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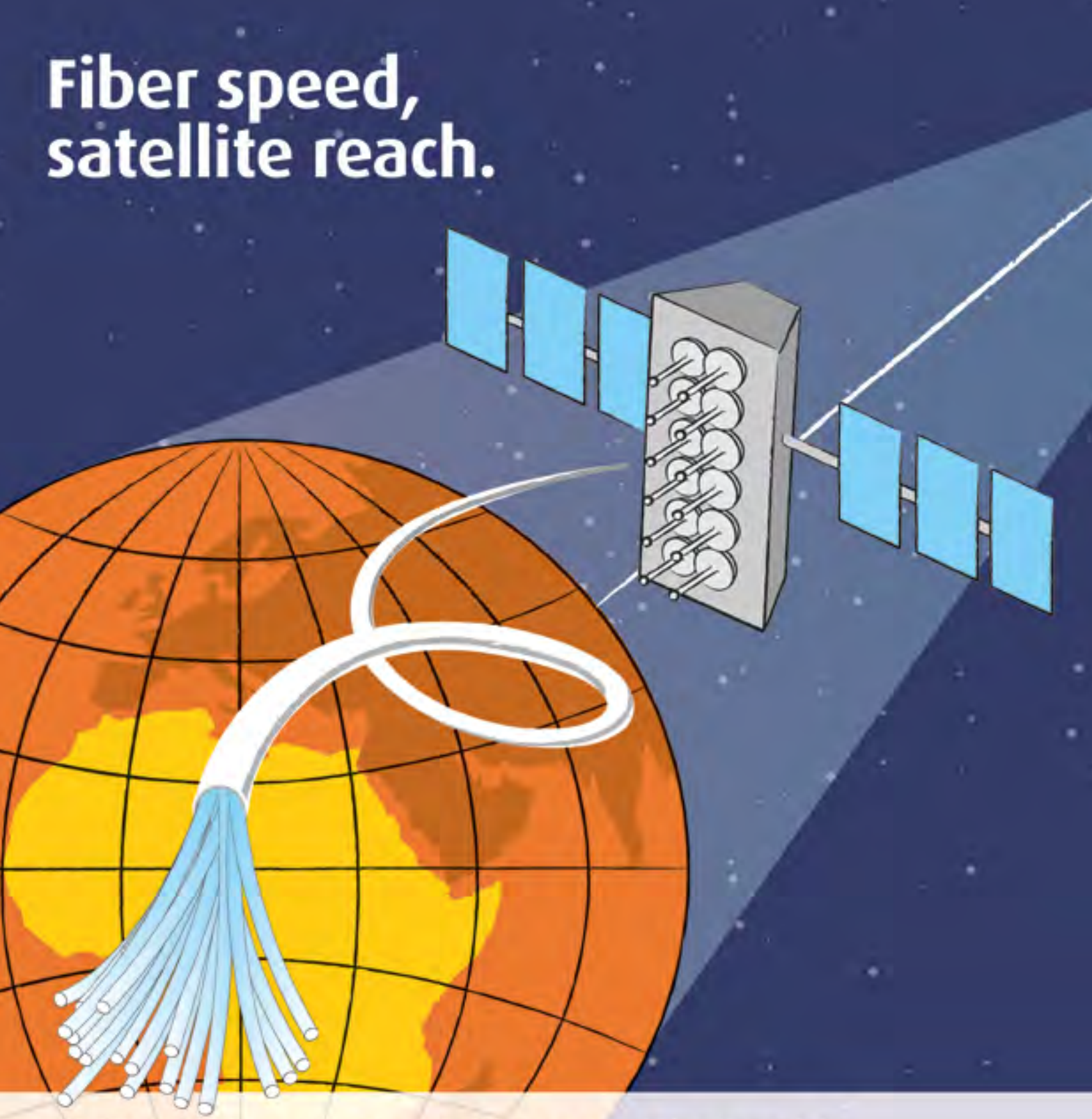

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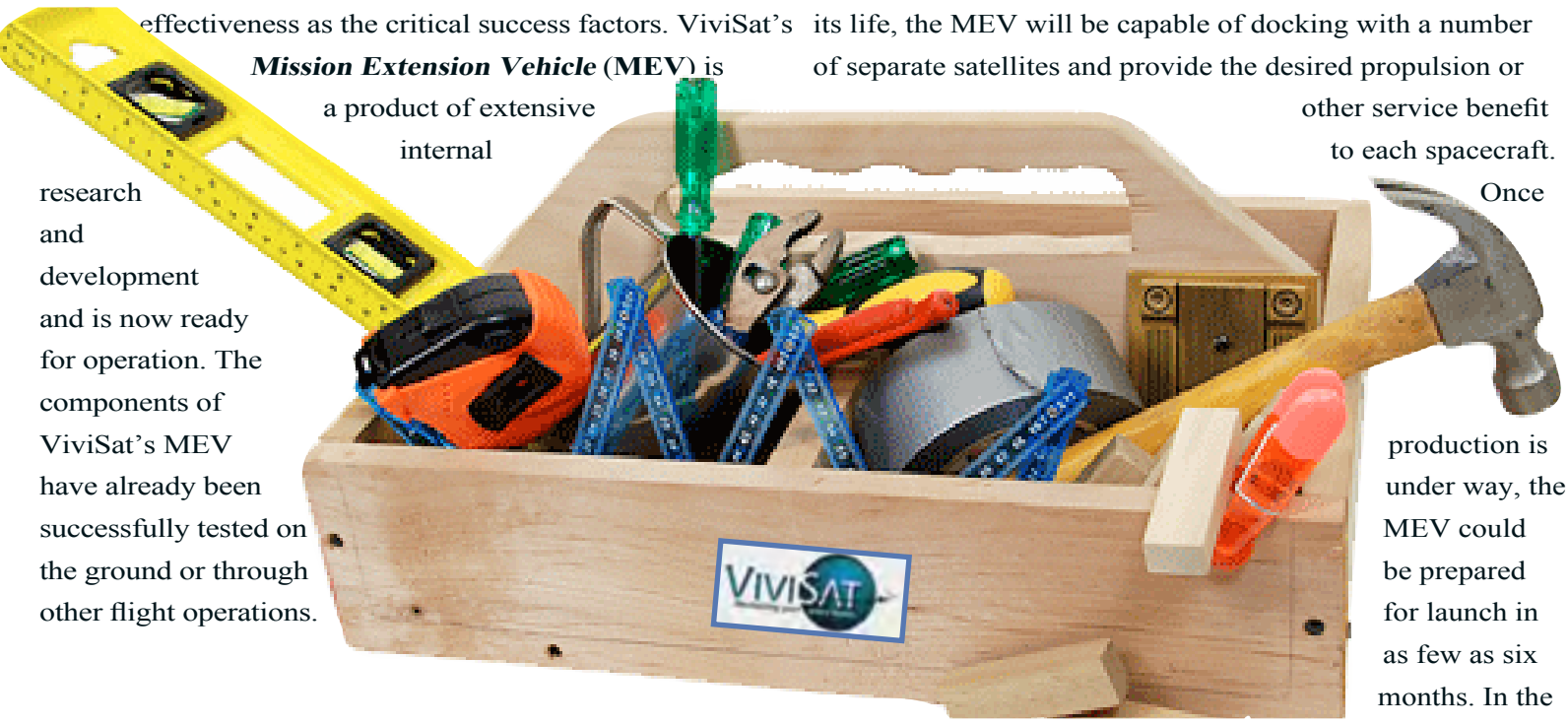
New Life For Old Satellites — A Compelling Industry Need Is Now Addressed...

By Major General, USAF (Ret.) Craig P. Weston, CEO, U.S. Space and ViviSat
and
Tom Wilson, ViviSat Board Member and Vice President and General Manager of ATK Spacecraft Systems and Service

Finding a way to extend the life of satellites that have exhausted their fuel, strayed off orbit or lost position has been an industry quest for decades. Earlier efforts have gotten close, but were ultimately determined to be unworkable for economic or other reasons.

ATK Space Systems and **US Space LLC** joined forces to solve this problem more than a year ago, and those efforts resulted in the formation of **ViviSat**. A U.S. Space/ATK joint venture, ViviSat provides satellite operators with flexible, scalable, capital-efficient and low-risk operations protection services as well as in-orbit mission extension that can add years to the revenue producing life of a satellite. ATK's long satellite heritage and exceptional performance record in the satellite industry combined with the deeply experienced management team of U.S. Space make the ViviSat venture one that is competent, agile, and capable.

To guide the development plan for this service, the Company focused on simplicity, a proven technology, and cost effectiveness as the critical success factors. ViviSat's ***Mission Extension Vehicle*** **(MEV)** is a product of extensive internal research and development and is now ready for operation. The components of ViviSat's MEV have already been successfully tested on the ground or through other flight operations.



The driver behind the ViviSat service is the MEV capable of docking with an existing satellite and providing...

- *Additional propulsion services to extend its viability*
- *Rescuing a satellite that is in an improper orbit*
- *Boosting a satellite at the end of its life to safe harbor*

Unlike other potential solutions, the ViviSat model does not interfere with any current satellite tasking. ViviSat is simple, low risk, and unique.

How Does It Do What It Does

The MEV docks with the client satellite and provides propulsion for that satellite, much like a satellite "jet pack" — without significant interruption to the host satellite. During its life, the MEV will be capable of docking with a number of separate satellites and provide the desired propulsion or other service benefit to each spacecraft. Once production is under way, the MEV could be prepared for launch in as few as six months. In the

future, the vision sees the MEVs on-orbit, able to service a satellite directly in a short timeframe and be readily available for a crisis response mission.

Due to the simplicity of the MEV docking system and its compatibility with existing space assets, the ViviSat solution has a highly favorable risk profile. ViviSat has two capabilities for docking with the host spacecraft — ViviSat's standard version that is compatible with most nozzles and interface rings, and an alternate version that can connect to other satellites. ViviSat can service most satellites in geosynchronous orbit.

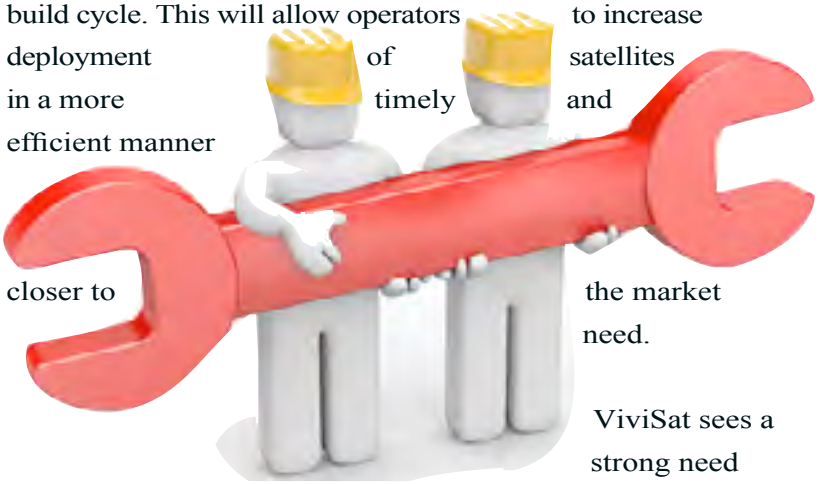
This service is an advance of game-changing proportions in the operation of geosynchronous satellites. However, is the satellite market ready for this service? We believe so — ViviSat was built to meet a significant market need. Before designing the service, there were many conversations with commercial and government satellite operators. Great detail was offered regarding their opportunities, goals and challenges, and the ViviSat MEV was then designed to meet such needs. The interest in ViviSat's ability to improve the customer's performance, cash flow, and return from existing space assets is substantial.

The Timing Is Correct

The challenging economic conditions in which the industry operates today are similar to those that have historically given rise to determining new ways of doing things. Lean times are great for innovators.

To make greatest use of the ViviSat MEV service, it will be ingrained in an organization's business planning process. An operator, instead of budgeting for satellites up to six years in advance of the end of life, can budget for a low cost MEV backup, freeing up most of the significant investment capital tied to an artificially extended satellite

build cycle. This will allow operators to increase deployment of satellites in a more timely and efficient manner



closer to the market need.

ViviSat sees a strong need of the MEV for U.S. Government missions, as well. There are numerous costly civil government satellite missions nearing end of life for which ViviSat's MEV could play a valuable life extension role. ViviSat anticipates few, if any, technical hurdles to connect with these U.S. Government satellites. Close engagement with government customers throughout the entire process will be practiced to ensure safe operations with national assets.

As the U.S. Government tightens its belt, and commercial operators continue to search for better ways to add value to their to their companies and shareholders, ViviSat provides a new avenue upon which to service satellites and assist both sectors in delivering the capabilities they are committed to perform. The value proposition changes the way satellite operators and other stakeholders deploy their assets, build their business models, and evaluate risk.

The ViviSat services fits satellite operator needs as all work to manage costs. Potential customers see this product as extending the life of their satellites — this service will offer more life and more profitability for their space assets, improve performance, return on investment, and cash flow from existing assets.

Bringing new life to existing space assets has long been a challenge for the satellite industry. The ViviSat model meets the challenge head-on with innovative solutions to extend the length of satellite missions, drive asset value, and protect franchises in ways that, before, have never been offered. ViviSat is proud to be the first U.S. company to offer these services that will activate new markets and provide new opportunities for satellite operators around the world.

About the authors

Craig P. Weston is President, Chief Executive Officer and Board Member of U.S. Space LLC; President and CEO of ViviSat; and President, CEO and Member of the Management Committee of U.S. Space Mobile Communications. Before joining U.S. Space in April 2009, Weston was a Vice President and Deputy Director of a business unit of SRA International, a $1.5 billion information technology and services company based in Fairfax, Virginia. A retired Air Force Major General, Weston spent a large part of his career developing, launching and operating communications, infra-red warning and reconnaissance satellites. His last assignment in the space arena was as the Chief Information Officer and Director of Research for the National Reconnaissance Office. In the command and control arena he oversaw production of the Boeing 707 JSTARs ground surveillance fleet, major upgrades to the Boeing 707 AWACS airborne surveillance fleet and the Cheyenne Mountain nuclear command center, and fielding of the Air Operations Center used in the air campaigns in the Afghanistan and Iraq conflicts.

Tom Wilson is Vice President and General Manager of Spacecraft Systems and Services (SSS) for ATK Aerospace Systems, at Alliant Techsystems Inc. (ATK), a premier aerospace and defense company with operations in 24 states, Puerto Rico, and internationally with revenues of approximately $4.8 billion. As General Manager of SSS, Tom is responsible for leading all aspects of a $140M/yr business with a team of over 560 employees in California, Maryland and Virginia. Previously, Tom served as the Vice President of Strategy, Business Development and Advanced Systems for ATK Space Systems Group. He was responsible for managing and coordinating all activities at ATK Space Systems involving corporate business and acquisition strategy, business development, and aligning ATK's capabilities/ synergies to customer requirements, the development of program management and business enterprise processes at Swales Aerospace.

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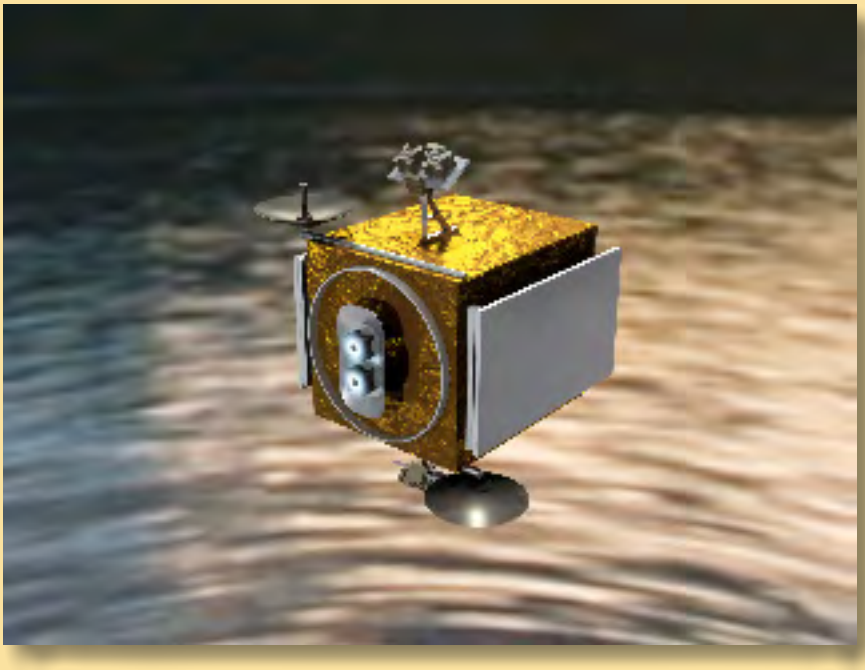
The Technology of ViviSat

by Dr. Dany Harel, CTO

The technologies that enable the MEV to perform the different stages of its critical mission:

- ◊ *Travel through space and arrive to a designated orbital location*
- ◊ *Close proximity operations, rendezvous, with another orbiting object*
- ◊ *Capture and perform the planned combined activities*
- ◊ *Decouple and relocate to another orbital position*



were demonstrated on multiple occasions through numerous government projects. Some of the recent, well published and known projects include **International Space Station** resupply, the ***Hubble*** servicing missions, and the ***Orbital Express*** demonstration mission. The above listed demonstration missions were all *Low Earth Orbit* (**LEO**) missions. Performing the same tasks at the *Geosynchronous Earth Orbit* (**GEO**) simplifies the operations and reduces the mission risk. At GEO the vehicle is always in the operator's field of view and the communications link is always maintained. In addition, the available lighting is stable and continuous.

All of the associated technologies, methods and algorithms, are well established and available in multiple forms and multiple sources. The challenge is not a technical development challenge as much as a challenge to down select the right elements and create a vehicle that can succeed commercially. Some of the critical decisions that affect the commercial success include:

- ◊ *Mission objectives*
- ◊ *Platform*
- ◊ *Propulsion type: chemical, electrical, hybrid*
- ◊ *Launch mechanism*
- ◊ *Commercial approach*

To address mission life requirements, communications satellites have built-in redundancies of critical units (transmitters, receivers, on-board computers, attitude sensors, and such). Historical data indicate that most of the satellites that reached their intended orbit and survived the initial two to three years of operations ("infant mortality") will be retired due to fuel depletion, with most of their original equipment still operating within specification.

Not all of the in-orbit satellites are good candidates and targeted by the ***MEV***. The initial MEV mission design objective is to extend the fuel life of most of the available in-orbit satellites and extend the mission life of satellites that experienced certain Attitude subsystem anomalies without any invasive operation on the serviced satellite.

In its current configuration, the MEV can extend the mission life of satellites (EOL activity) and salvage satellites stranded at the wrong orbit due to launch

failure (BOL activity). Planned enhancements will enable the MEV to address and resolve other possible in-orbit anomalies associated with *Power subsystems* (solar arrays and batteries), *Antenna Subsystems*, *Guidance*, *Navigation & Control* (GN&C) subsystems.

The only connection between the MEV and the serviced satellite is the mechanical interface created at the end of the Rendezvous and Capture operation. Reducing the requirements to a simple, non-invasive mechanical interface enables the MEV to service satellites from different manufacturers, which posses different attitude, power, and propulsion subsystems as well as to significantly reduce the mission risk.

In contrast, other proposed approaches require — post the rendezvous and capturing process — invasive actions/steps and risky complex robotic arm movement inside the serviced satellite to enable actual fuel transfer.

The simple technical approach designed into the MEV makes it a universal, very useful vehicle to be incorporated and used as a standard tool for effective, long term satellite fleet planning.

About the author

Dany J. Harel joined U.S. Space as Chief Technology Officer when the company was formed in January 2009, and holds the same position with ViviSat, the satellite life extension business that is a partnership between U.S. Space and ATK.. Dany has been responsible for all technical aspects of the dedicated space solutions U.S. Space offers to the governments of the U.S. and its allies and to commercial enterprises worldwide. Working with spacecraft manufacturers and launch vehicle providers, Dr. Harel has established satellite system designs that meet the specific needs of customers for improved flexibility, cost-effectiveness and deployment speed.

Prior to joining U.S. Space in January 2009, Dr. Harel was with SES Americom and its predecessor companies from 1980 to 2008, where he was involved in every technical aspect of its satellite fleet. When SES-Engineering was created in 2007, he, as Senior Vice President Space – Infrastructure, was responsible for all of the SES group space assets from satellite design and specification, program management of manufacturers and launch service providers, launch and in-orbit test activities.

As Senior Vice President and Chief Scientist, his last position at SES, Dr. Harel was responsible for all activities associated with SES Mergers and Acquisitions in relation to the Space segment and for activities associated with hosted payloads opportunities for Government, Science, Technology Development and Experimentation. He acted as the chief investigator and expert in the advancement of technological designs. In 1980, he joined RCA American Communications, a predecessor company to SES Americom. In 1975, he joined Bell Laboratories where he worked on the development of advanced Packet Switching data communications networks.

Euroconsult Studies Space Markets

Euroconsult recently announced the findings of their just-published report, *Government Space Markets, World Prospects to 2020.* According to the report, government spending on space hit a number of major milestones in recent years, including a historic peak in combined government spending of $71.5 billion in 2010. However, after 10 years of spending increases across the globe, this trend is about to come to a halt. According to Euroconsult, public space program financing will slow dramatically in the next five years due to several factors.

