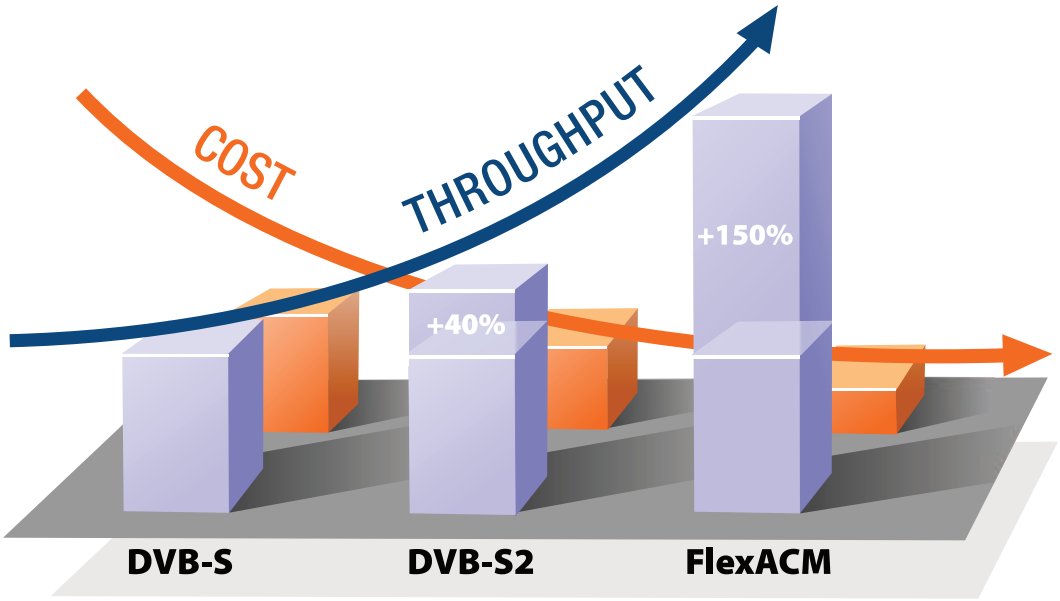
Via Satellite's

Tech Focus REPORT

Double Your Business With Adaptive IP Trunking Networks



Satellite service providers, teleports and satellite operators providing IP Trunking services to ISPs are faced with new and complex challenges to maintain their competitiveness, while remaining profitable. Implementing the best technologies to deal with these challenges is more essential than ever. Newtec's DVB-S2 FlexACM implementation doubles the data throughput in satellite IP Trunking and IP backbone systems, and provides 100% link availability.

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IP Trunking & Backbone Applications

Satellite IP backbone and IP Trunking are network applications that provide high speed Internet connectivity to remote service providers or companies. While IP-backbone usually refers to high speed links between 2 parts of the world, IP Trunking is a more generic term used for point-to-multipoint networks that provide IP connectivity from a central location to a number of remote sites. Digging deeper in the IP Backbone and IP Trunking context, some typical applications can be identified. Point-to-point links are typically used for permanent links towards regions that have no fibre or cable infrastructure, but also as a back up to submarine cables between continents. IP backbone or trunking networks are also deployed for disaster recovery, to restore emergency communication links in regions that are hit by war or by natural disasters such as floods or hurricanes. Permanent IP trunking networks on the other hand are commonly used to provide Internet access to local Internet Service Providers (ISP) that offer DSL or WiMax services in their regional markets. Another growing market for satellite IP trunking is the backhauling of GPRS or 3G services in GSM networks.

Business Challenges

Regular interaction with the market reveals that satellite service providers, teleports and satellite operators are faced with four major challenges.

A first challenge they encounter is the fact that satellite services become less competitive in comparison to terrestrial services (cable or fibre) where they are or become available. This challenge requires the operators to offer differentiators, such as better guaranteed Service Level Agreements (SLA's), or simply to cut their prices. This leads to a second worry in the IP Trunking market about the pressure on the profitability of satellite services. As this profitability is driven by the operational costs (OPEX) and these are dominated by the cost of the satellite capacity, there is a definite cry for technology that reduces bandwidth needs, or that optimizes existing bandwidth resources to allow operators do more business with their existing capacity.

The lack of satellite capacity to expand business in some areas is a third problem that needs to be tackled. How can companies in the IP-Trunking business find new additional capacity in these regions? By adopting transponders that are left by others are left by others because they cannot be used efficiently or reliably with conventional technology. This is the case of Ku and even Ka band capacity in regions dealing with heavy rain storms, or inclined orbit satellites.

