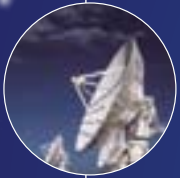


SatMagazine



The American Satellite Market

- *An Auspicious Start To The New Year*
- *North American Satellite Market Leads in New Applications*
- *Eye On Europe*
- *Guide To The D.C. Show*
- *And More...*



SPECIAL SHOW GUIDE

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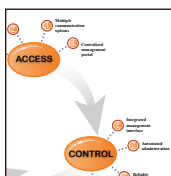
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Courtesy of The Aerospace Corporation

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SATMAGAZINE

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EDITOR'S NOTES

My firm belief as the editorial director of SatNews Publishers is that it is a highly worthwhile endeavor for *SatMagazine*, *MilsatMagazine*, *SatNews*, and *digiGO!* readers to become more familiar with those who help to “grow” our critically-needed products. I am in the unique position of being able to talk with many company leaders and decision makers and to derive insights from them regarding their companies, product lines and thoughts about their careers and work. Some may be your competitors, others your associates—all have a common goal... they strive to improve the products delivered to various clients who, in turn, offer services to millions of their customers. I will attempt to provide such **Executive Spotlights** and **Product Perspectives** in each issue. I hope you will find these conversations interesting and informative.

As is my norm, I am also requesting suggestions from our readers as to what topics they would wish to read in our publication in future issues. Is there a specific case study that you feel would be enlightening, or perhaps there's a feature article you know would make for a superb read? If so, contact me and let me know and we'll get onto that bandwagon immediately.

This issue of *SatMagazine* will be printed for distribution and is packed with interesting features. I wish to thank all of our columnists, authors, and interviewees for their time and assistance in helping to make *SatMagazine* the leading publication for satcom and ancillary business.

NEW PUBLICATION! Next month, **digiGO!—The Digital World**, debuts online. **digiGO!** news and feature articles will be contained within its own, dedicated website, rather than as an inclusion within *SatNews* daily. The editors and publishers are myself and an experienced team with more than 20 years of experience writing and editing magazines, newspapers, books and sites within the digital environs. Coverage will encompass all matters digital within the realms of businesses, content, creation, and delivery. We hope you'll join us.

NEW PODCAST! Each week a new **SatNews InfoCast** featuring our constellation of the top stories of the past week will be available for your listening edification. With distribution via **RSS** and on our website, the podcast highlights the leading stories and offers an alternative method for you to remain “in the know”. www.satnews.com/infocast to access the latest broadcast. Thank you.

Hartley Lesser, Editorial Director,
SatNews Publishers



AN AUSPICIOUS START TO THE NEW YEAR

by Tara K. Giunta

As we begin a new year, it is customary to reflect the challenges, achievements and lessons of the previous year and consider how they might influence 2008. In an election year in the United States (such as 2008), “politics” typically affect how legislators, policy makers, and industries view priorities and make decisions.

This election year, there is yet another interesting twist affecting – indeed, infecting – telecom policymaking and legislative oversight that has not been present in prior election years (at least not in recent – meaning 50+ years) memory. Specifically, Chairman Martin’s management style and leadership of the **U.S. Federal Communications Commission** (FCC or Commission) has invited such criticism and vitriol that it has become the hallmark, indeed the symbol, of the Bush Administration. As a result, this election year, the United States will not only grapple with rhetoric and stump speeches by

candidates from both parties, but the telecommunications and satellite industries will be dealing with a lame duck FCC Chairman who is under active, *bipartisan* attack by the US Congress. It is a sordid tale.



It has become an unfortunate reality, widely acknowledged by those who practice before the Commission, that effective and efficient decision making has become an anathema at this Commission. Responsibility is unfortunately (but perhaps not completely fairly) laid at the feet of the FCC Chairman. While past Commissions have engaged in a certain amount of cynicism, partisanship, and politics, this Commission is generally viewed as having become incapacitated with internal bickering, consternation and conflict.

REGULATORY OVERVIEW

Regrettably, over the past several years, the Commission's monthly meetings have become a source of amusement. Even though they are scheduled to commence at a certain hour, it has become customary for them to be delayed. Indeed, one recent FCC meeting started almost 12 hours after its scheduled start time. These delays are understood to be the result of one or more Commissioners not having received the proposals from the Chairman's Office well enough in advance to participate in meaningful discussion during the meeting, and/or acrimonious disagreement, among certain Commissioners and their staff.

The criticism of the Commission became blatant in October 2007 when the **Government Accountability Office** (GAO) issued a report on the process by which the FCC gathers and releases information about important votes and other agency actions. In analyzing four rulemaking proceedings between 2002 and 2006, the GAO found that some "stakeholders" in those cases had advance access to inside information, which provided them a competitive advantage.

According to the *GAO Report*, several stakeholders reported having learned which items the FCC would vote on at an upcoming meeting weeks in advance — even though it is against Commission rules for that information to be released to the public (without authorization from the FCC Chairman). In contrast, other stakeholders advised the GAO that they were not made privy to this information. As recognized in the GAO Report, stakeholders who know which items have been scheduled for a vote know when to meet with FCC commissioners and staff — after all, "timing is everything".

In brief, the FCC circulates information internally approximately three weeks before a public meeting in order to notify FCC staff of which items are scheduled for a vote at the upcoming public meeting. However, the agenda for each Commission meeting is publicly announced one week in advance. Once the agenda becomes public, the "*Sunshine Period*" begins and no one can lobby FCC officials about the proposed rule. As a result, those stakeholders with advance warning can take advantage of the time until the Sunshine Period commences to lobby the Commission, much to the disadvantage of those who are not made aware of the issues.

Problems at the Commission became decidedly more acute in December 2007 when, on December 3, 2007, *John Dingell*, Chairman of the House Committee on Energy and Commerce (HCEC) which has oversight responsibility for the FCC, sent a letter to Chairman Martin addressing an, "apparent breakdown in an open and transparent regulatory process,"

at the FCC. Dingell cited a disturbing trend at the FCC: "[f]or instance, the [FCC] does not put the text of proposed rules out for notice and comment; there is little public notice of certain proposed Commission actions; and the Commissioners are often not informed of the details of draft items until it is too late to provide the necessary scrutiny and analysis that is so important to reasoned decision making."

In an effort to stave off further action and assuage concerns, Chairman Martin instructed that all matters "on circulation" with the Commissioners be listed on the FCC's website. Unfortunately, this move was insufficient, particularly given Chairman Martin's further actions in December.

Specifically, the US Congress had warned Chairman Martin to postpone any FCC decision with regard to media ownership. Despite these admonitions, on December 18, 2007, Chairman Martin pushed through a vote in favor of his proposal overturning a decades-old ban on broadcasters in the top 20 largest media markets from also owning newspapers. Even though Congress had advised the Chairman not to proceed, Martin (with the support of the two other Republican Commissioners) approved the proposal, with the two Democratic Commissioners voting against it. The move received immediate and strong reaction in Congress.

Of particular concern were the accusations of the two Democratic Commissioners that Martin had made changes to his media ownership proposal "in the dead of night", and at the last minute without affording all Commissioners adequate time to review, comment and make an informed decision. Of course, such maneuverings were the exact concerns noted in Dingell's December 3, 2007 letter.

The result was the initiation of a formal investigation by the HCEC's Subcommittee on Oversight and Investigations ("Subcommittee"). On January 8, 2008, a letter was sent by the bipartisan leadership of the HCEC and Subcommittee to Chairman Martin advising him of the investigation, "to determine if the FCC's regulatory procedures are being conducted in a fair, open, efficient and transparent manner."

The letter further advised that the Subcommittee investigators would be issuing a comprehensive list of documents to be produced and would be interviewing FCC employees and other witnesses in preparation for oversight hearings later this year. The letter then instructed Chairman Martin to notify all FCC employees of their right to communicate with Congress and reminded Martin that it is a violation of federal law to deny or interfere with that right, to interfere with

a Congressional inquiry, or to retaliate against any “whistle-blower”. Finally, the letter instructed the Chairman to immediately preserve all electronic records “including work e-mail and personal e-mail communications relating to official work of the Commission”.

So, what does this mean for satellite industry and their representatives? In short, with the exception of certain high-profile proceedings, such as the [XM-Sirius merger](#), the Chairman and his staff will be heavily preoccupied with responding to document production. They’ll be meeting with counsel to prepare for interviews and Congressional hearings. They’ll be trying to contain any political fall-out (the old proverbial “damage control”), and generally trying to repair the image of the Chairman and his Commission. At a minimum, it means further delay in reaching informed decisions. Finally, the closer we get to the November 2008 elections, the less likely any material proceeding will be passed, and that’s certain to cause quite a quagmire. ■



Tara Giunta is a partner of the Washington, DC office of Paul, Hastings, Janofsky & Walker LLP. Ms. Giunta has extensive experience in advising clients operating in, providing services to and/or financing companies in the satellite sector. She has expertise in structuring international satellite projects and developing and implementing strategies for commercializing those projects on a global basis. She works on structuring strategic alliances, partnerships and joint ventures; negotiating the full range of commercial contracts; structuring projects to accommodate legal and regulatory requirements and obtaining required licenses and authorizations; and conducting due diligence, internal audits and compliance investigations and advising clients and their officers and directors on compliance in a broad range of areas, including regulatory and licensing and the foreign corrupt practices act and related laws.



Executive Spotlight On...

STUART DAUGHTRIDGE

*Executive Vice President, Commercial Division
Integral Systems*

Interview by Hartley Lesser, Editorial Director, SatNews Publishers

As executive team availability at Integral Systems can be intensely guarded, due to the press of business, obtaining

the time necessary to converse with Stuart Daughtridge was quite momentous.

Hartley

Good day, Stuart, and thanks for giving us the time to find out more about your position and Integral Systems. Can you tell us about your career, prior to joining Integral Systems?

Stuart

I graduated from Lafayette College in 1986 with a B.S. degree in electrical engineering. I began my career working for Spacecom as a spacecraft engineer on the TDRSS (Tracking and Data Relay Satellite System) program. When I left the company, it had become part of **Contel**. Now, that group from Contel is part of General Dynamics.

In 1990, I joined Intelsat and spent two years as a spacecraft engineer to support the operations of the Intelsat 5 and 6 fleet, and the construction of the Intelsat K satellites. Then an opportunity to become the manager of Spacecraft engineering at a startup company called Orion Satellite Corporation. Orion was sold to Loral in 1999 at which time I decided to join Integral Systems.

Hartley

What are the commercial group's responsibilities at Integral?

Stuart

The Commercial Division is comprised of Integral's core commercial Command and Control (C&C) group and three wholly owned subsidiaries—

Executive Spotlight On...

Integral Systems Europe (ISE), SAT Corporation and Newpoint Technologies.



SAT Corporation supplies automated RF signal monitoring systems for satellite and terrestrial spectrum management applications in some 50 countries around the world. Integral Systems Europe specializes in providing ground station solutions, offering hardware and software services based on the ISI product family. Newpoint is deeply involved in satellite and terrestrial network management systems.

The commercial group provides customer solutions based on three distinct technologies and associated product lines through Integral Systems and the aforementioned subsidiaries:

- In satellite command and control, Integral has the **EPOCH IPS** (Integrated Product Suite), the world's most widely used satellite control system.



- For RF monitoring, SAT Corporation is the world's technology leader in RF monitoring and interference detection systems for satellite signals and terrestrial signal monitoring, including *Direction Finding (DF)* systems.
- For element and network management, including *Manager of Managers (MoM)* systems, Newpoint Technologies provides the **Compass/TrueNorth** product line.

Hartley

What are the primary markets the Integral Commercial group addresses?



Executive Spotlight On...

Stuart

The Integral Commercial Division's primary focus is on the ground system needs of commercial satellite operators and service providers worldwide, such as Intelsat, EchoStar, Telesat Verizon, Qwest, Arrowhead, Artel, SES Global and many others. We also work on the ground system needs of governmental agencies around the world. Integral's C&C group and Integral System Europe (ISE) focus on satellite C&C and larger, turnkey systems that span one or more aspects of the ground segment. Additionally, SAT and Newpoint have significant business in other markets, including the satellite user community, military ranges, television broadcasters, terrestrial remote monitor and control applications as well as with government and commercial integrators. Other organizations within Integral are keyed in on the specific ground system needs of the U.S. government.

Hartley

It sounds as if though you have three distinct markets to address... the Command & Control, carrier management, and network management markets. However, there must be some synergy between them to ensure they are all within the commercial division umbrella?

Stuart

Actually, it is because of this synergy that Integral sought out and acquired SAT and Newpoint, especially as they were the leading providers of their respective systems.

By integrating these three product lines, Integral can offer a fully integrated ground system solution, based on the leading products. As satellite operations is a single operation typically executed by multiple systems controlled by multiple operations teams, our integrated solution can provide satellite operations team with full situational awareness across entire operations. Such integration improves operator efficiency, responsiveness, quality of service, and the overall safety of operations, all the while reducing operations costs and outage times.

We are accomplishing this work beyond satellite operations, as well. Newpoint is expanding their Compass/TrueNorth product line to offer the same, fully integrated approach and full situational awareness using a Manager of Managers (MoM) approach for communications, broadcast, and network operations. A MOM system is a top level management system communicated with all of the other management systems in the network to provide the user a single system from which the entire network

can be managed, even though there are several different management systems actually interfacing with and controlling the different hardware elements of the overall system.

