Cisco DCM Series D9901
Digital Content Manager – MPEG Processor

Today's digital systems demand powerful, flexible, and compact solutions that will allow the service provider to support new network architectures. The Cisco® DCM Series D9901 Digital Content Manager (DCM) MPEG Processor is a compact 1 RU platform capable of processing a high number of MPEG video streams. The DCM Series D9901 MPEG Processor is the next generation of intelligent headend processing equipment where the combination of compactness and flexibility leads to a cost-effective solution. Based on our experience, the DCM Series D9901 MPEG Processor should bring operational and economic benefits in MPEG processing applications. The optional built-in DVB scrambler allows easy integration with several Conditional Access (CA) systems.

Figure 1.   Cisco DCM Series D9901 MPEG Processor

Physical Configuration

The DCM Series D9901 MPEG Processor comes in a compact 1 RU chassis with hot-swappable and redundant power supplies. The unit can be configured with up to two I/O cards, with each card having either a maximum of ten ASI ports or four GbE ports. Additionally, the DCM Series D9901 MPEG Processor can be fitted with up to two co-processor cards or one transcoder card to support advanced video processing functions.

The ASI cards have been designed to support full ASI rates, allowing freedom in system design. All ASI ports can be individually configured as either input or output, and all ASI ports support both MPTS and SPTS streams.

The GbE I/O cards support four GbE ports via SFP connectors, with the card having a total throughput of 2 Gbps in and 2 Gbps out. The GbE ports support both MPTS and SPTS streams.

The co-processor cards' powerful MPEG content processing cores allow the DCM Series D9901 MPEG Processor to perform content recompression to lower bit rates, support open loop statistical multiplexing, digital program insertion, and scrambling. Because the cards are designed around general purpose FPGAs, the DCM Series D9901 MPEG Processor is prepared to support multiple functions in the future through simple code downloads.

Grooming and Remultiplexing

Grooming and remultiplexing of content is only the first step of the DCM Series D9901's MPEG processing capability.

The DCM Series D9901 MPEG Processor supports advanced PSI and descriptor handling capabilities. PSI, SI, and PSIP tables can be regenerated and played out, changing dynamically according to input changes and configurations. Integration with Continuum® DVP SI-Server allows customized PSI/SI situations to be addressed.

Furthermore, it supports extensive transport stream and program analysis, including program level bit rate measurements on both incoming and outgoing streams. This allows the operator to easily configure the content into logical outgoing program groups. Every version also includes monitoring of many TR 101 290 errors.

The high processing power of the DCM Series D9901 MPEG Processor is designed to meet evolving architectures for certain future applications.

Advanced Video Processing

The DCM Series D9901 MPEG Processor has been designed to provide MPEG processing power for today's needs as well as anticipated future requirements. The DCM Series D9901 MPEG Processor supports up to 4 Gbps of input and output capability. Each of the two co-processing cores is capable of transrating, statistically multiplexing, or rate-limiting up to 350 SD streams or 85 HD streams using new IntelliRate *Plus* advanced transrating technology and algorithms. Each of the cores allow for digital program insertion (ad splicing) on SD streams as well as on HD streams. Splicing on component level allows for seamless insertion of regional content or advertisements into existing transport streams. In addition to video processing, these cores also enable the DCM Series D9901 MPEG Processor to perform DVB Simulcrypt compliant scrambling. Functionality of the co-processing cores is enabled via software licenses, allowing the operator to scale the functionality to meet their needs while at the same time reducing the capital expense necessary to meet the system requirements.

MPEG Processing Applications

Designed as an MPEG processing application platform, the DCM Series D9901 MPEG Processor accommodates bandwidth management of several encoder pools using IP-based closed-loop statistical multiplexing.

The DCM Series D9901 MPEG Processor can also operate as a Digital Transport Formatter (DTF) in which multiple incoming transport streams are combined into a single transport stream, making it suitable for distributing DVB-T and DVB-H signals for broadcast networks that may operate in an SFN environment.

Furthermore, using an ASI SFN I/O card in the DCM Series D9901 MPEG Processor offers full SFN adapter functionality, including insertion of MIP information according to TS 101 191 in any outgoing ASI MPEG transport stream on that card.

Conditional Access

The built-in scrambler allows easy integration with several CA systems. Integrating multiple CA systems at the same time is possible through the Simulcrypt interface. The DCM Series D9901 MPEG Processor also supports BISS-1 scrambling to secure satellite transmission links.

