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F: + 44 (0) 1376 533764
e: sales@paradise.co.uk

www.paradisedata.com

Paradise Datacom LLC
328 Innovation Blvd.
State College, PA 16803, USA
T: +1 814.238.3450
F: +1 814.238.3829
e: sales@paradisedata.com

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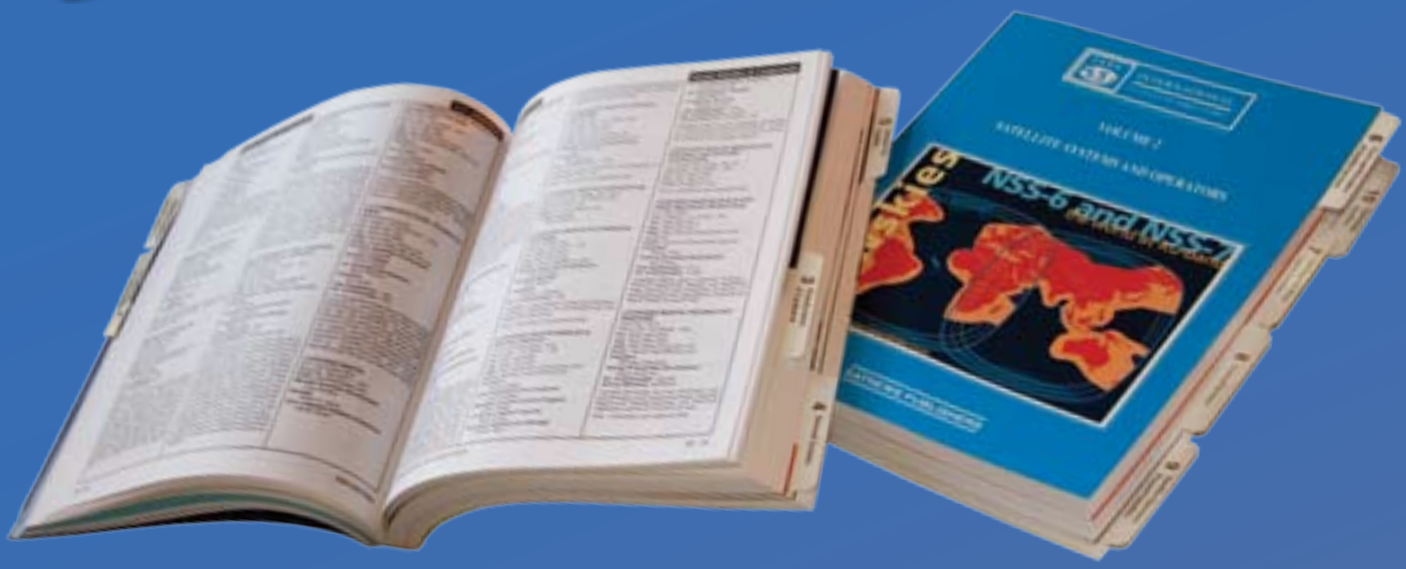

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To Positive Effect...

UPLINK

You are now reading yet another highly informative issue of *SatMagazine* — we thank you for taking your valuable time to read our offering. This issue's content ranges from interesting Executive Spotlights to Case Studies of products that are truly of assistance for our industry, insightful analysis by subject-matter experts, and a number of features to help drive your success.

We work in an amazing industry, yet there are days when the mechanics of our duties edge on the mundane, when repetitiveness can be a challenge to the thought processes. This occurs to all of us, no matter our position in our organizations. Fortunately, and this is proven by our industry's continued success and growth, the technologies and the spirit with which new opportunities are faced drive our enjoyment factor at "what we do" to new heights of personal and business enrichment.

I was reminded of how fortunate we are to work in this sector of the world's business. A new neighbor named Brian moved in down the street from us a couple of months ago. He is an editor and writer within the world of high tech — for the publication *EDN*, as a matter of fact, whose tagline is "Electronics Design, Strategy, News ...a comprehensive information source for providing in-depth technical information for electronics design engineers and news and business strategy insight for executives." I would have to heartily agree and I now find myself reading the publication at least 2x weekly. EDN's Senior Technical Editor, *Brian Dipert*, writes a blog entitled "***Brian's Brain***" on the EDN site. And this is a tale of one particular pre-sunrise event...

My wife and I thoroughly enjoy viewing the International Space Station (ISS) on crisp, early mornings when such sightings are made possible due to its orbit and the conditions of the morning sky. As we live at a high altitude in a rural mountain environment, the ISS sightings are unaffected by atmospheric variants such as one might find at lower altitude or in a city.

Brian was walking his dog the other morning during one of our ISS sojourns and he stopped to chat. My wife explained why our necks were craned heavenwards and he stopped in his busy routine to join us in this "visit" with the ISS. As he wrote in his EDN blog, "... right on schedule the ISS emerged on the southwest horizon a few minutes later, glittering brightly in the reflected light of the partially illuminated moon and pending dawn. We were able to discern it for nearly the entire duration of its six-minute (it was moving fast) sojourn across the sky...it disappeared from view shortly before dipping beneath the northeast skyline due to contending illumination for the soon-to-rise sun. I was admittedly quite moved by the event." (You may read Brian's entire blog at at this direct link to the EDN website).

As we work with satellites and space and technologies driving all forward for communication and exploration sake, we tend to forget how truly amazing our industry is, especially to those who work in other environments, even highly technical ones. Human manufactured orbiting bodies, created

through knowledge derived from decades of research, technical breakthroughs, exhaustive people hours, money, and superb effort, link our communities across the globe.

In the beautifully produced, and superbly executed, "***The Space Report (2008)***" from **The Space Foundation**, they report global space revenue from government and private resources reached US$251 billion in 2007. That represented an 11 percent growth rate over the previous year. Of that amount, more than three-fourths of that economic activity resulted from the acquisition of commercial satellite-based products and services (55 percent) and U.S. government spending (25 percent). The total revenue for space products and services is estimated by The Space Foundation to be US$138.83 billion anincrease of 20 percent over 2006. (You may view an Executive Summary .pdf via this direct link.)

Let's also consider **Euroconsult**'s latest research and analysis regarding satellite market growth in 2007. In their recently released "***World Satellite Communications & Broadcasting Markets Survey, Market Forecasts to 2017***," they reveal FSS grew by 8 percent in transponder demand and 9.5 percent in overall revenues. Euroconsult breaks the world down into 12 regions, and there was transponder growth of more than 5 percent in nine of those regions during 2007. Satellite market revenues reached US$8.9 billion, according to their report, with US$12 billion expected in the FSS market by 2017. You can learn more about the Euroconsult report at this direct link.

As you are well aware, the economic news has been rather tumultuous of late, dulling the positive analysis of the industry for last year. I had occasion to communicate with the President of **MITEQ**, *Howard Hausman*, regarding this concern.

"Like most companies, MITEQ is concerned about the economy," he said. "We are in a business that grows more intensely when the economic conditions are favorable, but with proper guidance and innovation, growth is viable under all economic conditions. Engineering and innovation are commonplace at MITEQ, and in uncertain times, that is focused on the basics. A concentration on development efforts needs to be implemented to provide better value in basic system components to provide simplified solutions to make our customers system integration easier and more cost effective."

Those terms "innovation", "better value","simplified solutions" all draw to customer service as the high earth orbit for continued growth, even when economic environment is less than robust. Customers will always need to communicate, a process most efficiently resolved by satellites.

Given the glowing earnings' reports, our industry must be doing something right, in spite of the occasional launch failure, increasing insurance rates, partnerships that fail to materialize, and so on. As Brian so aptly stated in his EDN blog regarding our ISS moment, "I was admittedly quite moved..." Our industry has more of a positive effect on others than we realize, and all to our benefit.

—Hartley Lesser, Editorial Director

The Commercial NGSO Launch Market

by Jeff Foust, Ph.D.
Senior Analyst, ***Futron Corporation***

The market for commercial launches of satellites to non-geosynchronous orbits (NGSO) is very different from the market for launches of geosynchronous orbit (GSO) satellites. In the case of the latter, the market is comprised almost exclusively of commercial communications satellites, a relatively mature market that, while cyclical, is not prone to huge swings in demand.

In comparison, the commercial NGSO launch market consists of several sectors, only one of which is communications. The market has also experienced a great degree of volatility in the last decade, from the boom in the late 1990s driven by the deployment of systems such as Iridium and Globalstar, to the bust in the years that followed when launch demand almost completely dried up, as *Figure 1* illustrates on ***Page 8***.

There are indications of a renaissance in the commercial NGSO launch sector. Satellite systems deployed during that earlier boom are nearing end of life and will be replaced over the next several years. This will stimulate launch demand. Other market sectors, from remote sensing to government missions, are continuing to use commercial launches for new and replacement spacecraft. Moreover, new markets are emerging, from resupply of the International Space Station to space tourism that could, over time, generate substantial additional launch demand. While we may not see a return to the NGSO launch boom of a decade ago, we instead may see a steadier — and, ultimately, healthier — increase in NGSO launch demand over the next decade.

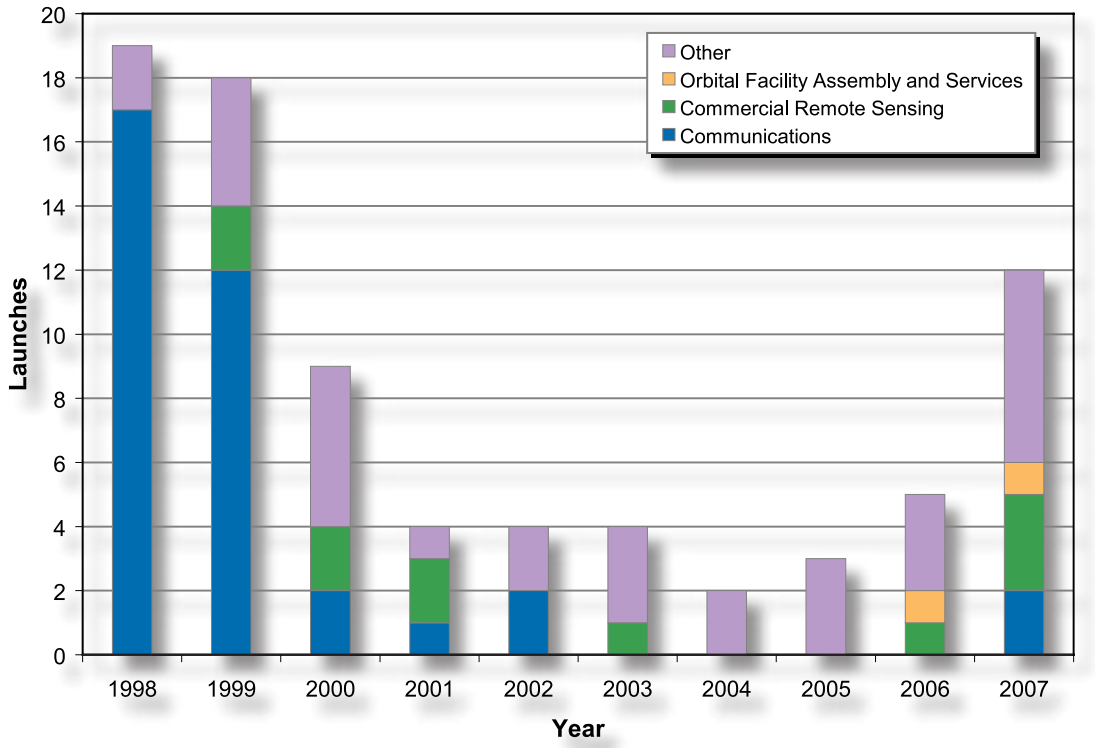


Figure 1: Commercial NGSO Launches, 1998-2007

Communications

The surge in commercial NGSO launches in the late 1990s was primarily due to the deployment of three communications systems: **Globalstar**, **Iridium**, and **ORBCOMM**. At that time, these systems were seen as pioneers of a new wave of satellite communications. Many other similar systems — **Teledesic**, **Skybridge**, and **Ellipso**, among others — were under development and would continue and even grow the demand for such launches. However, faced with stiff terrestrial competition and the end of the telecom boom, those three pioneering companies all filed for bankruptcy protection. The other, proposed systems never materialized, virtually eliminating launch demand in this sector.

Today, Globalstar, Iridium, and ORBCOMM have all emerged from Chapter 11 and are taking on a new challenge: replacing their existing systems that are nearing the end of their lives. These companies have either signed manufacturing contracts for their new satellites, or are in the process of selecting a prime contractor.

In the case of Globalstar, the company has already signed a launch contract with **Arianespace** for at least four ***Soyuz*** missions from Kourou, French Guiana. Provided these companies can remain in good fiscal health and raise the money needed to deploy these replacement systems (not a certainty in today's markets) these systems could generate demand for 20 or more launches in the next decade, depending on the deployment schedules decided upon.

There are also signs of new entrants into this market. In September, **O3b Networks** announced plans to deploy a constellation of 16 satellites in an equatorial medium Earth orbit, starting as early as 2010. The company still needs to raise a significant amount of capital to make this system a reality, but it does have the backing of several major companies, including **Google**, **HSBC**, and **Liberty Global**. If O3b is successful, it might attract additional interest from new players to the NGSO communications market, stimulating additional launch demand.

Remote Sensing

The commercial remote sensing industry, after struggling for several years, is now far more robust, thanks to a combination of industry consolidation, government support, and growth of commercial markets. This has resulted in an uptick in launch demand in this sector. The two major U.S. companies, **DigitalGlobe** and **GeoEye**, have launched their first second-generation satellites, funded in part by the **National Geospatial-Intelligence Agency**'s ***NextView*** program; they are also developing additional spacecraft using only private funding for launch in the next few years.

There is also some growth beyond high-resoltuion imagery outside the U.S. In August, German company **RapidEye** launched its constellation of five satellites that are designed to provide medium-resolution imagery. **Infoterra** and **MacDonald, Dettwiler and Associates** (MDA) launched radar imaging satellites in 2007 and they also have plans for additional spacecraft over the next few years. These developments all suggest there will be continued modest, but steady, demand for commercial launches of remote sensing spacecraft through the next decade.

Additional and Emerging Markets

With the communications market in stasis and remote sensing solutions providing only limited demand, what has sustained the commercial NGSO launch field for the last several years has been an ad hoc market of primarily government and university-built small satellites that procure commercial launch services, often manifesting several satellites on a single vehicle. Much of this demand comes from nations with emerging space programs who do not possess indigenous launch capability. These nations go to the commercial market for their satellite launches.

Additional demand also comes from European governments looking for vehicles better suited to launch smaller satellites. The ***Ariane 5*** is too large for such spacecraft, but that situation may change once the ***Vega*** launch vehicle enters service. As more countries seek to establish space programs, and as interest in smaller satellites in general increases, this level of launch demand is likely to continue for the near future.

An interesting — and potentially significant — new market for commercial NGSO launches is emerging: delivering cargo and crews to, and helping assemble, orbiting space facilities. NASA is currently supporting the development of spacecraft and launch vehicles by **Orbital Sciences Corporation** and **SpaceX** under its *Commercial Orbital Transportation Services* (**COTS**) program. There are plans to procure services to transport cargo and, eventually, astronauts to and from the International Space Station (ISS) in the near future. (Recent geopolitical events could force NASA to accelerate those efforts, particularly if access to Russian vehicles is cut off.)

In addition, a private company, **Bigelow Aerospace**, has plans to develop its own orbital complexes using inflatable modules; the company has already launched two subscale demonstration modules, ***Genesis 1*** and ***2***, in 2006 and 2007. Those complexes will create demand for the launch of their components as well as for cargo and crew services, such as those planned for the ISS. This could, over the next decade, create a sizable new sector of the commercial NGSO launch market, possibly larger than any existing segment.

Conclusions

In support of work for the ***FAA Office of Commercial Space Transportation***, **Futron** has analyzed the trends in these various market sectors and developed a forecast for future commercial NGSO launch activity, shown in *Figure 2* on ***Page 10***. This is intended to be a somewhat conservative forecast: more speculative systems and applications have been left out of the forecast, in an effort to avoid the "irrational exuberance" of some past forecasts.

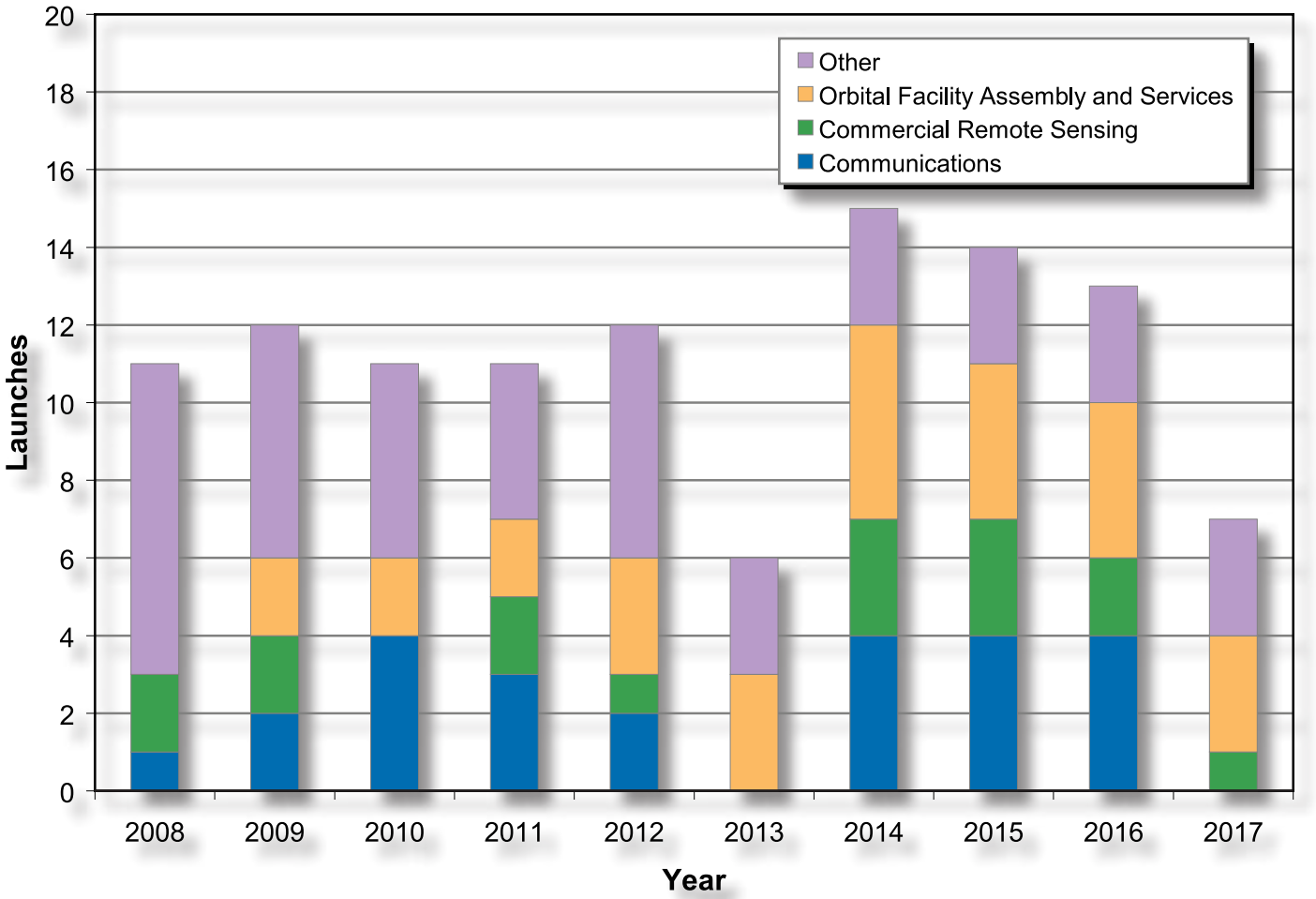


Figure 2: Commercial NGSO Launch Forecast, 2008-2017

The forecast shows an average of more than 11 commercial NGSO launches a year over the next decade. More importantly, the forecast shows a relatively steady level of activity, without the sharp peaks and sudden drops in activity that have taken place over the previous ten years, as *Figure 2* shows. This may be a sign that the commercial NGSO launch field is finally starting to mature into a more stable market similar to the commercial GSO launch market: a successful development for the overall space industry.

About the author

Jeff Foust is a senior analyst and project manager with the Futron Corporation of Bethesda, Maryland, and has been with the company since late 2001. He investigates current conditions and future trends in domestic and foreign commercial, civil, and military launch industries and related markets. He has a Ph.D. in planetary sciences from the Massachusetts Institute of Technology and a B.S. with honors in geophysics and planetary science from the California Institute of Technology. He also maintains several online space resources, including the news aggregator Spacetoday.net and the weekly publication The Space Review.

Executive Spotlight On...

John Higginbotham
CEO
Integral Systems

The recently named new CEO of Integral Systems, Inc., is an individual who is a "mover and a shaker" within our industry. John Higginbotham, the founder and former Managing General Partner of SpaceVest Capital (which is now known as Redshift Ventures), joined Integral in July of 2008. John has always been involved in the cutting edge as a guiding force. He founded Intec, a global underwriting management company for insurance and financial risk management for aerospace companies, satcom operators, and national space programs. In addition to an early career at Hewlett Packard, John was also formerly the Chairman (now Director Emeritus) of the Space Foundation, a premiere non-profit organization that supports space activites, space professionals, and education. He's also a member with the IEEE, ASCE, and AIAA — and he received the 2007 National Space Society Space Finance Award. His B.S. with Honors in civil engineering was received from Virigina Tech and he earned his M.B.A. from Harvard Business School. Naturally, *SatMagazine* jumped at the opportunity to have a chat with Integral's leader...

SatMagazine
Good day, John, and thanks for giving us the time to learn more about your position and Integral Systems. First, can you tell us a bit about your career highlights, prior to joining Integral Systems in July 2008, in particular SpaceShift, now RedShift Ventures

John Higginbotham
My professional career in the industry goes back about three decades now and includes a variety of exciting and rewarding career experiences, with Hewlett Packard in 1979 as a product manager for their first microcomputers, then with International Technology Underwriters (Intec) in the '80s. Later known as AXASpace, they essentially underwrote the expansion of commercial satellite communications by financing the risks of doing business in space.

Ten years after founding Intec, I started a company called SpaceVest to privately invest in space businesses. By the mid-1990's, the firm's investment operations expanded by adding the first of what eventually became three institutional venture capital funds. By the time I retired from the active managment of venture capital operations in 2005, SpaceVest ("RedShift Ventures)" had more than $270 million under management, with investments in more than 50 companies.

Through these efforts, I've had the opportunity to become involved in more than 100 satellite missions, helped support many of the dominant players in the satellite communications marketplace, and assisted in delivering many critical capabilities to the aerospace and defense industries. I've had the privilege of working with some of the most capable leaders and pioneers in this business.

SatMagazine
After earning a BS in civil engineering and an MBA from Harvard University, what made you choose the space industry in particular for your career path?

John Higginbotham
My passion for the space industry can be traced to my childhood when my father worked with ballistic missiles and NASA. As I built and launched model rockets while growing up, I closely followed the fascinating evolution of space flight. These activities inspired me to become involved and to do all I could to keep this business alive and prosperous.

While at business school, I participated in the first NASA/Harvard University study on Materials Processing in Space, which eventually led to my employment at Hewlett Packard. While managing the project that introduced the first HP microcomputers in the global marketplace was satisfying to me and hugely successful, I knew I would be drawn back into the space

industry. This is what led me to explore potential entrepreneurial opportunities to support commercial endeavors in space and establish a key role in expanding the industry.

SatMagazine

John, you mentioned you retired from managing venture capital operations at SpaceVest. What was it about Integral Systems thateased you out of retirement?

John Higginbotham

I was able to retire once SpaceVest became a recognized national leader for high-technology ventures. I wanted to be able to take time to pursue some of my special personal interests, as well as have the chance to stand back and reflect on the major issues facing the industry without the pressures and demands of daily management responsibilities. Having this period away really afforded me the opportunity to gain some perspective on the next challenges facing the industry and to think about the best approaches for addressing them.

As I learned more about the capabilities and aspirations of Integral Systems through conversations with our Board members and several senior managers, it became clear to me the company is on course to deliver a new business model to address the industry's needs. I felt I could build upon what Integral Systems already offers the marketplace and further expand Integral's growth potential.

SatMagazine

Now that you've been Integral Systems' CEO since July and have learned more about the company, what are your main plans for Integral's growth in the near term?

John Higginbotham

Integral Systems has established itself with a core ground systems capability and has proven to be the leader in delivering on time and on-budget very important programs over the years. Now we need to focus on communicating effectively to our customers and the marketplace to spotlight the extensive breadth and depth of Integral Systems' capabilities.

