

Cable Modem Termination System 1000 (CMTS 1000)

Cornerstone solutions enable operators to offer services that maintain existing subscribers and provide new revenue opportunities while keeping costs at a minimum.

High speed services subscribers demand

Maximizes Network Performance:

- Provides the forwarding and filtering rates necessary to meet today's demanding applications
- Support for up to 8 upstream channels and one downstream channel and upstream redundancy for robust and reliable functionality
- Provides Ingress Avoidance capabilities to allow operators to customize their operations based on their particular cable plant characteristics
- Ensures easy IP network administration via Layer 2 switching



Grounded in standards.

Protects Existing Investments and Prepares Operators for Tomorrow:

- Developed to the DOCSIS 1.0 specification
- Support for EuroDOCSIS requirements without any hardware changes
- Interoperability tested with CableLabs® Certified™ cable modems

Generate new revenues without new capital costs

Maximizes Operator Revenues:

- Support for guaranteed service levels
- Provides smaller footprint and more modems per channel than other cable headend equipment
- Enables operators to readily provide differentiated services at a reduced cost via Layer 3 routed switch headend architecture

Soothe Subscriber Security Fears

Enhances Network Security:

- Fully compliant with DOCSIS Baseline Privacy Specifications to ensure cable services security and private end-to-end communication
- Provides system security by using data encryption and packet filtering

Management by design

Eases Management:

- Fully Simple Network Management Protocol (SNMP) manageable via any remote station
- Provides enhanced command line and account management functions via a Command Line Interface (CLI)
- Provides identical CLI capabilities via multiple-user Telnet sessions to allow operators to remotely manage their CMTS 1000s

***Build your network to suit subscribers...
...don't force subscribers to fit your network!***



Introducing the CMTS 1000 - Overview

The Cornerstone CMTS 1000 is a scalable, interoperable, Layer 2/3 headend developed to the DOCSIS 1.0 specification that enables cable operators to provide reliable, high-speed services to their customers. It provides efficient message forwarding, with extensive advanced IP features such as Layer 3 filtering and multicast support and offers up to eight channels upstream and one channel downstream for flexibility. The CMTS 1000 is developed to the Data Over Cable Service Interface Specification (DOCSIS) standards that define standards for networking equipment that will be attached to the cable plant (i.e. the cable modem and cable modem termination system).

Featuring a high performance reduced instruction set computer (RISC)-based architecture, the CMTS 1000 delivers the data forwarding and filtering capabilities required by the most demanding applications. The CMTS 1000 also features a 10/100 Mbps Ethernet interface and supports a 6 or 8 MHz 64 or 256 Quadrature Amplitude Modulation (QAM) cable TV (CATV) downstream channel and a variable-rate Quadrature Phase Shift Keying (QPSK) or 16 QAM upstream channel. These features enable a cable operator to provide users with a flexible, high-performance networking solution.

The CMTS 1000 is fully compliant with the DOCSIS Baseline Privacy Specifications to ensure cable services security and private end-to-end communications. It also provides comprehensive filtering capabilities based on packet type, address, port or protocol, allowing cable operators to configure their security measures to fit their exact requirements.

The CMTS 1000 is Simple Network Management Protocol (SNMP) manageable by any SNMP management station. It can also be provisioned with its IP address and operational parameters over the network via standards-based provisioning platforms.

The Cornerstone product line scales to support thousands to millions of cable modems and enables cable operators to deploy products that flexibly support a variety of customer applications, from residential to small office/home office (SOHO) to large businesses.



DOCSIS 1.0 Support

The Cornerstone CMTS 1000 is developed to the DOCSIS 1.0 specification and meets the standards that include radio frequency (RF) interfaces, data interfaces, security, and operations support system interface specifications. It is also compliant with the Physical Protocol (PHY) Layer and MAC Layer characteristics as defined by DOCSIS. This strict adherence to standards enables cable operators to implement multi-vendor networks cost-effectively and safely.

EuroDOCSIS Based

The CMTS 1000 offers support for the European Data Over Cable Service Interface Specification (EuroDOCSIS) requirements and will operate on a typical European cable infrastructure. Deployment of EuroDOCSIS based products will enable operators to transition to DOCSIS 1.1, PacketCable and OpenCable features and functionality with lower cost and fewer equipment changeovers.

In order to meet the EuroDOCSIS requirements, the CMTS 1000 supports downstream channels widths of 8 MHz, an upstream split of 5 to 65 MHz and a 100-860 MHz downstream split. The change from DOCSIS to EuroDOCSIS is possible through a single step implemented through CPS 2000, SNMP sets or the Command Line Interface (CLI). The CMTS 1000 also supports ITU-T J.83 Annex A for Forward Error Correction (FEC).

