

Cisco 12000 Series Internet Router Three-Port Gigabit Ethernet Line Card

Providing Service Providers with Cisco 12000 Series High-Throughput and Cost-Effective Connectivity

Cisco offers the three-port Gigabit Ethernet line card (part number 3GE-GBIC-SC(=)) for the Cisco 12000 series family of Internet routers to address the needs for interconnecting devices within points of presence (POPs) at gigabit rates. The three-port Gigabit Ethernet line card is the second Ethernet-based product for the Cisco 12000 series family of Internet routers, providing a cost-effective, high-bandwidth solution. This compelling solution is sought by Internet service providers (ISPs) with large Web hosting equipment such as servers, caches, edge routers, Gigabit Ethernet switches, and so on, who are looking for cost-effective links between their Cisco 12000 series platforms and other network equipment.

This new line card, depicted in Figure 1, can be configured with up to three of the following interface types: a 1000BASE-SX multimode fiber interface with up to a 550-meter reach, a 1000BASE-LH single-mode fiber interface with up to a 10-km reach, or a 1000BASE-ZX single-mode fiber interface with up to a 70-km reach.

Feature Summary

Packet Layer

- Layer 3 quality-of-service (QoS) support, providing differentiated services
- Virtual output queues
- Weighted Random Early Detection (WRED) Modified Deficit Round Robin (MDRR)
- Application-specific integrated circuit (ASIC)-based Layer 3 Forwarding and queuing engine for Internet-scale performance
- Multiple virtual output queues optimizing class of service (CoS) by minimizing latency and eliminating head-of-line blocking
- A local forwarding table that can accommodate up to one million forwarding entries 512-kB burst buffers in Tx and Rx directions to smooth out bursty traffic
- 256-MB default packet buffer memory to maximize TCP goodput
- Scalable up to 512 MB
- Configurable with up to 256 MB of code and route table memory



Ethernet Upper Layers

- Ethernet frame size up to 9180 bytes¹
- Media Access Control (MAC) with full-duplex operation
- 8/10B encoding/decoding
- Optional 1000BASE-SX multimode 550-meter interface, 1000BASE-LX 10-km interface, or 1000BASE-ZX single-mode 70-km interface, compliant with IEEE 802.3z specifications

Physical Layer

- SC duplex connectors
- Error-Correcting Code (ECC)

Software Features

Table 1 Software Features for the Three-Port Gigabit Ethernet Line Card

Features	Benefits
Auto-Negotiation	A link protocol that automatically selects full-duplex operation if enabled on the 3GE-GBIC-SC(=)
Flow Control (receive)	The management of transmission between two devices; 3GE-GBIC-SC supports Rx flow control; the 3GE-GBIC-SC(=) line card Rx flow control is negotiated with the remote end by responding to the received PAUSE frames
Precedence Setting/Mapping	Allows the IP packet to be delivered with QoS for different classes of applications
Access Control List (xACL)	Extended access control lists used to provide access control by filtering out unwanted packets; with xACL, filtering can be done on source destination IP addresses and transport protocols using their source and destination address; ACLs can be up to 128 lines long
Hot-Standby Router Protocol (HSRP)	Provides automatic router backup when configured on Cisco routers that run the Internet Protocol (IP)
Cisco Group Management Protocol (CGMP)	Cisco efficient multicast control mechanisms that provide efficient distribution of multicast video/data streams at all networking layers
Multiprotocol Label Switching (MPLS/Tag Switching)	Uses labels, or tags, that contain forwarding information, which are attached to IP packets by a router; 3GE-GBIC-SC(=) currently supports MPLS-P (provider) switching only, with future releases to include traffic engineering (TE), MPLS-PE (provider edge) QoS to support real-time voice and video as well as Service-Level Agreements (SLAs) that guarantee bandwidth, virtual private networks (VPNs), and CoS in network core applications
802.1Q Virtual Local-Area Network (VLAN)	VLANs logical subgroup within a LAN that is created via software; combines user stations and network devices into a single unit, regardless of the physical LAN segment; 3GE-GBIC-S(=) can support up to 1K VLANs per card and all the VLANs can be in one port or can be divided into many ports. Over all VLAN limitation for the box is dependent on the number of IDBs supported by the IOS. For the latest info about the IDB limits, please refer to: www.cisco.com/warp/customer/63/idb_limit.html

