost savings and operational efficiencies

- Reduces management consoles by over 30:1 with one centralized controller console

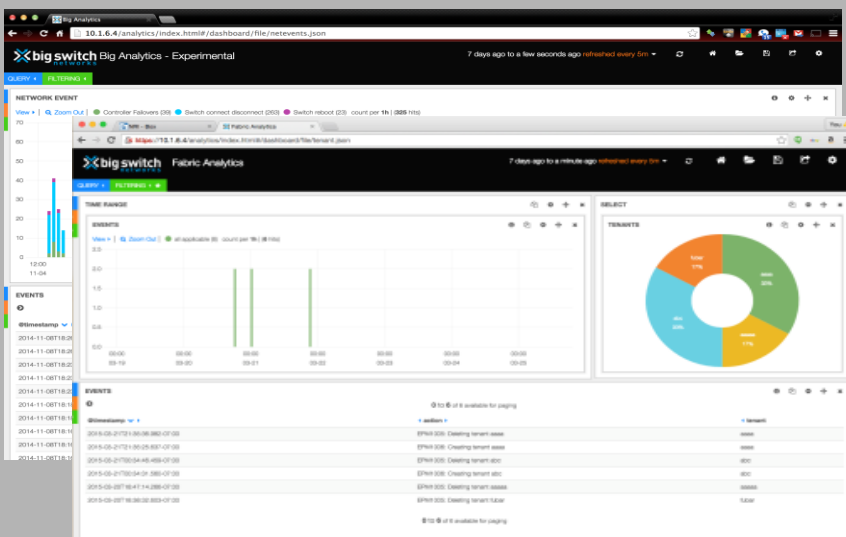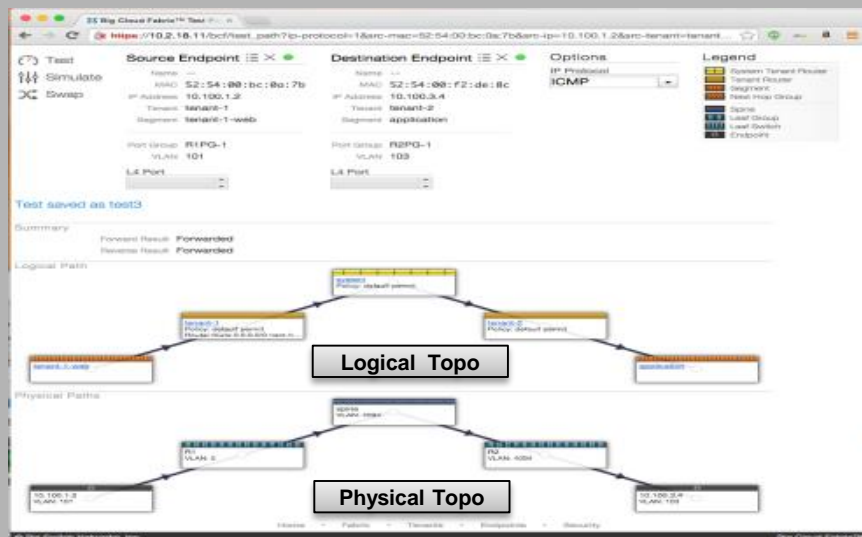BCF Controller configures logical network across various physical fabric nodes
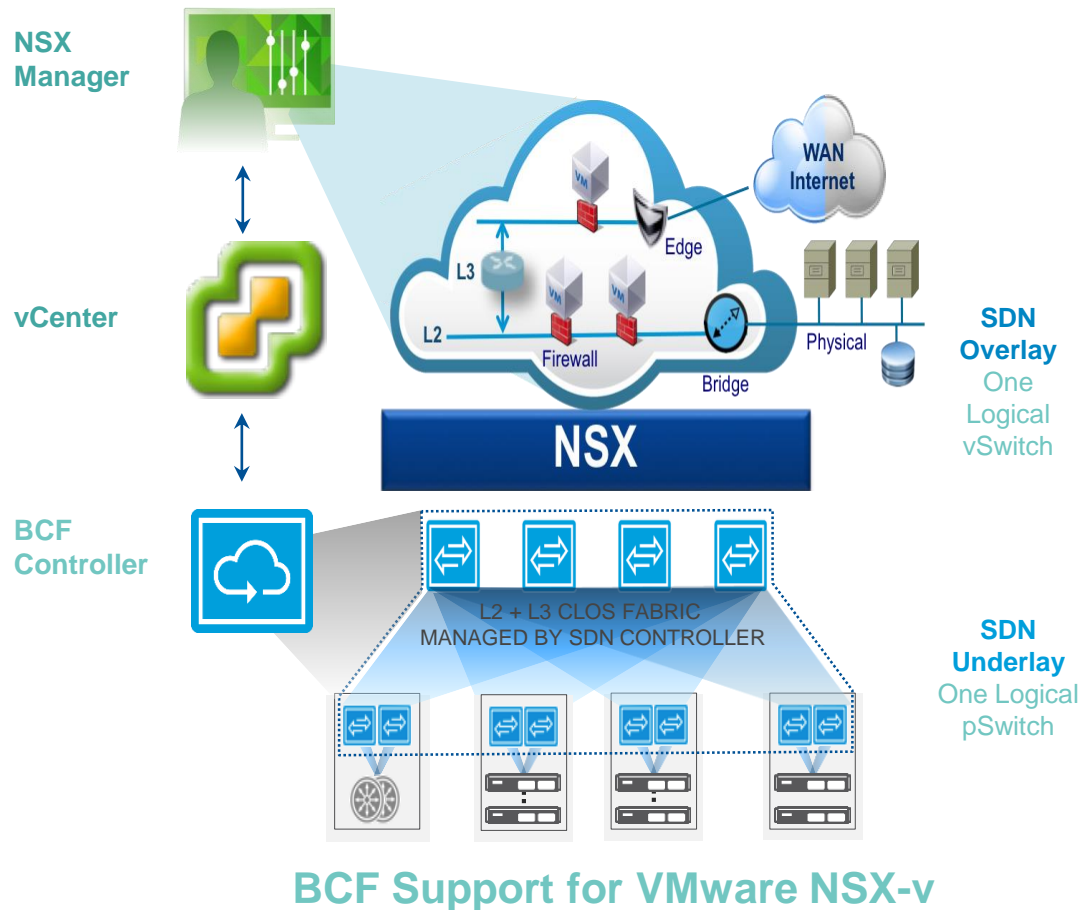

Physical Topology

Logical Topology
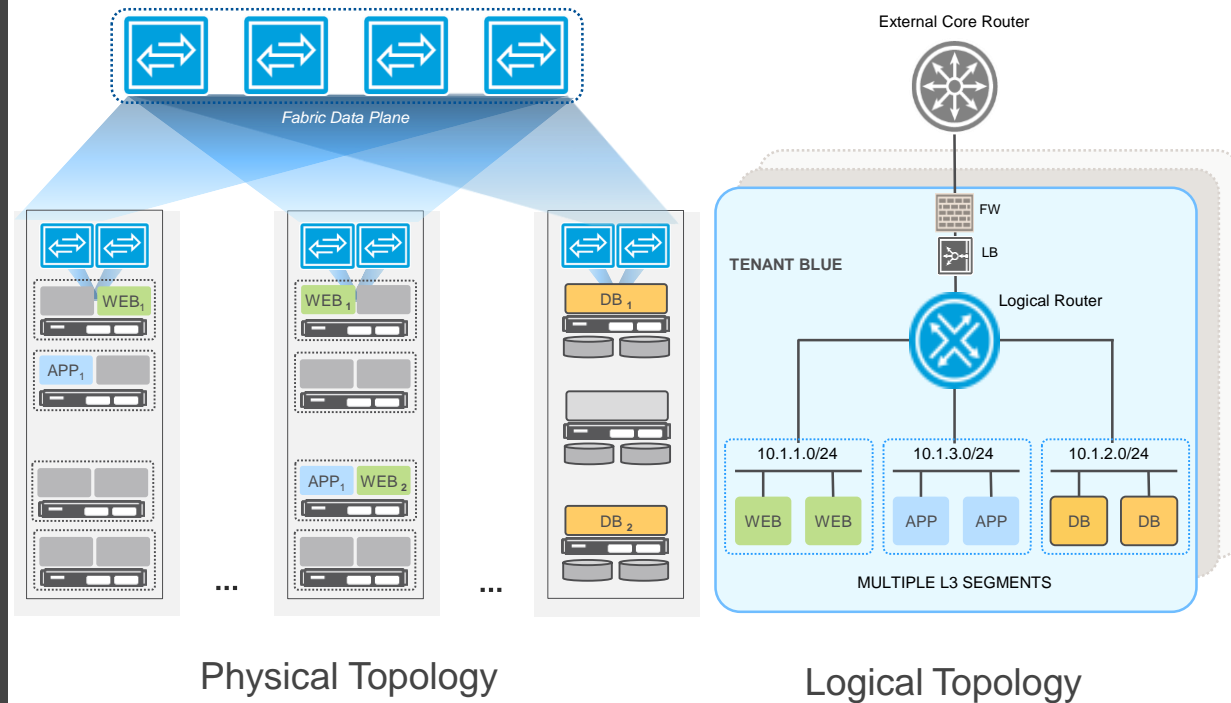
Big Switch UI and visibility

