

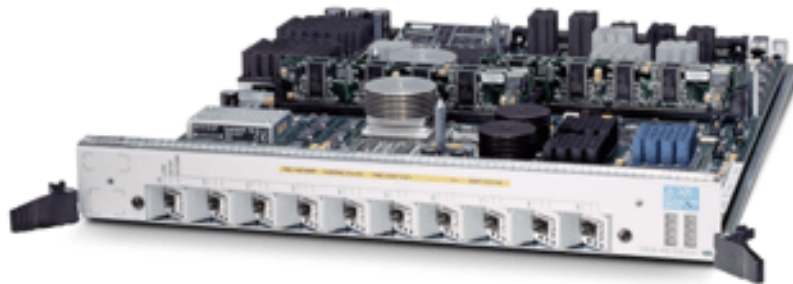
The Cisco 12000 Series Ten-Port Gigabit Ethernet Line Card

For service providers who need to cost-effectively scale their networks in response to growing high-bandwidth demands, the Cisco 12000 Series Ten-Port Gigabit Ethernet Line Card delivers 10 dedicated Gigabit Ethernet ports ideal for intra-Point of Presence (POP) connectivity, Ethernet aggregation, and peering.

Product Overview

Today's service providers who want to build their IP networks with Gigabit Ethernet are looking for a high-bandwidth solution that offers reliable service and reduces operational costs. The Cisco 12000 Series offers the industry's only 10G portfolio, delivering the capacity, performance, service enablers, and operational efficiencies service providers need to support high-density Ethernet aggregation, intra-POP connectivity, and peering.

Figure 1 The Cisco 12000 Series Ten-Port Gigabit Ethernet Line Card



The Cisco 12000 Series Ten-Port Gigabit Ethernet (10-Port GE) Line Card provides 10 dedicated, Gigabit Ethernet ports per card with Cisco 12000 Series distributed system architecture and industry-leading quality-of-service (QoS) and class-of-service (CoS) features. It delivers network scalability and performance, while helping providers maintain customer service-level agreements (SLAs). When deployed in Cisco 12400 Internet routers such as the Cisco 12406 and Cisco 12404, the line card enables service providers to offer high-density, high-bandwidth solutions from within space-constrained locations.