We have some 600 seasoned professionals at Integral Systems and all its subsidiaries working diligently to ensure that our customers are more successful in their businesses, while meeting their mission-critical needs. In the future, we'll keep this customer focus a main priority and expand our capabilities through internal growth and targeted acquisitions. We'll continue to broaden our capability to deliver commercial practices using proficient program management, and efficient system development and integration as the best possible value for our customers.

Integral has an extensive array of capabilities that can be more fully integrated to assist our government customers. Armed with all the critical skills, technologies, and experience we've acquired, we can bring these integrated solutions to larger, more complex challenges in this industry. My mission as CEO is to help the organization reach its full potential.

SatMagazine

What about the plans for Integral Systems' flagship product offering, the EPOCH Integrated Product Suite (IPS) as well as any other product plans that you have?

John Higginbotham

We'll continue to ensure that we effectively enhance the capabilities of EPOCH IPS as we've done in the past. A top priority for us has always been to consistently meet our customer's needs by providing regular enhancements through our planned version releases, user group input, and regular updates. EPOCH IPS has established itself as a standard in the industry and is widely recognized for efficiently and reliably supporting its customer's TT&C needs. Integral Systems intends to maintain EPOCH IPS' leadership position in the industry.

Integral Systems will expand on its portfolio of product capabilities through robust IR&D efforts, funded development programs, teaming relationships, vendor arrangements, and integration services. Our current generations of core capabilities from our subsidiaries RT Logic, SAT Corporation, Newpoint Technologies, and Lumistar are the most technologically advanced in the industry.

Executive Spotlight On...

We'll ensure that we're well connected to marketplace demands so that we can enhance our capabilities organically and through targeted acquisitions that are mutually beneficial. Our product development process will continue to evolve aggressively in order to always deliver the best possible, most cost-effective solutions to our customers.

SatMagazine

How is Integral Systems able to effectively meet the needs of such a varying customer base in the satellite industry?

John Higginbotham

I believe there are several key elements required to successfully support such a wide variety of satellite missions and customers from government, commercial, enterprise, and industry. These include developing and maintaining a comprehensive reliable product suite with the ability to easily add mission-unique features without modification to the core products; building up engineering expertise and experience in satellite ground systems; and sustaining a systems integration capability that is responsive to changing customer requirements.

John Higginbotham

For 26 years, Integral Systems has continually demonstrated a new standard of performance in providing solutions that meet critical government, commercial, and industrial customer requirements, on-schedule and within budget. This puts us in a perfect position to

move forward and address critical needs for delivering reliable capabilities beyond the space industry, extending to land, sea, and air applications.

At this time, I believe the company is one of the best in this business at integrating commercial practices with best-in-class proprietary capabilities to deliver solutions that represent the best value propositions in the marketplace for satellite and network operations, situational awareness, geospatial intelligence, and many other related customer needs.

Our job is to sustain this leadership position while continually refining and improving our contribution to the marketplace to achieve increased productivity, maximal operational efficiency, and profitability for our customers.

SatMagazine

John, what do you foresee for the overall future of the space industry?

John Higginbotham

Looking at the big picture, the space industry has gone through several stages of growth. The first wave of growth started in the mid-1940's and lasted through the 1960's. In this stage, civil and military government sponsorship was the main driver for the fundamental architecture of the industry. The 1970's brought about the second stage of growth, during which the methods for using space in areas such as satellite telecommunications, geo-positioning (GPS), and remote sensing, were defined and deployed.

This new third stage of growth we're progressing into includes a comprehensive incorporation of space-based and space-related applications into established economic sectors. As we move into the future, we will see the integration of mature commercial business models with the advanced capabilities of the industry delivering new levels of usability and efficiency for government and enterprise customers in virtually every developed economic sector.

SatMagazine

Thanks, John, for your time and insights.

by Jorn Christensen, Ph.D, P. Eng.

Improvements in telecommunication infrastructure are usually evolutionary, building upon the existing technology. However, sometimes a new technology that performs the same functions as an existing technology is brought to market and may replace, to a large extent, the existing technology. Many analysts believe that WiMAX has the potential to be a disruptive technology as it may replace wire-based telecommunications services, such as fixed copper telephone lines, or cable coaxial cable. What does this have to do with satellite communications?

First, satellite operators must always be aware of what competing terrestrial technologies are being brought to market as they may compete with satellite offerings. For example, consumer broadband services can be provided via **WiMAX** and this may be a less expensive offering than a satellite solution. Secondly, WiMAX deployed in the extended C-band causes interference into FSS operations, even when there is a separation in frequency of operation of the two services.

To understand why WiMAX is now being deployed in the C-band, we need to examine where WiMAX fits into the telecommunications landscape.

WiMAX

Development of the WiMAX Family of Standards

The first ***IEEE 802.16 Standard*** (**WiMAX**) specifies the ***WirelessMAN Air Interface*** for wireless ***Metropolitan Area Networks*** (**MAN**). The standard focuses on the efficient use of bandwidth between 10 and 66 GHz. This standard supports continuously varying traffic levels at many licensed frequencies (*e.g.*, 10.5, 25, 26, 31, 38 and 39 GHz) for two-way communications. The standard enables interoperability among devices, allowing carriers to use products from multiple vendors. Engineers from the world's leading operators and vendors created this standard in a two-year, open-consensus process.

Further Development of the IEEE 802.16 Standard

The two main standards now being deployed are the 802.16d (fixed) and 802.16e (mobile) standards. For these standards, WiMAX solutions have been implemented for licensed and unlicensed bands in the 2 to 11 GHz range.

The main mileposts in the development of the WiMAX standards are:

- **December 2001 – 802.16 adopted for wireless Metropolitan Area Network (MAN) in 10-66 GHz frequency range (line-of-sight);**
- **January 2003 – 802.16a extension adopted for (2 – 11 GHz, non line-of-sight);**
- **June 2004 – 802.16d 2004 Standard adopted for WiMAX (non line-of-sight);**
- **December 2005 – 802.16e 2005 Standard adopted for mobile WiMAX.**

Fight between 2G/3G and WiMAX

Manufacturers of cellular equipment naturally want their standards recognized to the fullest extent possible. Some years ago, manufacturers, operators, and administrations met under the umbrella of the ***International Telecommunications Union*** (**ITU**) based in Geneva, Switzerland, to try to define one standard for third generation (3G) systems for mobile communications. As it was not possible to agree on one standard, all standards with enough commercial support were included in a family of 3G cellular network standards under the label of **IMT-2000**. Prior to the inclusion of mobile WiMAX (802.16e) in the IMT-2000 standards, as defined by **ITU Rec. M.1457-6**, IMT-2000 supported five radio interfaces and three different access technologies, using **CDMA**, **TDMA**, and **FDMA**.

Mobile WiMAX could be a disruptive technology as far as the incumbent cellular network operators are concerned. New entrants not burdened with having to support legacy equipment could establish national networks and potentially offer mobile voice and data services at lower prices.

One way in which the 2G/3G cellular network operators tried to keep mobile WiMAX from offering service was by having spectrum designated in the ITU Table of Frequency Allocations for use by IMT-2000 (3G) technologies, which support legacy networks. WiMAX is a pre-4G standard and does not support circuit switched networks. However, the fight ended with victory of the WiMAX lobby when the mobile version of WiMAX was included into the IMT-2000 family of standards.

3G	*4G*
—backwards compatible with 2G	—not backwards compatible with 3G
—circuit and packet switched networks	—entirely packed switched networks
—combination of existing and evolved equipment	—all network elements are digital
—data rate up to 2 Mbps for stationary or walking users, and about 348 Kbps in a moving vehicle nomadic applications	—peak data rate up to 100 Mbps in high mobility applications, and up to 1 Gbps in low mobility or nomadic applications

IMT-2000 Designation in ITU Table of Frequency Allocations

The increasing demand for more bandwidth for cellular networks had led to the designation at the ***ITU World Radiocommunication Conferences*** (**WRC**) administrations for more and more spectrum for IMT-2000. Prior to WRC-07, over 700 MHz below 3 GHz had been designated for IMT-2000. Based on very optimistic projections for cellular broadband services, there was a drive at WRC-07 for additional spectrum to be designated for IMT-2000. This lead to proposals for spectrum designation in the extended (3.4 to 3.7 Ghz) and standard (3.7 to 4.2 Ghz) C-band. Satellite operators fiercely opposed these proposals.

IMT-2000 and IMT-Advanced Standards

The ITU has clarified the terms IMT, IMT-2000 and IMT-Advanced as follows:

- *The term "IMT-2000" encompasses its enhancements and future developments;*
- *The term "IMT-Advanced" is applied to those systems, system components, and related aspects that include new radio interface(s) that support the new capabilities of systems beyond IMT-2000;*
- *The term "IMT" is the root name that encompasses both IMT-2000 and IMT-Advanced collectively.*

The next cellular network evolution will be from 3G to 4G, although some operators are now deploying what they call 3.5G networks. The main characteristics of 3G and 4G networks are seen in the table on ***Page 16***. IMT-2000 technologies are often described as 3G technologies and IMT-Advanced technologies (still to be developed) as 4G technologies. The mobile WiMAX 802.16e Standard is often described as a 4G network as it has all the characteristics of 4G networks, except for the speed. However, the criteria that constitutes a 4G network has not yet been defined. It is more appropriate to speak of mobile WiMAX 802.16e Standard as a pre-4G standard.

WRC-07 Results with respect to allocations for IMT in C-band

The best result at WRC-07 for satellite operators would have been no IMT designation within the C-band. While

not a complete success, the results were better than expected since WRC-07:

- *Limited IMT designations through opt-in footnotes in the range 3.4 – 3.6 GHz*
- *Adopted very stringent protection criteria from IMT interference into FSS operation in neighboring countries*

In **ITU Region 1** (Europe and Africa), a footnote allocates the band 3.4 to 3.6 GHz to the mobile service on a primary basis and designates the band for IMT in 81 countries.

In **ITU Region 2** (the Americas), a footnote allocates the band 3.4 to 3.5 GHz to the mobile service on a primary basis (but without a designation for IMT) in 14 countries.

In **ITU Region 3** (Asia, Australia and Oceania), a footnote upgrades the secondary mobile allocation in the band 3.4 to 3.5 GHz to a primary allocation and designates this band for IMT in 7 countries. A footnote also designates the band 3.5 to 3.6 GHz for IMT in 8 countries. (The mobile service is already primary in this band.)

Interference That Satellite Operators Can Expect from WiMAX Operation

At the FSS Earth station antenna, the BWA terrestrial signal is far more powerful than the signal from the satellite. Typically, the ***power-flux density*** (**pfd**) of a C-band satellite signal at the FSS Earth station antenna is about 122 dBW/m2, while the pfd of a 25 watt BWA transmitter at a distance of 500 meters is around -50 dBW/m2. There is difference in power between the two signals of 72 dB. It is difficult to overcome this power difference, either by shielding and/or filtering. At best, the FSS Earth station antenna has a sidelobe/back-lobe discrimination of about 30 dB. The interference caused into the FSS Earth station can be divided into three types:

a) Co-frequency Interference

If no shielding is available at the satellite antenna site, then interference can be caused at distances up to about 150 km.

(b) Out-of-band Interference

With the existing out-of-band emission limits for BWA transmitters, interference can be caused at distances up to 2 km. If additional filtering is implemented at the BWA base station and the use of outdoor BWA terminal stations is not allowed, the distance may be shortened to about 0.5 km.

(c) FSS Receiver Saturation Problem

Signals from nearby BWA equipment transmitting in the 3.4 to 3.6 GHz band will cause saturation of FSS receivers with their LNB operating in the 3.7 to 4.2 GHz range. In this case saturation can be caused in satellite receivers located at a distance up to about 1.2 km. Off-the-shelf filters can reduce the interference level by about 10 dB in which case the interference can be caused at distances up to about 0.5 to 0.6 km.

What Satellite Operators Can Expect in Terms of Future Deployment of BWA Technologies Including WiMAX in the 3.5 GHz Band

- *Most of the administrations that decided to be included in the new footnotes in the 3.4 to 3.6 GHz band have tested BWA technologies (usually WiMAX) and have licensed, or are considering licensing, BWA networks*
- *In all ITU Regions, the fixed service is primary in all of the C-band (extended and standard), while in ITU Regions 2 and 3 the mobile service is primary in the band 3.5 to 4.2 GHz. Fixed BWA (including WiMAX) can be deployed under the primary fixed allocation and mobile BWA (including WiMAX) can be deployed under the primary mobile allocation. Therefore, in many areas of the world, there is no need for an IMT designation in order to deploy BWA (including WiMAX)*
- *Due to the greater attenuation at higher frequencies (say, 2 to 3.5 GHz), cellular networks at these frequencies require more towers for the same coverage area. This means cellular networks at higher frequencies are often used for high capacity, i.e.*

many smaller cells, whereas cellular networks at lower frequencies are often used for networks having wider coverage. As cellular network operators move to higher capacity networks, they will move up in frequency e.g. into the 3.5 GHz band.

- *The legacy 3G cellular networks typically use channeling bandwidths of 1.25 to 5 MHz. This means the traditional lower frequency cellular frequency bands have been divided into relatively narrow channels. The new generation of pre-4G and 4G networks require wider channels (20 to 30 MHz) to achieve their design efficiency. This will put more pressure on the 3.5 GHz band.*

- *The 3.5 GHz band is under pressure on two fronts:*

  Countries with highly developed telecommunications infrastructure need new spectrum for high capacity mobile BWA networks in cities;

  Countries with large under-served rural areas need new spectrum for fixed BWA networks.

As a result, more countries may decide to deploy BWA networks in the 3.5 GHz band and may join the opt-in IMT footnotes at future WRCs.

About the author

Dr. Jorn Christensen is a satellite communications consultant. He has participated in every satellite World Radiocommunication Conference (WRC) since 1983. He has published over 20 articles and been an invited speaker at over 25 satellite conferences.

The Emerging Launch Market Threat?

by Prashant Butani, Analyst, NSR

Clearly there exist three factions of the satellite launch market when measured against the yardstick of satellite launching capabilities. "The Big Three", comprised of Arianespace, Krunichev (ILS) and Sea Launch, form the most formidable of these factions. Bringing up the rear are what we shall term "The Emerging Three" — China's CASC, Japan's JAXA, and India's ISRO, all of whom are moving hard and fast toward closing the gap. The third faction that rests in between the two is that of the United States as a whole, its involvement in Sea Launch notwithstanding.

Table 1 below lists the launch facilities, launchers and maximum payload-carrying capacity of each of these factions. All three factions have the same number of launch vehicles currently in operation, three each as of 2008. However, ***The Emerging Three*** have launch vehicle development programs nearing completion that will more than double their payload carrying capability by 2010. Does this mean that the market will effectively shift its weight from the primarily "Western" to "Eastern" launchers?

Currently, 50 percent of the total tonnage that can be lifted into orbit every year is possible only through The Big Three, with their existing infrastructure of six active launch pads and the ability to handle about 24 launches per year. As opposed to this, The Emerging Three can currently manage only 12 launches per year from their five active launch pads.

This scenario is set to undergo a rather radical shift over the next two years. If timelines set by the respective space agencies are to be believed, or even discounted, by 2010, ***China***, ***India***, and ***Japan***, should be able to launch between 16 and 20 times a year. As a consequence, they will have increased the total tonnage they can carry into orbit every year from today's 18 percent to 34 percent of the global tonnage carrying capacity. The question sceptics are quick to ask is, will this increased supply of orbital launch capacity be met with appropriate rise in demand, or will we once again see a drop in launch prices as was experienced in 2003?

The collapse of the NGSO market, the predictable downturn in GSO launch demand due to overcapacity, and the telecom and dot.com busts (combined) brought down launch prices considerably during the period between 2002 and 2003. From a total of 27 GSOs and five NGSOs in 2002, The Commercial Space Transportation Advisory Committee (**COMSTAC)** expected only 19 GSOs and less than five NGSOs in 2003, a fear that came true.

The industry as a whole saw a revival in demand in 2006. **Sea Launch** and **Arianespace** were completely booked, and prices rose 30 percent. There was a quiet resurrection of the NGSO market as **Iridium** and **Orbcomm** finally found firm ground from which to launch. The cyclic nature of the space industry manifested itself in the launch markets as well, with the market oscillating between overcapacity and fully-booked launch schedules, all within the span of three years.

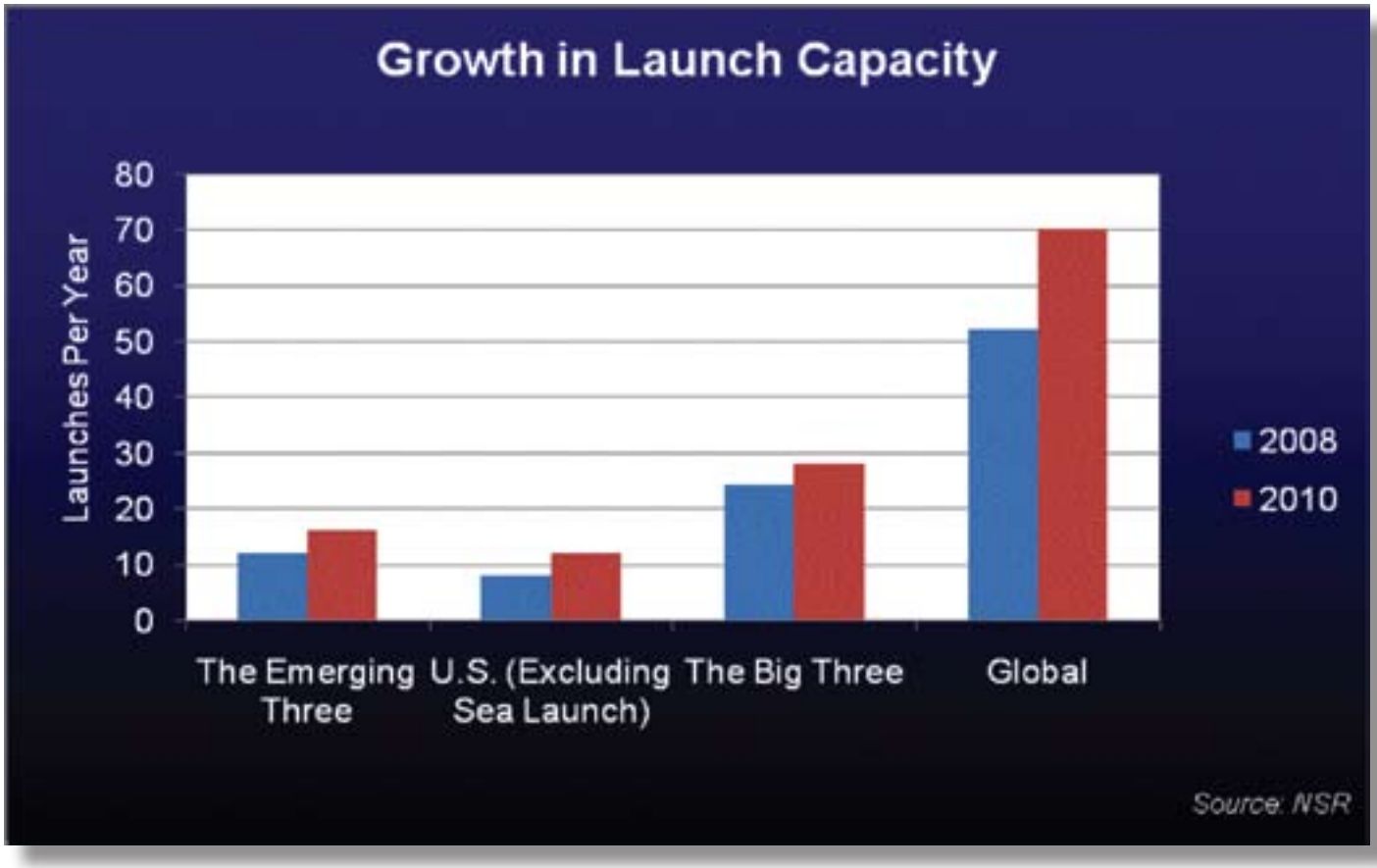
Faction	Group	Country	Launchers (2008)	Payload (2008)	Launchers (by 2010)	Payload (by 2010)	Launch Pads
The Big Three	Arianespace	France	Ariane 5	10000	Soyuz Vega	3150 1500	2
	Sea Launch	USA	Zenit-3SL	6000			1
	Krunichev	Russia	Proton	5535			3
United States (excluding Sea Launch)	Boeing	USA	Atlas V	13000			4
	Boeing	USA	Delta II	2120			
	Boeing	USA	Delta IV	12980			
The Emerging Three	CASC	China	CZ-3	5200	CZ-5	15000	2
	ISRO	India	GSLV Mk-II	2500	Mk-III	6000	2
	JAXA	Japan	H-II	3800			1

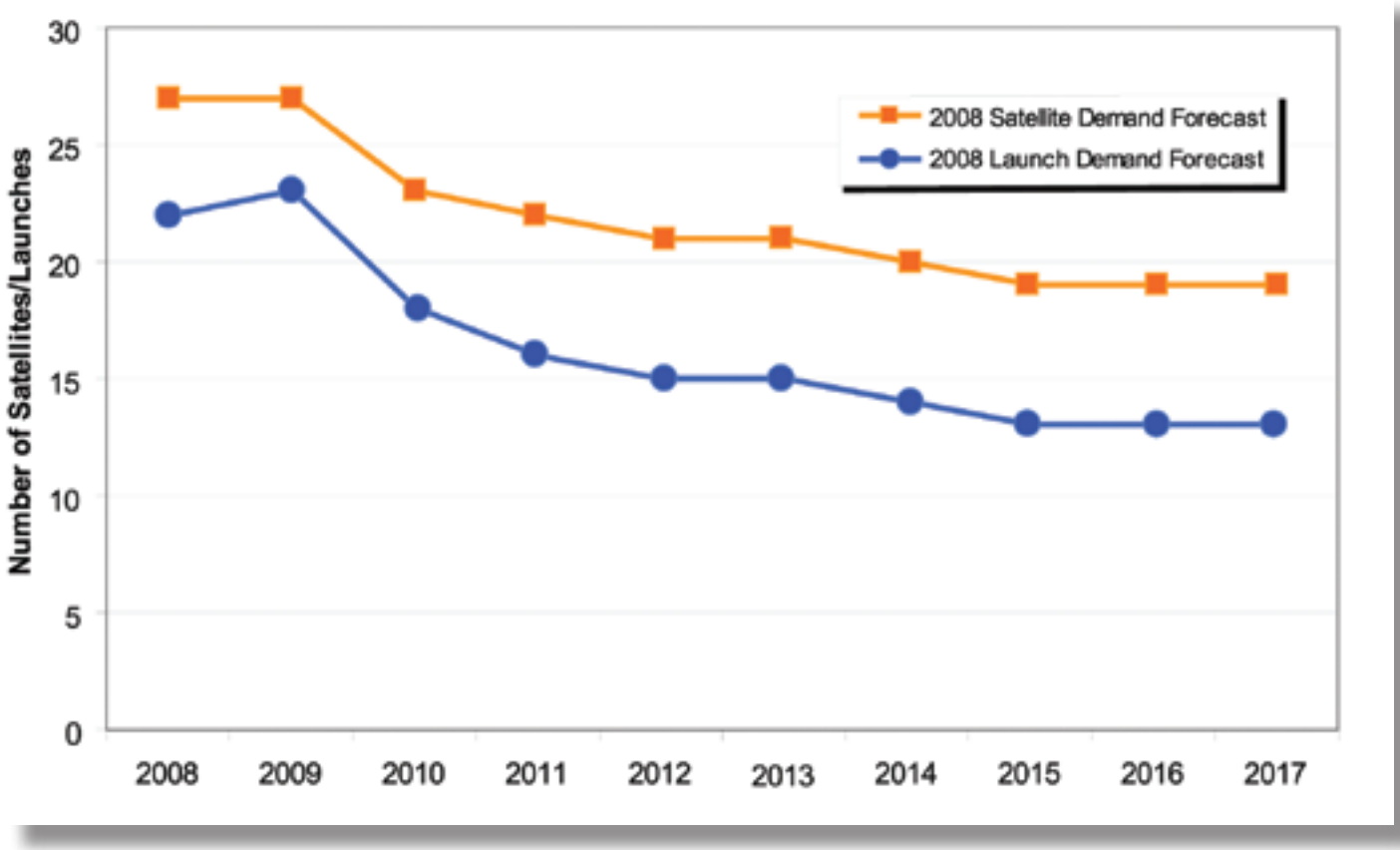
Table 1 — Source: NSR

Though the ***2008 COMSTAC*** report pegs the annual satellite launch demand at 21.8 per year (up one from the 2007 forecast), one must note that, due to the multi-satellite launches popular among the Big Three, this translates into only 16.2 launches for this year. This is a clear indication the current global launch market, which currently maxes out at about 50 launches a year, will find itself once again in a state of overcapacity as nearly 70 launches become possible every year by 2010.

