Cisco 12000 Series 4-Port Gigabit Ethernet ISE Line Card

Product Overview

The Cisco 12000 Series 4-Port Gigabit Ethernet ISE Line Card delivers a comprehensive range of features at line rate that enable the Cisco 12000 Series to accommodate many Layer 2 and Layer 3 Ethernet edge applications such as metro Ethernet aggregation, peering, and Cisco IPv6 services without compromising performance. The line card provides granular quality of service (QoS) with dedicated queues per virtual LAN (VLAN). Each card supports 4 physical ports and 1020 VLANs, and 4 classes of service can be provided in each VLAN or port.

The card has been designed to be highly flexible to accommodate the new features required by service providers. Supported by the Cisco 12000 Series distributed system architecture, the 4-port Gigabit Ethernet line card provides advanced features, and it maintains performance when the features are enabled as a result of the dedicated Layer 3 forwarding application-specific-integrated-circuit (ASIC) and advanced-memory components. The card’s features include industry-leading QoS, which is ideal for customer service-level agreements (SLAs), extended access control lists (ACLs) to address security risks, rate limiting to ensure that all customers are served according to the SLAs, a comprehensive set of Multiprotocol Label Switching (MPLS) features for high-level services to customers, and Ethernet features such as VLANs, source and destination Media Access Control (MAC) accounting, and jumbo frames.

Applications

The Cisco 12000 Series 4-Port Gigabit Ethernet ISE Line Card is designed to interconnect Cisco 12000 Series routers with other systems in points of presence (POPs), including edge routers and multilayer switches, providing a cost-effective, high-bandwidth solution for intra-POP connectivity, metro Ethernet aggregation, and peering.

Intra-POP Connectivity

Because of its cost-effectiveness and simple configuration, many service providers have adopted Gigabit Ethernet for intra-POP connectivity to aggregate traffic from routers and switches. The 4-port Gigabit Ethernet line card can be used to connect multiple networking devices in a POP (Figure 2).
Metro Ethernet

Metro Ethernet is an area in which delivering features over VLAN is critical because a Layer 2 Ethernet switched network transported over either a Synchronous Optical Network/Synchronous Digital Hierarchy (SONET/SDH) infrastructure or dark fiber will map user traffic to individual or multiple VLANs, which need to be terminated on the provider edge router. With the 4-port Gigabit Ethernet line card, all the VLANs can be terminated from a switch, and all the features can be applied in this card instead of relying on the switch. The line card supports important features over VLAN: Ethernet over MPLS (EoMPLS), QoS, rate limiting, rate shaping, and Layer 3 VPN (Figure 3).
Peering

Peering applications demand security features against denial-of-service network attacks (xACL, Unicast Reverse Path Forwarding (uRPF), rate limiting, and packet coloring to ensure traffic does not exceed the committed rate, and Border Gateway Protocol (BGP) Policy Accounting/NetFlow for billing. The 4-port Gigabit Ethernet line card excels in these applications (Figure 4).

Figure 4
Peering

Features and Benefits

The Cisco 12000 Series 4-Port Gigabit Ethernet ISE Line Card maintains performance when these features are fully configured:

- *Industry-leading QoS features*—Help maintain customer SLAs through dedicated queues per VLAN, class-based congestion control, a priority-based queuing algorithm, rate limiting, and traffic shaping
- *Extended ACLs*—Enable service providers to protect their networks from security risks
- *Comprehensive MPLS features*—Allow service providers to offer high-level services to their customers through extensive MPLS VPN functions, Layer 2 transport using EoMPLS, and traffic engineering
- *Accounting mechanisms*—Enable service providers to support customer billing and network profiling applications through the use of byte and packet counters and sampled NetFlow
- *Extensive Layer 2 features*—Support 1020 VLANs per card, source and destination MAC accounting, VLAN-based accounting, and jumbo frames
- *Cisco IPv6 provider edge router and ACL*
The Cisco 12000 Series 4-Port Gigabit Ethernet ISE Line Card supports three types of small form-factor pluggable (SFP) transceivers. All are hot-swappable, operate in full-duplex mode, and are 802.3z-compliant. Each of the Gigabit Ethernet interfaces can be configured with:

- 1000BASE-SX: 850-nanometer (nm), serial, multimode fiber for 550-meter (m) transmission
- 1000BASE-LH: 1310-nm, serial, single-mode fiber for 10-kilometer (km) transmission
- 1000BASE-ZX: 1550-nm, serial, single-mode fiber for 70-km transmission

The Cisco 12000 Series represents the industry’s most intelligent portfolio of 10-Gbps routing solutions to service-enable the carrier IP/MPLS core and edge networks. This proven portfolio uses state-of-the-art silicon and software technologies, delivering uncompromising 10-Gbps routing performance, superior QoS capabilities, comprehensive high-availability support, and integrated core and edge features. With a fully upgradable modular switch fabric, the Cisco 12000 Series provides the industry’s only proven investment protection and lowest total cost of ownership. Based on years of innovation and on a base of more than 20,000 systems installed worldwide, the Cisco 12000 Series is uniquely positioned for carriers worldwide to build the most sophisticated and competitive 10-Gbps IP/MPLS service delivery infrastructure.

