Worldwide Satellite Magazine October 2010

SatMagazine

The Launch Sector

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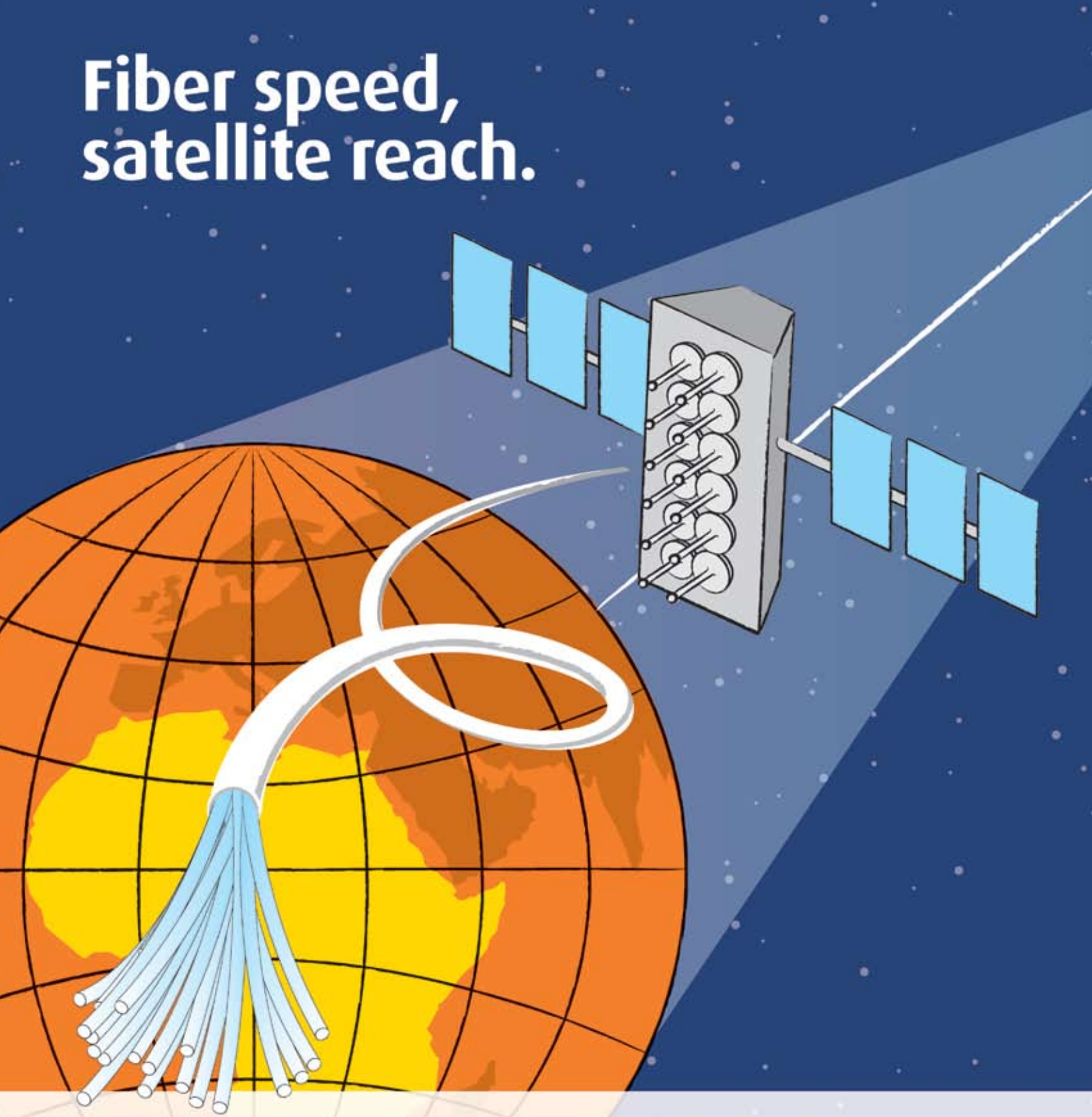

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Cover image: ILS Proton prepares for launch from the Baikonur Cosmodrome
The photo is courtesy of International Launch Services

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INTELSAT
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Supporting The Future Of The Industry

author: Louis Zacharilla, Director, SSPI

If you're reading this editorial, hopefully you are already a "friend" of SSPI. For that I thank you. I'd like to specifically address those who support SSPI in various ways, but have not yet joined our corporate sponsorship program.

SSPI is dedicated to two primary objectives and our corporate sponsorship program enables both of them. The first objective is to bring together satellite professionals for the purpose of enriching their careers and ensuring their professional development. What this means is that whether you are a broadcast industry executive, an engineer at one of the world's great satellite operators, a woman with a satellite services company, or a man whose daily activities are as a lawyer serving the industry, you share a common bond. You are a satellite professional.You are part of a small, but powerful industry that enables an enormous degree of economic activity, security, and social good. You have a career which many believe borders on a vocation. SSPI connects all of you and offers conferences, events, social network platforms, mentoring, scholarships and collegiality to enhance your career.

To keep the industry "together" requires support. In exchange for your support, SSPI also provides support — such allows you to do the one thing that is essential in any business: to build trust among colleagues through ongoing visibility and contact.

SSPI's second objective is to expand the markets for satellite related services. This activity needs little explanation, but it does require patient money. However, as those who support us and upgrade their support each year know, without customers, there is no point to business.

Peter Drucker said this more than 60 years ago and it remains a core fact today. Without markets, or with markets that are in decline, competition becomes a desperate, zero-sum game. With expanding markets, opportunities emerge, innovation persists, and capital flows. Expanding markets are virtuous and in their wake the satellite community becomes more secure and attracts needed talent. SSPI continues to support the industry by expanding awareness of the satellite option to new industries.

For nearly three decades, SSPI has been working for the industry and the talented professionals that make up this industry. We've been able to build resources and opportunities for the men and women who work in satellite industry and for those young individuals who are interested in joining our industry.

Companies of all sizes and in all niches of the industry support SSPI. Why? Because they know that keeping professionals connected and developing new business and market opportunities is something they can't necessary do on an individual basis. But that's what we do best. SSPI is the channel to market, to the future, and to better things through satellite technology and services.

Consider becoming one of our nearly 70 corporate sponsors for 2011. I hope that if you are a sponsor you will increase yur support, attend the Gala in Washington or one of our other events, and continue to support our future leaders program, our publications, and our social media platforms.

I am asking you, before our prices increase, to test the water. I suspect that you, too, will become one of our regulars. I look forward to hearing from you.

Sincerely,
Louis Zacharilla

For more info — http://www.sspi.org/

Executive Summary

The Space Report 2010

The Authoritative Guide To Global Space Activity

Space Foundation

Amidst a widespread international economic crisis, the space industry proved resilient, demonstrating growth and expansion through 2009 and into 2010. While several other leading industries suffered dramatically, and many governments struggled to remain fiscally viable, the space industry defied the upheaval and broadened its fields of endeavor. This is due in large part to the space industry's robust array of products and services, which enables it to respond rapidly to changes in global demand. The relationship between government and commercial enterprise is evolving, as can be seen in the proposed changes to the U.S. national space program announced in February 2010.

Space Shuttle Endeavour is silhouetted against the vivid colors of Earth's atmosphere in this photograph by an Expedition 22 crew member aboard the International Space Station. Credit: NASA

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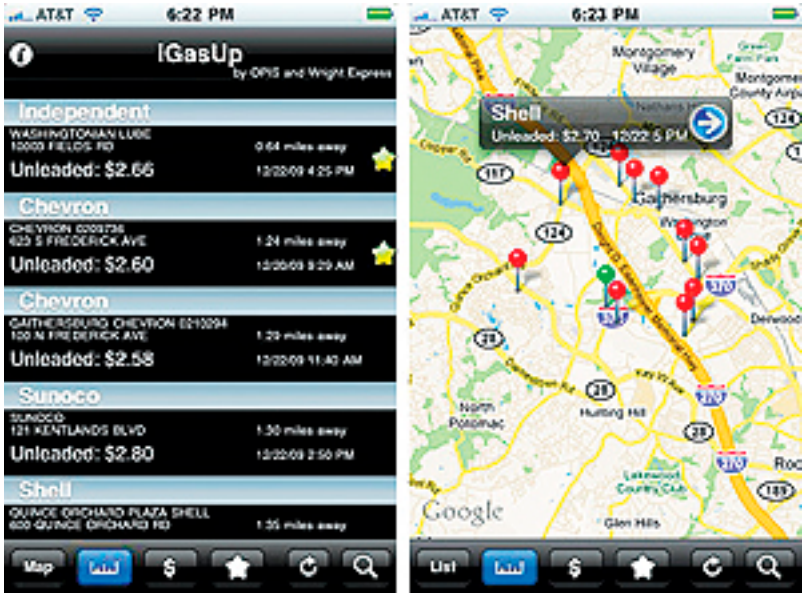
An Atlas V rocket built by the United Launch Alliance carries the U.S. Air Force's second Wideband Global SATCOM (WGS-2) satellite into orbit from Cape Canaveral Air Force Station, Florida. WGS-2 will provide enhanced communication abilities to military personnel in the field. Credit: United Launch Alliance

This evolution will likely include an increasing role for the private sector through the development of commercial space markets and the spinoff of space technology into non-space industries. Research performed aboard Earth-orbiting platforms, such as the International Space Station, is but one of the many avenues that space provides for the development of knowledge and applications with near-term commercial potential. Meanwhile, the increasing diversity and importance of military space activity in the past year continues a trend as armed forces enhance their tactical communications, imaging capabilities, and intelligence applications. Military interest in space has already led to the commercialization of navigation technologies and satellite imagery, and it is reasonable to expect further advances as other capabilities reach the commercial sector.

Governments around the world have taken a pragmatic approach to challenging economic times by focusing on practical, close-to-home projects while rethinking longer-term, high-cost strategic and visionary programs. The U.S. plan, for example, seeks to invest more in primary research and development, education, and commercial space. While some countries will level their funding for space in the next few years, others such as the United States plan to increase spending. Part of the reason for this increase is the expectation that it will stimulate the economy by encouraging innovation that reaches far beyond the space sector itself. As more nations realize the strategic impact and economic potential of space, motivations for national space activity are not only about the fulfillment of state-sponsored ambitions but also about the development of an industry that can compete in a global marketplace.

Space Products + Services

Space products and applications provide increasing monetary and social benefits to everyday life. Powerful technology combinations are bringing new products and services to market. Examples abound, with several of the most exciting and fastest-growing uses being delivery of high-definition television and the development of three-dimensional (3D) television content. These build on the ability of space systems

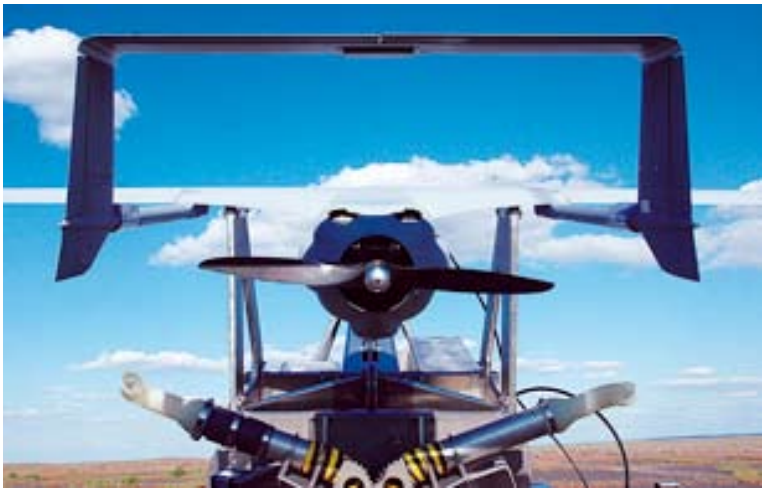


iGasUp lets iPhone users quickly find the nearest gas station with the best prices. The application saves its users time and money by combining GPS location with prices from the Oil Price Information Service. Credit: United Communications Group.

Executive Summary

to rapidly provide new forms of media to a broad customer base. The desire of consumers for constant connectivity plays to another of the space industry's strengths. Services can be made available to customers on the move, anytime, anywhere, simply by tying terrestrial mobile devices to satellites.

The results of this fusion can be seen each day in the many space-enabled services on mobile phones, such as location-based applications that harness imagery, social networking, and a plethora of other information. A driver looking for fuel on a road trip can easily map the most direct route to the nearest gas station and pre-order lunch in a nearby restaurant. Hikers who want to update their social networking pages with the latest pictures of a backpacking tour can use satellite connections and applications that make the process as simple as a phone call home.

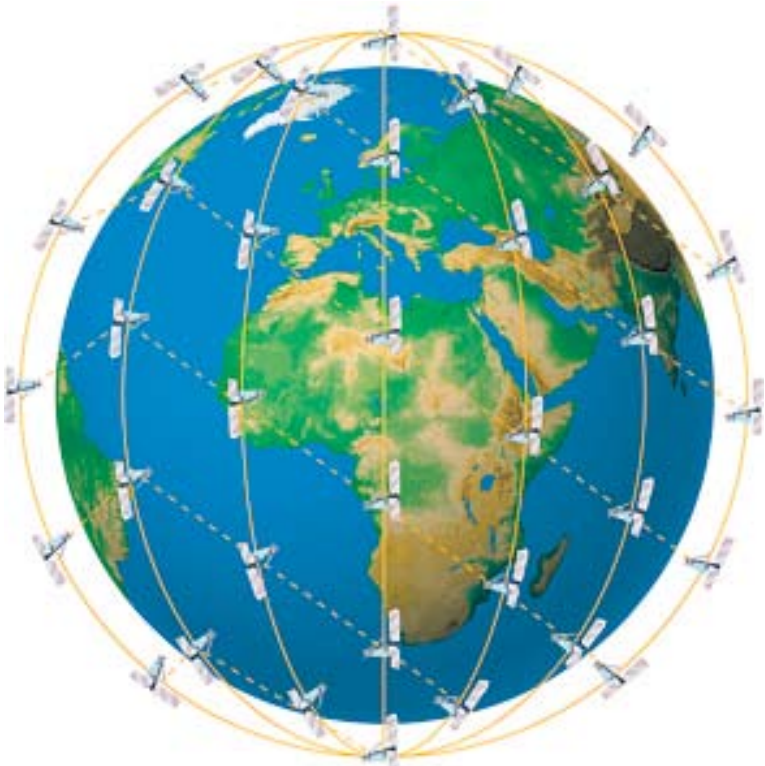


Locked into its catapult, Insitu's Integrator unmanned aerial vehicle (UAV) is ready for launch. Owned by Boeing, Insitu develops UAVs used by the U.S. military and other organizations. The combination of a satellite link with a small UAV that does not require a runway produces an extremely versatile system. Credit: Insitu

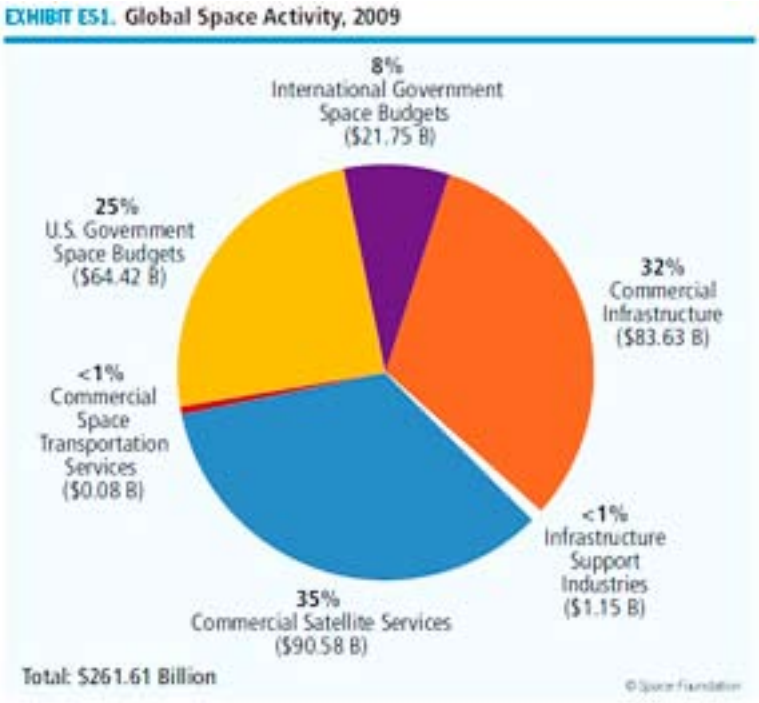
Space-related systems are experiencing dynamic commercial growth. Low-cost GPS hardware and new geographic reference applications are embedded in cars, phones, homes, and businesses. Land imaging services for commercial and government use have changed the way people travel and spend their leisure time, and have added enormous detail to our understanding of urban and rural landscapes. The worldwide networks enabled by space are altering entertainment habits and improving the experience of viewing sports, gaming, videoconferencing, and Internet browsing.

Operating in a very different environment from the average consumer, unmanned aerial vehicles (UAVs) also rely on numerous capabilities provided by space. Primarily used as military platforms, these aircraft often depend on satellites for communication and control. Civil authorities and businesses alike have realized the applications and benefits of these systems, and there has been considerable interest in non-military UAVs. In the foreseeable future, UAVs will find new missions providing a layer of capabilities between the Earth's surface and the satellites in orbit. Their space-based connections and control systems will allow them to survey disaster areas, provide emergency communications, monitor borders, and transport mail and goods.

All of these capabilities exist and succeed largely due to space technology. From security systems used at airports to enhanced electrolyte formulas for hydration, technologies originally developed for space improve public health and safety every day.



Iridium uses a constellation of 66 active satellites, the largest fleet of any commercial provider, to keep its customers connected anywhere in the world. Credit: Iridium



The Space Economy

While the global economic crisis grabbed the headlines daily in 2009, the global space industry experienced steady growth throughout the year. Estimated space industry revenue and government budgets increased by 7 percent, to $261.61 billion. This amounts to 40 percent growth during the previous five years for the global space economy. Commercial satellite services increased by 8 percent, reaching an estimated market value of $90.58 billion during 2009 and representing 35 percent of the space economy. Space infrastructure, which comprises spacecraft manufacturing, launch services, in-space platforms, and ground equipment, constitutes the second-largest segment, accounting for $83.63 billion, or 32 percent of the total market value.

Government space budgets increased considerably from 2008, demonstrating an aggregate growth rate of 16 percent. During 2009, governments spent an estimated $86.17 billion, accounting for 33 percent of the space economy. Excluding stimulus funding, U.S. government spending on space totaled $63.19 billion during 2009, a 9 percent increase over the $57.98 billion budget for 2008. An additional $1.23 billion of stimulus spending targeted space activities, which increased 2009 spending by 11 percent over 2008 budget figures. International government budgets that were counted in both 2008 and 2009 increased by 22 percent to reach $19.97 billion. With the addition of international budgets that are counted for the first time this year, this total becomes $21.75 billion.

Meanwhile, two smaller market segments also experienced revenue growth in 2009. Infrastructure support industries and space commercial transportation services were valued at $1.15 billion and $80 million, respectively. With growth in both the commercial sector and government spending, 2009 financial data highlights the merits of investing in space and its future prospects for generating value.

Government spending led growth as emerging space nations sought to develop their programs, and traditional space powers maintained or increased their overall spending levels. While each nation has its own reasons for participating, space is attracting increasing attention from a larger number of countries. This has resulted in higher spending on military space applications and dual-use programs, as well as offensive and defensive capabilities. Military activity in outer space has recently received increased attention but the heart of the space industry remains satellite telecommunications.

Commercial satellite services, which generate revenue from telecommunications, Earth observation, and positioning services, remain the largest driver of space-based revenue. There is increasing interest in imagery applications, 3D content for television,

Satellite internet connections, like this HughesNet setup in Alaska, allow people in remote areas to access the internet at broadband speeds. Credit: John Bollinger

Executive Summary

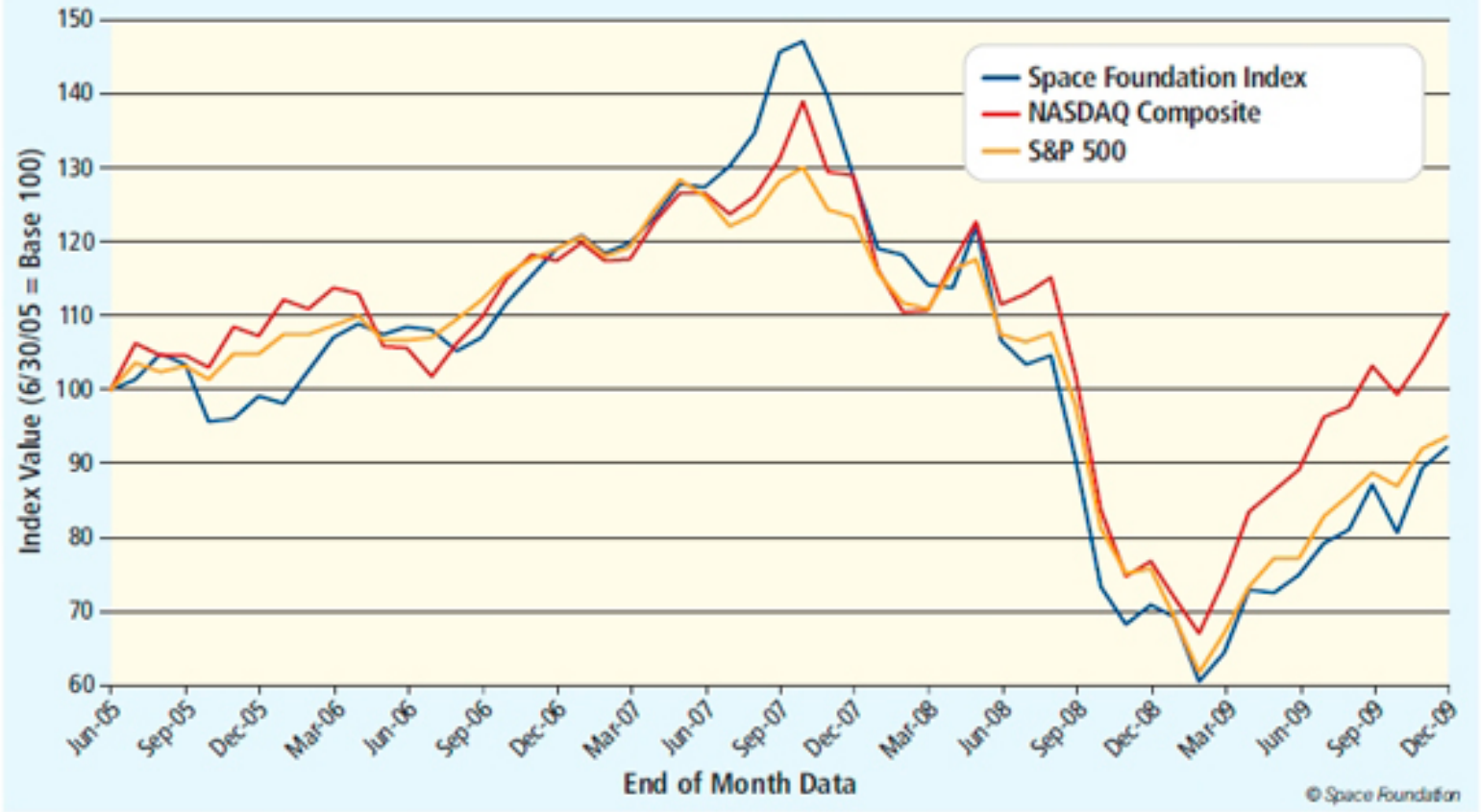
Internet access via satellite, hybrid satellite-terrestrial communications, and expanding access to satellite radio. The benefits of these services will spur growth in the space industry and generate ancillary benefits for society and the economy.

Internet access via satellite, for example, will eventually bring the information age to every corner of the planet, dramatically improving the economies of rural areas, underserved communities, and developing nations. Ever-present broadband Internet access may impact patterns of urbanization, the provision of government services, models of education, and the organization and productivity of businesses. Each specific telecommunications service will likely have a different business model, growth path, and degree of geographic success. The variety of emerging applications highlights the health of the industry, its market stability, and its ability to drive future revenue and economic expansion. This healthy marketplace is also demonstrated in the Space Foundation Indexes. After falling with the rest of the stock market in the recession of 2008, the Space Foundation Indexes began a strong recovery in 2009 with gains ranging from 14 percent to 56 percent for the year. The Indexes track the breadth and depth of the overall space industry as well as space infrastructure and services segments in U.S. public markets. In another promising sign of resilience in the space markets, two private space companies went public. DigitalGlobe had an initial public offering and Iridium Communications went public by virtue of its purchase by GHL Acquisition. Mergers and acquisitions activity in 2009 also increased over the previous year, registering a high volume of small but important transactions.

Space Infrastructure

The manufacture and launch of satellites during 2009 represents a dynamic level of space activity not seen since the turn of the millennium. During the year, there were 78 orbital launches compared to 69 in 2008, continuing a four-year trend of growth. Several countries demonstrated first-time launch capabilities. Iran successfully launched its first satellite and both South and North Korea made orbital launch attempts. Other countries, such as Brazil, are working to develop new launch platforms. Entrepreneurs are

EXHIBIT ES2. Space Foundation Index vs. Other Market Indexes



testing human-rated suborbital systems and several space companies are developing new launch vehicles that may dramatically reduce the cost of accessing space.