Logical Networking
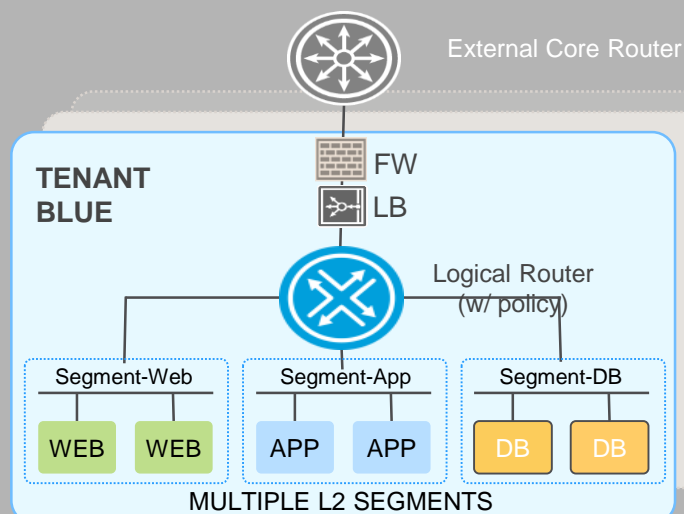
Zero-Touch Fabric

BCF – Ideal underlay for NSX

Optimal SDN Architecture across Overlay and Underlay

NSX Manager

vCenter

BCF Controller

VM

WAN Internet

L3

Edge

L2

Firewall

Bridge

Physical

NSX

SDN Overlay
One Logical vSwitch

L2 + L3 CLOS FABRIC MANAGED BY SDN CONTROLLER

SDN Underlay
One Logical pSwitch

BCF Support for VMware NSX-v

Fabric Automation for NSX-v

- Auto Host Detection & LAG Formation
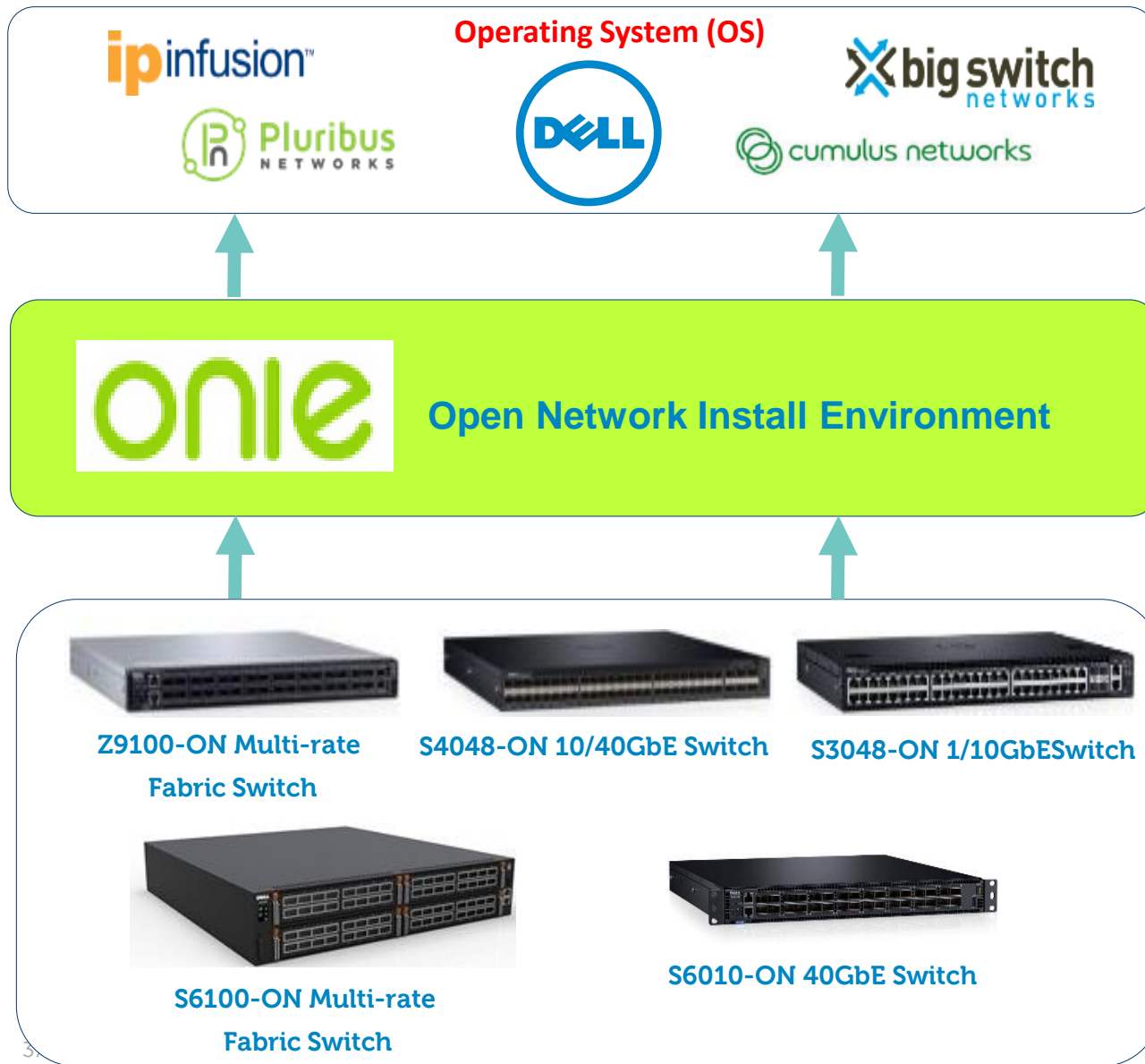- Auto L2 Network Creation for VTEP, vMotion, and Storage port groups

Underlay Troubleshooting

- VTEP-to-VTEP (vSwitch-to-vSwitch) troubleshooting
  - Host – Leaf – Spine – Leaf – Host

NSX HW VTEP Integration with BCF

Dell Open Networking switches simplified
100% ONIE loading for all OS's on new ON switches

Operating System (OS)

