Cisco Catalyst® 3550 Series Switches
Catalyst 3550 Series

- Product Overview
- Intelligence in the Network
- Features and Benefits
- Deployment Examples
- Service and Support
“...the introduction of these products [Catalyst 3550/2950] will put Cisco competitors on the defensive to match its price, performance, and value.”
Catalyst 3550 and Catalyst 2950 Series Switches

- **Wiring Closet**
  - Catalyst 2950SX-24/2950-12/24 / Standard Software Image
    - Wire-speed standalone 10/100 switching
    - Basic Cisco IOS functionality (Standard Software Image)
    - 2 fixed 1000BaseSX uplinks (2950SX-24)
    - Clustering capable

- **Wiring Closet Aggregation**
  - Catalyst 3550 Stackables / Enhanced Software Image
    - Stackable 10/100 switching
    - GBIC-based Gigabit connectivity
    - Intelligent services (Enhanced Software Image)
    - Clustering capable

- **Small Network Backbone**
  - Catalyst 2950T-24/2950C-24 / Enhanced Software Image
    - Wire-speed standalone 10/100 switching
    - 10/100/1000BASE-T and 100BaseFX uplinks
    - Intelligent services (Enhanced Software Image)
    - Clustering capable

- **Catalyst 3550 Series**
  - Catalyst 3550-12T
  - Catalyst 3550-12G
  - Stackable 10/100, inline power and GE configurations
  - High performance switching and routing
  - Enterprise-class intelligent L3/L4 services
  - Clustering capable

- **Scalability**
  - Price/Performance
  - Catalyst 3550 Series
  - Catalyst 3550 Stackables
  - Catalyst 2950 Series
  - Catalyst 2950 Stackables / Enhanced Software Image
Cisco Delivers the Most Complete Line of LAN Products in the Industry

Price-Performance

Cisco Catalyst 6500
- Modular 10/100/1000
- Highest density switching capacity
- Layer 2/3/4-7
- 32-720 Gbps switching engine
- Highest availability

Cisco Catalyst 4500
- Modular 10/100/1000
- Highest density switching capacity
- Layer 2/3/4-7
- 24-64 Gbps switching engine
- Chassis-level high availability

Cisco Catalyst 3750
- Stackable 10/100/000 and 10/100 configurations
- Cisco StackWise Technology
- Optimized for Gigabit Ethernet deployment
- Enterprise-class intelligent Layer 3, Layer 4 services
- Highly resilient 32Gbps switching stack interconnect
- Single management interface with autoconfiguration

Cisco Catalyst 3550
- Stackable 10/100 and Gigabit Ethernet configurations
- High performance switching and routing
- Enterprise-class intelligent Layer 3, Layer 4 services
- Clustering capable

Cisco Catalyst 2950
- Stackable 10/100 switching
- GBIC-based Gigabit connectivity
- Advanced intelligent Layer 3, Layer 4 services
- Clustering capable

Function and Flexibility
Catalyst 3550 Series Switches

Positioning

• Enterprise-class, stackable, multilayer switch family with Fast Ethernet and Gigabit Ethernet configurations

• Enables the deployment of network-wide intelligent services
  – High Availability
  – Enhanced Security
  – Advanced Quality of Service

• Powerful access layer or small network backbone switch deployed in enterprise wiring closets and branch offices

• Embedded Cluster Management Suite software allows easy configuration of network-wide intelligent services

• Familiar IOS Software
  – Software based on Native IOS release for the Cat 6x00 Series
  – Supports same port, VLAN and SVI configuration options in CLI
Catalyst 3550 Series

Product Overview

• **Enterprise-class services**
  – High Availability: IP Routing, HSRP, STP enhancements, 802.1s/w, IGMP snooping
  – Enhanced Security: 802.1x, SSH, SNMPv3, ACL, Port Security, MAC address notification, RADIUS/TACAC+
  – Advanced QoS: L2-L4 QoS with CoS/DSCP, WRR, WRED, Strict Priority Queuing

• **High performance**
  – GE configurations provide dynamic IP routing at 17 Mpps forwarding rate
  – FE configurations provide wire-speed switching and routing
    - 10.1 Mpps forwarding rate on Catalyst 3550-48
    - 6.6 Mpps forwarding rate on Catalyst 3550-24
  – CEF based forwarding

• **Ease of management**
  – Extends Web-based Cluster Management Suite to Layer 3/4 services

• **Ease of deployment**
  – Boots as a traditional Layer 2 Catalyst switch, configurable for Layer 3 routing and services
  – 1 or 1.5 rack unit (RU) stackable form factor

• **Full Cisco GBIC support**
  – All existing GBICs (GigaStack™ GBIC, 1000BASE-T, 1000Base-SX, LX, ZX)
# Catalyst 3550 Series

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catalyst 3550-24</td>
<td>24 10/100 Ports, 2 GBIC ports, Inline Power version, DC version</td>
</tr>
<tr>
<td>Catalyst 3550-24-FX</td>
<td>24 100FX ports, 2 GBIC ports</td>
</tr>
<tr>
<td>Catalyst 3550-48</td>
<td>48 10/100 Ports, 2 GBIC ports</td>
</tr>
<tr>
<td>Catalyst 3550-12T</td>
<td>10 10/100/1000 Ports, 2 GBIC ports</td>
</tr>
<tr>
<td>Catalyst 3550-12G</td>
<td>10 GBIC Ports, 2 10/100/1000 Ports</td>
</tr>
</tbody>
</table>

