



Catalyst Intelligent Switching and Product Update

Foundation Technologies, Apac
Technical Marketing Engineer

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BDM

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Evolution of the Modern Network Technology Trends

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- **Converged networks driving requirements for greater intelligence everywhere**
- **New and growing application deployment with unpredictable traffic patterns**
 - Greater reliance on delivery optimization
- **Increased simultaneous application use and desktop computing power increasing**
- **Security is Mission-critical and required everywhere**
 - Networks are more open with ever-increasing threats



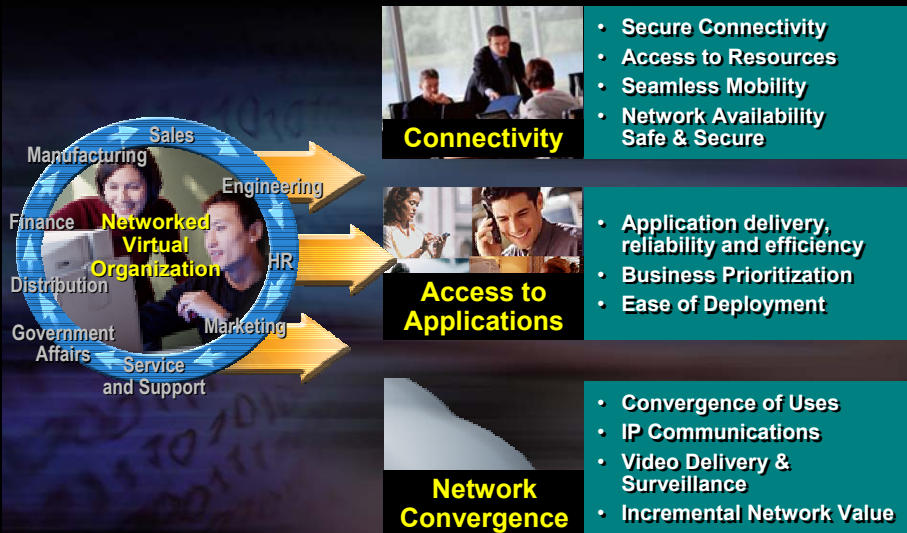
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The Network is Very Relevant ...

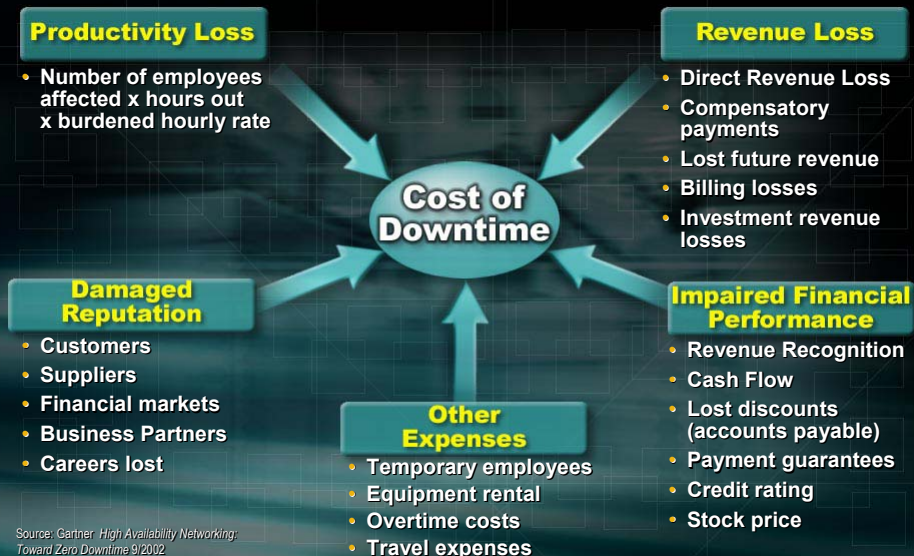
Leverage Network Assets to Deliver Business Value

Cisco.com



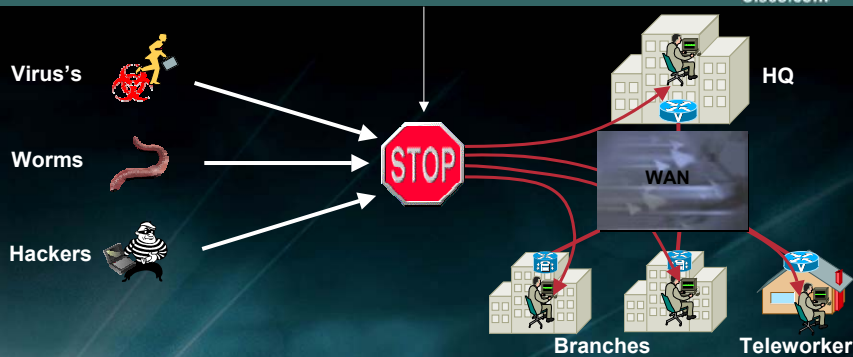
What are the Costs of Downtime?