The fourth and final challenge of the satellite service operators comes in the form of the constraints that satellite communication put on the quality of service. Real time services such as VoIP or real time video streaming demand a guaranteed quality of service, constant data throughput, and minimum delay. Network congestion, rain fade and signal propagation delay are inherent factors of a satellite transmission system that make it tough for the operator to fulfil the expectations of the customer.

Technology to the Rescue

Implementing new solutions to deal with these challenges is more essential than ever. Here is where the FlexACM technology comes to the rescue. FlexACM is an advanced technology based on the DVB-S2 standard that provides auto-optimization of the satellite capacity. FlexACM is a one stop end-to-end solution for IP backbone and IP trunking networks, largely validated, deployed and approved by the market.

FlexACM

FlexACM is the end-to-end solution for implementing ACM technology, traffic shaping, IP compression and acceleration in a very efficient way for IP Trunking and IP Backbone networks. In the next chapters the main blocks of the FlexACM technology will be unveiled by discussing DVB-S2 ACM, Cross layer Optimization and NoDE.

Adaptive Coding and Modulation (ACM), a part of the DVB-S2 standard, allows modification of the modulation and coding parameters (modcods) of a satellite signal on the fly, without interrupting the transmission and without losing data. What is the main difference between DVB-S2 ACM and FlexACM? DVB-S2 ACM is a generic mechanism at RF level. FlexACM is an implementation of DVB-S2 ACM specifically for IP trunking and backbone applications that includes unique technology to optimize the performance at all levels, from RF to IP.

In an ACM system, the modulation parameters are changed dynamically and automatically based on a continuous measurement of the instantaneous link conditions (signal to noise ratio) at the receive side. Under these circumstances, the satellite link always uses the highest possible modulation scheme and the lowest possible level of error correction for the given signal to noise ratio, without ever loosing signal lock. When the link conditions degrade, for example in case of rain fade, the level of error correction is automatically increased. In a FlexACM system, the measurement of the link condition in at the receive side is transmitted back to the uplink via an in-band satellite channel, or via any type of satellite or terrestrial IP link.

The quality and reliability of an ACM system therefore relies on the quality of the measurement in the remote sites. The FlexACM system relies on a unique technology call the "Noise and Distortion Estimator" (NoDE). While other systems just give an estimation of the link conditions based on the noise level, NoDE is capable of measuring both the level of noise and the amount of non-linear distortion in the transmission chain. By providing a more accurate measurement of the real link margin NoDE allows FlexACM to operate with minimum margin (i.e. maximum efficiency) and maximum reliability. Because the link margin of a static system is used to transmit useful data in a FlexACM implementation, the increase in efficiency can be as much as 100%. This means that the average throughput in a given satellite segment is multiplied by two.

But this additional throughput is not available all the time. In rain conditions for example, the available throughput is momentarily reduced. Depending on the varying link conditions, the FlexACM system must decide how to distribute the available capacity among the different services and customers. This requires a dynamic shaping of the IP services and a QoS management in line with the bandwidth variations caused by the ACM behavior. The built-in traffic shaper needs to ensure priority for services with a predefined SLA, VoIP, audio and video services

FlexACM includes an advanced Cross Layer Optimization technology that not only dynamically optimizes the performance of traffic shaping at all times, but also the performance of traffic compression and traffic acceleration, which is necessary to compensate for the inherent satellite transmission delay. Cross Layer Optimization makes sure that all the available throughput is used optimally when the capacity increases, and that a minimum of IP packets are dropped when the capacity is reduced.

FlexACM in Practice

The FlexACM solution can be used in point-to-point (IP Backbone) and point-to-multipoint (IP Trunking) systems, in one way (with terrestrial return channel) as well as in two way configurations (with the return channel also over satellite). It is also possible to implement the FlexACM solution in existing satellite links without changing the rest of the transmission chain, such as the antenna and HPA.

Increase Profitability, Reduce the Costs

How to turn a barely viable business into a profitable one? The space segment is one of the biggest operational costs for a teleport operator and is often in scarce supply. The challenge for teleport operators is in the fact that they are buying space segment in MHz, but their customers are typically paying them for Mbit/s throughput. The logical consequence is that the more data throughput they can achieve per MHz bandwidth, the more profitable their business becomes.