**Product Specifications**

**Table 1  Product Specifications**

<table>
<thead>
<tr>
<th>Chassis Compatibility</th>
<th>All Cisco 12000 Series chassis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software Compatibility</td>
<td>Cisco IOS® Software Release 12.0(25)S or later</td>
</tr>
</tbody>
</table>
• 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 (IGMP) versions 1 and 2; Cisco Group Management Protocol (CGMP); Multiprotocol Border Gateway Protocol (MBGP); Multicast Source Discovery Protocol (MSDP); and others  
• Comprehensive MPLS support  
• Traffic engineering using RRR |
| Cards, Ports, Slots   | 4 ports per line card, per chassis slot  
15 slots in Cisco 12016 and 12416 routers—60 ports  
11 slots in Cisco 12012 Router—44 ports  
9 slots in Cisco 12410 Router—36 ports  
7 slots in Cisco 12008 Router—28 ports  
5 slots in Cisco 12406 Router—20 ports  
3 slots in Cisco 12404 Router—12 ports |
**Connectivity**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short reach:</td>
<td></td>
</tr>
<tr>
<td>Connector type:</td>
<td>LC duplex</td>
</tr>
<tr>
<td>Wavelength:</td>
<td>850 nm</td>
</tr>
<tr>
<td>Fiber type:</td>
<td>multimode fiber</td>
</tr>
<tr>
<td>Core size:</td>
<td>50.0 microns</td>
</tr>
<tr>
<td>Modal bandwidth:</td>
<td>500 MHz per km</td>
</tr>
<tr>
<td>Cable distance:</td>
<td>550 m</td>
</tr>
<tr>
<td>Link power budget:</td>
<td>7.5 decibels (db)</td>
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<tr>
<td>Long reach:</td>
<td></td>
</tr>
<tr>
<td>Connector type:</td>
<td>LC</td>
</tr>
<tr>
<td>Wavelength:</td>
<td>1310 nm</td>
</tr>
<tr>
<td>Fiber type:</td>
<td>single-mode fiber</td>
</tr>
<tr>
<td>Core size:</td>
<td>9/10 microns</td>
</tr>
<tr>
<td>Cable distance:</td>
<td>10 km</td>
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<tr>
<td>Link power budget:</td>
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<td>Very long reach:</td>
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<tr>
<td>Connector type:</td>
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<td>Wavelength:</td>
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<tr>
<td>Fiber type:</td>
<td>single-mode fiber</td>
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<tr>
<td>Core size:</td>
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</tr>
<tr>
<td>Cable distance:</td>
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<tr>
<td>Link power budget:</td>
<td>23 db</td>
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**Features and Functions**

<table>
<thead>
<tr>
<th>Feature</th>
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<tbody>
<tr>
<td>IP, MPLS-TE, and MPLS-VPN:</td>
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<tr>
<td>IP and MPLS load balancing:</td>
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<tr>
<td>MPLS, VPN mapping, EoMPLS:</td>
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<tr>
<td>IPv6:</td>
<td></td>
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<tr>
<td>Forwarding in hardware (3.6 Mpps):</td>
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<tr>
<td>ACL, 6 PE in hardware:</td>
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</tr>
<tr>
<td>Statistics and accounting:</td>
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<tr>
<td>Byte and packet counting for IP and MPLS packets on port and VLAN level:</td>
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</tr>
<tr>
<td>Packet counting for Modified Deficit Round Robin (MDRR) and Weighted Random Early Detection (WRED) on port and VLAN level:</td>
<td></td>
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<tr>
<td>Sampled NetFlow (v5) and Aggregate NetFlow (v8) on port and VLAN level:</td>
<td></td>
</tr>
<tr>
<td>BGP policy accounting per port or VLAN level:</td>
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</tr>
<tr>
<td>Security:</td>
<td></td>
</tr>
<tr>
<td>Extended ACLs (filtering) on port and VLAN level:</td>
<td></td>
</tr>
<tr>
<td>Unicast Reverse Path Forwarding Loose Mode only (anti-spoofing checks) on port and VLAN level:</td>
<td></td>
</tr>
<tr>
<td>ICMP rate limiting on port and VLAN level:</td>
<td></td>
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### Features and Functions (Continued)

