Data Sheet

# DS3/E3 ATM Network Modules for the Cisco 2600, 2800, 3600, 3700 and 3800 Series Routers

**The Cisco DS3/E3 ATM Network Modules available for the Cisco 2600, 2800, 3600, 3700, and 3800 Series Routers provide ATM WAN connectivity for the branch office. Both versions provide a single ATM connection of either 44 Mbps for DS3, or 34 Mbps for E3 using 75-ohm BNC connectors. Both the DS3 (NM-1A-T3) and E3 (NM-1A-E3) ATM network modules support ATM Forum compliant framing standard AAL5. ATM Traffic Management support includes UBR, UBR+, VBR-rt, VBR-nrt, CBR, and ABR classes of traffic.**

The DS3/E3 ATM network modules provide a cost-effective solution that can be deployed in the Cisco 2600, 2800, 3600, 3700, and 3800 Series Routers as service provider customer premise equipment (CPE) or at large enterprise branch and smaller regional office locations for consolidating multiservice data, voice and video services over a single ATM link.

**Figure 1.** DS-3 and E3 ATM Network Modules

**The Following Key Features are Supported:**

- ATM Classes of Service support for: Unspecified Bit Rate (UBR), UBR+, Variable Bit Rate real-time (VBR-rt), Variable Bit Rate non-real time (VBR-nrt), Constant Bit Rate (CBR), and Available Bit Rate (ABR)
- ATM UNI 3.0, 4.0 Traffic Management support
- RFC 1483 and RFC 1577 support
- 1024 maximum simultaneous Virtual Connections (VCs)
- 8 bits of VPI (VPI range 0–256), 10 bits of VCI (VCI range 0–1024)
- Permanent Virtual Circuits (PVCs) and Switched Virtual Circuits (SVCs)
- PLCP and HEC cell delineation support
- Operations and Management (F5 OAM) cell support
- LANE 2.0 support
- ILMI 1.0 support
- IETF PPP over ATM support
- IP-to-ATM Class-of-Service (CoS) Mapping Feature
- Multiprotocol Label Swapping (MPLS) VPN support

- MPOA Client and Server
- Next Hop Routing Protocol (NHRP)
- On-line Insertion and Removal (OIR) on 3660
- Permanent Virtual Path (PVPs) support
- FRF.5/8 Interworking
- ITU-T G.703 Compliant

**Table 1.** Cisco IOS Support and Orderability Matrix for DS3/E3 ATM Network Modules

| Product | IOS S/W Version Required | IOS Feature Sets Required | Maximum Recommended Number of Modules[1] |
|---|---|---|---|
| **2600 Series** | 12.2(12) Mainline, 12.2(8)T | All Cisco IOS 12.2(12) Mainline and 12.2(8)T and above "Plus" feature sets | 1 |
| **2600XM Series** | 12.2(12) Mainline, 12.2(8)T | All Cisco IOS 12.2(12) Mainline and 12.2(8)T and above "Plus" feature sets<br>Also<br>All 12.3(1) Mainline and 12.3(2)T and above “SP Services” feature sets | 1 |
| **2800 Series** | 12.3(8)T | All Cisco IOS12.3(8)T and above “SP Services” feature sets | 1 |
| **2691** | 12.2(8)T | All 2691 Cisco IOS 12.2(8)T and above "Plus" feature sets<br>Also<br>All 12.3(1) Mainline and 12.3(2)T and above “SP Services” feature sets | 1 |
| **3620** | 12.1(2)T | All Cisco IOS 12.1(2)T and above "Plus" feature sets | 1 |
| **3640** | 12.1(2)T | All Cisco 12.1(2)T and above "Plus" feature sets | 1 |
| **3660** | 12.1(2)T | All Cisco 12.1(2)T and above Cisco IOS "Plus" feature sets | 2 |
| **3725** | 12.2(8)T | All 3700 Cisco IOS 12.2(8)T and above "Plus" feature sets<br>Also<br>All 12.3(1) Mainline and 12.3(2)T and above “SP Services” feature sets | 1 |
| **3745** | 12.2(8)T | All 3700 Cisco IOS 12.2(8)T and above "Plus" feature sets<br>Also<br>All 12.3(1) Mainline and 12.3(2)T and above “SP Services” feature sets | 2 |
| **3825** | 12.3(11)T | All Cisco 12.3(11)T and above “SP Services” feature sets | 1 |
| **3845** | 12.3(11)T | All Cisco 12.3(11)T and above “SP Services” feature sets | 2 |

