

Enhanced ATM Port Adapter (ATM PA-A3)

OC-12c, STM-4, OC3, STM-1, DS3, E3, T1/E1, IMA

The Enhanced ATM port adapter (ATM PA-A3) family offers a variety of interfaces and support on platforms including the Cisco 7200 and 7500 series routers and the FlexWAN module for the Catalyst 6000 family of switches. Supporting OC-12c, STM-4, OC-3c, STM-1, DS3, E3, T1 and E1 inverse multiplexing over ATM (IMA), these ATM port adapters are designed for a wide range of asynchronous transfer mode (ATM) applications, including Intra-Pop connectivity, Digital Subscriber Line (DSL) aggregation, wide-area network (WAN) aggregation, metro and LAN Emulation over ATM (LANE) applications. The ATM PA-A3 is ideally suited for ATM-based enterprise WAN and service provider applications.

Cisco Systems has recently introduced a new addition to the PA-A3 product family. This OC-12c/STM-4 single-port, dual-wide port adapter (PA) allows higher speed support for WAN aggregation, Intra-Pop, LANE, and metro applications (available only on the Cisco 7500 series router with VIP4-80.) This allows ATM-based enterprise WAN and service providers to take advantage of the higher bandwidth and quality of service (QoS) available with ATM services. High-speed ATM access provides cost-effective, value-added, high-speed managed router services to both enterprise and service provider customers.

The Enhanced ATM port adapter includes a comprehensive ATM feature set including per-virtual circuit (VC) and virtual path (VP) traffic shaping, support for ATM services classes including Near-real time Variable Bit Rate (nrt-VBR), Available Bit Rate (ABR) except on the

OC-12c, Universal Bit Rate (UBR), Multiprotocol Label Switching (MPLS), QoS, a high-performance Segmentation and Reassembles (SAR) architecture, and support for more than 4000 ATM virtual connections. All of these features are based on industry specifications and standards.

The Enhanced ATM port adapter continues to add new features as it takes advantage of industry-leading Cisco IOS protocols, services and ATM-rich feature set.

These ATM port adapters address the growing demand for improved ATM QoS features, combined with the advanced Layer 3 class of service (CoS) capabilities provided by a router. Users now have the ability to provide robust QoS mechanisms for prioritization of traffic from legacy and high-speed local-area networks (LANs) over an ATM network. Managers can now cost-effectively terminate high-speed ATM, providing robust QoS features for applications at the corporate office for aggregation or campus applications.

The ATM PA-A3 complements the existing ATM port adapters including the ATM circuit emulation service (CES) PA (PA-A2), which provides multiservice (voice and data) integration on the Cisco 7200 for remote Enterprise WAN/ MAN applications and the lower-end ATM PA (PA-A1) providing a lower entry point for ATM applications (available only on some platforms).

The ATM port adapters support a variety of single port choices, including OC-12c, STM-4, OC-3c, STM-1, DS3, E3, or T1 and E1 IMA interfaces for worldwide use. These modules are designed to support the convergence of data, voice, and video services that allow customers to migrate existing voice and video traffic onto a corporate data network for substantial cost savings. Additional support of voice over ATM (VoATM) and multiservices will soon be available.

The entire PA-A3 product family is available on the Cisco 7200 and 7500 series routers and the FlexWAN module for the Catalyst 6000 family of switches except the OC-12/STM-4 version, which is only available on the Cisco 7500 series router with VIP4-80 platform. The PA-A2 is only supported on the Cisco 7200 series router.

Features/Benefits

Table 1 shows which platforms and features are supported for each port adapter.

Table 1

	PA-A3-OC3 PA-A3-T3 PA-A3 E3	PA-A3-OC12SM PA-A3-OC12MM	PA-A3-8TIMA PA-A3-8EIMA
Cisco 7200 series router	Supported	Not supported	Supported
Cisco 7500 series router	Supported	Supported	Supported beginning with 12.0(5XE), 12.1(E) and 12.0(11)S
FlexWAN module for the Catalyst 6000 family	Supported	Not supported	Not supported
VIP2-40	Supported	Not supported	Supported
VIP2-50	Supported	Not supported	Supported
VIP4-50	Supported	Not supported	Supported
VIP4-80	Supported	Supported	Supported
NPE-150	Supported	Not supported	Supported
NPE-200	Supported	Not supported	Supported
NPE-225	Supported	Not supported	Supported
NPE-300	Supported	Not supported	Supported
Single-wide port adapter	Supported	Not supported	Supported
Dual-wide port adapter	N/A	Supported	N/A
Available Bit Rate (ABR)	Supported	Not supported	Not supported
Near-real time Variable Bit Rate (Nrt-VBR)	Supported	Supported	Supported
Universal Bit Rate (UBR)	Supported	Supported	Supported
LAN Emulation (LANE)	Available	Supported beginning in 12.1(3)E and 12.1()T	Not supported
Class of Service(CoS)	Supported based on Cisco IOS release	Per VC and per VP traffic shaping is supported. All CoS features are not supported	Per Virtual Circuit (VC) and per Virtual Path (VP) traffic shaping is supported

A variety of new ATM features are now available through Cisco IOS. The overall benefit of these features, outlined in Table 2, allows these routers to be deployed in many ATM applications.

