Cisco Nexus 7000 Series

Delivering a Unified Architecture to a Virtualized Data Center

Nexus 7000 Platform Overview

Next Generation Modular

Nexus 7000 and NX-OS

- 10 & 18 Slot versions
- 15+ Terabit System
- Unified Fabric Ready
- Modern, Modular OS
- Device Virtualization
- Cisco TrustSec
- Continuous Operations

Linecard Modules

Supervisor

10G Ethernet

- 32 Port SFP+ 10G
- *8 Port X2 10G - XL*

1G Ethernet

- 48 Port 10/100/1000
- 48 Port 1G - XL

10G Ethernet/DCB

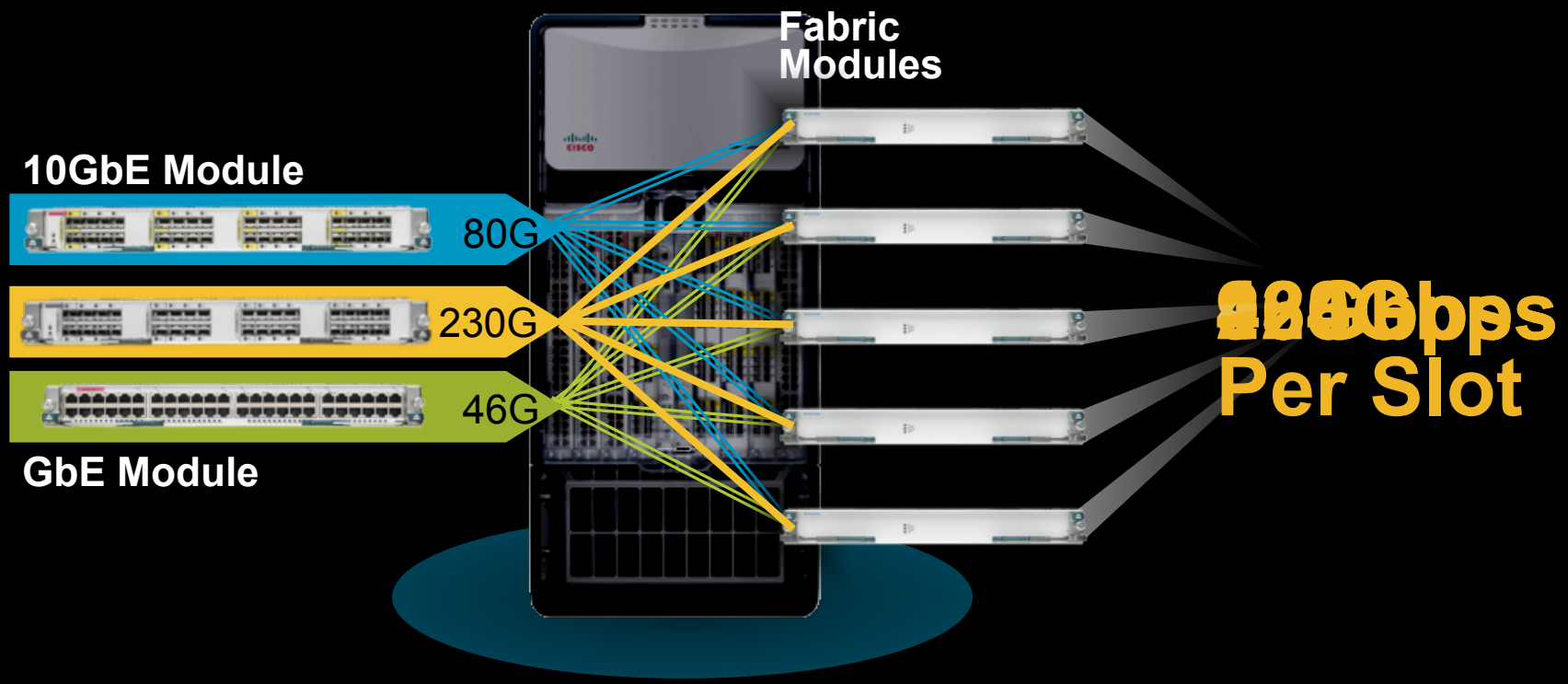
- *32 Port SFP+ 10G*
- *32 Port 10GBase-T (future)*

Cisco NX-OS Multi-protocol Operating System

Data Center Network Manager (DCNM)

15Tb+ System Performance

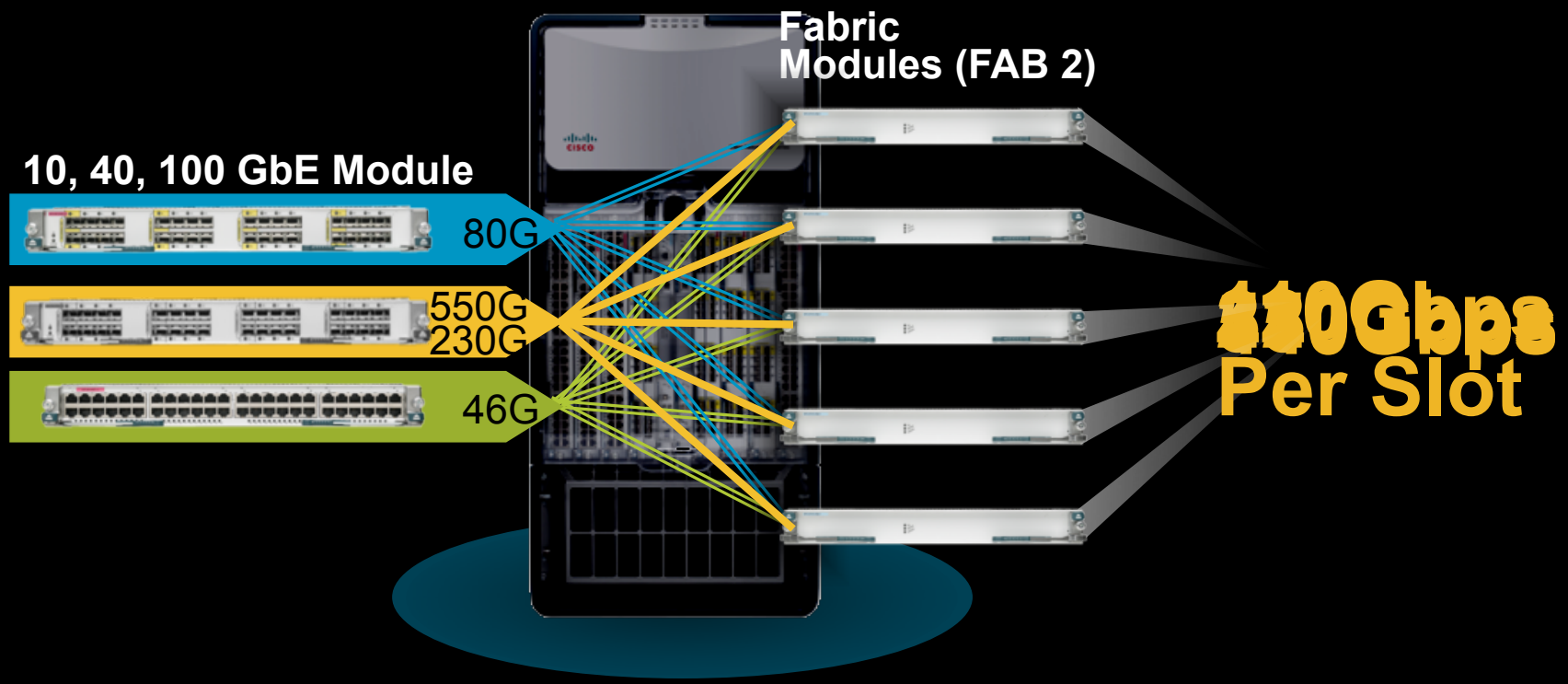
Bandwidth Scales with Each Fabric Module



Investment Protection and Unified Fabric

15Tb+ System Performance

Bandwidth Scales with Each Fabric Module



Investment Protection and Unified Fabric

Provide Simple solutions to complex problems

Nexus 7000 Modules – Providing Options tailored to the deployment need

F-Series

Access and Aggregation supporting High Performance Unified Fabric Transport capabilities

- **L2+ for highest port density and bandwidth**
- **FabricPath, DCB, vPC, FCoE, Low Latency**
- **Optimized for the 1G to 10G transition**

M-Series

L2 / L3 flexibility and Scalable Services

- **Broad L2 and L3 features, "6500 HW capability"**
- **QoS, Security, Large ACLs and Tables, Netflow**
- **10G/1G options with deep buffers**

Common characteristics:
Performance, Scale, NX-OS

Nexus 7000 I/O Module Roadmap
Services Rich Platform (M Series Modules)

"XL" Capable

32-Port 10GbE Module

SFP+ SR, LR, and ER
Integrated L2 / L3 Forwarding Engine
128K FIB TCAM-> 1 Million Prefix with XL Lic.
80 Gbps per slot, 60MPPS
Fabric Extender Support, 802.1aeLink-Sec
4:1 over-sub or 1:1 line rate mode

"XL" Capable

8-Port 10GbE Module

X2 Optics – SR, LR, ZR. xWDM
Integrated L2 / L3 Forwarding Engine
128K FIB TCAM - 1 Million Prefix with XL Lic.
80 Gbps per slot, 120 MPPS

"XL" Version in Cairo Maint.