## ADVANCED TRAFFIC MANAGEMENT

Advanced traffic management mechanisms in the DS3/E3 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 DS3/E3 supports all the ATM service classes, including UBR, UBR+, VBR-rt, VBR-nrt, and ABR. Supporting these ATM service classes allows the DS3/E3 network modules to concurrently support various network applications on the same ATM interface. VBR-rt is intended for applications that require guaranteed services, and ABR and UBR are intended for applications that need only “best-effort” service.

[1] Maximum recommended modules does not imply will meet performance at wire rate

The ABR support includes the Explicit Rate (ER), Relative Rate (RR), and Explicit Forward Congestion Indicator (EFCI) modes. ABR was defined specifically to minimize cell loss and maximize good put through the ATM network. Explicit Rate ABR is typically deployed in ATM WAN switches, and is used in products such as Cisco's 8400/IGX and 8800/MGX ATM switches. Relative Rate ABR is more effectively deployed in the campus and is supported by the Cisco Lightstream 1010, and 8500 series ATM switches. EFCI is typically used for backward compatibility with legacy ATM switches that support neither Explicit nor Relative Rate.

**Table 2.** ATM Service Class Definitions

| ATM Service Classes | Typical Use |
|---|---|
| **VBR-nrt—non-real time Variable Bit Rate** | Used for all applications that require a level of Service guarantee through the ATM. |
| **VBR-rt—real-time Variable Bit Rate** | Used for connections that transmit at a rate varying with time and that can be described as bursty, often requiring large amounts of bandwidth when active. Intended for applications that require tightly constrained delay and delay variation such as compressed VoIP and video conferencing. |
| **ABR—Available Bit Rate** | Used to maximize bandwidth utilization on the ATM link through the use of congestion feedback notification. |
| **UBR—Unspecified Bit Rate** | Most legacy data applications using fair best-effort service. |
| **CBR—Constant Bit Rate** | Provides guaranteed bandwidth for data applications such as SNA traffic. |

## PER-VC TRAFFIC SHAPING

Traffic shaping is a function typically provided on ATM edge devices to ensure that bursty traffic conforms to a predetermined Service Level Agreement (SLA). 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 switch.

The ATM DS3/E3 supports traffic shaping in hardware which eliminates performance degradation when shaping is enabled. Providing traffic shaping on a per-VC basis in done by the software using IP-to-ATM CoS mapping feature and allows total flexibly and control over every VC configured.

For each ATM service class, the ATM DS3/E3 supports highly configurable parameters: 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.

**Table 3.** ATM Class of Service Traffic Shaping Parameters

| VBR –rt and nrt Parameters | ABR Parameters | UBR Parameters |
|---|---|---|
| **PCR (kbps)** | PCR (kbps) | PCR (kbps) |
| **SCR (kbps)** | MCR (kbps | |
| **MBS (cells)** | | |

The ATM DS3/E3 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 are prioritized in the following order (starting with highest priority): 1) OAM cells and signaling; 2) nrt-VBR; 3) ABR; and 4) UBR. Prioritizing the VCs in this manner ensures that the high priority and guaranteed traffic have precedence over the best-effort traffic.

To provide further flexibility, the ATM DS3/E3 allows each of these parameters to be set over a wide range of small increments.