## Enhanced Multilayer Software Image (EMI)
- SMI feature set plus more functionality including
  - Advanced IP unicast and multicast routing, WCCP

## Standard Multilayer Software Image (SMI)
- Enterprise-class intelligent services and Basic IP unicast routing
  - Advanced QoS, Rate-Limiting, ACLs, **Static and RIP routing**
- Available on the Catalyst 3550-24 and 3550-48

## Ordering Information
- Catalyst 3550-24/48 are orderable with either software image preinstalled
- Catalyst 3550-24/48 can be upgraded from SMI to EMI
- Catalyst 3550-12T/12G are only orderable with the EMI image
Cisco Catalyst 3550-24 PWR
Intelligent Ethernet Switch

Excellent Performance
• Twenty-four 10/100 ports with two built-in GBIC ports
• Wire-speed switching and routing
• Delivers inline power up to 15.4W per 10/100 port

Power Redundancy
• Compatible with NEW Cisco Redundant Power System 675 (RPS 675) and an uninterruptible power system (UPS) to provide maximum availability

Intelligent Services
• High performance IP routing, advanced QoS, and enhanced security features support integrated voice, video and data applications

Lower Total Cost of Ownership
• Deliver inline power to Cisco IP phones and Cisco Aironet wireless LAN access points directly from the switch:
  – Centralizes power provisioning
  – Eliminates the need for wall power to each device, easing deployment
  – Eliminates the need for additional, separate wiring to power devices
Catalyst 3550 and 2950 Series

Key Positioning Differences

<table>
<thead>
<tr>
<th>Feature</th>
<th>Catalyst 3550 Series</th>
<th>Catalyst 2950 Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deployment</td>
<td>Aggregation: Medium-sized network / enterprise branch office distribution or small network core/backbone switch with fixed and GBIC-based gigabit / fiber connectivity. Stackable: Medium – sized network / enterprise branch office, serves as enterprise-class multilayer access switch and provides increased availability and control over Catalyst 2950 Series. Inline power capability ideal for IP phone and wireless LAN deployments. Able to provided routed uplinks to the core to maximize network availability. Supports GBIC-based gigabit/fiber connectivity.</td>
<td>Stackable: Medium-sized network / enterprise branch office multilayer access switch with flexible GBIC-based connectivity. Standalone: Small to medium-sized business or enterprise branch office access switches with options for fixed 100BASE-FX and 10/100/1000BASE-T connectivity. Basic Standalone: Small to medium-sized network access switch providing basic connectivity. Available with two fixed 1000BASE-SX uplinks.</td>
</tr>
</tbody>
</table>
# Catalyst 3550 and 2950 Series

## Key Feature Differences

<table>
<thead>
<tr>
<th>Feature</th>
<th>3550 Series</th>
<th>2950 Series (Enhanced Image)</th>
<th>2950 Series (Standard Image)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Availability:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RIP/Static Routing</td>
<td>Yes (EMI/SMI)</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Upgrade to Advanced IP unicast and multicast routing (OSPF, IGRP, EIGRP, BGPv4)</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Flexible TCAM resource allocation across filters</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Routed ACLs, HSRP</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>WCCP</td>
<td>Yes (EMI)</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>ISL-based VLANs</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>Multicast Management:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>802.1s Multiple Spanning Tree Protocol</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>802.1w Rapid Spanning Tree Protocol</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>IGMP Snooping / PIM</td>
<td>Yes</td>
<td>IGMP Snooping</td>
<td>IGMP Snooping</td>
</tr>
<tr>
<td>Gigabit EtherChannel</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes (2950SX-24 only)</td>
</tr>
<tr>
<td>CrossStack UplinkFast</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td><strong>Security:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACLs</td>
<td>Port-based, VACL, RACL</td>
<td>Port-based</td>
<td>No</td>
</tr>
<tr>
<td>DHCP Interface Tracker</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Secure Shell / SNMPv3 (crypto images)</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
## Catalyst 3550 and 2950 Series

**Key Feature Differences**

<table>
<thead>
<tr>
<th>Feature</th>
<th>3550 Series SMI &amp; EMI</th>
<th>2950 Series (Enhanced Image)</th>
<th>2950 Series (Standard Image)</th>
</tr>
</thead>
<tbody>
<tr>
<td>QoS Details</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class of Service (L2 Classification)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>WRED (on GE ports)</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Full DSCP Support</td>
<td>Yes, All 64 Values</td>
<td>No, Only 13 Values</td>
<td>No</td>
</tr>
<tr>
<td>Support for IP Precedence</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Rate Limiting</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Policing Range</td>
<td>8 Kb-100 Mbps for 10/100b</td>
<td>1 Mbps-100 Mbps for 10/100 ports</td>
<td>None</td>
</tr>
<tr>
<td>Number of policers:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Ingress policers/port</td>
<td>8 on 10/100, 128 on GE</td>
<td>6 on 10/100, 60 on GE</td>
<td>None</td>
</tr>
<tr>
<td>- Egress policers/port</td>
<td>8 on 10/100, 8 on GE</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>DSCP to DSCP maps between autonomous systems</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Active VLANs</td>
<td>1000 (128 spanning-tree instances)</td>
<td>250 (64 spanning-tree instances)</td>
<td>64 (64 spanning-tree instance)</td>
</tr>
<tr>
<td>Number of MAC addresses</td>
<td>8,000-12,000</td>
<td>8,000</td>
<td>8000</td>
</tr>
<tr>
<td>Number of multicast groups</td>
<td>2,000-8,000</td>
<td>255</td>
<td>255</td>
</tr>
</tbody>
</table>
Catalyst 3550 Series