Transcoding

Following today's rapidly growing IPTV channel lineup requirements, the DCM Series D9901 MPEG Processor also performs high-density MPEG-2 to H.264 video transcoding, and is able to support optional audio transcoding from AC-3 and MPEG-1 Layer II to HE-AAC. It is capable of processing a high number of video streams, and is designed to support numerous advanced features like closed caption handling, audio, and metadata pass-through. Functionality of the transcoding modules is enabled via software licenses, allowing operators to scale and grow to meet their needs.

Redundancy and Reliability

The DCM Series D9901 MPEG Processor has been designed to help operators configure highly reliable networks. It supports hot-swappable and redundant power supplies and hot-swappable cooling fans. The DCM Series D9901 MPEG Processor can be configured in a hot 1:1 configuration to support maximum up-time with minimum switch-over interruption. To maximize service availability, the DCM Series D9901 MPEG Processor also offers port, transport stream, and service redundancy.

High-Quality Video Transmission over IP Networks

As IP is becoming more and more the transport network of choice, advanced functionality is required to maximize quality of service. The DCM Series D9901 MPEG Processor's extensive set of IP over GbE features, including extensive protocol support and Forward Error Correction (Pro-MPEG COP3 release 2 / SMPTE 2022 FEC) functionality, allows for seamless integration with these IP networks.

User Interface and Management

The DCM Series D9901 MPEG Processor is controlled via an easy and intuitive GUI. To keep things simple, there is no software to load on the user's computer. The GUI of the DCM Series D9901 MPEG Processor is a pure HTML-based user interface that can be opened using Microsoft Internet Explorer 6.0 and higher or Firefox 3.0. The GUI supports simple program provisioning through drag-and-drop functionality. The interface provides detailed information to the user, showing the DCM Series D9901 MPEG Processor configuration, input and output bit rate measurements, transport stream alarms, and other information. Additionally, for easy access to content details, sorting of program information can be performed on various program criteria, including input and output ports, bit rates, and program names. The general-purpose inputs on the chassis also allow for triggering of service backup or digital program insertion.

For integrated network monitoring and control, the DCM Series D9901 MPEG Processor is integrated with ROSA® Network Management and Control (NMC) system. All functionality available via the HTML interface is available with the ROSA control system.

Features

Interfaces

- Up to 20 ASI interfaces ports (10 ASI ports per ASI I/O card)
  - SPTS and MPTS supported
  - User-configurable as input or output on a per-port basis
  - Each ASI port supports up to 213 Mbps data rate
  - Supporting ASI input bandwidth limiting
  - Connector type: BNC
- Interface for external GPS receiver on ASI SFN I/O card (8 ASI ports per ASI SFN I/O card)
  - 1 PPS and 10 MHz inputs
  - SPTS and MPTS supported
  - User-configurable as input or output on a per-port basis
  - Each output port can be configured in normal or in SFN mode
  - Each ASI port supports up to 213 Mbps data rate
  - Supporting ASI input bandwidth limiting
  - Connector type: BNC
- Up to 8 GbE ports (4 ports per GbE I/O card in 2+2 configuration)
  - SPTS and MPTS supported
  - Unicast and multicast support
  - Protocols supported: 802.3, Ethernet, VLAN, RTP, UDP, IP, ARP, ICMP, IGMPv2 / v3
  - Quality of Service: Diffserv/TOS 802.1p
  - Connector type: SFP interfaces
  - FEC according to Pro-MPEG COP3 release 2 (COP3R2)/SMPTE 2022
  - Low latency dejitter option
  - Connector type: SFP interfaces

Re-multiplexing

- PID filtering / remapping on each input
- PID tracking
- Auxiliary PID synchronization with video
- Remultiplexing of services and components
- Content routing from any input to any output port

Monitoring

- Error monitoring on each input
- Input and output bit rate measurements
- Graphical bit rate viewer showing transrater group bit rates

