



TELEDYNE PARADISE DATACOM, Ltd.
A Teledyne Technologies Company

PARADISE DATACOM APPLICATION NOTE

BROADCASTING APPLICATIONS

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INTRODUCTION

In a world where the need to communicate more information in even more different ways is constantly evolving the field of Satellite communications can deliver the services to cope with the changing demands. Paradise Datacom provides a range of integrated satellite solutions including modems, modulators, demodulators and RF equipment that are extremely flexible and are designed to satisfy the needs of broadcasters, network operators and service providers. These products deliver scalable solutions for a wide range of applications that employ the latest technologies and provide a safeguard for the future. The feature sets include industry standards for interoperability and a range of enhanced proprietary solutions to meet the financial and technical demands of our customers. Broadcasters typically use Paradise products for contribution, primary distribution, direct-to-home, Digital Satellite News Gathering (DSNG), data broadcast and distance learning. They are also used for IP backbones, telephony backbones, data backbones, GSM backhaul, cable restoration, point-to-point communications, point-to-multipoint communications and networks.

OVERVIEW

Paradise Datacom products are used to provide a wide range of services to deliver broadcast material via satellite. Broadcasters use DVB-S and DVB-S2 modulators for the distribution of MPEG transport stream content direct-to-home. This may be in either SD or HD format. They may also be used for primary distribution to deliver TV content from a central point to a network. Multi-streaming can be used to deliver programme content to digital terrestrial networks or mobile TV over satellite systems. Paradise modems are also used for contribution and DSNG applications. These include live news and sports coverage. Our broadcast modems are both MPEG and IP capable making the transition from ASI to IP seamless as there is a continuing trend towards IP traffic. Paradise Datacom's IP feature set looks to the future for our customers, including TCP/IP acceleration, header and payload compression. Using these features a modem may be used in a mobile terminal, instead of a modulator, so that two way communications may be established between the van and a central point so that it may be included in the production environment. These are just a few examples of common uses but when a satellite link is required Paradise can provide a cost effective and robust solution.

REDUCING COSTS

A major factor in the deployment of any system is the cost. Not only is the initial capital expenditure (Capex) an issue but the long term operating expenditure (Opex) determines the business case. Current technologies provide a range of options to satisfy the technical requirements of a satellite link. However, with the range of solutions from Paradise Datacom the operator has the opportunity to optimise the costs for any link.

Reducing Opex

Long term operating costs are dominated by power and bandwidth demands on the satellite. Both of these can be address by the choice of modulation and coding scheme used. Paradise Datacom offers industry standards such as DVB-S2 and the proprietary solutions of *Smartlink* and *Fastlink* to reduce costs. In addition to this Paired Carrier™ technology can be used to up to halve the bandwidth used resulting in a significant saving.

Reducing Capex

Although the initial purchase is usually a one off cost it is an investment in the future and must represent best value for money. Paradise Datacom products represent excellent value but they also reduce capex significantly by reducing the system box count due to the built in diagnostic equipment. This removes the need for costly addition separate test equipment. It is also possible to use modem features such as combining independent streams in to a

single satellite carrier having a significant effect on the overall initial cost of a system and subsequently the associated operating costs.

PARADISE DATACOM MODEMS

Paradise Datacom modems are extremely flexible and can be configured to meet customer requirements. These broadly fall into two series. The Vision series meets many requirements but should be specified if you need an ASI interface or DVB-S services. The Quantum series is also broadly specified and should be specified if you need legacy interfaces or traditional SCPC features. It should be noted that although each series specifically caters for the features mentioned both also cover a vast range of other applications mentioned in the introduction. For example IP based DVB-S2 services are supported by both series.

Vision Series

Compliant with the DVB-S and DVB-S2 standards the Vision can be supplied as a modem, modulator or demodulator. They are available in L-band and IF versions with ASI and IP interface options. Designed for use in traditional ASI transmission networks and IP networks they can be used to combine these services and migrate between the two standards. Other key features include multi-streaming VCM support, a proprietary implementation of ACM that simplifies use and an embedded IP encapsulator for ULE, MPE and proprietary PXE. The Vision modem also has a mode that is compatible with the Quantum modem using an IP interface and PXE encapsulation and *Smartlink*.