48-port 10/100/1000

RJ-45 Copper
Integrated L2 / L3 Forwarding Engine
128K FIB TCAM
46 Gbps per slot

"XL" Capable

48-port 1 Gigabit SFP Module

SX, LX, ZX, T and xWDM
Integrated L2 / L3 Forwarding Engine
128K FIB TCAM - 1 Million Prefix with XL Lic.
46 Gbps per slot

Cisco Confidential

M1 Series Forwarding Engine Hardware

- Hardware forwarding engine(s) integrated on every I/O module
- Layer 2 bridging with hardware MAC learning
- 60Mpps per forwarding engine IPv4 and 30Mpps IPv6 unicast
- IPv4 and IPv6 multicast support (SM, SSM, bidir)
- RACL/VACL/PACLs
- Policy-based routing (PBR)
- Unicast RPF check and IP source guard
- QoS remarking and policing policies
- Ingress and egress NetFlow (full and sampled)

Hardware Table	M1 Modules	M1-XL Modules without License	M1-XL Modules with License
FIB TCAM	128K	128K	900K
Classification TCAM (ACL/QoS)	64K	64K	128K
MAC Address Table	128K	128K	128K
NetFlow Table	512K	512K	512K

Release 5.1(x) Release Cairo

- F1-Series 32 port 1/10GE I/O Module
- Nexus 7000 FEX Support
- FabricPath

Nexus 7000 F-Series Module

High Performance 10GbE supporting Unified Fabrics

- Scalable 512 ports per system, 230Gbps per slot
- Low Latency sub 5µs port to port latency
- Standards Based TRILL and DCB support
- Flexible 1G and 10G autosensing
- Energy Efficient ~10W per 10GbE port

Shipping

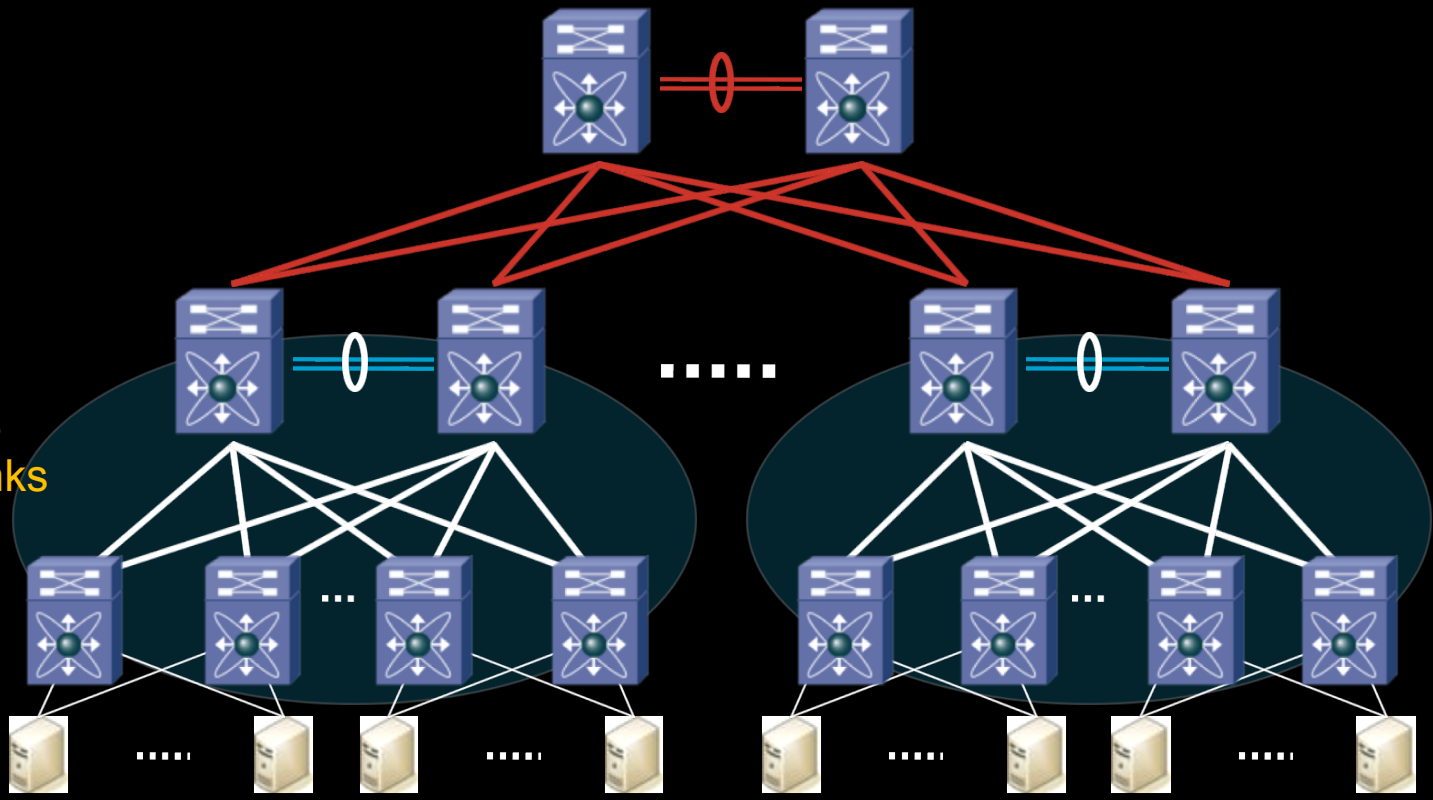
32-port 1/10 GbE for server access and aggregation