Table 2 on ***Page 22*** shows the growth in launch capabilities from 2008 to 2010, while ***Table 3***, sourced from COMSTAC, reveals the flat-lining of satellite launch demand over the same period. The Emerging Three are contributing significantly to this overcapacity. You need to remember how Indian and Chinese launches have traditionally tried to undercut market pricing. The other argument against The Emerging Three is the need for these vehicles to establish they are flight proven. This is clearly evident from the fact that of the 13 commercial telecommunication satellites launched in the first half of 2008, 12 were carried aboard the Big Three, with the only exception being the Chinese launch earlier this year. Last year ended with only three out of 13 commercial telecommunication satellite launches aboard vehicles sent into space by China, India, or Japan. Clearly, there is a lot of ground to cover and time to pass before The Emerging Three challenge their larger counterparts.

The final blow dealt to the satellite launch market for The Emerging Three is a four letter word called ITAR. There are only a handful of telecommunication satellites per year that are "***ITAR-free***" — these arise mainly from the Russian, Indian, and Chinese markets. They are able to make the launch capacity of the emerging countries available by satisfying internal demand


Growth in Launch Capacity
Launches Per Year
80
70
60
50
40
30
20
10
0
The Emerging Three
U.S. (Excluding Sea Launch)
The Big Three
Global
2008
2010
Source: NSR


Number of Satellites/Launches
30
25
20
15
10
5
0
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2008 Satellite Demand Forecast
2008 Launch Demand Forecast

rather than cater to the global marketplace. As long as ITAR restrictions continue to be in place, the market will continue to hold potential for emerging players such as SpaceX, despite the fact they are yet to successfully launch a single payload into orbit.

In the midst of this discussion lies the "once fertile" ground that is the United States launch services market. According to the latest Satellite Industry Association report, the global Satellite Launch Services market stands at US$3.2 billion in 2007, occupying 3 percent share of the global satellite Industry. Forty-nine commercial launches occurred in 2007, of which 55 percent were conducted for commercial customers bringing in 47 percent of launch revenues. SIA's figures indicate that while the Satellite Launch Services market grew from US$2.7 billion to US$3.2 billion from 2006 to 2007, the share of the United States during the same period remained at about US$1 billion declining from 37 percent to 31 percent. Although the launch sector contributed the smallest proportion of total satellite industry revenues, it employed the second highest number of satellite personnel in the U.S.

It is the sheer might of the upper factions that will keep The Emerging Three in check. The Big Three and the United States' "heavy lifting" capabilities will ensure that the large telecommunication satellites launched each year continue to lift off from either Baikonur or Korou. ITAR regulations dictate demand cannot flow as easily as it should to the most cost effective solutions from the Far East. And finally, the development of the Soyuz and Vega programs to tap the mid-size market will bring in new streams of revenue for the market leaders.

About the author

Based in Mumbai, India, Mr. Butani joined NSR in February of 2008 and holds the title of Analyst, Satellite Communications. His areas of expertise include Digital Signage and Media Applications, VSATs and Project Management from the point of view of Satellite Operators. Following his Bachelors degree in Engineering, majoring in Information Technology, Mr. Butani obtained his Masters degree in Satellite Communications from the University of Surrey in Guildford, United Kingdom during which period he was actively involved with the SSETI project for student-built space missions, under the European Space Agency. During this time he also interacted with SSTL, the satellite manufacturing company on campus.

Upon graduation Mr. Butani worked with Inmarsat and Avanti Communications in the London area. At Inmarsat he was engaged in activities related to the BGAN-X system, and from there he moved to a Project Management role at Avanti Communications working on their upcoming Hylas Satellite project focusing on areas such as Risk Management and Ground Segment engineering. While at Avanti, Mr. Butani was also exposed to a number of consultancy projects with the European Joint Research Centre, ESA and other EU Consortiums. In India, Mr. Butani worked with the Bharti Airtel group for their International VSAT business during which he was exposed to the Middle East market for satellite services.

DVB-S2 —Beyond Video Broadcast

by Colin Mackay

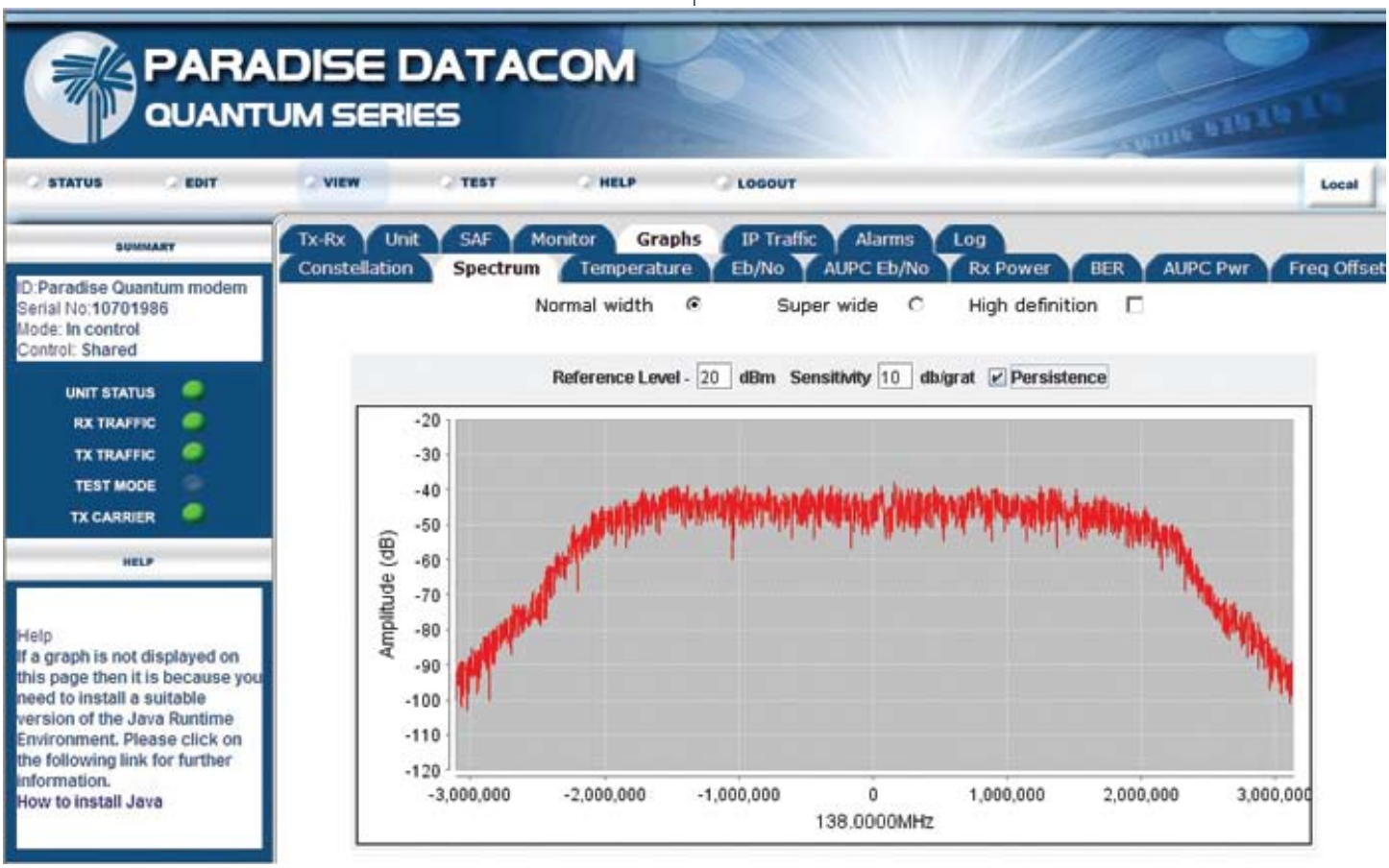
The Digital Video Broadcast for Satellite (DVB-S) Standard is well known and heavily used throughout the satellite Industry. Though initial adopters used this transmission format as a way to efficiently deliver TV programming, it wasn't long before DVB-S became a method of choice for two-way services as well. Release of the DVB-RCS Standard enticed manufacturers to develop duplex communications products and architectures as another step in the relentless pursuit of satellite-spectrum efficiency.

Following approval by **ETSI** (***European Telecommunications Standards Institute***) in November of 2006, the newer DVB-S2 Standard was born. The new standard yielded greater spectral efficiency, due in part to improved stability, and allowed for the use of high-order modulation schemes and more powerful FEC coding.

Add ***Low Density Parity Check*** (**LDPC**) and the efficiency gained rivals that of competing technologies that use complex and operationally cumbersome signal cancellation techniques to superimpose transmit and receive carriers on the transponder.

Earlier this year, **Paradise Datacom** launched the **Vision PD80**, the Company's first DVB-S2 satellite modem, as well as their latest creation, **Quantum**. Why two new modems in one year — and why now, you may well ask?

We deliberately delayed entering the DVB-S2 marketplace. This has given us some advantages. First, we didn't have to pay the high pioneering costs prevalent a few years ago to acquire the technology. We knew we could offer extremely cost-effective solutions to our customers and help speed up the industry's migration to DVB-S2.



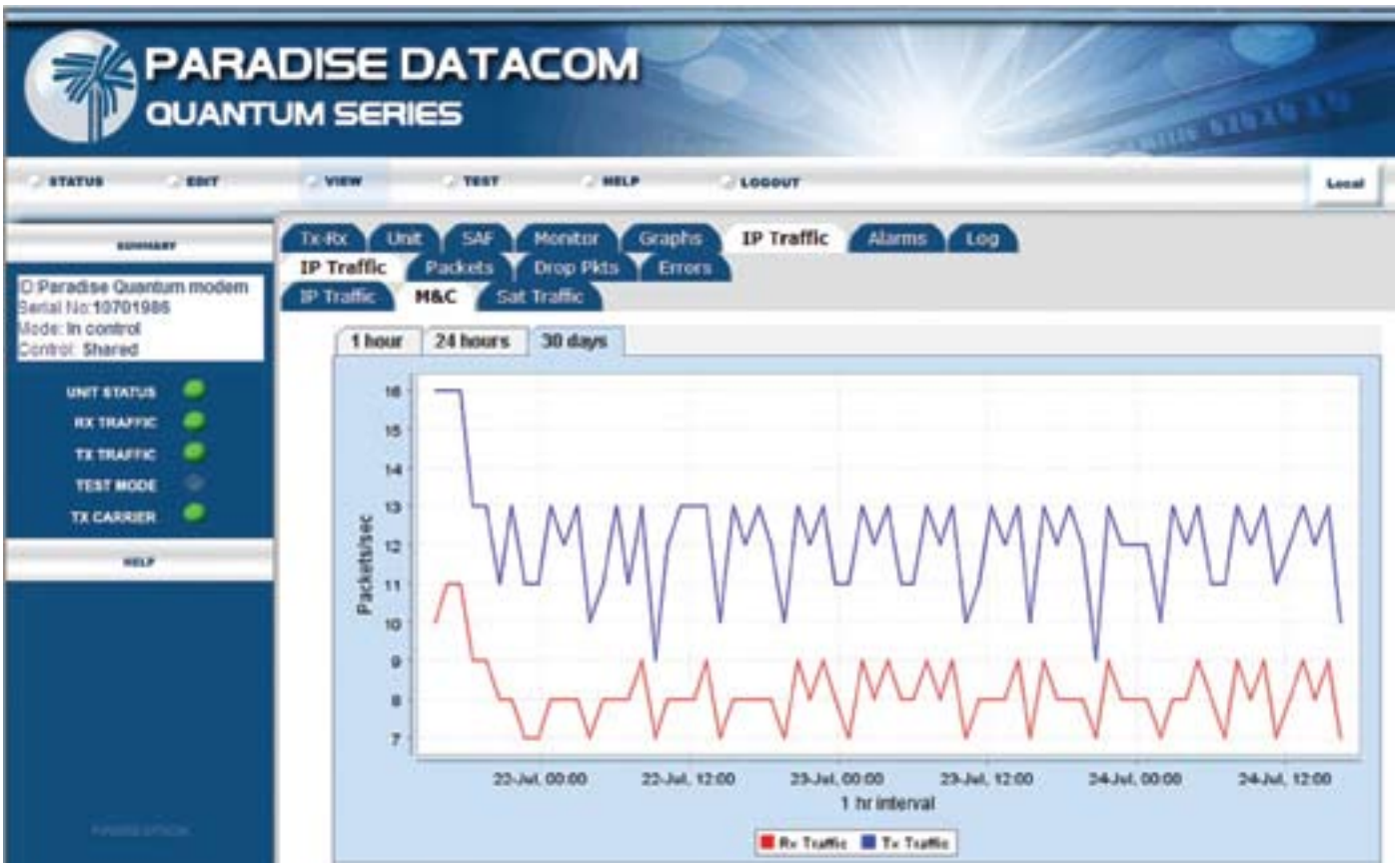
Secondly, many of our competitors designed their products specifically for the high-rate digital video broadcast market, resulting in expensive offerings with limited features. Though we wanted to address that market as well, unique features in our DVB-S2 products have afforded us an advantage in other applications, such as cellular backhaul, which makes up the largest part of our existing modem market.

We intend to break the myth that DVB-S2 is an expensive technology aimed at high rate video. We realized that the space segment savings of DVB-S2 could be equally applied to traditional low-rate SCPC links.

For broadcast video applications, the Vision PD80 will accommodate the conventional ASI and Ethernet terrestrial interfaces, including an onboard ASI multiplexer that will combine as many as four ASI streams onto a single carrier.

The Vision has two distinct differentiators. First, the modem has the most comprehensive set of IP features of any DVB-S2 modem available today, courtesy of what was already resident on the Evolution. IP Encapsulation is performed inside the modem with no need for external hardware.

Secondly, we've been able to launch the product with extremely competitive prices through the use of state-of-the-art technology that wasn't even available two years ago."



For their customers who require conventional SCPC modem features such as **ESC**, **AUPC**, **Extended D&I**, a wide range of physical interfaces such as **G.703**, **HSSI**, **LVDS**, **IP**, **EIA530**, as well as traditional **IBS** and **IDR** services, the Company introduced **Quantum**, their ***Ultimate SCPC Modem***.

Quantum allows customers to continue with their existing services and gives them the ability to switch on DVB-S2 when upgrading or installing new links. In effect, Paradise Datacom created a new satellite standard combining the best of SCPC with DVB-S2. Customers who need the old satellite framing for interoperability with other existing equipment (for example, to implement a DVB-S2 outbound carrier with SCPC return) can have that as well.

Consider this; a cellular backhaul customer will typically save 15 percent satellite bandwidth simply by changing from TPC turbo coding to DVB-S2. Paradise Datacom found DVB-S2 is remarkably stable in terms of working lower into the noise and is able to operate with higher order modulation schemes to save even more bandwidth. This is because the modem was designed for the DTH market, where receivers have relatively poor Eb/No performance.

Right now, we have Quantum modems delivering a hybrid E1/IP GSM backhaul channel comprised of multiple E1s + IP with IBS multi-destination Drop and Insert, courtesy of our unique MultiMux interface. This is combined with an ESC channel that is providing a mixture of serial M&C communications and AUPC — all over DVB-S2. In addition, the IP stream is being processed in the modem to provide TCP acceleration, header compression, and dynamic routing, all simultaneously. Finally, our proprietary Adaptive Signal Predistorter actively compensates for non-linearities to further improve overall link performance.

It is naïve to think our customers will simply migrate from conventional SCPC to SCPC/DVB-S2, unless that transition is compelling, inexpensive, and painless to implement. As transponder prices continue to climb, the market demand for technologies and products that make maximum use of space segment will rise as well. In addition to being spectrally efficient, these

products should be cost effective and easy to use. What is important for Paradise is that we have now established ourselves as pioneers helping to enhance the appeal of DVB-S2. This is done by reaching out to a wider audience and helping to speed up the migratio to this exciting new technology.

About the author

Mr. Mackay has significant expertise in embedded system software, TCP/IP protocols, satellite modems and professional project management. He specializes in the area of Internet and IP backhaul over satellite. He has been an employee of Paradise Datacom for 6 years and is responsible for managing the Modem Development Group.

He has been intimately involved in the design and management of many Paradise development projects, including the highly successful and novel start-from-scratch Evolution modem.

As well as management and technical expertise in various areas, Mr. Mackay is responsible for Paradise's product roadmap and evaluating emerging technical standards and industry trends. He has considerable experience outside of the satellite industry, mainly in advanced radar systems and digital video surveillance systems.

COW To The Rescue

by Mark Gilbaugh, Keith Lewis, and Tac Berry

Fighting fires in California is a nasty business; add in the additional problems of remote locations, non-existent cellular communication channels, and coordination of multiple fire companies, and the business gets worse. In July, 2008, a large fire in Northern California near Big Sur (Basin Complex fire) required the call-out of 3,000+ firefighters from more than 50 crews, almost 100 engines, and more than 20 aircraft. The initial area of the fire was the beautiful but remote Los Padres National Forest and Park, south of Monterey (Ventana wilderness area).

For vacationers, this area has traditionally been one of the most beautiful drives along the Pacific coast. But due to the terrain and remote areas, mobile phone service in this area is sketchy at best and often non-existent. An annoyance is not being able to call home while touring the California coast — the annoyance turns into total frustration when supporting thousands of firefighters and there is no cell service to aid critical communications.

To solve this problem, several companies worked together to quickly install a communication system known as a '**COW**'. COW stands for ***Cellular on Wheels***, an industry description for a transportable mobile communications access point. The COW is a system designed to provide mobile services for short periods of time during potential high cell traffic periods (Cell On Wheels - Wikipedia, the free encyclopedia.) Think of communities holding major events, such as the **Super Bowl**, that require additional mobile connections, but just for a few days. During such situations, the unusually high volume of mobile calls can often overwhelm a standard cellular network. Adding temporary cellular switching capacity has become a standard practice by all mobile service providers to help alleviate the call volume problems and assure mobile phone access for all callers.

Normally the COW can be rolled into a parking lot, powered up, and then connected to local switching equipment using standard **Telco T1** interfaces (wired or wireless). The system then performs like a reserve switching point for the overload of mobile voice and data traffic. As was shown during the **Big Sur** fires, a COW can also be used in emergencies to extend cellular services to remote areas with the right combination of technology and expertise.

In the case of the Big Sur fire, of course, there were no local switching points for a COW interface. There were not even T1 connections within reasonable reach of the equipment installation site. The COW, by itself, does not solve any cellular access problems without a connection to the main telephone switching network.

Additionally, the complexity and technical requirements for installation increases significantly when a COW is required for communications outside the reach of typical Telco interfaces. But, making cell service available for the fire fighters was a necessity — a solution had to be implemented.

With the remote locations of the ***Basin Complex*** fire, the COW access to the **PSTN** (***Public Switched Telephone Network***) was to be more than 50 miles away from the actual COW equipment. The **U.S. Forest Service** contacted **ComCentric** and asked for their assistance in the installation of cellular access equipment for the firefighters that could be remotely connected using satellite data circuits.

Satellite communications has becoming significantly more available and more economical with the addition of IP, packet-based circuits. Using packet protocols mean that a satellite link does not have to be dedicated to a single broadband user, like a T1 connection must be. The bandwidth per satellite can be shared by more users and each user gets the bandwidth they require when they have data to transmit. If the connection to one user is idle, the bandwidth is available for another user's IP packets. This 'sharing' of the satellite bandwidth means lower costs and more connections being completed.

To use a packet-based satellite backhaul path, the COW interfaces would have to be converted to IP packets to support the satellite protocol standards. Satellite networks and IP backhaul over satellite is ComCentric's expertise. The company is a Washington-based reseller and system integrator specializing in highly secure, mobile communication solutions. Their experience is derived from years of designing secure networks to

provide remote connectivity and highly reliable services for local and Federal government requirements. Experience with using satellite communication connections for network backhaul meant the company offered significant expertise when engineering the system infrastructure and technical specifications.

ComCentric had to determine the technical requirements for engineering a satellite communications link for backhaul from the remote COW equipment to the switching network point of presence (POP). To make the network connection in this remote environment, ComCentric contacted **ATCONTACT COMMUNICATIONS**, a leading Ku- / C- and Ka-band satellite services provider. ComCentric worked with ATCONTACT to provide custom network technical services and satellite capacity extending access to the Cell On Wheels even in the remote environment.

With a satellite link now being engineered, ComCentric needed to convert the existing telecom T1 interfaces, standard with the COW equipment, to a packet-based interface for the AtContact satellite backhaul. This is where **Engage Communication** became involved in the project. Engage provides a series of high-speed TDM to IP conversion products specifically designed for backhaul of legacy telecom circuits over packet-based networks. Engage has had significant experience in using packet technologies for traditional telecommunication connections, such as IP over Satellite, as well as in designing solutions for connectivity to COWs.

The key when adapting a packet network for communication services is to maintain proper interface timing and communication standards. This is even more important when converting cell voice and data traffic to IP and then transmitting these packets over satellite links. Satellite communication has inherent latency in delivery of traffic due to the time delay of satellite interfaces. The conversion equipment must be able to handle these inherent delays and maintain proper network timing.

ComCentric and Engage designed an interface using the latter's products that were available in a short timeframe as well as reliable and robust enough to handle the satellite links as part of the network. Engage provided their ***IP-Tube***, T1 to IP converter. The IP-Tube encapsulates full and fractional T1 circuits into IP packets. This enables legacy telephone circuits to be carried over high-speed packet network connections. The product maintains all required signaling interfaces and protocols for telephone network control and allows standard telephone test patterns to be used for end-to-end circuit testing and maintenance.

The communication from the COW became packet based and was carried over satellite from the fire locations to the receiving station at the ATCONTACT facility. The call traffic had to be carried from the receiving location to the public switching network. This demonstrated another benefit of using packet protocols for the connections.

By using ATCONTACT's ***VSAT IP Network***, traffic from the receiving station site could still be transported as IP packets on the final leg to the public switching network. Using legacy Telco type of transmission interfaces would have required multiple protocol conversions and could have delayed the project due to T1 availability issues on the terrestrial side of the installation. Instead the packet-based data protocols made it possible to use the existing broadband services for the final terrestrial leg of the network.

ATCONTACT's advanced Internet backbone network transported the packet-based traffic (encrypted) from the receiving Earth station to the public network access point, providing an end-to-end IP Network, with only 11 hops from satellite to switch. Engage IP conversion products were again installed at the termination of the final transmission leg to change the packet information back to TDM voice circuits. The voice traffic was then available to the public switching network.

The final technical solution was capable of handling thousands of mobile phone calls in even the remotest areas of the Big Sur Wilderness. The crews fighting the fires in those remote locations definitely appreciated the equipment, which permitted personal and official communications over previously unavailable cellular networks. The fire resulted in more than 162,000 acres of wilderness area destroyed. The cost to fight the fire,

The Basin fire in central California is featured in this image photographed on July 4th, 2008, by astronaut Greg Chamitoff, Expedition 17 flight engineer, on the International Space Station. One of the largest and most destructive fires raging across California over the July 4 weekend was the Basin fire, threatening Big Sur, and covering the coast in a thick blanket of smoke.

Credit: NASA

protect structures, and finally contain the fire, was more than US$77 million.

High technology can provide solutions to problems caused by the most primitive of situations and locations. The correct blend of technical expertise, desire to solve problems, and reliable equipment can be combined to meet even the most critical of emergencies.

ComCentric, designs and installs emergency satellite internet and phone service to the U.S. Forest Service**.** ComCentric is a veteran owned small business located near Olympia, Washington specializing in emergency wireless and satellite communications. More information at http://www.comcentricusa.com.

Engage Communication manufactures transmission interface products that enable existing voice circuits and PBX connections to be converted to Ethernet or IP for backhaul and automatic path switchover. Engage products can provide compression of voice information and encryption of voice, serial and IP circuits to meet AES standards and can network SS7 data messages for billing and call management. Engage IP products are SNMP manageable and provide SSH security for in-band control and configuration. More information: http://www.engageinc.com.

ATCONTACT provides comprehensive broadcast, streaming and data services using satellite technologies from its secure satellite earth station in Colorado. ATCONTACT provides affordable VSAT IP services through its iDirect VSAT hub to rural locations in the Lower 48, Alaska, Central and South America including the Caribbean. ATCONTACT is a leading provider of custom Satellite communication solutions and networks for Telcos / Government / Oil and Gas, Mining and Business sectors. For more information, please visit http://www.atcontact.com.

About the authors

Mark Gilbaugh is the President of ComCentric and, prior to establishing the Company, he served in the U.S. ARMY as a Med-Evac Instructor Pilot. During his tenure, Mark deployed twice to Iraq and has held the positions of Med-Evac Team Leader, Information Management Officer, and Military Assistance to Safety and Traffic (MAST) Frequency Coordinator. Prior to joining the U.S. Army, he had been a lead technician for a telecommunications provider installing systems for state and federal government agencies, including the Tennessee Highway Patrol's E-911 system. Mark is a BICSI certified technician, and has over 12 years of experience in the telecommunications industry.