ip infusion™

Pluribus NETWORKS

DELL

big switch networks

cumulus networks

onie — **Open Network Install Environment**

Z9100-ON Multi-rate Fabric Switch

S4048-ON 10/40GbE Switch

S3048-ON 1/10GbESwitch

S6100-ON Multi-rate Fabric Switch

S6010-ON 40GbE Switch

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**

10G

Hot Model

Accelerating 1G to 10G migration in the rack
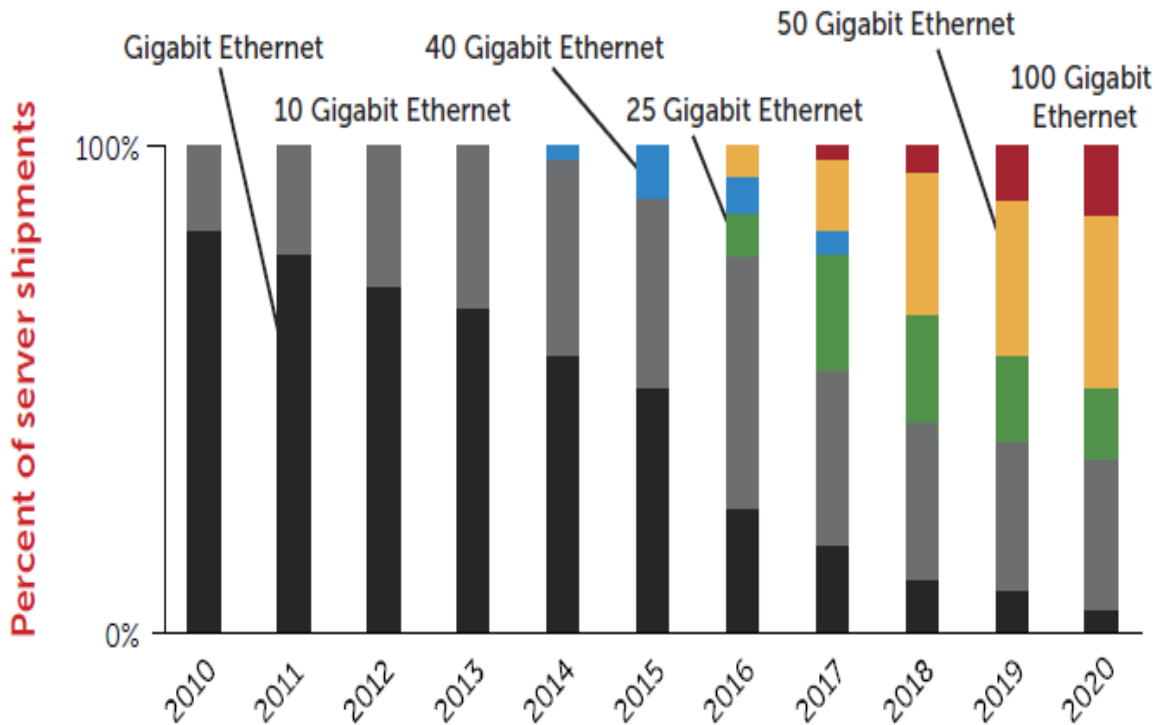
- New 10G copper solution for in-rack networking

Dell Networking S4048T-ON

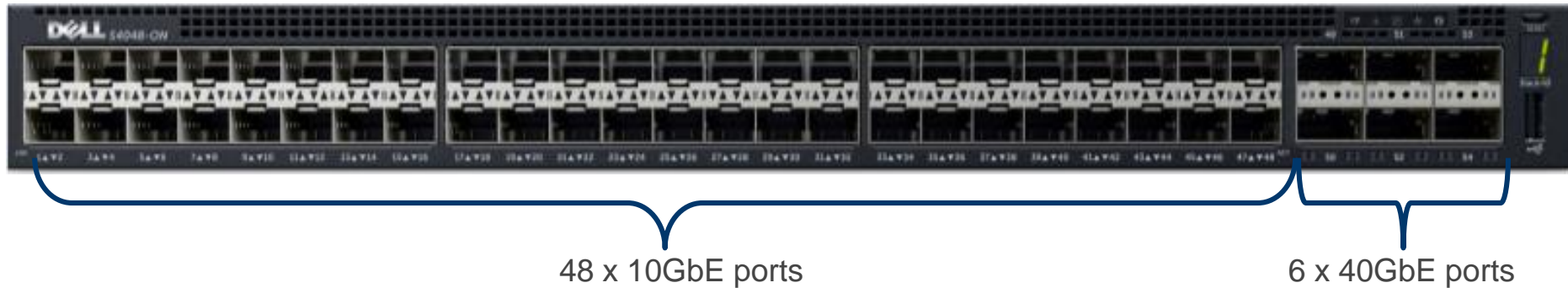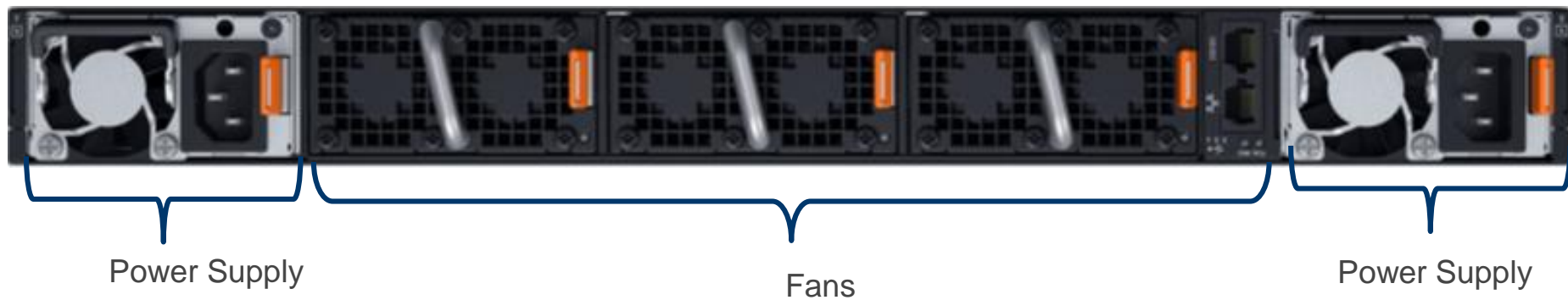- New 10/40G solution for in-rack networking

Dell Networking S6010-ON

Gigabit Ethernet • 10 Gigabit Ethernet • 40 Gigabit Ethernet • 25 Gigabit Ethernet • 50 Gigabit Ethernet • 100 Gigabit Ethernet

Percent of server shipments (100% – 0%), years 2010 through 2020

S4048-ON views

IO Side

48 x 10GbE ports

6 x 40GbE ports

PSU Side

Power Supply

Fans

Power Supply

S4048T-ON views

IO Side

48 x 10Base-T ports   6 x 40GbE ports

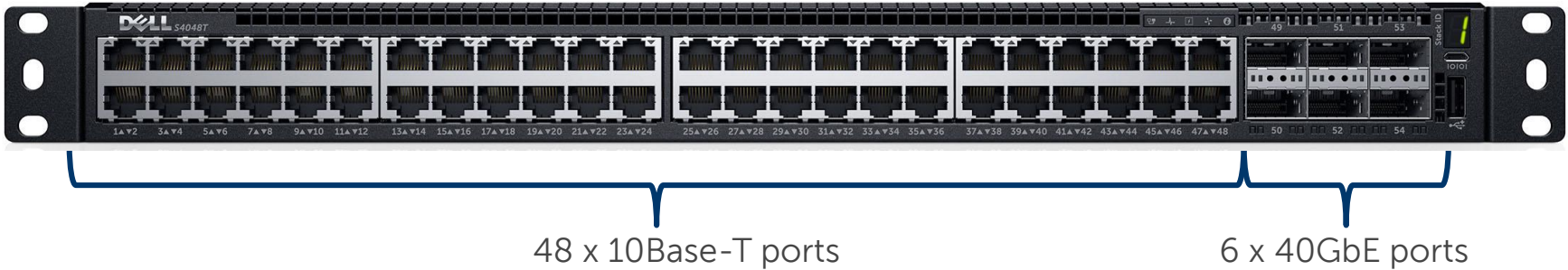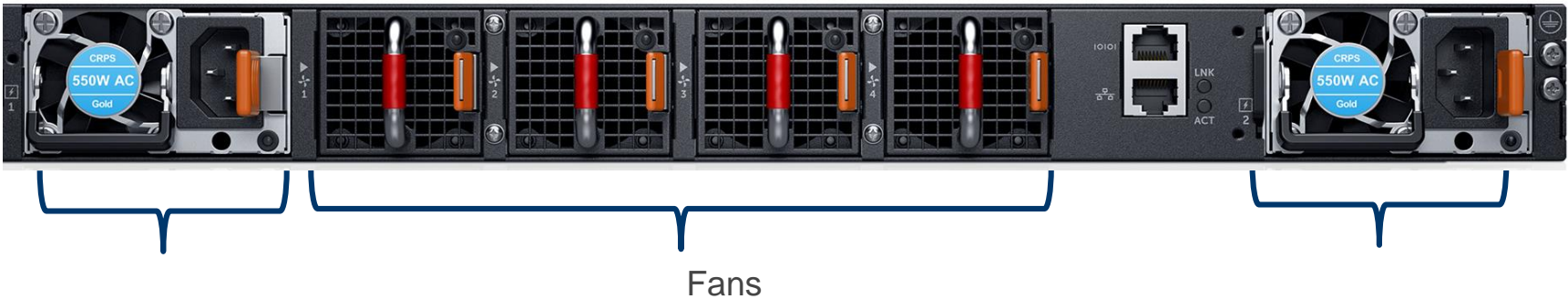**PSU Side**

