



Growing your Business with the Cisco Network Architecture

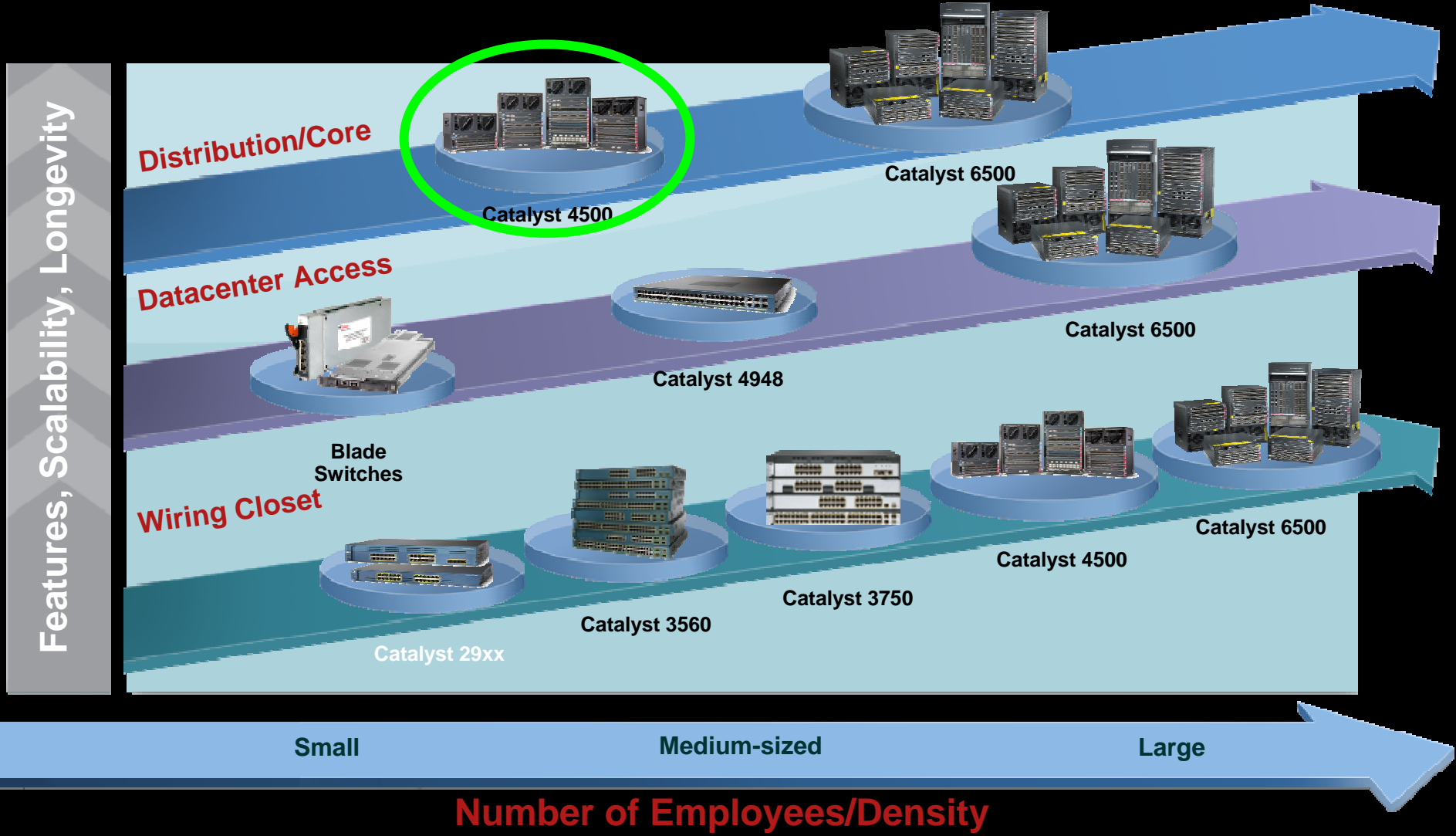


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AGENDA

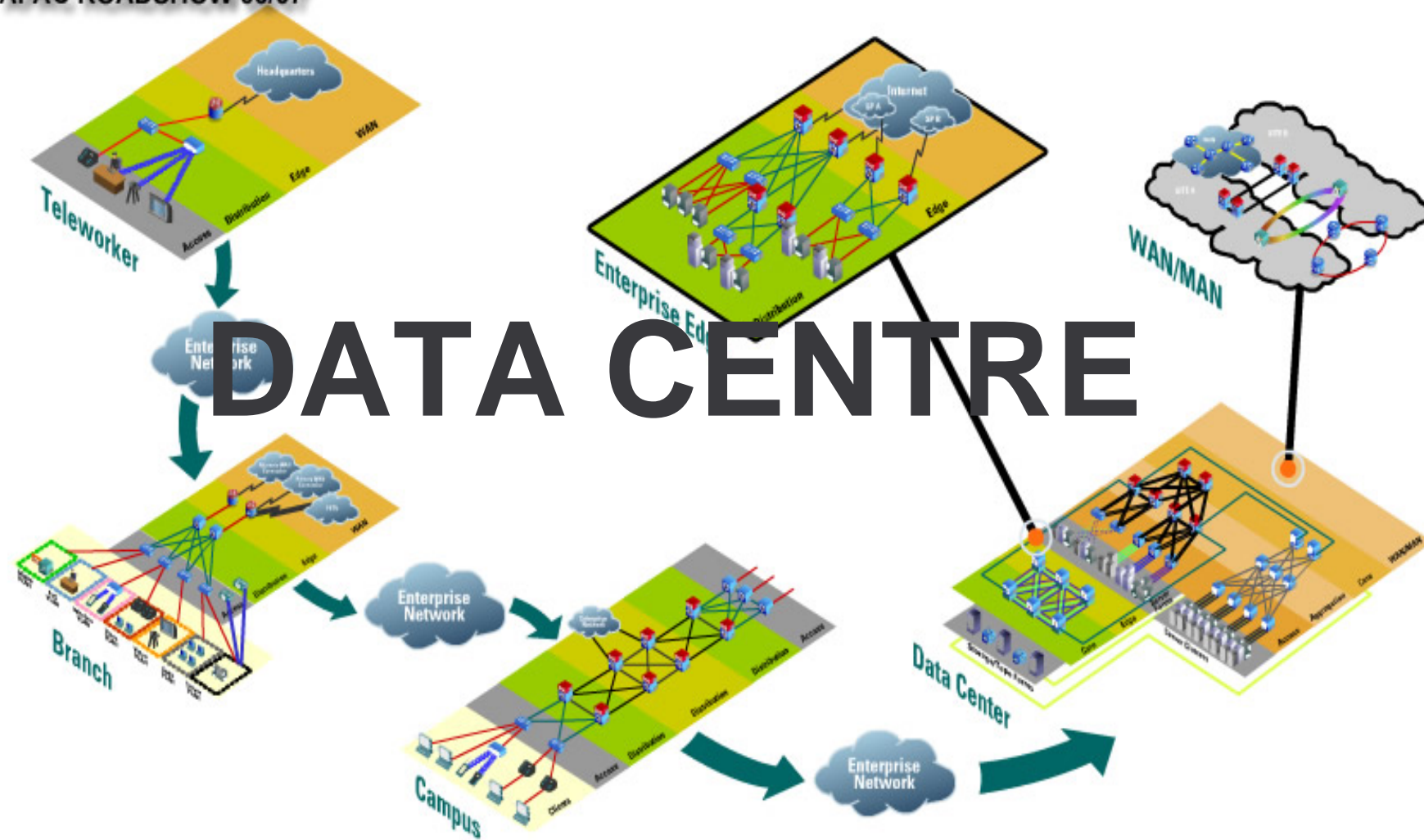
- Data Centre Ethernet Switching
- Catalyst 6500 Data Centre and Campus Switching
- Catalyst 4500 Campus and Branch office switching
- Catalyst 3750 and 3560 Campus & Branch office
- Catalyst 2960 Branch office connectivity
- Cisco Unified Wireless Network

Catalyst Switching Portfolio



Cisco Enterprise Architecture

APAC ROADSHOW 06/07



Data center evolution

Consolidation	Virtualization	Automation
<ul style="list-style-type: none">• Reduces operating expenses• Aligns human resources to the compute/storage environment	<ul style="list-style-type: none">• Enabler of consolidation• Better utilization on existing capital assets• Reduces power and cooling requirements	<ul style="list-style-type: none">• Simplifies virtualized environments• Enabler of “service velocity”• Reduces risk of operator error• Consistent and repeatable results

Cisco delivers the most comprehensive data center switching portfolio in the industry

Server Ethernet Switching

Catalyst 6500 Series Switches

Catalyst 4948 Top-of-Rack Switches

Catalyst Blade Server Switches

Server Infiniband Switching

SFS 7000 High-Density Infiniband Compute Fabric Switch

SFS 3000 Infiniband Gateway

Storage Switching

MDS 9500 Storage Directors

MDS 91xx/ 90xx Fabric Switches

Storage Service Modules

Application Network Services

Application Control Engine (ACE)

Application-Oriented Networking (AON)

Management and Provisioning

Proactive Automation of Change Execution (PACE) – Fabric Manager - VFrame - Application Networking Manager

Trends driving data center switching

- Higher service rollout velocity
- Service provider-like business model
- Ensuring regulatory compliance/audits



Operational
manageability

- Shrinking downtime windows
- 24x7 business continuity
- Pervasive security



Comprehensive
resilience

- Scaling physical infrastructure while minimizing cabling/power/cooling
- Scaling virtual infrastructure
- Scaling services



Architectural
scalability

Cisco Delivers the Most Value Behind Each Switch Port

All switch ports are NOT created equal

Operational manageability

Comprehensive resilience

Architectural scalability

Investment protection



Market Response: Cisco 10GbE and 1 GbE Market Shares = 70%+

Sources: Dell 'Oro Group, Infonetics Research, and Synergy Research (2Q 2006 report)

Automation

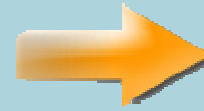
Enabling self-healing: Embedded Event Manager (EEM)

Benefits:

- Automates time-consuming tasks
- Simplifies and accelerates resolution of network issues
- Provides deeper control than SNMP

Example
EEM Script:

**New interface
module is
inserted**



**Automatically
configure ports to
custom settings**



Cisco Beyond, an online scripting community, helps customers and partners share best-practice EEM Scripts

Architectural scalability

Far more than ports and throughput

Scaling Challenges



Higher loads on network



Limited rack space



Cabling complexity



Power / Cooling costs



Virtual machine scaling

IP Address limitations



Solutions

Flexible network designs

Performance: Services, protocols & bandwidth

Higher physical port density with congestion management

Complete range of form-factors:
End-of-Row, Top-of-Rack, Blade Switches

Virtualization and power efficiency

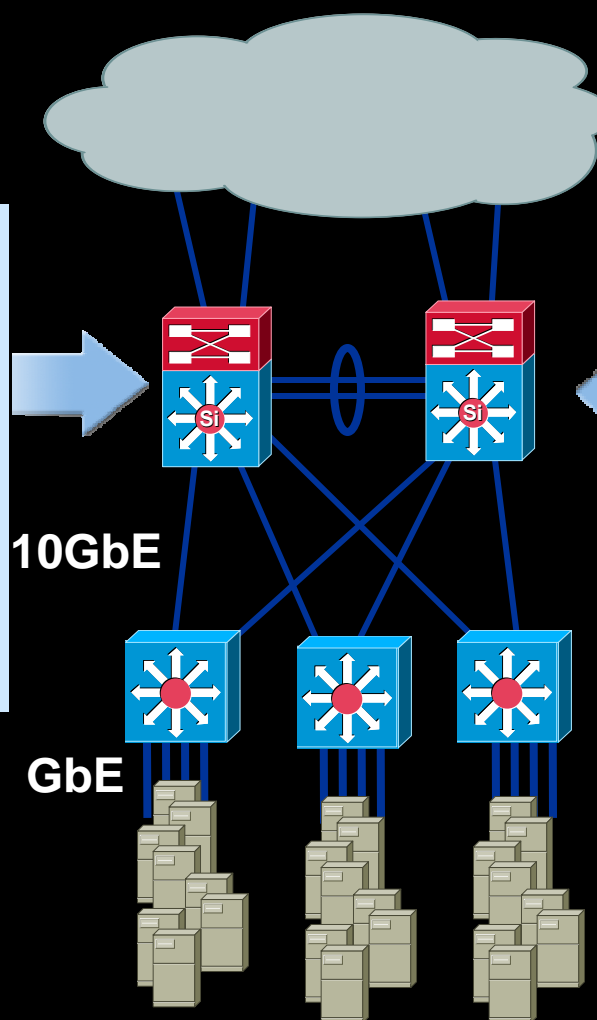
Hardware MAC address learning

Private VLANs and IPv6

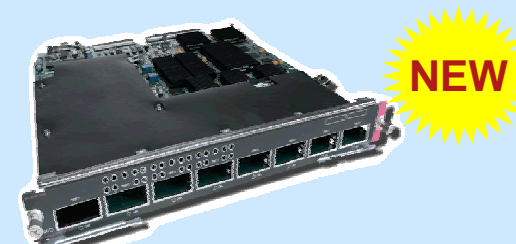
Only Cisco offers complete architectural scalability

