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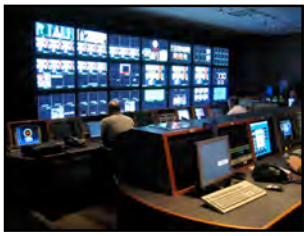

Industry Outlook | Outside Broadcast

DSNG Services Over IP at Ka-Band

Making News Gathering More Accessible & Cost Effective

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Abstract

In this paper, KIT digital's Technical Director, Stephen Burgess, looks at the possibilities of reducing costs of DSNG facilities by addressing the limitations of satellite capacity and increased data throughput, thereby making DSNG facilities a more attractive option for more operators.

Introduction

Back in the late 1990's, I attended an internal meeting at Megahertz (now part of KIT digital) to discuss the future strategies for the business. MHz had been successful up to that point selling vehicle-based broadcast systems, and Digital Satellite Newsgathering vehicles (DSNGs) in particular. The general conclusion at this time was that these vehicles were too expensive, the market was pretty much saturated and future links would be over the ever-increasing network of fibre being installed. Luckily for us, we can apply Mark Twain's quote to this subject namely, "the reports of my death are greatly exaggerated". Today the DSNG market remains extremely healthy and KIT digital continues to deliver a wide variety of vehicles ranging from small people carriers (SUV's) to large chassis cab solutions.

The challenges in the area of DSNGs are no different to the rest of the broadcast industry at this time. More services are needed to a higher quality on a reduced budget. There are pressures at the higher end to deliver HD and ultimately 3D, and there are pressures on news operations to get more people to where the action is more quickly and provide better and more in-depth reporting.

Given that news seems to happen just about anywhere, satellite is still the preferred medium for transmitting the pictures back into the broadcast network. Even if other mediums are available to file reports, it could be that in any disaster area for example, these are likely to be under strain from the ongoing events and the broadcaster needs his own pipeline back to HQ.

This paper looks at the possibilities of reducing costs of DSNG facilities by addressing the limitations of satellite capacity and increased data throughput, thereby making DSNG facilities a more attractive option for more operators. It also addresses how KIT digital supports broadcasters to meet these challenges as they take advantage of these new opportunities.

Satellite Capacity

As a means of making life relatively simple, the broadcast industry uses geostationary satellites for delivery of content to the home and for contribution of material from the field. There are only a finite number of orbital slots available for geostationary satellites to avoid interference with each other and the most useful positions serving Europe, North America and China/Japan are increasingly being filled. Added to this, there is an increasing demand for satellite communications from other industries. As the demand continues to outstrip the limited resource, the cost of using these facilities remains comparatively high.

One possible solution to provide increased capacity is to use higher frequencies. Most broadcast satellites have traditionally used C-band (typically 5.925 GHz to 6.425 GHz for uplink), Ku-band (13.750 to 14.500 GHz for uplink) or more recently DBS-band (17.300 GHz - 18.100 GHz for uplink). Technological enhancements in recent years have brought about the use of higher frequencies at **Ka-band** (26.5 GHz to 40 GHz for uplink) as a means of capitalising on further operating efficiencies.

Several satellite service providers are already offering space at Ka-band and many more are planned in the near future. There are currently around 38 launches planned with Ka-band space proposed up to 2013 (satellites are ordered 3 years in advance). Of course, not all of these will have occasional use space available to broadcasters, but many will.

Much of the capacity of Ka-band is aimed at providing Internet access via satellite for domestic and business users; however it is also targeted at broadcasters. It would be possible for a contribution link to be received by a dedicated ground station and relayed via satellite again to the broadcaster's receive site. This "double hop" and consequential extra delay may not be desirable, so more likely, after receiving the signal at the ground station, it will be delivered to the broadcaster via IP/MPLS over fibre for example (more later).

Moving up the spectrum and gaining more bandwidth comes at a price. The technical challenges are greater due to increased losses in the system and Ka-band's greater susceptibility to such interference as rain fade. As a leading systems integrator of large and complex earth stations, KIT digital has long-standing experience with RF technologies and this positions us well to guide customers through the challenges of deploying such technology, minimising the risks and enabling them to benefit from the lower costs offered by transitioning their operations to Ka-band.

Video over IP over Satellite

There have been major technological advances to reduce the bandwidth needed for video transmission over satellite in recent years. The introduction of MPEG-4 as an encoding standard and DVB-S2 as a modulation standard are now well established.