Cisco.com



The Cost of Security Attacks and Breaches

Cisco.com



- Theft of proprietary information causes greatest financial loss: \$2.7M per incident (2003)
- DOS resulted in the second most expensive computer crime (after theft of proprietary information), at \$65,643,300.
- Virus incidents (82%) and insider abuse of network access (80%) were most cited forms of attack or abuse

Source: CSI / FBI Security Study 2003

Cisco Catalyst Intelligent Switching

Cisco.com

 Availability & Resiliency	 Integrated Security	 Optimized Delivery	 Enhanced Manageability
<ul style="list-style-type: none"> • Reliable product design • Critical component redundancy • Stateful failover for mission-critical deployments • Scalable network design for High-availability 	<ul style="list-style-type: none"> • Pervasive security connectivity services • Identity-based trust and identify management • Wire-speed Access Control Lists • Controlled access to system maintenance 	<ul style="list-style-type: none"> • Layer 2/3/4 traffic classification (QoS) • Shaping/Sharing and policing • Intelligent, wire-speed multicast • Granular policy enforcement and real-time adaptability • Hardware-based wire-speed performance 	<ul style="list-style-type: none"> • Real-time troubleshooting and traffic monitoring • Configuration automation • Device discovery and PoE intelligent power management • Integrated Web-based management access • RSPAN for cross-network visibility • Network Accounting



Cisco IOS Software

Catalyst Integrated Security

Cisco.com

Baseline Features (Cisco and Competition)

- Security ACLs
- Port ACLs
- NAT
- 802.1x
- Port security
- TACACS+/RADIUS
- Multilevel Account Privilege

Unique Cisco Features and Capabilities

- IP Source-Guard
- Dynamic ARP Inspection
- DHCP Snooping/Option 82
- MAC-Address Notification
- Reflexive ACLs/Time-based ACLs
- IBNS extensions
- VACLs with redirect and capture
- Private VLANs
- BPDUGuard/LoopGuard/ RootGuard
- Hardware-based NAT
- CEF

Catalyst Availability and Resiliency

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Baseline Features (Cisco and Competition)

- Dual Supervisors, Fabric, Power Supplies
- Power-up diagnostics
- 802.1d Spanning Tree
- 802.1w Rapid Spanning Tree
- 802.1s Shared Spanning Tree
- VRRP (HSRP)

Unique Cisco Features and Capabilities

- SSO/NSF
- Per-VLAN Rapid Spanning Tree
- EIGRP
- Sub-second Layer 3 convergence (EIGRP)
- Gateway Load Balancing Protocol
- UDLD
- Worm mitigation
- Internal attack mitigation

Catalyst Delivery Optimization

Cisco.com

Baseline Features (Cisco and Competition)

- Multiple queues per port
- CoS/ToS re-write
- Strict priority queuing
- Traffic classification
- Per-port policing
- Per-VLAN policing

Unique Cisco Features and Capabilities

- QoS End-to-End Baseline Architecture
- Active Queue Management (WRED)
- Microflow policing
- User-based policing
- Aggregate policing
- Hierarchical policing
- NBAR (PISA engine on Sup32)
- Trusted/Untrusted Port State
- Multicast Suppression
- Multicast Feature set
 - Source Specific Multicast
 - Bi-directional PIM
 - RGMP

Catalyst Manageability

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Baseline Features (Cisco and Competition)

- Syslog
- NTP
- SPAN
- SNMP
- RMON

Unique Cisco Features and Capabilities

- CDP
- Smart Ports/Ease of Use
- Integrated Network Analysis
- NetFlow
- RSPAN and ERSPAN

Delivering System Level Resiliency

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In-Service Software Upgrades (ISSU) – (2005/2006)

Upgrade the system SW or SW modules without impacting system operation

NSF/SSO

No line card reboot required upon processor fail over. Standby processor activates CEF entries. Linecards begin forwarding packets

Logical redundancy

HSRP, Gigabit EtherChannel, Layer 3 load balancing, 1+1 SONET APS

StackWise

Ensures convergence around link or switch failure in a stack

Physical redundancy

With dual supervisors, and power, fabrics, clocks



Catalyst Modular Resiliency

Optimized for the single connection to the End User

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Hardware Redundancy for the most complex components

Power Supplies(1+1)



N + 1 Redundant Fans

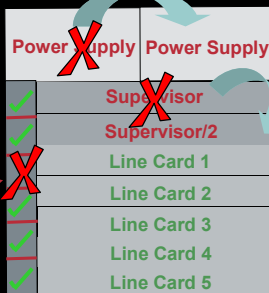


Supervisors (1+1)



Simple Line Card Design

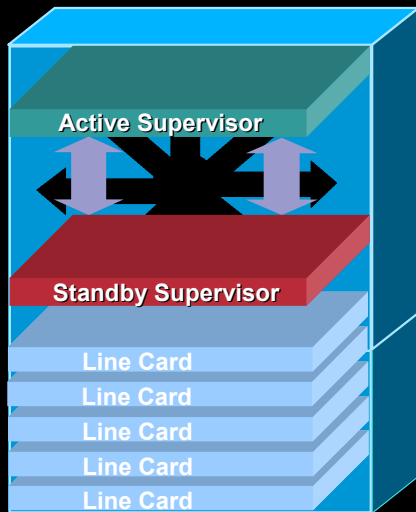
Much higher MTBR than Supervisors, Fans & Power Supplies



Stateful Switchover (SSO)

Non-Stop Application Delivery and Layer 2 Forwarding

Cisco.com



- Active/standby supervisors are synchronized at all times
- Seamless Supervisor Engine **sub-second** switchover with **NO** interruption to packet forwarding and Layer 2 sessions
- Protect application delivery from Supervisor Engine hardware or software failure

SSO Synchronizes:

Port Security	802.1x
IGMP Snooping	ARP/DHCP
VLANs/Trunks/Ports	STP/VTP/DTP
PAgP/LACP	802.1Q
ACL/QoS	Voice VLAN with PoE

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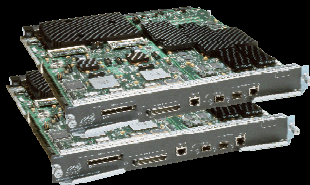
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Non-Stop Forwarding (NSF)

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Active
Standby



Layer 3 Routing Protocols
synchronized between Supervisors

What it Does

NSF allows for graceful restart of protocols between devices in the event of a supervisor failure. Works in conjunction with Stateful Switch Over (SSO) to ensure total Supervisor resiliency

Benefit

Routing protocols (OSPF, BGP, EIGRP, IS-IS) do not have to re-converge, ensuring better network availability.

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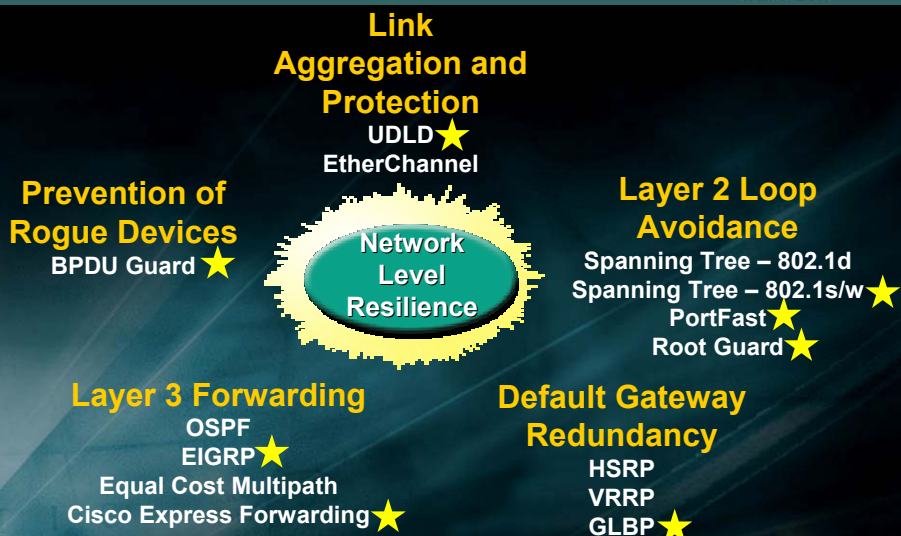
NSF and SSO Working Together

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Characteristics of Network Level Resilience in LAN Switches

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★ Denotes competitive advantage

Catalyst Integrated Security

Cisco.com

Network Security Challenges

Internal and External Attacks

Denial of Service Attacks

Loss of Privacy (Packet Sniffing)

Impersonation (Identity Spoofing)

Bringing Down the Network

Data Theft

Solution

Integrated Security



Trust and Identity Management

Authenticate, Authorize, and Audit



Threat Defense

Control Network/ Application Access
Internal Attack Mitigation



Secure Connectivity

Protect Traffic Across Untrusted Networks

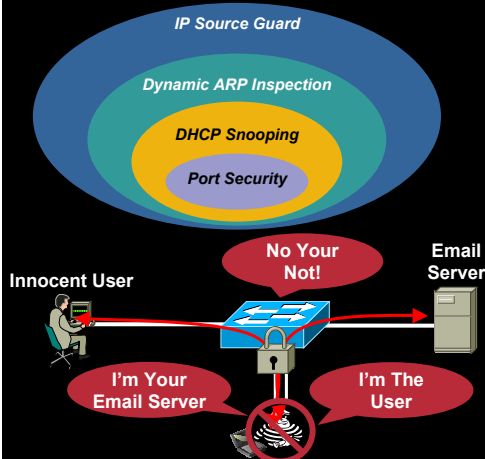
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Example: Mitigating Man-in-the Middle Attacks

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Attack	Catalyst Feature
MAC Address Flooding	Port Security
DHCP Rogue Server for Default Gateway Interception	DHCP Snooping
ARP Spoofing or ARP Poisoning	Dynamic ARP Inspection
IP Spoofing	IP Source Guard

- Helps administrators prevent and track man-in-the-middle attacks
- Prevents DHCP starvation attacks
- Prevents IP Spoofed DoS Attacks
- Hardens the Ethernet standard

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Port Security

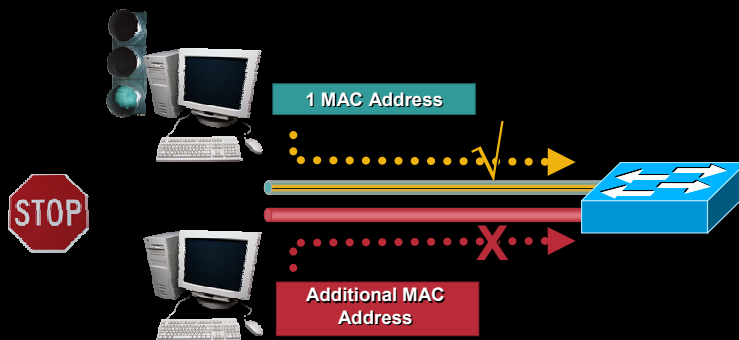
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What It Does:

Limits the number of MAC addresses that are able to connect to a switch and ensures only approved MAC addresses are able to access the switch.

