Product Bulletin
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CDM-760 Advanced High-Speed Trunking Modem

Overview

Comtech EF Data has been a thought leader in the high-end satellite ground equipment market for decades, providing telcos, service providers and systems integrators with the most cost-effective backhaul and trunking solution suite for the most demanding fixed and mobile networks. This trend continues with the release of the integrated High-Speed Packet Processor for the CDM-760 Advanced High-Speed Trunking Modem . This new high-end solution provides the efficiency, intelligence and horsepower required to support the ever-increasing demands of hybrid backbone networks that leverage both terrestrial and satellite connections.

Satellite operators continue to innovate in the sky, launching new High Throughput Satellite (HTS) designs that promise increased performance and better economics. In parallel, it is imperative that ground manufacturers provide innovative, purpose-built and future-ready solutions that allow users to attain these new levels of performance and economics that allow them to penetrate new markets, offer enhanced services and minimize subscriber churn through a differentiated service offering. The CDM-760 is Comtech EF Data's high-end answer to this market challenge.

Groundbreaking Efficiency

When discussing satellite communications, one must start with the raw efficiency of the solution, or the number of Mbps that can be sent through a given MHz. In its simplest form, Mbps/MHz ratios are calculated using the modulation (number of bits per symbol) and coding (amount of error correction added) method. The CDM-760 leverages many of Comtech EF Data's industry-leading coding gain and physical layer operations, including DVB-S2 Efficiency Boost (DVB-S2-EB), Adaptive Coding & Modulation (ACM) and DoubleTalk Carrier-in-Carrier Adaptive Cancellation to provide the highest raw Mbps/MHz rates in the industry, creating the most attractive economics possible, allowing either:

- **Reduced Bandwidth (MHz) for a Given Throughput (Mbps)**, resulting in a decrease in OPEX cost structure for a given revenue stream, or
- **Increased Throughput (Mbps) for a Given Bandwidth (MHz)**, resulting in an increase in revenue stream with a given OPEX cost structure.

DVB-S2 Efficiency Boost (DVB-S2-EB)

The DVB-S2 standard, widely accepted as the most spectrally efficient standards-based waveform, was recently expanded upon with several modem manufacturers releasing enhancements, creating several DVB-S2X approaches. The CDM-760 leverages Comtech EF Data's Efficiency Boost technology (DVB-S2-EB1), providing a 10%-35% increase in efficiency over the DVB-S2 standard. Its increase in the number of modulation and coding methods available teamed with new tighter carrier roll-off factors results in the most efficient waveform in the industry.

Adaptive Coding & Modulation (ACM)

ACM varies the throughput of a link dependent upon real-time atmospheric conditions. This is in contrast to a Constant Coding and Modulation (CCM) method, which assigns a single throughput for a link at all times. The disadvantage of the CCM approach is that a link must be designed to the worst-case operating condition to ensure a given Service Level Agreement (SLA). As worst-case conditions typically occur less than 1% of the time, much additional potential throughput is wasted. This results in significant inefficiencies,unattractive economics and severely limits the addressable market. The CDM-760 leverages ACM in both directions of the link, enabling users to use aggressive modulation and coding methods in times of clear weather conditions (high Mbps/MHz ratios) while backing down to less efficient methods to meet SLA's in times of adverse conditions.

DoubleTalk® Carrier-in-Carrier® Bandwidth Compression

Taking this a step further, the CDM-760 leverages Comtech EF Data's patented bandwidth compression technology that overlays transmit and receive carriers. The CDM-760 on each end of the link receives a combined signal that includes information from both the remote modem and itself and intelligently removes its own signal from the information flow. This ability to re-use bandwidth results in a significantly reduced bandwidth requirement and further increases the overall efficiency of the link.

