

ADVANCED VSAT SERIES

PRODUCT LINE OVERVIEW

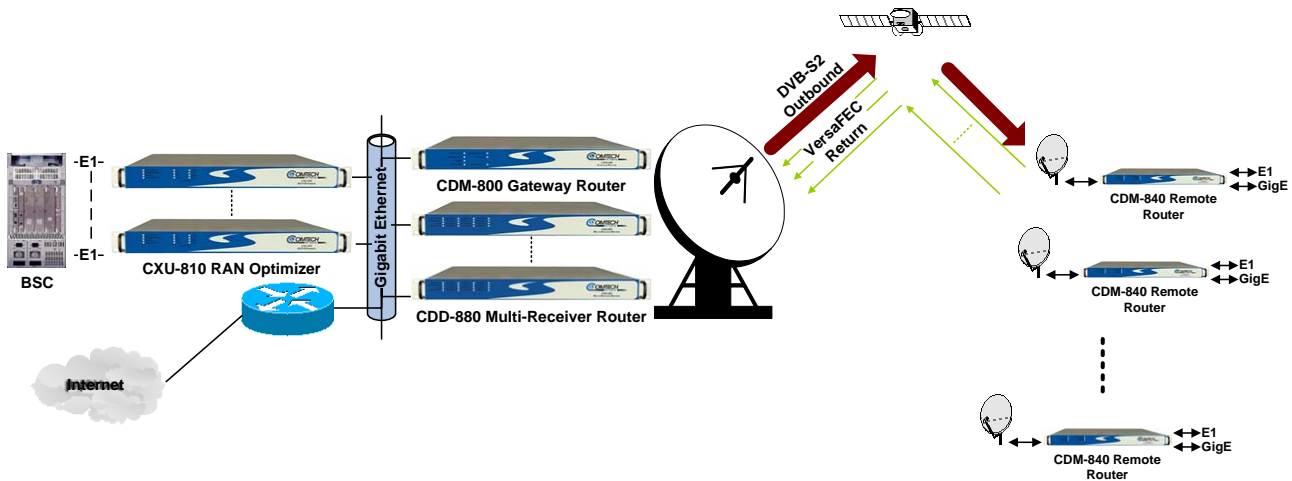


Figure 1: Hybrid Hub-Spoke Network Supporting E1 RAN and IP/Ethernet Traffic

Comtech EF Data's Advanced VSAT Series products offer industry-leading solutions for cellular backhaul, Universal Service Obligation (USO) networks, corporate networks, Internet Service Providers and other applications requiring high-performance IP transport in a hub-spoke network environment. Incorporating advanced technologies developed by Comtech EF Data, Comtech AHA and Memotec, these products are specifically designed to provide unmatched performance at an attractive price for a wide range of applications in a hub-spoke environment.

The Advanced VSAT Series includes the CDM-800 Gateway Router, the CDM-840 Remote Router, the CDD-880 Multi-Receiver Router and the CXU-810 RAN Optimizer. The products incorporate industry-leading WAN bandwidth optimization to provide the most efficient:

- Physical layer transport without compromising latency
- Link layer transport
- Higher layer transport
- Transport for Radio Access Network (RAN) backhaul

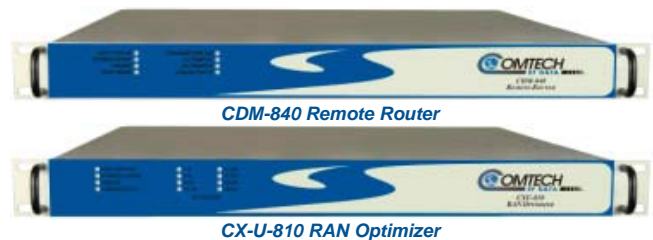
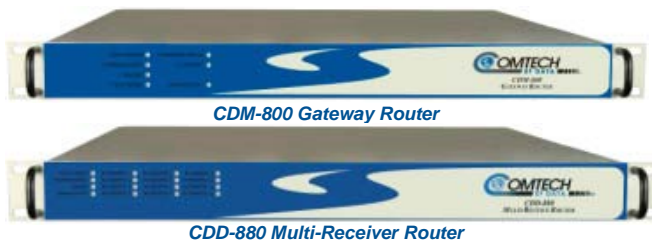
Leveraging our global leadership in cellular backhaul solutions, we developed products that are specifically engineered for cellular backhaul and high-performance IP transport in hub-spoke network environments. The Advanced VSAT Series provides **unmatched hub-spoke network efficiency**.