Scaling the physical infrastructure: Data center-optimized 10GbE module

- Oversubscription is typical in data centers
- But it requires more engineering prowess than just adding more PHYs per interface module



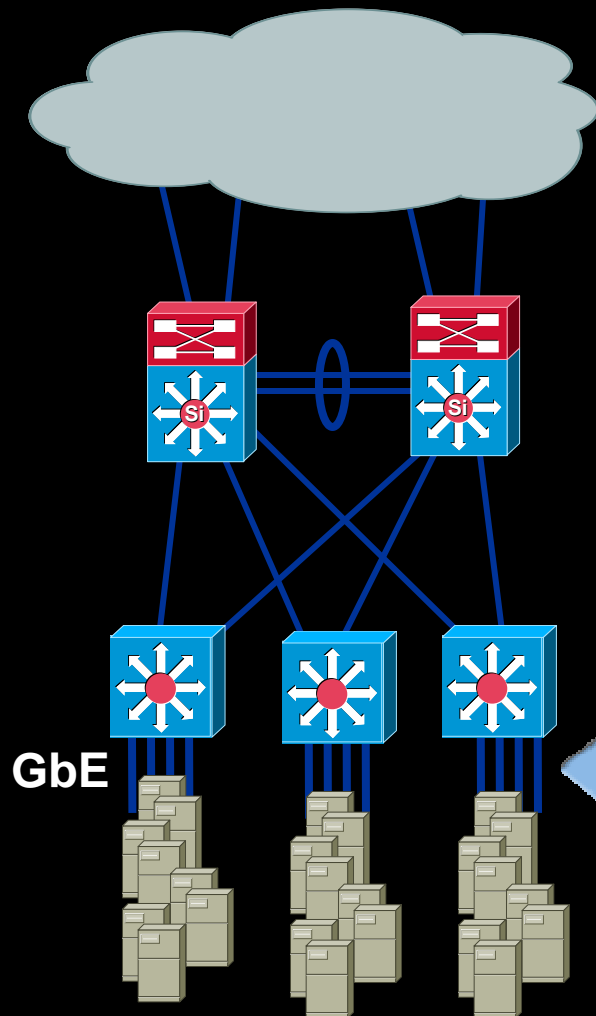
Catalyst 6500 8-port 10GbE module



Data center-optimized 10GbE module

- **60% more performance:** 64 Gbps / slot local switching
- **Superior congestion management:** Large buffers
- **Attractive 10GbE pricing:** 30% lower price per port relative to existing offering. 30% price reduction on select 10GbE optics.

Scaling the physical infrastructure: Data center power efficiency



- Server power consumption is more than 50x access switch power consumption per port
- Cisco is lowering power consumption while increasing services per port
 - 8-port 10GbE module: 40% power/port reduction
- Cisco services virtualization (ACE module) minimizes power consumption as apps grow

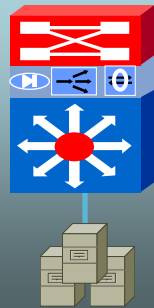
Switch: consumes **< 10 Watts** per port

Server (1 RU or blade): consumes **450+ Watts**

Scaling services

Virtualization rapidly scales service requirements

Cisco Catalyst 6500 with Application Control Engine (ACE)



