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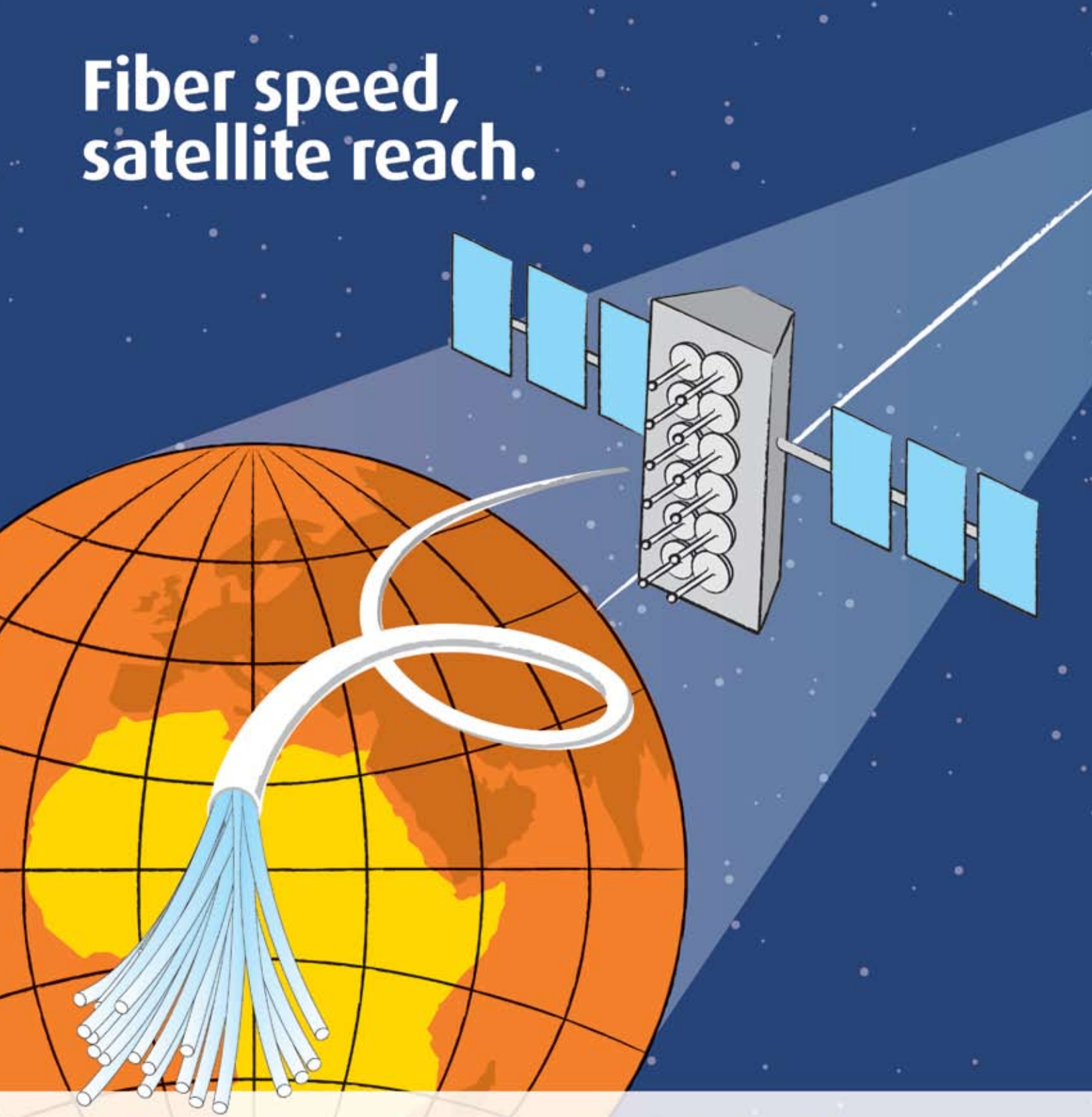

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The Race To Ultra Broadband... A Major Challenge For Satellite Players

author: Maxime Baudry, IDATE

Even more than bridging the digital divide, it appears to IDATE the race to ultra broadband has become the next main challenge for satellite players, as the public and private sectors are moving towards this objective. Switch to superfast broadband is spurred by the rise of the digital home…which leads to increased demand for bandwidth.

In parallel to the reduction of the digital divide, Governments are now focused on the development of ultra broadband. In the USA, on the matter of ultra-fast broadband, and specifically of optical fibre access, the federal government has yet to announce any dedicated programme. Existing **FTTx** networks have been deployed chiefly by the RBOCs, **Verizon** and **AT&T**, and by a handful of local authorities — some of which can probably count on getting a subsidy from the new national programmes if they show an interest in performing a rollout and their targets are in line with those of the national initiative.

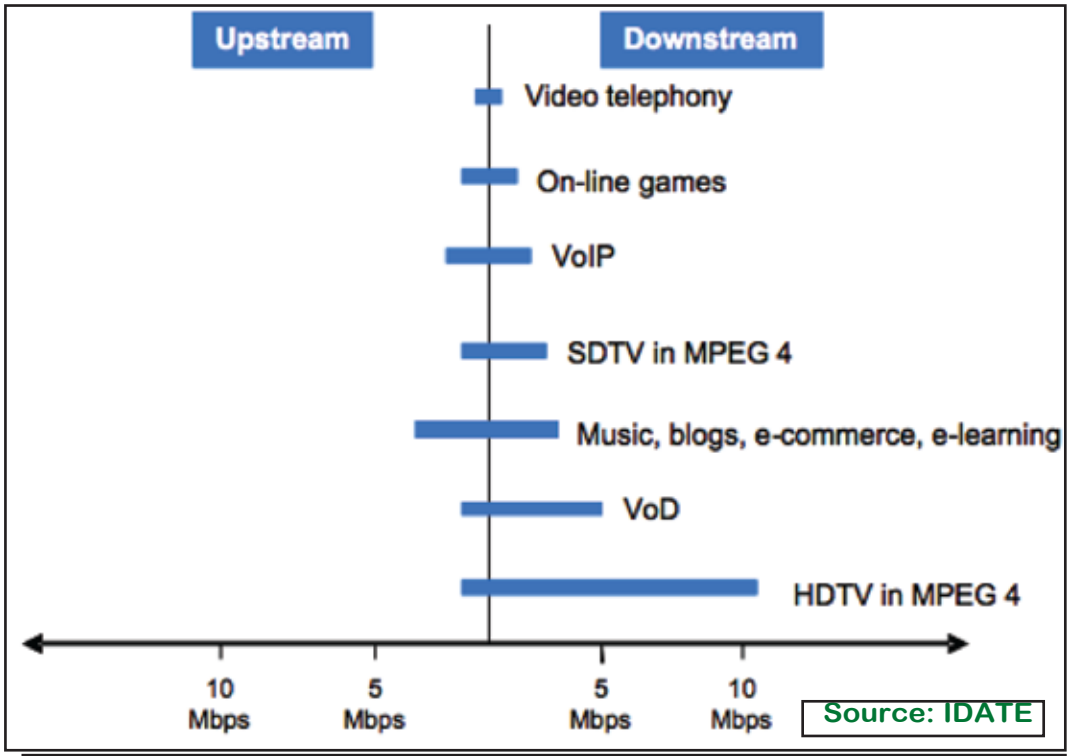

Figure 1: Estimate of the need for speed for consumer applications.

In Asia, the Australian government issued an RFP in April 2008 for a national broadband network, or NBN for short. The goal of the network, which would be based primarily on an FTTN architecture, was to provide 98 percent of the population with high-speed access at 12 Mbps.

Australia has become one of the first countries to have a nationwide FTTH rollout programme. Through the "NBN Company", which is a public-private partnership of which the State owns 51 percent, the government plans on deploying an open network that will supply 90 percent of Australian households (i.e. all towns and cities with a population of over 1,000) and all schools and businesses, with an FTTH access service running at 100 Mbps.

For the remaining 10 percent of the population, alternative wireless and satellite technologies will be deployed, delivering access at up to 12 Mbps. Towards this objective, Australia recently expressed interest for satellite systems in the Ka-band, which is likely to attract potential providers like Hughes or Thaicom.

In Europe, and notably in France, the government has decided to become more heavily involved in helping to develop ultra-fast broadband nationwide through funds from the national. As a

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result, 2 billion EUR have been earmarked for ultra-broadband, the main goal being to step up rollouts in the most sparsely populated areas where private sector initiative is lacking (low commercial potential compared to the investments needed). National authorities, and especially the regulator **ARCEP**, are working on defining the different areas in the country with the stated goal of encouraging a greater degree of cooperation between private sector companies operating in this market, and so to enable a certain level of cost sharing for the rollouts. In a recent report made public, the strategy recommended to insure full population coverage is to combine FTTx with LTE.

Is LTE THE Solution?

Whereas it is certain the coverage of fixed FTTx and cable DOCSIS 3.0 networks will remain limited on the long term, LTE appears more and more as the best solution to insure a 100 percent coverage. But is it really the ideal solution? LTE, with its theoretical 100 Mbps, appears on the paper as a seducing solution but in reality, effective bitrates will be in the 5-10 Mbps range and strong uncertainties remain on the cost of deploying widely this technology, even through mobile infrastructure sharing. **IDATE** performed a model demonstrating that in France for instance, the cost per inhabitant of deploying LTE in rural zones (less than 500 inhab/km2) would be 4 to 7 times more expensive than in urban areas depending on configuration of the landscape. IDATE strongly believes there is a strong window of opportunities for satellite players.

Satellite + The Ultra Broadband Arena

Satellite is clearly a viable alternative technology for reducing both broadband and ultra broadband digital divides. Its development is nevertheless being challenged by the steady progress being made in terrestrial technologies and the need to increase data rates.

Although the **Eutelsat *Ka-Sat*** or **Avanti *Hylas*** spacecrafts will be launched this year and allow access speeds of around 8-10 Mbps, they are already behind their landline competitors as the data rates supplied by DSL2+ and FTTx are closer to 20-80 Mbps. Regarding LTE, bitrates will be limited to 5-10 Mbps but operators are already working on next generation

Scenario	Coverage	Cost
80% FTTH* + 5% SC**	85%	17 Bn EUR
80% FTTH + 5% SC + 15% LTE***	≈ 100%	18 Bn EUR
80% FTTH + 20% SC	≈ 100%	22 Bn EUR
100% FTTH	≈ 100%	30 Bn EUR

*FTTH: deployment of an all optical network to the home
**SC: increase access rates by equipping the sub local-loop
***LTE: next generation, or 4G wireless network

Source: French Ministry responsible for Regional Development

Table 1: Target scenarios for covering the French population with ultra high-speed access

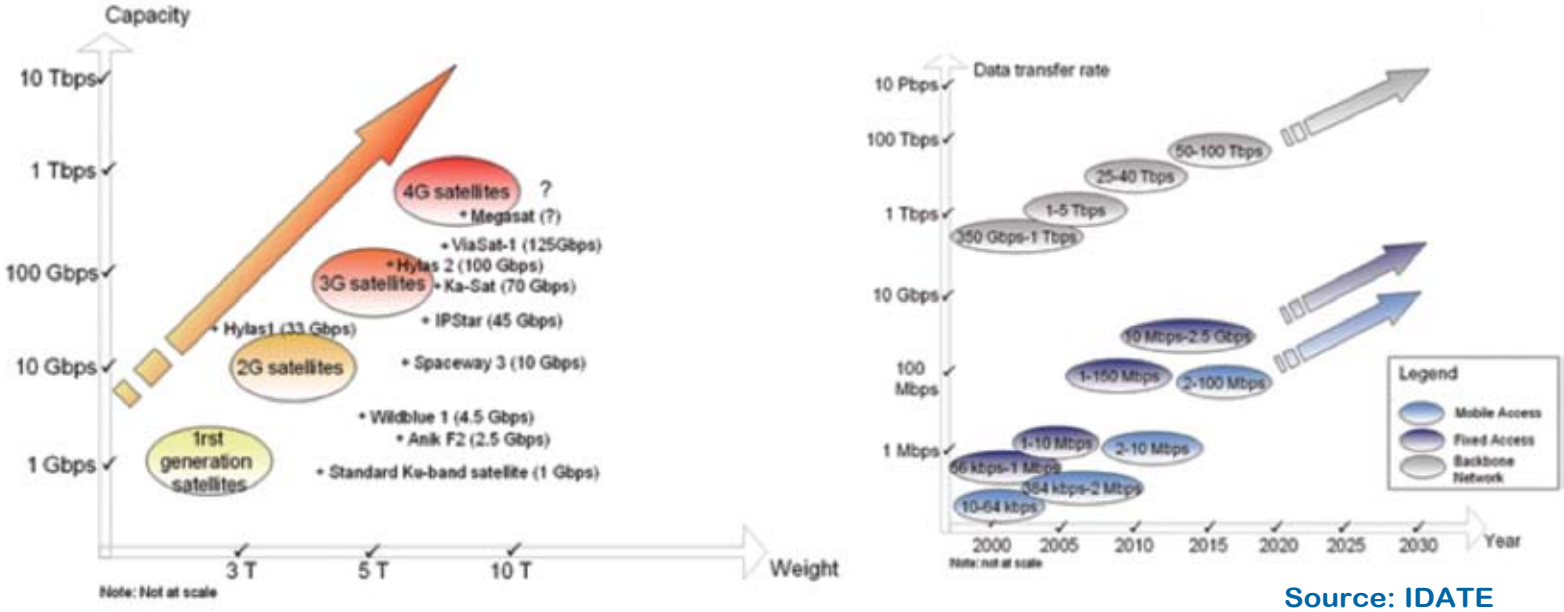
mobile networks (LTE advanced) which could allow theoretical bitrates of 270 Mbps from 2016 (effective bitrates of at least 30-50 Mbps).

The satellite industry has begun to react to the threat. The French space agency, **CNES**, in fact announced in late 2009 that 500,000 isolated households could be supplied with ultra high-speed access using a revolutionary satellite. Baptised ***MegaSat***, this satellite could supply French households with access at 50 Mbps starting in 2014. The MegaSat initiative involves satellite manufacturers **EADS Astrium** and **Thales Alenia Space**, and service provider **Eutelsat**, among others.

As part of its **ARTES** programme, the European Space Agency also has plans to develop a very high-speed satellite called the ***Terabit*** satellite. Based on a very broad platform (probably ***Alphabus***), the Terabit will make it possible to achieve speeds of around 200 Mbps with dishes measuring 40 cm in diameter, through the use of the Q and V frequency bands (2017-2020 timeframe). In addition to L-band payload operated by Inmarsat, the first commercial satellite using the Alphabus model, the ***Alphasat I-XL***, which is due to launch in 2012, will have three technological demonstration payloads (TDP) supplied by the ESA: an advanced star tracker using active pixel technology, an optical laser terminal for geostationary to low-Earth orbit communication at high data rates, and a dedicated payload for the characterization of transmission performance in the Q-V band in preparation for possible commercial exploitation of these frequencies. It is only by being able to rival its terrestrial counterparts that satellite can become a credible alternative, which is why projects like the MegaSat and the Terabit Satellite are the focus of current efforts.

About the author

Maxime Baudry joined IDATE as a senior consultant in April 2006. His main area of endeavour is monitoring the satellite industry, the telecommunications services market and operator strategies. Prior to IDATE, Maxime worked for two years for a major strategy consulting firm specialised in the space industry, where his work focused primarily on industrial analysis of satellite telecommunications for space agencies and the sector's equipment providers.



Source: IDATE

Figure 3: Satellites follow terrestrial performances

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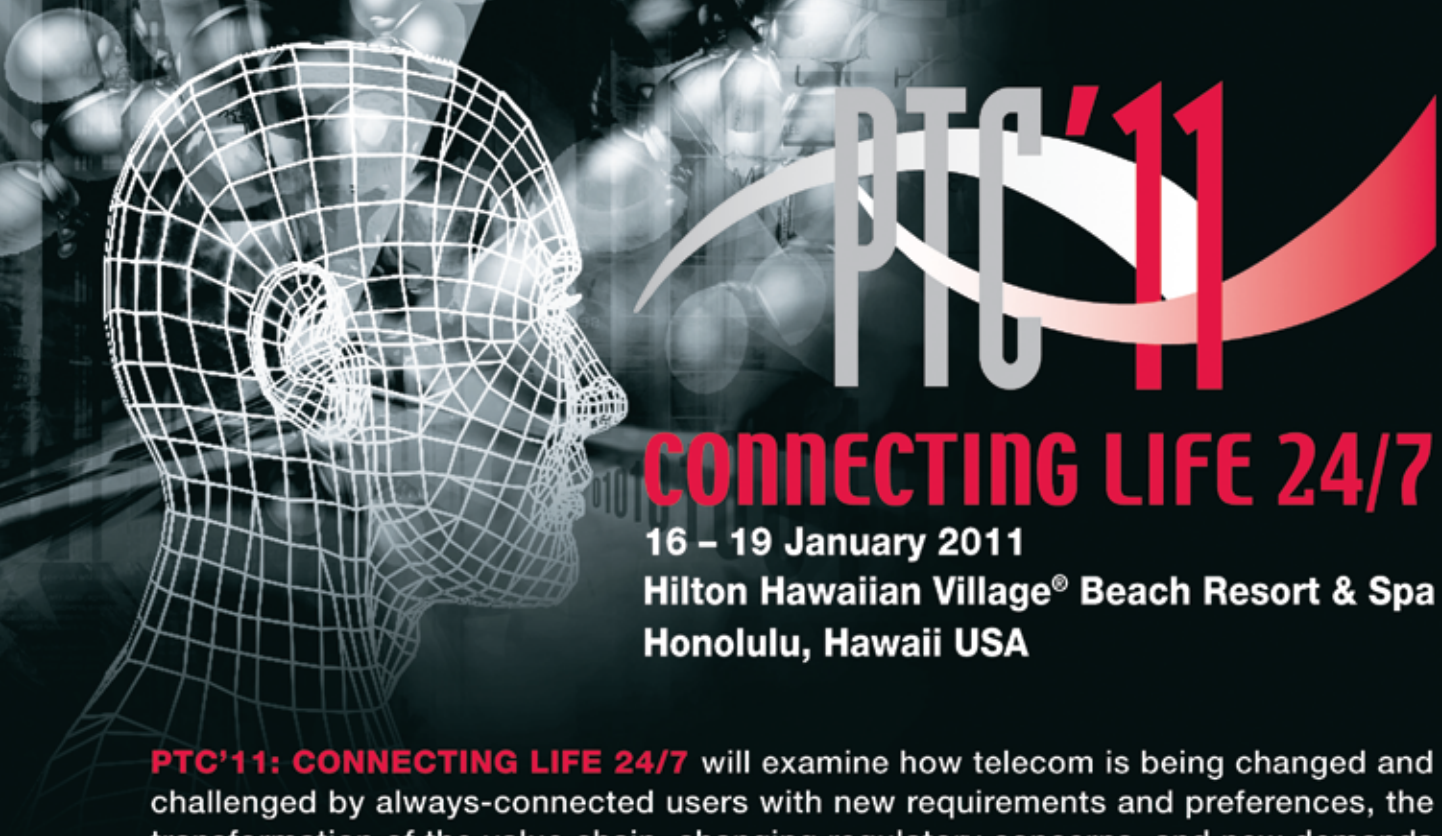

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- SCOTT PUOPOLO, VP, Global Service Provider Practice, IBSG, Cisco, *USA*
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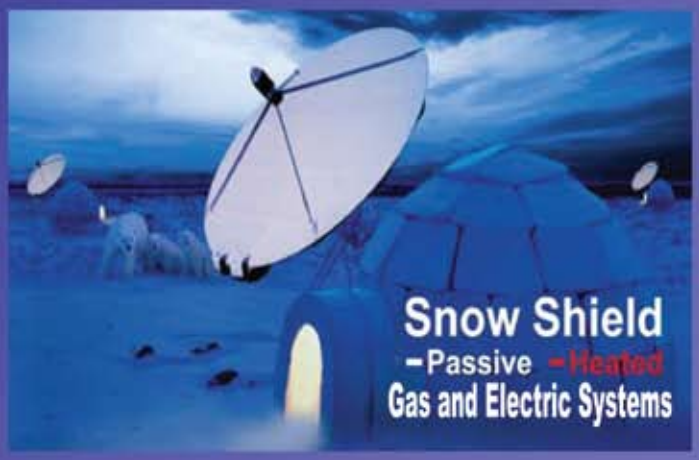

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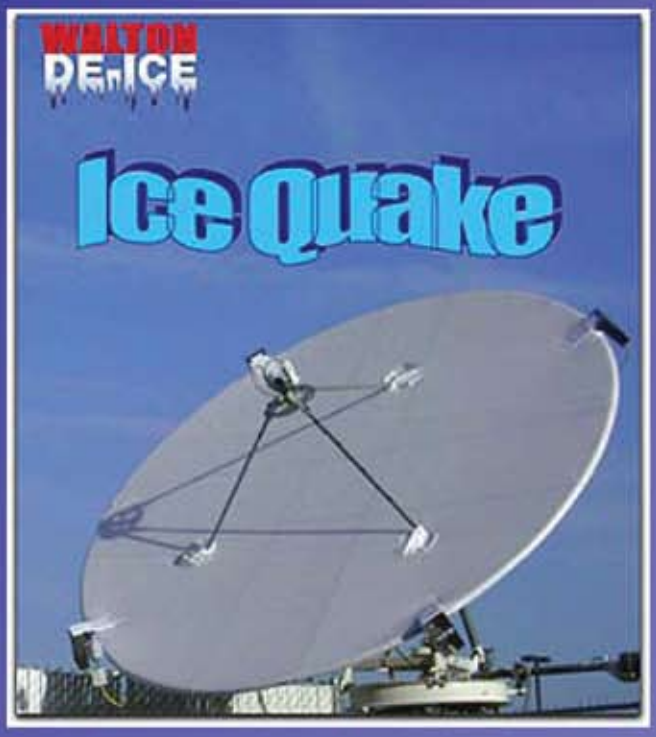

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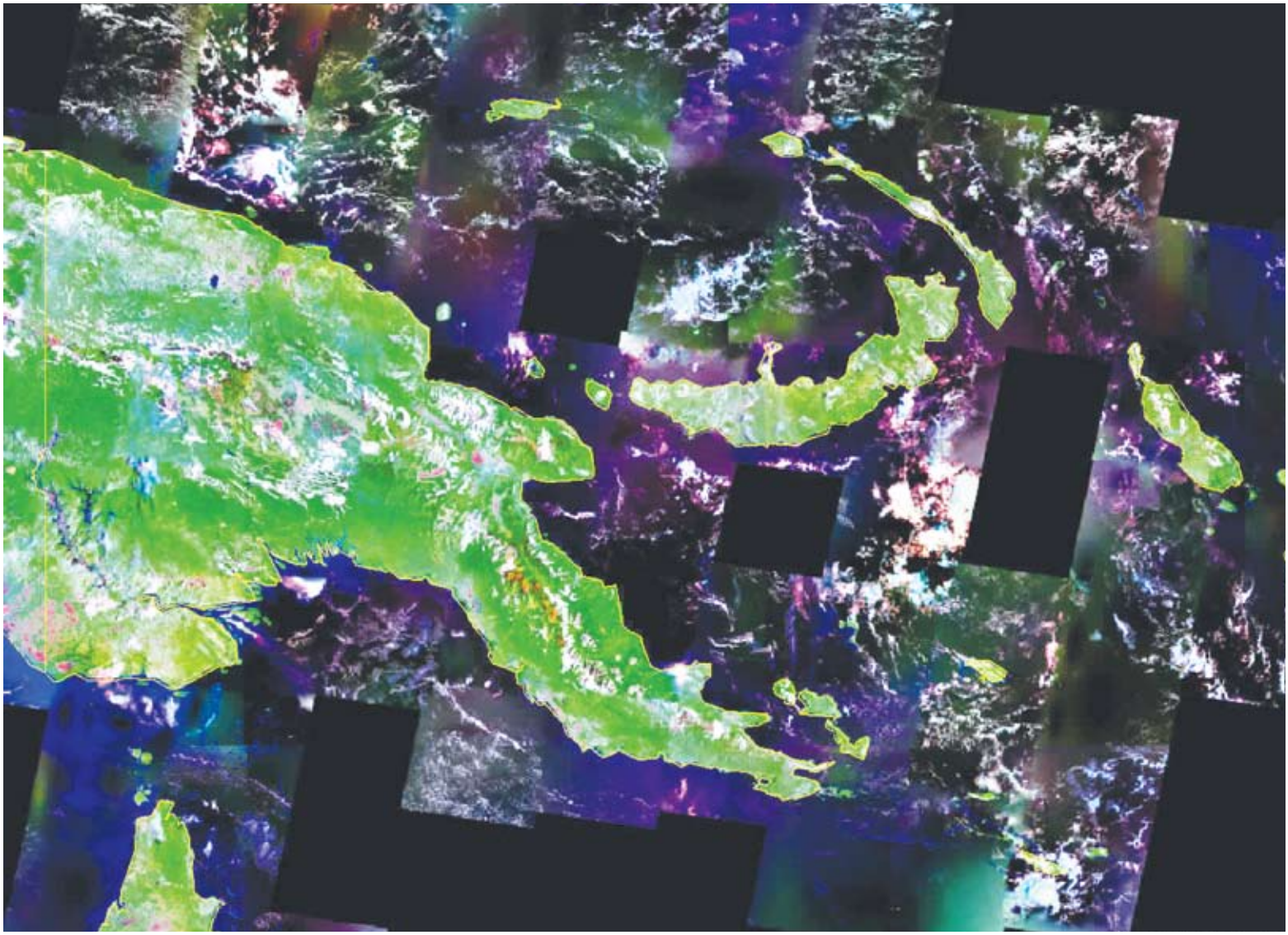
Mining Imagery For All It's Worth

author: Dr. Christopher Ralph Lavers, Britannia Royal College

High resolution commercial satellite imaging is now a sufficiently mature technology which can provide near-real time monitoring of a broad range of man-made land use and cover activities, and is an important geographical tool for the modern GIS professional.

Market globalisation and climate change related factors are set to increase the impact of conflict between complex resource extraction and simple ethnic communities — the greatest burden of impact usually affects those nearest to the base of the socio-economic scale the hardest. The latest developments in this technological area, combined with astronomy-based image processing methods, are used to look at regions of global concern that include: ***Zimbabwe***, ***West Papua,*** and ***India***.

The use of high resolution satellite imagery has been associated with the military ever since the Cold War — they were the only organisations with launch capability to place polar orbiting satellite platforms into space. Historically, such sensitive



Papua New Guinea Satellite Image, image courtesy of Geology.com

satellite imagery was difficult to disseminate due to security classification. However, ex-Soviet commercial provision of high-resolution military imagery (degraded to 2m resolution), as well as the 1994 *Clinton Administration Presidential Decision Directive,* enabled private companies to access and sell high-resolution imagery from US and Soviet Cold War military satellites (*e.g.*, the *Corona* and *KVR* series).

Since 1999, the birthing of a new generation of commercial providers for civilian GIS applications has been experienced. This new generation of commercial providers with 1 metre or better ground resolution is ideal for '*swords into ploughshares*' civil applications, such as dealing with humanitarian and disaster related applications, as well as spotlighting transnational mining corporate activities.

Quality imagery is available from several satellite data archives in the West, especially the following from company **GEOEYE**, whose offerings include: ***Orbview-3*** (launched in March of 2003), which has 1m panchromatic (Black and White) resolution and 4m multispectral resolution. ***IKONOS 2*** (launched in 1999) is a multispectral (colour) satellite with 1m panchromatic resolution, 3 true colour bands: blue (0.45-0.52), green (0.51-0.60), red (0.63-0.69), and an invisible near infra red band (0.76-0.90 microns), which when combined together generate false colour images for discriminating key land features. There'a also **DigitalGlobe's *QUICKBIRD 2*** (launched in October of 2001) that provides panchromatic image products at 0.61-0.72m resolution and 2.44m multispectral resolution.

The main problem with use of high resolution imagery by non-governmental organisations remains prohibitive cost. For example, the *UN Operational Satellite Applications*

Artistic rendition of Corona satellite

Programme **UNOSAT,** which provides satellite imagery and maps to *Inter-Governmental Organisations* (**IGO**s) and ***Non-Governmental Organisations*** (**NGO**s) for early warning, crisis response, relief, sustainable recovery, and vulnerability reduction, couldn't finance high resolution mapping of all of its worldwide activities.

A key challenge for confirmation of the impact of mining on isolated tribal groups is a rapid response to credible eyewitness reports. Effective and timely response is critical if the international community is able to mitigate against unlawful or environmentally damaging activities.

NGO's are often hindered by not knowing details such as the size of and population distribution within affected areas while simultaneously having to deal with governments' unwillingness to permit investigators to gain access to areas to verify environmental conditions on the ground, or to provide urgently needed humanitarian relief when required (*e.g.*, in the aftermath of *Cyclone Nargis* in Burma in 2008). High resolution satellite imaging can provide critical tools for the making of quality, detailed maps essential for the distribution of key resources such as food and water. In some cases, journalists' access is also highly perilous, as in the ***West Papuan Mining*** case study region where two American journalists were shot dead trying to take ground images of the mine — one of the West Papuan Independence movement leaders in contact with my *Survival International* colleagues, *Kelly Kwalik*, was killed in the vicinity of the mine in December of 2009.

IKONOS-2, image courtesy of GeoEye

QUICKBIRD-2, image courtesy of DigitalGlobe

I was invited by *Survival International,* a human rights organisation focused primarily on endangered indigenous groups around the globe, to look closely at the **Grasberg** mine complex in West Papua, as very few maps or geophysical data is available for the West Papuan mining areas due to their inherent inaccessibility. This request followed previous studies I had been involved with, including land clearances in Zimbabwe (*Reference 1*).

There has been considerable concern for the welfare of the indigenous ***Amungme*** and ***Komoro*** tribes for many decades, especially since the expansive growth of the Grasberg mine, operated by **Rio Tinto** (a US registered company) as a 40 percent joint venture partnership with **Freeport McMoran Copper and Gold** (**FCX**) in partnership with the **Indonesian Government**. **PT Freeport Indonesia** (**PTFI**) is a subsidiary of FCX. This mine is the largest gold mine in the world and the third largest copper mine, and is a highly significant factor in the Indonesian economy.

A recent comprehensive report by **WAHLI,** the *Indonesian Environmental Forum*, and environmental watchdog, stated significant concerns over Rio Tinto's continued failure to address key human rights and workers' rights, as well as environmental protection shortcomings. The report listed the following: legal breaches, copper waste and pollution, engineering weaknesses, tailing toxicity, estuary habitat destruction, estuary food chain contamination and ecological disruption.

WAHLI recommended that the Indonesian government enforce its own national environmental laws by halting Freeport-Rio Tinto operations until the shortfalls were remedied and undertake its own thorough and regular sampling. They also called for the government to re-examine tax and royalty arrangements and establish an independent panel to define various issues, including

processing and waste management. Local communities protesting against cultural and environmental damage by the mine's expansion and operations have been subject to a wide range of measures, including harassment, torture, and murder.

It is on such grounds that the *Norwegian Pension Fund* recently disinvested from Rio Tinto in 2008. For the Amungme and Komoro tribes, destruction of Mt. Grasberg has been little short of devastating. Tribes were forcefully relocated by the Indonesian government, leaving thousands of indigenous people removed from their traditional food gathering and farming territories. Moving the Amungme to the tropical lowlands brought people without immunity into contact with malarial carrying mosquitoes for the first time, leading to an increase in mortality rates.

The vast Grasberg and gold mine, first prospected thoroughly by Dutch geologists in the 1930s, comprises several delicate ecosystems — alpine meadow, wetland and mangrove forest — which make this environmental site world-renowned for its wide range and diversity of flora and fauna. The mine is seen (left) with glaciers (right) in *Figure 1*. The accelerated rate of mine and infrastructure development and consequential environmental destruction are set against a backdrop of rising ethnic tension. The strong indigenous desire for West Papuan independence, which began during the Indonesian occupation in the 1960s, places Grasberg's Freeport mine as a strong contender for the most contentious environmental mining project in the world. Damage to the environment caused by the mine has impaired the ability of thousands of Amunge and Komoro tribesmen, traditional owners of the river areas and mine site, to access clean water and food, or maintain their unique traditions and cultural practice. Daily, the mine dumps several hundred thousand tons of waste into the *Ajikwa River*, resulting in increased sediment transport, which has deoxygenated the river, killing plants and fish alike.

Rapid development of land to the south of mine has led to rapid deforestation between 2000 and 2008 due to mine infrastructural development (*Figures 2 and 3, respectively Page 112*). In this one example image pair of before and after imagery, the

land cleared to the east of the river is about 7,190 yards^2 with bridges and man-made lakes created. New square buildings, displacing what was recently pristine forest, are visible at about 16 yards x 16 yards. This land clearance is not an isolated case but is a major problem, as documented in recent **ESA** satellite projects. ***ERS-1* SAR** (*Synthetic Aperture Radar*) data has been used to monitor rain forest "conversion" and land use planning. The ESA pilot project ***TRULI***, located on the island of **Borneo**, 450km upstream of the *Mahakam* river, sets a benchmark for monitoring Indonesian tropical rain forest removal.