Applications

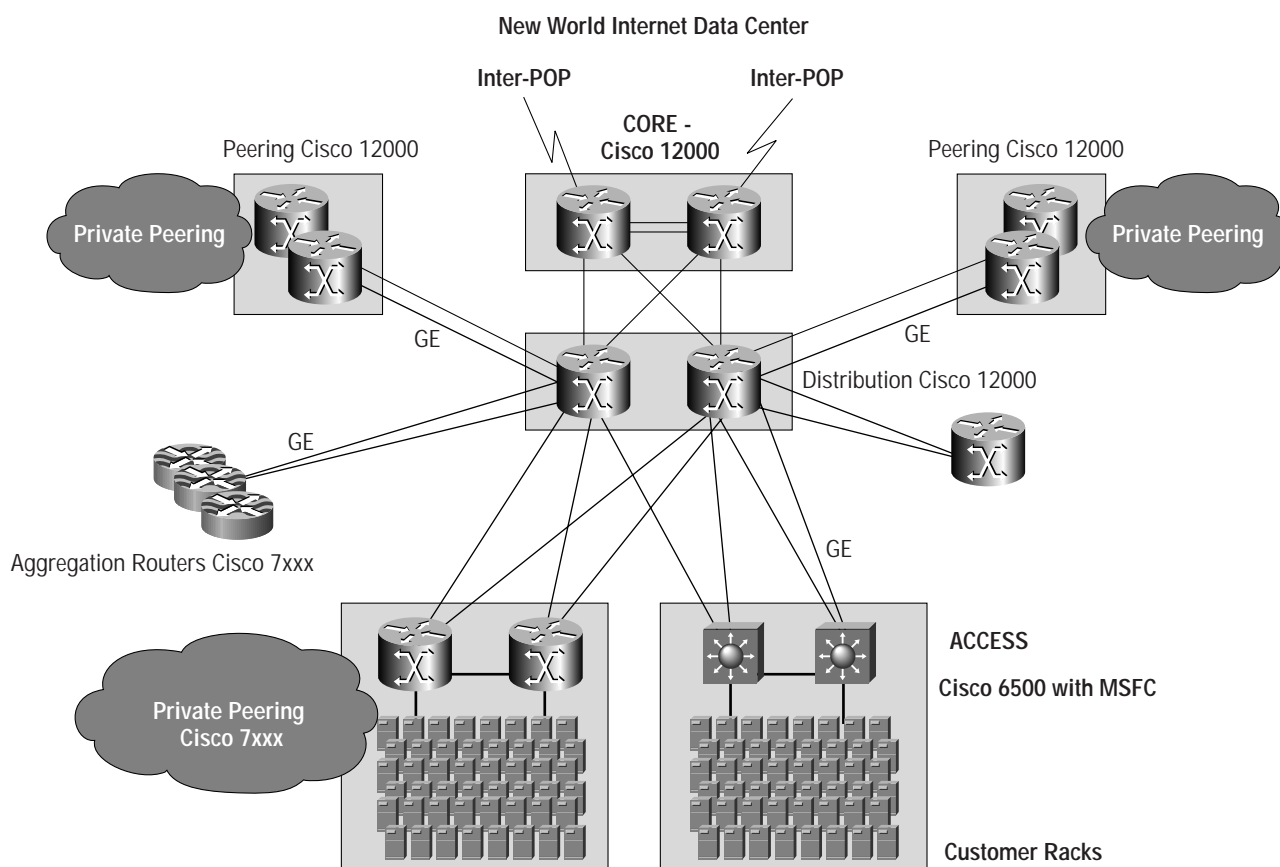
The Cisco 12000 Series 10-Port GE is designed to interconnect Cisco 12400 Internet routers with other systems in POPs, including edge routers and Layer 2, 3, and 7 switches, providing a cost-effective, high-bandwidth solution. Each of the line card's 10 ports can be configured to support the following interface types:

- 1000BaseSX multimode fiber interface for transmission over distances up to 550 meters
- 1000BaseLH single-mode fiber interface for transmission over distances up to 10 kilometers

IDC Connectivity

The Cisco 12000 Series 10-Port GE is ideal for (IDC) connectivity, providing Ethernet configuration simplicity and ease of management. IDC connectivity often requires connecting to server farms and the Cisco 12000 Series 10-Port GE on-card high-performance forwarding engine is well-suited for this purpose with its support for high Ethernet fan-out.