Hartley

And how is this different than what your competitors are offering and what most satellite operators use today?

Stuart

Typically, satellite operators procure stovepipe systems for each operation area, such as satellite control, CSM [Communications System Monitoring], M&C (Monitor & Control), network management, frequency planning, and geolocation. Many operators still employ several independent systems for each application. For example, they may have different satellite control systems for various satellites, dissimilar M&C systems for each Earth station, as well as unsimilar network/modem control system for each communications network. Unfortunately, each of these systems are specifically designed for their own specific task and have little to no ability to interface with other systems.

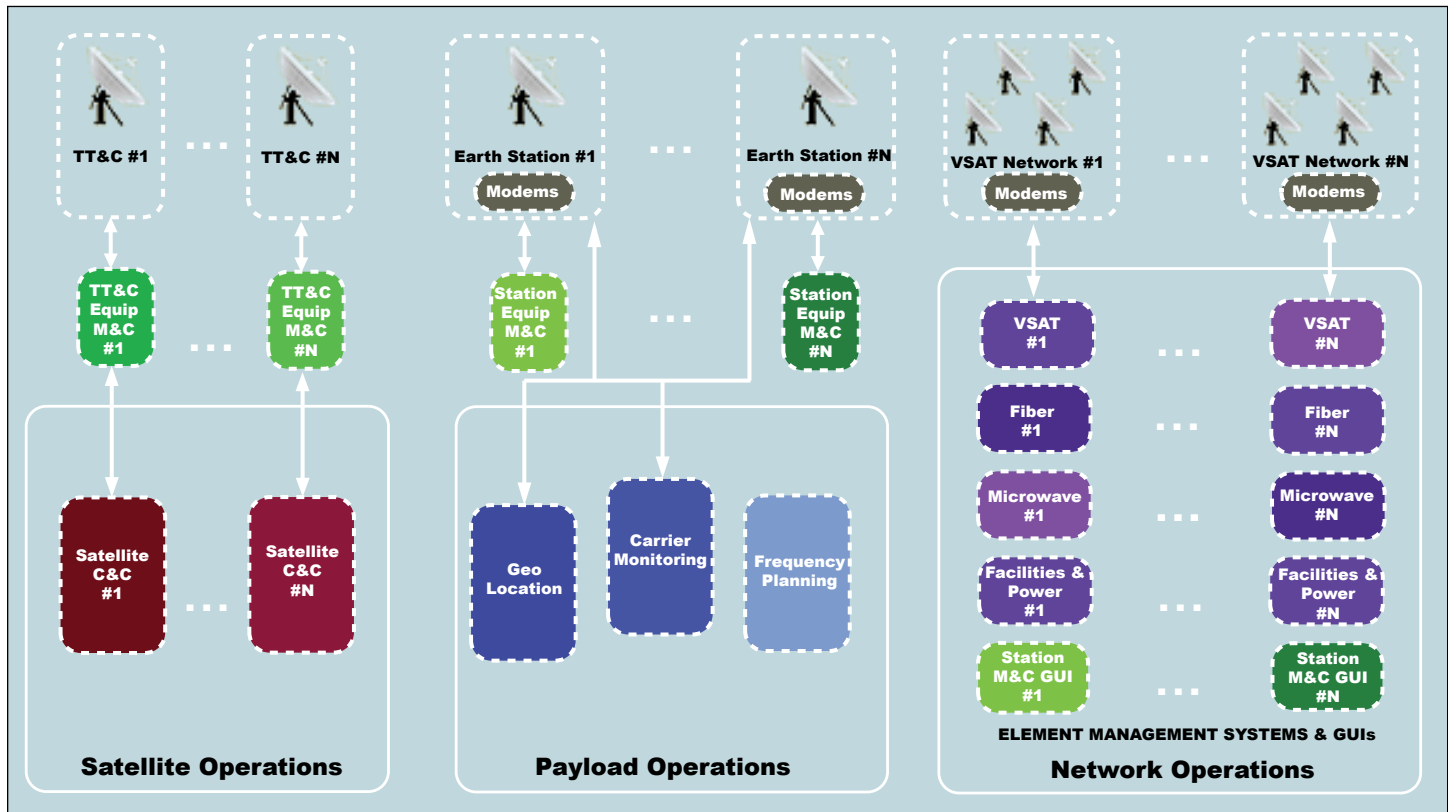
Hartley

Can you give us an example of how an integrated system would save effort, as compared to the manner in which most operations are run today?

Stuart

Certainly. Take the case where of a failure at a teleport that causes the loss of a large carrier. In a typical stovepipe operation where all of the systems are stand-alone, the teleport M&C system will alarm on the equipment failure, notifying the operator of both the problem and the source of the problem. Simultaneously, the payload operations center monitoring the RF links, and is the primary interface to the end customer, will receive an alarm in their CSM system due to the loss of the carrier telling them there is a problem, however there's no information available to the CSM system on the source of the problem. At the satellite control center, the satellite control system will alarm on the change in helix current on the amplifier (due to the loss of drive), notifying the operator of a problem. Once again, there's no information available on the source of the problem. As a result, this one problem has been reported on three different systems to three different operations groups, all of who will start anomaly investigations. Only one of the groups has the information to identify the cause of the predicament and the resources to resolve the problem.

Executive Spotlight On...



Numerous “stovepipe” systems to operate and maintain that cannot readily share data between systems and cannot be readily expanded to support growth of your operation

With an integrated system, all three systems and their associated operations teams would be able to immediately recognize the cause of the problem was a failure at the tele-port uplink site. As a result, only one anomaly investigation is generated and the payload operations team has the information to proactively notify the customer of the problem and the planned resolution. For this case, having an integrated system prevents wasted manpower and allows for proactive—and much appreciated—customer support.

Hartley

Haven’t operators attempted to integrate their systems by themselves?

Stuart

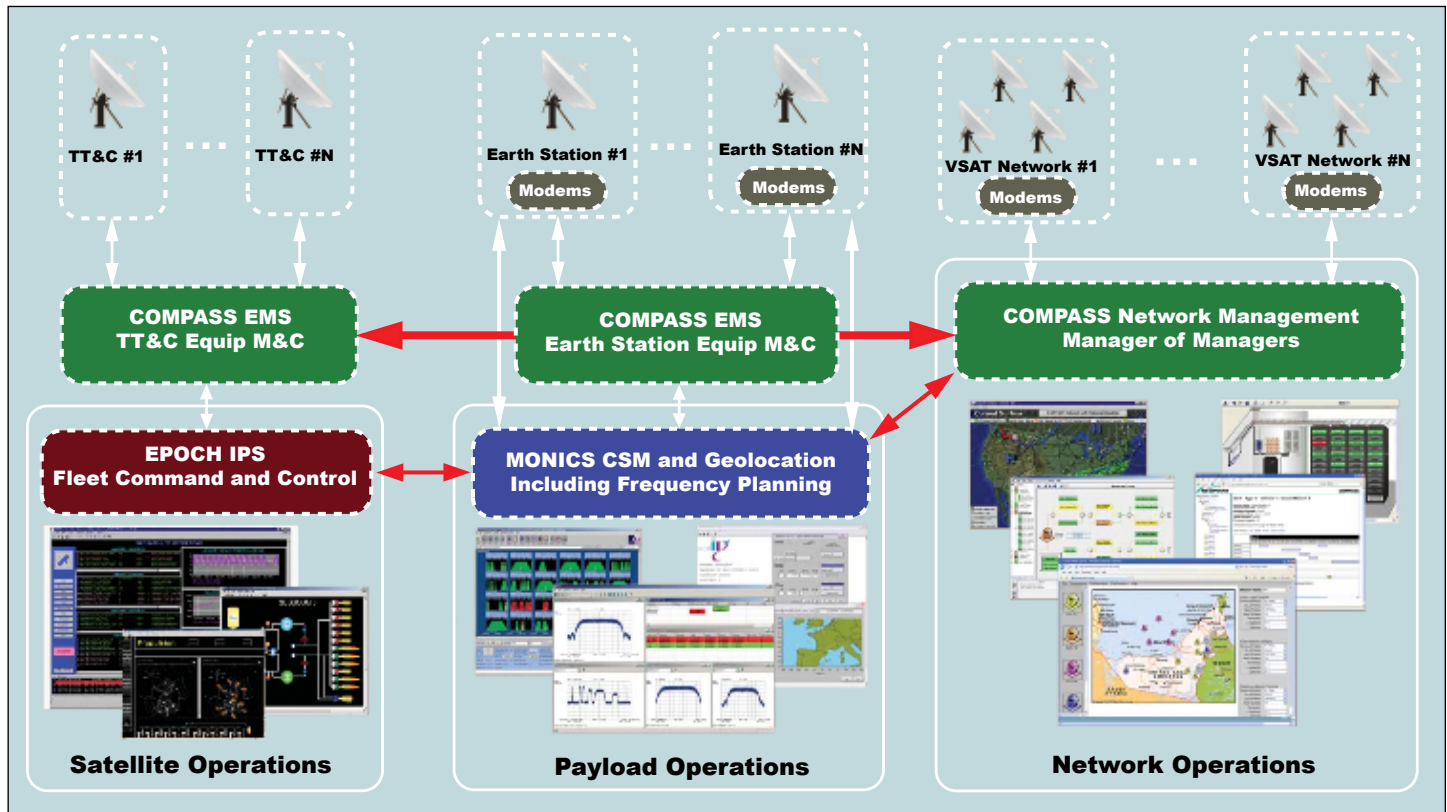
There have been a few operators who have tried to integrate systems themselves. On the military side, there have been several large system integrators who attempted to build so-called “best of breed” systems when they don’t control the majority of the core products going into the system.

There have been two primary problems with these integration efforts. First, at the product level, the basic products them-

selves are stovepipe products without the interfaces or infrastructure built into them to support and take advantage of integration with, and data from, other systems. For example, as when trying to obtain a real-time command and control system that can receive, understand, display RF data, and vice versa. As a result, when a third party (satellite operator or a system integrator) tries to integrate the products, it is usually technically difficult, expensive, and the end results do not live up to the original expectations.

The second problem, primarily for commercial satellite operators taking this approach, is that the efficiency gains and operations cost reductions achieved in operations from these integration efforts are swamped by extra costs. These costs are associated with the need for a full-time software development and support team to integrate and maintain the integrated systems. The forgotten element is that a system does not stay static for long—the speed at which hardware, operating systems, and general software technology change drive the need for continual investment in maintaining and upgrading your software systems. As a result, for companies that try to bolt together a variety of different stovepipe systems, there ends up being a significant long-term support and sustainment effort required to maintain these systems.

Executive Spotlight On...



An illustration of a fully integrated solution where each operations group is given full situational awareness

If you are a government contractor building a “best of breed” system, this is great news, as you have now locked your government customer into requiring your services for as long as they have a need for your system of systems. However, if you are a commercial satellite operator attempting to reduce operations costs by integration of your systems, you will find that those costs have actually increased because the costs to maintain the integrated system is larger than the efficiency gains you achieved through the integration effort.

Hartley

How is Integral’s approach different and how are the problems you present alleviated?

Stuart

The main difference is we actually handle the integration processes at the core product level. As a result, the products are now designed for integration as well as to support the receipt and display of data from other systems. The full advantage of having a fully integrated system can then be realized. As Integral has already completed the integration as part of our R&D efforts, there is no development risk for the end customer.

Let’s take this a step further. By completing the integration at the product level, the interfaces are now a part of the standard product. They are fully supported and tested to ensure backwards compatibility in future releases. An operator can safely upgrade one of their systems and remain confident the upgraded system will continue to work seamlessly with the other systems in their operations. As our solutions are built on our COTS products, they are proven and come with long-term software maintenance programs that fix the operators maintenance costs over the life of the system. In this way, the operators can have a state-of-the-art system through periodic system upgrades, all as part of the maintenance program over the entire life of the system, at no extra cost.

Hartley

What about systems that Integral does not initially provide?

Stuart

To be able to offer a turnkey fully integrated solution, we realize we need to team with industry partners. Three key areas are required in order for Integral to provide turnkey systems: RF and antenna systems, frequency planning system (a system that helps operators optimize the use of their communications payload), and a geolocation system.

Executive Spotlight On...

For the RF and antenna systems, as these are primarily hardware systems controlled by the M&C system, we can work with any vendor, although we definitely have preferred vendors.

For the frequency planning and geolocation systems, we initially sought out the two best systems in the industry—Complan by Optimal Satcom and satID from QinetiQ—and we teamed with them to develop our integrated solutions that include their systems.



With QinetiQ, we have also gone one step further—we host the satID software in SAT's **SAT-DSA** unit to create the sat-IDSA product. This product is a low cost, state-of-the-art solution that provides a CSM system with the industry's leading interference detection and characterization and is combined with the superb geolocation capabilities packaged in a rack mount product solution that shares common hardware resources.

Recently, **IN-SNEC** has come on the market with a new geolocation offering. As a result, we are already working with them to integrate our **Monics CSM** software with their offering to allow our customers the option to choose between the two best geolocation technologies on the market.