There was a dramatic change in U.S. space policy and investment that may significantly impact the development of new commercial orbital and suborbital vehicles. The President's fiscal year (FY) 2011 budget proposal discontinued funding for the Constellation program, altering the plan for NASA's activities in the coming years. The budget provides NASA with an additional $6 billion in funding over the course of five years, distributed among existing programs and new efforts. The three new major areas of funding in the five-year budget proposal include a technology demonstration program totaling $7.8 billion, heavy-lift and propulsion research and development of $3.1 billion, and robotic precursor missions of $3 billion. By extending the lifespan of the International Space Station and using commercial transportation services, NASA's strategy should also stimulate private launch companies, indirectly support growth in the commercial human spaceflight business, and provide seed money for in-orbit systems such as fuel depots.

Despite the passionate responses to NASA's new direction, both in favor and against, most space activity remains focused on satellite communications. With more than 900 active satellites in orbit in 2009 providing a wide range of applications, commercial communications satellite providers have enjoyed success in recent years thanks to increased demand for HDTV, satellite Internet, and military usage of commercial satellite communications. In fact, telecommunications satellites represent more than 45 percent of all satellites. Satellite-based positioning, navigation, and timing systems are another field of intense interest. Several countries, including Russia, China, and Europe, are developing and expanding systems similar to the existing U.S. Global

Executive Summary

Positioning System. With ambitious government programs underway, strong demand for satellite services, and increased reliance on commercial providers for space station supply activity, the outlook for space manufacturers and launch providers looks brighter than ever.

Economic Impacts, Workforce + Education

Space activity provides tangible benefits for professionals around the world, creating high-paying jobs that have positive direct and indirect effects on local, regional, and national economies. In the United States, more than 260,000 people worked in the space sector in 2008, earning an average of $90,000 per year. The five highest-paying states for space employees were Colorado, Maryland, Massachusetts, Virginia, and California. Space workers in all five of these states earned an average of more than $100,000 per year in 2008. Five high-paying metropolitan regions for space employees are centered around Boston, Dallas/Fort Worth, Denver, Los Angeles/Long Beach, and San Jose/Sunnyvale. Space workers in these metro areas earned average salaries ranging from $100,000 to $110,000 per year in 2008. The recession showed only limited impact on the U.S. space industry between 2007 and 2008, with net job losses in the low hundreds, and a small decline in wages when adjusted for inflation. This is likely to change if NASA concludes Space Shuttle flights as planned in 2010 and if funding for the Constellation program is discontinued as outlined in the President's budget. At the end of 2009, there were approximately 4,200 civil servants and 20,000 contractors working on the Shuttle and Constellation programs.

The Space Report 2010 also contains new information on military space professionals and their training. The U.S. military is developing a formal space workforce program tying mission requirements to training and certification that crosses all services, including active duty, guard, and reserve personnel, and its civilian workforce. Today, the U.S. military has nearly 14,500 positions for military space professionals, designated by their training, skill, military rank, and service requirements. In the future, other militaries may look to the United States as a benchmark for similar national military space training programs.

Also new in The Space Report 2010 is employment data for Europe and Japan. In 2008, European nations employed 30,300 people in space jobs, the highest level of European space employment since 2001. Japan employed approximately 6,250 space workers in 2008, slightly more than the low point for the decade in 2003, when there were 5,840 employees. Each country classifies space employment differently, making direct country-to-country comparisons difficult. Regardless of how they are counted, the high value of space jobs encourages national and private-sector investment in education to

Raytheon technicians work on the Glory satellite's Aerosol Polarimetry Sensor (APS). The APS will explore the global distribution of aerosols and measure their effect on atmosphere. Glory will also carry the Total Irradiance Monitor, which will take measurements to help determine the Sun's direct and indirect effect on Earth's climate. Credit: Raytheon

The Space Professional Development Program run by the U.S. Air Force provides training and certification in space-related fields for U.S. military forces. The space badge is awarded based on training and years of service as a space operator. Credit: U.S. Air Force

develop a technically skilled workforce. These talent pools, in turn, continue to reinvest in themselves through ongoing training programs and promotion of further educational investments.

Traditional space educational models, such as national aerospace academies geared toward honing specific skills, may well be changing. Substantial interest is being shown toward interdisciplinary, international, and intercultural approaches to space education through programs such as the International Space University and the United Nations Space Education Program. In the United States, a number of aerospace charter schools have emerged, such as the Jack Swigert Aerospace Academy, created by a partnership between the Space Foundation and Colorado Springs School District 11 to offer pre-collegiate interdisciplinary aerospace education.

The Jack Swigert Aerospace Academy in Colorado Springs, Colorado, is the result of a partnership between the Space Foundation and Colorado Springs School District 11. The campus is also home to the Space Foundation Discovery Institute, which will house multiple laboratories, classrooms, and a NASA Educator Resource Center. Credit: Space Foundation

Outlook

As the second half century of the space age gets under way, the future of global space activities looks as diverse as it does bright. This generation of space activity will solidify the role of commercial space while expanding the global reach of the industry. More nations than ever realize the strategic and economic value of space, leading to the creation of new international organizations, national space agencies, and investment in an ever-broader set of programs. Nations will need to decide to place more or less emphasis and reliance on traditional military and civil space programs in favor of leveraging international, regional, interagency, and commercial capabilities. The growing number of spacefaring states working cooperatively and competitively, coupled with the rapid development of capabilities, creates an environment in which innovation can flourish and be rewarded.

The rising tempo of space activity has brought greater awareness that orbital space is getting crowded. Driven in part by concerns of orbital debris, governments and commercial operators are increasingly looking for global solutions through international collaboration. Existing relationships in the fields of disaster management, emergency response, and Earth observation have led to cooperative agreements for space situational awareness. It is advantageous for everyone who relies on space to prevent collisions by improving monitoring and predictive capabilities.

Human space exploration appears likely to occupy a less prominent role in national space programs in the next few years, but this shift is being offset to some extent by greater activity and focus on entrepreneurial opportunities, Earth sciences, and Earth-oriented commercial capabilities. In addition, the importance of military space will continue to grow as more countries develop offensive and defensive space systems. Military space in the United States will increasingly rely on interagency coordination, hosted payloads, and commercial sourcing of communications, imaging, and other services.

Assuming governments change their means of operating, businesses will adapt by creating new models that will change the underlying industry economics. The result, as in the case of military space, will be public-private partnerships and increased reliance on commercial services. Pure commercial space activity, as opposed to government-supported commercial space activity, will continue to broaden and grow. Most space activity remains tied to terrestrial business, but the variety and number of activities will likely grow, as space products and services are integrated deeply into consumer electronics and daily necessities.

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The European Union and the European Space Agency are considering an orbital shipyard in low Earth orbit. This shipyard would assemble components from different European nations into ships destined for the Moon and Mars. This approach would allow construction of spacecraft that are too large to be launched on a single rocket.
Credit: Tim Bicheno-Brown/Flightglobal

Meanwhile, commercial human spaceflight is poised to emerge as a viable industry in the next few years. Initial success will lead to new services, markets, routes, missions, and possibly lower prices. Failure of commercial spaceflight to develop could stymie orbital services that depend on economies of scale. Governments will likely need to regulate commerce, travel, and military and diplomatic national interests in space. Collectively, this will increase the importance of international and multilateral cooperation between governments, and underline globalization and international strategic business planning for commercial space companies. Whether space is used to greater effect by governments or commercial interests, it is a common domain shared by all who operate in space and it is in the collective interest to preserve the space environment both now and in the future.

The Space Report 2010 Data

The Space Report 2010 is the result of extensive research by the Space Foundation and an array of independent research organizations and individuals with expertise in space, policy, financial markets, science, education, and technology. This combined effort involves identifying, gathering, analyzing, and synthesizing publicly available sources including government and corporate reports, congressional records, and data provided by trade associations and private research firms. The report also draws upon articles in news, business, and industry publications. Illuminating the text of The Space Report 2010 are scores of exhibits tracking industry sector activity, major sources of industry revenue, trends in education and training, employment, government investment in space, and market performance of space industries.

About The Space Foundation

In 1983, a small group of visionary leaders in Colorado Springs saw a need to establish an organization that could, in a non-partisan, objective and fair manner, bring together the various sectors of America's developing space community and serve as a credible source of information for a broad audience — from space professionals to the general public. The Space Foundation was founded in March 21, 1983, as an IRS 501 (c)(3) organization "to foster, develop and promote, among the citizens of the United States of America and among other people of the world ... a greater understanding and awareness ... of the practical and theoretical utilization of space ... for the benefit of civilization and the fostering of peaceful and prosperous world." The Space Foundation embraces all facets of space — commercial (including telecommunications and other satellite-based services), civil, and national security. In fact, the Foundation is one of few space-related organizations that embraces the totality of this community rather than focusing on a narrowly defined niche. In the 27 years since its founding, the Space Foundation has become one of the world's premier nonprofit organizations supporting space activities, space professionals and education. The Foundation's education programs have touched teachers in all 50 U.S. states and Germany. It conducts the premier event for space professionals anywhere in the world today: the National Space Symposium. More information is available at...

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The Space Report 2010: The Authoritative Guide to Global Space Activity provides a comprehensive summary of the state of the space industry in 2009 and forecasts for future developments.

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SPACE FOUNDATION

photo courtesy of NASA

SES ASTRA...

Dramatically Transitioning Beyond Europe

author: Chris Forrester, Founder, RapidTV News

SES Astra dominates the delivery of DTH (Direct-to-Home) television over three major EU markets: Germany, the UK, and France. But when you have near 100 percent saturation, where do you go next? Astra's recently appointed CCO Norbert Hölzle has some very decisive plans to win further market share within Europe and well beyond its borders.

Norbert Hölzle

"We are leader in key markets and in digital, that`s true. But there are two reasons why we cannot rest: First of all, we look for growth and therefore expand into new, dynamic markets, even beyond Europe. And secondly, we want to further benefit from the head start we had in digital and develop the premium television that we are able to deliver, and that means: push HD and push 3D. Astra will strengthen its position as ***THE*** player in the digital world."

Hölzle recognizes the challenges ahead, but compares many of them with the position in the highly competitive telco world, where he has considerable experience. "If you're just selling capacity on any telco, then you cannot succeed. It is the same with us at Astra. We need to be seen as much more than just the supplier of capacity in the industry. We can do so much more, and we will have some more excellent deals to announce in the near future.

"Our thinking has changed dramatically," he states, adding that visitors to Astra's IBC stand in September saw a strong flavour of how the strategy was altering. "Everything that we showed the client was digitally displayed, we had a massive screen that interactively showed how our satellites are looking at the world and as with the iPhone, you could expand or move to another position just with a finger touch. And this is at the root of the new look for Astra and how we want to talk to our customers about our view of business today and the opportunities for tomorrow. For example, what do we have to do to show them how very fast we can provide capacity on an end-to-end basis and to include ground stations and everything else? What I have to say is that as the incumbent we have to have and show a detailed knowledge of our industry, and I believe we have done that at IBC.

"Of course, satellite remains at the heart of our proposal: a high performing digital infrastructure. But we take an integrated view, what we provide is solutions, on an end-to-end basis, including ground stations and everything else that broadcasters need. We talk to our customers about their business today and the opportunities for tomorrow," he stresses.

"Astra never has, and never will, step into the shoes of its customers. It is our credo that we do not invest into content but remain neutral. We do not look for a vertical integration but our growth only takes places along the technical value chain. That is a pretty unique position, and a clear differentiator from what other infrastructure businesses are."
Norbert Hölzle, SES Astra CCO

Hölzle recognized that most of Europe's public and commercial free-to-air broadcasters, and especially those in Germany, need a new economic and business model to finance the extra costs of HDTV – and 3D. "It is for this reason that SES Astra introduced the HD+ platform. The objective of this was simply to allow also free-TV broadcasters to realize an HD business. They like the idea, not because they like us, but because it's common sense and they refinance their investment in HD.

Furthermore, they make sure that broadcast TV remains the most important entertainment medium. I compare the digital world with the mobile industry. What HD+ does is comparable to the concept of a mobile phone. HD+ places a card like a Sim card at the consumer premises, and using that card in your receiver you can find and access your content and benefit from extra value from the broadcasters. As a broadcaster, you can deliver this extra value. This direct bridging between broadcaster and customer is a big change in our thinking."

Astra has enjoyed the fruits of the HDTV boom. Now it is preparing for 3D.

Hölzle: ”We are extremely active supporters of 3D. We have already held 3D forums in Luxembourg, helped by our customers, we have seen 3D being broadcast live and can see the instant benefit that it offers. There are still sceptics out there who think that the obligation to wear glasses is a problem but I think the industry is now much more relaxed and understands that viewers are perfectly happy to wear 3D goggles for hours. And even when the 3D transmission ends, people keep the goggles on! We realized at IBC that talking about HD is not as much fun as looking at HD and it is the same with 3D, talking about 3D is not as much fun as viewing 3D. For us at Astra, it’s not a question of whether it’ll happen, it’s already happening. The bigger question ‘how much an impact will 3D have?’ is more difficult to quantify but I see it happening. Our customers and ourselves are putting considerable effort behind 3D and I believe that their and our strategies are the right ones.“

“Talking about 3D is not as much fun as viewing 3D.”

SES has itself expanded far beyond its Luxembourg base. But Astra also has to seek out new markets, and products. Some might criticize SES for concentrating on expansion through acquisition and allowing local rivals, notably Eutelsat and Telenor. “We have to recover our position in these markets and in some of them we are not even the big Astra, we are the aggressor, not the incumbent. But have no doubt we know how to act as the aggressor and you will see a very different Astra compared to the past. Just before IBC we agreed on a new strategy and this will see us play much more of a market game in Eastern Europe. Otherwise, the industry will pass us by totally. We [recently] signed a DTH deal in Croatia .We have to run faster than the others to get back into the game.

“SES Astra has to grow in all of its markets but especially in Central and Eastern Europe, in the Middle East and in Africa, especially in South Africa and Kenya,” admits Hölzle. “It will come as no surprise that we intend attacking our competitors in those markets very heavily indeed. We will grow in these areas which we consider to be our backyard. And we will run fast to win the game!”

This is undoubtedly fighting talk, but it also reflects a quite dramatic change of pace at SES. While it is true to say that they will never set up as a broadcaster in competition with their own clients, that ‘rule’ does not apply to virgin markets. One such region is sub-Saharan Africa, and SES Astra has recently taken a stake in On Digital Media, which trades out of Johannesburg as TopTV. TopTV offers viewers a low-cost DTH bundle and directly competes with giant incumbent DStv, part of the MultiChoice empire.

“We can even help our customers at our own cost. We see this as a necessary entry fee in getting this customer on its feet. We won’t dump prices but I will certainly spend market entry money to help these new clients for DTH and B2B marketing.“

Astra’s strategy is explained by Hölzle: “Take a moment to look at the basics of this industry where a client might come and knock at our door and ask what can we offer. In the past we have offered capacity and expertise and the potential client would

your content, play out your content and while this is not my core business model, I can help you bring your product to market easily and speedily. And this is our preferred option: we like working with clients, offering a one-stop shop, getting them to our viewers' screens and I can tell you this philosophy is very interesting to many clients. This even applies to large players like Canal+ which, while it has an excellent position in its home market, wants to reach beyond that market. The fact is that there are plenty of people out there who can offer playout, and media management but they may not have a clue as to how to really set up a channel, how to achieve satellite distribution or marketing of their channel on DTH.

"Besides selling pure capacity, we like to offer B2B and other services to get the player on air. We can even help our customers at our own cost. We see this as a necessary entry fee in getting this customer on its feet. We won't dump prices but I will certainly spend market entry money to help these new clients for DTH and B2B marketing.

say 'yes, but Eutelsat can offer that as well'. So, as a capacity seller, I have three options: I can undercut the price being charged in the market, which will lead to my rival undercutting me and we will both kill ourselves in the process so this is not an option for Astra. My second argument would be that our quality is the best in the market, this is true but is the client willing to pay for this superb service? Or third, I can say that we can provide you with a one-stop shop of end-to-end solutions where I can manage

"Then there's another new territory, the Middle East, where Astra has craftily partnered with the YahSat operators out of Abu Dhabi. "Even in the recent financial crisis that affected the whole of the Middle East, Abu Dhabi came out of it much stronger. However, we are realistic about the Middle East, this will not be an overnight success. We are going

Active screens in SES ASTRA's Digital Network Operations center.

to have to work hard to achieve our goals and the Middle East will take time," adds Hölzle.

And the future: " I don't have much that I can add other than my core building blocks: we want to lead in the digital world, secondly, we have to become a good partner for the telcos and create packages for them and even help market boxes for them. The third is that we will have market entry strategies creating indirect sales channels on the ground, offering prices that are appealing and attractive to different types of users and fourth, I want to build on the relations we have with our existing customers to move them out of their home markets, growing with them as they expand overseas."

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. He founded Rapid TV News and has edited Interspace and its successor Inside Satellite TV since 1996. He also files for Advanced-Television.com . In November 1998 he was appointed an Associate (professor) of the prestigious Adham Center for Television Journalism, part of the American University in Cairo (AUC), in recognition of his extensive coverage of the Arab media scene. He wrote "High Above – the untold story of Astra, Europe's leading satellite company", in 2010.

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Executive Spotlight

Frank McKenna
President, International Launch Services

Frank McKenna became the president of International Launch Services (ILS) in October 2006, after two years serving as vice president and deputy at the company. He possesses more than three decades of experience in aerospace and the space launch businesses with Martin Marietta and Lockheed Martin Corp., which was a partner in ILS until October 2006. McKenna's background includes business management, business development and strategy, several CFO positions, and domestic and international joint ventures. McKenna holds a bachelor's degree in economics from Stetson University in Deland, Florida.

ILS' Proton launch vehicle, tower-ready. Photo courtesy of ILS.

SatMagazine (SM)

Mr. McKenna, what are your thoughts on supply and demand in the commercial satellite marketplace?

Frank McKenna

We believe we are currently at the end of a peak replacement and recapitalization cycle for the FSS market and that commercial GEO launches will drop to about 20 per year or less. This is consistent with historical business cycles and the most recent Euroconsult estimates. Given this expected drop in the coming years, we feel an increase of additional launch suppliers could be extremely damaging to the marketplace. As we have seen in the past, oversupply leads to instability and drives businesses out of the market as it did with Atlas and Delta and the resultant bankruptcy of Sea Launch. We could see a very rocky road in commercial launch in the next several years as Sea Launch attempts to return from bankruptcy and others enter the market.

SM

What is your current backlog and how does ILS plan to prepare for the expected drop in demand in the near-term?

Frank McKenna

Our current backlog is 23 orders worth approximately $2US billion. ILS and Khrunichev have been planning and preparing for the anticipated trough in satellite orders. With an average backlog of 20 or more orders for the last three years, ILS/Proton will be launching

eight systems a year for the foreseeable future and overall Proton is launching at the rate of about once per month including the Federal launches. We believe that a balanced mix of Government and commercial launches provides for the strongest and most viable foundation for success in the business.

SM

What are the new improvements or enhancements to the Proton vehicle?

Frank McKenna

There has been a series of evolutionary improvements made to the heritage Proton system. Phase III Proton enhancements include a payload systems mass capability to 6.15 metric tons. This capability was initially successfully demonstrated on Proton with the Federal dual Express mission in February 2009 and commercially demonstrated this year with the launch of EchoStar XIV for DISH Network in March of this year. This was the heaviest satellite launched to date, weighing 6.38 metric tons at spacecraft separation. Phase III was demonstrated again with another EchoStar mission in July of this year, with the EchoStar XV satellite, so that is three successful flights with the Phase III enhanced Proton to date. This will be the standard configuration for most commercial missions going forward.

Phase IV Proton enhancements include 150 kg of added performance which bring total payload systems mass capability to 6.3 metric tons. These improvements are scheduled to be completed in 2012. These incremental improvements to the Proton system are specifically designed to address the favorable value and trend towards larger spacecraft

An assemblage of Protons

Proton's Power Plant

including hosted payloads, and continue to make Proton the industry leader in heavy-lift. In addition to the Proton vehicle improvements, Khrunichev is also in the process of modifying the 92A50 processing facility to allow two spacecraft and spacecraft manufacturer teams to conduct simultaneous spacecraft test operations. It will also help to create additional manifest flexibility with two launch campaigns overlapping by seven to eight days, providing additional schedule assurance for our customers.

SM

As Khrunichev State Research and Production Center has purchased the majority shares of ILS in May 2008, how has the partnership been working?

Frank McKenna

The ILS/Khrunichev partnership has been a tremendous asset to the commercial launch industry. We have a streamlined ownership structure and decision making, and an extremely solid financial foundation, increased productivity across the board and a commercial focus, all to serve our customers better.

Also, Khrunichev has been the leader of the Russian space industry consolidation — with most of the Proton suppliers and manufacturers all being overseen and managed in full by Khrunichev. Looking at the past five years with Khrunichev, the results are dramatic in terms of production, going from a rate of six systems produced annually to up to 14, which is more than double over that timeframe. As an example, last month we had two commercial Protons in Baikonur and one Federal Proton; this

demonstrates a truly unprecedented production rate. These efficiencies in the factory create an added benefit to our customers in terms of pricing due to the increase in efficiencies and economies of scale.

SM

Mr. McKenna, what is the difference between the ILS/ Khrunichev partnership and that of Sea Launch/Energia?

Frank McKenna

The differences between the ILS/Khrunichev partnership and the arrangement between Sea Launch and Energia are dramatic. We appreciate the opportunity to make the distinction. ILS is healthy and launching routinely and serving the commercial launch industry with new capabilities and real competitive value, launching some of the most important commercial missions that the customers across the globe have initiated. Quite frankly, we do not understand the organizational and financial structure of the realigned Sea Launch business as it looks unusually complex for what would be a rather straightforward business arrangement. In our opinion, it appears to be very risky, operationally constrained and not needed as the commercial launch market drops over the next several years. Both Energia and the Sea Launch customers will need significant financial resources to weather the operational and financial risks of this plan and the market.

In terms of the Khrunichev structure, Khrunichev is a Federal State Unitary Enterprise (FSUE) with complete support and backing by the Russian Federal Government, which represents roughly half of Khrunichev's business. The Russian Federation makes ongoing investments in the Khrunichev infrastructure, future programs and upgrades to help ensure the success of one of its core Space Centers in Russia. As we stated earlier, this balance is key to being successful in the commercial launch industry. Khrunichev has a diverse product portfolio; however, the Proton launch system is the primary business for Khrunichev. A large portion of the entities now merged under Khrunichev support the ongoing development and production of the Proton

vehicle. The supply chain is robust, healthy and well managed. To date, Khrunichev has invested over $300M into the supply chain integration effort – across the Proton product line.

Khrunichev is one of the world's premier aerospace entities and, in 2008, was responsible for orbiting one out of every 3 kg of world space cargo or more than 39 percent. Khrunichev has invested $300M in the retooling and upgrading of production equipment since 2006 and will continue to reinvest in the business as they are committed to ensuring the success of the Proton vehicle. The bottom line is, the ILS/Khrunichev partnership is sustainable and well organized and is an established business that is way ahead of the pack and will be here for the long term.

SM

Is ILS involved in the Russian GLONASS satnav constellation project and/or other Russian launch manifests?

Frank McKenna

No, ILS is not involved in the Glonass missions and does not have any involvement in any of the other Federal missions on Proton. ILS has the exclusive rights to market the Proton launch vehicle for commercial satellite missions. Khrunichev manages the Federal manifest and missions including the Glonass navigation satellites.

With respect to the European navigation system — Galileo — ILS has provided a cost effective and technical solution that could help ESA and the EU retain the mission objective for that program. As it stands now, the program is up to 400 million Euros over budget and a delayed deployment could result in diluted capabilities for the entire European navigation system. With Proton's successful history of launching multiple spacecraft, and ability to deliver on-time with a price that makes sense, it could be the ideal solution to a program that has a very uncertain future.

Additionally, with the announcement of the YAMAL 401 and 402 missions in May of this year, two satellites for Gazprom Space Systems, the world's largest producer of natural gas, ILS will be launching the first set of Russian commercial satellites. ILS will be launching another first, with the pairing of SES-3 for SES with the Kazsat-2 satellite, a Khrunichev-built satellite for the Kazakh government to provide telecommunications services to Russia and central Asia. This will be the first time a Western (Orbital) commercial satellite will be launched with a Russian Federal mission, which will be exclusively managed by Khrunichev. We see more opportunities such as these, opening up for ILS.

SM

What do you see as new opportunities or trends in the marketplace that could be ideally suited for ILS Proton?

Frank McKenna

We see the hosted payload market as becoming more of an opportunity for ILS Proton given that it is a high performing vehicle with a history of launching on schedule. We've been serving this market for a while now and have the technological and licensing capability; with several launches under contract such as: YahSat 1B for Yahsat with a dual use payload for the United Arab Emirates Air Force; IS-22 for Intelsat, a commercial satellite with a UHF payload for the Australian Defense Force; and the Anik G1 satellite for Telesat, with an X-band payload for military use. I-22 and Anik G-1 are both scheduled to launch in 2012.

The satellite industry is developing some exciting, new technologies and innovations; ILS and Khrunichev are very proud to be playing an important role in their development. Two of note are the KA-SAT satellite for Eutelsat, the first to operate exclusively in high-capacity Ka-band and SkyTerra-1 with its hybrid satellite and terrestrial 4G network services. Both of these satellites will launch this year on ILS Proton with SkyTerra-1 scheduled for November and KA-SAT in December.

A Federal Proton Glonass mission will take place in November as well. The next launch for ILS Proton is the SIRIUS XM-5 mission for SIRIUS XM Satellite Radio on 15 October. This will round up the year with up to eight commercial missions and four Federal Missions for Proton. This in an exceptional launch pace that ILS and Khrunichev plan to continue in the years to come.

ILS UPDATE

International Launch Services (**ILS**) and **SES** (Euronext Paris and Luxembourg Stock Exchange: SESG) announced the extension to the December 31, 2014, of the ***SES Multi Launch Agreement*** (**MLA**) and the addition of a sixth firm **ILS Proton** mission through 2014.