Fans

Dell networking N4000 10GbE Family
Layer3 10/40G Switch

N4032
- 24x 10GbE ports, optional expansion module

N4032F
- 24x ports SFP+, optional expansion module

N4064
- 48x 10GbE ports, 2x QSFP, optional expansion module

N4064F
- 48x ports SFP+, 2x QSFP, optional expansion module

Dual QSFP
- 2x 40GbE ports, optional breakout cables to deliver 8x 10GbE
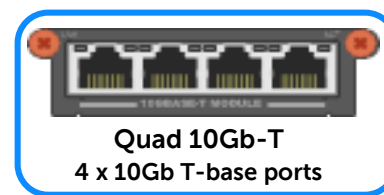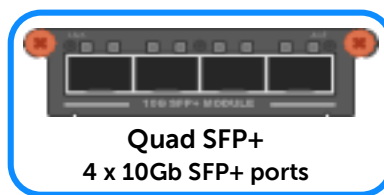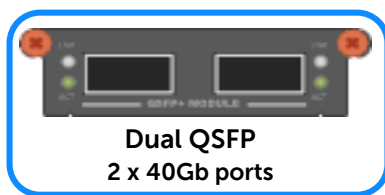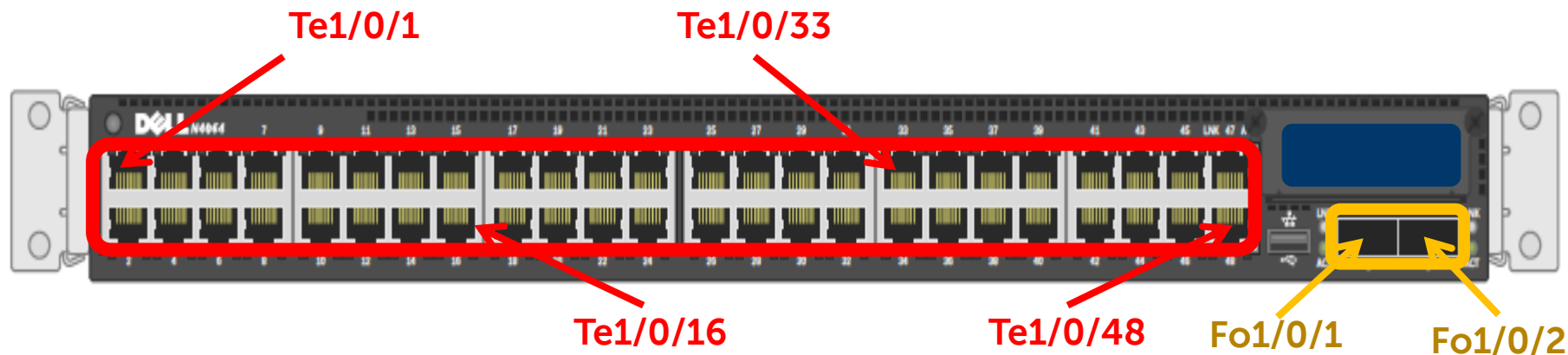
Quad SFP+
- 4x 10Gb SFP+ ports

Quad 10Gb-T
- 4x 10GbE ports

Configure Stacking on Dell networking N4000

Te1/0/1

Te1/0/33

Te1/0/16

Te1/0/48

Fo1/0/1

Fo1/0/2

Dual QSFP
2 x 40Gb ports

Quad SFP+
4 x 10Gb SFP+ ports

Quad 10Gb-T
4 x 10Gb T-base ports

MTP Fiber Channel Cables
For QSFP+ 40GbE Optic to Optic connectivity

QSFP+ 40GBase-SR4 Optic

QSFP+ MTP Fiber Breakout Cable to 4x SFP+ LC
For QSFP+ 40GbE optic to 4x SFP+ 10GbE optic connectivity

QSFP+ 40GBase-SR4 Optic

QSFP+ Direct Attach Breakout to 4x 10GbE SFP+ Cables
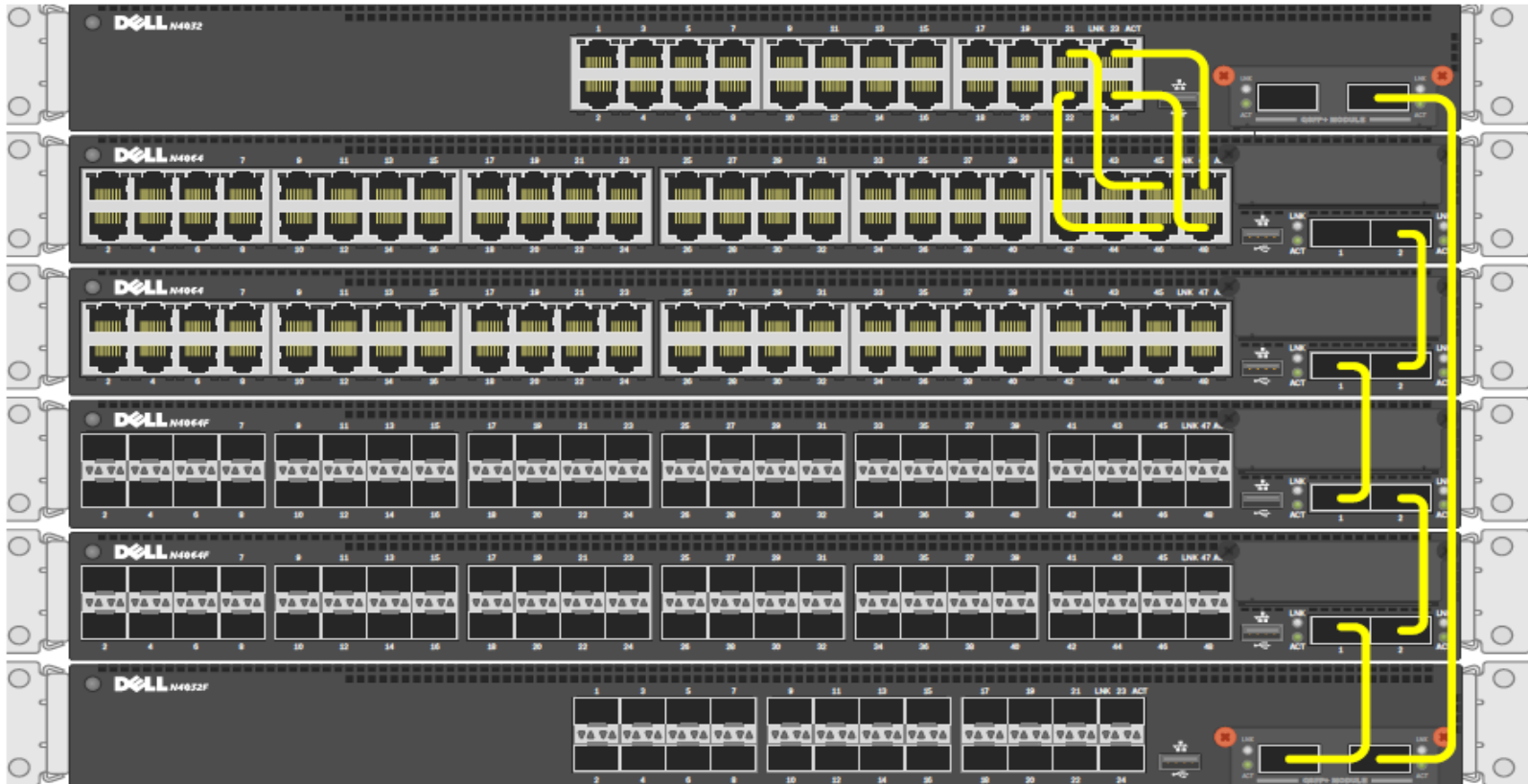**For QSFP+ 40GbE port to 4x SFP+ port connectivity, no optics required.**

QSFP+ Passive Copper Twinax / Direct Attach Cables
For QSFP+ 40GbE port to port connectivity, short distances

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Dell networking N4000 Series Stacking Overview
## using 40G and 10G stack links

All other Dell Networking Stacking Characteristics remain:

- ~50ms failover times
- Ring topology strongly recommended for HA and prevention of split stacks.
- Single IP Management, Shared Tables, etc.
- Available now: Stacking Whitepaper, and User Guide with additional details

Introducing the Dell Networking X-Series

X-Series is a family of smart managed 1GbE and 10GbE Ethernet switches designed for small and medium businesses who crave enterprise-class network control fused with consumer-like ease.