- Product Overview
- Intelligence in the Network
- Features and Benefits
- Deployment Examples
- Service and Support
Concerns in the Network

- Reliability
- Interoperability
- Technical Support
- Speed/Bandwidth
- Security
- Scalability
- Device Management
- Quality of Service
Key to a Successful Implementation

- Reliability
- Speed/Bandwidth
- Scalability
- Interoperability
- Device Management
- Technical Support
- Availability
- Security
- Quality of Service

CISCO IOS Software
End-to-End Solutions
Network Management
Service and Support
Intelligent Network Attributes & Services

Delivering Layer 3 and 4 Services
From the Edge to the Core to the WAN
Catalyst 3550 Series

- Product Overview
- Intelligence in the Network
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Catalyst 3550 Feature Overview

### Availability
- IP Unicast Routing
  - Static, RIPv1/v2, OSPF, IGRP, EIGRP, BGPv4
- IP Multicast Routing
  - PIM, DVMRP tunneling
- PBR*
- PVRST+*
- HSRP
- WCCP
- DTP and PAgP
- 802.3ad
- Dynamic VLANs
- IGMP Snooping
- STP enhancements
- L2 load balancing (PVST)
- L3 load balancing (ECR)
- 802.1s/w
- RPS 675
- RPS 300

* New Cisco IOS® Software Release 12.1(13)EA1

### Security
- ACLs
- 802.1x
- 802.1x w/ VLAN assignment
- 802.1x w/ ACL assignment
- SNMPv3
- SSH
- Kerberos
- Port Security
- Private VLAN Edge
- DHCP Interface Tracker
- MAC Address Notification
- CMS Security Wizard

### Quality of Service
- Quality of Service
  - Auto-QoS for VoIP
  - 802.1p CoS and DSCP
  - Egress queue servicing: WRR and Strict Priority Queuing
  - Congestion Avoidance: WRED for GE ports
  - Granular Rate Limiting

### Manageability
- Cisco CMS Software
- CiscoWorks
- Voice VLANs
- Dynamic VLANs
- QoS Policy Manager (QPM)
- SPAN, RSPAN
Catalyst 3550 Series

- Product Overview
- Intelligence in the Network
- Features and Benefits Examples
  - High Availability
  - Enhanced Security
  - Advanced Quality of Service
  - Manageability
- Deployment Examples
- Service and Support
IP Routing
The Case for Routed Uplinks to the Core:
Traditional 80/20 Rule - Flat Layer 2 Networks

Layer 2 only closets work
- Low number of VLANs
- Mostly local traffic
- Few Spanning-Tree Protocol instances
- Little need for redundancy

Layer 3 Core
20% of Traffic through Core

Layer 2 Domain with 80% local traffic
80% of Traffic within wiring closet/VLAN
Most traffic is local to a wiring closet,
or VLANs are easily trunked to
maintain locality

Administration
- Local applications
- Users with similar needs grouped
geographically or logically

Layer 2 Domain with 80% local traffic
Most traffic is local to a wiring closet,
or VLANs are easily trunked to
maintain locality
The Case for Routed Uplinks to the Core:
New 80/20 Rule - Need for Top of Stack Multilayer Switching

Changes
- Web based applications
- Centralized servers/applications
- Greater reliance on the network

Advantages
- Redundant routed uplinks
- Deterministic paths/failovers
- Faster convergence
- Broadcast domain segmentation
- Routing network scalability

Layer 3 Core
80% of traffic through core

Wiring closet with Layer 3 top of stack design

Wiring closet with Layer 3 top of stack design

20% of traffic within wiring closet/VLAN
### IP Routing Configuration

- Boots as a traditional Layer 2 Catalyst switch
- Delivers same bridging services as the Catalyst 3500 XL
- Configurable via Cluster Management Suite, CiscoWorks, or CLI
- Supported Protocols: RIPv1/v2, OSPF, IGRP, EIGRP, PIM

#### TCAM Allocation for Catalyst 3550-12T and 3550-12G

<table>
<thead>
<tr>
<th>Resource</th>
<th>Default Template</th>
<th>Access Template</th>
<th>Routing Template</th>
<th>VLAN template</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unicast MAC addresses</td>
<td>6K</td>
<td>2K</td>
<td>6K</td>
<td>12K</td>
</tr>
<tr>
<td>IGMP Groups</td>
<td>6K</td>
<td>8K</td>
<td>6K</td>
<td>6K</td>
</tr>
<tr>
<td>VLANs</td>
<td>1K</td>
<td>1K</td>
<td>1K</td>
<td>1K</td>
</tr>
<tr>
<td>QoS ACLs</td>
<td>4K</td>
<td>4K</td>
<td>2K</td>
<td>4K</td>
</tr>
<tr>
<td>Security ACLs</td>
<td>4K</td>
<td>8K</td>
<td>2K</td>
<td>4K</td>
</tr>
<tr>
<td><strong>Unicast Routes</strong></td>
<td><strong>12K</strong></td>
<td><strong>4K</strong></td>
<td><strong>24K</strong></td>
<td><strong>0</strong></td>
</tr>
<tr>
<td><strong>Multicast Routes</strong></td>
<td><strong>6K</strong></td>
<td><strong>8K</strong></td>
<td><strong>6K</strong></td>
<td><strong>0</strong></td>
</tr>
<tr>
<td>Routed Ports and SVIs</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
</tr>
</tbody>
</table>