Thousands of tons of waste rock are also dumped by lorry into local alpine valleys where high tropical rainfall (often leaving the mountains hidden in thick mist) and erosion lead to fine materials moving downstream, releasing further heavy metals such as Mercury, Cadmium and Copper into the local river networks used by the Amungme and Komoro tribes. Contamination is toxic to aquatic organisms and may be further concentrated in the food chain. The mine complex itself stands at just over 15 Million yards^2 with its characteristic bored out circular core *Tambang Terbuka* (*Figure 1*). The level of observable detail allows for identification of individual vehicles and the ability to differentiate clearly the operations of different types of mining machinery (*Figure 4, Page 112*).

Nearby alpine glaciers, some of the closest to the equator (latitude close to -4° South and longitude 137° East) are considered sensitive markers of immediate climate change. Alpine glaciers have exhibited area change between June 2000 and June 2002, although the *Mount Jaya* glacier region has been in documented retreat since the mid-19th century. Imagery from the ***GeoEye Foundation*** covered areas for the period spanning 2000-2008 (*See Figures 2 + 3 on Page 112*). Existing, known, underlying terrain feature sizes made measuring the area relatively straightforward using viewer polygonal area image measurement techniques.

Panchpatmali Mine + Dongria Kondh

I was further invited by Survival International to have a look at another controversial proposal for an open cast mine which would affect the **Dongria Kondh** indigenous tribal people in *Orissa*, India. The Dongria Kondh are a peaceful people who live in the *Niyamgiri Hills*, in the Orissa State of India. The mine proposals have been put forward by **Vedanta Resources**, a UK company determined to mine this mountain's rich seam of bauxite (aluminium ore).

Figure 1: Panchpatmali Mine left, glaciers right © GeoEye Foundation.

The Dongria Kondh farm the mountain slopes and grow crops in the forest and gather wild fruit for sale. There are about 8,000 tribal members living in villages scattered right across the Niyamgiri Hills. The Dongria Kondh call themselves the ***Jharnia***, meaning 'protector of streams' as they protect their sacred mountains and the life-giving rivers that rise up within its thick forests. Vedanta's proposed open pit mine would destroy the forests, disrupt the rivers, and end the Dongria Kondh as a distinct people. The Norwegian Government and investment firm **Martin Currie** have sold their shares in Vedanta Resources. Vedanta claims the mine in the Niyamgiri Hills will be based on a model environmental mine at *Panchpatmali*.

Satellite imagery as shown in *Figure 1* of the Panchpatmali open cast mine (Latitude North 18.9444, longitude 83.1045 East) was obtained from the ***GeoEye Foundation***.

.

(article continued on page 112)

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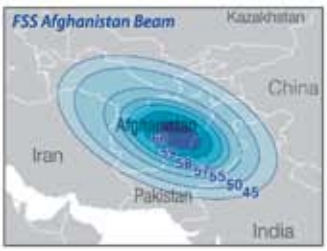

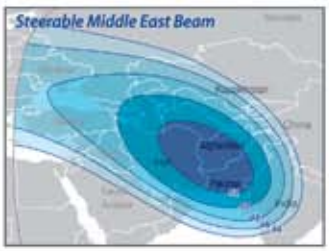

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Standards... What Standards?

author: Martin Coleman, Director - CCL & Senior Partner - CEng, Colem

Over my years in the broadcast and satellite industries I continue to see the usual, rather mundane approach to monitor and control and its operation. It has occurred to me that in the world of Network Management Systems (NMS, as such is now referred to) they are, in reality, far behind with their technology and thinking.

We are in an industry built around standards — and for good reason. The way in which media is gathered, edited, and transmitted is standardized and adheres to specific formats, enabling cross platform compatibility. As technology moves on, this becomes even more significant, as broadcasters need to allow for the fact that consumers are viewing their content on a whole host of different platforms.

So then, why, in this regulated industry, are most NMS systems not standardized?

Having seen all sorts of different breeds of NMS assailing our clients (myself being one of those clients many years ago), surely it is time for our clients to re-think their NMS strategy with something that will last well into their future and cover the enormity of technology and processor platform change that are happening by the minute.

Why Bother?

We have seen massive developments in broadcast technology over recent years. The way in which content is delivered has shifted, as has the way in which content is now viewed. With the advent of **IPTV**, **Connected TV**, **Mobile** and **Internet TV**, competition is absolutely fierce. Add in consumer expectations for a great offering anytime, anywhere, and you have to match your operations to the broader content in which our business exists. In order to keep up, broadcasters need to ensure they are exploiting the latest technology themselves.

For the most part, satellite broadcasters are doing just that, but for some reason, Network Management Systems are often not high on their list of priorities. That's not to say they don't have one, but simply the NMS is suffering from seriously outdated technology. To put it into context, would you build a high performance sports car and put standard wheels on it?

This also affects the manufacturers of broadcast equipment and the firmware therein! This area alone is completely out of control when it comes to standards. The advent of **SNMP** was supposed to help but, again, standards are lacking and complex **MiB** files vary significantly between manufacturers.

When we don't standardize and that technology becomes outdated, the entire NMS ends up with a short life cycle. However, using proper standards we can effectively future-proof that technology and allow for new market requirements, such as HD, and 3D. Essentially, the core remains the same, but new technology can be incorporated as it becomes available.

By standardizing, we will find a shift in reliability and efficiency of those systems, thereby ensuring the whole process is a well-oiled machine.

Re-inventing The Wheel

The real problem stems from a resistance to change. Many companies are simply continuing within the traditional NMS mold, which was originally brought about from those early DOS systems — such needs to be made to suit each client's individual requirements. Effectively, this means re-inventing the wheel each and every time.

We continue to think of these systems as bespoke and directed at the all-encompassing satellite industry alone. This, in itself, has led to the lack of adherence to standards, disparate and individual protocol and device driver derivatives. We still continue to work with a rather single minded view in an industry that now covers multi-platform and media content.

As most people can appreciate, technology has moved on a great deal since that time with a whole host of possibilities in the world of NMS. However, in actual fact, refining the thinking around NMS in the broadcast chain is a relatively simple process. There are already tried and tested standards available in the process and production industries.

Why did we have to invent that rather quirky bespoke wheel that our clients see as our industry standard NMS? It would be far simpler to adhere to those standards and adapt the systems where necessary to fit our industry. The principle is essentially the same.

Surely our clients deserve this?

Regaining Control

Of course, our industry does have its own set of challenges, which is exactly why I feel it necessary to adhere to those available standards. Rather than re-inventing that wheel, industry should concentrate on innovating in terms of broadcast-specific add-ons and features, enabling broadcasters to effectively manage the processes to deliver media and the usual scheduling, recording, billing and service level agreements.

As mentioned previously, standardization allows the system to easily adapt to new technology and that is certainly critical in our industry. There has been a whole host of changes to the broadcast chain — broadcasters are now expected to record in different formats, from SD through HD, and now 3D. Delivery mechanisms are changing, with many consumers selecting to watch TV via the Internet or on their mobile phone. All this means broadcasters have to adapt to that change and ensure their content is available for all platforms.

Couple this with the challenge of reducing interference, which is an all too common problem for satellite broadcasters. The ***Satellite Users Interference Reduction Group*** is coming up with ways of doing that, such as **Carrier ID**, but having an effective NMS is, in my opinion, one of the best ways of achieving that goal.

All of these factors mean keeping control of the whole chain is more important than ever, while at the same time adapting to changing formats and technology, yet keeping that all-important change cost to a minimum.

Future Challenges

The key challenge we face is convincing the industry that change is absolutely required by demonstrating that standards are available to use, and that they can work effectively within the broadcast chain. We can concentrate our efforts on tackling the more specific hurdles that affect our industry, such as reducing interference and keeping up with new formats and delivery methods, and so on.

I strongly believe that NMS standards are a must for this industry and the broadcaster to survive this rapidly changing media environment.

About the author

Martin Coleman is the Director - CCL & Senior Partner - CEng, Colem

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Visitors to the exhibition — for which registration is free — gain more than a show floor passes. To help visitors maneuver their way through the latest technology presentations, there are special display areas. For example, one was launched in 2009, the **Production Village**, which brings together a camera comparison area, free seminars on practical issues, and is also the base for ***IBC TV News,*** which broadcasts live on the web as well as creating a daily, morning show.

In the **Connected World,** the exhibits focus on additional platforms such as IPTV and mobile television, as well as digital signage and other out-of-home media. As home networking for content and data moves from concept to reality, so IBC is creating two specialist displays — a connected home and a content hub to showcase such capabilities. Connected World, too, has its own free seminars on business and related topics. Other free events range from special conference sessions to screenings on the ***IBC Big Screen***. Additionally, the ever-popular movie nights are also likely to include showcases on hot topics and award winners.

The IBC conference links three strands: Creative innovation, the business of broadcasting, and advances in technology. These are offered through the six days of IBC and allow colleagues to approach the key issues and to share their knowledge with peers, all the while developing a strong sense of direction for the future. Two elements set IBC apart from other conferences: The presence of proven thought leaders from around the world to drive the debate forward, and the superb production standards. Delegates do not just talk about the latest advances — they experience them.

IBC also places great emphasis on the social side — cafes and restaurants abound, and ***The Beach*** is a major social hub where colleagues and even competitors can share knowledge and improve understandings. Movie screenings, the awards ceremony, and other events ensure numerous opportunities for networking — and, of course, Amsterdam is a city famous for its dining and nightlife.

We all agree these are challenging times — the one weapon we must carry is knowledge. IBC runs from September 9th through 14th in Amsterdam and registration is already underway at ***www.ibc.org***... don't miss out on your opportunity to ensure your success.

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Solaris Mobile: "Swimming With The Tide" But Partners Are Wary

author: Chris Forrester

It has been the toughest of tough years for Dublin-based Solaris Mobile. CEO Steve Maine has had to struggle with a faulty S-band antenna on Eutelsat's otherwise perfect W2A craft, then negotiate an insurance claim while at the same time conducting rigorous tests as to what portion of the mission could be salvaged.

Meanwhile, Solaris is still having to pressure and cajole many European member states to grant the national operating licences for the complementary ground component (CGC) that gives the project its unique satellite + terrestrial offering.

W2A was launched back in April 2009, and despite subsequently receiving a significant insurance payout for the Solaris 'anomaly' there has been no word — yet — on any sort of replacement for the payload. Indeed, in many respects, the primary mission for Solaris, that of supplying the gap-filling spectrum for European telcos and their DVB-H services, is no longer much talked about. DVB-H is, for most European nations, no longer an active proposition.

Asked whether he remained optimistic, given the challenges ahead, *Maine* carefully dissected and reviewed those very obstacles. He said any process that required getting individual national regulation in place was bound to be laborious. "I am almost surprised that everyone was able to get the first part of the legislation through, which gave us the original authorisation

Steve Maine, CEO

process, and now we are trying to make sense of the rest of it, and which is to gain the individual operation licences [in each country]. I am, I guess, disappointed by the time it is all taking. Here we are, some 12 months in, and we have yet to get the basic authorisations in place in all the countries, let alone some of the other hurdles.

"But in the greater scheme of things, I certainly do not feel too downbeat because, even if the satellite had been working perfectly properly, then we would have still had to go through all this work. On a scale of 'jubilant' at one end, and 'morose' at the other, I would still feel closer to the jubilant end of the scale. This may have more to do with my own chemistry, but it is also founded on 35 years-worth of hard-bitten experience of trying to get new projects off the ground.

"In summary, it is disappointing, but it might be said that it is also a warning to the regulators and those who set the rules that in their caution they may be doing real harm to a fledgling business."

Nevertheless, Maine states he is very confident of the success of Solaris. However, asked whether his co-owners **Eutelsat** and **SES Astra** share that confidence, he pauses and admits, "No. I would have to say 'no', because the market dynamics are very different today compared with 2006 [when the payload was ordered], and they are still changing very quickly. Even in practical terms, the reality is that we have kicked off an RFP process, and we are still at the stage that we make sure that, when we have finalised the design of the next satellite, that it meet as closely as we can the apparent demands of the market. This is not as airy-fairy as it sounds, because we *ARE* at the stage where we have concrete market prospects, and we have signed a 'heads of agreement' with one customer.

"We are at the stage where, while we know that any satellite has to be designed to be as flexible as possible, we are also at the stage where we are talking to people who are more interested than you might imagine and saying to them that we can focus the design on this [new craft] to your actual requirements, which will result in better performance from it for your business than if we simply keep it flexible. We are at this stage at the moment, and while we are being careful during all these negotiations it is true to say that our shareholders are being 100 percent supportive it is also fair to say that they are being wary. They are wary because of the market dynamics. They are wary about the design and the specifics and known opportunities, and that we seize those opportunities. They are also wary that 12 months down the line we are still trying to make sense of the legal and regulatory aspects."

"This project has legs," argues Maine. "Ask yourself some fundamental questions. For example, if you are a business what might we offer more than that which you might have achieved with a terrestrial only or a satellite only component? Can we help expand that business plan you have? The answer is undoubtedly 'yes'. There is most definitely a place for this network of ours. But we have to recognise that for some of our potential customers thinking beyond their established box is also a challenge. We had a very valuable opportunity to place our payload onto the Eutelsat satellite, and this reduced our entry cost to market considerably.

Maine warns, "Those regulators, and those who set the rules that, in their caution, they may be doing real harm to a fledgling business."

"We are now looking at a wide range of follow on options, but the opportunity to hitch a ride again onto one or other of my shareholders planned satellites is not as extensive as we might wish, and so we are having to consider right at the top of our list of options funding our own satellite. This isn't just the question of us spending the insurance cash we received and getting on with the business, but it is very likely that the next satellite for us will be very much more expensive. Put all of these issues in a list; market dynamics, regulatory uncertainty which I still see a disappointing but not debilitating, and the step-up in terms of costs for the next phase of the business, and you have some questions to answer. Our shareholders are hugely supportive but they are anxious that we get the next stage of the business right!"

Maine says bluntly that, despite these problems, Solaris Mobile has done a great deal. "We have achieved so very much. We were obliged to cover 60-70 percent of the European landmass by 2011 and to have launched services by then. Our 'heads of agreement' letter is but one which shows that we have made

very real offers to a number of potential clients for services, and that the satellite is very stable with 15-years of life left out of it, and in other words it is our view that we are wholly compliant with the terms of the licence.

"While people are naturally interested in what we will do next, and when the next significant investment is going to come, we don't believe that (the investment) needs to be tied to any view about our ability to make commitments under the EU process. We are faced with purely a business judgment, and how quickly we can make that next stage of investment and which will enable us to achieve scale in our business. These decisions have nothing to do with meeting the EU requirements."

He explained that at a recent quarterly meeting with the EU's Communications Group (Cocom/MMS), they discussed the project and how progress was being made. "They look in particular at elements of subsidiarity and what must be done at the various levels within Europe as well as in individual countries. One has to tread quite carefully around this area and the meeting heard from all of the member states as to where they were in the licensing process and the issue of fees and what their policies were on an individual nation by nation basis, and the use of CGC because there are within Europe different views on how CGC might be used.

Asked whether the regulators were sympathetic to the plight of Solaris Mobile, Maine said "I don't think they were. They were polite. They listened and while some of them recognised that our focus must be on commercial realities, others were more relaxed."

"And I cheekily asked, having heard all these statements and plans, whether the initial 18-year licence period would commence once all of the nations had issued their own individual licences for the system, and not from May 14th 2009 when the EU issued its licence, and whether this assumption was correct. That was blown away pretty quickly!

Solaris Mobile has an 18-year S-band MSS licence from the European Commission that started in May 2009. Inmarsat has a matching licence. Other member states which have granted the matching national CGC licences include France, Sweden, and Germany, to add to existing licenses granted by Finland, Luxembourg, Italy, and Slovenia.

But it made my point, that this process cannot and must not be allowed to go on forever. Our period is rapidly eroding, we have to make a sensible business while at the same time observing the rules and regulations of local regulators who seem to be quite relaxed [about time passing by]."

Solaris has conducted a number of city-specific multi-channel tests for both TV and radio and Paris, Barcelona, and elsewhere. There are now other plans afoot. "Our message over the past year has changed significantly, we are still demonstrating a platform in and around Paris and as a focal point for discussions for potential customers, we are proposing to build other demonstration platforms in other European cities but they will have a different focus to them.

"The next one we are going to build will be a radio distribution platform with a bunch of radio channels so although the network topology might look very similar to that we have demonstrated in Paris, the content itself will be very different and this will mean different terminal equipment going into cars.

"Our intention is for this to be a long term strategic investment, incorporating CGC as well. We'd hope to be demonstrating multiples of 10 radio channels and certainly in the 30-50 channel range," adds Maine.

However, if the European auto-trade is to make any move into S-band radio, then it will take some years for it to equip new vehicles with suitable radios. Maine says the car makers are holding back from making any sort of commitment. "It's much the same problem that I walked into when I started this job some two and a half years ago. They see a multitude of technology distribution options out there and are unsure as to

which way to jump. They are already suffering, most of them, from the consequences of a quite savage recession where sales of new cars are being hit and their own development plans in this area have been affected.

"That is not to say that those plans are on the back burner but they are definitely being pushed towards the back burner, in my view. While we have not yet seen hard commitments from the major auto players, and while those announcements are slow to happen, we are seeing very real announcements coming out of the USA about putting Internet into car radios and the game is changing so very quickly, helped by the growing availability of mobile Internet and its ability to support radio. You can understand why the manufacturing sector is pausing for breath to see what might happen. This means that we are initially concentrating on the after-market, as a first point of entry."

Maine says that he hopes to be announcing very real services by year-end 2010. "I would hope to be offering a range of services in 2011. The satellite, even in its damaged state, covers well over 60 percent of the European land mass. Indeed, we reckon it covers more than 80 percent, but even with a satellite in place, we have to recognise the economics of an overall system that requires that the ground components also be in place, complete with their individual country licences and it is this element that is slowing us down today. However at the end of the day, we cannot force businesses to make commitments until they are ready so to do. If you listed the largest Western European countries by population, then you would see where we think market entry is going to take place."

Maine then agreed that Germany, Poland, France, the UK, Scandinavia as a block, Italy and Spain were all major markets being addressed. "The ability to deploy in large markets is obviously important. There is no homogeneous European market for these services. Consequently, individual territories have to be examined on a case by case basis. I am quietly confident we'll see launch of services before the end of 2010, or very early in 2011. It's what we are certainly aiming for and will represent the launch of a commercial service. I am very hopeful that if this can be achieved, then it will have a knock on catalytic effect on others in the market.

"Getting this first one right is important. I remember 25 years ago the decision by Sky to launch just a handful of channels was, itself, the catalyst for many others to come into the market. It seems to me you do not necessarily need a massive explosion of services across the whole of Europe. This is unlikely. What you need is one player to spot an opportunity and decide to go for it and this will prompt others to look over the hedge and see what might be done in their own individual markets.

"I certainly see light at the end of the tunnel. I have already said how determined I am and if I thought for an instant that there was no hope, then I'd be the first to say so, and we are nowhere near that stage with this project. There is a huge shaft of light that I can see in the distance. At the moment, that light is just reflecting off the walls, but it gives me immense confidence for our future. You need only look at all the market dynamics, look at the consumption of entertainment services, look at the explosive growth in products like the iPhone and the iPad and what that means to consumption of services on the move, look at how people are consuming music while on the move and look at the way applications are driving network usage forward.

"This is the business we are in — we are network carriers for these kinds of entertainment services. Look at the public sector and what was once a pure voice network has developed a thousand fold into all the applications that we offer today. Then there's data. Why would terrestrial networks want to spend fortunes and another twenty years creating networks to deliver sophisticated data when we can do it for them overnight? Using satellite as part of a hybrid network is a good, sound, sensible solution for them, so I would say, just look at the market dynamics.

"We are not swimming against the tide, but with the tide. We know from the discussions we are having with potential users and with industrial players who are keen to work with us that they are like-minded people. I look at this business and I can confidently say it is looking good. I see it moving broadly in the right direction. I think it is looking good and it is well worth the effort and that is the way the shareholders still feel about it."

About the author

Chris Forrester is a well-known broadcasting journalist and industry consultant. He reports on all aspects of broadcasting, with special emphasis on content, the business of television, and emerging applications. This includes interactive multi-media and the growing importance of web-streamed and digitised content over all delivery platforms He has been investigating, researching and reporting on the so-called 'broadband explosion' for more than 25 years. He has been a freelance journalist since 1988.

Maine, on a possible deal, and Worldspace

"The Heads of Agreement" we have is in radio. You would be surprised at how many people out there are interested in radio and in many respects, we are swimming with the tide. If you think about the migration of TV from analogue to digital, that has yet to happen with radio and it is going to happen over the next 10 years across Europe, although at different speeds in different countries, which means that it isn't just potential pay-radio operators who are interested in multichannel subscription radio for cars.

"There are all kinds of players who will need distribution for their radio channels or who are interested in looking at digital distribution generally. Those industry dynamics are in fact very interesting and look very promising but there are other areas which are just as promising outside of radio."

And Worldspace?

"Spending $5.5 million [to buy the Worldspace assets] is easy. Funding a new satellite to replace the one about to fall out of the skies is a very different exercise. Samara/Worldspace/Liberty cause me no anxieties at all in our own plans. We have had serious discussions with Sirius and with Liberty in the past, although we have had no discussions with Worldspace.

"I think I understand pretty well where Liberty and Sirius are in the equation but may I issue a word of caution and say that you should not jump to any conclusion when I talk about radio in assuming that it is necessarily anything to do with Ondas Media [which is looking to start subscription radio services over Europe]."

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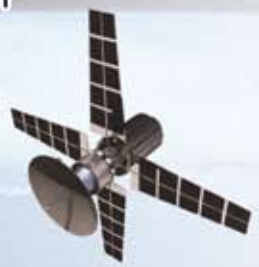

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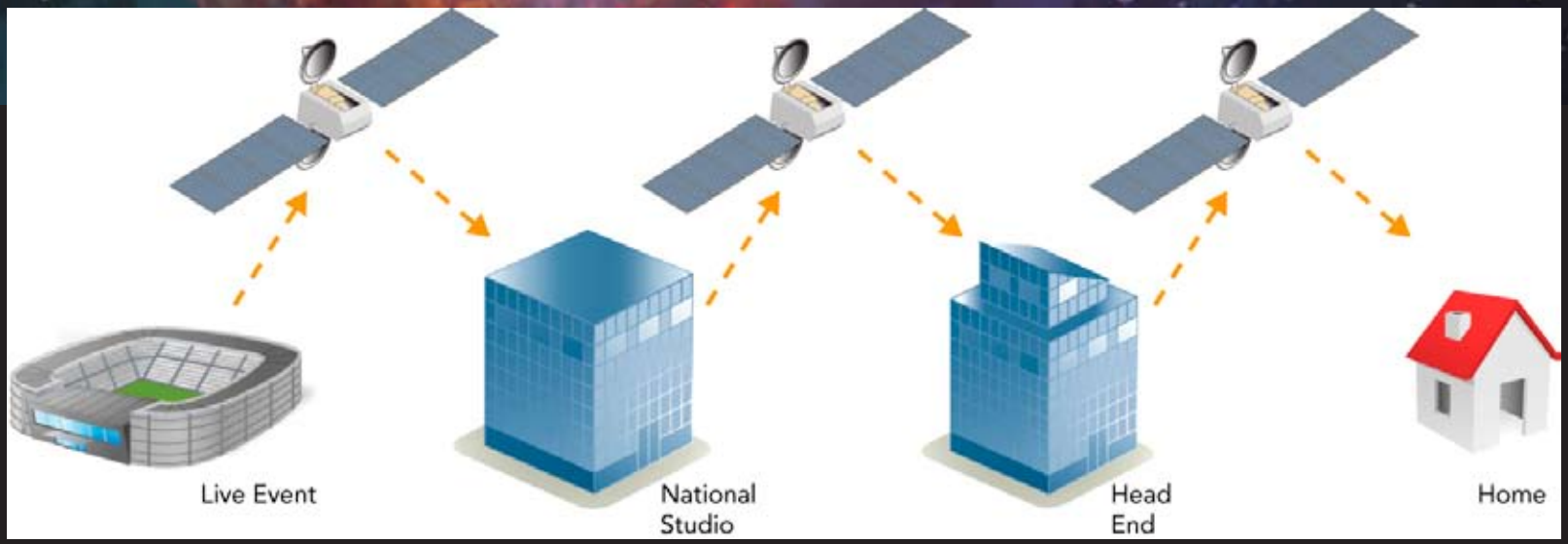
SatBroadcasting™

Satellite Broadcasting — An Evolution

author: Jack Vickers, SENCORE Product Manager

Since the advent of satellite broadcasting, cost-effective operations and consistent, high-quality, viewer experience have continued to be the main priorities for content owners and producers. Technical advances including state-of-the-art video delivery products and signal transmission products continue to play a significant role in the improvement, evolution, and future of satellite broadcasting.



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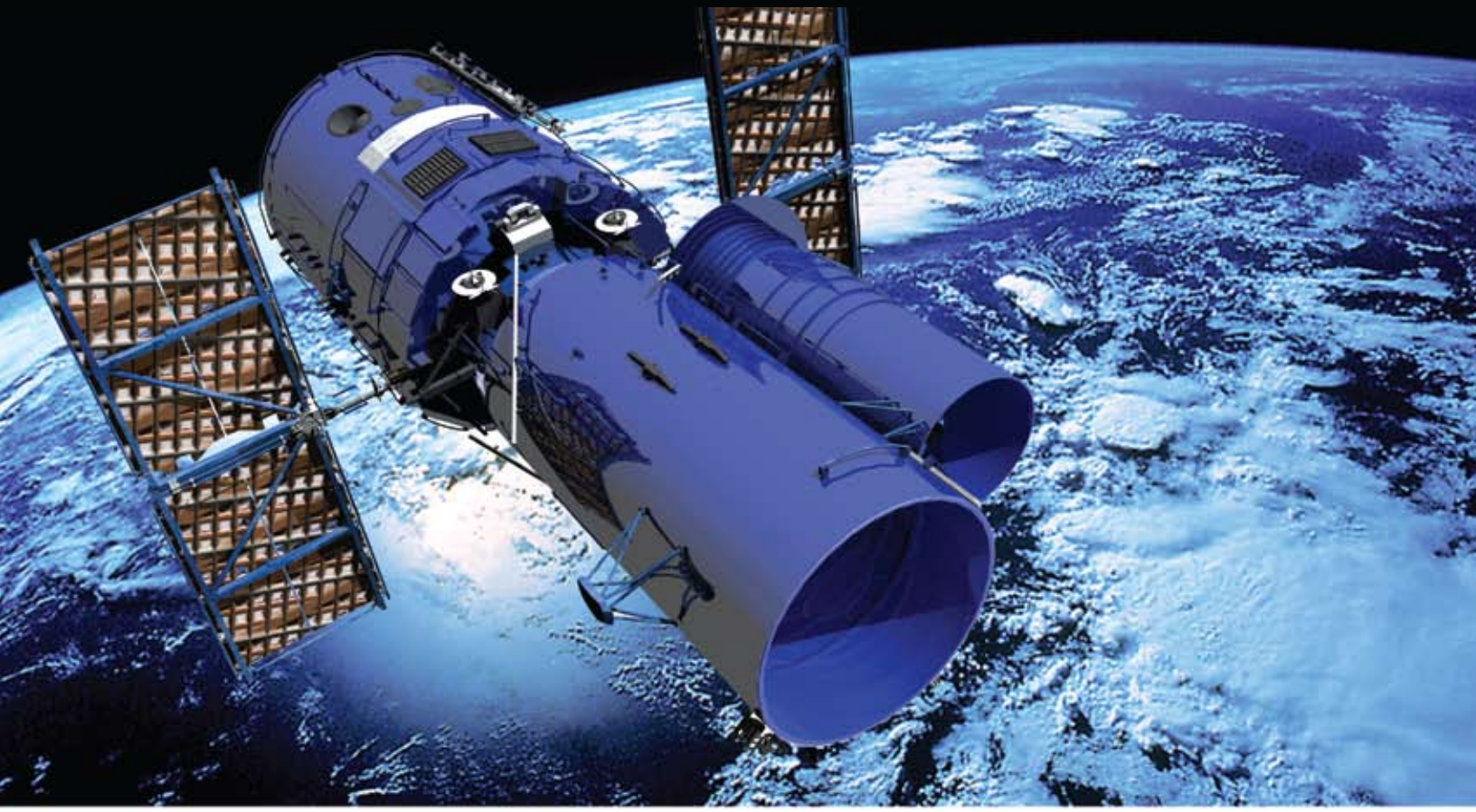

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Early on, for example, the SENCORE engineering team helped one of the first DTH networks in the United States launch its new digital transmission platform. This was accomplished though collaborative efforts to build a modulator that could use a semiconductor manufacturer's proprietary forward-error correction. As a direct result of this collaboration, today a large number of DTH network signals in the United States are modulated by these types of devices.

From contribution to distribution, satellite technology has and will continue to play a vital role in the delivery of video from the point of origin to the home. Figure 1 shows a simplified video distribution chain with satellite as the carriage medium throughout. As video nears the home, there are more options for transmission including IPTV and cable, but satellite can be deployed without the need to bury cable, making it extremely attractive in emerging countries.

As the satellite industry has developed and new standards including DVB-S2 have emerged, it is increasingly true that spec by spec, pieces of gear in the video delivery chain seem equal. This should not come as a surprise. After all, the providers are all meeting the same standards. If you won't find key differentiators among devices in the fine print, where are they to be found? Most often, the difference is between products that work as advertised in real-world applications, and those that do not.

The Key Differentiator

Logically, the next question becomes: What determines what works? Because the video delivery chain has become so complex, most often the devices that work are those that have sufficient built-in versatility to enable them to work well with others. Because any product can be designed to simply "meet" a specification, it is experience and expertise within the entire broadcast chain that are the major differentiators between different test and measurement products today.

Complexity in video delivery is principally the result of two things. First is the wide variety of satellite applications, each with a different signal chain whose links are products made by different vendors. Second is the inherent flexibility within the standards. Ideally, products such as receiver/decoders and modulators should be capable of performing in multiple places in the video delivery chain.

The variety of formats is a response to the variety of delivery platforms in demand today, including television, PC, and mobile phones. They are also a response to technology improvements that facilitate the ability to deliver HD over satellite, such as more efficient compression technology. The shift to the DVB-S2 modulation scheme, for example, is in response to the need to deliver more bits for less bandwidth.

Recognizing the need for versatility, SENCORE was among the first companies to offer a receiver decoder built on a modulator platform with configurable inputs, outputs, and decoder options to suit users' individual needs.

The customer is empowered by offering options such as the latest modulator for DVB-S2, the SMD 989, which brings into play dual-bay versatility. This means the user can populate each bay with a modulator and/or demodulator. This flexibility allows the customer to use the platform as a space-saving, high-density modulator. In fact, when compared with traditional devices, the SMD 989 DVB-S2 Modulator cuts space requirements in half. Such is especially desirable for DTH applications that require many channels and thus modulators at the head-end, putting space at a premium.

A further advantage of this device is the flexibility to house a modulator and demodulator within a single chassis, essentially performing monitoring and verification of the signal that is being transmitted from the satellite. Given that satellite providers pay for bandwidth by unit of time, they do not want to spend time on setup and verification. The SMD 989's design affords the ability to verify and validate the signal in real time.

Interoperability Is Crucial

Interoperability — in other words, a device's ability to perform in multiple use cases with myriad other equipment — has become even more critical with the increase of HD adoption. The size and detail of HD content requires the use of H.264 AVC compression over carriage mediums, including IPTV over ADSL and DTH satellite delivery.

Decompressing H.264 AVC is, itself, more demanding than decompressing predecessor standards such as MPEG-2. In addition, the H.264 AVC standard has new options within it, including new block sizes, as well as expanded profiles and levels to enable increased compression efficiency.

The consequence of encoder manufacturers having so much flexibility is an increased burden on the receiver decoder. Likewise, HD encoding requires higher bit-rate

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streams. This has prompted the move to the DVB-S2 standard for carriage over satellite in order to minimize use of transponder

If clean interoperability is the key to successful video delivery via satellite, then — to borrow an apt cliché — the chain of equipment is only as strong as its weakest link.

A glitch in a single piece of equipment, or component in a piece of equipment, or even the interaction between components in pieces of equipment, can wreak havoc with the entire system. There are literally thousands of things that can go wrong and create a problem with consistent, high-quality video delivery.

SENCORE engineers have experienced many years of real-life use cases in a wide variety of applications. They know what can go wrong theoretically, what has gone wrong in actuality, and the corrective response has to build in effective solutions. This has made SENCORE products exceptionally reliable, a fact that's attested to by the company's reputation in the industry. Due to the complexity of the video delivery system, it takes years of real-world testing to deliver a useful piece of gear with the off-the-shelf reliability found in our devices.

In addition, as SENCORE has multiple operational products for satellite video delivery, the company is familiar with the handshake points among products and is able to make those that work seamlessly within the signal-flow — even when that includes legacy devices.

For example, the 3000 series receiver decoders are versatile enough to operate over a wide variety of parameters, including DVB-S and low symbol rate applications. At the same time, the receivers can demodulate any DVB-S2 modulation scheme, including 16-APSK and 32 APSK, and can also support multi-stream ISI applications. The 3000 series receiver decoders enable the customer to do whatever is needed with one box, for today's and tomorrow's use cases.