The MLA was originally signed in June 2007 between **ILS** and **SES Satellite Leasing Limited**, SES's satellite procurement and leasing company in the ***Isle of Man***. The first SES launch under the MLA was the successful ILS Proton launch of ***SES-1*** on April 24, 2010. In addition, two of the four SES missions scheduled in 2011 and 2012 for the launches of the ***SES-3***, ***SES-4***, ***QuetzSat-1*** and ***SES-5/ASTRA 4B*** satellites will be part of the MLA.

The remaining three MLA missions will be assigned as needed and in principle cover the 2012 — 2014 time frame. In addition, Proton will provide back-up launch capability for SES missions in 2011 as part of the increased flexibility and improved schedule assurances under the Multi Launch Agreement. The Proton vehicle, built by ILS majority owner **Khrunichev State Research and Production Space Center**, is Russia's premier heavy-lift launcher and has a heritage of 359 flights since the 1960's. In the past 26 months, Proton has launched 25 successful consecutive missions.

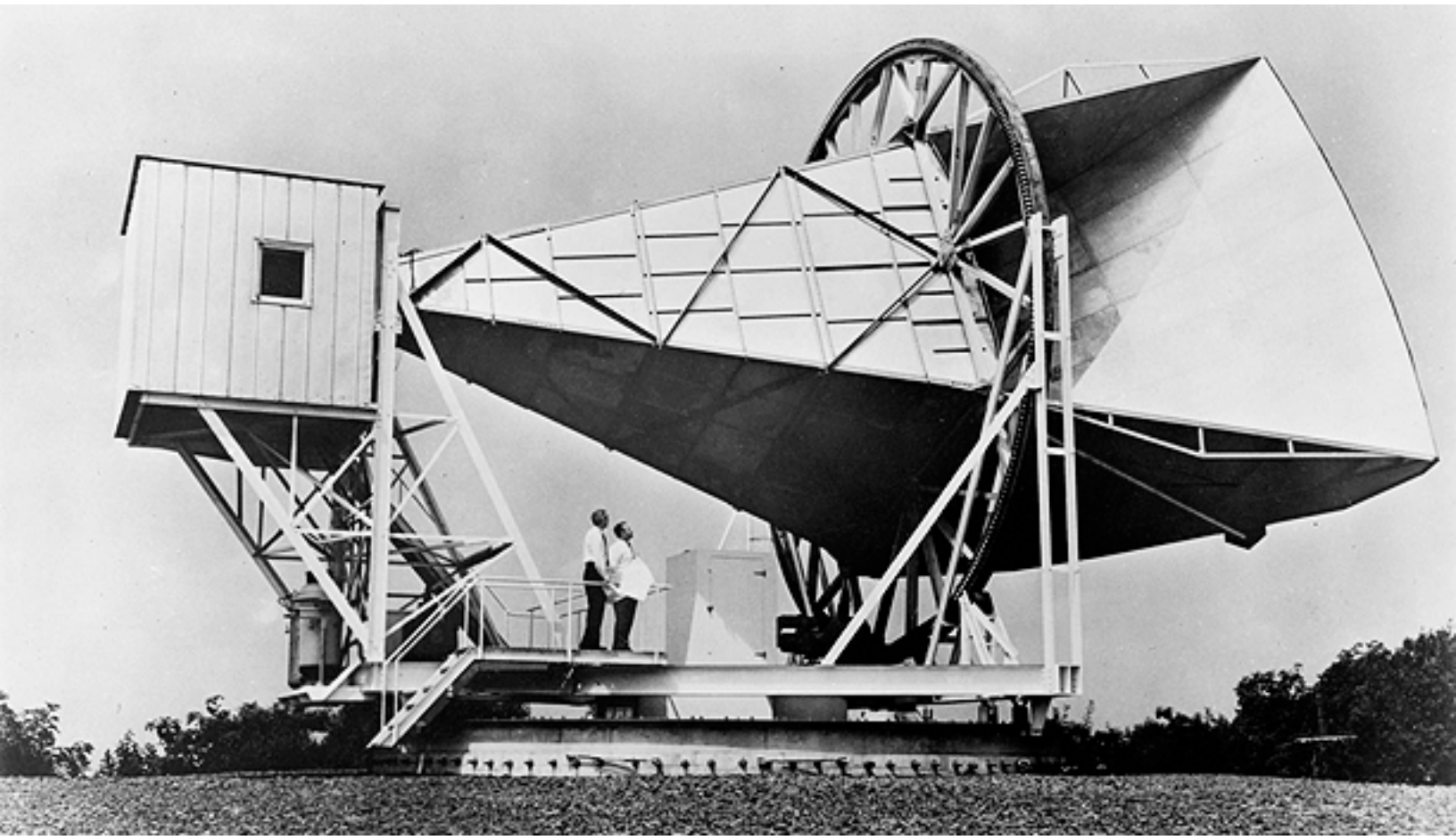
SES-1

NexGen Protocol Optimization

Obtaining The Highest IP Throughput From Your Satellite Link

author: Jeffrey Weaver, Director, Technical Marketing, XipLink

As any user of satellite networks quickly realizes, space links just don't work that well when TCP is used for applications such as file transfers or Internet surfing. In this article, we will recap traditional TCP acceleration functions developed during the late 1990's, then move on to describe new features and functions that deliver even more bandwidth gain — combinations that are only possible by virtue of leveraging today's computing power with the major advancements in memory management.



The Horn reflector antenna at Bell Telephone Laboratories in Holmdel, New Jersey was built in 1959 for pioneering work in communication satellites for the NASA ECHO I. The antenna was 50 feet in length and the entire structure weighed about 18 tons. It was comprised of aluminum with a steel base. It was used to detect radio waves that bounced off Project ECHO balloon satellites. The horn was later modified to work with the Telstar Communication Satellite frequencies as a receiver for broadcast signals from the satellite. In 1990 the horn was dedicated to the National Park Service as a National Historic Landmark. Photo courtesy of NASA

The Beginning — TCP Acceleration

The original TCP algorithms can generically be described as connection oriented, with guaranteed data delivery that operates in an uncoordinated yet cooperative way to share the available bandwidth. As we all have witnessed, this model has worked across various link types for many years, far beyond the Ethernet and Token Ring LAN networks that existed in the early days of data networking.

Today, TCP / IP is used worldwide to connect clients to Internet servers across networks that include an incredible mix of wireless, fiber optics, and wire-line services. During the middle 1990's, early users of satellite connections recognized that TCP was less than speedy in establishing an initial connection and the transfer rate was painfully slow, rarely, if ever, approaching the maximum link capacity. When packet loss occurred on those links, traditional TCP packet recovery algorithms actually caused an increase in packet loss. Subsequently, even more retransmissions were required while the protocol tried to catch up to the lost data. This was a well-understood and vicious cycle. A casual user would not notice this occurrence, only observing that transmissions started out slowly and seemed to get worse as time went on!

Wireless, and satellite links in particular, share a few common characteristics that are the underlying cause of such poor performance.

- ***Dynamic Bandwidth — wireless links rapidly change capacity***
- ***High packet loss — bit error rates are many orders greater***
- ***Asymmetry — links and overlay networks where senders and receivers are using different link types and power levels***

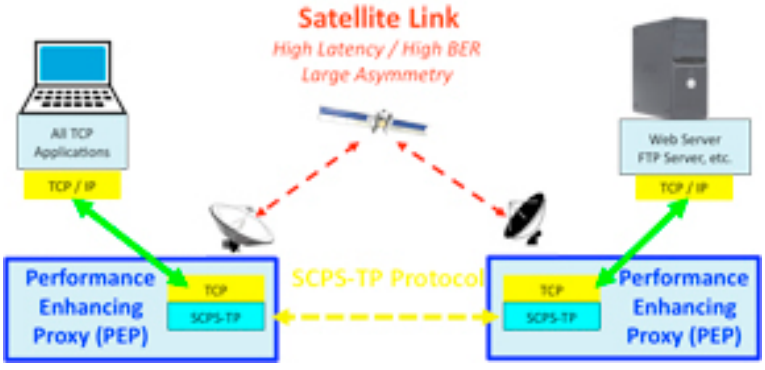
To address these issues, a set of TCP modifications for use across space-based communication links was created. These modifications speed up initial connections and the transfer of data to achieve the true link capacity, while also increasing the efficiency of recovering lost packets, a frequent occurrence on satellite links. Implementation of these new algorithms resulted in the emergence of hardware appliances termed a ***Performance Enhancing Proxy***, commonly referred to as a **PEP**. This is a device that intercepts TCP connection requests before they are sent over the satellite link and proxies those requests on behalf of the user. The proxy opens a new session using modified TCP algorithms for the initial connection and specialized recovery algorithms during the transfer of data to maximize the link utilization — the end-user is unaware that this has occurred.

PEP devices are installed in-line between the LAN segment and the satellite terminals or wireless modems on the hub-site and each remote site and operate over any IP network topology. During this phase of TCP acceleration, there was a general assumption that one device resided on each end of a connection and there was no ability to aggregate multiple, remote sites on a single hub-side appliance.

The bandwidth gain resulting from protocol acceleration can be generally characterized as filling a wireless link to the full capacity. Using proprietary *Transport Controls*, this can be done on even short duration flows such as the connections and quick data transfers web servers use to send custom advertisements to all of us.

Standards Based Protocol Acceleration

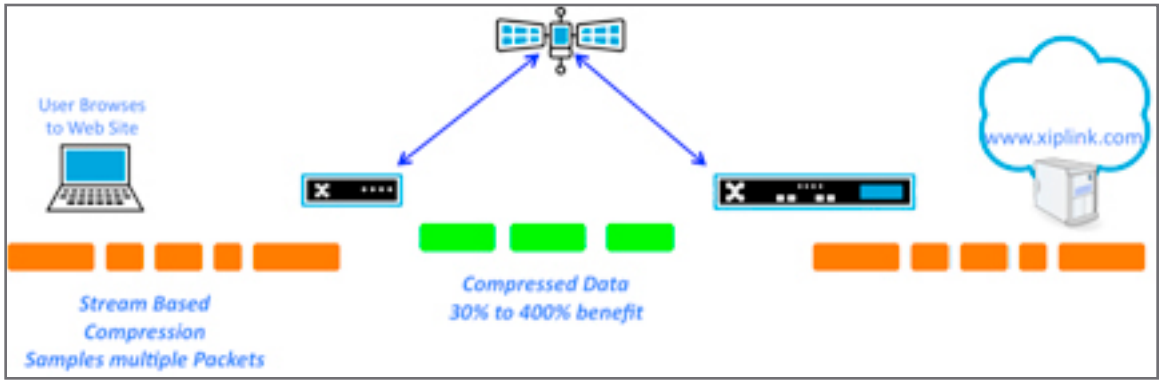
As PEP technology became accepted as a required component in virtually all space communications systems, a set of default TCP algorithms was defined in an industry standard called the ***Space Communication Protocol Standard – Transport Protocol*** (**SCPS-TP**). SCPS (pronounced *skips*) defines a minimum level of interoperable TCP operations between SCPS compliant proxies from different vendors, in case two users encounter each other over any kind of wireless link. The *Defense Information Systems Agency* (**DISA**) for the US *Department of Defense* now mandates compliance



with this standard for any equipment used to optimize satellite connections.

Data Compression, The Wireless Optimizer

By design, the SCPS-TP standard left plenty of room for vendors to innovate, anticipating vendor enhancements to TCP when used across a wireless link. By identifying other functions, a vendor can implement multiple data compression techniques that operate on the accelerated data prior to transmission, while remaining SCPS compliant for protocol acceleration. Data compression is the point at which PEP interoperability between vendors may be lost, as the data compression and decompression technique must be common to both ends of the connection, much like encryption.



Standards based PEP vendors remain capable of negotiating TCP protocol acceleration for use on the connection, but other options to increase bandwidth gain and link efficiency may be ignored unless both ends are similarly equipped. Protocol acceleration and data compression operate in the upstream and downstream direction for all TCP applications. This is called *Streaming Data Compression* as it operates on multiple packets in a stream, potentially reducing the overall number of packets needed to send data, rather than simply compressing the payload of each packet. Because each optimizer appliance or portable device is sized to match the expected bandwidth, from very low speeds at remote sites to very high speeds and thousands of TCP connections at hub-sites, different compression algorithms are used.

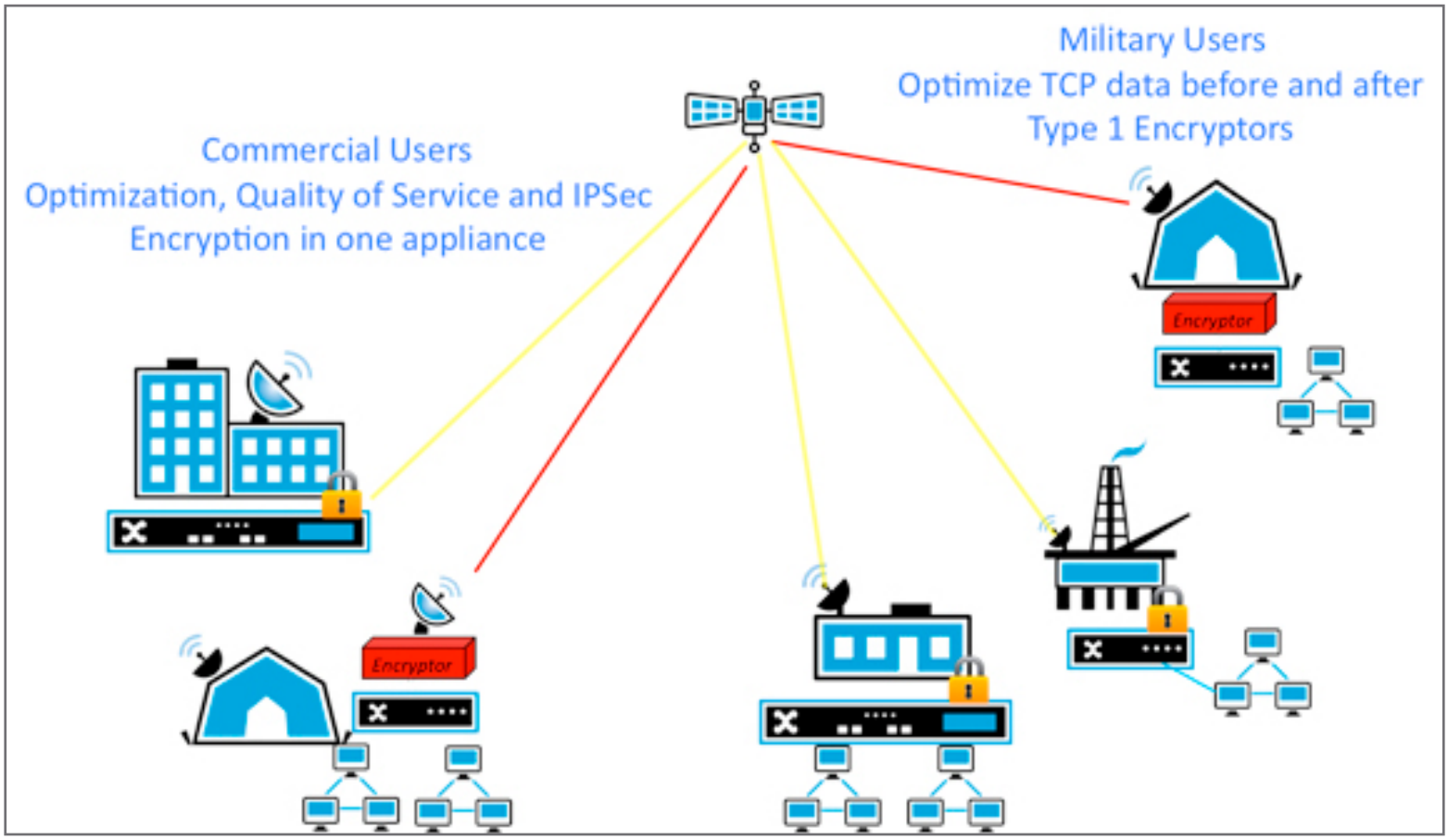
Small portable devices use a simple algorithm, while appliances with more CPU horsepower and significant memory capacity, can use a stronger algorithm that results in higher compression ratios. An active software resource manager balances these functions in real-time by making adjustments under very high load. In typical deployments, data compression is described as the function optimizing the transfer of data upstream and downstream at a rate that exceeds the link capacity. Bandwidth gain from data compression is variable, based on the type of data being transferred and the algorithm in use. Some files, such as office documents, text files, and non-image web objects, are highly compressible — as much as 400 percent, in some cases. On the other hand, TCP files such as zip archive files, executable binaries, and streaming video, will experience little benefit from data compression, but there's no harm in trying.

Wireless Optimizers Meet QoS + Encryption

Whenever a PEP was deployed, network engineers generally found it necessary to manage the priority of the data to ensure the accelerated TCP data was not unintentionally causing packet loss on other applications such as *Voice over IP* (**VoIP**). As faster and more powerful hardware became available, PEP operations were merged with QoS functions, allowing operators to control and coordinate both activities on a single appliance.

Integrated quality of service features must scale in two dimensions to manage and control optimized data on public and private networks. On hub-site deployments, the QoS must support TCP rate controls and priority levels to hundreds or even thousands of remote sites. On the other end, remote sites typically need QoS to prioritize applications or users. Such ensures dedicated or shared bandwidth is properly allocated.

As satellite services expanded their reach to more and more areas of the world, many commercial network users began to implement **IPSec** to protect their organization's data. When any type of encryption is used, network or modem based acceleration is effectively disabled, as the data passing through the optimizer is scrambled and unreadable. Modem wireless optimizers now include



the ability to add IPSec encryption as a software option, further reducing the number of devices needed in each remote site. A modern wireless optimizer appliance will enhance TCP data and provide branch office QoS and IPSec in one device.

Another good example is cited in defense deployments. For military users today, bracketing the link outside the **Type 1 Encryptors** continues to be considered the best practice, meeting the networking and physical requirements for device isolation.

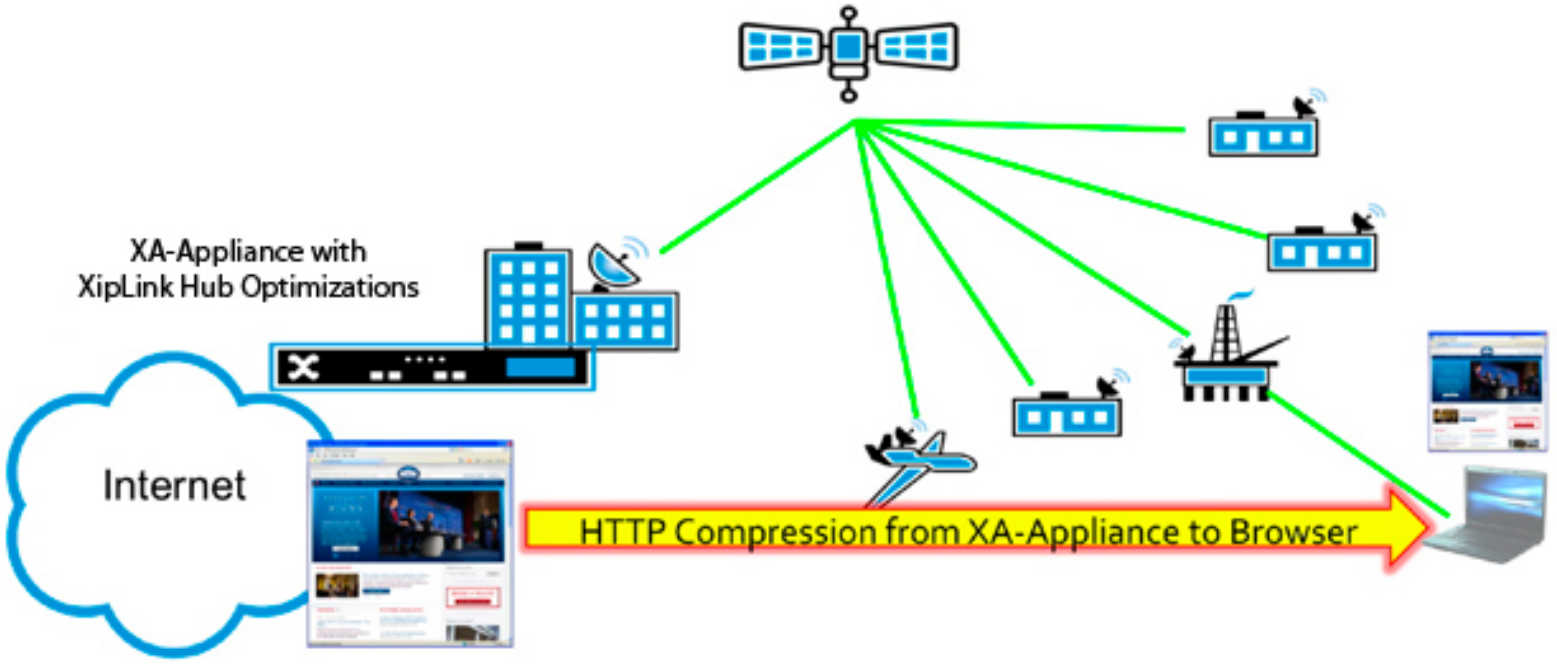
Going "One Way"

In the early days of satellite communications, end users were generally skilled in some aspect of networking and were often handling such tasks in military or research sites. However, as satellite communications became mainstream and encompassed many commercial markets, it became more common to find relatively unskilled, remote users attempting to install PEP equipment directly in the critical path of the satellite or wireless link, often in uncomfortable or hard to reach physical environments. In combination with the technical challenges of remote two-way site installations, also noted was a usage trend towards more of these links carrying basic Internet access traffic, sometimes serving entire isolated communities. These trends steadily led to the emergence of a new set of hub-site data compression solutions that operate only on Internet web content and require no hardware or software at the remote sites — they operate in a one-way mode.

One-way optimization is CPU intensive. At **XipLink**, *Hub Optimizations* (the **XHO** option) are offered only on high-end appliances, such as the **XA-10K** and **XA-30K**. This same device can simultaneously handle two-way SCPS connections for users with a remote optimizer installed, enabling SCPS acceleration and data compression for all TCP applications, particularly FTP in the upstream and downstream direction.

One-Way Hub-Site Optimizations

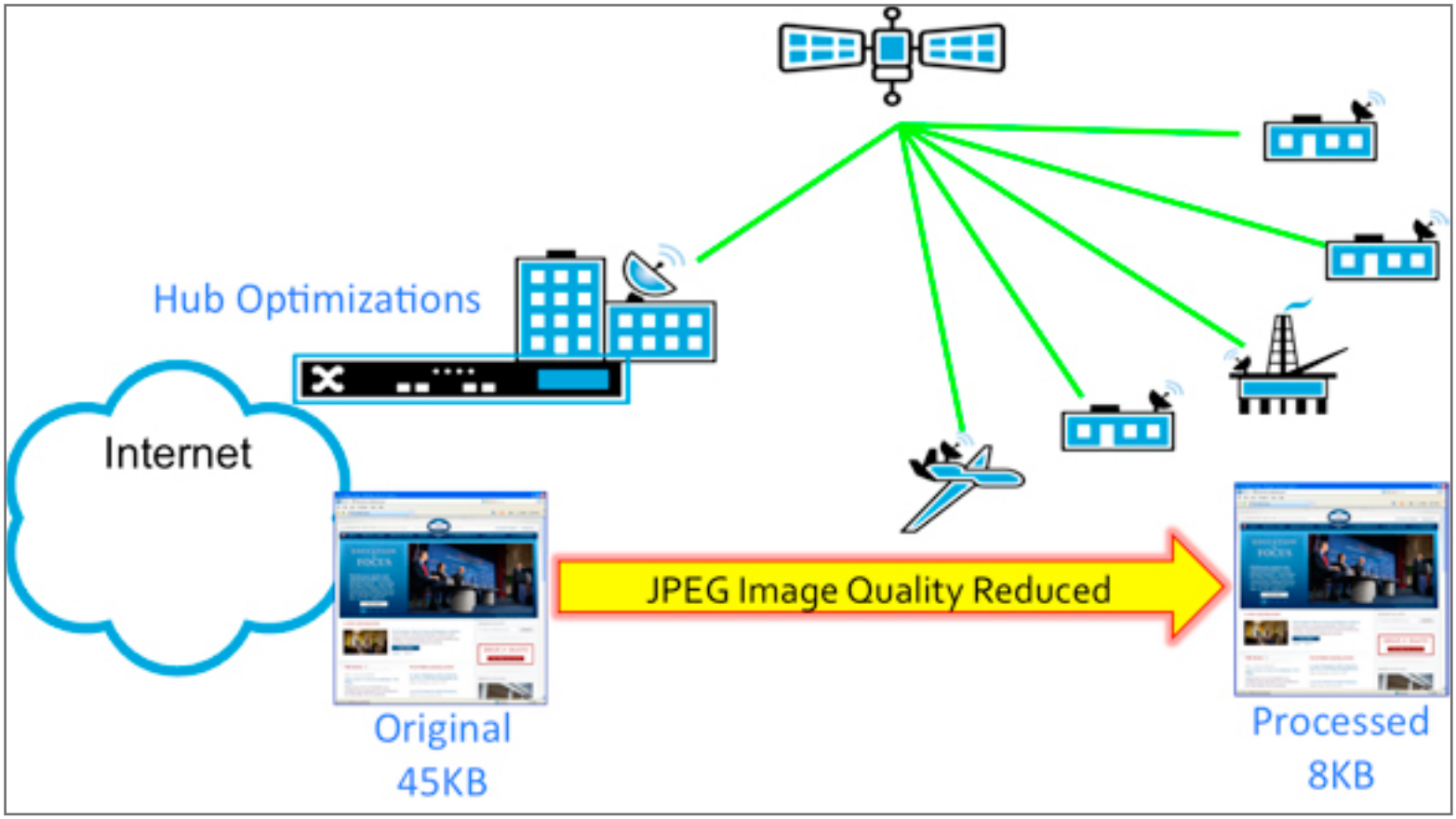
In traditional two-way SCPS deployments, each optimizer sends data from any TCP application using SCPS protocol acceleration and a common data compression algorithm, relying on the remote-site optimizer to decompress the data and to work with the sender to efficiently recover from packet loss. These algorithms have been carefully refined and tuned over many years and have resulted in a selection of operating modes specific to the various installation environments.



