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Cisco SAN Switching

MDS Switches

Vincent Meoni, vmeoni@cisco.com
Systems Engineer

Speed of Technology Transition is Accelerating

Digital Disruption

UBER

World's largest taxi company

Owns no taxis

World's largest software vendors

Owns no apps

Alibaba.com Global trade starts here.™

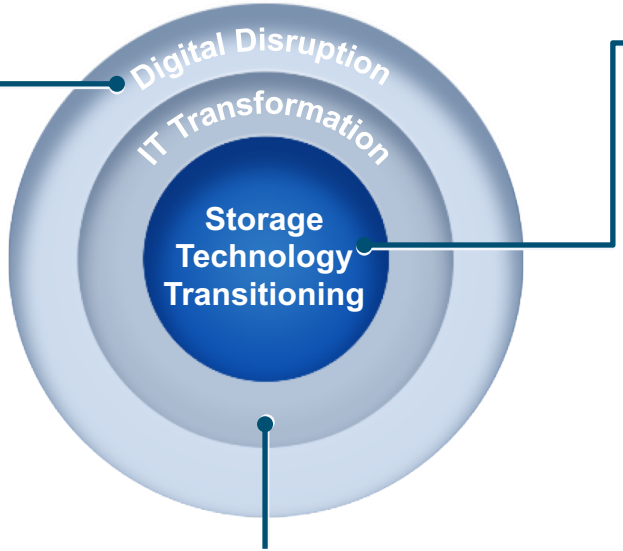
World's most valuable retailer

Owns no inventory

airbnb

World's largest accommodation provider

Owns no real estate



IT Transformation

Public, Private, Both Build, Buy, Rent,
Devops: Agility and simplicity
Self-Service Operations

Storage Technology Transitioning

Speed transition: 16G > 32G
Protocol evolution: SCSI > NVMe
Media transition: HDD > SSD

7 out of 10 external disk arrays are flash based

60% of enterprise storage appliances will have NVMe bays by **2020**

IT Operations Analytics emerging fast as the new norm, GDPR
Integrated SAN Analytics

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Need for 32G SAN

Why now ?

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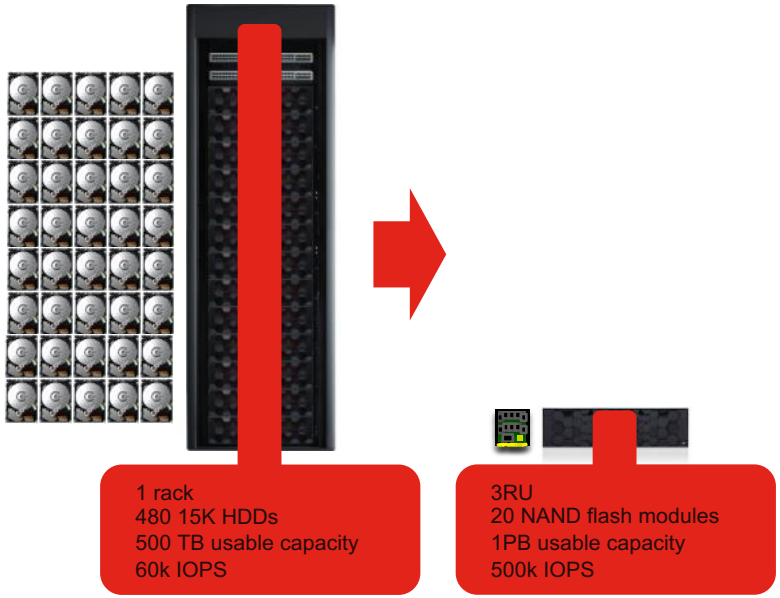
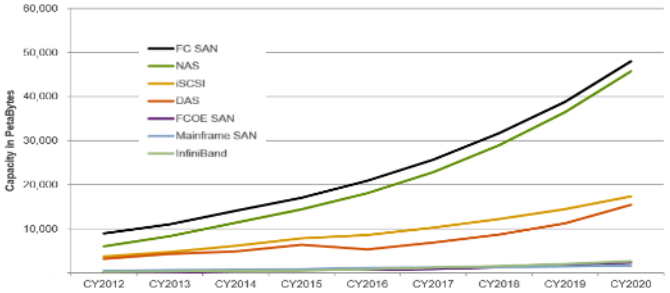
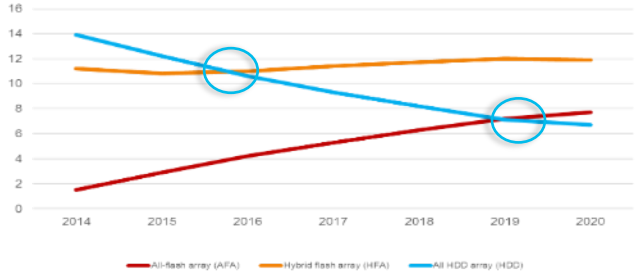
Flash Arrays Driving The Need For Faster Connectivity



Capacity growth and access solutions



Revenue by storage array type ($B)



Source: IDC Oct 2016 Worldwide Enterprise Storage Forecast

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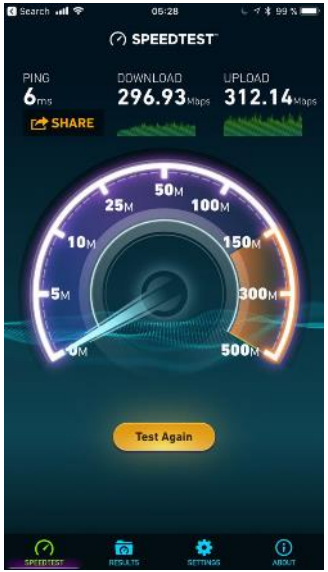
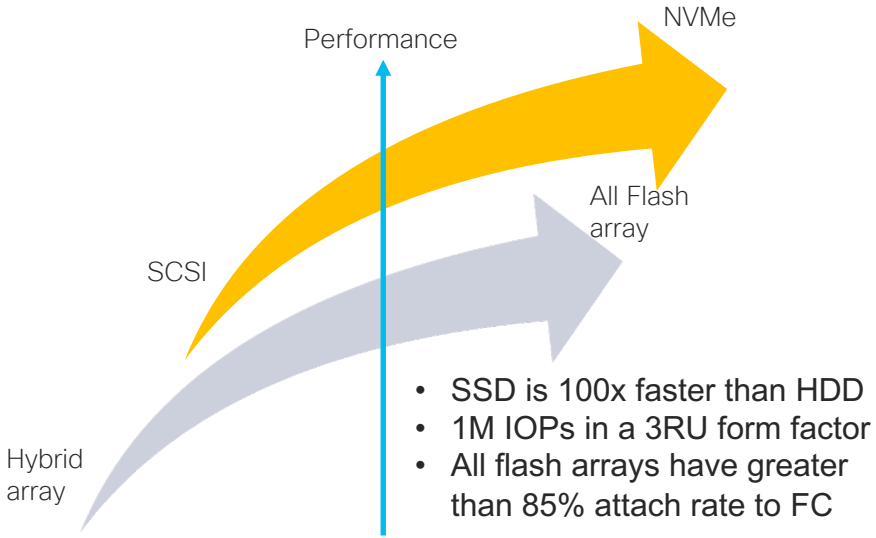
Moving The Performance BottleNeck

Don’t let your SAN become the new bottleneck





From ADSL to FTTH

- Bottleneck shifting to home network

From HDD/SCSI to SSD/NVMe

- Bottleneck shifting to storage network

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New Technologies

FC NVMe Support

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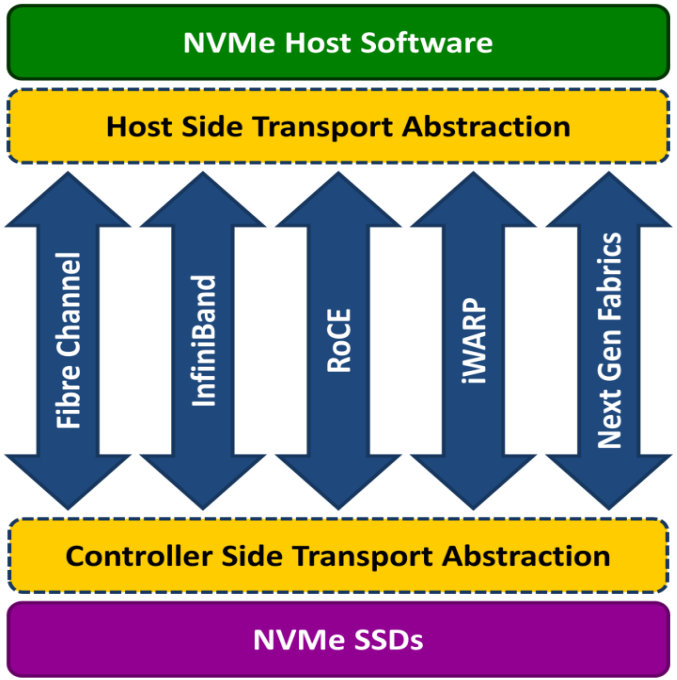
Since NX-OS 8.1(1)

NVMe and FC

- Market transitioning to All-Flash Arrays (AFA)
- NVMe is next-gen media protocol - replacement for SCSI
  - Exploits inherent parallelism offered by flash devices
- FC as the transport of choice for NVMe fabrics
  - Support FC-SAN customers upgrading to flash
  - Minor control plane changes, no data plane change
  - NVMe over FC is officially supported with NX-OS 8.1.1 release and above on MDS 9000 series



T11 Standards Specs:
FC-GS-8: http://www.t11.org/ftp/t11/pub/fc/gs-8/16-375v1.pdf
FC-LS-3: http://www.t11.org/ftp/t11/pub/fc/ls-3/16-395v2.pdf

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Since NX-OS 8.1(1)

NVMe over FC
Same FC Paradigm

Increased Performance	Seamless Insertion	Phased Transition	Multiprotocol Flexibility	Ecosystem Support