A good example of SENCORE gear interoperating within the signal delivery chain is CBS's deployment of the company's MRD3187B on Super Bowl weekend that occurred earlier this year. During the broadcast, CBS paired the SENCORE receiver decoder with a high-performance encoder from another vendor for low-delay ancillary news coverage. Together, the two devices provided MPEG-4 AVC compressed live HD feeds for CBS's Weekend News program from Sun Life Stadium in Miami to the CBS studios in New York.

Interoperability is so important to the industry that the *International Satellite Operations Group* (ISOG), a subcommittee of the *World Broadcasting Union* (WBU), sponsors independent interoperability testing. The latest round took place in June 2009 and was focused on MPEG-4 AVC (H.264) contribution and 1080i/720p codec interoperability. SENCORE submitted the MRD3187B receiver-decoder for testing, and it finished in the top three in each category tested, including...

- Video interoperability
- Audio interoperability
- Lip sync
- Long-term lip sync
- System latency measurements

Rather than focus exclusively on listed specifications, WBU-ISOG tests focused on interoperability and real-world system performance across many equally important parameters. Consider the complex relationship between latency and lip-sync, which are significant challenges in HD systems. A lower-latency system is especially useful in field-to-studio interviews where the delay between the conversations can be annoying to the viewer. An encoder or receiver-decoder that offers best-in-class latency is of no use to an operator if it lacks in lip sync; the system delay may be reduced, but the trade-off could be audio leading video.

The Growing HD Push

As an early entrant in the satellite industry, SENCORE has a uniquely broad and knowledge-backed perspective on its trajectory, recognizing, for example, that the trend will always be to pack more data into less time and less bandwidth. Consumer demand for HD is one significant driver for this trend. HD is already seeing wide use in Western Europe and North America, with more limited adoption in Asia, South America and Eastern Europe. In emerging economies, use is still limited — but everywhere there is room for growth, particularly as viewers' expectations increase. SENCORE was one of the first providers of modulators to carry HD content as well as one of the first providers of HD receiver decoders. We continue to stay ahead of the curve by building in support for up-and-coming formats, signals, compression strategies, and codecs — even before they are widely adopted.

Market forces notwithstanding, DVB-S2 is approaching the Shannon Limit — the physical limit — of how densely bits can be packed and then resolved by a demodulator after a noisy trip to and from the satellite. Even before physical limitations are pushed, there are industry challenges to HD transmission, including the high cost of investment and of operation. HD transmission is expensive — necessitating more power consumption by more expensive, large, and hard-to-site satellite dishes.

The 16-APSK scheme is one potential path to enable satellite operators to further reduce bandwidth because it offers more bits per symbol than an 8-PSK system (*See Figure 2*). An 8-PSK (2^3) system offers eight positions in the constellation, whereas the extra bit in 16-APSK (2^4) adds another eight possible positions in the constellation.

The tradeoff is that it also requires higher transmit power and higher gain-receive antennas to accommodate the link budget necessary for the C/N constellation to be resolved at the receiver. Of course, 16APSK modulation is also much less forgiving of the system's non-linearities, and as a result, the higher power comes with its own limitations.

In any case, 16-APSK is much more useful in point-to-point applications than in multipoint applications, and even for point-to-point it pushes the envelope. This being said, some operators are testing the waters, and SENCORE is ready to accommodate them.

Whereas Western Europe and North America have functional legacy infrastructure that has to be replaced to accommodate advancements in technology, countries in Eastern Europe and elsewhere in the world may be building digital television infrastructure from scratch — skipping the limitations of yesterday's technology and embracing the advantages of tomorrow's.

In fact, worldwide equipment demand for DVB-S2/MPEG-4 is expected to grow nearly 40 percent over each of the next two years. India is one of the world's largest and most powerful emerging markets, and its *Telecom Regulator Authority of India* (TRAI) has recommended the use of DVB-S2 and MPEG-4, even for broadcasting SD video. The Indian DTH market is one the fastest growing satellite markets in the world, expected to quadruple from about 5 million today to 20 million in 2012 — any manufacturer targeting the global market needs to be sure it is providing versatile products that are compatible with legacy systems while they also include advanced features.

Meanwhile, the European market presents a unique opportunity for providers of operational video distribution gear because it is more fragmented than the North American market, and more of its contribution and primary distribution is carried via satellite. Because of that fragmentation, and because European providers rely on the open DVB-CI standard for encryption, satellite becomes the ideal solution for delivering content to many head ends and even terrestrial broadcast stations. DVB-S2's multi-stream

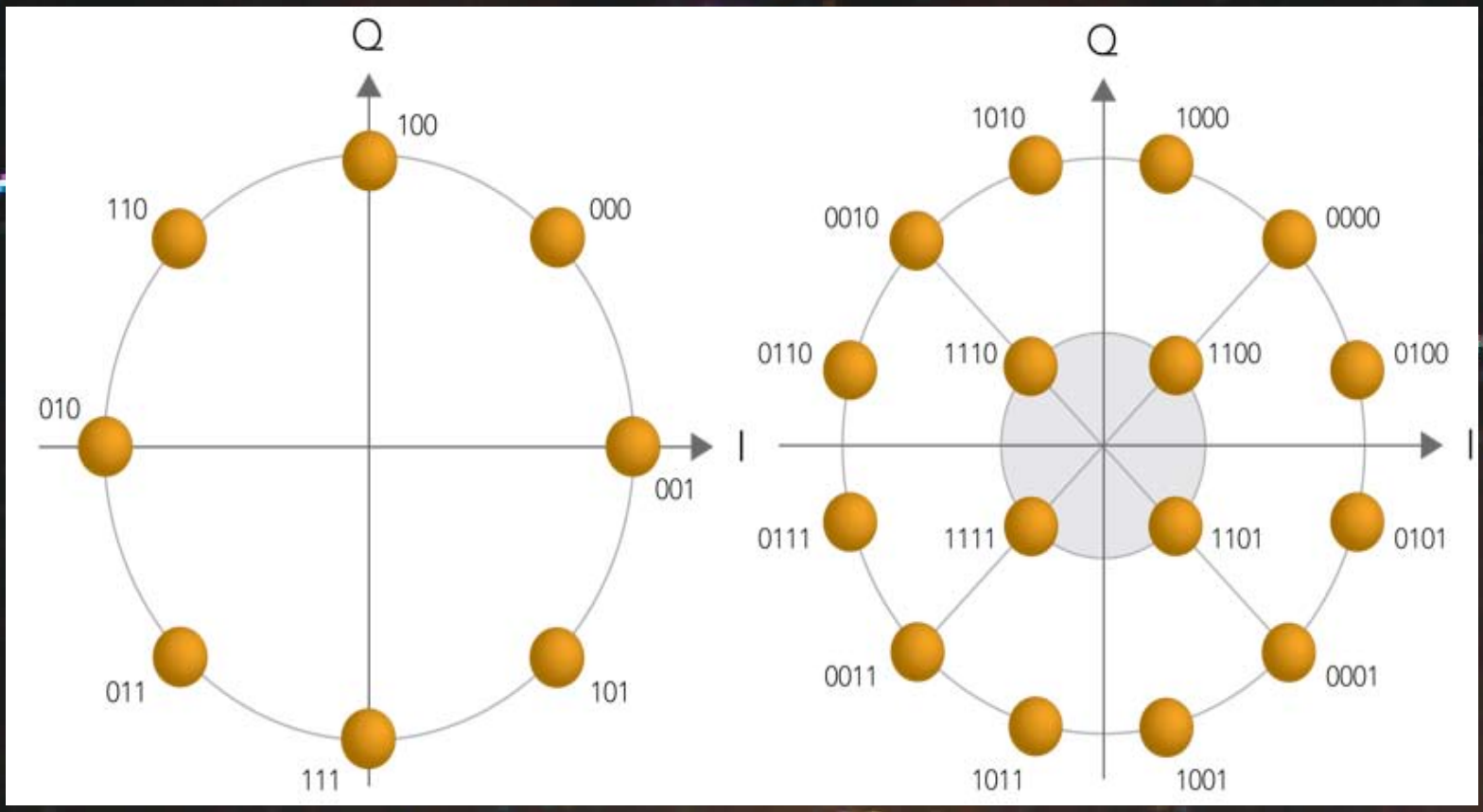

Figure 2: Comparison of constellation between 8-PSK and 16-APSK

capability is very useful in implementing single frequency networks for DVB-T terrestrial distribution.

SENCORE's IRD 3000 series of receiver decoders are particularly useful for content providers who are receiving an SD signal today but are anticipating HD roll-out in the future. They were designed to fit cost-effectively into existing SD infrastructure and are capable of decoding SD and HD video, and outputting SD. The IRD 3000 series also offers facilities a cost-effective, field upgradable path to output HD for future HD offerings to their customers.

Since 1951, SENCORE has specialized in all manner of technologies for processing and distributing video signals and video systems. The company's longevity affords not only unique knowledge but a unique perspective on a dynamic industry. Our company's most significant contribution to the industry as a whole is the ongoing development of time-tested, cost-effective products that are versatile enough to suit the many complexities of the video delivery chain, and technologically advanced for long-term usefulness.

About the Author

Jack Vickers is a senior product manager at SENCORE with primary product management responsibility for satellite receiver decoders. Vickers has held various design and product management positions in the broadcast, RF, and semiconductor industries, with emphasis on electromagnetic and RF communications. He holds a BSEE and MSEE from the Georgia Institute of Technology and an MBA from Emory University.

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Getting The Most Out Of IP-Based Satellite Bandwidth

Network and application infrastructure continues to get more complicated, with new technology advancements such as advanced web applications and a growing workforce of employees located in branch offices, tele-commuters, and mobile workers. Adding to this complexity are enterprise initiatives to centralize IT resources, while the decentralization of employees continues to increase. Just when you think you have it all figured out, something new is certain to come along.

author: Gordon Dorworth, President + CEO, Stampede Technologies

For virtually all IT organizations there are business imperatives to ensure economical use of Internet technology and to provide faster delivery and security for enterprise applications to users no matter where they happen to be located, with access anytime, day or night. However, hampering these business imperatives (particularly satellite connectivity) are problems due to bandwidth constraints and high-latency, as well as TCP, web application, and content delivery inefficiencies.

Enter WAN optimization and application acceleration. There are two types of solutions that address these problems. The first are acceleration appliances that reside at the head-end, that work together with acceleration appliances located at each remote site. These products provide two-sided WAN optimization and acceleration to alleviate the adverse effects that the WAN has upon application performance. They are referred to as *WAN Optimization Controllers* (**WOC**s), and branch office optimization appliances. These solutions are considered to be symmetric (bi-directional or two-sided), because they typically require an acceleration appliance at the head-end and at each remote site. Branch office optimization solutions improve the performance of applications that are sent from the head-end to remote offices, to individuals with computers, laptops and mobile devices. A wide variety of acceleration technologies are used within branch office optimization solutions.

Figure 1 on page 46 shows a **Stampede *FX4000*** Series appliance at the head-end, and an ***FX1000*** Series Branch Office appliance at the remote site providing two-sided WAN optimization and application acceleration.

The second solution is called an *Application Delivery Controller* (**ADC**). These devices accelerate application delivery and reduce

the amount of traffic over the WAN. ADCs are a single-sided (asymmetric) solution, requiring an appliance only in the head-end. The devices work as front-end processors to offload tasks from web and application servers. ADCs free up processing power on servers by performing tasks such as SSL termination, caching and compressing data. They also have server load balancing capabilities to efficiently manage traffic among multiple servers, and offload server resources.

With a single-sided solution, the ADC serves as a proxy for TCP management, acceleration and offloading server resources for out-bound traffic. TCP acceleration removes the time, quantity and complexity associated with multiple short-lived connections that slow network performance and add overhead to web server CPU resources. An ADC terminates the client-side TCP session requests, and multiplexes many short-lived sessions into a single longer-lived session between the ADC and the web servers.

ADCs also offload web servers with various compression techniques on web browsers and servers, and utilize static caching to maintain copies of routinely accessed data to eliminate unnecessary requests to the web servers. ADCs can also terminate SSL sessions from clients, removing the compute-intensive task of encryption from the web servers — freeing up valuable processing resources.

Figure 2 on the next page shows a single Stampede FX Series appliance at the head-end providing single-sided acceleration to remote users.

The more advanced WAN optimization solutions from Stampede offer a variety of head-end and remote site deployment options that don't require hardware at remote sites. In particular, Stampede's solutions include hardware, software clients, and Acceleration On-Demand injection technology. Stampede's FX Series appliance is deployed at the head-end, but rather than requiring a hardware appliance at the remote sites, there are options for delivering bi-directional acceleration using either hardware, client software deployed on user devices, or Acceleration On-Demand that automatically injects the appropriate acceleration technologies into the remote user

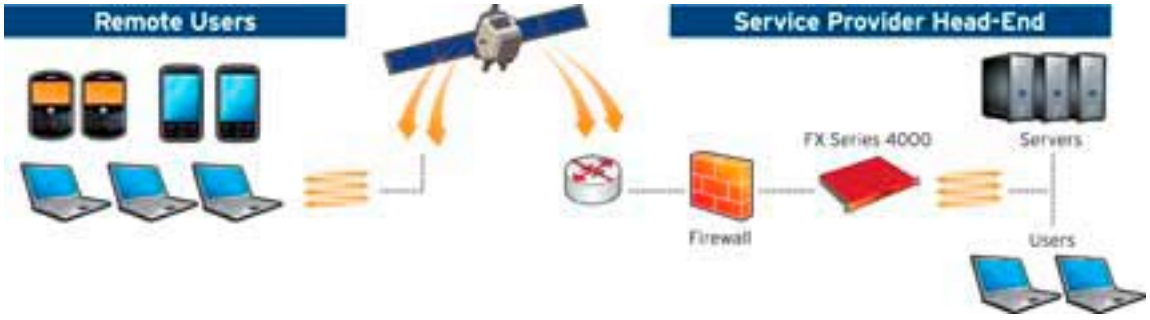

Figure 1: This diagram shows a single Stampede FX Series appliance at the head-end providing single-sided acceleration to remote users.

computers, laptops and mobile devices — without the need to install software on the user devices.

WAN optimization and application acceleration techniques improve WAN performance, the ability to both fill the satellite link, and optimize traffic throughput. Some of the key benefits include:

- ***Reduce the amount of unnecessary data sent over the satellite WAN***
- ***Reduce the number of TCP and application turns (handshakes) required to complete a transaction***
- ***Offload computationally intensive tasks from clients and servers***

As IT infrastructure gets more complicated with new technology advancements, and enterprise IT departments are given initiatives to improve WAN performance to support a greater number of diverse remote workers and leverage Internet technology in order to reduce costs, more IP-based satellite links are being used to deliver applications and information to workers located in places where bandwidth is scarce and/or expensive.

Employees in remote offices, telecommuters, and mobile workers are becoming a larger part of the workforce. Business imperatives are being handed down to ensure economical use of WAN links and to provide faster (anytime, anywhere) delivery and security for enterprise applications.

Unfortunately, there are some roadblocks that can make delivering on these business imperatives a challenge. There are myriad problems caused by high-latency, chatty TCP and web applications, content delivery inefficiencies, and adverse environmental conditions when using IP-based satellite communications.

Fortunately, Stampede's WAN optimization solutions address all of these problems. The solutions provide single-sided and two-sided WAN optimization and acceleration to alleviate the adverse effects that can impede satellite WAN performance. Stampede is the only company that offers a single, flexible platform for delivering all of these capabilities.

More info at this link:
http://www.stampede.com/_documents/Stampede_Data_Sheet_DTFX0210.pdf

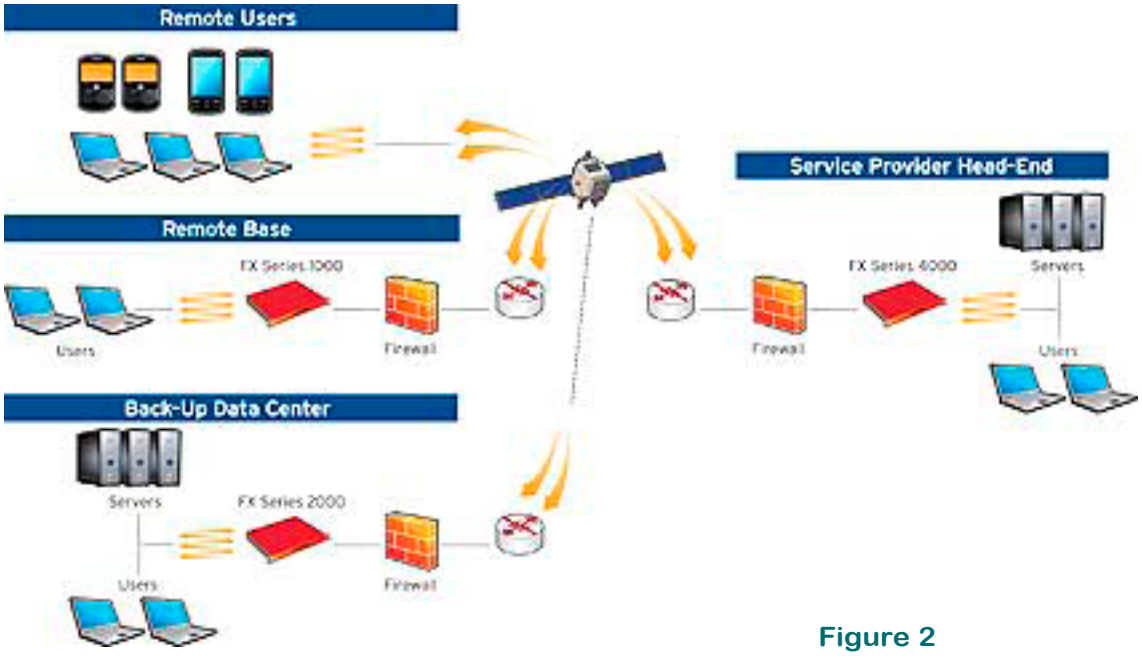

Figure 2

About the author

Gordon Dorworth is the President and CEO of Stampede Technologies, a leading provider of WAN optimization and application acceleration solutions for satellite and terrestrial-based networks.

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Stagnation Prevention— A Meeting Of SatMinds

Leonardi da Vinci is credited with stating...

"Iron rusts from disuse; water loses its purity from stagnation... even so does inaction sap the vigor of the mind."

And that's why the satellite industry embraces and attends trade exhibitions and seminars, to prevent idea stagnation and to learn about all of the new technologies that can assist and drive business to even greater heights.

One such event is **SATCON**, which will be held at the **Jacob K. Javits Convention Center** in New York city on October 13th and 14th. The keynote speakers for Wednesday, October 13th, at 9:00 a.m. include:

- ***Anthony Bailey, the Vice President of Emerging Technology at ESPN***
- ***Glenn Oakley, the Vice President of Media Technology, Production and Operations for Discovery Communications, Inc.***
- ***Alec Shapiro, the Senior Vice President of Sales and Marketing, Broadcast and Production Systems, for Sony Electronics Inc.***
- ***Alan Young, Senior Vice President and Chief Technology Officer at SES WORLD SKIES***

These speakers will address ***3DTV to the Home: Current Advances, Challenges, and the Future***, and offer their expertise to attendees regarding the burgeoning **3DTV** environs.

On **Thursday, October 14th**, starting at 9:00 a.m., ***One-on-One Interviews With Media, Satellite and Government Leaders*** is the theme to be tackled by the following speakers...

- ***David McGlade, the CEO of Intelsat***
- ***Robert Zitter, the Executive Vice President and Chief Technology Officer at HBO***
- ***A senior official from the US Department of Defense***
- ***The moderators for this session will include Warren Ferster, the Editor of Space News, and Harry Jessell, the Editor of TVNewsCheck.com***

Attendees will have the opportunity to hear, live, one-on-one interviews of these highly influential experts regarding the role of media, satellite and the government. Their visions, perceptions, highlights, challenges and the future of these environments will be presented to the audience. As far as the conference sessions are concerned, depending upon the track selected, SATCON's power packed schedule offers...

WEDNESDAY

- ***Fundamentals of Satellite Communications Systems, Part 1, presented by Burt H. Liebowitz, the Principal Network Engineer with MITRE Corporation.***

» ***Hosted Payloads: Challenges In Meeting Commercial and Government Needs.*** *The moderator of this information session will be the highly respected Colonel Patrick H. Rayermann, Director, Communications Functional Integration Office, National Security Space Office. The Speakers will include; — Charles Baker, Deputy Assistant Administrator for Satellite & Information Services, National Oceanic and Atmospheric Administration (NOAA) — Don Brown, Vice President of Business Development and Hosted Payloads, Intelsat General Corporation — Colonel Charles Cynamon, Commander, MILSATCOM Network Integration Group, USAF — and Brig Gen Robert "Tip" Osterthaler, (USAF, Ret), President & CEO, SES WORLD SKIES, USG Solutions.*

» ***Where Have All The News Feeds Gone? will discuss the move away from satellites and examine new trends and changes.*** *The moderator will be Dick Tauber, the Vice President of Transmission Systems and New Technology at CNN News Group. The speakers will include; Jeff Coneys, Director of Satellite Operations, NBC — Brian Kennedy, Director, Digital News Gathering, CBS NEWS — Chris Myers, Executive Director, Newsgathering Operations, ABC News — Mel Olinsky, Director of Operations, CBS News — and Martin Turner, Head of Operations, BBC Newsgathering.*

» ***The State Of The Satellite Industry: A Business and Financial Analysis Roundtable,*** *moderated by Susan Irwin, the President of Euroconsult USA, with speakers; Paul Bush, Vice President, North American Sales, Telesat — Arnold Friedman, Senior Vice President, Marketing & Sales, Space Systems/Loral — and Andreas Georghiou, Chief Executive Officer, Spacenet Inc.*

» ***MSS in an IP world: Where Does the Industry Go Now?*** *The moderator will be Tim Farrar, President, Telecom Media and Finance Associates, Inc., President, MSUA, with speakers; Blair Kutrow, Vice President of Marketing, SkyTerra Communications — Bob Roe, President, SGSI — and John Stoltz, Director, Commercial Sales, GMPCS / NETWORK INNOVATIONS.*

» ***Why Media Storage Is Different: What to Consider When Purchasing a Storage System,*** *presented by Geoff Stedman, Sr. VP, Marketing and Business Development, Omneon, Inc.*

» ***Collaboration is Key,*** *speaker Joel Ledlow, CEO, ScheduALL.*

» ***Future Commercial Satellite Communications Services Acquisition (FCSA) Update*** *will be moderated by Charles Edwards, FCSA Program Manager, PEO-STS, Defense Information Systems Agency. The speakers will include; Tony Bardo, Assistant Vice President, Government Solutions, North American Division, Hughes Network Systems, LLC — Daniel Gager, Program Manager, Defense Information Systems Agency — and Kevin Gallo, Program Manager, Future Commercial SATCOM Services Acquisition Integrated Tech., GSA Federal Acquisition Service*

» ***A Call To Action: Working Together To Combat Satellite Interference*** *will be moderated by Rich Wolf, Vice President, Telecommunications & Affiliate Services, ABC Television Network. The assemblage of speakers will include; Adam Edwards, President, AEdwards Consulting / SUIRG — Jonathan Higgins, Managing Director, BeaconSeek Ltd. — Brian Nelles, Senior VP, PSSI Global Services — and Mark Rawlins, Head of Payload Engineering and Operations, Eutelsat.*

» ***Commercial vs. MILSAT - Considerations for Information Assurance & Protection*** *will find; Shaum Mittal, Chief, Lead System Engineering Office, Prgrm Exec Office- Satellite, Transport & Services (PEO-STS) Directorate DISA — John Ratigan, President, iDirect Government Technology — and Abbas Yazdani, President and CEO, ARTEL, Inc., as the speakers.*

THURSDAY

» ***Changing Cultures and Technologies: Which Is Hardest? (Invitation Only!),*** *with Mr. J. Tracy Allison, Chief, Transformational Communications Engineering, Global Information Grid (GIG) Engineering Directorate, DISA*

» ***Fundamentals Of Satellite Communications,*** *with speaker Burt H. Liebowtiz, Principal Network Engineer, MITRE Corp.*

» ***From NYC to Haiti: Re-Learning the Disaster Preparedness Lesson,*** *moderated by David Hartshorn, Secretary General, Global VSAT Forum, with speakers; Claire Bailey, Agency Director and Chief Technology Officer, State of Arkansas Department of Information Systems — Chief Charles Dowd, Commanding Officer, Communications Division, NYC Police Department — Joe Simmons, Global Program Director, NetHope — and Larry Wentz, Senior Research Fellow, Center for Technology and National Security Policy, National Defense University.*

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» ***How is IP Technology Affecting Content and Delivery in a Multi-Platform World?*** *John McCoskey, Chief Technology Officer, PBS, will be the moderator and he will host; Gary Carter, Vice President & Chief Technology Officer, International Datacasting Corporation — Craig Cuttner, SVP, Advanced Technology, HBO — Don Gabriel, General Manager, Sales, Echostar Satellite Services — Glenn Reitmeier, Vice President, Technology Standards, Policy and Strategy, NBC Universal, will offer their expertise.*

» ***Optimizing Technology Choices for Comms-on-the-Move,*** *with moderator Rebecca Cowen-Hirsch, President, Inmarsat Government Services Incorporated, and speakers; Rick Lober, Vice President and General Manager, Defense and Intelligence Systems Division, Hughes Network Systems and Ron Lockerby, Regional Sales Manager, Americas, Thrane & Thrane, Inc.*

» ***Meeting Media's Future Demand for Satellite Capacity,*** *with moderator Robert Bell, Executive Director, Society of Satellite Professionals and World Teleport Association. Joining Robert on the dais will be; Mike Aloisi, VP Technology, Satellite & Affiliate Services, MTV Networks — Keith Hall, President and Chief Operating Officer, Globecomm Systems, Inc. — Tim Jackson, Vice President, Media Product Management, Intelsat — Scott Sprague, Senior Vice President, Global Sales, SES World Skies — and Brent Stranathan, Vice President, Broadcast Distribution, CBS Television.*

» ***Military Challenges in Theater,*** *hosted by Patricia Cooper, President, SIA, with; Bruce Bennett, Director, Program Executive Office- SATCOM, Teleport & services (PEO-STS), DISA — Byron Browning, CIO G6, US Army — and LT Sonia Kendall, Commercial Satellite Communications Program/Asset Manager, United States Coast Guard.*

» ***Unmanned Aerial Vehicles: Outlook for New Technologies, Applications and Services*** *will be presented by SIA.*

I'm very excited about the 2010 SATCON program. One of the highlights of the conference is certain to be the State of the Industry roundtable panel, which will feature senior executives from the manufacturing, operating and ground segment sectors of the satellite industry, plus Omar Jaffrey, Managing Director of UBS, and one of Wall Street's most knowledgeable analysts. This panel will offer key insights into the market and what we can expect for the future of the industry — Susan Irwin, President, Euroconsult USA.

Jacob Javitz Convention Center, New York

For a complete description of each session, head over to ***satconexpo.com/sessions_byDay.asp#S2399***.

Please join the industry experts in New York City for this informative event. For registration details or additional information, visit ***http://satconexpo.com/register.asp***. ***SatNews Publishers*** hopes to meet and greet you at **SATCON**.

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What's Next For 3DTV?

author: E. Pinson, Business Unit Manager, TEAMCAST

There is no doubt that today we are facing a new and exciting way to consume TV content as interest in 3DTV is growing. This technology is currently spreading within the digital production and post-production arenas, and broadcasters are becoming concerned about how to distribute future 3DTV content to consumers through the various Digital TV platforms such as satellite, cable, IP networks and terrestrial.

In a context of where there is a massive push for new digital channels and new digital content, the interest in 3D content and its delivery to consumers is growing exponentially. In parallel, the second generation (2G) of the terrestrial Digital TV standard, known as **DVB-T2**[1], is being rolled-out in the UK, and this is a great opportunity for broadcasters who want more transmission capacity for more value-added services based on HDTV content.

The objective of this article is to provide some key elements that explain how **3DTV** can be conveyed over a DVB-T2 network. After a brief introduction to basic principles and the projected market trends, the service requirement for 3DTV to the home is identified. A generic illustration of a 3DTV transmission network is introduced and a possible implementation using the DVB-T2 standard is explained.

TEAMCAST is capitalizing on more than 15 years of experience in implementing terrestrial Digital TV solutions. Through this article, TEAMCAST is pleased to share its own market and technology vision, built on more than two years of successful and pioneering experience in the domain of DVB-T2.

Coming Fast — 3D Television

During the last couple of years, stereoscopic TV technology (so-called "3DTV") has developed significantly within cinema and digital broadcasting ecosystems.

3D content is not new in the cinema, as the very first 3D films have been available since the 1920's (see the illustration, ***The Creature from the Black Lagoon***, from the 1950's). However, digital technology has recently pushed 3D to the forefront with more than twenty 3D films released, or planned for release, by the close of this year. In 2010, the success of the 3D movie ***Avatar*** (the film grossed US$430 million; 78 percent from the 3D screen[2]) demonstrated viewers' growing interests in 3D content and also the potential for significant revenues from this technology.

Image courtesy of Samsung

Consequently, many players in the Digital Broadcast ecosystem are becoming quite interested in the development of 3DTV content, the potential transmission solutions for 3D, and of course the availability of consumer 3D-ready products (3D-ready TVs, LCD monitors, Set-Top-Boxes (STBs), Mobile handsets, Notebook PCs, and so on).

In the situation where Pay TV operators are monitvoring the acceptance of 3D services closely to decide whether consumers are going to be satisfied with the 3D content experience and what kind of 3D technology would bring the best results in term of **QoE** (*Quality Of Experience*), some early adopters such as **BSkyB**[3] in the UK and **DIRECTV**[4] in the US are preparing 3D services' delivery over satellite. Pay TV satellite broadcaster **Canal+**[5] has announced its intent to launch a 3D channel before Christmas of this year and many others broadcasters, such as **MediaPro** in Spain for its football channel ***Gol TV***, are investigating in 3D technology.

As usual, the question of the availability of consumer receiving and decoding products arises. Everything is moving fast and major display manufacturers such as **Samsung**, **Sony**, **Philips**, **Panasonic**, and others, are competing to be ready first for 3D TV mass production!

Recently, Samsung released a 3DTV set with prices starting at $2,500 — the set comes with two pairs of proprietary, active shutter style, 3D glasses, while Sony's first 3D ***Bravia*** products have already arrived in Australia.

The market for 3D displays — which is encouraged by the recent success of 3D cinema — is forecast to take off in 2010, providing a welcome boost to the electronics industry. As seen in *Figure 1*, **DisplaySearch** forecasts 3D-ready TVs will grow from 0.2 million units in 2009 to 64 million units in 2018. It is predicted that 3D-ready TVs will be the largest consumer product in terms of revenue in 2018, with $17 billion of sales worldwide.

Seeing on the one hand the fast emergence of 3DTV content at the production level, and on the other hand, the increasing number of 3D displays on the consumer side, the need by broadcasters for efficient 3DTV transmission solutions will intensify during the next few years.

3D Service Broadcast Requirements

Following early experiments and trials for 3DTV, broadcasters are still wondering, precisely, how much capacity a 3D service would require, and how 2D and 3D simulcast service could be broadcast in the most efficient way, as spectrum is a scarce resource.

Today, there is no clear specification of 3D service technical requirements, as the 3D service transmission techniques are multiple and still under evaluation.

In July 2009, **ZetaCast**, on behalf of the UK regulator **Ofcom**, published an independent report[6] *Beyond HDTV: Implications for Digital Delivery*. In this document, ZetaCast illustrated what would be the required bit-rate for 3D channels relative to 2D, and for the different 3D techniques. **ZetaCast** assumed that it would be required to deliver full **1080p/50Hz** HDTV resolution video to each eye with different options. Broadcasting synchronized left and right eye views is straightforward, but is rather wasteful with bit rate (200 percent relative to 2D). Other techniques provide the opportunity to decrease the video bit-rate, but they bring some additional technical constraints on the signal processing at the decoding, which consequently might create some additional costs at the consumer site.

From the data provided by ZetaCast, we can assume the ratio between 3D and 2D required bit-rate is in the range of 160 percent, for a given resolution and considering a 2D plus Depth or Difference method for transmission.

In order to estimate what would be the actual bit rate for 3DTV service, the next step is to characterize the data bandwidth and bit rates currently in use for HDTV (2D) services. The following table illustrates the different data rates, the video resolutions and the transmission standards currently in use for different HDTV channels over Terrestrial Networks (in France and in UK). Assuming the 160 percent ratio, it is then possible to derive what would be the equivalent service data rate required for 3D.

In France, the HDTV services are distributed onto the DVB-T network, and a complete 8 MHz multiplexed channel referenced as **R5** is used to carry three channels: **TF1HD**, **France2HD** and **M6HD**, using a total bandwidth of 24.88 Mbps (FFT 8K, 64QAM, GI 1/8, FEC ¾).

These three HDTV services are statically multiplexed to reach the best transmission efficiency and each service data rate is variable from 4 to 14 Mbps, providing an average total bit rate around 8 Mbps.

