Product Bulletin
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CDM-625A Advanced Satellite Modem

Overview

Comtech EF Data has been a thought leader in the high-end satellite ground equipment market for decades, providing Mobile Network Operators (MNOs), 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 VersaFEC-2 Forward Error Correction and Modulation method in the CDM-625A Advanced Satellite Modem. CDM-625A equipped with the new VersaFEC-2 provides the efficiency, intelligence and horsepower required to support the ever-increasing demands of MNOs for medium rate links for mobile backhaul.

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 equipment 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-625A is Comtech EF Data's mid-range 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 VersaFEC-2 method is the latest in the line of Comtech EF Data's industry-leading coding schemes and physical layer innovations, providing unparalleled efficiencies at low-to-medium symbol rates. Used in tandem with Comtech EF Data's Adaptive Coding & Modulation (ACM),DoubleTalk® Carrier-in-Carrier® bandwidth compression, optimized transmit filter rolloffs, and packet processor optimization the CDM-625A provides 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.

VersaFEC-2

A highly evolved version of Comtech EF Data's industry-leading VersaFEC waveform, the high-performance VersaFEC-2 waveform has been designed from the ground up to provide optimal performance for applications from up to 12.5 Msps, providing bandwidth savings from 20-30% over its predecessor. VersaFEC-2 introduces a number of new modulation and coding combinations and a new family of constellations that allows better operation on non-linear satellite channels, outperforming the DVB-S2X standard. This new innovation offers both large block and small block options, with the latter providing an 80% decrease in end-to-end latency versus those associated with the DVB standards. End-to-end latency significantly affects connection-oriented and interactive applications, either severely reducing the speed and quality of the application or, worse, causing the application not to operate at all. The VersaFEC-2 modulation and coding method was purpose-built to support these applications at the low-to-medium data rates typical with mobile backhaul.

Adaptive Coding & Modulation (ACM)

An ACM method 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, which results in significant inefficiencies and unattractive

economics, severely limiting the addressable market. The CDM-625A leverages ACM in both directions of the link, enabling users to use aggressive modulation and coding in times of clear weather conditions (high Mbps/MHz ratios) while backing down to more robust modulation and coding to meet SLA's in time of adverse conditions.

DoubleTalk Carrier-in-Carrier Bandwidth Compression

Taking this a step further, the CDM-625A leverages Comtech EF Data's patented bandwidth compression technology that overlays transmit and receive carriers. The CDM-625A 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. For loopback connections, 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 (HTS) 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-625A 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-625A's lossless compression engine provides over 60% 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 a header compression technique

The CDM-625A's header compression engine compresses typical layer 2, 3 and 4 headers (anywhere from 38 to -72 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 over 70% in overall bandwidth savings.

Traffic Shaping 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 powerful packet processor of the CDM-625A functions in Layer 2 (managed switch) or Layer 3 (routed) modes of operation while performing the advanced Quality of Service functions required to properly handle traffic. The packet processor provides full VLAN support, providing an additional layer of traffic separation and prioritization in a multi-tenant environment.

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 packets per second (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. When traffic shaping (QoS) and header compression are concurrently enabled, the packet processor will handle over 50,000 packets per second duplex. These performance numbers make the CDM-625A the most powerful mid-range IP packet processing engine in the market, allowing the packet processor to run at the full capacity of the CDM-625A's top speed of 25 Mbps.

Conclusion

The CDM-625A Advanced Satellite Modem has been purpose-built to best support mobile backhaul links of today and into the future. It provides not only the best overall link efficiencies of any mid-range offering in the market but is also future ready, having the underlying horsepower to carry the most demanding links of tomorrow with the highest throughputs. The CDM-625A provides the many layers of optimization that are essential to providing the most robust yet cost-effective solution for mobile network and telco operators to continually increase throughputs per site in response to increased subscriber demand, roll out new enhanced services to generate new revenues, upgrade existing infrastructure to support 3G and increase subscriber base while minimizing user churn through a heightened level of service, reliability and uptime.

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