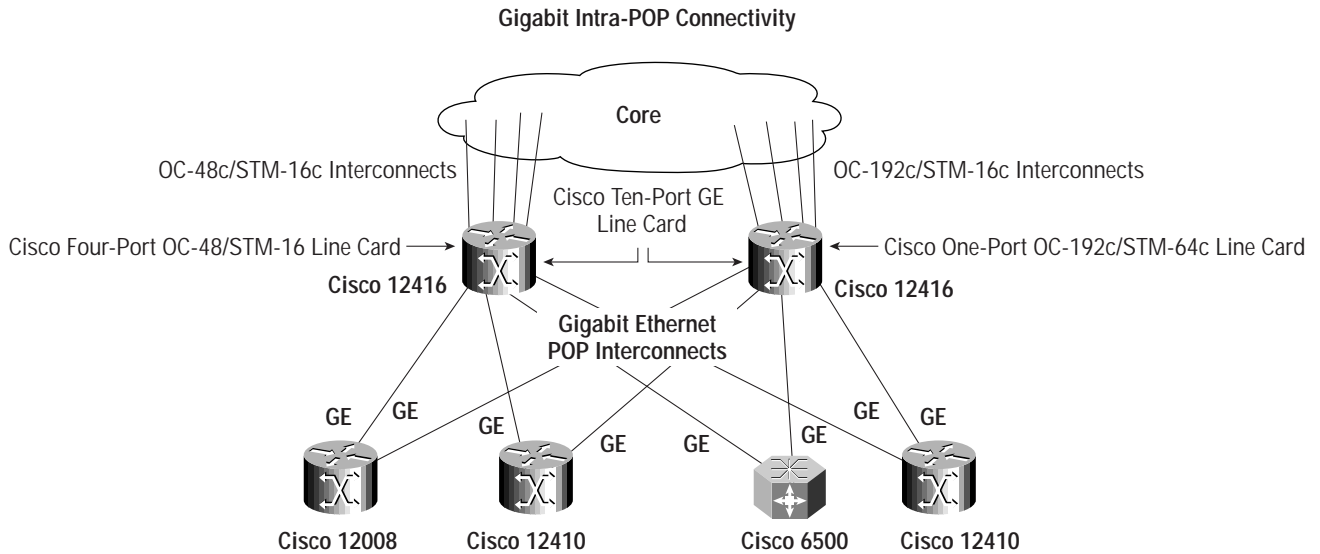
Figure 2 Internet Data Center Connectivity



Intra-POP Connectivity

Many service providers have adopted Gigabit Ethernet for intra-POP connectivity to aggregate traffic from routers and switches. The Cisco 12000 Series 10-Port GE provides line-rate performance simultaneously on all 10 ports, connecting routers at the core, peering, and distribution points.

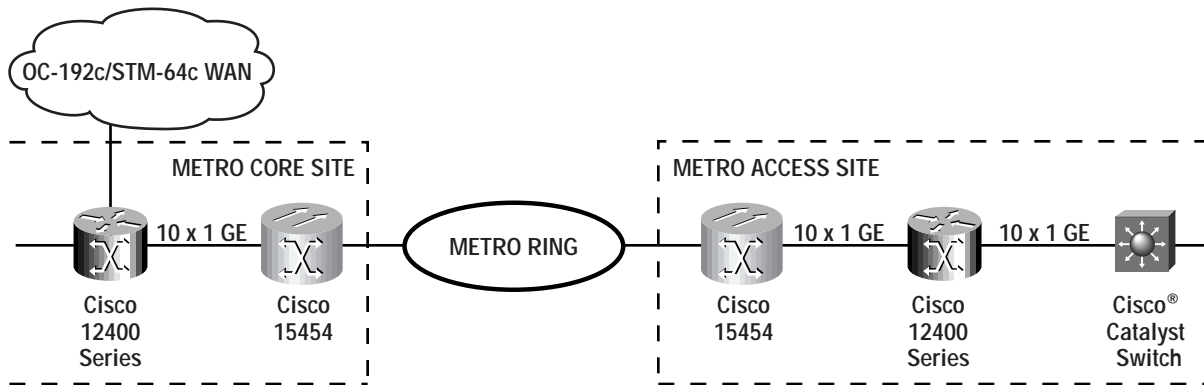
Figure 3 Gigabit Ethernet Intra-POP Connectivity



Metro Ethernet Services

Metro ISPs provide Ethernet connectivity to multitenant buildings for business and residential markets. The Cisco 12000 Series 10-Port GE can be deployed in metro POPs and in building sites along with the Cisco 15454 Synchronous Optical Network (SONET) Multiplexer where high aggregation density is required.

Figure 4 Metro Ethernet Services



Key Features and Benefits

High Scalability-The Cisco 12000 Series 10-Port GE concentrates 10 full-duplex 1-Gbps Ethernet ports in one line card, increasing density per rack and overall router capacity, thereby enabling service providers to scale network architectures cost-effectively.