Quantum Series Modem

This series of modems is an enhanced version of the Evolution series. They offer all of the features of our traditional SCPC modems and the benefits of DVB-S2 technology. In addition to operating in all of the traditional SCPC modes using TPC/Viterbi/Reed Solomon FEC schemes and standard modulation techniques the Quantum offers *Smartlink*. This allows the operator to use legacy interfaces and framing modes combined with DVB-S2 modulation and coding technology providing advantages in the space segment. They are available in L-band and IF versions. *Fastlink* is also offered as a low latency LDPC FEC option providing a performance improvement over TPC. Quantum modems also offer a pure DVB-S2 mode that is compatible with a Vision modem using an IP interface and either ULE or MPE encapsulation.

Common Features

Paradise modems offer a range of common features. All of our modems are software configurable providing an upgrade path and future proofing. They are easy to use with clear and concise local interface and remote control via a web based interface. Performance parameters and status information are provided along with an advanced logging system. For IP users there is a suite of performance enhancing features. These include TCP/IP acceleration, header and payload compression, and traffic shaping techniques.

TECHNOLOGIES EXPLAINED

What are these features and why are they needed? Here is a brief overview of the technologies:

What is DVB-S2?

The DVB-S2 standard superseded the DVB-S standard although both are still used. It uses improved Forward Error Correction (FEC), LDPC (Low Density Parity Check) inner coding and BCH (Bose-Chaudhuri-Hocquenghem) outer coding with performance close to the Shannon limit. Eleven code rates from 1/4 to 9/10 are used and modulation schemes up to 32APSK. The addition of a physical layer header improves performance. Coding and modulation schemes such as CCM, VCM and ACM offer operational improvements as does the option addition of pilot tones.

Advantages of DVB-S2

This standard has provided many advantages. It uses less bandwidth than DVB-S. In fact the improvements in modulation and coding techniques can yield up to 30% bandwidth saving and up to 2.5 dB margin gain leading to reduced satellite costs, smaller power amplifier requirements and smaller antenna size. The physical layer in the space segment improves demodulator performance. Along with an improvement in BER performance a DVB-S2 link can operate in the noise floor. Pilot tones may also be used to improve performance in noisy environments and in the presence of some RFI.

DVB-S2 modes of operation

What are the coding and modulation schemes used for?

- CCM (Constant Coding and Modulation)
 - Uses fixed parameters and is the basic mode
- VCM (Variable Coding and Modulation)
 - Different streams are configured for different MODCODs on the same carrier
- ACM (Adaptive Coding and Modulation)
 - Each frame is coded separately according to link conditions

Adaptive Coding and Modulation

Paradise Datacom has implemented a simple approach to ACM mode. Basically it is just a matter of setting the normal link conditions and just turning ACM on. The implementation can be anything from basic to intricate to suit the conditions but the end result is that the operator can customize the link to optimize IP throughput. The feature seamlessly switches MODCOD to maintain best data throughput. Any link margin can be converted to useable bandwidth. This feature can also be used with Paired Carrier™.

Paired Carrier™

Paired Carrier™ is ViaSat's patented PCMA technology. It can be used to reduce overall satellite bandwidth by up to 50% or double the throughput for a given bandwidth. This feature can also be used with Adaptive Coding and Modulation.

Smartlink

Smartlink allows the operator to use legacy interfaces and framing modes combined with DVB-S2 modulation and coding technology providing advantages in the space segment. The available modulation and coding schemes are the same as for the DVB-S2 standard offering the same performance and advantages. However, our customers can continue to use the feature sets that Paradise Datacom has traditionally supported that are not part of the DVB-S2 standard.

Fastlink low-latency LDPC

Fastlink is an efficient LDPC Forward Error Correction (FEC) technology that improves on the BER performance of TPC by around 1 dB on average. This benefit can be taken as either a power reduction or an increase in throughput by using a spectrally more efficient modulation and coding scheme. All code rates have three optimizations allowing the operator to use low BER, low latency or a balanced option giving even greater flexibility when implementing a link.

CONCLUSION

Paradise Datacom offers a wide range of integrated satellite communications products. The advanced feature sets are designed to reduce capital and operational expenditure and the future proofed designs make a sound investment.

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