Virtualized Security,
Load Balancing, and
Packet Inspection

Non-Virtualized Solutions



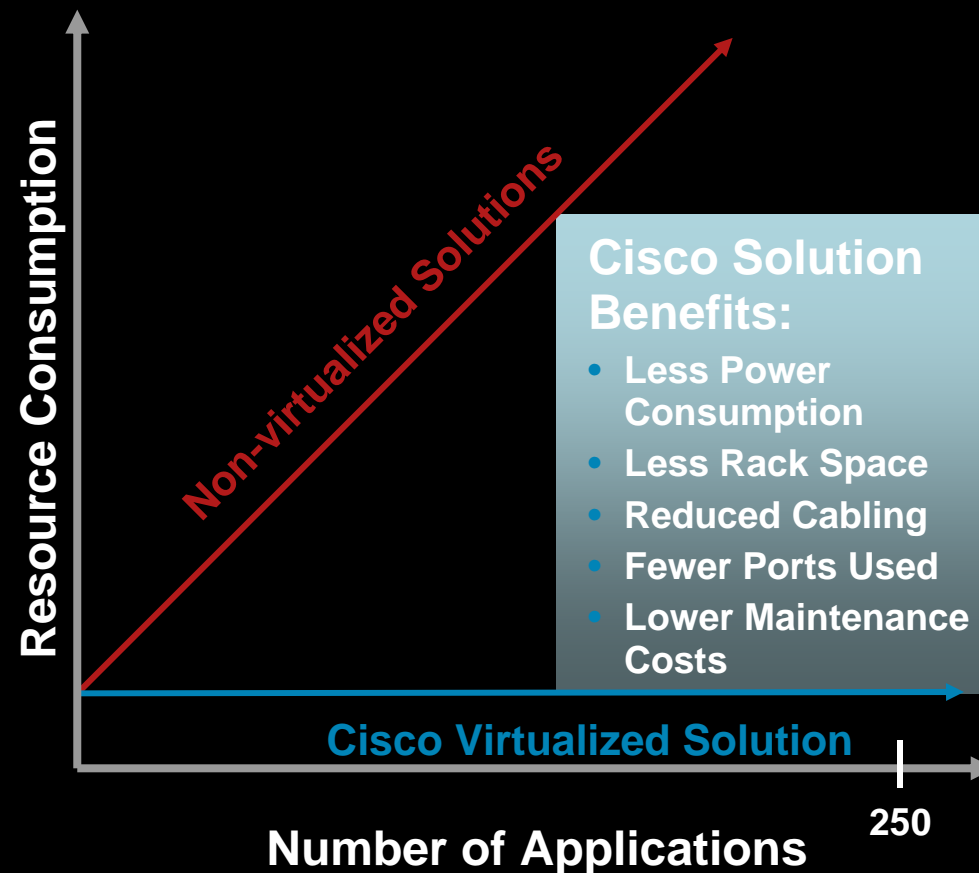
Firewall



SLB

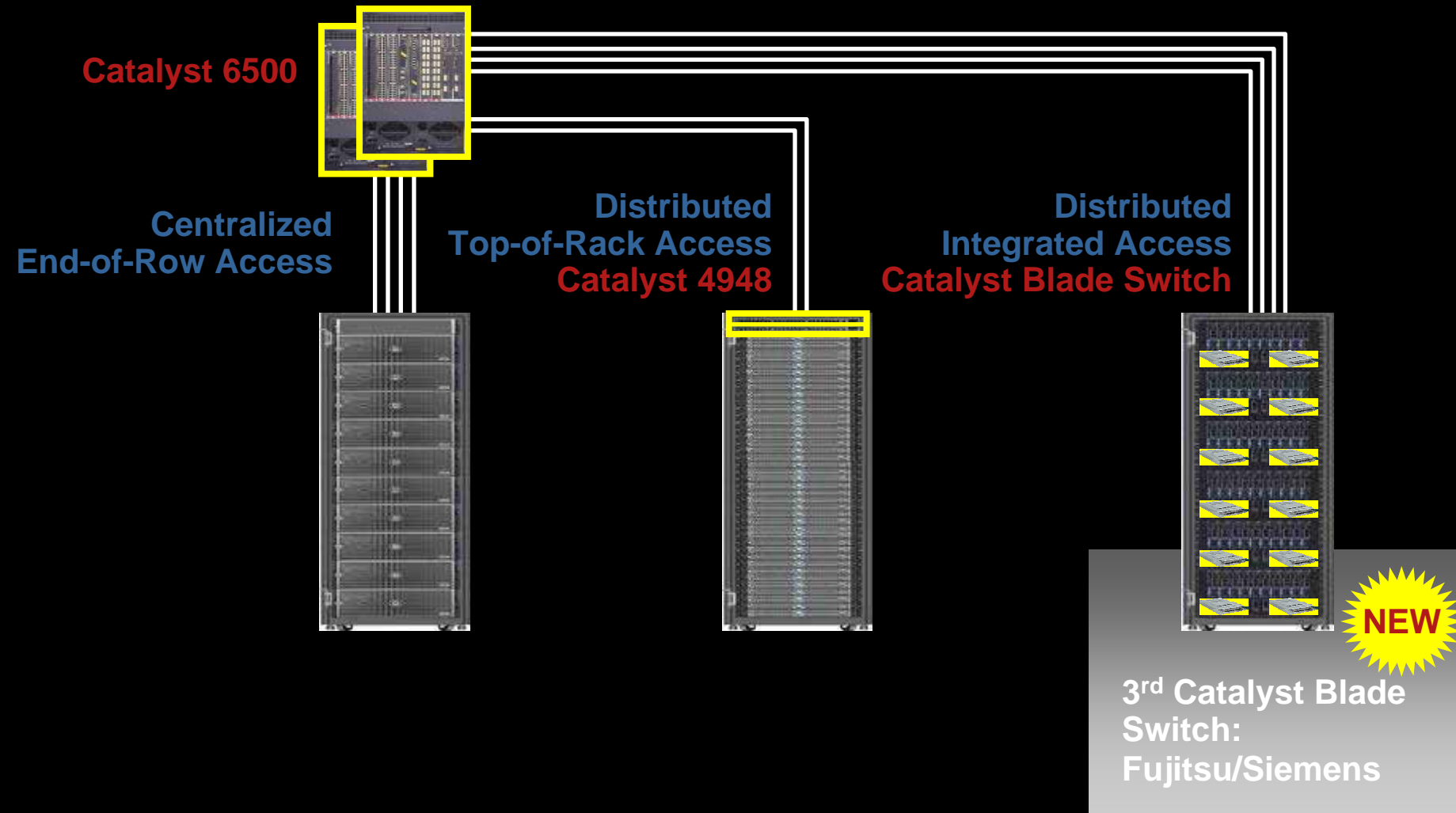


IDS



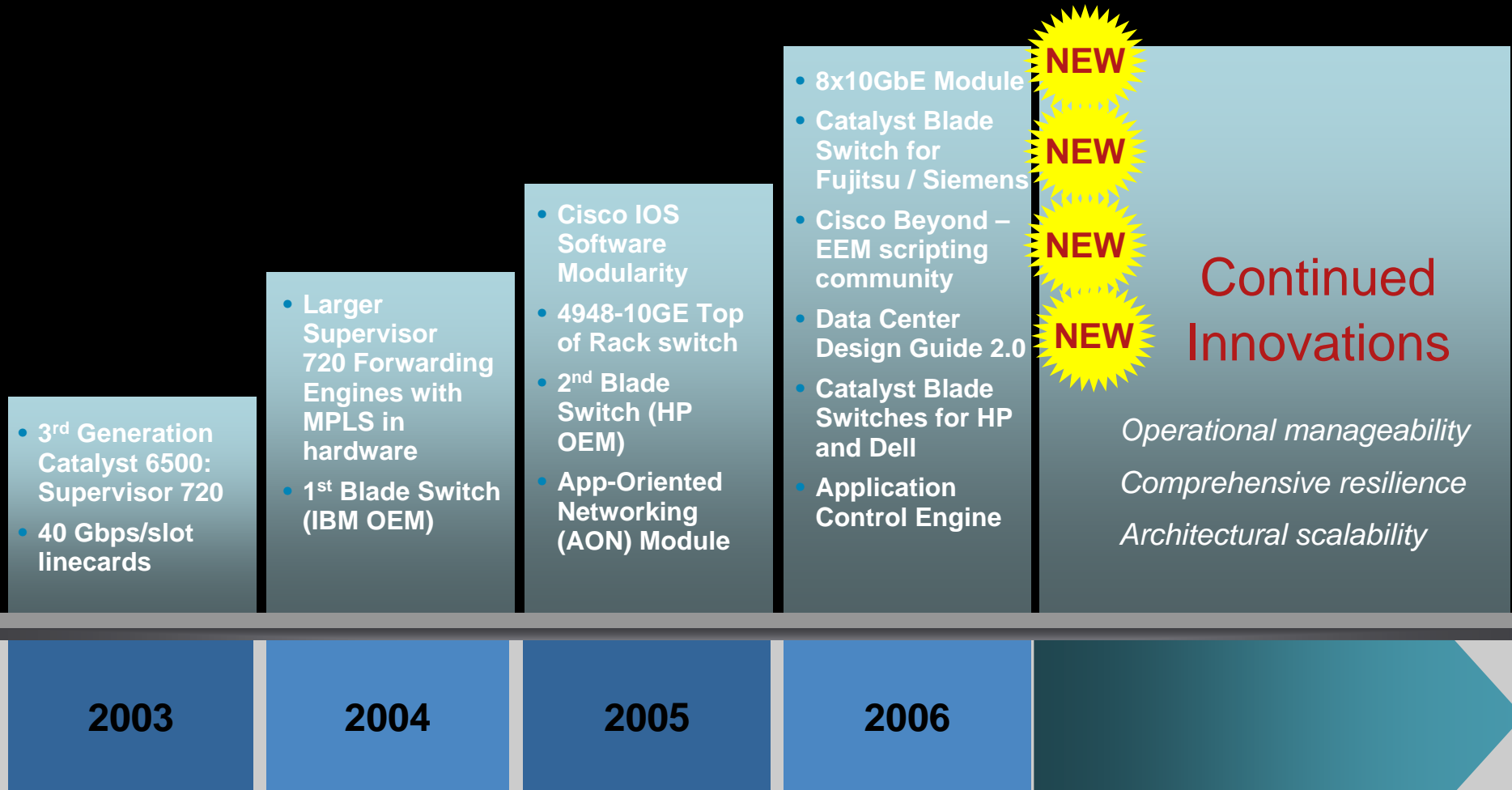
Reducing cabling complexity

Complete range of switching form factors



Cisco data center switching leadership

Innovations with investment protection

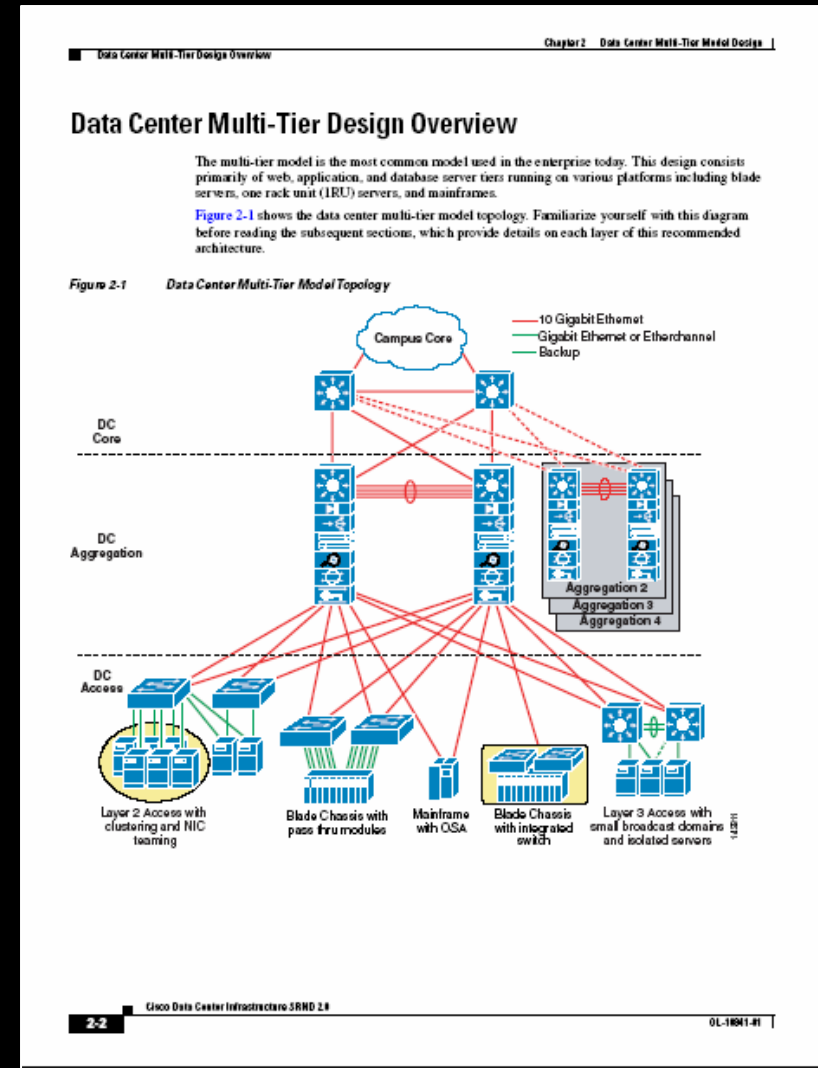


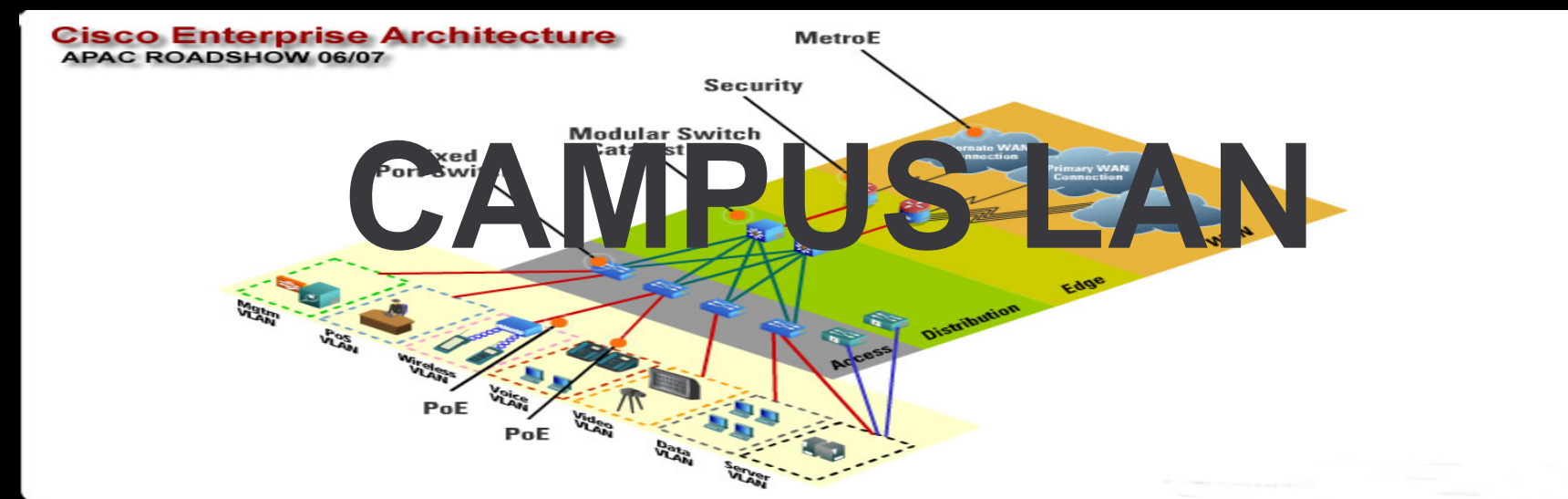
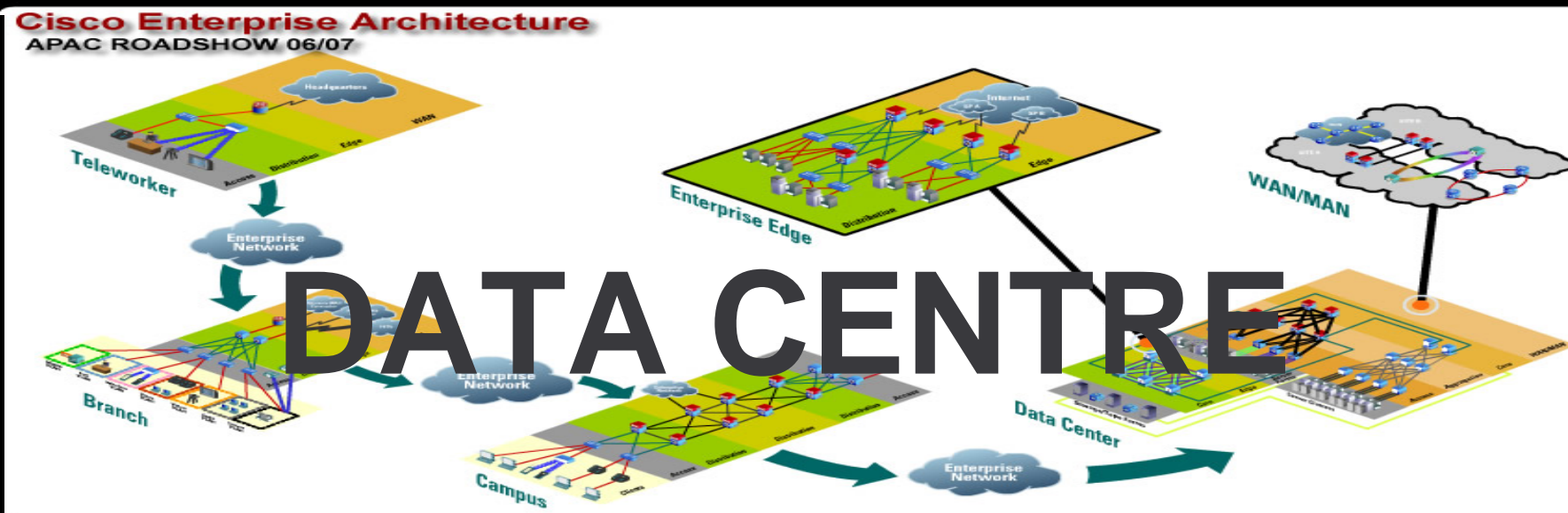
Increasing Comprehensive Resilience

Cisco Data Center Infrastructure Design Guide 2.0



- Cisco-Tested Data Center Switching Designs
- Scalability and High Availability Best Practices
- Reference Configurations
- 150+ pages