"Government investments in many space applications are cyclical, particularly when related to the procurement of operational systems," said *Steve Bochinger*, President of **Euroconsult North America**. "Defense procurement, which has driven budget growth for a decade — particularly in the United States — is a typical example. Furthermore, following stimulus funding allocated to space projects to support national economies and innovation, most governments have returned to more stringent budget spending. This has already resulted in cutting non-priority budget items and, potentially, space programs."

Civil Programs Support Investments In Space Applications

According to the Euroconsult report, overall growth in civil program expenditures will be sustained — albeit at more moderate growth rates — thanks to a growing commitment from a wider range of countries and agencies. Leading programs such as those in the United States, Europe, and Japan, are expected to see continuing budget pressure. In Russia and countries reaching 'space maturity' (*e.g.*, China and India), space expenditures will continue to grow, though more modestly than in the past.

Defense space programs are expected to be influenced by military agency procurement cycles as well as the completion of most programs currently under development, especially in the United States. Developing initiatives in other countries (such as Australia, Canada, and emerging countries) are expected to open the door to other commercial opportunities for the commercial space industry, the Euroconsult report indicates.

A total of 692 satellites will be launched by governments in the coming decade, up 43 percent from the previous decade. This is a direct reflection of the increasing number of new space-capable countries across the globe. Civil agencies will launch roughly 75 percent of these satellites, a significant increase compared to the last decade during which they accounted for 67 percent of all government satellites launched.

Spending Trends In Key Applications

Applications that drove overall spending increases in 2010 included manned spaceflight, SATCOM, and Earth observation. Government spending on space security, satellite navigation (SatNav), science and exploration, and access to space declined. According to Euroconsult, in the coming five to 10 years, a number of important trends will emerge or continue that will have a major impact on overall government space spending.

- **SatCom grew by 49 percent in 2010 to reach $8.4 billion fuelled, primarily by defense spending. Spending should, however, return to historical levels in the short term.**
- **Manned spaceflight spending totaled $11.6 billion in 2010, but the current transition of the American program should lead to decreasing investment in the future.**

- **Earth observation reached $8 billion and spending will continue to be driven by defense, climate change and the growing participation of emerging space nations in Earth observation, with spending likely to exceed the $9.5 billion mark by 2015.**
- **Science and exploration budgets totaled $5.6 billion in 2010. After a period of decreasing investment, budget growth should resume in the coming years, especially in the United States.**
- **Access to space (launch capability) investments reached $4.6 billion in 2010, and should be sustained in the coming years as more governments see independent access to space as a top priority of their space programs.**
- **SatNav spending totaled $2.9 billion, a 22 percent drop due to the end of the European Space Agency's financing of Galileo. Growth should resume in the short term with deployment of several new domestic systems.**
- **Space security budgets fell to $1.7 billion, a 47 percent decrease, which is linked to program challenges and cancellations in the United States. Governments are expected to support funding in this area to adapt to a wide variety of threats to protect their space assets and capabilities.**

The Euroconsult report details of developments on government expenditures on an application-by-application basis, including in-depth analysis on each of these applications.

Budget Pressures To Encourage Partnerships

With governments across the world adopting strict spending policies, the space sector will experience a new era of cooperation as governments strive to make their programs as efficient as possible in order to compensate for budget limitations. According to Euroconsult, these constraints will lead to enhanced cooperation with the private sector and more multilateral government projects. Areas of cooperation will likely favor innovation in programs, financing and management.

"We have seen a trend towards partnerships and innovative schemes for financing and risk sharing with the private sector," said *Bochinger*. "European countries have pioneered these innovative schemes in the late 1990s because they were facing tough budget constraints. Whether it be public-private partnerships, Private Finance Initiatives, hosted payloads, COTS or service agreements, more governments across the world are looking for extended cooperation with the private sector. Countries are also expected to undertake an increasing number of international cooperation projects in an effort to reduce costs. This is applicable not only to space science and exploration projects but also for satellite applications including defense and security."

About the report

Government Space Markets, World Prospects to 2020, is an exhaustive assessment of all the applications important to government space programs. The report provides accurate insight into government agencies looking to benchmark and initiate partnerships and serves as an indispensable planning tool for companies looking for government space business. It offers exclusive data, forecasts, and analysis for all major space applications including Satcom, Earth observation, Satnav, space science, manned spaceflight, access to space, and space security. Each application is analyzed in detail, including priorities and objectives, current trends in civil and defense programs and future trends in government spending and satellites to be launched. The comprehensive overview pulls all that information together to assess consolidated trends and identifies budget trends and leading agencies in terms of investment in a given application.

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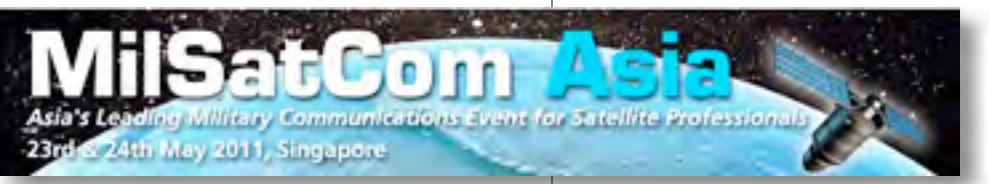
SMi is delighted to invite all to attend the launch of their inaugural MilSatCom Asia 2011 conference and exhibition, which runs from May 23rd through the 24th at the Merchant Court Hotel in Singapore. This is the largest gathering of high level government, military and industry MilSatCom experts in Asia Pacific.



Following in the footsteps of **SM**i's flagship event and Europe's largest military satellite conference and exhibition, ***Global MilSatCom***, ***MilSatCom Asia*** will attract regional and international SATCOM experts to a highly regarded niche conference unique to Asia. This show will be the ideal place to keep up-to-date with issues affecting the MilSatCom industry across Asia. The exceptional speaker line-up includes:

- **Jonathan Hung, President, Singapore Space and Technology Association**
- **Major General (Dr) Siva Kumar, Chief Executive Officer, National Spatial Data Infrastructure, Department of Science and Technology, India**
- **Atsuo Suzuki, Director Defence Policy Planning, Head of Space Policy, Ministry of Defence, Japan**
- **Brigadier General John W. "Jay" Raymond, Vice Commander, 5th Air Force and Deputy Commander 13th Air Force, Yakota Air Base, Japan, United States Air Force**
- **Professor Chau Van Minh, President, Vietnam Academy of Science and Technology**
- **Lieutenant Colonel James Dryburgh, JS01 CIS (J6), New Zealand Defence Force**
- **Dr. Mohammed N Murbarek Alahbabi, Information Communication (ICT) Advisor, United Arab Emirates Air Force**
- **Captain Michael Rothewell, Director, Satellite Communications Capability HMAS HARMAN DNOC-1C 12 CIOG, Department of Defence Australia Group**
- **Captain Praphon Vibisukh, Director of Space Affairs, Department of Defence Technology and Space, Ministry of Defence Thailand**
- **Bhaskar Burman, Additional Director, O/O Scientific Advisor to Chief Naval Staff, Defence Research and Development Organisation, India**
- **Commander Andy Raynor, S01 Core Networks, Cap CC&11, Ministry of Defence UK**

Attendees will hear timely case studies from key regional and international SATCOM experts on their latest national SATCOM programs and initiatives. Issues will be discussed that range from national requirements, to technological challenges and emerging technologies. The opportunity will be present to network with major MilSatCom players from across Asia and the rest of the world to help establish future strategies.

There is also a half day post-conference interactive workshop on the May 25, 2011, that will be led by Cobham Technical Services and will focus on *Why Ka-band? — advantages and disadvantages of Ka-Band and Mobile Satellite Systems*

Additional information:
http://www.smi-online.co.uk/events/overview.asp?is=1&ref=3640

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- Data usage: breakdown by type, demand by sector, forecasts
- Applications: drivers & risks
- Data demand: 10-year regional forecasts
- Current launches & forecasts through 2019

Mobile Satellite Communications Markets Survey

Prospects to 2018

- Strategic issues & forecasts
- Operators & value chain
- Applications & markets
- Market segments: Maritime, Land, Aeronautical

Earth Observation: Defense & Security

World Prospects to 2019

- Strategic issues & forecasts
- Supply-side analysis (manufacturing & data)
- Data demand & procurement analysis

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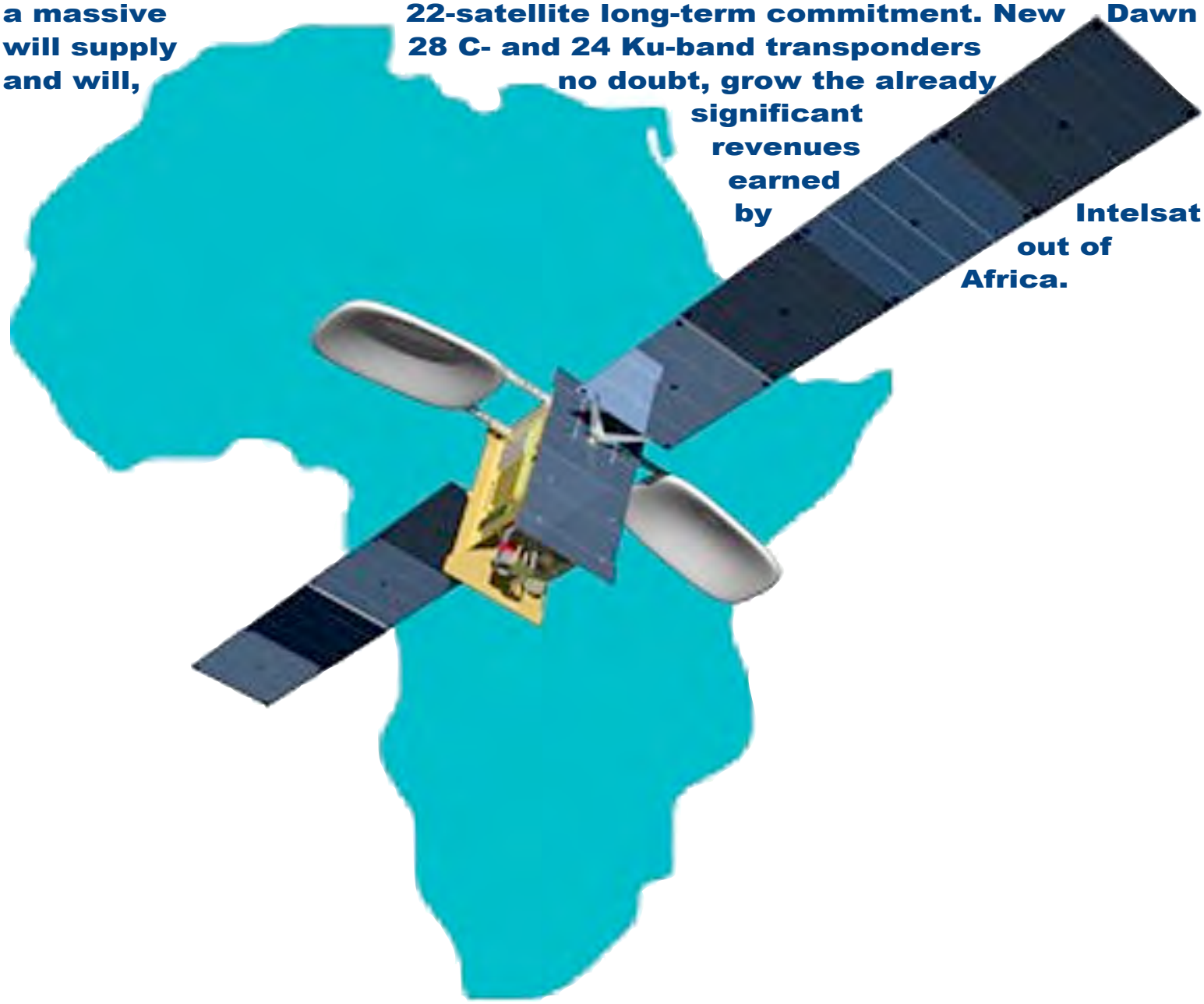
Forrester's Focus

European Pay Radio — Getting Ready!

By Chris Forrester, Editorial Director, Broadgate Publications

***Jean-Phillipe Gillet*, Intelsat's regional VP for Europe/Middle East, is sitting in a most comfortable position. It seems just about all of the satellites under his influence are mostly sold, with many of the transponders pre-sold in the shape of upcoming satellites. At the end of March (probably on March 29-30), a new satellite is scheduled to join Intelsat's portfolio in the shape of 'New Dawn', a clever addition in that the craft is owned by a consortium led by Convergence Partners and Intelsat. New Dawn will slot in at 32.8 degrees East, and slap in the middle of Intelsat's huge African coverage zone that now comprises a massive 22-satellite long-term commitment. New Dawn will supply 28 C- and 24 Ku-band transponders and will, no doubt, grow the already significant revenues earned by Intelsat out of Africa.**



Indeed, ***Intelsat New Dawn*** is just the latest example of creative thinking by the satellite operator, although in this case, the satellite is about 90 percent funded from African sources (15 percent equity, and 85 percent debt). **Intelsat** has provided 74.9 percent of the equity funding, while **Convergence** supplied 25.1 percent. The debt funding has come from a consortium of African banks, including **Nedbank** and the **African Development Bank**.

Intelsat has other assorted business relationships active, notably with **Telenor** (at 1 degree West), Japan's **JSAT** (at 85 degrees East, 74 and 127 degrees West, at 72 degrees East) with the **Australian Defence Force**, and now ***New Dawn*** at 32.8 degrees East. They differ one from each other, but all demonstrate the willingness to be flexible in how it builds relationships, and its market.

Telenor Satellite Broadcasting's links with Intelsat remain as strong as ever. *Gillet* explained, "Telenor and Intelsat share the 1 degree West orbital slot. We each have rights to certain frequencies, but it is also fair to say that we help one another a lot, leasing capacity from each other. At the moment, the position is enjoying great success supplying DTH over Europe. Telenor also has Occasional Use customers, and maritime clients including a common client for us both in the shape of Marlink Vizada."

A few weeks ago, Telenor confirmed its order for ***Thor 7***, their latest beast at 1 degree West and scheduled to be on station towards the end of 2013 — as well as expanding Ku-band capacity for their existing DTH clients, this satellite will also permit Telenor to strengthen its maritime service proposition to the North Sea, Baltic Sea and the Mediterranean.

I asked *Gillet* if this plan posed a threat to Intelsat's own communication clients. "We already provide services for most of the major players in the maritime sector. From our standpoint, we are already planning on our next-generation satellite with a bunch of wide beam Ku-band frequencies that will also be focusing on the maritime market. These footprints will start being available from 2012-13 and we believe this capacity will help our customers grow their

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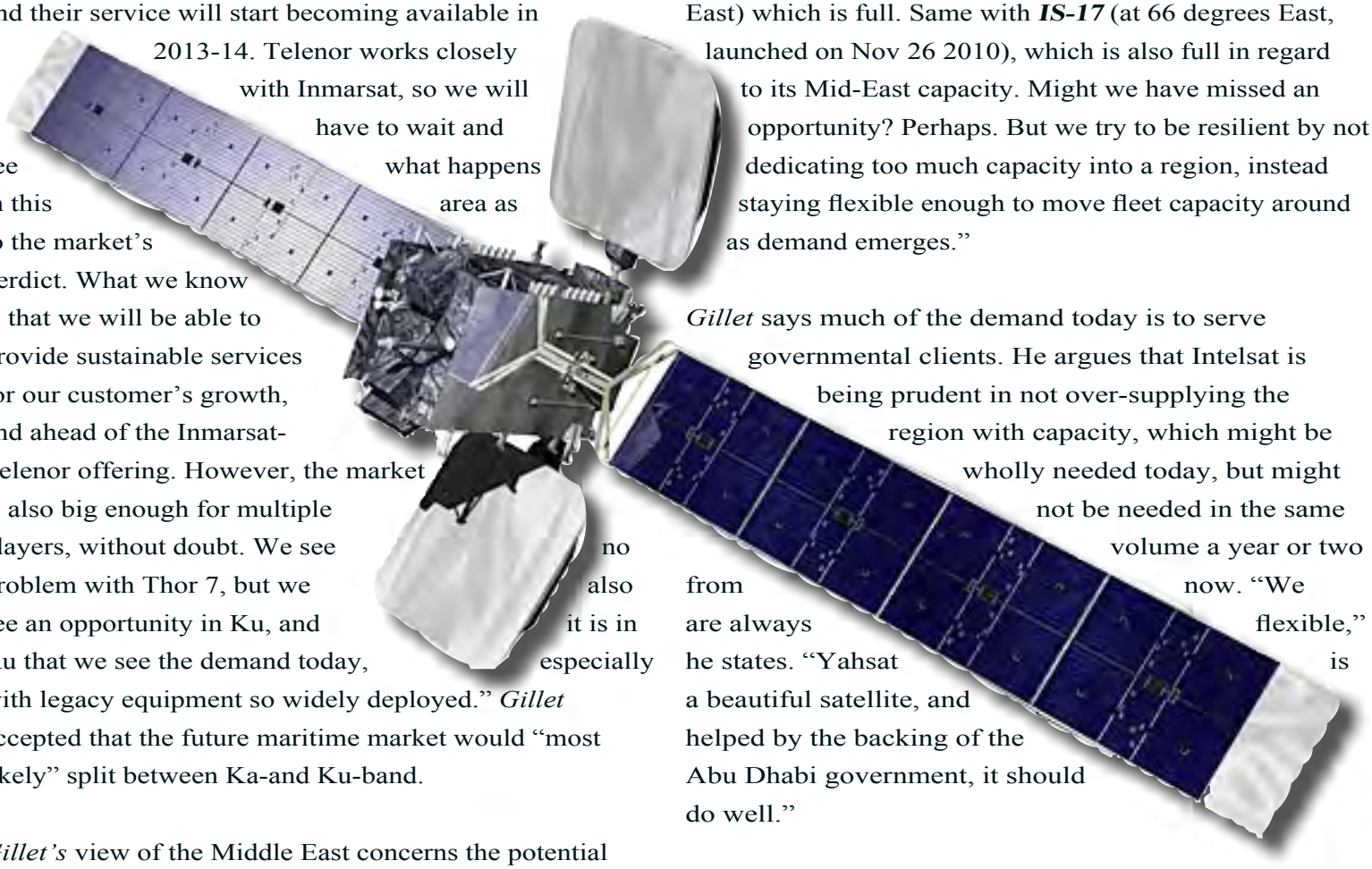
businesses and serve a growing demand. What's clear is that Inmarsat is taking another route, into Ka-band, and their service will start becoming available in 2013-14. Telenor works closely with Inmarsat, so we will have to wait and see what happens in this area as to the market's verdict. What we know is that we will be able to provide sustainable services for our customer's growth, and ahead of the Inmarsat-Telenor offering. However, the market is also big enough for multiple players, without doubt. We see no problem with Thor 7, but we also see an opportunity in Ku, and it is in Ku that we see the demand today, especially with legacy equipment so widely deployed." *Gillet* accepted that the future maritime market would "most likely" split between Ka-and Ku-band.



Gillet's view of the Middle East concerns the potential growth, not only out of the region, but for clients in Europe and the Americas, which are themselves looking to access the Middle East (and North Africa). Discussing **Yahsat**, Gillet said, "We have added a great deal of new capacity to the Middle East, mostly by relocating existing assets to the region. In the last year or two, we moved two satellites, and both these are full as far as the Middle East is concerned. This is our current policy, and we are not announcing brand new satellites. But this doesn't mean we have no plans. We have launched ***IS-15*** (to 85 degrees East) which is full. Same with ***IS-17*** (at 66 degrees East, launched on Nov 26 2010), which is also full in regard to its Mid-East capacity. Might we have missed an opportunity? Perhaps. But we try to be resilient by not dedicating too much capacity into a region, instead staying flexible enough to move fleet capacity around as demand emerges."

Gillet says much of the demand today is to serve governmental clients. He argues that Intelsat is being prudent in not over-supplying the region with capacity, which might be wholly needed today, but might not be needed in the same volume a year or two from now. "We are always flexible," he states. "Yahsat is a beautiful satellite, and helped by the backing of the Abu Dhabi government, it should do well."

"It is always tough to enter a new market where you have no share. The Eastern European market is far from mature, and is very different from, say, the German, French or British market"

Intelsat is, at best, cautious on Ka-band. "Intelsat believes that Ka-band and other frequency-reuse designs can efficiently deliver valued applications to customers in specific regions of the world. In our view, the greater opportunities lie in regions with less fiber and terrestrial wireless penetration, as opposed to a region such as Western Europe."

As far as ***New Dawn*** was concerned, Gillet said this provided a new route for its African customers and was good for Intelsat to be seen partnering with a local African company. "We like to have as many transponders pre-sold on any new satellite, and New Dawn is mostly pre-sold, thanks to the role already played by ***G-11*** (on station at 33 degrees East for more than two years)."

As to these new 'hot spots,' *Gillet* has just visited Russia and CabSat at Dubai and said, in his view, the number of new transponders coming into the two regions were high. Nevertheless, customers seemed extremely optimistic as to future market prospects. "A year ago, they were very much more cautious, but are much more bullish today."