X1018P   X4012   X1018   X1052P   X1052   X1026   X1026P   X1008   X1008P
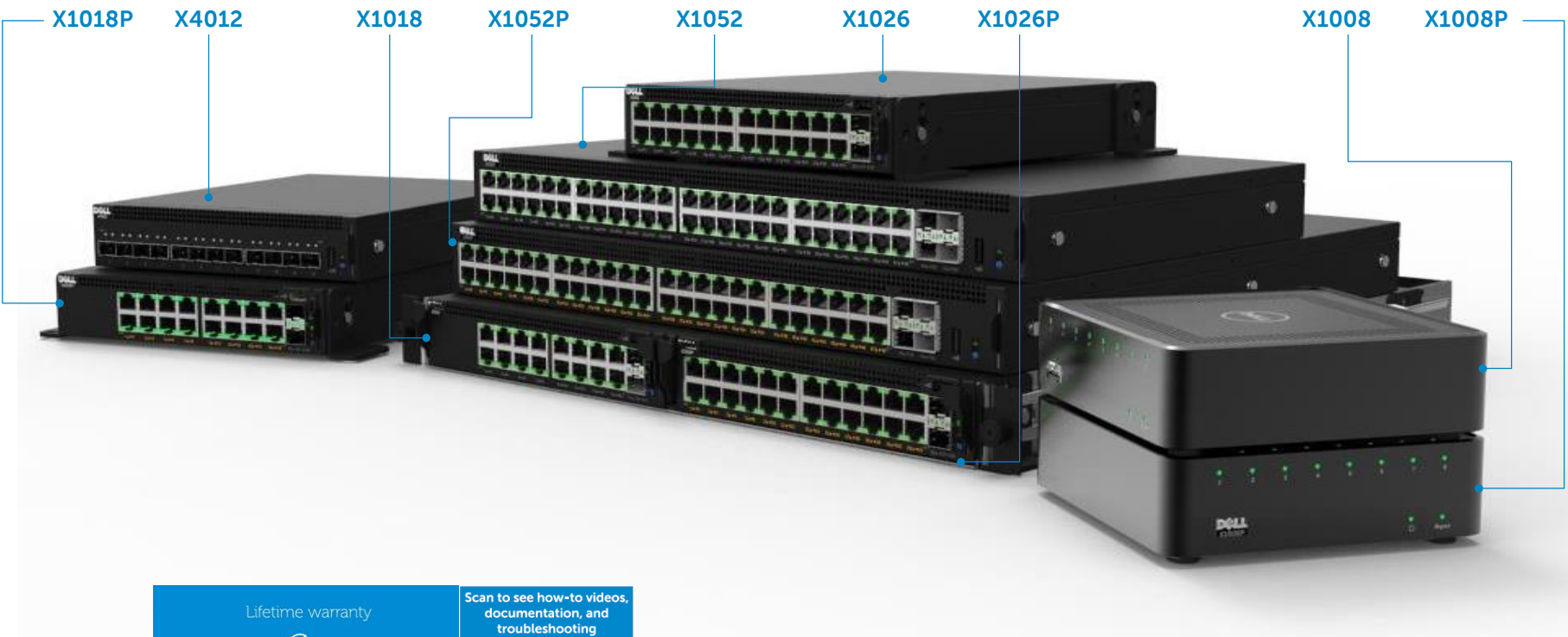
Lifetime warranty

Software upgrades   Hardware Repair   Optics   Cables
*When purchased with the switch

Scan to see how-to videos, documentation, and troubleshooting

Quick Resource Locator
Dell.com/QRL/Networking/X-Series

Dell Networking X4012

Smart Web Managed 10 Gigabit Ethernet Layer 2+ Switches

❖ **Only smart web managed 10 GbE all fiber switch in the industry!***
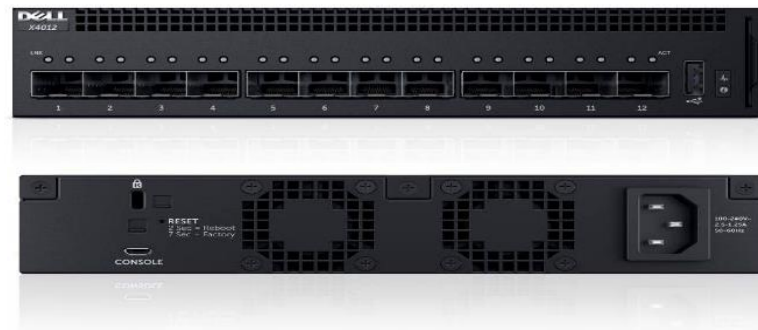
🔑 **Key features and Innovations**

- **12x 10 Gigabit SFP+ full duplex ports for greater bandwidth and distance**

- Asset protecting locking plug

- Micro-USB port and serial cable provided for local switch monitoring & debug access

- Compact 1U half rack width design

- Optional tandem switch tray holds two switches in 1RU

- Redundant variable speed fans

🔗 **Great For**

- Simplifying management of office networks without sacrificing features

- High speed server and storage connections, or network aggregation

- Perfect for bandwidth intensive environments such as virtualization and IP surveillance devices

Products

| Model	Size (H x W x D)	Port configuration
X4012	1.62 in x 8.23 in x 9.84 in (41.25 mm x 209.0 mm x 250.0 mm) (1RU, half-width)	12x 10Gb SFP+ ports

Are you on the right way?

D.C Ethernet Marketing Trend

Data Center Revenue Forecast

We believe the addressable market for many vendors will actually decline over the next five years, as **most vendors will not be able to compete in all areas of the market with the same effectiveness as in the past**. We believe this situation will be most evident in the data-center space, as *only a few vendors can compete in the mega Cloud data centers. We anticipate that for each year of the forecast, the list of mega Cloud data centers using white-box switching will increase*.
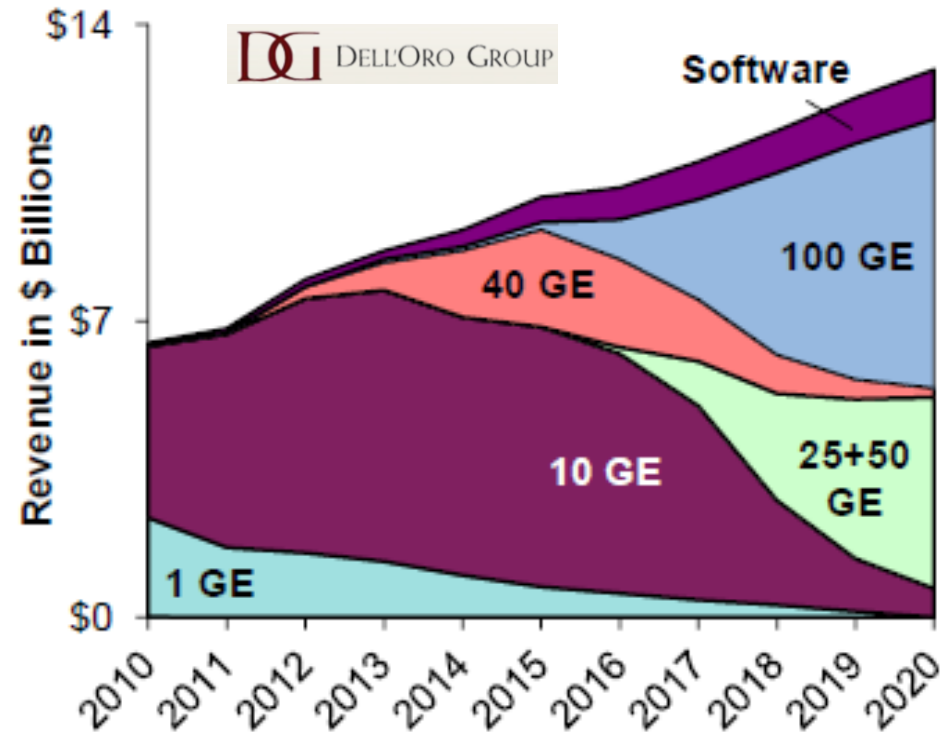
DELL'ORO GROUP PUBLISHED APRIL 2016