In one-way deployments, a single hub-site optimizer is configured with the Hub-Optimization software and is installed at the Internet point of presence — but no hardware or software is required at the remote sites. The device can be installed in-line as in traditional SCPS deployments, or the operator can use policy-based routing to direct select groups of users through the appliance.

The two primary functions in the Hub-Optimization software are:

- ***GZIP gateway — which compresses non-image web content in real-time***
- ***Image Transcoding — a configurable real-time function that re-scans and encodes jpeg images***



to an operator defined quality that results in fewer bytes per image

The GZIP gateway operates on **HTTP** web page contents, compressing non-image web objects such as the index page, custom style sheets, Java scripts, etc., using the GZIP format. Standard web browsers then transparently perform the GZIP de-compression function prior to displaying the contents for the user. This is a lossless compression technique that eliminates the need for a remote device or proprietary plug-in software as GZIP compression is a standard function in today's web browsers. Many web sites already GZIP compress their content in order to deliver their pages faster and more efficiently, however the Hub-Optimization function performs this in real-time for those sites that do not take advantage of this capability.

The second Hub-Optimization function, image trans-coding, is configured by the operator based on their accepted balance between bandwidth savings and image quality and is considered a real-time lossy compression scheme. JPEG images that are embedded in HTTP web pages are scanned in real-time and resaved at a "quality" metric specified by the operator. This function results in images that are the same physical size and same original pixel count, but at a reduced quality that results in far fewer bytes per image.

Simple Cost Savings

When the GZIP gateway and XiPix transcoding functions are used together, the bandwidth gains can be substantial. However, at some point the image quality will degrade to the point it becomes unacceptable. This setting is subjective and may be changed by the network operator in either direction, trading reduced image quality for more bandwidth, or using more bandwidth to preserve a higher quality image. XipLink has noted a significant willingness to use this function aggressively in areas where satellite or other wireless coverage is scarce, with no user objections so far.

In example, here's the case of a VSAT operator in an area with limited coverage, trying to get as many users on the network as possible while maintaining acceptable performance and image quality. This indicates tuning optimization parameters will be moderately aggressive in order to save as much bandwidth as possible, but leaving the users with what is considered to be good image quality. For these calculations, the assumption is that the GZIP gateway and trans-coding functions are enabled in the one-way hub-optimizer.

In this author's opinion, using an image quality setting of 20 will result in web page images that are quite acceptable, while still delivering significant bandwidth gains. Let's use that setting in the model below...

What about voice?

By their very nature, PEP devices are designed to proxy a connection from one machine, over a wireless link to another machine, without user intervention or configuration. TCP is the connection-oriented protocol that is used to establish these connections, but the wireless optimizers are deployed in a key network location to address another area of optimization for connectionless protocols, driven by the growth of Voice over IP.

Outbound IP utilization (shared TDMA)	~15 Mbps
Transponder Capacity (~1.25 Mhz x 15 Mbps)	~18.75 Mhz
Transponder Cost (~USD $3500 / Mhz)	USD $ ~65,625 / month
Link Traffic that is HTTP 1.1= 50%	~7.5 Mbps
Transponder Capacity that is HTTP 1.1	~9.4 Mhz
Trans-coding Quality = 20 + GZIP = 33% page reduction	
Outbound IP Savings = %33	~1.87 Mbps
One-Way Hub-Optimizer Deployment	
Transponder Savings	*USD $~7,000 / month*

When these systems were originally deployed, the majority of Internet traffic was TCP/IP based, generally between web browsers and servers.

Today there are many more protocols riding across these links other than TCP, supporting all kinds of interesting applications. There is one application and protocol that has noticeably increased on almost every link XipLink encounters and that is Voice over IP that uses the **UDP** protocol. These UDP packets are typically very small, containing small voice samples that must be quickly sent in order to reproduce high-quality voice. The presence of this protocol by itself should not really be that interesting in light of a conversation around optimizing connection oriented sessions, but the fact there are so many of these packets arriving so rapidly due to their small size has driven even robust modem vendors to request optimization of this protocol.

When many callers are off-hook, the network will experience very high UDP packets per second on the LAN, also explained as very tight packet arrival intervals, which can cause packets to be dropped at the modems LAN interface — designers simply could not have forecast how fast this application has taken off nor the implications of this technology to the mix of LAN data. As wireless optimizers are installed in-line, just upstream of any wireless modem, they are in a unique topology location where they can optimize this data as well as TCP, by the addition of a lightweight tunnel to the upstream site.

The two main components in these real time protocol optimizations are ***Packet Coalescing*** and ***Header Compression***. When using packet coalescing, the wireless optimizer will wait a configurable time interval, aggregating UDP packets together, then transmitting many UDP packets over the wireless link as one larger "coalesced" packet, delivering a much more manageable packet per second rate to the modems.

The second function is specifically for the ***Real Time Protocol***, where well-known algorithms can be applied, further reducing the number of packets required to send the same amount of voice data. Wireless optimization vendors have come a long way and still have far to go. The adoption of CPU and memory technologies is certainly quick, as they continue to take leaps and bounds in efficiency.

Wireless optimization vendors must use those core technologies on hub-site appliances, making certain these devices scale to hundreds and thousands of remote users, but never forgetting the tight cost restrictions wireless customers expect. Wireless optimization vendors must also design software solutions that scale down, where very efficient algorithms must operate on smaller and smaller mobile devices in limited memory with busy mobile processors — there really are no alternatives to increasing bandwidth, so these functions must operate even on very small wireless devices.

Wireless optimization represents an evolution of early TCP performance enhancing proxy technology and represents a revolution for the application acceleration techniques that emerged from environments where large platforms in high performance chassis and large disk sub-systems were always assumed. Software efficiency remains a prime consideration once customers and partners understand these optimization solutions must be portable, mobile, and interoperable in both very large and very small form factors.

About XipLink (http://www.xiplink.com)

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Embedded Software for BSD and Linux devices

Wireless Optimization

One-way Hub-site only deployments

Two-way SCPS optimization simultaneously Multiple TCP Transport Controls

Streaming Data Compression

Hub Optimizations

Software Option One-way installation – at hub-site only

Internet Web Optimizations for all users GZIP real-time gateway for non-image objects

XiPix image trans-coding for JPEG pictures

Space Communications Protocol Standard

Interoperable TCP Acceleration

Transparent to end-users

Mandated by DISA for DoD users

Vendor enhancements to increase optimization

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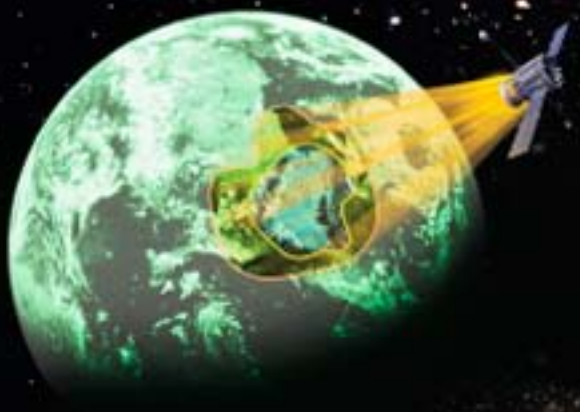

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- **Bruce Bennett,** Director, Programme Executive Officer for SATCOM, Teleport & Services, **Defence Information Systems Agency (DISA), USA**
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From The Satellite To The STB

author: Simen Frostad, Bridge Technologies

I posed this question in a previous article I authored for SatMagazine...

> **Your content is downlinked from satellite, and your infrastructure is up and running, ready to deliver to an eager subscriber base — what could go wrong?**

The answer — then, as now — is there's plenty to go wrong. My question also contained a tacit assumption, an assumption that most operators also make when they download content from satellite without monitoring the quality and integrity of the signal — things only start to go wrong once the content is downloaded and travelling through the delivery infrastructure. Few operators establish specific monitoring procedures for the incoming satellite signal. Why is that? The old IT maxim — **garbage in, garbage out** ***— should provide enough warning here.***

Broadcasters and digital media operators increasingly understand the requirements for monitoring the delivery chain and there is a growing appreciation of the importance of an integrated monitoring approach. It's simply not viable to operate separate monitoring 'silos' for the broadcast and IT links of the chain. More and more broadcasters are coming to understand that end-to-end monitoring technology that embraces the broadcast and IT domains is the way to ensure efficient fault identification, tracking, and resolution. It is really remarkable how many broadcasters and media operators simply take the satellite signal on trust, and ignore it in their 'end-to-end' monitoring.

To be really worthy of the description 'end-to-end', a monitoring solution should provide a transparent view of the data from the satellite to the set top box (STB), with the ability to focus in on any error, anywhere it occurs, and see it in the context of the entire chain. If a broadcaster leaves the satellite signal out of the monitoring solution, the engineers are handicapped when trying to trace the source of a problem because the signal from the satellite may be the cause of errors that manifest themselves much later in the delivery chain.

This signal has usually been through quite a lot already! The media will have been encoded and sent to a MUX system, and from there, via a microwave link to a satellite uplink center, where it's probably decoded and re-encoded in a new MUX. The signal is then uplinked to the satellite, downlinked, and descrambled. It's quite an act of faith for the broadcaster to leave the signal unmonitored after all of that technical activity. Without including the satellite signal in a system-wide overview, maintenance staff attempting to determine where the cause of a fault lies may be completely misled.

The redundancy strategy many headend operators have resorted to as a remedy — in order to maintain service on an alternative infrastructure in the event of failure — is not only expensive, but also fails to get to the root of the problem if the fault is at the transponder. Unless the satellite is monitored, even switching to an alternative path would not remedy the failure.

Critical service-affecting problems can be introduced from changes in the satellite signal which are not in themselves errors, but which will cause severe disruption unless identified by the monitoring system. Take as an example a sports network broadcasting in many different languages across Europe: If a new language is added, the changed **PIDs** (*packet identifier*) could result in complete loss of audio across all the channels received from the network. Without the ability to include the monitoring data from the incoming satellite content, engineers searching for the cause of the problem would be likely to spend a lot of time barking up the wrong tree.

Bridge's microVB

The philosophy of end-to-end monitoring that takes in both broadcast and IT/IP technology would be flawed if it did not provide a solution for monitoring the signal from the satellite, and for monitoring the quality of service at the STB. When service-affecting problems occur, operators need to see the big picture across the entire delivery chain, in order to track and resolve issues quickly and to restore service levels to the subscriber.

The ***VideoBRIDGE*** monitoring system provides for both ends of the chain: at the satellite, with the ***VB270*** probe, and at the STB, with the ***microVB***. The key advantage of these two probes, despite the fact that they sit so far apart, is that they form part of a completely integrated system in which all of the component probes contribute to the overall view of the delivery chain and provide an all-embracing monitoring and analysis environment.

With the VB270, broadcasters and media operators can monitor the **QPSK/8PSK** signals found in *DVB-S* and *DVB-S2* satellite transponders — a fully configured probe can provide real-time monitoring and alarming for two QPSK/8PSK RF inputs, 10 IP MPTS/SPTS multicasts, and one ASI TS input. Analysis using the open industry standard **ETSI TR 101 290** is performed in parallel for QPSK/8PSK inputs, the ASI input, and the IP input. If the VB220 is used as a master card, the IP monitoring capacity is increased to support 260 MPTS/SPTS multicasts. The built-in round-robin functionality allows sequential analysis of multiple QPSK/8PSK multiplexes, making it possible to monitor a complete satellite using a single VB270.

In addition to the TR 101 290 parameters monitored and analyzed, the VB270 also provides comprehensive RF parameter monitoring that allows the operator to see signal degradation over time — one of the causes could be drifting alignment of the antenna itself, or to offer a true customer example, the growing and thick foliage of nearby trees. Many of those problems can be hard to understand without continuous monitoring of the signals in question.

At the other extreme of the delivery chain, the microVB is the industry's first viable solution for continuous, real-time monitoring at the STB. As the subscriber is often the first to flag up a problem, and service affecting problems can be generated anywhere in the delivery chain from satellite to the STB itself, any monitoring system that cannot provide comprehensive data on the subscriber experience is a system that limits the effectiveness of the support and maintenance operation.

Bridge's VB220 IP-Probe

The microVB is a miniaturized, remote monitoring and analysis probe — small enough in size at 75mm x 20mm, and light enough to be delivered to the customer via mail, and robust enough to arrive intact. After a simple, plug-and-play installation the subscriber can complete in a couple of minutes, the microVB automatically locates a server on the operator's VideoBRIDGE monitoring network and begins sending data, enabling deep packet inspection without requiring a technician to visit the customer's home to install the device or diagnose problems.

Data from both the STB and the satellite input (together with data from any other VideoBRIDGE probes installed elsewhere on the network) is collated and presented in advanced graphical displays that immediately highlight potential or actual problems and assist rapid resolution, by giving engineers the ability to trace the source of errors, wherever they occur in the chain.

Equipped with the ability to see from one end of the delivery chain to the other, operators have the tools to ensure a very high quality of service for their viewers. But even though the tools are now available, making effective use of them does require an understanding of the potential for service affecting problems to be introduced into the system from the earliest stages — in the content downloaded from satellite — or directly at the end of the chain, in the STB. Without that end-to-end integrated monitoring system, operators can't be certain of accurately tracking down the source of a problem quickly and efficiently.

Further information at:
http://www.bridgetech.tv/

Insight

Is The Next Star... Globalstar?

How Consumer Focus + A New Constellation Brighten The Future

author: Alan Gottlieb, CEO, Gottlieb International Group

Hardly anyone talks about Globalstar, yet this satellite operator has made a unique transition from commercial communications provider to a consumer products company — one that is rather unique in the traditionally enterprise-focused satellite industry.

Globalstar's unusual transition from commercial focus to the consumer mass market was driven by a unique set of circumstances — problems with the S- band amplifiers aboard its satellites, which caused a degradation of duplex voice services. With voice capabilities disrupted by the amplifier failures, the company had to reinvent itself, and reinvent itself it did, with gusto.

Relying on the unaffected simplex capabilities of the Globalstar constellation, *Peter Dalton*, Globalstar's CEO, created an innovative series of location and messaging products for the mass consumer market, including ***Spot Satellite Messenger***, the ***DeLorem/ Spot Image Communicator*** (an integration of the **DeLorem** navigation product and Globalstar's messaging service), and ***Hug***, a feature rich location and tracking service for the boating industry.

The unusual nature of the Globalstar approach represents an emphasis and understanding of mass marketing not traditionally applied in the technology-focused satellite industry, and is a credit to *Dalton*, an entrepreneur recognized for his ability to create low cost technology that enables mass market penetration.

About Spot

Essentially, ***Spot*** provides hikers and outdoorsmen enhanced safety and security in the field. Unlike conventional GPS devices, Spot transmits a continuous stream of location data every few minutes, providing tracking information and the ability to send messages to family and friends. The unit is palm-sized and an easy to transport device with coverage in practically the entire continental United States, Canada, Europe, Mexico, and Australia, sections of South America, Northern Africa, and Northeastern Asia. Optionally, the location data may be accessed over the Internet and viewed on *Google Maps*. At a retail price of $99US, Globalstar has sold thousands of units.

The DeLorem/Spot Image Communicator

The ***DeLorem/Spot Image Communicator*** essentially integrates DeLorem's *Navigation GPS Tracker*, ***Earthmate***, with the Globalstar Network, resulting in a unique hybrid product that combines GPS navigational capability with Globalstar's communications and tracking capabilities. With it, users can send geo-tagged text messages from remote areas to their personal contacts as well to their *Facebook* and *Twitter* contacts. Other features include the ability for users to be tracked over the Internet, check in, or send SOS messages.

The Spot Hug

Spot Hug, ***Hybrid Universal Guardian***, is a unique, low cost asset monitoring and messaging system. At a ground breaking low-price of $399US, plus a small monthly subscription fee, the product monitors a boat's location and sends "unauthorized movement" alerts to the *Spot Asset Monitoring Center*. The Spot device also includes a fob that is carried by the owner when boating. If the owner leaves the boat and the boat is moved, an automatic alert is sent to the monitoring center and owner, a feature especially useful when the boat is parked while the owner stops at a waterside restaurant.

The New Constellation

The first of Globalstar's new satellites is scheduled for launch in October, far ahead of Iridium. With the new satellites in place, Globalstar's full voice services should be restored to the company's 400,000 subscribers and, with the added cash flow from Spot and Hug added to its voice revenue, Globalstar should be in a strong position to service its debt and to ultimately attain an attractive level of profitability.

About the author

Mr. Gottlieb is CEO of Gottlieb International Group. His firm, Gottlieb International Group Inc., specializes in assisting ship owners and managers with evaluation of satellite service offerings and helping service providers structure appropriate product offerings. Mr. Gottlieb is a recognized expert in the field, has extensive contacts in the global shipping industry and VSAT vendor community and is a frequent published author and speaker at satellite and maritime conferences. Established in 2002, Gottlieb International Group has worked with ship owners and managers, VSAT vendors around the globe, and his clients have included such major companies as Inmarsat, Iridium, Globecomm Systems, KVH Industries and Intelsat. His new E-Book, The First Independent Guide to Maritime VSAT is now available through his Company's website:

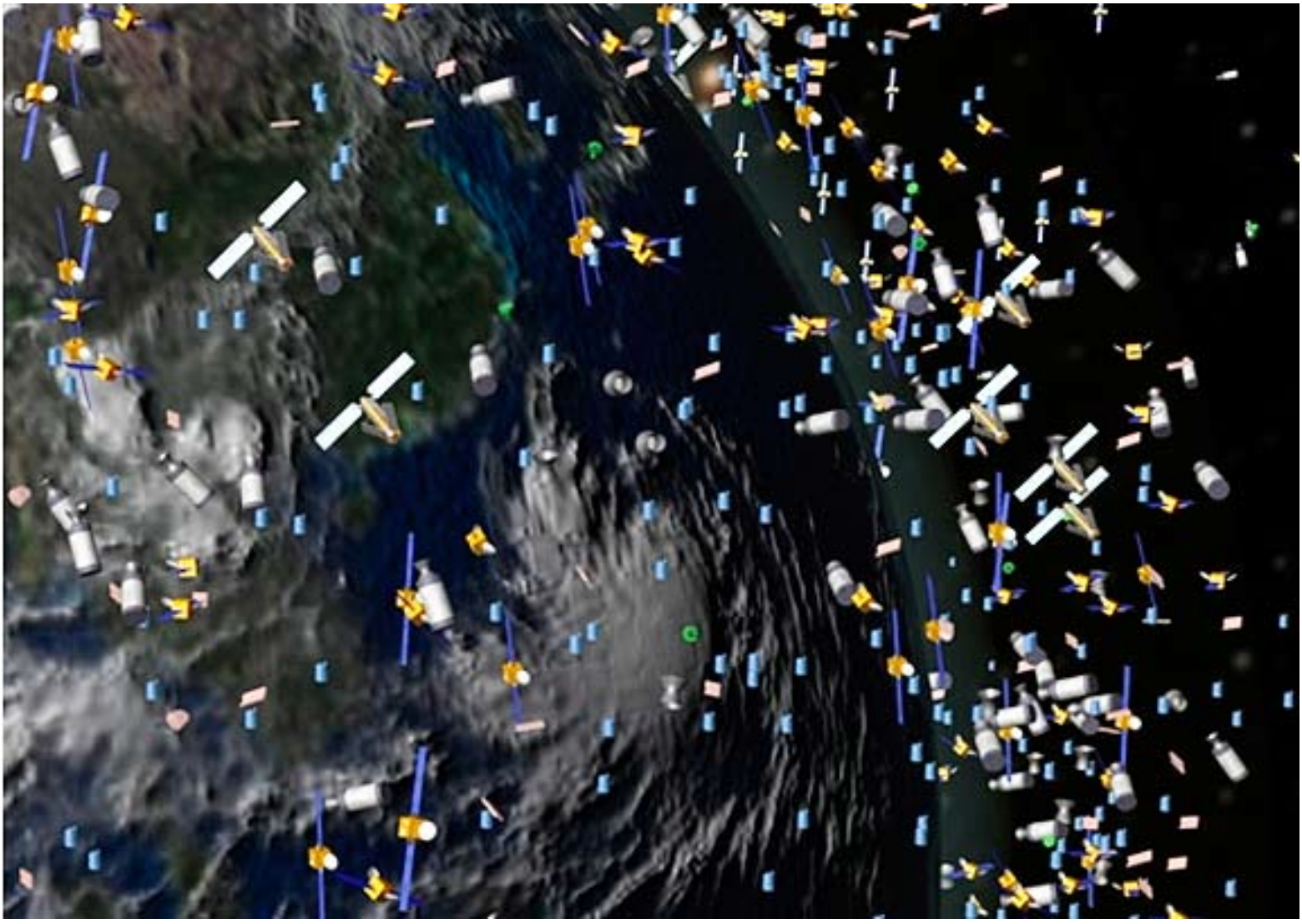
http://www.gottliebinternationalgroup.com

Fighting Space Debris

Small Satellites — Part Of The Solution Instead Of The Problem

author: Jose Guerrero, ATK Space Systems

It all started as a hot topic around the lunch table at the ATK Spacecraft Systems and Advanced Technology Group in Pasadena, California, and resulted in a paper that was just recently presented at the 24th Annual Conference on Small Satellites sponsored by the American Institute of Aeronautics and Astronautics (AIAA) and Utah State University in Logan, Utah. Not the usual discussions on past weekends and latest upcoming vacations. Instead, a group of ATK scientists and engineers decided to tackle a troublesome international issue affecting spacecraft operators in low Earth orbits: orbital debris.



The ATK booth at 24th Annual AIAA/USU Conference on Small Satellites. (Credit: USURF photo)

ATK recently participated in the *American Institute of Aeronautics and Astronautics* (**AIAA**) and **Utah State University's** (**USU**) *Small Satellite* conference. As described on their website (http://www.smallsat.org/index), for more than 23 years, the AIAA/USU Conference on Small Satellites has been a forum for researchers and technology advocates from government, industry and academia to share new ideas and discuss the important topics of the day in small satellites.

In recent years, small satellites have proven their potential in scientific, commercial and military missions. The 24th Annual AIAA/USU Conference on Small Satellites focused on understanding future mission needs, within the context of small spacecraft system capabilities or limitations, striving to identify future technological advancements to make these programs successful.[1]

ATK attended this conference as one of 350 organizations, to combine for over 1,100 registrants from 20 different countries.[1] This collective assembly provides a key opportunity to build industry partnerships that can address the existing commercial and government needs as well as anticipate future opportunities in the aerospace market. The conference included more than 60 presenters across a variety of small satellite discussion topics.

Orbital debris mitigation was one of two ATK papers accepted by the conference for presentation. The ATK paper was the only one to address what is a growing concern for the domestic and international space community. Written by *Jose Guerrero*, *Jon Manash*, *Matt Russell*, *Doyle Towles* (**Spacecraft Systems & Services** in Pasadena, California) and *Steve Stone* (**Aerospace Structures** in Laguna Hills, California), the paper was titled, *How Can Small Satellites Be Used to Support Orbital Debris Removal Goals Instead of Increasing the Problem* and was presented at the conference by *Kevin McKee* (**Spacecraft Systems & Services**).

The Main Conference room of the 24th Annual AIAA/USU Conference on Small Satellites; the conference had more than 1100 registrants from 20 different countries. (Credit: USURF photo)

Orbital Debris — Background

Orbital debris is any obsolete, man-made object in Earth orbit and it constitutes a serious concern for NASA, DARPA, Air Force organizations and the commercial space industry. These objects include spacecraft, upper stages of launch vehicles, any debris released during spacecraft launch separation or operations, created as a result of spacecraft explosions or collisions, solid rocket motor emissions, paint particles and thermal blankets.[2] It is estimated there are 19,000 objects larger than 10 cm and 500,000 objects between 1 and 10 cm in diameter.[2] The number of particles smaller than 1 cm probably exceeds tens of millions.[2]

The most concentrated area for orbital debris is in *Low Earth Orbit* (**LEO**). These are orbits with altitudes less than 2000 km with the highest concentration of <10cm diameter particles within an orbital band between 800 – 850 km. Larger (> 10 cm) orbital debris objects are routinely tracked by the *U.S. Space Surveillance Network*.[2] Objects as small as ~3 cm can be detected by ground-based radars, providing a basis for a statistical estimate

of their numbers.[2] Assessments of the population of orbital debris smaller than 1 cm have been done by examining impact features on the surfaces of returned spacecraft, although this has been limited to spacecraft operating in altitudes below 600 km.[2]

The issue of orbital debris is not going away — it's going to get worse unless corrective action is taken. Since 2005, the space debris environment has been unstable, with NASA projections pointing toward a collision cascade effect in the near future. A recent *International Orbital Debris Removal Conference* held in December of 2009 focused on the need to find solutions for orbital debris removal and manage any space debris increase potential.

Orbital debris continues to get increased scrutiny from the **Defense Department**, **NASA**, and the **White House**. The *Joint Space Operations Center* (**JSPOC**) operators now track 40 to 50 possible space collisions per day.[3] JSPOC states that debris fields have grown rapidly in recent years, along with increases in satellite launches; these facts dramatically indicate the increased potential for space mayhem.[3]

The proposed ATK solution concept concentrates on mitigating LEO based debris particles ranging from 1cm to 10cm in diameter; precisely those particles that cannot be tracked by current ground systems capabilities, but can cause serious damage to spacecraft. The envisioned small spacecraft can be used in either of two modes...