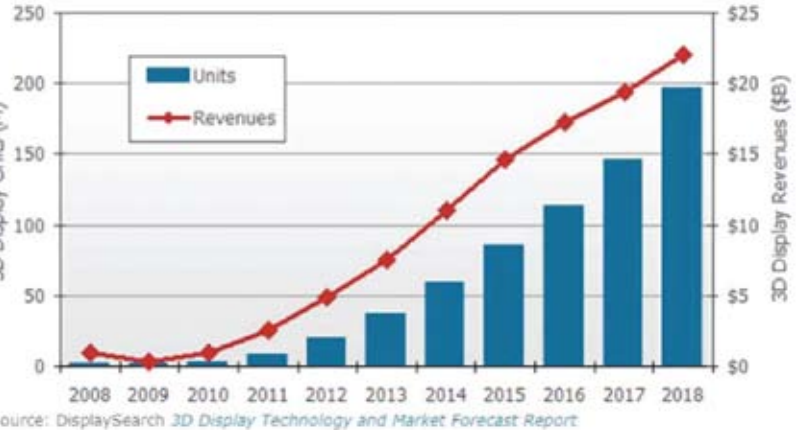

Figure 1: Display units and revenues forecast
Source: *DisplaySearch — 3D Display Technology and Market Forecast Report*

Regarding the picture resolution, the 1440x1080 anamorphic configuration is in use today, rather than full HD resolution (1920x1080). This is mainly for three reasons: first of all, it reduces the required transmission data rate compared to the full resolution (-30 percent). Secondly, it is the same picture resolution as content supplied from popular consumer sources such as HDV/HDCAM. Thirdly, a good percentage of HD acquisition is done at this resolution.

In the UK, recently, the **Freeview** platform started to be upgraded to DVB-T2 to distribute HDTV content. Today, the Freeview HD multiplex carries three services, although the channel data rate will, in fact, allow an additional service in the future. The **BBC** HD total data rate per service is currently around 13 Mbps on average, but this might be reduced to 9 Mbps to enable 4 services to be multiplexed together.

The technical characterization of current HDTV services derives the data rate necessary for a future 3DTV service. Applying a 160 percent 2D to 3D ratio, a base figure of 13 Mbps is required to broadcast a 3DTV service (assuming a 1440x1080 resolution and the 2D Plus Difference/Depth format).

Frame Compatible Format

Before the final adoption of any 3DTV optimized encoding techniques, such as **2D Plus Difference/Depth**, or a new format likely based on MPEG-4 **Multiview Video Coding** (*i.e.*, **MPEG-4 AVC** with the **MVC** extension[9]), broadcasters plan to start broadcasting in 3DTV using what is called a ***Frame Compatible*** format.

Indeed, during the first phase of 3DTV service broadcast, the objective is to reuse as much of the existing HDTV delivery system for early 3DTV content delivery, and if possible, the full backward compatibility of the transmitted 3DTV service with 2D displays is also targeted.

Several 'Frame Compatible' formats have been defined such as *Side-By-Side*, *Top/Bottom*, and so on, and these are now supported by the latest **HDMI 1.4** release[10].

The basis of the Frame Compatible format is to halve the resolution of the left and right images in order for the two signals to be squeezed together into one combined frame — the whole thing looks like a 2D HDTV signal to a normal STB. The two pictures are then unravelled into the left and right pictures in the TV set and displayed separately on the screen according to the 3D viewing system being used (anaglyph, polarization, shutter, etc.). This enables broadcasters to operate using exactly the same transmission system as currently in use for standard HDTV content broadcast with H.264 video encoders.

Taking the example of the **SKY** satellite 3DTV channel, the video encoder delivers the total video service at around 14 Mbps, with a combined pixel resolution of 1920x1080 per frame. The actual horizontal resolution for each eye is half of this — the viewer experiences an equivalent resolution of just 960 pixels by 1080 lines for 3DTV content. Note this 14 Mbps bit rate is not far from the previous projection of 13 Mbps.

Generic 3D Transmission Architecture

A generic 3D broadcast transmission architecture is illustrated in Figure 4. 3D content can be generated from either a live signal source or from content servers. In the case of live capture, a typical 3D camera provides a composite stereoscopic 3D signal, for left and right eye viewing. At the service provision site, real-time encoders generate the compressed signals to be conveyed over the broadcast network. The compressed signal includes one video service and one, or several, audio components.

Digital broadcast architectures can be separated typically into two groups: the IP based architectures and the Transport Stream based ones. For *IP based delivery* scenarios, IP packetized services are conveyed from the different service encoders to consumers via IP networks. In the case of *Transport Stream architecture*, a service multiplexer gathers all the difference-encoded service stream into

	Broadcast Format	Able to be watched by viewer with 2D display	Required Bit-Rate Relative to 2D
Independent Left and Right Eye Views	2 x 1080p/50	Yes	200%
Temporally Interleaved	1080p/100	Possible if scalable video coding is used	170 – 190%
Spatially Interleaved	2160p/50 (or other format at twice 1080p/50 resolution)	May be possible if scalable video coding is used	170 – 190%
2D plus Difference	1080p/50 + metadata	Yes	140 – 180%
2D plus Depth	1080p/50 + metadata	Yes	120 – 160%
2D plus DOT	1080p/50 + metadata	Yes	180 – 220%

Table 2: Estimated bit-rate ratio 2D/3D
Source: ZetaCast Ltd.

Terrestrial HD Channel	Platform	Current Resolution	Current video & service bit rate(s)[7] – 2D	Projected 3D service bit rate[8]
TF1 HD	French R5 DVB T	1440x1080	4.2 Mbps – 14.5 Mbps VBR Average 8 Mbps Total service ~8.3 Mbps	13.1 Mbps
France 2 HD	French R5 DVB T	1440x1080	4.1 Mbps – 14.5 Mbps VBR Average 7.2 Mbps Total service ~7.6 Mbps	12 Mbps
M6 HD	French R5 DVB T	1440x1080	3.9 Mbps – 14.5 Mbps VBR Average 7.7 Mbps Total service ~8 Mbps	12.7 Mbps
arte HD	French R4 DVB T	1440x1080	7.7 Mbps CBR Total service ~8.3 Mbps	13 Mbps
BBC HD	Freeview UK DVB T2	1440x1080	3 Mbps – 17 Mbps VBR Average 12 Mbps Total service ~13 Mbps	20 Mbps

Table 3: HDTV terrestrial service bit rate 2D + 3D projection

a global *Multi-Program Transport Stream*, the so called **MPTS**. This MPTS is generally statistically multiplexed to optimize the total useful bandwidth and is then sent over a digital broadcast platform such as **Satellite DTH** (*Direct To Home*), **Cable**, or **Digital terrestrial network**.

At the consumer site, the technical architecture would vary according to the different 3D technology being used. For instance, display manufacturers have already demonstrated 3D displays that work with either polarized glasses, shuttered glasses, or no glasses at all (in the case of auto-stereoscopic — multiple viewing position or *look around*) solutions. In the case of Pay-TV service, the digital terminal located at the consumer site (STB or PVR) is likely to operate transparently to 3D content. Pay-TV operators who want to develop 3D service are investigating technical scenarios that would limit the impact on the consumer terminal, so existing network use would be straightforward.

Emergent DVB-T2 Market

Since its introduction in 2008, the 2nd generation of the terrestrial Digital TV standard DVB-T2 has been embraced by broadcasters who wish to launch a new generation of terrestrial Digital TV services. From the technical point of view, compared to its predecessor, DVB-T2 brings several key advantages, as illustrated in *Figure 5* on Page 55.

The key advantage of DVB-T2 is the capability to transmit a higher data rate, which is especially important for transmitting HDTV and 3DTV services.

Today, several countries have expressed their interest in DVB-T2. Early adopters, such as **BBC** and **Arqiva**[11] in the UK, have decided to deploy a DVB-T2 service and network infrastructure — half of the population in the UK was able to access terrestrial HDTV service during the ***FIFA World Cup***!

In Finland, two licences for HD service multiplexes have been awarded to **DNA**. The Mobile Phone Operator is currently planning to roll-out a DVB-T2 network that will cover 60 percent of the population by 2011.

Other countries are also interested in DVB-T2 technology. A massive deployment of DVB-T2 networks is likely to occur after the **ASO** (*Analog Switch Off*) plans in Europe are implemented over the next few years.

There are several key drivers for DVB-T2 technology development, as illustrated in *Figure 6*. Some drivers are related to the terrestrial TV service penetration. For example, countries such as the UK, Spain, France, and Italy with a significant number of terrestrial TV households are more likely to be interested in the transition to DVB-T2. The future success of DVB-T2 can, therefore, be related to today's increasing consumer demand for HDTV content and the future need for 3DTV. Indeed, as has been shown, such content will require more channel data capacity and the transition from DVB-T to DVB-T2 will be essential.

The question of terrestrial DTV competitiveness is also crucial. In the context of active competition between different network platforms (satellite, cable, IPTV, terrestrial), the race for more capacity is endless and this is pushing the 2G of transmission technologies.

For satellite and cable platforms, **DVB-S2** and **DVB-C2** are being rolled-out to permit significantly more data rate compared to their predecessors, **DVB-S** and **DVB-C**. **DVB-T2** can, therefore, be foreseen as a logical and certain evolution to ensure the terrestrial broadcasting platforms remain in the most competitive position when compared to the alternative networks.

DVB-T2 Transmission Capacity

In line with DVB's aim to provide a coherent and compatible family of standards, DVB-T2 uses **OFDM** (*orthogonal frequency division multiplex*) modulation to deliver a robust signal and to offer a range of different modes, making it highly flexible. DVB-T2 employs the same **LDPC** (*Low Density Parity Check*) error correcting codes as used in DVB-S2 for excellent performance in the presence of high noise levels and interference. A significant number of highly innovative features such as *Physical Layer Pipes* (**PLP**), support of *Multiple-Input-Single-Output* (**MISO**) and *Rotated Constellations* are also included to improve the reliability and efficiency of the system.

Rotated Constellation

In order to allow greater capacity in a given channel bandwidth, DVB-T2 implement signal constellations of up to 256-QAM per carrier. Additionally, guard interval ratios down to 1/128 reinforce the opportunity to maximize the useful bandwidth especially in good receiving conditions (fixed service with roof top antenna).

There are a large number of possible combinations between the different modulation parameters.

This typical configuration is currently used in different countries where DVB-T2 is under trial and is referred to as a **SISO** (*Single Input Single Output*) implementation. However, in DVB-T2, other network topologies can be introduced, such as **MISO** (Multiple Input Single Output) and **MIMO** (*Multiple Input Multiple Output*). In one example of MIMO, a pair of antennas is used at the transmitting and receiving ends — one of each pair using vertical polarization; the other using horizontal. The effect of this can be to double the transmitted data capacity, in theory.

Although MIMO technology might be highly attractive for broadcasters who wish to increase data capacity, this approach falls foul of one of the commercial requirements of T2, which stipulates the T2 broadcast will be compatible with existing DVB-T (and, by implication, analog TV) domestic installations, *i.e.*, single antenna, single down lead.

3DTV Over DVB-T2

DVB-T2 would be definitively the preferred technology to carry 3DTV services over terrestrial networks, compared to its predecessor DVB-T, as the data capacity is about 40-50 percent greater. The exact number of 3DTV services that could be conveyed over DVB-T2 cannot yet be defined, as these are the early days of 3D and DVB-T2 technologies and many parameters are not yet completely defined and verified. Nevertheless, there are some assumptions that will lead to a good estimate for the number of 3D channels in a DVB-T2 multiplex, as seen in *Table 9*.

We end up with three 3DTV services within a DVB-T2 multiplex inside a terrestrial 8 MHz bandwidth channel. Just to illustrate, today in France the multiplex referenced as **R5** is dedicated to carry three HDTV services via DVB-T (**TF1 HD**, **M6 HD** and **FRANCE 2 HD**). In this context, the conclusion is that the number of 3DTV services would be equivalent to the number of HDTV services, considering the technology transition from DVB-T to DVB-T2.

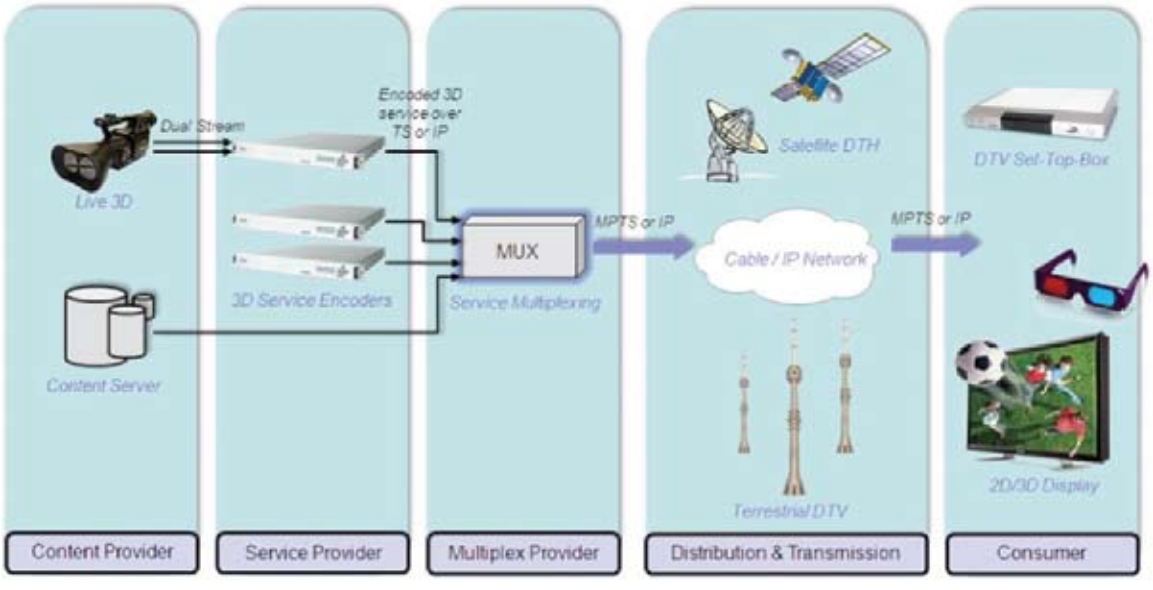

Figure 4: Generic 3D transmission architecture

It can be expected that some of the key assumptions listed

Figure 5: DVB-T2 standard benefits

here will change as DVB-T2 experience develops, such as: the video coding rate, the statistical multiplexing efficiency, and so on. The remaining key question revolves around the picture resolution necessary to achieve the viewer-expected quality for a good 3D experience: is this adequate to ensure the success of 3DTV in the consumer marketplace?

Regarding the transmission network architecture, DVB-T2 networks would be quite transparent to the 3DTV service content. As shown in *Figure 10*, the service multiplexer is interfaced to the **T2 Gateway**, which is used to generate the **T2-MI** output stream and controls the correct stream timing and time stamping to operate in *Single Frequency Network* (**SFN**). The T2-MI can be send through an IP based or a MPEG-TS/ ASI based network, to feed the different transmitter sites.

Each of the transmitter sites pictured in *Figure 10* consists of a T2 modulator that then feeds the UHF or VHF transmitter power amplifiers. The signal is radiated into the air via the mast and antenna, to be received by consumers in their homes or even on the move.

Will Dreams Become Reality?

Although 3DTV technology is still undergoing trials, and many technical parameters are subject to change, it is possible to predict what would be the required service bit rate for a 3DTV service, taking into account several assumptions. In this article, the data rate has been estimated to be around 13 Mbps, which leads to the conclusion that the number of 3DTV services that can be broadcast within a single multiplex in a DVB-T2 terrestrial network is three.

There is also the advantage that the transition from 2D to 3D content will remain transparent in terms of channel bandwidth usage when the transmitter technology is upgraded from DVB-T to DVB-T2.

Regarding the transmission architecture, the transition to 3D content involves mainly new service encoders and compliant 2D/3D displays. The transmission chain through the multiplexer, the distribution network and the terrestrial transmission will operate transparently for either 2D or 3D content. DVB-T or DVB-T2 networks, already in use or under deployment, can be easily used to carry 3D content to consumers. The dream of 3DTV will, indeed, become a reality.

Footnotes

[1] *DVB is a registered trademark of the DVB Project*
[2] *Source: CRN*
[3] *Source: SKY*
[4] *Source: DIRECTV*
[5] *Source: PCInpact*
[6] *Source: ZetaCast Report*
[7] *Source: digitalbitrate.com, reghardware.co.uk*
[8] *Assumptions: 2D Plus Difference. Most probable 3D/2D bitrate ratio at 160 percent*
[9] *ITU-T Rec. H.264 & ISO/IEC 14996-10 Advanced Video Coding (AVC) standard on Multiview Video Coding*
[10] *See HDMI 1.4: Specification*
[11] *Source: DigitalSpy*

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About the company

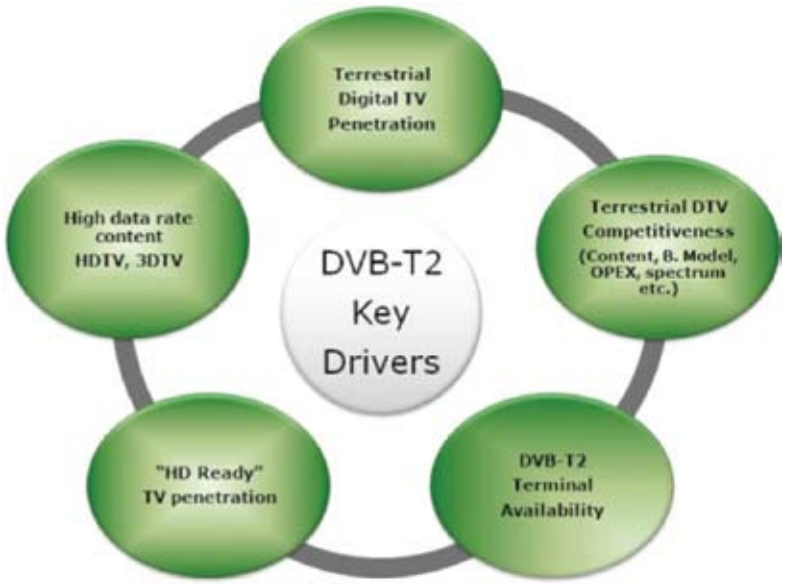

Figure 6: DVB-T2 key drivers

TeamCast is a highly active member of the TV Broadcasting ecosystem worldwide, with innovative technology offerings based on a solid expertise in both Digital TV and Mobile TV transmission. TeamCast is a company with strong technical credentials who supplies product technologies to infrastructure equipment providers for Digital television broadcast networks. TeamCast's strategy consists in developing Terrestrial DTV and Mobile TV solutions as soon as new standards and new technologies are released.

In the specific framework of DVB-T2, TEAMCAST has been involved right from the beginning as an active member of DVB. Its active participation within several projects such as Celtic Project B21C, SME42 project, and Celtic Project Engines has been a key opportunity to build a concrete experience concerning this emerging technology. Furthermore, TEAMCAST has developed a close relationship with early DVB-T2 adopters such as Arqiva in UK, Teracom in Sweden and DNA in Finland, having delivered DVB-T2 professional products and solutions.

More information is available at
www.teamcast.com

DVB-T2 Parameter	Value
FFT	32k
Guard Interval	1/128
Pilot pattern	PP7
LDPC Code Rate	3/5
Modulation	256-QAM
Total Bit rate	36.14 Mbps

Table 8: Typical DVB-T2 data bit rate

Assumption	Figures	Comments
DVB-T2 Mode	SISO 256QAM GI 1/128 FEC 3/5 FFT 32k	Mode currently in use in UK (Freeview)
Total capacity	36.14 Mbps	
Signalling data	0.5 Mbps	SI/PSI signalling
Interactive Service	0.5 Mbps	Example: MHEG in UK
Other data (padding)	1 Mbps	
Total for useful	34 Mbps	
Stat Mux Efficiency	15%	
Total equivalent CBR	39 Mbps	Equivalent CBR in statistical mux.
3D Service datarate	13 Mbps	Equivalent CBR – 1440x1080
Number of 3D Services	3	

Table 9: Estimated number of 3D services over DVB-T2

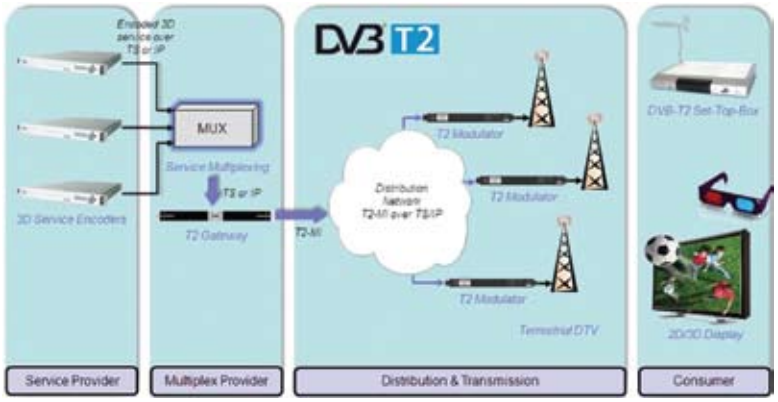

Figure 10: 3DTV over DVB-T2 transmission architecture

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Compressed Content Analysis

author: Robert Millis, Product and Project Manager, Harris Broadcast Communications

There is an increasing demand for broadcasters and service providers to more efficiently broadcast and transport audio, video and data content. Encoding of both video and audio is evolving to meet the varied quality needs of diverse networks and consumption styles.

Although MPEG2 remains relevant for contribution and distribution, video encoding standards continually evolve to provide the same or better quality than previous standards, while significantly reducing bandwidth needs. In fact, the H.264 standard is really a "group of standards," with new features being added on a consistent basis.

H.264, with its wide range of profiles and scalability, is the new video codec of choice for real-time contribution and distribution. While H.264 decoders are not required to handle all profiles, those that can stay current by supporting the newest profiles provide facilities with the opportunity to continually monitor a link. This enables improved Quality of Service (QoS) monitoring of the one or more programs present in the stream. A newer profile just starting to be commercially realized is ***Annex G, Scalable Video Coding*** (**SVC**). This standard is ideal when preparing content for a network topology that varies in bandwidth at different points in the network.

Techniques within H.264 are now being refined to provide stereoscopic or ***three-dimensional television*** (**3DTV**). Software-based decoding solutions naturally have a better opportunity to stay current, where the monitoring platform can be sized to meet the decoding needs; and the platform can be quickly and efficiently upgraded to respond to changes in the technology.

No matter which profile is chosen, H.264 encoders have more flexibility in the combination of coding techniques used when creating output, while remaining within the standard. The complexity of H.264-encoded output increases the processing demands on decoders, which is another pressure point for hardware-based decoding. Audio has seen a proliferation of compression formats.

Along with MPEG audio and Dolby Digital, frequently used audio formats include **HE-AAC 2.0** and **5.1** (**HE** an acronym for *high-efficiency*), **AAC-LC** (*low complexity*), and **Dolby E**, the professional version of Dolby Digital. Many of these new audio formats increase compression ratios while providing a larger channel count. Others optimize for low-bandwidth applications. It is a challenge for ***Integrated Receiver/Decoders*** (**IRDs**) to keep current with the technology, support the increasing channel capacity and meet all licensing requirements.

Ancillary data and other standardized forms of program-associated data in streams grow in complexity as the A/V experience grows richer and content is repurposed for various applications. The ancillary data, if present, is typically integral to the overall experience and must be monitored along with the A/V content.

Increasing Volume of Streams

While some contributors will just save bandwidth by using new encoding technologies, many contributors will take this opportunity to increase the number of programs. The number of channels your typical consumers have available through their local providers is, on average, double of what was available 10 years ago.

Even if we project the convergence of multi-view displays with their multiple decoders into IRDs, power and size will limit the overall decoding capacity of these devices. IRDs must concentrate on the RF reception side first and supplement their decoding capabilities, as allowed. Alarming and notification to potential remote management systems add even more burden on the IRD.

Keeping IRDs Current

All of this flexibility and variability within the encoding puts great pressure on the IRDs, which are usually hardware-based solutions, to stay current in the decoding and monitoring aspect of a downlink.

DVB-ASI was the traditional way of forwarding the stream received at the downlink. The proliferation of IP networks means that today's IRD must be capable of routing the compressed signal over IP on the output side. It can be routed as a complete stream or by using filters to select or groom a stream for a specific downstream device, along with the traditional DVB-ASI delivery format.

Stream Validation At The Uplink

Detection of low-level reception problems is more of a challenge in the digital age. Nothing will replace a spectrum analyzer and oscilloscope for tuning and power associated with RF reception. The digital stream is either present or not to IRDs and other monitors, unlike the *Frequency Modulated* (**FM**) beacons or clear video feeds that have historically been associated with uplink scenarios.

Analysis tools applied to the feed just prior to uplink are fundamental to the verification of transport level requirements, bandwidth settings and system level information. Identification of signal integrity at the uplink point minimizes the headaches and saves hours of trouble at the large community of downlink sites where content is received. This identification of a known good signal isolates the range of problems that could happen when a specific downlink site recognizes problems on a transponder.

Remote Management + Monitoring

Uplink and downlink facilities are larger and more complex than ever. It is a major task to manage all the insertion and/or reception points.

While transient events should be logged, or at least statistically counted, facility managers only want to see alarms on significant, ongoing problems. The ability to log issues, accumulate alarms over manageable intervals, retain conformance and trend histories is a big advantage over IRD-only based monitoring solution. The filtering, measuring, long-term logging and trending requires sophistication in the analysis and monitoring tools.

Remote connection to an analysis and monitoring device is essential. This allows the operator to see a problem in real time once the tool has remotely sent the alarms. Centralized monitoring of multiple facilities has become an economic imperative. Along with the essential remote monitoring of many devices, there is a huge troubleshooting advantage when a remote view of the confidence-monitored audio and video is enabled in conjunction with a running history of the alarm conditions.

Software-Based Analysis + Monitoring

There is no substitute for a powerful software-based analysis and monitoring solution that can multitask. The best can handle multiple sources simultaneously and support a wide range of audio and video codecs. These tools can also provide QoS measurements on each program within a source, while accumulating and reporting those results via a range of network management and notification options. The value proposition increases if the analysis and monitoring tool can also provide a rich experience for a facility manager in a remote location. Whatever analysis and monitoring solution is employed, software-based solutions can evolve as the technology advances. This provides satellite operators with the best chance to maintain high-quality contribution and distribution networks.

Harris' MSA Analyzer Series

The new Multi-Source Analyzer Series from Harris provides analysis and monitoring tools that fit the needs of the satellite contribution and distribution market with software-based products on leading-edge platforms. The multi-source analyzer couples confidence monitoring with full testing of compressed video conformance, audio level, data services and TR-101-290 on all sources at once. The compact yet powerful flagship model, the MSA-300, is designed for today's video-over-IP infrastructures, while still supporting legacy delivery interfaces. It features dual quad-core CPUs, redundant power supplies and RAID1 protection, making it ideal for mission-critical applications at network operations centers and other large satellite network facilities.

The MSA-300 delivers awareness of system information and ancillary data in a space-efficient 1RU package. It possesses a rich user interface for both local and remote control situations, with conformance results displayed in the intuitive GUI. Real-time, full-motion video decode and audio level analysis can be viewed in one or more mosaic displays. It has support for multiple DVBS/S2 and DVB-ASI ports as options, along with all major compression standards, a wide array of transport and streaming protocols, and the ability to simultaneously handle a large number of channels in real time. The MSA-300 can meet the needs of a wide range of satellite network monitoring needs.

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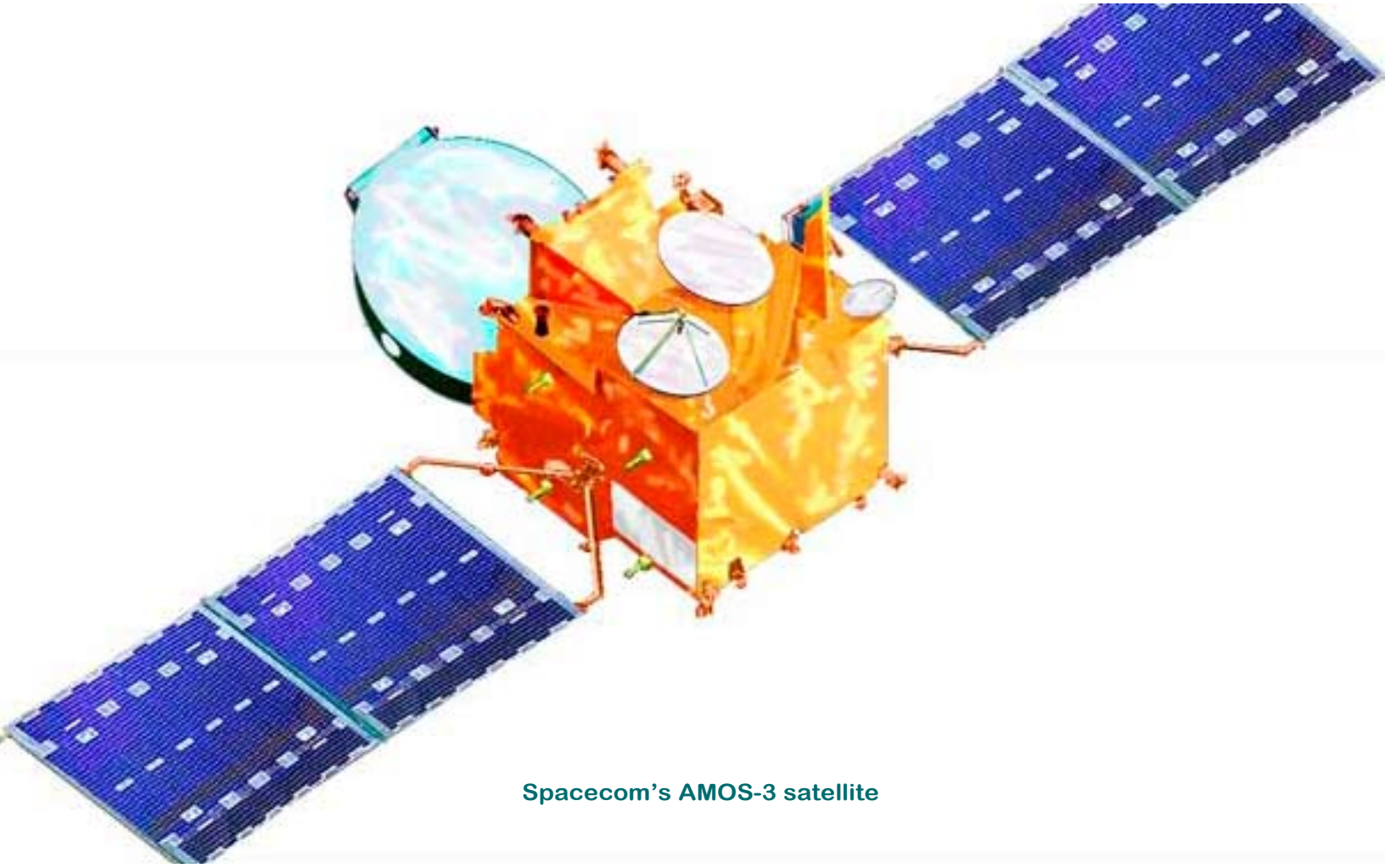
author: David Pollack, CEO and President, Spacecom

Since the launch of Spacecom's first satellite in 1996, the AMOS satellite constellation has provided connectivity to the growing markets of Central and Eastern Europe and the Middle East from its 4 degrees W orbital "hot spot" that links the U.S. East Coast, the Middle East and Europe via Spacecom's single-hop Atlantic Bridge. With the AMOS-2 and AMOS-3 satellites for in-orbit redundancy and total service reliability, Spacecom continues to solidify its presence as an emerging global leader of satellite broadband services to Europe and beyond.

In the first half of 2010, **Spacecom** improved its position within the European satellite market through a series of strategic partnerships with some of the region's most respected broadcasters and telecommunications carriers. Already the host to a number of the **CEE**'s top channels and platforms, such as Romania's ***National Geographic Wild***, HD channels from *HBO Central Europe* and **T-Home's *SatTV*** in Hungary, Spacecom has experienced a solid increase in capacity contracts for Eastern and Central Europe clients this year. Led by the Ukraine's most popular channel, ***ITV***, **U.A. Inter Media Group**, the country's



Spacecom's AMOS-3 satellite

national broadcaster and leading channel network, shifted nine channels including ***Inter+***, ***Enter***, ***Enter Film***, ***NTN***, ***K1***, ***K2***, ***Mega*** and ***MTV Ukraine*** to the ***AMOS-3*** satellite in May.

Two months prior, **Slovak Telekom**, a subsidiary of the global **Deutsche Telekom** group, launched ***Magio TV*** satellite service on AMOS, joining other Direct-To-Home (DTH) services: Hungary's T-Home ***SatTV***, Romania's ***BOOM*** and Israel's *YES*. Also in 2010, AMOS-3 began distributing the ***Da Vinci Learning Channel*** from Germany's **Da Vinci Media**. Spacecom provides satellite capacity and uplink services for the educational channel that is broadcast throughout Hungary, Romania, Poland, Slovenia, Ukraine, and Bulgaria. Spacecom's 2010 contract agreements are strengthening the AMOS brand in the Eastern and Central Europe with an increase in noteworthy media groups and channels, all now broadcasting via AMOS.

Satellite Services — Regional + Global

Spacecom's coverage, range of services, and rich neighborhood in Central and Eastern Europe, allows satellite service providers to tailor solutions for local and regional broadcasters and telecommunications carriers, a key competitive advantage in the market. The AMOS satellite constellation provides flexible and dependable connectivity solutions for the public and private sector and facilitates access and connectivity between hundreds of locations.