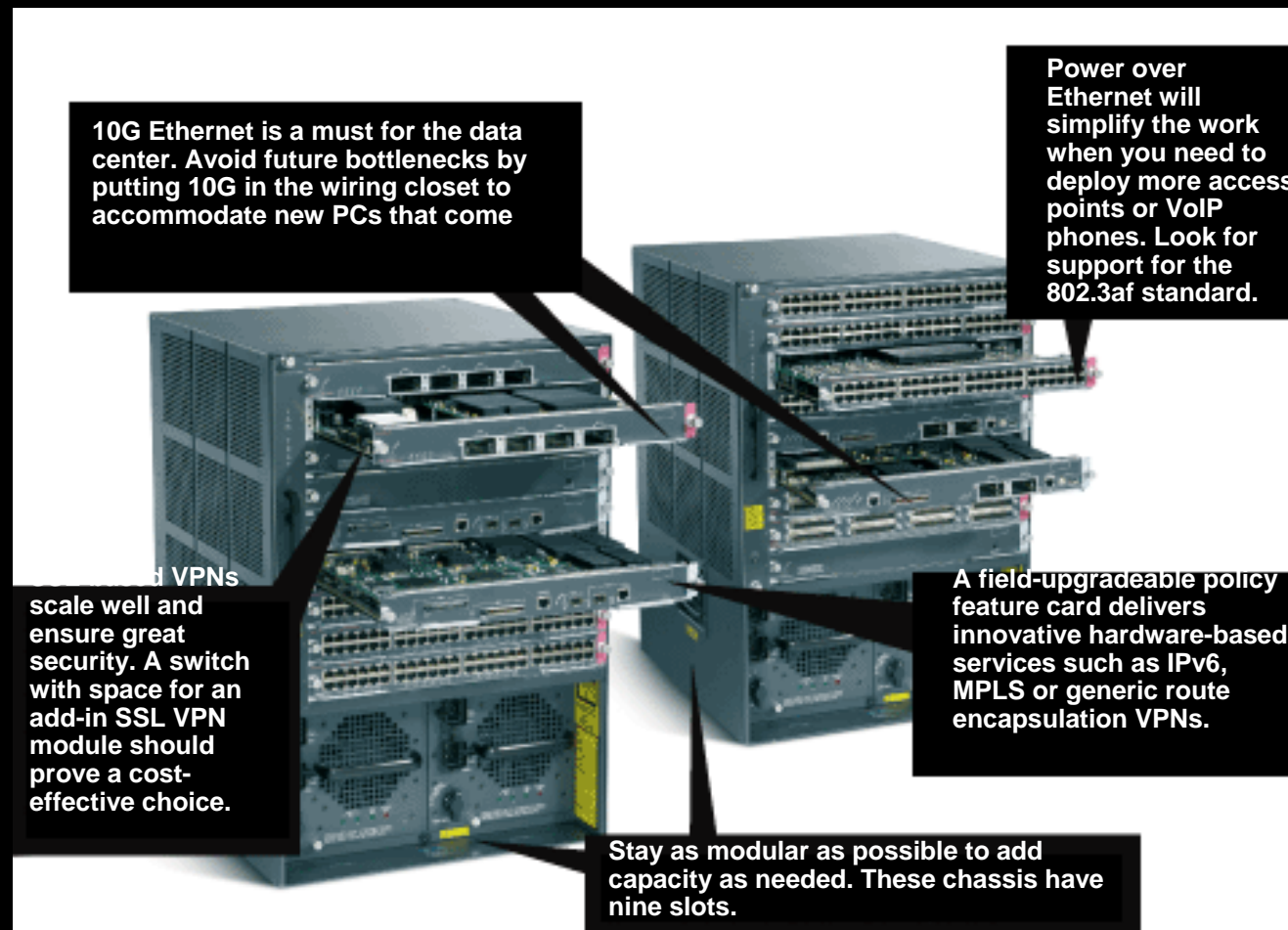


Catalyst 6500: Switch with a Future

Another 7+ Years of Investment & Innovation

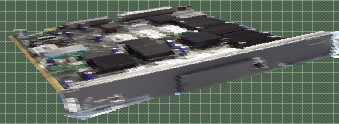
Switch With a Future

The right infrastructure gear can be a key ally in your quest to avoid a forklift upgrade. A switch such as Cisco's Catalyst 6509, as shown here in data center and wiring closet configurations, protects investments by keeping several important options open.



CY06
NAC
IOS Modularity
10GbE Density
HW NBAR

Catalyst 6500 Series CY06-CY07 Hardware Roadmap



ACE Service
Module



8port 10GE

1HCY06

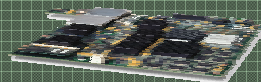
2HCY06

1HCY07

2HCY07



WISM



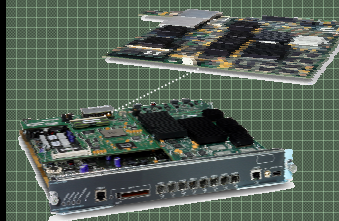
802.3af PoE
daughter card



ME-C6524GS-8S



8700W PS



Programmable
Intelligent Services
Accelerator (PISA)

Catalyst 6500

8 Port 10 Gigabit Ethernet Linecard

Q3CY06

WS-X6708-10G-3C / WS-X6708-10G-3CXL



High Density 10GbE

- Up to 64 ports of 10GbE in a single chassis
- 2:1 Oversubscribed
- DFC3C/DFC3CXL included (1G DRAM)
- Support for VSL
- 128MB Buffer on Ingress/Egress
- Supports DWRR and SRR
- Support for <200ms fast switchover
- Interoperable w/ Sup720-3A/3B/3BXL, Sup720-10G
- Supported in both E and non-E chassis

X2 Optics Supported at FCS:

100% compatible with XENPAK

- LX4: 300m over MMF
- SR: 26m over FDDI grade MMF, 300m over 50um 2000MHz*km MMF
- LR: 10km over SMF
- ER: 40km over SMF
- CX4: 15m over Infiniband copper

Cisco Catalyst 6500 8700 W Power Supply

Q4CY06



# of Inputs	Type of Input	Output Power	Class 3 802.3af Devices
1	110V	-	-
2	110V	2800W	130
3	110V	4200W	195
1	220V	2800W	130
2	220V	5800W	285
3	220V	8700W	427

New 8700W Power Supply Featuring :

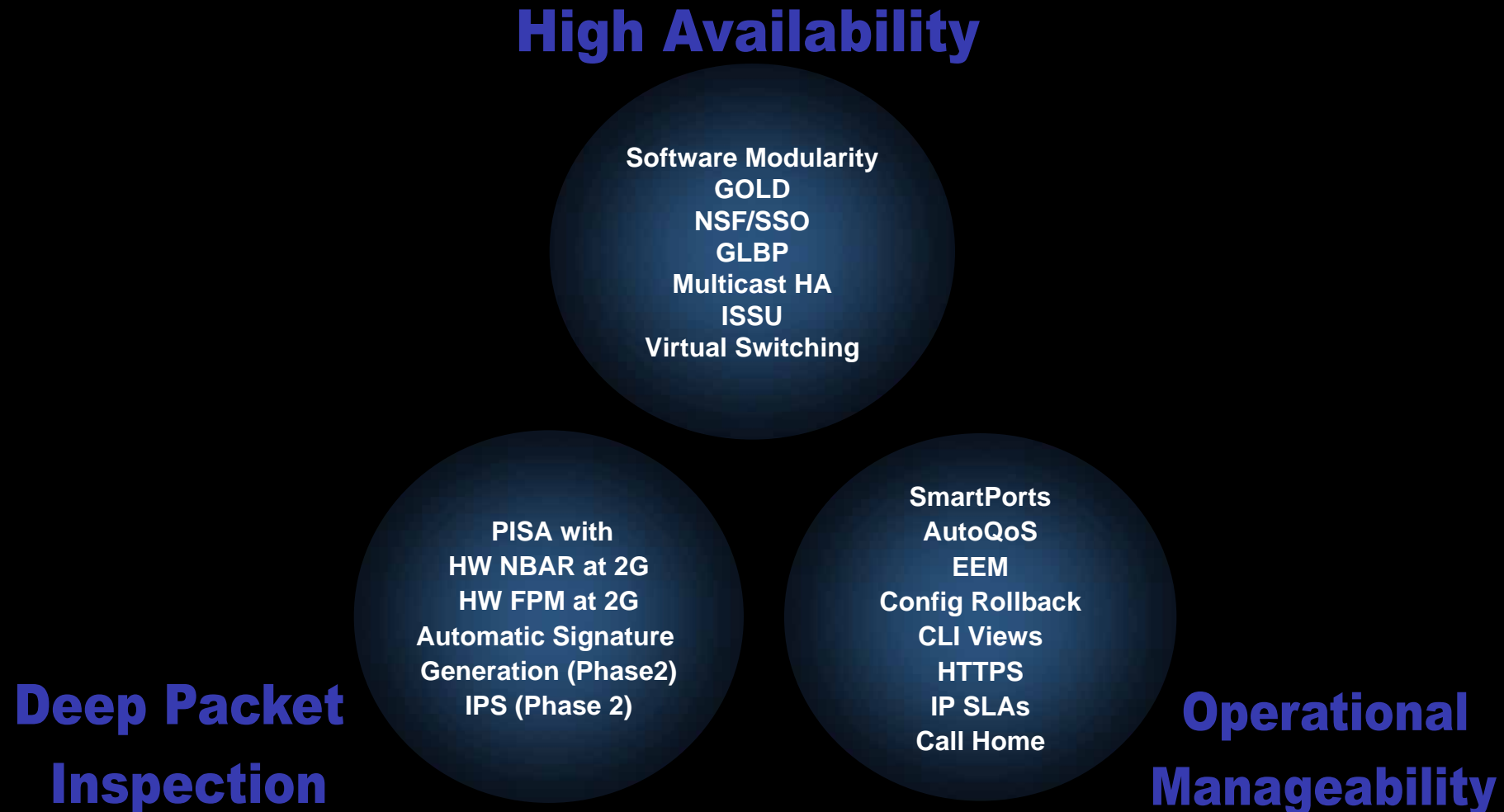
Cat OS: 8.6
IOS : Rockies.Vail

- Highest Density PoE support in the industry - Support 400+ Class 3 PoE with full redundancy
- Optimize rack space - No need for external power shelf
- Independent circuits for increased availability of the power supplies
- Ability to remotely power cycle the Switch via CLI or Terminal Server

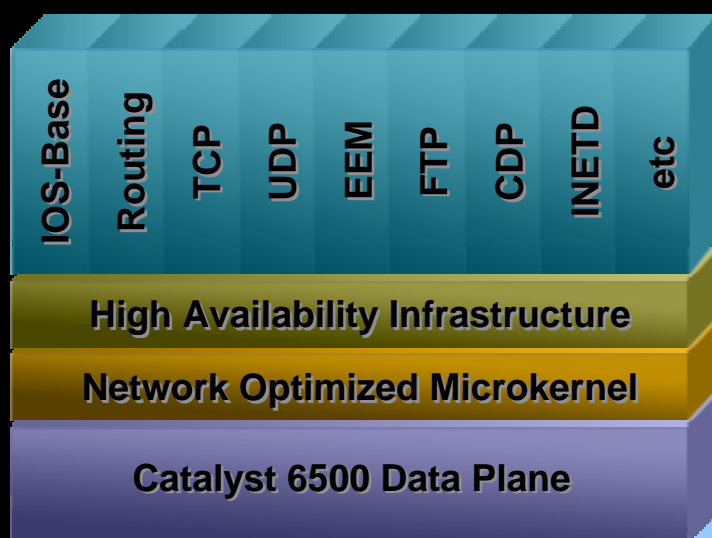
POE
High Power

Catalyst 6500 – Key Innovations

Today's Focus Areas



Catalyst 6500 Innovations – Highest Resiliency with Software Modularity

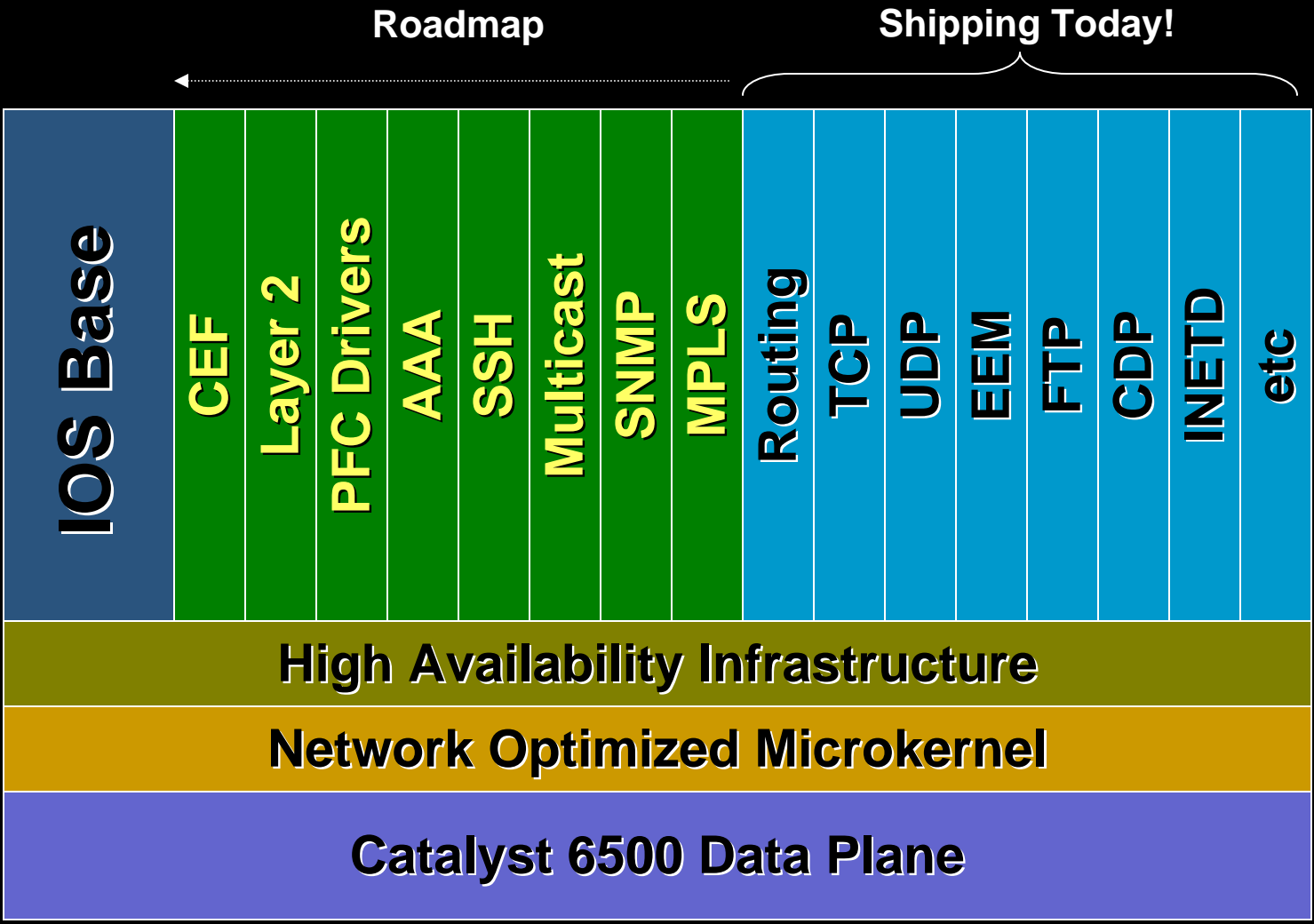


- **Memory Protection**
- **Fault Containment**
- **Restartable Processes**
- **Subsystem ISSU**
- **Operational Consistency**

- Sup720 – SHIPPING in 12.2(18)SXF4!
- Sup32 – Q3 2006 in Rockies3.Vail
- PSIRT Patching Support
- Safe Harbor – June '06
- Whitney1 (Q1CY07) will bring:
MPLS, IPv6, and BFD support
Support for planned remaining service modules and WAN cards

Over 600 Downloads!