- **High Performance**—The Cisco 12000 Series 10-Port GE features a dedicated Layer 3 lookup engine that delivers full line-rate throughput for all Ethernet frame sizes on all 10 ports simultaneously for IP forwarding and MPLS. Both QoS and accounting features may be enabled without affecting performance. This ensures sustainable performance for IP services required today and in future new services. Service providers can scale their networks to deliver high-performance IP services with a minimum of investment.



- *Comprehensive MPLS capabilities*—MPLS features, such as MPLS traffic engineering (TE) using RRR and MPLS VPN per port, support the development of service-optimized networks and can accelerate migration from circuit-based networks to packet-based networks, creating new market opportunities for service providers. (VLAN to MPLS VPN mapping is not supported.)
- *Guaranteed priority packet delivery*—Cisco QoS support for IP and MPLS provides efficient, predictable control of network connections and reduces the cost of network operations by maximizing bandwidth utilization without affecting performance.

QoS also ensures the highest-available bandwidth with minimum delays required by time-sensitive applications such as voice over IP (VoIP) and multimedia, enabling service providers to grow revenue by offering advanced differentiated IP services. Support for IP, class of service (CoS), and QoS features include:

- Multiple virtual output queues (eight per port) optimize CoS by minimizing latency and eliminating head-of-line blocking.
- Precedence mapping allows IP packets to be delivered with QoS for different classes of applications; IP type of service (ToS) to MPLS CoS is supported.
- Weighted Random Early Detection (WRED) congestion control/query management allows selective discard of low-priority flows protecting higher-priority flows.
- Modified Deficit Round Robin (MDRR)-Class-based packet queuing controls the packet dequeuing process to guarantee transit latency for differentiated flows.
- IP load balancing enables load sharing over multiple links (eight maximum).
- Cisco Group Management Protocol (CGMP) provides efficient distribution of multicast video/data streams at all networking layers.
- Extended access control lists (xACLs) provide access control by filtering out unwanted packets. With xACLs, filtering can occur on source or destination IP addresses and transport protocols using their source and destination ports. Input ACLs up to 15,000 lines and output ACLs up to 1,024 lines are supported. Filtering is supported in hardware.
- *Industry-leading Ethernet features*—To meet high-bandwidth, scalability, and quality of service requirements in Ethernet networks, service providers need features that deliver reliability, operational simplicity, and flexibility:
 - Standardized Small Form-factor Pluggable SFP (or minigigabit interface controller [GBIC]) module interfaces provide flexibility in network design by supporting transmission distances up to 550 meters or 10 kilometers. The SFP unit is hot-swappable, and SFP modules are IEEE 802.3z compliant. Modules are pluggable, enabling convenient changes between short- and long-wavelength optics on a per-port basis.
 - Options for single and multimode fiber and short- and long-wavelength optics maximize interconnect flexibility in deploying fiber upgrades. Network expansion can be performed cost-effectively.
 - Hot Standby Router Protocol (HSRP) and Virtual Router Redundancy Protocol (VRRP) provide automatic router backup when configured on Cisco routers that run Internet Protocol (IP).
 - Virtual LAN (VLAN) accounting provides traffic statistics based on individual VLAN utilization. Counters are provided on a per-packet basis.
 - Source/destination Media Access Control (MAC) accounting provides traffic statistics based on source and destination MAC addresses, enabling a provider to capture link utilization on a per-source or per-destination basis, up to 256 MAC addresses.
 - Ethernet frame sizes up to 9180 bytes (jumbo frames) are supported. MPLS-enabled Ethernet frames smaller than 9180 bytes can be switched without fragmentation.

- 802.1Q VLAN combines user stations and network devices into a single unit, regardless of the physical LAN segment.
- Autonegotiation automatically selects full-duplex operation (if enabled).
- Flow control (receive) supports flow control between two devices; Rx flow is negotiated with the remote end by responding to the received PAUSE frames.
- Error-Correcting Code (ECC) circuitry is supported for enhanced memory reliability.
- *Cisco 12000 Series investment protection and cost reduction*—Like all Cisco 12000 Series line cards, the Cisco 12000 Series 10-Port GE supports nonservice impacting online-insertion and removal (OIR), compatibility with all Cisco 12400 Internet routers, and 10G scalability.