Key Features

- Advanced Forward Error Correction (FEC) – DVB-S2 & VersaFEC® low-latency LDPC
- Adaptive Coding and Modulation (ACM) capable
- RAN Optimization
- Integrated Router
 - Header Compression
 - Payload Compression
 - Low Overhead Encapsulation
 - Quality of Service (QoS)
- Seamless E1 and IP/Ethernet Operation
- G.703 Clock Extension

Common Applications

- Cellular backhaul with RAN Optimization
- Universal Service Obligation (USO) networks
- Corporate networks
- Internet access (ISP)
- Hybrid networks supporting IP and E1 transport



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Advanced FEC

The Advanced VSAT Series supports the most advanced FECs available today:

- DVB-S2 for the high-speed shared outbound traffic
- VersaFEC (Low-latency LDPC) for return traffic

DVB-S2 delivers unmatched bandwidth efficiency for high-speed traffic.

VersaFEC is a patented (covered by U.S. patents 7,353,444 and 7,415,659; other patents pending) system of high-performance, short-block, low-latency LDPC codes designed to support latency-sensitive applications, such as cellular backhaul over satellite. VersaFEC provides excellent coding gain with lowest possible latency. VersaFEC's coding performance is similar to that of DVB-S2 (short block) with 70-90% lower latency.

The combination of DVB-S2 for the outbound traffic and VersaFEC for the return traffic provides maximum spectral efficiency with minimal latency.

Adaptive Coding & Modulation (ACM) Capable

Satellite users have traditionally relied on worst-case link margin to overcome rain fade and other impairments, which leads to significant inefficiencies. ACM converts the available link margin into increased throughput – a gain of 100% or more is possible.

With the ability to maximize throughput under all conditions – rain fade, inclined orbit satellite operation, interference or other impairments – ACM allows each remote to achieve maximum throughput thereby maximizing network efficiency and availability.

RAN Optimization

RAN Optimization can significantly reduce the satellite bandwidth required for cellular backhaul. The RAN Optimization capability of the Advanced VSAT Series gives users the ultimate control by allowing them to select the level of RAN optimization to achieve desired link quality and bandwidth savings. The pre-emptive bandwidth management maintains superior voice and service quality even under wide area network (WAN) congestion. Supporting E1 RAN and IP RAN, the Advanced VSAT Series provides a seamless migration from a legacy E1 RAN to an all IP RAN with no change in satellite equipment.

Detailed usage statistics are also provided to assist with link monitoring and fine tuning.

Seamless E1 and IP/Ethernet Operation

The Advanced VSAT Series allows simultaneous E1 and IP/Ethernet operation in a hub-spoke topology, while supporting advanced capabilities including RAN optimization, header compression, payload compression, Quality of Service and ACM.

In addition to supporting hybrid networks, the products allow for seamless migration from an E1 RAN to an all IP RAN.

Idle	FR	FR	GPRS	Ingress E1 (Fixed TDM bandwidth)
SID	Idle	FR	FR	
GPRS	HR	SID	Idle	
Idle	SID	Idle	HR	

