

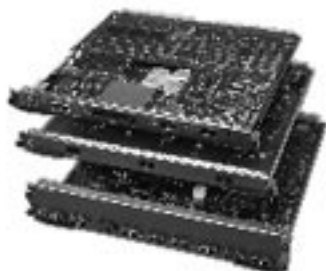
Catalyst 5000 Family Gigabit Ethernet/EtherChannel Solutions

THE CISCO CATALYST® 5000 FAMILY OFFERS A COMPLETE SET OF TRULY MULTIPROTOCOL, MULTILAYER SWITCHING SOLUTIONS FROM THE CAMPUS BACKBONE TO THE DESKTOP. THE CATALYST 5000, 5002, 5505, 5509, AND 5500 CHASSIS ALLOW NETWORK MANAGERS TO DEPLOY COST-EFFECTIVE MULTILAYER SWITCHING AND SERVICES FROM THE WIRING CLOSET TO THE DATA CENTER. ALL CATALYST 5000 FAMILY CHASSIS SHARE THE SAME SET OF INTERFACE MODULES AND SOFTWARE FEATURES, PROVIDING SCALABILITY TO GIGABIT ETHERNET SWITCHING WHILE MAINTAINING INTEROPERABILITY AND INVESTMENT PROTECTION ACROSS ALL CHASSIS.

Flexible, Modular Gigabit Ethernet Switching and Uplink Solutions

The Catalyst 5000 Family offers a variety of choices of Gigabit Ethernet products, from high-density Gigabit Ethernet switching modules for powerful Gigabit switching in high-performance backbones to uplink modules that aggregate traffic from high-density 10-/100-Mbps wiring closets. The complete range of Gigabit Ethernet switching and uplink modules from Cisco extend the Catalyst 5000 Family to more than 50 Gbps and throughput of tens of millions of packets per second (pps). By making use of multiple modules in the Catalyst 5500 Family, port densities of up to 38 ports of Gigabit Ethernet per Catalyst 5509 chassis are possible. In addition, Gigabit Ethernet port aggregation is supported via Gigabit EtherChannel®, providing up to 8 Gbps of throughput on a single logical link between devices.

Figure 1 A Flexible Choice of Gigabit Switching Solutions (top to bottom: Supervisor Engine III with two-port Gigabit Ethernet uplinks, three-port Gigabit Ethernet switching module, nine-port Gigabit EtherChannel module)



Supervisor Engine III A, Supervisor Engine III G, Supervisor Engine II G, Gigabit Ethernet: Two High-Speed Wiring Closet Uplink Ports

Supervisor Engine III A, Supervisor Engine II G, and Supervisor Engine III G can all be deployed in the Catalyst 5000, 5502, 5505, 5509, or 5500 chassis. Supervisor Engine III G provides dual GBIC based Gigabit Ethernet uplinks, allowing customers the flexibility of multiple distance configurations.

In addition to Fast Ethernet and Fast EtherChannel uplink modules, Supervisor Engine III A and Supervisor Engine II G offer two-port Gigabit Ethernet uplink modules to provide the performance, scalability, flexibility, and redundancy required for building large, switched intranets. The latest two-port GBIC uplink module delivers QoS capabilities to the uplinks, allowing customers to build end-to-end QoS networks. These uplink modules can be used or upgraded interchangeably as network needs grow to accommodate Gigabit speeds. This flexible solution helps maintain your current network infrastructure design.

Gigabit EtherChannel Switching Module: Nine Ports of High-Density Local Switching

The nine-port Gigabit EtherChannel switching module offers up to nine ports of switched Gigabit Ethernet per module. With integrated nonblocking wire-speed local switching, up to 24 Gbps of bandwidth of switching capacity are provided on each module. Data between two ports on the module is switched onboard at wire rates, without crossing the chassis central crossbar fabric. Even if

traffic is locally switched, all management information, such as Remote Monitoring (RMON), is available via the central Supervisor Engine module and management software. In addition, the module is designed for maximum compatibility with existing network management; configuring Gigabit Ethernet on the local switching module is as simple as configuring any Ethernet or Fast Ethernet port in the Catalyst 5000 Family. Four full-duplex links can be combined in a Gigabit EtherChannel configuration, offering 8 Gbps of throughput between devices.

Gigabit Ethernet Switching Module: Three Ports of Cost-Effective Gigabit Aggregation

The three-port Gigabit Ethernet switching module provides cost-effective aggregation of gigabit uplinks, or gigabit server connections in the Catalyst 5505, 5509, and 5500 platforms. For example, an enterprise might want to add a server or Web cache engine locally to improve performance of a workgroup application. The three-port module allows for a cost-effective addition of Gigabit Ethernet switching on an as-needed basis. Just as it is on the Gigabit EtherChannel module, all management information is readily available, and Gigabit Ethernet is managed by familiar Ethernet tools. This three-port Gigabit Ethernet module will also work with Catalyst 5000 and 5002 chassis, but in such configuration, only one port of the three-port Gigabit Ethernet module will be active.