He admitted that, by and large, Intelsat was not in the forefront of DTH delivery in the Middle East, so was not entirely reaping the benefits of the shift to HDTV. "We are busy distributing programming out from the region to the rest of the world. Yahsat is going to also enter this market, already dominated by Nilesat and Arabsat, and with Eutelsat and Noorsat also active, and Yahsat will add to the overall complexity within the market."

However, Intelsat does have solid DTH contracts over Europe, especially Eastern Europe and Russia. "We are busy and growing from 1 degree West, and we are highly opportunistic in some video markets.

For example, with Vivacom over Bulgaria and using IS-12 at 45 degrees East, we have a very nice customer who is building a strong video neighborhood. It is the same at 1 degree West, again with another extremely strong video neighbourhood, thanks to clients such as UPC and various U.S. broadcasters."

Gillet admits that Central and Eastern Europe has grown to become highly competitive DTH regions, where just about every satellite operator is pitching its best prices and service to match. He says two elements influence transponder rental prices — the competition aspect as well as the business model of the potential client.

Intelsat's 2011-12 launch manifest

New Dawn	*Late March—2011*	*33 degrees East*
Intelsat 18	*Mid-2011*	*180 degrees East*
Intelsat 20	*Mid-2012*	*68.5 degrees East*
Intelsat 21	*Spring-2012*	*58 degrees West*
Intelsat 22	*Mid-2012*	*72 degrees East*
Intelsat 23	*Autumn-2011*	*53 degrees West*

"While the telcos are increasingly looking to launch DTH services, the prospect of a 'western' ARPU level of $60 or so is not realistic. They are looking for a more sensible single digit monthly revenue. Vivacom's basic bundle, for example is just 5 euros. It is much the same in Romania, where a highly competitive environment means revenues are also around that 5 euros mark. We cannot expect clients to pay us millions a year per transponder. When they start increasing their ARPU, and when consolidation takes place, then our customers will be in a better position to make meaningful revenues. We have to be patient. We have to take the long-term view. Our approach is different from our competitors.

"For example, our 1 degree West slot is a key neighborhood position for Eastern Europe. But if you are one of our competitors wanting to get into this market, then you might well have to negotiate a deal which is [perhaps expensive] to gain access to that market. We don't need to do that. We always look at the realities in the market and price accordingly, taking account of the competitive position."

Of course, Intelsat is far more than a point-to-point (or even multipoint) operator. It has a sophisticated global fibre network that increasingly drills down closer and closer to a market's users. *Gillet* explained that almost every market has gone through much the same development cycle.

"Look at the Latin American market of a few years ago, where, initially, fibre was expensive then becomes cheaper and becomes more attractive for users. This second phase, (that is the demand for local communications) increases. Different types of clients, with different applications, and a growing demand for satellite — and fibre. Today the demand in some Latino countries for communications services is huge. What we see in those countries where fibre has just landed is that IP trunking between Europe and Africa is actually decreasing, while VSAT demand is not decreasing at all. We see many of our customers installing hubs in Africa, and this is new, and expensive. What we know for sure is that demand for connectivity with a region is increasing, and will be the driver for us to add new satellites for our customers."

Intelsat's continuous process is — like any major operator — to look at opportunities, at current demand, and at growth rates, and, subject to the usual fiscal rules, order up a new satellite. As *Gillet* admits, "sometimes it is hard to keep track and remember quite how many satellites we have under procurement at any one time. I think today's count is eight or nine! We are very opportunistic, even buying satellites [like ***ProtoStar 1***, in January 2010]. We are certainly not ignoring new opportunities. The challenge for us is to quickly adjust to respond to the market. The market is growing. We have just launched [Nov 26, 2010, to 66 degrees East] IS-17 serving Russia. Today, it is full, and we'd love to find extra capacity for that position."

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 including cable, satellite and digital terrestrial TV as well as cellular and 3G mobile. Indeed, 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.

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Executive Spotlight

Leslie Klein, President + CEO, C-COM Satellite Systems

Leslie Klein is also the co-founder of C-COM Satellite Systems Inc., which was founded in 1997 with the intent of designing and developing a system capable of delivering high speed Internet over satellite into vehicles and transportable structures. With the rapidly growing demand for Internet services world wide, and with no technology available to make it transportable, C-COM designed, developed, manufactured and sells its proprietary *iNetVu Mobile Satellite Antenna Systems* which make it possible to deliver high speed Internet services, voice over IP and video over satellite into locations where no terrestrial infrastructure exists.

Leslie Klein is an Electrical (Professional) Engineer with MBA and PhD degrees. Dr. Klein was employed by such notable corporations as Hewlett Packard (NYSE: HPQ), IBM (NYSE: IBM), Control Data Corporation, and Bell Northern Research (part of Nortel Networks). He has been involved in the high-technology business over the past 35 years and has been a founder of a number of successful computer companies.

Houston Fire Department sports a C-COM iNet Vu antenna

SatMagazine (SM)

Dr. Klein, would you please take us through C-COM's history and how the company has performed over years?

Leslie Klein

C-COM was established in 1997 and became a publicly traded company on the Toronto Venture Exchange in 2001 (symbol TSX: CMI). The company has since had 27 consecutive profitable quarters, remains debt free, and is one of the leading providers of auto-pointing satellite antenna systems around the world. The company has an extensive distribution network on all continents and over 3000 installed systems from areas like Northern Canada and Siberia to the deserts of Saudi Arabia and Australia.

SM

What are the mainstream products of C-COM and what applications are they used for?

Leslie Klein

C-COM manufactures the iNetVu mobile antenna systems which range in size from 66cm to 1.8M and offer Ka, Ku and C-Band coverage. We also manufacture auto-pointing flyaway and vehicle-mount antenna systems along with one of the most advanced controllers in the world, which are used to control the robotic iNetVu VSAT platforms. The iNetVu antenna systems are used in many vertical markets such as Oil and Gas Exploration, Emergency Management, Police, Military, Fire Fighting, Telemedicine, Emergency back-up, Cellular Backhaul, Wi-Fi Delivery, Mobile Banking, Mobile Post Office and many others.

SM

Did the global economic downturn impact C-COM?

Leslie Klein

C-COM has been growing organically over the last 13 years and has never had a bad year. Even during the economic

The iNetVu mobile antenna system is working well and helping to support SATCOM in disaster-torn Japan. From Telemann Communications' President Yoshiya Kato in Japan, the message to C-COM's Dr. Klein is... "Your system working very fine."

downturn we performed very well, growing in the double digits. Our products are in great demand globally; we are not reliant on one particular market segment or region. Opportunities come our way from all around the world.

SM

You have had a busy 2010, what are your plans for 2011?

Leslie Klein

2011 is expected to be a banner year for C-COM, based on some initial orders and potential requests for equipment. We will have new products also released during the first half of the year which are expected to provide us with new customers and revenue streams. I can tell you that our existing customers are eagerly awaiting the release of our new products.

SM

What are your expectations from the launch of these products?

Leslie Klein

The new generation vehicle-mount antenna and the airline checkable system will fill another niche market we have been filling for the past 13 years as we are confident that they will deliver great price/performance and innovation. C-COM continues to hope to break a new barrier for delivering affordable high performance portable VSAT terminals.

SM

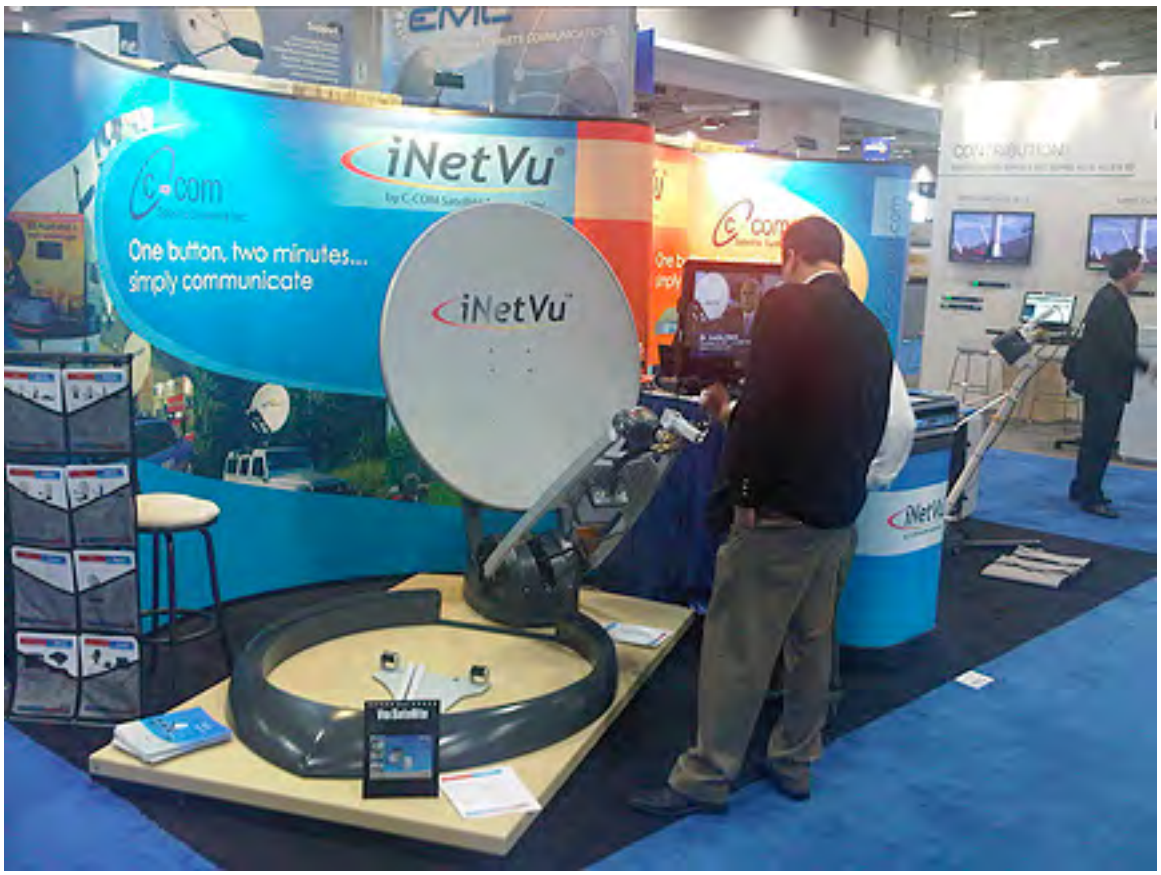
How is the new iNetVu vehicle-mount antenna system better than the previous generation of antenna systems?

Leslie Klein

The vehicle-based second-generation antenna systems are a complete redesign of the existing iNetVu workhorses that have proven to be extremely reliable and durable. The new design incorporates many of the features of the first generation product for reliability and durability; improvements will be noted in accuracy and modularity which will conversely allow us to manufacture the units more efficiently. Our nexgen 1200 uses the latest available technology which dramatically improves pointing accuracy, allowing users to operate in Ka band, along with the traditional Ku- and C-bands.

SM

What are the key features of the new iNetVu Airline-checkable system and what are its markets?



iNet Vu on display at a trade exhibition at the C-COM booth

Leslie Klein

Our 1.2m airline checkable flyaway system will deliver new price performance benchmarks to the industry and uses advanced materials that will allow us to manufacture the units in large quantities at very competitive prices. The units will use segmented carbon reflectors and will incorporate new design features making them very precise, light weight and easy to assemble without the need of any tools.

Pacific Telecommunications Council

Pacific Telecommunications Council (PTC) is an international community of members from more than 60 nations, with the common vision of promoting the development and use of telecommunications and ICT to enhance the lives of people living in the Pacific hemisphere.

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CONFERENCE

PTC'11 Conference Figures

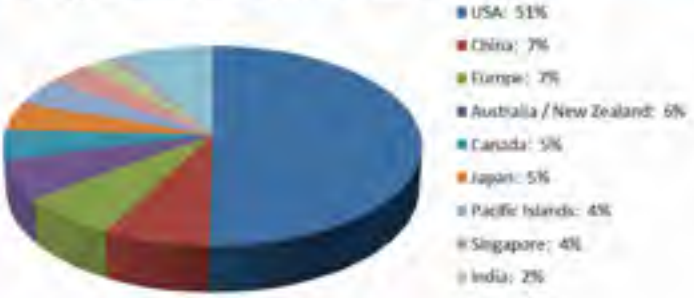
Category	Number
Registered Attendees	1,479
Speakers	201
Sessions	53
Conference Sponsors	39

PTC'11 Attracted Senior Executives

Note: C-Suite category includes Chairman, President, CEO, COO, CFO, CTO & CIO

60 Countries and Territories Represented at PTC'11

Percentage represents attendees at PTC'11 from each country



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The MidEast At The Forefront Of A $7.5 Billion Industry

The plethora of opportunities for private and public sector investors throughout the region that exist in the commercial space and satellite industry will be examined during the third annual Global Space & Satellite Forum (GSSF), in Abu Dhabi on 9-11 May.

With many aspects of commercial space and satellite services continuing to take giant strides forward, it is highly appropriate that ***Abu Dhabi*** should be hosting one of the leading international space and satellite conferences. Having just arrived in French Guiana, **Yahsat**'s ***Y1A*** satellite, which is due to be launched in the coming weeks, highlights the crucial investment role that Abu Dhabi and the wider Middle East is playing.

Indeed, those involved in space tourism are looking towards the Middle East for further funding. "Virgin Galactic and Bigelow Aerospace have already set up investment deals with UAE groups and perhaps it's only a matter of time before we see another international space company's development being funded from the Middle

Original poster artwork is available for purchase directly at http://www.deviantart.com/print/102920/?

East," said *Nick Webb*, Director, **Streamline Marketing Group**, organizers of ***GSSF 2011***.

At the moment, the cost of a return ticket to outer space for the first flights stands between $95,000 and $200,000, depending on the flight provider — these prices will fall as capacity increases. Some experts estimate that the typical price to fly into space by 2030 will be around $25,000. "Even if we take a conservative estimate of the market size to be around 250,000 to 300,000 people travelling into space by 2030, we're looking at an industry worth up to $7.5 billion," added *Webb*.

One US-based company that is making great strides in development is **XCOR Aerospace,** which will be presenting an update of its commercial space flight vehicle 'The *Lynx*' and the opportunities that exist for investors to become involved.

With ***Lynx*** commercial operations starting in 2012 and production deliveries starting later the following year, XCOR has already signed two Memorandums of Understanding (MOUs) for the 'wet lease' of Lynx vehicles, representing more than $50 million of back orders. The first two customers are **Yecheon Astro Space Centre** of South Korea and Netherlands-based Space **Experience Curacao** (**SXC**). The Curacao agreement will see SXC market and XCOR operate, suborbital space tourism and scientific research flights out of **Space Port Curacao** in the *Netherlands Antilles*. Furthermore, in an exciting development, **KLM Royal Dutch Airlines** has signed on to co-market SXC flights and include them in their frequent flyer program.

XCOR anticipates commercial flights in the U.S. to start in late 2012, with production Lynx vehicles flying internationally by 2014. XCOR's COO, *Andrew Nelson,* said that the company continues to develop and produce safe, reliable and reusable rocket powered vehicles, propulsion systems, advanced non-flammable composites and other enabling technologies.

"We're building the Lynx, have a robust wet lease order book and we're making engines for other customers," Nelson said. "We're always delighted to talk to potential investors and partners interested to join us in our development program".

As with most pioneering technology, a continuous stream of funding will be required, and the GCC region is attractive in that respect primarily due to its relative liquidity, robust oil prices, and substantial sovereign wealth funds. The combined sovereign wealth funds of the GCC countries stands at more than $1.36 trillion, the largest being Abu Dhabi at $664 billion, with Saudi Arabia at $420 billion and Kuwait $203 billion, Qatar $65 billion, Dubai $19.6 billion and Oman $8.2 billion, according to a 2010 report by the ***Sovereign Wealth Fund Institute***.

About GSSF 2011

In addition to investment opportunities, GSSF will address other issues facing the commercial space sector, such as insurance, regulatory issues, and life-saving developments in disaster management. Headline speakers include:

- *Gen. Thomas Reiter, Member of the Board, German Space Center (DLR)*
- *Ahmed Al Mansoori, Director General, EIAST*
- *Major Dr. Mohamed Al Ahbabi, ICT Advisor to the UAE Armed Forces*

- *Sir Martin Sweeting, Executive Chairman, Surrey Satellite Technology Ltd*
- *Ahmed Talebzadeh, Director General Asia-Pacific Space Cooperation Organization*
- *Dr. Hessa Al Jaber, Secretary General, ICT Qatar*
- *Samer Halawi, CEO, Thuraya*
- *Dr. Somchet Thinaphong, Chairman of Executive Board at GISTDA*
- *Dr. Omar El Emam, Advisor to the Arab Science and Technology Foundation*

GSSF is now in its third year and is the only event in the region dedicated to the discussion of commercial opportunities surrounding space and satellite development. ***GSSF*** is supported by the **UAE Space Reconnaissance Centre**, **NASA**, **Emirates Institute for Advanced Science and Technology**, **UAE Telecommunications Regulatory Authority**, the **Environment Agency Abu Dhabi**, the **Association of Specialist Technical Organizations. for Space**, the **Society of Satellite Professionals International**, **National Research Foundation** and the **European Association of Remote Sensing Companies**.

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The Office At Sea

By Michel Verbist, Product Manager for Satellite Solutions, Orange Business Services

For the past several decades, maritime communications have been dominated by the L-band satellite frequency. When conceived, L-band provided a very good channel for reaching ships and freighters traveling deep ocean routes. To consider any of the other terrestrial bands would involve outfitting ships with large, costly antennas that only oil and gas freighters could reasonably afford. So over time L-band grew to become the de-facto industry standard, covering nearly 90 percent of all vessels sailing the seas. However, with the march of time, new opportunities presented themselves that challenged L-band's status quo. Chief among them were new advances in antenna technology that modularized on-board receptors for IP switching and automatic re-pointing. This perfectly fed into recent industry changes that expanded the availability of the much more extensive Ku-band over the Pacific and Atlantic Oceans. Taken together, satellite providers could now offer maritime companies global broadband service via a VSAT network, a considerable quantum leap in the field of maritime communications.

Under the L-band model, communications were always severely impacted by a very limited bandwidth channel. Transfer rates clock in around 64-128kbps on a good day without high-traffic congestion. Only small electronic files (typically a max of 1 Mbps) can be sent over such a limited pipeline, and transmissions are usually limited to twice a day. The majority of these communications end up being text-based, stripping out many of the bells and whistles found in the applications and email systems being employed onshore. To cope with this technical disparity, vessels create their own native applications, most of which are offline from the main corporate network. Maritime CIOs have to manage two completely separate onshore/offshore IT environments and reconcile any data that is housed within those offline applications. What CIOs are essentially dealing with is a communications system that is failing in its primary goal of communicating.

These technical limits are a relativity new challenge for L-band users considering that the model employs a pay-per-use framework that no longer makes economic sense. The usage model behind L-band dictates that subscribers pay according to the bandwidth they consume. Thirty years ago when a few Mbps of data were comparable to a few Gbps, this wouldn't have been so much of a problem, but needs evolve and now L-band systems are ill-equipped to handle today's data intensive business applications. A typical merchant shipping fleet demands speeds in excess of 512kbps and gigabytes of data transmissions per month. Operating costs would immediately spiral out of control if fleet owners were dealing with those requirements under an L-band usage model. The only remedies available would be to limit the monthly bandwidth usage to under 100 Mbps or to limit

usage to low-end applications; either option debilitates much of the potential benefits provided by satellite communications. Without the capacity to match bandwidth to future applications use, the L-band model has become a technical dead end for the modern maritime industry.

The VSAT Alternative

VSAT on the other hand opens up a limitless world of possibilities that up to this point were unattainable under L-band. At the pricing level, these wider broadband pipes operate at a flat-fee so maritime companies are not penalized for the amount of bandwidth they consume on a monthly basis. Beyond communications speed, VSAT allows the introduction of more mainstream communication applications such as *Microsoft Exchange* or *Lotus Notes*, along with a full gamut of IP services such as VoIP, security, WAN optimization, call centers and video conferencing. These types of services are appealing to maritime companies because they bring ships within the domain of the larger corporate network regardless of where they are at sea. The same corporate applications an employee can access in a terrestrial office, a crew member can access at sea. It is as if the ship is a floating office and enjoys all the amenities of a terrestrial site.

Here are several examples of how VSAT-backed applications transform the way maritime business is conducted:

- ***Vessel Repairs*** *— A vessel that is temporarily in port for maintenance can cost a company $25,000-$100,000 a day. Thanks to a broadband satellite connection, experts on shore can monitor ship equipment in real-time while the vessel is still at sea. Any technical problems can be addressed via remote IT access or though voice and video discussions with a specialist on shore. The same goes for virus updates or software upgrades via the network, eliminating the need to do so through CD-ROMs or having a dedicated IT person onsite. Real-time maintenance through the network extends vessel life, enables the crew to focus on more important tasks, and saves the company in revenue lost for vessels that are out-of-service.*
- ***Enhanced Navigation*** *— A VSAT network can deliver real-time, accurate data on weather conditions so that vessels can navigate around any potential trouble spot. It can also map out more efficient routes to speed vessels to their destinations. Both applications can lower fuel costs and reduce delays.*
- ***Crew Retention*** *— Maritime companies constantly deal with the issue of crew attrition due to the long spans of time that are spent at sea. A reliable satellite connection offering voice, emails, video, social media and Internet can ensure that crew members enjoy all of the amenities of home or work and are able to reliably communicate with family or loved ones. Crew morale will be higher and maritime companies can afford to keep their ships longer at sea. Another added benefit is the ability to conduct telemedicine or video training at sea without having to necessitate time off.*
- ***Supply Monitoring*** *— A VSAT satellite connection opens a ship up for real–time monitoring and analysis. Data relating to the supply of cans in a soda machine to the median temperature level for the cargo hold can be tracked and adjusted. It solves the delays and human errors made by data entry under the L-band model.*

Real World Applications Of VSAT Broadband

Today, many maritime companies are considering VSAT as a possible replacement to L-band systems. According to figures from **Northern Sky Research**, satellite broadband has the potential to become a $7.6 billion market by 2018.

