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E6000® Converged Edge Router
Release 9.0

Product overview

The E6000® Converged Edge Router (CER) is a next-generation Converged Cable Access Platform (CCAP™) that provides cable operators unprecedented advances in channel density, power efficiency, and cost savings in a redundant, integrated architecture designed from the ground up for high availability. This powerful design allows operators to converge all services (video, high speed data, and voice) on a single physical connector, enabling additional savings in capital and operational expenditures along with increased operational efficiency.

A single E6000 CER chassis can simultaneously support both Integrated CCAP (I-CCAP) and CCAP Core (for Remote PHY) operation beginning with Rel. 7.0. Release 9.0 includes many significant new features that deliver financial and operational benefits to cable operators and brings a large set of new capabilities for the R-PHY architecture and others for I-CCAP. The main new features of this release are greater channel density, scaling improvements, additions to the PNM feature set, and support more support for more types of RPDs.

Release 9.0 delivers cost savings and increased operational efficiencies for E6000 operators. A single E6000 chassis running Rel. 9.0 software can simultaneously support both I-CCAP and CCAP Core (for R-PHY) operation. This "hybrid" mode functions at the CAM level, meaning some CAMs are configured for I-CCAP and others for CCAP Core. Separate in-chassis stand-by CAMs are required for CAM Sparing. Rel. 9.0 adds additional support for the DOCSIS 3.1 Proactive Networking Maintenance (PNM) feature set. Rel 9.0 also delivers increased channel density and chassis scalability, OFDM and OFDMA enhancements, and new or enhanced routing capabilities.

Roadmap for future capabilities is subject to change.

Summary of new and existing features (partial list)

New Rel. 9.0 Features for I-CCAP:	New Rel. 9.0 Features for I-CCAP and CCAP Core:
• OFDM DS Dynamic Bit Loading for Gen 1 DCAM Annex A	• Extended DOCSIS Manufacturer CA Certificate Support
• Support of OSPF multiple instances (Gen 2 Only)	• Support for 2nd OFDMA Upstream Channel
• Insertion of Service Group ID into VOD SDT packet, Annex A	• 64 DOCSIS ANNEX A, No IEQ, no OFDM
• Service Level Redundancy for Broadcast Video	• MIB enhancements
• IP Host TFTP Load Balancing Feature	• OFDM 0.9375 and 1.25 microsec cyclic prefix with Annex B SC-QAMs

New Rel. 9.0 Features for CCAP Core:	
• Support for ARRIS 2x2 RPD (Gen 2)	• DS Dynamic Bit Loading
• DOCSIS 3.1 DS 512 and 2048QAM	• Support for distances significantly greater than 160km (100 miles)
• Enhanced NDF and NDR control plane support	• Increased CCAP Core Chassis Scalability
• PNM - D3.1 US Active/Quiet Probe and US Triggered Spectrum Capture	• OFDM 0.9375 and 1.25 microsec cyclic prefix with Annex A SC-QAMs
• 7 IUCs per US OFDMA channel per port	• FM radio support over NDF – Annex A
• Enhancements to CLI Command to Query RPD SFP Status	• DSCP Marking for Video Traffic Prioritization on the CIN

General feature summary

CCAP Core (R-PHY) DS Channel Densities (Annex A):	CCAP Core (R-PHY) DS Channel Densities (Annex B) with ARRIS VUE:
• 32A DOCSIS + 16A TB-VOD + 72A B'cast+ 2 x 192 MHz OFDM	• 48B DOCSIS + 2 x 192 MHz OFDM
• Please contact ARRIS for other supported channel density combinations	• Video supported via VUE Aux Core
	• Please contact ARRIS for other supported channel density combinations

Gen 2 I-CCAP DS Channel Densities:	Gen 1 I-CCAP DS Channel Densities:
• DCAM-2: 40A DOCSIS + 2 x 192 MHz OFDM	• Gen 1 DCAM: 36A DOCSIS + 144 MHz OFDM
• DCAM-2: 48B DOCSIS + 2 x 192 MHz OFDM	• Gen 1 DCAM: 48B DOCSIS + 192 MHz OFDM
• DCAM-2: 32B DOCSIS + 32B SDV/VOD + 192 MHz OFDM	• Gen 1 DCAM: 31A DOCSIS + 1B DOCSIS + 4A TB-VOD + 144 MHz OFDM
• Please contact ARRIS for other supported channel density combinations	• Gen 1 DCAM: 32B DOCSIS + 16B TB-VOD + 192 MHz OFDM