Keith Lewis is in the Business Development division with ATCONTACT. Before to joining the Company 10 years ago, Keith spent 5 years in Bahrain, consulting for telephone and data companies in the adoption of secure smart card based technologies for ecommerce, streaming media for live and on demand applications, multimedia, and audio advertising production for clients such as Coca Cola, KLM Airlines, Quantus, Batelco, Brtish Airways and Starbucks. Keith joined ATCONTCACT as IT Manager and built the entire IP and streaming architecture for the Teleport. He broadened his knowledge in to VSAT and Satellite communications with network design, operation, and maintenance of all platforms.

Tac Berry (with Luke) is the Vice President of Business Development at Engage Communication. He has worked in the telecommunications industry for more than 30 years. After 6 years as a MTS with Bell Laboratories, he held Marketing and Business Development positions for companies that include Granger Associates, Digital Link, Amati Communications, and Jetstream.

New Evolution in Network Management Systems

by Richard Fullerton, Newpoint Technologies

Since the inception of device management systems, network operators wish to see the concept through to its ultimate end — a single console providing end to end control of the disparate equipment and subsystems comprising a modern communications network. Initially, divergent hardware protocols made this impossible. Serial equipment was managed by a completely different set of outboard hardware than contact closure devices. This gap was closed at the close of the last decade when intelligent controllers allowed you to use a single solution for managing the serial as well as contact closures. Such an example would be Newpoint's Mercury Element Manager.

The advent of *Simple Network Management Protocol* (**SNMP**) promised a future where all equipment would share a common interface using standard Ethernet connections. Such would make the writing of formal device drivers and creating custom communications cables obsolete. As important as an advance this was, the practical applications were limited initially, as replacing equipment for the sake of management capability was cost prohibitive and impractical. Well-respected programs such as *HP Openview*, *NetCool* and *NetBoss* have no native capacity to communicate with non-SNMP equipment. The creators of satellite network management software had to fill the gap. The core technology underlying device management systems uses IP sockets to transport information to and from a piece of equipment. To define a socket that would communicate over IP with a SNMP device

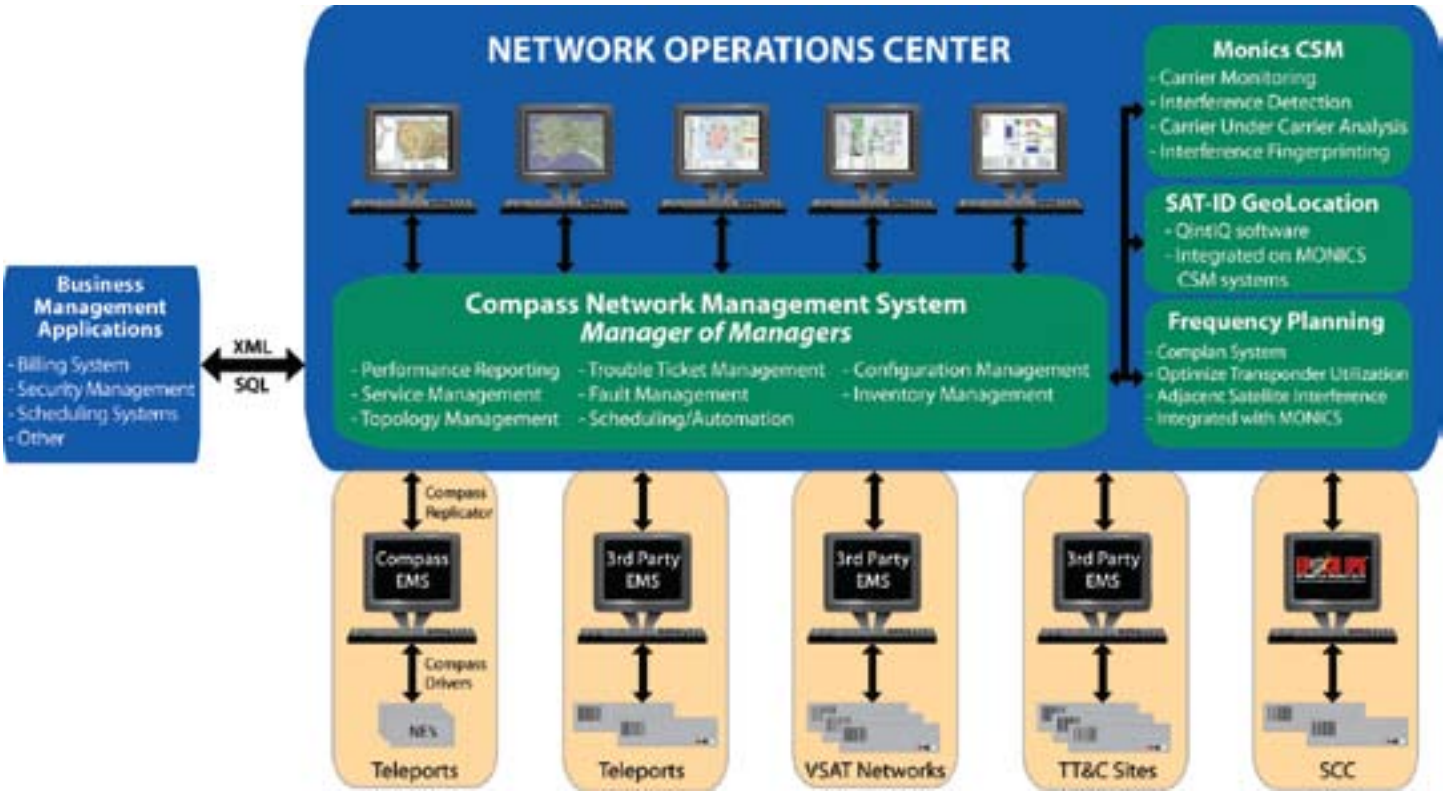


Figure 1

In this diagram, you can realize how Compass sits as the hub in a spoke and wheel system, supporting multiple access points for receiving and distributing information. Legacy equipment communicates using either serial or contact closure using the proprietary protocol from the manufacturer over a serial port aggregator or serial to contact closure converter. Standalone Element Management Systems (EMS) such as a VSAT system, another NMS product like MicroMuse or a carrier monitoring system such as Sat's Monics are managed via SNMP, Corba, C, or XML.

or system was a simple exercise. The killer application of this technological advance was the ability to communicate with entire subsystems — the ***Manager of Managers*** (**MoM**) concept was born.

MoM offers big advantages in cost effectiveness, scalability, and life cycle. Businesses that have significant investments in management software technology running across diverse systems can simply point a SNMP feed to a MoM, such as ***Compass***, and enjoy a fully featured web-based, GUI, such as Newpoint's ***True North***. There's no need to reintegrate their equipment, change server architecture, or engage in the costly rewiring of equipment to the new software.

This also holds true for companies who have been reliant upon vendors who are suddenly out of business, or simply unwilling to ensure their products are up to date. Existing subsystems with their own SNMP stream, such as a **Nokia** telecom switching system for example, can be integrated directly into Compass without any other intervention. other than an Ethernet connection to the host.

But what if the information is not available from these applications via SNMP? The Compass software APIs easily allow you to communicate with these systems using their native protocol language over the Ethernet network, providing full integration of your SNMP and the proprietary and Ethernet enabled management software applications.

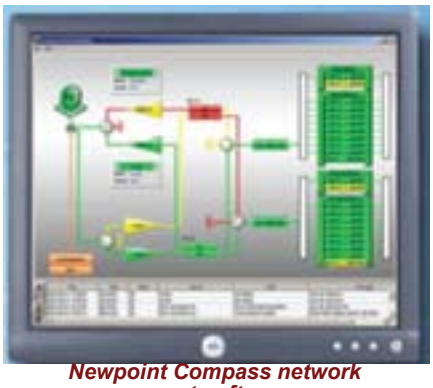
There may also be ***Alarm Managers*** in place (such as ***NetCool*** or other business applications). Compass can bundle all of the non-native devices (*i.e.*, parallel facilities

management gear, or serial devices) and send/receive a SNMP communications string for command and status relay. The operator receives all systems information from a single source. Compass seamlessly functions as middleware between these applications and the equipment.

It gets even better — scripting tools can be used with Compass' database structure to manage equipment and subsystems directly as well as define their functions in harmony with one another. Service Level Agreements can be measured. Circuits can be provisioned. Services can be prioritized. Corrective actions can be triggered or suppressed. Insight into the entire network gathers a powerful range of knowledge that can be acted upon from a single nerve center. MoM technology offers an opportunity to have central control of your entire network and to receive the benefits derived from its operation. NMS systems can now draw upon standalone components across different business areas and function as true enterprise software.

Once the device or system information is captured, the Compass engine can act upon the data. Scripts to automate system responses to specific sets of faults or conditions are created to maintain key services online, manage redundant equipment, or initiate scheduled communications packages or maintenance windows. Messaging via telephone, SMS page, or onscreen popup, alerts key personnel to the status of specific equipment or processes monitored by Compass.

Compass database replication makes it possible to eliminate single points of failure by allowing redundant servers to contain duplicate system architecture, recognize any primary server failure, and promote a backup server to control the entire system. The system is scalable by definition, as additional interfaces to systems or devices can be added or deleted at will,



Newpoint Compass network management software screen

without requiring additional software or licensing.

Beyond functioning as an aggregator of information, a MoM can distribute information to other business logic systems. Alarm information can be sent to a trouble ticketing package such as *Remedy*, environmental data to a security management software system, and so on. This is accomplished by populating a SQL database or by using an XML interface connected to the Compass engine.

Compass can also draw information from these sources and use its scripting engine to write business logic rules into the system. As a result, Service Level Agreements can be monitored and actions taken to maintain services, and prioritize the most important customers to ensure optimal use of equipment.

Similarly, the information captured by Compass is capable of being correlated — specific network situations can have predetermined responses built in to the system. This can be established as a decision tree to ensure accurate actions are taken in the correct order.

In a rain fade example, attenuation may be modified to boost output to overcome the disturbance. After performing the action, the scripts check to determine if, in fact, the network conditions are now in an acceptable range. If so, an SMS is sent notifying key personnel of the activity. If not, the script will try again for a set number of times. In the event that power is still not in the acceptable range, diversity switching may be initiated to move the entire service to another site, and a notification sent.

The implications of this technology are far reaching. Labor savings can be realized by automating and integrating systems and responses that previously required operator intervention. Human error is minimized, as the automated scripts perform the appropriate actions faster, and in the correct order, each time, all the while testing to ensure the network is in the correct state before moving on to the next test.

All of the information is now displayed on a single console. This reduces training costs as operators need to learn only one software package. Executive dashboarding of multiple system status is possible using the onboard report generation tools, which eliminates the need to produce information from individual systems. Trouble ticketing is now centralized and can be automated as well. Aged faults may generate a priority message to a manager. Specific customer impacts can be forwarded to the appropriate account executive, allowing proactive action.

In short, the MoM concept provides network operators with the ability to manage their system from end to end. This creates economies of scale by placing fault management, service provisioning, scheduling, and asset management and control, on a single platform. MoM knows best!

About the author

Richard Fullerton is the Director of Business Development – Europe for Newpoint Technologies, Inc, a wholly owned subsidiary of Integral Systems. The Company provides Satellite Command and Control, Network Management, and Carrier Management software solutions to the satcom and broadcast marketplaces. Richard has over a decade of experience in network engineering all over the world. Prior to joining Newpoint in 2008, Richard was with Datapath Inc., formerly Industrial Logic Controls (ILC), as the International Accounts Executive responsible for global install base sales and driving new business in Latin America. He also has extensive experience as a project manager, systems/consulting engineer, and as a training manager.

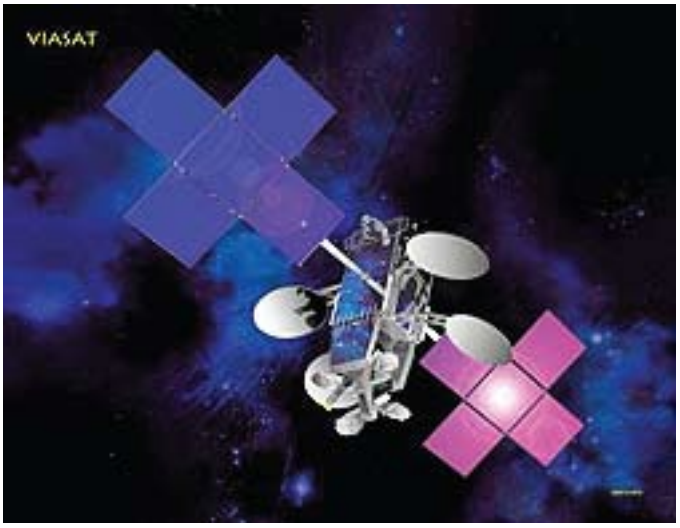
If We Build It, Can They Launch It?

by Robert Bell, Executive Director
Society of Satellite Professionals International

Several months ago, I had the opportunity to talk with Tom Moore, Senior Vice President of ViaSat and President of the recently announced ViaSat-1 Ka-band broadband satellite initiative. As one of two founders of WildBlue Communications, Moore carved a name for himself as a true pioneer of satellite broadband services. When he started talking about the relevance of satellites in meeting unserved or underserved markets and meeting the voracious appetite for consumer satellite applications, I took immediate notice.

ViaSat calculates there are approximately 12 to 15 million unserved broadband households in the United States and another 10 to 20 million underserved homes. According to *Moore*, "The success of satellite broadband in the U.S. today shows that satellite is a very viable alternative for this unserved and underserved population."

In response, ViaSat is launching ***ViaSat-1***, which according to Moore, will be "the highest capacity satellite ever built by an order of magnitude." ViaSat-1 will be able to support far more subscribers at lower cost and the technology will bring customers a far better user experience by providing the more abundant bandwidth.



ViaSat's ViaSat-1 satellite

Moore and the ViaSat team aren't alone in expressing excitement in launching new projects. During **Euroconsult**'s ***World Satellite Business Week***, held September 8th through 11th in Paris, several CEOs, including major satellite operators, echoed the need to expand offerings into unserved or underserved areas.

A Building Boom?

With a 12 to 15 year life expectancy, it was not unheard of for satellites to take up to 7 years to reach 70-80 percent capacity. These days, however, many satellites are being launched with anxious customers waiting to flip the switch as soon as the satellite is pronounced operational. It's not a huge stretch to conclude that building and launching even more satellites would provide additional capacity and additional revenues.

According to Euroconsult, over 80 geosynchronous satellites and 48 Low Earth Orbit satellites are in the pipeline to be built and launched in the next few years. Eutelsat, for example, announced during World Satellite Business Week that it had 7 satellites to be delivered between the 2010-2011 timeframe. In addition, with service providers looking to expand into new and exciting markets, that number could continue to grow.

However, according to a **Futron** study published by the ***Satellite Industry Association*** in June, only 21 new commercial satellite orders were announced in 2007, four fewer than the year before. One possible reason voiced during World Satellite Business Week was the skyrocketing cost of securing a launch.

The Costly Ride to Space

There was a time not so long ago when the industry was faced with launcher over capacity. A ride to space could be secured within a reasonable time frame and at costs that didn't break the bank. Today, however, the tables have been turned, with launch slots coming at a premium and being booked far in advance.

According to reports out of World Satellite Business Week, prices have escalated to the point of placing some projects in serious jeopardy. *Giuliano Berretta*, CEO of Eutelsat, was quoted as saying, "Some have paid $120 million for a Proton. It is another world." Dan

Goldberg, CEO of Telesat agreed that the costs were beginning to impact decisions on moving projects forward.

Cost has always been an issue debated in the launch industry. Rides to space don't come inexpensively. The increasing costs are getting more difficult to swallow, especially when reliability is in question.

A recent spate of launch failures has raised concerns that pricing isn't reflecting quality. Launch providers are responding with stepped up campaigns to ensure quality assurance, but the satellite industry and the insurance community are notoriously skittish. Nervous insurers mean higher rates leading to yet more cost constraints on projects already struggling to secure funding.

A Snapshot of the Launch Industry

The Futron/SIA report reveals that 102 satellites were launched in 2007, with 49 of those commercial launches. That's an increase from 2006, but not by much. Revenues for the launch industry also increased in 2007, reversing a 10 percent decline the previous year.

Arianespace' Ariane 5 launch vehicle

2007, however, also witnessed two launch failures — one for **Sea Launch**'s ***Zenit*** vehicle, and one by the ***Proton*** rocket under **International Launch Services**.

Those failures left Sea Launch grounded for the entire year while Proton resumed flight after two months (a different configuration ***Proton K/Block DM*** was launched in the interim for a Russian government mission carried out by a **Russian Space Forces** launch crew).

As of the beginning of September, Sea Launch had completed four successful launches and had one more scheduled, while **Land Launch** had one successful flight and one campaign underway. ILS had two successful launches and one failure, with another 2 missions scheduled before closing out the year. **Arianespace** had completed five successful ***Ariane 5*** missions and one ***Soyuz*** mission, with an additional four Ariane 5 launches scheduled. **Lockheed Martin Commercial Launch Services** had one ***Atlas 5*** mission in 2008.

Launch Pad Gridlock

Speaking volumes about what's to come for operators looking to expand their fleet of satellites are the backlogs. At the start of 2008, ILS issued a release stating they had a total backlog of 22

Soyuz launch vehicle

Lockheed Martin Commercial Launch Services Atlas 5 launch vehicle

firm launches through 2013. Since then, they've announced four more contracts, totaling five additional launches. The Arianespace backlog includes 24 geostationary satellites using either Ariane 5 or Soyuz, 10 government launches aboard Ariane 5, and an additional 7 dedicated Soyuz launches.

The days of securing a close-in launch slot are all but over. Larger operators, such as SES, are taking drastic steps to ensure a ride when they need one. In June 2007, **SES Global** signed a groundbreaking contract with Arianespace and ILS that, according to the press release, would cover "the majority of the satellite launch requirements for the SES group from the period 2009-2013." The multi-launch agreement ensures each SES satellite has a primary as well as a back-up launch vehicle, each with two launch slots.

That level of flexibility is not for everyone. For the smaller operators, securing such contracts is likely out of their financial realm. For service providers looking to gain more capacity, availability may be harder to locate.

The premise is straightforward — you need the satellite in orbit to generate revenue and the launch vehicle to place that satellite into orbit. Without an adequate fleet of launch vehicles available at costs that the majority of operators can afford, the innovative services that have made satellites so indispensable in our daily lives may become the victim of a major traffic jam.

Different Ending to an Old Story?

This is, of course, an old story. The industry has long lived with cycles of boom and bust. In one part of the cycle, launch companies increase capacity and raise prices to handle strong demand from satellite carriers, only to be stuck with excess capacity when demand

for new birds drops in an economic downturn. Sharp price-cutting quickly follows.

SpaceX Falcon 9 launch vehicle

In this context, it is interesting to consider another part of the ViaSat vision as described by Tom Moore. Given huge pent-up demand for broadband and the emerging ability of satellites to meet it at a competitive price, Moore believes that tomorrow's broadband satellites will take only 1 to 3 years to fill, instead of the 5, 7 or more years in today's business plans. With payback so much sooner, carriers will probably seek to loft more birds, putting further strain on launch capacity.

No one should forget the launch business itself is facing the potential for disruptive change. In April, **NASA** awarded *Elon Musk*'s **SpaceX** an indefinite delivery, indefinite quantity contract worth anywhere between US$20,000 and US$1 billion for launches starting in 2010. On September 9th, SpaceX was granted an operational license by the **U.S. Air Force** for the use of **Launch Complex 40** at **Cape Canaveral**, paving the way for SpaceX to start ***Falcon 9*** launch operations later this year.

Musk is another pioneer seeking to change the rules of the game. If he is successful, his Falcon rockets could sharply undercut current pricing for launches. This would present today's launch companies with trouble they have not yet experienced.

If you were seeking a quiet life, this may not be the best of times to be working as a satellite professional.

But, hey, what's so great about a quiet life anyway?

About the author

Robert Bell is the Executive Director of the Society of Satellite Professionals International. Robert has authored articles in numerous industry publications and has appeared in segments of ABC World News and The Discovery Channel. He is a frequent speaker and moderator at industry conferences including SATELLITE, NAB, SATCON, and Sportel. He is also the author of the World Teleport Association's Teleport Benchmarks and Sizing the Teleport Market research studies; and of B2B Without the BS, a guide to sales and marketing in the business-to-business sector available from Amazon.com.

Executive Spotlight On...

Dr. Alan Amir
CEO, ***Bivio Networks***

by C. Karr

A modern day Renaissance man, living a broad and balanced life with many roles, from being a soldier to scholar to leader, Dr. Elan Amir has always been comfortable approaching life's challenges. His passion, drive, and diversified background provide the CEO of Bivio a unique vision to shed light on a new networking technology — deep packet inspection. Through a discussion recently held with Dr. Amir, his thoughts on networking and his company reveal how the industry is changing... for the better.

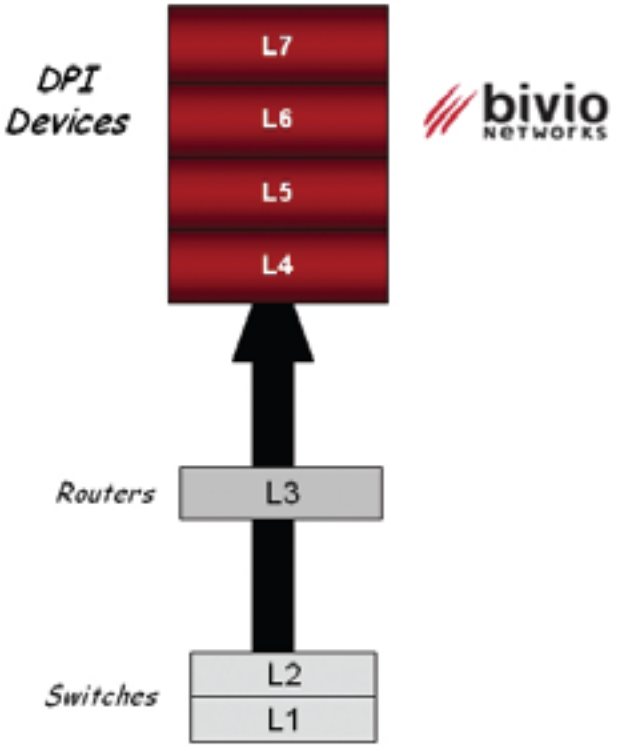
As a technology that opens network packets, ***deep packet inspection*** (**DPI**) looks beyond the header to analyze and manipulate the information contained within the payload. Network packet headers do not expose details necessary to manage the network, such as security threats, intruders and data leaks, which are incorporated in the payload. DPI is needed to ensure security of the network while opening new vistas for service creation, by making it possible to provide levels of service based on specific types of protocols and requirements. For today's satellite network, DPI enables network managers to observe and manage network flow, ensure the quality of service, and protect the network from security threats.

Dr. Amir uses his passion and drive to lead **Bivio Networks** with a unique vision and aggressive strategy that he developed at an early age. Bivio designs and produces performance network appliance platforms that enable the deployment of wire-speed DPI and processing applications.

Amir began his life in Israel. As a teen, he served as a sergeant in the Israeli army and says it was then that he learned the importance of making quick decisions and following through on them. "If you talk to any successful CEO, they will tell you the key to their success is a history of decisive action," says Amir. "They may not always be taking the right action, but the important thing is to make a decision and learn from it."

After the military, Amir's life was a series of right actions. He enrolled at the ***University of California***, Berkeley, where he earned his doctorate and masters degrees in computing science and a bachelor of science in electrical engineering and computing science. While at Berkeley, Amir would also form friendships he could call upon as he walked through life.

Upon graduation, Amir co-founded his first company, **FastForward Networks**, providing a foundation for his future work with Bivio Networks. After a year, he left to join **Proxinet Inc.**, which was among the first mobile web browsing companies to be purchased during the



dot com boom. He was ultimately recruited by **Omnisky** to lead and develop wireless technology. When Omnisky was sold to **Earthlink**,

Amir was prepared to leave the wireless area and return to his foundation in networking. As he transitioned into the corporate world, Amir leveraged the same skill set to become a strong leader of startups in Silicon Valley.

"The industry is seeing a new type of naked networking, or networking 2.0," says Amir. "We are moving away from connectivity toward policies and devices that run software to inspect and manage the network."

in funding from **Silver Creek Ventures**. To reach that point, Bivio and Amir remain an innovative force in the industry. Bivio already boasts superior hardware performance, based on the flexibility of its Linux-based standard. The company's flagship offering, the **Bivio 7000**, is capable of wire-speed packet processing at 10 gigabits per second.