The projected price declines *on 25 GE and 100 GE are aggressive*, and our corresponding increases in port growth are high. We may be assuming that **price elasticity is too strong, particularly as the 25 GE market matures**. **Also, 25 GE Fixed Managed prices may erode faster than we predicted**.
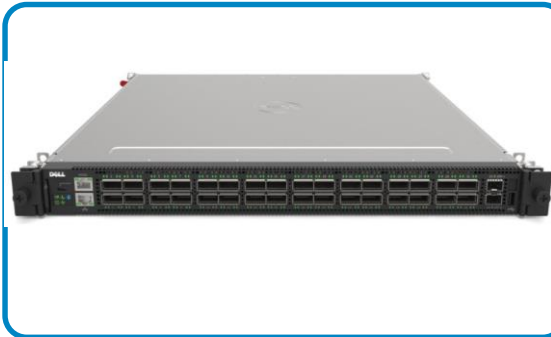
Multi-rate

Dell Innovations with Z9100-ON

Multi-Rate 10/25/40/50/100GbE

High-Density per RU

Ultra low latency

Network Virtualization

Rich Optical Connectivity

Full DCB / RoCE Support

Choice of OS

SDN Ready

Dell Innovations with S6100-ON

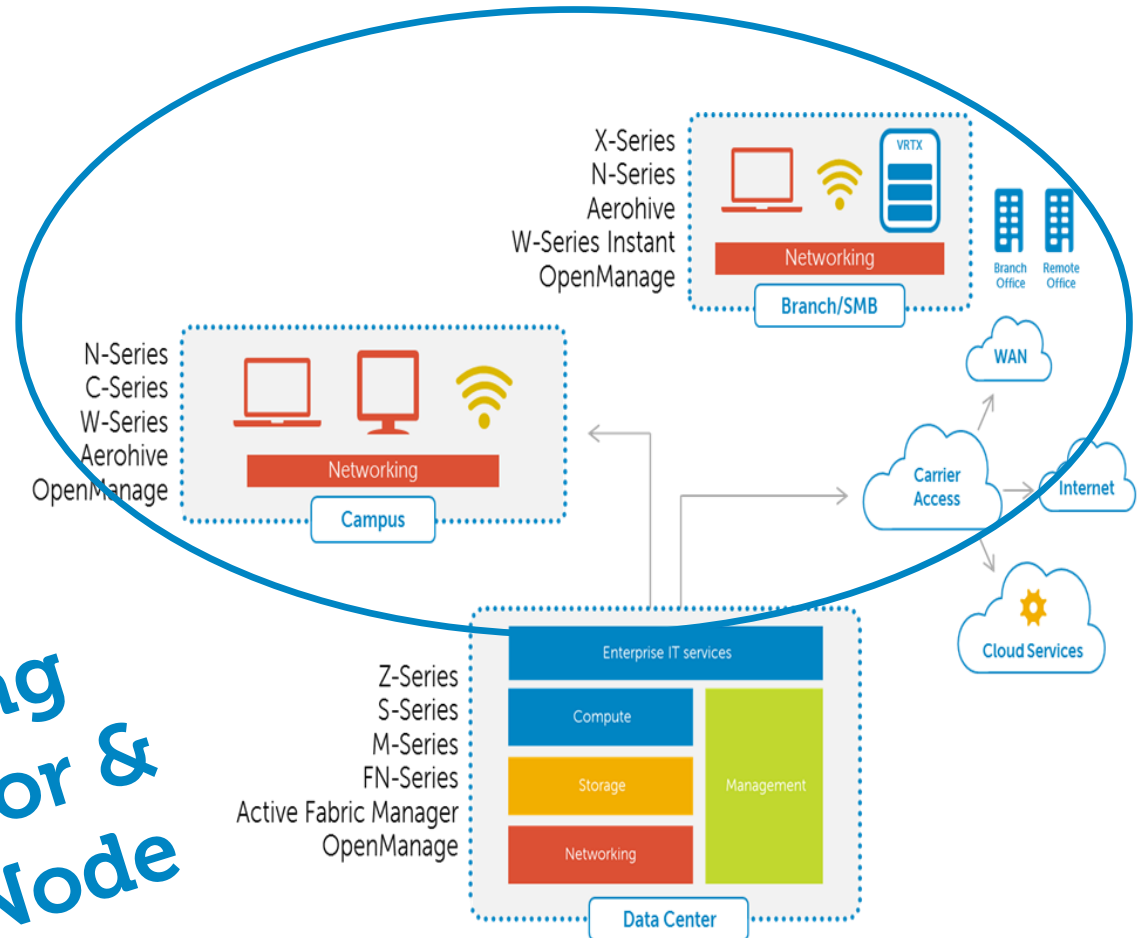|		
Multi-Rate 10/25/40/50/100GbE	**Modular Options for 100G, 40G, 25G**	**Ultra low latency**
Network Virtualization		**Rich Optical Connectivity**
Full DCB / RoCE Support	**Choice of OS**	**SDN Ready**

Traditional networks are not optimized for end users, Increases complexity for administrators

Multiple tiers

Multiple configurations

Multiple policies

Multiple applications
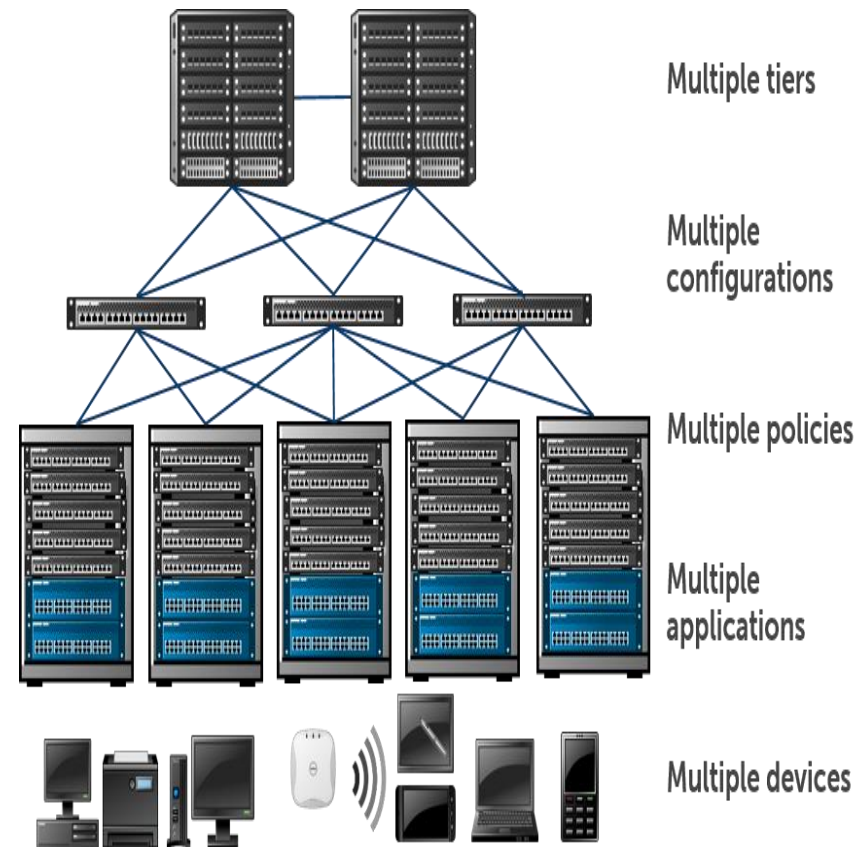
Multiple devices

Challenges

- Multiple protocols and tiering (both physical & logical)
- Policy enforcement (users, devices, content)
- Complex configurations (multiple devices & types)
- High operating costs/shrinking budgets

Requirements

- Personal device support
- "Seamless" mobility across network locations
- Multi-media usage for video, rich media
- Increased security needs
- Rapid service deployment (new services & applications)

Industry Leading Performance and Scalability

Dell Networking C9010 Network Director

Dell Networking C1048P Rapid Access Node

NETWORKcomputing AWARDS 2016

TMC Communications 2016 SOLUTIONS™ Product Of The Year

1 Tier

Virtual Ports	Multi-Rate	Stacking	Density
Supports 2,000 Virtual Ports (40 Rapid Access Nodes) at RTS, and 4,000 Virtual Ports (80 Rapid Access Nodes) in a future release	C9010 backplane is designed to support multi-rate for 100GbE/40GbE/10GbE	Supports Rapid Access Node stacking up to 8 units high	Supports up to 248 10GbE ports (SFP+ or 10GBASE-T) Supports up to 60 40GbE ports

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Dell's innovative architecture reduces complexity

Single logical tier & operating environment speeds deployment

C9010 Network Director

C1048P Rapid Access Nodes

- Simplifies the enterprise network by merging core and access layers

- Administrators build and manage the entire network from a single console providing increased visibility

- Reduced risk of manual errors when deploying or upgrading the network.

