DATA SHEET

ENHANCED ATM PORT ADAPTER (ATM PA-A3) OC-12c, STM4, OC3c, STM1, DS3, E3, IMA

The enhanced asynchronous transfer mode (ATM) port adapters (ATM PA-A3) are single-port, single and dual-wide ATM port adapters for the Cisco® 7200, 7500, and 7600 OSR series routers using the FlexWAN module for the Cisco Catalyst© 6000 family of switches. The ATM PA-A3 is designed with a high-performance, dual segmentation and reassembly (SAR) architecture with local buffer memory.

The PA-A3-OC12 family went End of Sale (EOS) on May 2005 and are no longer orderable.

The PA-A3-T3, PA-A3-E3, PA-OC3MM, PA-A3-OC3SML and PA-A3-OC3SMI will be End of Sale (EOS) on December 31, 2006 for all platforms supported. The PA-A3-8T1IMA and the PA-A3-8E1IMA are not affected by this end of sale announcement. For more details on the mentioned EOS PA's, please see the following bulletin:

http://www.cisco.com/en/US/prod/collateral/modules/ps2033/prod_end-of-life_notice0900aecd80224b94.html

The ATM PA-A3 supports advanced ATM hardware features listed in Table 1, such as per-virtual circuit (VC) and per-virtual path (VP) traffic shaping, as well as support for most ATM service classes such as non-real-time Variable Bit Rate (nrt-VBR), Available Bit Rate (ABR) and Unspecified Bit Rate (UBR), and support of 4096 ATM VCs.

Table 1. Platforms and Features Supported for Each Port Adapter

	PA-A3-OC3 PA-A3-T3 PA-A3-E3	PA-A3-OC12SMI PA-A3-OC12MI	PA-A3-8TIMA PA-A3-8EIMA
Cisco 7200 and 7200VXR series with NPE 150, 175, 200, 225, 300, 400, NSE-1 and NPE-G1 series router	Supported	Not supported	Supported
FlexWAN module for the Cisco Catalyst 6000 family	Supported	Not supported	Supported
Cisco 7500 series with VIP2-40 and VIP2-50	Supported	Not supported	Supported
Cisco 7500 series with VIP4-50	Supported	Not supported	Supported
Cisco 7500 series with VIP4-80	Supported	Supported	Supported
Form factor	Single-width Port Adapter	Dual-width Port Adapter	Single-width Port Adapter
Available Bit Rate (ABR)	Supported	Not supported	Supported
Non-real-time Variable Bit Rate (VBR-nrt)	Supported	Supported	Supported
Unspecified Bit Rate (UBR and UBR+)	Supported	Supported	Supported
LAN Emulation (LANE)	Supported	Will be supported in later Cisco IOS® release	Not supported
Class of Service (CoS), per VC and per-VP traffic shaping	Supported	Supported	Supported

Table 2. Ordering Information

Product Model	Product Description	Minimum Cisco IOS Release
PA-A3-OC12SM	1-port ATM OC-12c/STM-4 single-mode port adapter, enhanced	12.0(11)S, 12.0(11)ST3 12.1(3a)E, 12.2(1)T
PA-A3-T3	1-port ATM DS3 port adapter, enhanced	11.1(22)CC 12.0(1), 12.0(1)T, 12.0(5)S 12.1(1), 12.1(1)E, 12.1(1)T 12.2(1), 12.2(1)T
PA-A3-E3	1-port ATM E3 port adapter, enhanced	
PA-A3-OC3MM	1-port ATM OC-3c/ST-1 multimode port adapter, enhanced	
PA-A3-OC3SMI	1-port ATM OC-3c/STM-1 single-mode (IR) port adapter, enhanced	
PA-A3-OC3SML	1-port ATM OC-3/STM-1 single-mode (LR) port adapter, enhanced	
PA-A3-8T1IMA	ATM inverse multiplexer over ATM port adapter with 8 T1 ports	12.0(5)XE 12.1(1)E, 12.1(5)T 12.2(1), 12.2(1)T
PA-A3-8E1IMA	ATM inverse multiplexer over ATM port adapter with 8 E1 ports	

MAIN FEATURE SUMMARY

The ATM PA-A3 combines high performance and a wide array of new ATM features that are ideal for both enterprise wide-area network (WAN) and service provider backbone applications:

- IETF RFC 2684 (updated RFC 1483) support for multiple protocol encapsulations over ATM
- IETF RFC 2364 and 2516 for PPP over ATM
- IETF RFC 1577 support for classical IP and ARP over ATM
- 1024 concurrent SARs
- ATM service classes: UBR, UBR+, VBR-nrt, ABR (not on OC-12/STM-4 interface)
- ATM Forum UNI 3.0, 3.1, and 4.0
- Supports AAL5 ATM adaptation layer for data services
- Supports AAL2 ATM adaptation layer for voice services (Cisco 7200 with OC-3/STM-1, DS3 and E3 interfaces only)
- Up to 4096 simultaneous virtual circuits (VCs)
- Layer 2 per-VC and per-VP queuing and traffic shaping
- ATM PVCs and SVCs
- LANE 2.0 client and server
- F4 and F5 Operations and Maintenance (OAM) cell support
- MPOA client and server
- MPLS, MPLS Traffic Engineering, MPLS-VPN, MPLS-COS
- Interim Local Management Interface (ILMI)

ADVANCED TRAFFIC MANAGEMENT

Advanced traffic management mechanisms in the ATM PA-A3 architecture allow for the support of bursty, client/server traffic, while supporting applications that require guaranteed or best-effort service.

The ATM PA-A3 supports multiple ATM service classes, including Available Bit Rate (ABR), nrt-VBR and UBR, including UBR+ extensions.

Table 3. Supported Service Categories

ATM PA-A3 Service Classes	Typical Uses
Non-real time Variable Bit Rate (nrt-VBR)	Used for all applications that require a level-of-service guarantee through the ATM network
Unspecified Bit Rate (UBR and UBR+)	Used mostly for data applications requiring only best-effort service with little configuration required
Available Bit Rate (ABR)	Used to maximize bandwidth utilization of the ATM link through the use of congestion feedback notification (with ability to define minimum bandwidth). (Not available on OC-12c/STM-4)

PER-VC AND PER-VP TRAFFIC SHAPING

Traffic shaping is a function typically provided on ATM edge devices to ensure that bursty traffic conforms to a predetermined “contract.” More specifically, traffic shaping ensures that traffic from one VC does not adversely impact another, resulting in data loss. This function is very important when connecting to an ATM WAN or public ATM network—especially when the ATM switches enable traffic policing that will discard all traffic that exceeds the predetermined contract at the ingress of the ATM Network.

The ATM PA-A3 supports traffic shaping on a per-VC basis and per-VP basis. Supporting traffic shaping in hardware means that there is no performance degradation when shaping is enabled. Providing traffic shaping on a per-VC and per-VP basis allows flexibility and control over every VC and VP configured.

Depending on the selected ATM service class, the ATM PA-A3 supports highly configurable parameters such as: peak cell rate (PCR), sustainable cell rate (SCR), maximum burst size (MBS), and minimum cell rate (MCR). These parameters can be defined based on the specific bandwidth requirements of an individual VC, as needed for a specific application.

The ATM PA-A3 hardware “shapes” the VC to the specific parameters using a wheel-based scheduling algorithm to ensure fairness across the ATM interface. In the event that two cells compete for the same time slot, the VCs, by default, are prioritized in the following order (starting with highest priority): 1) OAM cells and signaling; 2) nrt-VBR; and 3) ABR; 4) UBR. Prioritizing the VCs in this manner ensures that the high priority and guaranteed traffic have precedence over the best-effort traffic. It is also possible to configure a custom prioritization scheme on a per-VC basis.

To provide further flexibility, the ATM PA-A3 allows each of these parameters to be set over a wide range of small increments.

Table 4. Supported Traffic Shaping Granularity—OC-3, DS3 and E3 Versions

Parameter	Range	Increments
Peak Cell Rate (PCR)	56 kbps to line rate	4.57-kbps increments for OC-3c/STM-1, 1.33-kbps increments for DS3, and 1.03-kbps increments for E3
Sustainable Cell Rate (SCR)	56 kbps to line rate	4.57-kbps increments for OC-3c/STM-1, 1.33-kbps increments for DS3, and 1.03-kbps increments for E3
Maximum Burst Size (MBS)	1 to 64,000 cells	One cell

HIGH-PERFORMANCE ARCHITECTURE

The ATM PA-A3 is based on an advanced dual-SAR architecture. One SAR processor is dedicated for transmission and one for reception. Each SAR supports AAL5 ATM adaptation for high-performance data applications. Many of the ATM PA-A3 advanced traffic management features mentioned previously are a direct result of this SAR design.

The ATM PA-A3 also includes a large amount of buffer memory locally on the port adapter—a feature unique to the ATM PA-A3. This buffer memory is partitioned on a per-VC and per-VP basis, providing better overall performance and the ability to absorb large bursts of traffic. This design ensures that bursty traffic from one VC does not prevent another VC from being serviced, an issue that could be crucial for any service provider ATM network.

