E6000® Converged Edge Router

Release 7.0

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.

Release 7.0 includes many significant new features that deliver financial and operational benefits to cable operators. 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. The E6000 CER acting as a CCAP Core is also known as "E6000 eCore." Together with this I-CCAP / CCAP Core hybrid mode, Rel. 7.0 brings a large set of new capabilities for either or both I-CCAP and Remote PHY (R-PHY) architectures. Channel density enhancements, ARRIS E6000r™ R-PHY Shelf Support, and several operational enhancements are among the key new features for CCAP Core operation. In addition, Rel. 7.0 supports operation of the E6000 CCAP Core as a single, unified core or within a multi-core architecture. For I-CCAP, Rel. 7.0 includes increased DCAM-2 channel density, chassis-level density and scaling enhancements, and additional DOCSIS® Proactive Network Management (PNM) capabilities. Rel. 7.0 also contains a set of routing enhancements that are supported for both I-CCAP and CCAP Core operation.

Roadmap for future capabilities is subject to change.

E6000® CER Release 7.0

Release 7.0 delivers cost savings and increased operational efficiencies for E6000 operators. A single E6000 chassis running Rel. 7.0 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 if redundancy is desired for both architectures simultaneously. For CCAP Core mode, Rel. 7.0 adds E6000r R-PHY Shelf support, PTP clock redundancy, and others. New I-CCAP features include DCAM-2 support for 48 Annex B DOCSIS SC-QAMs with 192 MHz OFDM, chassis density and scaling enhancements, additional PNM support, and others. MPLS L3VPN enhancements, IPv6 PBR support, and OSPFv3 Graceful Restart are added for both I-CCAP and CCAP Core modes.

Roadmap for future capabilities is subject to change.

SUMMARY OF NEW & EXISTING FEATURES (PARTIAL LIST)

New Rel. 7.0 Features for I-CCAP: DCAM-2: 48B DOCSIS + 192 MHz OFDM (no IEQ) Enhanced Device Scaling (SDV/VOD Model) D3.1 PNM US Triggered Spectrum Analysis (Free run mode)	New Rel. 7.0 Features for I-CCAP and CCAP Core: MPLS L3 VPNs VPNv6 Address Family MPLS L3 VPNs IPv6 PE-CE Protocols (Local, Static, PDRI) Policy-based Routing for IPv6 OSPFv3 Graceful Restart Support
New Rel. 7.0 Features for CCAP Core: Annex A Multiple Broadcast Video Ad Zones (Max of 10, Pass-thru only) RPD Continuous Wave (CW) Tones (Annex B) Multi-core Solution Architecture Support Dual PTP Clock Support (for Redundancy) DVB-CSA Encryption for Narrowcast Video (Annex A)	New Rel. 7.0 Features for CCAP Core: Support for Shelf RPD with 1 (DS) X 2 (US) Service Groups Configurable Downstream Power Level & Tilt for Shelf RPD PTP Excessive Clock Holdover Notification RPD Secure Software Download with HTTP RPD Soft Reset Support
General Feature Summary	
CCAP Core (R-PHY) Channel Densities (Annex A): 24A DOCSIS + 12A TB-VOD + 60A B'cast + 192 MHz OFDM 32A DOCSIS + 12A TB-VOD + 36A B'cast + 192 MHz OFDM Please contact ARRIS for other supported channel density combinations	CCAP Core (R-PHY) Channel Densities (Annex B): 24B DOCSIS + 36B B'cast + 96 MHz OFDM 32B DOCSIS + 8B TB-VOD + 96 MHz OFDM Please contact ARRIS for other supported channel density combinations
Gen 2 I-CCAP Channel Densities: DCAM-2: 40A DOCSIS + 192 MHz OFDM DCAM-2: 32A DOCSIS + 12A TB-VOD + 192 MHz OFDM DCAM-2: 48B SC-QAMs + 192 MHz OFDM Please contact ARRIS for other supported channel density combinations	Gen 1 I-CCAP Channel Densities: Gen 1 DCAM: 36A DOCSIS + 144 MHz OFDM Gen 1 DCAM: 31A DOCSIS + 1B DOCSIS + 4A TB-VOD + 144 MHz OFDM Gen 1 DCAM: 32A DOCSIS + 4A TB-VOD + 144 MHz OFDM Gen 1 DCAM: 36B DOCSIS + 12B TB-VOD + 192 MHz OFDM
Integrated Edge QAM (IEQ) Feature Set: Table-based VOD, SDV, or SB-VOD DVB Simulcrypt Encryption (Annex A) or VPME (Annex B)	IPv6 Support: IS-IS MT and OSPFv3 Prefix Delegation with Prefix Stability IPv6 CM Management, others
MPLS L2VPNs: Point-to-point architecture (VPWS) Remote LDP Signaling PE router operation	MPLS L3VPNs: 63 non-default VRFs RIPv2 Passive Mode, static, or local routing Route leaking via static routes
OFDMA Support with UCAM-2 1 x 96 MHz with up to 12 SC-QAMs per US-SG US Bonding of Eight (8) Channels 96 Downstream Service Groups and 96 Upstream Service Groups per Chassis (Gen 2, 1:1 Combined)	DOCSIS 3.1 Downstream Support: Gen 1 DCAM and DCAM-2 OFDM Block Size Flexibility (as low as 24 MHz) 5 usec or 2.5 usec Cyclic Prefix LDPC Shortened Codeword Exclusion Band Support (DCAM and DCAM-2)
Bonding of 32 Downstream Channels, 8 Upstream Channels	5 to 85 MHz Upstream Support (UCAM) 5 to 204 MHz Upstream Support (UCAM-2)

