

# Cisco Catalyst **4000/4500** Series Gigabit Ethernet Modules

## Overview

The Cisco Catalyst<sup>®</sup> 4000/4500 series of scalable, modular, high-density, switches deliver high performance, integrated Layer 2, 3 and 4 switching with intelligent services, for network control and resiliency. These switches offer a rich variety of 1000-Mbps Gigabit Ethernet modules that include both fiber, and copper, interfaces for Gigabit server and desktop Enterprise switching solutions and Service Provider metropolitan Ethernet networks. Gigabit Ethernet switching modules include cost-effective, high-performance 1000BASE-X Gigabit Interface Converter (GBIC)-based Gigabit Ethernet line cards and the highest density 48-port 10/100/1000BASE-T triple speed auto-sensing, auto-negotiating Gigabit Ethernet line card and system in the industry.

## Product Description

### Gigabit-over-Copper Modules

The Cisco Catalyst<sup>®</sup> 4000/4500 Series offers a rich variety of gigabit-over-copper solutions for wiring closets and server farms, enabling high-density gigabit connectivity to the desktop and servers over Category 5 copper cabling. The two line card options for the Cisco Catalyst<sup>®</sup> 4000/4500 Series, shown below, include the 48-port 10/100/1000BASE-T (WS-X4448-GB-RJ45), and the 24-port 10/100/1000BASE-T (WS-X4424-GB-RJ45) module.

**Figure 1**  
48-Port Line Card (WS-X4448-GB-RJ45)



**Figure 2**  
24-Port Line Card (WS-X4424-GB-RJ45)



### 48-Port 10/100/1000BASE-T Line Card (WS-X4448-GB-RJ45)

The Cisco Catalyst 4000/4500 Series 48-port 10/100/1000BASE-T line card extends Cisco's leadership in the modular switched Ethernet market, providing the industry's highest density auto-negotiating Gigabit Ethernet from the network edge directly to desktop computers. This line card provides 48 RJ-45 ports with triple speed auto-sensing and auto-negotiating technology, enabling all ports to be used at 10 Mbps, 100 Mbps, or 1000 Mbps up to 100 meters over Category 5 copper cabling for optimum flexibility and investment protection. This module provides wiring closet investment protection by allowing Fast Ethernet desktops today to migrate to Gigabit Ethernet in the future without replacing

the switch line cards. The 48 ports can burst to Gigabit Ethernet line rate and share 12 Gbps of capacity (6 Gbps full-duplex) into the switching fabric. The amount of oversubscription can be controlled by varying the number of ports used at 1000 Mbps. All ports can utilize Gigabit EtherChannel or IEEE 802.3ad for high-speed interconnection applications. All ports use the standard IEEE 802.1x flow control (PAUSE frame) mechanism to control Gigabit Ethernet host traffic.

**24-Port 10/100/1000BASE-T Line Card (WS-X4424-GB-RJ45)**

The Cisco Catalyst 4000/4500 Series 24-port 10/100/1000BASE-T line card provides 24 RJ-45 ports with triple speed auto-sensing and auto-negotiating technology, enabling all ports to be used at 10 Mbps, 100 Mbps, or 1000 Mbps up to 100 meters over Category 5 copper cabling. This module provides wiring closet investment protection by allowing Fast Ethernet desktops today to migrate to Gigabit Ethernet in the future without replacing the switch line cards. The 24 ports can burst to Gigabit Ethernet line rate and share 12 Gbps of capacity (6 Gbps full-duplex) into the switching fabric. The amount of oversubscription can be controlled by varying the number of ports used at 1000 Mbps. All ports can utilize Gigabit EtherChannel or IEEE 802.3ad for high-speed interconnection applications. All ports use the standard IEEE 802.1x flow control (PAUSE frame) mechanism to control Gigabit Ethernet host traffic.

**Gigabit-over-Fiber GBIC-Enabled Modules**

The Cisco Catalyst 4000/4500 Series offers a rich variety of GBIC-enabled gigabit-over-fiber solutions for high-performance Gigabit Ethernet uplinks and server farm connectivity. The three GBIC-enabled gigabit line card options for the Cisco Catalyst 4000 Series, shown below, include the 6-port 1000BASE-X (WS-X4306-GB), the 18-port 1000BASE-X (WS-X4418-GB), and the 48-port 1000-BASE-LX module.