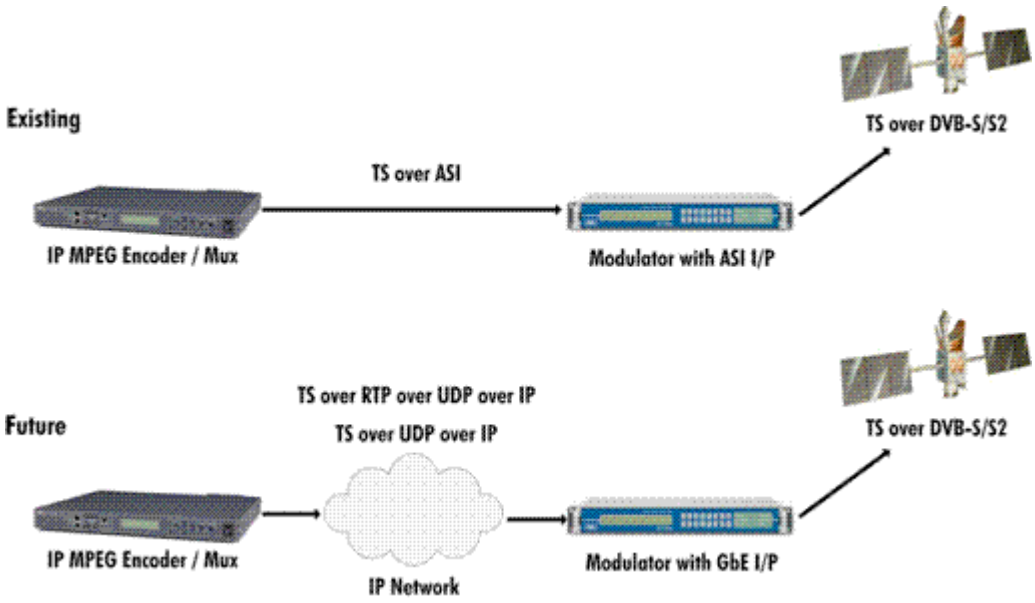
Broadcasters are quite familiar with sending Internet Protocol (IP) traffic over satellite to support the DSNG function. Previously, however, DSNG services such as remote control, communications, access to newsroom server and the like, could only be achieved by sending up extra channels over the satellite. These extra channels require additional equipment and the booking of supplementary space on the satellite (or sacrificing some bandwidth from the video channel). Using IP technology allows everything to be on the same network in the truck and using less equipment while a single "IP pipe" connects the truck to the TV station over the satellite.

KIT digital has been at the forefront of these technological developments to deliver more efficient DSNG operations. For example, in 2008 the company introduced the Megahertz Monitoring Remote Control application (M2RC) for remote control and monitoring of DSNG's in the field. This solution, developed in response to customer business and operational requirements, enables news operations to cost-effectively deploy their news crews in the field and re-deploy resources where they can be most beneficial to the whole news operation. One way to achieve this is by using IP satellite modems at each end of the link rather than in addition to the broadcast chain modulators and demodulators.

There is now also broad acceptance by broadcasters of IP technology within their station infrastructure. File-based workflows are being rolled out throughout the industry. Files are replacing video delivered via coax cables from the cameras, through the post-production phase and on to the playout servers and archiving. Furthermore, Multiprotocol Label Switching (MPLS) is rapidly becoming the preferred mechanism for delivering video over terrestrial fiber to broadcasters. So far, satellite video delivery over IP has been lagging behind.

Unlike traditional video delivery mechanisms, IP is asynchronous. This has the advantage that the same format can be used for sending both real-time video and file transfers either faster or slower than real time. As mentioned earlier, even though IP is an asynchronous protocol, encapsulation techniques such as Real-Time Transport Protocol (RTP) have been developed to ensure it is possible to deliver time-critical signals successfully.

It is likely that MPEG will continue to be the format for broadcast encoding in the foreseeable future. MPEG encoders are usually equipped with a Transport Stream (TS) output over Asynchronous Serial Interface (ASI). However, already many manufacturers have fitted their equipment with Gigabit Ethernet (Gibe) outputs. A suitably equipped modulator can take this data stream, which might be over UDP over IP, or RTP over UDP over IP, it will strip off the RTP, UDP and IP layers, and send only the transport stream over the satellite link. This will be encapsulated much more efficiently. The encapsulation scheme for both DVB-S and DVB-S2 can be Multi-Protocol Encapsulation (MPE) and in the case of DVB-S2, Extended Performance Encapsulation (XPE), giving up to a further 8% saving on bandwidth requirements when compared with MPE.