Benefit:

Ensures only approved users can log on to the network.



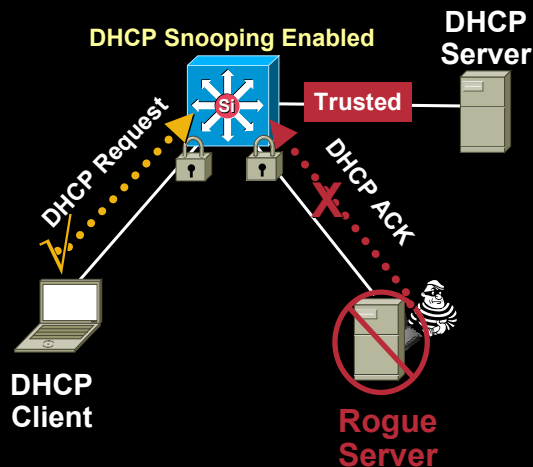
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DHCP Snooping

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What It Does:

- Switch forwards only DHCP requests from untrusted access ports, drops all other types of DHCP traffic.
- Allows only designated DHCP ports or uplink ports trusted to relay DHCP Messages
- Builds a DHCP binding table containing client IP address, client MAC address, port, VLAN number

Benefit:

Eliminates rogue devices from behaving as the DHCP server

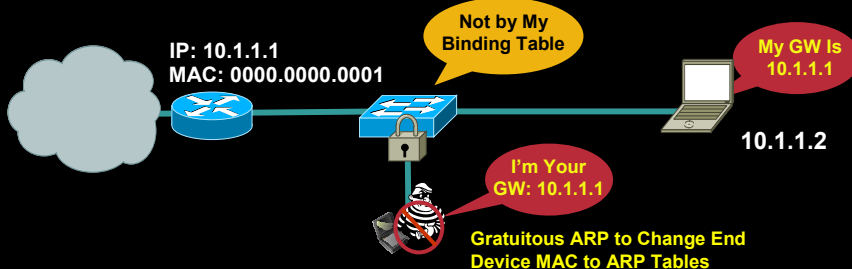
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Dynamic ARP Inspection (DAI)

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What It Does:

Maintains a binding table containing IP and MAC address associations dynamically populated using DHCP Snooping

Benefit:

Ensures integrity of user and default gateway information such that traffic cannot be captured

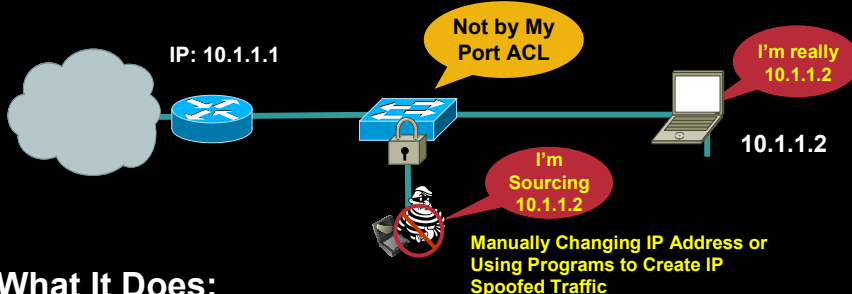
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IP Source Guard

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What It Does:

Automatically configures a Port ACL for IP address and adds MAC address to port security list for the port. DHCP Snooping allows learning and binding of IP address and MAC address by the switch
Removes ACL and MAC entry when lease expires

Benefit:

Prevents snooping of data or anonymous launching of attacks

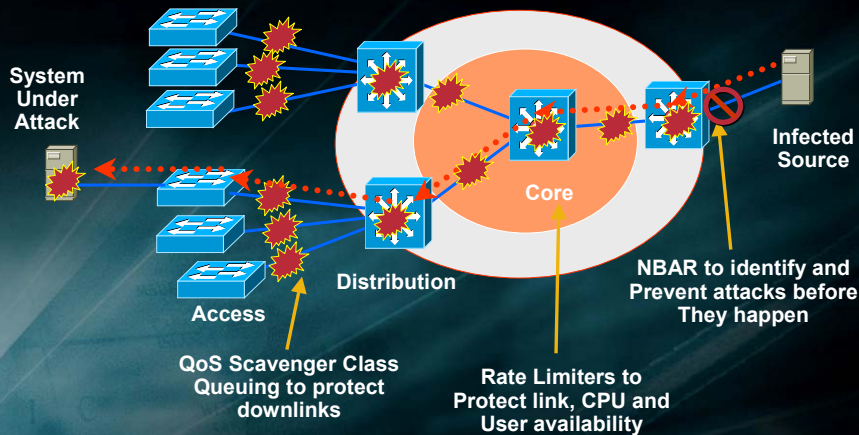
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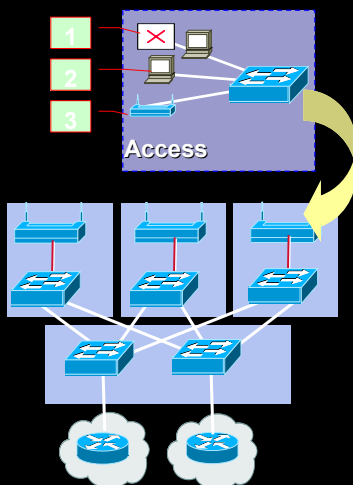
Using Quality of Service to Mitigate Worm Attacks

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Smartports

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• What It Does

Preconfigured macros that enable easy configuration of advanced Cisco capabilities on a per-port basis

Ability to create customized macros

Smartports can quickly enable QoS, Security and availability features with a single command

• Benefit

Prevents switch mis-configuration, reducing downtime due to user error

Maintain configuration consistency across the network

Reduce deployment time

SmartPorts Feature

Maximizing Network Value

Cisco.com

This....

