DATA SHEET

CISCO 7600 SERIES 2-PORT ATM OPTICAL SERVICES MODULE

High Performance OC12c ATM for Aggregating High Speed Connections from Enterprise to Service Provider ATM Backbones

Figure 1
Cisco 7600 Series 2-Port ATM Optical Services Module

The rapid growth of Internet-enabled user applications has led to a dramatic growth in the bandwidth provisioned through service provider networks. In order to accommodate this growth, service providers are consolidating their various existing network architectures that deliver traditional Layer-2 WAN transport, such as Frame Relay and ATM, with those that deliver Layer-3 WAN services, such as high speed Internet access and Layer-3 VPNs. The consolidation of these network architectures optimizes the service providers capital investments, so that all such expenditures simultaneously benefits all network services.

Achieving the convergence of these network architectures is particularly challenging at the network aggregation points that must deliver a variety of services. The devices at these network aggregation points must be capable of providing an efficient transfer of network traffic from the customer access nodes to the core network and back. Therefore, these aggregation devices must provide scalable bandwidth and interface density between the access and core networks, while simultaneously supporting a wide range of network protocols, as well as quality of service (QoS), security, and accounting features.

The Cisco 7600 is designed to provide the performance, density, and features that are needed for network aggregation devices in such consolidated network architectures. The Cisco 7600 is a high performance aggregation router, which integrates high speed LAN and WAN modules, and is specifically intended for service provider networks.

The two port OC12c/STM-4c ATM Optical Services Module expands the connectivity options for the Cisco 7600 Series Routers and Cisco Catalyst 6500 Series Switches. The cards are ideal for aggregating large enterprise virtual channels and connecting them to an existing ATM infrastructure.

The ATM OSM cards are standards based and completely compatible with the full-line of Cisco high-performance ATM switches and routers.

The Cisco 7600 Series ATM OSMs enable the integration of legacy ATM networks with next-generation IP backbones in several ways. The following applications provide two examples.

With the use of the Cisco 7600 Series ATM line cards, service providers can now offer connectivity to customers via an ATM network. (See Figure 2.)
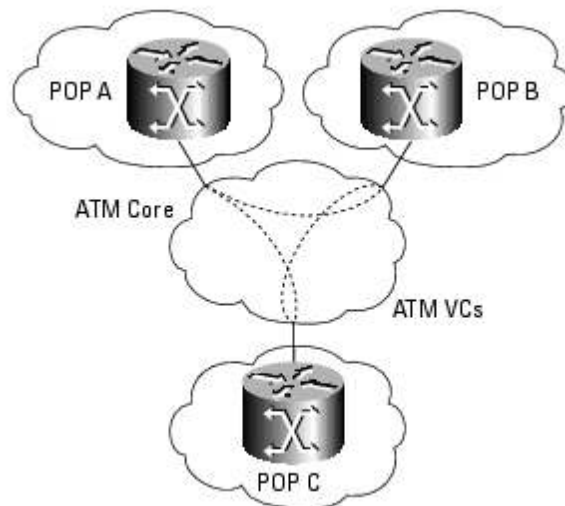
Figure 2
Application 1: ATM WAN Connectivity
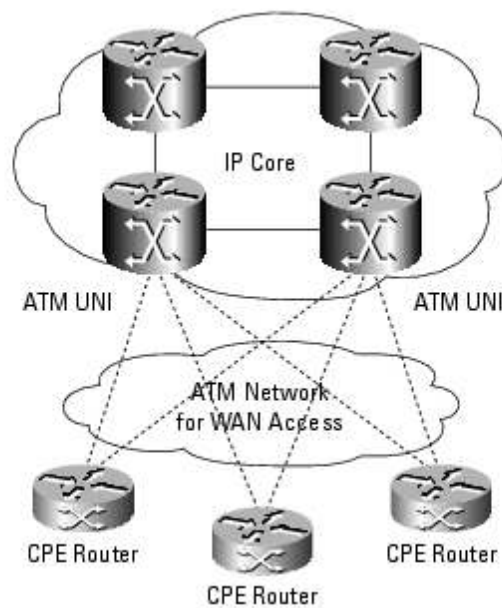
Using the Cisco 7600 Series ATM line cards, service providers can interconnect their points of presence (POPs) via a core ATM network. (See Figure 3.)