Hartley

What about satellite operators and satellite users that already have existing infrastructure—how can they achieve an integrated system?

Stuart

All of our products have easy to use and well-documented interfaces. As a result, legacy systems can be integrated to the extent that those systems can support the technologies. In addition, our open interfaces allow us to interface to other third party systems, such as billing systems, CRM systems, and so on. For example, we have integrated our products with systems to allow automatic billing for actual time of use for occasional use services as well as for automatic reporting for contracts that contain service level agreements.

Hartley

You mentioned the MOM Concept Newpoint is addressing. Could you explain further?

Stuart

Newpoint is expanding their Compass/TrueNorth product line to offer fully integrated, full situation awareness from any terminal for the communications and network side of the satellite operator and satellite users needs. The Compass product can manage existing element and network management systems and allows for a single, fully integrated view and control of the entire ground network. That includes the satellite RF links through the integration with SAT's Monics system. Customers may have teleports with different M&C systems and diverse networks from different providers. And they're running their own proprietary network management systems. They can have all these systems integrated and controlled by a single source. This hides the multiple systems from the operator and gives a single system for entire ground system control. This greatly improves efficiency, improves response times, reduces training and operations costs, and reduces the chances of operator errors.

Hartley

Stuart, can you offer an example of how Newpoint's MoM approach could help a communication network operator?

Stuart

Consider the case when an end customer link is implemented using different networks that are owned by the service provider, such as a hybrid fiber/satellite network link. Without a Compass MoM type of system, when a customer calls in due to a service problem, it is often difficult to track the problem down, as the operator will have to examine several systems to obtain a complete picture of the end-to-end service. Another predicament for operators is when there is an equipment failure, it is not always easy to know exactly what customers are impacted—operators only see the equipment failure. With the Compass MoM system, when such an equipment failure occurs, operators can see all of the effected customer services affected by the equipment failure.

Hartley

What is the future for technology beyond integrated systems?

Stuart

We believe satellite operations software will follow an evolutionary model quite similar to business software. First, there

Executive Spotlight On...

were custom and then COTS stovepipe systems for each operations area. Today's stage of industry maturity finds automation within each of the systems and integration of the separate operational systems to provide the added efficiency and cost effectiveness of full situational awareness. The next step, following the business software model, is the enterprise level solution for satellite and network operations.

Hartley

What do you mean by an "enterprise level solution for satellite and network operations"?

Stuart

An enterprise level solution analyzes the data from the integrated data set from the different systems to provide real-time access to key performance indicators. This information is available to company management to improve the performance and efficiency of the company and operations.

At Integral, we have already started development of our enterprise level dashboard system. We will be deploying a prototype system to the first customer in the spring of this year. An example of the type of data the dashboard will be able to provide includes:

- Real-time as well as average satellite and individual transponder use
- Available power equivalent bandwidth available per region, satellite, and transponder
- Real-time running averages and reports on service outages. These will be available on satellite, transponder, and customer basis and can be used in support of customer service agreements. Outages will be able to be categorized by type (satellite problem, RF interference, sun outage, ground system problem, operator error, and so on)
- Planned satellite activities (such as maneuvers, commissioning, new customers, or even listings of occasional use customer events)

Hopefully you can see the potential value of easy, real-time access to this data by satellite operations and service providers' management teams, sales teams, engineering and operations management teams, etc.

Hartley

Stuart, before we leave you in peace on this busy day, would you summarize your opinion of where you believe the satellite ground system industry is heading?

Stuart

We believe the future of satellite ground systems will eventually become fully integrated systems with intelligent automation, designed to support operations and also the business of satellite operators. As a result of that belief, Integral is investing our R&D funding into making this a no risk, low cost reality for our customers. ■



Stuart Daughtridge joined Integral Systems in January 1999. In February 2000, he was appointed Executive Vice President of the Commercial division. In this role, Mr. Daughtridge oversees four operational groups including Integral Systems Commercial Command & Control, based in Lanham, MD, and subsidiaries Integral Systems Europe, based in Toulouse, France; SAT Corporation, based in Sunnyvale, California; and Newpoint Technologies, based in Salem, New Hampshire. Under Mr. Daughtridge's leadership, the combined capabilities of Integral Systems' satellite command and control, SAT Corporation's carrier and interference monitoring, and Newpoint Technologies' network management all work together to provide a complete integrated ground system solution approach for satellite operators around the world.

Prior to joining Integral Systems, Mr. Daughtridge worked in several management positions in the spacecraft engineering and satellite operations division of Orion Satellite Corporation (which later became part of Loral). His last position at Orion was Director of Satellite Operations. From 1990 to 1992, he worked at INTELSAT on various aspects of the design, development and operations of the INTELSAT K spacecraft and the INTELSAT V, IV and VII series of satellites. From 1986 to 1990, he worked for Contel (which later became part of GD) as a spacecraft engineer for NASAs Tracking and Data Relay Satellite System. Mr. Daughtridge graduated from Lafayette College in 1986 with a B.S. degree in electrical engineering.

PROVIDING THE BIG PICTURE FOR SATELLITE SYSTEMS

Over the past decade, there has been a significant increase in the use of “enterprise solution” software to monitor, analyze, and improve business operations for various applications and corporations. Applied appropriately, these “business process management” (BPM) tools offer an effective way to visualize an organization’s activities and improve operational efficiency.

To accomplish these results, BPM tools use “**data mining**” strategies to access and integrate disparate data from multiple parts of a system. Key performance metrics are then added to the resulting data to produce meaningful business intelligence. The resulting data is displayed through the use of **dynamic/interactive data visualization techniques** designed to quickly communicate complex data to busy executive managers and operations personnel.

The approach used to display data in a concise and visually effective way is often referred to as an “**executive dashboard**”—due to

the similarity of trying to obtain information quickly from an automobile dashboard. The goal is to provide a fast and effective view of complex data or business operations “at a glance”, while allowing users to “drill down” to obtain additional detail, when desired.

Integrated, Open, and Accessible Systems Required

Until recently, comprehensive enterprise solutions have been mostly applied to financial applications, sales organizations, and even manufacturing applications. However, such use has been slow within more complex environments—satellite command and control as well as communications systems. This is partially because, to be effective, data must be available from multiple portions of the system and across different operations environments.

Historically, satellite ground systems have been built using “stovepipe” solutions with minimal communication between the unique system components. This inability to communicate across system components made it difficult for these systems to benefit from the use of BPM tools or other enterprise solutions.

A Helping Hand: An Enterprise Executive Dashboard Feature

Much of this is changing as **Integral Systems Incorporated (ISI)**, based in Lanham, Maryland, takes the lead to provide fully integrated solutions and applies enterprise level strategies to the satellite command, control, and communication industry. Building on an existing strategy of providing “fully integrated solutions” to end users, Integral recently announced the development of a new control system feature referred to as the **Enterprise Executive Dashboard for the Satellite Ground System**. As the name implies, the Executive Dashboard feature is designed to collect critical data from the entire system, apply strategic “business logic” to the raw data, and generate and display key performance data using highly graphical and interactive web based displays.

The strategy is to exploit the best features of interactive web technology and enterprise solutions to benefit complex control system applications/systems.



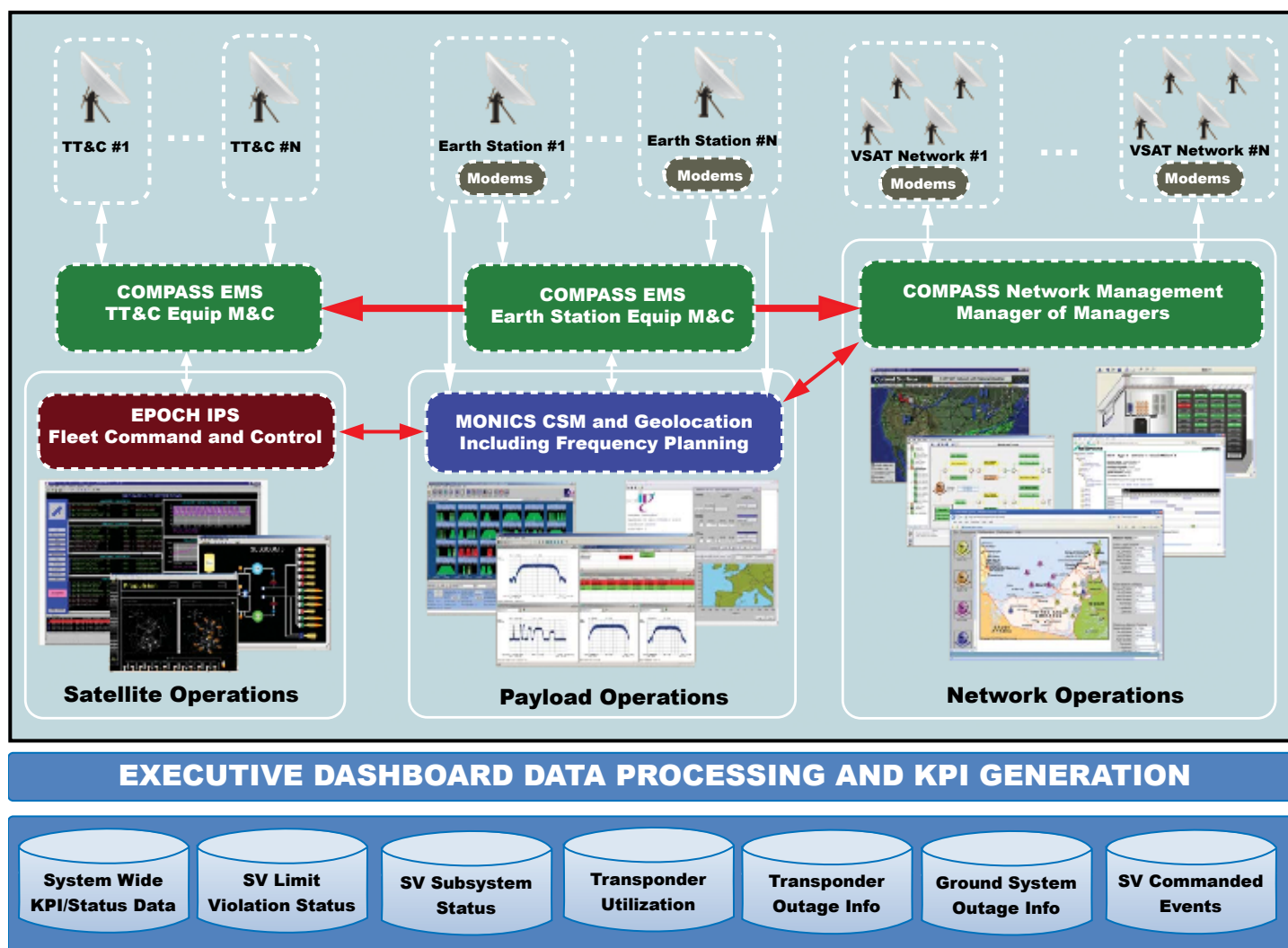
Multi-Satellite Control System Dashboard

The First Step—Foundation Building

Truly effective enterprise solutions are built on integrated systems. Integral’s unique emphasis on fully integrated solutions makes it possible to connect primary system components so that system wide data can be accessed.

The core components of a satellite control system are shown in the figure on the next page and include Satellite Operations (command/control), Payload Operations/Monitoring, Network Operations, and Ground Equipment M&C. While previous systems were typically integrated using “stovepipe” solutions, Integral Systems has taken a fully integrated approach to control system development. This approach breaks down the walls between the different components and opens up a range of possibilities to improve system operations. (For more information on Integral’s “fully integrated solutions”, refer to the November 2007 Edition of *SatMagazine* —“Integrated Solutions: Improving Operations and Quality of Service,” By Mark Schmitt and the interview with Stuart Daughtridge in the Q&A section in this edition of *SatMagazine*).

SPOTLIGHT ADDENDUM



A core component of this enterprise solution comes from **Newpoint Technologies**, a wholly owned subsidiary of Integral Systems, based in New Hampshire. Newpoint's **Compass** product serves as both a system wide "monitor and control" function and also establishes a system wide data conduit between system components. To accomplish this, Compass interfaces with disparate system elements (software processes and hardware components) and other element management systems; collects data from each critical component of the system, and makes that data available via standard database access methods.



Using data made available from Compass, enterprise applications (such as the executive dashboard) can collect and apply "business logic" to critical system wide data. This data can then be used to produce, evaluate, and store **Key Performance Indicators (KPIs)** and other data for each system component in an open enterprise database. In addition to storing

the core data, "end of period" processing can be done on the data to support historical data access and regular/periodic reporting purposes (e.g. End of Month, End of Quarter, End of Year, etc.) With critical data from the major system components now easily accessible, the data can be processed and presented to the user in multiple ways.

Defining Initial Key Performance Indicators (KPIs)

Identifying the most effective key performance indicators for each system will vary, based on overall mission, number and types of satellites, type of equipment, and even the specific personnel handling operations. In addition, preferences of how operations are performed at individual locations and what specific information is useful to executive users will influence the way KPI's are defined, processed, and displayed.