M1 and F1 modules are complementary

Core
All M1 Series

Aggregation
M1 Series Up Links
F1 Series Down Links

Access –
All F1 Series



Requirements analysis will dictate where M1/F1 will be most advantageous

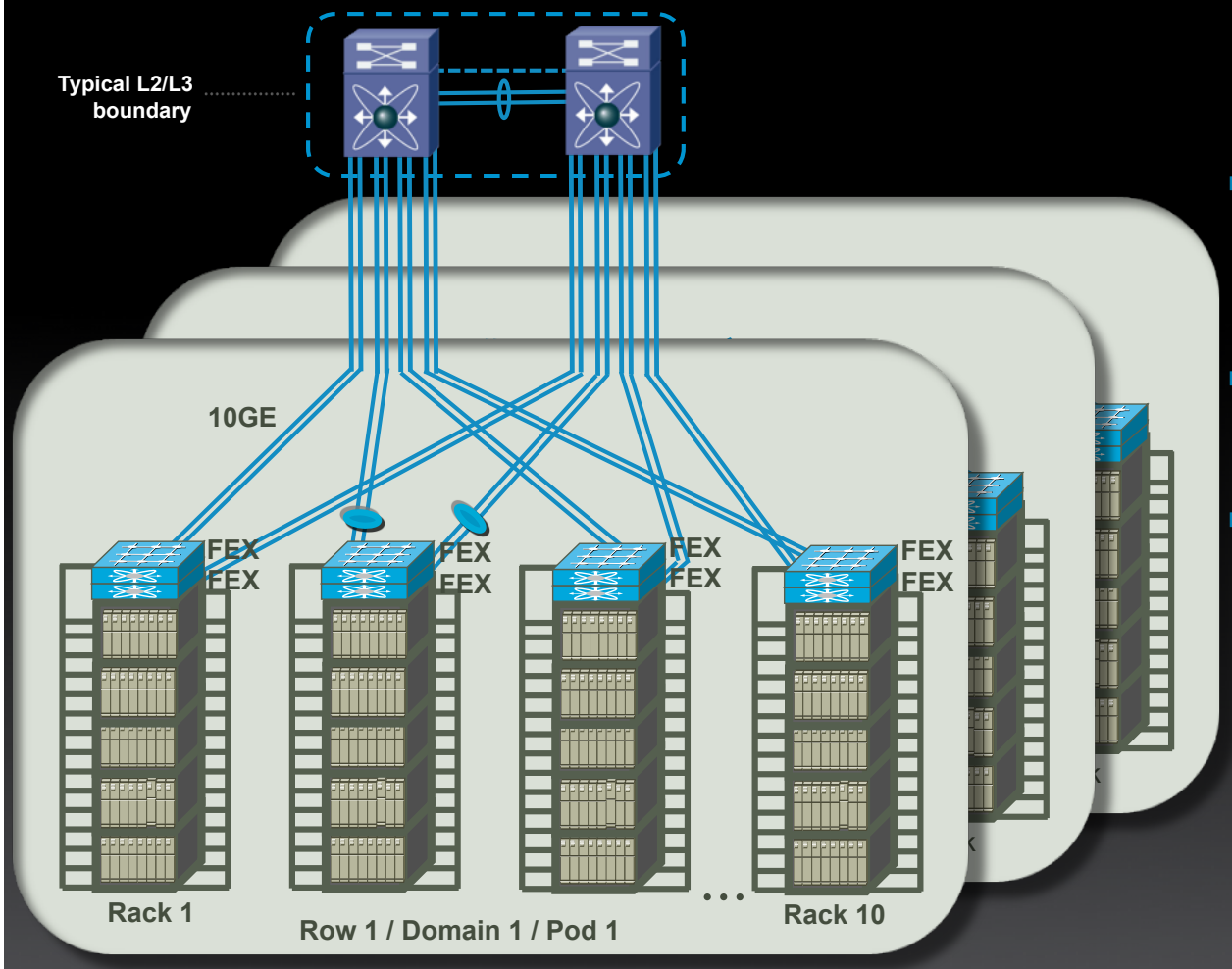
Nexus 7000 Linecard Options

Feature comparison of M-Series and F-Series

	M1 Series (Service Rich)	F1 Series (DCE/Performance)
Performance (bps)	80Gbps	320Gbps Local, 230Gbps Fabric
Line Rate 10GbE Ports (18 slot)	128	512
L3 (IPv4, IPv6)	Yes (Up to 1M routes)	No
L2 Table	128K	16K
Netflow	Yes	No
ACL	Up to 128K	2K
Per Line Rate 10G Port Ingress / Egress Buffer	100MB / 112MB	1.53MB / 0.7MB
FCoE	No	Yes
FabricPath (TRILL)	No	Yes
Latency	~ 20 µs	~ 5 µs
Power per Line Rate 10GbE Port	~ 80 watts per port	~ 10 watts per port
List Price	$70K - 32 ports 4-1 $44K – 8 ports 1-1	$35K – 32 ports

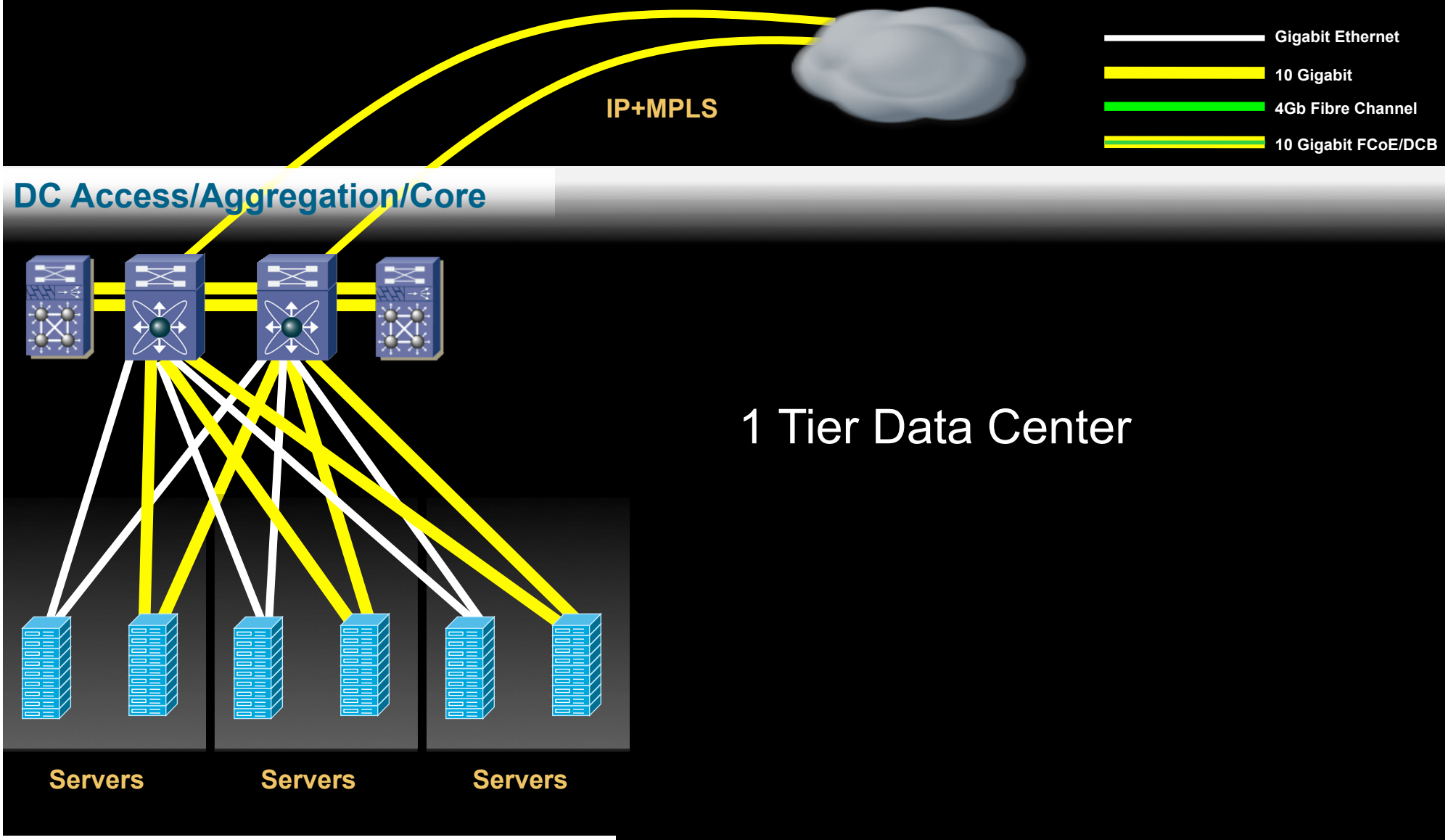
Support for Virtualized Access Layer (FEX)

Deployment Scenario: Nexus 2000 + Nexus 7000



- Nexus 2000 Fabric Extenders can be connected directly to Nexus 7000
- Simplifying management domain – 1500+ ports managed centrally
- Benefits of ToR Cabling with Modular Chassis Features
- Software update only on Nexus 7000
  - Supported on N7K-M132XP-12 and N7K-M132XP-12L