Integrated Edge QAM (IEQ) Feature Set:	IPv6 Support:
• Table-based VOD, SDV, or SB-VOD	• IS-IS MT and OSPFv3
• DVB Simulcrypt Encryption (Annex A) or VPME (Annex B)	• Prefix Delegation with Prefix Stability
• Broadcast video pass-through	• IPv6 CM Management, others

MPLS L2VPNs:	MPLS L3VPNs:
• Point-to-point architecture (VPWS)	• 63 non-default VRFs
• Remote LDP Signaling	• RIPv2 Passive Mode, static, or local routing
• PE router operation	• Route leaking via static routes

SC-QAM and OFDMA Support with UCAM-2:	SC-QAM and OFDM Downstream Support:
• 2 x 96 MHz with up to 12 SC-QAMs per US-SG	• Gen 1 DCAM and DCAM-2
• US Bonding of Eight (8) Channels including OFDMA	• OFDM Block Size Flexibility (24 to 192 MHz)
	• Exclusion Band Support
	• Bonding across SC-QAM and OFDM

Overall Service Group Support:	
• 96 Downstream Service Groups and 96 Upstream Service Groups per Chassis (Gen 2, 1:1 Combined) in I-CCAP mode	

Managing the E6000 CER is typically done via SNMP and/or CLI. The E6000 CER has multiple options available for IPDR, a useful tool for measuring bandwidth usage. Physical maintenance of the E6000 CER is very simple. Air filters – one in the front and another in the rear of the chassis – should be inspected and/or replaced per recommendations in the E6000 CER User Documentation.

General specifications

RF Downstream (I-CCAP)	
Frequency Range (MHz) Gen 1 DCAM	57 to 999 (DOCSIS 3.0) 90 to 1002 (EuroDOCSIS 3.0)
Frequency Range (MHz) DCAM-2	108 to 1218
RF Output Level (dBmV)	25 to 60 (SC-QAMs)
Typical Modulation Error Ratio (MER) (dB)	47
Modulation (QAM)	64, 256, DOCSIS 3.1
Data Rate (Mbps) (Max.)	30.34 to 55.62 per channel (SC-QAMs)
Output (load) impedance (ohms)	75

RF Upstream (I-CCAP)	
Frequency Range (MHz)	5 to 85 (UCAM) 5 to 204 (UCAM-2)
SC-QAM Modulation	QPSK, 16 QAM, 32 QAM, 64 QAM
Channel Type	OFDMA (UCAM-2),TDMA, ATDMA, TDMA/ATDMA
Data Rate (Mbps) (Max.)	30.72 per channel (ATDMA)
RF Input Level (dBmV)	-16 to +29
Frequency Resolution (KHz)	< 1
Symbol Rate (Ksym/sec)	1280, 2560, 5120
Bandwidth per SC-QAM (MHz)	1.6, 3.2, 6.4

Physical	
Power (Gen 1)	-48 VDC (-40 to -72 VDC)
Power (Gen 2)	-48 VDC (-44 to -72 VDC)
Power Consumption (full-fill Gen 1 system)	3,800 W nominal at -48 VDC, 77°F (25°C)
Power Consumption (full-fill Gen 2 system)	5,800 W nominal at -48 VDC, 77°F (25°C)
Operating Temperature:	
Short Term °F (°C)	+23 to +131 (-5 to +50)
Long Term °F (°C)	+41 to +104 (+5 to +40)
Storage Temperature °F (°C)	-40 to +158 (-40 to +70)
Operating Humidity (Min.-Max.)	5 to 85% (Non condensing)
Dimensions (H x W x D) in. (cm)	28 x 17.4 x 32.5 (72.0 x 44.2 x 82.6)
Weight lbs. (kg) (full-fill system)	Approx. 235 (107)