DTH operators are taking advantage of trends in communications to beef up their service offerings. Spacecom notes these operators combine satellite with broadband Internet, telephony, IPTV and mobile services. Adding terrestrial to the company's services augments client businesses. These combinations are complementary to Spacecom's business and, as such, growth in the satellite broadband market enables DTH operators to provide satellite-based, triple-play offerings.

To increase the global nature of the firm's business, Spacecom works with various players to assist clients in reaching farther afield than their traditional regional markets. For instance, Spacecom partnered with **Europe Media Port** (**EMP**) to provide a global fiber network, allowing international government and commercial organizations direct access to the Internet

AMOS-5 satellite

backbone, as well as connectivity between the Middle East and any location in Europe, the U.S., and Asia. Spacecom provides European-standard service at less than European-level prices to allow EMP to deliver the highest quality transmissions of data, IP, video and audio.

Due to the success of the Spacecom-EMP partnership, European enterprises, ISP providers, satellite operators, broadcasters, and governments are able to use the AMOS satellite constellation to fulfill their satellite communications needs. The company continues to establish long-term relationships with organizations and to provide DTH television broadcasting, video distribution, VSAT communications and broadband Internet, rural telephony, data trunking and cellular backhaul to Europe, the Middle East and, now, Africa.

The Road Ahead

Spacecom recently entered the African market with the interim satellite ***AMOS-5i***, and are scheduled to launch its successor, the ***AMOS-5*** in mid-2011. The reach into the African market with the AMOS-5/5i platforms marks the company's transition from a leading regional player to an emerging global satellite operator. The plan is to be a prime carrier of African traffic over the coming years — the AMOS-5/5i platforms at the **17 degrees East** orbital position will provide powerful pan-African C- and regional Ku-band coverage. Contracts have already been secured, many of which represent pre-selling capacity that's worth more than $5 million in annual sales in this market alone. Among those with long term leasing capacity on the AMOS-5/5i satellites is South Africa's **Q-Kon**. They will use the satellites for specialist corporate network solutions to provide Africa-to-South Africa, and Africa-to-Africa, connectivity. The satellites' C- and Ku-band transponders deliver pan-African signals as well as connectivity to Europe and the Middle East. This allows Q-Kon to meet the connectivity needs of a variety of corporate, health, financial, telecom and other data centric businesses.

After Africa, the company plans to include expansion into one of the world's fastest growing satellite markets with ***AMOS-4*** to provide capacity over Southeast Asia and the Indian Ocean. The AMOS-4 is scheduled for lift-off in 2012 to a new orbital location over the Indian Ocean region where it will offer customers Ka- and Ku-band frequency capabilities throughout South East and Central Asia, as well as enhance coverage over the Middle East and Africa. Once launched, the AMOS-4 will round out Spacecom's constellation, positioning the firm as a global satellite services provider capable of reaching more than 80 percent of the world's population.

The European presence at **4 degrees West** will be augmented with the ***AMOS-6*** satellite, whose launch is tentatively scheduled for 2013, which will extend the reach of Spacecom's offered European services.

About the author

David Pollack directed the fund raising for the AMOS satellites program as well as the company's IPO in the Tel-Aviv stock exchange. Pollack joined Spacecom from Israel Aerospace Industries, where he held several key positions and was responsible for international cooperation ventures. Prior to joining the industry, Pollack served in the Israel Air Force where he held field and staff assignments as a commanding officer. He retired from active military service with the rank of Colonel.

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An Uplink Project Of Olympian Proportions

When Image Media Farm (IMF) of Vancouver, British Columbia, was bidding to provide the media coverage for the Vancouver 2010 Torch Relay, they knew it was going to be a tough job. The flame was to visit more than 1,000 communities in 106 days. Although the flame would be transported by air to the northern most latitudes, the majority of the time would be taken up by a road trip from St. John's Newfoundland, at the Eastern tip of Canada, to Vancouver on the Western coast — that's a route of more than 20000 Km / 12000 Miles.

As demanding as the journey itself was going to be, there would be the weather, time constraints, operational and budgetary pressures to contend with. It is perhaps not surprising there where mixed feelings when they won the contract; satisfaction for providing the winning bid, resolution for the work ahead and anxiety, perhaps even a little fear for the difficulties to come.

The challenge — to provide a mobile satellite uplink service, capable of providing SD and HD video feeds to North America, plus high speed data sent to the server and accessed by international media; not to mention moving their operational site twice a day almost everyday for three months through the Canadian winter.

This was going to be a formidable job in anyone's book.

Introducing The SIS LIVE uPod

SIS LIVE is the largest independent uplink provider in Europe. The ***uPod*** is their fully automated, mobile satellite uplink system — it has revolutionised the SNG market in the UK and mainland Europe over the past few years.

With minimal operator input to the uPod's control PC, the system locks on to the programmed satellite. It does this using GPS, tilt sensors, and a compass to determine where in the sky the antenna should be aimed. The uPod then executes a search pattern for the specific satellite beacon frequency and verifies the satellite with a unique modem connection. uPod is capable of finding and tracking even inclined satellites — automatically.

In normal operation, when the remote modem locks to the incoming carrier, it triggers the system to transmit its own modem signal. This establishes Internet connectivity and, if required, VOIP phones. Once the Internet connection is established, the control PC communicates with the SIS LIVE *uBook* scheduling system.

uBook enables uPod uplink systems and satellite space segment to be reserved online. Once these bookings are made and a uPod is on site and connected via the satellite modem link, all the

transmission parameters are transferred from the online booking server to the uPod control PC. This then automatically programs and controls the encoders, modulators, and HPAs to initiate a fully automatic video transmission. It starts at the requested time with no need to make the traditional call to the satellite service provider, runs for the duration booked and automatically shuts down, all with no input from the operator.

This automation has streamlined traditional SNG operations and allows for completely unmanned terminals to be operated remotely.

Adapting To The Challenge

IMF contacted a number of traditional uplink service companies all of which could provide the SD & HD video links. However...

"SIS LIVE and Intelsat were the most proactive and only contenders who tested and proved a mobile satellite data connection of the speed we needed." states *Roger Williams*, President of **Image Media Farm.**

The uPod system normally uses inbound and outbound modem carriers of 128kbps — for this application, the carrier being sent from the remote modem was configured for 6Mbps, and the return 256kbps. This allowed IMF to push large amounts of data to a third party server. The data was transmitted over the satellite link to **Intelsat**'s ***Mountainside*** teleport in Maryland and then on to a server based in Vancouver via fibre.

The uPod was operated in fully automatic mode in this case as the data link used the same leased satellite capacity from Intelsat as the video transmissions. Data and video links were not needed simultaneously, so this sensible use of satellite capacity helped reduce costs.

The narrow band modem carrier transmitted to the uPod by Intelsat remained "on" constantly, however, so the automated acquisition functionality of the uPod remained in tact (it uses this carrier to confirm acquisition of the correct satellite). This meant the operator simply had to turn on the satellite encoder/modulator for video transmissions or enable the 6Mbps inbound modem carrier when data transmission was required.

By adapting functionality already built into the uPod system, SIS LIVE and Intelsat were able to provide a solution to meet the operational challenge. Thankfully, SIS LIVE had commissioned two demonstration vehicles using **GMC *Yukon*** SUVs with 4-wheel drive, so the vehicle should have been capable of facing the Canadian winter too.

Life On The Road

Chuck Magee, a freelance TV technical production engineer, was hired to operate the uPod, and *David Solomon,* Broadcast Technical Coordinator with IMF, was in charge of using the satellite data link. Here are a few of their thoughts...

Chuck Magee

After 16,955 Kilometres and 87 days on the road, I can say that the uPod system performed brilliantly in all conditions and situations throughout the Olympic Torch Relay. We encountered weather ranging from heavy rain through steady snow to freezing cold and were not impeded by any of these conditions. We were hit with minus 40 degrees Celsius, followed by consecutive days of minus 30 degree weather, and were still able to deploy and acquire the satellite. A little care was needed to remove ice build-up along the front edge of the uPod — some "gentle physical encouragement" during initial elevation and azimuth moves was all that was needed.

During our tour, we received dozens of calls from network master control operators regarding our signal feed and 100 per cent of the time the concerns were found to be sourced at the receive end. Not once was there a signal acquisition fault generated from our truck or the satellite. These concerns were always traced back to in-house routing, communication, or interpretation of information at the receive site.

There were many days where the uPod acquired the satellite with geographic and physical challenges that on paper would not have looked probable or even possible — the majestic Rockies appeared a little too high, we were boxed in by power lines, transformers or sky scrapers and we still achieved successful signal transmission.

We gained a great sense of confidence in the uPod system and the Yukon SUV that served so well through these challenges. When the job finally came to its successful conclusion, it was with a little sadness rather than relief that I returned the keys.

David Solomon

The system handled itself very well, even in the -40C weather of Timmins, Ontario, when we had a special media request and had to deploy in these conditions. The weather stayed bitterly cold, occasionally very windy, with snow storms for almost two weeks, and we never had any weather related deploy or satellite link issues due to these conditions.

Our production demands changed by the minute and the flexibility of the uPod and Yukon saved us more than once. Being able to send data at high speed made the uploading of web and HD content possible, often there simply was no alternative IP connectivity available. The truck was fully equipped with VTRs and other production equipment that we were able to integrate into our workflow and gain efficiency because of it.

(continued on Page 113)

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TWTAs Lead The Way

author: Doug Slayton, CPi

Over the past 15 years, much progress has been made among high power amplifier (HPA) manufacturers in the area of prime power to output power conversion, also known as conversion efficiency. These improvements have resulted in significant savings of electrical costs, as well as reductions of size and weight, and have been introduced in response to a market which is demanding any, or all, of multiple frequency capabilities, greater mobility, greener Earth stations and greater restrictions on electricity use. The most significant improvements have been made in traveling wave tube amplifiers (TWTAs), thus resulting in the continued popularity of the technology despite the advent of solid state power amplifiers (SSPAs) and subsequent improvements to those products since their inception.

Linear Output Power

In order to make a valid comparison among the various technologies of HPAs, one must first find a common way, as well as the most meaningful way, to measure their effectiveness. The output power capability of SSPAs is commonly referred to by either the saturated power (Psat) they provide, or by the output power they provide at 1 dB backoff (P1dB, also known as the -1 dB compression point), depending on the manufacturer and frequency band in question.

The output power of TWTAs is commonly referred to by the minimum power the tube provides at saturation, prior to any loss within the amplifier. However, one of most useful measures of HPAs is at linear output power (Plin), or the point at which the amplifier can maintain the most output power while still conforming to restrictions on intermodulation products, spectral regrowth, and other non-linearities. For SSPAs, Plin is typically 3 dB backoff from P1dB. Thus, an SSPA advertised as a 150 W (P1dB) amplifier would actually have a Plin of 75 watts.

TWTAs are somewhat different. To calculate Plin, one must first account for the loss between the tube and the TWTA output, about 1 dB, and then subtract 6 dB. Thus, a "400 W" TWTA has a Plin value of 80 watts. However, if linearization is added, an option on almost all TWTAs, then Plin is doubled, and the "400 W" TWTA's Plin value increases to 160 W. The conversion efficiency can be measured by simply dividing the linear output power by the prime power required to operate the amplifier at that output level.

Early TWTAs + SSPAs

The TWTAs of 20 years ago had no linearizers, and operated with a tube that had a single-stage collector. The HPAs were usually in two-drawer configurations totaling over 20 inches in height and weighed more than 250 lbs. A 700 W TWTA would typically draw 3.04 kW at linear power (140 W), for a conversion efficiency between 4.5 percent.

SSPAs then entered the market with somewhat better numbers. A 100 W SSPA would provide 45 watts Plin while drawing 750 W of prime power, for 6 percent efficiency. With better efficiency and an RF "soft-fail" feature that allowed the less risk-averse to get away without redundancy, it seemed that SSPAs were the amplifier of the future, and that TWTAs would be shunted aside.

Linearizers + Dual Depressed Collectors

If TWT technology was to survive, it would certainly have to improve. Solid State amplifiers were only limited by the amount of power they could produce, and that number was increasing on a regular basis. TWT manufacturers first turned to a technology that had been available for years on space tubes — the dual depressed collector.

	Prime Power (i.e. consumption), watts	Linear Output Power (Plin)	Conversion Efficiency	Cost to run per year, full time, @ $0.10 per kWh	Cost per Linear Wat per year
2250 W C-Band SuperLinear TWTA*	4500 W	950 W	21%	$3,837	$4.04
2250 W C-band Standard TWTA*	6300 W	950 W	15%	$5,513	$5.80
1500 W C-Band SSPA	7300 W	650 W	9%	$6,388	$9.83
750 W C-Band TWTA*	2100 W	300 W	14%	$1,838	$6.13
600 W C-Band SSPA	2800 W	240 W	9%	$2,450	$10.21
250 W Ku-Band SuperLinear TWTA*	500 W	80 W	16%	$438	$5.48
250 W Ku-Band SuperLinear TWTA	500 W	40 W	8%	$438	$10.96
100 W Ku-Band Spatial Combine SSPA	650 W	40 W	6%	$569	$14.23
50 W Ka-band SSPA	550 W	25 W	4.50%	$481	$19.24
50 W Ka-band TWTA	300 W	25 W	8.30%	$263	$10.52
50 W Ka-band TWTA*	300 W	40 W	13.30%	$263	$6.58

Exhibit A: Relative Operational Costs Associated With Various HPAs
*** WITH LINEARIZER**

A collector is a chamber in the TWT where, after the electron beam has interacted with the microwave circuit, electrons are stopped in metallic electrodes, and the remaining kinetic energy is converted to heat.

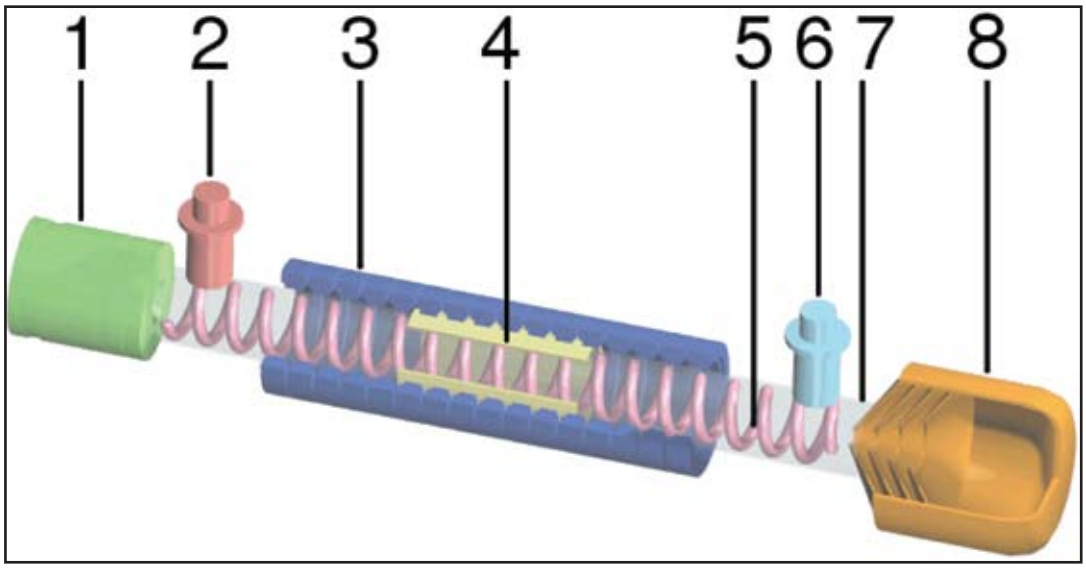


Illustration of a Travelling wave tube amplifier
1. Electron gun — 2. RF input — 3. Magnets — 4. Attenuator
5. Helix coil — 6. RF output — 7. Vacuum tube — 8. Collector

Multiple collector stages enable more efficient use of the electron beam, thus more prime power is usable and less heat is produced. This results in the ability to produce smaller tubes and amplifiers, and reduces the power needed to fan the system and keep it cool.

Immediately, TWTAs were drastically reduced in size and became much more efficient. Where previously a 700 W amplifier required over 3 kW of prime power at Plin, the new ones required only 2.3 kW, improving efficiency from 4.5 to 6 percent. While TWTAs could now match SSPAs for efficiency, amplifiers were reduced in size to only 5 to 9 inches high, depending on power

level, and lost more than half their weight, down to 60-95 lbs versus the previous 225.

In addition, linearizers were also introduced to the market. A linearizer is a device that improves the AM to AM and AM to PM conversion of a VED, thus reducing the intermodulation distortion, spectral regrowth and *noise power ratio* (**NPR**). This enabled TWTAs to achieve linear power at double their previous output power levels. Where a 700 W TWTA previously operated at 140 watts output power to meet linear requirements, use of a linearizer enabled 280 watts.

All of a sudden, TWTAs were twice as efficient as SSPAs, and once again truly viable as competition for the newer solid state devices. This turns out to be true even for recent 'spatially combined' SSPAs, which are even less efficient than some corporate combined SSPAs.

SuperLinear® TWTAs

TWTA efficiency took another step forward in the mid-2000s with the advent of "SuperLinear®" TWTAs, a name trademarked by HPA manufacturer **CPI, Inc**. In a SuperLinear TWTA, the dual-collector tube is designed for optimization at Plin. The result is an amplifier that achieves more than 20 percent efficiency.

An example of this product is a **2250 W C-band TWTA**, which offers Plin of 950 watts, while typically consuming 4.5 kW watts of prime power. While no SSPAs are capable of Plin of 950 watts, the most powerful consume 7.3 kW of power to achieve only 650 W Plin, or still only 9 percent.

Differences such as this *do* translate into real dollars. If one pays $0.10 per kWh, an end user can save thousands of dollars per year in operating costs for a single amplifier. Further, TWTA reliability has improved at such a rate, due to less heat, that 80,000 hours MTBF is typically achieved.

Recent Developments

With such significant headway being made by TWTAs, SSPA manufacturers have begun to concentrate on efficiency as well. One SSPA manufacturer has found a new way to combine solid state FETs more effectively, and can now provide 40 W Plin of Ku-band power using 650 watts of prime power for 6 percent efficiency. SSPAs combining is less efficient at higher frequencies, so this is actually somewhat of an improvement. However, this still does not match the 20 percent efficiency experienced by TWTAs of similar power.

Helping Others To Help Others

author: Eric Jan Bakker, Sales Director, Government + NGO, Vizada

There are clear benefits to providing training for customers before they are deployed in the field, particularly when using mobile satellite communications. Eric Jan Bakker looks at the advantages of Vizada's NGO training programme.

NGO worker arrives on site

Satellite signal search

Requesting an Internet connection

Laptop + Explorer 500 BGAN come out of the carry bag

Watching for signal detection on the screen

Connected to the Internet

Whether assisting in the aftermath of the earthquake in Haiti, or providing healthcare in Africa, *non-governmental organisations* (**NGOs**) work in some of the most difficult environments imaginable. One of the major challenges NGO field staff face is undertaking their work in a country or region in which the existing telecommunications network is depleted, or non-existent.

In order to do their jobs effectively, NGOs require fast, reliable communications systems to coordinate their operations and exchange crucial information. New technological developments allow NGOs to set up a broadband mobile office in minutes from anywhere in the world, even in areas with limited, or no access to fixed-line or GSM networks. While this technology has led to a change in the way in which NGO's can conduct their work in the field, it is important that staff have been effectively trained to install and use the system to ensure they obtain the greatest operational benefits possible and can focus on their primary tasks.

NGO medical and human aid experts are often flown out to countries at the last minute, taking minimal equipment. When they arrive in the disaster area, war zone, or foreign base, they need to know the equipment they rely on will work instantly on arrival in the field. **Vizada** works with NGOs to provide the **Inmarsat BGAN** mobile satellite service to quickly and straightforwardly establish a mission-critical, operation-enhancing communications infrastructure.

The beauty of these systems is that — with a basic level of training — they can be deployed within a matter of minutes, with minimum complexity, and can offer global network coverage. The smallest terminals are the size of a paperback book, providing optimal portability for those who don't have the luxury

of remaining stationary, or for whom operations necessitate constant mobility.

To support its customers, Vizada runs dedicated training programmes at two global training centres, or through customised training delivered online. Vizada has trained some of the most prominent NGOs in active operations across the globe, including: UN organisations; **Télécoms Sans Frontières** and **Médecins Sans Frontières**, in how to effectively use its mobile satellite services. The training programme can take as little as one or two days, depending on the requirement in terms of service and applications required by the NGO in question.

Vizada trains technical experts in the first instance, who will fine-tune the configuration of the equipment and, in turn, ensure their colleagues in the field are able to operate the equipment they are taking with them. Whilst these field workers may be medical or humanitarian aid experts, they are not necessarily communications or IT experts. Therefore, they require a service which offers genuine ease of use. Vizada's BGAN provision comes in a range of small, lightweight satellite terminals, for which someone with even the most limited technical experience could be trained to use the pre-configured system within 30 minutes. With a little practice, mobile broadband can be established — thanks to Vizada's expert training — in less than five minutes.

Mobile broadband can support voice and data applications, but is increasingly being used to transfer images and video footage, to allow for a greater, more comprehensive exchange of operations information.

Telemedicine is just one example of the kind of application for which mobile broadband satellite services can deliver real operational efficiencies; it is the practice of sharing live video and pictures via data networks, enabling ground workers to reference medical expertise without requiring that specialists are present in the field. A doctor might share photographs of an injury to a burns specialist, and in turn, the specialist can diagnose the injury via video link, advise how to treat the injury, and send documents with further instructions, all in a matter of minutes.

It is important to note that any training programme goes beyond simply educating users on how to establish a network connection. Vizada also enables its customers to:

- ***control data connections***
- ***manage costs***
- ***ensure that the necessary level of network security is in place***
- ***customise the satellite broadband service to meet an NGO's specific operational requirements.***

Through Vizada's proprietary portal — ***The Source*** — customers have the ability to access and download billing and account information; administer a single or group of terminals and view network traffic information, as well as monitor call logs in real time. Similarly, costs can be controlled and security permissions managed through the *Data Manager* website, or through setting up a virtual private network between a BGAN terminal and the NGO's corporate network, enabling field workers to access company files and information through a secure line.

Selling a piece of equipment which is fully compatible to your customers' needs is indisputably paramount to any business. At Vizada, we would argue that training your customer to help them configure and effectively deploy the right package is just as vital. The positive outcomes of the training programme for NGOs are limitless, from allowing staff to phone their loved ones, to enabling doctors to remotely diagnose injuries, but also to allow our customers to publicise the good work they do in dangerous and remote parts of the world.

About the author

Eric Jan Bakker is Sales Director, Government and NGO for satellite communications provider Vizada.

TÉLÉCOMS SANS FRONTIÈRES

Vizada has renewed its partnership agreement with **Télécoms Sans Frontières** to provide mobile satellite communications services in 2010, including a comprehensive training program for TSF personnel. Télécoms Sans Frontières (TSF), a non-governmental organization (NGO), specializes in emergency telecommunications following conflicts or natural disaster and will benefit from the ***Vizada Solutions Certification Program*** (**VSCP**).

The VSCP is a professional training program run by Vizada's mobile satellite experts which aims to help customers make the most of their terminals and handsets. This includes prepaid cards for voice calls, email and web browsing, messaging services for email and SMS, cost control services such as web portals to monitor communications traffic and credit in real time, as well as set limits and alerts on traffic, and specific calling numbers to reduce the cost of calling a mobile satellite terminal from a fixed line.

These solutions and applications can be used over any mobile satellite terminal, including **Inmarsat BGAN** and **ThurayaIP** data services, and Thuraya and Iridium handsets, used on a regular basis by TSF staff during crisis missions.

TSF used Vizada's mobile satellite services on 14 separate occasions in 2009, notably in Haiti in January 2010 — representatives established a telecoms center for Haitians to call family and friends abroad, and to improve coordination on the ground between the NGOs workers.

"We've worked with Vizada for 12 years now, and each year we find together ways of improving the mobile satellite services that make up our telecoms centers," said *Jean-François Cazenave*, President of TSF. "It's vital for us to be able to provide NGOs a reliable telecoms service on the ground, and we're looking forward to the training to see how we can improve this further."

In addition to TSF, Vizada supplies mobile satellite services to a number of nongovernmental organisations and first responders — including **Médecins Sans Frontières**, **International Red Cross**, **United Nations** organisations, and the **United States Army Corps of Engineers**. Vizada has a dedicated team and offers training in place to cater for these organisations' specific requirements.

Capacity Optimization — A Technology Comparison

authors: Dirk Breynaert, Max d'Oreye, Newtec

For operators of IP trunking or Backhauling networks, profitability is a permanent challenge: one has to keep up with the ever increasing demand for IP traffic, cope with a limited supply of satellite capacity in regions where satellite services are most needed, and deal with eroding prices of competitive terrestrial services in other regions.

While high satellite costs and fierce competition keep driving the margins down, it is essential to get the maximum efficiency of the available satellite capacity.

Over the last few years, several new technologies have been put on the market to help service operators to optimize the performance of their networks. Old **DVB-S** and **Turbo** code modems have been progressively replaced by more efficient equipment implementing *LDPC Forward Error Correction* (**FEC**) codes either in compliance with the **DVB-S2** standard or as proprietary solutions. These products increase the bandwidth efficiency by as much as 40 percent and usually offer a return on investment in a matter of months. On top of these new modulation formats, other advanced technologies are offered to further optimize the bandwidth efficiency.

In this article, two of the most popular technologies available today will be examined: Signal cancellation technologies that allow sending the forward and the return channels in the same space segment, and DVB-S2 ACM technologies that allow the user to vary the transmission parameters dynamically in order to operate with much less link margin. These two technologies will be compared for a typical IP trunking network delivering services from one central hub to 10 remote sites.

The Reference Network Configuration

To perform this comparison, a reference network that delivers IP trunking services to 10 remote sites in Africa from a hub in Sudan is considered. A typical downlink station is in Dakar, Senegal. The satellite offers 36MHz Ku-band transponders, with an EIRP of 47.9 dBW and a G/T of -0.7 dB/K in the direction of Dakar. The hub uses a large 7.8 m antenna and each remote is equipped with a smaller 2.4 m satellite dish.

For this analysis, two typical cases will be analyzed: In the first case the network provides *symmetrical* services (10 Mbit/sec in both directions) to each remote site. In the second case, *asymmetrical* services (10 Mbit/sec forward, 2.5 Mbit/sec return) are considered instead. To enable the comparison, the assumption is that all implementation examples are using DVB-S2 modulation equipment (note that bandwidth cancellation compatible with DVB-S2 may not be available from all vendors. Proprietary LDPC solutions should, however, offer comparable performance). All carriers are modulated with a 20 percent roll-off factor. For fixed rate services, availability is expected to be in the range of 99.9 percent. For variable rate services, it will be expected that the service is available at maximum capacity for 99 percent of the time, and a service with a maximum data throughput degradation of 30 percent is available for 99.9 percent of the time.

Conventional Network Implementation

In a conventional implementation, each signal of each service uses a separate transponder segment and the transmission parameters are fixed in order to achieve the expected service availability over time and link condition variations. The link budget optimizes the forward and return links separately. A link budget optimization is performed to achieve the highest bandwidth efficiency, assuming

the cost of the amplifiers in the ground station is less an issue than the cost of the satellite capacity.

The most critical factors of the link budget are the uplink fading in the forward and the return channels, and the *Carrier to Inter-Modulation* ratio in the transponder.

Running link budget calculations based on the satellite characteristics described in our reference case above shows it is possible to use the modulation parameters described in *Table 1*. For the symmetrical case, a total bandwidth of 105.5 MHz is necessary to carry the 10 services. A minimum of 3 transponders is required to implement the network (*Figure 2*). In the hub, one TWTA is uplinking the 10 carriers. With a minimum of 6dB back-off for the multiple carrier configuration, at least 275 watts of power are necessary. In the remote the power requirements are also large so TWTA's must be used. With 4.5 dB of back-off for the 16APSK modulation scheme, at least 350 watts amplifiers are needed.

For the asymmetrical case with 2.5 Mbit/sec return channels, a total bandwidth of 73.8 MHz is necessary, which is just too much to fit in two transponders (*Figure 3*).

Optimization By Signal Cancellation

Signal cancellation technologies allow the return channels to be transmitted in the same satellite segment as the forward channel. The signal received from the satellite is therefore the sum of the two uplink signals. A digital device in each station subtracts the signal sent by that station from the signal received from the satellite. This allows the station to recover and demodulate the other signal, intended to that station, with a minimum degradation (typically 0.6 dB).

The link budget is optimized to balance the uplink and downlink power, and to minimize the intermodulation effects on the transponder. The most critical factors are the uplink fading of the forward link, and the uplink fading in the return channel.

For the symmetrical case, the results are summarized in *Table 2*. The combined Input Back-Off for the sum of the forward and return channels is 10.8 dB. The total bandwidth to carry the 10 symmetrical services is 79 MHz and, therefore, 3 transponders are still needed.

This example illustrates that because power and back-off issues, signal cancellation requires more bandwidth than just putting the original forward and return signals on top of each other.

In the hub, a single TWTA uplinks the 10 carriers. With 6dB back-off, at least 400 watts are needed. In each remote, 275 watts TWTAs can be used with 3.7 dB back-off for the QPSK signal. The link budget results for the delivery of asymmetrical services are presented in *Table 3* on page 83. The combined Input Back-Off of the sum of two signals is 10.2 dB. The 10 services can fit in 70.4 MHz, which can be distributed over two transponders (*Figure 6*). In the hub, a TWTA of at least 450 watts is needed to transmit the 10 carriers with 6 dB back-off . The remotes can be operated with 20 watts SSPA and a minimum back off of 1.7 dB for the QPSK signal.

Optimization By Adaptive Coding + Modulation

In ACM mode, the receive site of a transmission link continuously monitors the instantaneous receive conditions and reports this information to the uplink site in real time. The uplink site is able to change the modulation parameters dynamically without loosing the synchronization with the receiver and without loosing any data in the process. Thanks to this mechanism, the transmission system can operate with a minimum link margin at all times: whenever the link degrades for one reason or another, the system automatically increases the level of error protection and/or uses a more robust modulation constellation, so the demodulator remains locked and the transmission remains error-free. When the link improves again, less error correction and higher modulation schemes are automatically reactivated. Since statistically rain fades are short and happen quite rarely over time, higher modulation parameters can be used most of the time and the average throughput of such a system is much higher than the fixed throughput of a conventional system.

In a DVB-S2 ACM system, the modulation parameters can be changed dynamically on a frame by frame basis. This gives the

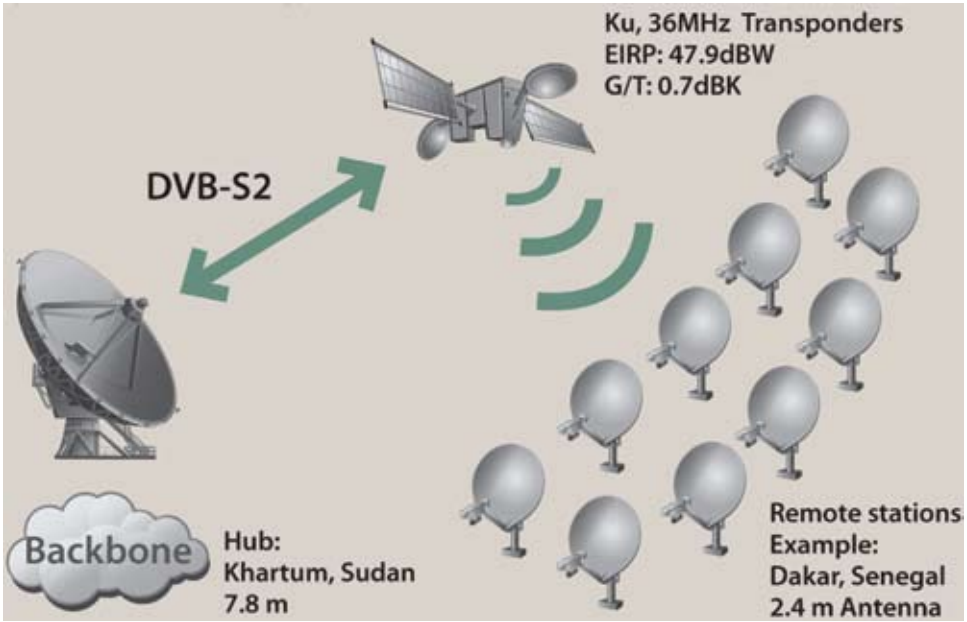


Figure 1: Network topology

	MODCOD	IBO (dB)	OBO (dB)	SFD uplink direction (dBW/m2)	Clear weather link margin (dB)	Bandwidth efficiency (Mbps/MHz)	Required bandwidth per channel (MHz)	Required uplink power per channel (watts)
Forward carrier	8PSK 2/3	9.6	4.7	-76.1	6.9	1.582	6.32	6.9
Return carrier (10 Mbps case)	16APSK ¾	13	7.6	-70.1	7.3	2.366	4.23	115.2
Return carrier (2.5 Mbps case)	16APSK ¾	13	7.6	-70.1	7.3	2.366	1.06	28.8

Table 1: Link budget parameters conventional case

possibility to send several services on the same satellite carrier continuously while selecting different modulation and error coding parameters for each service, and making these parameters vary dynamically independently for each service. Using a single large carrier instead of multiple smaller carriers allows saturating the transponder and is a very efficient way of sending all the services from the hub to the remote sites. Thanks to the *Multistream* mode of DVB-S2, the various streams are logically separated from each other with a unique *Input Stream Identification* (**ISI**) number, so from the enduser point of view, the level of separation among the services is the same as with the multiple carrier configuration.