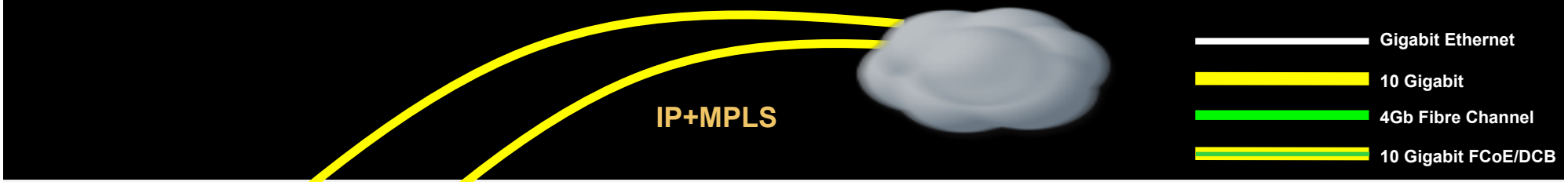
Data Center Virtualized Architecture



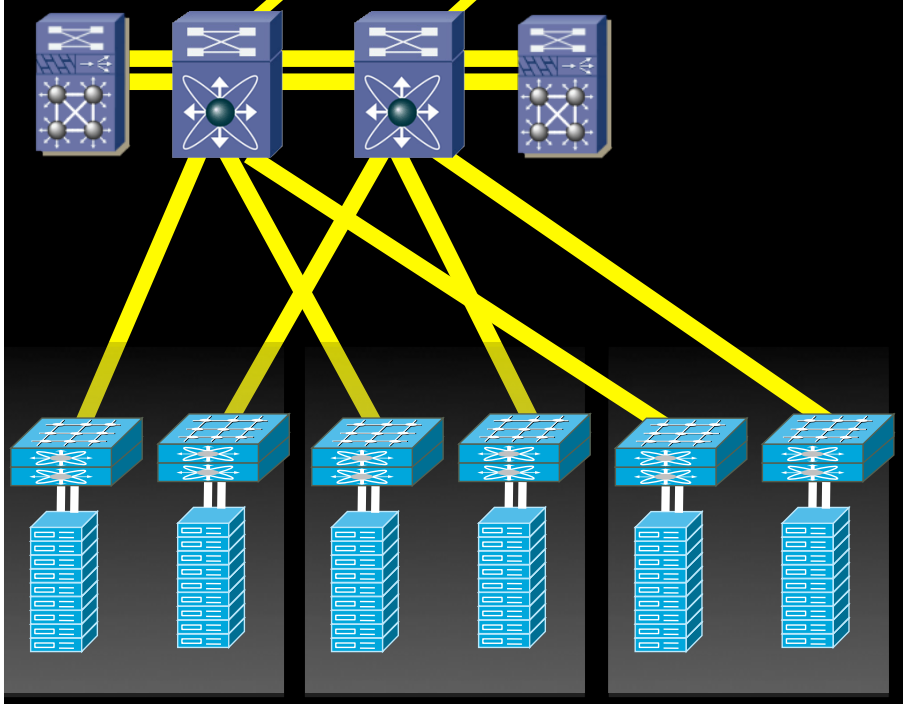
1 Tier Data Center

1GbE/10GbE Server Access

Data Center Virtualized Architecture



DC Access/Aggregation/Core



Nexus 2000 Top of Rack

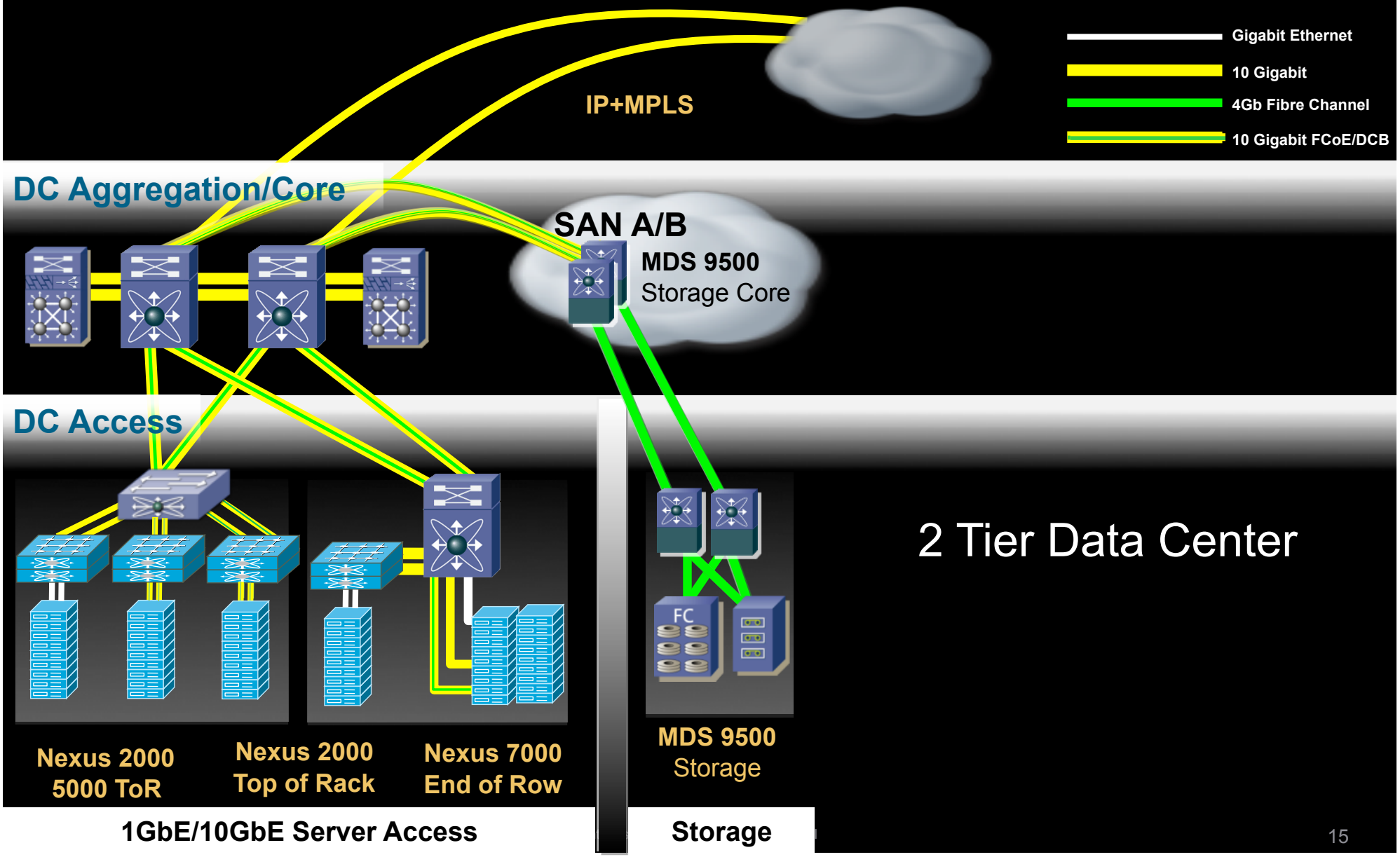
Nexus 2000 Top of Rack

Nexus 2000 Top of Rack

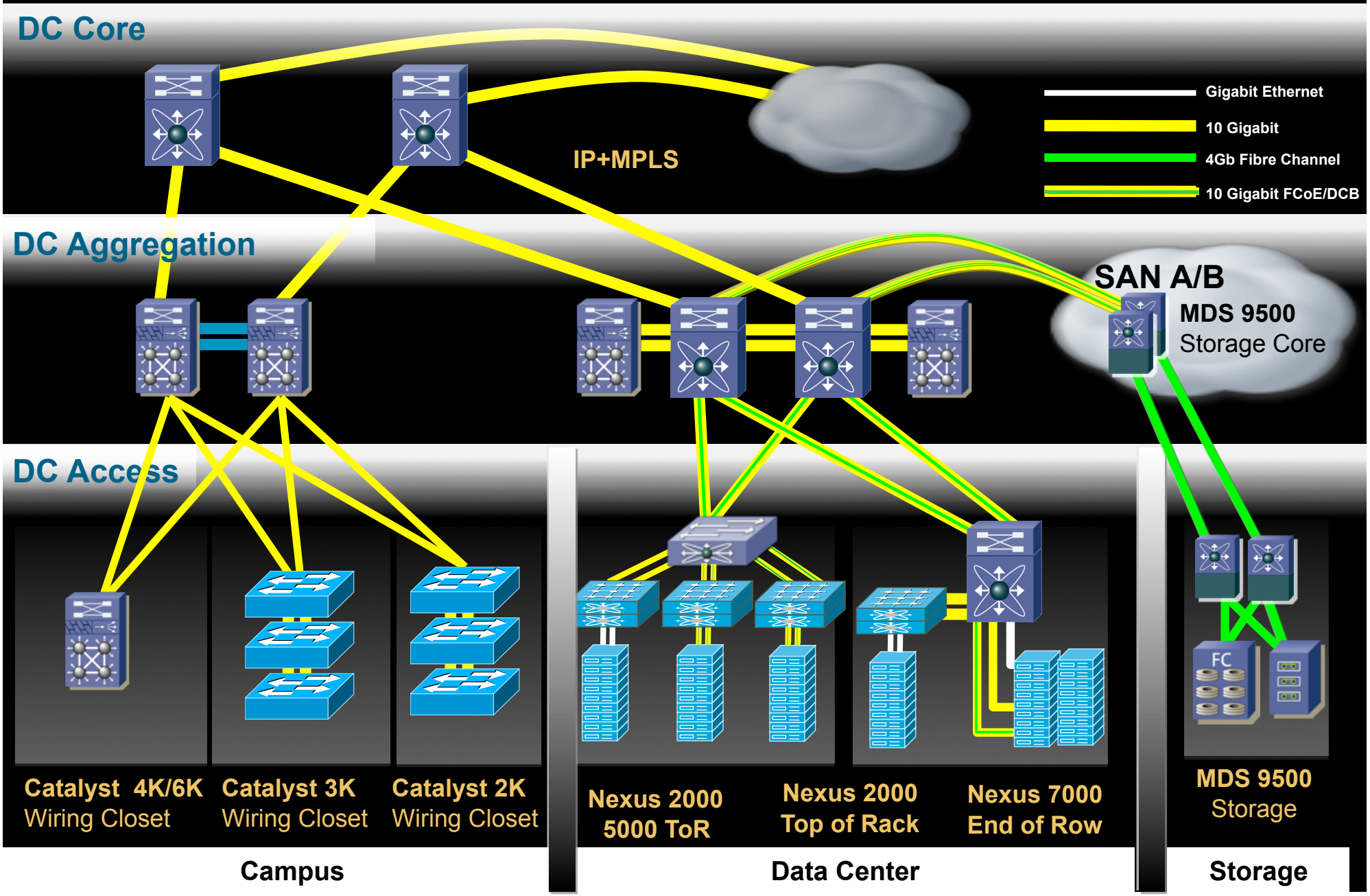
1 Tier Data Center with N2K-2248 FEX

1GbE/10GbE Server Access

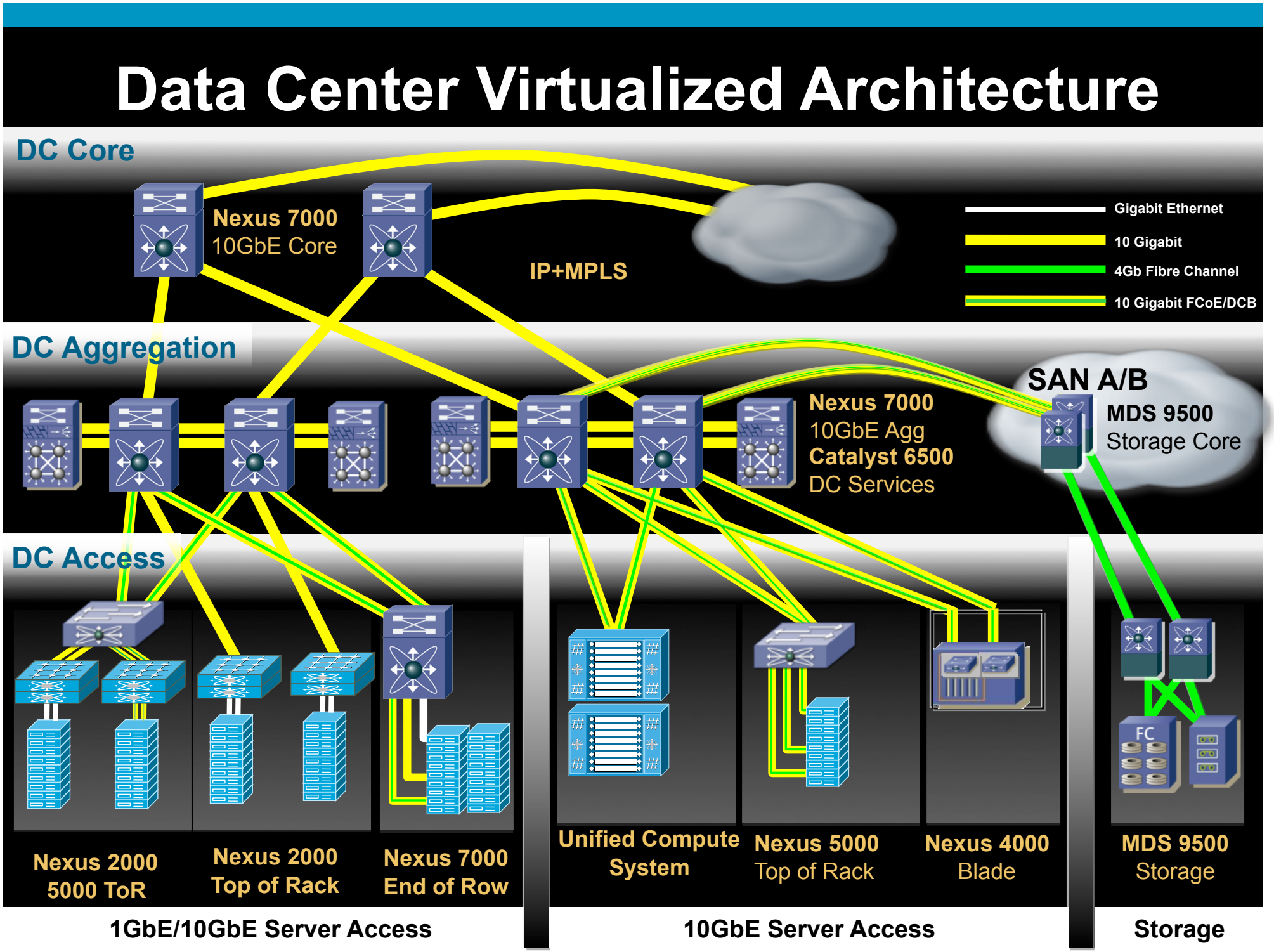
Data Center Virtualized Architecture



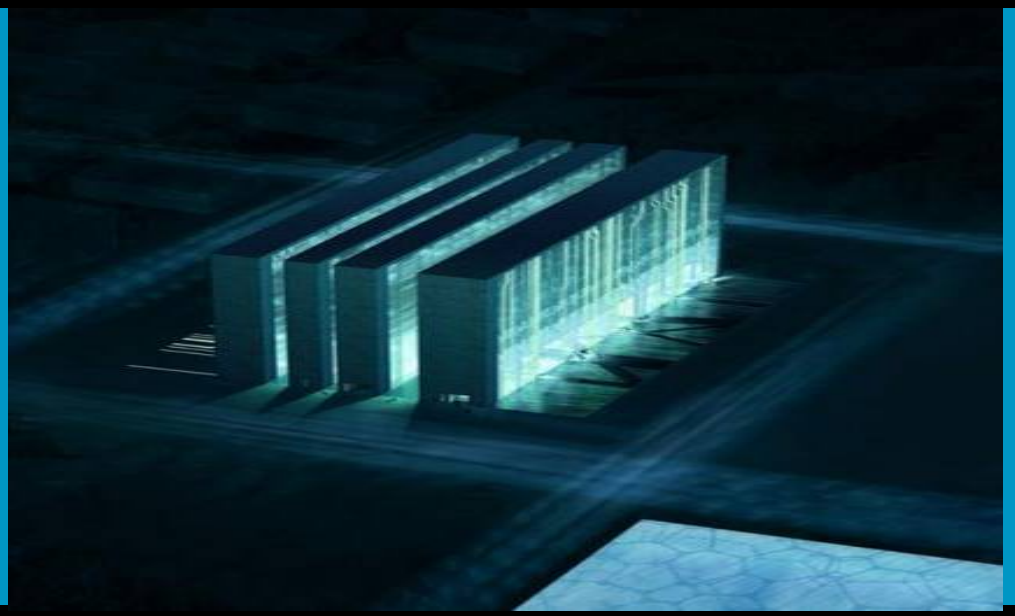