Modular Port Interfaces Provide Choice and Upgrade Flexibility

Catalyst 5000 Family Gigabit solutions allow for flexible Gigabit interface configuration of backbone and wiring closet connections. For example, Gigabit Ethernet uplinks within a building might make use of 1000BaseSX over multimode fiber for distances up to several hundred meters, but backbone connections between buildings might require using 1000BaseLX/LH over single-mode fiber in cable runs up to 10 kilometers, and Metropolitan Area Network Connections might require using 1000BaseZX over single-mode fiber in cables running up to 70-100 km. The Supervisor Engine III can be configured with either 1000BaseSX, 1000BaseLX/LH, or 1000BaseZX, depending on the application. By making use of industry-standard hot-swappable GigaBit Interface Converter (GBIC) modular technology, other Cisco Gigabit Ethernet interfaces can intermix any combination of 802.3z-compliant 1000BaseSX, 1000BaseLX/LH, or 1000BaseZX interfaces on a port-by-port

basis. Furthermore, Cisco is offering a 1000BaseLX/LH interface that is fully compliant with the IEEE 802.3z 1000BaseLX standard, but has the ability to go up to 10 km over single-mode fiber, 5 km further than garden-variety 1000BaseLX interfaces. As additional capabilities are developed, these modules make it easy to upgrade to the latest interface technology, maximizing investment protection.

Figure 2 Hot-Swappable GBIC Modules Provide Easy Selection or Upgrade of Interfaces on a Port-by-Port Basis, Shown Here on the Nine-Port Gigabit EtherChannel Module



Figure 3 Our Newest Two-Port GBIC Uplink Offers QoS Capabilities



Industry-Leading Functionality and Investment Protection

Cisco supports the widest range of industry standards, as well as functionality such as Fast EtherChannel and Gigabit EtherChannel, where customer needs for link aggregation and resiliency run ahead of the standards process. Even while supporting these new capabilities, Cisco created the Catalyst 5000 Family with investment protection and with the same software and functionality that have made it the industry's leading platform in total number of Ethernet and Fast Ethernet ports. The Catalyst 5000 Gigabit Ethernet

solutions build on this functionality, providing capabilities such as Gigabit EtherChannel, multicast, virtual LANs (VLANs), management, and security that are as easy to administer as previous tools, but with an order of magnitude improvement in performance, as outlined in the following features.

Gigabit EtherChannel for Future-Proof Backbones

Because customers needed a growth path to faster, resilient links, Cisco has led the industry with innovative Fast EtherChannel and Gigabit EtherChannel technology. Thousands of Fast EtherChannel ports have been deployed in production networks. Cisco Gigabit EtherChannel is based on this proven technology. With Cisco Gigabit EtherChannel technology, critical backbone trunks can be scaled to multiple gigabits of throughput as backbone traffic continues to grow. By combining four Gigabit Ethernet links into one logical link, up to 8 Gbps of throughput is possible between devices. Traffic is automatically load-balanced between physical links in the most efficient manner possible using the Port Aggregation Protocol (PAgP). Furthermore, Gigabit EtherChannel technology provides an unmatched level of resiliency. If one physical port on a Gigabit EtherChannel link goes down, all traffic on that port is automatically redirected and load-balanced to the remaining ports. This redirection happens in under one second with no operator intervention, assuring maximum backbone throughput and availability. Gigabit Etherchannel is available on the nine-port Gigabit Ethernet module.

Industry-Leading VLANs

Cisco Catalyst 5000 Gigabit Ethernet solutions support the complete Cisco VLAN architecture, providing for broadcast containment that scales solutions to 1000 VLANs per switch. These VLANs can be established across multiple switches within the fabric, including support for dynamic Media Access Control (MAC) and network-layer VLANs, dynamically accommodating moves, adds, and changes within the switched network without operator intervention.

Multicast Performance

As an intranet service, the Catalyst 5000 Family also supports efficient intranet multimedia and multicast support through the use of Protocol Independent Multicast (PIM), Internet Group Management Protocol (IGMP), and Cisco Group Management Protocol (CGMP), delivering end-to-end, scalable bandwidth for multimedia and multicast applications.

Advanced Quality of Service

With the convergence of mission-critical business and multimedia applications on the common intranet, there is an increasing need for quality of service (QoS) and support for multicast-intensive applications. A new set of intranet services is required to ensure the reliability and availability of these applications. IEEE standard 802.3x (pause frames) flow-control compliance is provided on the Catalyst 5000 Gigabit Ethernet solutions for link-layer flow control. Since pause frames block an entire link for a given period of time, they are used primarily in smaller networks where a blocked link won't block flows for multiple switches or hosts.

Because QoS and flow control are really end-to-end, not link-layer issues, and they need to be scaled across the enterprise, the Catalyst 5000 Family supports the most advanced traffic management and QoS in the industry. Cisco QoS capabilities go well beyond 802.3x pause frames. For frame switching, the Catalyst 5000 Family implements active congestion control and extensive buffering mechanisms to ensure timely delivery of packets without packet loss, even in severely congested situations.