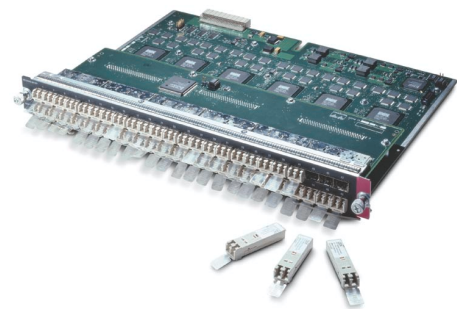
**Figure 3**  
6-Port Line Card



**Figure 4**  
18-Port Line Card



**Figure 5**  
48 port 1000-BASELX Line Card



**Six-Port GBIC-Enabled Gigabit Ethernet Line Card (WS-X4306-GB)**

The Cisco Catalyst 4000/4500 Series six-port Gigabit Ethernet line card provides six ports of dedicated 1000BASE-X Gigabit Ethernet uplinks for high-speed backbone, switch-to-switch applications or small server-farm applications. It uses the versatile GBIC technology so intrabuilding multimode connections can be intermixed with long-distance, campus, single-mode connections. All ports can utilize Gigabit EtherChannel or IEEE 802.3ad for high-speed interconnection applications.

**18-Port GBIC-Enabled Gigabit Ethernet Line Card (WS-X4418-GB)**

The Cisco Catalyst 4000/4500 Series 18-port Gigabit Ethernet line card provides two ports of dedicated 1000BASE-X GBIC-based Gigabit Ethernet uplinks, as well as up to 16 GBIC-based ports for high-performance Gigabit Ethernet server connectivity. The 16 server ports can burst to Gigabit Ethernet line rate and share 8 Gbps of capacity (4 Gbps full-duplex) into the switching fabric. Because all ports use GBICs, the amount of oversubscription can be controlled by varying the number of GBICs used. All ports can utilize Gigabit EtherChannel or IEEE 802.3ad for high-speed interconnection applications. The server ports use the standard IEEE 802.1x flow control (PAUSE frame) mechanism to control Gigabit Ethernet host traffic.

## **48-Port 1000-BASE-LX Gigabit Ethernet Line Card (WS-X4448-GB-LX)**

The Cisco Catalyst 48-port 1000BASE-LX Gigabit Ethernet line card provides 48 ports of high-performance 1000BASE-LX Gigabit Ethernet connectivity allowing service providers to run point-to-point Gigabit Ethernet links over single-mode fiber within the access/distribution layer of their metropolitan Ethernet network. This line card leverages, and includes, 48 1000BASE-LX small form-factor pluggable (SFP) optics for a high density solution. The 48 ports can burst up to Gigabit Ethernet line rate and share 12 Gbps of capacity (6 Gbps full-duplex) into the switching fabric. The amount of oversubscription can be controlled by controlling the number of ports enabled. All ports use the standard IEEE 802.1x flow control (PAUSE frame) mechanism to control Gigabit Ethernet host traffic.

### **Key Benefits**

#### **High Performance and Cost-Effective Gigabit Ethernet Connectivity**

Delivering advanced switching solutions that scale bandwidth as you add ports, the Cisco Catalyst 4000/4500 Series solution is powered by leading-edge ASIC technology that offers non-blocking, Cisco Express Forwarding (CEF) based Layer 2/3/4 switching at 48 Mpps and 64 Gbps with intelligent services. Supporting a very low latency, centralized, shared-memory switching fabric architecture, the Cisco Catalyst 4000/4500 Series enables high performance, Gigabit Ethernet server connectivity and Gigabit Ethernet to the desktop. By blending advanced engineering and advances in manufacturing, the Cisco Catalyst 4000/4500 Series delivers powerful Gigabit Ethernet switching solutions at a very cost-effective price point.

#### **Functionally Transparent gigabit Ethernet Line Cards**

The Cisco Catalyst 4000/4500 Series architecture enables customers to easily upgrade all Gigabit Ethernet line cards on their Cisco Catalyst 4000 systems to higher-layer switching functionality by simply adding a new Supervisor Engine. This enables customers to easily upgrade their networks to deploy new higher-layer functionality on their Gigabit Ethernet switching solutions without replacing existing Gigabit Ethernet line cards.