The FlexACM solution integrates advanced IP optimization technologies (such as traffic acceleration, compression and shaping) with the complete feature set of DVB-S2 (generic mode, ACM technology) in order to increase the throughput of the satellite channel.

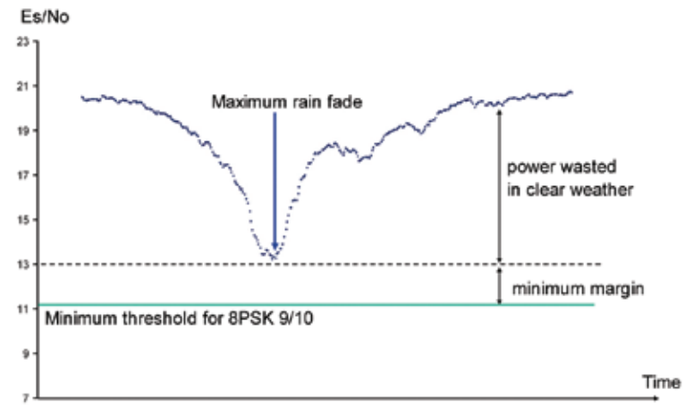
Efficiency gain related to the use of ACM technology can reach up to 130% compared to DVB-S systems without ACM. On top of the benefit of DVB-S2 ACM, the integrated result of cross layer optimization (dynamic optimization across the physical and traffic layers) results in a further drastic reduction of the required satellite bandwidth for a given data throughput.

Increase Service Reliability

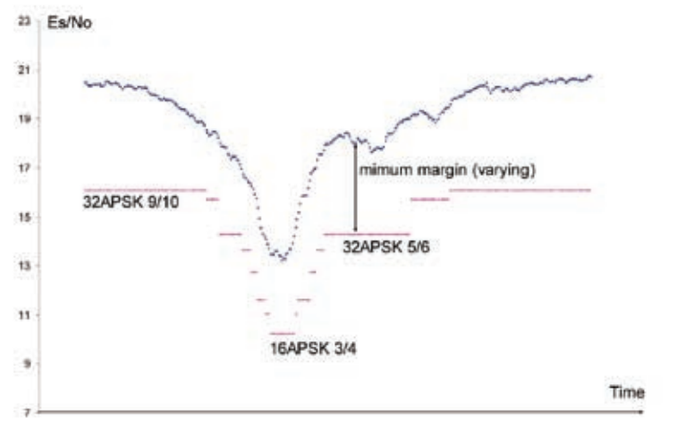
A unique feature of FlexACM is its ability to react very fast to heavy rain storms, increasing dynamically the level of error correction so the satellite link is never interrupted. This results in a reduction of the available throughput, but the shaping function makes sure the SLA is respected and that critical services are not affected. When the storm is over and the link conditions improve again, every customer immediately recovers its original transmission speed. Even in the worst weather conditions, FlexACM guarantees "Always on" connectivity. Higher SLA's can offer and result in higher revenues for the teleport owner.

Actually, in almost every form of interference or less optimal transmit or receive conditions, FlexACM proves to be beneficial. Some examples where FlexACM is valuable are ground noise due to extreme heat, high attenuation at low elevation angles, pointing/tracking losses, satellite gain variations, and many more.

Typical Link Dimensioning With Fixed Modulation Parameters



Typical Link Dimensioning With ACM



Increase Customer Satisfaction

The FlexACM solution contributes to improving customer satisfaction at many levels. FlexACM offers advantages for the ISP as well as for the end-user. Because the FlexACM system recognizes data packets at application level, the FlexACM system can dynamically assign bandwidth and priority to each individual service or application. For example, VoIP applications typically get one of the highest priorities while FTP download gets a lower priority, and services are differentiated according to the Service Level Agreements (SLA) subscribed by the customers. This process of dynamically assigning bandwidth and providing prioritization is called shaping of the IP traffic and is embedded as a standard capability in the FlexACM solution.

The ISP can also define different sets of profiles for groups of customers, determining features such as Maximum Information Rate (MIR), Committed Information Rate (CIR) and overbooking ratios. With all these features, the ISP can avoid having a small part of its customers consume almost all the available bandwidth and affect the satisfaction of the other users.

Conclusion

FlexACM is a unique end-to-end solution for implementing ACM technology, IP shaping, compression and acceleration in a very efficient way for IP trunking and IP backbone satellite links. The implementation of FlexACM can result in a doubling of the data throughput in a given satellite segment while also guaranteeing a 100% link availability. ■

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