Table 2

Feature	Description/Comment	Benefits
Nine standards-based physical interfaces	The ATM PA-A3 supports OC-12c/STM-4-MM, OC-12c/STM4-SM, DS3, E3, OC-3c/STM-1 MM, OC-3c/STM-1 SM-IR, OC-3c/STM-1 SM-LR, T1 and E1 IMA.	A common set of advanced ATM PA-A3 hardware and software features can be deployed to any existing or new ATM infrastructure through common physical interfaces.
Unique high-performance hardware architecture	The ATM PA-A3 design uses dual high-performance, feature-rich SARs with local buffering and ATM service category prioritization.	This allows the ATM PA-A3 to provide high performance.
Advanced traffic management	The ATM PA-A3 supports highly configurable traffic shaping in hardware on a per-VC and per-VP basis in hardware. Total flexibility to create VCs based on exact bandwidth and service requirements coupled with the shaping ability prevents congestion on any single VC from impacting another VC.	This feature is especially important when connecting to an ATM network where the ATM switches enable traffic policing, which will discard all traffic that exceeds the pre-determined contract.
Several ATM Forum service classes	The ATM PA-A3 supports ATM Forum Traffic Management Specification 4.0 service classes: nrt-VBR, ABR, and UBR. ABR is not supported on the PA-A3-OC-12.	Guaranteed and best-effort service types can be concurrently supported on a per-VC basis allowing the appropriate ATM service to be used depending on the specific network application.
Available Bite Rate (ABR) in SAR hardware	The ATM PA-A3 hardware fully supports ABR including Explicit Rate, Relative Rate and Explicit Forward Congestion Indicator (EFCI) modes except on the OC-12/STM-4 version of the port adapter.	Minimizes cell loss and maximizes throughput across the ATM network. The support for ABR now allows end-to-end ABR networks.
Up to 4096 virtual connections	The ATM PA-A3 can maintain a very large number of ATM virtual connections.	Ideal for any application requiring a large number of connections such as in the Campus/LANE and in emerging DSL/Cable modem applications.
Up to 1024 simultaneous Segmentation and Reassembles (SAR)	The ATM PA-A3 can concurrently process a large number of SAR functions (depending on platform) at any one time.	Well-suited for any application needing to process many ATM connections simultaneously.
Cisco IOS protocols, services and ATM-specific software support	The ATM PA-A3 leverages the full suite of Cisco IOS protocols, services and Cisco-developed ATM software including UNI signaling, ILMI, LANE, RFC1483 and RFC1577, MPLS, QoS, and multiservice support.	As new Cisco IOS capabilities are developed, the ATM PA-A3 can seamlessly take advantage of these new features as required.
IP Class of Service over ATM capability	The ATM PA-A3 supports Cisco IOS software to ATM IP to ATM Class of Service (IP to ATM CoS) feature implements a solution for coarse-grained mapping of QoS characteristics between IP and ATM, including IP to ATM CoS	IP to ATM CoS ensures consistent QoS between IP and ATM interworked networks. Now networks can offer different service classes (sometimes termed "differential service classes") across the entire WAN, not just the routed portion. Mission-critical applications can be given exceptional service during periods of high network usage and congestion. In addition, noncritical traffic can be restricted in its network usage, which ensures greater QoS for more important traffic and user types.
Per-Virtual Circuit Weighted Fair Queuing and Class-Based Weighted Fair Queuing (IP to ATM CoS, per-VC WFQ and CBWFQ) feature	Allows you to apply CBWFQ functionality to an individual VC configured for IP to ATM CoS	Provides for consistent QoS between IP and ATM interworked networks
MPLS	The port adapters can be used in an MPLS environment supporting Basic MPLS, MPLS-Traffic Management, MPLS-QoS, and MPLS-VPN.	This enables routers at the edge of a network to apply simple tags to packets, while devices in the core of the network switch packets according to these tags.

Applications

The ATM PA-A3 was designed for a wide range of network applications. The specific combination of ATM features and standards makes the ATM PA-A3 ideal for both ATM Enterprise-based WAN and service provider infrastructures.