No New Network | Established Solution | Co-exists with current Solutions

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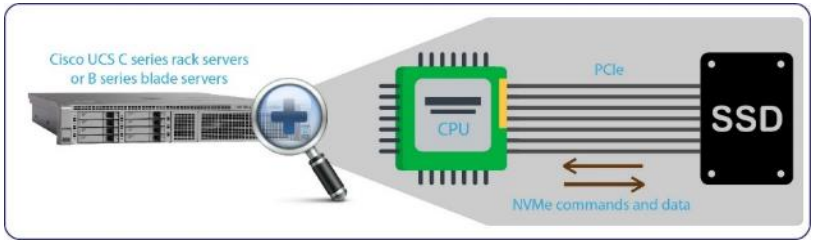
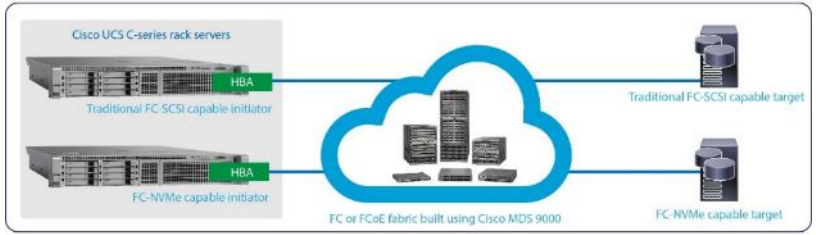
Since NX-OS 8.1(1)

FC-NVMe Solution Paper





Scope: Cisco UCS, MDS & Nexus

Contents

- Why NVMe ?
- What is NVMe ?
- NVMe over Fabrics (FC-NVMe)
- Cisco's leadership and offerings
- NVMe Storage for Cisco UCS C-Series Rack and B-Series Blade Servers
- NVMe over Fibre Channel (FC-NVMe) using Cisco UCS, MDS and Nexus
- Supported Products

https://www.cisco.com/c/dam/en/us/products/collateral/servers-unified-computing/ucs-c-series-rack-servers/solution-overview-c22-740196.pdf

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Cisco Multi-Protocol Product Portfolio

LAN/SAN

Cisco Nexus 7000

Cisco Nexus 9000

Cisco Nexus 5500

Cisco Nexus 5672UP-16G

Cisco Nexus 5600

16G FC: Cisco Nexus 2348UPQ

Cisco Nexus 2000

Cisco Nexus 3000

Cisco Nexus 93180YC-FX

SAN

Cisco MDS 9706

Cisco MDS 9710

Cisco MDS 9718

48x 16G FC

48x 32G FC

24/10 SAN Ext

48x 10G FCoE

MDS 9132T 32x 32G FC

24x 40G FCoE

MDS 9148S

MDS 9250i

MDS 9396S

COMPUTE

Cisco UCS 6332-16UP

Cisco UCS 6248UP

Cisco UCS Fabric Interconnects

Cisco UCS 6332

Cisco UCS 6296UP

Cisco UCS B-Series Blade Servers

VIC 1385 40G CNA

Cisco UCS C-Series Rack Servers

15+ Years of Proven **Single Operating System**: NX-OS; **Single Management Suite**: Data Center Network Manager

Consistent and Simplified Features, Management, and Programmability

Technology Pillars of MDS 9000 Series

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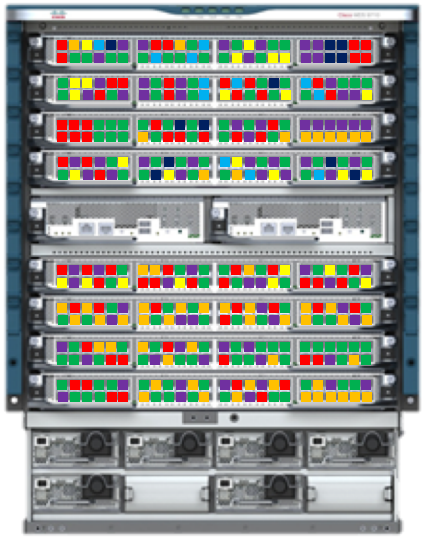
VSAN

Cisco Virtual Storage Area Networks (VSANs)

Widely deployed since 2002

- A Virtual SAN (VSAN) Provides a Method to Allocate Ports within a Physical Fabric and Create Virtual Fabrics
- Analogous to VLANs in Ethernet
- Virtual fabrics created from larger cost-effective redundant physical fabric
- Reduces wasted ports of a SAN island approach
- Fabric events are isolated per VSAN which gives further isolation for High Availability
- FC Features can be configured on a per VSAN basis.
- ANSI T.11 committee and is now part of Fibre Channel standards as Virtual Fabrics

Per Port Allocation



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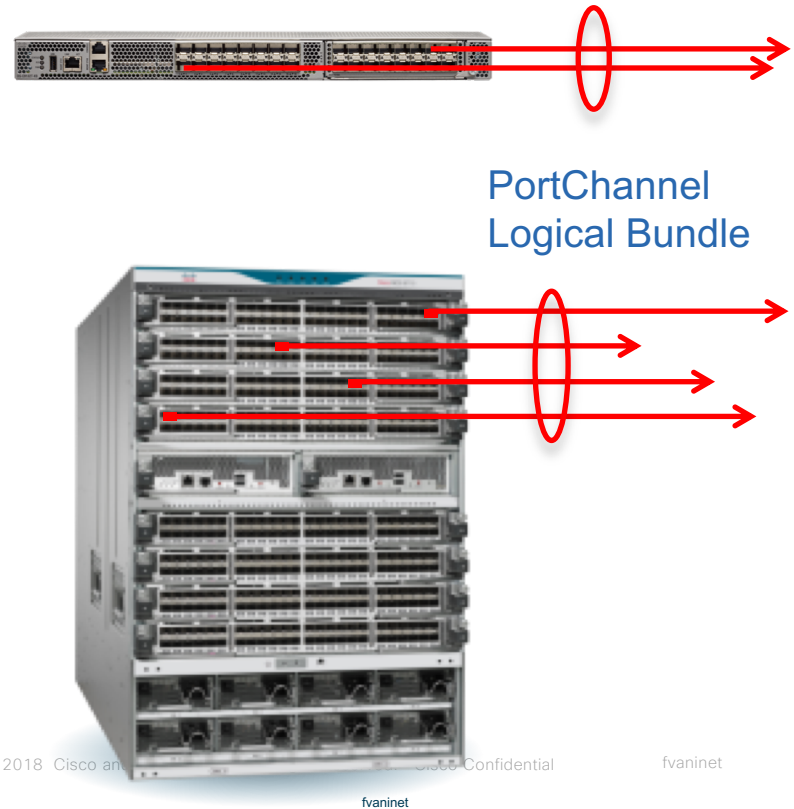
The Bliss of MDS 9000 PortChannels

Simplification, Performance, High Availability, Flexibility



Topology simplification
Seen as single link by FSPF
Topology stability upon ISL member failure

Bandwidth scale
Up to 16x 32G FC in a single bundle
Up to 16 PortChannels in parallel

High availability
Pick and choose member ports
Independence from linecard/ASIC

Flexibility
Length and optics agnostic
Ideal for DR solutions

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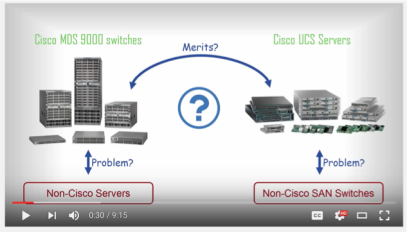
Port Channel + VSAN

UCS + MDS Better Together

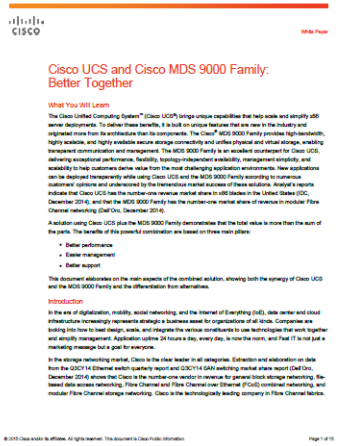
- Cisco UCS and MDS better together (YouTube Video)

  https://www.youtube.com/watch?v=dHmrVpbRCaI&feature=youtu.be



- Cisco UCS and MDS better together (White Paper)

http://www.cisco.com/c/en/us/products/collateral/storage-networking/mds-9700-series-multilayer-directors/white-paper-c11-734381.pdf


Cisco UCS and Cisco MDS 9000 Family: Better Together

What You Will Learn

The Cisco Unified Computing System™ (Cisco UCS®) brings unique capabilities that help scale and simplify x86 server deployments. To deliver these benefits, it is built on unique features that are new in the industry and originated more from its architecture than its components. The Cisco® MDS 9000 Family provides high-bandwidth, highly scalable, and highly available secure storage connectivity and unifies physical and virtual storage, enabling transparent communication and management. The MDS 9000 Family is an excellent counterpart for Cisco UCS, delivering exceptional performance, flexibility, topology-independent availability, management simplicity, and scalability to help customers derive value from the most challenging application environments. New applications can be deployed transparently while using Cisco UCS and the MDS 9000 Family according to numerous customers' opinions and underscored by the tremendous market success of these solutions. Analyst's reports indicate that Cisco UCS has the number-one revenue market share in x86 blades in the United States (IDC, December 2014), and that the MDS 9000 Family has the number-one market share of revenue in modular Fibre Channel networking (Dell'Oro, December 2014).

A solution using Cisco UCS plus the MDS 9000 Family demonstrates that the total value is more than the sum of the parts. The benefits of this powerful combination are based on three main pillars:

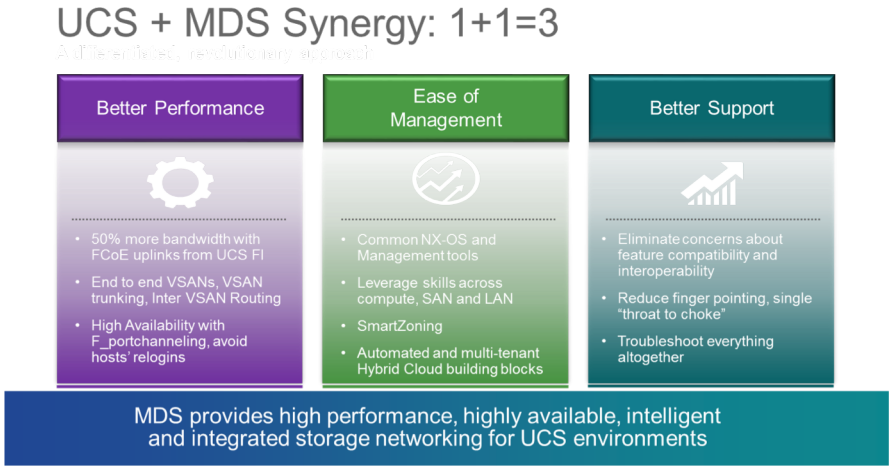
- Better performance
- Easier management
- Better support

This document elaborates on the main aspects of the combined solution, showing both the synergy of Cisco UCS and the MDS 9000 Family and the differentiation from alternatives.