1) *Protection Mode, whereby the satellite would be placed near a high value space asset such as the ISS location for protection*

2) *"Sweeping"' volumes of specific regions near the space asset or orbit to remove or collect debris*

Figure 3 shows objects in LEO that are being tracked — 95 percent of these objects are orbital debris.[2] Even though the objects shown are not actual size, the image provides a clear message regarding the serious issue of orbit debris in LEO.

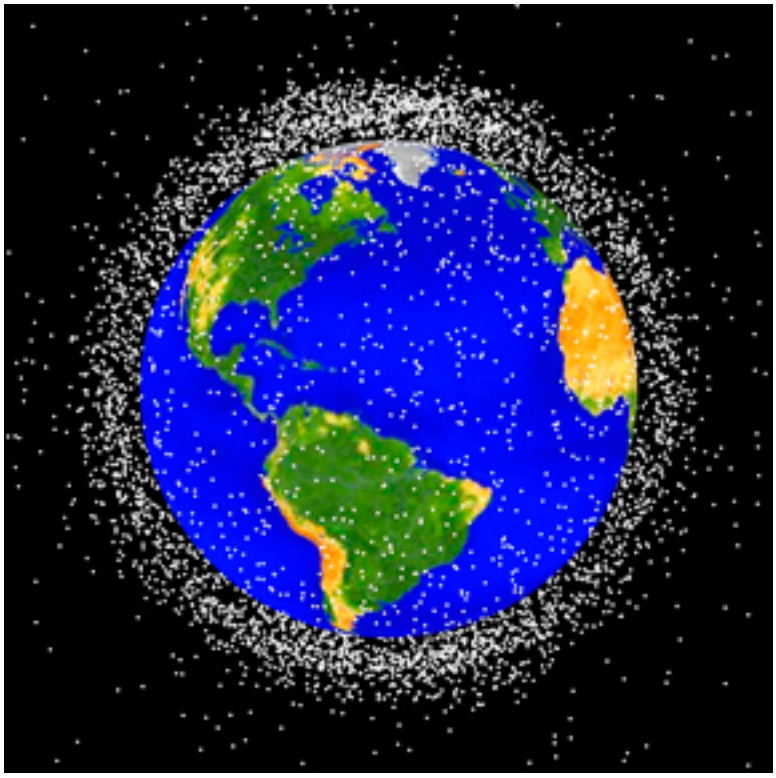


Figure 3: Debris in Low Earth Orbit (Image credit: NASA)

Defining The Problem + Trade Studies

The average impact speed of orbital debris with another space object is 10 km/sec.[2] At this speed, 1 cm diameter objects and larger will cause loss of functionality or failure of a satellite due to impact damage.[2] *Nicholas Johnson*, NASA's chief scientist for orbital debris at the **Johnson Space Center** in Houston, was quoted in an August 2010 *Space News* article and commented, "Every spacecraft, whether manned or unmanned, is vulnerable to debris larger than 1 centimeter."[4]

Certain debris objects less than 1 cm can also cause significant damage to spacecraft.[2] Objects greater than 10 cm are tracked by the *United States Space Surveillance Network* (SSN) and, therefore, active spacecraft can maneuver around these objects because of their well-known orbits. However, objects less than 10 cm are too difficult to observe with ground based telescopes and radars and cannot be tracked or prevent spacecraft damage via defensive maneuvering operations.[2]

The ATK lunch group got down to business on the issue, conducted research, and evaluated various solutions for eliminating hazardous space debris. A trade study comprised of six different system concepts to minimize the problem was conducted.

All the study concepts were rated and then ranked based on key performance criteria.

Four of these concepts used methods of heating the surface of the debris particles in order to induce ablation which would result in a thrust force that quicken the time to de-orbit the particles. Heating was accomplished by using either lasers (ground-, air- and space-based) or a solar concentrator. The fifth system involved using a deployed multi-layer sphere to capture and break up the debris. The sixth system used a large piece of aerogel with the intent to capture incident debris particles.

All trade study concepts were rated and ranked based on key evaluation figures of merit and 'scored'. Scores were assigned to each using a point system, with 10 being best and 1 the worst. Each trade study Lead Engineer provided initial scores based on figure of merits for each design category. Then, each concept was evaluated and compared to the others and ranked by total score.

The highest ranking system was the *multi-layer sphere* (**MLS**) approach, which is based on the development of a spherical spacecraft enclosed in multiple layers of a lightweight material. This MLS spacecraft would act as a protector and sweeper, breaking up debris particles and reducing their velocity, kinetic energy and potential to induce impact damage. It was also noted that this concept was the only one of those investigated that could be implemented using a small satellite.

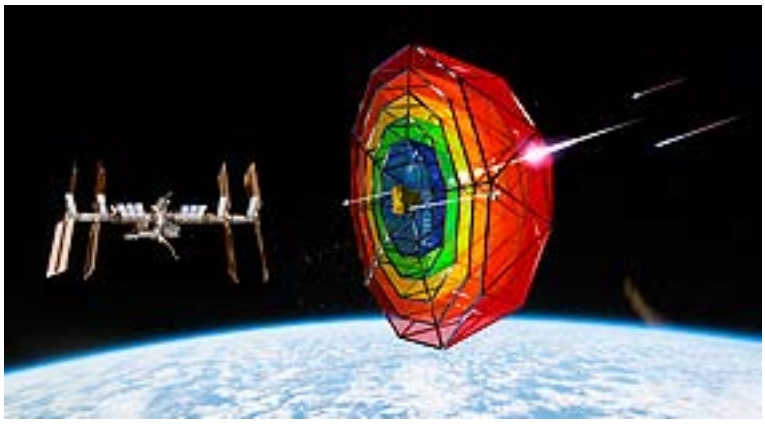


Figure 4: Above is a sectional view of the MLS concept (only a half of sphere is shown), a problem-solving system that would act as a protector of space assets and sweeper to break up debris particles in space and reduce their velocity; a configuration of MLS could be used on a small satellite, and it would reduce the possibility of catastrophic debris-impact accidents in space, to which all spacecraft are vulnerable.
(Credit: ATK Space Systems photo)

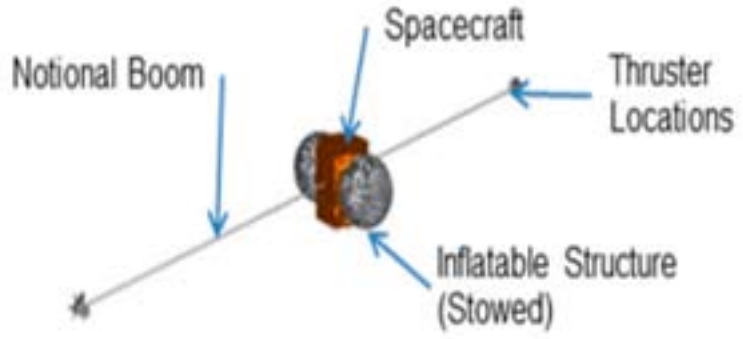


Figure 5: MLS sphere stowed and boom deployed
(Credit: ATK Space Systems photo)

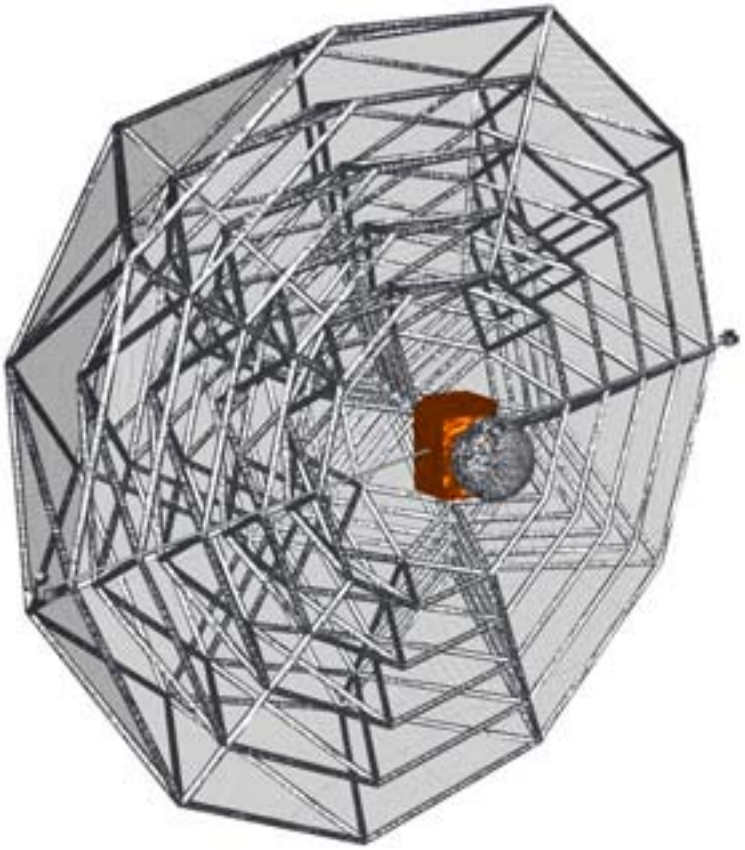


Figure 6: One-Half of MLS sphere deployed
(Credit: ATK Space Systems photo)

Small Satellite Capability

A small satellite can fit into the fairing of any of today's launch vehicles and is defined as having a maximum total mass of 500 kg and up to 3 kW of power. The following is a more detailed description of the Multi-Layer Sphere and how it addresses hazardous space debris in Low Earth Orbit.

Multi-Layer Sphere (MLS) Concept

A lightweight, multi-layer material in the shape of a sphere, deployed in space (see *Figure 4*) can break-up large debris particles, creating particles to break up other particles, causing effective "Mass Fission" debris depletion. Some mass fraction of the incident particles are even expected to directly vaporize, depending on their mass, incident velocity, and material composition. The purpose of the MLS is to convert high velocity 1 to 10 cm debris particles into multiple, lower velocity shield-able (< 1cm) debris particles. The particles are broken up upon impact on the outer layer and then further destroyed when impacting subsequent material layers. The surviving particles are expected to be small enough such that the spacecraft can be effectively shielded to protect against damage. *Figures 5* and *6* depict the net structure in its stowed and deployed configurations. Note that *Figure 6* shows only half of the sphere deployed for clarity.

Spacecraft Maneuverability, Mass Estimate + Mission Life

The spacecraft, in sweeper mode, should be maneuverable enough to sweep out a LEO torus volume over a specified orbit, as illustrated in *Figure 5*. It's envisioned that several spacecraft could be operated over a few, pre-selected critical debris populated orbits to mitigate debris over a range of LEO altitudes.

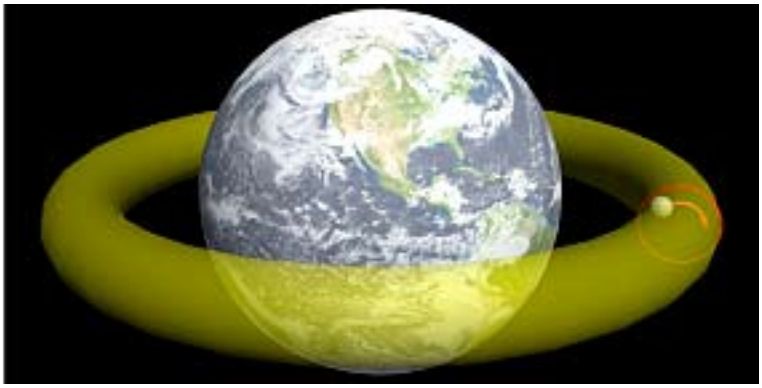


Figure 7: Low Earth Orbit Torus (Credit: ATK Space Systems photo)

The mission life is expected to be one to five years and will depend on the time it will take to sweep the maximum available debris particle field, the MLS spherical diameter, and available fuel. The maximum number of allowable impacts on the sphere is estimated to be 50,000 to 100,000. Therefore, it's expected to require at least five (5) spacecraft to eliminate 500,000 medium sized debris particles.

This new technology clearly identifies the small satellite as a potent solution in the battle to fight space debris instead of being viewed as the cause behind the problem. The next step is to obtain funding to develop a working prototype that can be used as a space demonstrator. Hopefully, publicity will result in commercial or government funds to turn the idea into reality.

The ATK Team is proud that what started as a lunchtime discussion ended up in the form of a potential ground breaking technology that could assist in solving the orbital debris dilemma. As we all know, engineers love to work on a complex problem.

ATK Space Systems website is located at...
http://www.atk.com

About the author

Chief Technologist within ATK's Systems and Advanced Technologies Group (Spacecraft Division), Mr. Guerrero manages space program phases including, but not limited to, development, research, design, procurement, integration and test with 23 years of space flight hardware experience with expertise in systems engineering, space and advanced technology. He has over 12 years of Planetary Exploration hardware experience supporting JPL and NASA HQ programs and 11 years of Manned Space Flight Aerospace experience. Additionally, he has managed successfully over 50 ATK Space engineering multi-discipline tasks and supported over 60 space missions during service at Rockwell International.

Special thanks to Matt Russell and Kevin McKee from ATK Space Systems for their inputs to this article.

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Fairing Well, Thank You

author: Hendrik Thielemann, RUAG Space

Just three and a half minutes, and it is all over — after 208 seconds in flight, the payload fairing of the Ariane 5 rocket is jettisoned. But in those few minutes — and during the run-up to the launch — a payload fairing has to prove its worth, so as to ensure that the valuable freight in the nose cone of the rocket makes it into orbit unharmed.

Payload Fairing for Vega. The new small European launcher is to have its maiden flight in 2011. Photo: RUAG Space

Satellites are highly sensitive, and the phase directly before and during the launch is fraught with perils – including extreme temperatures, solar radiation, dust, moisture, and rain on the launch pad – that could cause them damage. Then there is the deafening noise, and the enormous amount of frictional heat generated both during launch and while the rocket passes through the Earth's atmosphere. Finally, there are the mechanical loads: as it hurtles through the atmosphere, the structure of the fairing is subjected to axial loads of up to 60 metric tons (600 kN) and lateral loads of up to 35 metric tons (350 kN) simultaneously. Throughout all this, the payload fairing must provide reliable protection for the satellite enclosed within it.

The engineers at **RUAG Space** in Zurich have more than 40 years experience in making sure that the rocket nose cone safely survives those all-important first three minutes. The Zurich headquarters of Europe's foremost supplier to the aerospace industry is home to some of the world's leading experts in payload fairings. Since the early days of the European Ariane program, Switzerland has been responsible

for producing all of the nose cones for the western European launch vehicles.

The first payload fairing engineered and designed by RUAG Space was for the ***Ariane 1*** launch vehicle, which made its successful debut on December 24th, 1979. Today, the engineers of RUAG Space can look back on some 200 successful launches, during which their payload fairings functioned with fabled Swiss precision. Not once in more than 30 years has a shroud from RUAG Space failed to protect the payload on board Europe's ***Ariane***, or the American ***Atlas V-500*** rocket. RUAG Space is now one of the leading international suppliers of payload fairings using composite technology, which are deployed on both the Ariane 5 and Atlas V-500 launch vehicles.

What is more, ***Vega***, the new European small orbital launch vehicle premiering in 2011, will be equipped with a RUAG shroud, as well.

The fairing of a rocket must be as light as possible, and yet capable of withstanding the high loads that occur during launch. Striking a balance between these two contradictory requirements is one of the fundamental challenges designers of fairings have to face. The first use of composite technology in the fairings of the ***Ariane 4*** rocket in 1988 represented a quantum leap in development. This new technology allowed the weight of the shroud to be reduced by around 20 percent compared with the aluminum fairings customary up until then. It also enabled engineers for the first time to

Ariane 5 launcher on the launch pad.
Photo courtesy of Arianespace

develop an aerodynamically optimized fairing for the Ariane 5 and Atlas V-500 rockets in a double-curved form known as an ogive. The ogive-shaped fairing significantly reduces aerodynamic drag and increases the launcher's payload capacity.

Today, a fully equipped composite fairing for the Ariane 5 launch vehicle weighs just 2.4 tons — at a length of 17 meters and a diameter of 5.4 meters. It is made up of 14 different elements, each of which consists of an aluminum honeycomb core covered with layers of carbon fiber reinforced plastic.

These fairing shell elements are manufactured at RUAG Space headquarters in Zurich. Their different layers (*i.e.,* the inner face sheet of composite laminae, the honeycomb core, and the outer face sheet) are laid up on curing molds. The entire assembly is then processed in a large autoclave.

After the curing process, the shell elements are outfitted with the necessary inserts and interface equipment for the bespoke mission.

Once finished, the elements are transported to another RUAG site in Emmen, near Lucerne, for final assembly. Interfaces to the launcher, launch table mast and connections for on-ground payload cooling, separation systems, and electrical wiring are then installed. At Emmen, the fairing halves are painted with a special coating to prevent electrostatic charging, providing the necessary protection against solar radiation until launch. The two fairing halves are transported by either ship or cargo aircraft to the launch pad, where RUAG Space experts are responsible for assembling the fairing and readying it for the mission.

Final integration of RUAG Payload Fairings in Emmen, Switzerland. Photo: RUAG Space

**Continued fairing integration.
Photo: RUAG Space**

When the rocket ignites and lifts off, above all is the ear-splitting noise that poses a danger to the satellite. However, thanks to the effective sound-proofing system of the fairing and its acoustic design, the sound waves cannot propagate inside it — this reduces the noise to a level that poses no threat to the satellite. Depending on the fairing, the sound-proofing may be either an efficient acoustic resonator or a lightweight multi-layer porous absorber — both types are optimized in terms of acoustics, cleanliness, mass, and reliability.

In flight, an Ariane 5 rocket reaches speeds in excess of 8,000 km/h. The atmospheric friction generated at this velocity heats up the rocket's thin outer layer, and temperatures of up to 700 degrees Celsius are not uncommon. For this reason, the exterior of the

**Preparation of a fairing for a separation test.
Photo: NASA / GRC**

fairing is covered with thermal insulating tiles based on natural cork. But a number of other measures provide protection against extreme temperatures, including special coatings, and ventilation ports to keep the payload cool when the rocket is on the launch pad.

After about three minutes in the air, the fairing has reached the end of its lifecycle — the rocket has reached an altitude of about 120 km, and broken free of the earth's atmosphere, so there is no longer any need for an aerodynamic form or any special protection for the satellite. Triggered by the onboard computer, the pyrotechnical elements of the separation systems are ignited, and the fairing halves are jettisoned, falling back to Earth.

It is this final moment of separation that poses a special challenge to the development engineers. The separation process must function reliably, and it must be possible to predict with accuracy the trajectory of the jettisoned fairings. On no account should a fairing come into contact with the fragile satellite. That is why the engineers at RUAG Space put their separation systems through such painstaking tests, often analyzing the separation behavior of the payload fairings in campaigns lasting

Acoustic absorbers inside a payload fairing. Photo: RUAG Space

several months. Such tests are carried out in the world's biggest vacuum chamber at **NASA**'s *Glenn Research Center* at Plum Brook Station, Ohio. To make the grade, a newly developed fairing must pass a series of additional tests, including static load and acoustic tests. Later, during routine operations, the performance of every individual payload fairing is thoroughly assessed.

A comprehensive measurement system forms part of every RUAG fairing, ensuring that the dynamic environment of the satellite and the performance of the fairing can be accurately monitored.

About the author

Hendrik Thielemann studied Communications science at the University of Münster and graduated with an M.A. After completing practical training, he worked as newspaper editor. Since 2001, he has been working in the European Space Industry, holding various positions. Hendrik Thielemann has been the Head of Communications at RUAG Space since RUAG acquired Oerlikon Space in Summer 2009.

About RUAG Space

RUAG has become a major international technology group. The company today continues to operate from a strong domestic foundation to serve a growing global clientele. RUAG focuses on two market segments, Aerospace (space travel and aviation) and Defence (security and defence technology), each of which is involved in civilian and military applications in roughly equal portions. The headquarters is situated in Bern, Switzerland, and operates production centres in Switzerland, Germany, Austria, Sweden, Hungary and the United States. Its sole shareholder is the Swiss Confederation. More info at...

http://www.ruag.com/

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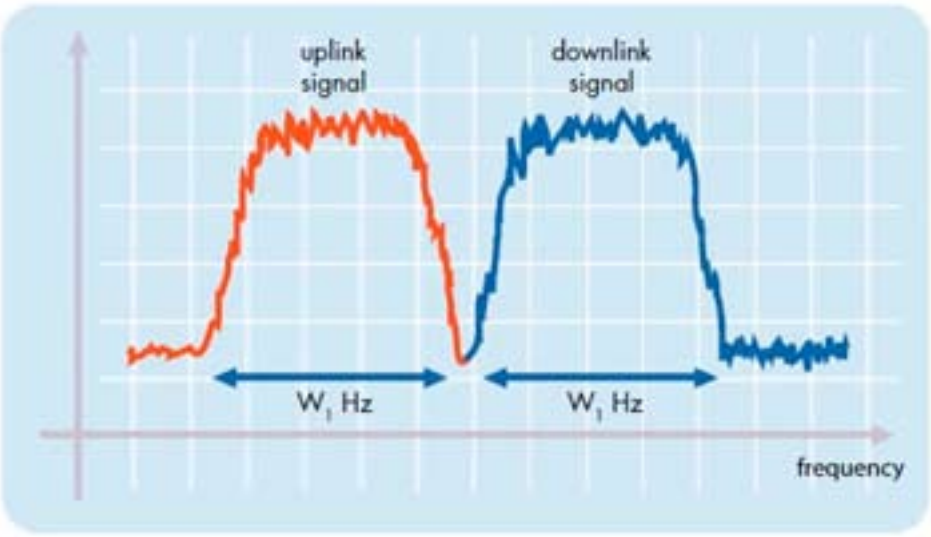
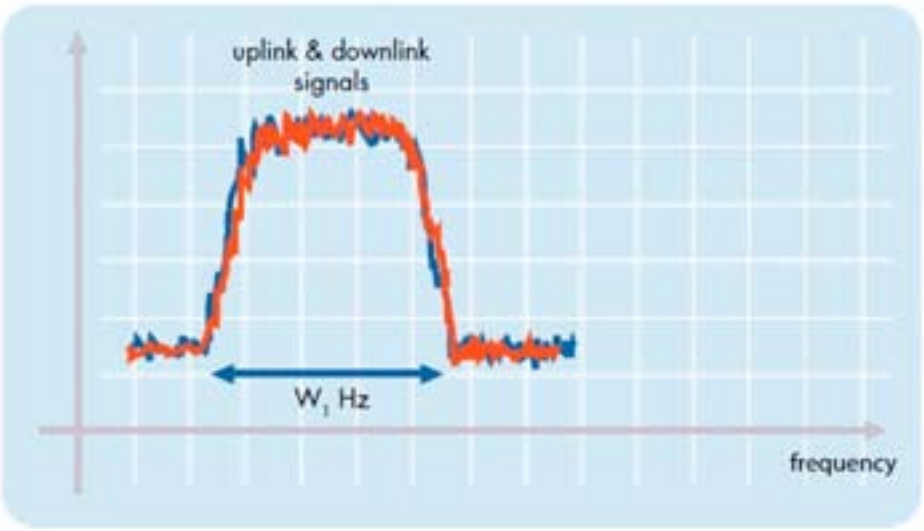
PCMA... The Plumber's Helper For Bandwith Betterment

Based on Paired-Carrier-Multiple-Access (PCMA), a technology developed and patented by ViaSat, Paired Carrier is an embedded feature available in satellite modems. Paired Carrier allows the reuse of satellite space segment by overlaying transmit and receive carriers in the same frequency domain — this reduces the transponder bandwidth required to facilitate a satellite link by as much as 50 percent. Paired Carrier can be used in conjunction with other bandwidth saving techniques to provide added cost savings, such as those offered by Paradise Datacom.



Typical satellite transmission with separate frequency slots for uplink and downlink.