Advanced Video Processing

- Transrating of single SD and HD programs (recompression to lower bit rates)
  - VBR to VBR
  - VBR to CBR (clamped VBR)
  - CBR to CBR
- Open loop statistical remultiplexing of SD and HD programs
  - Group statistical multiplexing of programs and transrating to lower bit rate if required
  - Support of user-defined program prioritization
- Digital Program Insertion in both SD and HD domains
  - Ad insertion based on SCTE 35 and SCTE 30 standards
  - Program substitution based on SCTE 35 triggers or manual interaction
  - eTV (enhanced TV) support
- DVB Simulcrypt and/or BISS-1 scrambling of SD and HD programs
- Advanced processing features enabled through software licenses on a per-program basis

Transcoding

- Up to 16 SD channels in 1 RU
- Up to 32 stereo pairs transcoding of AC-3 or MPEG-1 Layer II to HE-AAC
- Support of audio and metadata pass-through
- Closed caption handling
- Transcoding features enabled through software licenses on a per-program basis

Extended PSI-SI Capabilities

- Dynamic PSI/SI regeneration
- PSI/SI playout carousel
- Import of PSI/SI tables according DVB Simulcrypt
- PSI descriptor editing capabilities
- Built-in PSI/SI viewer
- Pass-through and regeneration of PSIP tables

Redundancy

- 1:1 Redundant configuration supported
- 1:1 GbE port backup supported
- ASI, GbE port, and GbE port pair mirroring
- Input service and transport stream redundancy

System

- 5 Gbps internal processing throughput with 4 Gbps of I/O capability
- User hot-swappable power supplies and fans
- Redundant load-sharing power supplies, supports both AC and DC power supplies
- Configuration settings stored on Compact Flash card (transferable to cold standby unit)

Management

- SNMP traps
- ROSA management
- Easy control using web browser
- Ethernet interface for communication with management system and web browser
- IPsec
- General-purpose Inputs

Product Specifications

Table 1. Product Specifications

| Specification	Value
ASI Interface Card	
Number of ports per card	10 ports, each port configurable as input or output
Connector	BNC-type
Impedance	75 Ω
Interface type	Asynchronous Serial Interface (ASI) (according to EN 50083-9)
Packet format	Auto detection: 188 / 204 byte packets
Bit rate	0.1 – 213 Mbps
Syntax	SPTS or MPTS (according to ISO/IEC 13818)
ASI SFN Interface Card	
Number of ASI ports per card	8 ports, each port configurable as input or output
ASI port connector	BNC-type
ASI port impedance	75 Ω
ASI port interface type	Asynchronous Serial Interface (ASI) (according to EN 50083-9)
ASI port packet format	Auto detection: 188 / 204 byte packets
ASI port bit rate	0.1 – 213 Mbps
ASI port syntax	SPTS or MPTS (according to ISO/IEC 13818)
GPS interfaces	1 PPS & 10 MHz reference inputs
GPS interface connector	BNC-type
GPS interface impedance	50 Ω or > 1 KΩ (selectable via GUI)
10 MHz reference input frequency	10 MHz
10 MHz reference input level	200 mVpp – 3 Vpp
10 MHz reference input coupling	AC
10 MHz reference input clock edge	Rising or falling edge (selectable via GUI)
1 PPS reference input frequency	1 PPS, phase locked to the 10 MHz reference input
1 PPS reference input range	0 V min., 5 V max.
1 PPS reference input sensitivity	200 mVpp min.
1 PPS reference input power	150 mWRMS into 50E max.
1 PPS reference input coupling	DC
1 PPS reference input trigger	Rising or falling edge (selectable via GUI)
1 PPS reference input trigger level	Automatic or manual (selectable via GUI)
Digital Transport Formatter (ASI Interface Card Mode)	
Number of ASI input ports per card	7 ASI ports
Number of ASI output ports per card	3 ASI ports (ports are identical)
Scrambling Activation	Per combined incoming transport stream
Conditional Access	BISS Mode 1