By offering 10 dedicated Gigabit Ethernet ports with industry-leading QoS and performance within Cisco 12000 Series Internet routers that scale as your network grows, service providers can now support high-density Gigabit Ethernet aggregation, connectivity, and peering for the carrier-class Internet.

Product Specifications

Chassis Compatibility	All Cisco 12400 Internet Router chassis	
Software Compatibility	<ul style="list-style-type: none"> • Cisco IOS® Software Release 12.0(21)S or higher • Cisco IOS Software Release 12.0(21)ST or higher 	
Protocols	<ul style="list-style-type: none"> • Layer 3 routing protocols include Border Gateway Protocol Version 4 (BGPv4), Open Shortest Path First (OSPF), Intermediate System-to-Intermediate System (IS-IS), Enhanced Interior Gateway Routing Protocol (EIGRP), Routing Information Protocol (RIP), Distributed Forwarding Information Base (FIB) IP switching, Cisco Discovery Protocol (CDP), Internet Control Message Protocol (ICMP), Routing with Resource Reservation (RRR), and others • Multicast forwarding with support for source and shared distribution trees and the following protocols: Protocol Independent Multicast—dense mode (PIM-DM); PIM—sparse mode (PIM-SM); Internet Group Management Protocol Versions 1 and 2 (IGMPv1/v2); CGMP; Multiprotocol Border Gateway Protocol (MBGP); Multicast Source Discovery Protocol (MSDP); and others • Comprehensive MPLS support • Traffic engineering using Routing with Resource Reservation (RRR) 	
Port Density	10 Gigabit Ethernet ports per line card per chassis slot	
	15 slots (Cisco 12416)	150 Gigabit Ethernet ports
	8 slots (Cisco 12410)	80 Gigabit Ethernet ports
	5 slots (Cisco 12406)	50 Gigabit Ethernet ports
	3 slots (Cisco 12404)	30 Gigabit Ethernet ports
Connectivity	LC-duplex connector	
Optical Specifications Short Reach	<ul style="list-style-type: none"> • Connector type: LC • Wavelength: 850 nm • Fiber type: MMF • Core size: 50.0 μ • Modal bandwidth: 500 MHz/km • Cable distance: 550 m • Link power budget: 7.5 dB 	

Optical Specifications Long Haul	<ul style="list-style-type: none"> • Connector type: LC • Wavelength: 1300 nm • Fiber type: MMF • Core size: 9/10 u • Cable distance: 10 km • Link power budget: 8 dB
Features and Functions	<p>Statistics and Accounting</p> <ul style="list-style-type: none"> • Byte and packet counting per ingress port for IP and MPLS packets • Packet counting for Modified Deficit Round Robin (MDRR) and Weighted Random Early Detection (WRED) Functions • Packet counting for Committed Access Rate (CAR) rule conformance • Counting per ingress port for IP prefixes and Cisco Express Forwarding (CEF) adjacencies
Memory	<ul style="list-style-type: none"> • 256 MB of route table memory standard • 512 MB of packet buffer memory standard
Performance	<ul style="list-style-type: none"> • Line-rate throughput for IP forwarding and MPLS switching • Dedicated Layer 3 forwarding engine provides line-rate throughput for all Ethernet frame sizes • Sustained performance in fully loaded system • Sustained performance for all IP prefix sizes • No performance drops as QoS or accounting features are enabled
Environmental Conditions	<p>Temperature</p> <ul style="list-style-type: none"> • Operating, nominal: 41 to 104 F (5 to 40 C) • Operating, short term: 23 to 131 F (-5 to 55 C) • Storage: -4 to 149 F (-20 to 65 C) <p>Humidity</p> <ul style="list-style-type: none"> • Operating, nominal: 5 percent to 85 percent RH • Operating, short term: 5 percent to 90 percent RH • Storage: 5 percent to 95 percent relative humidity (RH) <p>Altitude</p> <ul style="list-style-type: none"> • Operating altitude: -60m to 4000m
Reliability and Availability	<ul style="list-style-type: none"> • Online insertion and removal (OIR), enabling insertion and removal of line cards and SFP modules without impacting traffic
Network Management	<ul style="list-style-type: none"> • Cisco IOS command-line interface (CLI) • Cisco 12000 Manager for configuration, fault, and performance element management • Simple Network Management Protocol (SNMP)
Management Indicators and Interfaces	<p>LEDs at each port</p> <ul style="list-style-type: none"> • Link • Active (port) • Rx activity
Physical Specifications	<p>Line Card</p> <ul style="list-style-type: none"> • Width (occupies single thin slot): 1.25 in. (3.2 cm) • Weight: 10 lb (4.5 kg) • Height: 14.5 in. (36.5 cm) • Depth: 17.5 in. (44.5 cm)
Power	190 watts