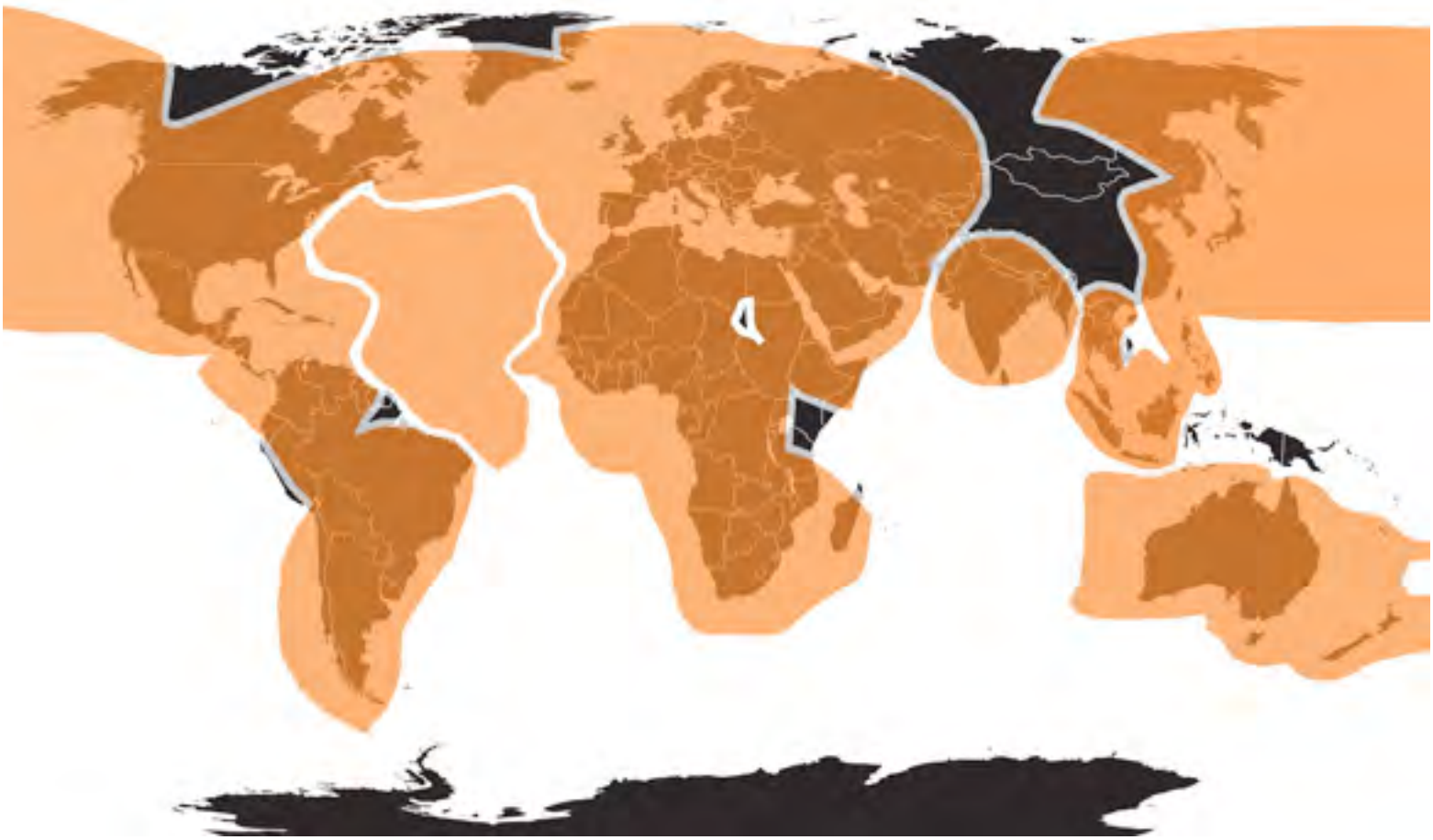
One company that made the jump is **Crest Subsea Pte**, a relatively new company that is part of the **Pacific Radiance Group** of companies based in Singapore. Crest provides offshore support vessels and integrated marine solutions for oil and gas, engineering contracts and related services support industries. To gain a competitive advantage over entrenched incumbents, it turned to **Orange Business Services** to implement a VSAT satellite solution that was specifically tailored for marine logistics. The solution Orange delivered connects Crest's outgoing and incoming vessels to its corporate network, giving

each ship access to the company's business applications while enabling the home office to monitor ship status and the use of consumables.

Crest's VSAT satellite solution also added a homogeneous IP telephony solution, based on Orange's ***Business Talk Global*** service. Here the conventional PABX is replaced by a central IP-PBX, delivering all the benefits associated with unified messaging systems, including number portability, click to call, operational guarantees with its back-up system, flexible billing (consolidated, by site) and a report generation system. The IP telephony component operates on a monthly subscription contract while outside calls are covered by an IP pricing rate that is eight times cheaper than a traditional L-band communication solution.

Thanks to the voice, email and chat functionality of the solution, Crest crew members can instantly stay in touch with friends and family. This functionality appealed greatly to Crest who face a growing workforce that will double over the next two years and who could use these added network amenities as a recruiting tool for prospects.

In addition to Crest, Orange Business Service has also conducted work with a major offshore company to modernize its fleet of 150 vessels with a VSAT broadband communications network. The new system can now transmit a wide range of electronic data, from a single VoIP call to a real-time prognosis of vessels. It has reduced communications costs by 80 percent, eliminating the variable pricing that was once connected to its consumption



The above image shows Orange's global Ku-band coverage. The coverage consists of many Ku- spot beams, each covering a significant territorial segment. To achieve global coverage under VSAT, one need only overlap VSAT beams across multiple points. A popular alternative is to use the L-band as a background support to VSAT. Any spots where VSAT is unavailable would be compensated by the L-band. A hybrid satellite system offers all of the benefits promised by VSAT and, because L-band is only used when necessary, the risk of seeing your bandwidth costs rise would be restrained considerably. Any company hesitant about making a full commitment to VSAT, a hybrid system would be a great safe step for testing it out. However, with VSAT coverage increasing, it's only a matter of time before it becomes the new dominant satellite band in maritime shipping.

of bandwidth. This all translates to an estimated savings of several million euros over the next three years.

The ability to offer unlimited phone, email and online chat services to off-duty crew members was another major attraction for this company. Similar to Crest, it expects to double its workforce over the next four years and access to personal communications has become a critical tool for boosting employee morale and reducing turnover among staff having to work in remote locations.

VSAT plays such an important role that all new vessels commissioned by the company now come equipped from the shipyard with a VSAT antenna, an **iDirect** router, **Cisco** switches and VoIP.

Whether you are a start-up like Crest or a recognized industry leader, VSAT's benefits are applicable to you.

L-band Will Stick Around

Despite the tell-tale signs, L-band's eventual decline is not necessarily imminent. As mentioned previously, L-band systems are pretty much entrenched in the industry and maritime companies will likely take their time migrating in this post-global recession landscape, not to mention the high-costs associated with satellite installation.

In the interim of this ramp up, we expect to see more and more maritime companies dip their toes in the VSAT pool through hybrid systems offering both VSAT and L-band capabilities. This scenario provides the best of both worlds. The biggest drawback for VSAT, up to his point, has been the scoop of its beam footprint. However, with the new satellite launches scheduled over the next 24 months, the Ku- footprint should vastly improve to fill in some of the gaps.

About Orange Business Services

As part of the France Telecom group, Orange Business Services is a leading global integrator of communication solutions for multinational corporations. With VSAT making it possible for vessels to become extensions of the corporate network, Orange finds itself uniquely positioned to address the needs of maritime companies. It has a rich history in connecting remote offices to corporate virtual private networks, and the premise for connecting sea-fearing ships to shoreside systems is the same, only on a more complex scale. Success depends on the ability to marry terrestrial capabilities with satellite capabilities while ensuring availability and global coverage.

With the Orange Business Services Maritime solution we are able to do just that. It integrates satellite with Business VPN so that employees can access the same applications regardless of whether they are on land or at sea. Global coverage is made possible by mixing multiple satellite technologies (including SCPC, TDMA, DVB-S2) with multiple Orange teleports around the world. Service level agreements are attached to the solution ensuring performance quality. Orange brings all these elements together enabling seamless communications from office, to port, to ship and back.

The BIG Book of Satellite Communications

Still at Your Finger Tips After 26 Years.

The 2011 International Satellite Directory

Visit: www.satnews.com/directory

The Directory is a comprehensive guide to the people, companies, products, services and the market of the booming satellite industry. With changes of all kinds affecting this dynamic industry, the Directory remains a powerful tool, mapping in detail an otherwise uncharted and complex segment of modern communications.

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Executive Spotlight

Greg Pelton, Senior Director, Global Government Solutions Group, Cisco

Greg Pelton is Senior Director of *Cisco Internet Routing In Space* (IRIS), which is a major Cisco initiative that is transforming space-based communications by allowing satellites to become part of the converged IP network and enabling *Next Generation Global Services*. Through IRIS, Cisco will extend the information transport power of the Internet into space, integrating satellite systems and ground infrastructure for commercial and government users who need anytime, anywhere IP-based data, video, voice and mobile communications. Mr. Pelton is responsible for creating a suite of space-ready products and developing the business plans and go-to-market strategies necessary to fulfill the IRIS vision.

Previously, Mr. Pelton led the Cisco Technology Center, which created strategies for entrance into new markets and to incubate disruptive technologies to create growth opportunities for Cisco. Greg led Cisco into new businesses, including IP telephony, wireless networking, home networking, broadband cable, IPTV, mobile networking, and Cisco TelePresence. He was also responsible for developing strategic partnerships with industry leading companies, creating ecosystems with technology startups, funding university research programs and driving the development of standards. Before joining Cisco in 1998 Mr. Pelton held executive positions at Nortel Networks, developing telecommunication products for service providers. He also established and operated a JV with Daimler Benz. Greg is recognized for his work in equity investments and acquisitions, and is a frequent speaker on innovation and emerging technologies.

Intelsat 14 Launch

SatMagazine (SM)

Good day, Mr. Pelton, and thanks for taking the time to "chat" with our readers. You have a great deal of experience within the emerging technologies environs... how do you measure the effectiveness of today's technologies as far as industry growth is concerned in terms of product viability and financial gains?

Greg Pelton

It is interesting how some things have changed but many themes have stayed the same throughout my career. We are still riding the productivity curve that has been created by Moore's Law. As the performance of silicon technology doubles and the costs halve every 18 months, new markets for IT technology continue to become available on a regular basis. An early example of this was Voice over IP. Thanks to advances in silicon technology, at some point in the mid 1990s it became cost effective to carry voice traffic over IP data networks. The user experience could be maintained and it was more efficient to have one network carrying both voice and data traffic than two separate networks. This fundamentally transformed the $100B voice industry of that time. We have seen this same transition happen in wireless networks, in video networks, in industrial automation and it is beginning in the power grid and even satellite networks, my current focus.

The other key trend that has impacted our industry is Metcalfe's Law, which posits that the value of a network is in proportion to the square of the number of entities in the network. Broadband access to the consumer through Fiber, DSL, Cable and wireless has dramatically increased the value of the network. In the early 1990s I used dial-up access primarily for work. Today I use broadband for education, music, TV, games, keeping in touch with family, planning events, telephone calls and, yes, still to do work. The advent of social networking is just the latest iteration of this trend where Facebook can make a community of over half a billion people in just a few short years.

I don't see either of these trends slowing down anytime soon. There are many more networks to build and many more users to connect and many more new businesses that will result.

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Having worked with Daimler Benz and Nortel in the past, as well as serving on many VC company executive boards, how did you decide to become involved in the space segment?

Greg Pelton

Like most things in life, it was serendipity. I had been leading Cisco's Technology Center for a number of years and had the honor of being involved in the creation of a number of our new businesses. However there always came a point in time where the business idea was mature enough that we needed to hand it over to a Business Unit to take the idea to market and make it a sustainable business. It was kind of like watching your children go off to college. Eventually I decided I'd like to spend a bit more time with a new business and nurture it through the early scaling and commercial success phases. Luckily Cisco had just decided to enter the satellite market and the IRIS program had been kicked off. I had the opportunity to join a tremendous team, to leverage the technology and business development experience from my past and to be in the position to watch a new industry grow from infancy into maturity.

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Could you tell us the reason for the development of, and purpose for, the Cisco Technology Center?

Greg Pelton

As networking technology has evolved over the years, it's become clear that the network is no longer just about providing connectivity. It has evolved from data-only to a converged voice/video/data network. These converged networks have become a strategic asset to many businesses by improving business processes and thereby boosting productivity. It also became possible to transform the life of the end user. As Cisco's corporate mission states, our goal is to "change the way we live, work, play and learn."

To accelerate this evolution and beyond, the impetus is on Cisco to deliver networking technologies in various forms for various applications, in order for customers to reap the full rewards of working within a converged network system. Cisco's strategy for entering new markets has three elements — build, buy and partner. We can build new products and solutions, we can acquire complementary businesses and we can partner with industry leaders to develop the right solutions and go to market channels.

However when a market is in its infancy, it is hard to tell which of these three strategies should be employed, and even if the market is ready for Cisco to enter. The Technology Center was an internal incubator that nurtured new technology and business ideas and helped take them to the point where it made sense for Cisco to enter the market through some combination of build, buy and partner. I'm proud of the work we did in the Technology Center and the many new businesses we helped create for Cisco.

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Would you describe the work of the center as far as its ability to locate new markets? And how do disruptive technologies aid in creating growth channels for Cisco?

Greg Pelton

One of Cisco's strengths is to identify market disruptions proactively, get ahead of them and by leveraging all of our assets eventually lead these new markets. Given our strong position in the traditional IT industry, new markets are a very important part of our

The Cisco® 18400 Space Router, the primary component of the IRIS initiative.

growth strategy as a company. The hardest part of entering new markets is determining the right timing. We see this over and over again in the VC world where investors will flock to a new area and dozens of companies will be formed with 'hockey stick' growth projections. Typically, these markets take longer to develop than expected and many of the start-ups fail. The key to financial success is to invest across a portfolio of opportunities and to fail early. Failing early means recognizing that the market isn't ready or the business strategy isn't working before you have made the investments to scale the business. Adapt, retrench, move forward or just call it a day.

The Technology Center had to deal with the same issues. Our ability to identify viable new technologies and new markets probably had a 90 percent success rate. However our ability to time the market was much lower, below 50 percent. Markets always take longer to develop than you expect. What was critical to Cisco is that a small investment in incubating the idea helped avoid making a big investment too early in the life cycle of the market.

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Much of your work involves interfacing with government agencies as their processes can be daunting. How do you manage such crucial connectivity? Do you have any insights as to how effective Cisco is in dealing with this side of the satellite/space business?

Greg Pelton

Government agencies have long been interested in using commercial technology and reaping the cost and functionality benefits that industry can provide. This has led global governments to be one of the largest customer segments for Cisco. However space has traditionally been seen as too unique and too proprietary to rely on commercial solutions. Advances in commercial satellite technology and current budgetary realities have generated growing interest from governments in commercial options. This interest can be seen in the new FCSA contract vehicle, which allows easier use of commercial satellite capabilities. FCSA delivers a much richer set of commercial managed services to the government and it also supports Hosted Payloads. A Hosted Payload involves the government supplying a package of technology that essentially hitches a ride by being integrated into an already planned

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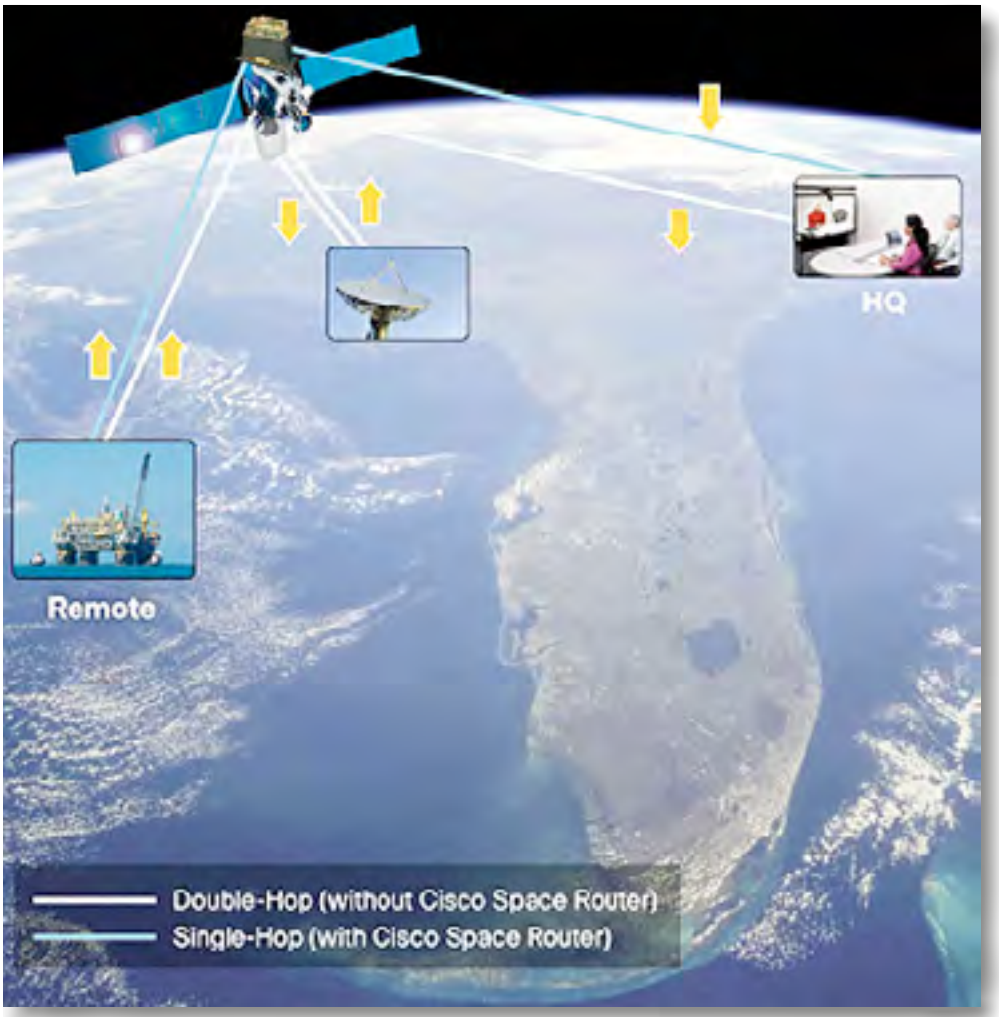

A satellite network with, and without, Cisco Space Router

commercial satellite launch.

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Given the cry for capacity on the commercial and military/ government sides of the equation, how do you see such becoming alleviated over the next year or two? Do you see hosted payloads as an answer?

Greg Pelton

Hosted payloads enable the planning and implementation of space missions more quickly compared to the time it takes to procure an entire government funded satellite — typically 24 months versus seven to 15 years. Placing a hosted payload on a commercial satellite costs a fraction of the amount of building, launching, and operating an entire satellite. This also has the benefit of helping commercial satellite operators close their business case for a new satellite earlier and put more total capacity on orbit. It is a win-win for both sides.

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How well will Cisco's Internet Routing in Space (IRIS) work in assisting our warfighters in countering hostile threats?

Greg Pelton

The vision behind IRIS is to converge satellite and ground networks into a unified service delivery platform. This is a very powerful solution for the defense applications because it allows the warfighter to collaborate better and access network services in congested and contested environments. The technology has the potential to transform how the military uses IP-based network services to accomplish missions. IRIS testing has enabled us to explore the potential of this technology as we look to expand our customer offering, particularly in areas that often require peer-to-peer communication and the rapid transfer of data, such as crisis management situations, remote medical emergencies and mobile military operations.

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Considering all of your accomplishments, do you have one that especially brings a smile to your face?

Greg Pelton

There are very few individual accomplishments in our industry and every success depends upon a team. I've had the benefit of working with a lot of very talented and dedicated people over the years. Whenever I've been part of a team that accomplishes something that has never been done before, it is particularly gratifying. The most recent time I experienced this was when I went down to Cape Canaveral to see the launch of IS-14, the satellite that contains our first IRIS Space Router. I had never been there before and was driving across the causeway at night with my partner from Intelsat General, Don Brown. In the distance I saw bright lights pointing up into the sky but it was too far off to tell what was there. I asked Don what the lights were for and he said, "Dude, that's your rocket." That was the moment when what we were doing with IRIS really sunk in and I was grinning ear to ear.