Figure 3
Application 2: Inter-POP Connectivity

In addition to the two OC12 ATM ports, each card comes with four switched Gigabit Ethernet interfaces that enable Ethernet connectivity in service provider networks. These line cards facilitate network growth with a variety of high-performance IP services.

TWO PORT OC12 ATM OSM FEATURE SUMMARY

- Parallel Express Forwarding (PXF) IP Services Processor on the line card. The PXF IP Services Processor consists of a 4 x 4 array of microprocessing units, each equipped with local memory, to deliver a pipelined, parallelized processing array. Each PXF IP Services Processor can apply IP services to 16 different packets simultaneously—all with high levels of performance. The OC12 ATM line cards are populated with one PXF IP Services processor.
- High-Performance forwarding of distributed IP service.
- Programmable software feature sets for "evergreen" IP service delivery. Unlike traditional ASICs, which have feature sets hardcoded in silicon, each PXF engine can be enhanced in the field via an easy software upgrade.
- Deep packet buffering to maximize TCP throughput, with advanced traffic management and prioritization schemes to ensure deterministic packet delivery.
- Four additional ports of Gigabit Ethernet provides connectivity to other routers or servers without burning up "customer-facing" line card slots.

ATM Features

- Unspecified Bit Rate (UBR)
- Variable Bit Rate-non real-time (VBR-nRT)
- Max VCs (1000 per card, 500 per port[1])
- Max simultaneous segmentation and reassembly: 1000 (1000 Max active VCs)
- VPI Range 0-255 (up to 16 configured simultaneously)
- VCI Range (1-1023)
- RFC-1577 classical IP over ATM

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[1]Limit of 4000 VCs per Cisco 7600

- RFC 1483 Routed and Bridged AAL5 PDUs
- UNI 3.x, 4.0
- ILMI 1.0
- OAM (F4 and F5)
- Per-VP shaping
- Per-VC shaping
- Per-VC L3 queuing
- L3 traffic shaping
- L3 QoS—CBWFQ, LLQ
- L3 Multicast Point-to-Point
- L3 Multicast Point-to-Multipoint
- MTU: 9180 per RFC2225/RFC1577

Per-VC and Per-VP Traffic Shaping

Traffic shaping is typically provided on ATM edge devices to ensure that bursty traffic conforms to a predetermined "contract." The ATM OSM supports traffic shaping in hardware, on a per-VC basis or per-VP basis. Depending on the selected ATM service class, the ATM OSM supports configurable parameters such as: peak cell rate (PCR), sustainable cell rate (SCR), and maximum burst size (MBS). These parameters can be defined based on the specific bandwidth requirements of an individual VC, as needed for a specific application. To provide further flexibility, the ATM OSM allows each of these parameters to be set over a wide range of small increments:

- Peak and Sustainable Cell Rate (PCR, SCR): 37k to 299,520k with 1k increments
- Maximum Burst Size (MBS): 1-255 cells

High-Performance Architecture

The ATM OSM is based on an advanced dual-SAR architecture. Each OC12 port has one SAR processor dedicated for transmission and one for reception. Each SAR supports AAL5 ATM adaptation for high-performance data applications. The ATM OSM also includes a large amount of buffer memory. Head of Line (HOL) blocking is avoided through a TX credit check mechanism that runs on the PXFcode. This design ensures that bursty traffic from one VC does not prevent another VC from being serviced.

ORDERING INFORMATION

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 online. Support is provided for both OAM F4 and F5 flows. During segmentation, the OAM cells have the highest priority, and are transmitted ahead of other queued data.

ENHANCED TWO PORT OC12 ATM OSM FEATURES

The Enhanced two port OC12 OSM cards will support all of the same features as the Original 7600 OSMs, and will take the Cisco 7600 platform to a higher level of functionality. Some of the major feature differences between the enhanced and the original OSMs include:

- Support for enhanced QoS features, such as WRED
- Support for *future* software enhancements to deliver either Layer-2 or Layer-3 network aggregation services deployed over a network architecture based on either IP or MPLS protocols. The Cisco 7600 IR will then be capable of supporting Layer-2 services while simultaneously supporting Layer-3 services, such as Internet Access or IETF RFC 2547 VPNs.