Compliance and Agency Approvals

This product is designed to meet the following requirements:

Safety

- UL 1950
- CSA 22.2-No. 950
- EN60950
- IEC 60950 CB Scheme
- ACA TS001
- AS/NZS 3260

EMI

- FCC CFR 47-Part 15 1998 Class A
- ICES 003 Class A
- AS/NRZ 3548 Class A
- EN55022 Class B (up to 1GHz)
- VCCI Class A
- CISPR 22 Class B (up to 1 GHz)
- BSMI / CNS 13438: 1997 Class A
- IEC-1000-3-2 Power line harmonics
- IEC 61000-3-3 Voltage Fluctuations and Flicker

Immunity

- IEC-1000-4-2 ESD (8kV contact, 15kV air)
- IEC-1000-4-3 Radiated immunity (10V/m)
- IEC-1000-4-4 EFT (2kV power port, 1kV signal port)
- IEC-1000-4-5 Surge AC port(4kV CM, 2kV DM)
- IEC-1000-4-5 Surge Signal port(2kV CM, 1kV DM)
- IEC-1000-4-5 Surge DC port(0.5kV CM, 0.5kV DM)
- IEC-1000-4-6 Low Frequency Conductive Immunity, (10V)
- IEC-1000-4-11 Voltage dips and sags
- EN55024\CISPR24 ITE Immunity

NEBS

This product is designed to meet the following requirements (some qualifications in progress):

- SR-3580—NEBS criteria levels (Level 3 compliant)
- GR-1089-Core—NEBS EMC and safety
- GR-63-Core—NEBS Physical protection

ETSI

- EN 300 386\EN 300 386-2 Class B

Ordering Information

Description	Part Number
Cisco 12000 Series Ten-Port Gigabit Ethernet Line Card	10x1GE-SFP-LC-B
1000BaseSX Short-Reach/Short-Wavelength SFP (mini-GBIC) Module with Multimode Fiber Interface, LC Connector	GLC-SX-MM
1000BaseLH Long-Haul/Long-Wavelength SFP (mini-GBIC) Module with Multimode Fiber Interface, LC Connector	GLC-LH-SM

Service and Support

Cisco offers a wide range of service support offerings for its service provider customers. Cisco has earned the highest customer satisfaction ratings in the industry by providing the world-class service and support necessary to deploy, operate, and optimize service provider networks. Whether the goal is speed to market, maximizing network availability, or enhancing customer satisfaction and retention, Cisco is committed to its service providers' success.

For More Information

For more information on Cisco service and support programs and benefits, go to www.cisco.com/public/Support_root.shtml.

For more information about the Cisco 12000 Series and the Cisco family of next generation Internet routers, visit Cisco at www.cisco.com, contact your account representative or call Cisco today.



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