



# The next generation

Satcom users are demanding more from their modems. They are looking for bandwidth efficient, compact modems that are low cost and can deliver high-speed communications. Satellite Evolution takes a look at what is out there.

**Satellite modems form an integral part** of the satellite communications circle. The modem converts the digital data into radio waves that communicate with a satellite antenna. In past years, modems have evolved into future-proofed, versatile devices that can cope with the demand for high-speed communications. There are a wide range of satellite modems on the market. A modem will usually have Intermediate Frequency output of between 50-200MHz but the signal is often modulated to L-band. The frequency has to be converted using an upconverter before amplification and transmission. Modems can now be controlled remotely and can provide a huge amount of data so that the user knows exactly how it is performing. They are also becoming much more bandwidth efficient and more compact and rugged. The demands of the user are changing and the satellite modem manufacturers are working hard to meet these demands.

## Vision and evolution

Paradise Datacom introduced their new 'Vision' series of 80Mbps Digital Video Broadcast modems (DVB) in 2008. They are available in both IF and L-band versions and feature TCP Acceleration, HTTP acceleration, Header compression, Ethernet Bridge, Quality of Service, VLAN Support, and IP Diagnostics for all network topologies.

Their next generation Evolution modem series is available in 10Mbps, 25Mbps and 55Mbps configuration, again, for IF or L-band operation. The Evolution series are open network/closed network modems and are compliant with Intelsat Earth Station Standards-308,309,310,314,315 and offer a range of data interfaces including Ethernet, High Speed Serial Interface (HSSI) and serial Low Voltage Differentials (LVDS). The modem is easily reconfigured and therefore can be tailored to the needs of the user making it flexible and future proofed. The difference with Evolution can be found in its redundancy. Paradise Datacom have taken a new approach through the integration of the Backup Modem and 1:N Redundancy Controller into a single unit. The Backup Modem is just 19 inches high and incorporates the traffic and overhead interface connectors necessary to support the online modem group. The modem is low cost and compact and also includes 1:1 Redundancy technology that was pioneered by Paradise Datacom.

The modem allows for easy upgrading – a must in order to keep well ahead of technology and accommodate new capabilities. The modem can be simply updated through an Ethernet management port and via a simple menu procedure. The modem is also available with an advanced user interface that accommodates different languages, remote control of the unit and also in-depth analysis using Internet Explorer.

## Comtech optimises satellite links

Comtech EF Data has always been focused on providing high performance, cost effective modems. Their CDM-625 Advanced Satellite Modem is now in high volume production. The CDM-625 builds on Comtech EF Data's tradition of providing bandwidth and power efficient satellite modems, and is the first modem to combine the Low Density Parity Check (LDPC), Forward Error Correction (FEC) with the DoubleTalk Carrier-in-Carrier bandwidth compression. DoubleTalk Carrier-in-Carrier is based on the patented "Adaptive Cancellation" technology which allows the transmit and receive car-

riers of a duplex link to share the same transponder space. LDPC is an advanced FEC capable of providing performance much closer to the Shannon limit compared to any other technique. The Shannon limit is the calculation that deciphers at what point the transfer speed becomes so high that the noise of the medium makes the received data too unreliable. The combination of LDPC and DoubleTalk Carrier-in-Carrier can enable savings in transponder bandwidth and power utilisation, as well as earth station BUC/HPA size.

The CDM-625 is suited for mobile and telecommunications operators, satellite service providers, government and military entities, and enterprise users. The modem includes a number of other advanced features. Supporting 70/140 MHz and L-Band capability in the same unit with independently selectable transmit and receive IF, it simplifies sparring and stocking in networks requiring both frequencies. It features data rates from 18kbps to 25Mbps and symbol rates of 18ksps to 12.5Msps. The unit supports Viterbi, Concatenated Reed Solomon, and TCM Forward Error Correction plus an integrated TPC and LDPC codec. Providing ultimate flexibility for diverse environments, the CDM-625 offers a wide range of data interfaces, including EIA 422/530, V.35, G.703 T1, G.703 E1, G.703 T2, G.703 E2, Quad G.703 E1, ASI, LVDS, HSSI, and 4-port 10/100BaseT Ethernet for traffic bridging.

For telecommunications and high speed trunking applications, the CDM-625 supports a Quad E1 interface that can aggregate up to four full or fractional E1s into a single carrier with very low overhead, significantly reducing multi-carrier power backoff requirements. This allows users to reduce the number of modems required while simultaneously reducing their BUC/HPA power requirements.

The CDM-625 also provides several options for local and remote management. The modem can be managed via the front panel, the remote monitor and control port or the 10/100BaseT Ethernet port. With support for SNMP, http and Telnet, the modem can be easily integrated into an IP-based management system. It is also backwards compatible with the CDM-600/L. It even supports a CDM-600/L emulation mode that makes it easy to deploy in existing networks using CDM-600/L without changes to the 1:N redundancy switches or the management platform.

Testimony to the effectiveness of the CDM-625 can be found through General Communication, Inc. (GCI), a regional integrated communication provider serving the state of Alaska. The company invests in integrated communication assets to create value for customers, opportunities for employees and growth for shareholders. With a company culture of utilising the latest technologies for their network infrastructure, GCI recently conducted performance testing of the CDM-625.

