



Advanced VSAT Solutions





Unmatched Performance & Efficiency for Hub-Spoke Networks

Our Advanced VSAT Solutions portfolio provides high-performance satellite-based communication solutions for a diverse range of applications, including mobile backhaul with RAN optimization, IP trunking and backhaul, maritime and offshore networks, corporate and enterprise networks, emergency and disaster recovery. Incorporating advanced technologies developed by Comtech EF Data, AHA Products Group, Memotec and Stampede, the solutions provide unmatched performance, industry-leading bandwidth efficiencies and network optimization – while minimizing total cost of ownership.

The Advanced VSAT hub provides:

- DVB-S2 outbound transmission with ACM / VCM
- VersaFEC® return channel reception with ACM
- ACM / VCM controller
- Packet processing and optimization including quality of service (QoS), header compression & lossless payload compression
- E1 aggregation and RAN optimization
- WAN optimization
- Network management system
- Dynamic bandwidth management (dSCPC)
- Redundancy

The remote terminal provides:

- DVB-S2 outbound reception
- VersaFEC return channel transmission with ACM
- Packet processing and optimization including QoS, header compression and lossless payload compression
- RAN optimization – integrated E1 RAN optimization or external RAN optimization
- WAN optimization

The remote terminals are based on the CDM-840 Remote Router or the outdoor versions, the ODM-840 and the ODMR-840. The CDM-840 and the ODM-840 support integrated E1 RAN optimization for one E1. If required, the Memotec CX-U 1010/1220 can be used to support multiple E1s. The Stampede FX-1000 can be used to add WAN optimization and application acceleration. And, the Vipersat Roaming Oceanic Satellite Server (ROSS) adds global roaming capability for maritime users.

The Advanced VSAT Solutions are designed to minimize the total cost of ownership. The combination of advanced forward error correction with ACM/VCM, header and lossless payload compression, RAN and WAN optimization, advanced QoS and dynamic bandwidth management:

- Reduces OPEX by minimizing leased bandwidth
- Reduces CAPEX by reducing antenna size and BUC size
- Reduces OPEX and CAPEX by minimizing power consumption





Key Features & Technologies

Multi-Layer Optimization

The Advanced VSAT incorporates industry-leading optimization at every layer.

- DVB-S2 and VersaFEC with ACM/VCM enable the most efficient physical layer without compromising latency
- Ultra low overhead Streamline Encapsulation (SLE) and Enhanced GSE enable the most efficient link layer
- Header compression and lossless payload compression enable the most efficient transport for IP datagrams
- RAN optimization minimizes the bandwidth required for mobile backhaul
- WAN optimization provides TCP connection management, TCP optimization, image reduction and smoothing, caching, bandwidth pooling, and other capabilities for significant bandwidth savings
- Advanced QoS and Group QoS ensure the highest quality of service with minimal jitter and latency for real-time traffic, priority treatment of mission critical applications and maximum bandwidth efficiency

Scalable

The Advanced VSAT provides a highly scalable and cost-effective solution to meet the needs of a diverse user community. A network can start with a few sites and expand to hundreds of sites. The bandwidth can also scale as needed – the outbound can scale from as low as 1 Mbps to as high as 160 Mbps. The return can scale from as low as 16 kbps to as high as 15.35 Mbps.

Advanced Forward Error Correction (FEC)

The Advanced VSAT incorporates latest forward error correction technologies:

- DVB-S2 for the high-speed shared outbound traffic; delivers unmatched bandwidth efficiency for high-speed traffic.
- VersaFEC (low-latency LDPC) for return traffic; a patented system of high-performance, short-block, low-latency LDPC codes designed to support latency-sensitive applications, such as mobile 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 up to 95% lower latency.

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





Adaptive Coding & Modulation (ACM)

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 and other impairments – ACM allows each remote to achieve maximum throughput thereby maximizing network efficiency and availability.

ACM operation is tightly coupled with advanced QoS and other optimization technologies to maintain desired service levels.

Variable Coding & Modulation (VCM)

Without VCM, a shared link is sized to support the most disadvantaged site – due to smaller antenna size or satellite footprint location disadvantage. This leads to significant inefficiency in network design.

VCM is a technique that allows different Modulation and Code Rate (MODCOD) for different users and applications sharing a common outbound. The MODCODs are statically assigned based on link budget and unlike ACM, VCM does not require a feedback mechanism.


RAN Optimization

RAN Optimization significantly reduces the satellite bandwidth required for mobile backhaul. The Advanced VSAT's RAN optimization capabilities allow users to select the level of RAN optimization to achieve the desired link quality and bandwidth savings, providing ultimate control. And, the pre-emptive bandwidth management maintains superior voice and service quality even under WAN congestion conditions.

Advanced Packet Processing

For efficient IP networking and transport over satellite, the product features advanced packet processing capability with very low overhead encapsulation, header compression, lossless payload compression and QoS. The 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 incorporates 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 savings of almost 65%. Bandwidth requirements for typical Web/HTTP traffic can also be reduced with TCP/IP header compression.



Lossless Payload Compression – The Advanced VSAT incorporates industry-leading 2nd generation lossless 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 40-60%.

Low Overhead Encapsulation – The Advanced VSAT incorporates low overhead encapsulation for transmit and receive. Our 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 framing
- 90% compared to DVB-RCS framing
- 90% compared to proprietary framing used by other VSAT products

Enhanced GSE is typically 20-30% more efficient compared to standard GSE.

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

- DiffServ – Industry-standard method that enables 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

Group Quality of Service – The Group QoS capability allows users to create multi-level QoS rules.