Global
Commands

```
failureserrdisable recovery cause link-flap
errdisable recovery cause udd
errdisable recovery interval 60
vtp domain [smartports]
vtp mode transparent
udld aggressive
spanning-tree mode rapid-pvst
spanning-tree loopguard default
spanning-tree extend system-id
```

Interface
Commands

```
default interface range FastEthernet[1]/0/[1 - 48]
interface range FastEthernet[1]/0/[1 - 48]
switchport access vlan [data]
switchport mode access
switchport voice vlan [voice]
switchport port-security
switchport port-security maximum 3
switchport port-security violation restrict
switchport port-security aging time 2
switchport port-security aging type inactivity
auto qos voip cisco-phone
spanning-tree portfast
spanning-tree bpduguard enable
```

OR

This.

```
Switch(config)# <template type>
```

SmartPorts allows
for simple and
accurate deployment
of high value
network-optimizing
features

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What is Power over Ethernet

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- Power over Ethernet (PoE) is the ability to deliver regulated - 48V DC power over a standard copper Ethernet network cable
- This power is utilized by connected devices for their operation
- Cisco products support both the pre-standard inline power AND the IEEE 802.3af standard
- Enables new uses for the network
 - IP Telephony
 - Wireless
 - IP Video Surveillance
 - Badge Readers
 - Video Kiosks

POWER
ETHERNET

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**Cisco Catalyst
Switches offer
Intelligent Power
Management
Capabilities That
Extend the Optional
IEEE Power
Classification
Feature and Enable
Intelligent, granular
Management of All
PoE Ports**

Cisco 802.3af Power over Ethernet – S.P. Shalita – February, 2004 – R10b

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Cisco.com

- ## Simplifying PoE configuration and deployment





Power supplies required and UPS support requirements

[illegible]

<http://www.cisco.com/go/powercalculator>

Cisco Catalyst Switches— Industry's Most Comprehensive Portfolio

Cisco.com

Performance Services Functions Density		Industry Leading Modular Chassis <ul style="list-style-type: none"> Multiple deployment and performance options Highest availability and 10/100/1000 + GbE densities Integrated WAN and advanced IP services modules Wire-speed 10 GbE aggregation 	Deployment Focus <ul style="list-style-type: none"> Core Distribution Data center access/core + services High performance wiring closets
		Mid-Range Modular Chassis <ul style="list-style-type: none"> Resilient Layer 3 switching with intelligent Layer 3 and 4 services High density 10/100/1000 Power over Ethernet modules Media configuration flexibility with WAN connectivity options 	<ul style="list-style-type: none"> Medium wiring closets Small/medium distribution/core Medium data center access/core Large/medium branch offices
		Advanced Fixed Configuration <ul style="list-style-type: none"> Layer 3 switching with intelligent Layer 3 and 4 services Resilient stacking options Medium density 10/100/1000 Power over Ethernet versions 	<ul style="list-style-type: none"> Small wiring closets Medium branch office Small data center access Small network aggregation
		Entry-Level Fixed Configuration <ul style="list-style-type: none"> Layer 2 switching with intelligent Layer 3 and 4 services Advanced cluster management Fixed-configuration 10/100/1000 Redundant power option 	<ul style="list-style-type: none"> Small wiring closets Small branch offices Industrial environments Classroom deployments