- **QoS**
  - 1024 interfaces per card (4 ports and 1020 VLANs) sharing 4096 queues
  - 4 queues per port or VLAN, WRED/MDRR per port or VLAN and queue
  - Rate limiting on the ingress and egress side (port and VLAN)
  - Traffic shaping on the ingress and egress side (port and VLAN)
  - Hierarchical rate shaping (port or VLAN level and queue level)
  - Policy based routing in port or VLAN level Ethernet
  - 802.1q VLAN support, 1020 VLANs, jumbo frames
  - Source and destination MAC accounting and VLAN accounting

- **Ethernet**
  - 802.1q VLAN support, 1020 VLANs, jumbo frames
  - Source and destination MAC accounting and VLAN accounting

- **Memory**
  - 256 MB of route table memory and 512 MB of packet memory (256 MB Tx and 256 MB Rx) as default; 512 MB upgrade as spare for route memory; no upgrades for packet memory

- **Options**
  - ISE-MEM-512-UPG (route memory upgrade)

- **Performance**
  - 3.6–3.8 Mpps in ingress; 3.2–3.5 Mpps in egress (with all features configured)
  - 2.5 Gbps for 40–46 bytes packets (64 bytes Ethernet frame)
  - 3 Gbps for packet sizes of 80 bytes or more
  - Sustained performance in fully loaded system
  - Sustained performance for all IP prefix sizes
  - No performance drops as features are enabled

- **Environmental Conditions**
  - **Temperature**
    - Operating, nominal: 41 – 104°F (5 – 40°C)
    - Operating, short term: 23–131°F (~5 – 55°C)
    - Storage: –4 – 149°F (~20 – 65°C)
  - **Humidity**
    - Operating, nominal: 5 – 85% relative humidity
    - Operating, short term: 5 – 90% relative humidity
    - Storage: 5 – 95% relative humidity
  - **Altitude**
    - Operating altitude: –60 to 4000 m

- **Reliability and Availability**
  - Nonservice affecting online insertion and removal (OIR), route processor redundancy plus (RPR+), stateful switchover

- **Network Management**
  - Cisco IOS Software command-line interface (CLI)
  - Cisco 12000 Manager for configuration, fault, and performance element management
  - Simple Network Management Protocol (SNMP)

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**Table 1** Product Specifications

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<td></td>
<td>Simple Network Management Protocol (SNMP)</td>
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### Physical Specifications

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<tr>
<th>Line Card</th>
<th>Shipping</th>
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<tbody>
<tr>
<td>• Weight: 8.0 lb (3.6 kg)</td>
<td>• Weight: 21 lb (9.5 kg)</td>
</tr>
<tr>
<td>• Height: 14.5 in. (36.8 cm)</td>
<td>• Height: 25 in. (63.5 cm)</td>
</tr>
<tr>
<td>• Width 1.25 in. (3.2 cm)</td>
<td>• Width: 7 in. (17.7 cm)</td>
</tr>
<tr>
<td>(occupies single thin slot)</td>
<td>• Depth: 25 in. (63.5 cm)</td>
</tr>
<tr>
<td>• Depth: 18.5 in. (45.7 cm)</td>
<td></td>
</tr>
</tbody>
</table>

### Power

- 105W

### Compliance

This product meets the following requirements:

**Safety**
- UL 60950
- CSA 22.2-No. 60950
- EN60950
- IEC 60950 CB Scheme
- ACA TS001
- AS/NZS 3260
- EN 60825
- IEC 60825 laser safety
- FDA Code of Federal Regulations (USA) laser safety

**Electromagnetic Interference**
- FCC CFR 47-Part 15 Class A
- ICES 003 Class A
- AS/NRZ 3548 Class B
- EN55022 Class B (up to 1 GHz)
- VCCI Class B
- CISPR 22 Class B (up to 1 GHz)
- IEC-1000-3-2 power line harmonics
- IEC 61000-3-3 voltage fluctuations and flicker
- ETSI EN 300 386 (EN5502 CLASS B)

**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
- IEEE 802.3

Network Equipment Building Systems (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
Availability and Ordering

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
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<tbody>
<tr>
<td>Cisco 12000 Series 4-Port Gigabit Ethernet ISE Line Card</td>
<td>4GE-SFP-LC</td>
</tr>
<tr>
<td>Cisco 12000 Series 1000BASE-SX Short-Reach/Short-Wavelength SFP (mini-GBIC) Module with Multimode Fiber Interface, LC connector</td>
<td>GLC-SX-MM</td>
</tr>
<tr>
<td>Cisco 12000 Series 1000BASE-ZX Very Long Reach SFP (mini-GBIC) Module with Single-Mode Fiber Interface, LC connector</td>
<td>GLC-ZX-SM</td>
</tr>
</tbody>
</table>

Service and Support

Cisco Systems offers a wide range of service and 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 the success of its service provider customers.

For More Information

For more information about Cisco service and support programs and benefits, go to:

For more information about the Cisco 12000 Series, visit Cisco at:
http://www.cisco.com/go/12000 or contact your account representative today.