

LightStream 1010 Multiservice ATM Switch

The LightStream[®] 1010 is the first member of Cisco Systems' midrange Asynchronous Transfer Mode (ATM) switches for multiservice applications—from the ATM workgroup and campus backbone to metropolitan-area networks and alternative service provider backbones.

Multiservice ATM Switches

The LightStream 1010 is the first in a series of switches that will span from 5 to 40 Gbps, providing services optimized for both cell- and packet-based applications.

The LightStream 1010 is an excellent complement to the Cisco BPX[®], AXIS, and IGX[™] WAN switches as well as the Cisco MC3810 multiservice access concentrator, for an integrated ATM WAN backbone. The LightStream 1010, Catalyst[®] multilayer LAN switches, and Cisco routers are the foundation for many large campus ATM networks based on LAN Emulation and Multiprotocol over ATM (MPOA) today. The LightStream 1010 switch processor and port modules can be used in the Catalyst 5500 multilayer LAN switch, providing many options for deployment in addition to investment protection. In metropolitan-area networks, the LightStream 1010 and Cisco 7200 routers integrate video applications, such as distance learning, and voice applications, such as private branch exchange (PBX) interconnect, over ATM circuit emulation.

Building upon the Cisco IOS[™] software as well as supporting the latest ATM Forum specifications and Tag Switching (emerging Internet Engineering Task Force [IETF] Multiprotocol Label Switching), the LightStream 1010 offers the most complete feature set of any switch in its class. It delivers the performance, scalability, and robustness required for true production ATM deployment.

LightStream 1010 Overview

The LightStream 1010 uses a five-slot, modular chassis featuring the option of dual, fault-tolerant, load-sharing power supplies. The central slot in the LightStream 1010 is dedicated to a single, field-replaceable ATM switch processor module that supports the 5-Gbps shared-memory, fully nonblocking switch fabric with two field-upgradable feature cards, and the high-performance RISC processor that provides the routing intelligence for this architecture.

Figure 1 LightStream 1010



Uniquely, the switch processor module can be ordered with one of two different traffic management feature cards, which can be changed later in the field, if needed, to protect your investment. For typical campus ATM networks, one feature card provides per-class queuing, which supports all the defined traffic classes in the ATM Forum Traffic Management 4.0 specification and offers the flexibility needed for bursty, client/server traffic patterns. For service provider or customer premises deployments, the other feature card supports per-flow queuing, which can support greater traffic shaping granularity and can service individual quality-of-service (QoS) contracts for several thousand flows at once, making it perfect for wide-area environments that demand more unique and granular QoS features.

The remaining slots support up to four hot-swappable carrier modules (CAMs), each of which, in turn, can support up to two hot-swappable port adapter modules (PAMs), for a maximum of eight PAMs per switch. This configuration supports a wide variety of desktop, backbone, and wide-area ATM and circuit emulation interfaces.

The LightStream 1010 offers the sophistication and depth of functionality required for true ATM production deployment. Advanced traffic management mechanisms allow for the support of bursty, client/server traffic, while also delivering the QoS guarantees required for voice and video applications. The unique intelligent packet handling mechanisms of the LightStream switch family allow the switches to discard entire packets (early packet discard) or the remaining cells of a packet that has experienced loss (partial or tail packet discard), or to merge packets from different incoming connections onto the same outgoing connection (virtual circuit [VC] merge), increasing the effective goodput and scalability. The LightStream switch family supports all the ATM Forum-defined traffic classes, plus the first of many unique traffic classes:

- Constant bit rate (CBR)
- Real-time variable bit rate (RT-VBR)
- Non-real time variable bit rate (NRT-VBR)
- Available bit rate (ABR) + minimum cell rate (MCR)
- Unspecified bit rate (UBR) + MCR
- Unspecified bit rate (UBR)

With support for the ATM Forum Private Network-Network Interface (PNNI) v1.0 protocol for nearly two years, and with hierarchical PNNI routing and Tag Switching available shortly, networks of LightStream 1010 and Catalyst 5500s can scale to several hundred ATM switch nodes with QoS-based routing. Cisco's value-added PNNI and UNI signaling capabilities provide for ATM access lists, load sharing across parallel links, and PNNI Closed User Groups (CUGs) used to construct virtual private networks at the ATM layer. All this sophistication does not result in complexity for the user because the LightStream 1010 and Catalyst 5500 support standards-based, "plug-and-play," and autodiscovery capabilities.