1. From 12.0.22S; older releases support frame sizes of up to 2450 bytes.



Table 1 Software Features for the Three-Port Gigabit Ethernet Line Card

Features	Benefits
Error-Correcting Code (ECC)	Memory that corrects errors on the fly
Weighted Random Early Detection (WRED)	Congestion control or query management; allows selective discard of low-priority flows before dropping packets from higher-priority flows
Modified Deficit Round Robin (MDRR)	Uses class-based packet queuing to control the packet dequeuing process in a manner that allows the users to guarantee transit latency for differentiated flows

Features and Benefits

Table 2 Features and Benefits Summary for the Three-Port Gigabit Ethernet Line Card

Features	Benefits
IEEE 802.3z Standards Compliant	Used to connect to Gigabit Ethernet switches or Gigabit Ethernet IP port adapter of Cisco 7500 router
Standardized on GBIC Module Interfaces (1000BASE-SX 550 meters, multimode and 1000BASE-LH 10 km, single mode, and 1000BASE-ZX, single mode 70 km)	Provides flexibility in network design with reach capability up to 70 km; hot-swappable GBIC unit enables change/replacement without the need to power down the line card
Supports IEEE 802.1q VLAN Tagging	Gigabit Ethernet link can be used as a VLAN trunk
Support for IP QoS/CoS, Including ACL and MPLS/Tag Switching	Enables traffic engineering solutions to increase network utilization and provide basis for offering differentiated CoS models
128-MB Packet Buffer Memory and 512-KB Burst Buffers for Each Rx and Tx Direction, Upgradable to 256-MB for Each Direction	Maximizes TCP/IP throughput and smoothes out all traffic bursts
Forwarding Table with up to One Million Forwarding Entries	Allows for phenomenal growth well beyond today's Internet with 40,000 route entries
Minimum Very Long Reach (ZX) Link Power Budget Parameter	10um SMF UNit Link Power Budget 21-db; operating distance 70,000 meter
ECC	Memory that corrects errors on the fly
WRED	Congestion control or query management; allows selective discard of low-priority flows before dropping packets from higher-priority flows
MDRR	Uses class-based packet queuing to control the packet dequeuing process in a manner that allows the users to guarantee transit latency for differentiated flows



3GE-GBIC-SC Line Card Features Flexible and Expandable Packet Buffer Memory

Depending on the network topology, sufficient buffering must be available on Layer 3 line cards to satisfy queuing requirements for the network at gigabit rates. The largest queuing requirement would be 120 MB of memory. The Cisco 12000 series line cards implement the buffering memory with SDRAM modules, giving users the flexibility to install the requirements for their applications and to upgrade their requirement when necessary. The Cisco 12000 series Gigabit Ethernet line cards provide 256-MB and 512-MB SDRAM options. Other features include:

- Multiple virtual output queues, eliminating head-of-line blocking
- ASICs-based queuing, providing line-rate queue performance
- Layer 3 QoS support, providing differentiated services

The packet memory option on the Cisco 12000 series Internet router three-port Gigabit Ethernet line cards will be different from some existing line cards. The memory on the Gigabit Ethernet line card runs at 100 MHz, versus 50 MHz for some existing line cards. (See Table 3.)

Table 3 Packet Memory Options

Part Numbers	Description
Default- 256 MB	128/128 Tx/Rx line-card buffer memory (4 x 64 MB)
MEM-PKT-512-UPG(=)	Option upgrade 256/256 Tx/Rx line-card buffer memory (4 x 128 MB)

Cisco 12000 Series Internet Router Gigabit Ethernet Line Cards Feature Flexible and Expandable Routing Table Memory

These line cards support Cisco Express Forwarding (CEF). This technique implements a distributed architecture within the platform whereby each line card can make its own decision in forwarding packets in the network. Away from the data path, the route processor card maintains the routing tables and transports a full image of its routing table to every line card.

As the number of networks that make up the Internet grows, the number of entries in the routing tables will grow as well. The Cisco 12000 Gigabit Ethernet line cards implement an expandable routing table with the addition of DRAM modules, which provide flexibility to the user. The expandable DRAM options range from 128 MB to 256 MB. The forwarding table can accommodate up to one million forwarding entries. (See Table 4.)