Introduction

In the era of digitalization, mobility, social networking, and the Internet of Everything (IoE), data center and cloud infrastructure increasingly represents strategic a business asset for organizations of all kinds. Companies are looking into how to best design, scale, and integrate the various constituents to use technologies that work together and simplify management. Application uptime 24 hours a day, every day, is now the norm, and 'Fast IT' is not just a marketing message but a goal for everyone.

In the storage networking market, Cisco is the clear leader in all categories. Extraction and elaboration on data from the Q3CY14 Ethernet switch quarterly report and Q3CY14 SAN switching market share report (Dell'Oro, December 2014) shows that Cisco is the number-one vendor in revenue for general block-storage networking, file-based data access networking, Fibre Channel and Fibre Channel over Ethernet (FCoE) combined networking, and modular Fibre Channel storage networking. Cisco is the technologically leading company in Fibre Channel fabrics.



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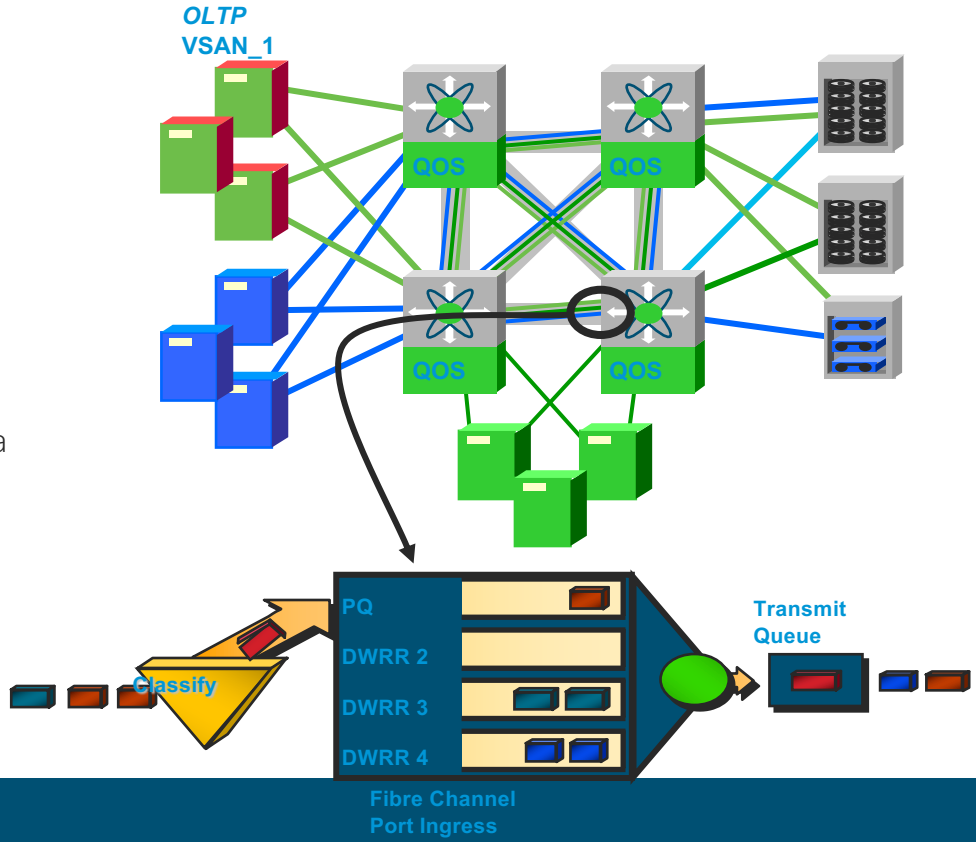
Quality of Service (QoS)
Advanced Differentiated Fabric Service

- MDS 9000 embedded QoS hardware and software capability
- QoS brings to SANs what has long been a requirement in any network – ability to provision and manage different levels of service for different clients (applications, departments)
  - For example, MDS can prioritize latency-sensitive OLTP transactions over throughput-intensive Data Warehousing traffic
- QoS levels can be set against the following
  - Differentiated service per VSAN
  - Differentiated service per source and/or destination pair (WWN)
  - Differentiated service per physical source port

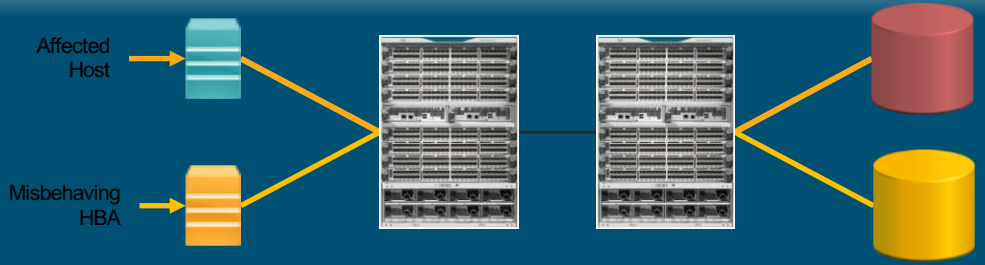


Slow Drain

Hardware-based FC Congestion
Detection and Recovery

Potential Reasons for Slow-drain Devices

- Speed Mismatch
- HBA issues
- Server Performance issues – application/OS
- Non graceful Virtual Machine exit



- Misbehaving device "slowly drains" packets destined to it from the SAN. Unrelated flows and devices can be affected
- MDS auto-detects slow drain devices and can take recovery actions

	Platforms	Detection Granularity	Recovery Action Latency – Start and Stop
Software-based	MDS 9500 MDS 9148	100ms	100ms
Hardware-based NEW!	16G and 32G MDS 9000 devices	1ms	Immediate (ns)

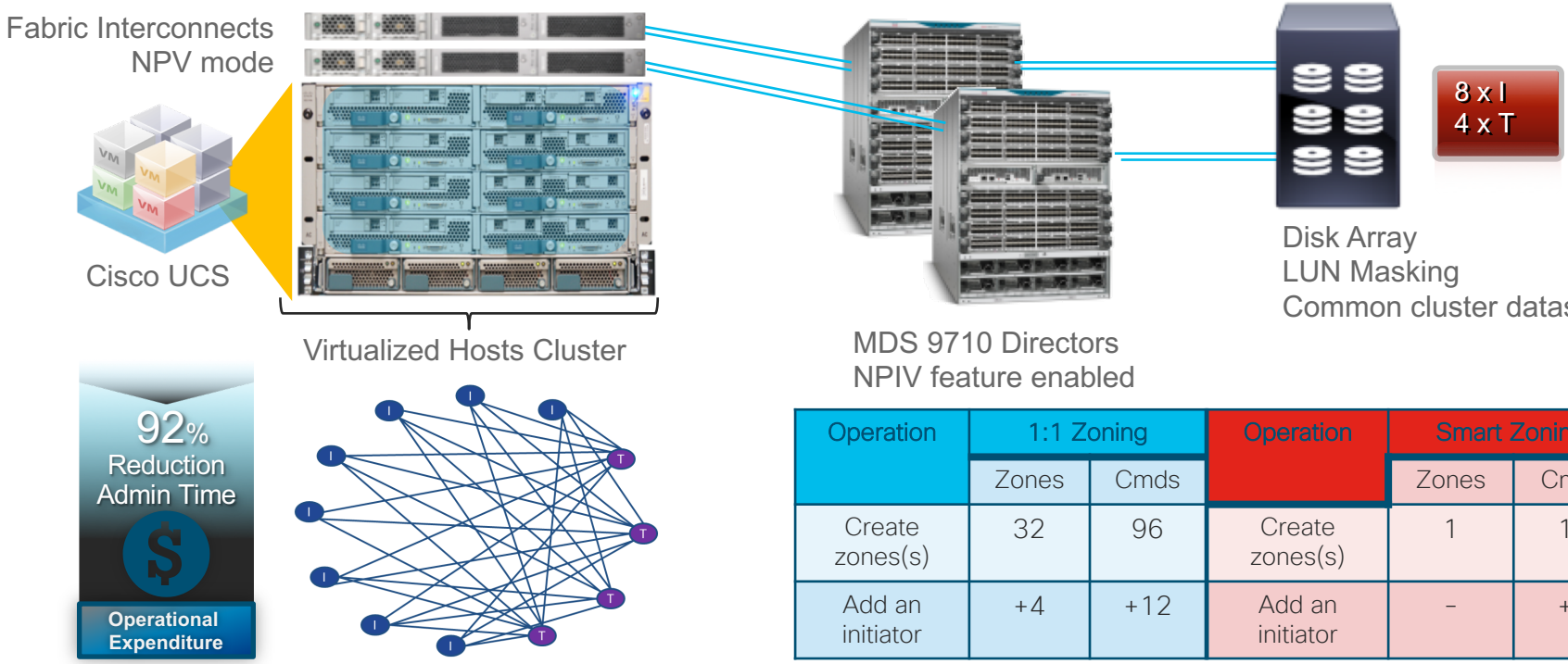
http://www.cisco.com/c/en/us/products/collateral/storage-networking/mds-9700-series-multilayer-directors/white_paper_c11-729444.html

Deploy Robust FC Networks and Reduce Operational Cost

Smart Zoning on Stage

Smart Zoning

Cisco Only



Operation	1:1 Zoning		Operation	Smart Zoning	
	Zones	Cmds		Zones	Cmds
Create zones(s)	32	96	Create zones(s)	1	13
Add an initiator	+4	+12	Add an initiator	-	+1

The simplicity of large MIMT zoning with the security and compliance of SIST zoning

Analytics – What's the Customer Problem?