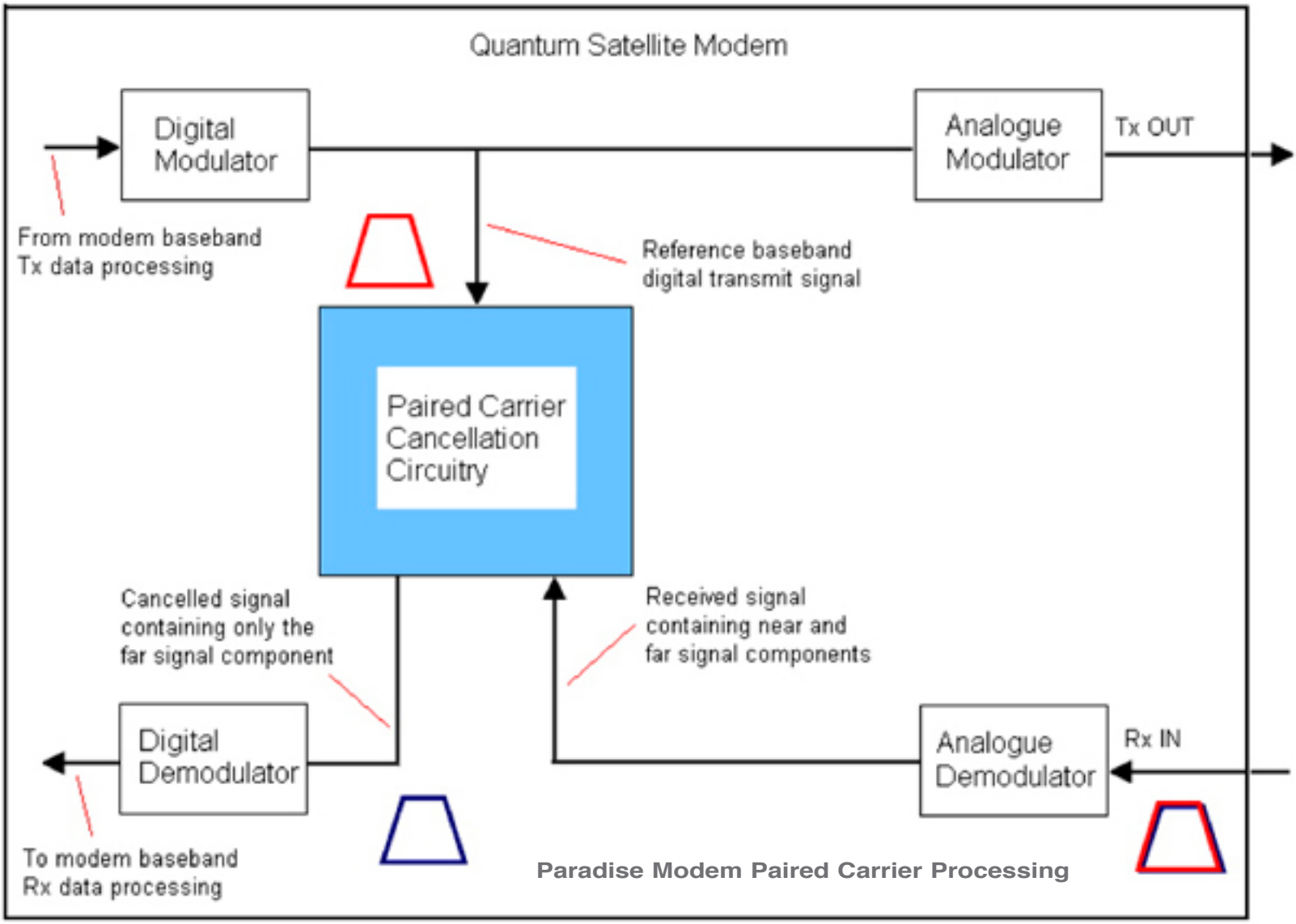
Using *Paired Carrier*, uplink and downlink carriers overlaid, can save 50% on space segment.

During the process of "carrier cancellation", Paired Carrier cancels the locally-generated signal from the composite signal being received from the satellite that contains both carriers leaving only the signal being generated from the opposite end of the link. This is depicted in the diagrams above. The signal-cancellation algorithm estimates and compensates for gain, frequency, phase and delay in matching the unwanted component of the composite Rx signal with a delay-buffered version of its own transmission.

In contrast to the complex signal processing taking place in the background, the setup and operation of Paired Carrier is extremely simple. Beyond the normal setup required for any satellite link, activating the Paired Carrier feature involves only one additional step. By entering the relative locations of the satellite and the Earth station where the modem is installed, the embedded algorithm will calculate the exact distance and adjust the signal propagation-path delay to achieve optimum performance.

In circumstances where the distance between the modem and satellite are dynamic, such as a shipboard application, Paired Carrier–enabled modems will now accept a GPS input from an RS-232 GPS via an NMEA-183 interface. The two commonly used GPS protocols, *GPS Fix Data* (**GGA**) and *Geographic Position Latitude / Longitude* (**GLL**), are currently supported and the modem will automatically detect and switch to whichever is available.

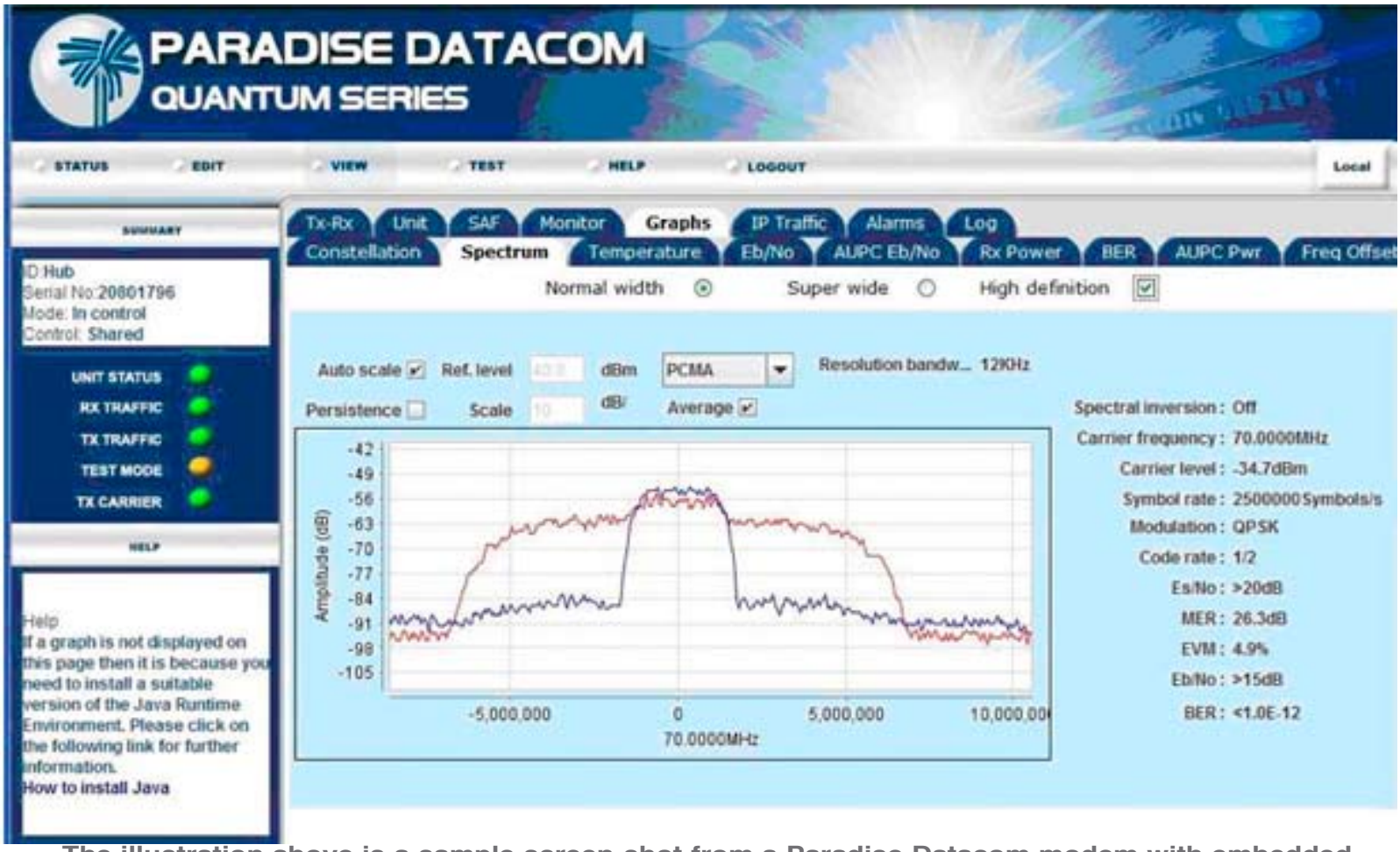
Paradise Datacom's GPS feature allows the modem to track changes in the ships position as it moves inside the satellite footprint and constantly updates the Paired Carrier algorithm to ensure the satellite delay component is always correct. Consequently, maritime operators are now enjoying the opportunity to utilize Paired Carrier in their fleets and capitalize on the cost-saving benefits that result from satellite link optimization previously available only to land-based operators.



Paradise Modem Paired Carrier Processing

With respect to establishing the point to point link between stations, there are no special requirements in terms of how the two carriers are initialized. One or both modems can be powered down and back up again in any order and the link will be automatically re-established with no need for user intervention. Additionally, if a modem's outbound carrier is muted, it will continue to receive the inbound carrier without any interruption.

As a result, Paired Carrier performance is remarkably robust when experiencing common link impairments induced by conditions such as rain fade or the use of inclined-orbit satellites. Paired Carrier can be used in combination with an *Automatic Uplink Power Control* (**AUPC**) system for an even higher degree of reliability. As is the case with any carrier-cancellation technology, the only restriction is that you must be able to see your own transmission. As long as the transponder accommodating the link is operating as the conventional "bent pipe" and the link itself is "bandwidth limited" with respect to its utilization of satellite transponder resources, Paired Carrier can provide a user with significant savings in their cost of operation.



The illustration above is a sample screen-shot from a Paradise Datacom modem with embedded Paired Carrier. The image is provided by the display of a laptop computer connected to the modem's monitor and control port and shows a pair of superimposed carriers in the same frequency domain.

Paradise Modem Paired Carrier Processing

Paired Carrier can be added to existing systems as well as being incorporated into the design of new systems. The signal cancellation techniques used guarantees at least 25dB (typically 30dB) cancellation of the unwanted signal. By doubling satellite throughput in terms of spectral efficiency (bits/s/Hz),

Paired Carrier can be used to cut operational expenses and/or free up satellite bandwidth for new applications and services. The savings can be used to reduce bandwidth or increase throughput, or convert to a higher coding gain to decrease power.

For Paired Carrier to work, the link must be bandwidth-limited. However, if a link is instead power limited then it is usually possible to change its design to turn it into a bandwidth-limited link. The two carriers must have power spectral densities that lie within 10dB of each other. There are many ways of balancing the power being used at each end of the link to achieve this.

The simplest techniques involve changing the *Forward Error Correction* (**FEC**) scheme, the FEC rate and modulation — all of which affect power requirements. If the Paired Carrier link budget cannot be closed using these techniques then, because of the significant bandwidth cost savings, it may still be viable to make more significant changes, such as to the antennas being used — and still achieve a fast return on investment.

Paired Carrier is available on all Paradise satellite modems and works with all modulations and FEC schemes. As an example, Paired Carrier and DVB-S2 represent the two most bandwidth-efficient technologies available today and can uniquely be used together in the Quantum modem.

Bye Bye Black Box?

author: Viraf Kapadia, Star Navigation

It is the middle of the Atlantic. Meal service is almost over. Two hours to YYZ (Pearson International Airport, Toronto, Canada) and home.

In the cockpit, a highly trained flight crew monitors the autopilot and chats about football.

Also in the cockpit is a small box that doesn't care at all about football, spouses, dogs, or kids... it just works quietly.

This box's only concern is to constantly monitor and analyze up to 3,000 parameters per second…every minute of the flight. Should any monitored system, part, or flight characteristic vary from assigned norms, the small box will send a real time, encrypted alert via satellite to a ground station and, from there, immediately to the airlines Ops Center, for assessment and, if necessary, immediate action.

The small box? This is the ***STAR-ISMS™ In-Flight Safety Monitoring System***, based on patented technology and developed by **Star Navigation Systems Group Ltd**. of Toronto, Ontario, Canada. Some eight years in development, the commercialization of the STAR-ISMS comes at a critical moment in aviation history and its importance to air safety cannot be overstated. The June, 2009, loss of **AF-447** in mid Atlantic, with 228 passengers and crew, combined with the inability of the French and U.S. Navies to locate the *Flight Data Recorder* or the *Cockpit Voice Recorder* (**Black Boxes**), galvanized authorities worldwide into a search for a way to avoid such a situation from ever reoccurring again.

Determining the causes of the AF-447 disaster would bring some comfort to the families of those lost in the accident. It could also lead to the prevention of similar accidents in the future. Some information was received during the latter stages of the flight through the **ACARS** system onboard. ACARS stands for *Aircraft Communications Addressing and Reporting System*, which has been in use since 1978. Unfortunately, while the information received gave hints of potential problems, the amount of detail transmitted was insufficient to confirm the probable cause, or causes, of the accident. The information would have typically been high-level fault codes only. In the event that technical issues caused or contributed to the loss, no trends would have been transmitted.

STAR-ISMS™ was conceived in 2002 by the author, who is now the Chairman and CEO of Star Navigation Systems Group Ltd. Mr. *Kapadia* felt there existed a real need to be able to monitor, and analyze the functioning of the myriad systems aboard an aircraft, all the while that aircraft was in flight, and, if necessary, send information concerning potential problems to the ground, all in real time. Satellite technology was in place. Mr. *Kapadia* and his team, lead by Chief Technology Officer *Dale F. Sparks*, set out to develop what is now the STAR-ISMS™ system.

The STAR-ISMS™ system reads data from the aircraft avionics buses (**ARINC 717/573** and **ARINC 429**) and monitors aircraft parameters provided by a variety of avionics including essential systems such as, but not limited to:

- ***Flight Management Computers (FMC)***
- ***Inertial Reference Systems (IRS)***
- ***Air Data Computers (ADC)***
- ***Flight Control Computer (FCC)***
- ***Flight Gauging System (FGS)***
- ***Flight Warning Computer (FWC)***
- ***Digital Flight Data Recorder (DFDR)***
- ***System Data Analog Converter (SDAC)***

Flight Data is stored on solid state storage inside the *Star Server Unit* (**SSU**), the centerpiece of the STAR-ISMS™ hardware on board the aircraft. STAR-ISMS™ analyzes the data in real-time and sends alerts about abnormal parameters and events to the ground along with selected data. It uses satellite communication when in the air and **WLAN** (**IEEE 802.11**) when on the ground. Time-critical information is sent immediately, while other information is stored on board and transmitted at lower cost when on the ground.

The STAR-ISMS™ on-board data analysis capabilities range from simple bound checking (*e.g.*, aircraft pitch within -15 degrees and + 25 degrees), to multi-parameter combination checking (*e.g.*, aircraft speed less than 250 kts below FL 100), to complex equations with multiple parameters. A set of the most common analyses are pre-defined in STAR-ISMS™. Airlines can specify additional analysis to be performed, independently for each aircraft or aircraft type.

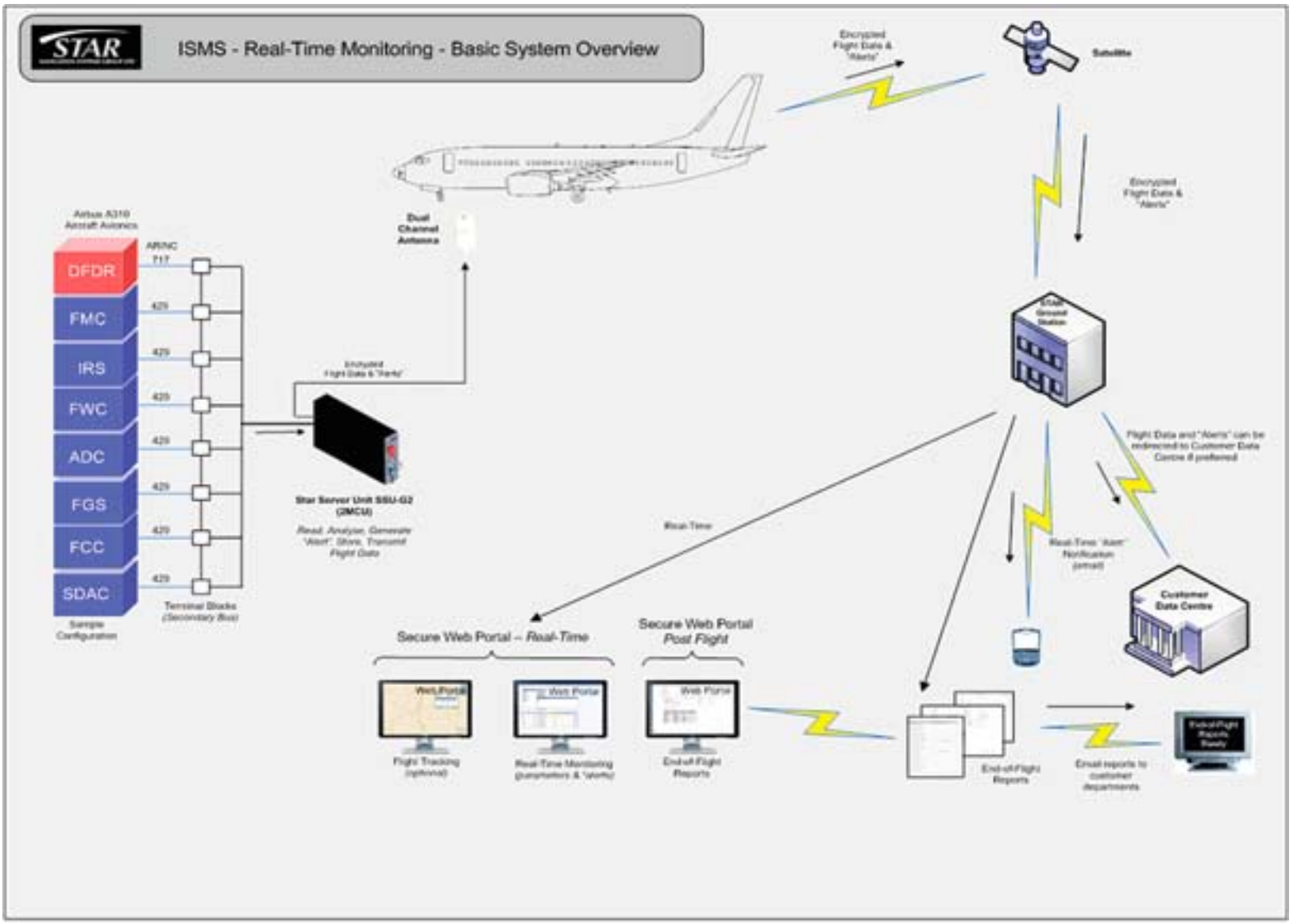
Once on-board analysis identifies an abnormal parameter or combination of parameters, it generates and transmits an alert. The ground station receives

the alert then transmits it to the airline and/or ground personnel (*e.g.*, PDA) via email, subject to local network capabilities. This enables the airline's maintenance department to know about the status of the aircraft before it arrives and to prepare tools, parts and resources. As a result, costly flight delays and aircraft downtimes are reduced.

The STAR-ISMS™ system gives airline ground personnel the ability to monitor trends, predict possible failures, schedule repairs, and assists the flight crew in taking preventive action as required. It acts as an early warning system, detecting the earliest signs of potential problems. As a result, airlines can reduce aircraft downtime and flight delays due to unscheduled maintenance, increase compliance to standard operating procedures and gain efficiencies from the many reports and data feeds available.

The on-board data analysis configuration is designed to be flexible in order to meet the needs of a constantly changing operating environment. This is achieved through the dynamic automated end-of-flight configuration change feature. Updated and customized analysis configurations are uploaded to the aircraft and activated remotely when necessary. For example, if "over water" routes, such as the North Atlantic, require a closer monitoring of **ETOPS** relevant parameters, a separate data analysis configuration is pre-activated for such flights automatically, without human interaction.

At the end of each flight, STAR-ISMS™ automatically creates a set of reports for various departments within the airline. These reports are available as both formatted reports and as raw data feeds. Formatted reports in PDF format are sent by e-mail and are also available through STAR-ISMS™'s secure *Customer*



Internet Portal. Raw data feeds can be transmitted to the airline's systems through e-mail or *file transfer protocol* (**FTP**).

A comprehensive pre-defined report set for various departments covers the most common and most relevant parameters that are required for awareness, transparency and decision support, including:

- ***Flight Operations***
- ***Flight Safety***
- ***System Operations Control***
- ***Maintenance***
- ***Engineering***
- ***Engine Condition Monitoring (ECM)***
- ***Finance / Administration***
- ***Payroll***

In addition to the pre-defined reports, customized reports can be created to satisfy the customer's specific requirements.

STAR-ISMS™ fully automates data acquisition and transmission for *engine condition monitoring* (**ECM**). All relevant engine parameters are read at various stages of the flight and can be set up to automatically upload into the airline's or engine manufacturer's ECM database via IP Internet communication either through satellite communication when in the air or through WLAN (IEEE 802.11) when on the ground. Airlines can specify the set of parameters transmitted, the number of samples recorded during a flight, and the flight phase and/or time at which the samples are recorded. With automated ECM, the airline can collect engine data more frequently and with greater accuracy while reducing pilot and data-entry workload.

STAR-ISMS™ offers real-time flight tracking via satellite communication. The system submits position reports at a user-specified rate (default – every 2 min; max rate – every 30 sec). The parameters typically transmitted for tracking are:

- ***Position Report Date/Time***
- ***Registration/Flight Number***
- ***Latitude***
- ***Longitude***
- ***Altitude***
- ***Ground Speed***
- ***Track***

Tracking messages are received and processed either by the Star Data Centre or by the airline. The tracking data is available through STAR-ISMS™'s Customer Internet Portal, both as position reports, as well as plotted on an interactive map. In addition, with some STAR-ISMS™ flight tracking configurations, the tracking data can be interfaced with third party tracking and/or plotting software such as *Google Earth*.

During operation, STAR-ISMS™ records and monitors data from the aircraft systems and stores it on solid state storage in the Star Server Unit (SSU). Once on the ground, the in-flight data set is transmitted automatically to the airline or the airline's flight data analysis provider for processing and analysis using IP Internet communication via WLAN. This capability eliminates the risk of data loss from media handling and human error present in traditional manual data recovery. It also eliminates the need for maintenance personnel to access the aircraft, and thus, resource requirements, and significantly reduces data delivery delays. Data is typically available within minutes from the aircraft arrival at a WLAN-enabled gate. In addition, the system offers opportunities for improved fuel management through transmission of the required fuel parameters to the ground in real-time, to better support the fuel management program and positively affect fuel utilization. (e.g. late landing gear retraction, excessive APU usage, improper flap settings on take off/landing, excessive taxi speeds, multiple engine taxi, etc.).

STAR-ISMS™ provides automated and accurate timekeeping for block and flight times. STAR-ISMS™'s timekeeping uses the high precision atomic clocks on GPS satellites and can, therefore, reach an accuracy unmatched by manual timekeeping. The data can be transmitted in real-time through satellite communication or through WLAN (IEEE 802.11) when on the ground after the flight. OOOI times are also available through STAR-ISMS™'s Customer Internet Portal. Aircraft maintenance intervals, part

lifetimes, and often payroll of crew, relies on accurate and timely OOOI time reporting. With STAR-ISMS™, airlines eliminate manual handling of OOOI times and reduce the potential sources of error associated with it. It also compliments existing **FOQA**, **MOQA,** and **ETOPS** programs, creating savings to the airline.

As an option, STAR-ISMS™ also offers two-way text messaging and voice calls through satellite communication. The STAR-ISMS™'s *Mission Management Unit* (**MMU**) lets aircraft crews send pre-set or customized messages, such as number of passengers, special service requests such as wheelchairs upon arrival, etc. Ground personnel can send pre-set or free-form text messages to the aircraft. In addition to text messaging, satellite voice calls are available to, or from, the aircraft through STAR-ISMS™.

STAR-ISMS™ offers airlines an easy and convenient way to access key information through the STAR-ISMS™ Customer Internet Portal. The following information is accessible via the Internet from anywhere in the world:

- ***Alerts messages***
- ***OOOI times***
- ***End-of-flight reports***
- ***Tracking position reports and tracking on map***
- ***Selected parameters monitored from the aircraft systems***

For added security, the STAR-ISMS™ Customer Internet Portal is protected behind a firewall and utilizes a password login scheme.

The STAR-ISMS™ system is currently certified via *Supplemental Type Certificate* (**STC**) by **Transport Canada** and the **FAA** in the USA.

While the main thrust of the Company is to service the Commercial airline market, other "scaled down" versions of the System are available.

STAR-ISMS Lite offers real-time tracking and two-way communication when no flight parameter monitoring is required.

STAR-ISMS Ultralite offers a low cost real-time tracking solution when no two-way communication and/or flight parameter monitoring is required.

Earlier, reference was made to the AF-447 disaster and to the amount of information received on the ground concerning the situation aboard the plane at the end. The Star system incorporates an automated emergency MAYDAY function — if any "critical" alert is generated, the system will automatically notify the ground of the "alert", open up the designated communication channel and start transmitting as much flight data as the bandwidth will allow (including aircraft position and speed as a priority).

In these emergency situations, the potential for having access to real-time flight data by ground personnel allows for a valuable level of support and information to be given immediately, so that the flight crew has as much information as possible and, if the worst happens, rescue efforts can be mobilized efficiently and accident reconstruction commenced.

Commercial aviation today is one of the safest known modes of transportation. Unfortunately, any serious accident is front page news around the world, mainly due to the number of fatalities often involved. Aside from the loss of life, the cost of a major accident can be in excess of $800 million, to say nothing of the loss in passenger traffic and reputation to the airline involved.

It is hoped that the widespread use of the STAR-ISMS™ system will improve that safety record by providing airlines with a means of cost efficient preventative maintenance, and by providing the airlines and investigators with more data with which to ascertain the reasons for an accident and ways in which a reoccurrence can be avoided.

About the author

Viraf Kapadia is Chairman and CEO of Star Navigation.