Catalyst 6500 Software Modularity – Further Modularization for 2007-2008 (pre-CC)



Moving Beyond Packet Forwarding: Deep Packet Inspection

Simple Forwarding
Paradigm with
Optimized
Performance...

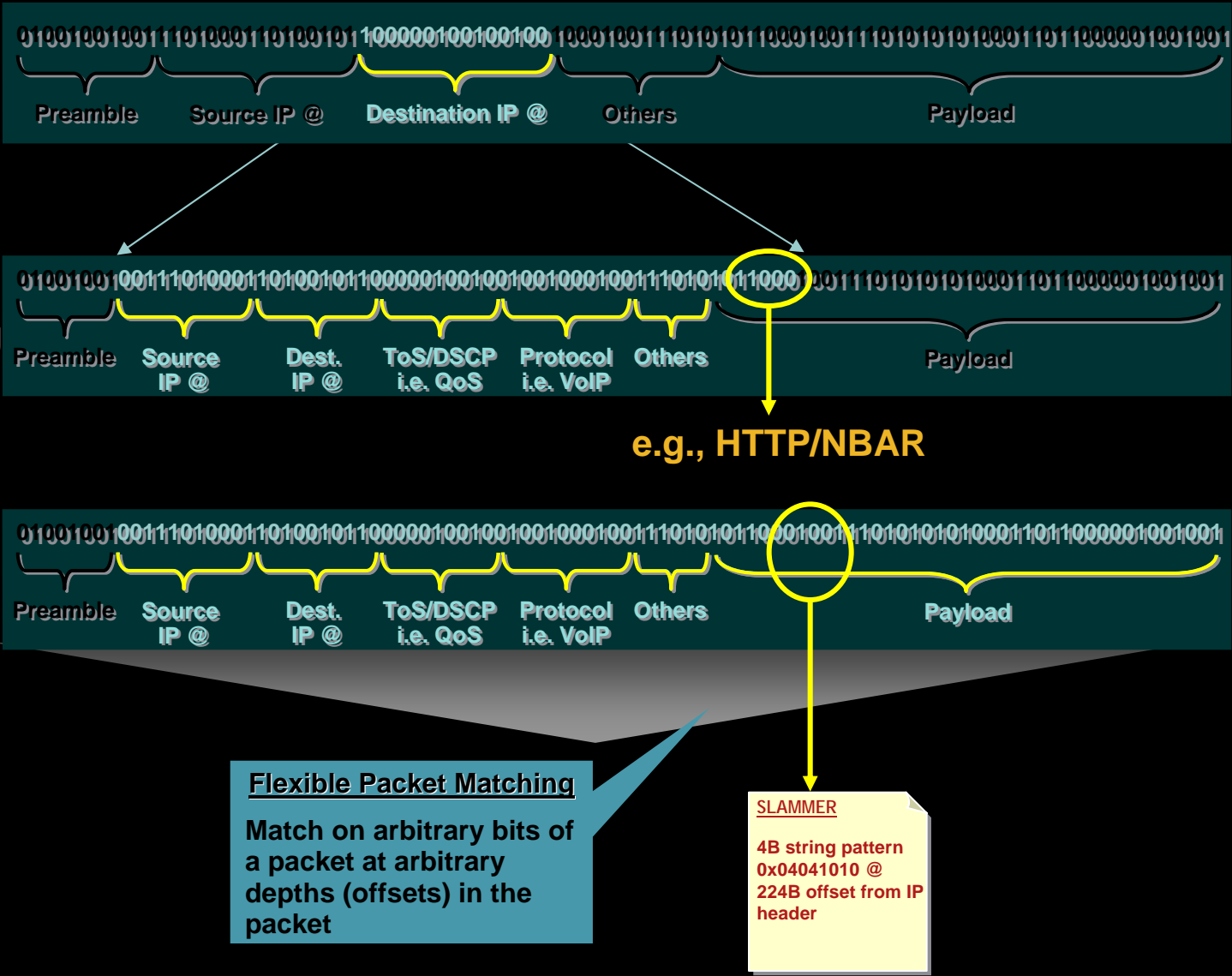


Intelligent Forwarding
Paradigm,
Optimized for Service
Creation



Deep Payload
Inspection

Applying Policies
and Security



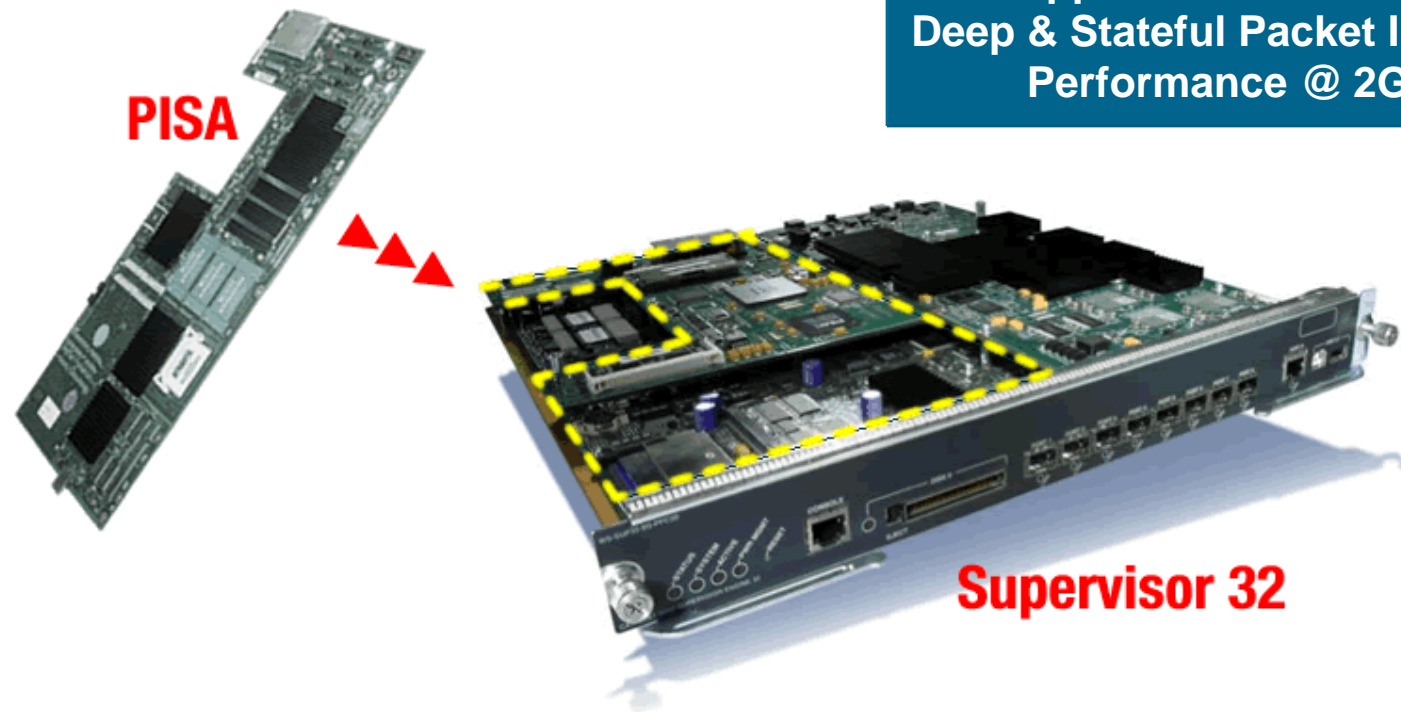
Catalyst 6500 Innovations – PISA

Programmable Intelligent Services Accelerator

Q1CY07

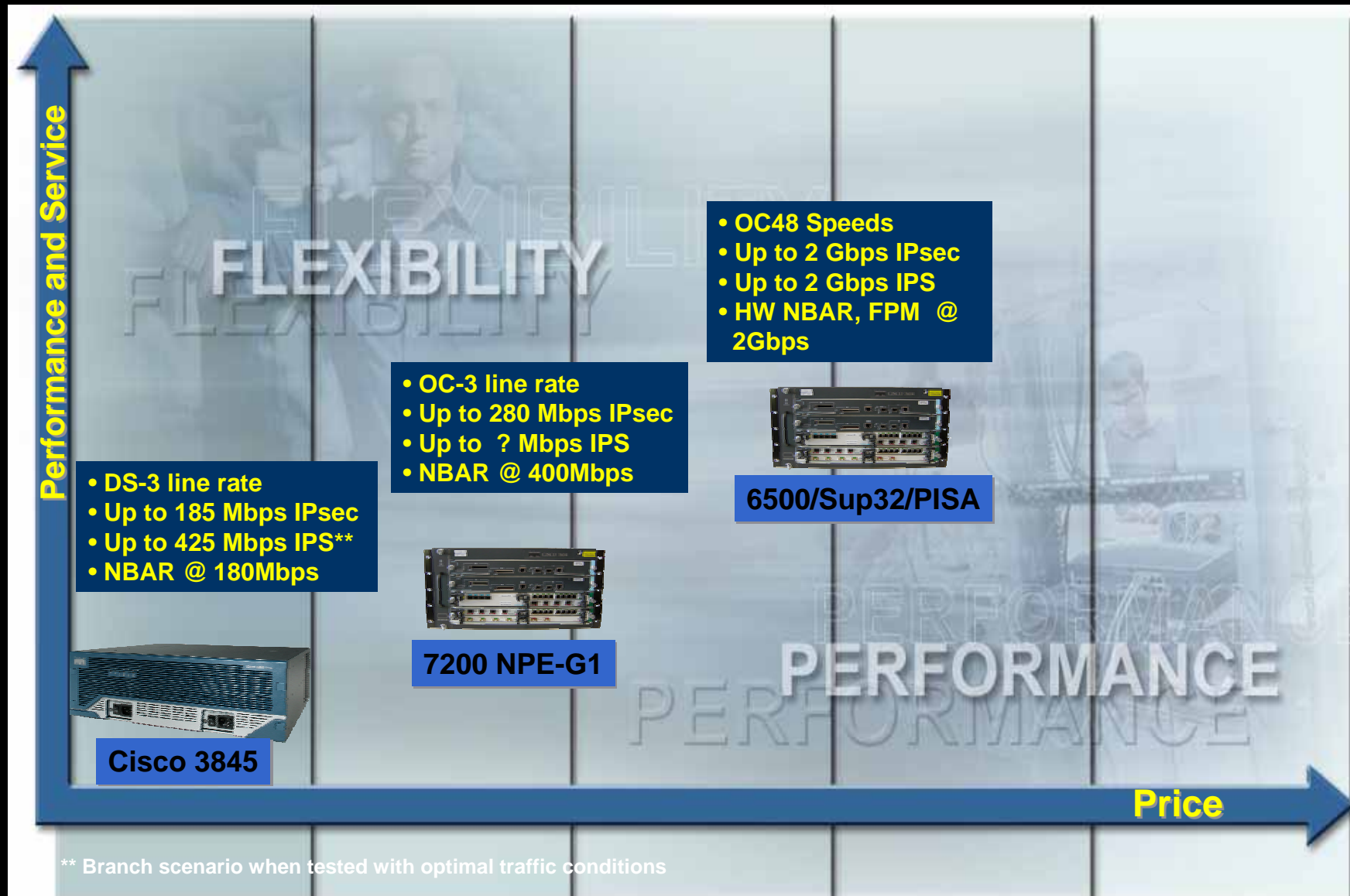
PISA is a Daughter card replacement
for the MSFC2A on the Sup32...

