



Casa Systems C10200 CMTS

Overview

The Casa Systems C10200 Cable Modem Termination System (C10200 CMTS) is a new class of cable edge device that combines a third generation DOCSIS 3.0 CMTS and an MPEG video Edge-QAM in a high density, high availability 12RU platform.



The broadband access over cable market has experienced two generations of DOCSIS CMTS. Most of the products on the market today are either first generation CMTS or second generation CMTS that can be characterized by fixed downstream to upstream ratios, instantaneous bandwidth per subscriber limited to a single RF channel, very low downstream channel density per rack unit, and high cost per unit bandwidth.

The legacy CMTS does not have any MPEG video processing capability and thus makes it necessary to implement two parallel access networks for MPEG video and IP data. With those limitations, the legacy CMTS is not economically viable in the new market of high bandwidth applications such as IPTV or IP video delivery and is not competitive with other broadband access methods such as FTTH.

Feature Highlights

Full DOCSIS 3.0 qualified – Multi-channel DRFI RF for Annex A, B, & C, downstream channel bonding up to 16 channels, upstream channel bonding up to 16 channels, IPv6, AES encryption/decryption, multicast QoS, bonded channel multicast, bonded S-CDMA with multiple logic channels, full DOCSIS 3.0 MIBs, and IPDR

Separate Downstream and Upstream Modules – Unlike traditional CMTS with fixed downstream to upstream ratio, Casa CMTS has separate downstream modules and upstream modules that provide flexible downstream to upstream ratio

Integrated CMTS & Video QAM – DOCSIS traffic & MPEG/DVB video traffic can share the same RF channel

Cost Effectiveness – The lowest cost per DOCSIS channel in the industry. The only economical solution for high bandwidth multimedia IP applications

Software Licensing – Ability to activate additional channels as needed up to the available physical capacity of the module

Superior Density – Offers the highest channel density in the industry, ranging from 176DSx32US for IP video to 128DSx128US for typical broadband service deployment in a single chassis

Best Multi-channel RF performance – Exceeds DOCSIS DRFI specification

Extended Frequency Range – Downstream frequency range up to 1GHz (48~1002MHz)

DOCSIS 1.1 and 2.0 Features – Complete DOCSIS/EuroDOCSIS 1.1 and 2.0 feature sets

Rich Operational Features – Rich operational features such as show cable modem, flap list, spectral management and IP bundling ready for deployment

High availability – Dual hot-pluggable AC power supply or DC power supply, hot-pluggable fan tray, dual hot-pluggable SMM, and hot-pluggable line card modules, GbE link redundancy

As a third generation CMTS, the C10200 has several unique capabilities beyond DOCSIS 3.0 features. First, the C10200 supports complete separation of downstream channel capacity and upstream channel capacity in a single physical chassis, and thus provides a flexible downstream to upstream channel ratio. Cable operators can add downstream channels and upstream channels completely independently within the same chassis. Business users may require more symmetric downstream to upstream traffic ratios, while residential broadband is typically more asymmetric. For IPTV or video-over-IP applications, significantly more downstream traffic is required than the upstream traffic which is mostly for control plane applications.

Second, the C10200 has significantly higher channel density than a second generation CMTS. The extremely high downstream channel density makes it economical to provide video-over-IP service today.

Third, it can support both DOCSIS and MPEG/DVB traffic in a single platform. This unique feature is very important for cable operators to manage their HFC spectral resources in a single platform. It also allows the spectral resources to be shared dynamically between MPEG video, DOCSIS business users and DOCSIS residential users. For example, more bandwidth can be allocated to DOCSIS business traffic during the day while more bandwidth can be allocated to MPEG/DVB video traffic at night to efficiently utilize the spectral resource.

Fourth, The C10200 has the most extensive DOCSIS 3.0 features on the market today. It offers the highest channel bonding capability in both downstream and upstream. This bandwidth scalability from 150Mbps to 800Mbps makes it essentially equivalent to PON in bandwidth capacity.

The revolutionary DOCSIS bandwidth capacity and cost per-bit of DOCSIS bandwidth of the C10200 provides an unprecedented opportunity for cable operators to cost-effectively provision high-

bandwidth IP services such as IPTV or video-over-IP and interactive gaming in addition to traditional broadband access and VoIP services.