Data Center/Campus Architecture



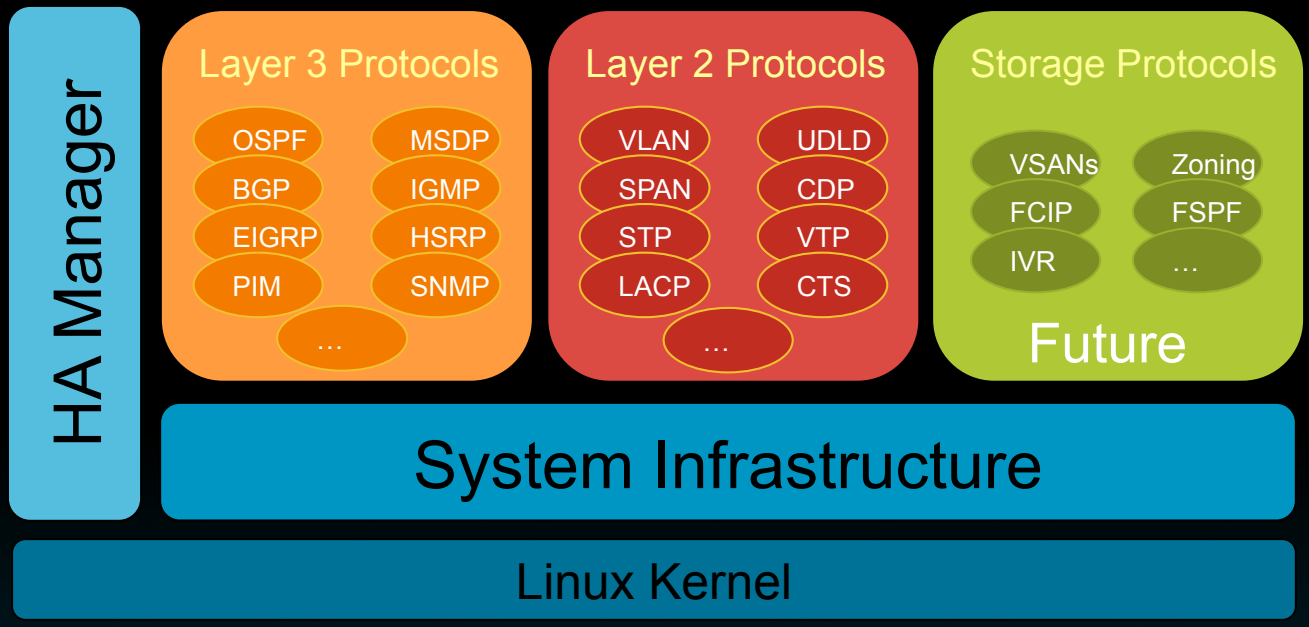
Data Center Virtualized Architecture



NX-OS Software



High Level NX-OS Architecture



- Linux kernel provides preemptive multitasking, virtual memory, multithreading, SMP, etc.
- System infrastructure and HA manager leveraged from SAN-OS: Reliable messaging, state database, process management/monitoring
- Modern, streamlined, scalable Layer 3 protocol implementation
- Data-center focused, standards-based Layer 2 feature set
- Storage protocols will “plug in” to NX-OS in future
  - Implementation taken directly from SAN-OS