Strategy and execution are nothing without vision. For Amir and Bivio Networks, the vision is simple: develop network devices able to compute vast amounts of information as part of the infrastructure. This vision enables Bivio Networks to supply customers such as SourceFire Inc., Arbor Networks Inc., Checkpoint Software Technologies, and Samsung Electronics, with a hardware appliance that can be used for a number of purposes, from traffic management and analytics to security applications.

According to *Alex Mendez*, founding general partner of Menlo Park-based **Storm Ventures**, and the Bivio Networks board chair, Amir's strategies to achieve his vision are excellent. "Elan has sorted through the chess game of customer, OEM deals and partnerships; he gets a 10 out of 10 for judgment and common sense," says Mendez.

Executive Spotlight On...

The Bivio 7000 Series of Network Appliance Platforms is a family of compact, extremely high-performance, and fully programmable network appliances that combine a unique packet processing hardware architecture with a software platform that includes a standard Linux-based execution environment and a comprehensive set of networking features.

Designed specifically to provide wire speed deep packet processing, the Bivio 7000 Series architecture fuses network-processing components with application processing CPUs to deliver uncompromising performance and unmatched flexibility. The family includes two main product groups to deliver true line rate packet processing from 3 Gbps to 10 Gbps throughput.

"The evolution of networking is underway," advises Amir. "We're moving from connectivity to policy. The first generation of networking supplied connectivity, but networking 2.0 embraces policy."

Amir stated that networking is moving from dumb pipes to smart pipes — or, more technically — from layers one-three to layers four-seven. In the past, network administrators had to depend on end-to-end security solutions. Now, with networking 2.0 and network-based devices, security services can be hosted directly on the network. "We are no longer concerned with switches and routers," says Amir. "The future is DPI. And the future is now."

by Martin Jarrold
Chief of International Program Development
GVF

In April 2007, Schlumberger Information Solutions and BT launched the world's first public wireless broadband service for offshore and remote oil and gas drilling rigs and production platforms. The Wi-Fi-based service allowed offshore workers to communicate with their homes and friends more easily via wireless-enabled laptop computers and PDAs for e-mail, instant messaging, and video/webcam. They use the same type of satellite links that comprise the backbone of the digital communications infrastructure of oil and gas rigs around the world. Initially, this service was deployed in the North Sea. Increasingly, such services are being rolled-out throughout the E&P (Exploration and Production) patch.

Such services are being introduced for the welfare of rig and production platform crews who often work in harsh, extreme, and remote locations, particularly offshore. This is only one of many examples of the use of broadband satellite communications in the search for, and production of, hydrocarbon energy resources. Indeed, the subject of *digital oilfield* applications and satellite communications commands a far larger canvass.

Even so, this greater canvass is but a subset of the wider panorama of the Broadband Maritime market, which has assumed a significantly heightened customer and end-user profile for the satellite communications sector. The Broadband Maritime user environment may be defined in terms of four principal market segments — there are others, but of lesser significance:

Merchant

*This segment includes tankers for crude oil, its refined derivatives, as well as LNG (liquefied natural gas); container vessels; bulk carriers; oil and gas field maintenance & supply vessels; and cable/fibre/pipeline laying vessels. High demand communications applications in this segment include: remote Internet & corporate intranet access; email and web mail, large file transfers; SMS (short message service) text and instant messaging; video conferencing; store & forward video; real-time navigation & weather updates; Global Maritime Distress Safety System (***GMDSS***); crew welfare communications; corporate secure communications; vessel and engine telemetry; cargo monitoring and telemetry; and, telemedicine.*

Passenger

This segment principally refers to point-to-point vehicle and passenger ferries and shares many of the above listed applications, plus that of cellular/mobile backhaul and trunking.

Ocean Resource

This segment includes inshore fishing trawlers and their offshore and deepwater equivalents and factory ships, as well as deepwater floating and semi-submersible oil and gas platforms and rigs — typically features applications such as telephony; email & Internet access; crew welfare communications; telemedicine; real-time navigation, position reporting and weather updates; GMDSS; sea/ocean floor depth mapping; market information (e.g. fish market price downloads and selling catch online); tracking applications (^ fish finding); updating electronic logs.

Leisure

This segment covers ocean-going cruise liners, ocean-going private leisure craft, and inshore leisure craft — communications requirement includes key applications such as: maintenance of 24/7 business communications via telephony, email, fax, Internet, cellular backhaul and trunking, and video conferencing, as well as credit card verification and ATM support, plus real-time weather and navigation updates, GMDSS, and ship-to-shore advance repairs booking and supplies orders.

As these segments inevitably and progressively occupy the satellite broadband space, their collective migration to a broadband satellite requirement may be understood as falling under the following headings:

Key hardware technology developments in the design and deployment of state-of-the-art stabilized satellite antennas, which enable effective satellite tracking and maintenance of signal integrity as vessels pitch and roll, all the while maintaining constant reliability through robustness and rugged design against challenging weather conditions.

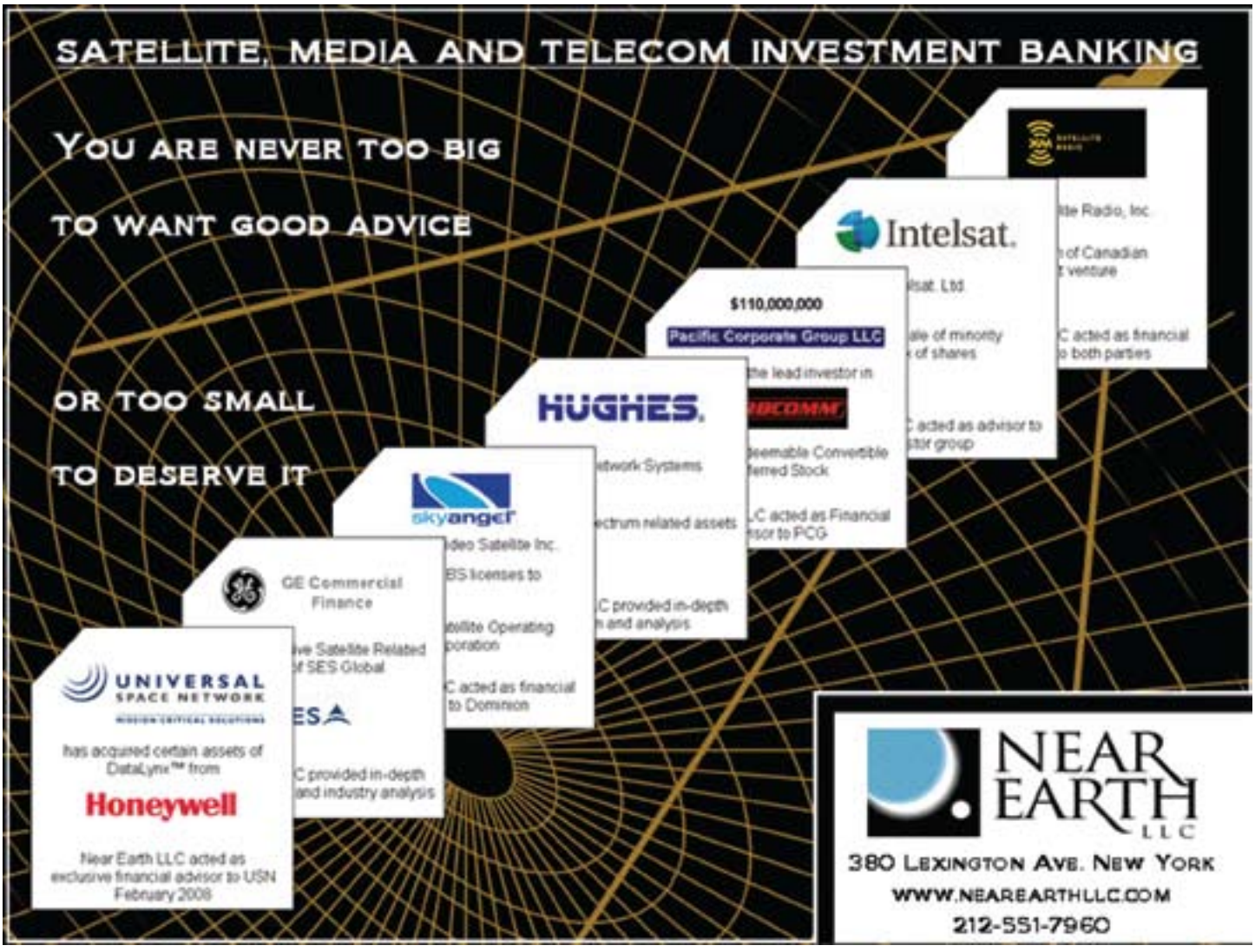
New service provisioning, delivering "always on" broadband applications with QoS guarantees that go beyond basic "pay-by-the-minute" service types, which facili-

tate greater predictability in mission critical delivery, as well as accuracy in the calculation of the cost of communications and, therefore, improved corporate overheads budgeting.

Access to applications and networks: meeting today's imperative for constant, seamless and cost-effective connectivity to ensure optimised exploitation of physical maritime assets, maximised passenger satisfaction, maximised crew welfare, and optimised navigational safety.

In particular, mission critical operational success in the oil and gas exploration and production environment is heavily dependent on access to the most efficient *information and communications technologies* (**ICTs**), and to a vast array of sophisticated applications these technologies bring to the use of geologists, geophysicists, drilling engineers, seismic data analysts, and a wealth of other subject-matter experts. Be it, for example, production data management, remote surveillance, or modelling solutions, etc., all integrated into an inclusive web-based visualisation framework, these various constituent elements of the *digital oilfield* (and gas field) depend on the satellite, and satellite-hybrid, communications environment to provide the necessary connectivity, the required bandwidth, the imperative reliability, and essential cost-effectiveness.

Today, the growing global thirst for new supplies of hydrocarbon-based energy is driving oil (and gas) exploration investment into ever more extreme environments. Such is not occurring only offshore, but in increasingly deepwater locations. Nowhere is this more



true than in South, East, and South East Asia. Indeed, India's recent discovery of US$100 billion dollars-worth of subsea natural gas is indicative of the fact regional powers (China, India, Indonesia, Malaysia, and others) now account for an increasing percentage of overall deepwater capital expenditures. This proportion is forecast to reach almost 10 per cent of the global total over the next four years.

In this context, it is vital to pose key questions such as:

- **How can satellite, and satellite-hybrid, communications solutions help enable the** *digital oilfield***?**
- **How does the solutions vendor community compete to satisfy the efficiency and data risk-management needs of the buyers of** *digital oilfield* **ICT solutions in the E&P environment?**
- **How do we define the applications and communications dynamics of a unique regional oil & gas marketplace, whilst considering precisely how the use of different communications platforms is helped, hindered, and determined by geographically determined supply factors?**
- **What are the key regulatory and licensing issues in the region? What is the potential for spectrum allocation conflicts between terrestrial wireless and satellite solutions?**

Since 2006, **GVF** (in partnership with **UK-EMP**) has produced three widely acclaimed **'Oil & Gas Communications: Middle East & North Africa'** conferences held in Cairo and a highly successful **Oil & Gas Connectivity: Digital Applications & Communications Dynamics** conference in Aberdeen in 2008. The regional expansion into the European oil & gas patch earlier in 2008 will be followed-up in November this year by **Oil & Gas Communications South East Asia: Digital Applications & Communications Dynamics Onshore, Offshore & Deepwater (O&GCSEA)**.

This further expansion into South East Asia is a direct reflection of a complex and highly dynamic interplay of regional supply and demand factors that have created a particularly vibrant regional energy environment characterised by an accelerated exploration for, and production of, new reserves of oil & gas. In addition, the conference has been recognised as an opportunity to tackle the aforementioned questions by private and public sectors. For example, while the details are yet to be finalized, both Petronas and the ITU will be involved in the two-day program over the 18th and 19th November.

To be included in the conference program are such key topics as:

- *digital oilfield resilience and security*
- *investment in advanced communications infrastructures*
- *satellite links for floating production platforms and semi-submersible rigs*
- *SCADA and broadband satellite*
- *commercial applications evolved for the satellite environment*
- *data management remote collaboration and Operational Support Centres*
- *technology hybrids*
- *stabilized and ruggedized antenna technologies*
- *satellite communications in disaster recovery*
- *new training dynamics in oil & gas communications*
- *out-of-band control and monitoring solutions*
- *the regional regulatory environment – will be an examination of the difficulties associated with the sensitivity of certain types of exploration data which, in the case of a number of countries in the region, cannot be sent outside of the certain national jurisdictions. One example of this relates to subsoil data analytics, the procedures and process of which must be accommodated to some countries having banned data "exports" — presumably for reasons of national security.*

Another topic listed in the above agenda for Kuala Lumpur has already entered into the general dialogue surrounding the Oil & Gas Communications conference series, that of the inter-relationship of oil and gas

industry levels and flows of investment in advanced communications infrastructures and the price of a barrel of oil.

Over the last five or sixth months, oil has significantly dropped from near the US$150 per barrel level, but nevertheless, oil companies have, as a result of the high-price period, accumulated significant additional revenues. I had intuitively supposed this meant significantly greater availability of resources for just such increased investment in satellite communications infrastructure. However, intuition can, and does, lead to error. It has been clearly emphasised to me, in my capacity as Chairman of the Oil & Gas Communications conference series, that this is not so, and just as much as ever the oil and gas sector demands efficiency and cost-effectiveness as core features of its expanding satellite communications imperative.

About the author

Martin Jarrold joined the GVF in June If 2001 and was appointed to the position of Chief of International Programme Development. His particular responsibilities include outreach to the member organizations of the GVF and to further develop the profile of the Forum within the satellite communications industry, as well as across the global telecommunications policy and regulatory community.

Prior to joining the GVF, Mr. Jarrold was Commissioning Editor and Head of Research for Space Business International magazine. Mr. Jarrold holds an honors degree in History and Politics from the University of Keele in the United Kingdom.

To learn more about the upcoming Oil & Gas Communications Conference, please select the graphic below.

Executive Spotlight On...

Edward M. Morris, ***NOAA***

By Jeffrey Donald and Hartley Lesser

In January of 2006, Edward Morris was appointed Director, Office of Space Commercialization (OSC), within the U.S. Department of Commerce. His office is reponsible for implementing national space policies and promoting the capabilities of the U.S. commercial space industry, all the while acting as a liaison with the Executive Branch to make certain the U.S. Government maximizes its use of commercially available space goods and services, while avodiing legal and regulatory impediments and does not compete, itself, with the U.S. space industry.

Mr. Morris is also the U.S. Government co-chair of the ***GPS-Galileo Working Group on Trade and Civil Applications***. This group is responsible for addressing non-discrimination and other trade related issues concerning civil satellite-based navigation and timing services and their augmentations. The objective of the working group is to ensure equal access to GPS and Galileo capabilities by worldwide government and industry users. We think the conversation with Mr. Morris is most enlightening for our readers...

SatMagazine

Hi, Edward. Your department is a little known entity within NOAA. Would you please inform us about the mission of OSC...

Edward Morris

The Office of Space Commercialization, or OSC, is part of the **National Oceanic and Atmospheric Administration.** This is the principal unit for space commerce activities within the U.S. Department of Commerce. We work to create conditions for the economic growth and technological advancement of the U.S. commercial space industry.

We consider "space commerce" to be businesses that use the unique medium of space to benefit our economy. Our website is intended to educate the public about the **Commerce Department**'s role in promoting U.S. leadership in space commerce through the Office of Space Commercialization and other Commerce organizations.

The Office focuses on key sectors of the space commerce industry, including satellite navigation, commercial remote sensing, space transportation, and entrepreneurial activities or "New Space." The Office also participates in broad governmental discussions of national space policy and other space-related issues.

SatMagazine

Very interesting... what do you see as the next frontiers for commercial space?

Edward Morris

While the "space age" has been around for about 40 years, it was not until recently that we started to realize the full impact of space on our economy. Today's "next frontier" will be space as a viable commercial enterprise, both from government sources as well as purely commercial ones. OSC works to identify opportunities within the government for space commerce activities and also helps to promote U.S. leadership in the global marketplace.

Government markets include the military's procurement of commercial satellite communications services, national security and civil organization procurement of commercial remote sensing data, homeland security personnel using commercial Geographic Information Services (GIS) products developed from space-related data, civil agency's procuring Earth Observation (EO) and potentially Space Weather data from commercial sources, and a variety of government payloads hosted on commercial satellites. OSC works to ensure that commercial capabilities and services are used within the government to the maximum practical extent, that the government does not itself compete with the space commerce industry, and ensures government assets are available for commercial use.

Commercial markets include telecommunications for voice, video, and data services, user applications such as Google Earth and Yahoo Virtual Earth, satellite radio, GPS user electronics, tourism, commercial public safety devices, and precision farming and construction. OSC works to ensure that the regulatory framework is current and reflects the changing markets, provides public outreach on the benefits of U.S. capabilities, negotiates international agreements for full market access, works within the USG to increase demand for space commerce services to include long-term commitments to attract private capital.

SatMagazine

What are the significant challenges we still have to overcome in the commercial space realm?

Edward Morris

One of the most significant challenges for the commercial market is lowering the costs and the barriers to entry for commercial companies to use space for a particular business venture. Several entrepreneurial firms are currently working to lower the cost of space transportation as well as developing orbital capabilities to accommodate tourism, manufacturing, research, and entertainment.

Government market challenges include a cultural change within the government related to space programs. In the past, the government often directed how a particular program would be conducted. We are moving to a model where government will contract to

receive a particular capability, such as data, and will leave the business approach and technical solution to the commercial entity.

SatMagazine

For those of our readers unaware of this division, what government opportunities exist for commercial firms?

Edward Morris

The U.S. Government has already moved toward a more open acceptance of "capability-based" procurements for some key projects. Examples include the National Geospatial Intelligence Agencies' Clearview and NextView contracts, NASA's Commercial Orbital Transportation System, and the emerging Earth Observation and Space Weather requirements at NOAA and other civil operational agencies.

SatMagazine

Government space programs have typically been focused on the larger industry players. How is it possible for smaller, yet just as crucial, firms to compete for government attention?

Edward Morris

While it is true that larger companies have dominated in the past and will continue to provide expertise and capabilities for large complex projects, opportunities exist today for smaller companies to participate in government markets. With "capability

based" procurements, innovation suddenly becomes a competitive advantage. This is clearly an area where small firms have excelled historically. In addition, as commercial markets continue to mature and increase demand for various products and services, we expect to see more commercial capabilities crossing over into the government markets providing cost-effective, reliable solutions.

SatMagazine
How do commercial companies proceed if they wish to work with OSC as far as processes, forms, and regulations?

Edward Morris
OSC has an open door policy for all companies seeking assistance. We host and participate in a variety of industry forums around the country. Our OSC website is a terrific resource for firms wishing to learn more about the office and to establish a relationship within the government to identify opportunities and contribute to space commerce.

SatMagazine
Jeff, what are some of the latest projects OSC has been involved with?

Edward Morris
The ***Office of Space Commercialization Industry Day***, held earlier this year, identified opportunities for commercial space companies to fulfill key government mission requirements. Officials from NOAA and other civil agencies presented information about specific, validated operational requirements. U.S. companies

were encouraged to submit materials describing commercially available capabilities that could satisfy the government's requirements.

Prior to the Industry Day, a ***Sources Sought / Market Survey Request For Information*** (**RFI**) was issued in December of 2007 to help identify interested parties capable of providing commercial solutions for space-based Earth and space weather observation requirements. The primary areas of interest include the availability of space and resources on commercial manifested satellite missions; commercial satellite systems that complement or meet government earth observing requirements; and potential commercial Earth and space weather observation data buys.

The Industry Day consequently served as the venue for USG representatives to provide presentations on NOAA and other civil agency goals as they relate to Earth observing capabilities, and to present examples of space-based Earth and space weather observation requirements. Several dozen industry attendees participated, representing large, medium, and small firms. NOAA received 22 separate responses to the RFI.

The information gathered through this process will be used to facilitate future government mission and resource allocation planning. As a follow-on activity, NOAA issued a ***Request for Quote*** (**RFQ**) on August 4, 2008, for additional information associated with the RFI and the January 28, 2008 Industry Day, as well as other interested parties.

The Office of Space Commercialization also promotes the interests of commercial GPS users, manufacturers, and service providers. The Office conducts and disseminates economic studies related to GPS and promotes modernization efforts to improve future civilian and commercial capabilities. The Office participates in discussions with other nations to promote international use of GPS and leads discussions with the European Union (EU) on GPS and Galileo trade issues to ensure full and open industry access to all global satellite navigation systems.

The Administration has proposed the ***Space Commerce Act*** to codify several key functions of the office such as promoting U.S. geospatial technologies and providing permanent support to the federal government's national management of GPS.

SatMagazine

Could you discuss the various relationships between the departments within NOAA and OSC that are involved with space and satellite programs?

Edward Morris

OSC works with all the line offices of NOAA as well as the different bureaus of the Department of Commerce on space-related issues and activities. The OSC director reports to the Under Secretary of Commerce for Oceans and Atmosphere and provides direct support to Departmental leadership on all space commerce issues.

SatMagazine

What is your background and how did you come to play this important role within OSC?

Edward Morris

I have always been fascinated by how space continues to capture the imagination of the global community. I was assigned to Cape Canaveral, Florida, as a military launch officer early in my career, where I learned about the history of early manned and unmanned space flight. I have also spent time in the private sector working on new space-related business initiatives with NASA and international customers. This job enables me to use my experience to enhance the ability of US business to provide commercial solutions to government challenges and demonstrate its leadership in the global marketplace.

SatMagazine

Thanks for the informative discussion, Mr. Morris. Hopefully, some of our readers will discuss within their companies their potential contributions to NOAA via OSC.

by Tim Nichols

Astrium designs and manufactures customized satellites and provides services through its own space platforms. A wholly owned subsidiary of the European Aeronautic Defense and Space company (EADS), Astrium has 12,000 employees and state-of-the art facilities in France, Germany, the United Kingdom, Spain, and the Netherlands. Astrium was recently selected to build the European Space Agency's Mercury mission, BepiColombo, and is the single prime contractor for the Ariane 5 launcher.

Being susceptible to economic and political cycles, the aerospace and defense industry has traditionally experienced variable periods of demand. A key objective for Astrium, who provides complete end-to-end tailored satellite solutions, is to balance the company's workload by providing manufacturing services to external suppliers as well as to its in-house design departments.

To be competitive in an external market, Astrium's ***Payload Equipment Manufacturing Department*** had to cut the cost and time of manufacturing components and assemblies. Playing a key role in this effort is ***Tecnomatix***® software from **Siemens PLM Software**.

Taking control of manufacturing

"We looked at our actual process and decided to target non-value-added activities," says *Jonathan Roe*, MES project manager, ***Equipment and Subsystems Division***, Astrium. The main issue was manufacturing was a paper-based process. Historically speaking, paperwork associated with a product is regarded as a deliverable.

Customers expected documentation as well as the actual product. As with any reliance on paper, inaccurate or missing documents can result in errors, taking time to resolve.

"We began a review of how we operate the manufacturing facility, organize our teams and manage resources," says Roe. "As testing takes place continuously — we have a 24-hour facility — our focus was on how to meet the needs of external customers by using our people and resources more efficiently." It became clear that if an electronic process replaced paper, manufacturing time could be drastically reduced. The company set itself the aim of cutting the average lead-time in half.

Selecting the best system

"We initially thought we might just extend our existing enterprise resource planning system," Roe explains. "But after looking at the different options, we decided that we needed a manufacturing execution system. We looked at 10 to 12 suppliers and three firms made the shortlist. We selected Tecnomatix based on ease of use, cost, and compatibility with our existing infrastructure. Siemens has a strong heritage within Astrium and this was a reassurance. The first phase of implementation began in September 2006 and was completed in March 2007.

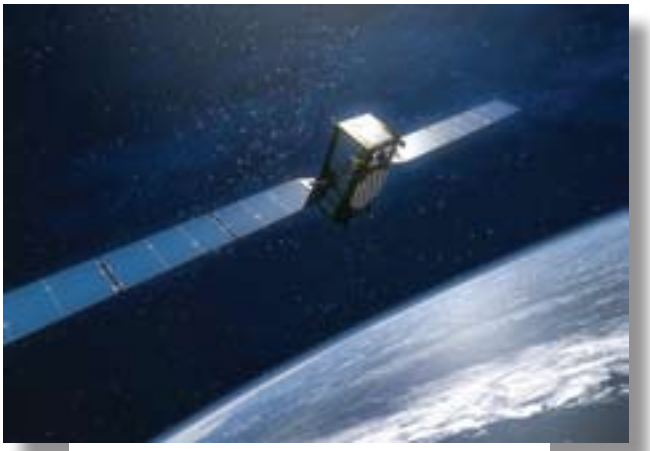
"It was quite challenging," admits Roe. "We were not only introducing new software to track all aspects of manufacturing, we were completely changing the way the department operated." As a result, Roe was responsible for organizing awareness events and technology training workshops. The second phase of implementation, which delivered additional features, was completed by early 2008.