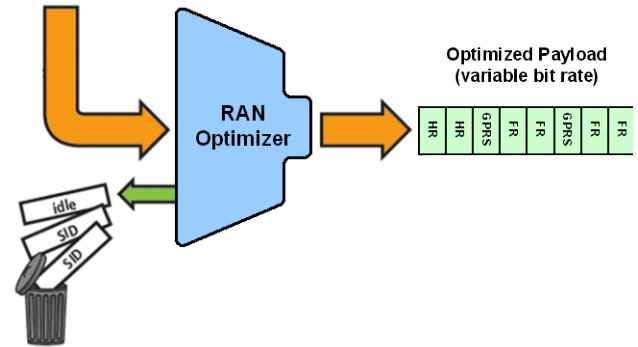


Figure 2. RAN Optimization

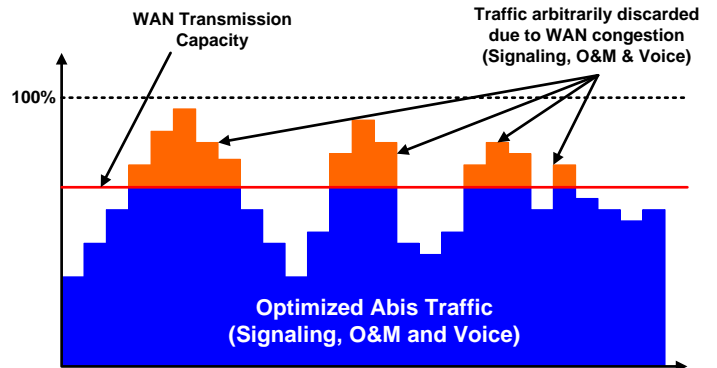


Figure 3. RAN Optimization without Pre-emptive BW Management

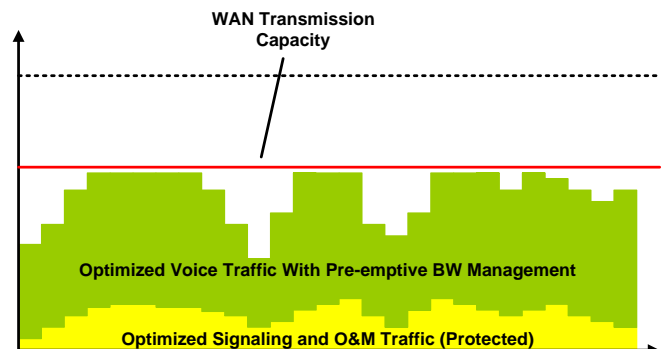


Figure 4. RAN Optimization with Pre-emptive BW Management

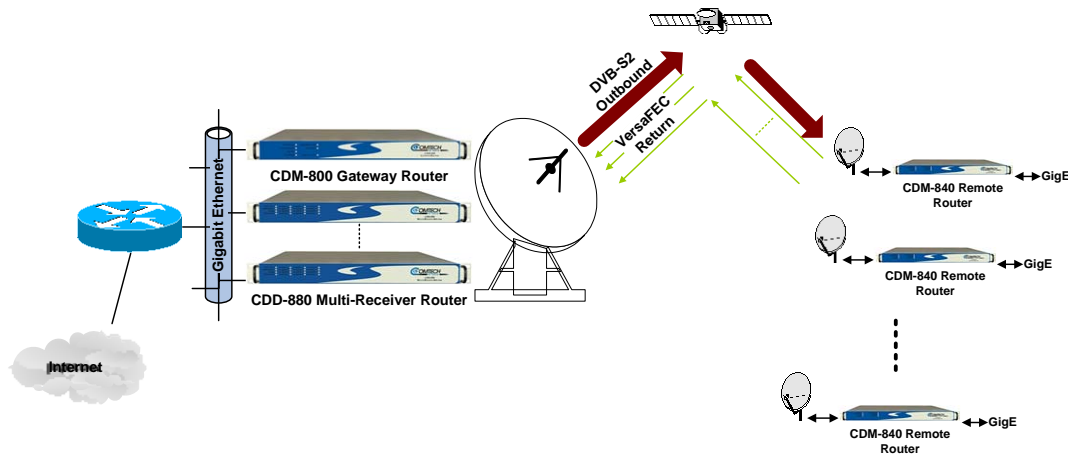


Figure 5. Hub-Spoke IP Network

Integrated Router

For efficient IP networking and transport over satellite, the Advanced VSAT Series features integrated routing capability with very low overhead encapsulation, header compression, payload compression and Quality of Service. The advanced QoS combined with header and payload compression ensures the highest quality of service with minimal jitter and latency for real-time traffic, priority treatment of mission critical applications and maximum bandwidth efficiency.