#### TCAM Allocation for Catalyst 3550-24 and 3550-48

<table>
<thead>
<tr>
<th>Resource</th>
<th>Default Template</th>
<th>Access Template</th>
<th>Routing Template</th>
<th>VLAN template</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unicast MAC addresses</td>
<td>5K</td>
<td>1K</td>
<td>5K</td>
<td>8K</td>
</tr>
<tr>
<td>IGMP Groups</td>
<td>1K</td>
<td>2K</td>
<td>1K</td>
<td>1K</td>
</tr>
<tr>
<td>VLANs</td>
<td>1K</td>
<td>1K</td>
<td>1K</td>
<td>1K</td>
</tr>
<tr>
<td>QoS ACLs</td>
<td>1K</td>
<td>2K</td>
<td>512</td>
<td>1K</td>
</tr>
<tr>
<td>Security ACLs</td>
<td>1K</td>
<td>2K</td>
<td>512</td>
<td>1K</td>
</tr>
<tr>
<td><strong>Unicast Routes</strong></td>
<td><strong>8K</strong></td>
<td><strong>2K</strong></td>
<td><strong>16K</strong></td>
<td><strong>0</strong></td>
</tr>
<tr>
<td><strong>Multicast Routes</strong></td>
<td><strong>1K</strong></td>
<td><strong>2K</strong></td>
<td><strong>1K</strong></td>
<td><strong>0</strong></td>
</tr>
<tr>
<td>Routed Ports and SVIs</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>
Supported Interfaces

- **Switch Ports**: Layer 2-only interface with one switch interface per physical port
  - **Access ports**: Traffic received and transmitted must be in native format (i.e., VLAN-tagged traffic is dropped)
  - **Trunk ports**: Carries traffic from multiple VLANs
    - **ISL-Trunks**: Packet must be encapsulated with ISL header
    - **802.1Q-Trunks**: VLAN tagged packets are trunked and untagged packets are sent to user-defined default VLAN
- **Routed Ports**: A port that is configured to behave like a traditional IOS router
- **Switch Virtual Interface (SVI)**: Provides Layer 3 routing and Layer 2 bridged access to a switched VLAN
Support for Multiple Interfaces
Fall Back Bridging

Enables bridging of non-IPv4 traffic between VLAN/SVI

Bridge groups are configured to connect multiple VLANs into a single bridging domain

Example: Configure fallback bridging to bridge non-IPv4 traffic (IPX, AppleTalk, IPv6, etc.) to an appropriate VLAN

Application: Bridging IPX or IPv6 traffic to VLAN which contains a v6 or IPX router
Multicast Management
Multicast Benefits

Why implement Multicast?
- Bandwidth considerations
- Server loading
- Network loading
Multicast Benefits Bandwidth Usage

Increasing use of applications which require multiple user access
- Distance learning
- Company meetings
- Streaming financial info

Multicast more effectively manages bandwidth usage
Multicast Benefits Network Load

Unicast Example

Multicast Example
Multicast Benefits Network Load

Multicast Routing Benefits

Layer 2 Switches with CGMP/IGMP Snooping

Traffic replicated for each VLAN through wiring closet uplink per source

Multicast Routing

Traffic replicated only once through wiring closet uplink per source
Multicast Support

- CGMP/IGMP snooping is used for managing group membership information
- Multicast routing protocols (PIM) control delivery between source, groups/receiver and maintain the multicast routing domain
- Catalyst 3550 multicast support
  - IGMP snooping
  - CGMP server
  - PIM (Sparse, Dense, Sparse/Dense)
Multicast Support

- IGMP Snooping implemented in hardware
- IP Multicast Routing Protocol: PIM (Dense, Sparse or Sparse-Dense Modes)
- Interoperate with DVMRP via DVMRP tunneling (software processing)
IGMP Snooping

- Default behavior of Layer 2 switch is to flood multicast packets to ports in the ingress VLAN
- This behavior is not desirable — IGMP Snooping resolves this issue
- Implemented in hardware
  - "Snoop" or intercept IGMP Joins and Leaves received on interfaces from hosts
  - Enable or disable on a global or per VLAN basis
  - Ingress port parses packet and sends to CPU for processing, CPU suppresses redundant IGMP joins and sends one proxy report to router
  - Overrides forwarding or flooding in VLAN
Catalyst 3550 Series

- Product Overview
- Intelligence in the Network
- Features and Benefits Examples
  - High Availability
  - Enhanced Security
  - Advanced Quality of Service
  - Manageability
- Deployment Examples
- Service and Support
- Competitive Positioning and Advantages
- Ethernet Switching Market Overview
Access Control Lists