GbE Interface Card	
Number of ports per card	4 GbE ports, 2+2 (for redundancy)
Connector type	Optical/electrical Small Form Factor Pluggable (SFP) (see Note 1)
Interface type	Gigabit Ethernet (GbE) according to IEEE 802.3ab (Electrical) or IEEE 802.3z (Optical) Support for IEEE 802.Q VLAN tagging
Protocols	MPEG over IP/UDP and IP/UDP/RTP
Maximum throughput	2 Gbps input and 2 Gbps output per card
Syntax	SPTS or MPTS (according to ISO/IEC 13818)
Forward Error Correction	Pro-MPEG COP3R2/SMPTE 2022
IP Statmux (GbE Card Mode)	
Number of supported encoders	Up to 60
Number of supported encoder pools	Up to 20 statmux pools
Co-Processing Card	
Video formats	MP@ML (SD) en MP@HL (HD)
Audio formats	MPEG-1 Layer II and Dolby AC-3
Transrating (MPEG 2)	Up to 420 PAL/350 NTSC SD Streams or 85 HD Streams per card
DVB Simulcrypt Scrambling	Up to 500 streams per card
Maximum throughput	2 Gbps
Transcoder Card	
Video input coding format	MPEG-2 MP@ML (SD)
Video output coding format	H.264 HP@L3
Video resolutions	SD: 525i/29.97 and 625i/50
Video modes	CBR and VBR
Video transcoding	Up to 16 SD streams per card
Audio input coding format	MPEG-1 Layer II and AC-3
Audio output coding format	Pass-through: MPEG-1 Layer II, AC-3 and others Transcoding: HE-AAC
Audio transcoding	Up to 32 stereo pairs per card
Chassis Compact Flash size	16 GB required
Conditional Access	
Scrambling Algorithm	DVB Common Scrambling Algorithm BISS Mode 1
Level and mode of scrambling	Service/Program level scrambling support, Component level scrambling support Both MPTS and SPTS scrambling supported
Number of CA system connectors	1
Connector type	RJ-45
Interface Type	Ethernet 10/100/1000 BT
Simulcrypt	Simulcrypt version 3
Transport Stream Processing	
PID filtering / remapping capability	
Built-in PSI Viewer	
Dynamic PSI regeneration with advanced descriptor handling support	
Detailed bit rate measurement of incoming services	
Error monitoring	

Management and Monitoring	
Number of ports on chassis	2
Connector type	RJ-45
Interface type	10/100 & 10/100/1000 BT
Protocols	HTTP, SNMP, IIOP
User interface	Embedded HTML user interface
General Purpose Inputs	4 (spring clamp terminal block connector)
Environmental Specifications	
Operating temperature	0°C – +50°C / +32°F – +122°F
Storage temperature	-40°C – +70°C / -40°F – +158°F
Humidity	5% – 95% (non condensing)
Altitude	-200 – 10000 feet (-61 – 3048 m)
Power Requirements	
Power consumption (fully loaded)	< 190 W

Input voltage
    AC input voltage
        Nominal
        Normal service voltage range
        Frequency
    DC input voltage
        Nominal
        Normal service voltage range
	
	100 – 240 VAC
	90 – 254 VAC
	47 – 63 Hz
	
	-48 VDC
	-38 – -58 VDC

Chassis Mechanical Specifications	
Height	1 RU 1.74 in. / 44 mm
Width	19 in. / 483 mm
Depth	22.13 in. / 562 mm
Weight (fully loaded)	23.2 lbs / 10.5 kg
Cooling	Front to back, forced air; units are stackable

Note: 1. SFP Module not included.

Figure 2. Cisco DCM Series D9901 MPEG Processor Rear Panel with 2 AC power supplies, 1 ASI card and 1 GbE card
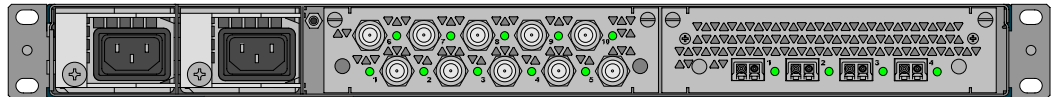
Table 2. Ordering Information Cisco DCM Series D9901 Components