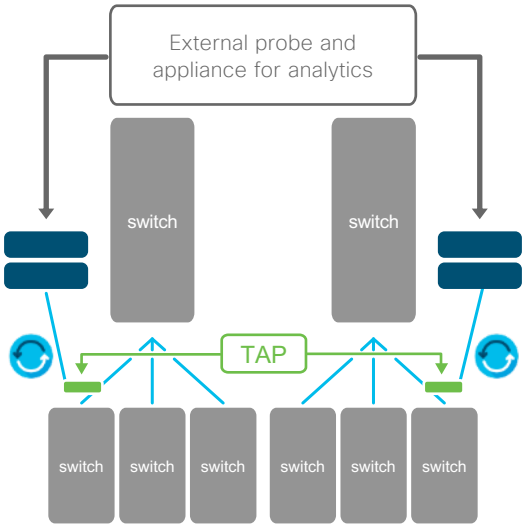
Need end-to-end visibility to troubleshoot effectively

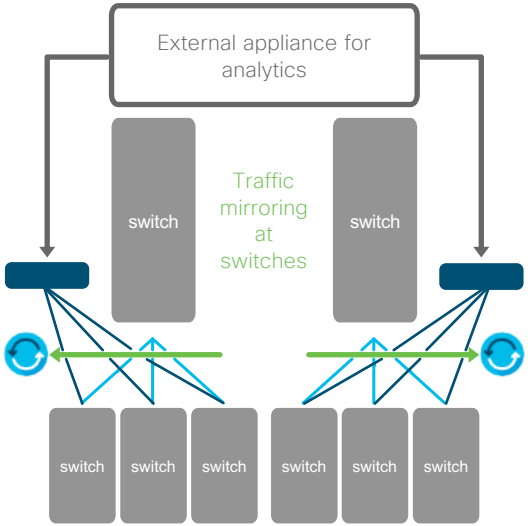
Putting an appliance or hardware probe is expensive, intrusive and not scalable

Hard to predict where the issue will be, so need something which is integrated and pervasive

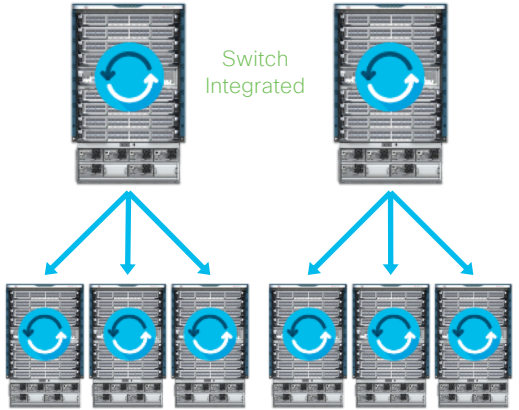
End to End Visibility Continues to be an Issue

SAN Telemetry





Existing



NEW: Cisco SAN Telemetry Streaming

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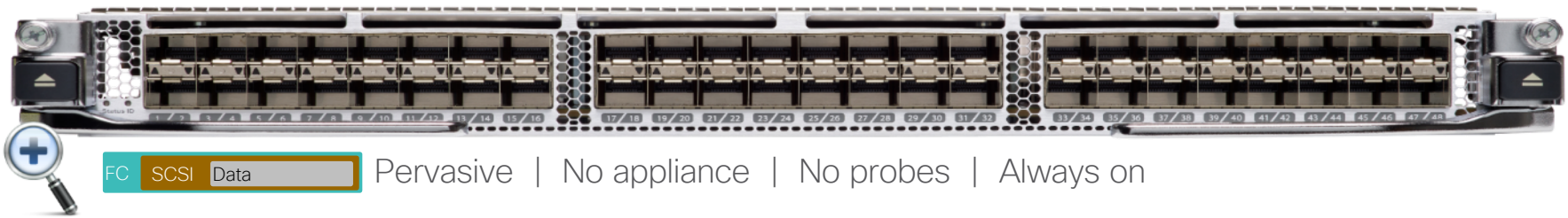
Switch Native Real Time Analytics



Pervasive | No appliance | No probes | Always on

High Performance
Onboard analytics engine for data collection

End to End Visibility for troubleshooting

Deep Visibility
Every **Packet,** Every **Flow,** Every **Speed**

Scale with MDS 9700 Director Platform, scale to entire fabric

Available on 32G linecard (from NX OS 8.2.1) and 32G switches (from NX OS 8.3.1)

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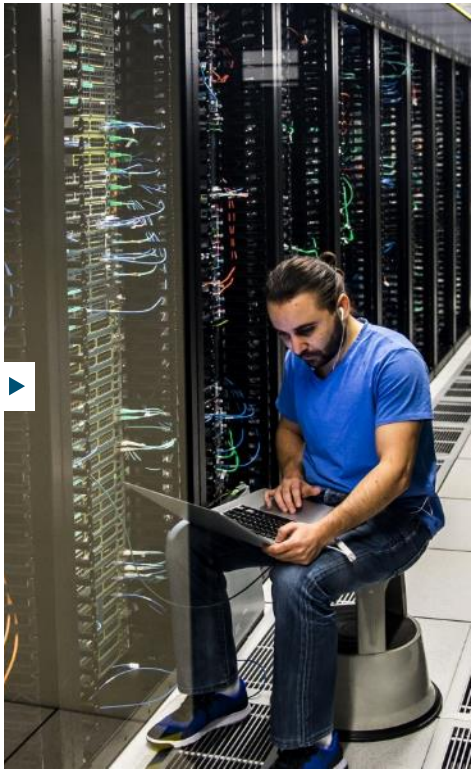
SAN Telemetry Streaming

Since Sept 2017
and NX-OS 8.2.1

- Allows to monitor, analyze, identify, and troubleshoot performance issues on Cisco MDS 9700 Series Multilayer Switches
- Ability to track top-n flows
  - Up to 64 simultaneous flows per ASIC: 192 per module
  - Can track on any port on module
  - Uses filters like VSAN/SID/DID
  - Shows rates, bytes, frame, count, etc. for port- and switch-level granularity
- Truncates matched flow packets to any length, and encapsulate with Ethernet header to send the same to network processor
- MDS 9700 32 Gb/s FC Module required
- SAN Telemetry license required (Term-based licensing or Smart licensing)



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Portfolio

MDS 9700 Directors Portfolio and Architecture

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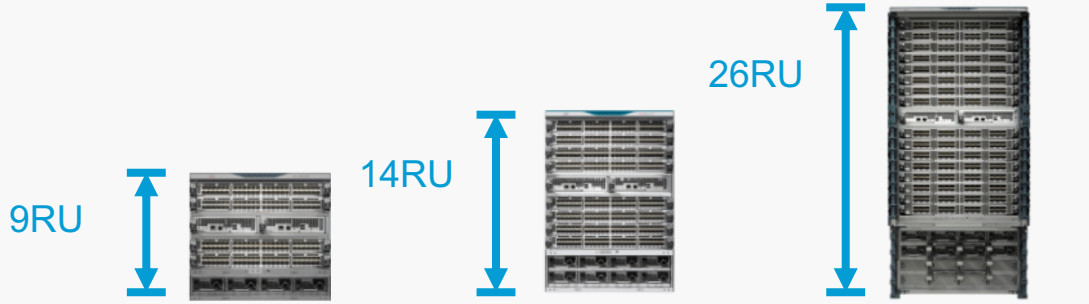
Cisco MDS 9700 Series Directors

Common Items: Linecards, PSUs, SFPs, NX-OS

Winning Points

- Multiprotocol flexibility
- Single OS (Cisco® NX-OS)
- Single management (Cisco DCNM)
- **Line-rate performance**
- **Better Cisco UCS® interoperability**



Hardware Feature	Cisco MDS 9706	Cisco MDS 9710	Cisco MDS 9718
Cisco part number	DS-C9706-1K9	DS-C9710-1K9	DS-C9718-1K9
Line-card slots	4	8	16
Line-rate ports at 16/32-Gbps and 10-Gbps FCoE	192	384	768
Line-rate ports at 40 GE FCoE	96	192	384
Fabric Module slots (available / default)	6 / 3	6 / 3	6 / 6
Sup Slots	2	2	2
Airflow	Front to Back	Front to Back	Front to Back
Power Consumption (Typical@32G FC)	1600W	2850W	5800W

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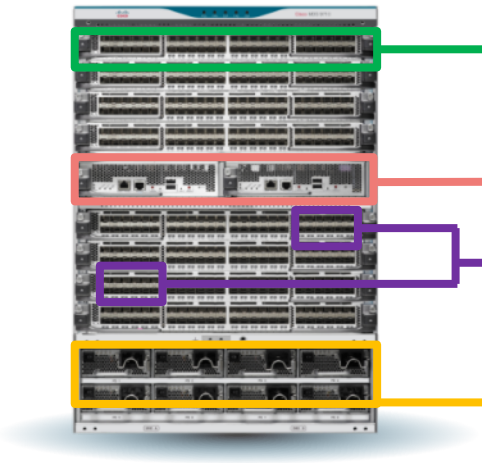
MDS is designed for the Modern SAN

Proven Architectural advantages for successive generations of Storage Networks



Front

- ✓ 100% 32G bandwidth per slot guaranteeing all line rate ports
- ✓ Multiple generations of FC modules pluggable in the same chassis
- ✓ Interop between multi-protocol SAN switching modules

- ✓ Dual Redundant Supervisor for centralized Restful management

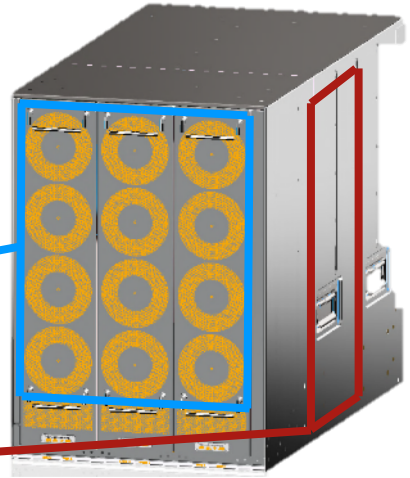
- ✓ Consistent and Predictable performance between any 2 Ports
- ✓ Port Channel group members across multiple modules
- ✓ Up to 8270 B2B Credits per Port

- ✓ Up to N+N Redundant and Hot Swappable Power Supply
- ✓ Options of AC ,DC or combination of AC+DC

- ✓ Redundant and hot swappable Fan Trays

- ✓ Up to N+N redundant and hot swappable fabric Modules
- ✓ Backplane capable of 16G/32G and 64G in future
- ✓ High Data Integrity using Store and Forward Architecture
- ✓ Centralized switching arbiter for non-blocking traffic flows

Rear



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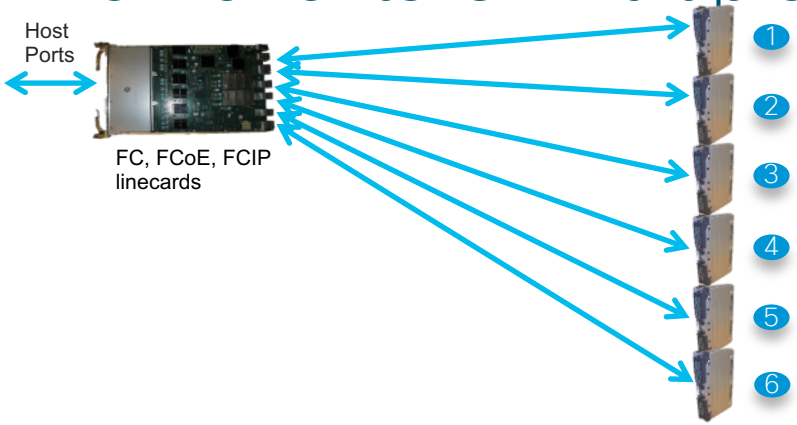
The Benefits Of Multiple Fabrics