For example, the level of actual transponder use over a one month period might be more important to analyze than the utilization during a much shorter period of time (e.g. a one

minute or even a 24 hour period). Similarly, to monitor the “bigger picture” performance of the system, it’s typically more useful to highlight repeated or pervasive outage conditions than individual spot outages that might be expected to occur from time to time.

While target KPIs for each system are expected to evolve to support different systems, the following core data types and status information are targeted for support in the initial versions of Integral’s Executive Dashboard feature:

Satellite Status - Command and Control Operations

- Out of Limits Data Summary/trending of out of limit items (alarm and warning violations)
- OOL information overlaid with satellite commanding events (for expected OOL violation bursts)
- Scheduled Events (recent and future event execution)
- Rolled up system status displays across components

Transponder and CSM Related – Use and Outage Information

- Fleet transponder utilization summary, satellite transponder utilization summary (PEB, Backoff, Utilization, Utilization by Region)
- Summary of in alarm carriers and outages by types (e.g. missing, too much power, too much b/w, unauthorized carrier, experiencing interference)

Ground System Status

- Roll-up of site status - Outage/Fault summaries (Major/minor alarms, average recovery times, etc.)
- Planned satellite activities (like maneuvers, or the commissioning and new customers, or even listings of occasional use customer events)

Providing key system data from multiple system components on one single display will save executives, operators and operations management teams significant amounts of time as well as prevent them from wading through multiple databases.

SPOTLIGHT ADDENDUM

es, spreadsheets, and control system displays each month to gather the necessary data.

Example Dashboard Data and Displays

The screen image below shows a portion of a composite display for an individual satellite in a fleet. The data presented includes a top-level view of satellite status data, ground system outage info, transponder utilization, transponder outages/interference, and an indication of recent and upcoming events.

The goal is to provide a “dashboard view” sufficient for a quick but comprehensive picture of each primary system element. In addition, the goal is to show the “current” status as well as to provide a broader view of the overall system operations status. The latter is accomplished by showing current (summarized over the past hour), recent (past 24 hours), and past (previous 30 days) of data.

The idea is that even if a specific indicator was “OK” at a particular point in time, it would also be useful to know how the identical data appeared at slightly different, relative points in time. Similarly, if a status currently indicates a “not ok” status, it’s useful to know whether this might be a persistent condition or if the data might be somewhat spurious.



As part of the display, the goal is to provide multiple options to view the data graphically. A default graphical display is provided (in this case, the combined satellite transponder utilization over the past 30 days). The user can select different data sets and overlays by clicking on numbers in the cell, drilling down right through the graph, or using other user interface controls. Consistent with providing the broader picture of the system, if the satellite exploits the automated scheduling tool, the dashboard can display the most recently executed “event” associated with the satellite and the “next scheduled” event.

System Element	1 Hour	24 Hrs	30 Days
Satellite Status	OK	OK	OK
Ground Status	OK	OK	OK
Transponder Use	92	67	89
Outages	4	3	5
Interference	2	5	5

“Business Logic” and Derived Limits

To present an overview of the system status, “business logic” and additional processing is applied to the raw data. This results in data that has been trended and derived from various sources. In effect, a new set of “**derived limits**” is used to process the raw data and derive summarized states (e.g. OK, Warning, Alarm/Alert). For example:



Example of Derived Limits: Satellite Status – It is standard to derive the “state” of the satellite using the current Alarm/Warning “Out of Limits” data.

Current Status - More than Just an Instantaneous Status

Check – Rather than evaluating the “current” status as an instantaneous check of the OOL violations/status, the dashboard uses a KPI that measures the number of violations experienced during a target timeframe. This is to determine if they exceed an expected number. For example, over the past hour, it might be considered “OK” if only a handful of data points have gone in and out of “out of limits” (as limit violations do sometimes occur), but it might be more worrisome if the number of violations exceeds a certain pre-defined number. This is especially true for longer duration periods (such as 24 Hour and 30 Day data points, as some number of OOL violations are certain to occur in those periods).

Longer Term Period - 24 Hours and 30 Days – to evaluate the status over a longer period of time, the display would consider the peak number of violations that occurred during that period and derive the overall “status” based on the number of limit violations considered acceptable or expected during that time. Using this approach, the “Satellite Status” for “Current,” 24 Hours,” and “30 Days” might be considered

acceptable, but that would not mean that no OOL violations were experienced during that time. It would only mean that the number of violations did not exceed the predetermined or expected level.

Drill Down to Get Detailed Data

While users can view the derived state of the satellite, they can also drill down to view the source data used to derive the higher level status. For example, in the example provided,

while the “30 Day Status” for the Transponder Utilization indicates “OK” at 81 percent overall utilization, there still may be certain days of the month where the overall utilization dropped below acceptable levels (as depicted in the graph above). Drilling down into these data points makes it possible to view the more granular data used to derive the higher-level status.

Data Fusion: Combining Data to Derive Additional Information

By graphing and overlaying multiple data points and types, it’s possible to derive information that is more useful. For example, the graph below shows utilization data overlaid with the outage/interference data. In some cases, lower than desired utilization numbers are coincident with higher than acceptable outage/interference events. This suggests that interference/outage events could be the cause for the low utilization. However, if the data point indicated lower than acceptable utilization, but the interference/outage data appears within normal ranges, it might suggest the need to look for other causes of the lower than expected utilization.

Enterprise Solutions for Satellite Systems – Just the Tip of the Iceberg

The application of enterprise solutions to access, analyze, and display critical data across the entire system using a single display offers a powerful first step in exploiting the power of a fully integrated system. A central interface and source of critical data from multiple system components opens a number of options for use of this data in creative and effective ways. The use of standard tools, advanced web based technologies, and open architecture designs will allow this imple-



mentation to evolve as additional data points, business logic, and KPIs are identified by end users.

Combining strategic enterprise solutions, business process management, and fully integrated solutions for complex satellite systems offers yet another reason why Integral Systems continues to be an important asset to the industry with reliable and technically advanced solutions for the satellite industry. ■



Scott Norcross is the President/CEO of **Rolling Storm Communications Corporation**, a strategic communications, information technology, and media production company in the Washington DC area. Mr. Norcross has more than 20 years experience in the satellite industry, focusing on complex solutions for satellite command/control, remote sensing, video technology/production, and complex data visualization. Mr. Norcross can be reached at:

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FEATURES

EYE ON EUROPE

Arqiva—Ready For Expansion!

By European columnist, *Chris Forrester*

Arqiva, amongst other assets, operates the United Kingdom's largest Earth Station portfolio. A handful of years ago, the company itself was up for sale and was eventually acquired by Australian financial interests headed by Macquarie. Arqiva has since mopped up rivals and new businesses at an impressive rate. Its latest toy is operating much of the uplinking for the UK's embryonic Freesat rival to BSkyB's Sky Digital pay-TV operation.

Freesat is backed by the UK's main terrestrial networks, in particular the **BBC** and **ITV**. They're hoping **Freesat** will enjoy some of the success that its terrestrial 'big brother' has enjoyed with **Freeview**. Either way, Freesat will tap into those homes where (a) terrestrial reception is a challenge, and/or (b) where consumers are reluctant to fund pay television.

Freesat will launch this coming spring and Arqiva's *Nick Thompson* ([Managing Director, Satellite Media Solutions](#)) says

Freesat will have free-to-view HDTV as one of its central thrusts. "At the end of the day, they have a list of between 80 and 120 channels and brands that are looking to launch, and many of them will end up with an HD product. Whether they're all on Sky today is another question, but without doubt, there's a strong opportunity for an HD element to be part of the Freesat platform, and perhaps even first on Freesat. However, what is clear is that the two main sponsors of Freesat, BBC and ITV, have a great deal of HD content that they'd probably want to get out [in front of the public]."



Freesat operates from the same **SES Astra** satellite platform as **Sky Digital** (at 28.2° E). In many cases, the same transmission will be visible as free channels on both Sky and Freesat. However, Freesat demands its own electronic program guide (EPG) 'look and feel'. Finding space for this extra data stream hasn't been easy, especially where transponders are operating at full capacity.

"I have to say the actual EPG task for Freesat is something of a logistical nightmare for us. The main problem is that most

channels simply don't have what you might describe as bandwidth headroom, especially if they are already in a StatMux (Statistical Time Division Multiplexing). And it's good business practice, from everyone's point of view, to run the Muxes (multiplexers) at a full rate. It might all amount to an extra half a Megabyte per transponder, but it's a half we don't have. So first up, it's technically tricky, and asking someone to pay for it is even more of a challenge," jokes Thompson.

"For the BBC or ITV, it's easy," he continues. "They have 4 Muxes and can re-engineer and squeeze a bit of extra capacity out of their systems, and make the bandwidth overhead available. Where the Mux is shared you obviously get another set of problems. It might be assembled from 10, 12 or 14 channels, and it could be that only half of them want to be on Freesat, so you end up with a very complex set of challenges. In other words, the channels that want to be on Freesat are all over the place. In very round figures it is just that half Meg per transponder. What we'd ideally like to do is to squeeze the Mux in order to achieve the extra data traffic, and then as we move forward, we can plan and position the overall demand into some new configuration."

"There's a huge amount of legacy MPEG-2 kit out there, most notably in home set-top boxes. The STB's, and the platform owners, will decide the future route."

- Nick Thompson, Arqiva

Freesat will transmit in MPEG-2, although any HD transmissions will use MPEG-4. Asked how long he saw MPEG-2 transmissions continuing, Thompson believes the UK – and much of the rest of the planet – wrapped up within MPEG-2 for years to come. "The question is, for how long? There's a huge amount of legacy kit out there, most notably in home set-top boxes. The STB's, and the platform owners, will decide the future route.

"From our point of view, we have, I guess, 20 or so Muxes. The cost of refurbishing those into MPEG-4 will have to happen one day, and is wholly manageable, but first there has to be a base of subscribers to make it meaningful for the platform owners. Nobody is going to make a first move without that audience beginning to build. However, there's a certain inevitability about a scenario where a transponder is carrying new MPEG-4 signals alongside MPEG-2 traffic. And to a certain extent, Sky is again a pioneer in this regard. But the future will see multiple legacy Muxes.

"Taking the UK as a perfect example, you can see how today's huge legacy MPEG-2 box universe will, over time, be churned

out in favour of higher specified MPEG-4 units. Sky will either up-sell to an HDTV MPEG-4 box with a PVR (personal video recorder), or – and I am not sure that Sky would like this – whether a new player like Freesat comes in and steals their thunder, but at the consumers cost. One way or another, the legacy boxes will be upgraded. Everyone wants MPEG-4, but someone has to pick up the bill. But will it be Sky, or the viewer, who has to make the investment?

"I have no doubt that broadcasters would like this to happen tomorrow, with technically attractive new boxes with high functionality. People pay high prices for any of the PlayStation consoles, and think nothing of having a Wii and other stuff as well. It's the way the market works these days. They're almost disposable items. Why should set-top boxes be any different? And these days, with seemingly the whole world investing in high-priced flat-panel TV sets, why should anyone want an 'old' set-top box?"

"I was an HDTV sceptic. I am totally converted as to the merits of HDTV, both as a viewer and as a basis for our business and its expansion potential."

On the question of HDTV's progress, Thompson admitted that four years ago, he was something of a sceptic. "I am totally converted as to the merits of HDTV, both as a viewer and as a basis for our business and its expansion potential. It isn't a bad business to be in! My only frustration is that today there are only a dozen or so channels, and from where I sit, too much of that content isn't true HDTV. I only discovered the other day that the HD box is [pushing programming to the hard drive] and storing material for me to view in HD. I simply wasn't aware, and I suspect I am not alone, but 9 and 10 year-olds all understand it, as do teenagers—it's us [older folk] who are the idiots."



Thompson says Arqiva is having solid discussions with customers about their HDTV plans. "I think we'll see a number of enhanced channels, using either existing content or from newly-commissioned material. The new Sky high-def EPG

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looks terrific, I understand. The bandwidth crunch that everyone anticipated hasn't really happened. We have adequate capacity on line, and the trick for us is to draw down the capacity that's needed on a 'just in time' basis. We are about to light up a new EuroBird transponder, in 72 MHz, and we'll bring that on about springtime.

"What we are doing is looking at whether we can create a hybrid service that carries both MPEG-2 and MPEG-4 on the same transponder and for all of the signals to be in the same

MUX, which filters down to our operational level, and is technically quite complex. The mindset has been to keep MPEG-2 and MPEG-4 separate, but we are looking at the efficiencies possible. It is more difficult when the MUX is all-HD to fill every last gap in the MUX."

Last year, Arqiva acquired most of the assets of British Telecom's Broadcast Services Division (BTBS). The purchase added considerably to Arqiva's portfolio of teleports. "Post the acquisition of BT Broadcast Facilities in April, we have fully retained their London Docklands site," says Thompson. "Initially we were told that Docklands was full. However, discussions with the local staff showed there were gaps in their system. We found that all matter of capacity was potentially available, and that some of the dishes should have been in museums. In other words Docklands does have capacity.



"BT's Madingly [Cambridge] site was not part of the sale. Some of its services are coming to Bedford, some to Chalfont, some to Docklands. But importantly, we have good expansion just about everywhere. Bedford, in dish terms, is no more than half full. We have plenty of land. It's the same here at Chalfont and also at Winchester. Docklands was once the most prime of prime real estate for the industry, and it is tough to say whether with today's fibre solutions such is still the case. However, in its strong favor is the fact that it is in almost at the heart of the London 2012 Olympics site. Fibre is just about everywhere, and incidentally where we are putting in fresh fibre, we think the site could be very interesting.