Header Compression – The Advanced VSAT Series supports industry-leading header compression for IP traffic. Header compression can reduce the 40 byte IP/UDP/RTP header to as little as 1 byte. For TCP/IP, the 40 byte header is reduced to as little as 3 bytes. For applications such as VoIP, header compression can provide bandwidth savings exceeding 60%. E.g. 8 kbps G.729 voice codec requires 24 kbps of IP bandwidth once encapsulated into an IP/UDP/RTP datagram. With header compression, the same voice call needs about 8.5 kbps – a saving of almost 65%. And, bandwidth requirements for typical Web/HTTP traffic can be reduced by 10% or more with TCP/IP header compression.

Payload Compression – The Advanced VSAT Series supports industry-leading payload compression for IP traffic. Implemented in the hardware for maximum throughput and efficiency, payload compression can reduce the required satellite bandwidth by as much as 40-50%.

Low Overhead Encapsulation – The Advanced VSAT Series supports low overhead encapsulation for transmit and receive. Comtech EF Data's patent-pending Streamline Encapsulation (SLE) is used for the return channel encapsulation while Enhanced GSE is used for encapsulating the outbound traffic. SLE can reduce the encapsulation overhead by as much as:

- 65% compared to HDLC
- 90% compared to AAL5 used in DVB-RCS
- 90% compared to proprietary framing used by other VSAT solutions

And, Enhanced GSE is typically 15-20% more efficient compared to standard GSE.

Quality of Service (QoS) – The Advanced VSAT Series supports multi-level QoS to ensure the highest quality service with minimal jitter and latency for real-time traffic, priority treatment of mission critical applications and maximum bandwidth efficiency.

Supported modes are:

- DiffServ – Industry-standard method of providing QoS enabling seamless co-existence in networks that implement DiffServ
- Max/Priority – Provides multi-level traffic prioritization with the ability to limit maximum traffic per priority class
- Min/Max – Provides a Committed Information Rate (CIR) to each user defined class of traffic with the ability to allow a higher burstable rate depending on availability

G.703 Clock Extension

Cellular networks require precise synchronization of base stations, which is a challenge when using IP backhaul. Most operators are forced to use GPS-based external equipment for site synchronization. The Advanced VSAT Series' G.703 clock extension capability propagates a high stability G.703 reference from Hub to the Remote. This process does not require additional bandwidth.

Other Features

- 20%, 25% and 35% Rolloff
- L-band operation from 950 to 2150 MHz
- BUC and LNB support
- Redundancy options



Specifications

	Outbound (Hub to Remote)	Return (Remote to Hub)
Data Rate	1 – 167 Mbps	16 kbps – 15.35 Mbps (CCM)
Symbol Rate	1 – 62 Msps (QPSK, 8-PSK) 1 – 47 Msps (16-APSK)	16 kspss – 4.1 Msps (ACM) 16 kspss – 4.5 Msps (CCM)
FEC	DVB-S2	VersaFEC
Modulation and Code Rates	QPSK 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 8-PSK 3/5, 2/3, 3/4, 5/6, 8/9, 9/10 16-APSK 2/3, 3/4, 4/5, 5/6, 8/9, 9/10	BPSK 0.488 QPSK 0.533, 0.631, 0.706, 0.803 8-QAM 0.642, 0.711, 0.780 16-QAM 0.731, 0.780, 0.829, 0.853
Rolloff	20%, 25% and 35%	20%, 25% and 35%
Encapsulation	Enhanced GSE	Streamline Encapsulation (SLE)