Lead-time and cost reductions

The most important result for Astrium is a clear reduction in lead times. As Roe explains, "Tecnomatix gives us a complete and accurate picture of the manufacturing process with clear visibility on lead and queue times. A project for one customer might involve 300 to 400 separate orders. These can be managed down to individual serial-number level, which means that we can see exactly where any bottlenecks occur and take action."

Tecnomatix captures every stage of the manufacturing process and workflow. It is therefore easy to check on equipment and tools, keep control of inventory and consumables, track any defects and communicate with other departments. Tecnomatix defines processes, optimizes procedures, verifies compliance with standards, and manages data and measures costs. "As an indirect benefit, quality has definitely increased. We have already seen an increase in our pass rate at inspection points," Roe adds.

There has also been a reduction in the time taken to incorporate engineering change requests from the designers or customers, once manufacturing gets underway. "It is taking at least 60 percent less time to incorporate changes," says Roe.



"This is really significant for us. We manufacture specialized designs and on occasion, we have to incorporate engineering changes during the manufacturing process. We are dealing with components that are very expensive and cannot afford to scrap them unless they fail."

Another benefit is greater continuity and cooperation among the teams within the manufacturing facility. "They can quickly and easily see what has been going on since their last shift and access work instructions," notes Roe.

Administrative time has dropped by 60 percent as there are no physical documents to print, organize, and collate. This has freed up 10 percent extra time for planners and manufacturing engineers who can now focus on their core activities and on refining the manufacturing process even more.

Astrium is also seeing a huge savings on the expensive paper – £20/US$40 per ream — required to meet clean room standards. Manufacturing now only uses one or two sheets for every 100 that would have been used previously. A typical order would have generated 80 sheets that would ultimately have been thrown away. Expenditure on this paper has gone down from £15,000 to £2,000 (US $30,000 to US $4,000) per year. "We have a much better working environment with no more clutter," Roe adds. "The area is tidier and more pleasant to work in."

According to Roe, Astrium has already realized major benefits from its use of Tecnomatix and there are more to come. "We have increased our capacity to take in more work because we can provide quicker turnaround and we have used this gain to improve the competitiveness of our bids," Roe says. "With our prices and schedules going down, our bids have been more attractive and the company has won additional work in the past few months from the growing export market."

About the author

Tim Nichols is the Managing Director, Global Aerospace & Defense Marketing for Siemens PLM Software. He is responsible for coordinating the efforts of a worldwide cross-functional group dedicated to the Global Aerospace & Defense Industry, including commercial and general aviation, defense and space systems, as well as shipbuilding and related government agencies across the world. Nichols has more than 30 years of experience in aerospace and defense with several major A&D Original Equipment Manufacturers (OEMs) spanning product management, marketing, new business development and business general management, including nine years of active duty with the U.S. Navy. He is a graduate of the U.S. Naval Academy and also holds two graduate engineering degrees from the Massachusetts Institute of Technology in Cambridge, Massachusetts.

by Guy Nayum

The widespread of the Internet, and the ever increasing demand by end users to be connected, every-time and every-where, is slowly but surely penetrating into the mobile satellite communication (Satcom) world in the Air, Train and Ground platforms, but especially in Marine applications. Moreover, in today's modern digital communication environment, broadband connectivity at low affordable cost is no longer a ''wish'' but rather a ''demand''.

The **Marine Satcom** market has developed faster than the Air and Ground applications because the Trip Duration at sea is typically significantly longer than that of the Air or land trip duration, with the demand for the marine market for this service much greater. In addition, the early implementation of Mobile Satcom solution called for larger antennas that were able to comply with the basic standards and satellite regulations that existed then, applicable only for larger vessels (such as Oil Rigs, Tankers, Ferries, and so on) that are typical for the Marine world.

This market demand — and the obvious business opportunity — pushes the Mobile Satcom Antenna vendors to develop systems that are smaller in size. These are antennas able to fit onto smaller vessels. This enlarges the potential market to more vessels of smaller and smaller sizes. In the past few years, several small sized Ku-band antennas have become available at relatively low cost, opening a "broadband channel" to smaller sized vessels that can now enjoy always-on Internet connectivity at reasonable prices.

Nevertheless, the technical design of smaller Ku-band antenna systems is challenging. The need to comply with the regulation requirements of the satellite operators can result in higher operational costs and lower cost/performance ratio. As of this writing, low attention is paid to the importance of type approval of Mobile Satcom Systems; however, as the technology grows and the number of Mobile Satcom Systems increases, the need for type-approval and regulation compliance will become a necessity.

Why is regulation needed?

Geostationary satellites maintain their fixed relative positioning in space by moving along a specific orbit and hold a zero-sum force vector at all time. Geostationary positioning becomes possible at a predefined height of 35,680 km (22,170 mi), a predefined speed of 3.07 km/s (1.91 mi/s), and in an orbit that is directly above (parallel to) the earth's equator.

As the demand for communication increases and more and more satellites are being placed in the geostationary orbit, it becomes very "crowded in space" and the satellites end up being positioned closer and closer to each other. This physical proximity between adjacent satellites — currently standing at typical values of around 2 degrees — requires transmitting earth stations to limit their EIRP per bandwidth toward the adjacent satellites.

As of today, most satellite regulation requirements are aimed for fixed earth station's VSATs, where there are usually no dimensional restrictions. This is not the case for mobile satcom application where there is "a conflict of interest" between the need of the market to reduce the size of the antenna and the regulation requirement to avoid adjacent satellite interferences.

Consequently, most vendors of earth mobile stations avoid the submission of their earth station mobile antenna systems for type approval. They are settling down to obtaining individual approvals, per system and its geographical location, as they are installed. This is an inefficient

"…. In addition to the need for formal compliance with the regulation requirements, an antenna with better performance (low side-lobe levels) will be beneficial to the service provider, and in certain cases it will avoid the use of Spread Spectrum technology that uses a much larger bandwidth at higher cost to the service provider. ."

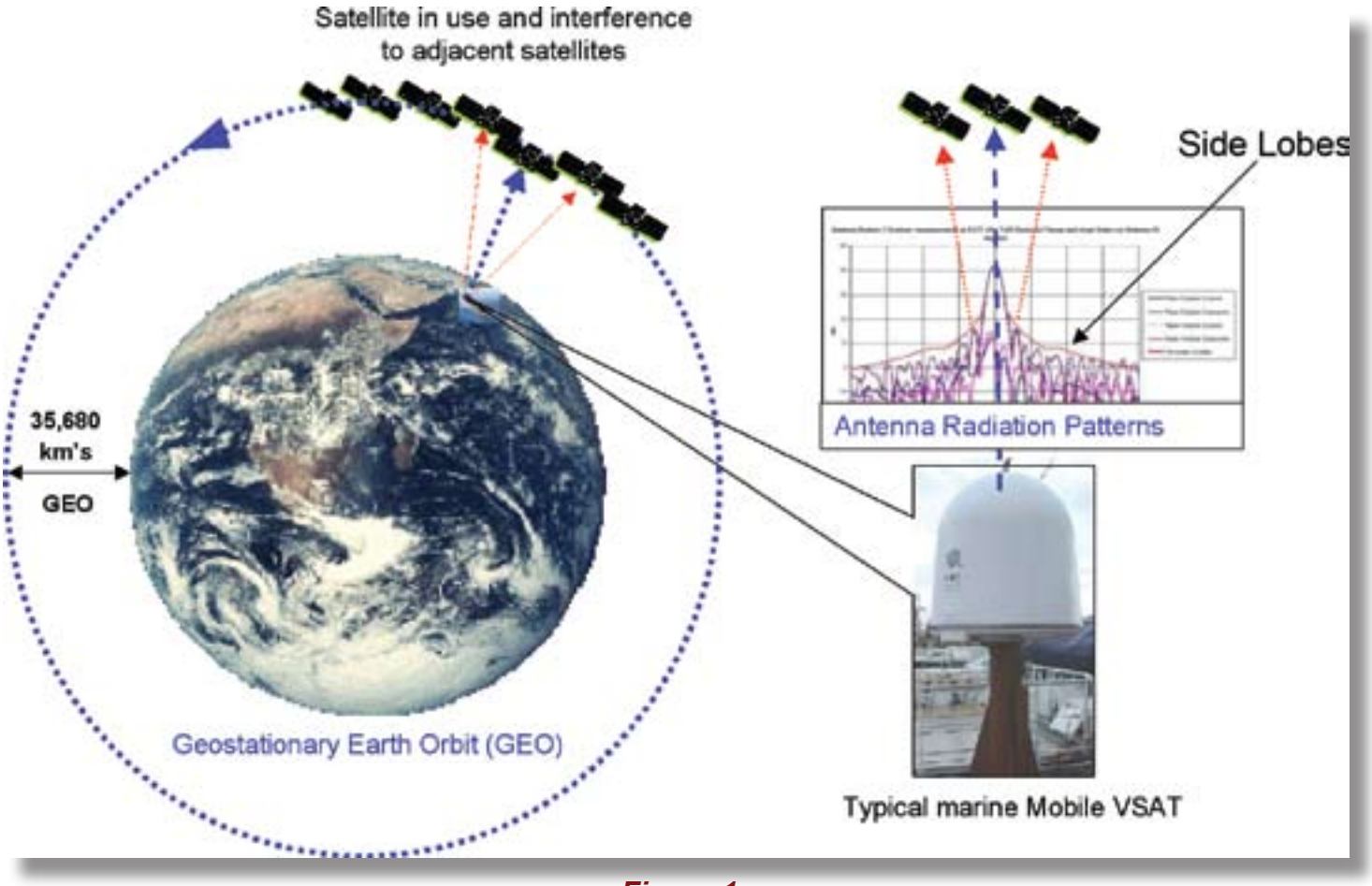


Figure 1
Crowded Geostationary Orbital Slots

administrative procedure, which is performed over and over again in each installation.

The ability to meet the satellite regulation while keeping the dimension of the systems as small as possible is the main differentiator between today's existing mobile satcom solutions. These differences between solutions are the main reasons as to why some systems are capable of obtaining the Type Approval while others fail. The results relate to the antenna size, the quality of the RF system, and the production repeatability capability of the system.

Also to take into account is the dynamic and tracking performance capabilities, with the provision of Cease Tx function (the ability of the system to stop its own transmission within 100 msec when tracking inaccuracy exceeding 0.5 degrees (as required by the FCC and ETSI).

In addition to the need for formal compliance with the regulation requirements, an antenna with better performance (low side-lobe levels) will be beneficial to the service provider and, in certain cases, it will avoid the use of Spread Spectrum technology that uses a much larger bandwidth at higher cost to the service provider.

The Satcom Regulation Status

The Satellite Communication — both for Fixed and Mobile earth stations — is governed by a three level spectrum management structure (see ***Figure 2*** on ***Page 57***)...

International Telecommunication Union (ITU) — defines and recommend the envelope limitations under which transmissions of ships the aircrafts and trains could be operated with GEO satellites worldwide.

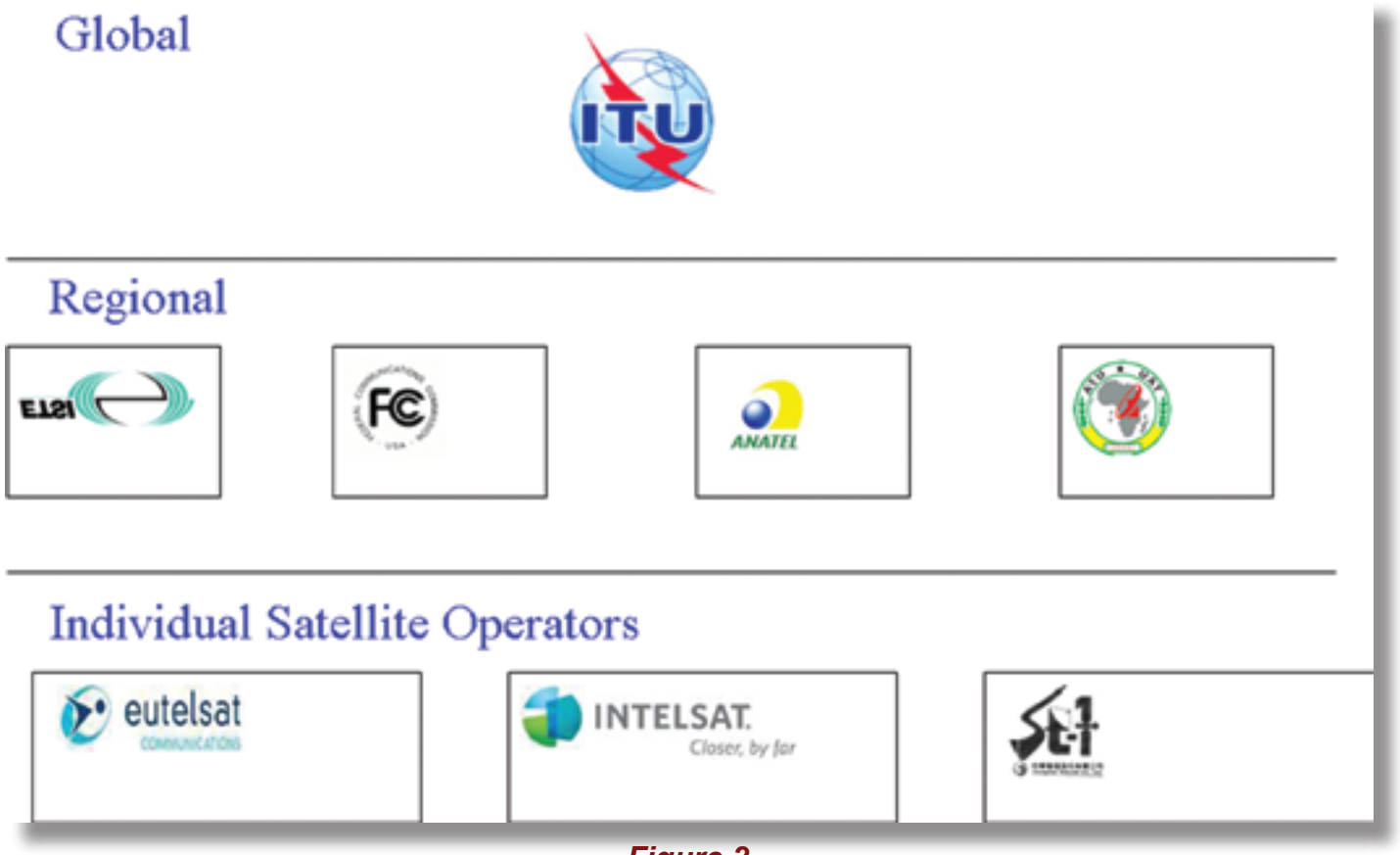


Figure 2
The Regulation Structure

Regional regulatory organizations: **ETSI** for Europe, **FCC** for North America, **Anatel** for Brazil and others, derive their own standards and regulations based on the ITU recommendations.

Satellite operators — Primarily concerned about the EIRP/Bandwidth as a function of the offset angle from beam center (**EIRP/BW**) and, about ***Cross Polarization Discrimination*** (**XPD**) at beam center, which is of practical importance for preventing interference to adjacent satellites and to their own satellites by XPD.

The Various Satellite Regulation Standards

Depending on the Authority (region) and type of Mobile Satcom System (Vessel, Train, Air), a relevant standard should be applied — starting on ***Page 59*** and continuing on ***Page 60*** are typical, useful standards:

ETSI

- **Earth Station Vessels (ESV)**

ETSI EN 301 447 V1.1.1. (2007-08)

Harmonized European Standard (Telecommunications series

**Satellite Earth Stations and Systems (SES);
Harmonized EN for satellite Earth Stations on board
Vessels (ESVs) operating in the 4/6 GHz frequency bands
allocated to the Fixed Satellite Service (FSS)
covering essential requirements of article 3.2 of the R&TTE directive**

- **Earth Station Train (EST)**

ETSI EN 302 448 V1.1.1. (2007-12)

Harmonized European Standard (Telecommunications series

**Satellite Earth Stations and Systems (SES);
Harmonized EN for tracking Earth Stations on Trains (ESTs)
operating in the 14/12 GHz frequency bands
covering essential requirements
under article 3.2 of the R&TTE directive**

- **FCC**

Federal Communications Commission — FCC 04-286

§ 25.221 Blanket Licensing provisions for Earth Stations on Vessels (ESV) receiving in the 3700-4200 MHz (space-to-Earth) frequency band and transmitting in the 5925-6425 MHz (Earth-to-space) frequency band, operating with Geostation Satellites in the Fixed-Sattelite Service.

Sec. 25.22 Blanket Licensing provisions for Earth-Stations on Vessels (ESVs) receiving in the 10.95-11.2 GHz (space-to-Earth), 11.45-11.7 GHz (space-to Earth), 11.7-12.2 GHz (space-to-Earth) frequency bands and transmitting in the 14.0-14.5 GHz (Earth-to-space) frequency band, operating with Geostationary Satellites in the Fixed-Satellite Service.

- **WRC-03**

RESOLUTION [COM4/20] (WRC-03)
Provisions relating to earth stations located on board vessels which operates in fixed-satellite service networks in the uplink bands 5925-6425 MHz and 14-14.5 GHz

- **EUTELSAT**

EARTH STATION MINIMUM TECHNICAL and OPERATION REQUIREMENTS STANDARD M EESS 502 ISSUE 11-Rev.0

- **INTELSAT**

INTELSAT EARTH STATION STANDARDS (IESS)
Document IESS-601 (Rev. 12)

STANDARD G
PERFORMANCE CHARACTERISTICS FOR EARTH STATIONS ACCESSING THE INTELSAT SPACE SEGMENT FOR INTERNATIONAL AND DOMESTIC SERVICES NOT COVERED BY OTHER EARTH STATION STANDARDS (6/4, 14/11 and 14/12 GHz)

- **ANATEL**

ADDENDUM TO RESOLUTION No 364, APRIL, 29TH, 2004 — NORMS TO CERTIFICATION AND HOMOLOGATION OF EARTH STATIONS ANTENNAS

Conclusion/Summary

In the Mobile Satcom Applications, there is "a conflict of interest" between the market demand for reduced size antenna and the regulation requirement to avoid adjacent satellite interferences.

The ability to meet the Satellite Regulation while keeping the dimension of the systems as small as possible is the main differentiator between today's existing mobile Satcom solutions/manufacturers.

In addition to the need for formal compliance with the regulation requirements, an antenna with better performance (low side-lobe levels while keeping the cross polarization requirement) will be beneficial to the service provider, and in certain cases it will avoid the use of Spread Spectrum technology that utilizes a much larger bandwidth at higher cost to the service provider.

The future need for Mobile Satcom Regulations is clear and, soon no Mobile Satcom System will be allowed to operate without a clear cut approval from local and regional authorities. Most equipment vendors are already taking into their design consideration the requirements that forcing their systems to operate within the imposed regulatory limitations.

There is a real and immediate need that the Satellite Operators will adapt too their requirements to fit the new huge demand for small/compact Mobile Satcom Systems by updating their "Type Approvals" requirements.

This update should be only for the On-Axis Gain Envelope (side-lobes). Co-polar and cross-polar EIRP per Bandwidth Densities (limitation of the spectral density interference to adjacent satellites and cross polarization interferences)

About the author

Guy Nayum is the V.P of Satcom Systems and R&D Programs. Mr. Naym joined the company in 1969. Over the years Mr. Naym has gained a worldwide reputation as a technology pioneer in the field of Antenna Tracking / Stabilized Systems & Mobile Satcom, and was the originator of many technical and patented solutions that added to the technical know-how of the company. He leads several developments that involve the establishment of domestic and International cross-functional consortiums in the field of Mobile Satcom. Recently, he served as one of the leaders in the development/design of the "OrSat" marine system and led the activities to obtain "Eutelsat", "Intelsat", "Anatel" Type Approvals for the "OrSat" system. Mr. Naym holds a degree in PE Electronics as well as an M.B.A.

Executive Spotlight On...

David Justin
Chief Executive Officer, ***GlobeCast Asia***

In April of 2006, David Justin was asked to take the reigns as the CEO of GlobeCast Asia. Based in Singapore, he manages all of the company's operations in Asia. These include a master control center and the access to teleport facilities in SingaporeHe was the Senior Vice President of Engineering for the company back in 2002, and most recently, he was the Senior Vice President of Marketing and Product Development at GlobeCast Europe. During his time with France Telecom Long Distance, David headed up the business unit that was in charge of providing services to satellite operators. He was then responsible for the four Telecom 2 satellite operations and was involved in all new satellite network or service programs. We were delighted to find David available for a quick discussion regarding his Asia-Pacific operations.

SatMagazine

Thanks for talking with us, Mr. Justin... would you please tell us about your own background and how you came to join GlobeCast Asia?

David Justin

I've been in the aerospace, satellite services and broadcast industries for 17 years with engineering and operations, business development and marketing positions in companies that include Aerospatiale, France Telecom, and Stellat. I joined GlobeCast in 2002, heading up the marketing and development team. GlobeCast is an international company that provides opportunities in numerous different markets around the world. Asia is among the most interesting of these markets, and I was very pleased to accept this position.

SatMagazine

David, would you tell us about GlobeCast Asia? How did the company became connected with France Telecom? Where does Asia fit in with GlobeCast's international business plan?

David Justin

GlobeCast is a full subsidiary of France Telecom. GlobeCast Asia opened its Singapore headquarters in 1997 and there are offices in New Delhi, Seoul, Beijing and, after the recent acquisition of PCM, Hong Kong. In total, we employ approximately 60 staff across our Asia operation. Asia is GlobeCast's fastest growing region: in the last three years, our revenue has more than doubled and the potential in this market is huge. GlobeCast offers content management and delivery services from anywhere in the world to anywhere in the world; having a strong presence and expertise in the Asian market allows us to offer international broadcasters and content owners solutions to reach audiences in Asia, to accompany Asian clients in their international expansion, and to cover sports and news events which take place within the region.

SatMagazine

You announced in June that you are acquiring Pacific Century Matrix in Hong Kong. Could you tell us about the thinking behind the acquisition? Which new markets will it open up for GlobeCast and are there any new services on offer?

David Justin

As a result of the acquisition of PCM, we have an additional teleport facility, an extended fiber connectivity network and increased local expertise. Through this, we have increased our capability to offer international broadcasters solutions to distribute and monetize their content in Asia.

PCM's pan-Asian cable distribution satellite solutions (with MEASAT-3 and ASIASAT-3S) complement GlobeCast's Telstar-10 platform. With this extensive portfolio of technical solutions, any TV channel wanting to expand in Asia can be offered a solution tailored to cost effectively reach its target audience.

As Hong Kong and Singapore are international media hubs, it is highly beneficial for us to have a presence in these markets and PCM has allowed us to achieve that goal.

SatMagazine
Please describe your company's satellite access and teleport operations.

David Justin
Globally, GlobeCast operates a network of global satellite and fiberlinks to manage and transport 10 million hours of video and other rich media each year. The Company leverages its worldwide ground and space segment assets (all company owned and operated) to power the distribution of diverse content across multiple markets. These markets include full-time and ad-hoc content, IPTV, mobile TV, broadband TV, digital signage, and corporate television.

GlobeCast Asia operates distribution platforms over multiple satellites across Asia, including Multiple-Channel-Per-Carrier (MCPC) satellite platforms Telstar-10, ASIASAT-3S, and MEASAT-3. From its technical hubs in Singapore and Hong Kong, access to a global network of fiber, 11 teleports, and technical operations centers can be provided — extremely diverse satellite capacity. The Singapore facility is also host to a state-of-the-art media management and playout facility for broadcasters looking to outsource their channel management needs.

SatMagazine
There's a new playout centre in Singapore— why was it deemed necessary to make this investment at this time?

David Justin
For starters, the demand for a greater choice of TV channels is rapidly growing throughout Asia, thanks to the increasingly middle-class population and the launch of new distribution networks (such as DTH in India or IPTV in Hong Kong, Singapore, and Korea).

At the same time, technology continues to evolve. To name a few, HDTV, IPTV, mobile TV, MPEG4, and tapeless workflow have launched in the last few years. For our broadcast customers, this means a wealth of new opportunities, but also added technical complexity.

Furthermore, Asian markets have specific requirements such as dubbing, subtitling, and content editing, to meet local preferences and regulations. For already established broadcasters in the region, the technological changes require extensive CAPEX to maintain the pace. For new broadcasters, the complexity of the market requires dedicated feeds.