Set up network faster

Reduce upgrade time

TW Case – C9010 One-Tier

採用兩台DELL C9010來實現雲端 SAP HANA高效能資料運算與SAP應用程式系統平台。應用C9010 One-Tier架構來簡化整體網路規畫並可提供未來IoT運用接入。實現一層式因而也實現低延遲與高效能異地備援，同時也VDI輕鬆佈署。

佈建理由:
- 實現**SAP HANA** 架構及模組式達到快速佈署並節省機房空間與電力
- 簡化架構反應快速資料備援於異地之間

競爭對手:
Cisco, HPE, Juniper

致勝關鍵:
- **One-Tier 消除STP**
- **模組式輕鬆擴充**
- **Pro Support Plus Service**

設備部屬:
C9010*2
C1048P*2
S4048-ON*2
Brocade6510*2
SC4020F*2
R630*6
R730*1
R930*1

Stacking
1GbE UTP ,RJ45
10GbE SFP+
40GbE SFP+
16Gb Storage Fibre

C9010　　　　C9010　　ISP

VLT

Firewall NAS 3600　　Firewall NAS 3600

VLT

S4048-ON　　S4048-ON　　C1048P　　C1048P

VM Host -1 R630　　SAP HANA -1 R930

Microsoft Hyper-V　　SAP vmware

VM Host -6 R630　　SAP HANA -2 R930　　VERITAS　　Backup SRV R730

S4048

PR Storage (SC4020)　　DR Storage (SC4020)

複製至新竹　　新竹資料

SC4020F

複製至土城

Brocade 6510　　Brocade 6510　　SC4020F　　土城資料

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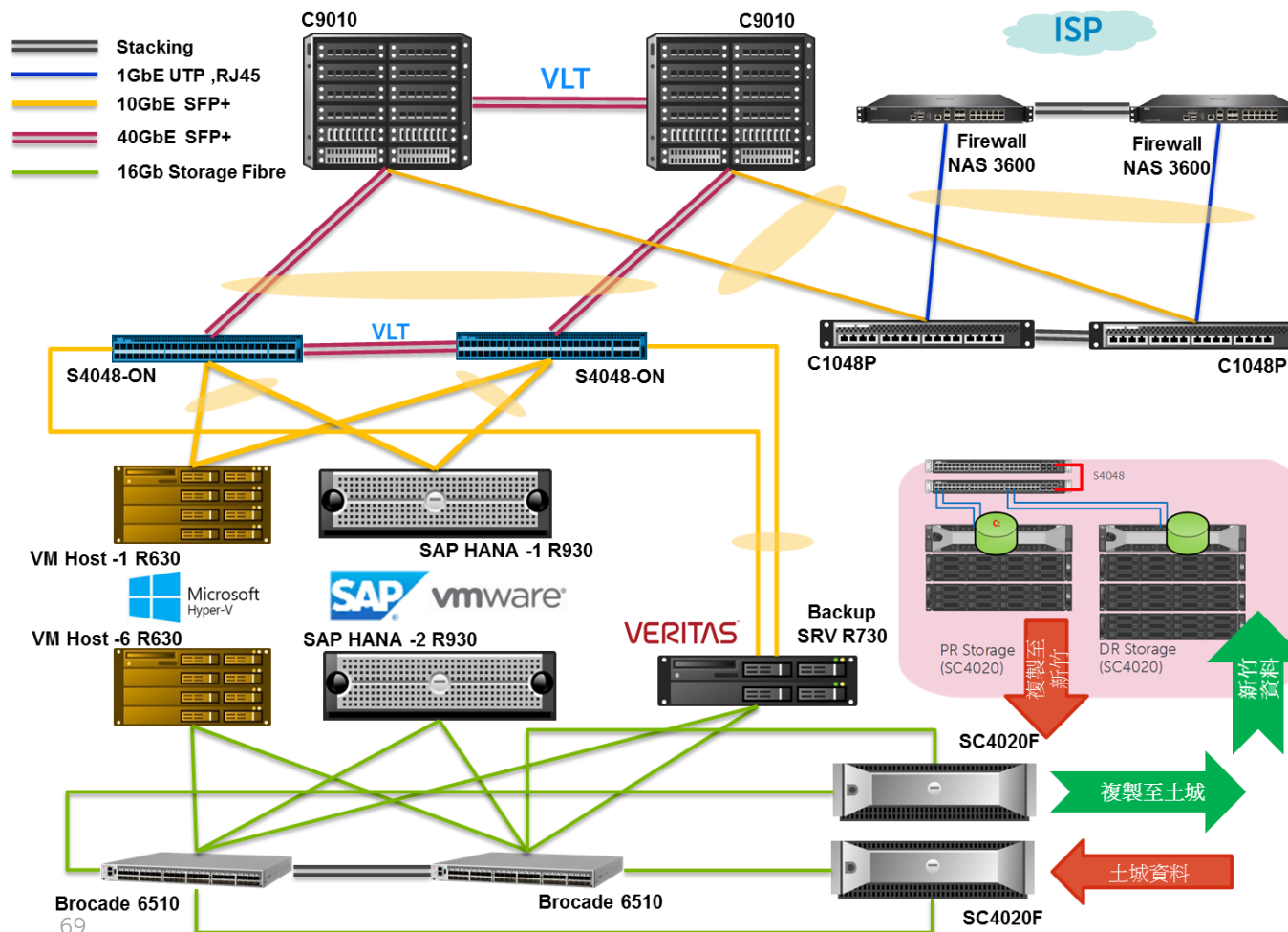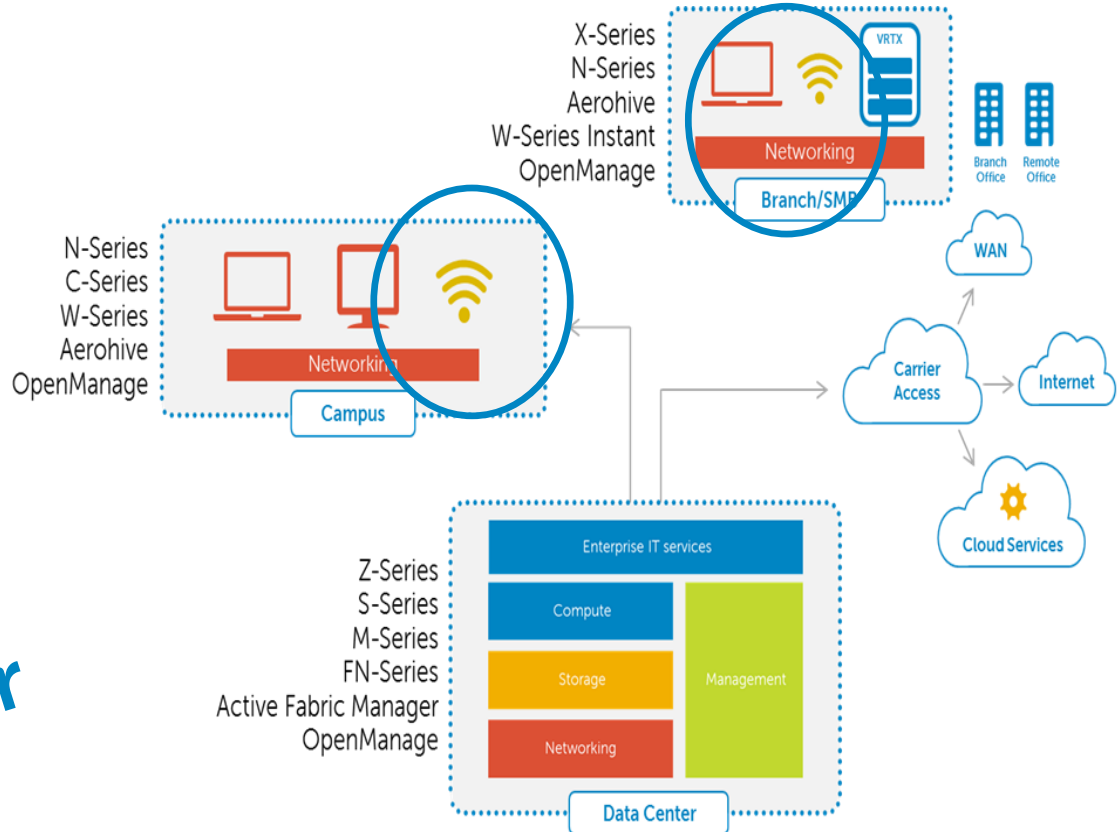
Cloud WiFi Solution