#### **Scalable and Reliable Gigabit Ethernet Solutions**

The modular chassis flexibility, variety of Gigabit Ethernet modules, redundant Supervisor Engine IV (Cisco Catalyst 4507R only), integrated and redundant inline power supplies and software redundancy features ensure that the Cisco Catalyst

4000/4500 Series meets customers' needs by delivering reliable, fault-tolerant, and scalable Gigabit switching solutions. Cisco Gigabit EtherChannel<sup>®</sup> technology, which is based on proven EtherChannel technology pioneered by Cisco and extensively deployed in networks worldwide, and support for IEEE 802.3ad (Link Aggregation Control Protocol), enables customers to deploy multigigabit links in server farms that scale up to 8 Gbps ports for each Gigabit EtherChannel. Port redundancy with UplinkFast and PortFast, Spanning Tree Algorithm enhancements, and link redundancy with Gigabit EtherChannel, across Gigabit links, ensures reliable and fault-tolerant operations of critical applications.

#### **Gigabit Ethernet Solutions with Intelligent Services for Control for Converged Data, Voice and Video Networks**

The Cisco Catalyst 4000/4500 Series Gigabit Ethernet solutions deliver intelligent services, such as quality of services, security, availability, multicast, and manageability. These intelligent services coupled with predictable high performance Gigabit switching improve network control and efficiency and enable the deployment of Internet business solutions for business productivity gains. Consistent intelligent services across the Cisco Catalyst switching portfolio, that includes the Cisco Catalyst 2950, 3550, 4500, and 6500 Series, enables customers to deploy scalable and flexible Gigabit Ethernet solutions with seamlessly interoperability and simplified management.

### **Features**

- Support for 32,000 MAC addresses dynamically allocated between active ports
- Hardware-based support for 4000 virtual LANs (VLANs)
- 64-Gbps capacity and 48-Mpps CEF-based integrated Layer 2/3/4 performance
- Hot swap capability on all Gigabit Ethernet line cards
- Support for up to 240 ports of 10/100/1000 RJ-45 in one Cisco Catalyst 4000/4500 chassis
- Gigabit Ethernet modules in the Cisco Catalyst 6500 Series are based on industry-standards IEEE 802.3z and IEEE 802.3ab, ensuring vendor interoperability and long-term investment protection
- All Gigabit Ethernet ports can be 1000BASE-SX, 1000BASE-LX/LH, 1000BASE-ZX, or CWDM, by using flexible, hot-swappable, GBIC modules
- GBIC-based Gigabit Ethernet modules enable data transmission up to 100 km, supporting fiber-optic SC interfaces for both multimode and single-mode connectivity

- Copper-based Gigabit Ethernet modules enable transmission at 10/100/1000 or 1000 Mbps speeds up to 100 meters over Category 5 cables
- Gigabit EtherChannel technology across all 1000 Mbps ports
- IEEE 802.3ad (Link Aggregation Control Protocol) technology across all 1000 Mbps ports 802.1s and 802.1w (Multi-Instance Spanning Tree and Rapid Convergence) for network scalability and reliability
- Granular quality of service with four queues per port
- Functionally transparent Gigabit Ethernet line cards

- Long distance runs of Gigabit Ethernet over single-mode fiber over single-mode fiber

### Cisco Catalyst 4000/4500 Series Gigabit Ethernet Port-Density Configuration Ranges

The fully loaded Catalyst 4003/4503 supports one Supervisor Engine and two line cards. The fully loaded Catalyst 4507R supports one, or two, Supervisor Engine IVs for a redundant supervisor configuration and five line cards. Table 1 lists the minimum and maximum number of Gigabit Ethernet ports, as well as the port-density alternatives and interface types for the Cisco Catalyst 4500 Series.

**Table 1** Cisco Catalyst 4000/4500 Series 1000BASE-T Gigabit Ethernet Port-Density Configuration Options

Cisco Catalyst 4500 Series Switching Modules	Number of Interfaces Supported per Line Card (Type)	Min/Max Interfaces per Chassis	
		Cisco Catalyst 4503	Cisco Catalyst 4506 and 4507R
Number of Gigabit Ethernet Uplinks on Supervisor	N/A	2	2
WS-X4306-GB	6 (GBIC)	6/12	6/30
WS-X4418-GB	18 (GBIC)	18/36	18/90
WS-X4424-GB-RJ45	24 (RJ-45)	24/48	24/120
WS-X4448-GB-RJ45	48 (RJ-45)	48/96	48/240
WS-X4448-GB-LX	48 (SFP)	48/96	48/240