	CDM-800 Gateway Router	CDD-880 Multi-Receiver Router	CDM-840 Remote Router	CXU-810 RAN Optimizer
Operating Frequency – TX	950 – 2150 MHz 50 – 180 MHz	—	950 – 2150 MHz	—
Operating Frequency – RX	—	950 – 2150 MHz	950 – 2150 MHz	—
Connector & Impedance – TX	Type-N, 50 Ω BNC, 50 Ω/75 Ω	—	Type-N, 50 Ω	—
Connector & Impedance – RX	—	Type-N, 50 Ω	Type-N, 50 Ω	—
Transmit Power	-5 to -40 dBm, (950 – 2150 MHz) -5 to -25 dBm, (50 – 180 MHz)	—	0 to -40 dBm	—
BUC Reference (10 MHz)	10.0 MHz ± 0.06 ppm, selectable ON/OFF, 0.0 dBm ± 3 dB	—	10.0 MHz ± 0.06 ppm, selectable ON/OFF, 0.0 dBm ± 3 dB	—
BUC Power Supply (HW Option)	—	—	24VDC, 4.17 Amps max., 90 W @ 50° C 48VDC, 3.125 Amps max., 150W @ 50° C	—
LNB Reference (10 MHz)	—	10.0 MHz ± 0.06 ppm Selectable ON/OFF, -3.0 dBm ± 3 dB	10.0 MHz ± 0.06 ppm Selectable ON/OFF, -3.0 dBm ± 3 dB	—
LNB Voltage	—	Selectable ON/OFF, 13 VDC, 18 VDC and 24 VDC	Selectable ON/OFF, 13 VDC, 18 VDC and 24 VDC	—
LNB Current	—	500 mA, maximum	500 mA, maximum	—
RX Monitoring	—	Es/No estimate, Receive Signal Level, Frequency Offset, I&Q Constellation	Es/No estimate, Receive Signal Level, Frequency Offset, I&Q Constellation	—
Adaptive Equalizer	—	5-tap Adaptive Equalizer	5-tap Adaptive Equalizer	—
Data Interfaces	2 x 10/100/1000Base-T Ethernet	1 x 10/100/1000Base-T Ethernet	1 x 10/100/1000Base-T Ethernet 1 x G.703 E1, 2.048 Mbps (Unbalanced 75 Ω)	0, 8, 16, 24, or 32 x E1 2 x 10/100/1000Base-T Ethernet
Supported Protocols	RFC 768 – UDP RFC 791 – IP RFC 792 – ICMP RFC 793 – TCP RFC 826 – ARP RFC 856 – Telnet RFC 862 – Ping RFC 894 – IP	RFC 959 – FTP RFC 1112 – IP Multicast RFC 1213 – SNMP MIB II RFC 1812 – IPv4 Routers RFC 2045 – MIME RFC 2474 – Diffserv RFC 2475 – Diffserv RFC 2578 – SMI	RFC 2597 – AF PHB RFC 2598 – Expedite Forwarding RFC 2616 – HTTP RFC 3412 – SNMP RFC 3416 – SNMPv2 RFC 3418 – SNMP MIB	
Power Supply	100-240 VAC, 47 Hz-63 Hz 48 VDC (HW option)	100-240 VAC, 47 Hz-63 Hz 48 VDC (HW option)	100-240 VAC, 47 Hz-63 Hz 48 VDC (HW option)	100-240 VAC, 47 Hz-63 Hz 48 VDC (HW option)
Operating Temperature	0° to 50°C	0° to 50°C	0° to 50°C	0° to 50°C
Storage temperature	-20° to 70°C	-20° to 70°C	-20° to 70°C	-20° to 70°C
Humidity	95% maximum, non-condensing	95% maximum, non-condensing	95% maximum, non-condensing	95% maximum, non-condensing
CE Mark	EN55022 Class B (Emissions) EN50082-1 Part 1 (Immunity) EN60950 (Safety)	EN55022 Class B (Emissions) EN50082-1 Part 1 (Immunity) EN60950 (Safety)	EN55022 Class B (Emissions) EN50082-1 Part 1 (Immunity) EN60950 (Safety)	EN55022 Class B (Emissions) EN50082-1 Part 1 (Immunity) EN60950 (Safety)
FCC Approval	FCC Part 15 Class B	FCC Part 15 Class B	FCC Part 15 Class B	FCC Part 15 Class B
RoHS Compliant	Yes	Yes	Yes	Yes

Note: Some of the features may not be available in the initial release.



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