High-Performance Architecture

The CMTS 1000 provides operators with a flexible software architecture based on a high-performance RISC-based engine with integrated application-specific integrated circuits (ASICs). A 10/100 Mbps Ethernet network interface, a 6 or 8 MHz 64 or 256 QAM CATV downstream channel, and a variable-rate QPSK or 16 QAM upstream channel are provided by the CMTS 1000. It supports up to eight channels upstream and one channel downstream to allow operators to match capital requirements with subscriber demands.

Cable Services Security with Baseline Privacy

The CMTS 1000 offers a complete set of security features that comply with the DOCSIS Baseline Privacy specification. It provides efficient message forwarding, with extensive advanced IP features such as Layer 3 filtering and multicast support and delivers features that increase cable services security and enable true end-to-end secure communications. The CMTS 1000 is a full spanning tree bridging device that forwards only to known destination addresses. Information on the cable channel is isolated from the 10/100 Ethernet channel of the CMTS 1000 unless destined for a device on that port. This forwarding method prevents unauthorized access to information and content, assuring subscribers and operators security and privacy in their communications.

The CMTS 1000 also prevents unauthorized and inadvertent access to services. Cable plant security is enabled via single Data Encryption Standard (DES) 56-bit encryption and key management. Each CMTS 1000 has an RSA public/private key pair used to exchange DES keys with a cable modem device.



Advanced IP Features

Layer 3 Filtering

The CMTS 1000 provides comprehensive Layer 3 filtering capabilities based on packet type, address, port or protocol. Its flexibility allows operators to apply a filter to a specific interface or to all interfaces on the CMTS 1000. Operators can also filter packets as they come in, as they go out, or both. The CMTS 1000 also offers enhanced capabilities for restricting network access and control through Layer 2 filtering through standard logical link control (LLC) filters.

Ten Logical Link Control (LLC) protocol filter entries and 30 IP protocol filter entries are supported by the CMTS 1000. The LLC protocol filter entries can be used to limit the forwarding capability of the Cornerstone CMTS 1000 to a restricted set of Network Layer protocols such as IP, Internet Packet Exchange (IPX), Network Basic Input/Output System (NetBIOS), and AppleTalk. The IP protocol filter entries can be used to restrict upstream or downstream traffic based on source and destination IP addresses, Transport Layer protocols such as Transmission Control Protocol (TCP), User Datagram Protocol (UDP), and Internet Control Message Protocol (ICMP), and source and destination TCP/UDP port numbers.

ARP Spoofing Protection

The CMTS 1000 offers ARP spoofing protection that prohibits forwarding traffic from IP addresses that were not learned by the CMTS via DHCP/ARP gleaning. This feature prevents the theft of another subscribers address and also can prevent someone from “stealing” other subscriber or server addresses.

Funnel Mode Operation

The CMTS 1000 offers funnel mode operation for additional cable services security. With funnel mode enabled, all traffic of the upstream path is forwarded to the IP side of the CMTS 1000. This would be done even if the destination for the message was on a downstream of the same CMTS 1000. With this mode of operation, a policy enforcement device can see ALL messages. This feature allows operators to enforce policies and security via an IP network element.

Multicast Support

The CMTS 1000 supports IGMPv2 to manage multicast traffic. Without IGMPv2, multicast traffic is broadcast to all NIU devices. The devices that are members of the multicast would consume the data. With IGMPv2, the CMTS 1000 acts as a proxy. It notes which NIU devices have signed up for multicast membership and forwards the multicast traffic only to those devices. This feature helps reduce broadcast traffic and congestion on the HFC network.



Mode B Forwarding

In this mode, the CMTS 1000 populates the forwarding database (FDB) based on gleaning DHCP and ARP message traffic. It only puts addresses in the database that were learned from DHCP or ARP traffic. This feature provides enhanced security because the FDB is populated only with addresses that are issued by servers/policies that are under network management control. Mode B forwarding also facilitates additional services for security and billing.

DHCP Relay

By implementing DHCP relay, cable modems and CPE devices, including PCs, can be segregated and managed separately. A “cable” DHCP server can manage Cable modems, while ISP servers could manage other devices. This feature provides enhanced security and control and also facilitates open access by separating the cable server from the server managing the other devices (i.e. PCs).

The CMTS 1000 offers four modes of DHCP relay:

- Disabled: DHCP discovers are forwarded with the broadcast DAddr unaltered
- Enabled: DHCP discovers are forwarded to specific DHCP server(s) by altering the DAddr
- Enabled with Tagging: DHCP discovers are forwarded to specified DHCP server(s) and the CM MAC address is included in the discover message for CPE correlation
- Enabled for CMs Only: DHCP discovers from cable modems are forwarded to specified DHCP server(s) while DHCP discovers from CPS are forwarded as broadcast messages

Ingress Avoidance

The CMTS 1000 features an Ingress Avoidance capability that manages the operation of each upstream channel in the presence of noise and sets operating characteristics to predetermined signal-to-noise and packet error rates. With Ingress Avoidance, the CMTS 1000 optimizes operation by dynamically changing channel width, modulation, channel frequency and forward error correction robustness based on operational requirements established by the operator. This enables operators to customize their operations based on their particular cable plant characteristics and avoid problems caused by channels experiencing high signal-to-noise conditions, maximizing reliability and uptime.