Robust Intelligence

Adaptive Coding and Modulation (ACM) is an important feature on many satellite links, enabling link margin to be converted to an increase in data throughput, thereby providing a service provider the ability to maximize the utilization of its leased satellite resource. However, when there are large variations in capacity, such as with High Throughput Satellite links carrying packet-based content, ACM simply isn't enough. What is really needed are robust traffic shaping (also known as Quality of Service) and header compression techniques to be teamed with the ACM functionality.

Lossless Payload Compression in Hardware

Bit streams have different levels of redundancy. The CDM-760 intelligent payload compression engine replaces actual information with a smaller, "representative" data stream that still fully describes the data to be sent. This information stream is then fully reconstructed without loss ("lossless") on the other end of the link, reducing the total number of bits that need to be sent over a satellite link. While the levels of redundancy vary depending upon traffic makeup, the CDM-760's lossless compression engine provides 52%-59% savings on industry benchmark data, a significant savings and increase in efficiency.

Header Compression with Packet Processor

The Internet Protocol (IP) breaks a stream of data into separate blocks that are to be sent to a destination through a network of nodes. Designed to operate in a complicated point-to-multipoint network that includes numerous "hops" to get to an endpoint, the protocol, as a means of protection, wraps the payload into a transmission packet that traverses a series of bridges and routers that each make a decision along a path on where to next forward the packet. To allow these many different devices to make the proper forwarding decision, a great amount of overhead is required within the header of the packet. As satellite networks are autonomous, much of this information, from a satellite communications perspective, is overhead and need not be transmitted over the satellite link. It is imperative that any satellite network solution incorporate header compression techniques.

The CDM-760's header compression engine compresses headers from 40-68 bytes down to 3 or fewer bytes, a significant bandwidth savings and increase in efficiency. Depending on the size of the payload, this can represent a 74% overall bandwidth savings.

Traffic Shaping (QoS) with Packet Processor

As packet-based content continues to dominate today's communication systems, traffic shaping is becoming a system level requirement for all network topologies. Traffic shaping is the engine that enables the transmission of the highest "value" traffic during periods of congestion, ensuring that the most important services are uninterrupted. Without it, all traffic is treated equally and even the most critical services can suffer. A site that has a terrestrial data rate that is greater than the satellite WAN capacity allocated to it will not operate properly without the proper traffic shaping, no matter the satellite network sharing mechanism, even with ACM implemented.

The high-speed packet processor of the CDM-760 functions in Layer 2 (bridged) or Layer 3 (routed) modes of operation while performing the three intelligent processes that comprise traffic shaping:

- Classification
- Prioritization
- Drain

Unparalleled Horsepower

There are two limits that define the capabilities of a satellite platform carrying IP data. The first is the amount of information that can be transmitted across a link, in Mbps. The second is the number of IP packets that can be processed simultaneously, in PPS. It is important to consider both when determining the scalability of a chosen platform.

All of the benefits of header compression, payload compression and traffic shaping won't be recognized if the hardware that performs these functions can't keep up with the user traffic. A high-end platform must be able to handle the traffic load on either Traditional or HTS satellites. The CDM-760 high-speed packet processor accepts Ethernet frames from 64 bytes to 9,000 byte jumbo frames. When traffic shaping (QoS) and header compression are concurrently enabled, the packet processor will handle over 190,000 packets per second simplex and over 350,000 packets per second duplex. These performance numbers make the CDM-760 the most powerful IP packet processing engine in the market, allowing the packet processor to run at the full capacity of the CDM-760's top speed of 314 Mbps simplex, 628 Mbps duplex rate.

Conclusion

The CDM-760 Advanced High-Speed Trunking Modem has been purpose-built to best support high-speed trunking and backhaul links of today and into the future. It provides not only the best overall link efficiencies of any high-end modem offering in the market, but is also future ready with the underlying horsepower to carry the most demanding links of tomorrow with the highest throughputs. The CDM-760 provides the many layers of optimization that are essential to providing the most robust yet cost-effective solution for hybrid networks as a primary link or as a backup to terrestrial core links.

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