Advanced ATM management functions in the LightStream 1010 and Catalyst 5500 allow for unprecedented levels of network visibility and control, including support for two specifications first introduced to the industry by Cisco and a few partners, specifically the ATM Remote Monitoring (RMON) Management Information Base (MIB) and ATM Accounting MIBs. The LightStream 1010 and Catalyst 5500 can be controlled and managed by AtmDirector™, CiscoView, and CiscoWorks for Switched Internetworks management applications.

LightStream 1010 Components

- Five-slot chassis (same as that of Catalyst 5000) with ATM backplane and fan tray
- Optionally redundant, autosensing load-sharing power supplies, each with own power cord
- AC or DC (-48V) power supply options
- ATM switch processor module running Cisco IOS software with a choice of one of two field-replaceable feature cards
- Option of up to four CAMs, each supporting up to two PAMs
- Variety of PAM types, from 25 Mbps to OC-12 ATM, as well as native T1/E1 ATM and T1/E1 circuit emulation.

ATM Switch Processor

- 5-Gbps shared-memory, nonblocking fabric
- 65,536 cells of shared ATM cell buffers
- 8 MB of Flash memory standard, internally expandable up to 16 MB plus up to 20 MB through PC Flash cards
- Interface timing: Stratum 4 accuracy clock for self timing, master clock distribution port, and loop timing

Two types of feature cards are available for the ATM switch processor: the per-class queuing feature card (FC1) and per-flow queuing feature card (FC-PFQ).

Feature	FC1	FC-PFQ
Traffic Classes	CBR, RT-VBR, NRT-VBR ABR (EFCI and RR), UBR	CBR, RT-VBR, NRT-VBR ABR (EFCI and RR) + MCR, UBR + MCR, UBR
Output Queuing	CBR, RT-VBR, NRT-VBR ABR/UBR per port	Per VC or per VP
Shaping	Per port (pacing)	Per CBR VC or CBR VP (128 shaped VPs total)
Queue Scheduling	Strict priority, rate per port	Strict priority, rate, weighted round robin
Intelligent Early Packet Discard (EPD) and Selective Cell Marking	Multiple fixed thresholds	Multiple, weighted (dynamic) thresholds
Intelligent Tail (Partial) Packet Discard	Supported	Supported
Policing (UPC) Algorithm	Dual mode, single leaky bucket (ITU-T I.371 and ATM Forum UNI specs)	Dual leaky bucket (ITU-T I.371 and ATM Forum UNI specs)
Frame Mode, VC Merge	Not available	Supported
Point-to-Point VCs Point-to-Multipoint VCs	Up to 32,000 Up to 1098 roots Up to 32 leaves per root	Up to 32,000 Up to 32,000 roots Up to 254 leaves per root Maximum 32,000 leaves total
Logical Point-to-Multipoint VCs	One leaf per output port, for each point-to- multipoint connection	Multiple leaves per output port with multiple VP tunnels, for each point-to-multipoint connection
Network Clock Switchover	Automatic upon failure	Programmable clock selection criteria
Nondisruptive Snooping	Per-port TX or RX	Per VC or VP
Standard Processor DRAM Configuration	32 MB, 64 MB optional	64MB

Connections

- Up to 32,000 virtual connections
- Virtual Circuit (VC) and Virtual Path (VP) switching, VP tunneling, VP multiplexing
- Permanent Virtual Circuit (PVC), Soft PVC, Soft Permanent Virtual Path (PVP), and Switched Virtual Circuit (SVC)
- F4 and F5 Operation, Administration, and Maintenance cell (OAM) segment and end-to-end flows, remote deflect identification (RDI), and alarm indication signal (AIS)
- OAM ping on IP or ATM address