### Ordering Information

**Table 2** Cisco Catalyst 4000/4500 Gigabit Ethernet Module Part Number

Product Number	Description
WS-X4306-GB	Cisco Catalyst 4000/4500 Gigabit Ethernet Module, 6 ports (GBIC)
WS-X4418-GB	Cisco Catalyst 4000/4500 GE Module, Server Switching 18 ports (GBIC)
WS-X4448-GB-LX	Cisco Catalyst 4000/4500 48-port 1000BASE-LX module (prepopulated with 48 1000BASE-LX SFP optics)
WS-X4424-GB-RJ45	Cisco Catalyst 4000/4500 24-port 10/100/1000 Module (RJ-45)
WS-X4448-GB-RJ45	Cisco Catalyst 4000/4500 48-port 10/100/1000 Module (RJ-45)
WS-G5484	1000BASE-SX 'Short-Wave' GBIC (multimode only)
WS-G5486	1000BASE-LX/LH long haul GBIC (single-mode or multimode)
WS-G5487	1000BASE-ZX extended reach GBIC (single-mode only)
CWDM-GBIC-XXXX	1000BASE-CWDM GBIC (please refer to CWDM GBIC data sheet)
CWDM-MUX-XX	CWDM OADM (please refer to CWDM GBIC data sheet)

## Technical Specifications

**Table 3** Gigabit Ethernet Link Distances

Fiber Core	62.5um Multimode	50um Multimode	9/10um Single Mode
Fiber Modal Bandwidth	160/500 MHz-km 200/500 MHz-km	400/400 MHz-km 500/500 MHz-km	N/A
1000BASE-SX	220 m 275 m	500 m 550 m	N/A
1000BASE-LX/LH	550 m 550 m	550 m 550 m	10 km
1000BASE-ZX	N/A	N/A	70 to 100 km
Coarse Wave Division Multiplexing (CWDM)	N/A	N/A	100 km

### Standard Network Protocols

- Gigabit Ethernet: IEEE 802.3z, IEEE 802.3x, IEEE 802.3ab
- 1000BASE-X (GBIC)
  - 1000BASE-SX
  - 1000BASE-LX/LH
  - 1000BASE-ZX
- CWDM

### EtherChannel Technology

- Gigabit EtherChannel technology: All 1000-Mbps ports
  - IEEE 802.3ad (Link Aggregation Control Protocol): All 1000-Mbps ports
- Port Aggregation Protocol (PagP): Yes
- Number of ports per tuple: 8
- EtherChannel and 802.3ad technology across line cards: Yes

### Gigabit Switching Line Card Modules

#### 6-port Gigabit Ethernet Module

- 6 Gigabit Ethernet ports, GBIC slots
- Status: Green (operational)/red (faulty)
- Link: Green (operational)/red (faulty)

#### 18-port Gigabit Ethernet Module

- 18 Gigabit Ethernet ports, GBIC slots
- Status: Green (operational)/red (faulty)
- Link: Green (operational)/red (faulty)

#### 48-port 1000BASE-LX Gigabit Ethernet Line Module

- 48 Gigabit Ethernet ports, SFP slots
- Status: Green (operational)/red (faulty)
- Link: Green (operational)/red (faulty)

#### 24-port 10/100/1000BASE-T Gigabit Ethernet Module

- 24 10/100/1000BASE-T auto-sensing ports, RJ-45 interface
- Status: Green (operational)/red (faulty)
- Link: Green (operational)/red (faulty)

#### 48-port 10/100/1000BASE-T Gigabit Ethernet Module

- 48 10/100/1000BASE-T auto-sensing ports, RJ-45 interface
- Status: Green (operational)/red (faulty)
- Link: Green (operational)/red (faulty)

### Physical Specification

- Occupies one slot in the Cisco Catalyst 6000 Series platform
- Dimensions (H x W x D): 1.2 x 14.4 x 16 in. (3.0 x 35.6 x 40.6 cm)

### 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
- Operating altitude: -60 to 4000 m

### Safety Conditions

- Fiber optic lasers: Class 1 laser products

### Safety Certifications

- UL 1950
- EN 60950
- CSA-C22.2 no 950
- IEC 950

## Electromagnetic Emissions Certifications

- FCC 15J Class A
- VCCI Class A
- CE Marking
- EN 55022 Class A
- EN 55024 Class A
- CISPR 22 Class A
- AS/NZ 3548
- NEBS Level 3 (GR-1089-CORE, GR-63-CORE)
- ETSI ETS-300386-2

## Cisco Catalyst 4500 Series Hardware Technical Specifications

Please refer to the Cisco Catalyst 4000 Series data sheet at:

[http://wwwin.cisco.com/cmc/cc/pd/si/casi/ps4324/prodlit/c4500\\_ds.htm](http://wwwin.cisco.com/cmc/cc/pd/si/casi/ps4324/prodlit/c4500_ds.htm)

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