ACM systems are best used with the *Automatic Level Control* (**ALC**) mode activated on the transponder. This enables the use of the most efficient **MODCODS** in the forward link. The link budget balances the uplink and downlink power, minimizes the nonlinear distortion of the single carrier in the forward channel, and minimizes the intermodulation of the return channels. The most critical factors of the link budget are the distortion and noise levels in the downlink of the forward link, and the intermodulation in the uplink of the return channels. The parameters of the link budget are summarized in *Table 4*.

For the delivery of symmetrical services, a total bandwidth of 65.46 MHz is needed, which fits in less than 2 transponders (*Figure 7*). The uplink power needed in the hub is quite limited and with 3.1 dB back-off for the 32APSK modulation schemes, a 40 watts SSPA is sufficient. In the remotes 100 watts SSPAs are necessary, with a back-off of 3.1 dB for 32APSK.

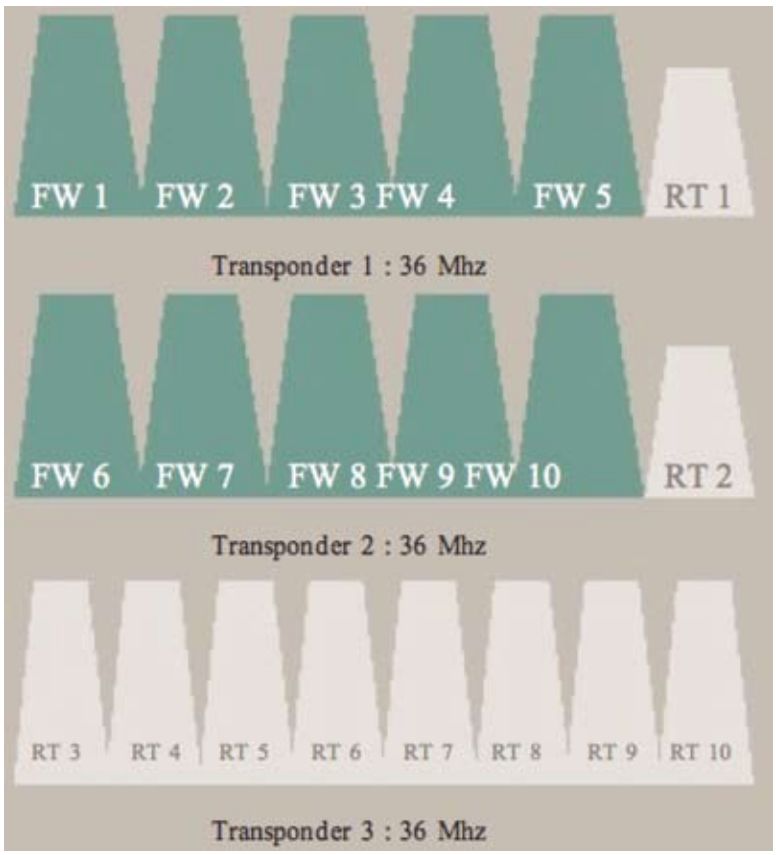


Figure 2: Frequency plan conventional case, symmetrical services

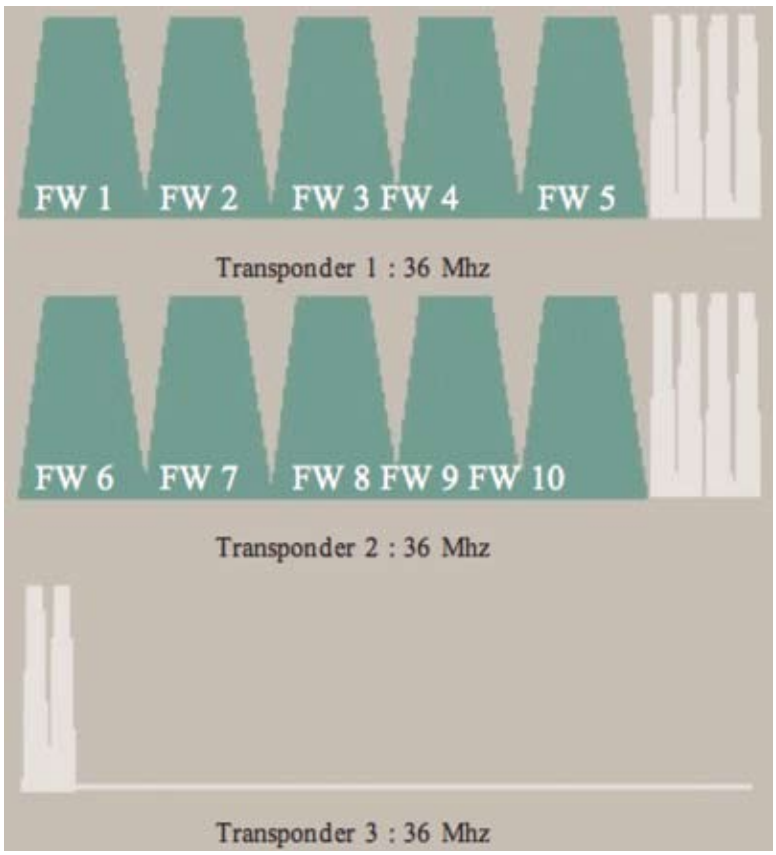


Figure 3: Frequency plan conventional case, asymmetrical services

	MODCOD	IBO (dB)	OBO (dB)	SFD uplink direction (dBW/m2)	Clear weather link margin (dB)	Bandwidth efficiency (Mbps/MHz)	Required bandwidth per channel (MHz)	Required uplink power per channel (watts)
Forward	QPSK 4/5	12.5	7.3 dB	-72.8	6.9	1.266	7.9	9.6
Return 10 Mbps	QPSK 4/5	15.9	10.4 dB	-71.7	7.3	1.266	7.9	76.9

Table 2: Link budget parameters, signal cancellation with symmetrical services

For the asymmetrical services, only 39.58 MHz are needed to carry all the services (*Figure 8*). The uplink of the hub can be operated with a single 40 watt SSPA while each remote requires 25 watts SSPAs with 3.1 dB back-off for 32APSK.

Ideally, the ACM technology is used in systems where the data throughput may vary over time, according to the link condition variations. This is the case of most IP networks, as protocols such as TCP/IP can adapt automatically and dynamically to the available bandwidth. In addition, an ACM system can cope with very deep rain fades and the link availability is much higher than fixed transmission systems.

However, when the transmission format or the business model requires a fixed transmission rate or a permanent high availability, a method exists to avoid the throughput variations in the forward link while keeping most of the efficiency gain of ACM. This method relies on the fact that rain fade will not affect two stations at the same time within the statistical model for the requested availability (assuming two remote stations are not in the same city or area). As all of the services are sharing the same forward carrier, it is, therefore, possible to foresee some buffer bandwidth capacity on this carrier to cope with rain fade affecting only one of the services. Through the statistical multiplexing effect of the common carrier, this buffer capacity can be used for any service and increases the availability of all services.

In the example, rain fade on one of the forward services would change the modulation parameters for this service from 32 APSK 3/4 to 16 APSK 2/3. This reduces the throughput for that service from 10 Mbps to 7.09 Mbps. So a buffer of 3Mbps excess capacity on the forward carrier would easily compensate for the rain fade on any of the services. This buffer needs to be available with the lowest modulation parameters (16APSK 2/3), so it requires 1.4 MHz of satellite capacity. Compared to the total capacity of the forward carrier, this is only 4.1 percent overhead, but it increases the service availability to 99.9 percent, the same as in the non-ACM network implementations. It is interesting to see that the larger the number of services in the forward carrier, the lower the overhead to maintain a constant throughput. Note that the 4.1 percent satellite capacity overhead has no impact on the frequency plan and link budget.

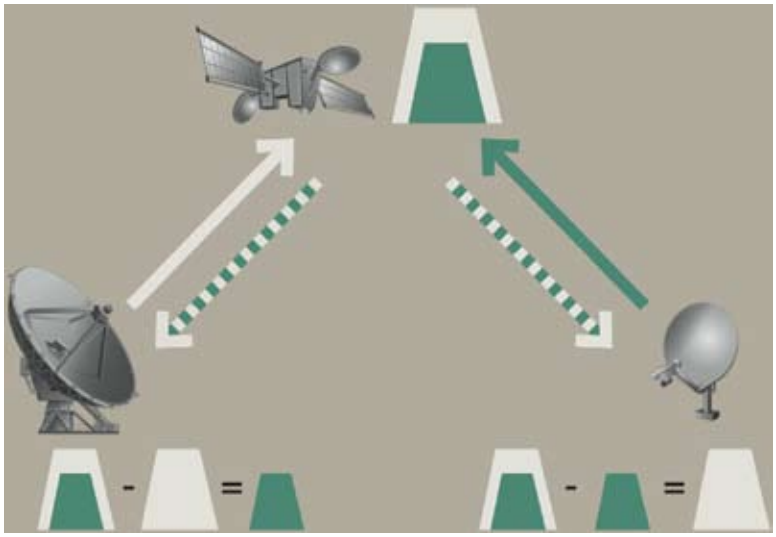


Figure 4: principles of signal cancellation

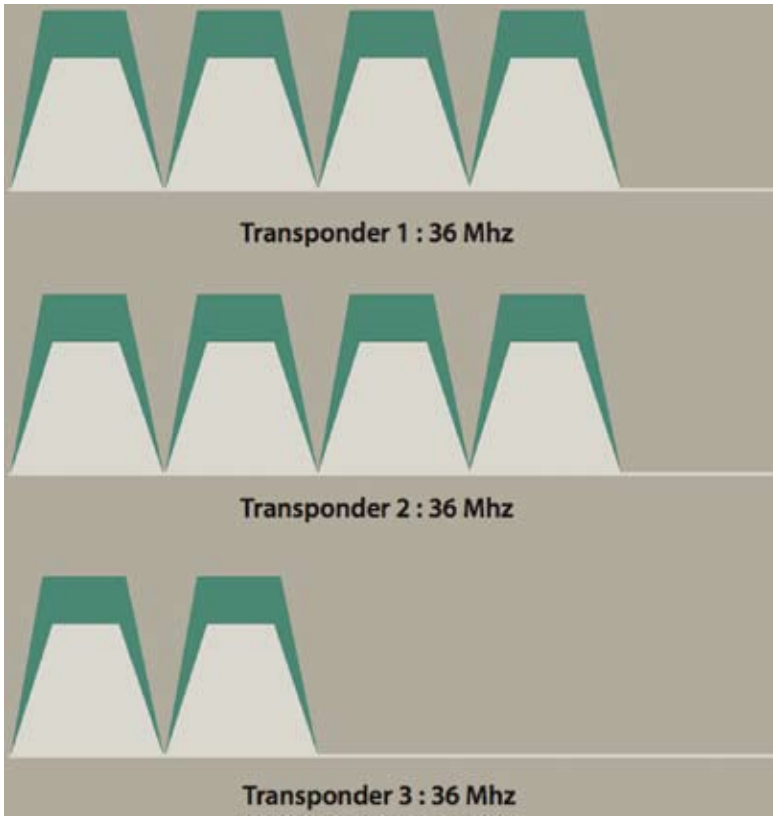


Figure 5: Frequency plan signal cancellation, symmetrical services

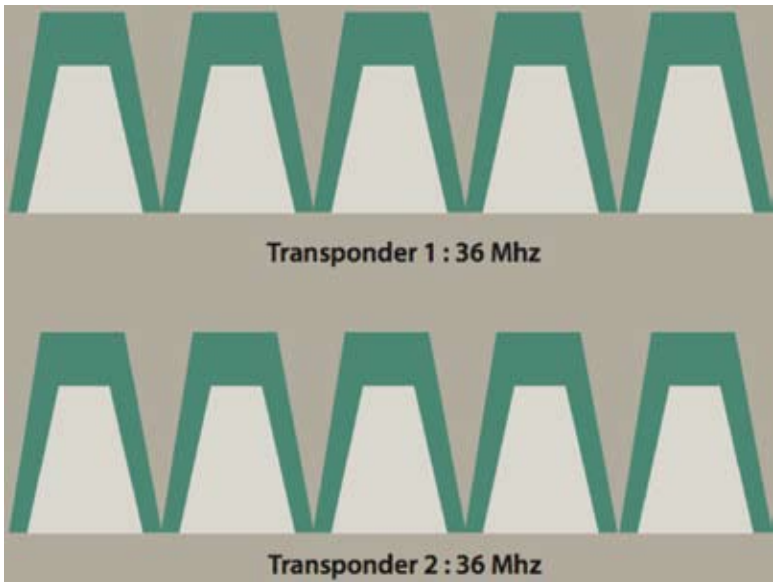


Figure 6: Frequency plan signal cancellation, asymmetrical services

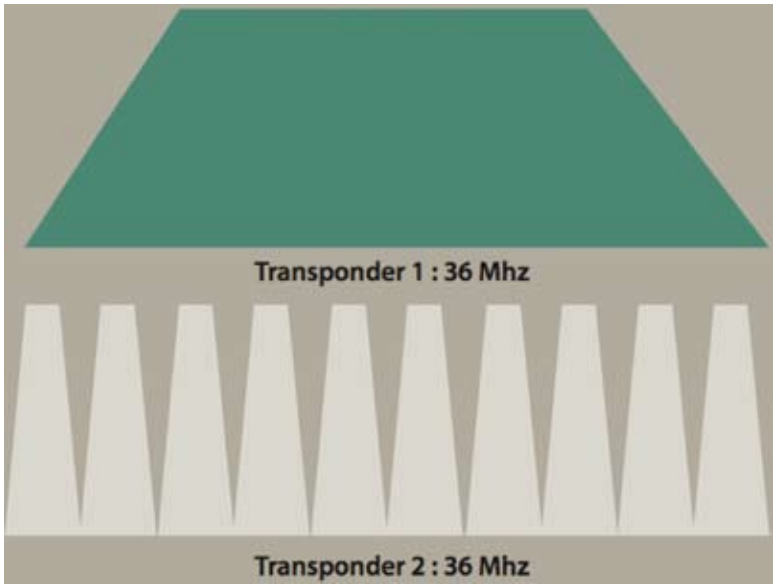


Figure 7: Frequency plan for ACM, symmetrical services

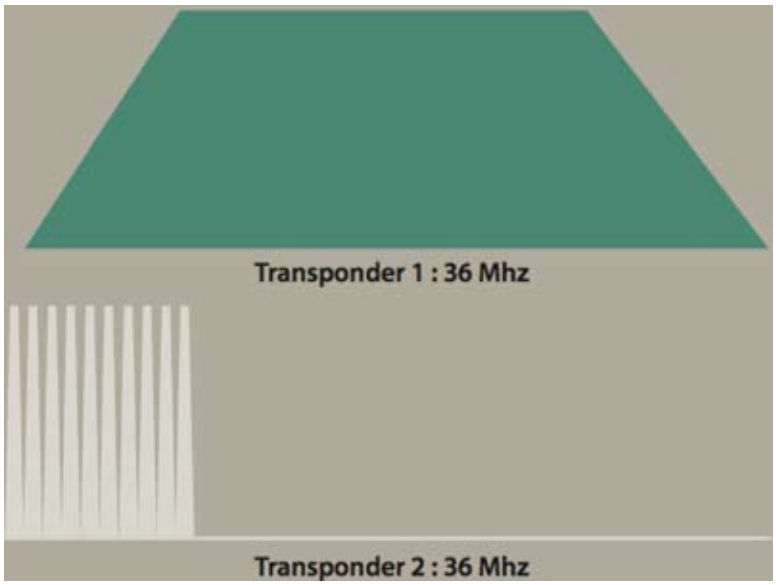


Figure 8: Frequency plan for ACM, asymmetrical services

Comparison Results

The results of the comparison among the three network implementations are shows in *Tables 5 and 6*.

It can be seen that signal cancellation only provides significant bandwidth efficiency gain for the symmetrical case. But in both the symmetrical and asymmetrical cases, the gains provided by ACM are much more significant and allow reducing the necessary satellite bandwidth almost by half for the distribution of asymmetrical services. In the remote stations, both the signal cancellation and ACM implementations require less uplink power.

For the symmetrical case, ACM requires much less power than signal cancellation, while for asymmetrical services signal cancellation is slightly more power-efficient.

In the hub, however, the single carrier implementation of ACM requires much less power than both the conventional and signal cancellation implementations.

Next to the bandwidth efficiency (**OPEX**) and uplink power (**CAPEX**) considerations, the systems should also be compared on basis of operational aspects: Signal cancellation systems typically have stringent constraints on phase noise, accuracy of the carrier center frequencies, and non-linear signal distortion. They require a careful power balance between the two carriers and, of course, only work on full-duplex links, where each station must be able to receive its own signal. In case of failure of one of the uplinks, it is also difficult for an operator to indentify which of the two signals is missing, as they occupy the same bandwidth.

ACM systems, on the contrary, have the ability to adapt automatically and dynamically to any link condition, without human intervention. **Newtec**'s ***FlexACM*** implementation for IP trunking networks relies on patent-pending a feature called **NoDE** (*Noise and Distorton Estimator*) in each demodulator.

Thanks to NoDE, the receiver can automatically make the distinction between link impairments due to fading and noise on one hand, and the non-linear distortion induced by amplifiers on the other hand. FlexACM is also able to automatically optimize its performance in non-linear conditions.

In ACM systems, the traffic to report the link conditions from the receive site to the transmit site uses very little bandwidth and can be implemented on any type of medium, being satellite or terrestrial. One way system implementations using low speed terrestrial returns are also possible. Contrarily, to signal

	MODCOD	IBO (dB)	OBO (dB)	SFD uplink direction (dBW/m2)	Clear weather link margin (dB)	Bandwidth efficiency (Mbps/MHz)	Required bandwidth per channel (MHz)	Required uplink power per channel (watts)
Forward	8PSK 3/5	11	5.8 dB	-73.4	6.9	1.421	7.04	10.5
Return 2.5 Mbps	QPSK 1/2	18	12.8 dB	-72.3	7.3	0.789	3.17	12.7

Table 3: Link budget, signal cancellation with asymmetrical services

	MODCOD	IBO (dB)	OBO (dB)	SFD uplink direction (dBW/m2)	Clear weather link margin (dB)	Bandwidth efficiency (Mbps/MHz)	Required bandwidth per channel (MHz)	Required uplink power per channel (watts)
Forward carrier (Multistream)	Dynamic: 16APSK2/3 to 32APSK3/4	5	3.1	-83.6	1	Min 2.104 Max 2.960	3.38	1.87
Return carrier (10 Mbps case)	Dynamic: 16APSK3/4 to 32APSK4/5	11.9	6.9	-73.6	1	Min 2.366 Max 3.159	3.166	48.9
Return carrier (2.5 Mbps case)	Dynamic: 16APSK3/4 to 32APSK4/5	11.9	6.9	-73.6	1	Min 2.366 Max 3.159	0.7915	12.2

Table 4: Link budget parameters, Adaptive and Coding Modulation

cancellation implementations, ACM implementations do not require a station to be able to receive its own signal.

As all services are uplinked on the same carrier in the forward channel towards the remote stations, frequency planning of an ACM system is much easier. The ACM system is also very flexible, as the distribution of the forward bandwidth among the stations can easily be modified without changing the modulation parameters and without interrupting the services.

The most complex aspects of an ACM system result from the possible variations in data throughput. Here a smart and dynamic traffic shaper must be used to make sure priority is given to realtime traffic and to customers paying for higher *Service Level Agreements*. The traffic shaper has to work dynamically with an ACM-specific data encapsulator to minimize the IP packet drops when the bandwidth is reduced and to maximize the performance in clear sky conditions.

In Newtec's FlexACM systems, a set of functions called *cross-layer optimization* ensures that the traffic accelerator, the traffic shaper, the encapsualtor, and the modulator, talk to each other across the layers of the OSI model to optimize efficiency and avoid congestion at all times.

Conclusions

This article reveals that for ***Point-to-Multipoint*** IP trunking networks, ACM can provide much more significant bandwidth savings than signal cancellation technologies, with comparable power requirements in the remote sites and large power savings in the uplink of the hub. ACM also provides a better service availability in case of deep rain fades and is easier to install and operate.

	Total BW (MHz)	BW Savings	HPA in the hub	HPA in the remotes
Conventional	105.5	0%	275 watts TWTA	350 watts TWTA
Signal cancellation	79	25.1%	400 watts TWTA	275 watts TWTA
ACM	65.46	38 %	40 watts SSPA	100 watts SSPA

	Total BW (MHz)	BW Savings	HPA in the hub	HPA in the remotes
Conventional	73.8	0%	275 watts TWTA	50 watts SSPA
Signal cancellation	70.4	4.6%	450 watts TWTA	20 watts SSPA
ACM	39.58	46 %	40 watts SSPA	25 watts SSPA

Table 5 (top): Comparison results, symmetrical services
Table 6 (bottom): Comparison results, asymmetrical services

Changing A Name Is One Thing... Changing The Industry Is Another Story

author: Angie Champsaur, Encompass Digital Media

In 2008, former Pixar and Fox executive Simon Bax and Bill Tillson, President of Broadcast Cable Services, Inc., formed Broadcast Facilities, Inc. with the intent to acquire broadcast facilities throughout the U.S., Asia and Europe.

Before forming **BFI**, *Simon Bax* and *Bill Tillson* knew that if they were going to be a leader in this highly competitive field, every decision they made as a company would need to play a pivotal role in their overall strategy to increase the company's footprint. To achieve this they knew that they would not only need multiple facilities, but they would also require a team of knowledgeable and forward thinking professionals.

The first step was the 2008 purchase of the Los Angeles-based **Andrita Media Center**, the largest third party HD/SD multi-channel network origination facility on the West Coast. As they focused on expanding the management team, adding digital media capabilities and growing the client base, another deal was already in the works and on January 15, 2010, the acquisition of Atlanta-based **Crawford Communications** was completed. The successful combination of these two industry leading companies not only meant that *Bax* and *Tillson*'s strategy was paying off, but it also provided an opportunity to make a name change reflective of their commitment to this expansion.

"We immediately recognized the natural fit between the two companies as the facilities and management teams both complemented each other in a myriad of ways," says *Bax*. "A growing need for disaster recovery was something that became evident while we were developing our corporate strategy. These sister facilities enable us to position our company within the industry as a company capable of providing a full complement of services to our clients."

Each facility was individually respected in the broadcast community for their turnkey media services to television networks, station groups, corporations and government entities. Uniting as **Encompass Digital Media**, the company builds momentum for even greater growth and expansion of capabilities.

"This unprecedented combination of talent and resources allows us to vastly expand our footprint in the marketplace and maximizes our ability to provide a broad range of services to our clients," says COO and President Bill Tillson. "We have integrated a client business solutions' team to support internal

operations and ensure client satisfaction. This team enhances our ability to provide creative and cost-effective solutions to meet the needs of our clients and this is a key component to our corporate philosophy and ultimately our success."

The industry has taken notice of their results as well. **Encompass** is the winner of the **World Teleport Association's 2010 World Teleport of the Year Award**. The company's achievements over the last year include new central casting services, the origination of local television stations from a centralized location; the launch of more than 40 TV channels; expansion of its Teleport capabilities; upgrades to its transportable fleet; material growth in digital media services; and increased support for government SATCOM.

Home to more than 250 television networks, Encompass clients are major networks and broadcasters, sports leagues and general entertainment cable channels including ABC, CBS, FOX and NBC Universal; DIRECTV Sports Networks, ESPN, GolTV, MLB, NASCAR Media Group, NBA, NFL Network, Tennis Channel and Universal Sports Network; Hallmark, Game Show Network, MGM HD, Sony HD/3D and TV Guide. Encompass also performs international services for Alterna'TV, Fox Latin American Channels, Latin American Pay Television (LAPTV), MGM Networks Latin America and SkyVision as well as disaster recovery for BET, Discovery Communications, Scripps Networks and The Weather Channel. The CDC, NASA and the U.S. military's Defense Video and Imagery Distribution System (DVIDS) are among the company's government clients.

While network origination continues to be the heart of what Encompass does, the company intends to further expand its digital media divisions in Los Angeles and Atlanta. Currently, Encompass creates over 15,000 files a month in Los Angeles for digital distribution on VOD, mobile, iTunes and other major platforms including fully supporting operations for Vudu.

Also setting the company apart is Encompass' transportable and Teleport businesses, which it plans to aggressively grow over the next 12-14 months. To further support these service areas, the company's TOC will undergo complete, state-of-the-art upgrades for increased transmissions via occasional-use and full-time bookings as well as its satellite uplink trucks.

Beyond the U.S., Encompass' road map includes facilities in Europe and Asia. These future plans will benefit clients with an even larger satellite and fiber network footprint enabling the movement of their media anywhere in the world.

For more information about Encompass, visit www.encompass-m.com

Executive Spotlight

Jonathan Weintraub
CEO, MTN Satellite Communications

***Jonathan Weintraub** joined **MTN Satellite Communications** (MTN) in 2008 with the charge of expanding MTN's business portfolio via entry into new market segments. He has spent his career advising and managing growing companies. MTN, recognized as the industry leader in maritime VSAT services for cruise lines and the luxury yacht market, has sharpened its focus to serve other verticals — commercial shipping, offshore energy, government, and aviation. Under Weintraub's leadership, MTN has grown, and continues to aggressively grow its global infrastructure and portfolio of innovative products and services to meet customers' communication needs worldwide and in diverse markets.*

SatMagazine (SM)

Good day, Jonathan, and thank you for giving us the time to learn more about MTN. Can you tell us about your background and what brought you to MTN?

Jonathan Weintraub

I was immediately drawn to MTN's unique value proposition in the satellite and space business, having served as the company's chief financial officer and acting chief executive during the SeaMobile period, prior to my appointment as CEO. My background has been focused on consulting with high-growth companies and MTN had a similar make-up and potential.

Prior to joining MTN, I held various positions with investment firms such as Lake Washington Capital based in Seattle, WA; UBS Investment Bank in New York; and Dillon, Read & Company, where I advised and invested in high-growth technology, telecommunications, and consumer-focused companies around the world. The common theme, if you look at my background and my position at MTN, involves companies that are changing the landscape of their specific market with leading technology and a strong, internal infrastructure to support it.

SM

How did the acquisition of MTN by SeaMobile come about? Has it been a success?

Jonathan Weintraub

SeaMobile was formed by a group of investors who saw an opportunity to develop technology that would permit passengers aboard cruise ships to use their mobile phones. It didn't take long for them to realize that this technology was dependent on the availability of broadband satellite links to transmit mobile phone calls to and from the ship when out at sea beyond the range of shore-based cell towers. After much due diligence for a partner to bridge the gap, it was apparent that MTN was the clear technology leader in cruise ship VSAT services with a commanding market share.

SeaMobile's investors acquired the much larger and well-established MTN as a natural extension of their business. At the time, MTN had a shipboard mobile phone solution of its own, which had been developed as a joint venture with AT&T Mobility, and ultimately the SeaMobile shipboard cellular service was combined with the MTN/AT&T joint venture. The original intent was to rebrand MTN under the SeaMobile banner and deliver the new services under a new brand. However, because the MTN brand was so strong, and because the name can be seen on vessels around the world via our radomes, it did not make sense to try to change an industry staple, so we are in the process of reverting to the MTN brand.

SM

What are the core benefit propositions MTN offers global marketplace?

Jonathan Weintraub

Clearly, the benefit of MTN's services is providing high-quality, reliable and responsive global satellite communications solutions suited to meet any customer's needs anywhere, anytime. When you combine customers' ambitions and needs with our portfolio of communication and content services, there really are no limits to what we will accomplish together. As the world is always connected, we at MTN realize that the expectations from a consumer and mission-critical business perspective are constantly pushing the limits and bounds of technology available today. Our extensive network infrastructure and satellite broadband experience

allow us to tailor our products and services to a wide variety of communication needs on land, at sea, and in the air. We actively work with our customers to develop innovative solutions we believe will improve their business operations and meet their consumer needs.

Additionally, the scale achieved by aggressively growing our satellite network and dedicated team of people supports further improvements in our customer service — from expanded teams to enhanced tools.

SM

Jonathan, can you tell us how MTN is faring in the marketplace.

Jonathan Weintraub

Over the past five years, MTN has more than doubled in size, averaging 15 percent annual revenue growth. MTN's success can be attributed to our over 20 years' experience in the maritime VSAT industry and our value proposition of reliable, global service that leverages state-of-the-art technology, an unparalleled satellite and terrestrial network, network operation centers (NOCs) strategically located worldwide, and a great team of people dedicated to providing outstanding customer support. Furthermore, we have had a tremendous year, as we continued to retain existing customers, expand contracts with new customers in various markets, and win government contracts such as our 5-year, $50 million DISA government contract.

As we grow our client base, we are also expanding our global network and are currently working with Ezra, the leading Spanish satellite services company, to open and operate our Santander teleport. A major achievement was the acquisition of security clearance for our Holmdel teleport, and we continue to partner with technology leaders to deliver unparalleled services to our diverse group of clients.

SM

You mention a diverse group of clients. What vertical markets do you serve and how do they break down in terms of percentage of your total business?

Jonathan Weintraub

MTN operates in four major vertical markets: (1) cruise and ferry, (2) megayachts, (3) commercial maritime and energy, and (4) government/military, with a fifth vertical market we are working to penetrate. The cruise and ferry sector is where MTN got its start. It has been a mainstay of our business ever since. MTN has a commanding market share in this sector, with over 80 percent of the world's major cruise ships in our client portfolio. Our expert teams continually work with our cruise line partners to bring to market revenue-generating and innovative, value-added services to satisfy the needs and wants of passengers and crew, leveraging our worldwide broadband satellite coverage and high network reliability.

Our experience in the cruise ship sector naturally led us into serving the large luxury yacht market. Many superyachts have considerable demands for high-bandwidth satellite connections to support the critical voice and data traffic for owners and guests as they travel to the most remote locations in the world. We offer a wide range of owner, crew, and passenger services such as crew calling, IPTV, Internet browsing, video conferencing, and fixed and mobile phones, to name a few.

Through innovation and dedication to providing best-in-class communication services, we have established a strong position in this market, with more than half of the world's 100 largest private yachts under contract with MTN. Add to that the commercial marine and offshore energy sectors, both of which are growth markets in which we are aggressively expanding. Particularly with the commercial marine sector, we find it is not so critical that the satellite system operates to near 100 percent reliability, and so a number of lower-cost competitors have entered the market.

Despite this very competitive, lower price-driven marketplace, we are well positioned to compete and differentiate ourselves by offering ship owners and managers a strong value proposition of wide-area coverage, high network reliability, responsive worldwide customer service, local field service and support, guaranteed uncontended bandwidth, and predictable, fixed monthly service plans. The government and military are our fastest-growing business areas, driven by increased demand for commercial satellite bandwidth to augment dedicated government-owned satellite resources.

Executive Spotlight

We established MTN Government Services (MTNGS) as a separate, wholly owned subsidiary with headquarters in Leesburg, Virginia. Our government team consists of subject matter experts who work with soldiers in Afghanistan, non-government organizations (NGOs) involved in disaster relief and recovery efforts in areas such as Haiti, scientific research ships mapping the ocean floor for NOAA, and a host of other government agencies with mission-critical communication needs.

SM

What can you tell us about new developments in your cruise and ferry business? Yacht services? Government services? Commercial?

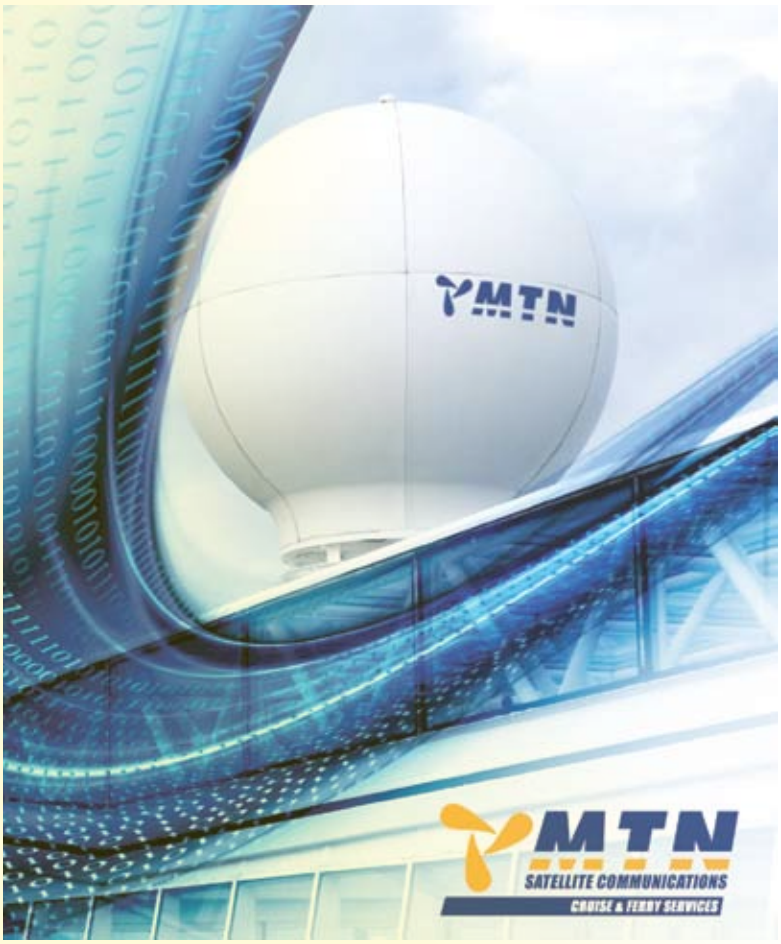
Jonathan Weintraub

In March 2010, we launched MTN Worldwide TV, the cruise industry's first fully digital, global broadband television service. MTN Worldwide TV delivers live programming from seven major U.S. and international television networks globally and is installed on more than 40 cruise ships. Since its successful launch, we have received high interest from our other markets for this live television service and we are working to include MTN Worldwide TV as a service offering for the other businesses. Notably, we recently signed an agreement with E! Entertainment Television to add their channel to the MTN Worldwide TV service lineup, giving cruise passengers access to popular Hollywood movies, news, and entertainment programming.