Number Of Fabric Cards	Front-Panel FC Bandwidth / Slot
1	256 Gbps
2	512 Gbps
3	768 Gbps
4	1024 Gbps
5	1280 Gbps
6	1536 Gbps

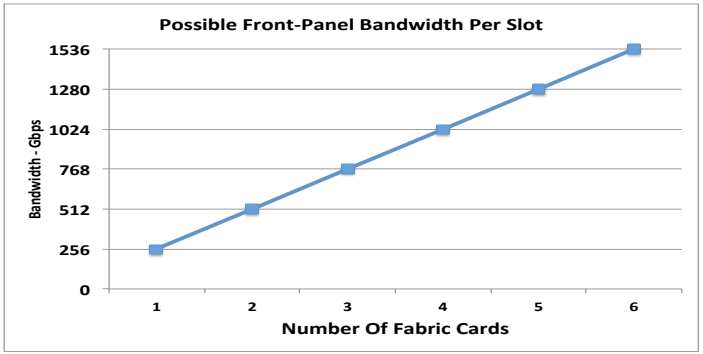
Default configuration
MDS9710 and MDS9706
32G FC capable

Default configuration
MDS9718
32G FC ready

The modern design with multiple fabrics provides two key benefits:

1) True operational redundancy: higher uptime at full performance

2) Easy scale up with addition rather than replacement: investment protection (upgrade to linerate performance for 32G FC, 40G FCoE)



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Highly Available MDS 9700 Networks

Components reliability
Architectural design
Software quality
Operational best practices

Properly engineered FC network
based on Cisco MDS 9700 family
of mission critical directors

99.9999% UPTIME

Design a Reliable and Highly Available Fibre Channel SAN
http://www.cisco.com/c/en/us/products/collateral/storage-networking/mds-9700-series-multilayer-directors/white-paper-c11-738426.pdf

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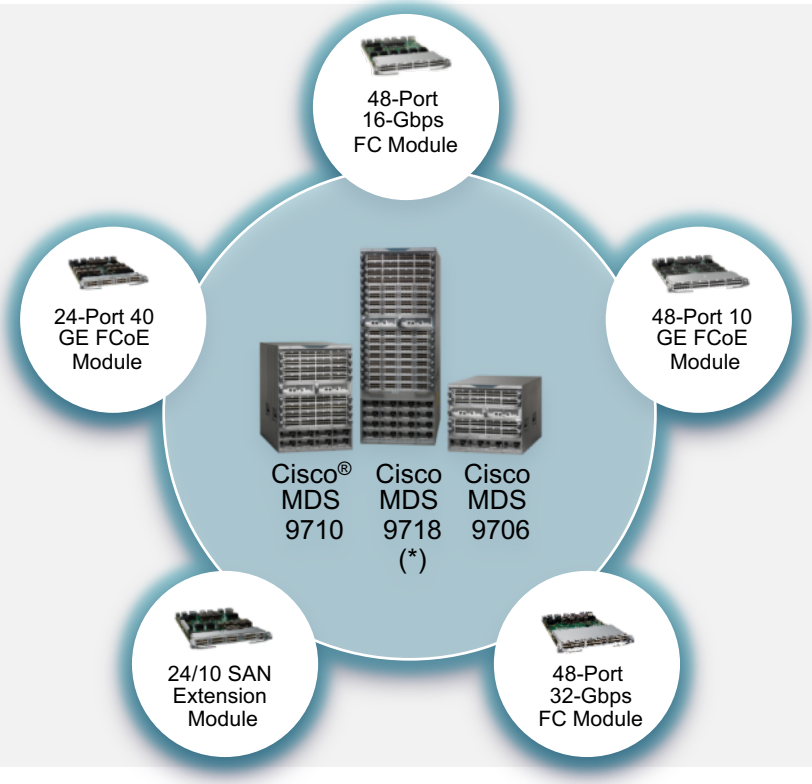
Cisco MDS 9700 Series Modules
Bringing FC, FCoE, FCIP and FICON Together

(*) not FICON certified

- Flexibility
- Redundancy
- Interchangeable
- Multiprotocol
- Licensing



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Migrating from Brocade to Cisco MDS 9000

- Same concepts, just a different and easy-to-learn CLI
- Same familiar Cisco NX OS approach
- Migration tool for zoning available
- Multiple strategies possible: one fabric at a time, parallel SAN, interoperability mode, edge/NPIV core approach
- You are not the first to migrate from Brocade to Cisco
- Cisco advanced services (at a price) in case of need, 100k+ ports migrated
- Training on the job included in our proposal

Storseisundet bridge, Atlantic route, Norway

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Portfolio

MDS 9000 Fabric Switches Portfolio

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MDS 9148S Fabric Switch

High-Performance, Easy to Deploy, Enterprise-class Fabric Switch

Front

48 x 16G FC Line Rate Performance
Expand from 12- to 48-ports in 12-port increments

Back

Dual Power Supplies and Fans for Enterprise-Class Availability

VERSATILE

- Line-rate 16/8/4/2G FC Ports
- Industry-leading port range
  - 12-port base
  - Scale up with 12-port licenses
  - Full 48-port option available

EASY TO USE

- Automated Provisioning
- Quick Configuration Wizard
- Same OS and Management across Industry's broadest SAN Portfolio

ENTERPRISE-CLASS

- Non-disruptive software upgrades
- Up to 32 Virtual SANs (VSANs)
- Inter-VSAN Routing (IVR), QOS, PortChannels, N-Port ID Virtualization (NPIV), N-Port Virtualization (NPV), Comprehensive Security
- Hardware-based slow-drain detection and recovery

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MDS 9396S Fabric Switch

Blend of Fabric Switch and Director Capabilities

Hardware Platform

- 2RU 96-port 16G FC fixed fabric switch
- 2/4/8 and 16-Gbps Line-rate Fibre Channel speeds
- Redundant power supplies and fans, with Port Side Exhaust or Port Side Intake air flow

Enterprise Class

- Up to 4095 B2B credits / port
- FC TrustSec Encryption
- Forward Error Correction

Fabric Switch-like Capabilities

- On demand port licensing (48-port base with 12-port incremental licenses)
- NPV Mode
- Power-On-Auto-Provisioning (POAP), Quick Configuration Wizard

Front View

Bidirectional airflow

Rear View

Deploy as a Stand-Alone switch or as an Edge Switch for an Edge-Core Network

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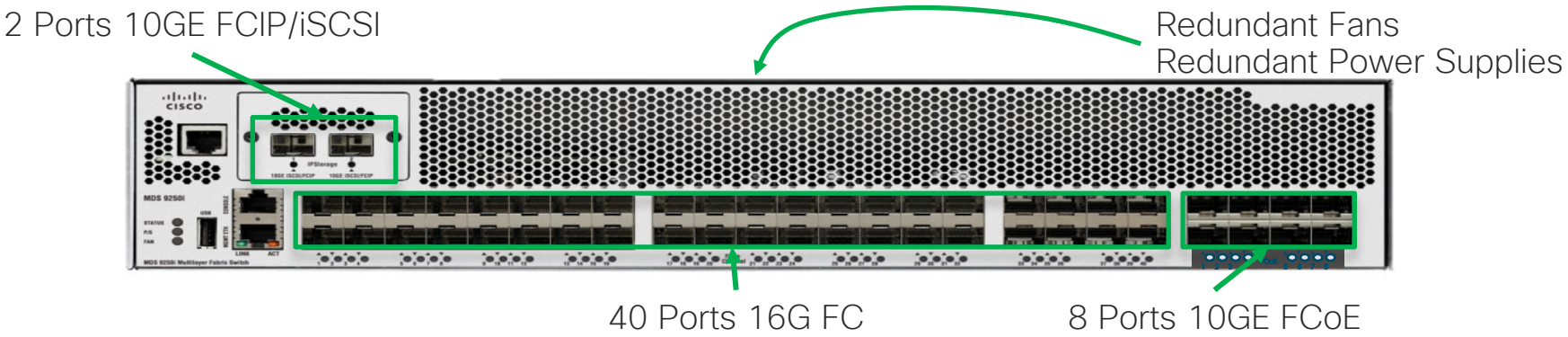
MDS 9250i Multiservice Fabric Switch

Next-Gen Storage Services Platform for Unified Fabric



Features

Line Rate Performance for:

- 16G FC, 10GE FCoE, 10GE FCIP, FICON, iSCSI

Rich set of Storage Services for FC and FCoE:

- FCIP, IO Accelerator (IOA), Data Mobility Migration
- Integrated Management (DCNM)

Benefits

Single Platform for deploying Storage Services across FC and FCoE Storage Area Networks:

- High-Bandwidth SAN Extension across MAN/WAN
- Migrate Data between FC and FCoE arrays

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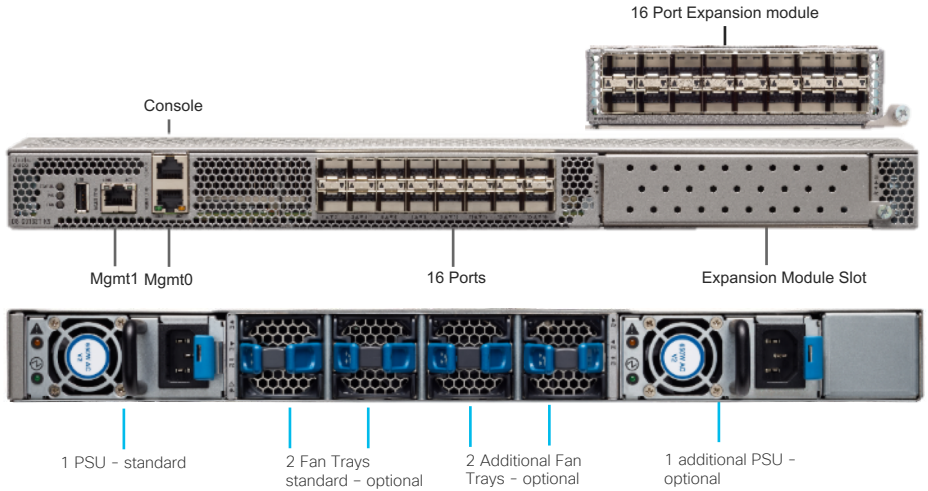
MDS 9132T