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Would you please provide our readers with an overview of Cisco's IRIS program?

Greg Pelton

Cisco's IRIS initiative extends the same Internet protocol-based technology used to build the World Wide Web into space. The long-term goal is to route voice, data and video traffic between satellites over a single IP network in ways that are more efficient, flexible and cost effective than is possible over today's fragmented satellite communications networks. The initiative includes the Cisco 18400 Space Router, a radiation-tolerant IP router for satellite and related spacecraft. The first space router was launched on-board Intelsat 14, a geostationary communications satellite.

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You have done a lot of work in the telecommunications industry. What attracted you to Cisco?

Greg Pelton

With Cisco I saw a company that had been very successful in one market — data communications — and had the vision and drive to transform every other communications market. That was pretty exciting for a guy who had spent his career up to that point focusing on just one industry. I also was very impressed with the people I met from Cisco. When I decided to join I wasn't really sure what job I'd be doing but I was sure I would be working with a top notch team. That makes all of the difference.

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Without getting into too much techno-speak, can you explain how IRIS is changing satellite communications?

Greg Pelton

The true power of IRIS is it takes all of the capabilities and benefits that exist in the terrestrial Internet and allows them to be used over satellite networks. It makes satellites an intelligent part of the overall network, rather than just passive repeaters of radio signals. But more importantly, it lets the end-user take advantage of the reach of satellite bandwidth without needing to deal with the complexities of satellite access. To be more specific, let's look at a few of the benefits of IRIS.

First the Space Router enables much more efficient use of satellite bandwidth. In traditional satellites, every user connection is like a T1 connection in the legacy telco world. It goes from point A to point B and the customer pays for the bandwidth whether they are using it or not. If the user wants more bandwidth, the network needs to be reengineered. If the customer wants to connect point A to point C, the signal must be brought down to the ground, routed there and sent back up to the satellite incurring a lot of delay and inefficiency in the process. With IRIS, bandwidth is allocated to users dynamically as they need it and shared amongst a large number of users. You pay for what you need and if you need, more or less, the network adapts. In addition, the user's signal can reach any other user connected to the satellite in any geography, without coming back down to the ground to be routed. This dramatically improves voice and video communications and access to remote applications in data centers. The user wins with better service and the satellite owner wins by making more efficient use of a very expensive resource.

The IRIS network is a managed service and comprises both the satellite and the ground infrastructure. In this way, the entire network can be secured using the best practices of the IT industry and quality of service can be guaranteed from end to end. The entire network can be managed as one entity reducing the operating cost for a service provider. Again, both the end users and the service provider win.

Finally, with IRIS the satellite can now be a service delivery platform, not just a dumb pipe. Our Space Router is software-based and runs the same software as our routers on the ground. There are billions of dollars of R&D in that software base and many features that have benefit when deployed on a satellite. One example is mobility and being able to keep users, perhaps on an airplane or ship, connected as they may move between satellite beams. Another example is emergency workers responding to a natural disaster. If the terrestrial infrastructure is destroyed, you can't get a cell phone signal to save your life — or anyone else's. The hurricane, earthquake or flood has leveled cellular towers for miles. What do you do? With IRIS, the satellite can provision voice service for emergency workers and connect police with the fire department with the hospital, all through the satellite. No traditional telephone network is required to route the call.

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What is unique about this technology? What radical change does it represent in the world of satellite technology?

Greg Pelton

Cisco has announced important milestones in IRIS testing, including the first-ever software upgrade of an Internet Protocol router aboard a commercial satellite while in orbit. This is an extraordinary achievement in an industry where satellite operators haven't previously had the luxury of changing a payload post launch, and it opens IRIS to the full features of Cisco IOS® software. Second, and equally important, Cisco completed the industry's first VoIP call made without the use of any terrestrial infrastructure to route the call. We are at a tipping point in the industry when satellite functionality can be defined by software rather than hardware. Think about how different your cellular phone is from the old rotary dial phones we used to have in our homes. The old phone just made telephone calls, the new phone takes pictures, plays games, surfs the web, sends text messages and can still makes calls. This difference is software. Over the coming years, IRIS will drive similar changes to satellite networks, and it should be pretty exciting.

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Can you explain the demonstration that was used in conjunction with Cisco's Unified Communication Manager Express?

Greg Pelton

Cisco updated the IOS Software in the router aboard Intelsat 14 to enable a variety of capabilities for enhanced service that are already available for Cisco's terrestrial products including Cisco Unified Communications Manager Express, IPv6, Mobile IP and SNMPv3 management (Simple Network Management Protocol version 3). It also enables additional security features, including hardware-based encryption. The demonstration was the first use of Cisco Unified Communications Manager Express to make a VoIP phone call via a router in space. The first VoIP call was made through the Cisco Unified Communications Manager Express located on the Cisco space router, which provided the ability to make calls between any terminals on the system.

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Cisco recently teamed up with Astrium to study the applications of space-based routers. Would you explain the findings?

Greg Pelton

In October 2010, Cisco and Astrium successfully demonstrated a number of IRIS services including multicasting, enabling the delivery of information to a group of destination computers simultaneously in a single transmission. Multicasting would make it possible for a Unmanned Aerial Vehicle drone to simultaneously send video of the enemy to the different groups that need it — such as personnel in a command center and troops on the ground. Astrium is a satellite manufacturer and a satellite service provider so they have a lot of wisdom to share and can really benefit from our IRIS capabilities.

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What's next for the program?

Greg Pelton

The next big milestone for IRIS is moving from testing to full commercial service on Intelsat 14, which is happening this year. We have pent up demand for a production IRIS service and it is important to get this capability in the hands of the customers who need it. We continue to work with industry partners to introduce proven networking standards into proprietary satellite systems, and we are in discussions with a number of customers that should result in the sale and launch of future Space Routers.

The NGGS Environment

Cisco® Next-Generation Global Services (NGGS) delivers current and emerging terrestrial and space-based services using Cisco IP networking solutions and leverages the capabilities of the Cisco Space Router. NGGS enhances the efficiency and reliability of defense and commercial SATCOM. Extending the IP network into space allows for the creation of seamless, global satellite networks to support continuity of operations and emergency communications.

The converged data, voice, and video capabilities of the Cisco NGGS network support traditional information transfer and collaboration applications. Plus, advanced services become available, such as Cisco TelePresence™ conferencing. Highly mobile field units are able to access vital broadband services, thanks to increased throughput for small ground antennas. As a managed service, the technology allows customers to focus on their missions, not on the engineering and operation of satellite networks.

The Cisco Space Router is a radiation-tolerant router that implements network services directly onboard a satellite. This first Internet Router in Space (IRIS) is a hosted payload on Intelsat 14 (IS-14). IRIS was created by Cisco at the request of the U.S. Department of Defense and will document the benefits and risk reduction of routing and other network services directly onboard a satellite as part of a Joint Capabilities Technology Demonstration (JCTD).

The purpose of the Cisco technology is to solve multiple, crucial communication issues resident with transponded satellite networks, wherein traditional satellite systems functions must be performed through a centralized hub. NGGS with the space-based IP router offsets such challenges and improves communication efficiency and cost effectiveness.

Single-hop communications: Satellite services that rely on ground-based hubs must either connect through a teleport or establish their own reach-back connectivity for each isolated network. This is an inefficient and costly approach that can introduce delays in excess of 500 milliseconds (ms) and requires double-bandwidth utilization. By using a space-based router, the Cisco NGGS network can route traffic between bands (Ku and C) and across transponders to interconnect small, geographically dispersed sites in a single hop.

• **Equipment and connectivity flexibility**: The simple installation of satellite ground terminals at remote sites instantly provides connectivity to a VPN and Internet or enterprise reach-back access through a Cisco NGGS gateway. This means that units can reach each other in a single hop simply by purchasing and installing terminals selected to meet each unit's specific requirements for equipment costs and service level. Because there is no need to double-hop through a teleport, even terminals with small antennas can support high-bandwidth applications such as video conferencing.

• **Efficient bandwidth usage**: Users of conventional satellite communications systems often pay for far more bandwidth than they use on a routine basis, just to ensure that sufficient capacity is available when they need it. Cisco NGGS offers multiple service levels — with committed information rates up to 512 Kbps and burst rates as high as 5.2 Mbps — that feature bandwidth on demand. And billing is based on actual usage, not on static bandwidth subscriptions.

• **Reduced startup and management costs**: Cisco NGGS is a managed service, so it eliminates the need for defense organizations to purchase and manage satellite bandwidth and associated network systems themselves. Customers need only purchase their chosen ground terminals and a service-level subscription. This hands-off architecture enables defense personnel to focus on their mission, not on the transport network.

Powering the space-based IP networking of Cisco NGGS is the Cisco Space Router. It offers many of the advanced features found in Cisco's terrestrial routers, including:

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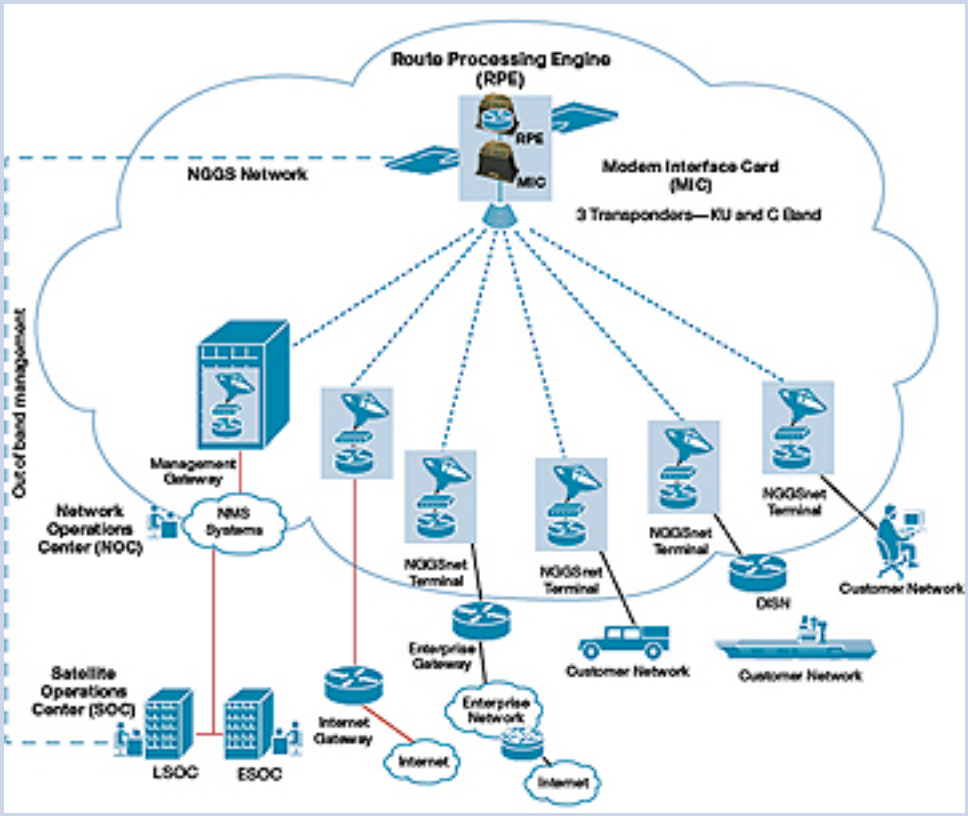

- ◊ *IPv4 • QoS*
- ◊ *Mobile IP*
- ◊ *BGP*
- ◊ *Multicast*
- ◊ *IPv6*
- ◊ *Access Control Lists (ACLs)*
- ◊ *Extensive Cisco IOS® Software security features*
- ◊ *IPsec VPN termination with hardware-assist encryption engine*

The integrated design of NGGS simplifies staffing and training in the challenging arenas of military preparedness and emergency communications. Remote terminal connections can be easily instituted within in a full-mesh environment, with reach-back access to the Internet or to enterprise networks. Additional terminals can be deployed quickly and easily in situations of equipment failure, cyber attack, or continuity of operations. Reengineering the solution each time disaster strikes or a unit deploys to a different operational area is unnecessary.

Using a web-based customer service portal, terminal usage and service can be monitored and re-provisioned for mission-critical requirements, TelePresence on demand, or increased service levels. Support for emergency communications and continuity of operations will become even more robust as additional satellites containing space routers are launched, increasing the ability to reroute traffic around failures in the terrestrial infrastructure.

For additional NGGS details:
http://www.cisco.com/go/iris

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A Case In Point

Buoy, Oh Buoy — Finding Sea-Rich Areas

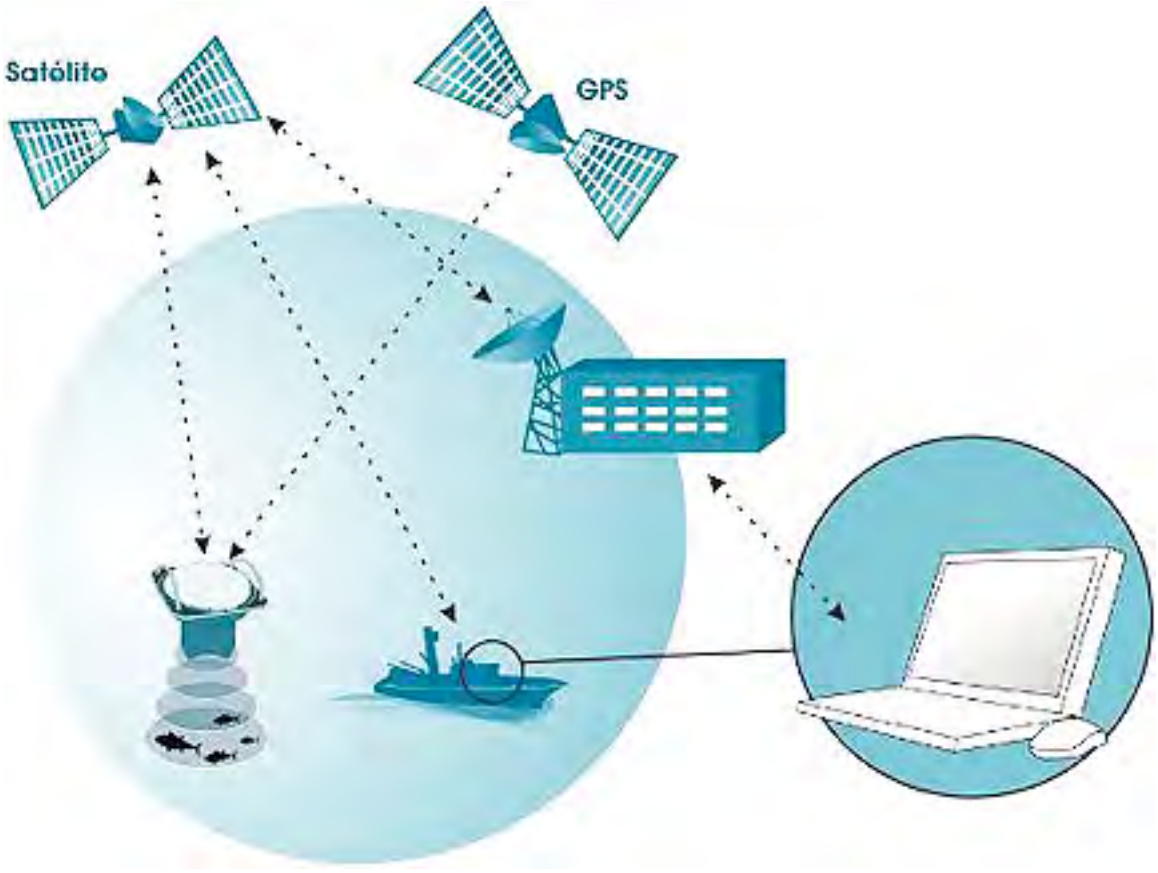
Throughout the Atlantic Ocean lie some of the world's most seafood-rich areas, including prime spots for tuna. In order to meet the ever-growing demands for seafood, today's fishermen don't just cast a line or toss nets and then wait and hope for the best.

Instead, they communicate via highly-efficient ocean buoys with built-in echo sounders for locating and monitoring drifting devices that provide reports on water temperature and the volume or absence of fish within an immediate area. This information is received directly aboard a fishing vessel providing the skipper with GPS coordinates allowing him to head for the best areas to catch fish — saving time and fuel.

One of the world's major providers of these buoys is **Marine Instruments**, a research and development-oriented company founded in Nigran, Spain, in 2003. From its origins, Marine Instruments has experienced continuous growth and has become a recognized leader in the manufacture of products with a strong emphasis on positioning and communications systems for the marine and fisheries environment.

Marine Instruments also manufactures systems for monitoring the position of fishing vessels, scientific buoys for collecting oceanographic data, airplane-launched rescue and tracking beacons and geofence buoys that monitor the position of anchored *fishing aggregate devices* (**FAD**), such as mussel platforms.

In the open ocean, these buoys need to be ruggedly built and capable of withstanding fierce storms. To be of value, they have to dependably communicate with their users. In the heart of the Atlantic, terrestrial wireless networks are difficult, if not totally impossible, to maintain. Marine Instruments has found the only reliable method of communications takes advantage of satellites orbiting the Earth.



Communication between a buoy and a satellite and a vessel at sea requires modems capable of sharing necessary information in an often-hostile environment. For its line of buoys, officials at Marine Instruments selected modems from San Diego-based **Quake Global**.

Quake modems...
Top, Q9612
Bottom, 9602

The modems are used in bi-directional onboard terminals to transmit GPS position and alarm distress for Marine Instrument's ship monitoring and tracking systems.

The buoy maker chose QUAKE's ***Q9612*** and ***9602*** communicators that combine the low latency of the SBD (short-burst data) service with the global coverage of the **Iridium** satellite network. Paired with QUAKE's modems, the Marine Instrument buoys save time and fuel by helping fishing boats and vessels quickly locate seafood-rich locations, receive alarm messages when fixed platforms move and locate raft positions for rescue purposes.

The QUAKE™ modems also allow users to remotely change operating modes of the buoys and automatically change the frequency of messages depending upon a ship's speed or manually by remote control. Messages can be encrypted to protect privacy.

According to *Polina Braunstein*, QUAKE's president and chief executive officer, the Q9612 and 9602 modems allow Marine Instruments' customers to quickly track and monitor FAD assets anywhere in the world.

"Marine Instruments was the first manufacturer to develop and control satellite buoys for the tuna sector worldwide," she said. "Since then the company has become known in the industry for its continuous innovation and quality control."

Fernando Ferro, commercial manager for Marine Instruments, said the QUAKE modems are a good fit for his company's maritime monitoring systems. "Quake Global modems have the features we require along with the reputation for dependability and ruggedness that is vital in the open ocean," he said.

With some experts predicting the worldwide demand for seafood products to increase by 70 percent over the next 30 years, the partnership of Marine Instruments and Quake Global will help the fishing industry to monitor issues that affect the quantity of available fish in the wild, while being more fuel efficient in helping to meet that demand.

For additional information, head to Quake's website
http://quakeglobal.com/products/

Broadband Studio Infrastructure

By John Mailhot, Director of Product Architecture, Workflow, Infrastructure, and Networking Business, Harris Broadcast Communications

There has been a massive evolution in the internal implementation of each television food-chain device over the past 30 years. Cameras, displays, satellite receivers, storage, editing, graphics, processing, routing, and branding devices have been re-invented, digitized and upgraded to high-definition. Transmission equipment has also evolved significantly, from tubes to solid-state and from analog modulation to digital and onto second-generation digital.

The workflow and architecture of a typical television plant – the operational steps, the order applied, the roles of the operations staff and the general capabilities, have remained largely the same through all of this change. Content comes in via satellite through a receiver, goes through a house router to a server port and is ingested (the server acts as a VTR). The content is then marked and segmented.

Traffic and automation systems manage the process from this point. Content is played out by the right server port at the right time and sent back through the router. Master control selects the right signal and adds branding before pushing the signal out to the air chain.

These basic steps have remained nearly constant, although today each piece of the chain is more capable and less expensive. Fundamentally, these separate units are still interconnected by video- and audio-specialized interfaces, and have unique arcane operating models specific to the legacy television industry.

Plant Transition of the Plant — Analog to Digital, SD to HD

The television plant "plumbing" today looks similar to 30 years ago – 75Ω coaxial cables, BNC connectors, and a high expense to build, modify, and maintain. The signals (the "water") in that plumbing have changed from analog CVBS waveforms to digital SD, and later to digital HD or 3Gb/s.

These are all unique signal interfaces that remain non-existent outside the television plant. Worse, these signals don't exist outside of the narrow professional television economic ecosystem — a fairly small universe compared to the economic ecosystem of IT Infrastructure.

Much of the developing world is still in analog SD television. Those just beginning to look at upgrade paths may well lead the way in going straight from analog SD to digital HD infrastructure or beyond, especially if that "beyond" offers a better economic path.

Doing More — Content, Versions, Channels, Delivery

Historically, a typical television plant was tasked to produce one "channel" of programming — news, sports, weather, network and syndicated programming, stitched together in a simple linear schedule with advertisements and promotions. Business systems supported the airtime sales and reconciled invoices back to the advertisers.