The integrated MPEG video capacity of the C10200 provides cable operators the flexibility to offer MPEG or DVB-based broadcast digital cable TV, video-on-demand (VOD), and interactive services in the same platform. The flexibility, multi-functionality and economics of the platform eliminate the need to deploy multiple parallel systems for MPEG TV, IPTV bypass and DOCSIS broadband access. The following sections detail the unique capabilities of the C10200.

Modular and Flexible Architecture

The C10200 CMTS comes in a 12RU chassis. It is based on a modular architecture that gives cable operators the maximum flexibility in tailoring their networks according to the requirements of their services. The C10200 consists of redundant Switch and Management Module slots, 12 slots for DOCSIS interface modules (downstream DQM modules or upstream DCU modules), and 12 slots for RF I/O modules (4-port downstream or 16-port upstream).

Any combination of downstream modules and upstream modules are supported by the platform. This enables flexible downstream to upstream channel ratio. The DOCSIS QAM Module (DQM) is a complete DOCSIS downstream unit that includes DOCSIS packet processing, QoS, DOCSIS downstream MAC, PHY, and RF up-conversion.

The DOCSIS Control and Upstream module (DCU) is a complete DOCSIS upstream unit that includes DOCSIS packet processing, DOCSIS upstream MAC and burst mode receivers. A typical configuration for channel-bonded deployment can be 128DSx128US for a 1:1 channel ratio or 96DSx192US for a 1:2 channel ratio. Each downstream QAM channel can be configured to support DOCSIS or MPEG/DVB-C video or a combination of the two.

Carrier-Class Reliability

The C10200 is a robust platform designed from the ground up to be carrier-class. It is NEBS compliant and includes many redundancies:

- Power-supply redundancy: dual -48VDC power supply
- Fan-tray redundancy
- Switch and Management modules: 1+1 redundancy
- QAM/Upstream modules: 10+2 redundancy
- Link redundancy: 12-port GbE interfaces for link fail-over
- A passive mid-plane

All modules in the C10200 are designed for “hot-swap” operation and can be inserted or removed while the system remains powered and in operation.



High Performance Video QAM

The C10200 downstream channels can also function as a MPEG or DVB-C compliant MPEG video Edge-QAM for digital video applications such as broadcast digital cable TV, video-on-demand, interactive TV, and network DVR. The C10200 receives MPEG-2 over IP/Ethernet packets in multiple program transport streams (MPTS) or single program transport streams (SPTS) through its multiple Gigabit Ethernet ingress interfaces, it then de-multiplexes MPTS and routes the native MPEG-2 packets to its egress QAM interfaces. At the egress interfaces, the re-multiplexing function generates multiple program transport streams (MPTS) for the designated cable channels. The C10200 performs PSI/SI table processing, PID filtering and

substitution, and PCR de-jittering to satisfy the most demanding needs of various video networks.

The C10200 supports both CBR traffic and VBR traffic for narrowcast applications and broadcast applications. The C10200 is the only product that can make the most efficient use of the RF bandwidth and maintains video quality at the same time through concurrent use of tools such as statistical multiplexing of all MPEG video traffic and DOCSIS traffic, and dynamical scheduling of MPEG and IP traffic.

Rich Operational Features

The C10200 supports industry standard Command Line Interface (CLI) and SNMP for configuration and management. Operational features such as show cable modem, show ARP, spectral management, CPU and memory resource reporting, user privilege management are available in the current release. Advanced features such as load balancing for bonded channels is also available in the current release.

Extensive IP features such as DHCP Relay and option 82, multiple DHCP servers, proxy ARP, IP subnet bundling, IGMP snooping, IGMP v2 and v3, access control list (ACL) are also available in the current release.

In the current release, the C10200 is functioning as a Layer 3 routing device. Static routes and default routes are supported. For route redundancy, multiple default routes can be configured. Layer 2 bridging, VLAN, RIP, BGP, OSPF, IS-IS, and PIM-SM are supported.

Applications

The applications of the C10200 in a cable network can be divided into two categories. The first category the C10200 provides is DOCSIS-based IP applications, such as broadband access, VoIP, and IPTV and video-over-IP etc. The second category the C10200 provides is digital video applications that include SDTV Broadcast over Cable, HDTV broadcast over Cable, VOD, Network Digital Video

Recorder (nDVR), interactive gaming, and switched digital video.