Management and NSI Interfaces	
Management Interfaces (Gen 1)	10/100/1000 Mbps Ethernet (RJ-45) plus Console (serial port, RJ45)
Management Interfaces (Gen 2)	100/1000 Mbps Ethernet (RJ-45) plus Console (serial port, RJ45)
Network-side Interfaces (Gen 1)	10 Gigabit Ethernet (SFP+) auto-baud, eight per card
Network-side Interfaces (Gen 2)	100 Gigabit Ethernet (QSFP-28), three per slot; 10 Gigabit Ethernet (SFP+), ten per slot

Management Access
In-band Management with Access Control Lists via any NSI port
Out-of-Band Management via dedicated Ethernet port on RPIC and RPIC-2Q
Console (serial) port on RPIC and RPIC-2Q

Ordering Codes M

Part Number	Description
1000536	GEN-2 Duplex Chassis Kit – Two RSM-2s, No CAMs
1000506	DCAM-2 DS Cable Access Module 2
1000445	UCAM-2 – US Cable Access Module 2 (must purchase one of the initial upstream license bundles for UCAM-2 with this item)
1000961	DCCM – DS CCAP Core Module (only for RPHY applications)
1000962	UCCM – US CCAP Core Module (only for RPHY applications;
1000963	CCRC – CCAP Core Rear Card (for DCCM and UCCM, active or spare)
1000716	D3.0 Downstream Annex B MAC Processing License (per 6 MHz D3.0 DS channel)
1000963	CCRC – CCAP Core Rear Card (for DCCM and UCCM, active or spare)
1000528	Single DOCISS 3.0 Downstream Annex A License
1000498	Single DOCSIS 3.0 Downstream Annex B License
1000226	DOCSIS 3.1 Downstream Licenses – 1 MHz DS License Bundle.
1000240	DOCSIS 3.1 Upstream Licenses – 1 MHz US License Bundle
1000303	Annex A Narrowcast Video License – Single VOD/SDV License
1000010	Annex B Narrowcast Video License – Single VOD/SDV License
Various	Initial DOCISIS 3.0 DCAM-2 Annex A Downstream License Bundle
Various	Initial DOCISIS 3.0 DCAM-2 Annex B Downstream License Bundle
Various	Initial DOCSIS 3.0 UCAM-2 Usptream License Bundle
1000708	Annex B Broadcast Video License – Single Broadcast License

Part Number	Description
1000508	Router System Module 2 (RSM-2)
1000325	Router System Module 2 Kit – 1 RSM-2 and RPIC-2Q
1000509	Physical Interface Card for RSM-2 (RPIC-2Q)
1000504	DPIC-2 - Physical Interface Card (Active) for DCAM-2
1000505	DPIC-2 - Physical Interface Card (Spare) for DCAM-2
1000715	DOCSIS 3.0 Downstream Annex A MAC Processing License (per 8 MHz D3.0 DS channel)
1001136	SYSTEM-PRINCIPAL-CORE LICENSE
1000716	DOCSIS 3.0 Downstream Annex B MAC Processing License (per 6 MHz D3.0 DS channel)
1000715	DOCSIS 3.0 Downstream Annex A MAC Processing License (per 8 MHz D3.0 DS channel)
1000743	DOCSIS 3.1 Downstream MAC Processing License (per 1 MHz channel)
1000744	DOCSIS 3.1 Upstream MAC Processing License (per 1 MHz channel)
Various	Initial DOCSIS 3.0 DCAM-2 Annex A Downstream MAC License Bundle
Various	Initial DOCSIS 3.0 DCAM-2 Annex B Downstream MAC License Bundle
Various	Initial DOCSIS D3.0 UCAM-2 Upstream License Bundle
1000972	Annex A MAC Narrowcast Video License – Single VOD/SDV MAC License
1000968	Annex A MAC Broadcast Video License – Single License
1000707	Annex A Broadcast Video License – Single Broadcast License
801169	E6000 Software Maintenance

Customer Care

Contact Customer Care for product information and sales:

- United States: 866-36-ARRIS
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