- Provides ability to access control all packets, either internally bridged within a VLAN or routed between VLANs
- Forwarding and routing performance not compromised by application of ACLs because all lookups are done in hardware
- Benefits of ACLs at the network edge
  - Extends security border to network’s outer-most perimeter
  - Minimizes congestion by filtering unwanted data immediately
Access Control Lists Types

- **Router ACL (RACL)**
  - Applied to SVI and routed ports
  - Standard and Extended IP ACLs
  - Can be applied to control plane or data plane traffic on all ports
  - Filter on MAC SA/DA, IP SA/DA, and TCP/UDP port

- **Port ACL (PACL)**
  - Applied to specific switch port
  - Filter on MAC SA/DA, IP SA/DA, and TCP/UDP port

- **VLAN ACL (VACL)**
  - Applied to all packets either bridged or routed within a VLAN, including all non-IP traffic
  - Filter on MAC SA/DA, IP SA/DA, and TCP/UDP port

- **ACL hierarchy**: VLAN ACL gets applied first on ingress and last on egress

- **Time-based ACLs**: security settings for specific periods of the day
Secure Connectivity

Secure Shell (SSH)
SSH encrypts administration traffic during Telnet sessions while configuring or troubleshooting switches

SNMPv3 (with crypto support)
Provides network security by encrypting administrator traffic during SNMP session to configure/troubleshoot switch

Kerberos
Authenticates users and network services using a trusted third party to perform secure verification
Perimeter Security

Wire-Speed ACLs
Including Port-based, VLAN-based and Router-based Access Control Lists to assist in accepting or denying access to sensitive portions of the network

Port Security
Provides another means to ensure the appropriate user is on the network by limiting access based on MAC addresses.

Note: Forwarding and routing performance is not compromised when implementing ACL-based security in the network.
Security Monitoring/Intrusion Detection

ACL Logging
Logging of Access Control Lists (ACLs) tracks ACL violations that occur in a network. The users MAC address can be obtained to assist in tracking the users location.

MAC Address Notification
Provides an alert to a management station so that network administrators know when and where users came on to the network and can take appropriate actions.
Identity Services

802.1x

Protects network access by allowing RADIUS server to authenticate user allowing/disallowing access to the network.

DHCP Interface Tracker (Option 82)

Tracks where a user is physically connected on a network by providing both switch and port ID to a DHCP Server.

Dynamic VLANs

Provides authentication capabilities and user segmentation by placing specific users in separate VLANs.
Security Management

Cisco Cluster Management Suite (CMS) Security Wizards

Eases the deployment of security features for restricting user access to a server, a portion of the network or access to the network.

Note: Cisco CMS Software with the Security Wizards are embedded in the switch.
Catalyst 3550 Key Security Features

- 802.1x and Identity-Based Network Services (VLAN and ACL assignments)
- SSH, SNMPv3, Kerberos
- Wire-Rate ACLs
- Port Security
- DHCP Interface Tracker
- MAC Address Notification
- Private VLAN edge
- RADIUS and TACACS+
- Dynamic VLAN

Security features can be downloaded FREE with the latest software release

View the DSBU Security Presentation at:

http://wwwin.cisco.com/comlob/eag/dsbur/product3550/3550ps_literature.html#presos
Catalyst 3550 Series

• Product Overview
• Intelligence in the Network
• Features and Benefits Examples
  – High Availability
  – Enhanced Security
  – Advanced Quality of Service
  – Manageability
• Deployment Examples
• Service and Support
• Competitive Positioning and Advantages
• Ethernet Switching Market Overview
Advanced QoS
Evolving Campus Network

Existing Network

PCs
Mission Critical

Mission-Critical Servers
E-Mail Servers

New Additions

Voice
Video Surveillance

Protect Mission-Critical Traffic!
# Not All Traffic Is Created Equal

<table>
<thead>
<tr>
<th></th>
<th>Voice</th>
<th>Video</th>
<th>Data (Best-Effort)</th>
<th>Mission-Critical Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bandwidth</td>
<td>Low to Moderate</td>
<td>Moderate to High</td>
<td>Moderate to High</td>
<td>Low to Moderate</td>
</tr>
<tr>
<td>Random Drop</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Sensitivity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delay Sensitivity</td>
<td>High</td>
<td>High</td>
<td>Low</td>
<td>Moderate to High</td>
</tr>
<tr>
<td>Jitter Sensitivity</td>
<td>High</td>
<td>High</td>
<td>Low</td>
<td>Low to Moderate</td>
</tr>
</tbody>
</table>
Why not just increase the link speed? throw more bandwidth at the problem?
Trade Offs of QoS vs. More Bandwidth

• More Bandwidth
  – Simplicity
  – TCP will eventually retransmit any dropped packets
  – Traffic is not delay or drop sensitive

• QoS
  – Differentiated traffic (video, voice, critical data)
  – Output buffers tend to operate at 100% in the campus at congestion points
  – Buffer management is required to control delay or drops
Where Congestion Exists? QoS is Required

- Links and buffers
- Points of substantial speed mismatch and points of aggregation
- Transmit buffers tend to fill (TCP windowing)
- Buffering reduces loss, introduces delay
QoS Trust Boundary in the LAN

Benefits of advanced QoS at the edge
⇒ ability to classify and mark traffic immediately
⇒ minimize upstream congestion
⇒ easier to set up a policy per user (MAC address and physical location known)
⇒ frees up router processing power
Catalyst 3550: Aggregate QoS Model

