Cisco 1- and 2-Port Multichannel Enhanced Capability Port Adapters

Cisco® 1- and 2-Port Multichannel Enhanced Capability Port Adapters provide hardware offload support of Multilink Point-to-Point Protocol (MLPPP), Multilink Frame Relay (MLFR), link fragmentation and interleaving (LFI), and FRF.12 at T3 line rate.

Product Overview

The 1- and 2-port multichannel T3 port adapters for the Cisco 7200 Series Routers and Cisco 7301 Router (Figure 1) are enhanced versions of the previous multichannel T3 port adapters (part numbers PA-MC-T3 and PA-MC-2T3+). The new port adapters address specific scalability challenges by increasing performance and lowering CPU usage. They offload advanced capabilities and features from the CPU, delivering them directly to meet enterprise and service provider WAN link-aggregation service requirements. Each port adapter T3 interface can be independently configured for either multichannel T3 or clear-channel packet-over-T3 operation. With T3 port configurations, connections to DS-3 and subrate DS-3 services can be provisioned. With multichannel T3 port configurations, up to 28 T1 links per T3 interface can be brought in on a singlewide port adapter. Each T1 can be further channelized to DS-0, making the port adapters highly flexible interfaces for WAN provisioning. The combination of multichannel T3 and clear-channel functions makes the Cisco 1- and 2-Port Multichannel Enhanced Capability Port Adapters ideal for today's rapidly changing WAN environment. Specific features such as MLPPP, MLFR, LFI, and FRF.12 have been offloaded from the CPU to further enable agile response to new services while using existing infrastructure connections to better advantage.

As an integral part of a service node where customer bandwidth needs are uncertain, the port adapters allow service providers to avoid determining beforehand how ports will be allocated between DS-0, DS-1, and DS-3 connections. For enterprise remote-site connection, the flexibility to support DS-0, DS-1, and DS-3 connections means the port adapters reduce equipment expenditures by integrating the capabilities and services of numerous port adapters onto a single adapter. They also provide investment protection by growing with the enterprise to meet the needs of both today's DS-0 and DS-1 aggregation networks and tomorrow's T3 aggregation networks.

Figure 1. Cisco 1- and 2-Port Multichannel Enhanced Capability Port Adapters

Applications

The Cisco 1- and 2-Port Multichannel Enhanced Capability Port Adapters meet a variety of service interconnection requirements, including concurrent support for leased line and Frame Relay. Enterprises and service providers can connect the DS-3 ports of the adapters into these services for aggregation of large numbers of remote-site and Internet service provider (ISP) customers into a central site. These multichannel port adapters combine advanced services and capabilities such as supporting MLPPP and MLFR bundling as well as performing LFI and FRF.12 fragmentation directly on the port adapter, thereby offloading the processing of these features from the central CPU of the router. With integrated DS-1 channel service unit/data service unit (CSU/DSU) functions, the port adapters are compatible with the large number of standards-compliant DS-1 CSU/DSUs on the market. As with the existing packet-over-T3 cards, in clear-channel mode, each DS-3 can be configured for full-rate or subrate operation that is compatible with a variety of third-party DS-3 DSUs.

The port adapters combine superior performance and an innovative design to provide the following benefits:

- Deliver line-rate performance while lowering CPU usage
- Perform all packet fragmentation and reassembly and resequencing for MLPPP and MLFR bundles while supporting LFI and FRF.12

Key Features and Benefits

Table 1 describes the features and benefits of the new port adapters.

Table 1. Features and Benefits of Cisco 1- and 2-Port Multichannel Enhanced Capability Port Adapters

Features	Benefits
Operation Modes	
Multichannel (channelized)	28 T1 ports multiplexed onto a single T3 connection per interface
Clear channel (unchanelized)	Offers an unchannelized 45-Mbps T3 clear channel per interface
Performance[1]	
Line rate	Provides full T3 line usage and throughput
New intelligent software architecture	Lower CPU usage increases router efficiency and improves resource usage, enabling more services
Feature Offloads	
MLPPP	Port adapter intelligence alleviates heavy processing of CPU-intensive features
MLFR	Lowers CPU processing while performing fragmentation and defragmentation
LFI	Reduces delay on slower-speed links by breaking up large datagrams and interleaving low-delay traffic packets with the smaller packets resulting from the fragmented datagram
FRF.12	Controls delay and delay variation when real-time traffic such as voice is carried across the same interfaces as data

[1] Performance constrained only by processing engine.
http://www.cisco.com/en/US/products/hw/modules/ps2033/products_data_sheet0900aecd8054951d.html#wp9000010#wp9000010