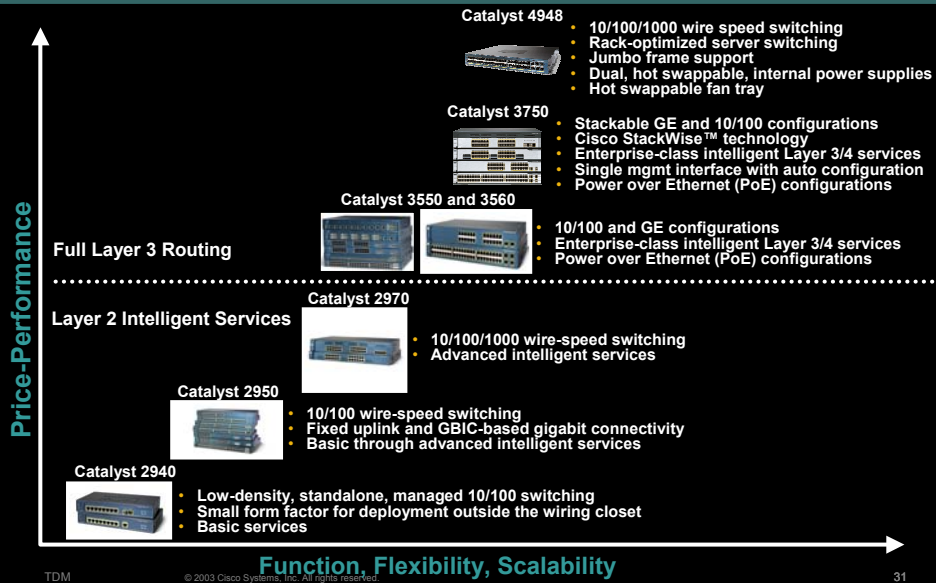


Fixed Configuration Switch Update

DESKTOP SWITCHING BUSINESS UNIT

Most Complete Line of Fixed Configuration LAN Products in the Industry

Cisco.com



Cisco Catalyst 3750 Series

Cisco.com

**Innovative Stacking
Sets New Standards for
Resiliency and
Management**



- Enterprise-class Services**
- Wire-speed switching and routing**
- Cisco StackWise™ Technology**
 - Fault-tolerant, Bi-directional 32-Gbps stack interconnection
 - Automated Configuration & Management
 - Single network instance (IP, SNMP, CLI, Spanning-Tree Protocol, VLAN)
 - Master/secondary architecture with master failover
 - Cross-Stack EtherChannel®, cross-stack QoS
- Next Generation in Stackable Switching**
 - Optimized for Gigabit Ethernet
 - IPv6-capable in hardware

Cisco Catalyst 3560 Series Switches

Cisco.com



- Enterprise-class, fixed configuration, multilayer switching line optimized for access layer deployments requiring IEEE 802.3af or Cisco® prestandard Power over Ethernet
- Enables the deployment of network-wide intelligent services
 - Availability
 - Enhanced security
 - Advanced quality of service (QoS)
- Ideal for small enterprise wiring closets and branch office environments
- Intelligent power management features that enhance PoE management capabilities
- New Express Setup and Embedded Cisco Network Assistant software for easy deployment and configuration

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Catalyst 3550 Series

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Catalyst 3550-24	Catalyst 3550-24-FX	Catalyst 3550-48	Catalyst 3550-12T	Catalyst 3550-12G
				
24 10/100 Ports 2 GBIC ports Inline Power version DC version	24 100FX ports 2 GBIC ports	48 10/100 Ports 2 GBIC ports	10 10/100/1000 Ports 2 GBIC ports	10 GBIC Ports 2 10/100/1000 Ports
Medium Port Density		High Port Density	Gigabit Ethernet Aggregation	

- Industry's highest volume Layer 3 stackable switch family
 - Nearly half of the worldwide fixed config L3 100/1000 revenue run rate*
 - More than 1 million units deployed
- Continued Investment Protection
 - New IOS innovations including Dynamic ARP Inspection, IP Source Guard, NAC, and IBNS extensions.
- Availability guaranteed throughout the 2005 calendar year
- Service and support extends 5 years from the End-of-Sale date
- Additional PoE and GE switch options in the Catalyst 3560 and 3750 families

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* Derived from Dell'Oro
CY04Q2 market estimates

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Catalyst 2950 and 2970 Series Switches

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- **Fixed configuration, stackable and standalone switch family with Fast Ethernet and Gigabit Ethernet configurations tailored for small and mid-sized networks**
- **Advanced Cisco intelligent services to the edge of a network (EI)**
 - Advanced Quality of Service
 - Enhanced security features
 - Sophisticated Multicast Management
- **Supports Gigabit Ethernet over a variety of media**
 - Modular GBIC or integrated 10/100/1000 connectivity provides flexibility in deploying Gigabit Ethernet over Fiber and Copper
- **Powerful combination of the Catalyst 3550 and Catalyst 2950 (EI) enables IP routing from edge to core of the network**
- **Embedded Cisco Network Assistant software allows easy configuration of network-wide intelligent services**



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Catalyst 4500 Update

GIGABIT SYSTEMS BUSINESS UNIT

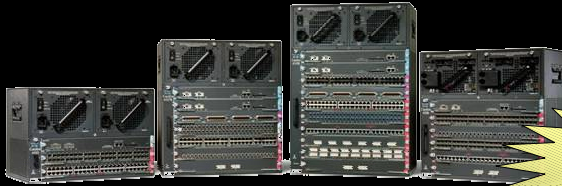
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Catalyst 4500 Series — Enables Control for Converged Networks

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Proven Architecture!
Industry's most widely
deployed
modular chassis

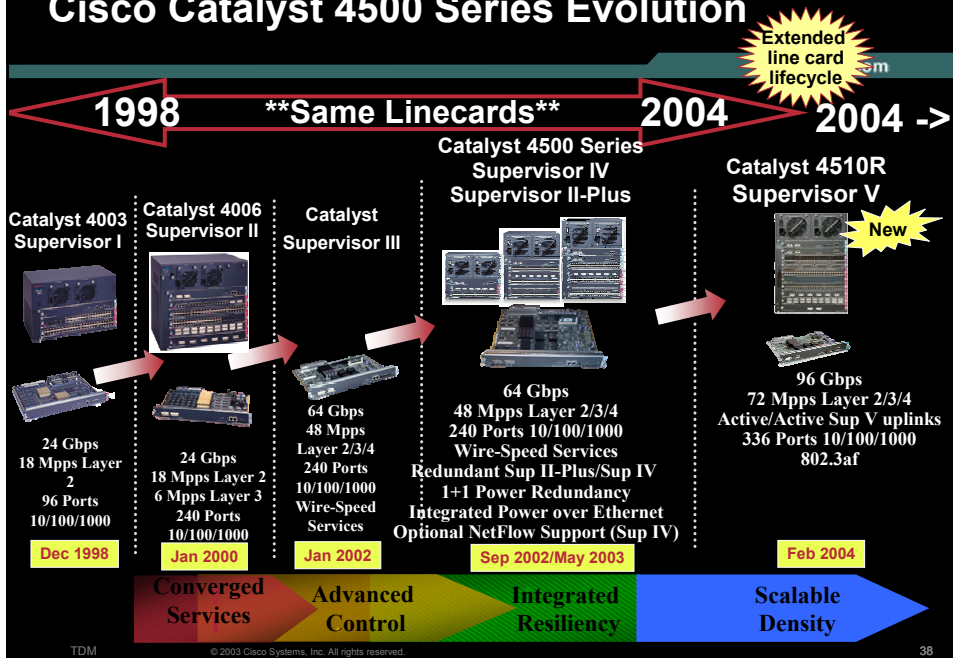
- **Evolutionary Multi-Layer Switching platform**
Flexible chassis, supervisor and line card options to accommodate different performance and connectivity requirements
- **Innovative Features to provide security and resiliency to connected devices**
Enhanced Security
Integrated resiliency for supervisors, power supplies and fans
- **Up to 384 10/100/1000 Ethernet ports — fiber or copper**
- **Enhanced Power over Ethernet support (IEEE 802.3af)**
- **Optional NetFlow analysis**