"The advantage of multiple teleports is very strong. All of our sites are fully manned. But each time you add another shift, it means a little extra in those costs, but overall, we are spreading the load across all the

facilities, especially when you consider disaster recovery. In Britain, we have 4 main hubs (Chalfont, Bedford, Docklands and Winchester) as our primary locations. Morn Hill at Winchester gives us good expansion there, and the old BT site at Martelsham we have retained as secondary sites. Martelsham can see Intelsat 710, the old PAS satellites, which are very low on the horizon from the UK, and we see this site continuing for the long term. We have two major sites in Paris, one in the centre of town and the overflow over near the EuroDisney park at Marne. Again, this allows for excellent expansion. Any expansion scheme has to cover the usual technical questions of line-of-site, frequencies and interference issues, but we can always find a solution."

"We have kept BT's West Coast teleport at Marina del Ray, and another in downtown Washington, on M Street, and we have fibre points of presence just about everywhere in the US."

Arqiva's financial year ends June 30. Last year's purchase of British Telecom's teleport assets is only now being full recognized. "Our guidance to the market is that this current full year will generate somewhere North of £200m, [\$400m] which will be at least double our pre-acquisition numbers in the year to June 08," says Thompson. "We have also been able to take out significant costs from the acquired businesses. This doesn't all mean staff, far from it. BT had run down their own staffing, so where it has been necessary and made sense, we have added to staff numbers. But we have also looked at being more cost effective, just about everywhere.

"We have improved BT's profitability, and have a proper sales focus in the USA. There was too

much uncertainty there, and this has been remedied as a result of the purchase. They simply didn't know what was likely to happen, and that's understandable. We inherited good customers and long-term contracts, and we are renewing them now. We are talking to clients saying 'we're still here, and will be for the long term'. It is all core business for us, and is a good growth business.

"Simply adding good commercial people into North America has improved local relationships. It is the same with relation-

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ships with satellite operators. It was never bad in the Arqiva world, but with the enhanced business the likes of Intelsat, the new Telesat, as well as Astra and Eutelsat, they all see us now as having good – and important – critical mass. That's crucial to their own businesses. Some of these were beginning to get active in the direct selling of capacity to their customers, perhaps bypassing us completely. We see that as having mostly ended."

"But the one gap we have in our global reach is South East Asia. It is a territory that we continue to look at closely"

Arqiva's relationship with Australia's Macquarie bank is close, and Macquarie has spent heavily buying up UK broadcast-related assets, although not all sit under the Arqiva umbrella. Thompson explains. "Macquarie's interests in Australia are limited to Broadcast Australia. We best describe them as 'distant cousins'. It runs the Australian terrestrial network and is a parallel business to our UK terrestrial business. There's a slightly different shareholding structure. We have an 80 percent Macquarie ownership, and they have a 100 percent Macquarie ownership, so we are very much at arm's length. We talk regularly, and look at joint opportunities wherever we can.

"There's another, even more distant cousin in Red Bee Media, the old BBC entity. But the one gap we have in our global reach is southeast Asia. We can serve some clients from here or California, but it is a territory that we continue to look at closely. We are on the record as saying that if you look at the map then a gap exists. How we might fill that gap, through ownership, or partnering locally? Those questions have yet to be answered, and the options are open.

"We are not ready to make any commitment just yet, but it is an obvious fit. At the end of the day, our shareholders want us to make money. Just a couple of years ago, people were leaping into regions – and losing money. We won't do that. It has to be the right fit, and largely customer driven, and there are things we are keen to do in the United States probably ahead southeast Asia. We are also looking at new platforms, new technologies. And these are our core skills. If we can leverage those skills with clients, then we will do so, even if it means buying or investing in a new area, or facilities. But the fit must be right. More and more clients like to deal directly with a single player to look after all, or most, of their solutions. The Middle East is interesting, and so is South Africa.

"There are also the obvious pressures from our shareholders who are keen to be ready for the next 'thing', whatever that

might be. We have a certain mass now that's rolling forward in an attractive fashion. This prompts questions such as 'What are you going to do next week or next month'. These are very attractive problems, and far better than, 'We have problems, so don't come asking us for more cash'."



Arqiva owns and operates

- The ITV commercial transmission towers
- Transmission for Channel 4
- Total of 1154 Tower sites
- 10 satellite teleports
- Radio transmission
- Playout
- Compression
- SNG and OB systems



London-based Chris Forrester is a well-known entertainment and broadcasting journalist. He reports on all aspects of the TV industry with special emphasis on content, the business of film, television and emerging technologies. This includes interactive multi-media and the growing importance of web-streamed and digitized content over all delivery platforms including cable, satellite and digital terrestrial TV as well as cellular and 3G mobile. Chris has been investigating, researching and reporting on the so-called 'broadband explosion' for 25 years.

Extracurricular Activity

DO YOU BELIEVE YOU'RE THE SMARTEST INDIVIDUAL TO GRACE THE SATELLITE COMMUNITY SINCE ARTHUR C. CLARKE? TRY YOUR SYNAPSES ON THIS SATPUZZLE...

Crossword by Tiare Widmaier and Myles Mellor

Solution on page 55

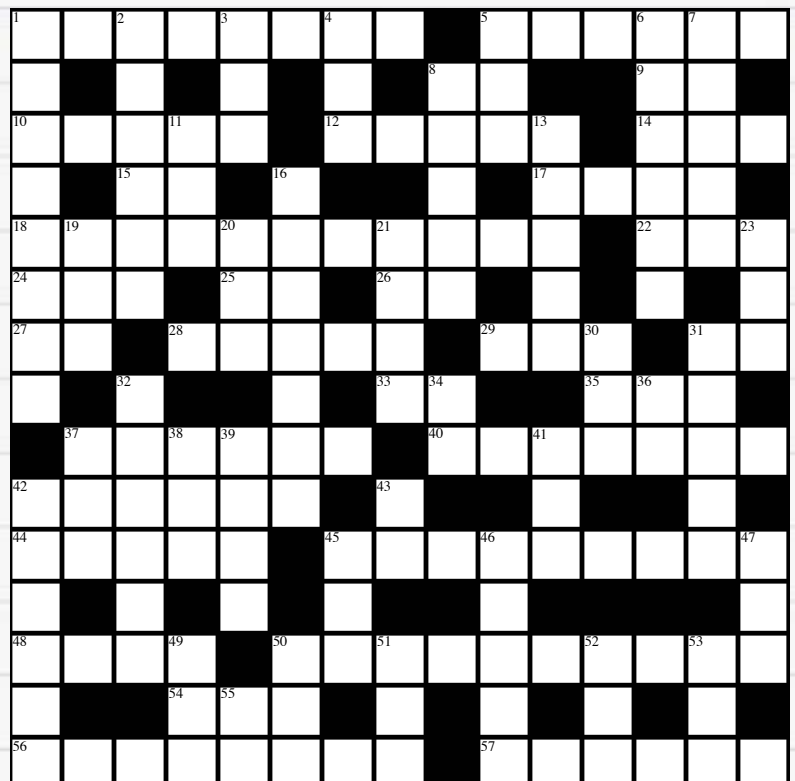
Across

1. ____ Radiation Belts (2 words)
5. ____ Spectrum, type of signal transmission
8. Single, before a vowel
9. Note well, abbr.
10. Slant ____, length between a satellite and the Earth station
12. Joke reaction
14. Listening device
15. Musical scale note after me
17. Broadcasts
18. The innate ability to invent
22. One billion cycles per second
24. She has nine lives
25. ____ C (communications regulator)
26. Zeros
27. Temperature control
28. ____ cast,
29. Pressure measure
31. Carrier to Noise ratio, for short
33. Operating system, abbr.
35. Yours and mine
37. The point in an elliptical satellite orbit which is farthest from the surface of the earth
40. System that is supplied, installed, managed by one vendor
42. He who rules; "____ of the universe"
44. ____ Satellite Link
45. Satellite television "snow"
48. Space explorer
50. Put into an equilibrium
54. Unit of force equal to that exerted by gravity
56. Scientific or observation satellites locale (2 words)
57. Solar ____ (out of commission)

Down

1. Straight up
2. Milk "lite" (2 words)
3. Rest
4. Satellite death for short
5. Satellite news gathering, briefly
6. ISS is powered by this in its solar form
7. Big party, such as New Years (2 words)
8. ____ Subcarrier
11. A humorous anecdote, or joke
13. Passes
16. Program used to convert from one signal to another
19. "B____" Method of transmitting tv signals

20. Aircraft regulations for flying, abbr.
21. Shopping list of the day's activities
23. Buddhist philosophy
30. A charged particle
31. The highest part of a wave
32. Flash floods or sudden heavy rain falls
34. Avenue companion, for short
36. Brit. abbreviation
37. Bristle-like projection
38. Listen in Spanish
39. Inspiration for later work
41. L. Frank Baum's flying creature from story of OZ
42. Variable wave
43. Where the stars are
45. A body that orbits Earth, for short
46. Rare African animal
47. The power required to achieve saturation of a single repeater channel on the satellite, abbr.
49. A while back
50. Power transistor burn-out? abbr.
51. Space ship rear
52. Believer suffix
53. Chicken or the ____?
55. Stumbling expression



FEATURES

AN EVENT OF MENA PROPORTIONS

by Martin Jarrold

Chief of International Program Development, GVF

The Middle East often claims the media headlines. Recently this has, in part, been due to escalating oil prices, which pushes the GDP of the region's oil producers sky-high. Even before the most recent oil-price "gushers", Middle Eastern countries were realizing an average annual GDP growth

of almost 6 percent. This level of economic expansion is well reflected in, and partly facilitated by, growth in the size of national telecom markets across the region.

The regional appetite for broadband connectivity is a major driver of this growth in the national telecom markets of the Middle East countries. The appetite originates in an ever increasing emphasis on Internet access as a means to improving education at schools and universities, as well as from the applications demands of a range of private sector verticals ranging across

oil and gas exploration and production, financial services, maritime transportation, and many more.

It is within this broad market environment the program for the forthcoming **GVF Middle East & North Africa Satellite Summit** is offered. The event will examine today's unprecedented levels of demand for IP-based services from millions of communications solution end-users across the Middle East and North Africa (MENA) region. Large-enterprise, Small-to-Medium (SME) businesses, Small Office/Home Office (SOHO) and residential users alike—all continue to clamor for cost-effective access to reliable solutions in order to accelerate the accessibility of a multitude of bandwidth-hungry, interactive applications. To meet this demand, multiple delivery platforms and technologies, notably satellite, are rapidly being deployed around the MENA regions. In the enterprise sector alone, a combination of the pent-up demand for broadband access solutions, together with a liberalizing

satellite market environment, is helping drive this region's business opportunities.



With this market liberalization continuing to advance, many countries across the region have established separate telecoms regulatory authorities. These authorities possess greater or lesser degrees of independence from the policy-making national administration. Eight of the 15 countries in the region have achieved tangible separation between regulatory and policy-making functions. The seven that lag behind in this separation process (Iran, Syria, Yemen, to name three) are, not surprisingly, the least liberalized markets. As of June 2007, these three Middle East countries, together with Lebanon and Kuwait, plus Iraq (facing understandable special circumstances), continued to exhibit total state-ownership of their incumbent telco. None of the other nine countries had moved to total privatization of the incumbent and they demonstrate a mix of minority and majority state-ownership.

From government networks to financial services, from oil and gas to the marine transportation environment, and from the education and health sectors to the reconstruction of Iraq, the international satellite communications industry is moving to address fixed satellite service (FSS) and mobile satellite service (MSS) requirements for bandwidth, ground segment

hardware, and value-added services. And, more than ever before, the emphasis of the regional communications market agenda revolves around how to satisfy an ever-increasing demand for cross-border solutions.

Over March 5th and 6th, GVF will be co-locating the **Middle East & North Africa Satellite Summit (MENASAT)** with the Dubai World Trade Centre (DWTC) 14th International Electronic Media & Satellite Communications exhibition for the Middle East, Africa & South Asia (CABSAT).

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In previous years, the GVF MENASAT Summit had been co-located with the annual GITEX show, also held at the Dubai International Convention & Exhibition Centre (DICEC). As in previous years, during each annual CABSAT exhibition, the GVF has formerly scheduled a one-day satellite symposium. Now, in recognition of the ever increasing importance of the CABSAT exhibition for the satellite communications industry, GVF has enhanced its collaboration with DWTC and has repositioned MENASAT in the calendar. This new date should provide a significantly value-added and extended conference component to the CABSAT 2008 exhibition during the second and third days of the show.

GVF has partnered with UK-EMP for the planning, promotion and delivery of **MENASAT@CABSAT 2008**, the theme of which is **'Growing the Broadband Networking Environment & the MENA Satellite Dynamic'**.