Features	Benefits
The new port adapters also include the following characteristics: • Support for up to 128 serial data channels per port adapter interface at speeds from N x DS-0 to DS-3 • One or 2 DS-3 (T3) lines • Twenty-eight DS-1 lines per DS-3 (T3) interface • Asynchronous bit serial PPP/High-Level Data Link Control (HDLC) delineation per RFC 1662 on all channels • 9000 maximum maximum-transmission-unit (MTU) size • MLPPP and MLFR support for up to 168 bundles with up to 12 T1 links per bundle, 168 for the combined two interfaces; no fractional T1s are allowed • Provision of receive and transmit statistics for runts, giants, cyclic-redundancy-check (CRC) errors, and frame-type counts • Support for the following serial encapsulation protocols: ◦ Frame Relay ◦ PPP ◦ HDLC	
DS-3	• Channelized DS-3 with 28 DS-1 lines • Unchannelized DS-3 supporting subrate and scrambling formats for: ◦ Digital Link DL3100 ◦ ADC/Kentrox DataSMART T3 IDSU ◦ Larscom Access-T45 ◦ Adtran T3SU 300 ◦ Verilink DLS2100 HDM2182DSUs • Full duplex and connectivity at DS-3 rate (44.736 Mbps per port) • DSX-3 level interface with dual female 75-ohm BNC coaxial connectors per port (separate RX and TX) • Bipolar-three-zero-substitution (B3ZS) line coding • C-bit parity and M23 framing • Internal or network clock selectable per DS-3 • Bit Error Rate Testing (BERT) pattern generation and detection per DS-3 • T3 local and line loopback • Generation and termination of DS-3 Maintenance Data Link (MDL) in C-bit framing • RFC 1407 MIB support
DS-1	• Superframe (SF), Extended Superframe (ESF), and J1 framing • Internal or network clock selectable per DS-1 • BERT pattern generation and detection per DS-1 or N x DS-0 channel • Local and line loopback • Generation and termination of Facilities Data Link (FDL) in ESF framing • RFC 1406 MIB support
Miscellaneous	• Faceplate LEDs for port adapter status ◦ PA Ready ◦ Port status ◦ Active/Loopback status ◦ Carrier/Alarm status • Support for LFI • Support for FRF.12 • High- and low-priority queues for each of the 1023 HDLC channels • Compliance with DS-3 pulse mask per ANSI T1.102-1993 • Compliance with ANSI T1.102-1993, ANSI T1.404-59, ANSI T1.404-5.10, ANSI T1.404-5.12-14, and Telcordia GR-499 • ANSI T1.404 • ANSI T1.107 • ANSI T1.231-1997 • ANSI T1.107 Far-End Alarm and Control Signals (FEAC) • ANSI T1.404 MDL • ANSI FDL • AT&T FDL
Software Features Not Supported	• E3 multiplexing (Channelized E3) • MLPPP or MLFR with unequal speed links in a bundle or higher speeds than T1 in a bundle • Loopbacks at N x DS-0 channel level

Feature Availability

Table 2 lists the router platforms, processors, and software releases that support the enhanced features available with the Cisco 1- and 2-Port Multichannel Enhanced Capability Port Adapters.

Table 2. Feature Availability

Feature	Supporting Platforms	Network Processing Engines	Cisco IOS® Software Release
Enhanced capability port adapters	Cisco 7204 and 7206VXR	Cisco 7200VXR Series NPE-G1 and NPE-G2 Network Processing Engines	12.4(11)T and 12.2SRC
MLPPP	Cisco 7204VXR, 7206VXR, 7201, and 7301	Cisco 7200 Series NPE-400, NPE-G1, and NPE-G2 Network Processing Engines	12.4(15)T1 and 12.2SRC
MLFR	Cisco 7204VXR, 7206VXR, 7201, and 7301	NPE-400, NPE-G1, and NPE-G2	12.4(15)T1 and 12.2SRC
LFI	Cisco 7204VXR, 7206VXR, 7201, and 7301	NPE-400, NPE-G1, and NPE-G2	12.4(15)T1 and 12.2SRC
FRF.12	Cisco 7204VXR, 7206VXR, 7201, and 7301	NPE-400, NPE-G1, and NPE-G2	12.4(15)T1 and 12.2SRC

Product Architecture

The port adapters support new algorithms for managing data. On the transmit side, they can either pull packets out of memory (Pull Model) or wait until the main processor pushes the packets to the port adapter (Push Model) for transmission. The Push Model, the most efficient algorithm, is activated only when the port adapters are installed on a Cisco 7204VXR, Cisco 7206VXR, Cisco 7201, or Cisco 7301 platform with the NPE-G1 and NPE-G2 network processing engines.