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Cisco Catalyst 4500 Series Evolution



Catalyst 4503 Series Update

Introducing Supervisor II-Plus-TS

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Designed specifically for SMB Networks and Enterprise Branch offices

- Increases Catalyst 4503 maximum port density to 116 total ports
- 12 wire speed 10/100/1000 ports with PoE and 8 SFP ports built in on the front faceplate of the Supervisor
- Two available line card slots compatible with all Catalyst 4500 Series line cards

- Cisco IOS based Layer 2 Supervisor with Layer 3 & Layer 4 services exclusively for the Catalyst 4503
- Based on Catalyst 4500 Supervisor II-Plus Hardware and Software (Basic L3 only)
- Supervisor ports have many uses including PoE device connections, server connections, uplinks, gigabit aggregation or user ports



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Catalyst 4503 Supervisor II-Plus-TS

Designed to meet the needs of the SMB

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Flexibility: 12 wirespeed 10/100/1000BaseT ports, 8 wirespeed SFP ports on front of Supervisor faceplate

Performance: 64 Gbps Switching Capacity, 48 Million packets-per-second forwarding rate

Ease of Use: Removable Compact Flash, with Front-panel insertion

Availability: 10/100 Ethernet management (RJ-45) for Disaster Recovery

Scalability: Increased Density 116 ports

15 Amp wall plug when supporting 12 or less PoE ports

IEEE 802.3af and Cisco pre-standard PoE support on all twelve 10/100/1000 faceplate ports

Console port (RJ-45) with Front-panel interface

Exclusive to the Catalyst 4503

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Flexible Line Card Options Designed for More Granular Port Densities



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- **24-Port 10/100 (RJ-45)**
Data Only
- **24-Port 10/100 (RJ-45) PoE**
Cisco Prestandard & 802.3af
- **24-Port 10/100/1000 (RJ-45) PoE**
Cisco Prestandard & 802.3af
- **48-Port 1000-X (SFP)**
Optional SX, LX & 1000-T SFPs
- **6-Port 10/100/1000 PoE (RJ-45) or SFP**
12 Physical Ports - Up to 6 active
Mix & Match 10/100/1000 PoE or SFP
Jumbo Frame Support
Wire Speed



RJ-45 SFP
(Alternative Wired)

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Introducing the Catalyst 4948 Rack Optimized Server Switching

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- Non-Blocking 48 ports of 10/100/1000 with 4 SFP uplinks (alternative wired)
- 1 RU form factor for aggregation of high performance servers & workstations
- IOS/CEF based Layer 2/3/4 switching on all ports (SMI & EMI versions)
- Dual, hot swappable, internal power supplies (AC or DC options)
- Hot Swappable Fan Tray
- Low Latency (5.8 microseconds for 64 byte packets)
- Jumbo frames on all ports
- Broadcast and Multicast Suppression in Hardware for all ports (L2/3)
- Based on Catalyst 4500 Series HW and SW Architecture

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Catalyst 6500 Update

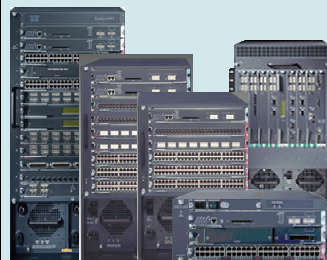
INTERNET SYSTEMS BUSINESS UNIT

Catalyst 6500

Industry's Most Flexible and Innovative Switching Platform

Cisco.com

- **Expandable Module Options**
Flexible range of leading interface modules
Consolidation for management simplicity
- **Industry-leading Scalability**
Flexible range of high performance options
Incrementally supports future growth
- **Advanced Services Integration**
Wide range of advanced services
Switch-integration lowers total cost of ownership
- **Highest Level of Availability**
Achieve maximum uptime of mission-critical apps
- **Multiple Deployment Options**
Operational efficiencies & maximum deployment options