More information at...

http:// www.star-navigation.com/

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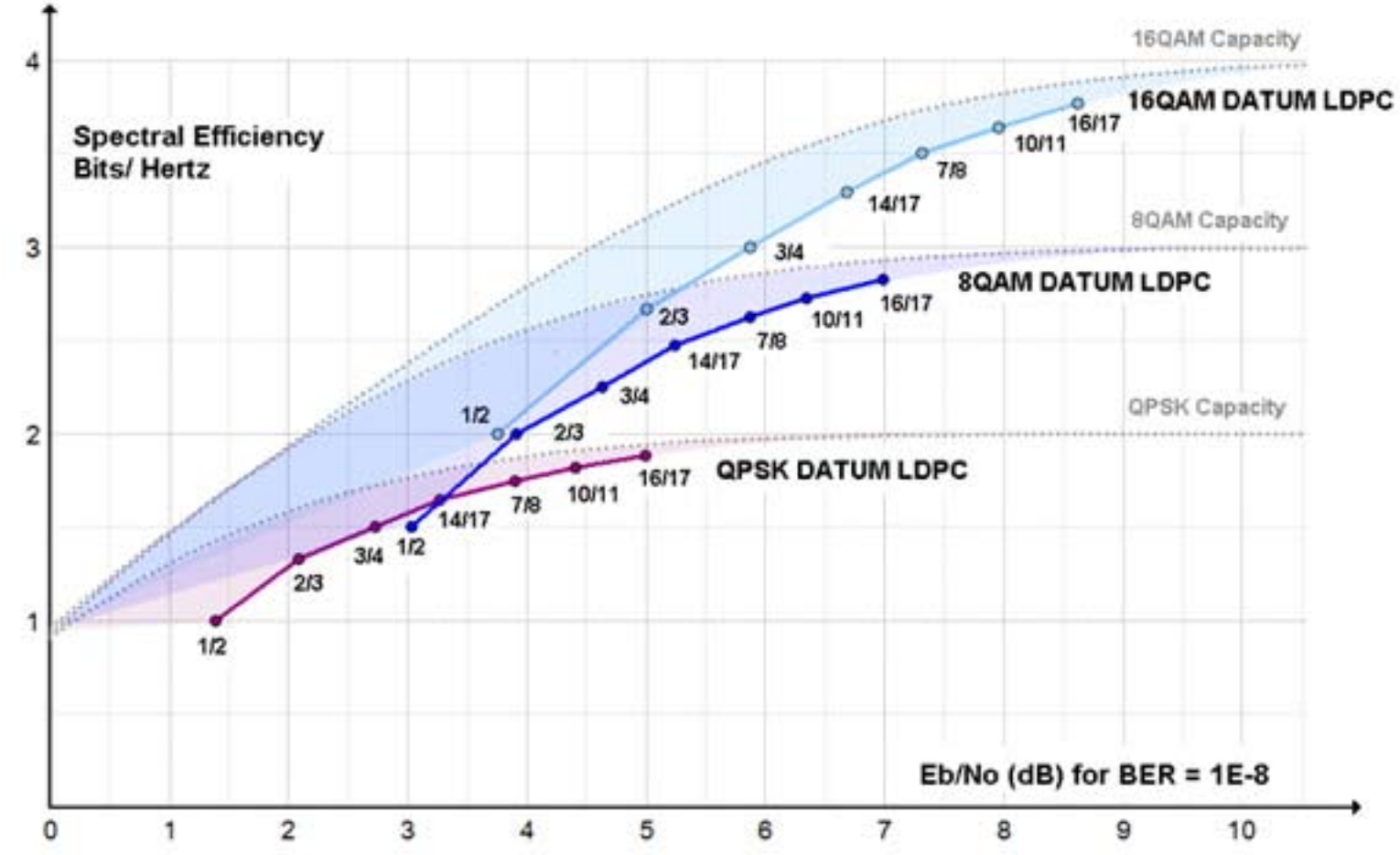
Cost Per Bit Buster...

SCPC Efficiency and Flexibility

author: David Koblinski, DATUM SYSTEMS

Flexible LDPC coding, FlexLDPC, has been introduced by DATUM Systems. As demonstrated in optimization projects conducted by major service providers, DATUM's future-proof modem with granular LDPC coding provides the industry's highest spectral efficiency and configuration flexibility. Offered by the company are highly versatile and efficient SCPC modems. These allow service providers to optimize the use of expensive satellite spectrum resources. With a smoothly distributed configuration map, every single SCPC link using FlexLDPC coding can be "personalized" to squeeze the most out of satellite's available bandwidth and spectral power, while keeping processing latency at the desired level.



Key Advantages

There are a number of features included with the company's SCPC modems that include:

» ***Unmatched Configuration Flexibility:*** *In addition to supporting standard Viterbi, Reed Solomon and Turbo coding options, DATUM offers an unprecedented choice for advanced LDPC coding configurations. The multiplicity of modulation, FEC and LDPC block size options provides around 200 distinct "mod-cod-block" LDPC combinations for a very smooth and efficient spectral efficiency and optimal latency performance. Service providers thus can count on a "Swiss army knife"- like utility to fine tune the link to the desired use of bandwidth, power and latency, or choosing to optimize available data throughput by managing trade-offs among these three design factors.*

» ***Efficient, Low OPEX Operation:*** *DATUM modems are engineered to provide superior spectral efficiency and high reliability / availability. When benchmarked against other SCPC modem manufacturers, DATUM has demonstrated to be the best performing SCPC modem in the Industry. High performance becomes synonymous to low operational expenses as DATUM allows links to closely match the limits of achievable channel capacity.*

» ***Low CAPEX, Future-Proof Modem:*** *Outstanding link performance does not prevent DATUM from simultaneously offering low CAPEX, reliable SCPC modems. DATUM modems are typically the low price winner in competitive bids because cost advantages derived from an efficient design are passed on to users. Moreover, with Flexible LDPC coding closely matching (within 0.5 dB) the maximum achievable capacity limits, DATUM modem purchases become future-proof, risk-free decisions.*

Flexible LDPC coding brings strong technical and economic advantages to satellite service providers. The low-OPEX, low-CAPEX combo directly translates into a high ROI and short payback cycle. Although most modem purchases are cash-based, the quantum leap in efficiency gain enables a variety of enhancing OPEX-for-CAPEX financing combinations including creative options for cash-constrained service providers; potentially enabling zero-cash, zero incremental OPEX upgrade projects.

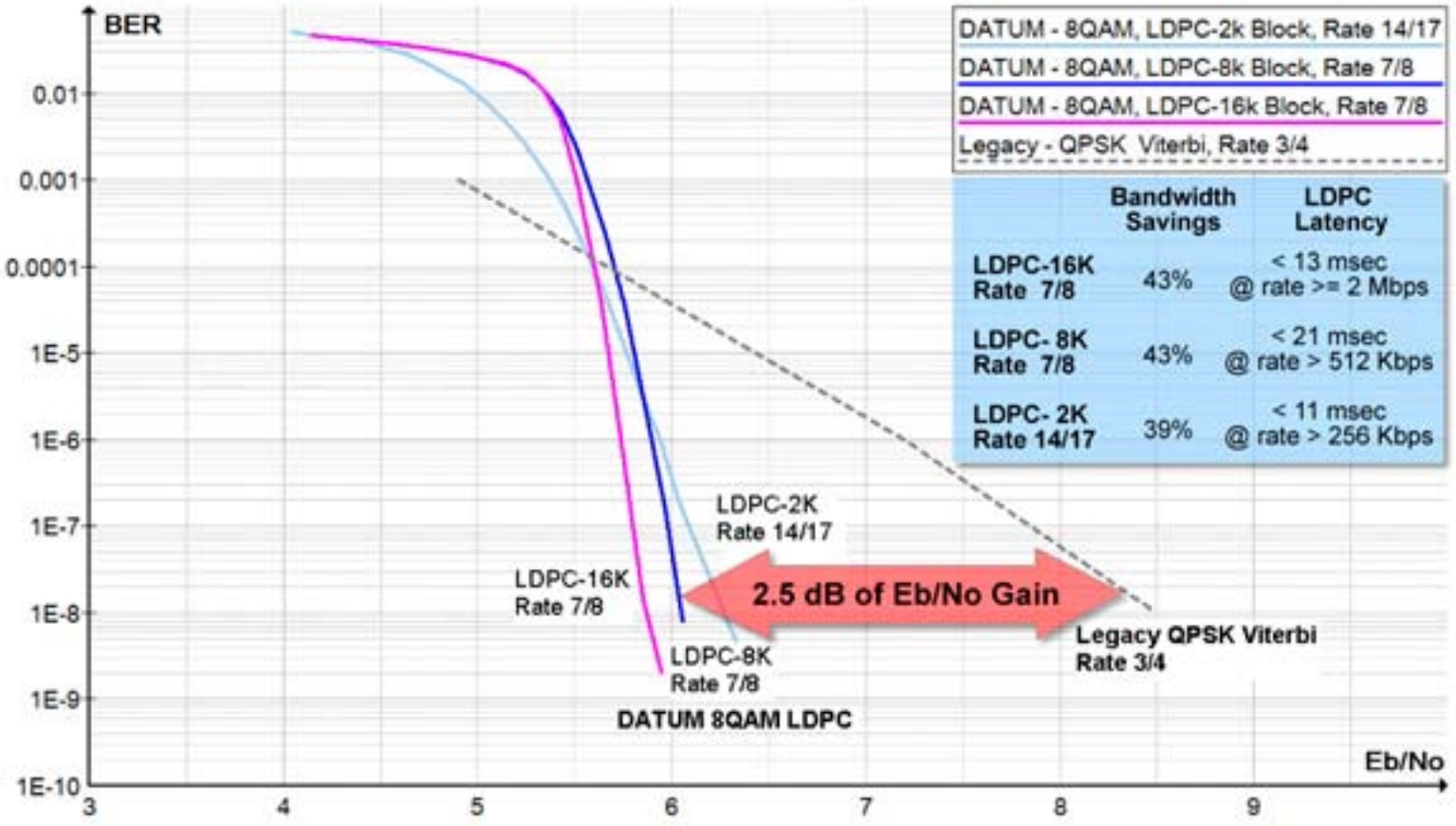


Figure 2: The LDPC block size can be configured to minimize processing latency for low-to-medium data rate scenarios. Thus, a 256 Kbps link can be configured with LDPC-2K block and FEC 14/17 to achieve processing latency of 11 msec, while a higher data rate link such as a 2 Mbps link can use 16K LDPC blocks with a processing latency below 13 msec. All shown coding options have equal C/N (real savings).

Consider the example of legacy **Viterbi Satcom** networks. Legacy SCPC links such as those using standard QPSK modulation with Viterbi decoding can be efficiently replaced with DATUM's LDPC modems. An LDPC Eb/No gain of 2.5 dB (at BER 1E-8) allows the service provider to "jump" to a higher order modulation scheme and/or less robust FEC rate.

As an example, when passing from QPSK Viterbi ¾ to 8QAM LDPC, bandwidth savings between 39 and 43 percent are achieved without an increase in carrier spectral power (same C/N), effectively freeing up satellite bandwidth and its associated spectral power. Vacated spectrum can then be reutilized for network growth, higher data throughput, or simply be returned to the satellite operator to lower operational costs. (*See Figure 2 above.)*

The LDPC block size can be configured to minimize processing latency for low-to-medium data rate scenarios. Thus, a 256 Kbps link can be configured with LDPC-2K block and FEC 14/17 to achieve processing latency of 11 msec, while a higher data rate link such as a 2 Mbps link can use 16K LDPC blocks with a processing latency below 13 msec. All shown coding options have equal C/N (real savings).

Substantial LDPC-derived OPEX savings naturally lead to short payback cycles for cash modem purchases. However, with manufacturer and/or third-party financing, even cash-constrained providers can conduct successful replacement projects.

Figure 3 on the next page shows the minimum number of loan months required to pay off financed modem purchases using equal spectrum monthly savings (zero incremental monthly cash flow). As an example, with capacity costs at $3,500/Mhz; a two-modem purchase to replace a 256 Kbps symmetric link, financed at 10 percent annual interest rate, would require a one year loan and where the monthly loan payments would equal the satellite cost savings.

Naturally, once the loan is completely paid, the service provider enjoys savings of 39 percent in recurring monthly costs in perpetuity, leading to clear positive NPV projects.

Likewise, an 8QAM, 8K block LDPC link operating at 512Kbps brings 43 percent bandwidth savings over QPSK Viterbi ¾ (and less than 12 msec of processing delay). This link would require a loan term of less than six months with monthly payments of the two-modem purchase loan to equal capacity savings.

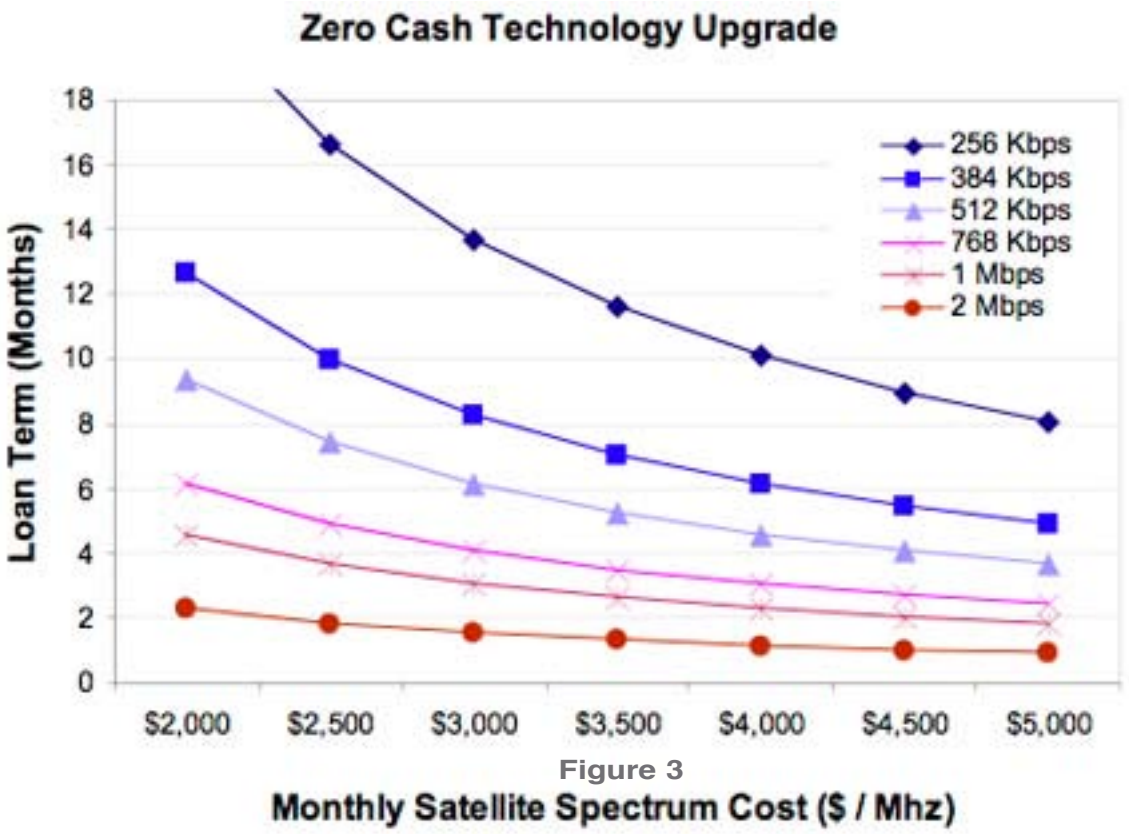


Figure 3

Higher data rate replacements — naturally — lead to shorter payback cycles, given higher monthly savings: It would take between two and five months for a 1 Mbps modem replacement to pay back the investment, realizing monthly capacity savings of 43 percent.

Cash-constrained service providers can even lower their monthly cash outlays during the lease or loan term without any upfront cash, as longer loan terms can lead to an incremental cash-positive operating condition (at the expense of higher interest expenses).

» ***For providers wishing to conduct legacy replacement projects, it is important to point out that advanced DATUM modems bring a series of advantages over alternate technology upgrade options, such as shared (TDMA) satellite broadband systems or the use of IP-only SCPC modems. Such advantages include:***

» ***Symmetric High Data Rate Capability: DATUM modems come with 5 Mbit/s rate as standard, with the ability to increase link data to up to 29 Mbit/s per link via software keys and upgrades.***

» ***Standard Serial Interface: No need to redesign serial-based client networks since modems always provide a universal serial interface. Serial-based legacy modems (such as those using V.35 or HSSI) are replaced transparently. Legacy modems are replaced by advanced modems, providing exact same link functionality but using less spectrum.***

» ***Reuse of existing RF subsystems: Thanks to the LDPC coding gain, bandwidth savings are achieved with no increment in carrier power, thus allowing the use of existing antenna and amplifier equipment.***

» ***Network Enhancements: DATUM offers a number of enhancing options including the ability to replace multiple point-to-point links with consolidated point-to-multipoint systems, achieving outbound statistical multiplexing gains, higher download speeds and lower equipment cost (fewer modems).***

- ***IP Enhancements: DATUM enhances IP links by supporting the use of an Ethernet interface that optimizes IP trunking links via TCP acceleration, HTTP pre-fetch, QoS prioritization and IP payload compression. These features lower link data rate requirements.***
- ***IP Transparency: In addition to supporting IP routing, DATUM also offers the ability to use modem's Ethernet interfaces as bridging ports for IP layer transparency. End customer IP networks can thus propagate any IP routing protocol (e.g. OSPF. BGP) across the satellite link without intromission.***

Offered by the firm are strong technical and economic incentives for legacy modem upgrades as well as for new networks, with validated operational and capital savings against competing advanced coding alternatives.

Figure 4 below illustrates DATUM's 16K block LDPC performance against typical industry performance — a 16QAM LDPC-16K block FEC rate ¾ link can be achieved using a FEC rate of 14/17 on DATUM modems, without an increase in spectral power (equal C/N, equal BER), effectively bringing around 9 percent bandwidth savings over other advanced modems.

With more than 15,000 modems shipped worldwide, DATUM SYSTEMS is proud to have had the opportunity to closely work with a number of leading service providers who are pleased with the quality of the DATUM SYSTEMS' modem and its LDPC technology.

Additional information at...
http://www.datumsystems.com/

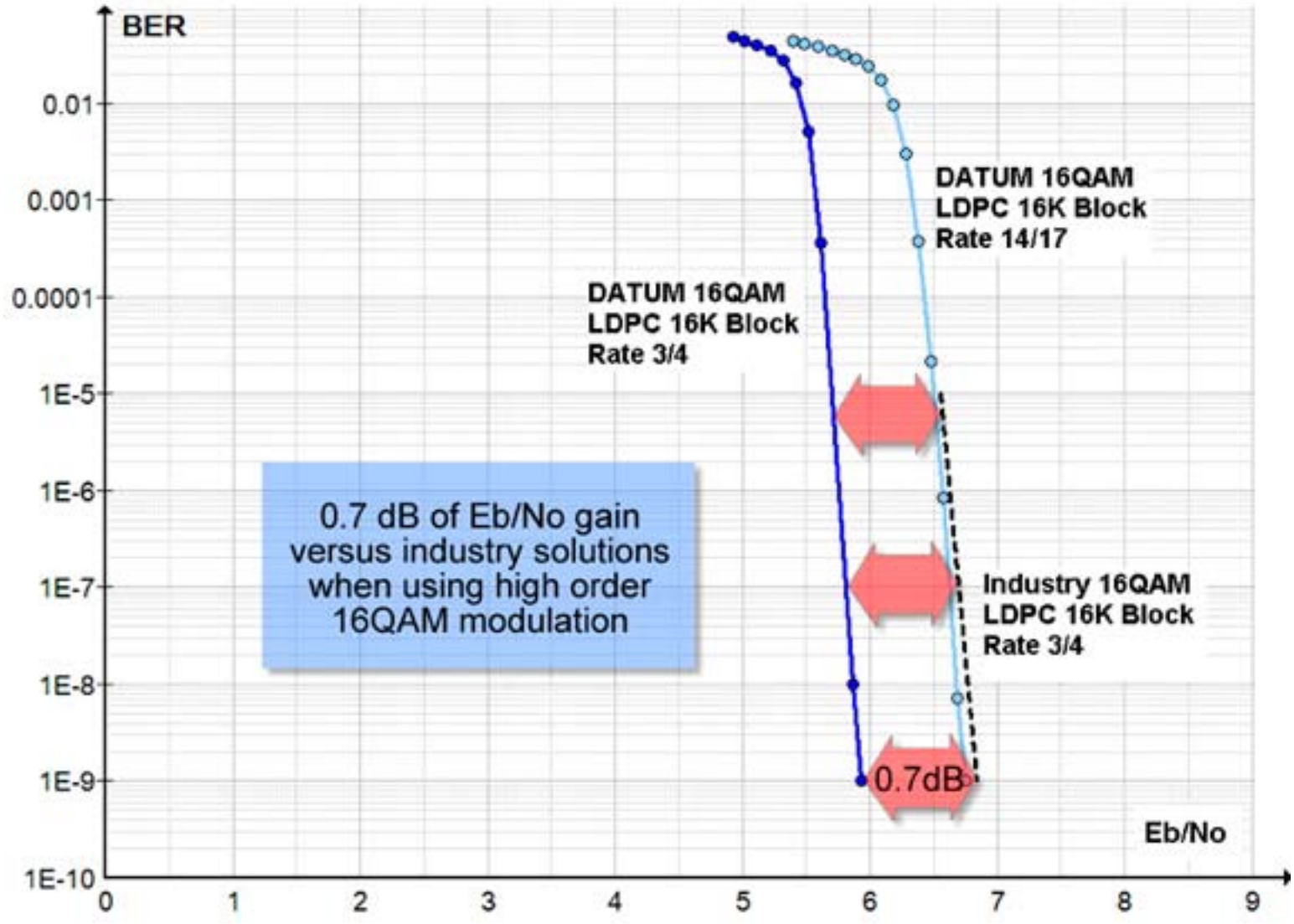


Figure 4

PTC'11

CONNECTING LIFE 24/7

16–19 January 2011
Hilton Hawaiian Village® Beach Resort & Spa
Honolulu, Hawaii USA
www.ptc.org/ptc11

PTC'11: CONNECTING LIFE 24/7 will examine how telecom is being changed and challenged by always-connected users with new requirements and preferences, the transformation of the value chain, changing regulatory concerns, and new demands for high-performance infrastructure.

PTC'11 SATELLITE PROGRAM SCHEDULE (as of 7 September 2010)

Sunday, 16 January 2011
1100 – 1230: Satellite Workshop
"Extreme Mobility – Where Satellites Connect To Daily Life"
Organized by the World Teleport Association and the Society of Satellite Professionals International

Monday, 17 January 2011
Feature keynote speaker
MARK DANKBERG, CEO and Chairman, ViaSat, Inc. USA

1230 – 1400: Satellite Luncheon - Space Infrastructure Panel
Participants: PETER JACKSON, Chairman of AsiaSat; ARNOLD FRIEDMAN, SVP, Space Systems Loral; EDDIE KATO, CEO, Thales Alenia Space North America; PHILIPPE SAINT-AUBERT, SVP, Astrium; JEAN-YVES LEGALL, Chairman and CEO, Arianespace; FRANK MCKENNA, CEO, International Launch Services; and GWYNNE SHOTWELL, President, SpaceX

1400 – 1530: Featured Session: Satellite Broadband
Participants: SUSAN IRWIN, President, Euroconsult USA; PATRICIA COOPER, President, SIA; NONGLUCK PHINAINITISART, President, Thaicom; ADRIAN BALLENTINE, CEO, NewSat; and MARK RIGOLE, CEO, O3b.

Additional programming to be announced.

Visit **www.ptc.org/ptc11** for detailed information.

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Live 3D Events

The Birth Of A New Sector

authors: Gary Carter, International Datacasting, & Etienne Fortin, SENSIO Technologies

Live delivery of 3D sports and entertainment events to digital cinemas only began to make headway during the past year and a half, but the 3D technologies that make it possible rely on established satellite systems to provide a rich, immersive 3D experience to audiences. The growth of the live 3D sector has been fueled by the combination of 3D encoding from SENSIO® and International Datacasting (IDC) satellite receiver/decoders, which, together, enable business risk-free, bandwidth-saving delivery of high-quality live 3D content via satellite.

Live 3D in Action

The availability of an affordable, practical solution has enabled an increasing number of players to get into the 3D game, and this game is very attractive to content producers, thanks to the "wow" factor of 3D and the prestige of being associated with high-profile events broadcast in 3D. Worldwide, the number and variety of events broadcast to theaters live in 3D are steadily rising as more and more content producers see the benefit of visibility in this market and the revenue-generation potential in offering their events in live 3D. The growing volume of 3D production is, in turn, providing incremental growth opportunities to businesses across the industry.

One shining example of the success of live 3D in theaters is the broadcast of the *2010 FIFA World Cup South Africa*™. From the first kickoff on June 11, **SENSIO**® 3D technology enabled soccer fans all over the world to view 25 FIFA World Cup matches live, in 3D and on the big screen.

Over the 30 days of the championship, more than 4,500 screenings of the tournament's most popular games took place across the globe in 475 cinemas in 33 countries. Built on SENSIO and **IDC** technologies, already proven in other high-profile live 3D broadcasts, the live 3D distribution of FIFA World Cup matches to the ***SENSIO 3D Live Global Network***™ of cinema operators established the companies' integrated solution as a go-to technology for delivery of alternative content. In fact, the majority of digital cinemas today rely on this technology to offer live 3D broadcasts.

How The Model Works

The success of 3D on the big screen, whether in movies or live-event broadcast, has driven content producers to build greater expertise and better resources in the area of stereoscopic (3D) production. While content producers improve their 3D production techniques, equipment, and workflows, they are turning to SENSIO and IDC for a risk-free solution for distribution of high-quality live 3D content.

The workflow itself is straightforward. The live 3D production is encoded on-site in the SENSIO 3D format and delivered to digital cinemas via satellite. Because it is encapsulated inside the main video stream already handled by today's video equipment and delivery systems, the SENSIO 3D stream can be distributed for 3D playback via the currently deployed 2D infrastructure. Each digital cinema within the network is equipped with a satellite antenna and IDC's SFX4104 Pro Video receiver with SENSIO 3D decoder technology on board.

The ***SFX4104*** Pro Video receiver/decoder is a turnkey solution that saves on rack space, eases the process of configuration and installation, and simplifies the digital cinema's launch of live 3D screenings. The IDC unit boasts designed-in reliability to ensure constant delivery of live video, regardless of weather conditions. Once decoded by the SFX4104 Pro Video system, the 3D signal is fed to the cinema's existing digital projector and shown on-screen.