Chassis and Processors

The Cisco 1- and 2-Port Multichannel Enhanced Capability Port Adapters are supported on the platforms and processors listed in Table 3.

Table 3. Chassis and Processor Compatibility

Chassis	Processors and Cisco IOS Software Release	Total Number of Port Adapters Supported per Chassis (not line rate)
Cisco 7204VXR and 7206VXR	NPE-G1—12.4(11)T, 12.2SRC NPE-G2—12.4(11)T, 12.2SRC NPE-400—12.4(15)T1, 12.2SRC	6 plus 1 in the jacket card 6 plus 1 in the jacket card
Cisco 7201	12.4(15)T1, 12.2SRC	1 (1 dual- or 1 single-port adapter)
Cisco 7301	12.4(15)T1, 12.2SRC	1 (1 dual- or 1 single-port adapter)
Cisco Port Adapter Jacket Card	12.4(15)T1, 12.2SRC	1 (1 dual- or 1 single-port adapter)

Product Specifications

Table 4. Product Specifications

Feature	Specifications
Physical	• Dimensions (H x W x D): Approximately 1 x 6 5/8 x 7 inches (overall) (2.54 x 16.83 x 17.78 cm) • Approximate weight: 2.5 lb (1.13kg)
Environmental	• Storage temperature: –38 to 150℉ (–40 to 70℃) • Operating temperature, nominal: 77℉ (25℃) (ranges 0 to 40℃) (ranges 32 to 104℉) • Storage relative humidity: 5 to 95 percent relative humidity (RH) noncondensing • Operating humidity, nominal: 5 to 85 percent RH noncondensing • Operating humidity, short-term: 5 to 90 percent RH noncondensing • Operating altitude: –60 to 2000 meters (196.85 to 6561.68 ft)

Feature	Specifications
Regulatory Compliance	CE Marking
Safety	• CFR 47, Part 15 Class A • ICES 003 Class A • UL 60950-1 • IEC 60950-1 • EN 60950-1 • CAN/CSA-C22.2 No. 60950-1 • AS/NZS 60950.1
Emissions Requirements	• CFR 47, Part 15 Class A • ICES 003 Class A • CISPR 22 Class A • EN 55022 Class A • EN 300386:2001 • EN 61000-3-2:2000 • EN 61000-3-3:2000 • AS/NZS CISPR 22 Class A • VCCI: V-3/2000.04 Class B
Immunity Requirements	• EN 50082-1 • EN 55024 • EN300 386 • EN61000-6-1 The port adapters meet the following specifications as defined in the reference standards listed previously. The approval levels are those required by each country in which the product is marketed, sold, and used as detailed by the approval levels of the host system and relevant standards. Investigations will be made against the Cisco Quality levels for informational purposes as a measure of system quality. The quality levels are defined as follows: • EN 61000-4-2 ESD 8kV/15kV • EN 61000-4-3 Radiated Immunity 10V/m • EN 61000-4-4 EFT AC 4kV • EN 61000-4-4 EFT DC 4kV • EN 61000-4-4 EFT Sign. Line 1kV/2kV • EN 61000-4-5 Surge AC L-E 4kV • EN 61000-4-5 Surge AC L-L 2kV • EN 61000-4-5 Surge DC 1kV • EN 61000-4-5 Surge Sign. Line 500 V • EN 61000-4-6 RF conducted immunity 10V • EN 61000-4-8 Immunity to magnetic fields 30A • EN 61000-4-11 Voltage dips and interruptions AC Line

Ordering Information

To place an order, visit the Cisco Ordering Home Page and refer to Table 5.

Table 5. Ordering Information

Product Name	Part Number
Cisco 1-Port Multichannel Enhanced Capability Port Adapter	PA-MC-T3-EC
Cisco 1-Port Multichannel Enhanced Capability Port Adapter (SPARE)	PA-MC-T3-EC=
Cisco 2-Port Multichannel Enhanced Capability Port Adapter	PA-MC-2T3-EC
Cisco 2-Port Multichannel Enhanced Capability Port Adapter (SPARE)	PA-MC-2T3-EC=

Service and Support

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to extend network intelligence and the power of your business. For more information about Cisco Services, refer to Cisco Technical Support Services or Cisco Advanced Services.

For More Information

For more information about the Cisco 1- and 2-Port Multichannel Enhanced Capability Port Adapters, visit http://www.cisco.com/en/US/products/hw/modules/ps2033/ps2762/index.html or contact your local Cisco account representative.

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