80 PLUS PLATINUM

Bidirectional airflow

Industry Leading Features, Cost Optimized with no watered-down compromise

8 > 16 > 24 > 32
Line Rate
4/8/16/32G Ports
Semi-modular
Cost-Optimized

Integrated SAN Telemetry
and deep visibility
Next-gen ASIC with NPU
Every Frame on all ports

1-Tbps
Line Rate Full Duplex
Bandwidth
No oversubscription

All flash arrays,
FC-NVMe and tape
Qualified and ready
Advanced feature set

Director-class Features
VSANs and Portchannels
Up to 16600 buffer credits
Non disruptive FW upgrades
FC encryption

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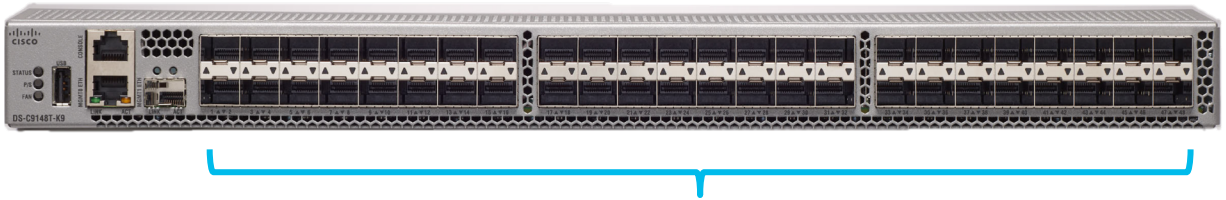
MDS 9148T



- Form Factor
  - 48 ports fixed form factor
  - 24 ports pre-activated base
  - Expandable to 48 ports in 8-Port increments via upgrade license
- Power and Thermal
  - 650W Bi-directional PSU
  - Dual PSUs and 4 FAN trays as standard
- Management ports
  - 1 X 10/100/1000M Base-T
  - 1 X 10G SFP+ (For streaming telemetry*)
- Auto-zoning : Automatically zone new devices without having to configure anything
- Configurations
  - 24-Port switch (DS-C9148T-K9)
  - 24-Port 32G switch bundle with optics
  - 8-Port 32G license bundle with optics

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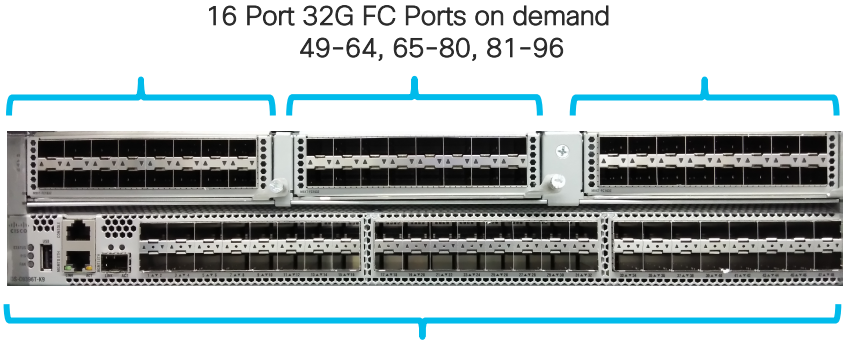
*Available via future software upgrade

MDS 9396T



- Form Factor
  - 48 ports pre-activated base
  - Expandable to 96 ports in 16-port increments via upgrade license
- Power and Thermal
  - 1200W Bi-directional PSU w/ SAF-D-Grid power cable (No jumper chord)
  - Dual PSUs and 4 FAN trays as standard
- Management ports
  - 1 X 10/100/1000M Base-T
  - 1 X 10G SFP+ (For streaming telemetry*)
- Auto-zoning Automatically zone new devices without having to configure anything
- Configurations
  - 48-Port switch (DS-C9396T-K9)
  - 48-Port 32G switch bundle with optics
  - 16-Port 32G license bundle with optics

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*Available via future software upgrade

Portfolio

Nexus Fabric Switches Portfolio

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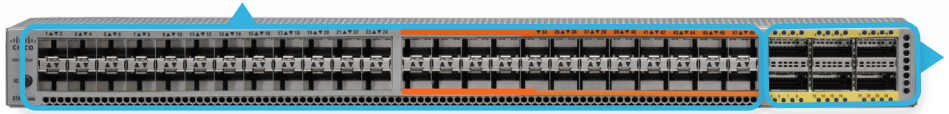
Cisco Nexus 5672UP-16G Switch

Since March 2016 and 7.3(0)N1(1)

- Part Number: N5K-C5672UP-16G
- 48 Fixed 10G SFP+ Ports of which 24 Ports are Unified
- 24 Ports Traditional Ethernet or FCoE + 24 Unified Ports provide 4/8/16G FC, 10G Ethernet or FCoE



- 6x 40G QSFP+ Ports
- Flexibility to use 4x10G or 40G
- Traditional Ethernet or FCoE

Compared to previous Nexus 5672UP, 5672UP-16G provides additional SAN storage capabilities with existing Nexus Ethernet functionality:

- 50% more UP Ports than previous 5672UP (24 vs. 16)
- Fibre Channel port speeds increased from 8G to 16G FC
- When configuring an FC port on N5672-16G, the fabric mode should be in the 40G mode to support 16G.
- Increased Buffer-to-Buffer credits (MAX 128 BB_Credits vs. 15 BB_Credits)
- Support 8G FC CWDM/ER optics and 16G FC ELW optics for improved DC-to-DC connections
- Support 14 VSANs including VSAN 1

Traditional Ethernet Plus Storage: NAS, iSCSI, FCoE and FC

NEXUS 2300 SERIES

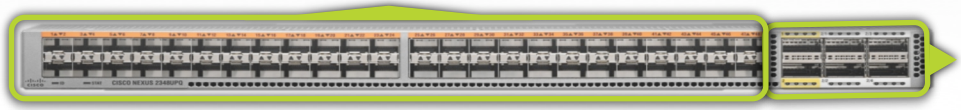
Chassis

Nexus 2348UPQ

Since 01/07/2014

BACK OF FEX

- 48 Fixed 1/10 Gb/s SFP+ Unified Capable Ports
- Traditional Ethernet or FCoE
- 48 Unified Ports provide 2/4/8 Gb/s FC, 24 Provide 16 Gb/s FC
- 32 M of Buffer with Lower Oversubscription ratio of 2:1
- Parent Switch : at FCS: Nexus 5000 and Nexus 6000, followed by Nexus 7000 and Nexus 9000



- 6 x 40 Gb/s QSFP+ Ports
- Flexibility to use 4 x 10 Gb/s or 40 Gb/s

FRONT OF FEX

Choice of Reversible Airflow

Redundant 1+1 AC/DC Power Supplies

Redundant 1+1 AC/DC Power Supplies

Redundant Fan Modules

Redundant 1+1 AC/DC Power Supplies

Mgmt / Console

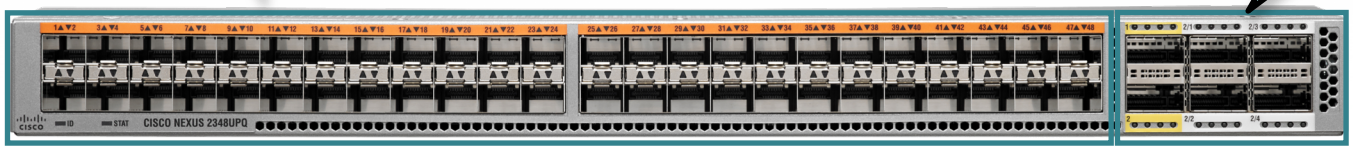
Compact 1 RU Switch in the Nexus 2300 Platform

FC Ports on Nexus 2348UPQ UP FEX

- 48x1/10G SFP+ Ports or 16G FC

- 48 Fixed 1/10G SFP+ Unified Capable Ports supporting Ethernet or FCoE or FC
- **Unified Ports provide up to 24x 16GFC ports or 48x 8GFC ports**
- 32M of Buffer with Lower Oversubscription ratio of 2:1
- Parent Switch for Ethernet/FCoE: Nexus 5K, 6K, 7K and 9K
- **Parent Switch for FC: Nexus 5600**

- 6x40G QSFP+ Ports
- 4x10G SFP+ Ports Flexibility



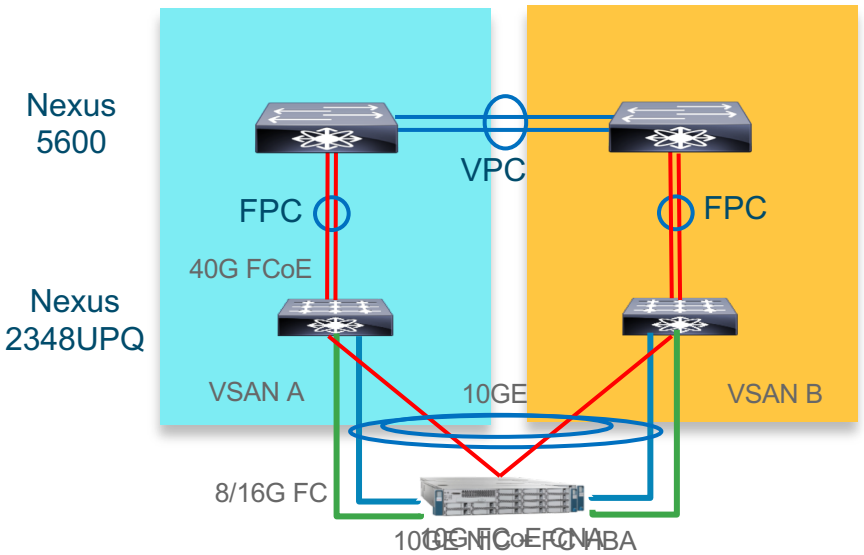
- Shipped with Ethernet/FCoE support in July 2014 with 7.0(3)N1(1)
- Enabled FC support in March 2016 with 7.3(0)N1(1)
- Fibre Channel FEX supported number (ID) range is from 100 to 130
- Support native Fibre Channel speed 2/4/8/16G
- Fibre Channel ports must be configured in groups of 4 ports and starts from beginning

- Only F port is supported on FC-FEX
- NP Port type is not supported so NPV device cannot connect to the FC FEX directly
- F-port trunking and F-port channel are not supported on FC-FEX ports
- The default BB credits on each FC interface are 32; and can be set to max 128
- Scale per parent switch: 24 FEX, MAX 96 FC ports