Additionally, a number of cruise lines have expressed interest in news and entertainment channels in the languages primarily spoken by their crews and passengers, which we are working to develop as a potential new feature. Furthermore, we are currently working closely with Royal Caribbean on the new Allure of the Seas project. The Royal Caribbean team has incredibly ambitious plans, and we expect to surpass the amazing technical accomplishments we achieved during the Oasis of the Seas launch last year. For yacht services, we recently outfitted MY Eclipse, the world's largest yacht, with the MTN DirectNet guaranteed bandwidth service used for more demanding applications such as video streaming, online trading or IPTV, where constant bandwidth is a must.

We also launched FlexNet, a cost-effective and flexible satellite communications service, which takes advantage of our multi-regional Ku-band satellite network. Combined with our advanced Automatic Beam Switching (ABS) technology, megayachts are able to enjoy seamless connectivity around the world. Government services, as previously mentioned, was recently awarded a 5-year $50 million DISA contract to supply global C- and Ku-band satellite bandwidth to support mission-critical requirements.

In addition, we are near completion of launching a new multi-band VSAT flyaway product and installing a suite of broadband communication services for the NOAA ship, Okeanos Explorer. We also have had very successful installations in commercial shipping both for new customers and for several of our flagship customers located worldwide, such as Teekay Shipping, Elcano, Hartmann Offshore, Goodwood Ship Management, and Beluga Shipping, to name a few.



Finally, to support our increasing customer base and demand for MTN VSAT communication services, we have been aggressively securing new partners and resellers around the world. Moreover, we continue to expand our global satellite network by strategically adding new satellite footprints, further improving worldwide secure connectivity requirements for customers traveling the farthest reaches of the world.

SM

How is MTN able to effectively meet the needs of such a growing customer base in the satellite industry?

Jonathan Weintraub

I believe there are several key elements required to successfully support demand by customers from cruise and ferry, government, commercial shipping, offshore energy, private yachts, and aviation. These include developing and maintaining a comprehensive product suite with the ability to add unique, value-add features to the core products; building up technical expertise and experience in satellite systems; and sustaining a systems integration capability that is responsive to changing customer requirements.

For more than 20 years, MTN has continually demonstrated a superior standard of performance in providing solutions that meet critical customer requirements across these verticals. This puts us in a perfect position to move forward and address critical needs for delivering reliable capabilities beyond the maritime industry, extending to land and air applications.

At this time, I believe the company is one of the best in this business at delivering solutions that represent the best value propositions in the marketplace. Our job is to sustain this technology leader position while continually refining and improving our contribution to the marketplace to achieve increased productivity and maximal operational efficiency for our customers.

SM

Where do you see your main growth opportunities in the short term? Long term? What is your business strategy for growing the business?

Jonathan Weintraub

In the short term, we have plenty of growth opportunities in our core business. We'll work diligently to ensure that we are meeting the mission-critical needs of our customers for increased bandwidth, reliability, and quality products and services. We are also focused on communicating effectively to our customers and the marketplace to spotlight the extensive breadth and depth of MTN's satellite capabilities.

In the long term, we'll keep this customer focus a main priority and expand our capabilities through internal and external growth as well as strategic acquisitions. We'll continue to broaden our service offerings, as we've been very successful on focusing on complicated, demanding applications for remote or mobile usage that require outstanding reliability, consistency, and responsiveness. Over the longer term, we will continue to look for markets that demand those kinds of solutions.

Armed with critical skills, technologies, and experience, we can bring our outstanding satellite communication solutions to larger, more complex challenges in the industry. My mission as CEO is to help the company reach its full potential technically, strategically, and financially while strengthening our core capabilities.

About MTN Satellite Communications

MTN Satellite Communications (MTN) is the global service provider of communications, connectivity, and content services to remote locations around the world. MTN's maritime VSAT solutions and global satellite communications network offer the reliability that only "Always On – Always Available" systems can provide. More than 600 vessels and land-based terminals worldwide, including cruise ships, commercial ships, offshore drilling and production sites, government and military vessels, private yachts, and ferries, depend on MTN's voice and data networks to allow them to "be in the middle of nowhere and at the center of everything." Premium services include remote access for Internet, fixed and mobile phones, fax, television, onboard newspapers, banking services, direct payroll deposit for crew, and other enterprise solutions. MTN is based in Miramar, Fla., and has offices worldwide.

For more information, visit www.mtnsat.com.

Global Sharing — Reaping The Benefits

author: Paul Sims

Rock band Dire Straits' chorus "I want my MTV" became an international hit in 1985 and a spot on prognosticator of television's global expansion. Two years later, MTV Europe was born. MTV Asia and MTV Africa followed soon thereafter in the 1990s — some of the earliest customized feeds focused on quenching insatiable viewer appetites for localized programming.

Discovery Networks, ***Turner*** and ***CNN*** were also among the first to reach out to new markets and regions across the planet — using **SES WORLD SKIES** satellites and the global **SES** fleet. The biggest names in media and entertainment programming have relied on SES WORLD SKIES for the secure distribution of their coveted content for decades.

"Our customers don't just sign with us, they stick with us, in some cases for 25-plus years," said *Steve Bunke*, vice president of North America media services for SES WORLD SKIES. "It's gratifying to see the likes of Viacom, Discovery, Scripps, Turner and many others building and growing their U.S. and global business on our satellites and expertise," *Bunke* added. The operator is aggressively replacing capacity over North America to meet the diverse needs of leading cable operators, broadcasters and programmers as they forge ahead in HD and 3D.

By integrating **AMERICOM** and **NEW SKIES** operations under the **SES WORLD SKIES** brand last year, the innovative operator is well positioned to distribute content seamlessly around the world. However, content is only part of the story. SES WORLD SKIES' global media strategy also revolves around its ability to share the know-how of its people, deeply experienced in the rollout of successful television platforms worldwide.

Elevating Emerging Markets

SES WORLD SKIES is strategically focused on the emerging markets in Asia, Africa and Latin America, where most of the demand for capacity is being derived for **DTH** (*Digital To Home*). The company can point to its aggressive satellite fleet roadmap, its track record of success in advanced services delivery across the Americas, its rich tradition as well as the expertise of its people as proof positive of its commitment for the long haul.

"Because of our aggressive investment in new global capacity and our long-term commitment to the business, we can look our customers in the eye and tell them we are going to be there in the future to meet the needs of their business," explained *Scott Sprague*, senior vice president of global sales for SES WORLD SKIES. "We are building alliances with customers aimed at helping their ventures succeed and grow."

That's exactly why Vietnam's newest DTH player, ***An Vien Group*** (**AVG**), inked a deal aboard SES WORLD SKIES' ***NSS-6*** satellite in May. With a fleet of 27 satellites, nearly two-thirds of parent SES' global fleet of 44 spacecraft, and 10 more in manufacturing stages, SES WORLD SKIES covers the world and the demands of every region.

"SES is a large satellite operator with a fleet of 44 satellites and many more under construction," said *Pham Nhat Vu*, CEO of An Vien Group. "We believe a relationship with such a large and stable partner will ensure that our DTH business will be protected and secure as we grow the business in Vietnam." AVG is great example of an increasing number of emerging market DTH providers who value the video distribution experience of SES WORLD SKIES in North America and sister operator **SES ASTRA** in Europe.


Elias Zaccack

"Our Asia-Pacific team together with the onsite support of SES ASTRA's DTH experts is providing AVG with a broad range of training — technical, marketing, content aggregation, the whole works — to help them launch successfully this month," said *Elias Zaccack*, vice president of Asia-Pacific sales for SES WORLD SKIES. "We are making big strides in our ability to serve customers globally as one seamless provider," Sprague added.

The strategy is striking a chord with customers from New York and the Philippines to Africa and Latin America.

Platforms For Growth


Nicolas Baravalle

In Africa, SES WORLD SKIES has enabled the timely rollout of four new DTH services in the last eighteen months. "MultiTV in Ghana, Pathfinder and Daar Communications in Nigeria, and Wananchi in Kenya have all benefited tremendously from our in-house expertise," said *Nicolas Baravalle*, vice president of Africa sales for SES WORLD SKIES.

"As these DTH start-ups expand, they know they have a distribution partner with aggressive capacity plans to meet their business needs," added *Baravalle*, noting strong demand in the region for cost-conscious programming alternatives to the big, expensive programming providers in Africa. "SES WORLD SKIES is committed to bringing new capacity to Africa's coasts and land-locked countries to deliver on growing demand for media content and enterprise connectivity."

Baravalle's Africa team is working with ASTRA colleagues to provide training for everything from effective conditional access card distribution and marketing collateral development to dish installation. "By helping DTH providers launch quickly and effectively in Africa, we are having a positive impact on their success and ability to add channels and HD to their growing lineups."

Some DTH providers, such as **MediaScape** in the Philippines, are quick to add premium HD channels. MediaScape did so just one year after it launched DTH in September 2008 on ***NSS-11***. "The MediaScape team spent some time at SES World Skies' headquarters in The Hague, seeing firsthand the power of HD," recalled *Zaccack*. "They immediately came back and said 'we need to do HD now.'"

The satellite carrying MediaScape's DTH SD and HD content is part of a strong, two-slot, four-satellite video neighborhood at **95 degrees** and **108 degrees East**. "We have more than a dozen operators, in excess of 500 channels and 35 million TV households counting on these two orbital slots," said *Zaccack*. "The satellites have formed a neighborhood of choice for programmers and DTH providers who want to penetrate the Asian market," he added.


Deepak Mathur

DTH is the dominant driver of the media business in India, with nearly 25 million subscribers. "DTH has come to represent 22 percent of India's multi-channel environment and could potentially peak at 40-45 percent, making it the largest DTH market in the world," explained *Deepak Mathur*, vice president of sales in South Asia and the Middle East for SES WORLD SKIES.

"With more than 400 channels, hundreds more pending government approval, and major sporting events — such as the Commonwealth Games in New Delhi next month — driving HD set sales, India is emerging as a true market leader," said *Mathur*. "And SES WORLD SKIES is well positioned to help India reach its full potential," he added, noting that one customer, Dish TV, serves 6.8 million subs over ***NSS-6***.

Multichannel success in Latin America is driving much of SES WORLD SKIES' innovative vision for capacity deployment. Recent studies show the ***NSS-806*** satellite is a regional leader in content delivery, reaching more than 3,000 cable headends and nearly 23 million subscribers. Those numbers are only

expected to rise with the addition of new channels and value-added services and will certainly lead to the launch of an even more robust replacement and neighborhood.

NSS-806 is home to some of the biggest names in the business, including ***Disney***, ***Fox***, ***ESPN***, ***MGM***, ***Universal***, ***MTV***, ***TV Globo***, ***Rede Record*** and ***RCN***.

"Telcos and Celcos throughout Latin America and the Caribbean realize the best way to remain competitive is to provide triple and quadruple play offerings, bundling landline and mobile phone service with broadband and TV," said *Dolores Martos*, vice president of Latin America and Caribbean sales for SES WORLD SKIES.

"Satellite-delivered DTH enables telecom providers to quickly add popular programming lineups to what is often a powerful brand of voice and broadband services," she added, noting major growth areas include Brazil, Mexico and Argentina, where new DTH platforms will be launched in the next 12 months. In the Caribbean, Puerto Rico Telephone, a subsidiary of **América Móvil**, launched its new DTH service aboard SES WORLD SKIES' ***AMC-21*** satellite in early 2010, with more than 130 channels (SD and HD) in Spanish and English.

"Over the next eighteen months, SES WORLD SKIES is making substantial investments to provide brand new regional capacity to the tune of 800 megahertz of Ku-band and 400 megahertz of C-band to meet strong growth across Latin America," *Martos* explained. The new bandwidth will come from the launch of ***SES-4*** into the orbital slot at **338 degrees East**, the redeployment of ***NSS-5/NSS-7*** at **340 degrees East** over the Atlantic, and the use of the brand new **67 degrees West** location (through the agreement with the *Community of Andean Nations*).

Artistic rendition of SES-6, courtesy of Astrium

In addition, a larger satellite, ***SES-6*** will replace NSS-806, a primary video distribution spacecraft serving the region. "The early replacement of NSS-806 with SES-6 is a clear demonstration of the long term commitment of SES to the Latin American market and its sustained growth strategy," *Martos* added.

On The Horizon

In some of the world's most advanced markets, television is on the verge of entering a new dimension. And SES WORLD SKIES is leading the way. The operator is hosting breakthrough **3DTV** system trials in the U.S. aimed at answering lingering questions and challenges surrounding reliable 3D content distribution via satellite and cable.

"3DTV will certainly be the next bandwidth driver. It's already a big hit in sports programming," said *Bunke*, citing successful 3DTV broadcasts on SES WORLD SKIES satellites, including last year's ***Super Bowl***. "We're delivering YES Network's 3D New York Yankees major league baseball game broadcasts, which have been well received among viewers and industry analysts," *Bunke* added. The 3D baseball games are delivered over full-time and occasional ***AMC-1*** capacity.

In sports lingo, 3DTV is on deck, following HD's grand slam home run in North America and Europe. And HD is gaining traction around the world in places like Brazil and Hong Kong. "We're starting to see the green shoots of an HD explosion here in Asia — even in emerging markets," noted *Zaccack*, recalling the minimal effects the 2008 economic crisis had on Asian TV viewers. "Consumers have continued to demand pay TV options, which have expanded at the consumer and business level without the slightest of hiccups," *Zaccack* said.

"HD is now the standard throughout America," said *Bunke*, who estimates at least 90 percent of the major programmers are 100 percent HD. "TV audiences throughout the U.S. have become accustomed to HD programming to the point of no return. Who wants to go back to SD?" asked *Bunke* with a smile. SES WORLD SKIES and its *Occasional Unit* have played a big part in transforming the discerning tastes of millions of viewers. The operator is a preferred HD distribution provider for the vast majority of the world's top sporting events — from the ***Super Bowl*** and the ***World Cup*** to the ***Olympics*** and ***Formula One Racing***.

(continued on Page 113)

SES WORLD SKIES

Accelerating the delivery of 3DTV

SES WORLD SKIES delivers 3DTV via satellite

With demand for high quality 3DTV delivery set to grow significantly, SES WORLD SKIES has established a test platform designed to help media companies determine the best way to transmit and distribute their 3D content.

This is a unique opportunity for content providers to be amongst the first to bring 3DTV to the mass market, taking advantage of the unique strengths offered by satellite and the global SES WORLD SKIES fleet.

To learn more, please call (609) 987-4200 and visit:
www.ses.com

Innovation In Network Management

author: Guy Adams, Vice President, Software Engineering, SatManage, iDirect

Today, service providers are focused on building global networks, capable of delivering seamless and guaranteed connectivity that supports voice, data and video applications in any business, geographical or communications environment. This often requires hybrid networks that combine satellite, terrestrial and wireless infrastructure to provide end-to-end connectivity. It also means extending full terrestrial-grade connectivity to vehicles of all shapes and sizes that traverse the globe, and keeping them connected as they travel thousands of miles across multiple footprints, often without an onboard satellite technician.

As networks increase in reach and size, the range and sophistication of applications that end users demand is steadily increasing as well. Today's satellite networks must bear the weight of a growing number of bandwidth-intensive applications, including real-time business productivity tools and rich media content, across a broad range of industries. While service providers have a tremendous opportunity to expand their networks and support new applications, this growth is making it more difficult for network operators to manage and monitor networks effectively while responding to the needs of new and increasingly demanding customers.

Network management can be a real fight unless an effective tool is applied to the data battle.

As networks grow, they often become more complex with the addition of new devices and technologies to address business growth and demands. The amount of trouble-tickets rise and more time is spent generating reports. Service agreement disputes become more common and tracking when and where an error occurred is difficult and time consuming.

But today's operators shouldn't fear expanding their networks and growing their customer base. iDirect offers an innovative, comprehensive network management system called SatManage that can help service providers address the heightened size and complexity of today's satellite networks.

Powerful, Intuitive Network Insight

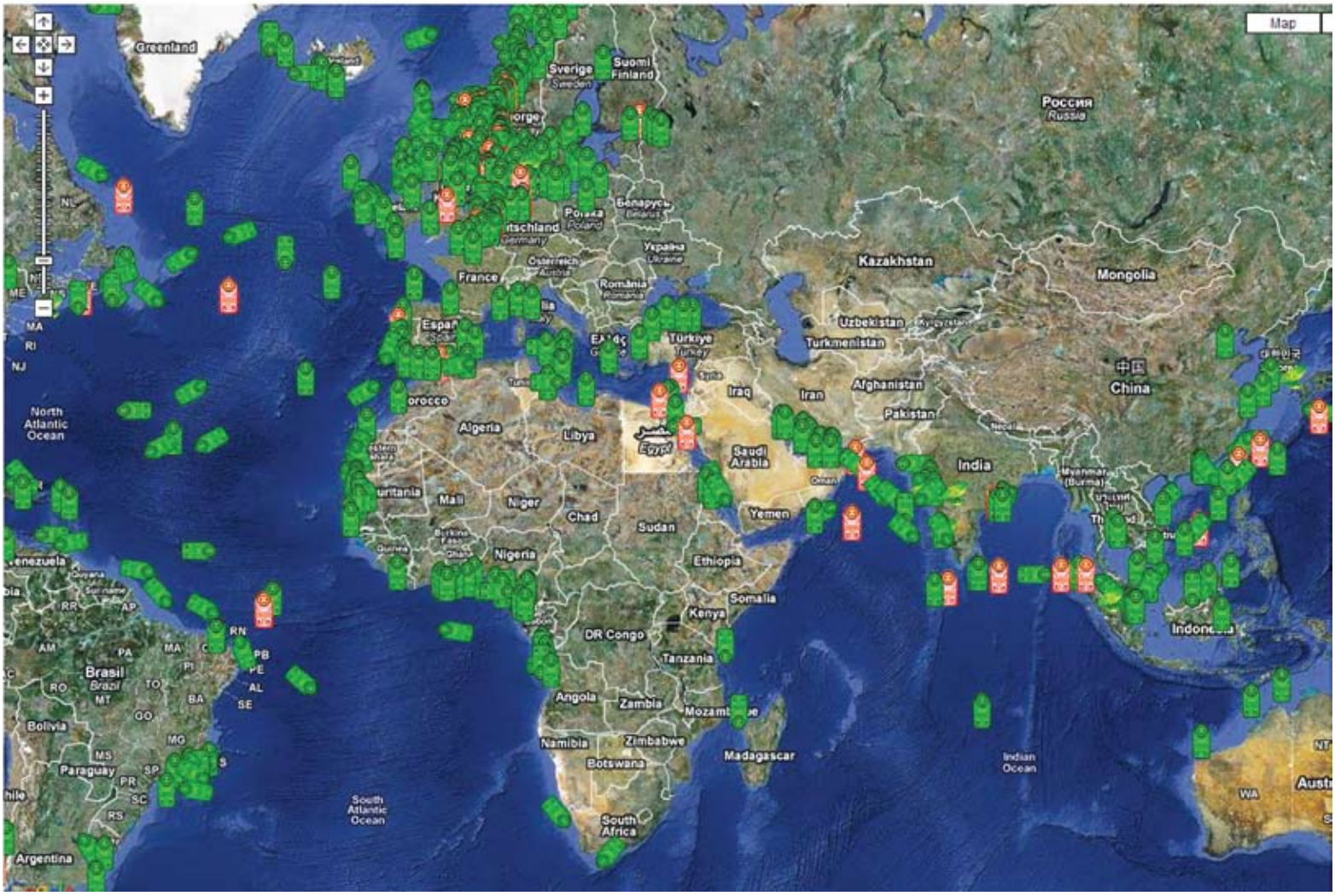
SatManage is a sophisticated suite of web-based software tools designed to handle operators' emerging network management requirements by integrating and automating disparate systems into a single, user-friendly interface. Leading service providers worldwide are using SatManage to transform how they manage large, complex customer deployments, resulting in stronger network performance, faster response times, greater customer satisfaction and lower operating costs. Here's how:

» *End-To-End Network Support — SatManage extends NMS capabilities to large-scale networks that span thousands of remote sites through intuitive network troubleshooting, intelligent alarm processing and integration with external OSS systems. A rich set of monitoring, correlation, and reporting tools enhance service performance management and maximize bandwidth availability and efficiencies.*

» *Managing Mobile Assets — With advanced mobility tools, service providers can use SatManage to track the location and status of every remote on their network in real time through a global mapping system, which can be overlaid with weather conditions, satellite footprint information, radar and other data sources. This integrated approach provides the speed and control that service providers require to optimize network availability for mobile applications.*

» *Automated Fault Management — SatManage delivers an in-depth view into every aspect of the network's performance so Network Operations Center (NOC) staff can easily and rapidly identify problem areas and initiate automated trouble-shooting and fault-management activities to solve issues in real time. The system enables automation of tasks for issue detection, Level 1 Support, preliminary fault diagnostics, and trouble ticketing. Service providers can also automate customer notification of issues or resolutions and send updates on open trouble tickets. Service providers are equipped with the insights they need to better understand traffic patterns and make informed network decisions that can result in bandwidth efficiencies and cost savings.*

» *Improved Customer Service — Service providers can use SatManage to automate SLA reporting and develop value-added services for customers that generate additional revenue. A customizable Web portal provides customers with increased visibility to network performance data including traffic usage, planned maintenance outages and vessel locations with weather overlays. SatManage ultimately allows service providers to simplify Service Level Agreement (SLA) reconciliation and increase overall customer visibility and confidence.*



SatManage's Location Tracker — the map shows the location and paths of the selected remote(s). The large, colored markers show the last known location of a remote, and its color represents the remote's last known status.

» ***Enhanced Visibility — A built-in dashboard gives operators a single-page overview of everything going on in the network, including trouble tickets, network traffic information and Service Level Agreement (SLA) reports. Service providers have the ability to view network traffic in a variety of ways by definable groups, enabling them to gain valuable intelligence for effective capacity and service planning. Color-coded displays of the sites' signal quality over an extended period allow network engineers to quickly hone in on performance degradation and distinguish between site, regional or hub issues and whether the root cause is weather, hardware failure, solar interference, etc. Further, a set of report tools provide instant views and access to all data points collected.***

A Successful SatManage Pilot

NOC operations BT is one service provider who is implementing iDirect's SatManage system to overcome its network management challenges. As BT looks to stay competitive and actively pursue new customers in the oil and gas, finance and manufacturing markets around the world, it's become increasingly critical for the company to maximize efficiency at the NOC to keep costs down and customer satisfaction high. In order to succeed, BT realized that it needed a more efficient method of troubleshooting at the NOC to keep up with its growing operations and gain greater visibility into and control of its expanding global networks. To address these challenges, BT recently completed initial pilot testing of SatManage in monitoring and analyzing its customer network data. BT found that SatManage had powerful interfacing capabilities — able to provide an end-to-end view of a network by integrating data from a variety of different systems in a single, easy-to-read display.

Thanks to SatManage's advanced data mining and reporting capabilities, BT was able to identify and resolve network issues more rapidly by examining service outage patterns that helped determine the root cause. Further, BT will increase its profitability through the new system by improving NOC efficiency, increasing SLA compliance and offering a customized Web portal to customers as a value-added service. The provider plans to track over 200 customer sites using SatManage, allowing it to grow its customer networks effectively now that its NOC has a highly effective and efficient tool to support core operations.

Profitable Growth

The opportunity to capture new customers and generate additional revenue has never been greater for satellite service providers. As operators build-out their networks to meet end-user demands, supporting bandwidth-rich applications on land, at sea and in the air across the globe, they need to be able to handle growing operations confidently and efficiently. SatManage can improve efficiency at the NOC so service providers can keep customers satisfied and stay focused on issues that are more central to their overall business-like growing profitably.

About the author

Guy Adams is iDirect's Vice President, Software Engineering. During his tenure he has overseen the development of a satellite network management system that is now used in many of the world's largest and most prestigious organizations within various industry sectors such as Maritime, Oil & Gas and Telecoms. His software's ground-breaking data correlation, visual displays and trouble ticketing automation form the basis of SatManage, a comprehensive satellite network management suite for the integration and automation of Network Operation Centers. This system won the prestigious British Computer Society Technology Award in 2005. In 2004, Mr. Adams was named the UK's Network Professional of the Year.

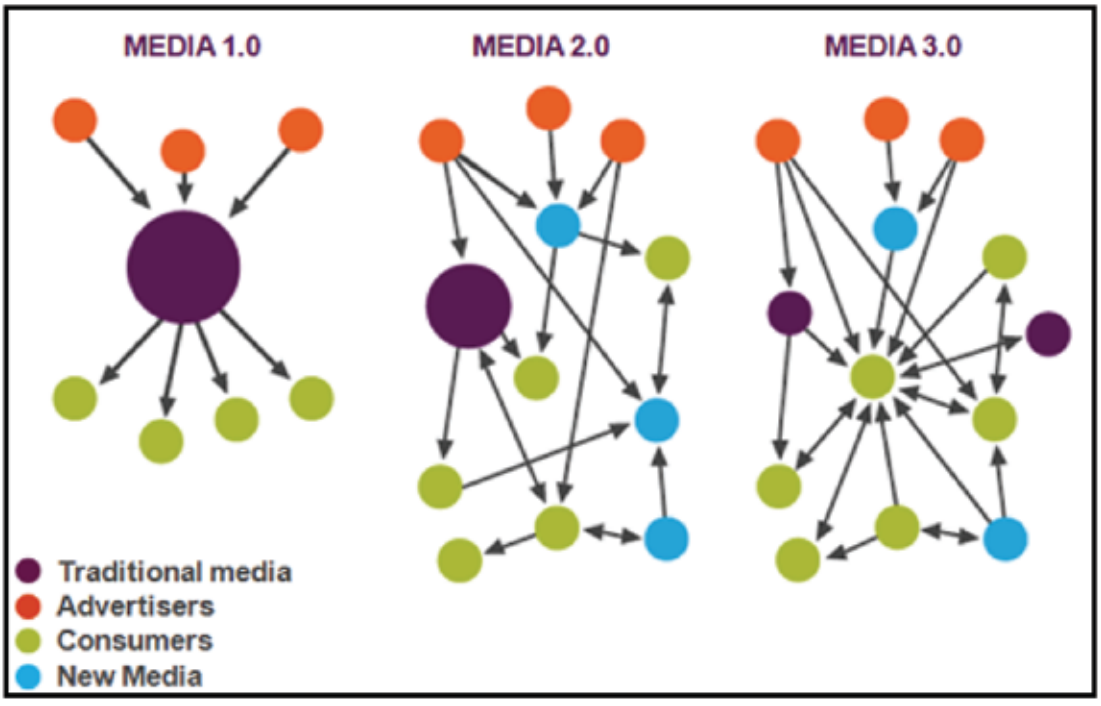
Entertainment At Your Command

author: Adam Nightingale, Regional Director, EMEA, Irdeto

Today, satellite broadcasters are contending with a vastly diverse and complex set of media devices and distribution options. This new and dynamic environment, called Media 3.0, demands access, reach, and the flexibility to publish premium content and establish brand equity on any consumer device.

In making the move from traditional satellite broadcasting to ***Media 3.0***, even the largest of companies know one thing for certain: consumers can not get enough quality content. The success of a content platform is determined by the quality and diversity of content, the ease with which content can be found and the range of end devices on which the content can be viewed.

Can satellite broadcasters make the transition to ***Media 3.0*** and contend with cable and IPTV competitors? One only has to look at **Viasat**, the largest commercial-free and pay TV provider in Scandinavia and the Baltic region to know that the answer to that qustion is **yes**. With its free and pay TV platforms and channels attracting a total of 125 million viewers in 31 countries, Viasat content has huge reach and a large opportunity. By working closely with **Irdeto**, a global leader in securing and delivering premium content and digital assets, Viasat offers a case study of how satellite broadcasters can successfully deliver compelling content to consumers in a Media 3.0 world.



Adapting To Consumer Habit Shifts

Increasing demand for premium live and on-demand content for consumption on devices other than the TV meant that Viasat needed to work quickly to develop a compelling on-demand service. The need to reinforce brand equity and make it easy for consumers to find a wide range of premium content in one place was a need that Viasat was ready to address.

In line with changing consumer demand, as well as high broadband speeds and adoption across Scandinavia, Viasat wanted to offer free, pay and subscription-based video on demand (VOD) services to new as well as existing customers. This would enhance and future-proof its successful linear channels by taking the business' digital media strategy to the next phase of its evolution. Viasat needed a solution that allowed it to very quickly launch new services on more destination devices: the solution needed to maximize usage, establish brand equity across those new devices and grow strong, sustainable revenues for Viasat's VOD and live content offerings.

Entertainment At Your Command

To stay ahead of the game and remain attractive to consumers, Viasat developed its "***Entertainment at Your Command***" strategy to deliver content across any device at any time. A key component is to deliver live content and VOD services to PCs, Macs, and mobile devices over the open Internet.

To deliver its VOD project, Viasat turned to Irdeto's content management products to enable rapid management and publication of rich media content to consumer

digital platforms. Viasat needed a solution that would simplify, and as much as possible, automate much of the management and delivery of content. Irdeto's products and services allow Viasat to manage not only its own content but also the aggregation of content from third party providers. The complex process of managing content from many sources in a centralized system is vastly simplified, thus generating operational efficiencies as well as incremental revenues.

To appeal to a wider range of consumers, Viasat and Irdeto have also made Viasat content available on mobile handsets. As a result, consumers of Viasat's VOD and TV-on-Demand services are now able to access premium content, including popular sports broadcasts, on the move.

Battling Digital Piracy

High broadband speeds and penetration in Scandinavia, as well as a hunger for premium content, means it has, in the past, been simple for end users to access illegal, pirated content. This poses a threat to any commercial broadcaster's subscription and advertising revenues as it diverts attention and spending away from the TV.

To ensure the success of its VOD offering, Viasat needed to ensure its content was protected by stringent content protection and digital rights management. To meet this need, Irdeto's media protection handles the encoding and encryption of content, offering a host of comprehensive capabilities including limiting device transfers, license revocation, and limited time spans for playback. In addition, content rights usage is enforced with defined geographic controls, release windows, multi-device and entitlement management, and end-user authentication and authorization.

A Multi-language, Multi-currency Approach

As Viasat's ***OnDemand*** offering is available across different European countries, it is essential the service is offered in a variety of different languages and priced in local currencies. Working with Irdeto, Viasat has ensured that language and currency settings are applied correctly to each region, ensuring content is published with the correct subtitles and menus. Additionally, local parental ratings are applied where appropriate to ensure that the cultural and regulatory requirements of multiple regions are met.

The Future Of Satellite Broadcasting

Today, Viasat's OnDemand PC service is available across Denmark, Sweden, Norway, and Finland. It provides consumers with a one-stop shop for all content as well as a choice of pay, subscription and free services. Not only does it provide Viasat's own content, including channels such as ***TV3*** and ***TV1000***, it aggregates content from third party players and other on demand services such as ***SVT Play***, the on-demand service of Sweden's national broadcaster.

The opportunities for traditional linear TV operators — whether they are using satellite, cable or terrestrial distribution — are huge. Broadcasters need to open up new revenue streams by offering unique and compelling services to existing and target customers and by providing new distribution opportunities for content owners. As well as attracting consumers, high quality content offered on new outlets will also attract advertisers and their revenues.

About the author

Adam Nightingale, Regional Director at Irdeto, heads up the company's Digital Media Solutions (DMS) business across Europe, Middle East and Africa. Adam is a global expert in pay media and broadcasting and works closely with pay TV platform operators and other rights owners and holders to create on-demand and live content services that simplify and automate the management of entire content workflows, from creation through security, monetization and publication to multiple consumer devices.

Additional information available at...

www.irdeto.com

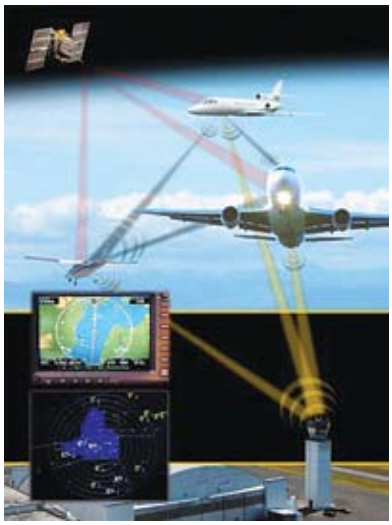
Space Technology Is Making Commercial Aviation Faster, Safer, and Greener

If you want to make air traffic management more efficient, more reliable, and more environmentally sound, look up. That's the conclusion of the latest white paper from the Space Foundation, Solutions from Space: Faster, Safer, Greener Commercial Aviation, which details how space technology is dramatically improving air traffic management.