Enhanced Forwarding Database

The CMTS 1000 with software release 3.5 increases the size of the forwarding database to 16,384. 2,000 forwarding database entries are “set aside” for locally attached cable modems to ensure that they can register even when there are many addresses in the forwarding database.

Software release 3.5 also allows the operator to set the time by which addresses age out of the forwarding database. This gives the operator greater control over managing IP addresses. The operator can set the aging timing for:

- Cable modems that have ranged but not register
- Cable modems that have de-registered

In both cases, the operator can set the aging timing from 30 seconds to 5 days.



Command Line Interface

Operators can remotely control the CMTS 1000 operation using Command Line Interface (CLI) code commands. The CMTS 1000 commands enable the operator to display network conditions using MIB commands presented in a user-friendly format to remotely track problems and troubleshoot CMTS problems, thereby reducing truck rolls and mean-time-to-repair. The CLI is optimized for the Cornerstone CMTS 1000 and requires just 7 commands to perform high-level network fault isolation.

Integrated Upconverter

The CMTS 1000 provides an integrated upconverter, which converts the Intermediate Frequency (IF) to the downstream operational frequency. The integrated upconverter delivers the needed functionality to translate from lower to higher frequencies at a lower cost and smaller footprint with integrated management.

SNMP-Based Management

The CMTS 1000 is fully SNMP manageable. It supports Internet Engineering Task Force (IETF) Management Information Bases (MIBs) including: Cable Device, Radio Frequency, Request for Comment (RFC) 1213 (MIB II), RFC 1398 (Ethernet), RFC 1493 (Bridge), RFC 1573 (Interface), and Cornerstone Private MIB Extensions. The CMTS 1000 also enables the operator to perform performance-enhancing software upgrades and modify parameters Trivial File Transfer Protocol (TFTP) operations.

Concatenation

The CMTS 1000 offers concatenation, a bandwidth management tool operators can utilize to increase performance and throughput. Concatenation allows multiple small messages to be put into one message, allowing operators to make efficient use of their bandwidth.

Cable Modem MAC to CPE MAC Association

The CMTS 1000 maps the cable modem MAC to the CPE MAC (i.e. local PC) to enable a service provider such as a hotel to bill for usage. Now hotels that provide cable modem service to their guests can properly bill for service.

Telnet Access

The CMTS 1000 provides identical CLI capabilities available via multiple-user Telnet sessions. This allows operators to manage their CMTSs remotely.



CMTS 1000 Specifications

Standards

Based on DOCSIS 1.0	Yes
Based on EuroDOCSIS	Yes

Physical Characteristics

Packaging Type	19 inch Rack-Mount or Standalone
Dimensions	(HxWxD) 2.62 x 17.35 x 16.56 in. (6.65 x 44.0 x 42.0 cm)
Weight	18 lb
Operating Temperature	0° to 40°C
Storage Temperature	-40° to +66°C
Humidity	10% to 90% noncondensing
Ethernet Connectivity	10/100BaseT

Power

Input voltage	88 to 264 VAC 47 – 63 Hz, or -48 VDC
Input power	100 W

RF Electrical Specifications

Downstream:

RF Channel Spacing	6 MHz (North American DOCSIS) or 8 MHz (EuroDOCSIS)
Frequency Range	88 to 860 MHz (band edges)
Modulation	64 QAM or 256 QAM
Forward Error Correction	Reed Solomon
Output Signal Range	50 to 61 dBmV
Return Loss	14 dB
Transmit Output Power Accuracy	1 dB
Output Impedance	75 ohms

Upstream:

RF Channel Spacing	Variable, 200 kHz to 3.2 MHz
Frequency Range	5 to 42 MHz (band edges – North America DOCSIS) or 5 to 65 MHz (band edges – EuroDOCSIS)
Modulation	QPSK or 16 QAM
Forward Error Correction	Concatenation of Reed Solomon Block Code and Trellis Code
Receive Input Level	-4 to 26 dBmV (operator configurable)

For additional information or to arrange for a demonstration of Cornerstone products, please call 800-342-3763 or contact your ARRIS sales representative. You can also get more information at our web sites: www.arrisi.com

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Arris Interactive L.L.C.
11450 Technology Circle
Duluth, GA 30097

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