Continuous Operations / HA

In-Service Software Upgrades

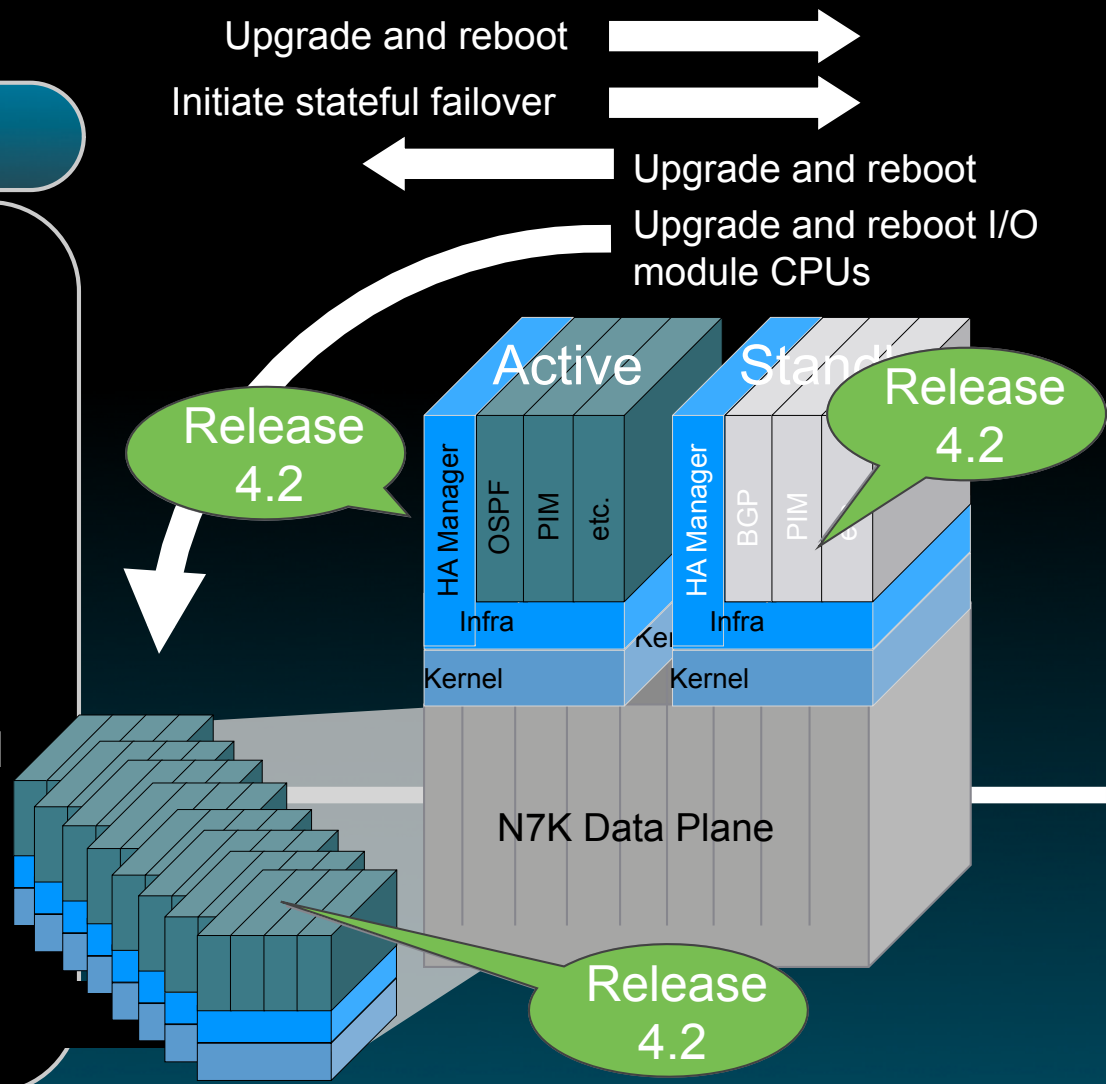
Continuous Operations / HA

In-Service Software Upgrades

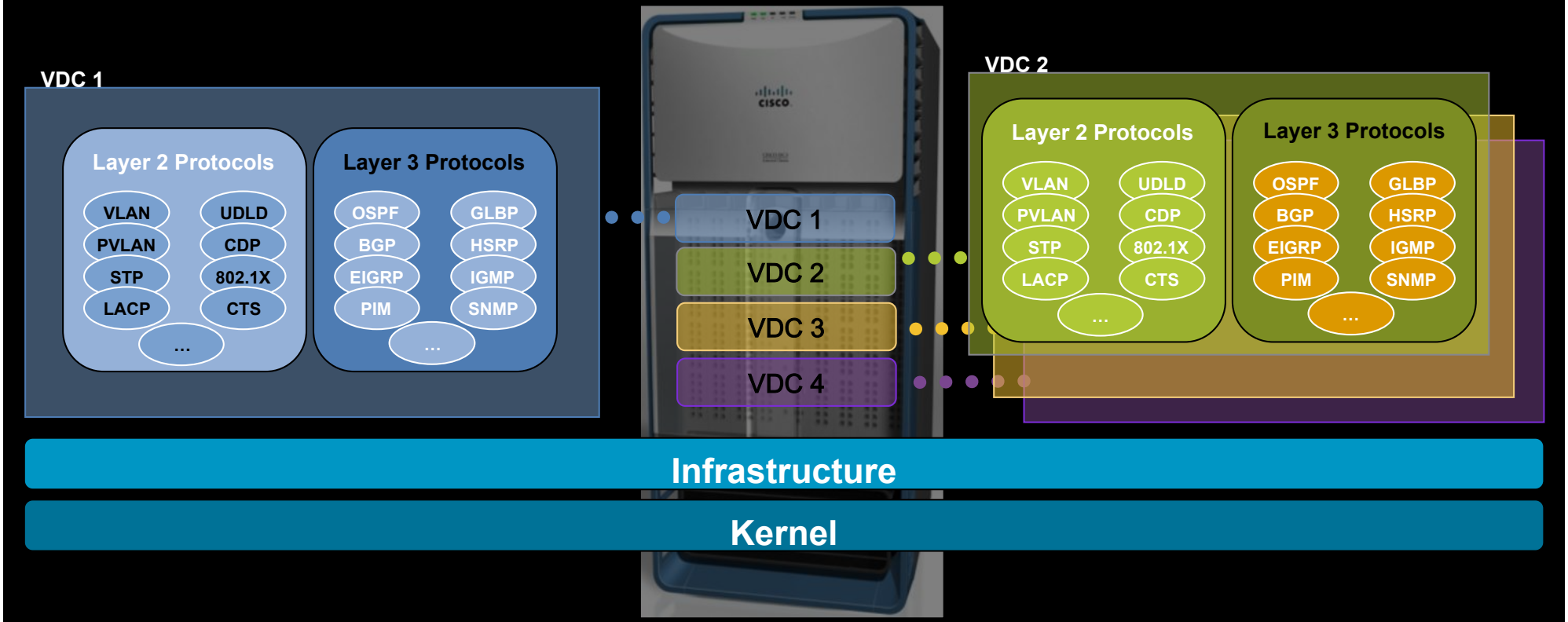
Minimize planned downtime

- ✓ Upgrade entire system, from one maintenance release to another, or one major feature release to another!
- ✓ Easily rollout new hardware, features, and enhancements
- ✓ Integrate critical bug fixes and PSIRTs without taking system offline

I/O Module Images



Nexus 7000 Virtualization with VDCs



VDC – Virtual Device Context

- Flexible separation/distribution of hardware resources and software components
- Comple
- Comple
- Securely delineated administrative contexts
- Forwarding engine scalability with appropriate interface allocation

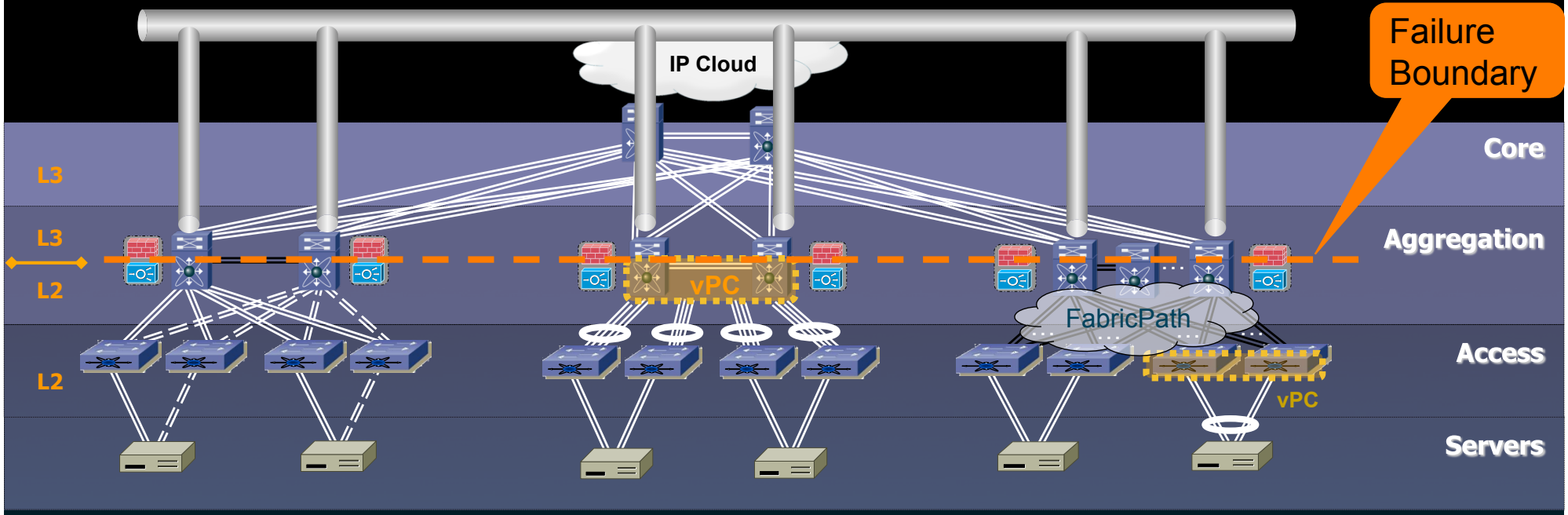
3rd Party N7K PCI Certification

Intelligent L2 Domains
POD Evolution

Release 5.0 **OTV**

Inter-POD Connectivity across L3

Failure Boundary Preservation



STP+

STP Enhancements
Bridge Assurance

vPC/VSS

NIC Teaming
Simplified loop-free trees
2x Multi-pathing

FabricPath

16x ECMP
Low Latency / Lossless
MAC Scaling
Operational Flexibility

Shipping | Shipping | Launch

Introducing – Overlay Transport Virtualization

O

Overlay - A solution that is **independent of the infrastructure technology** and services, flexible over various inter-connect facilities