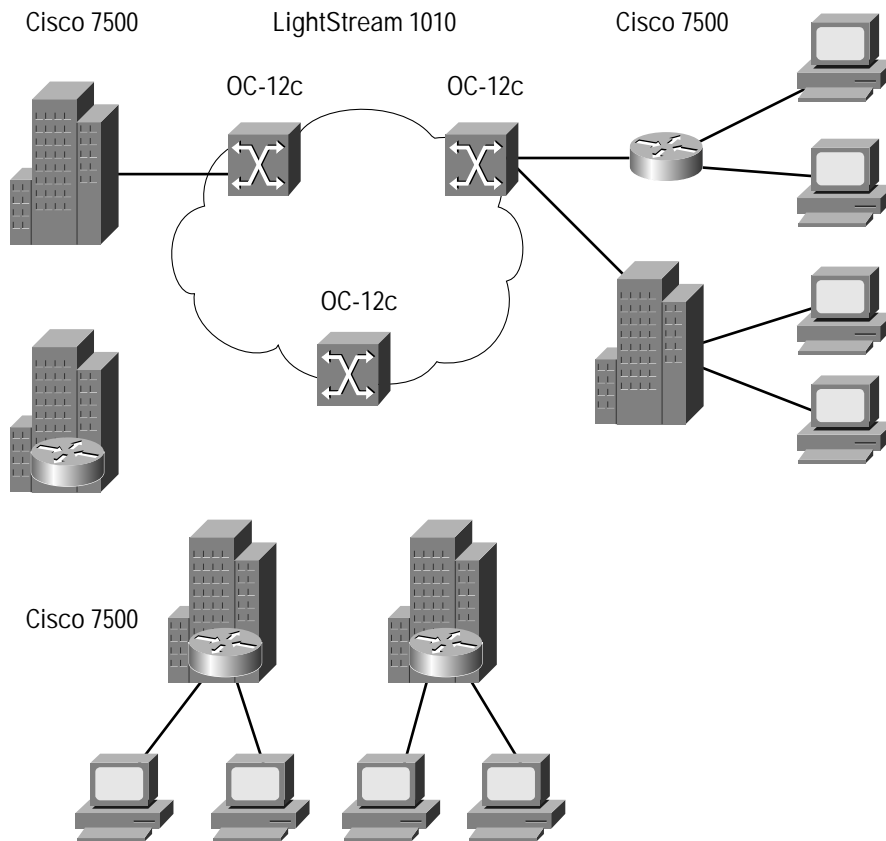
ATM Enterprise-based WAN

ATM technology is now a favored choice for very high-bandwidth corporate connectivity across an Enterprise WAN. Providing connectivity to geographically disperse facilities, typical ATM WAN interfaces range from 34 Mbps to 622Mbps. These very large WAN “pipes” supply ample bandwidth for the needs of corporate infrastructures today with room for growth in the future. These ATM Enterprise-based WANs can be deployed through private networks or through a public ATM service from large service providers.

With the many advanced ATM capabilities and support for MPLS and QoS (such as per-VC and VP traffic shaping), the ATM PA-A3 is ideal for interconnecting the Cisco 7200 or 7500 series router or FlexWAN module for the Catalyst 6000 switch at central sites or larger remote sites via an ATM Enterprise-based WAN. Through DS3, E3, OC-3c/STM-1/IMA, or OC-12c ATM links, the ATM PA-A3 can be connected to any standards-based ATM WAN switch including the Cisco LS 1010 and BPX./IGX% at the switching core.

In the Campus Backbone/MAN, the OC-12c provides the same scaled-up ATM bandwidth as in the point of presence (POP) when the bandwidth between the ATM switches is increased. RFC 1483 and RFC 1577 are both available for campus, metropolitan, and wide-area networks. In many Campus LANE networks the PA-A3 is deployed to provide inter-ELAN routing between emulated LANs and/or to provide WAN connectivity from the campus ATM backbone.

Figure 1 ATM PA-A3 in Enterprise/WAN Application



The ATM PA-A3 provides the ability to combine a diverse range of LAN technologies including Ethernet, Fast Ethernet, Token Ring and Fiber Distributed Data Interface (FDDI) with ATM at each corporate site. These high-end, advanced routing platforms—based on Cisco IOS services—also boasts the industry’s widest range of multiprotocol routing and ATM software capabilities of any platform.