Table 1. Enhanced 2-Port OC12 ATM OSM Ordering Information

Part Number	Description
OSM-2OC12-ATM-SI+	Enhanced 2-Port Single-mode Intermediate Reach OC12 ATM with 4 Gigabit Ethernet
OSM-2OC12-ATM-SI+=	Enhanced 2-Port Single-mode Intermediate Reach OC12 ATM with 4 Gigabit Ethernet
OSM-2OC12-ATM-MM+	Enhanced 2-Port Multimode OC12 ATM with 4 Gigabit Ethernet
OSM-2OC12-ATM-MM+=	Enhanced 2-Port Multimode OC12 ATM with 4 Gigabit Ethernet

Note "=" denotes a spares

Table 2.   2-Port OC12 ATM OSM Ordering Information

Part Number	Description
OSM-2OC12-ATM-SI	2-Port Single-mode Intermediate Reach OC12 ATM with 4 Gigabit Ethernet
OSM-2OC12-ATM-SI=	2-Port Single-mode Intermediate Reach OC12 ATM with 4 Gigabit Ethernet
OSM-2OC12-ATM-MM	2-Port Multimode OC12 ATM with 4 Gigabit Ethernet
OSM-2OC12-ATM-MM=	2-Port Multimode OC12 ATM with 4 Gigabit Ethernet

SONET COMPLIANCE

- Telecordia (Bellcore) GR-253-CORE (as applicable)
- ITU-T G.707, G.957, G825 (as applicable)

SONET Errors, Alarms, and Performance Monitoring

- Signal Failure Bit Error Rate (SF-ber)
- Signal Degrade Bit Error Rate (SD-ber)
- Signal Label Payload Construction (C2)
- Path Trace Byte (J1)
- Section:
  – Loss of Signal (LOS)
  – Loss of Frame (LOF)
  – Error Counts for B1
  – Threshold Crossing Alarms (TCA) for B1
- Line:
  – Line Alarm Indication Signal (LAIS)
  – Line Remote Defect Indication (LRDI)
  – Line Remote Error Indication (LREI)
  – Error Counts for B2
  – Threshold Crossing Alarms (TCA) for B2

- Path:
  - Path Alarm Indication Signal (PAIS)
  - Path Remote Defect Indication (PRDI)
  - Path Remote Error Indication (PREI)
  - Error Counts for B3
  - Threshold Crossing Alarms (TCA) for B3
  - Loss of Pointer (LOP)
  - New Pointer Events (NEWPTR)
  - Positive Stuffing Event (PSE)
  - Negative Stuffing Event (NSE)
  - Path Unequipped Indication Signal (PUNEQ)
  - Path Payload Mismatch Indication Signal (PPLM)

SONET Synchronization

- Local (Internal) Timing (for inter-router connections over dark fiber or WDM equipment
- Loop (Line) Timing (for connection to SONET/SDH equipment)
- ± 4.6 ppm Clock Accuracy

Network Management

- Local Loopback
- Network Loopback
- NetFlow Data Export
- RFC 1595, Performance Statistics for Timed Intervals (Current, 15 minute, multiple 15 minute, and 1 day intervals)
  - Regenerator Section
  - Multiplex Section
  - Path Errored Seconds
  - Severely Errored Seconds

Table 3.   ATM Optical Specifications

Fiber Interface	Output Power		Input Power		Wavelength	
	Min	Max	Min	Max	Min	Max
SI	-15.0 dBm	-8.0 dBm	-28.0 dBm	-8.0 dBm	1270 mm	1380 mm
MM	-20.0 dBm	-14.0 dBm	-14.0 dBm	-26.0 dBm	1270 mm	1380 mm

Gigabit Ethernet Specifications

- IEEE 802.3z compliant
- GBIC-based Gigabit Ethernet Interfaces with SC connectors:

Table 4. Gigabit Ethernet Optical Specifications

GBIC	Distance
1000BaseLX: 50 um multimode fiber	Up to 550 m
1000BaseLX: 9/10 um single-mode fiber	Up to 5 km
1000BaseLH: 62.5 um multimode fiber	Up to 550 m
1000BaseLH: 50 um multimode fiber	Up to 550 m
1000BaseLH: 9/10 um single-mode fiber	Up to 10 km
1000BaseZX: 9/10 um single-mode fiber	Up to 70 km
1000BaseZX: dispersion-shifted fiber	Up to 100 km