Multiple different "versions" of channels are produced in today's television environment and targeted for different delivery systems. This includes Mobile TV and web streaming in addition to cable and satellite systems. Frequently, multiple entire channels are produced, filling out the bouquets of digital transmissions. Some channels aren't really channels at all; they are collections of on-demand content for online viewers.

The historical architectures of television station design are strained to meet these challenges without significant cost multiplication. Consider the simple case where two delivery systems, such as cable and satellite, share exactly the same underlying content. The graphics and branding often require different presentation based on the final delivery system, and potentially different advertisement availability triggers for downstream re-distributions.

Metadata + Other Data Makes It Harder

Television 30 years ago was a 4x3 SD picture and mono or stereo sound. The PALplus (16x9) system and HD pictures introduced aspect ratio metadata that followed each video signal.

Multichannel (5.1) audio also requires metadata-like information in the plant. Closed captions, teletext, subtitles, and DVB subtitles each bring a layer of complexity to the signal chain. This is essentially another element of information that flows through the plant with the content. It is stored and retrieved in the asset management system, which often connects to management and automation systems.

Programming schedule information, the information presented to consumers about what is on and upcoming, was once a "front-office" matter between the station and various media outlets (mostly newspapers) that published upcoming TV schedules. This information has now become a necessary element in the technical plant, as the program guide information has become part of the delivery system package for most modern delivery platforms. Managing this information, and propagating late-breaking changes to this information from automation through the delivery system, is a current source of challenge in many plants today.

The Aggregator's Challenge

Content aggregators around the world are building larger head-ends, consolidating programming from many sources, and creating integrated packages for delivery over satellite, cable, IPTV, and other platforms.

Each incoming program source has differences in picture and sound formats, possible differences in captions, subtitles, and teletext information, and has (or is missing) some metadata. Each incoming signal also has a different data path for programming schedule information (if any is provided). Managing these differences and making a homogeneous lineup of picture, sound and metadata content for delivery is the central challenge for content aggregators.

Business cases for aggregators are built upon combinations

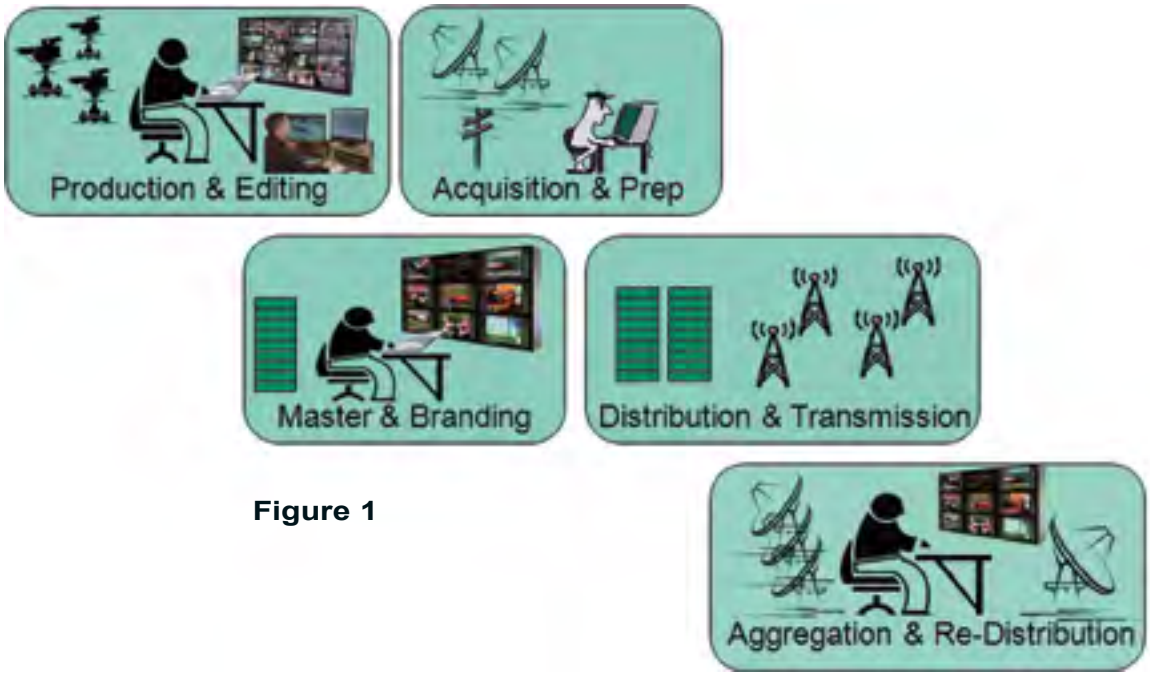


Figure 1

of subscription fees and paid advertising. This advertising is increasingly targeted to the specific demographics of the end viewer, with the goal of placing the best advertisement for each viewer. The traditional one-wire-per-channel architecture is a burden for the technical delivery platform, making it difficult to place these ads at a fine-grained scale. These challenges compound in each new country and region as cable and satellite systems cover the world with more bouquets of digital programming.

The Five Key Workflows

We have segmented the camera-to-consumer content pipeline into several high-level workflows to analyze the true technical system challenges in the modern television pipeline. *Figure 1* shows a sketch of these workflows, as further articulated below.

Production Workflow — Live News, Sports & Events

Live Sports and other live events have a unique production workflow, driven by the demands and requirements of events where there is no do-over or second take. There is a current trend in the production community to apply variations of the live production workflow to so-called "rapid production" environments: game shows and other live-studio shows where a limited amount of editing is OK, but keeping within a very constrained production budget and timeline. *Figure 2* on the next page shows an abstract view of a typical live/rapid production environment. Baseband video signals are still the currency of choice in the live/rapid production environment. The equipment (except for cameras) is contained within a confined space such as a production truck or a common equipment room. Video crosspoint routers provide an economical fabric for routing and switching signals. The multiviewer gives the production team good visibility to everything as it happens, and the production control switcher produces a final output.

IT-based workflow plays a critical role in the live production environment. Camera feeds and production outputs are often ingested into shared storage. Editors compile highlights during the shoot while logging data about the event, marking segments, scenes and cuts; and producing packages for later use.

This infrastructure evolves to look more and more like an IT data center as the editing workflow becomes more critical to the overall production. The servers, editing systems and associated shared storage accounts for a larger fraction of the overall equipment budget.

Content Acquisition, Ingest, and Preparation

Most television environments fill their schedules with material produced elsewhere. The acquisition, ingest, and prep workflow is responsible for getting this material into the plant and the asset management universe of the local automation system. Acquisition is about more than long-form content: News stories, commercials, promotions and almost every other element of the final package is somehow acquired.

Historically, acquisition produced a pile of tapes and a set of associated timecodes and media IDs in the automation system. Servers have largely replaced tape machines over the past decade. Still, the workflow is recognizable. Syndicated programming and other interstitials come in via satellite, are decoded to baseband video and recorded

on the server. A human ingest operator checks the file, adds missing metadata, and marks the beginning and end of each segment within the show. This information is then fed to the automation system. The baseband video step is removed in some recent innovations, with the bit-stream from the digital satellite delivery captured directly into a server playout file format. The segment marking and editing is still required, however, to properly identify the segments to the local automation system.

There have been significant recent changes in the direct distribution of server-ready files to stations. There are many competing file distribution services, each with the goal of delivering server-ready files into facilities. Each of these so-called "catch servers" presents a new data integration problem as the file formats must be converted into the locally-prevailing server file format.

A quality-assurance challenge also remains. Each local station is wholly responsible for the content aired. This makes many stations slow to trust material delivered as files without having an operator preview it in advance. Automated QA tools are available to check these delivered files for a variety of technical errors (automated checking content for appropriateness is still a research project).

The workflow will evolve to be less reliant on the human in the loop as file distribution systems become increasingly pervasive and more widely standardized. Server-ready files will be dropped in from distributors, and play to air without advance operator preview.

Once the data integration issues of the segment boundaries, media IDs, and file formats achieve a practical interoperability, the content acquisition, ingest, and prep workflow will be significantly reduced. This will translate to the near-elimination of baseband video within the acquisition and prep workflow.

Channel Playout + Branding

If the acquisition, ingest, and prep workflow is about gathering all the content for the channels, the playout and branding workflow is historically about taking these stored elements, intercutting live feeds (such as local news shows, or network live feeds) and transforming them into a consumer-recognizable, classic linear-branded channel. Playout servers have become the backbone of the playout facility. The true key to the channel playout center is the business software — traffic and automation — that tracks the time, media and placements and directs all of the technical workflow parts to build the channel.

Most of the look and feel of a modern branded channel is difficult to put together without automation. The financial underpinning of advertising-supported television would be strained without modern traffic systems to schedule, reconcile and invoice the various commercials. This single-channel playout model is being rapidly augmented in modern times. It is scaled to produce several linear channels in parallel instead of just one, while producing versions targeted to different delivery systems (mobile, for example) with different advertisements, audio mixing, video aspect-ratio requirements, channel branding and graphical requirements due to target screen resolution.

Baseband video remains the primary form of transit between the playout servers, master control and graphics. There is, however, a significant functional consolidation trend underway between servers, automation, and graphics. This is based on leveraging advances in computing technology to produce automated, branded channel outputs from integrated systems free of baseband video signals except for live contributions and the output.

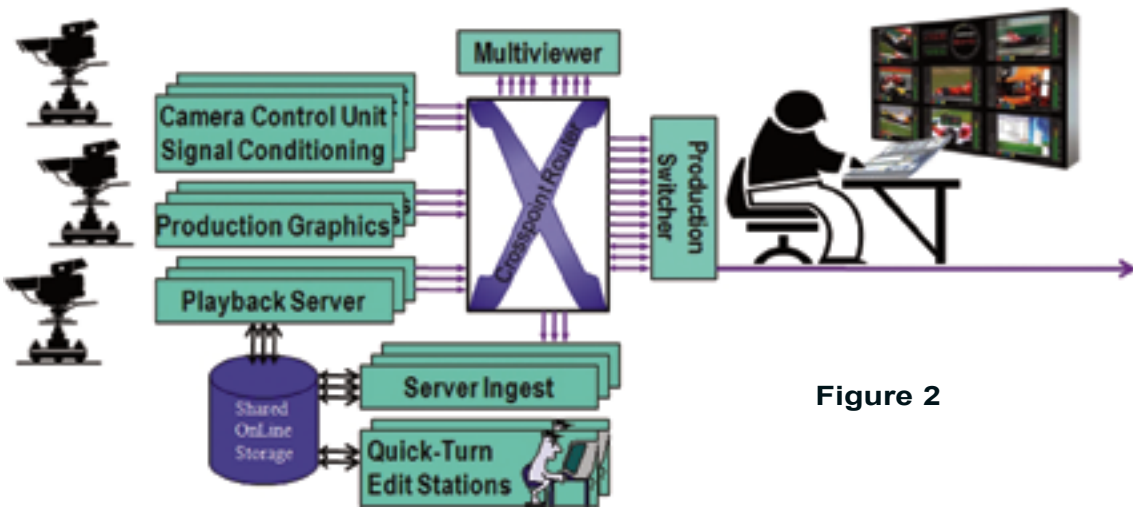


Figure 2

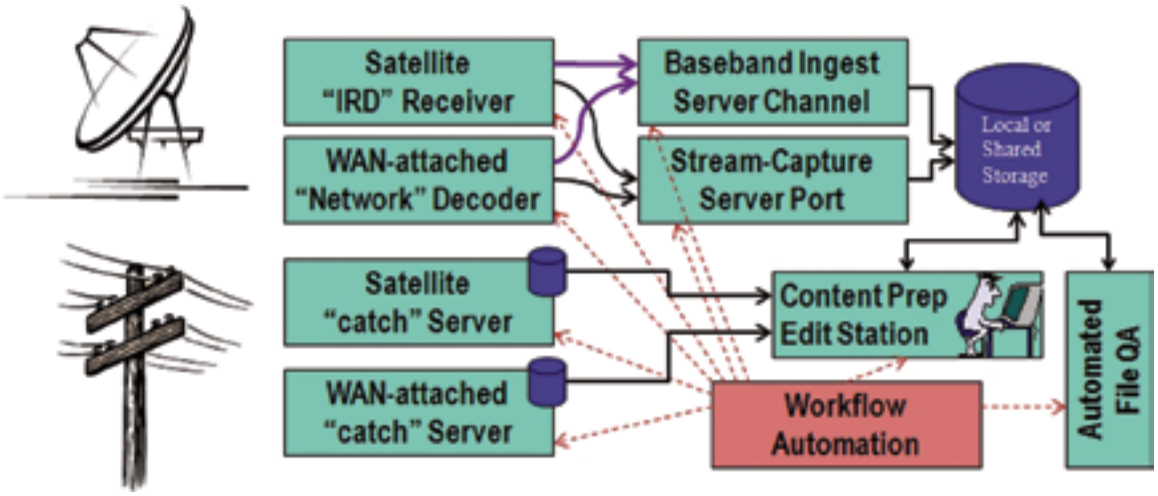


Figure 3

existing primarily to interface with the carbon-based operations staff.

Signal Distribution, Transport, and Transmission

Distribution was a simple prospect even a few years ago. A single analog channel was sent to analog transmitters and monitored with off-air analog receivers. Even the evolution to digital transmission preserved the straightforward nature of the distribution; the digital transmitter required compression encoding, but also improved accommodation (percentage of viewers who get a useful signal) and improved picture quality for most consumers.

The output signal can exist in compressed form for distribution. Producing a baseband signal is a convenience for the human operations staff for confidence monitoring, and a concession to the historically separate roles of the production and distribution departments.

Another modern development is the formatting and distribution of segments for web-based viewing, separate from any concept of linear channels. These segments can still be branded and coupled with interstitials for viewing, but their creation is a separate automated workflow process driven by a new set of file-based workflow tools. In these new non-linear workflows, the entire process exists primarily in the IT domain, with baseband video

Digital transmission also introduced program guide data and other metadata into the distribution system. Before the roll-out of digital transmission, this program guide data was purely the province of the front-office of the station, provided via fax or e-mail to local print media outlets. In global digital broadcast standards, this program information (titles, future listings, topics, guests, and other information about the programming) is included in the transmission signal and displayed by the receiver. This has driven a parallel IT metadata path through the facility, from traffic through automation and ultimately into the distribution system. Distribution encoders and multiplexers play a critical role, turning the produced video/audio/metadata packages into a continuous digital stream for distribution. The fabric of the multiplexing and transport of these digital streams and their

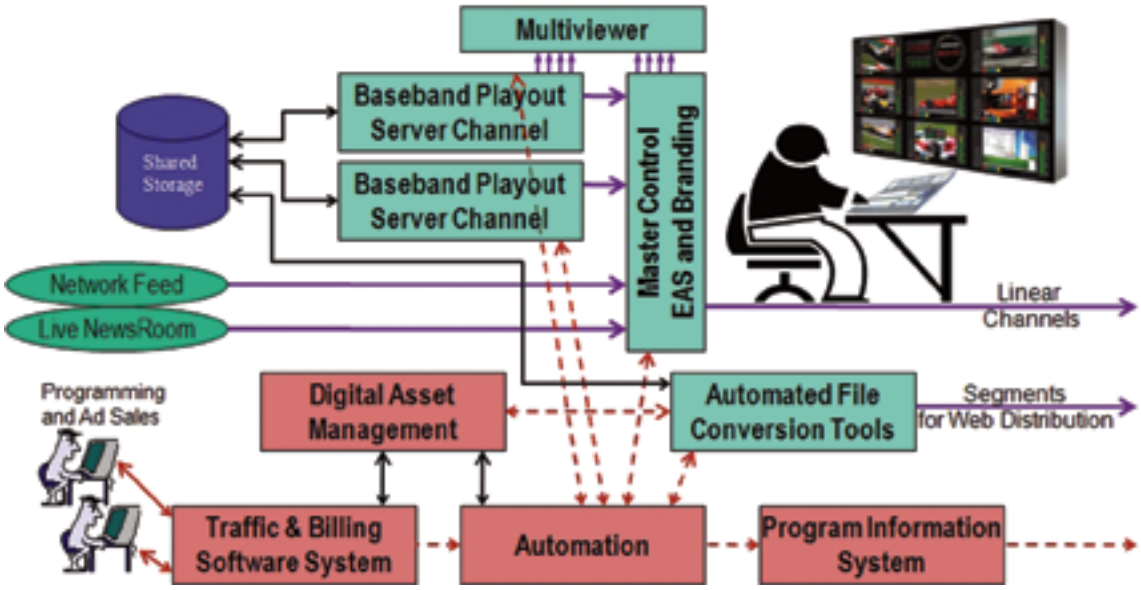


Figure 4

associated metadata has shifted from industry-specific specialized bitstream interfaces (such as DVB-ASI) into IP-based interconnections. The main role of baseband video in most distribution plants is getting signals to the encoders. The signals are then compressed and multiplexed, increasingly in IP. Operator-facing interfaces such as multiviewers are evolving to take IP inputs directly, internally decoding and displaying the images for monitoring purposes.

Program Aggregation + Re-Transmission

Most viewers today get their linear television through one or more program aggregators — cable operators, DTH-satellite operators or DVB-T/T2 multiplex operators. Historically cable-TV operators would acquire linear programming through satellite or off-air receivers, revert it to baseband, and then combine and re-modulate it into analog cable-TV. The advent of digital compression, multiplexing, and modulation technologies means that DTH satellite operators provide a second path of aggregated content to most consumers, though still via a traditional receive-baseband-re-encode technique. Both cable and satellite aggregators frequently insert advertisements into specific "avails" in the programming, augmenting their revenue streams. This requires business (traffic) systems and automation systems at the aggregator to put the right ad on the right channel at the right time, and ensure billing and payment.

As technology has developed, many of the satellite and cable-TV aggregators have moved to an all-digital compressed-domain model. Signals arrive at the aggregation site in digital compressed form. Transcoding or trans-rating technologies are increasingly used to convert the signals into the desired system compression standard and compatible bit-rates.

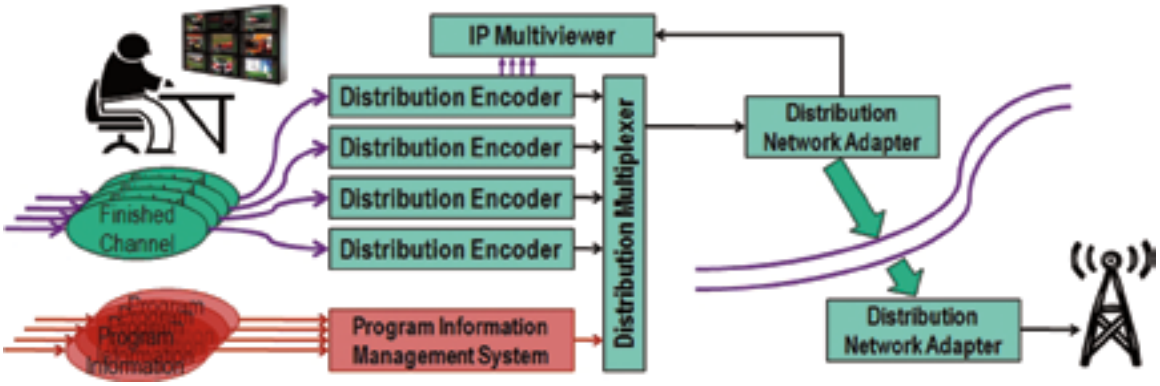


Figure 5

The insertion of commercials is also done in the compressed digital domain. The few instances of baseband video in these modern aggregation plants are cases where human operators need to see and monitor the signals. The advent of IP-based multiviewers promises to move this process into the IP-based domain.

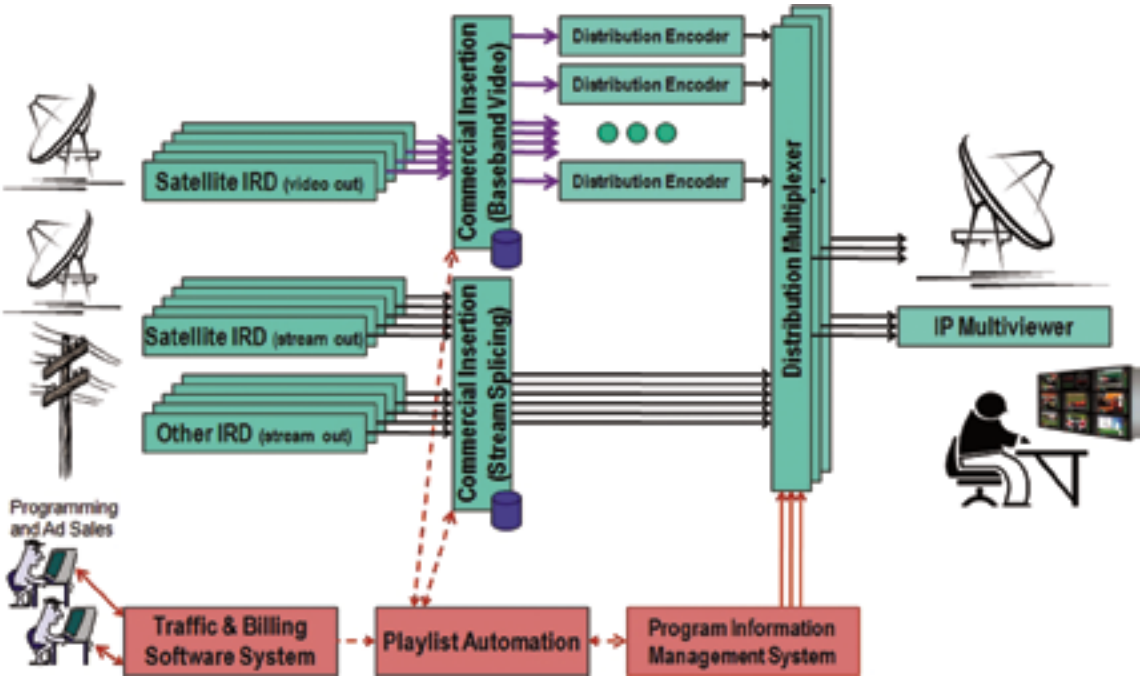


Figure 6

The Road To The Future

Traditional television infrastructure is undergoing its first major architectural shift in more than 30 years. Through the economic incentives of IP-based and IT-based infrastructures, many workflow processes that were traditionally built upon a baseband video infrastructure are now carried out in IP data networks or acting on stored files.