QoS across the frame switching fabric is implemented using a three-level priority scheme. The Catalyst 5000 Family supports multiple levels of priority in the switching fabric; two levels are user defined. Each interface can be set as either high priority or low priority (default is low). The Catalyst 5000 Family maintains the third priority group above the user's high priority for ports with buffers nearing overflow or extended time periods off the switching backplane. The bus arbitration logic maintains separate logical queues for each priority class and guarantees that high-priority queues are served first, reducing latency caused by buffering delays. In addition bus arbitration logic is interoperable with emerging standards such as Resource Reservation Protocol (RSVP) and 802.1Q/p. This feature is ideal for such time-sensitive traffic as voice or video. The same QoS architecture spans from the wiring closet to the backbone to ensure critical traffic receives the needed priority throughout its journey over the network.

Powerful Management and Administration Solutions

The Catalyst 5000 Family gigabit solutions are complete with comprehensive embedded manageability so that network managers can easily configure and monitor the module within the Catalyst system from the CiscoWorks enterprise management console. The CiscoWorks enterprise console provides

state-of-the-art features for network-wide discovery, mapping, configuration, monitoring, and software distribution services. In addition, this console is a complement to any Cisco switching or routing product.

In summary, the Catalyst 5000 Family from Cisco offers switching solutions that include distribution layer and server switching for small to medium-sized enterprise networks, as well as high-density wiring closet switching for large enterprise networks. The Cisco Catalyst 5000 Family builds on the award-winning architecture of the Catalyst 5000 while integrating the Cisco IOS® software-based routing technology. This combination of best-of-breed technologies creates a powerful solution for addressing the growing needs of high-performance networks. The addition of Gigabit Ethernet technology allows network managers to build wiring closet and distribution-layer networks using a common and proven architecture.

Catalyst 5000 Family Features

The Catalyst 5000 supports industry-leading functionality, with features for scalability, bandwidth management, security services, network resiliency, and embedded manageability. Highlighted features include:

Scalability

- Gigabit EtherChannel technology with PAgP for the nine-port Gigabit Ethernet module
- Policy server, Virtual Memory Policy Server (VMPS)
- Dynamic VLANs
- Cisco VLAN functionality
- Dynamic Inter-Switch Link (Dynamic ISL) for the three-port Gigabit Ethernet module
- VLAN Trunking Protocol (VTP) and VTP Pruning

Bandwidth Management

- CGMP multicast pruning
- IGMP fast leave processing
- Broadcast suppression
- Link load balancing

Security Services

- Port security by MAC address
- TACACS+ authentication
- IP permit list
- Traps and syslog messages on security violations

Network Resiliency

- Redundant Supervisor Engines
- Spanning-Tree Protocol
- Multiple spanning trees (spanning tree per VLAN)
- PortFast—a Spanning-Tree Protocol enhancement
- UplinkFast—a Spanning-Tree Protocol enhancement

Embedded Manageability

- Cisco Discovery Protocol (CDP)
- Simple Network Management Protocol (SNMP) agent
- RMON agent
- Switched Port Analyzer (SPAN)
- Enhanced SPAN
- Syslog support
- Domain Name System (DNS) services
- Network Timing Protocol (NTP)
- Command-line interface (CLI) and Telnet

Indicators and Interfaces

- Board status: green (operational)/orange (disabled)/red (faulty)
- Link: green (good)/orange (disabled)/off (not connected)

Environmental Conditions

- Operating temperature: 32 to 104 F (0 to 40 C)
- Storage temperature: -40 to 167 F (-40 to 75 C)
- Relative humidity: 10 to 90%, noncondensing

IEEE Standards

- 802.3z Gigabit Ethernet (1000BaseSX and 1000BaseLX)
- 802.3x full duplex and flow control
- 802.1D bridging
- 802.1Q VLAN tagging

Table 1 Link Distances

Fiber Core	62.5 m Multimode		50 m Multimode		9/10 m Single Mode
Fiber Modal Bandwidth	160/500 MHz-km	200/500 MHz-km	400/400 MHz-km	500/500 MHz-km	NA
1000BaseSX	220 m	275 m	500 m	550 m	NA
1000BaseLX/LH*	550 m	550 m	550 m	550 m	10 km
1000BaseZX	N/A	N/A	N/A	N/A	70-100 km

*Note: Cisco 1000BaseLX/LH interfaces fully comply with the IEEE 802.3z 1000BaseLX standard. However, their higher optical quality allows them to reach 10 km over single-mode fiber versus the 5 km specified in the standard.

Regulatory Compliance

Safety Certifications

- UL 1950
- CSA 950
- EN60950
- CE marking
- TUV GS
- IEC 950
- AS/NZS 3260

Electromagnetic Emissions Certifications

- FCC Part 15 (CFR 47) Class A
- VCCI Class A with unshielded twisted-pair (UTP) and Class B with shielded cables
- EN55022 Class A with UTP and Class B with shielded cables
- CISPR 22 Class A with UTP and Class B with shielded cables
- CE marking
- AS/NZS 3548 Class A with UTP and Class B with shielded cables



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