Aerohive

擴展靈活－按需增長

無需控制器=無痛苦的權衡

- Wi-Fi Controllers Force Painful Trade-Offs

分佈式控制器管理

- High Functionality
- High Cost
- High Resilience
- High Complexity

控制器集中管理

- Lower Functionality
- Lower Cost
- Low Resilience
- Still Complicated

AEROHIVE:無控制器－ 智能Wifi 架構

Scalable Performance High Functionality High Resilience Low Cost Low Complexity

Ideal architecture for cloud & .11ac

Up to 60% lower solution price

Up to 71% lower operating costs
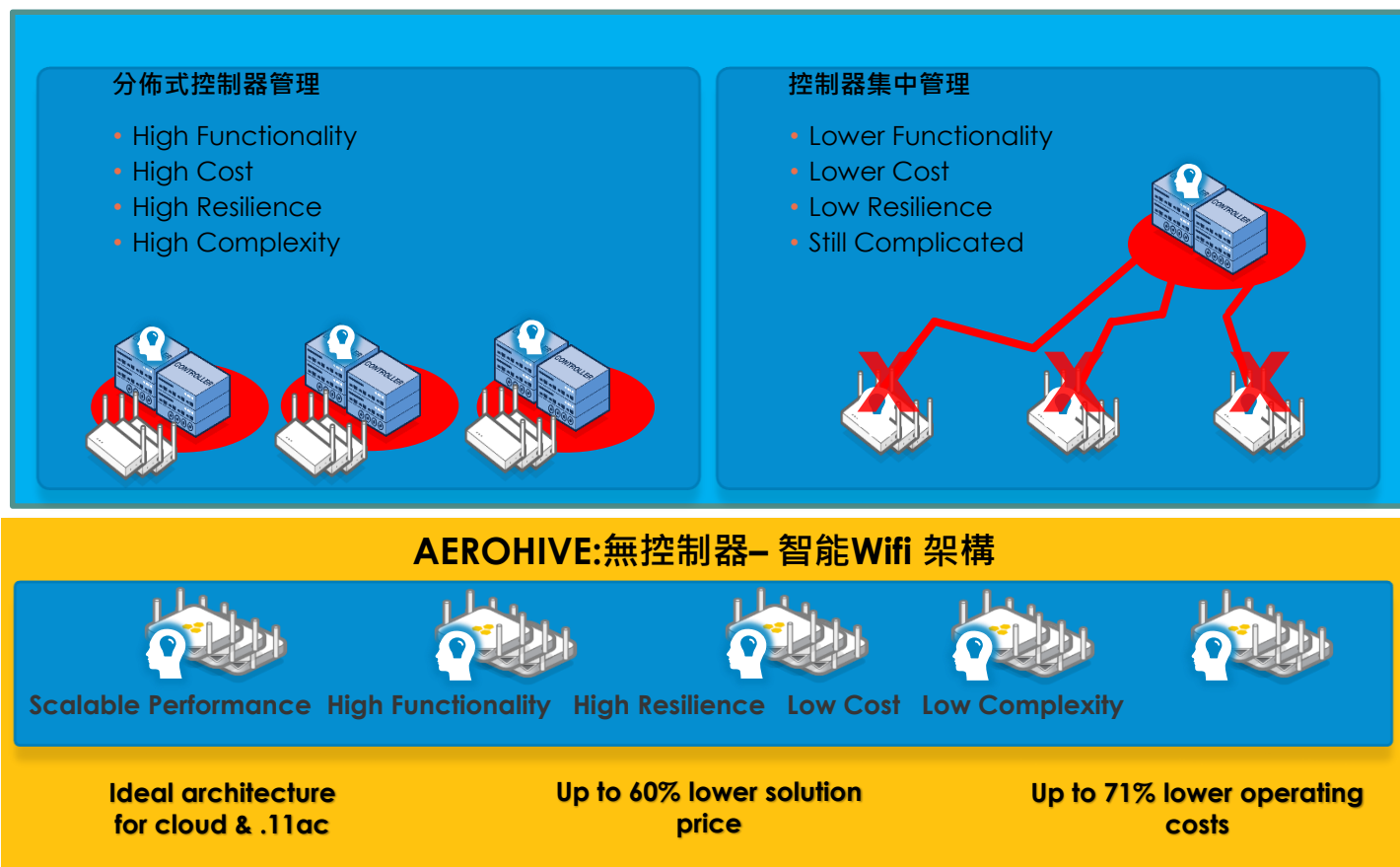
Dell and Aerohive unified wired + wireless portfolio

Dell Networking N-Series

Energy-efficient, cost-effective 1GbE and 10GbE switches
- N3000 Series: Power-efficient density for campus deployments
- N2000 Series: Powerful and economical 1GbE switching
- N1500 Series: Enterprise features for small and medium businesses

Family	Overview	Capacity and Ports	
N3000	Scalable GbE Layer 3 Advanced switch with energy-efficient design and PoE+ capabilities.	260 Gbps	Up to 48 line-rate 1GbE ports per switch and up to 624 1GbE ports in a 12-unit stack. Hot swap expansion module supporting dual SFP+ and dual 10GBaseT. Up to 48 ports of PoE+.
N2000	Scalable GbE Layer 3 Standard switch with energy-efficient design and PoE+ capabilities.	220 Gbps	Up to 48 line-rate 1GbE ports per switch and up to 600 1GbE ports in a twelve-unit stack. Two integrated 10GbE SFP+ ports. Up to 48 ports of PoE+.
N1500	16x RJ45 10/100/1000Mbps PoE ports (up to 246W total), 2x SFP ports	176 Gbps	Up to 48 line-rate 1GbE ports per switch and up to 200 1GbE ports in a 4-unit stack. Four integrated 10GbE SFP+ ports. Up to 48 ports of PoE+.

Aerohive APs

Distributed control + centralized management
- Self-organizing access points that eliminate single points of failure
- Effortlessly grow from a single access point, to hundreds of thousands
- Easily managed from a single, cloud-based management platform

Model	Features
AP130	Dual radio (2x2) 2 stream MIMO 802.11ac high performance AP
AP230	Dual radio (3x3) 3 stream MIMO 802.11ac high capacity AP
AP250	Dual radio (3x3) 3 stream MU-MIMO 802.11ac Wave 2 general purpose AP
AP245X	Dual radio (3x3) 3 stream MU-MIMO 802.11ac Wave 2 w/ external antennas
AP1130	802.11ac MIMO AP designed for outdoor/harsh environments
Additional access points and branch routers also available	

HiveManager NG Cloud-Based Management

The HiveManager NG cloud-management solution sets a new standard for simplicity and flexibility in unified networking through streamlined configuration workflows, real-time client and event monitoring, simplified troubleshooting, versatile RF planner tools and API integrations.

With HiveManager NG, you can completely deploy and configure an entire enterprise-class network within minutes. Available as a public or private cloud deployment.
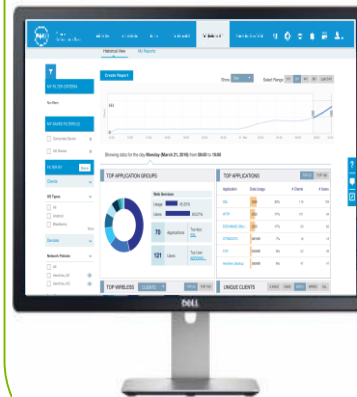
Thank you

The Power to Do More

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