The timing was right for GlobeCast Asia to offer state of the art Digital Media Management services to provide broadcasters with an array of value added solutions. The goal was to simplify their tasks of customizing their channels to the local requirements and to take advantage of the latest technologies, all under high level Service Level Agreements. Our media management and playout centers in Europe and the U.S. have been successful and the same is expected from our new Singapore center.

SatMagazine
What are the reasons behind GlobeCast Asia's recent growth?

David Justin
We've seen that the demand for more diverse TV channels is strong in Asia. Furthermore, globalization of the economy and the increasing Asian role has spurred the development of new international news channels wanting distribution in Asia, as well as Asian channels looking for worldwide distribution. With more than 10 years experience in Asia, our strong local presence and expertise — and the power of GlobeCast worldwide — has allowed us to tap into this growth. This has provided the Company with strong organic growth, but we are now at a level where it is appropriate for us to expand through acquisitions. This expansion and the increase in our service offerings also allow us to better position ourselves to serve the Asian media market.

SatMagazine
How has GlobeCast Asia's business changed in the last year? What are the company's core Asian competencies?

David Justin

The last year has seen exciting changes as many strategic developments which had been initiated some two years ago have come into fruition:

Facility and service expansion through the acquisition of PCM in Hong Kong — Launch of Media Management and playout services in Singapore — Launch of a consultancy service in India to help international channels obtain the downlink licence and negotiate carriage deals on local cable or DTH — Successful brokerage between Asian channels and IPTV operators in Europe and USA.

The last year has also seen GlobeCast Asia take an increasingly leading role in providing Sports Rights Holders services to cover the increasing number of large events taking place in Asia: the Beijing Games and IPL cricket in India, to name but two.

Being an independent service provider, the best solution for the customer can be built. Also, we have local presence and knowledge of each Asian market. Our staff is diverse and multilingual and they understand the local markets. Coupled with our international connectivity and the technical expertise of a worldwide group, this gives us a real competitive advantage.

SatMagazine

Companies in our industry constantly face new challenges — what have been some of the most interesting challenges for GlobeCast Asia over the past few years, and how were they overcome? How does GlobeCast maintain core employee loyalty and ensure a competent workforce?

David Justin

In this business, the risk of outages occurring is quite high, especially due to the occurrence of natural disasters in this region. In this highly dynamic and competitive environment, the challenge is to provide the best and most effective means to solve a problem and ensure smooth broadcast delivery. Because we have an exceedingly diverse network in terms of coverage and technology, there are backup solutions and redundancies to ensure customers remain on air to the maximum degree. This is a highly service-oriented environment. We focus on building relationships and maintaining a high level of professionalism in dealings with our clients and business partners.

Our colleagues come from various backgrounds — this provides an interesting mix of experience and work culture. Our Asian offices communicate regularly with one another and counterparts in our global offices. Having a close relationship with teams across our international business is key to our success.

SatMagazine

During the upcoming year, what are the major challenges and opportunities for the company in the Asian market? What are the major strategic opportunities for GlobeCast Asia, and what do you forecast for the entire industry?

David Justin

On the content side, the industry will see more channels being launched, especially from large U.S. and European broadcasters to cater to a specific geographic market in Asia or a niche audience, and from the ever-vibrant Indian media industry. The upgrade to HD is also on the top of the agenda for new and established broadcasters.

On the network side, several new satellite operators will launch their first satellites. That said, if we see a repeat of the European model, eventually there will besome consolidation as economic efficiency wins out over national pride.

One key opportunity for us rests in the ability to help our clients navigate the regulations in different Asian countries, as this is the one area where most Asian countries are more conservative than the U.S. or Europe. This is true at all levels of the broadcast chain, from content to foreign direct investments in media or infrastructure, as well as independent media/telecom regulatory authorities and effective anti-piracy schemes

SatMagazine

Thanks for your insights, David. We appreciate your time and information.

by Fred McClimans, **DTECH LABS, Inc.**

The Client

As a provider of secure mobile communications systems to the U.S. Government and military, we often encounter operational requirements that go beyond the norm of traditional COTS (commercial-off-the-shelf) solutions. In this particular case study, DTECH LABS was tasked by a particular organization to evaluate both their existing deployed COTS (in a rack) system and their communications requirements with a goal to develop a more tightly integrated, and better performing, communications package. The package would be required to meet their unique, operational needs for secure voice and data over varied, and somewhat unreliable, satellite communications networks. Their primary problem involved the inability to establish and maintain multiple Secure Calls across unreliable and/or variable satellite networks. One of the customer's major concerns was the ability to increase the number of Secure Calls over low-bandwidth (*i.e.*, 64 –128 kbps) satellite links. Of secondary concern was the ability to increase support for growing data and video applications.

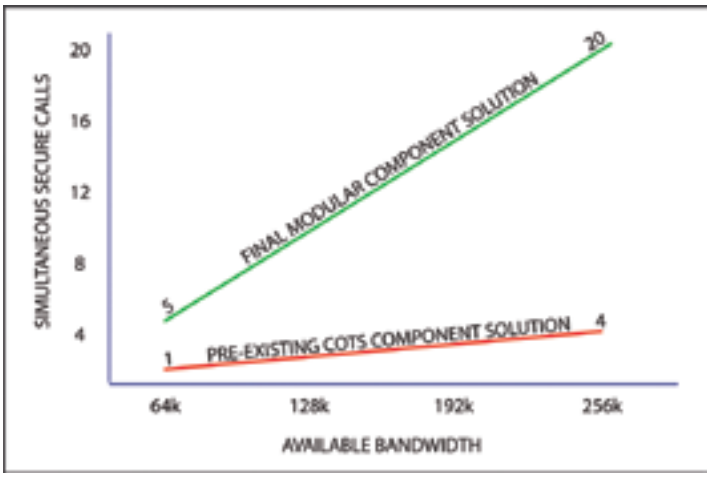
The Challenge

There were several operational challenges the customer faced during the course of their normal operations:

Limited bandwidth — The bandwidth available to the customer, predominantly IP or IP over ISDN-based, was typically limited to anywhere from 64 kbps to 512 kbps, with the higher speeds being the exception, rather than the norm.

Unreliable bandwidth — Given the nature of the satellite equipment in use, ranging from GAN to BGAN to the occasional VSAT system, and the global nature of their deployment, consistent bandwidth could not be counted on - even in situations where a fixed-bandwidth link could be established, the quality and consistency of the bandwidth was often unreliable.

Diverse operational environments — The customer had a fairly demanding set of deployment scenarios. They included the ability to establish secure voice, data, and video in a wide range of geographic environments and mobile transportation systems (*i.e.*, fixed location, vehicular transport, and airframe platforms).



Unreliable power availability — Given the nature of their mobile operations, wide-range power input was absolutely necessary. While emergency/generator power for satellite systems was typically available, standard AC and/or DC filtered power for mobile communications systems (especially in vehicles or airframe platforms) would not always be 100 percent available.

Expansion/sizing requirements — The system had to be designed in such a way as to provide support for a variety of users, ranging from small teams of one to two individuals to as many as 18-24 members of a larger travel team.

Fixed Parameters

As with most challenges, many times existing operational conditions must be taken into account for the ultimate solution. In this particular case, there were several fixed constraints:

- *the proposed communications solution must be man-carry and configurable to meet standard airline carry-on size and weight limitations,*
- *the existing infrastructure of Secure Phones (primarily STU and SCIP devices) must be supported in the system, and*
- *No changes to the satellite system (typically GAN or BGAN), including both modem and dish/terminal technologies, would be allowed.*

PHASE I of the task would involve establishing an op-

erational system to meet the core customer requirements. Expected refinement would take place "post-deployment" in **Phase II**.

PHASE I

Developing a "Semi-Custom" COTS Solution

After evaluating several different commercially available technologies and packaging options, it was determined that some incremental improvement over the existing deployed system could be met with alternative and additional COTS products. However, such a system would not be feasible from a practical perspective due to the size, weight, and complexity of the system (even reducing the footprint of their rack-mount system or integrating the COTS components into a smaller transit case would not meet their mobility requirements).

It was quickly agreed that a semi-custom solution (that would become COTS) would need to be developed to meet the operational and physical size and weight requirements of the customer. Several different design options were considered before the customer finally agreed that a modular approach would be the most viable. This allowed for best of breed COTS equipment to be integrated into a highly-modular system, as well as custom and semi-custom developed components that would enable future upgrades and accommodate changes to the customer's operations requirements.

To achieve this level of modularity, a split RED/BLACK chassis-based approach was selected. This required the repackaging of COTS products into universal modules for implementation as required by the client to meet the individual requirements of specific missions. The following modules were developed as "core components" of this system...

CISCO Mobile Access Routing Module — A core module providing full **CISCO IOS** and **Call Manager** support for voice/VoIP applications, as well as to serve as the prime routing interface into the customer's secure network.

DTECH LABS WHISPER Secure Voice and VoIP Optimization Module — A module that would support the direct connection of *Secure Call* devices (**STU/STE/SCIP**) with a level of call optimization that would increase the number of Secure Calls permitted over very low bandwidth links. The WHISPER also provided an added benefit of enhanced *Secure Call Relay* (through software licensed from Network Equipment Technologies, Inc.), which allowed for temporary network outages of up to 10 seconds or statistically poor periods of network performance, without the dropping of Secure Calls. This was critical, as most Secure Calls, which can take up to a minute to establish, tend to drop when even minor packet drop rates occur, a common occurrence over satellite links.

Wide-Range AC and DC Power Input Module — The module was designed to accommodate varying power sources in the field.

Encryption Support Module (Power/Interface) — A module allowing for the powering of external encryption devices by the main system, as well as providing for the connection of separate *RED* from *BLACK* chassis modules via standard LAN connection within the system.

PHASE I Results

The testing of the PHASE I prototype product was successful in meeting the core requirements established by the customer. However, as a result of testing, several additional "enhancements" were requested by the customer.

The first enhancement included the ability to operate entirely independent of the wired power grid. This was requested in order to allow emergency communications where adequate power was not available, such as within certain vehicles or while located in temporary facilities, such as an airport hanger between flights. To address this issue, an embedded UPS module was designed to power the complete system for as long as several hours. The power system was also designed to help support encryption and GAN/BGAN terminals

that may be integrated along with the mobile communications system.

The second enhancement involved the expansion of the requirement for pure VoIP calls across the network. VoIP calls tend to be transported across the network in extremely small packets, and can quickly overwhelm many satellite modems in terms of packet-per-second performance. This was an easy accommodation as the WHISPER provides for an advanced packet-aggregation feature for VoIP calls, greatly reducing the bandwidth and number of packets required to support large numbers of VoIP calls across a low-bandwidth satellite network. The only physical change required was the development of an expanded Power over Ethernet module to accommodate additional VoIP phones

PHASE II

Ongoing System Refinements and XipLink integration

With the final testing and acceptance completed on the unit, several additional features were discussed with the client, including ergonomic enhancements that would improve the operational capabilities of the system and improvements to the overall "data" performance of the system. The determination was made that we needed to find a means to offer advanced IP acceleration that worked at the base packet level. The enhancement also had to be able to differentiate between applications and allow the customer to improve services for various applications (voice, data, video, and so on), based on real-time operational demands.

To accomplish this, XipIlnk Wireless Optimization engine is presently being integrated directly into a new module for inclusion in the system. The benefits included real-time optimization for secure encrypted voice, which has now been combined with techniques for TCP protocol acceleration and advanced data compression. This further increases the use of available capacity over satellite links. This module is currently in final integration testing and will become one of the standard COTS modules for the system. Included will be a low-power CPU running the XipLink integrated system that will operate as a converged satellite voice and data platform, prioritizing voice calls and optimizing the remaining satellite bandwidth for data.

Conclusion

While the initial requirement presented seemed fairly straight forward, it was apparent from the start that a standard COTS integration might not meet the stringent operational challenges of the customer. This proved to be the case. A modular system that could be fielded on a mass scale was developed as a new product.

Individual COTS components, where available, were modified to fit within a standardized modular chassis. Essentially, a new COTS system was created from a combination of in-house developed product and the integration of board-level, commercially-available components. The original set of requirements also expanded as design, prototype and field-trials were completed. The resulting product, which has now been deployed as a single, self-powered, man-carry system, is currently being fielded in several configurations, operating in stand-alone, vehicular, and airframe deployments.

The key to success of this project, and the quick turn time (less than three months, from concept to full deployment) was in working closely with the customer. The high-level end users as well as the supporting travel team personnel responsible for the operations and maintenance of the system were all included in what is best described as a superb team effort.

About the author

Fred is the Chief Information Officer of DTECH LABS, Inc., a Sterling, VA-based provider of secure mobile communications systems. red has been active in the networking and IT industry for over 25 years, most recently as the CEO of Current Analysis, a competitive intelligence firm covering the Network, Communications and IT market sectors for technology and investment professionals. Prior to that, he was involved in developing Advanced Product and Marketing strategies at Newbridge Networks (now part of Alcatel), served as a Program Manager at industry research firm Gartner Group, and was a Manager in the IT Consulting Practice of Ernst & Young. Fred published his first book on physical networking infrastructure in 1992 and has served as an editorial contributor to Network World Magazine. He can be reached at 703-609-3733 or fmcclimans@dtechlabs.com.

The Integrating Factor

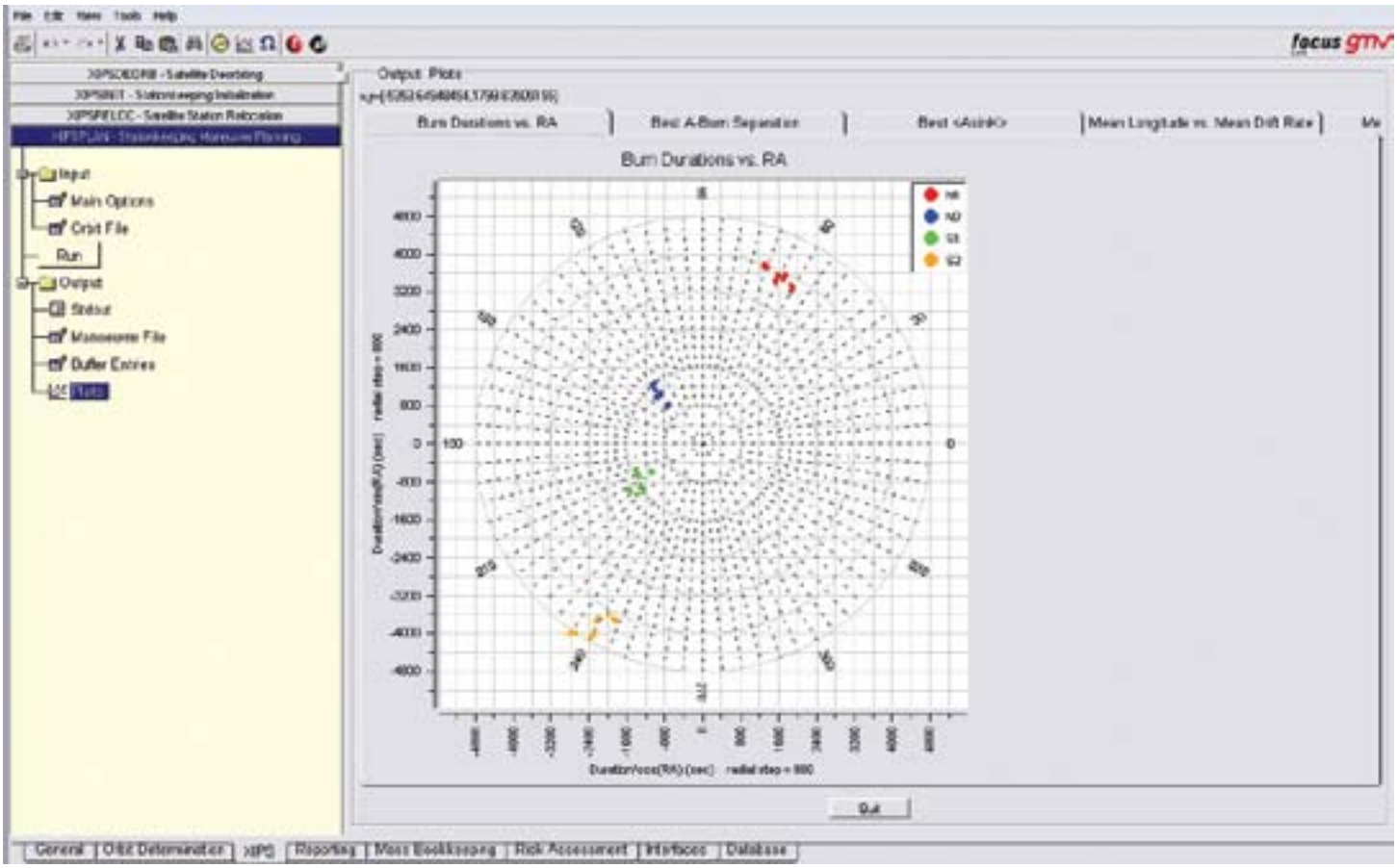
by Marci Paskowitz Possner

Following Intelsat's acquisition of PanAmSat in 2006, Intelsat desired to consolidate operations of both companies' satellites using the Intelsat Flight Dynamics System (FDS). As part of the Intelsat integration project, GMV and Intelsat worked together to develop portions of the necessary software modules into FDS to support the flight dynamics operations of Boeing 702 satellites.

Task—In its design of the modules for this custom software project, **Intelsat** and **GMV** sought to create a solution that would go above and beyond the original Boeing requirements by adding flexibility for users of the software. Specifically, the users are given as much control as possible in the computation of the maneuver plans and reconstruction.

GMV also planned to add the developed modules to ***focusSuite***, the Company's ***Flight Dynamics Software***. focusSuite is an advanced, off-the-shelf, multi-mission, multi-satellite flight dynamics solution for flight dynamics satellite control. The program provides a generic framework that allows further product development and evolution, including the ability to integrate external applications with ease. Productivity, system usability, accessibility and stability are dramatically boosted, thanks to an open framework, With an enhanced focusSuite, GMV would become one of only two suppliers capable of supporting ***Boeing 702*** satellites.

Challenges—The Boeing 702 satellite is one of the most complex geostationary (GEO) satellites, in terms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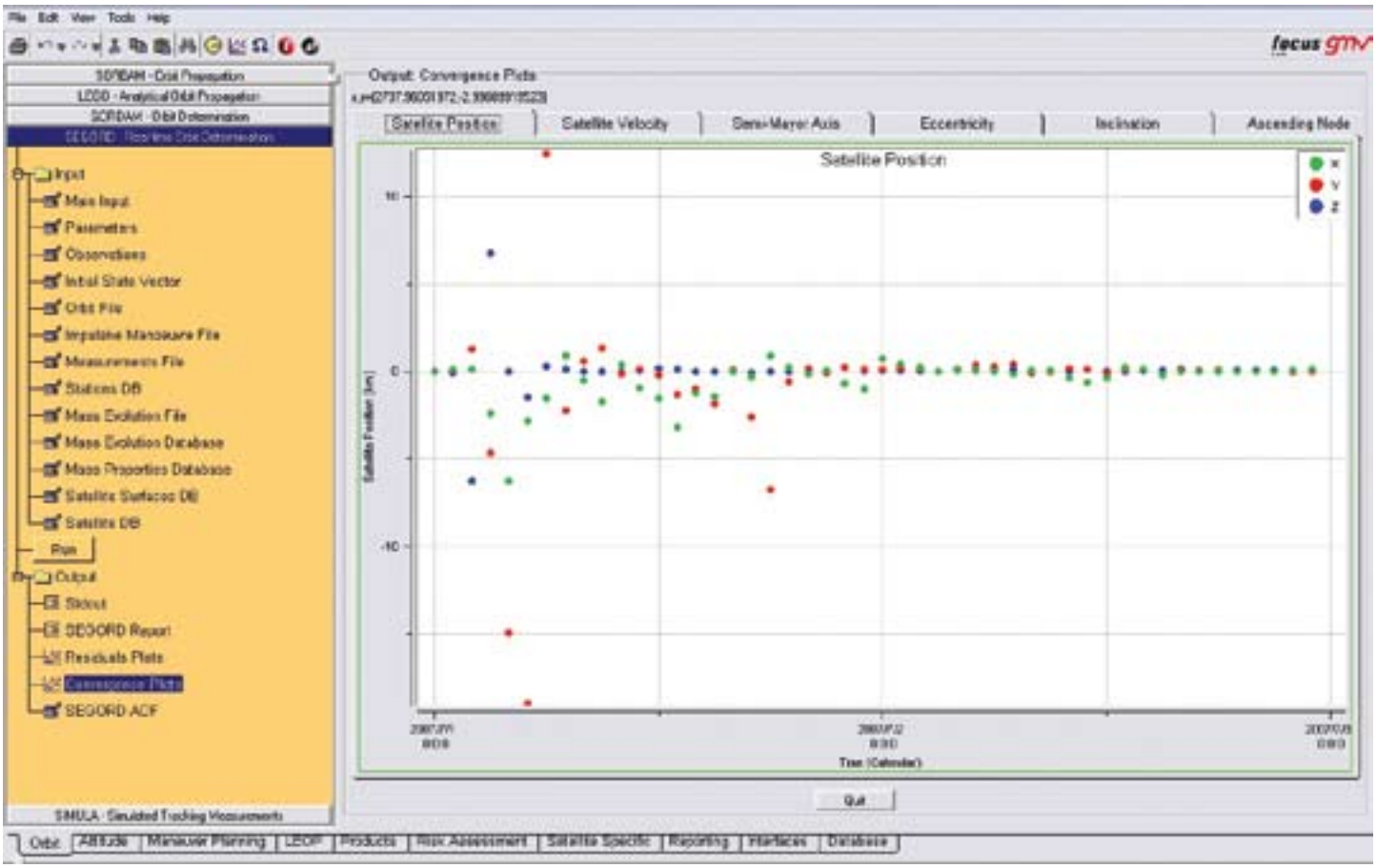
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Measurements File
Stations DB
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Mass Properties Database
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of its flight dynamics system. The Boeing 702 uses the ***Xenon Ion Propulsion System*** (**XIPS**), which provides low-thrust propulsion. This means the satellite has a far different operations concept when compared to typical geostationary satellites using a chemical propellant. In particular, the station-keeping maneuver planning is unique as four maneuvers are executed every day.

These maneuvers are planned simultaneously for a 14-day cycle for a total of 56 maneuvers. The algorithms to be used for the maneuver planning are complex and quite different from those used for planning the maneuvers of typical GEO satellites, where maneuvers are performed only every two weeks. The maneuver reconstruction is also challenging as the maneuvers performed by the Boeing 702 can last as long as one hour. The telemetry values needed for the reconstruction will change throughout the maneuver. The technique used for many GEO satellite buses that use representative telemetry data for maneuver reconstruction were not sufficient for this project, as the Boeing 702 maneuver must be divided into segments with varying telemetry values considered for each segment.

Challenges also existed from a software engineering point of view. The goal was to create software modules that could be integrated into Intelsat's ***Flight Dynamics System*** and GMV's ***focusSuite***. Modules had to be designed that required no dependency on GMV or Intelsat libraries. In order to maintain consistency between the software modules and the rest of Intelsat's FDS, it was crucial none of GMV's software libraries be incorporated into the development. Had Intelsat libraries been used, they would have been provided to GMV as "black boxes", forcing a layer of integration and adding complexity to the software. Not using the Intelsat libraries had an additional benefit for GMV; it would ease the task of integrating the modules into focusSuite.

Implementation—The algorithms used in the software modules were developed by GMV with support from Boeing and Intelsat. For the station-keeping maneuver planning, some studies were performed to determine how best to solve the maneuver planning challenges, such as an optimization problem used to determine how to distribute the four, daily maneuvers. GMV's solution resulted in maneuver plans consistent with those generated in operational reference data, while simultaneously minimizing the number of computations performed.

There was the added benefit of additional flexibility being integrated into the software. For the maneuver reconstruction, Intelsat users will have more control over how the telemetry data is interpreted as well as how the maneuver is divided into segments. The solution is quite flexible and does not dictate any particular maneuver division. In terms of the maneuver planning, users will have the capability of selecting elements of the maneuver plan that should be optimized, adding significantly more flexibility to the maneuver planning procedure.

Conclusion—The software modules were successfully developed by GMV with no dependence on Intelsat or GMV libraries and fulfilled all of Intelsat's requirements. The end result was extensively tested against Boeing 702 operational reference data. Comparisons revealed the results obtained using GMV's software modules were equivalent to those in the reference data. GMV can now count itself as one of only two Flight Dynamics Software suppliers in support of the Boeing 702 satellite. The features and capabilities available in the software modules developed for Intelsat will also be available to users of GMV's focusSuite who also operate Boeing 702 satellites.