Table 4 Route Memory Options

Part Number	Description
MEM-DFT-LC-2X64	128-MB line card program/route memory (2 x 64 MB)
MEM-GRP/LC-128	Option upgrade 128-MB GRP and line-card route memory (1 x 128 MB)
MEM-GRP/LC-256	Option upgrade 256-MB GRP and line-card program/route memory (2 x 128 MB)

Switch Card Requirement

At minimum, full bandwidth fabric cards must be installed in your Cisco 12000 series Internet router (which is one clock scheduler and three switch fabric cards).



Specifications

Physical

- Occupies a single slot
- Weight: 6 lb (2.7 kg)
- Height: 14.5 in. (35.6 cm)
- Depth: 18.5 in. (45.7 cm)

Environmental

- Operating temperature: 32 to 104 F (0 to 40 C)
- Storage temperature: -4 to 149 F (-20 to 65 C)
- Relative humidity: 10 to 90%, noncondensing

Regulatory Compliance

Safety

- UL 1950, Third Edition
- CSA C22.2, No. 950-95, Third Edition
- EN 60950
- AUSTEL TS001
- AS/NZS 3260
- EN 60825 Laser Safety (Class 1)
- IEC 950

Network Equipment Building Systems Level 3

Electromagnetic Emissions Certification

- FCC Class A
- AS 3548 Class B
- EN 55022 Class B
- VCCI Class B
- CISPR 22 Class B

Immunity

- IEC-1000-4-2 ESD
- IEC-1000-4-3 radiated immunity
- IEC-1000-4-4 EFT
- IEC-1000-4-5 surge
- IEC-1000-4-6 low-frequency common immunity
- IEC-1000-4-11 voltage dips and sags
- IEC-1000-3-2 power line harmonics



LEDs

- Link
- Active (port)
- Tx activity
- Rx activity

Connector

- SC-duplex connector

Network Management

- CiscoView
- Simple Network Management Protocol (SNMP)
- Management Information Base II (MIB-II)

System Feature

- Hot-swap without system interruption

Optical Power Budget

Table 5 Minimum Long-Haul Link Power Budget

Parameter	10um SMF	Unit
Link Power Budget	10.5	db
Operating Distance	10,000	m

Table 6 Minimum 1000BASE-SX Link Power Budget

Parameter	MMF	Unit
Modal Bandwidth (measured at 850 nm)	500	MHz*km
Link Power Budget	7.5	db
Operating Distance	550	m



Ordering and Availability

The Cisco 12000 series Internet router three-port Gigabit Ethernet line card (part number 3GE-GBIC-SC(=)) is orderable now.

Table 7 Cisco 12000 Series Internet Router Three-port Gigabit Ethernet Line Card Availability

Product Number	Description	Availability	Cisco IOS Release
3GE-GBIC-SC(=)	<ul style="list-style-type: none">• Three-port Gigabit Ethernet line card with default 128-MB code and route table memory• 28/128MB Tx/Rx packet buffer memory	June '00	Cisco IOS 12.(11)S3 or higher
WS-G5484	1000BASE-SX GBIC module with multimode fiber interface, SC connector, 550 meters	January '99	
WS-G5486	1000BASE-LH GBIC module with single-mode fiber interface, SC connector, up to 10 km	January '99	
WS-G5487	1000 BASE-VLR GBIC module with single-mode fiber interface, SC connector, up to 70 km	January '99	

Note: The 3GE-GBIC-SC(=) cards must be configured with WS-G5484, WS-G5486, or WS-G5487 modules. No third-party GBIC is currently approved by Cisco Systems.

Special Notes

1. When filling in the 3GE-GBIC-SC(=) sales order, do not use the following Cisco 7500 GBIC components: GBIC-SX, GBIC-SX=, GBIC-LX, GBIC-LX=.
2. When employing the Cisco 12008 or 12012 with 3GE-GBIC-SC(=) line cards, please ensure that the system is configured with full bandwidth (which is, one clock scheduler card and three switch fabric cards).
3. 3GE-GBIC-SC(=) and the GBIC part numbers can be ordered individually as spares.
4. MPLS-enabled Ethernet frames that are smaller than 2450 bytes can be switched without fragmentation. From 12.0.22S, this 2450 bytes size was extended to support 9180 bytes.

For more information please contact the Cisco 12000 marketing team at gsr-marketing@cisco.com.



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