 

**Table 4.** Traffic Shaping Granularity

| Parameter | Range | Increments |
|---|---|---|
| **PCR** | 64 kbps to line rate | 64 kbps |
| **SCR** | 64 kbps to line rate | 64 kbps |
| **MBS** | • <32 up to 4 Mbps<br>• <200 up to line rate | One cell |

**Note:** Although configuration to line rate is allowed, line rate is only reached with large packet sizes.

## EXTENDED VIRTUAL CONNECTIONS CAPABILITIES

The ATM DS3/E3 supports up to 1024 Virtual Connections (VC) and up to 256 Virtual Path (VP). Any combinations of VC and VP can be supported up to a maximum number of 1024 VC/VP combinations. These VCs can be either Permanent Virtual Connections (PVC) which are created manually or Switched Virtual Connections (SVC) created through point-to-point and point-to-multipoint UNI signaling.

**Table 5.** Interface Specifications

| Interface | Rate | Connector Type | Wavelength | Maximum Distance |
|---|---|---|---|---|
| **DS3** | 44.736 Mbps | BNC | Coaxial | 450 ft. |
| **E3** | 34.368 Mbps | BNC | Coaxial | 1250 ft. |

**Note:** The DS-3 version provides adaptive equalization for 0–450 ft. of cable and provides loopback capability. The E3 version provides adaptive equalization for 0–1250 ft. of cable and also provides loopback capabilities. The DS-3 version also has the ability to support line build-out for cable lengths of less than 50 ft. or greater than 50 ft., as required.

**Table 6.** LED Indicators

| ATM NM LED | Port Status | Function |
|---|---|---|
| **Enable** | Green | Indicates the ATM NM is successfully inserted and has established communications to the PCI bus. It is ready to accept CLI commands |
| **RCLK** | Green | Indicates that a receive clock has been detected |
| **FERF** | Yellow | The framer has detected a Far End Receive Failure |
| **OOF** | Yellow | The framer has detected an Out of Frame occurrence |
| **AIS** | Yellow | The framer has detected an Alarm Indication Signal |

## SYSTEM REQUIREMENTS

- Maximum of one DS3 or E3 ATM network module supported on Cisco 2600, 3620, and 3640, and two on the 3660
- Operates in conjunction with all currently available Cisco 3600 network modules and WAN interface cards (WICs)
- No slot placement restrictions

 

## NETWORK MANAGEMENT

Supported MIBs include:

- Synchronous Optical Network (SONET) MIB
- MIB II
- AToM MIB (FRC 1695)
- ILMI MIB
- CISCO-BUS MIB
- CISCO-LECS-MIB
- CISCO-LES-MIB
- LAN Emulation (LANE) MIB
- Cisco-AAL5-MIB
- DS3/E3 CISCO-ATM-IF-PHYS-MIB

## PRODUCT COMPLIANCE STANDARDS

The DS-3 and E3 ATM network modules are to receive all the agency approvals necessary for unlimited international availability. The following regulatory approvals are supported:

### Environmental

**Table 7.** DS3/E3 ATM Physical Specifications

| Product Specifications | Descriptions |
|---|---|
| **Dimensions (H x W x D)** | 1.55 x 7.10 x 7.2 in |
| **Weight** | 2 lbs. Maximum |
| **Environmental Conditions** | • Operating temp. 41–131℉ (+5 -+55℃)<br>• Non-operating temp. –13–158℉ (-25–70℃) |
| **Relative Humidity** | 0 to 90%, noncondensing |
| **EMI** | Class B EMI |
| **Cabling** | 75 Ohm BNC type connector |
| **LEDs** | Enabled, RX cells, RX carrier, RX Alarm |

### Safety Regulatory Approvals

- UL 1950 3rd edition/CSA C22.2, no. 950
- C1950 (Canada)
- AS/NZS 3260 (Australia/New Zealand)
- EN60950 (Europe)
- IEC 950 (National Deviations)

### Emission Regulatory Approvals

- FCC Part 15J Class A (US/Canada)
- VCCI Class 2 (Japan)
- AS/NZS 3548 (Australia/New Zealand)
- EN55022 (CISPR 22) Class B (Europe)


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