About the author

Marci Paskowitz Possner is a Lead Flight Dynamics Engineer at GMV Space Systems, Inc. She has worked as Project Engineer and Project Manager in the development of operational Flight Dynamics Systems for several low-earth orbit NASA missions (OCO, GLORY) and well as geostationary satellites (Intelsat 702's).

by Richard Forberg

A promising new generation of satellite mesh networking with greater efficiency and reliability has emerged as a means of achieving low latency connections between two VSATs. Only a single "hop" to the satellite is needed, which reduces transit delays and bandwidth consumption in roughly half the time that was previously required. This certainly moves mesh networking to the top of any implementation list for real time traffic applications such as local telephony in rural areas (*e.g.* village-to-village).

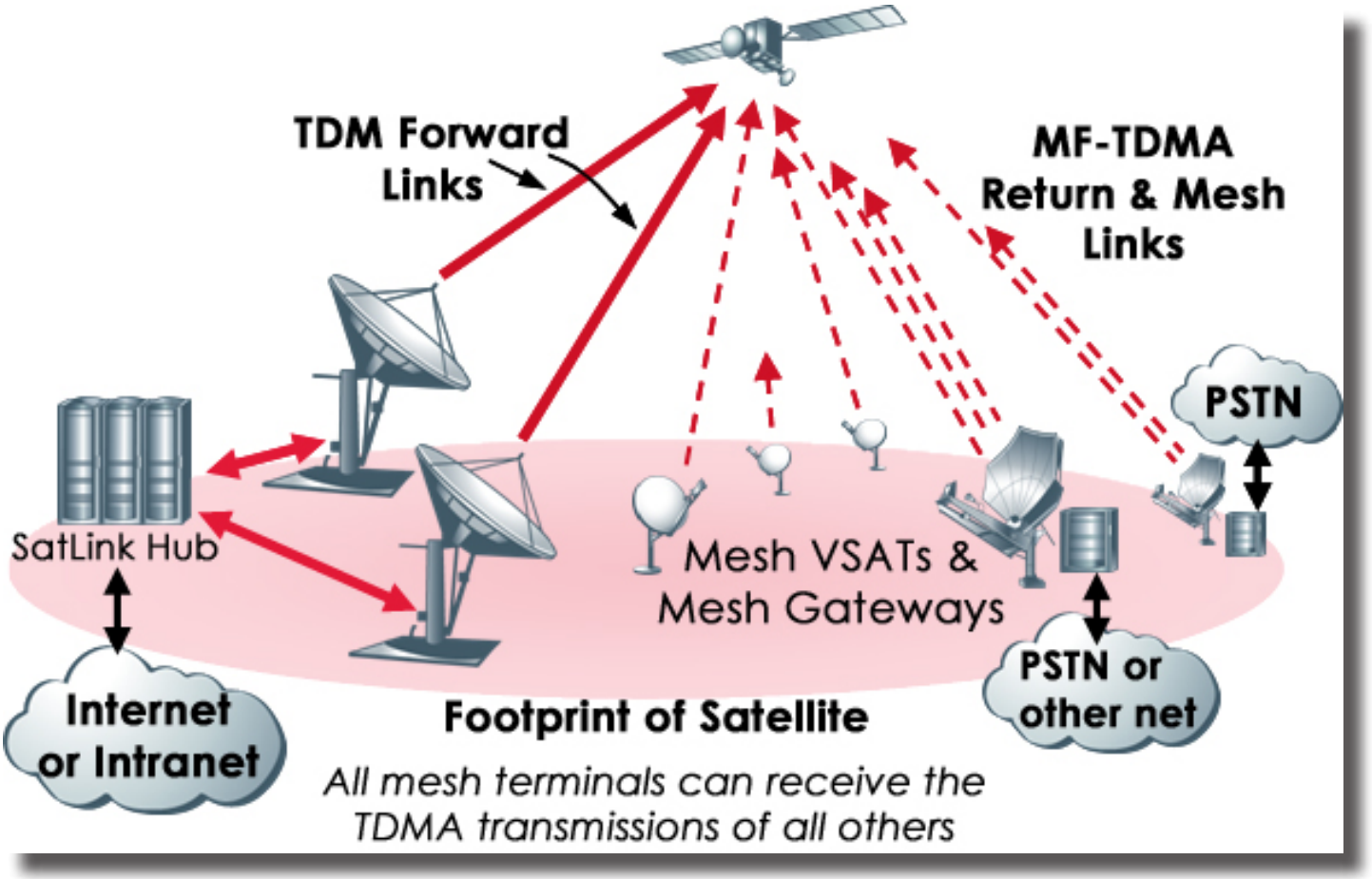
While mesh networking among ground stations has been available for many years using ***Demand Assigned Multiple Access*** (**DAMA**) methods, which assign capacity for voice or data on a circuit switched basis, this new generation is optimized for packet switching and the Internet Protocol (IP). In these new networks, capacity can be assigned according to rapidly varying data packet loads (*e.g.* as associated with web applications), as well as continuous packet loads (*e.g.* as associated with voice or video conferencing over IP), as is used today for star-topology VSAT networks using **MF-TDMA** techniques.

The dynamic assignment of satellite bandwidth according to the instantaneous IP packet loads greatly reduces total bandwidth consumption in comparison with the static assignment of circuit switching. In addition, packet headers are also compressed by the VSATs, creating further bandwidth savings.

Extending these dynamic, packet-oriented MF-TDMA techniques in star topologies to mesh networks is far from trivial — many challenges must be overcome. **STM** has worked through these challenges with its new SatLink mesh networking technology. This is an extension of STM's current **DVB-RCS** compliant SatLink product family. Consequently, all core technology elements of SatLink mesh networks also leverage the DVB-RCS standards for the maximum benefit.

Mesh Network Implementation

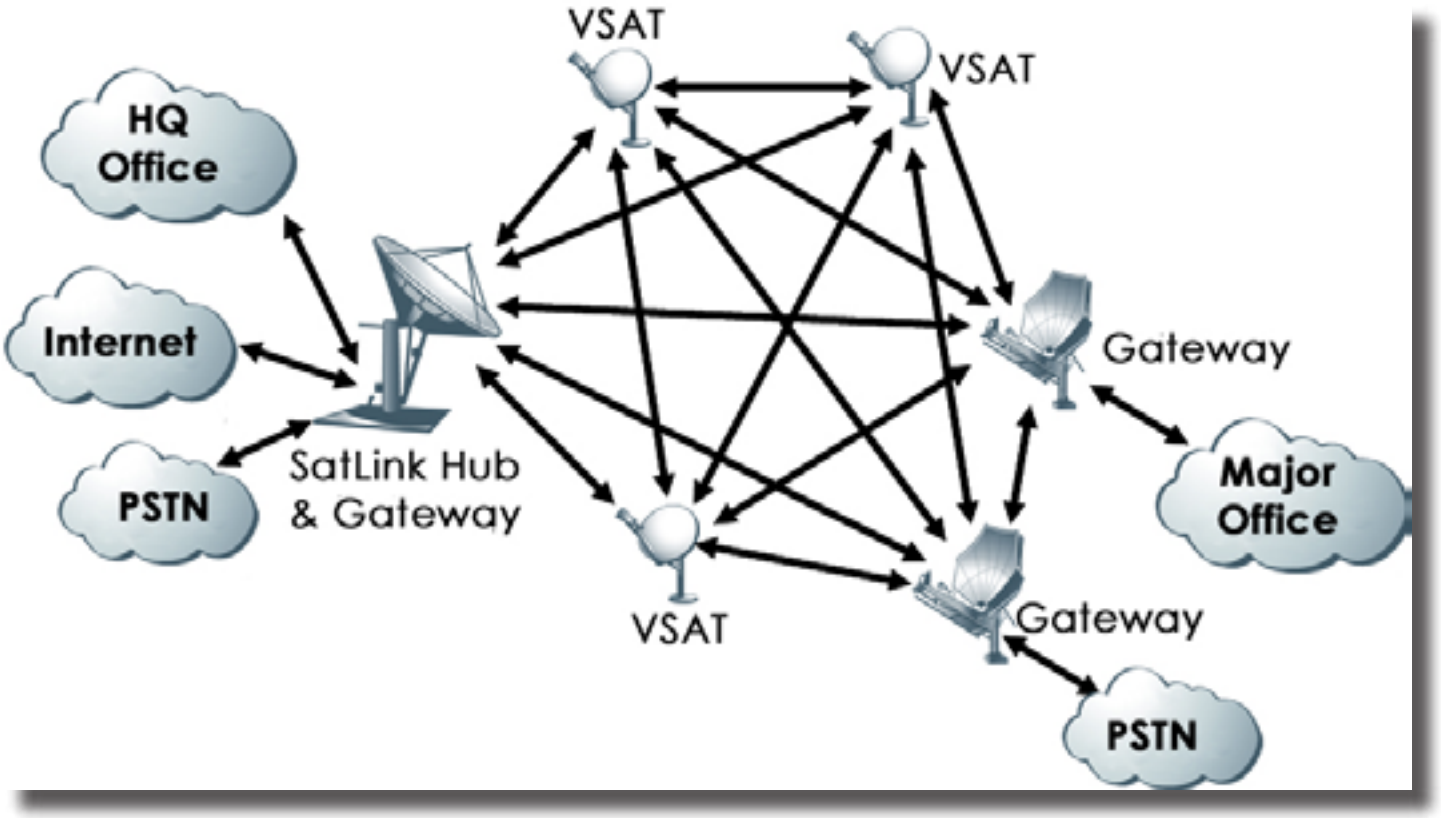
Today's certified DVB-RCS ***SatLink 1910 VSAT*** for star topologies is easily upgraded to also support



mesh networks through the addition of a small plug-on card. This card, plus a software upgrade, affords the SatLink 1910 the ability to receive TDMA bursts directly from other VSATs. The SatLink 1910 VSAT, of course, also continues to receive user traffic, network clock, and burst plan information from the SatLink hub over its DVB-S2 compliant TDM forward link and communicates back to the SatLink hub using DVB-RCS compliant MF-TDMA return links. What's new is the ability to be in direct communication with many other VSATs over what are called "mesh links," which also follow the DVB-RCS standards.

Each VSAT can have a large number of concurrently active mesh links. Furthermore, mesh links are established and removed dynamically under control of the hub, as needed, according to the supported inter-VSAT traffic patterns. Mesh links in this packet environment, however, differ from circuit-oriented DAMA mesh links because if there are no packets for a VSAT to send over an active mesh link for period of time, the mesh link consumes essentially zero bandwidth, even though it remains "active" as a table entry.

A key feature of the SatLink 1910 Mesh VSAT is that it can receive multiple concurrent TDMA bursts from other VSATs in the same mesh network. This greatly reduces blocking probabilities, which are common problems in mesh networks where ground stations can receive only one burst at a time. Low blocking probability for burst reception assures good voice quality, lower error rates, and increased bandwidth efficiency for data traffic, as the loss of even a single fragment of a TCP packet results in the re-transmission of many TCP packets.



The SatLink Carrier-Class Hub is a high-availability system optimized for IP networking with ACM (Adaptive Coding and Modulation), providing great versatility, reliability, and scalability. In its baseline configuration, it delivers capacity for 2,500 VSATs, fast-failover redundancy in all core components, and growth potential as many as ten forward links and tens of thousands of VSATs. Such makes the system ideal for carrier networks, large ISPs, and large private IP networks, including large carrier VoIP networks.

The SatLink hubs support scalable combined hybrid star and mesh networking and allows the mesh network to be partitioned into smaller mesh subnets only interconnected through the hub. The hub can be used as a shared WAN gateway for these mesh subnets, but they may as well use any of the VSATs for access to the WAN.

In a mesh network, many challenges arise due to a potentially huge number of mesh links. To illustrate, consider a mesh network with only 100 VSATs. Because of the multiple links per VSAT, there are potentially 10,000 half-duplex TDMA links (vs. only 100 return links in a star topology).

The core technical challenge in these new mesh networks is assigning and scheduling traffic onto mesh links dynamically.

The capacity assignment and scheduling process — which is performed by the hub based on requests from the VSAT — is much more difficult with the huge multitude of mesh links. STM has partitioned this problem without losing the bandwidth efficiency gains obtained from dynamic bandwidth assignment. The bandwidth distribution is adjusted every 100 msecs based on the immediate transmission needs for the mesh and return links of each VSAT. The distribution respects different QoS requirements.

Another issue is traffic routing. IP routing is more complex in a mesh network, as each IP packet addressed to any computer on any VSAT in the mesh must be mapped to, and transmitted directly to, the appropriate egress VSAT by the ingress VSAT. In order to handle this problem, each VSAT is required to

have its own route table for all possible IP hosts or subnets. With this table, the VSAT will be able to determine where to send an IP packet most efficiently, whether it is to the hub, or to another VSAT.

The table is updated constantly to accommodate for hosts or subnets being added to or deleted from the overall extended network. Unfortunately, the standard routing protocols used to update route tables in terrestrial IP networks introduce a lot of extra traffic. In a satellite network, this consumes large amounts of valuable bandwidth, making standard routing protocols unsuitable for large meshed VSAT networks. STM has solved this dilemma by implementing a customized route table update process that's been optimized for mesh satellite networks, with very low overhead. Tracking the performance of mesh links is a related issue also resolved in SatLink mesh networking. Unlike star topology return links, the hub cannot directly measure the link quality and error rates on the mesh links between two VSATs. Measurements have to be taken by each VSAT and reported to the hub systematically — this information is then fed into the route table update process. This allows each VSAT to countermeasure when a mesh link is down due to heavy rain at a distant VSAT by adjusting routes accordingly.

Due to the high number of links to monitor, regular tracking of the performance of all possible mesh links could be quite expensive in terms of satellite bandwidth in a large mesh network. However, STM has developed techniques to make tracking and collecting network traffic statistics much more efficient. This effort to reduce bandwidth consumption results in a network that operates smoothly at a minimized cost.

Some good applications of mesh networks include voice and video conferencing. Any private network, government or corporate, with distributed data applications to many sites is also an ideal candidate when cost-effective terrestrial connections are unavailable or unreliable. A SatLink mesh network operated on a shared-use basis from a service operator's hub can also efficiently serve the market for private lines with dynamic capacity between two or more sites for any type of data application.

With the cost-effective nature of today's VSAT technology for IP networking, this new generation of mesh networks will, over time, replace the traditional and more expensive circuit-oriented DAMA technologies. Just as IP networking is replacing circuit-oriented terrestrial networks, this evolution is inevitable also for VSAT networking.

About the author

Richard Forberg is responsible for STM's marketing, product planning and strategic business initiatives. He has 25 years of management experience in network systems, services and software companies. He has held senior marketing, product management and business strategy roles at networking equipment vendor 3Com Corporation, distributed computing systems supplier Digital Equipment Corp., plus various high technology start-ups. Mr. Forberg holds a B.S. in Physics from Beloit College, an MS in Physics from M.I.T and a M.S. in Management Sciences & Engineering from Stanford University.

ORBITZ — News Briefs

by Pattie Lesser

Here are some of the latest daily news items from SatNews (www.satnews.com). To read more about these news items, simply enter the following URL into your browser:

http://www.satnews.com/cgi-bin/story.cgi?number=

and then copy the number found at the close of each brief and paste that number in after the "=" sign...

Qualified Secret Clearance Only

ATCI Antenna Technology Communications Inc. will be hosting the industry's first comprehensive ***Satellite Surveillance and Monitoring Technology Conference*** on October 26-28, at ATCi's corporate headquarters located in Chandler, Arizona, with an opening welcome reception on Sunday, October 26. This seminar is limited to qualified U.S. citizens who hold Secret Clearance or above. [**259228072**]

Crawford Goes Fishing For New Biz

Crawford uplink antennas Crawford Satellite Services has launched two additional HD feeds for MavTV and World Fishing Network (WFN). Using MPEG-4 technology, Crawford transmits each feed to ***AMC-10***, **SES AMERICOM**'s ***HD-PRIME***® cable neighborhood. The Company provides uplink, encoding, and space segment for both channels, while additional services for MavTV HD include origination and playback. Broadcast in 1080i, these networks are available on multiple platforms. [**610258761**]

Gilat Satellite Networks Gets Going With O3b

Gilat Satellite Networks Ltd. and O3b Networks Ltd. have just announced plans for a new line of satellite terminals designed specifically for O3b Networks Ltd. O3b Networks, funded by Google Inc., Liberty Global, Inc., and HSBC Principal Investments, recently announced the Company will deploy the world's first ultra-low-latency, Medium Earth Orbit (MEO), Ka-band, fiber-speed satellite network. [**1097664977**]

Celestial Success For General Dynamic's LEOP

General Dynamics Advanced Information Systems has successfully completed the Launch and Early Orbit Phase (LEOP) of NASA's Fermi Gamma-ray Space Telescope. Fermi, previously known as the Gamma-ray Large Area Space Telescope or GLAST, is a nexgen, high-energy, gamma-ray satellite designed to make observations of celestial gamma-ray sources. NASA recently renamed the satellite in honor of Prof. Enrico Fermi (1901 - 1954), a pioneer in high-energy physics. The LEOP is a functional checkout of the observatory which demonstrates that all the instruments and subsystems perform to meet Fermi's mission. NASA Goddard Space Flight Center is now managing daily operations of the observatory. [**1513237815**]

Financially Speaking... GeoEye, Inc...

GeoeEye-1 satellite image GeoEye, Inc. has received notice from Nasdaq that as a result of filing its restated financial reports and current quarterly report on Form 10Q on September 8th, all compliance issues have been resolved — GeoEye remains in good standing on **The Nasdaq Global Market** exchange. [**290610599**]

Globalstar Catches and Measures Wind

Globalstar, Inc. has announced that Renewable Energy Systems Americas Inc. (RES Americas) will transmit wind measurement and other remote monitoring data from prospective wind farm locations to their back office using the Globalstar satellite network. [**595064039**]

Speed Is Good For Inmarsat

Inmarsat is increasing the guaranteed IP data speed available on its Broadband Global Area Network (BGAN) service in response to demands from the media sector. The enhancement, currently in development, will deliver a minimum guaranteed streaming rate of 384 kbps and will be introduced by mid-2009. The new premium streaming service will be available on all existing BGAN terminals capable of accessing current streaming rates of 256 kbps, and will be ac-

cessible without the need for additional external hardware. [993353543]

Nimiq4 Takes Off On a Breeze — Provides DTHTV 'O Canada'

Proton success for International Launch Services (ILS) Proton Breeze M launch vehicle carrying the Nimiq-4 satellite into space for Telesat at the Baikonur Cosmodrome, Kazakhstan. This was the fourth launch of the year, and 47th overall, for ILS. The satellite, built by **EADS Astrium**, was the second ***Eurostar 3000*** bus launched by ILS in a little over a month. Proton builder **Khrunichev Space Center** of Moscow is the majority owner of ILS, which is based in Reston, Virginia. Telesat is 64 percent owned by **Loral Space & Communications Inc.** and the world's fourth largest fixed satellite services operator. [2086587381]

Newtec's Box of PEP Has Paid Off With CSI Product of the Year

Newtec has received a Cable & Satellite International (CSI) Product of the Year Award 2008 during a ceremony held at the recent IBC exposition in Amsterdam. The award category was "best playout/connectivity service/solution" for its ***Mobile PEP-Box*** ® Terminal ***EL810***, formerly known as PEP-Box ® 1000. [2069095926]

Northrop Grumman Completes Their AEHF Integration Goodies

Northrop Grumman Corporation has completed integrating all electronic units of the payload module for the third Advanced Extremely High Frequency (AEHF) military communications satellite. The company is under contract to provide three communications payloads to Advanced EHF prime contractor **Lockheed Martin**, Sunnyvale, California. Integrated with Lockheed Martin's ***A2100*** space vehicle structure, the payload module consists of the complete set of radio frequency, processing, routing and control hardware and software that perform the satellite's protected communications function. The equipment includes approximately 20 electronics units and approximately 500,000 lines of software code. [765197586]

Proactive Communications Is Just That, With Network Configurator

Proactive Proactive Communications, Inc. (PCI), launched PCI Network Configurator™, the industry's first estimating tool to help companies understand basic system requirements for satellite communications networks. This tool is an all-conditions worldwide SATCOM provider, is an interactive online form that converts basic input variables and generates customized VSAT requirements based on geography, number of users, functionality and bandwidth. [1472720034]

SES NEW SKIES' NSS-12 Offers A Broader Future For CETel

NSS-12 SES NEW SKIES, an SES Company, has announced that CETel has formally contracted with the Company to provide services on the upcoming NSS-12 satellite to serve the Middle East and African market for VSAT services and corporate networks. CETel officially signed a contract for one full Ku-band transponder on the NSS-12 satellite during IBC 2008. SES NEW SKIES' NSS-12 satellite is scheduled for operational service in the second half of 2009 and will replace the existing NSS-703 satellite at the orbital location of **57° E**. [157378076]

Thrane & Thrane's BGAN Contributions To A Speedy + Watery World

Thrane & Thrane BGAN Volvo Race Thrane & Thrane is ensuring the legion of Volvo Ocean Race fans around the world receive even better television coverage. The Company is extending its sponsorship offering to include land based ***EXPLORER 700 BGAN*** terminals. [1784575642]

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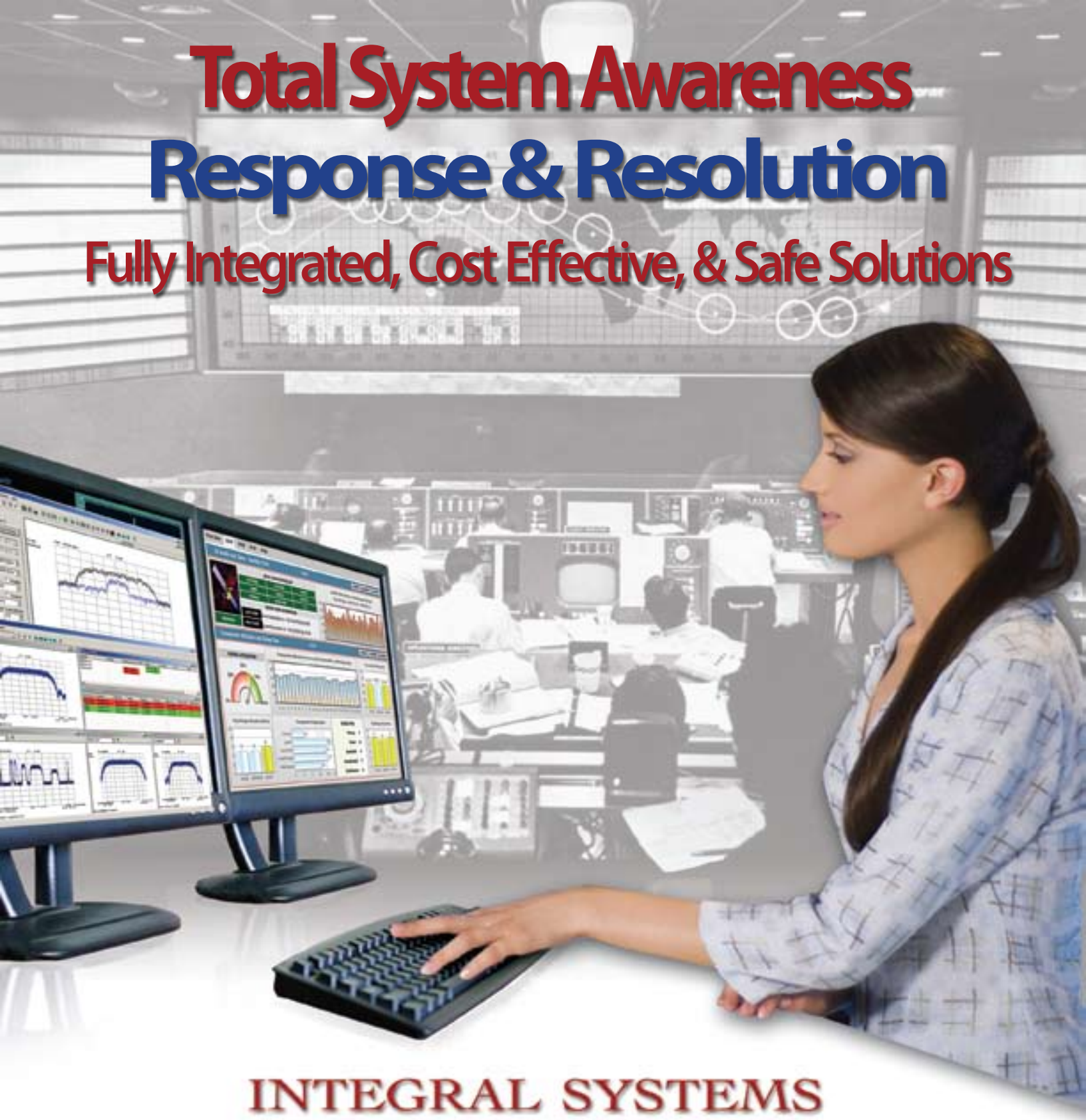

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