The underlying infrastructure of the plant needs to also shift as these technologies evolve and become even more pervasive in the television industry. Baseband video will become less prevalent. Compressed, networked storage systems and streaming systems will become the new norm.

These new technologies are key to delivering more versions of more channels and more content to an increasingly fragmented audience, while maintaining profitability through improved operations and throughput.

About the author

John Mailhot is the Director of Product Architecture Workflow, Infrastructure, and Networking Business Unit at Harris Broadcast Communications. His focus is on integrating IP workflows within his chief architecture role at Harris Broadcast.

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Selenio Media Convergence Platform

Harris *Selenio*™ is the industry's first integrated media convergence platform — a modular solution that combines traditional baseband video and audio processing, compression and IP networking features within a single, 3RU platform.

Suitable for any fixed or mobile production environment, broadcast facility, ATSC or DVB-T/T2 terrestrial head end, Selenio enables service providers to support content from multiple sources and deliver it over multiple mediums. While the media convergence platform fits into existing infrastructure, it also provides customers with an on-ramp to the IP world that can be accessed at their own pace.

Selenio hosts up to 28 channels of high-density baseband video processing in a single frame. MPEG-2 and H.264 compression standards are supported from SD and HD to 3 Gb/s and mobile. Advanced audio capabilities such as Dolby processing and DTS Neural Loudness Control can be mixed and matched on a single module.

A built-in, highly intuitive, graphically rich, web-based interface using Microsoft® Silverlight® technology promotes a user-friendly environment. With the first GUI on the market to feature functional block diagrams, Selenio enables operators to confidently configure, monitor and manage the platform's functionality without having to deal with an avalanche of manuals and bespoke commands.

Pure user benefits include intelligent, efficient management of IP and baseband signals and reduced control complexity. Efficiencies of the single-box design include easy deployment and increased functionality in a smaller footprint. Business benefits include the ability to rapidly deploy new capabilities and services with no need to replace infrastructure.

HView IP + Hybrid Multiviewers

The Harris HView IP multiviewer provides all the monitoring capabilities of a traditional baseband multiviewer, but functions in a networked environment where the feeds being monitored are all compressed video or audio. With its ability to support multiple compression formats and resolutions, the new IP-based multiviewer is ideal for operators that use different codecs for different jobs — from high-quality H.264 to lower-bit MPEG-2.

Unique features include support for virtual network connection (VNC) control, which allows the user to view and control PC-based devices; RSS display, which enables interaction with a broad range of network data providers; and multiformat IP stream decoding with built-in, visual alarming.

The Harris HView SX Hybrid multiviewer is designed for hybrid applications with routing and monitoring of both traditional and IP signals. Combining baseband and broadband monitoring, superior graphics, and optional integrated test and measurement tools for baseband signals in a single chassis, the multiviewer/router solution is built to reduce integration costs and enable a more efficient use of space in today's complex A/V monitoring environments.

The HView SX Hybrid multiviewer resides within the output section of the Harris Platinum router frame, and is available as either a multiviewer-only or multiviewer/router integrated solution.

Harris HView SX Hybrid Multiviewer

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A Case In Point

FishComms

Trident Seafoods of Seattle, Washington, recently selected KVH's *TracPhone® V7* satellite communications system and mini-VSAT Broadband℠ service to provide Internet and voice services for business communications and crew morale aboard six of its 130 to 162' trawl catcher vessels operating in the Bering Sea.

"We were looking for a solution to support our vessel-to-vessel and vessel-to-shore business communications, as well as for longer term web-based fishery management programs currently in development. In addition, we have seen a boost in crew morale due to the increased opportunities for them to stay in touch while being gone for extended periods," said *Christian Asay*, operations manager for Trident Seafoods Corporation. "We knew we wanted broadband, considered KVH a reputable operation, and like the mini-VSAT service plans as they allow us to accurately budget and control our communications costs without any month-end billing surprises."

Challenges

Finding a satellite communications system that is easy to install and comes with affordable, reliable service is difficult enough. However, Trident Seafoods is a sizable operation, so communications costs need to meet strict monthly budgets, while supporting day-to-day business functions such as email and fishery management, all of which can quickly eat up large amounts of bandwidth. Crew communications can do the same, but is available onboard all Trident vessels as one of the company's initiatives to offer crew members the best work environment possible.

The Solution

"We really like the controlled cost of the monthly mini-VSAT Broadband rate plans," *Asay* explains. "While the cost is actually a little bit higher than what we were paying with our old MSAT systems and their pay-per-minute plans, we have gained so much operational efficiency with the TracPhone V7s that we deemed the slight cost increase completely justifiable. We can use the mini-VSAT Broadband service much more without any added cost, and we can move data, which is a valuable tool that we didn't have before. I also determined that mini-VSAT Broadband is far more cost-effective than the other 'pay-as-you-go' VSAT plans that we considered."

While budgetary considerations determined that mini-VSAT Broadband service would best fit Trident's needs, the TracPhone V7 hardware was specifically requested by Trident vessel captains. "The recommendation for the TracPhone V7 actually came from some of the captains operating our vessels — they had heard about it from other captains," *Asay* explains. "They are very pleased with the system, specifically as it pertains to the ability to e-mail photos for hard-to-find parts, access weather reports, and communicate them to the rest of the fleet. The system is an important communications and data access tool that helps Trident vessels operate under various fishery management programs."

Hassle-Free Installation + Activation

All six TracPhone V7 installations were performed in Dutch Harbor, Alaksa, and went smoothly. The mini-VSAT Broadband service activation was problem-free as well, requiring just a couple of days, and the network continues to meet Trident's expectations. "We're very pleased and plan to add more TracPhone V7 systems to our fleet in the future," said *Asay*.

Results/Impact

"Even though we still have MSAT phones onboard the vessels, we rarely use them or the Inmarsat C systems, which are now used only for very limited text messaging. The TracPhone V7 and mini-VSAT Broadband are our go-to solution for all business and crew communications on these trawl catchers," *Asay* said. In addition to supporting Trident's vessel-to-vessel and vessel-to-shore business and crew communications, the six TracPhone V7 systems are also an insurance policy of sorts. *Asay* sees a strong trend toward web-based catch reporting and fishery management,

Trident Seafoods currently uses KVH's TracPhone V7 on six trawl catchers, including the 132' *Arcturus*.

as well as fishermen sharing important information about fishing conditions in various locations. He feels that having mini-VSAT Broadband aboard Trident's vessels offers them a unique opportunity to take advantage of these resources even as they are developing, giving the company a competitive edge. They've been so successful that Trident plans to purchase another five TracPhone V7 systems for other trawl catchers, ranging from 99' to 162'. Trident is also considering installing systems on several other vessels in the near future, including one of its large processing vessels.

"The future of catch and bycatch management in the Bering Sea is likely going web-based," he predicts. "Without full-time broadband onboard, boats have to wait until they get in to find out by catch rates and other pertinent data. Thanks to mini-VSAT Broadband, I feel our boats will have a distinct advantage by having full-time access to this data as well as blog sites to find and share information about the fishing grounds."

About KVH Industries, Inc.

Middletown, Rhode Island-based KVH Industries, Inc., and its subsidiaries are leading providers of in-motion satellite TV and communications systems, having designed, manufactured, and sold more than 150,000 mobile satellite antennas for applications on vessels, vehicles, and aircraft. For more information, access KVH's product infopage at http://www.minivsat.com

KVH's reliable mini-VSAT Broadband service helps Trident SeaFood's fishermen stay connected to vital resources while at sea.

Insight

Backhaul To The Future...

By Justin R. Phillips, Vice President of Marketing, Microsat Systems Canada, Inc

There's no secret that the global demand for backhaul is increasing at an unprecedented rate. This demand is being driven by wireless and wired users in well-connected parts of the world, and the two-thirds of the world not currently using the Internet but looking for ways to cost effectively gain access to it.

What is promoting this demand for high-speed Internet access? With the proliferation of smartphones and tablets such as **RIM**'s ***Blackberry*** line and upcoming ***PlayBook*** tablet, the **Apple *iPhone*** and ***iPad***, and the more than 100 tablets and the thousands of Smartphone brands worldwide, the demand for bandwidth for data has grown exponentially. A few years ago, companies such as **RIM**, **Apple**, **Nokia**, **Samsung**, and **Qualcomm** served a cell phone market for low bandwidth voice traffic, text messages, or email. Companies such as **Skype**, **Facebook**, **Twitter**, **Netflix**, and **Google** were much smaller, or didn't exist.

Today, for example, Apple still sells computers and phones, but they have developed an entirely new revenue stream for the sale of applications — this generated $2.2B in revenue in 2010. Apple's business case, and those of the pure Internet companies, hinges on the ability of their customers to have access to high-speed Internet.

This is a business model that many other Smartphone manufacturers are working towards. Google and Facebook also have business models that rely on Internet real estate. It's a numbers game. The more visitors on a site, the better chance of a user clicking on a revenue generating advertisement. If these businesses cases, as well as those of thousands of other Internet companies have achieved amazing success with only one third of the world's citizens with access, just image what their business models look like if — and when — the entire world is online.

These business models provide tremendous opportunity but also incredible strain for mobile operators and Internet service providers who supply bandwidth and generate huge revenues as a result. The challenge is that in well wired areas, "**Nearly every major mobile operator is, or will shortly be, at capacity…**" — *Chris Kissel*, Industry Analyst for **In-Stat**. (http://www.in-stat.com/press.asp?ID=2899&sku=IN1004716GW).

The cost for backhaul continues to increase and the operators are unable to pass these fees along to their customer thus chipping away at their profits. However, even as the service providers in the fiber world struggle to keep up with demand, the problem outside the fiber regions is much worse.

According to *Internet World Stats 2010*, approximately 4.9 billion of the world's almost 6.9 billion citizens are not currently using the Internet. Countries such as Canada and the United States are seemingly well wired, although the *Canadian Radio and Television Commission* (**CRTC**) has estimated that 700,000 Canadian households do not have access to the Internet. In the U.S., the number is even higher. A new telecommunications administration report, *Digital Nation 2010*, states that about one-third of U.S. households don't have high-speed Internet, which means functionality like surfing the web or downloading photos or videos is impractical.

Two key factors that contribute to the lack of Internet usage in North America are the cost of Internet access and the lack of fiber optic infrastructure in outlying areas. From a cost perspective, many Internet Service Providers (ISPs) are charging market prices and offering a wide range of packages in an attempt to meet most budgets — provided a household is already equipped with the necessary hardware and software. Infrastructure is another story altogether. To understand this, it is important to understand the basic structure.

High-speed Internet depends upon an infrastructure of fiber optic cable that criss-crosses much of the developed countries and runs across the bottom of the oceans to connect continents together. Most major urban centers, such as Toronto, Los Angeles, Tokyo, Moscow, and London, are covered in a web of fiber optic cable that forms part of the Internet trunk. Through cable and phone lines, users in these urban centers have access to Internet broadband. Their decision to get online and obtain high-speed access is primarily based on affordability.

Outside of the major urban centres, and this could be only a few miles "out of town," potential Internet users may find themselves with limited or even no access to "high enough" speed Internet. Consider small town North America, a self-contained population that is connected to itself by land lines, cable, and mobile access.

Quite often, these small towns have basic and antiquated infrastructures for carrying telephone, and perhaps coax or possibly even fiber for cable television in the town, but no fiber connecting the towns or connecting to the global fiber network. Consider that when cell towers were first installed, they were also designed with one purpose; to carry voice, not data. Voice over landlines or wireless within these small towns and even to urban centres is an easy business case for local telcos or cable operators.

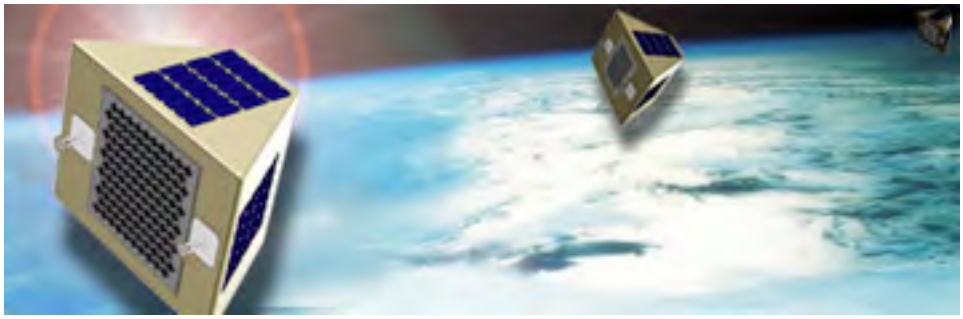
That calculation changes fundamentally when data traffic is entered into the equation. The bottleneck resides between the small town *Central Office* (**CO**) and the connection to the Internet trunk — called backhaul. Without fiber, the backhaul has to pass over phone lines that were not designed for high-speed to the fiber Internet. Alternatively, the data packets are passed through microwave towers, which again were designed for voice rates, not data rates. Data transmissions required for surfing the Internet or downloading a movie or pictures is not in the cards.

Now consider Africa, a continent where approximately 90 percent of the citizens do not have Internet access. Fiber optic cable runs around the coast of Africa but very little has been laid inland. In addition, small town Africa, in many cases, is not that small and may have a population of three to five million people. There is little or no infrastructure for Internet access and similar to small town North America, they have wired and wireless voice access which are barely capable of providing dial-up Internet access.

Most governments around the world recognize that the Internet is a wealth generator and an important component in improving the lives of their citizens. President Obama said he wants to see 98 percent of Americans with Internet access by 2015. Canada's *Economic Action Plan* also promotes access to the Internet for areas of Canada that are unserved or underserved. **MTS Allsteam**, a large Canadian telecommunications company, estimated a price tag of seven billion dollars and a 10 year timeframe to wire the Canadian North, yet the population served by this initiative would be just over 100,000 people. The business case does not make sense. Until there is a cost-effective solution to digging trenches and burying cable, the cost of wiring remote areas is a difficult pill to swallow.

The challenge remains how to cost effectively hook up the remaining two thirds of the world to the Internet in timely manner? From an options perspective, data can be transmitted either through cables or through space. From a timing perspective, it is a race of turtles. Backhaul via fiber is a very expensive and time consuming endeavour. Backhaul via satellite is a relatively new alternative and had been driven by necessity because that was the only option. Although it's a race of turtles, satellite infrastructure is a turtle on steroids as compared to fiber infrastructure. It's faster and cheaper.

But even these traditional GEO satellites designed for television broadcast, VSATs, or some mobile applications, have only megabit data rates, not the gigabit data rates required for high-speed Internet. Until recently, only purpose-built, high bandwidth GEOs like ***Viasat-1*** and ***Ka-Sat***, or the equatorial based ***MEO O3b***, hold some promise to make a dent in demand — but even these satellites don't offer a global solution.



The latest entrant into backhaul via satellite market is by a Canadian satellite manufacturer, **Microsat Systems Canada Inc**., with ***COMMStellation***, a global constellation of 78 microsatellites in a Polar Low Earth orbit (the satellites travel over the north and south poles) in six orbital planes that will provide 100 percent global coverage. The challenge is to bring Internet backhaul capacity to the global market in a cost-effective manner and in a reasonable time to market, while providing bandwidth comparable to that of fiber.
It's a tall order and requires consideration of the satellites' proximity to Earth, the footprint of the satellite beam on Earth, the ability to have enough satellites that each footprint overlaps, and the right payload and ground segment that can transmit high-speed data.

COMMStellation is able to achieve this based on the following factors. First, microsatellites are considerably less expensive than traditional full-sized satellites. Cost-efficiencies are based on two main considerations; the physical size and reduced complexity of the satellite. The second factor is that the microsatellites use a Low Earth Orbit at approximately 1,000 km from the Earth's surface. Radiation levels are comparatively benign thus the need for very expensive ultra-high reliability space-grade parts with long production times is reduced, and carefully selected but readily available high-quality commercial grade parts can be used. These cost and schedule efficiencies enable a business case for 78 microsatellites which in turn, at 1,000 kilometres, provide overlapping footprints to cover the entire Earth.

The orientation of the orbit is also a key factor in the coverage, speed and capacity of a constellation. A constellation in an equatorial orbit (orbiting the Earth around the equator) travels in one orbital plane. For a given beamwidth, the only way to increase coverage is to move a satellite further away from the surface of the Earth. But the further away it is, the more harsh the radiation environment and the greater the power required (increasing at roughly the square of the distance) to obtain the same signal strength back to Earth. The end result is increased latency, requirements for expensive space-grade parts, larger antennas, and a much larger and more complex satellite to generate the additional power required.

The resulting satellites are more expensive, physically larger, require larger and more expensive launchers to place the satellites in orbit, and result in a larger footprint on the Earth. This translates into more users per satellite, sharing the same bandwidth and thus lower speed per user. Equatorial orbits are also limited in their coverage and depending on the distance a satellite is from the Earth, a Medium Earth Orbit satellite, for example, will provide acceptable coverage only between 45 degrees of latitude north and south. A geosynchronous satellite will provide coverage up to around 70 degrees of latitude, but the further away a user is from the equator, the weaker the signal.

A polar constellation, on the other hand, does not need to travel on one orbital plane. As long as the satellites pass over the north and south poles, it is considered a polar orbit. COMMStellation will be placed into six orbital planes separated by approximately 30 degrees of longitude. Due to the nature of the polar orbits, satellites in adjacent orbits will be furthest away from each other at the equator. Even at the equator, they will still have a 250 km overlap. As these satellites are closer to the Earth than a MEO or GEO Satellite, for the same signal strength to the ground receiver, their footprint (coverage area) is much smaller, thereby concentrating the data bandwidth across fewer users. Ultimately, this results in higher speeds. As the satellites converge over the poles, ground footprints overlap and satellite bandwidth is shared over even fewer users. Where an equatorial orbiting MEO and GEO have lost signal strength, a polar orbiting LEO gets stronger and stronger until it reaches a point where it is the only option available.

Ultimately, the end-user doesn't really care from where high-speed Internet access is delivered, as long as they can perform a Google search, download an app, engage in a Skype video call, or share their travel pictures or download a movie without interruption. They are contented users. In areas of the world where the Internet is not a way of life as it is in the Western World, users are quite happy to be able to surf the web and send an email.

Backhaul via satellite has become a viable solution for the explosive demand being experienced worldwide. Backhaul is more cost effective and can be less expensive to implement and will, for now, have to meet demand until newer, more cost effective solutions emerge.

About the author

Justin R. Phillips is the Vice President of Marketing and a member of the Strategic Advisory Board for Microsat Systems Canada Inc. (MSCI) and COMMStellation™. Justin has more than 17 years of marketing experience in the high-tech and aerospace industries. For the past seven years Justin ran HiPoint Marketing as President and CEO.

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Helping To Save Lives In Haiti

By Ingrid Ricks

The 1.8m antenna sitting on top of the laundry building at Hospital Sacre Coeur in Milot, Haiti, a rural northern community located only 70 miles from the still-devastated city of Port au Prince, might not look like much to passersby.

But to the dedicated staff at the over-stretched 73-bed hospital — many of whom are volunteers working around the clock to care for Haitians who have suffered unimaginable disease and hardship since last year's horrific earthquake — that antenna symbolizes the difference between life and death. This life-saving antenna facilitates satellite-based Internet connectivity and telemedicine services for the hospital.

"It is not exaggerating to say this will save lives," said *Tim Traynor*, building and grounds coordinator for **Sacre Coeur** who spearheaded the Internet/telemedicine project for the hospital. "I would suspect that it has already done so even in the short period of time it has been up. Even for a small hospital in the United States to have exposure to this kind of technology would be awesome. To have this available in Haiti is unheard of."

The Internet and telemedicine project was made possible through a collaborative effort between **iDirect**, which donated all of the necessary equipment, and **NewCom International**, which donated a year of high bandwidth satellite-based Internet connectivity, VideoMeetings technology, project management and technical support.

The system officially went live in early February, providing what Traynor calls a "revolutionary service" for the struggling hospital. Beyond the critical life-saving support the technology provides, what makes the project remarkable is the lengths to which everyone involved had to go to in order to make it a success.

What started as a relatively quick project in June of last year turned into an arduous seven-month process marred by disease, natural disaster, and civil unrest that has become an all-too-familiar way of life in Haiti.