Signaling and Routing

- User-Network Interface (UNI) 3.0, UNI 3.1, UNI signaling 4.0
- Integrated Local Management Interface (ILMI) 4.0
- ATM Network Service Access Point (NSAP) and E.164 address support
- Single-level and hierarchical Private Network-Network Interface (PNNI), and Interim-Interswitch Signaling Protocol (IISP)
- PNNI (CUGs) for ATM virtual private networks (VPNs)
- Soft PVC and Soft PVP support, with rerouting optimization
- ATM signaling and ILMI access lists/firewalls, including time of day-based policy
- Plug-and-play mode with PNNI
- Anycast support
- Redundant, parallel link support with load balancing or best-fit selection

ATM Internetworking Services

- LAN Emulation Configuration Server (LECS), LAN Emulation Server (LES), and Broadcast and Unknown Server (BUS) for Ethernet and Token Ring emulated LANs as well as MPOA networks
- Cisco's standards-based Simple Server Redundancy Protocol (SSRP) and Hot Standby Router Protocol (HSRP) for LAN Emulation as well as MPOA networks
- RFC 1577 Classical IP over ATM Address Resolution Protocol (ARP) server
- Tag Switching

Network Management

- Port RX and TX LEDs, switch and common equipment status LEDs
- Per-port and per-VC/VP snooping and connection steering

- One Ethernet and dual EIA/TIA-232 serial ports for optional out-of-band management on ATM Switch Processor (ASP)
- Multiple standard ATM and enterprise MIBs (including, but not limited to, AToM MIB (RFC1695) and its supplemental SVC MIB, ILMI MIB, PNNI v1.0 MIB, ATM signaling diagnostic MIB, ATM RMON MIB, and ATM Accounting MIBs)
- Text-based command-line interface (CLI) based on familiar Cisco router CLI
- Standard Cisco IOS security capabilities: multilevel passwords, TACACS+, AAA
- Telnet, Trivial File Transfer Protocol (TFTP), BOOTP, LAN Emulation Client, RFC 1577 Classical IP over ATM client for in-band management access

Chassis Specifications

- Chassis H x W x D: 10.5 x 17.2 x 18.14 in. (26.7 x 43.7 x 46.1 cm); standard 19-inch rack mount
- Empty weight: 43 lb (19.5 kg)
- Fully loaded weight: Depends upon loading; approximately 85 lb (39 kg)
- ATM switch processor and CAM H x W x D: 1.2 x 14.4 x 16.0 in. (3.0 x 36.6 x 40.6 cm)
- PAM H x W x D: 1.2 x 6.5 x 10 in. (3.0 x 16.5 x 25.4 cm)
- Maximum power budget: 9.8A @ 115 VAC, 60 Hz
4.9A @ 230 VAC, 50 Hz
- Autosensing limits: 100–127/200–240 VAC, 8/4A, 47–63 Hz
- Maximum power budget: 14.0A maximum @ -48V

Mean Time Between Failure

- 7.1 years for system configuration

Safety Certifications

- UL 1950
- EN 60950
- CSA-C22.2 No. 950-93
- Electromagnetic Emissions Certifications
- FCC Class A (Part 15)
- EN 55022 Class B
- CE Mark
- VCCI Class II
- Network Equipment Building Systems (NEBS)

Operating Conditions

Altitude: -500 to 10,000 ft (-52 to 3048 m)

Temperature: 32 to 104 F (0 to 40 C)

Relative humidity: 10 to 90% noncondensing



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

European Headquarters
Cisco Systems Europe s.a.r.l.
Parc Evolic, Batiment L1/L2
16 Avenue du Quebec
Villebon, BP 706
91961 Courtaboeuf Cedex
France
<http://www-europe.cisco.com>
Tel: 33 1 6918 61 00
Fax: 33 1 6928 83 26

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

Asia Headquarters
Nihon Cisco Systems K.K.
Fuji Building, 9th Floor
3-2-3 Marunouchi
Chiyoda-ku, Tokyo 100
Japan
<http://www.cisco.com>
Tel: 81 3 5219 6250
Fax: 81 3 5219 6001

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