C10200 Specifications

System

- 24x2 Gbps switching capacity
- MPEG switching from any port to any port
- 12 DOCSIS module slots per system
- 1~11 Downstream modules per system
- 1~11 Upstream modules per system

DOCSIS Features

- Full DOCSIS 3.0 Qualified (December, 2008)
- Full Euro-DOCSIS 3.0
- DOCSIS 3.0 downstream channel bonding up to 16 channels
- DOCSIS 3.0 upstream channel bonding up to 16 channels
- DOCSIS 3.0 AES encryption/decryption
- DOCSIS 3.0 IPv6
- DOCSIS 3.0 Multicast
- Complete DOCSIS/EuroDOCSIS 1.1 features
- DOCSIS/EuroDOCSIS 2.0 A-TDMA (standard)
- DOCSIS/EuroDOCSIS 2.0 S-CDMA (optional)
- PacketCable 1.5 qualified
- PacketCable MultiMedia (PCMM) 1.0
- DSG

IP Features

- DHCP Relay and option 82
- Multiple DHCP servers
- Proxy ARP
- IP subnet bundling
- Static IP routing
- Multiple default routes
- IGMP snooping
- IGMP v2 and v3
- Access Control List
- RIPv2
- BGP
- OSPFv2
- PIM-SM
- L2VPN VLAN tagging
- IS-IS

Management

- RS232 Serial port (DB9)
- 10/100BaseT management port
- Command Line Interface (CLI)
- Telnet
- SSH
- SNMPv1, v2, and v3
- Standard DOCSIS and IETF MIBs
- IPDR
- Casa Systems Enterprise MIBs
- Event logging through Syslog
- Electronic mail notification
- Resource usage reporting
- TACACS+ and RADIUS

Additional Features

- Dynamic upstream and downstream load balancing
- Spectrum Management
- Software-defined MAC domains
- Software channel licensing
- Ingress cancellation filtering

MPEG Stream Processing

- MPEG de-multiplexing and re-multiplexing
- Unicast to Multicast conversion
- PAT and PMT extraction and regeneration
- PID filtering and remapping
- PCR jitter removal and re-stamping
- SI table generation and insertion
- DVB Simulcrypt scrambling
- Session-based Encryption

Switch and Management Module (SMM)

- 10/100/1000 Mbps interfaces
- 12-port GbE copper or fiber SFP
- Full line-rate support

DOCSIS QAM Module (DQM)

DQM16	16 channels, 4 channels per port
QAM modulation	Annex A, B or C
QAM constellations	64, 128, & 256 QAM
Data Rates (DOCSIS)	27 Mbps @ 64 QAM 38 Mbps @ 256 QAM
Data Rates (EuroDOCSIS)	36 Mbps @ 64 QAM 51 Mbps @ 256 QAM
Frequency range (center)	91 to 867 MHz (standard) 48 to 999 MHz (optional)
Frequency step size	5 kHz
Channel width	6 to 8 MHz (tunable)
Maximum output power Per Channel	61 dBmV @ 1-ch/port 57 dBmV @ 2-ch/port 53 dBmV @ 4-ch/port
Output step size	0.1 dB
Output stability	± 0.3 dB
Return Loss	50 ~ 870 MHz, 14 dB 870 ~ 1002 MHz 10 dB
Modulation Error Rate	44 dB (equalized)
Wideband Noise	-73 dBc

DOCSIS Control and Upstream Module (DCU)

DCU16	16 channels
DCU32	32 channels
Modulation	QPSK, 16, 32 & 64 QAM
Data rate per channel	0.32 – 30.72 Mbps
Input frequency range	5 – 42 MHz (DOCSIS) 5 – 65 MHz (EuroDOCSIS) 5 – 55 MHz (J-DOCSIS)

Input range -4 to 26 dBmV

RF I/O Downstream Module (RFD)

Number of ports 4 ports per module
Connector F-type, 75 Ω

RF I/O Upstream Module (RFU)

Number of ports 16 ports per module
Connector F-type, 75 Ω

Mechanical

Form Factor 12RU
Height 21 in. / 533 mm
Width 19 in. / 482 mm
Depth 16 in. / 406 mm
Weight 120 lbs (fully load)
Mounting 19 inch, 12 rack unit high
Front Panel LED power, alarm

Environmental

Operating temperature 0° to 50° C
Storage temperature -40° to 70° C
Operating humidity 5% to 95%, non-cond.
Power Requirements
DC -40.5 to -60 V (dual)
Power consumption < 1600 W (nominal)

Regulatory Compliance

Designed to NEBS level 3 requirements
Safety: EN/UL/IEC/CAN/CSA/C22.2 60950-1
EMC: FCC Part 15 Class A and CISPR Class A
Immunity: EN61000-4

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