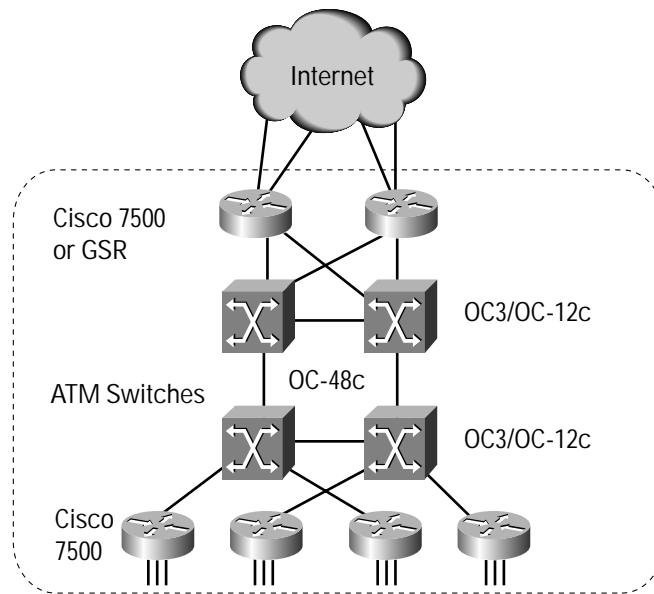
Service Provider Infrastructures

ATM deployment in service provider infrastructures has seen tremendous growth in recent years as well. This growth has been spurred for several reasons: 1) ATM provides highly scalable bandwidth within SONET/SDH infrastructures; 2)

ATM is inherently a multiservice (data, voice, and video) technology; and 3) ATM is based on international standards. The ATM PA-A3 provides high-performance interconnectivity, metro, and Intra-POP applications between service provider POPs for IP transport. ATM PA-A3 can also be deployed as customer premise equipment (CPE) to provide the data component to the service provider networks.

Through the support of ATM Forum specifications and International Telecommunication Union (ITU) standards, the ATM PA-A3 can be deployed with any standards-based ATM switch including Cisco BPX/IGX/MGX™, LS1010, and Cisco 8500 series products.

Figure 2 ATM PA-A3 Service Provider ATM Backbone



Intra-POP ATM Network

The ATM PA-A3 allows service providers to effectively manage the bandwidth at the edges of the network while implementing value-added Layer 3 services. With advanced traffic shaping features and support for many ATM service classes (including ABR), the ATM PA-A3 can be widely deployed in many parts of the service provider backbone.

Advanced traffic management features (such as per-VC and per-VP traffic shaping) is absolutely required to ensure that traffic from one customer does not impact traffic from another.

Table 3 Global U.S. Ordering Information

Product model	Product Description	U.S. List Dollars	Minimum IOS Release
PA-A3-OC12MM	1-port ATM OC-12c/STM-4 Multimode Port Adapter, Enhanced	\$14,000	12.0(11)S, 12.1(3)E, 12.1(4)T

Product model	Product Description	U.S. List Dollars	Minimum IOS Release
PA-A3-OC12SM	1-port ATM OC-12c/STM-4 Single-mode Port Adapter, Enhanced	\$17,000	12.0(11)S, 12.1(3)E, 12.1(4)T
PA-A3-T3	1-Port ATM DS3 Port Adapter, Enhanced	\$8,000	11.1(22)CC, 12.0(1), 12.0(3)T, 12.0(5)S, 12.1(1)E, 12.1(1)T
PA-A3-E3	1-Port ATM E3 Port Adapter, Enhanced	\$8,000	11.1(22)CC, 12.0(1), 12.0(3)T, 12.0(5)S, 12.1(1)E, 12.1(1)T
PA-A3-OC3MM	1-Port ATM OC-3c/STM-1 Multimode Port Adapter, Enhanced	\$8,000	11.1(22)CC, 12.0(1), 12.0(3)T, 12.0(5)S, 12.1(1)E, 12.1(1)T
PA-A3-OC3SMI	1-Port ATM OC-3c/STM-1 Single-mode (IR) Port Adapter, Enhanced	\$10,000	11.1(22)CC, 12.0(1), 12.0(3)T, 12.0(5)S, 12.1(1)E, 12.1(1)T
PA-A3-OC3SML	1-Port ATM OC-3c/STM-1 Single-mode (LR) Port Adapter, Enhanced	\$12,000	11.1(22)CC, 12.0(1), 12.0(3)T, 12.0(5)S, 12.1(1)E, 12.1(1)T
PA-A3-8T1IMA	ATM Inverse Multiplexer over ATM Port Adapter with 8 T1 Ports	\$8,000	12.0(5)XE, 12.1(1)E, 12.1(1)T, 12.1(E) 7500
PA-A3-8E1IMA	ATM Inverse Multiplexer over ATM Port Adapter with 8 E1 Ports	\$8,000	12.0(5)XE, 12.1(1)E, 12.1(1)T, 12.1(E) 7500

Further Information

For additional ATM PA-A3 information, please refer to the following documents/URLs: ATM PA-A3 OC-12 Datasheet

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