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

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)
The power consumption figures above apply to I-CCAP. CCAP Core applications consume less power due to fewer CAMs per chassis.	
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)

GENERAL SPECIFICATIONS (CONT'D)

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

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

Part Number	Description	Part Number	Description
1000718	128 Initial DS D3.0 Annex A MAC License Bundle - For MAC Channels 1-128 (requires DCCM HW PN 1000961 or DCAM-2 HW PN 1000506 purchase)	1000745	160 Initial DS D3.0 Annex A MAC License Bundle - For MAC Channels 1-160 (requires DCCM HW PN 1000961 or DCAM-2 HW PN 1000506 purchase)
1000963	CCRC - CCAP Core Rear Card (for DCCM and UCCM, active or spare)	1000717	64 Initial DS D3.0 Annex A MAC License Bundle - For MAC Channels 1-64 (requires DCCM HW PN 1000961 or DCAM-2 HW PN 1000506 purchase)
1000961	DCCM - DS CCAP Core Module (only for RPHY applications; must purchase one of the Initial DS D3.0 MAC License Bundles with this item)	1000962	UCCM - US CCAP Core Module (only for RPHY applications; must purchase one of the Initial Upstream D3.0 MAC License Bundles with this item)
1000716	E6000 D3.0 Downstream Annex B MAC Processing License (per 6 MHz D3.0 DS channel)	1000990	R-PHY Shelf Chassis with 1x RPD (1Dx2U SGs) and dual AC Power (10G SFP+ transceivers and AC Power Cords not included, priced separately)
1001136	SYSTEM-PRINCIPAL-CORE LICENSE	1000988	R-PHY Shelf Chassis with 2x RPDs (1Dx2U SGs each) and dual AC Power (10G SFP+ transceivers and AC Power Cords not included, priced separately)
1000715	E6000 D3.0 Downstream Annex A MAC Processing License (per 8 MHz D3.0 DS channel)	1000986	R-PHY Shelf Chassis with 3x RPDs (1Dx2U SGs each) and dual AC Power (10G SFP+ transceivers and AC Power Cords not included, priced separately)
1000716	D3.0 Downstream Annex B MAC Processing License (per 6 MHz D3.0 DS channel)	1000445	UCAM-2 (Must purchase PN 1000443 – 48 Upstream DOCSIS 3.0 licenses with this item)
1000743	E6000 D3.1 Downstream MAC Processing License (per 1 MHz channel)	1000483	72 INITIAL US D3.0 UCAM-2 License Bundle – For Channels 1-72
1000717	64 Initial DS D3.0 Annex A MAC License Bundle for DCAM-2 - For MAC Channels 1-64 (requires DCCM HW PN 1000961 or DCAM-2 HW PN 1000506 purchase)	1000458	96 INITIAL US D3.0 UCAM-2 License Bundle – For Channels 1-96
1000736	E6000 D3.0 Upstream MAC Processing License (per D3.0 US channel)	1000456	144 INITIAL US D3.0 UCAM-2 License Bundle – For Channels 1-144
1000506	DCAM-2 (Must purchase PN 1000488 – 128 DS DOCSIS 3.0 licenses with this item)	1000457	192 INITIAL US D3.0 UCAM-2 License Bundle – For Channels 1-192
1000600	160 INITIAL DS D3.0 DCAM-2 Annex A License Bundle - For Channels 1-160	1000561	138 INITIAL US D3.0 UCAM-2 License Bundle – For Channels 1-138
1000489	192 INITIAL DS D3.0 DCAM-2 Annex A License Bundle - For Channels 1-192	1000515	24 US DOCSIS 3.0 SC-QAM License Bundle (UCAM-2 Only)
1000494	192 INITIAL DS D3.0 DCAM-2 Annex B License Bundle - For Channels 1-192	1000444	48 US DOCSIS 3.0 SC-QAM License Bundle (UCAM-2 Only)
1000526	48 DS DOCSIS 3.0 SC-QAM Annex B License Bundle (DCAM-2 Only)	801169	E6000 Software Maintenance – Phone Plus Gold
1000535	48 DS DOCSIS 3.0 SC-QAM Annex A License Bundle (DCAM-2 Only)		

Full Price List available from ARRIS

CUSTOMER CARE

Contact Customer Care for product information and sales:

- United States: 866-36-ARRIS
- International: +1-678-473-5656