QoS Actions at Ingress

Classification/Reclassification
- Trusted or untrusted ports
- Identify packet groups and label using DSCP or CoS

Policing
- Ensure conformance to a specified rate
- Support for rate and burst

Marking
- Act on Policer decision
- Reclass or drop out-of-profile

QoS Actions at Egress

Queue/Schedule
- Four queues/port
- WRR Scheduling
- Strict Priority Scheduling
- WRED for congestion control (2 thresholds Per queue)

Congestion Control
- Egress Policing (up to 8 Aggregate policers)

QoS Actions

Classification/Reclassification

802.1p and DSCP Classification/Reclassification based on:
- Source/Destination MAC Address
- Source Destination IP Address
- TCP/UDP port number

128 ingress policers/port and 8 aggregate egress policers/port (GE ports)
8 ingress policers/port and 8 aggregate egress policers/port (10/100 ports)

Rate limiting down to 8 Kbps and in 8 Kbps increments
No support for traffic shaping
QoS Functions

Assign values to each of 4 queues

Classification

Application CoS and DSCP to packet, based on ingress port, Layer 3/4 info or MAC DA/SA

Classify packet: ingress port, Layer 3/4 info, MAC DA/SA

Associate CoS and DSCP to packet, based on ingress port, Layer 3/4 info or MAC DA/SA

Mark down or drop if out of profile

Check the profile of packet

Pass through if in profile

Apply CoS and DSCP to packet

Strict Priority

Priority Queue is always serviced first

Medium

High

WRR

Scheduling

Associate

values to each of 4 queues

Low

Low Medium

Out

In

Out

In

Drop

Egress

Ingress

Policer #1

Policer #8

Cisco.com
QoS Configuration and Management

- Manageable via Cisco QoS Policy Manager (QPM) application
- Cisco IOS CLI and embedded CMS will also allow configuration of all parameters
- Preconfigured template for video configuration
  - CoS to DSCP mapping
  - Policers
  - Strict priority queue for video
- Auto-QoS to simplify the configuration of QoS in VoIP networks
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Cluster Management Suite
Cisco Provides the Broadest Range of Network Management Products

- **CMS**
  - 16 switches
  - LAN only
- **CiscoWorks 2000**
  - LAN Management Solution (LMS)
  - Routed WAN Management (RWAN)
  - 1000s of devices
  - service management
  - WANs and LANs
- **WAN Manager**
  - 10s of 1000s of devices
  - service provisioning
  - global WANs
  - IGX/BPX and MGX switches only
- **CiscoWorks for Windows**
  - Small LANs, workgroups
- **CiscoWorks SNMS**
  - 20 devices
  - network resource mgt.

**Price/Performance**

**Function/Flexibility**

- **Small/Med Business**
  - CMS
  - 16 switches
  - LAN only
- **Enterprise**
  - CiscoWorks 2000
- **Service Provider**
  - WAN Manager
Cisco Cluster Management Suite Software

- Manage up to 16 geographically dispersed switches simultaneously with one IP address
- Accessed through any standard Web browser
- Provides Web-based interface for configuring and managing Cisco IOS® functions
- Use as an alternative to command line interface (CLI)
- Enables configuration of Layer 3/4 intelligent services
- Full backward compatibility provides support for Catalyst 1900/2820, 2900 XL, 3500 XL, 2950, and 3550
Typical CMS Environments

Medium Business/Branch Office

Wiring Closet

- Catalyst 3550
- Floor 12
- Catalyst 2950
- Floor 4
- 152.67.124.4
- Catalyst 3550-12G
AVVID Wizards for Simple Configuration of Technology Solutions

- AVVID = Architecture for Video, Voice, and Integrated Data
- In just a few steps, these wizards configure the switch for voice, video, and/or high-priority data applications.
- Wizards are compatible to each other
- Final summary page shows the configuration that will be implemented before you apply it
- Roll-back option to restore the old configuration if dissatisfied with the wizard
Example: Video Wizard – Optimally configures entire cluster for video traffic

Step 1

Step 2

Step 3

Done!
Guide Mode to Simplify Complex Configurations

**Guide Mode**
- Provides step-by-step prompts with instructions
- Used for many of the complex configuration options

**Expert Mode**
- Compact windows that provide configuration options without prompts

![Image of Expert Mode](image1)

![Image of Guide Mode](image2)
Multi-Device, Multi-Port Management

- Save time by selecting multiple ports across devices for simultaneous configuration
- Dynamic, detailed representation of up to 16 switches in cluster
- Simplifies troubleshooting and debugging
Configuration Cloning

- Using the Configuration Save and Restore feature, a customer or VAR can apply a configuration file to multiple switches
- Enables very fast deployment of networks
- Provides the ability to backup config files
One-Click Software Upgrade

- Use inventory report to quickly see software versions running on the switches
- Simultaneously update software of up to 16 devices
- Simply click on the desired switches and update
Advanced Quality of Service

- Use QoS feature to give preferential treatment to certain types of traffic
- CMS supports Layer 3 QoS and both Strict Priority and Weighted Round-Robin scheduling algorithms
- Use Guide Mode if not familiar with configuring QoS
Access Control Lists