First FEX Solution Designed for All Storage Connectivity

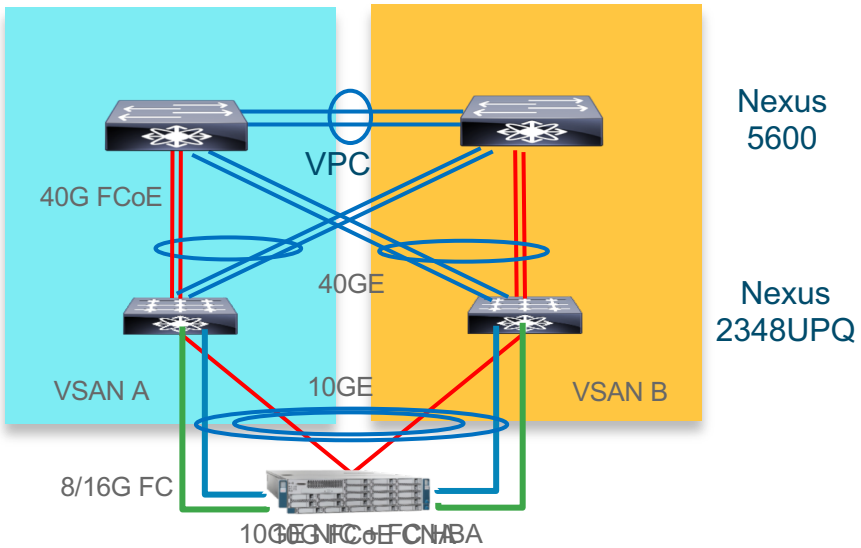
Typical UP FEX Topologies

Straight-Through FEX



- FC-HIF ports configuration must be the same in both the primary and the secondary VPC switches.
- For the Active-Active FEX, the port-conversion CLI should be configured on both the vPC peer switches.

Active-Active FEX



- The Active-Active FEX is supported, but only one FC FEX can be associated with a parent switch in the pair.

```
switch1(config)# fex 101
switch1(config-fex)# fcoe
```

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Nexus 9300-FX series

Since April 2017

Nexus 93180YC-FX

- 48 x 25 Gb/s Gb/s ports
- 6 x 100 Gb/s ports

27 500 USD GPL

Nexus 93108TC-FX

- 48 x 1/10 Gb/s Gb/s ports
- 6 x 10 Gb/s Base-T ports

27 500 USD GPL

Common to Nexus 9300-FX

- L2/L3 wirespeed
- NX-OS mode or ACI
- NX-OS 7.0(3)I7(1) min
- 32 Gb/s FC (NPV)*
- MACsec on all ports**
- ISSU
- UCS FI functionality***
- Redundant and hot-swappable PSs and fans
- Port-side exhaust or Port-side intake
- Supports Tetration
- Netflow

* Since NX-OS 7.0(3)I7(2)
** Since NX-OS 9.2.1
*** Roadmap

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Governing the SAN

DCNM Quick Overview

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DCNM Capabilities

5 **Analysis and Diagnostics**
Gather and display data about your environment to help reduce mean time to problem discovery and resolution

4 **Health**
Visually see health related indicators in the interface so that you can quickly identify issues in your environment

3 **Performance Measurements & Trending**
Visualize change in your environment and utilize predictive tools to understand how your environment is trending

2 **Visualization**
Let DCNM visually display fabric level information in a holistic view

1 **Configuration**
Leverage DCNM to configure your Nexus and MDS Switches

Introducing Data Center Network Manager version 10

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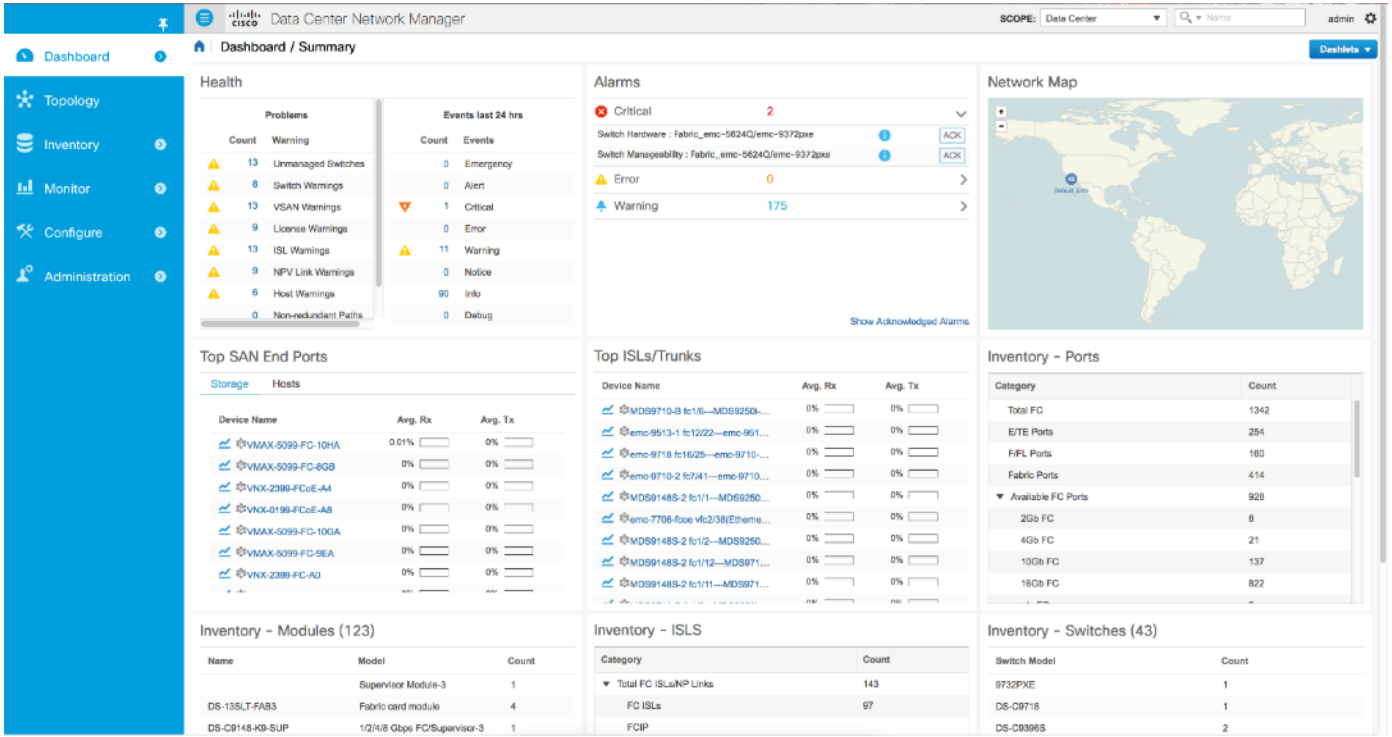
DCNM 10 HTML5 Web UI: Summary Dashboards



- Customizable layout with 16 different Dashlets
- Add and remove Dashlets for a custom view
- Auto Save your custom layout
- Focus on what matters in your environment

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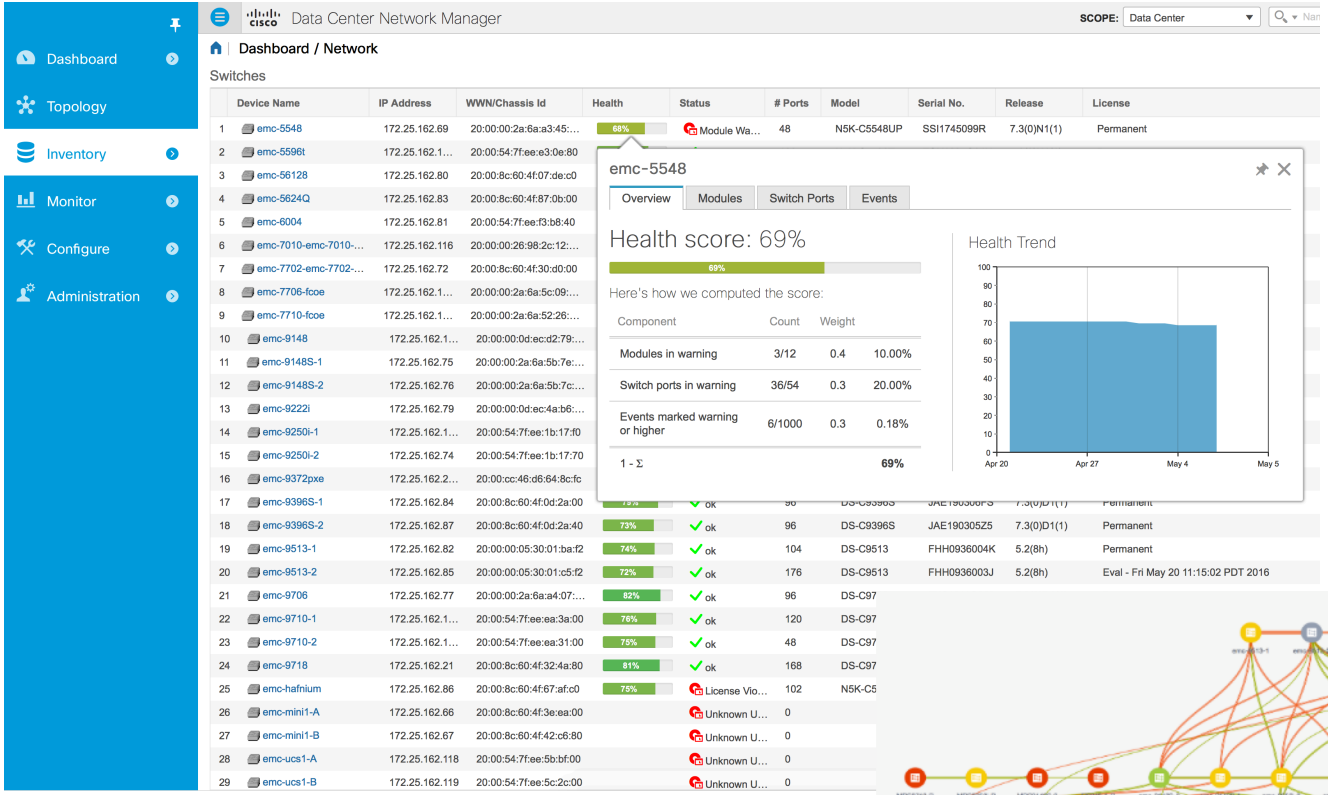
DCNM 10 Switch Health Score