Cisco DCM Series D9901 Components	Part Number
DCM Series D9901 Preconfigured Unit	
DCM Series D9901 preconfigured unit (fully assembled and pre-enabled licenses)	D1xxxxxxxxxxxxxxxx Call for Part Number
Hardware Upgrades (Boards delivered as separate kits)	
DCM co-processor board	4010882
DCM ASI I/O board	4010881
DCM ASI SFN I/O board	4027574
DCM GbE board	4023050
DCM GbE I/O + FEC board kit	4022724
DCM FEC board	4019399
DCM Transcoder board	4028140
DCM blank plate for power supply	4010913
DCM Series D9901 front panel	4025755
D9900 / D9901 DCM 16G Compact Flash upgrade kit V06.09.52	4031873.V06.009.52
D9900 / D9901 DCM 16G Compact Flash upgrade kit V07.00.55	4031873.V07.000.55
D9900 / D9901 DCM 16G Compact Flash upgrade kit V07.01.79	4031873.V07.001.79
Power Supplies	
AC power supply (AC power cord needs to be ordered separately)	4015490
DC power supply	4015491
License Upgrades (Upgrade delivered on a CD-ROM – see Note 2)	
DCM license upgrade containing one or more of the following licenses:	
- Transrating license package (1 license needed for each SD, 4 licenses needed for each HD, co-processor board needed)	40113440xxxx (Note 3)
- Splicing license package (1 license needed for each SD, 2 licenses needed for each HD, co-processor board needed)	40113460xxxx (Note 3)
- DVB Simulcrypt Scrambling license package (1 license needed per service, same license for BISS Mode 1 scrambling)	40113480xxxx (Note 3)
- Digital Transport Formatter (DTF) license package (1 license needed for each ASI board)	40223400xxxx (Note 3)
- Digital Transport Formatter BISS Mode 1 (DTF-BISS) license package (1 license needed for each ASI board) (BISS license can only be used on an ASI board already having a DTF license)	40223420xxxx (Note 3)
- COP3 FEC license package (1 license needed per FEC encode/decode repair stream)	40208020xxxx (Note 3)
- PID Sync Delay license package (1 license needed per PID that needs to be synchronized to the video)	40268760xxxx (Note 3)
- MIP insertion license package (1 license needed per MPTS that requires MIP insertion)	40281300xxxx (Note 3)
- GPI Interface license package (1 license needed per hard contact)	40290940xxxx (Note 3)
- EIT Filter license package (1 license needed per DCM)	402909000000
- EIT Advanced Filter license package (1 license needed per DCM)	402909200000
- MPEG-2 → AVC SD Transcoding license package (1 license needed for each SD, transcoder board needed)	40302320xxxx (Note 3)
- MPEG-1 Layer II → HE-AAC Transcoding license package (1 license needed for each stereo pair, transcoder board needed)	40302360xxxx (Note 3)
- AC-3 → HE-AAC Transcoding license package (1 license needed for each stereo pair, transcoder board needed)	40302380xxxx (Note 3)

AC Power Cords	
Argentina	207340
Australia	1000897
China	745415
Europe	3989835
Italy	3993130
Japan	3993133
UK	3989836
US	3989838

Note: 2. License Upgrade CD-ROMs are delivered as one separate CD-ROM per part number.

Note: 3. 'xxxx' in the License Upgrade part numbers represent the license quantity for that specific license type.

Table 3.   Ordering Information SFP Plug-ins (see Note 4)

Cisco DCM Series D9901 Components	Part Number
SFP Plug-ins – WDM types	
GbE SFP module 850 nm (LC, up to 500 m)	4002019
GbE SFP module 1310 nm (LC, up to 5 km)	4002020
GbE SFP module 1310 nm (LC, up to 40 km)	4003466
SFP Plug-ins – CWDM types	
GbE SFP module 1470 nm (LC, up to 40 km)	4002003
GbE SFP module 1490 nm (LC, up to 40 km)	4002004
GbE SFP module 1510 nm (LC, up to 40 km)	4002005
GbE SFP module 1530 nm (LC, up to 40 km)	4002006
GbE SFP module 1550 nm (LC, up to 40 km)	4002007
GbE SFP module 1570 nm (LC, up to 40 km)	4002008
GbE SFP module 1590 nm (LC, up to 40 km)	4002009
GbE SFP module 1610 nm (LC, up to 40 km)	4002010
GbE SFP module 1470 nm (LC, up to 70 km)	4002011
GbE SFP module 1490 nm (LC, up to 70 km)	4002012
GbE SFP module 1510 nm (LC, up to 70 km)	4002013
GbE SFP module 1530 nm (LC, up to 70 km)	4002014
GbE SFP module 1550 nm (LC, up to 70 km)	4002015
GbE SFP module 1570 nm (LC, up to 70 km)	4002016
GbE SFP module 1590 nm (LC, up to 70 km)	4002017
GbE SFP module 1610 nm (LC, up to 70 km)	4002018
SFP Plug-ins – 1000 BT copper	
GbE SFP module 1000 BT copper	4006222

Note: 4. All Class 1 SFP plug-ins according to IEC 60825-1 (1997) Amendment 2 (2001).

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