- CMS allows users to differentiate traffic into various categories and permit or deny certain categories of traffic.
- Allows re-ordering of Access Control Entries (ACEs).
- Security Wizard utilizes ACLs to restrict users to the networks.
IP Unicast & Multicast Routing

- Configure IGMP Snooping options
- Allows easy configuration of Layer 3 IP routing protocols*
- IP Multicast Wizard guides users through steps for setting multicast routing features*

*Only supported on Catalyst 3550
Sophisticated Embedded Help System

- Context-sensitive help button on every window!
- Help is embedded in the switch
- Easy navigation using:
  - Table of Contents
  - Index
  - Glossary
  - Search function
Topology View

- Provides comprehensive layout of all clustered devices:
  - Switches
  - IP phones
  - Wireless access points
  - Long-Reach Ethernet CPE
- Launch the Cisco Aironet Wireless Access Point management interface
- Quickly check status of all clustered switches at once from one location
- Automatically discovers the network
  - CMS can see any Cisco Discovery Protocol (CDP)-enabled device
Event Notification

- Enables an email to be automatically sent to a network administrator or VAR when a network problem occurs
- Can choose what severity level triggers an email notification
Fault and Event Monitoring & Reporting

- Systems Messages Monitor provides a filterable list of alarms and events
Performance Monitoring & Reporting

- Link Graphs and Link Reports provide network traffic updates in real-time

- All graphs can be printed for management reports
Cisco CMS Software Advantages

- No installation required – embedded in switch
- Manage cluster remotely from anywhere on your network
- Intuitive, easy to use
- Fast, easy tool to take advantage of Cisco Catalyst Intelligent Network Services
- It’s FREE!
Catalyst 3550 Series

• Product Overview
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• Deployment Examples
• Service and Support
Integrated Enterprise Wiring Closet: Catalyst 3550/6500 Series

- Catalyst 3550-EMI with GigaStack
- Catalyst 3550-SMI with GigaStack
- Catalyst 4000 Wiring Closet
- IP Phones
- Printer
- Workstations
- Cache Engine (Optional)
- Catalyst 6500 Campus Backbone
- Cisco 7xxx WAN Aggregation
- Servers Call Processing
- Layer 2 uplinks to the backbone – load sharing through PVST+
- Option for routed uplinks to the backbone for faster failover – load sharing through Equal Cost Routing
- Layer 3 QoS and security via DSCP support and ACLs in the access layer
- Stack resiliency through GigaStack loopback cable

Layer 2 or Layer 3 Wiring Closet Uplinks
Enterprise Wiring Closet Aggregation & Access: Catalyst 3550 Series

- Routed uplinks to the backbone for faster failover
- Equal Cost Routing for load sharing on wiring closet uplinks
- HSRP for increased redundancy
- Layer 3 QoS and ACLs at the access layer

Catalyst 6500

Catalyst 3550-12T/12G

Catalyst 3550 with GigaStack

Wiring Closet #1

Catalyst 3550-12T/12G

Catalyst 3524-PWR XL

Catalyst 3550

Wiring Closet #2

CallManager
Branch Office/Medium Network: Catalyst 3550 Series

- Catalyst 3550-12T/12G
  - Centralized Server Farm
  - VLAN 5
  - VLAN 10
  - Catalyst 3550s with GigaStack
  - Catalyst 3524-PWR XL
  - VLAN 15
  - CallManager

- Cisco 1700/2600/3600
  - Network Core
  - Inter-VLAN routing in the Distribution Layer
  - Layer 3 QoS and security via DSCP support and ACLs in the access layer
  - Cisco 2600/3600 for WAN access to branch offices (via VPN)
Server Aggregation: Catalyst 3550-12T/12G

Catalyst 3550-12T/12G
1000BASE-T or 1000BaseSX Server Links

Centralized Servers

Campus Core

Equal Cost Routes to Campus

10/100 Links

Cisco 2600/3600

ISP #1

ISP #2

Multi Homed ISPs to Remote Sites

- Central physical security and administration
- Access control lists for server access
- Scalable design
- Dynamic IP routing at 17 Mpps forwarding rate
- QoS/policing to prioritize mission-critical applications
- Redundant uplinks to the core
Cisco’s Midsize 1000BASE-T Solution

Why 1000BASE-T?

- Protects investment in installed horizontal cabling (Category 5)
- Leverages investment in installed gear
- Extends intelligent services at 17 Mpps forwarding rate over copper

Where in the network?

- Aggregation of wiring closets
- Uplinks to distribution layer
- Data centers

Catalyst 3550-12T/12G
Catalyst 2950T-24
Catalyst 3550 Series

- Product Overview
- Intelligence in the Network
- Features and Benefits
- Deployment Examples
- Service and Support
Services & Warranty for Catalyst 3550

- Software Upgrades for Life
  - FREE Maintenance and Version Releases for Cisco IOS® originally provided with the product
- Limited Lifetime Hardware Warranty
  - Advance Replacement shipping within 10 business days
  - Guest Access to Cisco Connection Online (CCO)
- Total Implementation Solutions (TIS)
  - Project management and Training
  - Installation, test, and cutover
  - Major Moves, Adds, Changes (MAC)
  - Design review and product staging

New!