Seamless E1 and IP/Ethernet Operation

The Advanced VSAT enables simultaneous E1 and IP/Ethernet operation in a hub-spoke topology, while supporting advanced capabilities including RAN optimization, header compression, lossless payload compression, QoS and ACM. In addition to supporting multi-service networks, this allows for seamless migration from an E1 RAN to an all IP RAN.





Ethernet Synchronization & G.703 Clock Extension

Mobile 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 incorporates key technologies for synchronization, including G.703 Clock Extension and IEEE 1588v2 Precision Time Protocol (PTP).



Multi-Service Connectivity via Advanced VSAT Solutions

WAN Optimization and Application Acceleration

WAN optimization and application acceleration provide TCP connection management, TCP optimization, image reduction and smoothing, caching, bandwidth pooling, and other capabilities. In addition to a significant improvement in user experience, they can also reduce bandwidth by 20-70% for web traffic.

Dynamic Bandwidth Management (dSCPC)

The dSCPC capability enables dynamic allocation and sharing of bandwidth among users. A number of automatic and manual switching modes are supported. Automatic switching includes load switching, application switching, ToS switching, QoS switching and VESP switching. A network operator or maintenance personnel can also trigger manual switching.

Roaming Oceanic Satellite Server (ROSS)

The ROSS enables global roaming for maritime users. Its functions include interfacing to the Antenna Control Unit (ACU), maintaining vessel location information, maintaining satellite footprint maps, maintaining exclusion zones, and initiating beam switching and handoff as the vessel moves through the satellite footprint. The ROAM protocol offers a common management interface for the ROSS and the ACU by providing a set of commands, information, interfaces and status queries.

Outdoor Modems

ODM-840 and ODMR-840 are available for deployment at shelterless sites. Due to low power consumption, they are ideal for solar powered sites. They also meet IEC 60529, IP 67 for protection from dust and rain.

Applications

Mobile Backhaul

We leveraged our leadership position in mobile backhaul over satellite to create the ideal platform to support 2G/3G mobile backhaul in a hub-spoke topology. The platform includes a number of key features and technologies that enable the most efficient, cost-effective, highest quality, reliable and highly scalable backhaul for 2G/3G networks, including:

- RAN optimization
- Low latency
- Low jitter
- QoS
- Simultaneous E1 and IP/Ethernet operation
- Ethernet synchronization

The Advanced VSAT can also reduce power consumption at the remote sites, thereby minimizing the OPEX and CAPEX for on-grid and off-grid locations.

IP Trunking & Backhaul

The Advanced VSAT is designed to provide the most efficient transport for IP traffic:

- Up to 160 Mbps DVB-S2 outbound with ACM, VCM
- Up to 15.35 Mbps VersaFEC return channel with ACM
- Header compression
- Lossless payload compression
- QoS including Group QoS
- Ultra low overhead encapsulation
- WAN optimization and application acceleration

The advanced optimization capabilities make it possible to achieve user throughput in excess of carrier data rate.

Maritime & Offshore Connectivity

Satellite is the only medium capable of providing global, always-on connectivity for maritime and offshore users. The Advanced VSAT incorporates a number of key features and technologies to enable efficient, high quality, reliable and scalable transport, including:

- ROSS
- Integration with all major stabilized antenna platforms
- Dynamic bandwidth management (dSCPC)
- Beam switching
- DVB-S2 outbound with ACM, VCM
- VersaFEC return channel with ACM
- QoS including Group QoS
- Header compression and lossless payload compression
- WAN optimization and application acceleration



Corporate & Enterprise Networks

Our Advanced VSAT Solutions are ideally suited to provide reliable, scalable and efficient connectivity for corporate and enterprise users for all their mission-critical applications including voice, video and data. The dynamic SCPC (dSCPC) capability combined with ACM/VCM, Group QoS, header and payload compression enables the most efficient on-demand bandwidth sharing among different locations, while maintaining the desired service levels.

Emergency & Disaster Recovery

Satellite communications has long been considered an ideal medium for disaster recovery and emergency backup services. Its ubiquitous nature allows it to be deployed anywhere, anytime and provide near instantaneous connectivity for service re-establishment.

Advanced VSAT enables disaster recovery and emergency backup for fixed installations as well as emergency response vehicles which travel to troubled areas and provide emergency communication services over satellite. Most operators cannot afford to have dedicated bandwidth for disaster recovery or emergency backup. The dynamic bandwidth management capability of our Advanced VSAT Solutions allows the available bandwidth to be used for general communications under normal conditions, while automatically re-assigning it in response to an emergency or terrestrial circuit failure.

Key Specifications

	Outbound (Hub to Remote)	Return (Remote to Hub)
Data Rate	1 – 160 Mbps	16 kbps – 15.35 Mbps
Symbol Rate	1 – 62 Msps (QPSK, 8-PSK) 1 – 47 Msps (16-APSK) 1 – 37 Msps (32-APSK)	16 ksps – 4.5 Msps
FEC	DVB-S2	VersaFEC
Modulation & Code Rates	<u>QPSK</u> 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 <u>8-PSK</u> 3/5, 2/3, 3/4, 5/6, 8/9, 9/10 <u>16-APSK</u> 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 <u>32-APSK</u> 3/4, 4/5, 5/6, 8/9, 9/10	<u>BPSK</u> 0.488 <u>QPSK</u> 0.533, 0.631, 0/706, 0.803 <u>8-QAM</u> 0.642, 0.711, 0.780 <u>16-QAM</u> 0.731, 0.780, 0.829, 0.853
Rolloff	20%, 25% and 35%	20%, 25% and 35%
Encapsulation	Enhanced GSE	Streamline Encapsulation (SLE)

Contact us today to learn more about how the Advanced VSAT Solutions can deliver significant benefits to your network.



U.S. Patents
7,353,444 & 7,415,659;
other patents pending

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