Application Awareness
Deep & Stateful Packet Inspection
Performance @ 2Gbps



PISA incorporates FULL MSFC functionality with the addition of a
Network Processor which provides support for NBAR, FPM, etc...

PISA Positioning – Integrated Security



Programmable Intelligent Services Accelerator (PISA) –Phase 1

SKU's

- WS-S32-GE-PISA NTE \$35,000
- WS-S32-10GE-PISA NTE \$40,000
- Both SKU's ship with free Advanced IP Services License

Support Modules

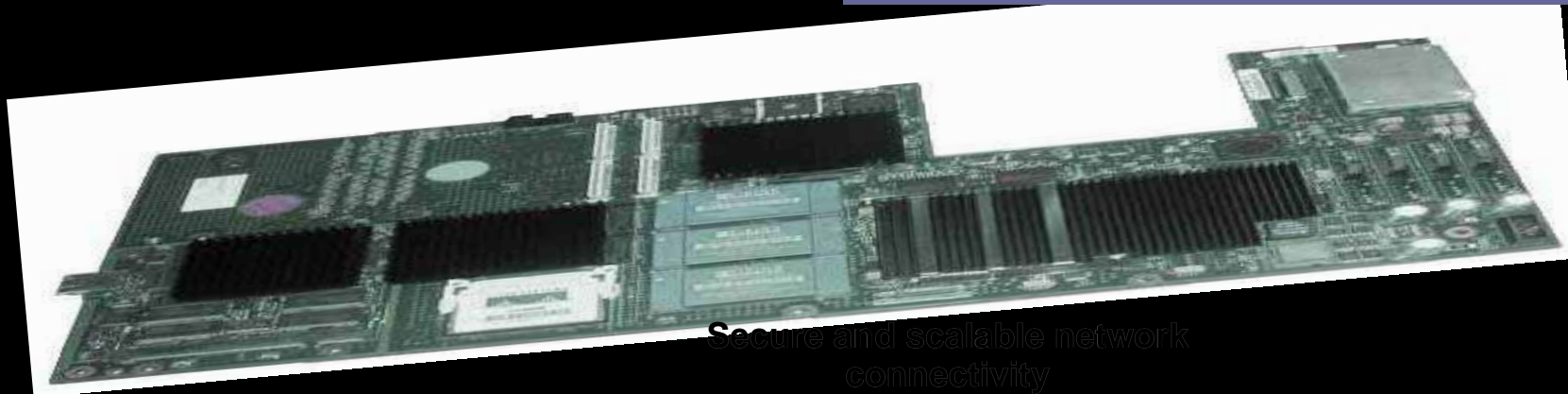
- All SUP 32 supported Line Cards
- WAN - Enhanced FlexWAN, SIP-200, SIP-400
- Service Module – FWSM, IDSM, IPSec, NAM

Software

- 12.2SZF (Rockies3 based) (1HCY07)
- ION Support (2HCY07)

Services

- Flexible Packet Matching
- Network Based Application Recognition
- Full L3 Functionality



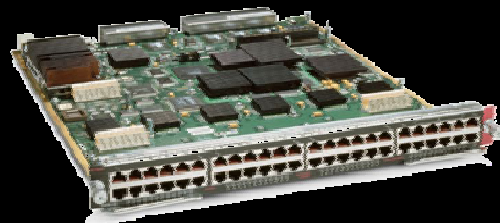
Secure and scalable network connectivity

Generic Online Diagnostics Diagnostic Integration

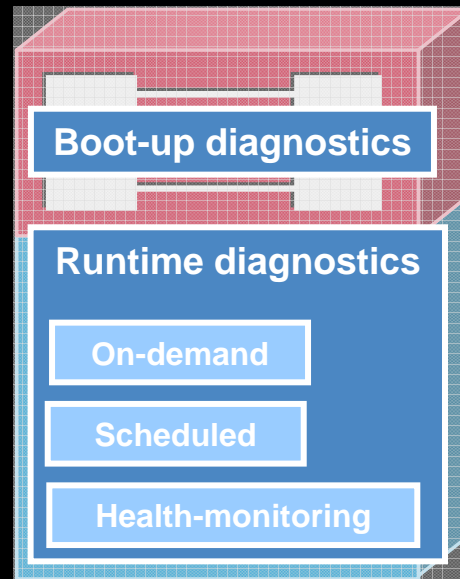
Configuration/reporting



Configure online diagnostics
and check diagnostics results

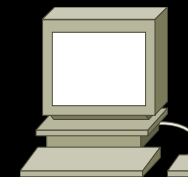


Verify hardware functionalities



Provides generic diagnostics
framework

Action



- Default corrective action
 - Supervisor reset
 - Supervisor switch-over
 - Fabric switch-over
 - Port shut down
 - Line card reset
 - Line card power down
 - Generate a call-home message
- Trigger Syslog
- Trigger EEM policies
- Generate SNMP Trap

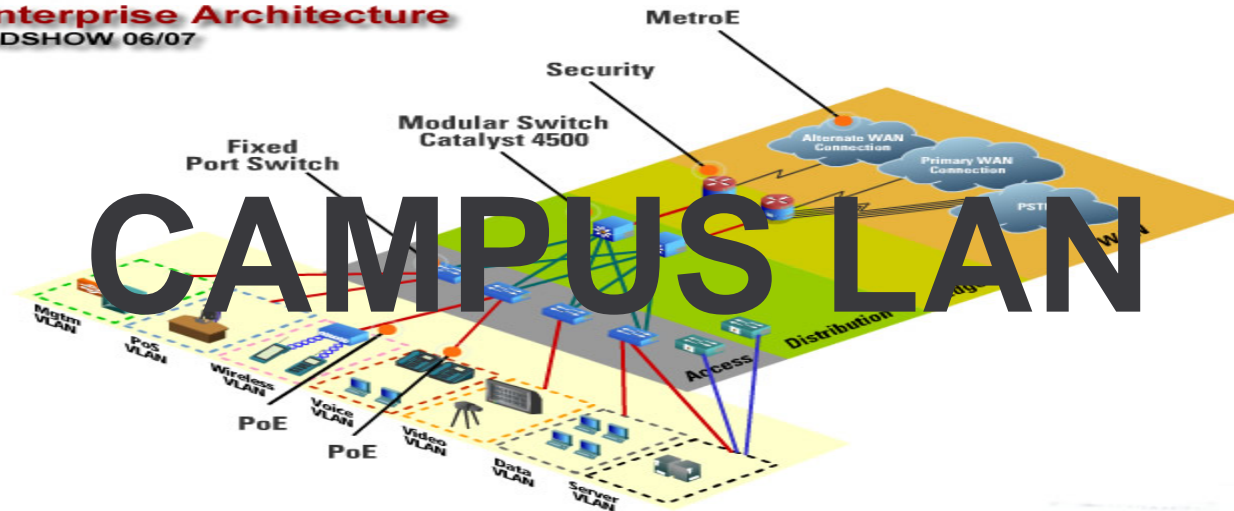
Automated action based on
diagnostics results



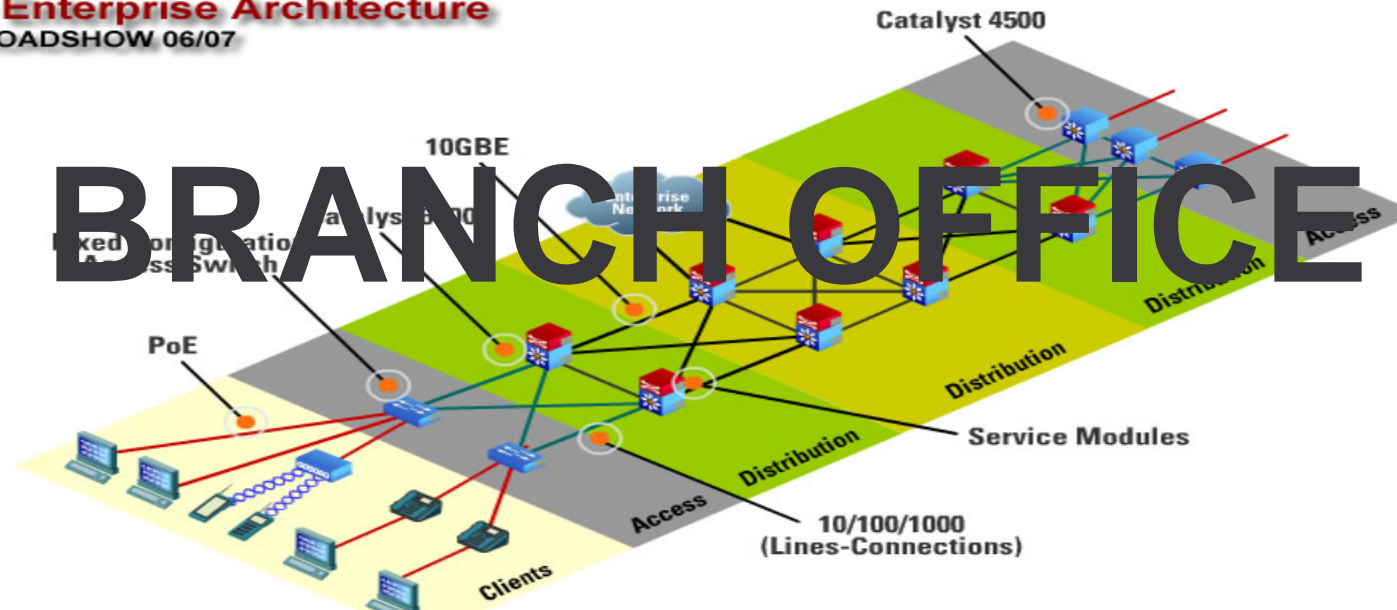
Detect and identify problems before they result in network downtime!

CATALYST 4500

Cisco Enterprise Architecture
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Cisco Enterprise Architecture
APAC ROADSHOW 06/07

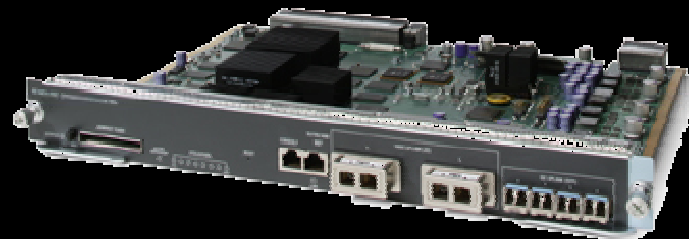


Award-Winning Cisco Catalyst 4500 Series

**InfoWorld
Technology Of The Year
"Best Enterprise Switch"
2006**



+



SUP II-PLUS-10GE



"The 4506 performed with aplomb, successfully keeping up with the traffic flow at the highest levels that I could push it."

"Try as I might, I couldn't get the Supervisor Engine II-Plus-10GE in the 4506 to stumble, even when presented with oversubscribed workloads and heavy QoS overhead."