ADVANCED BANDWIDTH MANAGEMENT FEATURE

Advanced bandwidth management mechanisms in the ATM network modules architecture allow for the support of bursty client/server traffic while supporting applications that require guaranteed or best-effort service. The ATM PA-A3's bandwidth management capabilities exceed those of existing older ATM interfaces in midrange routers.

This new feature provides the ability to keep track of the bandwidth used by a VC or VP on a per-interface basis. It prevents the over-subscription of the ATM link and is configurable by the user.

The total bandwidth allocated on the interface is tracked by aggregating the values specified for sustained cell rate for each VC. Whenever a new VC is requested, the requested rate is checked against the available rate to ensure the available bandwidth is not exceeded. This check can be disabled if link over-subscription is desired.

ATM LAYER CONNECTION MANAGEMENT

Operations and management (OAM) cells are used for ATM layer end-to-end link management messages. This ensures that the remote end of the connection is alive and functioning. Support is provided for both OAM F4 and F5 flows. During segmentation, the OAM cells have the highest priority, and will be transmitted ahead of other queued-up data. During reassembly, the OAM traffic will be routed to a global OAM receive buffer pool of 512 64-byte buffers.

MPLS

The Multiprotocol Label Switching (MPLS) feature classes that are supported include Basic MPLS, MPLS—Traffic Engineering, MPLS—Virtual Private Network (VPN) and MPLS-CoS.

IP TO COS FEATURES

The ATM PA-A3 port adapter supports Cisco IOS software's IP QoS to ATM Class of Service (IP to ATM CoS) feature. This implements a solution for coarse-grained mapping of quality of service (QoS) characteristics between IP and ATM. These features ensure consistent QoS between IP and ATM interworked networks. IP/ATM networks can now offer different service classes across the entire wide area network, not just the routed portion. Critical applications can be given higher classes of service during periods of high network usage and congestion. Great QoS flexibility becomes available for more important traffic and user types.

Per-Virtual Circuit QoS features allow one to apply advanced queueing and bandwidth management functionality like CBWFQ, WRED, or LLQ to an individual VC. Also supported is IP to ATM CoS mapping using the VC bundling feature that allows to divide traffic on different VCs depending on the desired CoS.

Extended Virtual Connections Capabilities

The ATM PA-A3 supports up to 4096 virtual connections (2048 for the IMA version) and up to 256 virtual paths. Any combinations of VC and VP can be supported up to a maximum number of 4096 VC/VP combinations. These VCs can be either permanent virtual connections that are created manually or switched virtual connections created through point-to-point and point-to-multipoint User-Network Interface (UNI) signaling.

These capabilities contribute to the high-performance throughput, and specifically benefits applications that require many VCs, such as in digital subscriber line (DSL) applications and in a campus local-area network (LAN).

Cisco IOS ATM Internetworking Services

Cisco IOS ATM services included in the ATM PA-A3, with specific features based on your Cisco IOS image, are:

ATM Internetworking

- Multiprotocol encapsulation with support for Logical Link Control/Subnetwork Access Protocol (LLC/SNAP) encapsulation and VC multiplexing (Internet Engineering Task Force [IETF] RFC 2684 updated RFC1483)
- Classical IP and Address Resolution Protocol (ARP) over ATM; client and ARP server (IETF RFC 1577, RFC 1755, RFC 1626)
- Multiprotocol routing over ATM for IP, Novell IPX, DECnet, AppleTalk Phases 1 and 2, Connectionless Network Service (CLNS), Xerox Network Systems (XNS), and Banyan VINES via IETF RFC 2684/1483
- Point-to-Point Protocol (PPP) encapsulation for the aggregation of ADSL subscribers' CPE using PVC and SVC (RFC2364 and RFC2516)
- ATM Forum LAN Emulation (LANE) including LEC, BUS, LES and LECS (available with Cisco IOS 12.1(6)E on the OC-12/STM-4 version)

ATM Services

- ATM Forum UNI 3.0/3.1/4.0 signaling for point-to-point and point-to-multipoint SVCs
- ATM Forum Interim Local Management Interface (ILMI) for address prefix acquisition and ATM service address registration
- ATM network service access point (NSAP) E.164 address support
- F4 (virtual path) and F5 (virtual connection) OAM cell segment and end-to-end flows, remote defect indication (RDI), and alarm indication signal (AIS)

Network Management

The ATM PA-A3 will support the following Management Information Bases (MIBs), depending on the Cisco IOS release deployed:

- MIB II
- Synchronous Optical Network (SONET) MIB
- AToM MIB
- ATM Integrated Local Management Interface (ILMI) MIB
- LAN Emulation (LANE) MIB
- DS3/E3 MIB

Table 5. Supported Interface Types

Interface	Rate	Connector Type	Cable Type	Wavelength	Maximum Distance
OC-12c/STM-4 single-mode intermediate reach	622 Mbps	SC	9 µm single mode fiber	1260 to 1360 nm	15 km
OC-12c/STM-4 multimode				1270 to 1380 nm	500m
DS3	44.736 Mbps	BNC	Coaxial 75 Ohm	N/A	450 ft
E3	34.368 Mbps				1250 ft
OC-3c/STM-1 multimode	155.52 Mbps	SC	62.5/125 um multimode fiber	1270 to 1380 nm	2 km
OC-3c/STM-1 single-mode intermediate reach			9 µm single mode fiber	1260 to 1360 nm	15 km
OC-3c/STM-1 single-mode long reach					45 km
DS1	1.544 Mbps	RJ-48c	Symmetric pair, 100 Ohm	N/A	650 ft (198 mt)
E1	2.048 Mbps		Symmetric pair, 120 Ohm		

Table 6. Power Parameters for Optical Interfaces

Interface	TX Power (min)	TX Power (max)	RX Power (min)	RX Power (max)	Power Budget
OC-12c/STM-4 single-mode intermediate reach	–19 dBm	–14 dBm	–30 dBm	–14 dBm	–11 dB
OC-12c/STM-4 multimode	–14 dBm	–20 dBm	–26 dBm	–14 dBm	–12 dB
OC-3c/STM-1 multimode	–20 dBm	–14 dBm	–30 dBm	–14 dBm	9 dB
OC-3c/STM-1 single-mode intermediate reach	–15 dBm	–8 dBm	–28 dBm	–8 dBm	15 dB
OC-3c/STM-1 single-mode long reach	–5 dBm	0 dBm	–35 dBm	–0 dBm	29 dB

Regulatory Compliance

Safety

UL 1950 (3rd Ed.)

CSA C22.2 No. 950-95

EN60950 (1992 including Amendments 1-4 and 11)

CE Marking

IEC 950 (2nd Ed. including Amendments 1-4)

AS/NZS3260 (1993 including Amendments 1-4)

EMI

FCC Part 15 Class A

ICES-003 Class A

VCCI Class B

EN55022 Class B

CISPR22 Class B

CE Marking

AS/NZS3548 Class B

FDA Class 1 laser

Product Compliance Standards

Environmental

Operating temperature: 10 to 40°C

CE Marking

IEC 950 (2nd Ed. including Amendments 1-4)

AS/NZS3260 (1993 including Amendments 1-4)

EMI

FCC Part 15 Class A

ICES-003 Class A

VCCI Class B

EN55022 Class B

CISPR22 Class B

CE Marking

AS/NZS3548 Class B

FDA Class 1 laser

Product Compliance Standards

Environmental

Operating temperature: 10 to 40°C

Corporate Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 526-4100

European Headquarters
Cisco Systems International BV
Haarlerbergpark
Haarlerbergweg 13-19
1101 CH Amsterdam
The Netherlands
www-europe.cisco.com
Tel: 31 0 20 357 1000
Fax: 31 0 20 357 1100

Americas Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-7660
Fax: 408 527-0883

Asia Pacific Headquarters
Cisco Systems, Inc.
168 Robinson Road
#28-01 Capital Tower
Singapore 068912
www.cisco.com
Tel: +65 6317 7777
Fax: +65 6317 7799

Cisco Systems has more than 200 offices in the following countries and regions. Addresses, phone numbers, and fax numbers are listed on the Cisco.com Website at www.cisco.com/go/offices.

Argentina • Australia • Austria • Belgium • Brazil • Bulgaria • Canada • Chile • China PRC • Colombia • Costa Rica • Croatia • Cyprus • Czech Republic Denmark • Dubai, UAE • Finland • France • Germany • Greece • Hong Kong SAR • Hungary • India • Indonesia • Ireland • Israel • Italy Japan • Korea • Luxembourg • Malaysia • Mexico • The Netherlands • New Zealand • Norway • Peru • Philippines • Poland • Portugal Puerto Rico • Romania • Russia • Saudi Arabia • Scotland • Singapore • Slovakia • Slovenia • South Africa • Spain • Sweden Switzerland • Taiwan • Thailand • Turkey • Ukraine • United Kingdom • United States • Venezuela • Vietnam • Zimbabwe

Printed in the USA C78-365324-00 09/06