T

Transport - Transporting services for layer 2 and layer 3 Ethernet and IP traffic

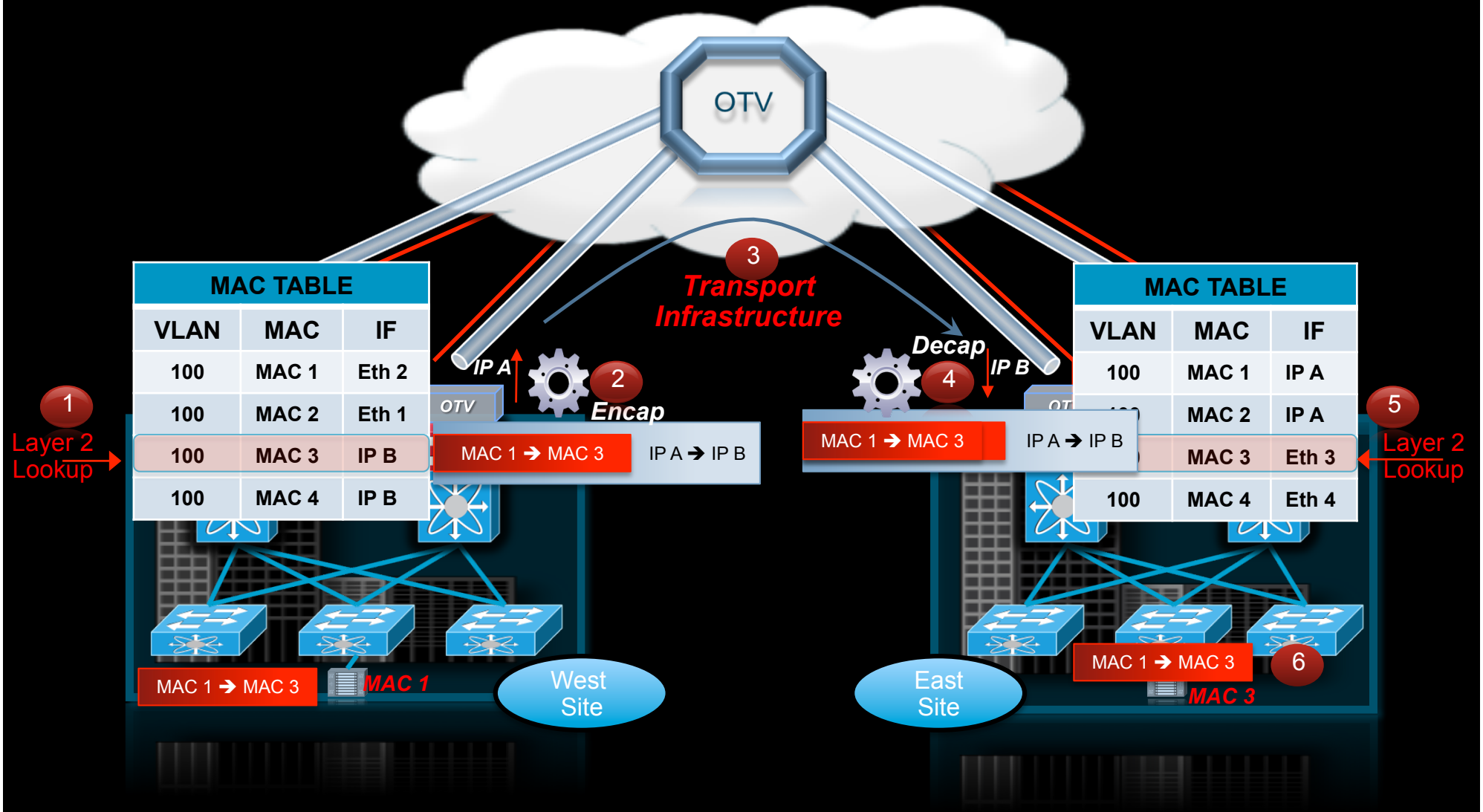
V

Virtualization - Provides **virtual** connections, **connections** that are in turn **virtualized and partitioned** into VPNs, VRFs, VLANs and Bridge Domain instances

IETF Standard - http://tools.ietf.org/html/draft-hasmit-otv-00

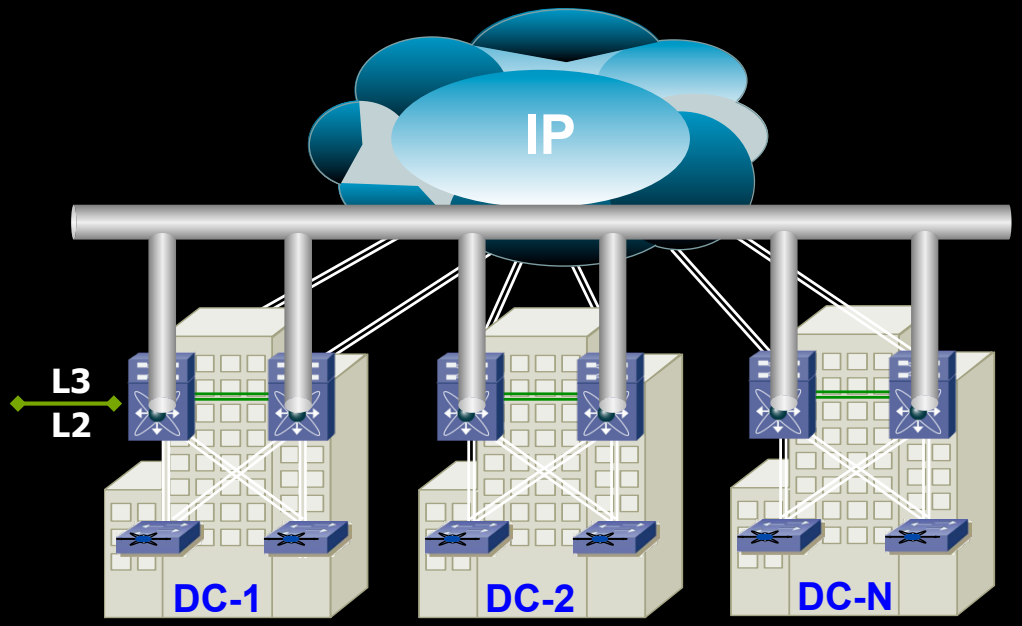
OTV delivers a virtual L2 transport

OTV Packet Flow



Overlay Transport Virtualization – OTV
Simplified Ethernet VPNs

- IP based Ethernet (L2) VPN solution
  - Logically a Shared Ethernet Segment
  - MAC routing
  - IP encapsulated forwarding
- Core and Site Transparency
  - Works across IP/MPLS
- Packet Switching
  - Multi-point connectivity
  - No PW state preserved
  - Optimal m-cast replication
- Full cross-sectional BW
  - Equal cost multi-pathing
  - All-active multi-homing



- Protocol Learning
  - No STP: Built-in loop prevention
  - Failure domain is bound
  - Floods/b-casts can be suppressed
- Seamless adds/removes

Additional Nexus 7000 Features Include

- Smart Call Home
- Generic On Line Diagnostics – GOLD
- Embedded Event Manager – Scripts
- WireShark – In-Band Ethernet Analyzer
- Sampled Netflow
- Port Profiles
- Control Plane Policing
- Roles Based Access Control
- Connectivity Management Processor
- …

Nexus 7000 Worldwide Deployment

2.5+ Years of Shipments
3,000+ Customers
10,000+ Chassis Shipped

Selected Customers With Nexus Deployments

Nexus Series Network Management

Data Center Network Manager (DCNM)

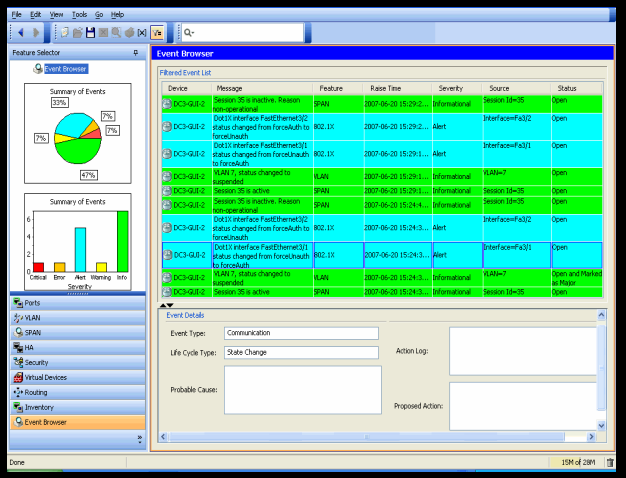
Comprehensive data-center class administration architecture:

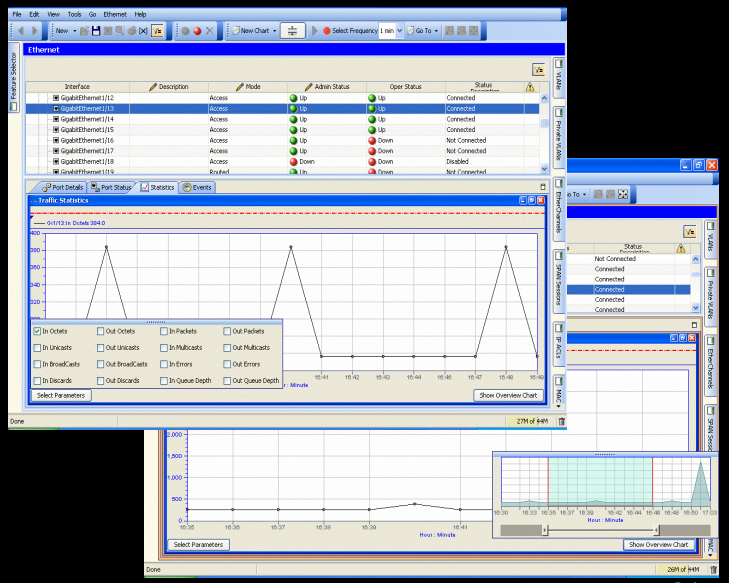
- Multi-protocol aware – consolidates and automates Ethernet, IP and Fiber Channel management
- Manages specific data-center network features
- Offers FCAPS coverage for full network service life cycle administration, with emphasis on provisioning, performance and accounting
- Provides management solution for all layers of Cisco-based data center networks

DCNM - Intelligent Information Solution

Discovery & Inventory | Configuration | Fault Management | Performance Monitoring | System & Infrastructure

- ✓ Centralized management throughout the data center network
  - Fiber Channel, Ethernet, IP routing and Network Security domain awareness
- ✓ Enables error-free provisioning
  - Configuration validation via syntax and semantics checks
- ✓ Health monitoring
  - Real-time alarms and key traffic performance indicators
- ✓ Facilitates the insertion of innovative network features
  - Network virtualization transparently supported day 1



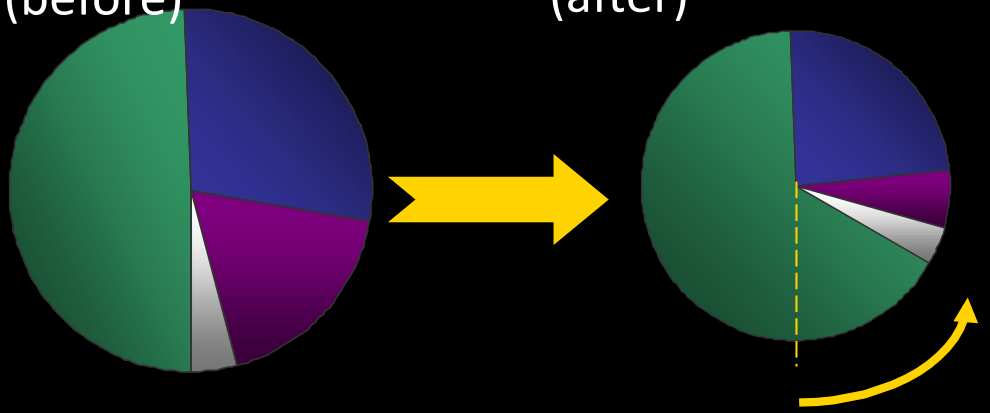


The Cisco Data Center Story

Data Center Power Distribution

Multiple Networks
(before)

Nexus - Unified Fabric
(after)

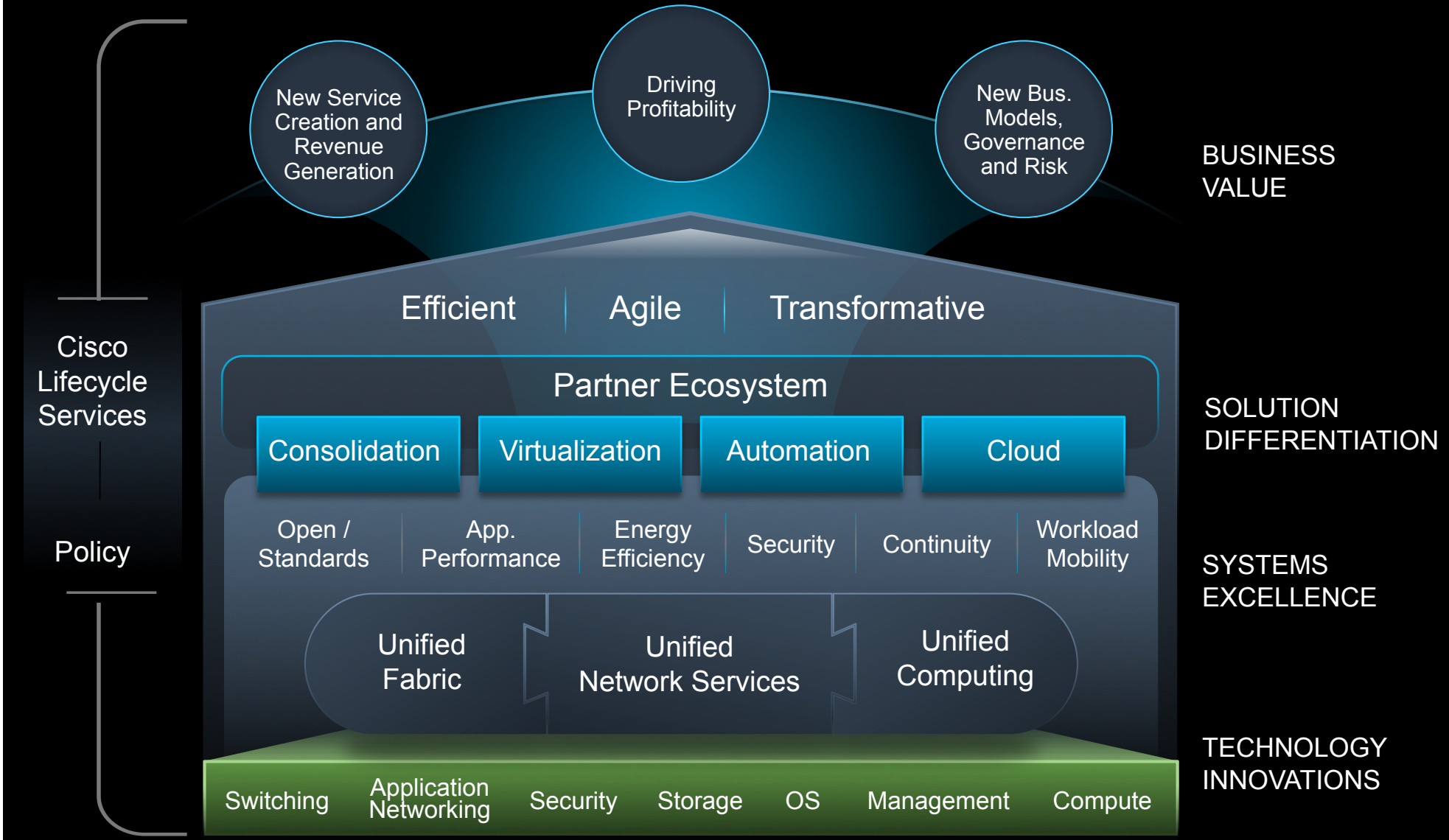


7 VM per KW

18 VM per KW

- kW Available for Servers
- kW Storage
- kW DC Network
- kW Other Network

Data Center Business Advantage
Total Solution Framework



Agenda

8:40 – 9:00	Welcome & Registration	
9:00 – 9:45	**The Data Center Journey to Virtualization and Cloud** *Cisco Data Center Business Advantage*	Business & Strategy
9:45 – 10:30	**Unified Network Services -** Consistency, Flexibility, Simplification *New Virtual Security Gateway with the Nexus 1000V & virtual WAAS solutions*	
10:30 – 10h45	Case Study Video & Coffee Break	
10:45 – 12:40	**Unified Fabric – Building the Network for Cloud ready Data Centers** *New Nexus 5500 and Nexus 7K innovations*	
12:40 – 13:30	Lunch buffet	
13:30 – 15:00	**Scaling the DC Architecture: be ready for the evolution to Cloud** *Network design, Fabric Path, Multi-hop FCoE and OTV*	Technical Design
15:00 – 15h15	Coffee Break	
15:50 – 16:45	**Addressing Server Access Networking challenges** Physical Server Networking & Virtual Server Networking considerations	
16:45	Closing