"We conducted extensive performance tests on the new CDM-625," said Jimmy Sipes, Vice President Network Services for GCI. "Based on the advanced feature set, performance and the prospect of additional operating expense savings, we will begin immediate deployment of Comtech's CDM-625 modems in our satellite network."

## Datum's next generation

Datum Systems' latest satellite modem implementation represents state of the art enhancements to the popular PSM-4900 series of modems. The new PSM-500 series incorporates all of the features



*The CDM-625 is suited for mobile and telecommunications operators, satellite service providers, government and military entities, and enterprise users. Photo courtesy of Comtech EF Data.*

of Datum's PSM-4900, and adds 8PSK, 8QAM and 16QAM modulation modes, a standard Reed-Solomon and IBS multiplexer and higher data rates. The PSM-500 series is available in IF versions for 70 MHz, 140 MHz and L-Band applications and also provides for remote control options.

In order to provide their customers with a flexible product that can be easily upgraded, Datum can provide three upgradeable 'Feature Sets' (M505, M511 and M523). Each offers a combination of modulation modes and data rates as shown below designed to match the needs of various users without paying for features not needed. In addition a user can upgrade a modem from one version to another at a very nominal cost when requirements change. Let's look at the new features:

- The M505 Feature set is designed as a direct replacement for the PSM-4900 modems. Its data rate and modulation modes are almost the same, plus it has a built-in IBS Multiplexer and Reed-Solomon capability;
- The M511 Feature set fits the requirements of users who need higher data rates up to 10Mbps, and/or 8PSK with Trellis Code modulation. The built in Reed-Solomon allows it to operate in the normal 8PSK, TCM, (Reed-Solomon with TCM at Rate 2/3) without anything additional needed. This is a good general purpose modem able to meet the needs of Teleports, users whose carriers require 8PSK to minimize bandwidth, and those transmitting video signals. With an optional TPC card the 8PSK mode can be operated at rates 1/2, 3/4, 5/6 and 7/8; and
- The M523 Feature set adds data rates up to 20Mbps and 16QAM modulation. This modem can provide wideband outbound signals for large Star Networks, or a large channel point to point.

There are currently two types of hardware options available for the PSM-500 series. They are FEC Cards (TPC and S-Tec) and Interface Cards (Ethernet and HSSI). The TPC and S-Tec are plug in cards to the main modem board and can be either a 4k block Turbo Product Codes FEC (as in the PSM-4900) or a newer 16k block Turbo Product Codes FEC with higher performance (backward compatible with the PSM-4900). The Interface option card can be either HSSI or Ethernet. The Ethernet interface can be either the older "SDMS" type card or the new Satellite Network Interface Processor, or "SnIP". The SnIP can also be stacked with the HSSI card for a dual option.

### VIASAT supports US DoD

ViaSat has delivered the 2000th Enhanced Bandwidth Efficient Modem for US Department of Defense teleport and US Navy operations. Their MD-1366 EBEM modem is interoperable with all the legacy DoD modems and it also includes new and efficient modes for high-speed, point-to-point satellite communications in all situations including quickly deployed, airborne and onboard vessels. Viasat has also received some follow-on orders for another 100 EBEMs from the US Army Communications and Electronics Command (CECOM) headquarters. Users of the modem have been impressed by its increased throughput capacity which results in more carriers on a single satellite transponder.

The EBEM includes a number of improvements over Mil-Std-188-165A modems and they include:

- More bandwidth capacity through a new set of open standard

features;

- Lowered system cost and weight with integrated Federal Information Processing Standards (FIPS) 140-2 security, protecting all control, monitoring, and user traffic;
- Certification for the new Wideband Global Satcom system ;
- Operation on commercial or military satellites in the X-, C-, Ku-, and Ka-band; and
- Compatible with legacy military standard hardware.

Ric VanderMeulen, VP and General Manager of Government Satcom at Viasat remarked: "Software defined MD-1366 modems can interoperate with deployed US DoD and intelligence terminals and provide a cost-effective performance upgrade path that can either reduce satellite costs or increase throughput. We were selected by the US Army as the price and performance leader and we anticipate that EBEM will become the most widely deployed point-to-point modem in the US DoD inventory."

The EBEM features advanced modulation and code rate options to optimise bandwidth efficiency, tighter carrier spacing to increase bandwidth capacity, improved signal-to-noise performance for power efficiency, and rates up to 155Mbps compared to 20Mbps rate for the modems it replaces. AUPC (Automatic Uplink Power Control), which keeps the link connected and maintains a constant throughput rate in harsh environments, ensures high performance regardless of heavy weather and other variations in satellite signal strength.

### Meeting the user requirements

The concentration from modem manufacturers on bringing down the costs of satellite communications for the user is paying off, literally. These new efficiencies ensure that users get much more for their money without affecting the performance of the modem.

These days, users are looking for highly efficient modems that can perform no matter where they are used. They are looking for increased bandwidth capacity, high data throughput, and suitability for a wide range of deployments whilst being future proofed at the same time. It's quite a list of requirements to ask for, especially when budgets are getting tighter, but the modem manufacturers are rising to the challenge with ever more innovative and flexible design and technology. ■

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