Why The Model Works

The video captured during production typically is an HD television signal with a resolution of 1080i / 50 Hz. Capturing 3D requires a video picture for each eye, which means that — prior to compression — twice as much video is required for 3D than for 2D.

The key to the success of the SENSIO/IDC model is that not only are the compression capabilities of the SENSIO codec powerful enough to reduce bandwidth by approximately half, but the decompression technology also maintains the same perceived resolution and image quality. By bringing bandwidth levels and associated costs in line with those of 2D distribution, and by enabling 3D distribution over existing satellite links, SENSIO eliminates two key barriers to live 3D delivery. The high quality of the final on-screen product helps to ensure the economic viability of this model.

SENSIO achieves a visually lossless result through a combination of spatial compression technology – essentially compressing two video data channels into one — and several complementary techniques that help to maintain a clear picture. The SENSIO codec is based on frame pre-processing (encoding) and a split-screen checkerboard (quincunx) spatial layout, coupled with advanced interpolation algorithms at the decoding stage. While other codecs depend on side-by-side and above-below scaling that cause horizontal or vertical blurring, SENSIO 3D relies on simultaneous vertical and horizontal sub-sampling.

SatBroadcasting™

Spatial compression of the 3D signal “decimates” half the original pixels of each source channel. When the compressed stream is decoded with SENSIO 3D, however, the codec uses analysis of the patterns and spatial frequencies of the original pixel information present around the interpolation site, along with a set of reconstruction algorithms, to reconstruct the missing half of each source channel. Inevitably, information is lost. But, because the human eye is less sensitive to diagonal frequencies, which occur relatively infrequently, and because much of the original data is reconstituted, the difference between the final decoded picture and the original source prior to encoding is imperceptible to the viewer.

Over the past two years, integrated technology from SENSIO and IDC has enabled live 3D delivery for many of the most popular sports and entertainment events around the globe. In fact, all commercial live 3D events have leveraged this partnership. With this reliable, repeatable model for low-bandwidth delivery of high-quality 3D firmly established, SENSIO has extended its role to serve as content facilitator. Working with event producers and other rights holders, the company is leveraging its 3D experience to help stakeholders plan, produce, and deliver live 3D via the SENSIO 3D Live Global Network to audiences around the world.

Comments On... The Future of Live 3D

Gary Carter
Chief Technical Officer
International Datacasting

We’re still in the early days of 3D, but over the next 24 months, the industry will make huge strides. Over this time, there will be a significant expansion in the number of theaters worldwide capable of offering live 3D events via satellite. Content drives the consumer much more than technology necessarily does; it is access to popular content that will determine the rate at which the 3D market continues to expand. And SENSIO is establishing itself in the role of a content facilitator. http://www.datacast.com/

Etienne Fortin
Chief Technological Officer
SENSIO Technologies Inc.

IDC’s SFX4104 Pro Video receiver is the ideal instrument for cinema and has been a real enabler for the live 3D market. International Datacasting was our initial partner, and the development of the SENSIO 3D Live Global Network™ of cinema operators could not have been achieved without them. The 3D market is really taking off now, and SENSIO is proud to be on board with IDC. We look forward to continuing to travel together. http://www.sensio.tv/

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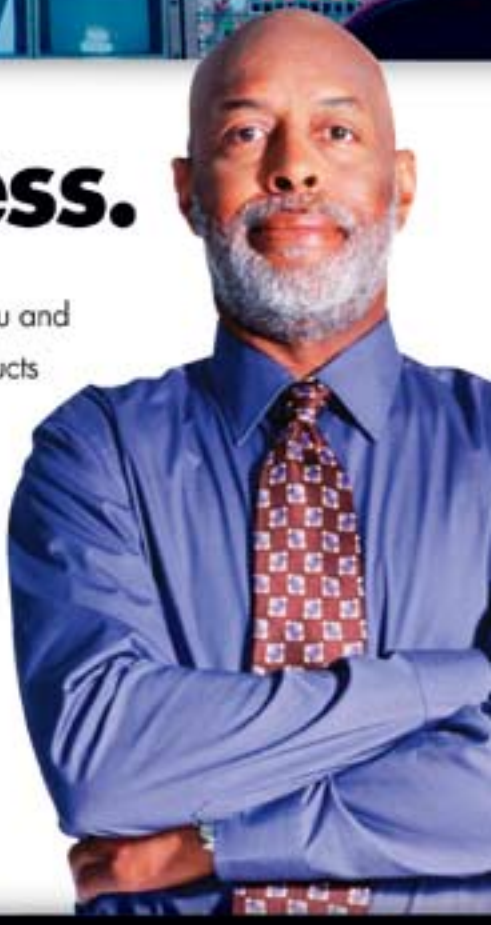

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Containing Cargo Theft...

With Satellite Technology

author: Anu Sood, SkyWave Mobile Communications

Cargo theft is an international phenomenon. While no definitive statistics are available as to how much cargo is stolen around the world, most agree the theft of goods during transportation or within a warehouse is a big problem. According to a 2007 EU Parliament report, the* Transported Asset Protection Association *(TAPA) estimated the yearly losses across the European Union due to cargo theft from trucks to be approximately 8.2 billion Euros.

An isolated road can be the perfect location for on-road cargo theft when protection is absent.

In the United States, estimates vary as to how much cargo is stolen, but expert estimates are as high as US$30 billion annually. Loss numbers often only includes the monetary value of the cargo stolen. Costs associated with replacement of goods, loss of business, reputation damage and price undercutting by the sale of stolen property are often not considered in the full economic assessment.

Cargo theft is usually carried out by highly organized groups or gangs. Proceeds from thefts are often used to finance other criminal activities and organizations. Given the players and the high stakes, it is not surprising that cargo theft is often executed in a very precise manner.

Goods and shipping companies employ many methods to deter cargo theft. Low-tech precautions such as locks offer some measure of protection. However, in many parts of the world where the risk of cargo theft is severe, such methods are not enough to deter cargo theft. High-tech solutions such as GPS-enabled tracking devices and monitoring solutions, which actively examine routes traveled by vehicles and determine location of stolen trucks and trailers, are essential to help mitigate theft and losses.

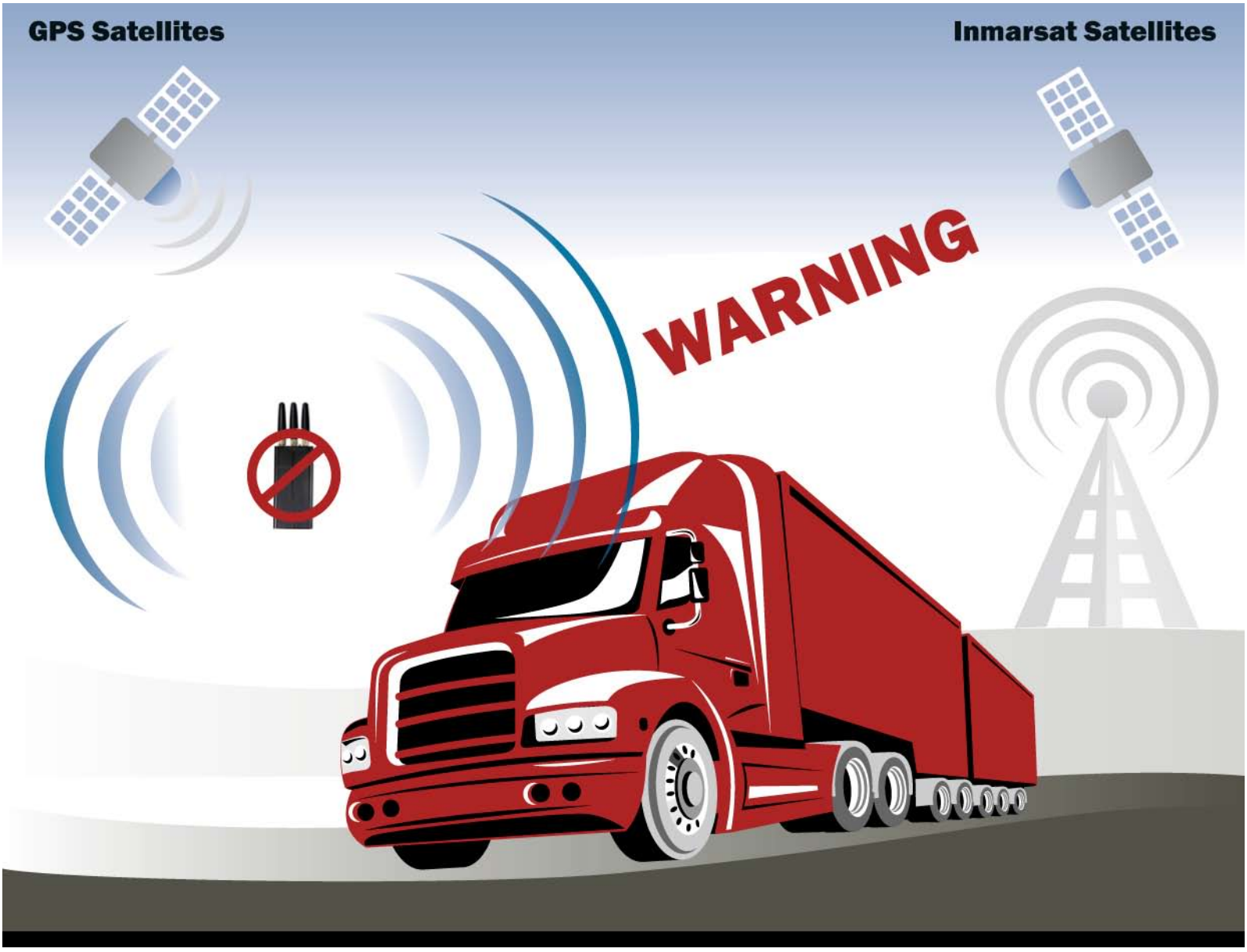
GPS-enabled tracking systems are common in the trucking industry and are deployed for both logistics and security applications. They provide trucking managers with many capabilities including the ability to quickly locate vehicles, coordinate pick-ups and drop-offs and calculate travel times. Many use cellular networks to relay information back to the logistic systems. However, in many high risk areas where cellular service is not uniformly available, or is prone to overloading or signal blocking, GPS-enabled tracking devices that communicate via satellite networks provide an additional protection measure.

SkyWave Mobile Communications (**SkyWave**), a provider of **Inmarsat**-based tracking and monitoring devices, has experienced high demand for its products to better manage fleets and deter cargo theft. According to *Silvio Ostroscki,* Sales Director for Latin America at SkyWave, Brazil is one country that makes extensive use of tracking systems that include satellite communication capability in order to reduce the risk of cargo theft.

"Insurance companies for high value cargo require the use of services of a recognized Risk Management company that make use of a satellite or dual-mode tracking system to monitor the status of the cargo full time until the cargo is delivered," he says.

Most of SkyWave's business in the region has been the sale of DMR series of satellite communication terminals to meet insurance company attempts to reduce the number of cargo theft incidents, which was reported to be a US$13 million per month problem in 2009 at a *Highway Cargo Transport Symposium*.

While the use of satellite-based GPS tracking devices have significantly decreased cargo losses, criminal theft rings are continuously finding new ways to steal cargo without being apprehended. For that reason, SkyWave recently introduced a number of new security features in its ***DMR-800*** series of satellite communication terminals and ***SureLinx 8100*** dual-mode satellite/cellular communication terminal to address evolving needs.



When the SkyWave terminal detects either a GPS or GSM jammer, it can execute a number of actions to warn the driver, the fleet owner and the monitoring company including sending a warning message via satellite and activating local auditory and visual alarms.

GPS Signal Jamming Detection

Originally used in military applications to confuse enemy navigational systems, GPS signal jammers are becoming common tools used by thieves. The devices interfere with the operation of on-board GPS chips on navigation and tracking devices, allowing thieves to steal trucks and cargo while leaving fleet managers and police unable to quickly detect that the truck has been stolen or its location.

Signal jamming equipment

Both the DMR-800 series and SureLinx 8100 terminals are now equipped with GPS signal jamming detection capability. They are able to detect when both *continuous wave* (**CW**) and wideband FM (also known as spread spectrum jammers) are interfering with the on-board GPS modules.

Sources of CW jamming can be malicious devices or unintentional sources such as clocks in computers and other electronic devices. Spread spectrum jamming typically comes from malicious devices that are in most countries illegal to own and/or operate.

If a CW jamming signal is detected, the DMR-800 and SureLinx terminals are able to provide an advanced warning to the fleet owner that the GPS capability of the device is being compromised. This provides the owner/operator the opportunity to investigate and correct, if the jamming is unintentional. If the jamming is intentional, it provides advanced warning to the driver, tracking company and fleet manager to exercise extra caution.

CW and spread spectrum jamming detection on the SkyWave terminals are based on configurable thresholds. Depending on the user's environment and requirements, these thresholds can be adjusted by tracking service providers who understand how to configure and program SkyWave terminals.

When either a CW or spread spectrum jamming threshold is reached, the DMR-800 and SureLinx 8100 tracking terminals can be programmed to execute a number of steps including sending a message to the fleet manager via satellite that GPS jammers have been detected. Using the sensor connection ports (serial and digital) tracking terminals can also alert the driver through a mobile/portable data terminal, a visual or auditory alarm to exercise caution. In the case of the SureLinx 8100 dual-mode satellite/cellular terminal, messages can also be sent to fleet managers via cellular networks.

Signal jamming equipment

Some tracking companies have gone as far as configuring the SkyWave tracking terminals to lock doors and activate horns when alarm conditions are detected.

GSM Jamming Detection

Similar to GPS jammers, GSM jammers are also becoming increasingly available. GSM jammers block or overwhelm GSM signals and prevent cellular-based tracking devices from sending position information and theft alerts. GSM jammers can also prevent drivers from using their cell phones to communicate.

When GSM signal jammers are being used, the SureLinx 8100 terminal has the capability to send a message via satellite that GSM signal jammers have been detected. As in the in case with GPS signal jammers, the terminal can also alert the driver through a mobile data terminal, a visual or auditory alarm.

Solutions For A Complex Problem

GPS and GSM jamming detection on SkyWave tracking terminals, combined with other features and security procedures provided by tracking and security companies, help to reduce the number of theft incidents. As cargo theft and the security of the supply chain will continue to be a global problem, goods manufacturers and cargo transporters who operate in high-risk areas, but still rely on low-tech security methods, will be forced to upgrade their security procedures to remain competitive and provide greater levels of customer service.

Those thinking about installing or upgrading their tracking devices need to ensure that the product and service that they select will service the current needs of all stake-holders as well as provide the opportunity to evolve as market forces change.

About the author

Anu Sood is the Product Marketing Manager for SkyWave Mobile Communications. She may be contacted at (613) 836-6288 ext. 8320, or via her Skype ID: Anu.Sood.SkyWave

Additional information may be obtained at...
http://www.skywave.com/

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Shrinking The World...

The Importance Of Compression

author: Sandy Johnson, SatCom Global

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

However, there is nothing less than a revolution currently taking place in the world of satellite communications. As a result, it is now possible for users who spend long periods of time in distant locations to benefit from the kind of high quality voice and data communications they have become increasingly used to at home.

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

First, the adoption of an advanced, flexible codec delivers a new level of high quality two-way voice and data communications in an easy-to-use and secure environment. At a fraction of the cost of existing satellite communications, this makes it affordable to all.

In addition, the technology is designed from the ground up to support ultra-efficient satellite communications delivery via both pre-paid and post paid options, providing public and private sector organisations with the flexibility and transparency to seize back control of their telecoms costs.

Keeping In Touch

The difficulty of staying in touch with family, friends and colleagues has long been especially problematic for those working in difficult and out-of-the-way land-based or maritime environments.

In the case of operational staff, frequently away for weeks on end and perhaps keen to save as much as much as they can in order to send money home and support their families, the options have historically been limited. Until recently, in most cases they have not been able to communicate from their operational base — for example, an oil or gas exploration site or a cargo ship — and have had to wait until they reached the nearest city or next port in order to use a local, expensive, pay-as-you-go phone.

In the past few years things have improved with the development of satellite communications, as it has become more common for the site operator to provide some form of calling facility — for example, offering vouchers which allow them to call home from their base, at a time that suits them.

The ability of those on limited incomes to take advantage of this has continued to be restricted by the high cost of calls, typically $1 per minute or more. In response, with the greater use of *Voice over IP* (**VoIP**) solutions, technology is now playing its part in making such communication much less expensive.

Without maritime communications, working at sea can be a lonely task.

Yet the issue extends significantly beyond a simple requirement to be able to call home using a pre-paid voucher. At home, and on-shore more broadly, workers are increasingly able to take advantage of a wide variety of sophisticated voice and data communications options — from instant messaging to sending and receiving emails to searching the

Internet — all in a secure, controlled environment that achives a much better value for the money as a result of compression technologies.

With the greater availability of IP in the home environment, when working away in outlying geographies, employees want to be able similarly to send and receive emails and photographs attachments — the modern day equivalent of the traditional 'long awaited letter (to and from) 'home'.

At the same time, they also want to be able to perhaps fill some of their often extended periods of leisure time surfing the net. Access to better, cheaper communications has also been beneficial for senior staff keen to send and receive business-critical information via voicemail, for example, with colleagues at the head office or at other remote sites.

In enabling this enhanced two-way communication capability, for the first time in a pre-paid environment, family or friends have the ability to leave a voicemail message so that the call can be returned at a convenient time, something which, once again, has long been taken for granted in the world of terrestrial landline and mobile communications.

SatCom Global's HORIZON Multi-VoIP unit

'One World, One Network' Approach

Another key beneficiary is the bill payer or owner of the communications device. Companies operating remote sites or shipping fleets are typically reliant on satellite for all communications between the head office and outlying operating units, with telecoms an important element of the budget in managing each site.

The availability of new satellite-based solutions using compression technology represents a revolution in enabling truly global land-based and maritime communications, in terms of cost and range of facilities, significantly narrowing the gap with what is available in more well-developed terrestrial environments.

The cost of communicating is dramatically reduced by using VoIP end-to-end by installing a ***Horizon*** Multi-VoIP unit on each remote location and another unit in the company's operational center or head office. Previously, the office would have had to use a landline phone and call each site or vessel via a PSTN line, an expensive option costing perhaps $3 to $4 or more per minute. Now it is possible to call the location direct through the local user extension number and make a VoIP-to-VoIP call, using the background IP channel, therefore by-passing the PSTN operator.

The concept of email data compression in remote terrestrial or maritime environments is not new, of course, although recent developments have taken performance and cost reduction to a new level. However, until now access on such broadband products has been limited to one voice channel, resulting in long queues to make a call.

With the introduction of a flexible new proprietary codec for the first time, it is possible to have multiple connections, with up to eight handsets on one Horizon Multi-VoIP unit. Not only does this allow eight people to make calls simultaneously, data can also be passed across the background IP channel at the same time. Users can also maximise savings by choosing from several call settings for optimum cost/quality voice delivery.

This is a radically different form of communication and is both highly intuitive and easy to install. Equally, the savings to be made here are huge, as this cuts the cost of such calls to just cents per minute.

Employer Of Choice

Operationally, the availability of instant messaging is another valuable new facility. Historically, sending data across a satellite communications network in this way has been highly bandwidth intensive — up to 25 kbps — and, therefore, once again very costly. With the advent of instant messaging and peer-to-peer VoIP, the satellite system is optimised, using less than 2 kbps and provides an ideal low-cost two-way conversation option.

This offers a number of other advantages. The instant messaging text facility enables correspondence to be put into print, which can be valuable in ensuring clarity of communication. For the site manager or ship's captain, for example, it also provides a way to communicate rapidly to the head office in the event, say, of an immediate requirement for equipment, engineering or other specialist support.

In a tough economic climate, this clearly offers a major benefit to the business owner in terms of reducing operating costs. However, in environments where it is more difficult to recruit and retain staff with specialist skills, it offers the additional plus of boosting the operator's position as an employer of choice by including superior, low cost voice and data communications facilities as part of a more competitive remuneration package.

This will become increasingly important as more countries look to implement staff welfare legislation in improving the working conditions of those operating in inherently tough conditions.

Shrinking The World

For employees working in industries such as cargo transportation, oil and gas exploration or dealing with emergencies such as natural disasters, the ability to access the Internet and stay in contact with home on a regular basis in this way — by phone, email and text — will make the world a much smaller place.

For the employer or bill payer, the visibility and control of communications costs, which such tools provide, means they can offer these benefits without the fear of expenditure spiralling out of control as they look to recruit and retain the best staff.

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.

Focus

A Higher Service

The Grand Canyon Resort Corporation (GCRC), wholly owned by the Hualapai tribe and located in Peach Springs, Arizona, is no stranger to the tourism industry. Since 1988, GCRC has welcomed millions of visitors each year to tour sites like the Grand Canyon Skywalk, and has grown to comprise the Hualapai Lodge & River Runners organization and Grand Canyon West, in addition to the Corporation's main office. As business and revenue grew over the years, it became increasingly important for GCRC to streamline communications at its 10 sites across the area.

This need presented significant challenges, considering the Grand Canyon West location, a tourist site on the Canyon's West Rim and home of the Skywalk, for example, had no Internet connectivity. To provide reliable connectivity effectively and securely for all 10 of its sites, GCRC turned to Hughes in early 2009 for a private network solution.

With HughesNet® Private Networks, GCRC now enjoys the benefits of an enterprise-grade IP solution employing state-of-the-art equipment and end-to-end network data security, keeping all its locations securely "in the loop." After enjoying so much success with the private network, GCRC came back to Hughes a year later to roll out a HughesNet Business Internet overlay to provide each location with the ability to access Web content.

Native Land

In 1988, the local *Hualapai* Indian tribe, which has occupied the land since 1883, purchased the Grand Canyon Resort Corporation — a conglomerate organization that coordinates all sales and reservations for the nearby lodge, river rafting company, and Grand Canyon West. To further increase tourism in the area, the Hualapai built the Grand Canyon Skywalk in 2007. The Skywalk is a glass, horseshoe-shaped bridge that enables visitors to walk beyond the canyon walls at Grand Canyon West, suspending them 4,000 feet above the riverbed and providing a true bird's-eye view of the incredible gorge.

Canyon Connections

As business continued to boom for the Grand Canyon Resort Corporation, it became increasingly important for all business operations and locations to share information, ticketing data, and software, both quickly and securely.

Grand Canyon Skywalk

"Originally, we were using a very expensive T1 line to get broadband connectivity since our main office in Peach Springs is located way beyond the reach of cable or DSL," said *Ken Zachreson*, IT manager for **GCRC**. "But we still had a problem getting connectivity to Grand Canyon West and, later, the Skywalk."

The GCRC corporate office also uses a ticketing solutions provider based in Pennsylvania that both records and collects admission information and revenue from Grand Canyon West. "The problem," said *Zachreson* "was actually sharing that data and software updates with Grand Canyon West so everyone could be on the same page. If we wanted to continue to bring in revenue and have accurate books, we needed a way to communicate easily and quickly."

To remedy their situation, GCRC selected a broadband satellite provider that claimed to offer reliable, high-speed connectivity and private networking for multi-site businesses at a low cost.

"Our main problem with the first provider we chose was that they only offered us a limited amount of throughput each month. Once we had achieved our monthly allotment, we'd be charged for each additional megabit," said *Zachreson*. "Needless to say, that wasn't such a 'low cost' solution after all."

Room To Grow

In late 2008, with the number of Skywalk tickets quickly increasing, GCRC sought a more efficient, cost-effective solution.

"I began researching broadband providers in the area and what I found was that it seemed everyone was reselling the HughesNet service from Hughes," said *Zachreson*. "I decided to go right to the source and began a series of very fruitful conversations with the Hughes sales reps."

Zachreson noted that, aside from the success of resellers in the area, one thing that drove him to Hughes was their experience working with small businesses, large enterprises, and government organizations alike.

Grand Canyon Corporation headquarters with the Skywalk attraction.

"The technology was both more advanced and easier to use than anything we've ever had before," said *Zachreson*. "I was really impressed with the reputation of Hughes and the fact that their private network solution had no throughput limit like other providers. It truly gives us room to grow."

Originally, GCRC purchased HughesNet Business Internet simply to obtain broadband connectivity. After consulting with Hughes, *Zachreson* learned that the addition of a HughesNet Private Networks solution would perfectly fit their need for connecting the multiple business sites.

HughesNet Private Networks offers flexible design configurations, specially designed for organizations like GCRC that have a variety of sites with varying bandwidth requirements. The service plans also include speeds of up to 8 Mbps downstream and up to 2 Mbps upstream. HughesNet Private Networks also offers 24/7 technical support, state-of-the-art encryption, and firewall protection technology, so *Zachreson* doesn't have to worry about the security of sharing reports or sensitive data with his accounting department.

Small businesses, such as GCRC, which use a private network solution from Hughes, also have the option to add a *Constant Bit Rate* (**CBR**) service. This is an on-demand service which provides additional bandwidth for real-time traffic such as Voice over IP (**VoIP**), videoconferencing, or video surveillance. For GCRC, the ability to add bandwidth when needed was crucial, as they needed the capability to seamlessly monitor the surveillance cameras around their various sites.

High-Altitude, High-Speed Success

Today, all ten GCRC business locations are connected securely through HughesNet Private Networks. "We can now share our ticketing software easily among locations, which has also allowed us to get our local call center in the loop," said *Zachreson*. "HughesNet Private Networks and high-speed Internet access service have been the ideal solution. Other businesses located beyond the reach of cable and DSL should know that it's made our business run more smoothly and more effectively and has ultimately saved us a lot of money."

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

The Grand Canyon from Point Sublime in Grand Canyon National Park
Photo is courtesy of the US National Park Service

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