DVB-S2/ACM Technology Brief

DVB-S2/ACM — The Next Evolution in Performance from iDirect Technologies

Satellite capacity is an expensive resource. And network operators continually struggle to make the best use of their costly supply. Now they can take advantage of new industry developments that can lead to dramatically improved levels of bandwidth efficiency, the much anticipated DVB-S2 communications standard powered by Adaptive Coding and Modulation (ACM). The adoption of DVB-S2 for the outbound carrier (hub to remotes) has the potential to deliver widespread technical and business benefits to satellite service providers.

ACM provides an additional and dramatic increase in bandwidth efficiency over the thirty percent already offered by DVB-S2 (over DVB-S) and allows far greater flexibility for network deployments.

Increasing bandwidth efficiency: DVB-S2/ACM

DVB-S2 is the second generation of the Digital Video Broadcasting Satellite standard used primarily for direct-to-home satellite broadcast. With enhancements such as more sophisticated modulation techniques and low-density parity-check error correction codes (LDPC), DVB-S2 promises a thirty percent bandwidth efficiency increase over existing DVB-S systems.

Most broadcast-orientated DVB-S2 systems provide much the same efficiency in like-for-like network profiles. However, when the DVB-S2 standard is implemented within two-way networks, additional capabilities can be brought into play.

Adaptive Coding and Modulation (ACM) is an enhancement to the DVB-S2 standard that dramatically improves its performance in the two-way VSAT environment, by dynamically optimizing the operating parameters of the outbound carrier. ACM leverages the return channel to provide an assessment of channel conditions at each remote to determine the optimum link parameters based on satellite link performance, terminal RF Characteristics and local weather conditions.

The hub can then, on a site by site basis, adapt the specific modulation and coding scheme to account for any impairment of the outbound link to each terminal. Continual adjustments are made in real time without intervention by the network operator.

By changing modulation and coding according to current link conditions, iDirect's DVB-S2/ACM solution provides an additional bandwidth efficiency greater than 50% when compared to other non-ACM DVB-S2 solutions.

ACM also allows far greater flexibility for network deployments. Traditionally, the specification of VSATs (antenna size, BUCs, etc.) within a network tended to be fixed from the outset. Link operating parameters had to be maintained throughout the lifetime of services.
This created an obstacle to various satellite applications.

Extending the full power of ACM

ACM is one of the most complex and extensive features ever implemented by the VSAT industry. It impacts nearly every feature of a satellitse network, including data encapsulation, signaling overhead, timing/carrier recovery and the real-time network monitoring and configuration.

As such, ACM must be approached as a total system design. If ACM is designed merely around a single element — such as a terminal chipset intended for the broadcast industry (CCM-based DVB-S2) — its performance will be significantly compromised.

The proper design of an ACM system must include all elements of the system (hub plus remote) in order to ensure:

- Simplicity of network design and configuration for the network operator
- Complete and seamless integration of ACM into a QoS system
- Maximization of the theoretical ACM efficiency gain over a standard broadcast DVB-S2 carrier

In a QoS scenario, for example, the ACM system must be set up to provide information about the link condition at each remote to the QoS system. This will enable the network to manage specific application requests for guaranteed bandwidth to a particular remote — factoring both the condition of the link to that remote and the QoS specifications that govern the specific activity on that remote.

With ACM and QoS integrated, a VoIP call would continue to get the same IP data rate required to maintain the call even if the modulation and coding is changed several times during the call due to a passing rain storm.

Overcoming rain-fade degradation

One benefit of ACM will be particularly noticeable for network operators in tropical zones where torrential rain challenges satellite links. Until now, network operators have been forced to balance the commercial imperative of making services economically viable for customers against engineering constraints required to maintain links during adverse weather conditions.

ACM automatically optimizes link performance, balancing efficiency and availability as link conditions change. The greater the difference between clear-sky and worst case conditions, the more the benefits of ACM become apparent.

Link margins previously required to survive tropical downpours can now be reassigned during the better conditions that prevail most of the time, to yield higher throughput from the same capacity. Given that rain-fade is often quite localized when averaged across a footprint, more customers can be served within the same capacity.

The availability of ACM for VSAT networks will substantially improve the engineering and commercial viability of Ku-band services, where only C-band was prev-iously considered.

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