According to the paper, the advanced positioning, navigation, and timing capabilities offered by satellite systems can:

- ***Reduce air traffic congestion***
- ***Lower fuel consumption***
- ***Reduce noise pollution***
- ***Lessen environmental impact***
- ***Provide clearer, more accurate, real-time understanding of where aircraft are within the airspace — even in remote areas***
- ***Prevent on-the-ground collisions and near-misses***
- ***Reduce weather-related risks and delays***

And, because these improvements are satellite-based rather than cockpit-based, they can be extended to a much broader class of aircraft, including small private airplanes that do not have sophisticated monitoring equipment, and unmanned aerial vehicles (UAVs) that do not have pilots onboard.



ADS-B System

"As the economy improves, we can expect air travel — and air traffic — to rebound and then to grow," said Space Foundation Vice President — Research and Analysis, Washington Operations, *Marty Hauser*. "We have an extraordinary opportunity to use space technology to make the global air industry better as well as bigger. And, now is the perfect time to make that happen."

Aviation focuses on the ***Nexgen Air Transportation System*** being developed by the *Federal Aviation Administration* (**FAA**), **NASA**, the **Department of Defense**, other government agencies, and industry partners.

The cornerstone of ***NextGen***, which is being introduced throughout the U.S. over the next decade, is a satellite-based technology named ***Automatic Dependent Surveillance-Broadcast*** (**ADS-B**) that:

- ***Is always on, requiring no operator intervention (Automatic)***
- ***Depends on an accurate global navigation satellite system signal or a flight management system for positional data (Dependent)***
- ***Provides radar-like surveillance services to determine aircraft position (Surveillance)***
- ***Continuously broadcasts aircraft position and other data to any properly equipped aircraft and ground station (Broadcast)***

The system uses positioning and timing signals sent from space by the **Air Force's** ***Global Positioning System*** (**GPS**) satellites, further enhanced within the U.S. by the ***Wide Area Augmentation System*** (**WAAS**), which calculates and corrects GPS errors caused by atmospheric conditions and other factors. ADS-B will give air traffic controllers unprecedented monitoring accuracy and clarity, enabling more planes to safely share airspace. The ultimate goal is to transform each control tower and aircraft into a self-aware node in a network capable of tracking all nearby nodes.

In addition, ground controllers will use NextGen's precision to move aircraft in and out of airports in a steady stream, making it possible for pilots to land in a relatively straight path, thus spending less time at inefficient cruising altitudes. This will alleviate congestion, reduce noise, and, potentially, allow the FAA to designate narrower aircraft-only corridors for direct approach routes to the airport, freeing up airspace for other uses.
The safety benefits of NextGen are many:

- ***Pilots in the air and on the ground will be able to see and avoid potential collisions with other aircraft***
- ***Air traffic controllers can safely direct more aircraft in areas with no ground-based radar installations, such as central Australia or the Gulf of Mexico***
- ***Instead of using voice communications via radio, air traffic controllers will be able to send flight path information directly to cockpit computers***
- ***Computer-aided calculations will improve routing, particularly in the busiest airports***

Drawing on experience with complex flight systems and automated navigation software, NASA is developing software assistants for the cockpit and the ground, including a system that interprets ADS-B data and flags important details for busy pilots and software that extrapolates future aircraft positions to more smoothly direct landings.

The networked nature of NextGen will improve airlines' and airports' ability to mitigate the effects of weather, one of the major causes of aviation delays. It can also assist with search and rescue efforts in the event of an accident by giving earlier and more accurate indications of problems.

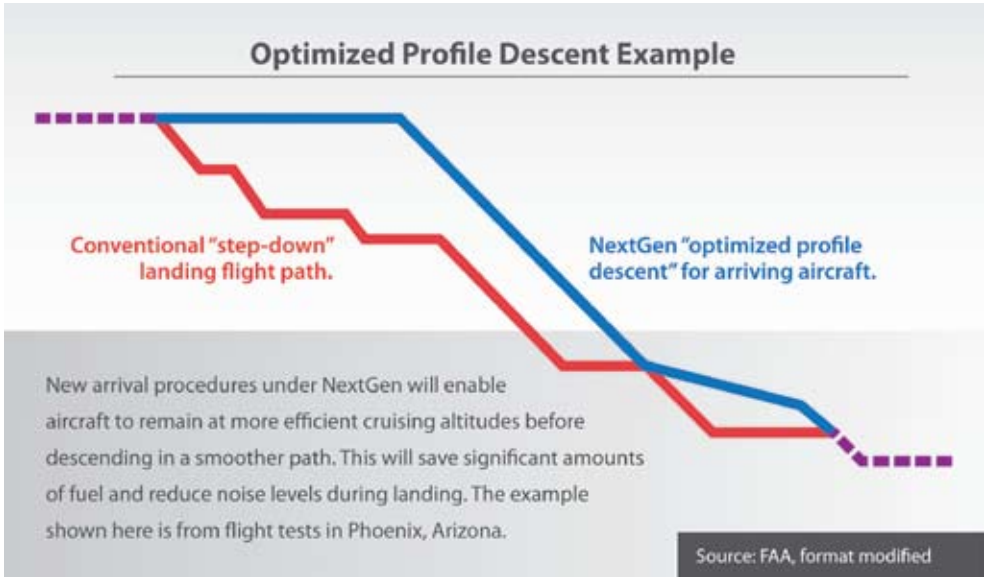
Boca Raton radio tower

Plus, NextGen can significantly reduce environmental impact by facilitating more direct routes and more efficient take-offs and landings, and by using weather satellite data to select the most efficient flying altitudes.

Initial ADS-B testing has been extremely promising and rollout to additional sites has been approved. Although the deadline is 2020 for providing situational awareness to pilots and ground controllers, airlines should be able to use the system earlier on airplanes with ADS-B equipment at any airport that has the required ground infrastructure and control systems. Major airports are at the top of the list for equipment installation, but new software applications and flight rules must be established before the information provided by ADS-B can be used to bring about improvements in air traffic management. By the end of fiscal year 2010, the FAA expects to have 340 of the 794 ADS-B ground stations installed, with the remainder scheduled for completion by 2013.

The NextGen program is an ambitious undertaking to modernize air transportation, and it will ultimately bring about improvements in the way we fly.

Aviation makes recommendations to government on how to even better use and more rapidly deploy these technologies:



- ***Accelerate ground infrastructure and software deployment so that the benefits can be experienced sooner***
- ***Set technical standards so that airlines can buy equipment with assurance that it will meet standards.***
- ***Establish NextGen traffic control procedures as early as possible so that airlines can begin to realize a return on their investments***
- ***Cooperate internationally on environmental legislation that affects the aviation industry***
- ***Structure regulations so that airplanes traveling from one country to another do not incur multiple costs under multiple systems***
- ***Use advanced capabilities offered by space technology to better track distances traveled and time spent in the air; offer incentives for airlines that operate on more efficient flight trajectories***
- ***Use funds from environmental fees paid by the aviation industry to speed deployment of energy-saving systems such as NextGen and to support other research on environmentally friendly aviation technology***
- ***Set standards for UAVs operating in domestic airspace to include basic transponders that would show up on the NextGen displays for both traffic controllers and pilots***

Aviation also makes recommendations for industry, including:

- ***Install or update equipment and procedures for satellite-based tracking and communication on all long-haul aircraft so that search and rescue teams know the precise location of an aircraft in distress***
- ***Prioritize investment in NextGen equipment for aircraft flying into airports that are the most congested or most likely to receive noise complaints***
- ***Enhance the passenger travel experience with satellite-based in-flight entertainment systems.***

To read ***Solutions from Space: Faster, Safer, Greener Commercial Aviation*** or to download a copy, go to www.SpaceFoundation.org/research.

About the Space Foundation

The Space Foundation is an international, nonprofit organization and the foremost advocate for all sectors of the space industry civil, commercial, military and intelligence. Founded in 1983, the Space Foundation is a leader in space awareness activities, educational programs that bring space into the classroom, and major industry events, all in support of its mission "to advance space-related endeavors to inspire, enable, and propel humanity." The Space Foundation annually hosts the National Space Symposium, the premier gathering of the global space community, at The Broadmoor Hotel in Colorado Springs. An expert in all aspects of the global space industry, the Space Foundation publishes *The Space Report: The Authoritative Guide to Global Space Activity* and provides three indices that track daily performance of the space industry. Through its Space Certification and Space Technology Hall of Fame® programs, the Space Foundation recognizes space-based technologies and innovations that have been adapted to improve life on Earth. Headquartered in Colorado Springs, the Space Foundation conducts research and analysis and government affairs activities from its Washington, D.C., office and has field representatives in Houston, Texas, and Cape Canaveral, Fla. For more information, visit www.SpaceFoundation.org.

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SPACE FOUNDATION

photo courtesy of NASA

This Hub Experiences The Benefits Of Elevation

author: Katie Gryadunova, Pactel International Pty Ltd, Australia

Founded in 2003, Pactel International provides high-grade communications solutions for corporate and government clients throughout the Asia-Pacific region. Pactel's particular specialty is in creating reliable networks for remote sites and rural locations across Australia, Indonesia, and the Pacific Islands.

Offered applications include Internet backbone connectivity, VSAT data solutions, VOIP gateways, broadcast and streaming video solutions, international private leased line, equipment hosting as well as satellite ground system and network design. Large organizations, such as Telikom PNG in Papua New Guinea, the Australian government's Department of Foreign Affairs and Trade, the World Health Organisation, and the French overseas territories of Wallis and Futuna, have all benefited from Pactel's ability to connect far-flung communities.

As a rapidly growing organization, **Pactel** continually reviews and upgrades its technical capacity to serve a broad customer base, with the aim to deliver high quality communications solutions through the use of leading-edge technologies. The company's offerings are based on a combination of turnkey solutions for rapid implementation of projects as well as the flexibility to adapt and expand existing services to meet changing and growing market demand. As part of its growth strategy, Pactel recently completed the installation of a new DVB-S2 ACM hub in Hawaii.

The new hub allows Pactel to extend their Internet, VoIP and GSM services into Asia-Pacific, Australia and Indonesia under C-band to meet new business opportunities and increased demand in the area, which had previously been served by Ku-band. This new, fully redundant platform connects directly to Pactel International's backbone in Hawaii via Gigabit Ethernet Interfaces, which is itself in a fully redundant configuration. The new infrastructure can now provide both point-to-point and point-to-multipoint satellite links.

The very wide dispersal of the communities served by the new hub places a premium on high reliability and Pactel's choice of **Newtec** equipment reflected this priority. In addition, Pactel took advantage of Newtec's one-box solution to replace legacy infrastructure that consisted of multiple receivers, an IP hub, and legacy modem. Newtec's ***Elevation*** family of products provide modulators, demodulators, and satellite modems for the new infrastructure, with the Elevation modulator used at the teleport and the Elevation modem at the remote sites.

"Newtec is known as the market leader and is renowned for quality products in high-rate IP Trunking markets," said *Steffen Holzt*, executive director of Pactel International. "The Newtec Elevation technology gives us the ability to increase efficiency and throughput on our new platform, and to advance our abilities to deliver vital telecommunications services to our customers. The quality, reliability and performance the Newtec components were the key factors in our choice, together with Newtec's proven experience in DVB-S2 and layer 3 IP."

The Elevation family of products provides state-of-the-art technology for transmission and reception of IP streams over satellite at rates of up to 155 Mbit/s, in full compliance with the DVB-S2 standards. The Elevation modem connects directly to terrestrial IP network infrastructures via a single auto-switching Gigabit Ethernet interface and offers several hardware and software options for flexibility. Pactel's customer base and range of services encompasses a broad variety of applications, so a flexible infrastructure that will allow alterations to suit evolving customer requirements without changing the equipment is a distinct business advantage.

The Elevation series can be used in point-to-point links as well as in point-to-multipoint networks and is compatible with a wide range of encapsulation protocols: data piping, MPE, ULE and Newtec's *XPE* (**Extended Performance Encapsulation**). The Elevation modem is capable of receiving DVB-S2 Multistream and VCM signals and can optionally transmit in VCM mode.

Optimal bandwidth efficiency and ease of operation are also vital to efficient operations for any satellite services provider. Newtec's ***FlexACM*** controller option offers automatic and dynamic adaptation of the uplink modulation parameters based

Pactel's coverage map

on the link conditions at the remote site(s). Link conditions are signaled by the remote demodulator and sent back via any IP link (in-band or out-of-band). At the output of the modulator, the signal is available on as L-band , extended L-band, or IF BUC power supply — the optional 10MHz reference frequency provides a compact and cost effective solution.

The Newtec upgrade to the hub allows Pactel International to improve quality of service to its customers by extending the existing services to the Asia-Pacific, Australian, and Indonesian regions on a more advanced, cost-effective platform. Services are being rolled out island by island.

In addition to rain fade mitigation, ACM can also help overcome interference problems. Such allows Pactel to use inclined orbit satellites, where required. As the majority of Pactel's customers are based on remote islands and rural locations, reliability of service is a key requirement — whole communities often depend on it for all their phone and web-based communication with the rest of the world, as well as for entertainment services.

As the company aquires new customers, building new infrastructure is a simple matter of adding modems in the remote site and creating a new configuration file in the hub. The new technology also enables a much more efficient use of bandwidth through Newtec's optimization methods, allowing Pactel to add additional sites and reduce satellite transponder operating costs.

Every stage of a telecommunications provider's infrastructure evolution should bring increases in efficiency as well as quality of service for all existing customers as well as the possibility to reach new markets.. For Pactel, the Newtec-equipped hub in Hawaii offers fresh potential to build relationships with local telecommunications carriers, corporate networks and mining, oil and gas industries – a whole range of new customers hungry for high-quality communications services throughout the region.

SatBroadcasting™

History In The Making — Again!

There has been recorded activity on the sites of Arqiva's Teleports at Crawley Court in Hampshire and Chalfont Grove in Buckinghamshire for more than 1000 years – with both sites mentioned in the Domesday Book. But while the historic nature of the sites makes for good stories, it is what has happened over the past few years – and what will happen in the years to come – that will determine how the sites leave their mark in the history books.

Tucked away in the leafy landscapes of Hampshire and Buckinghamshire are two of the highest-technology teleport facilities the European broadcast industry has to offer. The two sites host more than 70 satellite dishes used by some of the world's highest-profile broadcasters to distribute content to a range of digital and analogue TV platforms around the world.

Medieval Beginnings

Crawley derives its name from the Saxon and means '*meadow of the crows*'. There has been a settlement on the site since the Bronze Age and in 643 land was granted to the See of Winchester. The last century has seen constant change on the site of **Crawley Court** – since the early 1970s, following complete redevelopment of the site, it has been the engineering headquarters of the *Independent Broadcasting Authority*, the UK home of the broadcast division of cable group **NTL** and, since 2005, the headquarters of **Arqiva**, which was formed when a consortium led by **Macquarie** (**MCIG**) acquired NTL Broadcast and rebranded it Arqiva. Within the 32 acre site, **Arqiva Satellite & Media** has offices and a 35-dish teleport with access to more than 40 satellites: ***Eurobird 1***, ***Astra 2A***, ***Astra 2B***, ***Astra 1M***, ***Eutelsat W2A,*** and ***Astra 4A***. In the late 1970s, IBA engineers installed the very first satellite dish at Crawley Court to investigate techniques for satellite broadcasting. Using the ***Orbital Test Satellite***, detailed propagation and performance data were obtained which paved the way for operational services.

Arqiva's Crawley Court site

Changing Consumer Demands

The Crawley Court facility has grown in recent years, largely driven by advances in consumer demand for broadcast services to deliver an increasing volume of programming to a broader range of platforms across a wider geographical region and the prospect of an all digital broadcast future. Crawley Court currently manages around 350, largely broadcast, services out of a total of more than 1,200 spread across all of Arqiva Satellite & Media's sites around the world, including **Bedford** and **London** in the UK, **Paris** in France, and **Washington** and **Los Angeles** in the United States, with customers including a broad range of local, regional and global broadcasters. There are two on-site MCRs, one dedicated to broadcast services and the other to *Occasional Use* (**OU**). Each MCR is also backed up by a bookings team to process a customer's requirements – including 24x7 bookings – and to handle customer requests, even at short notice. Crawley Court also manages a second remote teleport some 10 miles away, on the other side of Winchester, which is managed remotely. The purpose-built facility has been developed over the last ten years to provide additional flexibility and scalability.

Quality of Service

Managing this growth has been a constant challenge, both technologically and in terms of ensuring that the quality of service delivered for customers has been consistent as the company has grown. This has meant a constant review of the technology located on the site, and keeping abreast of what the equipment and services that the broadcast market will be demanding in the coming months and years. One of the major evolutions at Crawley Court has been to implement new ways to deliver customer service and fine-tune systems and processes to ensure that services are maintained. As equipment vendors — particularly compression and multiplexer manufacturers — have been developing new products on an almost continual basis, Arqiva evaluates each piece of technology to ensure a

future-proofed broadcast infrastructure that meets customers' needs and provides process and cost benefits. This is likely to be an ongoing challenge as broadcasters look to launch new 3D channels and increase their HD offerings.

Events Driven

Crawley Court has also seen significant growth in its OU business in the last couple of years, including the first ever transatlantic 3D live broadcast — an interview with **Dream Works Animation SKG** CEO *Jeffrey Katzenberg*, which was transmitted between Los Angeles and the ***International Broadcasting Convention*** in Amsterdam in September of 2008. Much of the growth in OU has been driven by an increasingly active events market as broadcasters have looked to add live event content to their programme bouquets and consumers' appetites for live sports content, including soccer and tennis, and events such as live performances from **The Metropolitan Opera** in New York. Arqiva has also played a critical role in the broadcast of some of the first 3D live events to cinemas across the UK and Europe.

Another key area under continual development is a focus on service. The broadcast industry expects availabilities in excess of 99.99 percent, and by giving direct access to the engineers who manage the Arqiva services, ensures communications are accurate and timely. This is best described as a philosophy of excellence. Based on the rate of growth [through new customer acquisition and organic] over the last few years, this strategy is successful.

Diversity

The site at **Chalfont Grove** has developed a wider range of core competencies that include broadcast television, enterprise data, and digital cinema. Activities at Chalfont Grove are focussed on helping rights owners, programme makers, and broadcasters to create and capture content, manage and deliver high quality TV around the world, as well as providing state-of-the-art communications infrastructure for enterprises, governments, the military, and public services.

Chalfont Grove derives its name from the Saxon "*Celfunte*" and is reputed to mean "*Chalk Fountain*", describing the many springs in the area and has seen life as a country residence, the home of a close friend of *Elizabeth I,* and the headquarters of a World War II Anti Aircraft Battery. In 1953 the site was purchased by the **Army Kinema Corporation**, a large organisation based in Croydon, responsible for providing the British Army with film entertainment. The site retains its military links to this day as home to both **SSVC** [*Services Sound and Vision Corporation*] and its broadcasting arm, **BFBS** [*British Forces Broadcasting Services*]. Arqiva Satellite & Media started

Arqiva's Chalfont Grove site

using the site in 2005 after the acquisition of **Inmedia**. Chalfont Grove is currently home to a 36-dish teleport that beams content to the ***Astra 2B***, ***Astra 4A*** and ***NSS806*** satellites in addition to feeding content to other Arqiva teleports for uplinking. The site provides more than 400 services, 19 major uplinks, and three studios. The facility has also recently added a new playout suite to its existing *Playout Centre* which currently transmits 46 playout services for national and international distribution. This combination of resources, all just 40 minutes from central London, has made Chalfont Grove an increasingly attractive proposition for both channels and major international broadcasters alike.

Chalfont Grove also provides a wide range of datacomms services to the oil, telecoms, and maritime industries, as well as UK and international government agencies. Service management is provided by a dedicated MCR plus a *Customer Care Centre* for the management of business TV and radio networks in the UK and Europe. A recent addition to the products delivered from Chalfont Grove is the fully managed distribution of films to UK and European cinemas via Arqiva's *Digital Cinema* distribution network. The films are presented as electronic files to Arqiva by film distributors and are beamed simultaneously to multiple cinemas, via Arqiva supplied and managed equipment at each cinema, to be viewed by the public.

Crawley Court and **Chalfont Grove** are just two examples of Arqiva sites around the world where class-leading service, innovation and connectivity are held in high esteem. A recent project to link all Arqiva Satellite & Media sites with fibre will provide even greater flexibility for the delivery of customer content.

A Case Of Terminal Innovation

author: David Geen

From its rich heritage, Skyware Global is a new and dynamic player in the SATCOM space, offering OutDoor Unit (ODU) terminal equipment for Direct-To-Home (DTH), Consumer Broadband, and Enterprise VSAT applications in new ways that begin to bridge the digital divide between those with high speed cable/fibre/dsl access — and those without such access.

With advances in the sophistication and stability of satellite technology in recent years, and the resulting reduction in the cost of delivering each megabyte, the role of satellite in the global communications infrastructure is ever more significant, not just for developing nations, but also in rural areas of the Western world where digging trenches for land lines is not economically viable for telecom incumbents.

Existing technology, however, means the high cost of current terminals is a barrier to entry for consumers and, therefore, a potential barrier to the roll out of broadband networks on satellite platforms. The hardware is expensive and the total cost of ownership, including the cost of installation, is too high.

David McCourt

With the formation of Skyware Global, telecommunications visionary *David C. McCourt* is playing his part in advancing the satellite evolution through the provision of next generation ODU terminal equipment that satisfies the future requirements of system providers around the world. The bringing together of both antenna and electronics technologies under one umbrella, together with a commitment to company innovation through R&D investment, means Skyware Global is in a unique position to provide low cost communications terminals that enable high speed Internet connectivity via satellite everywhere — independent of telephone and cable availability —thereby ensuring satellite takes its rightful place at the global telecoms table.

To exploit the cost effective bandwidth becoming available on nexgen satellites, Skyware Global is now developing a range of terminals for operation at Ka-band (20/30GHz). Having the capability to adopt a holistic approach, and by developing a complete integrated terminal where the antenna and electronics are designed as one rather than as discrete components, ensures a compact, high performance and overall low cost package. This is made possible by building on extensive technology experience, solutions, and components used in mass-manufactured, low-cost, satellite receivers. This knowledge is then applied to new high frequency solutions and integrating them with innovative, low-cost antenna designs that are simple to install. In this way, the total cost can be greatly reduced and the barrier to entry for consumers can be eliminated — this opens the way for satellite to bridge the digital divide.

System providers continue to request assistance in the continuing battle to reduce costs. The traditional focus of trying to reduce discrete piece-part costs is no longer sufficient to satisfy the business case for upcoming networks. Through its approach, Skyware Global is in a position to meet such a challenge with effective solutions that reduce the total cost of ownership for all its customers.

Product Bundling

With a broad product portfolio and ability to offer electronics and antennas as bundled packages to its customers, Skyware Global can boast of both cost and performance advantages. By offering complete ODU solutions, Skyware Global products can reduce time, cost, and potential errors in the field. Pre-assembling and testing of components in a controlled environment can be considerably more efficient than assembling disparate components on site. Plus, a single shipping location assures that all needed parts arrive together.

Product Where You Need It

Antennas, by their very nature, are often large and bulky — the antenna design does not obey Moore's law (which states, as applied to electronics equipment, component size will halve

every 18 months.) This means there is a continual need for suppliers to seek practical ways to have product available where and when their customers need it.

i. Stocking/distributors — Skyware Global maintains a worldwide network of distributors who mirror Skyware Global's own commitment to quality and service. Skyware Global distributors are carefully selected to ensure that they operate according to the highest standards and offer value-added services to our customers. These distributors provide additional stocking options in other regions such as Africa, Middle East, Australia, and Russia.

ii. Manufacturing locations — Skyware Global, with manufacturing facilities in North America, Europe, and Asia is able to provide product cost effectively where the need arises.

iii. Product support — In addition to extensive support functions in the US and UK, Skyware Global have recently launched their Asian Division — a division which will provide technical support and consultancy for the company's products and services. This represents another step to ensure that the potential of satellite communications can be fully exploited around the world.

Overall Cost Of Ownership

Often, the emphasis is on the need to reduce the piece-part price to satisfy the buyers in a particular organisation. However, there is increasing recognition that dialog between the buyers, engineers and logistics teams on both sides can quickly lead to the conclusion that greater savings can be obtained by examining the bigger picture. Skyware Global recognises this and consequently digs deeper into its customer's logistics chains in an effort to find ways to deliver its product more effectively.

Product Line

The extensive range of Skyware Global products include consumer broadband equipment providing connectivity to customers for Internet access, complete VSAT Outdoor Units (antennas, electronics, and installation mounts) for virtual private networks and rural telecommunications, and DTH antennas and electronics for home satellite television entertainment systems.

Skyware Global offers breakthrough designs in the development of VSAT electronics. Their Ku-band transceiver products combine the LNB, BUC, OMT and TRF into a single, lightweight, water-tight housing. With a simple click of a switch, these transceivers are compatible with multiple receive frequencies. A switchable frequency PLL LNB built into the housing eliminates the need to stock a variety LNBs in multiple frequencies. In addition, these electronics are compatible with all known L-band interface modems. Custom adapters provided with each transceiver allow the transceiver to attach to any antenna system. SG also offers a full line of DTH electronics as well as Ku- BUC and LNB products.

2.84 cm ODU

The company specializes in turn-key and OEM design of high volume, DTH ODU's, tailored for any requirement. These DTH outdoor unit solutions include antennas, electronics, and installation mounts for multi-satellite and multi-band (Ku- and Ka- frequencies) applications to be used in the reception of satellite television and broadcast data. Also offered is a complete line of receive-transmit VSAT antennas and receive-only commercial quality antennas, in sizes from 42cm to 2.4 meters. These antennas are available with a variety of C- and Ku-band feed configurations Type approved models are available for **Intelsat**, **Eutelsat**, **AsiaSat** and many other international satellite platforms. Installation accessories include non-penetrating roof mounts, wall-roof mounts, king-post mounts, feed accessories, electronics and anti-icing.

Skyware Global is also driving innovation in the satellite broadband terminal equipment market, offering high quality antenna systems for transmission and reception of satellite signals in the emerging Ka-band. Sizes range from 66 to 98cm. Their specialized, custom designs have helped some of the largest companies in satellite broadband grow their service offering with the highest quality, cost-effective solutions.

In addition to hardware, Skyware Global provides solutions-based services such as turn-key design, engineering, product integration, and program management as well as a variety of value-added services such as RF testing, fulfillment, and logistics.

Additional information is available at
http://www.skywareglobal.com

(continued from Page 20 — Focus: Dr. Lavers

Figure 2 (left): Virtually untouched rain forest 2002 — Figure 3 (right): 2008 © GeoEye Foundation.

As can be seen significant changes in the imagery are visible due to intensive development of the Panchpatmali mine moving further North East to extract more bauxite (aluminium ore) along the geological fault of the valley.

It would appear that Vedanta's claims of using this site as a template for a model ecologically sound and landscaped open cast mine in a sensitive tribal area needs further close scrutiny and inspection. It is hoped that the transparency afforded by satellite imagery will assist Survival International to represent the impact of mining on vulnerable tribal communities to a global audience with great effect.

Reference

Porta Farm, Zimbabwe GeoEye Foundation Case Study — http://geoeye.mediaroom.com/index.php?s=57&item=57

About the author

Christopher Ralph Lavers, Ph.D., is a Subject Matter Expert in Radar and Telecommunications, Plymouth University, at Britannia Royal Naval College. He is a lecturer in Sensors and Remote Sensing. His research interests include the use of high resolution satellite imagery for human rights and Earth resource applications.

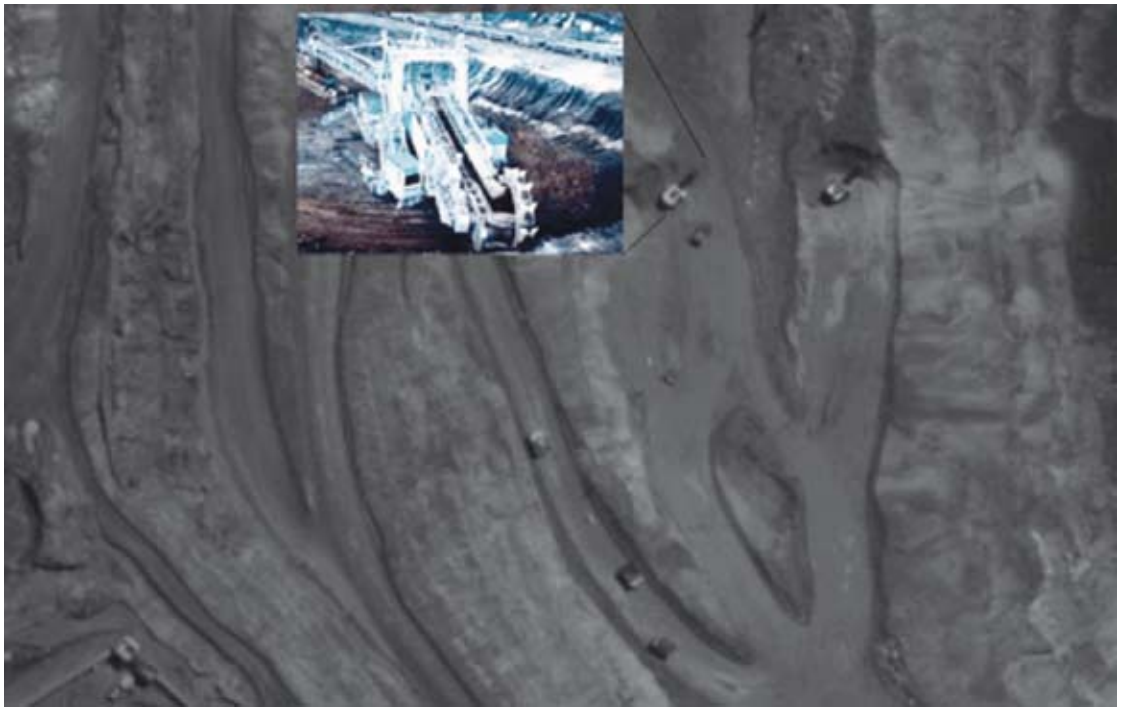

Figure 4: Satellite imagery differentiates crawlers from trucks © GeoEye Foundation.

(continued from P70—SIS Live)

One heckuva cold uPod — more info at http://www.sislive.tv/products-upod.php

The whole service & support provided by SIS LIVE & Intelsat gave us so much confidence. A job that at times seemed almost impossible was achieved with relative ease, what could have been a nightmare turned into an adventure and it could not have been done with out the SIS LIVE uPod.

On a couple of occasions we were able to uplink a traditional broadcast within moments of getting the requests, due to a large part by our dedicated spectrum with Intelsat, but also thanks to our ability to deploy rapidly even when shore power wasn't present.

As an example, with CTV Olympic host broadcaster Brian Williams, we were able to capture his Torch Run and within an hour CTV had his run and used the footage more than they anticipated because of the rapid turnaround.

An job of Olympic proporations well done!

(continued from P94 — SES WORLD SKIES)

The Future Is Bright

Africa seems poised for dramatic DTH growth in Nigeria and Kenya and even further inland in places like Angola. And SES WORLD SKIES has firm plans to add capacity to the region, in preparation for premium HD expansions, as well as broadband demand in developed countries and basic internet connectivity in less developed areas.

"With expertise in delivering both media and enterprise solutions, we are meeting the needs of a broad range of customers," explained *Baravalle*. "We can help DTH players like Pathfinder's Infinity platform get to HD quickly and reliably, enable telcos like Wananchi to add compelling programming bouquets to triple-play bundles, and connect the unconnected communities virtually anywhere on the continent," he added.

Like Africa, there is a real hunger for good, localized and regionalized content just about everywhere. SES WORLD SKIES satellites are overcoming barriers to feed the appetite. In Thailand, for example, where government regulators aren't granting licenses, SES WORLD SKIES is enabling Free-To-Air (FTA) success and the export of Thai content.

"We just signed an agreement in Thailand to deliver a full transponder of Thai channels throughout the U.S. It was our regional and global success, reputation and credibility that sealed the deal," said *Zaccack*, who credits the empowerment of his team with the operator's regional media growth — now at a 50/50 split with its strong data business.

"SES WORLD SKIES has 350 people who support more than 500 customers in more than 100 countries," said *Sprague*. "We're able to do that because we have a very talented team of people who are united, empowered and accountable at the local, regional and global level to get the job done."

"Regardless of our goal — whether it's helping DTH thrive in Brazil or enabling a household name programmer in America to build its brand and 3DTV strategy, we have the people, the know-how, the satellites and the reach to make it happen," *Sprague* added. "That's what sets us apart and absolutely makes SES WORLD SKIES the right choice for our customers."

More information available at the company's website: http://www.ses-worldskies.com/

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- Automatic 5/10 MHz internal/external reference selection with a 0.1 Hz nominal bandwidth clean-up loop
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FEATURES:

- Front panel, RS485/RS422 and Ethernet remote control (Telnet, SNMP, and embedded web server)
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- Firmware updates through Ethernet port
- Off line output
- Switch position indicators
- Time and date stamped activity log
- 2.92 mm connectors above 18.4 GHz
- CE Mark

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