The fundamental questions to be addressed at the MENASAT@CABSAT 2008 Summit include:

- How are satellite-based broadband solutions competing in this dynamic environment?
- What are the advantages of satellite-based broadband solutions?
- What are the unique characteristics of satellite broadband?
- How do broadband satellite service providers build their business cases?
- How will satellite-based services continue to evolve to match future market and demand dynamics?
- Where are the revenue streams to be achieved and profits to be made?

The MENASAT@CABSAT 2008 Summit will bring together industry leaders to identify and discuss the development of new opportunities in satellite services and technologies. The emphasis in 2008 will be on discussion and the interactive exchange of ideas between delegates and representatives of satellite users, as well as operators, manufacturers and analysts. This conference will provide an unrivalled networking opportunity for the MENA region.

The 12 Session Themes

- Regional Access & Applications: Satellite Networking Connectivity Initiatives & the Dynamics of IP Convergence

- State-of-the-Art Maximization of Satellite Bandwidth in the MENA Region
- Applications Study: Business Continuity & Disaster Response
- Market Vertical Study: Marine Transportation Sector
- 21st Century Satellite Pure-Plays & Hybrids: Regional Alignment of the Convergence Factor & the Mobile Dynamic
- Applications Study: Sustainable Economic & Social Development through Education Provision & Health Promotion
- Regional Study: Communications & the Reconstruction of Iraq
- The View from the Asia-Pacific Satellite Communications Council (APSCC)
- The New Training Dynamic in Regional Capacity Building
- Market Vertical Study: The Energy Industries & GVF Market Sector Initiatives
- Alternative Satellite Technologies & Next Generation Networking: Market Opportunity in the Evolution of Platforms & Performance
- Driving the New Dynamics of the Regional Broadband Satellite Solution

Full details of the **'Growing the Broadband Networking Environment & the MENA Satellite Dynamic'** program, including full descriptions of the above listed sessions, are available at <http://www.gvf-events.org>. Information about opportunities to speak at the Summit can be obtained from me at martin.jarrold@gvf.org. Information regarding sponsorships can be obtained from Paul Stahl of UK-EMP at paul.stahl@uk-emp.co.uk.

About UK-EMP

UK—EMP was founded in 2004

for the purpose of developing, organizing, and managing a niche portfolio of highly specialised conferences and summits for the ICT industry. Our

primary geographical focus is on rapidly developing, as well as developed, regional markets. The UK-EMP focus on these geo-territories is founded on the extensive and direct experience of our personnel and partners in these markets, and on an extensive *'Database of Expertise'*; comprising professional contacts obtained, and maintained, for countries throughout these, and other, regions. ■

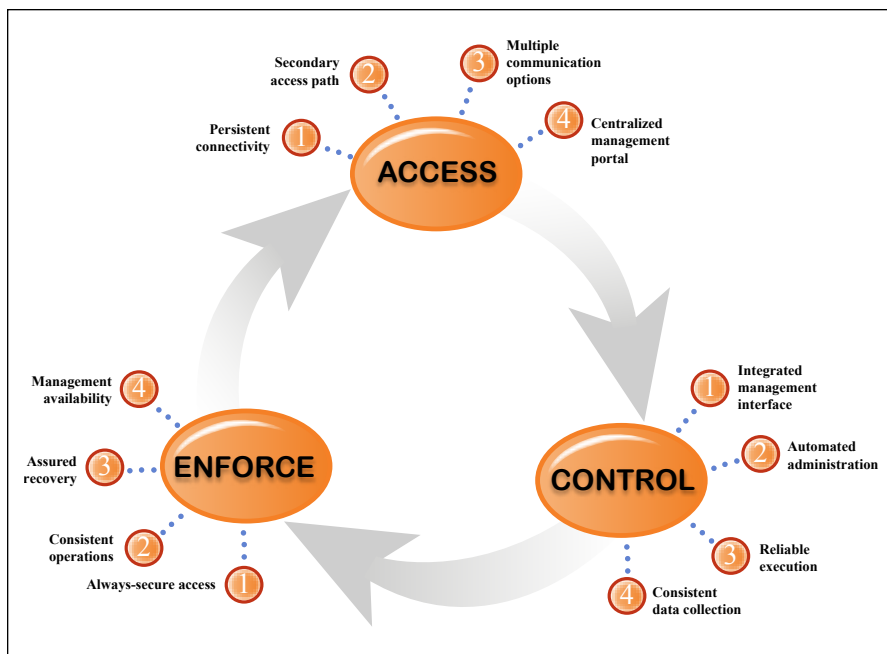


Martin Jarrold joined the GVF in June of 2001 and was appointed to the position of Chief of International Programme Development. Prior to joining the GVF, Mr. Jarrold was Commissioning Editor and Head of Research for Space Business International magazine.

REDUCING THE COST AND COMPLEXITY OF MANAGING SATELLITE-BASED NETWORKS

by Barry Cox

Satellite communications represent a cost effective and reliable means of transporting voice, video and data to and from remote locations. However, as the adoption of satellite-based communication networks continues to grow, so do the management challenges. Bolstered by high-speed satellite links, network infrastructures are pushing farther into the most demanding remote areas – jungles, mountaintops, deserts, and oceans. Regardless of geographic location, operational, and IT staffs are expected to maintain high availability, reliability, and security of their satellite networks to deliver the business applications they run — a daunting task.



However, when network problems arise and connectivity is lost, devices that use or manage this network are lost as well. These components include traditional network management devices and systems that communicate over the managed medium. When a remote device cannot be seen or managed over a network link, it requires an expensive and time-consuming site visit by a technician.



No one is more in tune to this problem than satellite service providers that frequently support terminals in remote areas. A terrestrial VSAT or teleport may be at a site that requires several hours of driving time. An isolated offshore drilling rig is at least a helicopter ride away. As a result, Service Level Agreements (SLAs) are missed, costs explode, and time is lost.

Next-Generation Remote Management

IT administrators who are tired of absorbing the costs and business risks of network problems, service providers and end users with demanding high availability requirements are applying a new remote management approach. This new approach reduces the cost and complexity of supporting satellite network environments, and can act intelligently as an IT administrator's eyes, ears, and hands. The result performs routine maintenance and problem resolution to ensure the network and system devices consistently stay up and running to support the applications critical to the business.

Next-generation remote management is dependent upon an appliance-based architecture that integrates three built-in intelligence and security functions addressing remote management challenges more quickly, securely and accurately:

- **Access:** Enables constant accessibility to gather, store, and process information, regardless of the state of the network.
- **Control:** Automatically discovers, diagnoses, and fixes routine problems in near real time.
- **Enforcement:** Enforces IT and security policies through a comprehensive security model that can run standalone or in conjunction with the existing corporate security standards.

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By working together, these functions displace remote site visits with a secure remote management solution that can be trusted and relied upon to execute monitoring, maintenance, and remediation any time of the day.

While there are many challenges secure remote management addresses, two specific problems satellite providers are most concerned about today include; automated problem resolution, and IT policy and security compliance.

Automated Problem Resolution

Whether IT staff is sent to remote locations in order to fix network problems like restoring unresponsive devices, or just to perform routine system maintenance such as upgrades or configuration changes, companies are forced to invest the time, money and valuable staff to remote locations. This time and cost can be recouped by simply relying on the intelligent automation capabilities that secure remote management can provide. Additionally, the use of automation helps reduce operator errors that may arise when relying on technicians to maintain and fix problems at remote sites.

According to **Nemertes Research**, IT staff at large enterprises spend between 30 and 50 percent of their time troubleshooting and fixing problems at remote locations. As companies who rely on using satellite-based networks continue to add more remote sites, IT staffs are stretched even further. In addition, delays in reaching these remote locations results in more production time lost. Nemertes Executive Vice President *Robin Gareiss* says this problem can easily be resolved by replacing the manual processes of IT staff with automated management tools.

Secure remote management has the ability to automate hundreds of network routine maintenance and recovery tasks. These include detection and correct diagnosis of equipment and communications failures; executing pre-defined, best-practice recovery procedures; provisioning and re-provisioning services; configuring devices via remote administration; and measuring and managing both application and network service levels from a remote perspective.

As the global demand for skilled remote IT staff increases, many industries and business sectors are deploying secure remote management. Satellite service providers have been able to automate more than 75 percent of their customer's

routine network support and maintenance tasks. In addition, they have been able to do more with less without having to increase or overextend IT staff, while also minimizing expensive, on-site visits that ultimately lower support costs in the process.

IT Policy and Security Compliance

Just as in the datacenter, security and management policies at remote sites must be enforced, even during a network outage or other maintenance window. System administrators and management must; **a)** have visibility to all who have access to devices on the network; **b)** control what is being done while the devices and network are being accessed; and **c)** have the ability to accurately report on all user interactions in order to satisfy security and compliance requirements. Secure remote management makes meeting these requirements possible.

Historically, when outages have occurred at a remote location, outsourced support staff would likely be given root-level access to systems and applications to quickly restore them from “bare metal” or other impaired states. As a result, organizations became unnecessarily exposed to potential security risks and threats.

The positive aspects of secure remote management are in providing encrypted access to all managed devices, enforces authorization and authentication policies while auditing all user interactions and configuration changes. In addition, the intelligent architecture ensures both internal and regulatory security standards will be enforced at all times, even during a network outage or service disruption, which addresses the problem without new costs and complexity.

Meeting All the Requirements

Secure remote management enables enterprises with distributed remote infrastructure to overcome the limitations of network-dependent monitoring tools to maintain remote sites online, under control and on budget.

By co-locating management technology at a remote site, secure remote management can perform the majority of the routine administration, maintenance and recovery tasks normally performed by an on-site technician, but in a quicker, error-free manner and at a fraction of the cost. And by diagnosing and fixing problems locally, automating routine maintenance tasks, and controlling access to networked devices from a centralized location, support costs and incidences of downtime are dramatically reduced.

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Secure remote management supporting satellite-specific applications has been adopted within many business sectors including the financial services, oil/gas and maritime industries.

Therefore, the next time communication is lost with that oil rig off the coast of Africa, or just a VSAT or teleport across town, IT administrators and management can relax. Companies no longer need to absorb the cost and risk of sending a technician across the city or the world, and worry about lost production time. Getting communications with the remote site back up and running can be done quickly, automatically and error-free with a secure remote management solution. ■



Barry Cox is the Chief Technology Officer at Uplogix and can be reached at bcox@uplogix.com. He has spent his career developing products for e-commerce and information systems and has managed across a number of corporate functions, including all areas of product design and development, as well as revenue generation and customer support. Prior to Uplogix, he was at AlterPoint, where he was responsible for product design and release management of their network device configuration management solution. Previously, Mr. Cox held senior technical, sales, and executive management positions at Coremetrics, Intellifact, Drake Industries, and CyberMark.



HOW SECURE REMOTE MANAGEMENT WORKS

Because secure remote management (SRM) appliances are deployed at remote locations, they can locally manage a wide variety of networking gear, including satellite modems, switches and routers, as well as intelligent racks, and power and environmental control systems.

To ensure the SRM appliances can communicate during a network outage, a secure and reliable alternative communication path is designed into the architecture. Dial-up and wireless service can be used; if the VSAT is in an extremely re-

mote location, low earth orbit connections can also be used. Many satellite service providers use service from Globalstar or Iridium for their secondary connection.

Through this direct connection to the console (serial) ports of the remote devices, the appliance can query the connected devices every few seconds, storing the data locally. Since the data is stored locally and doesn't need to be transmitted on a regular basis, there isn't a cost penalty for sampling frequently. Detailed event logs are available on an as-needed basis to help with problem resolution.

Once a sufficient repository of data has been gathered, it can then be analyzed. For a SRM appliance polling console ports at a remote location, the amount of data to indicate a problem can usually be gathered in 30-seconds or less. Once the data has been gathered, a policy engine inside the appliance determines if a parameter is in or out of specification, and either resolves the incident based on pre-approved guidelines, or communicates the problem to the network management center.

Once a problem signature is recognized, the SRM appliance can take steps to automatically resolve the incident and restore the service. In addition to restoring network connectivity, the logged and stored management data enable IT and service providers to establish a root cause that required the reboot. Such a determination can help to avoid in the future, or establish as a routine device issue that the SRM appliance is authorized to address automatically.

Unexpected downtime is always a possibility during software upgrades of network hardware. In some cases, the devices fail to boot after a new software load, thereby requiring a reliable and secure way to backtrack. In these cases, the SRM appliance needs to be able to restore the last-known-good-configuration automatically. The local control logs can then be examined once the network has been restored to understand what caused the network aberration.

Management actions and associated logging data exchanges between the NOC and the remote sites should be safeguarded. Designing a remote management platform with a robust AAA (authentication, authorization, and audit) security model, combined with the physical properties of a specific purpose appliance, ensures the protection of the systems and network devices and the network itself. This way, all actions are logged and stored locally, giving visibility to all management actions to these devices.

LASERCOM FOR BETTER SATCOM

by Hendrik Thielemann

Laser beams could soon become a viable alternative to radio waves for the transmission of large quantities of data over long distances through space. High data rates combined with little power consumption and low payload weight make laser communication terminals particularly interesting for application on-board satellites, space telescopes and scientific space probes. The first satellites equipped with laser communication terminals are already orbiting the Earth and more will follow in the coming years.