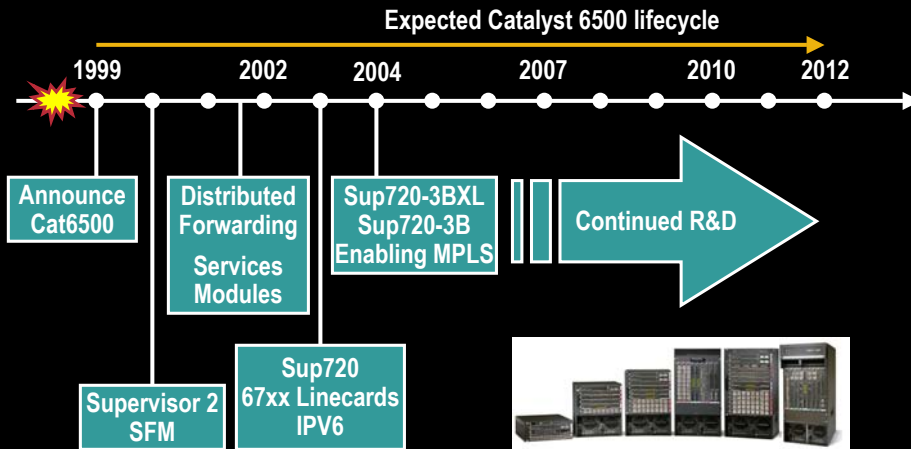


Catalyst 6500: Lasting Architecture

Delivering Long-term Innovation with Investment Protection

Cisco.com

The Catalyst 6500 was announced in 1999 and continues to deliver industry leading feature and performance with unmatched investment protection.



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Catalyst 6500 Family

Flexible Deployments – Industry Leading Port Densities

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The Catalyst 6500 provides industry leading port densities & range of form factors to maximize operational consistency...



Max Densities	Catalyst 6503 ¹	Catalyst 6506	Catalyst 6509	Catalyst 6513
10/100 RJ45	192	480	768	1152
10/100/1000 RJ45	96	240	384	576
GE (1000Mb) GBIC	34	80	128	192
GE (1000Mb) SFP	96	242	384	410
10GE	4	20	32	20

¹Densities for new E-Series Chassis

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Introducing Catalyst 6500 E-Series Chassis

New Higher Powered Chassis Options

Cisco.com

- Scale beyond 4000W up to 24000W
- Supports all 6K Interfaces
- Same price as current chassis
- No software upgrade to run new chassis



6503-E

6506-E

6509-E

6513-E (Future)

Max Densities	6503E	6506E	6509E	6513E*
Cisco 7960G IP Phones	192	480	528	528
802.3af Class 3 Devices	72	240	288	288

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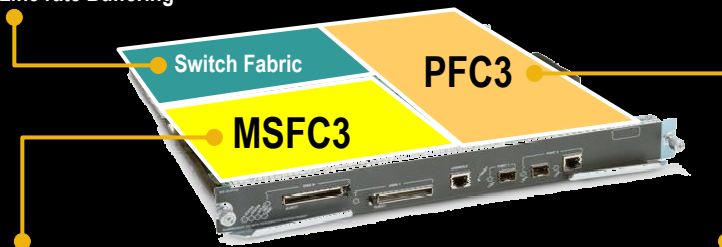
Supervisor 720

Industry Leading Performance & Investment Protection

Cisco.com

Integrated 720Gb Switch Fabric
Dual 20Gbps connection / slot
Dual speed 8Gb / 20Gb Traces
Line rate Buffering

Sup720 leverages hardware to scale performance for advanced services....



- Integrated RP and SP
- Over 400Mpps L2~4 performance

Optimized for Secure & Mission Critical Deployments

- Modular PFC Daughter Card for Maximum Investment Protection
- Industry Leading Security Features:
 - HW Acceleration for RP Rate Limiters, Security ACL's, Multipath uRPF Check, PACL's, ACL Counters
- Scalable Services for Optimal Application Support:
 - HW Acceleration for BI-DIR PIM, MPLS, GRE, NAT, PAT

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Catalyst 6500 Service Modules

Integrated Service Leadership

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Service Modules Innovations led by Catalyst 6500

Service Module	Features / Benefits
Firewall Module	Fastest firewall data rates in the industry: 5-Gbps throughput, 100,000 connections/second, and 1M concurrent connections. Based on Cisco PIX® Firewall technology.
Network Analysis Module	Real-time traffic analysis. IP Telephony quality monitoring, application performance problem troubleshooting, monitoring/curbing unproductive network traffic, and optimizing WAN bandwidth.
Intrusion Detection System Module	Accurate security threat detection, intelligent threat investigation, ease of management, and flexible deployment options
Content Switching Module	High-performance, high-availability load balancing of firewalls, web servers, caches and other network devices
VPN Module	High-speed IPSec VPN services. 1.9-Gbps 3DES performance, 8,000 active tunnels, and up to 60 tunnels/second
SSL Module	Accelerates the performance and increases the security of Web-enabled applications.

TDM

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Catalyst 6500 Evolutionary Innovations

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For More Information (External)...

Cisco.com

- **Catalyst LAN Switching**
www.cisco.com/en/US/products/hw/switches/index.html
- **Cisco SmartPorts**
www.cisco.com/go/smartports
- **Cisco Self-Defending Networks**
www.cisco.com/go/security

Summary and Call to Action

Cisco.com

- **Use new products and capabilities to churn the installed base**
- **Highlight Cisco's differentiation in features and how they enable the larger system**
 - Security**
 - High Availability Networking**
- **Upsell to Gigabit and Power over Ethernet to add value and investment protection to the customer.**

Questions?



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