Connecting Sacre Coeur To The World

It was *Traynor*, who left the comfort and security of the corporate world in the U.S. a few years ago to devote his life to helping the hospital care for the people of Haiti, who initiated the call with iDirect. For months he had been frantically trying to consult with doctors in the U.S. and generate media exposure that would bring medical help for thousands of patients seriously injured in the January earthquake. The hospital didn't have the bandwidth or software necessary to make multi-party conference calls so he resorted to conducting interviews and consultations via Skype™, where he was continually losing connectivity due to a passing storm cloud or the erratic behavior of a particular satellite modem.

"All we had were three Starband units with another network and connectivity was poor or non-functioning on all four dishes during the day," says *Traynor*. "Night brought a little better service because of a decrease in satellite traffic. But a passing cloud or the constant threat of a thunderstorm rendered these systems useless until calm, blue sky reappeared. Email was as or less reliable than snail mail because there was no expectation that the correspondence would ever reach its mark."

When a visiting volunteer who understood the dire situation that the lack of reliable Internet communications posed for the hospital told Traynor she knew an executive at iDirect,

Hospital Sacre Coeur in Milot, Haiti

a global leader in satellite communications technology, Traynor jumped on the opportunity. His request for help was routed to *Rob Kilroy*, Regional Vice President for the Americas, who readily agreed to offer assistance. However, in assessing the situation, *Kilroy* realized that beyond equipment, the hospital was in need of a satellite-based Internet service provider and immediately turned to NewCom International, a global satellite communications provider that focuses on providing bundled solutions that make a positive social impact in the world.

"NewCom has been a long-time customer of iDirect and is very strong servicing Latin America," explains *Kilroy*. "They have an excellent teleport facility in Miami and offer incredible customer support. The culture at iDirect and NewCom are very similar in that when there is a serious issue, it becomes about a lot more than making a dollar. It's about `How can we help?'"

The project started out quite smoothly. *Christian Vivas*, who oversees IP services and procurement for NewCom, consulted with *Traynor* to understand the exact needs of the hospital. He then customized a solution, requested a 1.8m antenna, modem, routers, cable kit and other necessary equipment from iDirect, and began configuring and testing the service. *Jaime Munera*, Director of Product Development and IT for NewCom, stepped in to handle the VideoMeetings portion of the project, helping Traynor and his team to understand the full interactive telemedicine capabilities of the technology, which enables a team of medical experts from different locations around the world to collaborate in real time over video and online whiteboard to diagnose and treat a patient.

Within a few weeks, the system was ready to be shipped to the hospital, installed and activated. "It was all pretty straightforward," recalls *Vivas*. "Tim said he could take

The iDirect donated VSAT atop the laundry room roof at the hospital

care of the transport so from that point, it was just a waiting game for us until the equipment landed at the hospital."

Trouble Brews

Traynor contacted **The Royal Caribbean Cruise Lines**, which has been working with Sacre Coeur since the early days after the earthquake hit Haiti. The cruise line staff agreed to bring in the equipment from Miami and drop it off at their port of call in Labadee, located approximately 30 miles from Milot.

The logistics were more difficult than anticipated. However, by autumn, the cruise lines had managed to bring in the 1.8m VSAT antenna donated by iDirect for installation. Then trouble hit.

In early November, *Hurricane Tomas* bore down on Milot and the surrounding areas. The storm brought torrential rains into the open trenches that served as sewer lines, which led to flooding and a deadly Cholera outbreak. The outbreak of the deadly disease, coupled by the civil unrest that followed, kept the cruise line from stopping at the Labadee port. As a result, *Traynor* had to rely on help from hospital volunteers who were coming from the United States to bring in the rest of the equipment, which further delayed the process.

When all the equipment finally made it to the hospital, *Traynor* brought in an installer and coordinated with NewCom's *Network Operations Center* to walk through the installation process. During installation, NewCom discovered that one of the modems had been damaged during transport and had to be returned — causing another delay while iDirect quickly sent a replacement satellite remote router to NewCom, which had to reconfigure it and then get it back down to the hospital.

After a rocky, seven month effort, the pieces were finally in place and between NewCom's NOC and Traynor's efforts, the system was finally launched.

The hospital's laundry room building

"It's been a long, arduous process and without NewCom's continued support and refusal to get discouraged along the way, this project wouldn't have happened," said *Traynor*. "In a place like Haiti, we are always trying to overcome just the challenges of day-to-day life and a lot of people get discouraged by this. It's nice to have that spark of excitement — that ving, vang, voom at the beginning of a project. But it takes something altogether different to grind it out when there is no spark, and that's what NewCom did. Every time I called, they gave me the assistance I needed and were there every step of the way. They have been remarkable. I can't imagine how they service people who are actually paying them.

Success

The system went live in February 2011 and, as its first test, *Traynor* immediately sent cardio graphic information on seven pediatric pulmonary cases — which required two gigs of data — to doctors in the United States. Since then, several video consultations have taken place and *Traynor* envisions using the technology to launch weekly training sessions in which medical experts from throughout the U.S. would hold virtual classes with groups of nurses at the hospital.

Traynor, who calls the Internet/telemedicine project "an extraordinary gift that is changing the face of health care in Haiti," says the difference the technology has made is monumental.

"During the quake relief activities, this thin thread of unreliable to non-existent connectivity was all we had to connect our doctors, donors, suppliers and others who availed themselves to the fragile lifeline we had established," says *Traynor*. "By contrast, the current VSAT network provides a strong, reliable signal even through the worst of tropical storms or most impenetrable cloud cover."

Knowing that their joint efforts have made such a powerful impact on the lives of people in Haiti is a gratifying, humbling experience for the team at iDirect and NewCom. Both companies say the project illustrates what they view as the big picture when it comes to satellite communication, which is to use the reach and power of today's global communications technology to change lives.

"The iDirect platform is designed to overcome traditional threats to satellite links such as weather and latency," says *Kilroy*. "We are proud to be part of such a life-saving effort with NewCom. When I was contacted by the hospital I immediately thought, 'what can we do that would have an impact?' and I thought of partnering with NewCom. This was a huge challenge on all of our parts and it's nice to see perseverance pays off."

"We're grateful that iDirect brought this opportunity to us," adds *Munera*. "It's what we are continually striving toward as a business, which is to take an integrated approach and bundled satellite communications into comprehensive solutions that drives positive social advancements around the globe. By taking a more integrated approach, connectivity has a purpose: It becomes a tool for education, health care and improving the welfare of people around the world."

About the author

Ingrid Ricks oversees marketing and public relations for NewCom International.

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A Case In Point

A Stronger Sightline From The NOC...

By Christian Bergan, Director of Maritime Marketing, iDirect

High-speed satellite broadband has become a constant, universal demand for vessels that must stay connected as they travel across commercial shipping lanes, through severe weather patterns, and in and out of ports scattered around the world.

While maritime service providers focus on building global VSAT networks to address end-user demand for seamless and guaranteed connectivity, they face several tough challenges — larger deployments, expanded geographic reach and more sophisticated network configurations. **MTN Satellite Communications (MTN)**, one of the first service providers to bring VSAT into the maritime market, needed a way to address these issues in order to better manage its continued growth.

MTN turned to **iDirect**'s ***SatManage*** solution, the industry's most sophisticated network management system. By integrating its iDirect network and customer web portal with SatManage, MTN has gained greater visibility into and control of its expanding global network.

Limited Visibility

MTN is a provider of communications, connectivity and content services to more than 600 vessels and land-based VSAT terminals around the globe. In 2003, the company implemented iDirect's VSAT platform to capitalize on the growing demand for broadband connectivity at sea, quickly becoming the market leader in the cruise line industry. Since then, MTN has leveraged the iDirect platform to expand its service to new markets including government and military installations, commercial ships, private yachts, offshore drilling and production sites, and commercial aviation.

As MTN's global presence and customer base increased, so did the challenges of managing a larger number of network deployments, each with numerous mobile assets to track, monitor and troubleshoot.

"We have several hundred vessels on our iDirect network, which are supported by 32 different C- and Ku-band satellite footprints and eight teleports worldwide, all interconnected by our private MPLS backbone," said *Kevin McCarthy*, MTN's senior vice president of network engineering.

"As we have grown, the challenge of monitoring hundreds of ships moving from satellite to satellite and from teleport to teleport has become increasingly difficult."

> ***"SatManage has been an important part of our scalability strategy, helping us maintain a high quality of service as we grow."***
> ***Kevin McCarthy***
> ***Sr. VP, Network Engineering***
> ***MTN Satellite Communications***

In addition to requiring greater control over its expanding network operations, MTN also needed to provide customers with better visibility into their service patterns. As complexity and activity inside their *Network Operations Centers* (**NOC**s) intensified, MTN also began to see limitations in its ability to respond to customers. MTN's previous system, developed in-house, could only offer customers bandwidth usage information by major categories such as Internet, voice and corporate data, lacking granularity within each category.

"When a customer is faced with an expensive bandwidth purchasing decision, their first question is always, 'What specific applications, services and users are using my bandwidth?' It was a difficult question for us to answer, often requiring extensive analysis by a network engineer," *McCarthy* said.

Seeing An Opportunity

For MTN, the solution was iDirect's SatManage, a sophisticated suite of operational support tools that allows service providers to integrate, monitor and automate network operations and NOC-based applications.

SatManage gave MTN's engineers a powerful dashboard that provides a simplified, single-page overview of all key issues across the network. The dashboard features intuitive visual correlation and reporting tools that display operational information including network performance data and traffic breakdowns to enhance MTN's network visibility.

"We had access to all of this data for a long time, but didn't have an efficient or effective way of visualizing it on a large scale, especially considering our growing customer base," *McCarthy* said. "When looking at trends for an entire region across multiple ships, it's difficult to identify data patterns using spreadsheets and reports. SatManage correlates and color codes the data in a logical way, easily allowing us to spot trends."

The Customer's View

SatManage also enabled MTN to provide customers with a better way to see, understand and monitor their network performance. MTN integrated a highly customized version of the ***SatManage Traffic Analyzer*** package into its customer web portal. The system helps MTN and its customers interpret data flows to better understand traffic patterns and bandwidth usage. With this information, MTN can make more informed decisions about the network that result in bandwidth efficiencies and cost savings. "Our customers, NOC personnel and sales teams all value the tool. It gives them insight into each ship's bandwidth demands and is easily accessible through our Web portal," *McCarthy* said. "The success of Traffic Analyzer led us to other SatManage functions such as the Network Correlator and Signal Analyzer.

"These tools allow our customers and engineers to look at detailed performance statistics of satellite links, including signal strength, errors, availability and other granular data that modems feed into network management systems."

Spotting Issues

MTN also uses SatManage as a trouble-shooting tool, allowing it to proactively detect and prevent problems. NOC engineers can monitor the status and performance of each remote router in their network in a user-friendly graphical display.

"SatManage has given us more visibility over our network at a macro level, allowing us to quickly spot issues and drill down to very granular details when necessary," *McCarthy* said. "The software has been an important part of our scalability strategy, helping us maintain a high quality of service as we grow."

Rapid Problem Identification + Troubleshooting

MTN uses SatManage to help it proactively detect and prevent network issues. A recent example of an issue that would have been difficult to spot without SatManage involved the tracking system on one of MTN's large teleport antennas.

Previously, it was nearly impossible to detect a subtle teleport antenna tracking issue by looking at one ship's signal strength. However, by using SatManage to correlate the data from dozens of ships over a period of several days, MTN was able to detect similar fluctuations in signal strength throughout the data. This common fluctuation helped isolate that the problem was at the teleport.

SatManage's Multi-homing System

Looking Forward

Since implementing SatManage, MTN has gained a single, consolidated view across its network, allowing it to simplify data analysis and improve customer support by generating detailed SLA reports. Customers now have complete visibility over their bandwidth utilization, broken down to extremely granular levels.

"We continually strive to provide unmatched network quality and user experience to our growing customer base around the world," *McCarthy* added. "As pioneers in the maritime VSAT industry, we fully understand the critical need for seamless communications at sea. Our goal has always been to invest in technology that maximizes the performance and reliability of our service while minimizing complexity for our customers. The sophistication of the SatManage solution to help us monitor our global maritime VSAT network, the largest in the world, puts us one step closer to that goal. SatManage has been an important part of our scalability strategy, helping us maintain a high quality of service as we grow."

About the author

Christian Bergan is responsible for the maritime market strategy at iDirect, working closely with iDirect's global network of service providers to promote the value of VSAT technology throughout the maritime industry. With a background in both the satellite and maritime industries, Christian offers a unique blend of knowledge and experience to help educate the maritime market on the expanding capabilities of satellite communications. Prior to joining iDirect, Christian spent 20 years with IC Bergan, Inc., a family-owned business engaged in manufacturing of sensors and controls for liquid cargo handling for the global commercial shipping markets. He currently resides outside Oslo.

Controlling SATCOM Costs With Compression

By Sandy Johnson, COO, SatCom Global

With the increasing availability of sophisticated voice and data communications options in both land-based offices and domestic environments, businesses and employees are pressing for flexible, cost-effective solutions — wherever their location.

For those operating in remote parts of the globe on land or at sea, the ability to communicate with colleagues, friends and family has, until now been restricted, due to both affordability and a lack of communications channels.

However, there is nothing less than a revolution currently occurring in the world of satellite communications. For the first time it is now possible for users in maritime, oil and gas, construction, government, emergency and first responder markets, who spend long periods of time in remote locations, to benefit from the high quality voice and data communications they have become used to at home.

In order to take a decisive step forward to provide high quality communications to meet today's needs, **SatCom Global** looked closely at what today's user requires from satellite-based solutions. A number of powerful drivers emerged from this analysis.

- *At a time of continuing and professive economic constraint, there was a demand to give control back to the bill payer*
- *Customers wanted greater flexibility, with multiple and simultaneous voice connections over their mobile satellite communications network*

- *They wanted voice and data available in a pre-paid environment, especially important in enabling improved crew calling and soldier welfare*

The Company's ***Horizon*** has developed as a suite of products designed to optimize and revolutionize communication via satellite. The suite consists of four primary elements:

- *Voice over IP (VoIP) with SmartPacket™ technology — This includes peer-to-peer and PSTN calling, offering ultra-low bandwidth consumption of 2kbps and is available on Multi VoIP hardware and desktop software*
- *Mail — Provides compressed and optimized, header-less email with cost-based decision-making tools*
- *Text — Instant messaging is compressed and optimized for satellite use, this function is corporate data-retention compliant*
- *Surf — This web browsing application is optimized for low bandwidth consumption and includes such features as socket management, white-list and image dithering management*

What makes Horizon different? In short, there are five core principles that underpin the engineering of the Horizon solutions. These include:

- *Low bandwidth: Every part of the Horizon system is designed to use as little bandwidth as possible, including the creation of silence detection and choosing from three call quality settings during a call, as well as a unique code, emails and email header*
- *Data recording: Each service within Horizon, including phone calls, sending emails and even logging onto the system is recorded against the individual PIN code. This enables detailed customer data records and produces bills for each user rather than for the satellite communications terminal in total. This contrasts with other systems based on, for example, Inmarsat records based on terminal usage, where the bill payer then has to manually identify individual usage*
- *Carve out: By recording everything, pre-paid and post paid usage can be carved out separately. This is especially valuable when using FleetBroadband or BGAN terminals in automatically distinguishing pre-paid expenditure for total satellite airtime*
- *Own the solution: SatCom Global develops and owns the total solution, which enables rapid development response to evolving market demands and more effective ongoing technical support*
- *The 'follow me' principle: Horizon post-paid users are assigned with an eight-digit user extension for receiving VoIP calls and voicemail. The user extensions are associated with the individual, so that each user can move from device to device across the Horizon global exchange simply and easily, with no further configuration required. Personal settings and emails 'follow you' and personal data remains fully available, irrespective of location*

Data Compression

The key to this step change in communications capability is compression. Advanced data compression technologies within Horizon provide two major benefits which now makes the provision of advanced communications channels a viable proposition for business operators and their staff.

The adoption of an advanced, flexible codec delivers a new level of high quality two-way voice and data communications in a secure environment. This represents an entirely new approach, offering all the features and benefits of a VPN VoIP solution, all the while minimizing the use of valuable data. The limited availability of bandwidth and high cost of satellite communications make this an ideal ultra-efficient alternative for optimizing the management of voice and data communications.

Horizon's Multi VoIP technology provides a powerful example of how this works. The Multi VoIP unit provides eight analog phone ports. When set up at both remote and office locations, Horizon users can direct dial any Horizon registered handset without the need to go through the PSTN, which means even greater savings.

The technology enables ultra-low bandwidth voice and data usage, from as low as 2kbps, and its flexible codec allows users to choose from three call settings for optimum cost/quality voice delivery enabling phone calls at a saving of more than 50 per cent over standard satellite voice. A step-by step view shows how Horizon Multi VoIP Unit delivers these benefits:

1. *The user lifts the handset and enters the PIN code. The call is then routed from the Multi VoIP terminal to the hub. The hub voice server completes a security check and sends the OK reply to the Multi VoIP unit. The user hears the dial-tone, indicating a call is ready to route. This security check takes just 60 bytes in total and is completed in two single TCP trips.*
2. *The user dials an international PSTN number, followed by #. The PSTN destination number is routed from the Multi VoIP terminal to the hub. The hub voice router opens a new PSTN connection using its least cost routing mechanism and sends the details of the connection to the Multi VoIP unit. This routing takes just 51 bytes and is completed in two single TCP trips.*
3. *The call connects: The Multi-VoIP unit establishes its UDP connection to the open PSTN call and the destination phone rings. The hub CDR server counts the UDP payload and packet data, to ensure full auditing of calls. The call is connected by default at call quality 2 (3.75kbps).*
4. *During the call: The caller can choose the voice quality in use as follows:*
   - ◊ *1* = 2.15kbps*
   - ◊ *2* = 3.75kbps*
   - ◊ *3* = 5.75kbps*
5. *The call uses asymmetric coding with silence detection to attempt to send minimum data with each call.*
6. *The call completes: The call is terminated by either party. The PRI (Primary Rate Interface) server hangs up the line and frees the PRI connection. The hub voice router marks the connection as closed and becomes available for another call, as the hub CDR server closes the CDR session.*

SatCom Global's Horizon Multi-VoIP Unit

Other Features

The ***Horizon Desktop***™ compression technology provides an optimized email system for satellite communications. The unique three-stage usage decision at header, attachment and composed mail gives the user full control of incoming and outgoing email file size. Internet surfing is also accelerated, while minimizing costs by compressing data and downloading only the information required as well as providing full visibility of data usage.

The software incorporates instant text messaging, email compression, web acceleration, and software-based VoIP telephone with voicemail capability in one convenient application. For friends and family outside the Horizon network, the ***HorizonLite*** software interface enables registered users to communicate using low cost text and VoIP-to-VoIP voice communication.

Additionally, the ***Horizon SoftPhone*** provides an ideal example of how these benefits are delivered in a highly intuitive, user-friendly way, so maximizing accessibility and usage. The SoftPhone is, in effect, a telephone on a computer, with voicemail messaging making telephone communications easier and more affordable. Callers can use the SoftPhone for VoIP only calls to other Horizon users and calling to any PSTN numbers utilizing specially-negotiated low PSTN rates.

Typical VoIP data usage is more than 10kbps, with compression leading to quality issues. By contrast, in using the ***SmartPacket***™ technology, Horizon delivers a new level of efficiency and quality, providing the ideal solutions for reducing high data costs associated with traditional 'on demand' satellite services.

As noted earlier, it offers three call quality settings so that, if the environment is noisy or the PSTN connection is poor, call quality can be changed during the conversation in order to maintain optimum performance at lowest cost. The SoftPhone screen is highly intuitive, with point and click options, and the personal head set and microphone is also inexpensive and easy to use, as Horizon uses standard Microsoft protocols. In addition, the Voicemail service is available to both pre-paid and post paid users — almost certainly providing pre-paid users in remote locations with the opportunity to enjoy voicemail messages from home.

Both the business and the individual end-user recognize that time is money — and here, visibility is critically important if communications costs are to be controlled. ***HorizonOut***™ PSTN rates via a PRI interface substantially reduce the cost of calling from a satellite communication device. This unique service also enables VoIP-to-VoIP calling to other Horizon users, at less than 2kbps. An on-screen call history is provided of all inbound and outbound calls, showing both the numbers dialed and call duration, with an on-screen timer displaying the length of each call.

Horizon provides a pre-paid starter voucher, including a personal PIN and 100 units of usage. The starter PIN can then be topped up through a range of voucher denominations and can be redeemed through the Horizon Multi VoIP handset.

Reinforcing its intuitive design, pre-paid users can have the convenience of one personal PIN/voucher for all Horizon services and can take advantage of HorizonOut™ for cheapest possible call rates.

One World, One Network

In harsh, remote environments, the new product suite offers flexible and affordable pre-paid and post paid solutions helping individuals stay in touch with family, friends and business colleagues. Simultaneously, it gives full visibility and control of satellite communications expenditure to the bill payer. Horizon has certainly added to and changed the data optimization rulebook.

About the author

Sandy Johnson is the Chief Operations Officer and a co-founder of SatCom Global with Mark White — she has been in the industry since 1995 when she joined Next Destination Limited as Finance and Operations Manager. Sandy has played a key role in the implementation of SatCom's proprietary billing system, online technical support and airtime services websites. She has responsibility for the Sales performance and Operations in the Group.