Laser-based data transmission has several advantages over conventional radio links. Due to the shorter wavelength, lasers can achieve higher data rates than radio signals for the same given aperture. Laser beams are inherently less divergent than radio signals and, therefore, require less power for data transmission. In addition, due to the higher efficiency and the low beam divergence of the laser beam, the laser link is an extremely secure point-to-point connection; a bugging device would have to be in the immediate vicinity of the receiver, or would even have to be introduced into the beam, and this would terminate the connection immediately.

These advantages are particularly useful in space applications. Lasers would be effective when large quantities of data need to be transmitted rapidly back and forth between satellites. In addition, lasers would be highly functional when data has to be transmitted across vast distances. Lasers will certainly be the communications medium

of choice in the future. Among many other applications, laser communication is currently being considered for:

- *Data relay services for unmanned aerial vehicles (UAV):* UAV inspecting remote areas can send their observation data to a data relay satellite in geostationary (GEO) orbit via an optical link.
- *Data relay services for satellites:* High-speed laser communication can be used to replace an expensive network of

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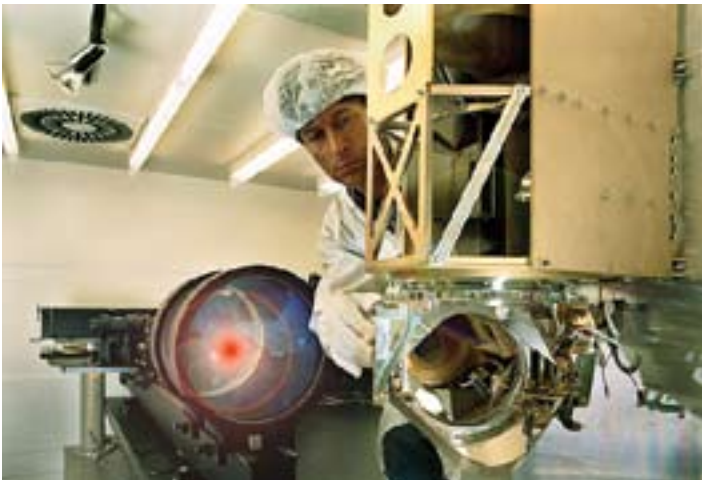
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ground stations needed to constantly receive low earth orbiting (LEO) satellites` data. The data gathered by the LEO satellites can be transmitted to a relay satellite in GEO orbit by means of laser communication. The relay satellite then transmits the data to a single ground station thus offering cost savings in operations and infrastructure.

- *Inter-satellite links between GEO satellites can be used to share resources and/or route traffic around a satellite network. They are also of interest for intra-continental communications (e.g. between satellites providing services throughout Europe with satellites providing services to Western Europe being linked to satellites providing services to Eastern Europe) and inter-continental links (e.g. between satellites providing services in Europe linked to satellites providing services to the US and / or Asia Pacific rim).*
- *Deep space data transmissions: The amount of data being collected on exploration missions, such as those to Mars, and are increasing and will soon become limited by RF capacity. This increase may require on-board data processing and coding be introduced, with the resulting loss of access to the raw scientific data. In addition, an increase in the long data transmission times increases operation costs and severely reduces the time available for scientific tasks. By using optical links, the data rate can be dramatically increased, thereby allowing the raw scientific data to be received and resulting in the increased scientific value of future missions.*



The Swiss company **Oerlikon Space** has designed a family of laser communication terminals to address these applications. The terminals are known as **OTEL** and have been developed for both near Earth and deep space applications. The OTEL terminal family consists of four optical terminals to support near Earth telecommunication applications as well as an optical terminal for the deep space link application.

The four OTEL terminals for near Earth telecommunication applications are:

- OTEL 02; the short-range terminal capable of transmitting data at Gbps rates over distances of, typically, 2,500 km. This class of terminal is of interest for applications such as the short range GEO – GEO crosslinks. Oerlikon Space has developed a demonstration model of this terminal under an ESA contract.
- OTEL 25; the medium range terminal capable of transmitting data at Gbps rates over distances of, typically, 25,000 km to 45,000 km. This class of terminal is of interest for applications such as LEO – GEO inter satellite links and medium range GEO – GEO crosslinks. An engineering model (EM) of this terminal has been developed by Oerlikon Space under an ESA contract.



- OTEL 80; the long-range terminal capable of transmitting data at Gbps rates over distances of 40,000 km up to 80,000 km. This class of terminal is of interest for applications such as LEO – GEO inter satellite links and long range GEO –GEO crosslinks.
- OTEL AP; the OTEL terminal design for atmospheric communications between either high altitude (stratospheric) platforms (HAP). The communications links between HAPs are dimensioned to a data rate of 155 – 622 Mbps over a distance of around 400 km. Oerlikon Space has developed a demonstration model of this terminal.





On the Canary Islands in November 2007, a team from Oerlikon Space demonstrated the feasibility of a deep space laser communications link by simulat-

ing the expected conditions between the islands of La Palma and Tenerife. To prove that data transmission across this vast distance is really feasible, the Oerlikon engineers had devised a special experiment in which they set up a laser link with the transmitter at La Palma and performed a communications link to the ESA optical ground station at Tenerife.

The transmission unit was modified in such a way that the conditions on the 142-kilometer stretch between the islands exactly reflected those that would prevail on a 1.5 million kilometer link through space. This was achieved primarily by reducing the emission aperture of the laser to a diameter of less than half a millimeter in order to weaken the light signal.

The Oerlikon team installed the transmission unit in a container beside the *Nordic Optical Telescope* at an altitude of 2400 meters on Roque de los Muchachos, the highest mountain on La Palma. Because of the unusually clear air, this is an ideal location for optical experiments. The receiver terminal was situated in the *Optical Ground Station* (OGS) of the European Space Agency ESA on Tenerife.

Although the optical experiment was hampered by unfavorable weather conditions with unusually high cloud and strong winds during the first few days, the experts from Oerlikon Space succeeded in establishing a laser link between La Palma and Tenerife. In the course of the experiment, they achieved transmission rates of over 10 Mbit/sec. At this speed, it would take a mere two seconds to transmit the entire text of the Bible. The data rate would also be sufficient to transmit three digital television programs simultaneously.

The distance of 1.5 million kilometers that was simulated on the Canary Islands is equivalent to the distance between the Earth and Lagrange points L1 and L2. These mark specific positions in space at which it is particularly advantageous to place space telescopes.

Scientists could benefit enormously from laser communications: Equipped with laser terminals, telescopes will, in the future, be able to transmit far greater quantities of observation data to Earth than is possible today by radio. Image data

from today's space telescopes are compressed on board the telescopes before they are transmitted to Earth. This compression inevitably brings information loss. Equipped with laser terminals, future telescopes could transmit raw data and thereby provide scientists with the full information gathered by their instruments.

The next step Oerlikon Space is planning is for the coming summer. This will be another test campaign on the Canary Islands to simulate a laser data link over a distance of 400 million kilometers. This is the maximum distance between the planets Earth and Mars. Similar to space telescopes, the amount of data transmitted from planetary probes to Earth could rise dramatically. This would significantly increase the scientific benefit drawn from these expensive missions.



While optical data transmission from deep space is an interesting mid-term perspective, it is currently becoming operational in the Earth's orbit. The ESA **Silex** project was the first program to successfully demonstrate laser communications links between two satellites **Artemis** and **Spot 4** as well as between the geostationary Artemis satellite and the ground.

In November 2001, Artemis established its first laser connection to the French Earth observation satellite Spot 4 and successfully demonstrated the feasibility of achieving the challenging accuracy requirements for pointing, acquisition and tracking that is demanded by the small divergence of laser



Artist's impression of the Silex laser link between the satellites Artemis (front) and Spot 5 (back)
Credit: European Space Agency

beams. Since then, Artemis, as a routine operation, has performed optical link services, with link distances in the order of 40'000 km and data rates of 50 Mbps. In December 2006, Artemis successfully demonstrated a laser communications links with an aircraft. These airborne laser links, established over a distance of 40'000 km during two flights at altitudes of 6'000 and 10'000 meters, represented another "world first".

The U.S. military satellite **NFIRE** is also equipped with a laser communication terminal built by the German company **Te-sat-Spacecom**. The German radar satellite **TerraSAR-X** was

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launched last year with another Tesat terminal on board. An inter-satellite link between NFIRE and TerraSAR-X is planned for the near future.

In 2009, the German Aerospace Centre will launch **TanDEM-X**, a second radar satellite nearly identical with TerraSAR-X: TanDEM-X will also be equipped with a **Laser Communication Terminal**, jointly developed and built by **Tesat-Spacecom** and **Oerlikon Space**. The two radar satellites will circle the earth in formation and generate a highly accurate digital elevation model of the

Earth. Inter-satellite communication between TerraSAR-X and TanDEM-X will be established using the laser terminals.

Laser communications terminals comparable to those on-board the TerraSAR-X and TanDEM-X satellites may also be used on the European **Sentinel** satellites. These four satellites will be launched starting in 2009 and they will constitute a key element in the European **GMES** program. **GMES (Global Monitoring for Environment and Security)** is a joint initiative of the European Commission and the European Space Agency.

Its aim is to establish European-wide co-operation for an independent, continuously available, cost-efficient and user friendly observation capability for political decisions makers.

Laser communication offers a number of advantages when compared to radio signals but also poses new technical challenges to engineers. However, the enabling technologies needed for a laser communications link have been demonstrated over recent years and are now believed to be understood and the difficulties solved. Laser communications can now be considered as a technology that's moving from being experimental to an operational technology. ■



Hendrik Thielemann studied communications science at the University

of Münster and graduated with a M.A. After completing practical training, he worked as newspaper editor. Since 2001, he has been working in the European Space Industry, holding various positions. Hendrik Thielemann has been the Head of Communications at Oerlikon Space in Zürich, Switzerland, since 2007.



THE HISTORY OF SATELLITES (Ongoing Series)

Reprinted from:

Communication Satellites (5th Ed.)

Authored by

Donald Martin, Paul Anderson, Lucy Bartamian

Courtesy of **The Aerospace Corporation**

Experimental Satellites

Although the performance of communication satellites could be predicted theoretically, until 1962 or 1963 there was considerable doubt concerning whether their actual performance would match the theory. This was one of the basic motivations for the early communication satellite experiments. Two other important factors were the desire to prove the satellite hardware (since space technology in general was still in its infancy) and the need to test operational procedures and ground equipment. Whereas the first few experiments (SCORE, Courier, and Echo) were very brief beginnings, the Telstar, Relay, and Syncom satellites laid definite foundations for the first operational satellites.

Communication satellites have been in commercial operation and military service since 1965 and 1967, respectively. However, there was, and still is, the need for additional experimental satellites. These are used to prove new technologies for later introduction into operational satellites. Some satellites combine experimental objectives with preoperational demonstrations. Discussions of such satellites are included in this chapter if their emphasis is primarily experimental; those

directly continued by operational satellites are described in later chapters.

Echo

During the late 1950s and early 1960s, the relative merits of passive and active communication satellites were often discussed. Passive satellites merely reflect incident radiation, whereas active satellites have equipment that receives, processes (may be only amplification and frequency translation, or may include additional operations), and retransmits inci-

dent radiation. At the time of Project Echo, the main advantages given for passive satellites were

- Very wide bandwidths
- Multiple-access capability
- No chance for degradations caused by failures of satellite electronics

The disadvantages were

- Lack of signal amplification
- Relatively large orbit perturbations resulting from solar and atmospheric effects (because of the large surface-to-weight ratio)
- Difficulty in maintaining the proper reflector shape

The progress in active satellites soon overshadowed the possible advantages of passive satellites, and interest in passive satellites ceased in the mid-1960s. In the mid-1970s, there was some interest in passive satellites concerning their use in a nuclear-war environment.

Project Echo [1–12] produced two, large, spherical passive satellites that were launched in 1960 and 1964. The details of Echo are as follows.

- **Satellite**
 - Echo 1: sphere, 100 ft diameter, 166 lb
 - Echo 2: sphere, 135 ft diameter, 547 lb
 - Not stabilized, no onboard propulsion
 - Aluminized Mylar surface, maximum reflectivity 98 percent for frequencies up to 20 GHz
- **Frequencies**
 - Echo 1: 960 and 2390 MHz
 - Echo 2: 162 MHz
 - Orbit
 - Echo 1: 820 x 911 nmi, 48.6 deg inclination (initial values)
 - Echo 2: 557 x 710 nmi, 85.5 deg inclination (initial values)
- **Orbital history**
 - Unnumbered: launch vehicle failure 13 May 1960
 - Echo 1: launched 12 August 1960, decayed 25 May 1968
 - Echo 2: launched 25 January 1964, decayed 7 June 1969
 - Delta launch vehicle
- **Management**
 - Developed by **G. T. Schjeldahl Company** (balloon), **Grumman** (dispenser) for **NASA** (National Aeronautics

and Space Administration) **Langley Research Center** (Echo 1), **NASA Goddard Space Flight Center** (Echo 2).



The Echo-1 Balloon Satellite as it sits, fully inflated, at a Navy hangar in Weeksville, North Carolina. The spacecraft measured 100 feet across when deployed, and was nicknamed a 'satelloon' by those involved in the project. The mylar film balloon acted as a passive communications reflector for transcontinental and intercontinental telephone (voice), radio and television signals. Echo 1 re-entered the atmosphere May 24, 1968.