- Support for IEEE 802.1Q VLAN Trunking with up to 4000 simultaneous VLANs
- Support for Hot Standby Routing Protocol (HSRP)
- IEEE 802.3x support for auto-negotiation flow control
- Support for Jumbo frames with an MTU of 9192 bytes

Cisco 7600 System Features

- Hardware-based Cisco Express Forwarding (CEF) at 30 Mpps
- Access control list (ACL) application at 30 Mpps
- QoS classification at 30 Mpps
- Policy routing at 30 Mpps
- Support for 128,000 traffic accounting entries per system
- Support for online insertion and removal (OIR)
- Support for 200 ms of packet buffering per port
- Support for Simple Network Management Protocol (SNMP) I and II and four RMON groups per port: Statistics, History, Alarms, and Events

Physical Specifications

- Occupies one slot in any Cisco 7600 chassis
- Two OC12 ATM ports supported per optical service module
- Four Gigabit Ethernet optical ports per optical service module
- Up to eight optical service modules supported in a nine-slot chassis
- Required with the Cisco 7600:
  – Supervisor Engine 2: WS-X6K-S2-MSFC2
- Recommended with the Cisco 7600 chassis:
  – Switch Fabric Module—256 Gbps Crossbar Fabric: WS-C6500-SFM
  – 2500W power supply
- Dimensions (H x W x D): 1.2 x 14.4 x 16 in. (3.0 x 35.6 x 40.6 cm)
- Mean Time Between Failure (MTBF): seven years for system configuration

Indicators and Interfaces

- Four LEDs per port:
  - Port Active: Green—when port is enabled and active; Off when port is not enabled
  - Carrier/Alarm: Green if valid SONET/SDH frame and no alarms; Yellow if valid SONET/SDH frame with alarms; Off if no SONET/SDH signal
  - Tx Activity: Blinks Green (or constant) if port is transmitting data; Off when no data is transmitting
  - Rx Activity: Blinks Green (or constant) if port is receiving data; Off when no data is received

Processors and Memory

- One 262 MHz RM7000 MIPS RISC processor for line card control and management
- Configurable processor/route table memory options:
  - 128 MB ECC SDRAM (default)
  - 128 MB ECC SDRAM
  - 256 MB ECC SDRAM
  - 512 MB ECC SDRAM
- One PXF IP services processors
- Provides up to 6 Mpps of distributed IP service application per PXF IP Services Processor

Environmental Conditions

- Operating temperature: 32 to 104° F (0 to 40° C)
- Storage temperature: -4 to 149° F (-20 to 65° C)
- Relative humidity: 5 to 90%, noncondensing
- Operating altitude: -500 to 6500 ft
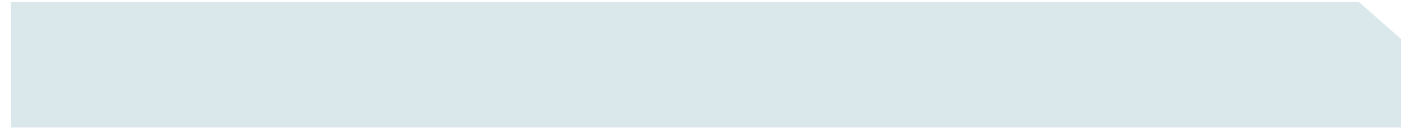
REGULATORY COMPLIANCE

Safety Compliance

- UL 1950
- CAN/CSA C22.2 No.950-95 EN 60825-1 Laser Safety (Class 1)
- 21CFR1040 Laser Safety
- EN60950
- IEC 60950
- TS 001
- AS/NZS 3260

EMC Compliance

- FCC Part 15 (CFR 47) Class A
- VCCI Class A
- EN55022 Class A
- CISPR 22 Class A
- AS/NZS 3548 Class A
- EN55024
- CE Marking

NEBS Level 3 Compliance

The Cisco 7600 chassis and Cisco Catalyst 6509 chassis are NEBS Level 3 compliant, according to the following specifications:

- GR-1089-CORE, Electromagnetic Compatibility and Electrical Safety
- GR-63-CORE: Physical Protection

ETSI Compliance

- ETS-300386-2 Switching Equipment

Minimum Software Revision

Enhanced OSM

- Cisco IOS® Software Release 12.1(12)E—visit: Cisco.com for the latest release information

Original OSM

- Cisco IOS® Software Release 12.1E—visit: Cisco.com for the latest release information

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