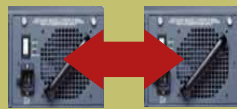
InfoWorld

Upgrade Hint Number 1: High Availability

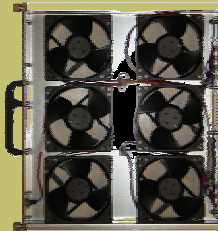
Circuit Failures
Are the Main Cause
of Outages

Power Circuit Redundancy

Power Supplies(1+1)



N +1 Redundant Fans



Pwr rail 1

Pwr rail 2



Supervisors (1+1) with SSO & NSF(new)



Simple Line Card Design

MTBR up to **6X HIGHER**
than Supervisors, Fans
and Power Supplies



Less Components =
Less Likely to Fail

Phone calls do not drop
Videos do not freeze

Helpful Hint :

***** Higher Feature Capacity *****



Catalyst 4500
128,000 **Dedicated**
Forwarding
Entries



Catalyst 4500
64,000 **Dedicated**
QoS/Security
Entries



Competitive modular
Up to 10,000 **Shared** entries
Forwarding/QoS/Security



Stackable switches
1,000 **Shared** entries
QoS/Security

- Dedicated Hardware Capacity for Forwarding
- Dedicated Hardware Capacity for Features
- Ample Headroom for Future Requirements
- Line Rate Performance for Security & QoS

Helpful Hint Number Four: IP Convergence

The **Only** Catalyst 4500 **PoE** Power Supply
Which Supports a Standard **110V, 15 Amp** Outlet



PWR-C45-4200-ACV: 4200 Watt AC Power Supply

- Up to 3700 Watts of PoE in Redundant Mode
- Up to 5500 Watts of Power & support for 281 Class 3 PD's
- Up to 1400 Watts of Data
- Operates on 110V or 220
- Add circuits when needed

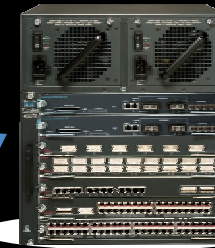
**Business opportunity to upgrade older
power supplies to new, more powerful
units for better voice and wireless support**

Key Catalyst 4500 Compelling Upgrade Features

Supervisor Redundancy with Stateful SwitchOver (SSO) & Non-Stop Forwarding (NSF)

- Secondary supervisor active within 50-150ms if primary Supervisor fails
- Accelerates L3 reconvergence time after Sup failover
- IP Calls don't drop!!!

Catalyst 4500



CNA

- Entry-level, GUI-Based network management

Extensive QoS

- Port Based vs Chassis
- 4 Queues per Port vs. 2 Queues
- L2/L3/L4 Classification
- Ingress/Egress Policers
- DBL for Flow Based Cong. Avoid.

1+1 Power Supplies

Integrated 1+1 redundancy vs. 2+1

No PoE Power Limitations

- 4003 does not support PoE
- 4006 limited to 400W/slot
- 4500 no limits

Integrated Layer 2 to 4 Security

- Prevent Man-in-the-Middle attacks
- Port Security, Dynamic ARP Inspection, DHCP Snooping, IP Source Guard
- Wire Speed ACL's with RACL/PACL/VACL
- 802.1x ..ID's and authorizes users
- Network Admission Control (NAC) to prevent infected devices on the network

NetFlow

- Monitor traffic flows and potential security problems

Up to 102Gbps vs. 18Gbps

- Layer 2/3/4
- Modular Supervisor Scalability with Optional 10 GE uplinks

Catalyst 4006/4003 Sup I/II



Cisco Catalyst 4948-10GE Awards

February 27th, 2006

NETWORKWORLD®

The Leader in Network Knowledge



Record low latency
Line-rate throughput
Innovative security mechanisms
Extensive list of switching and routing features



David Newman, president of Network Test

CLEAR CHOICE TEST

“Top of Rack” Server Aggregation

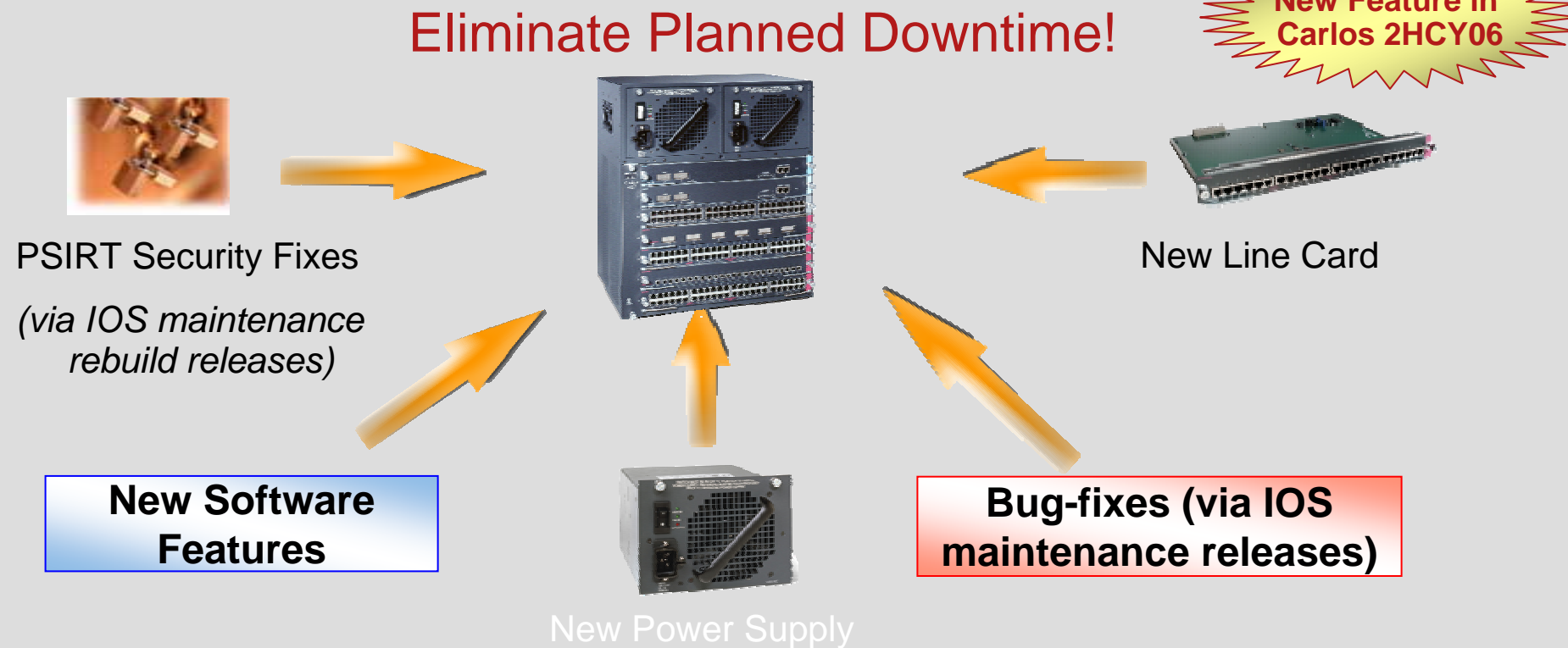


Catalyst 4948

- 44 to 48 RUs available in a standard rack
- High concentration of “rack-optimized” servers for:
 - High density network servers
 - High performance clusters
- Low profile, high performance 48-port switches needed to perform aggregation function per rack
 - One switch – single attached
 - Two switches – dual attached



How does ISSU help you?



- ISSU allows customers to upgrade the full software image, apply bug fixes and install new features while “eliminating” switch downtime.
- Adds Value to 4507R and 4510R Chassis with Redundant Supervisors

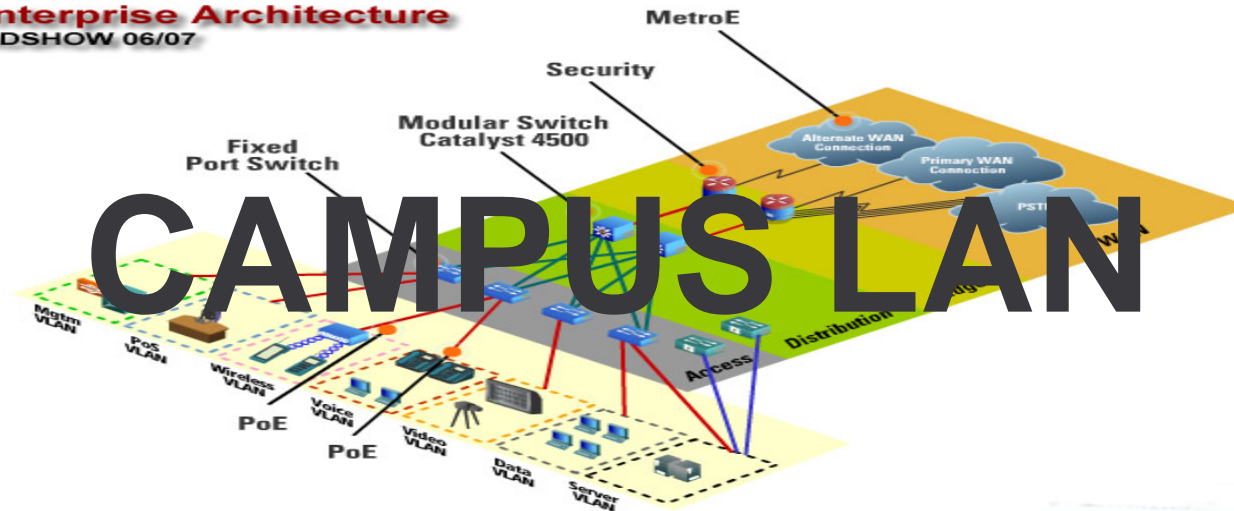
Summary Highlights



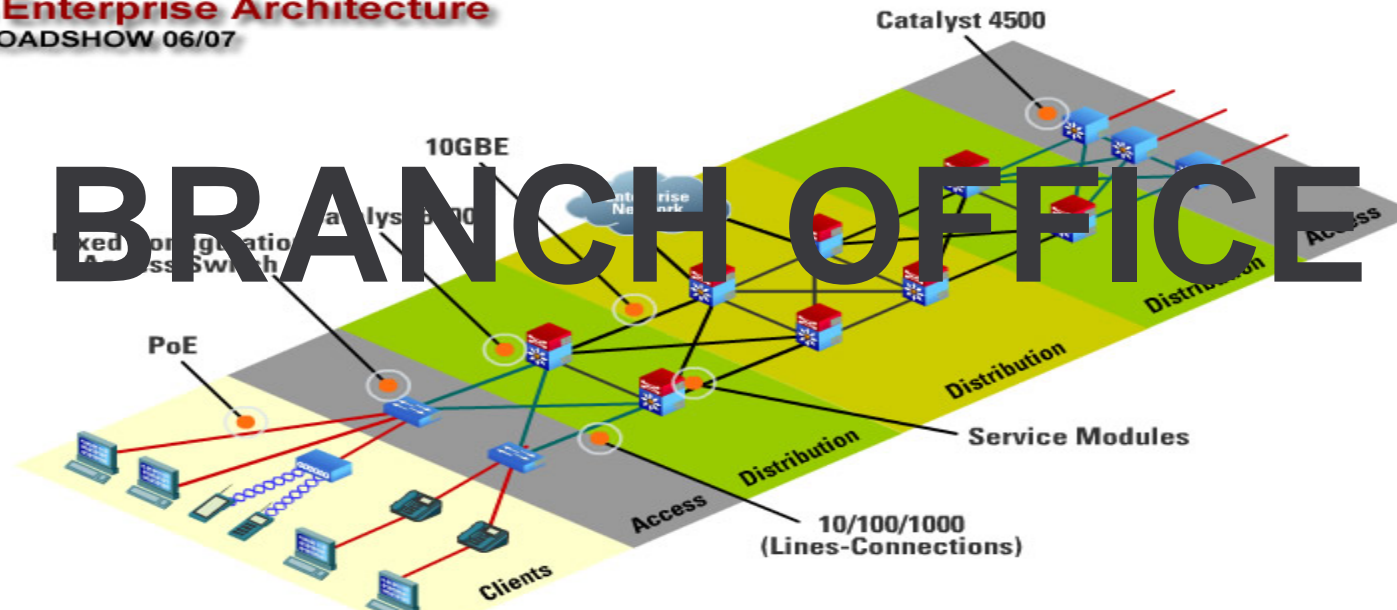
- Most Widely Deployed Modular Switch in the Industry
- Increased GSBU Staffing for Continued Growth
- \$2B Install Base is Ready for Upgrade : EOS of Cat OS
- Proven Investment Protection
- High Availability in Hardware & Software : Ready for IPT
- Line Rate 10GbE Provides Additional Future Proofing
- Catalyst 4900 for Top of Rack Server Aggregation