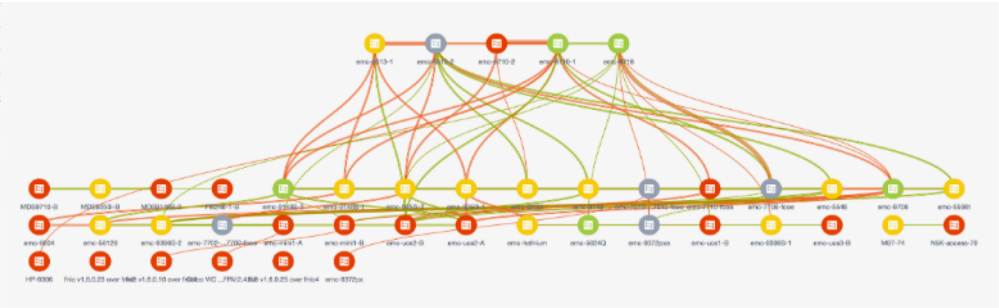


Policy Based configurable health score

See Health trend over time

Quickly Navigate to review warnings

See Health status on Topology map



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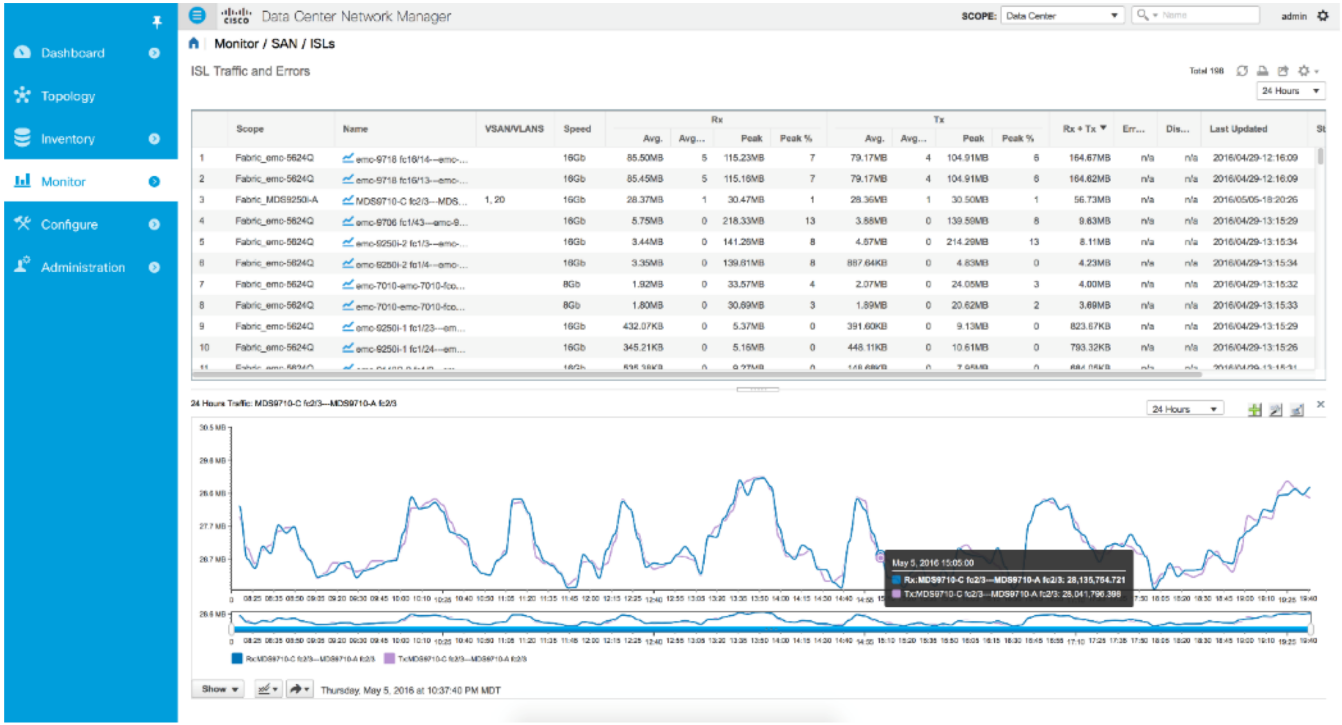
DCNM 10 Historical Data Trending



- Show ISL, Ethernet, FCoE and Fibre Channel port trending
- Append multiple interfaces on one chart
- Predict the future trends

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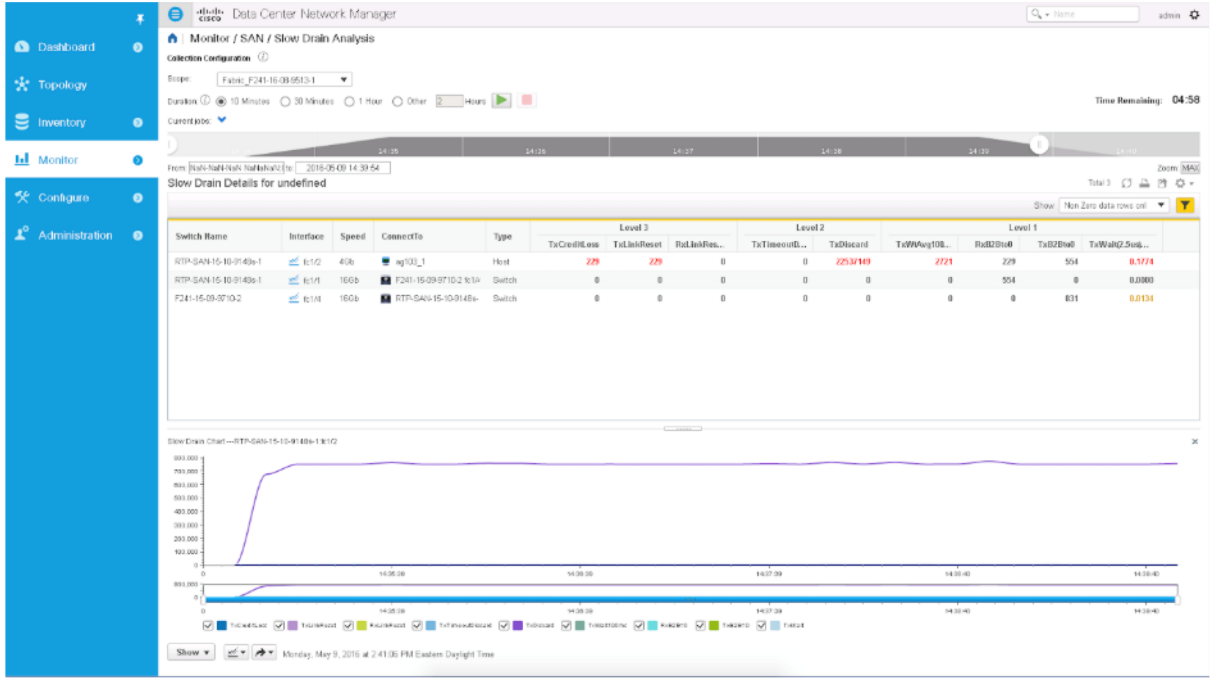
DCNM 10 Slow Drain Analysis

New Slow Drain Analysis report



- Show the results of the report
- Slider bar focuses on the data you want to see
- Graph data in the bottom section
- Filtered by Non-Zero by default

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Cisco and IBM

Partnership

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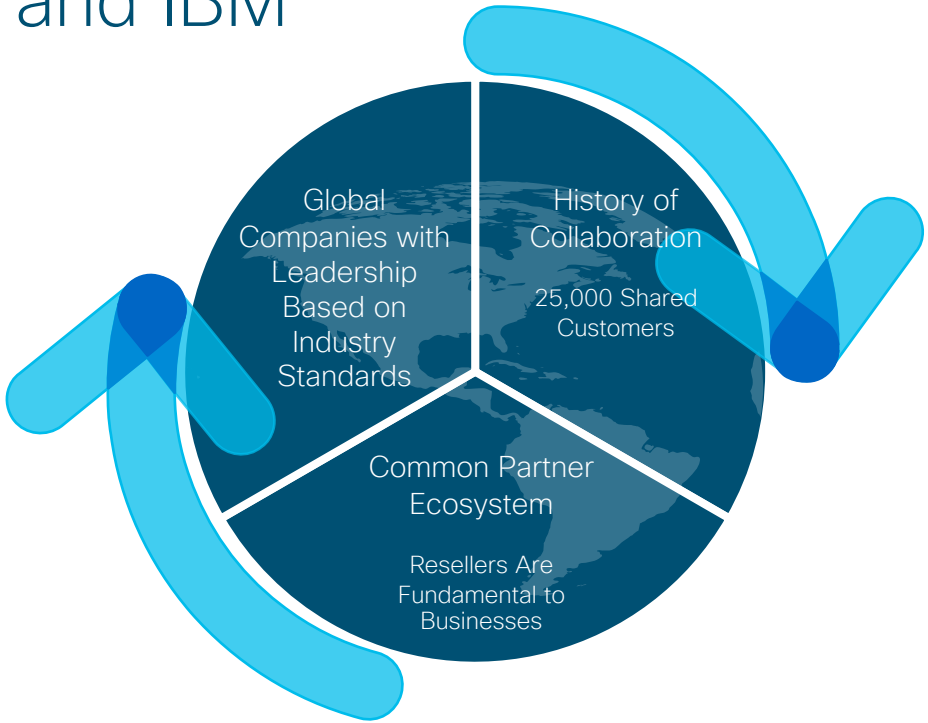
Why Cisco and IBM



DELIVERING INNOVATION THAT MATTERS

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What Is VersaStack?

VersaStack Solutions

CONVERGED INFRASTRUCTURE

Cisco Network

Nexus 5000/7000/9000 Switch Family, MDS Switches, Fabric Interconnect

Cisco Compute

UCS B-Series and UCS C-Series

Spectrum Virtualize

V5000, V7000, V9000, and SVC

Spectrum Accelerate

A9000 and A9000R

Hybrid Cloud

VersaStack CI On-Premises, Cloud Center, Public Cloud, IBM CDM

VersaStack Solutions

OBJECT STORAGE

IBM Cloud
Object Storage

IBM COS on UCS S3260

IBM Cloud Object Storage

UCS C-Series

UCS S-Series

VersaStack Solutions

SOFTWARE DEFINED STORAGE (SDS)

IBM **Spectrum Storage Suite**

Spectrum Protect

UCS C-Series, UCS S-Series

Spectrum Scale

UCS B-Series, UCS C-Series, and UCS S-Series

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CISCO