Configuration and verification services ease deployment of network-wide intelligent services: QoS and multicast management

- SMARTnet and SMARTnet Onsite offer 24x7x365 access to technical support via the web, email, and phone
  - Advance replacement of hardware parts in as little as 2 hours
  - On site field engineer (SMARTnet Onsite) to assist in hardware replacements
## Operational Technical Support Services

<table>
<thead>
<tr>
<th>Onsite Services</th>
<th>SMARTnet Onsite</th>
<th>SMARTnet</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 hrs/day, 7 days/wk, 2 hr response</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 hrs/day, 7 days/wk, 4 hr response</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 hrs/day, 5 days/wk, 4 hr response</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 hrs/day, 5 days/wk, next bus. day</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Advance Replacement of Hardware</th>
<th>SMARTnet Onsite</th>
<th>SMARTnet</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 hrs/day, 7 days/wk, 2 hr response</td>
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</table>

<table>
<thead>
<tr>
<th>Diagnostics</th>
<th>SMARTnet Onsite</th>
<th>SMARTnet</th>
</tr>
</thead>
<tbody>
<tr>
<td>24x7 TAC Access</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Registered CCO Access</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Technology Refresh</th>
<th>SMARTnet Onsite</th>
<th>SMARTnet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software Updates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Software Maintenance</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Service Levels

- **24X7X4**: 24 hours a day, 7 days a week, 4 hours response
- **24X7X2**: 24 hours a day, 7 days a week, 2 hours response
- **8X5X4**: 8 hours a day, 5 days a week, 4 hours response
- **8X5X2**: 8 hours a day, 5 days a week, 2 hours response
- **NBD**: Next Business Day - 10 business day replacement

### Technology Refresh

- **Warranty**
- **SAS**
- **SASU**
- **NBD**
- **9X5X4**
- **24X7X4**
- **24X7X2**
- **8X5X4**
- **24X7X4**
- **24X7X2**
Cisco is Your Partner for Delivering Intelligent Networks

- Over 1600 support engineers, 40% CCIEs
- Average 15 years experience
- 80% issues resolved online
- Highest level of customer satisfaction *
- Multiple awards for service
- 30,000 Technical Assistance Center cases/months
- 5000+ partners worldwide deliver direct and subcontracted services for Cisco technology
- 1200+ partner-employed CCIEs

* Information Week Study in 4th Qtr 2000
Backup
GigaStack Stacking GBIC

- Cascade at 1-Gbps Forwarding Rate
- Point to Point at 2-Gbps Forwarding Rate

- Flexible Gigabit Ethernet GBIC-based implementation
- Plugs into a standard Catalyst 3550, 2950, 3500 XL, 2900 XL GBIC slot
- Copper-based cabling technology
Redundant Power System 675 (RPS 675) and RPS 300

- Power supply redundancy
- RPS 300 supports up to six Cisco networking devices including Catalyst 3524-PWR XL, 3550 (except for the 3550-24PWR), 2950, 2924 LRE XL, 2912 LRE XL, 2980G-A and 4224 Access Gateway Switches
- RPS 675 supports the Catalyst 3550-24 PWR and is backward compatible to all other RPS 300 supported models (except Catalyst 3524-PWR-XL)
- Immediate failover capability
  - RPS 300 and RPS 675 sense failure and delivers uninterrupted power to device
  - Connected device will not reboot in the event of an internal power supply failure
  - Upon failure, RPS 300 and RPS 675 alerts network admin that the other connected devices will not be supported until failed device is restored or replaced
## Feature Description

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Availability</strong></td>
<td></td>
</tr>
<tr>
<td>802.3ad (LACP)</td>
<td>Allows EtherChannels to be configured using LACP as defined by IEEE standards</td>
</tr>
<tr>
<td><strong>Security</strong></td>
<td></td>
</tr>
<tr>
<td>802.1x with port security</td>
<td>Supports co-existence of 802.1x and port security on a per-port basis</td>
</tr>
<tr>
<td>802.1x with VLAN assignment</td>
<td>Allows a dynamic VLAN assignment for a specific user based on 802.1x auth.</td>
</tr>
<tr>
<td>802.1x with Voice VLAN</td>
<td>Allows configuration of auxiliary VLAN for voice support on a 802.1x port</td>
</tr>
<tr>
<td>SPAN for IDS support</td>
<td>Allows configuration of SPAN destination port to receive ingress traffic as well as forward it</td>
</tr>
<tr>
<td>Kerberos</td>
<td>Authentiﬁes users and network services using a trusted third party to perform secure verification</td>
</tr>
<tr>
<td>802.1x with ACL assignment</td>
<td>Enables configuration of extended ACLs to provide network security based on 802.1x authenticated users</td>
</tr>
<tr>
<td><strong>Manageability</strong></td>
<td></td>
</tr>
<tr>
<td>Layer 2 Traceroute</td>
<td>Provides network operator with Layer 2 path of unicast traffic going from source to destination</td>
</tr>
<tr>
<td>Show interface capabilities</td>
<td>Provides information on configuration capabilities of an interface</td>
</tr>
<tr>
<td><strong>QoS</strong></td>
<td></td>
</tr>
<tr>
<td>Auto QoS</td>
<td>Simpliﬁes the configuration of QoS in VoIP networks</td>
</tr>
</tbody>
</table>
Intelligent Services Throughout the Network

Delivering Layer 2 - 4 Services
From the Edge through the Core to the WAN