CATALYST 3750 & CATALYST 3560

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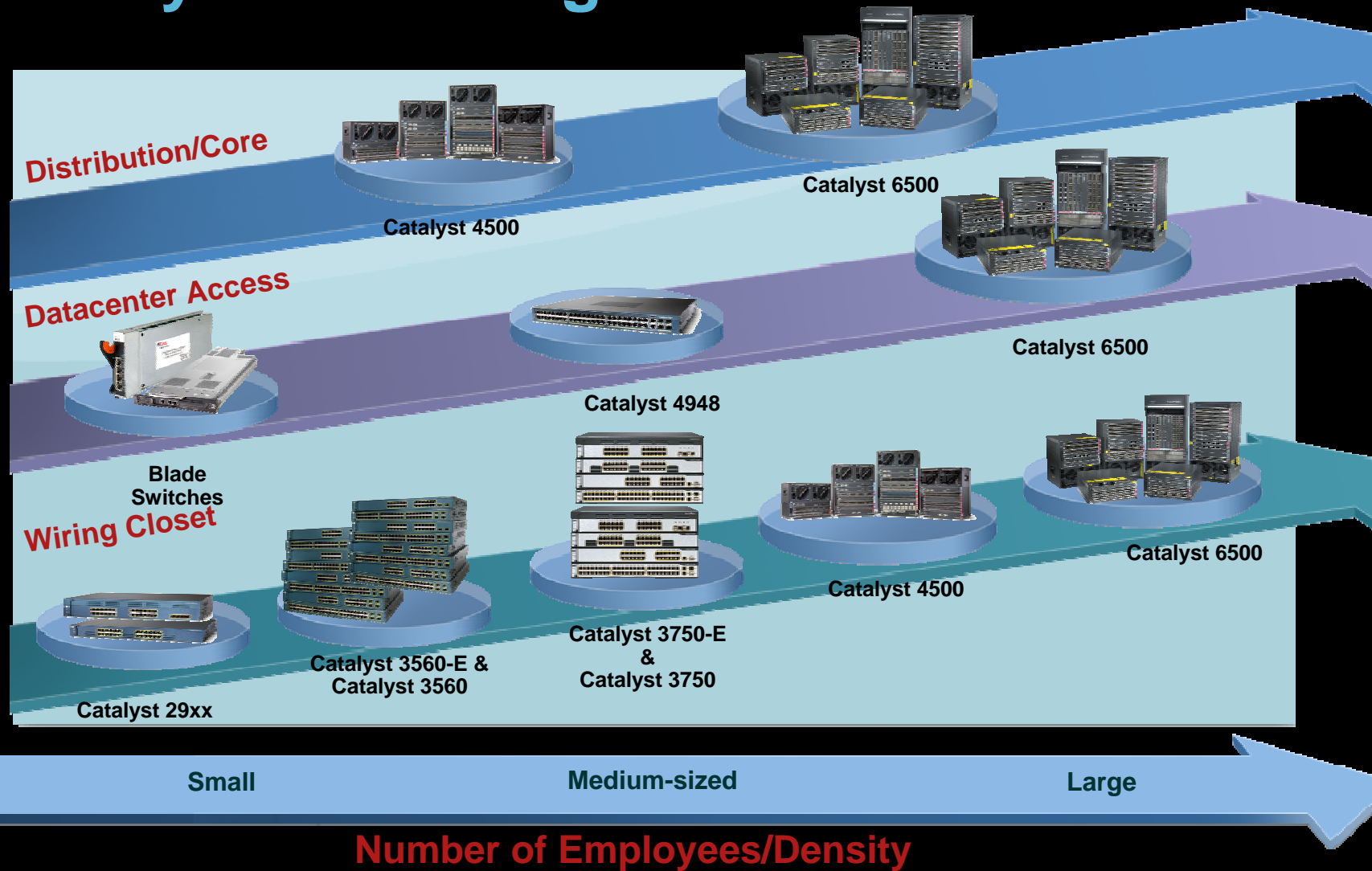


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Catalyst Switching Portfolio

Features, Scalability, Longevity



The Network Today

- Gig to the desktop adoption increasing
 - Gig uplinks to distribution become bottleneck
- IT purchases face longer time in service
- VoIP deployments increasing
 - Uptime more critical
 - Devices requiring PoE increasing
- Collaboration and real-time communication application use growing
 - User experience becomes top priority
 - Network system emerging as new platform for applications
 - Intelligent edge has become a competitive edge



Introducing The Catalyst 3750-E

- Complements the Catalyst 3750 Series
- 24 or 48 10/100/1000 ports
- All models have 2x10 GE uplinks
- PoE and data-only models
- Wire-speed performance
- StackWise Plus
 - Supports original StackWise features
 - Double the throughput of original StackWise
 - Backwards compatible with the Catalyst 3750
- Power
 - Modular power supply and fan
 - Multiple power supply options sizes
 - 48 ports of full IEEE POE in a single rack unit
 - Supported by new and improved redundant power system



The 3750-E In Today's Networks

- Bandwidth demands increase
 - Allows deployment of GE with 10GE uplinks
- Security threats continue to grow
 - Supports the latest Network Admission Control (NAC), Clean Access, and man-in-the-middle attack prevention
- Power over Ethernet (PoE) becomes prevalent
 - Flexible power options for a wide variety of deployments
- Network downtime is more expensive
 - Innovative power supply technology increases availability
- Network deployments are more complex
 - The 3750-E is backward compatible and interoperates with the 3750, simplifying deployment and operation

Catalyst 3750-E Models

- PoE and data only options
- Any 3750-E model can be connected with another through StackWise Plus
- 3750-E models can be combined in a stack with existing 3750 models in a mixed stack



24 10/100/1000T Ports + 2x 10GE



48 10/100/1000T Ports + 2x 10GE



24 10/100/1000T Ports w/POE + 2x 10GE



48 10/100/1000T Ports w/POE + 2x 10GE

Catalyst 3560-E Models

- The 3560-E is for standalone deployments
- Similar features to the 3750-E, but StackWise is removed
 - Same software features
 - Same PoE options



24 10/100/1000T Ports + 2x 10GE



48 10/100/1000T Ports + 2x 10GE



24 10/100/1000T Ports w/POE + 2x 10GE



48 10/100/1000T Ports w/POE + 2x 10GE

StackWise Plus

- 64Gbps Stacking Throughput*
- Local switching
- Intelligently traffic forwarding
- Backward compatible with the original StackWise
- Fault-tolerant, Bi-directional stack interconnection
- Automated Configuration & Management
- Single network instance (IP, SNMP, CLI, STP Protocol , VLAN)
- Master/secondary architecture with master failover
- Cross-Stack EtherChannel®, cross-stack QoS

**Unified Stacking,
Behaving As a Single Unit**



* For typical traffic patterns, actual performance may be higher or lower

StackWise Plus Architecture

Local Switching

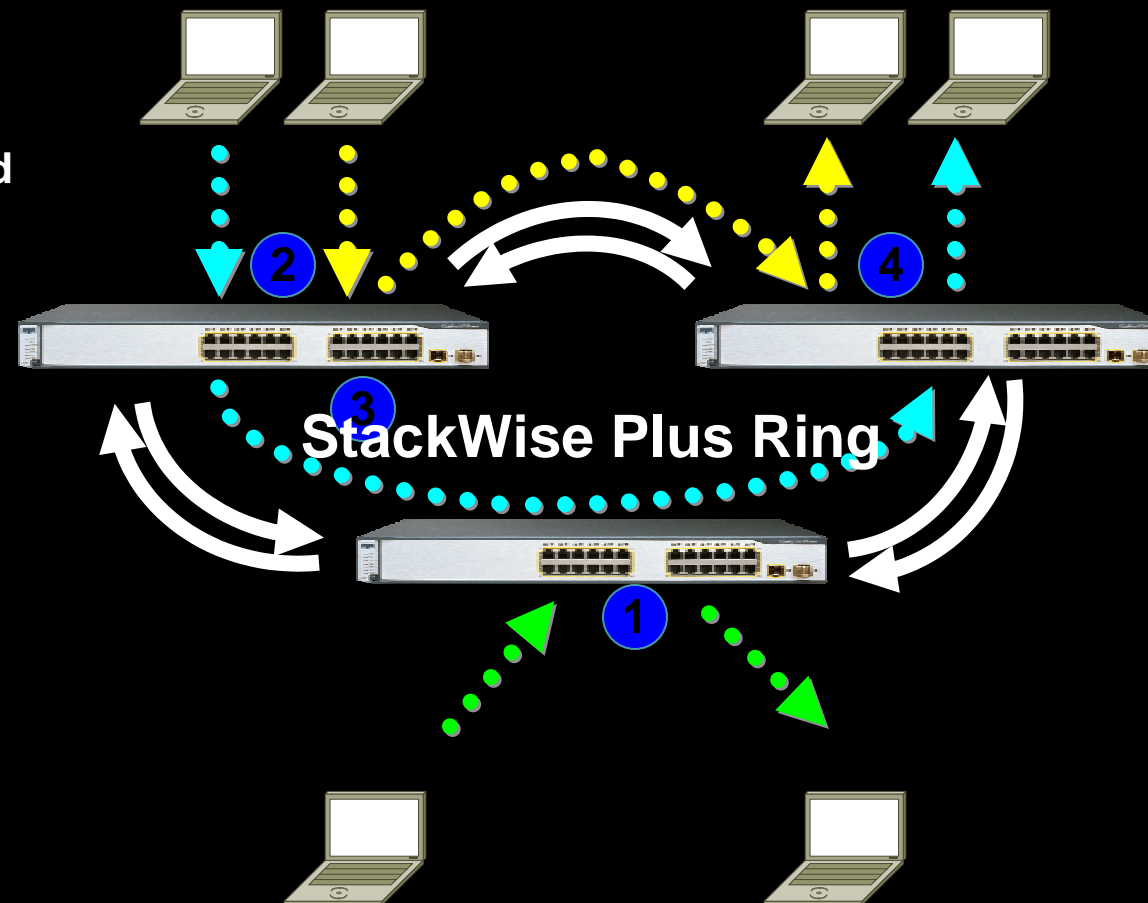


- 1 24 or 48 ports wire speed
No packets traverse
StackWise connections

StackWise Plus



- 2 Ingress Policing
- 3 Egress queuing and load balancing
- 4 Destination switch removes packets and delivers them



10 Gigabit Ethernet

- Two 10GE uplink interfaces
- Wire rate forwarding performance
- Supported X2 Transceivers
 - *LX4 (MMF - 300m SMF - 10km)
 - LR (SMF 10km)
 - SR (MMF)
 - *CX4 (Copper)
 - ER (SMF 40km)
- TwinGig Adapter converts an X2 interface into dual SFP interfaces
- All SFPs supported on 3750 platform are supported with the TwinGig Adapter
- TwinGig Adapters are hot swappable with X2 modules

* Available in February 2007



Out of Band Management

- Two management ports
 - RS-232 serial console port
 - 10/100BASE-TX Ethernet port
- Out-of-band management supports Telnet, TFTP, and SSHv2
- One interface can manage the entire stack of switches
- If multiple out-of-band ports are connected to different switches in a stack, one is selected for active use



Field Replaceable Power Supplies

- Wide variety of power supply options
 - 48 port POE, 24 port POE, and data only options
 - DC power available in every model for data only
- With the RPS 2300, a power supply can be replaced without powering down the switch

Cisco Catalyst 3750-E and 3560- E Series Switch Type	Power Supply			
	C3K-PWR- 1225WAC	C3K-PWR- 750WAC	C3K-PWR- 265WAC	C3K-PWR- 265WDC
48-Port PoE Switch	✓	✓		
24-Port PoE Switch	✓	✓		
48-Port Switch	✓	✓	✓	✓
24-Port Switch	✓	✓	✓	✓
RPS 2450	✓	✓		



Switch with 1225WAC Supply



AC Supply



DC Supply

Redundant Power System – RPS 2300

- Seamless failover from switch to RPS when PS fails
- Automatic back-off to switch when its power supply returns
- RPS and switches support dual AC power circuits
- Connect up to six switches
- Two switches can be actively backed up
- Dual modular power supplies allow the RPS to match the switches' supplies
- Field replaceable blower module



Backwards Compatible

Switches: 2950, 2960, 2970, 3550, 3560, and 3750

Routers: 2811, 2821, 2851, and 3825

Power Over Ethernet

- Prepare the network for IP Telephony and Wireless access
- Eliminate the need for separate electrical wiring
- Protect your investment and avoid a costly upgrade
- Cisco pre-standard POE and 802.3af are fully supported
- Cisco IOS provides intelligent power management with granular control
- Modular power supplies let you grow your POE capacity as requirements increase, up to 48 ports of full power
- Wide selection of standards-based IEEE 802.3af powered devices

IP Phones

Wireless Access Points

Surveillance cameras

Access Card Readers