If the link can be two-way, then we open up the possibility for the link to carry voice traffic (communications), email, access to newsroom servers, remote control and monitoring, as well as the live feed. This obviously makes much better use of the bandwidth available on the link. As an example, KIT digital's M^2RC remote control and monitoring system mentioned earlier could allow the DSNG to be operated from base via satellite using the same modems being used for the traffic resulting in less equipment being required. This reduction in equipment will also deliver economies to the operation through lower power consumption — supporting the development of more sustainable, environmentally – friendly processes.

A further advantage of a two-way link is that there could be quality of service (QoS) data transferred between modulator and demodulator. This means that the modulation scheme and error correcting (modcod) can always be optimally set for the conditions prevailing on the link at the time. The highest possible bandwidth will always be achieved whilst maintaining an acceptable QoS. At present, an earth station would generally use an Up Path Power Controller (UPPC) to vary the uplink power based on the conditions prevailing at the uplink location based on feedback from a beacon receiver. A UPPC is unlikely to be fitted to a DSNG so the operator would simply "ride" the power level controls. With QoS feedback from the receiving modem, the modcod can be automatically adjusted so a contribution feed from the DSNG in

the morning in clear weather might take place at 8PSK 5/6. In the afternoon, during a thunderstorm (and even a bit of miss-pointing), this may automatically be dropped to QPSK 2/3, without intervention from the operator.

With the use of clever prioritizing within the modems, it is possible for a single data stream to contain data for file transfer, browsing, email, remote control, etc, plus a live video stream which is always given priority.

Naturally, there are challenges in using IP over satellite. The delays inherent in the link actually makes it unsuitable for IP traffic, however, the modems can use techniques such as acceleration and pre-fetching to respond to local network requests from within the unit rather than wait for a response from the far end. These techniques have been in use for many years.

How Can KIT digital Help?

KIT digital has been at the forefront of the design and build of DSNG systems since the early 1990's and has built up vast experience of traditional broadcasting techniques from content acquisition through to delivery. The company's breadth of experience with RF technologies — achieved through the integration of large and complex earth stations— coupled with its understanding of the operational challenges facing broadcasters today, enables KIT digital to support the drive to make cost reductions through the deployment of improved mobile satellite systems, increased data throughput, lower power and weight requirements. As a result, DSNG facilities become more accessible to smaller news operations.

With the intrinsic design of DSNG vehicles changing through greater integration of IP technologies will come improved workflow efficiencies and the implementation of more straightforward satellite systems — allowing the satellite links to be used more economically. With these efficiencies the requirement for powering the uplink is reduced leading to smaller onboard power systems — hence reduced weight requirements, which will ultimately result in smaller, "greener" and more economical vehicles being built. In some cases this can provide cost savings of up 25%-30% on the build out of smaller DSNG vehicles — a very attractive consideration for news organizations, including those smaller regional news operations and remote international bureaus, whose budgets are continually being eroded.

Another key consideration for containing costs is KIT digital's ability to handle all aspects of a DSNG system implementation in-house — effectively the company is a "one stop shop" for the design and build of mobile applications. However KIT digital not only designs and builds from new, but also delivers a significant return on investment (ROI) for customers with its phased refurbishment approach – for both fixed and mobile systems. In the case of DSNG operations, this reduces the overall cost of new technology deployment while increasing the productivity of an aging fleet, for instance, by upgrading an SD vehicle to have full HD capabilities. KIT digital can deliver these services in a fast, flexible and cost-effective way, minimizing downtime to the business.

Conclusion

As we have seen in this paper, the use of Ka-band for satellite contribution will offer savings in terms of increased capacity. The greater integration of IP technologies will make the system and the workflow simpler and allow the satellite links to be used more economically.

More economical use of the links in turn means less power is needed for the uplink. Less uplink power can lead to smaller power systems in the DSNG vehicles and this can result in smaller and more economical vehicles being the most suitable solution.

KIT digital continues to use its expertise and understanding of the business, technical and operational drivers to develop applications that meet the changing needs of today's news operations. By reducing the cost of designing and building DSNG facilities in the light of the ever-increasing demand for digital satellite communication capacity and by providing practical solutions that drive down the operational costs of DSNG implementation, KIT digital is the ideal technical partner to minimize the risk of deploying new technology in what continues to be an expanding DSNG market.

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