Echo 1 was used for picture, data, and voice transmissions between a number of ground terminals in the United States. In addition, some transmissions from the United States were received in England. Numerous modulation methods were tested during the Echo 1 experiments, and valuable experience was gained in the preparation and operation of the terminals, especially in tracking the satellites. In addition to the communications experiments, Echo 1 was used for radar and optical measurements, and its orbital data were used to calculate atmospheric density.



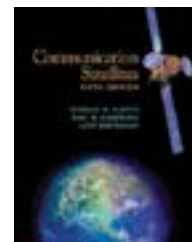
The Echo 2 was a 135-foot rigidized inflatable balloon satellite. The satellite is shown undergoing tensile stress test in a dirigible hanger at Weekesville. The satellite, 50 times more rigidized than Echo I. When folded, the satellite is packed into the 41-inch diameter canister shown in the foreground.

Echo 2 had a slightly different design to provide a stiffer and longer lasting spherical surface. It was used very little for communications, although some one-way transmissions were made from England to the Soviet Union. It was primarily used in scientific investigations similar to those performed with Echo 1.



Donald H. Martin is a senior engineering specialist in The Aerospace Corporation's Architectures and Spectrum Management Office. Martin joined the Communications Department in the Engineering Group at Aerospace in 1968 after receiving B.S. and M.S.

degrees in engineering from the University of California, Los Angeles. He has been collecting information on satellite communications since 1972, when his manager offered him a choice of assignments: of the three options, he chose to write a description of communication satellites then in orbit. The assignment grew the next year to include a report describing satellites being built, and gradually expanded to the first edition of *Communication Satellites* in 1986, with the book now in its Fifth Edition.



* * * * *

1. Space Communications and Navigation 1958–1964, NASA SP-93 (1966).
2. Special Issue on Project Echo, Bell System Technical Journal, Vol. 40, No. 4 (July 1961).
3. Satellite Communications (Military-Civil Roles and Relationships), second report by the Committee on Government Operations, U.S. House of Representatives, House Report No. 178 (17 March 1968).
4. H. S. Black, "Latest Results on Project Echo," *Advances in the Astronautical Sciences*, Vol. 8 (1961).
5. J. R. Burke, "Passive Satellite Development and Technology," *Astronautics and Aerospace Engineering*, Vol. 1, No. 8 (September 1963).
6. L. Jaffe, "Project Echo Results," *Astronautics*, Vol. 6, No. 5 (May 1961).
7. W. C. Nyberg, "Experiments to Determine Communication Capability of the Echo II Satellite," *Publications of Goddard Space Flight Center* 1964, Vol. II.
8. D. H. Hamilton Jr. et al., "Transcontinental Satellite Television Transmission," *Proceedings of the IRE (Correspondence section)*, Vol. 50, No. 6 (June 1962).
9. A. Wilson, "A History of Balloon Satellites," *Journal of the British Interplanetary Society*, Vol. 34, No. 1 (January 1981).
10. D. R. Glover, "NASA Experimental Communications Satellites," <http://sulu.lerc.nasa.gov/dglover/satcom2.html> (10 June 1999).
11. D. C. Elder, "Something of Value: Echo and the Beginnings of Satellite Communications," in *Beyond the Ionosphere: Fifty Years of Satellite Communication*, A. J. Butrica, ed., NASA History Office, Washington, D.C. (1997), ch. 4.
12. C. B. Waff, "Project Echo, Goldstone, and Holmdel: Satellite Communications as Viewed From the Ground Station," in *Beyond the Ionosphere: Fifty Years of Satellite Communication*, A. J. Butrica, ed., NASA History Office, Washington, D.C. (1997), ch. 5.

Executive Spotlight On...

GARY HATCH *PRESIDENT AND CEO, ATCI*

Interviewed by P.J. Waldt, **Associate** Editor, SatMagazine

Antenna Technology Communications, inc., known as ACTi, is a private company based in Chandler, Arizona that was started in 1990. Gary Hatch, the company's President and

CEO, has analyzed the satcom and electronic media industries since 1981. Gary has extensive domestic and international experience in satcom, cable TV, broadband, telephone, Internet and the broadcast entertainment industries.



He was also President and CEO of ATCi's predecessor company, ATC, a satellite-engineering firm. In 1997, he negotiated a buyout of ATC. Gary became the principal shareholder of the newly formed ACTi, until a recent, major investment infusion that he brought to the table. He has served as an international executive and engineer for Motorola and Telecommunications Inc. / Liberty Media, as a board member for World Teleport Association (WTA), Society for Satellite Professionals (SSPI), Near Earth Investment Bankers and Skyway Connect.



P.J.

Gary, it's a pleasure to be able to chat with you today. Would you offer our readers some ATCi's history? I'd also be interested in the evolution of what has occurred for your company.

Executive Spotlight On...

Gary

The company's original roots are in antenna RF development systems that were geared toward government and military applications. During that time period, government systems and defense budgets were being cut back. ATCi immediately began evolving its product to meet the needs of additional markets.

Simultaneously the CATV and broadcast industries were in the process of using satellites for content distribution. We converted one of our products that was originally created for government systems and transformed it into a commercial package, The Simulsat Multibeam. Simulsat and related equipment have the capacity to receive signals from 35 satellites at the same time.

Over time, the Simulsat package has truly become a workhorse for the satellite processing of digital carriers throughout the world. Simulsat and related products are incorporated into key systems in most of the large cable systems and broadcasting operations throughout the U.S. ATCi's Simulsat continues to be a tremendous insurance offering for these operators. This is because as new satellites launch, new programming options appear, or existing satellites are moved—all that's required with Simulsat is a simple change to any one of the (35) feed locations to make the necessary connections.

P.J.

Could you give us a rundown of ATCi's current portfolio of products and services?

Gary

In addition to Simulsat, ATCi designs and manufactures products and services offering customers expanded capacity, design excellence and value. Those products include: uplinks, flyaway systems, teleports, headend components, antennas,

test equipment, matrix switches, and satcom fiber optics solutions. Because of our low product acquisition cost, quality flyaway and uplink systems, ATCi is becoming known as "The Turn-key Uplink System Provider", as we also offer several unique packages to meet customers' needs.



Simulsat 5, Phoenix, Arizona

In addition, we were recently licensed to integrate a satellite backhaul telecom network throughout Iraq. We provided a fully redundant, state-of-the-art, modern GSM (Global System for Mobile Communications) network. This installation has become the widest reaching mobile telecommunication network in the country and provides services to approximately 3,250,000 customers. We are also currently involved in numerous similar GSM backhaul projects throughout EMEA.



The Warrior Monitoring System, our most recent product package addition, is designed to meet the ever increasing and unique requirements of government and military entities. This system is able to simultaneously process surveillance of thousands of RF carriers—X-, C-, Ka- and Ku-band. With the Warrior's comprehensive satellite reception and transmission capabilities, customers can monitor, archive, broadcast and decipher more than 70 satellites

Executive Spotlight On...

(140 degrees) simultaneously *from* anywhere in the world, *to* anywhere in the world.

P.J.

Given the length of time ACTi has been in operation, your firm must have dealt with a number of customers... who, would you say, are ATCi's primary customers?

Gary

ATCi's primary customer base encompasses government, military, cable TV, broadcasters, GSM telephone operators, telecom, education facilities, and various large corporations around the world. Some of our clients are rather diverse,

such as The Consejo Hondureño de Ciencia y Tecnología (COHCIT - the Honduras Council of Science and Technology), where we designed, integrated and commissioned RF for an Earth station teleport in that country. This was for a ViaSat VSAT network to enable rural communities to access the Internet and other services. We brought in an 8.1-meter Ku-band antenna and RF full redundant equipment. Then we provided to COCESNA (Corporación Centroamericana de Servicios de Navegación Aérea), who supply air traffic control for Central American countries, a solution for voice and data compression in a VSAT network. This was in Nicaragua. We provided the antennas, RF equipment and voice and data compression in three of the sites

P.J.

What is the value proposition you see as important for operators in today's markets?

Gary

We believe it is important to be prepared for change. This is why we make systems scaleable, as the markets are undergoing continuous change. The only constant we see *is* change. For example, the Warrior package saves tremendous space and has every feature, advantage, and benefit of a world-class teleport. In these projects, there is a great need to conserve real estate and/or maintain a very low profile.

The Warrior package, coupled with its dual, tri-band uplink package, sees well over 70 satellites, while only occupying an area equal in size to that of about five parking spaces. Our objective with the Warrior system is to design in order to bring our customers cost efficiencies at the highest quality, all the while providing technological insurance for their future expansion requirements.

P.J.

What are some new areas that you see ATCi offering to its customer base? What new markets is ATCi involved in?

Gary

Clearly, bringing a vision of how our customers can improve their businesses and operations is our goal in each of our projects. We have found because we are able to offer low-cost, high quality flyaway uplink systems, doors open for new markets that can now afford to back-haul voice, video, and data. In all cases, third-world countries who never believed they could be

part of the satellite miracle suddenly are able to access and use technology that was previously unavailable. To help evoke positive change is truly exciting.

Accordingly, our experience with customized, disaster recovery mobile systems within U.S. sectors have now allowed us to offer our communication products to many critical path communication applications needs around the world. As a result, we are opening offices in the Middle East and Asia to provide even closer contact with customers and to supply their vitally needed equipment and services. We are eager to bring enthusiasm and innovation to global markets where satellite technologies can provide effective solutions to improve communication infrastructures.

P.J.

Thanks, Gary. We wish you and your company continued success.



Nigeria Flyaway

NORTH AMERICAN SATELLITE MARKET LEADS IN NEW APPLICATIONS

by Pacome Revillon
Manager Director of Euroconsult
Euroconsult

North America has, almost always, been the first region where new satellite applications are introduced. This is especially evident since the early 2000s with the launch of digital audio broadcasting, high definition television, consumer broadband access, and asset tracking by satellite services that all translate into new benefits for households, individuals, businesses, and governments. In addition, North America is the first region to promote the effectiveness of hybrid satellite/terrestrial networks for ubiquitous communications with the new concept of Ancillary Terrestrial Components (ATC).

A number of factors favor the emergence of new applications in North America, as opposed to other regions. These elements include; early deregulation in service provision; a large addressable market; a sophisticated distribution network, and easier access than other locales to investment capital. As a result, the innovations brought to the market, and the pace of growth in new segments, have been impressive in recent years.

Digital entertainment as leading satellite business

Digital entertainment is the field in which innovative satellite services have appreciated the largest value creation to date. For fixed TV services, the US is the country with the two largest satellite TV platforms (**DirecTV** and **Echostar**), with a combined subscriber base of more than 30

million. The combined revenues of almost \$25 billion in 2007 of these two, vertically-integrated satellite broadcasters have made North America the largest satellite payTV market in the world. These two platforms ordered a total of 10 satellites between 2000 and 2007, and have also been instrumental in the takeoff of high definition television in the US and Canada over the last two years. More than 350 HDTV channels were already broadcast by satellite in North America last year, including US

FEATURES

local network channels, and the broadcast of two Canadian satellite pay-TV Platforms.

At the same time, leading FSS (Fixed Satellite Service) operators **Intelsat** and **SES Americom** have brought innovation to the marketplace. They have accomplished this with the offering of integrated delivery platforms for digital TV channels addressing emerging IPTV (Internet Protocol Television) platforms in rural America. Currently, both operators claim to

deliver close to 600 video and radio channels and services to the market, and offer a relay for growth in C-band usage.

Digital radio by satellite has also taken off in the US ever since 2001, providing a proxy for the design of radio and multimedia satellite broadcasting systems in other regions such as Asia, Europe and the Middle East. The two vertically-integrated satellite radio broadcasters **XM** and **Sirius** have signed more than 16 million subscribers in the last seven years and built a business now close to \$2 billion, served by seven satellites with several additional satellites currently on order.

Broadband access — a new field of innovation

The most recent innovation in the satellite communications sector has been the launch of consumer broadband access services by satellite in Ka-band in Canada and the US. Currently, 400,000 subscribers have been signed in both countries. While the market is rapidly growing, availability of satellite capacity appears to be limited. For instance, a number of the spot-beams of the **Wildblue 1** satellite seem to have reached saturation. Competition may further accelerate growth in 2008, with the availability of **SpaceWay** and the launch of **Viasat** Ka-band satellite. While concerns about the size of this market niche have been expressed over the years, the market potential seems to be in line with Euroconsult's market forecasts of more than one million subscribers by 2010.

Mobile communications facing the ATC challenge

New applications and business models in mobile communications may also see their beginnings in the North American market. While the development

of asset tracking by satellite is already taking off rapidly in the region (with services provided either by dedicated systems delivered by **Orbcomm**, **Iridium** or **Globalstar**), the introduction of new generation systems appears more challenging. The *Ancillary Terrestrial Components (ATC)* systems planned for the US market, despite the attractiveness of allocated spectrum, may require several billion dollars per system, due to the cost of building the ground network. Business models that could include either communication or multimedia applications are not yet clarified. While head-to-head competition of new systems with terrestrial networks would be hard to imagine, strategic agreements that may be signed in the course of the year would shape this emerging business segment.

A leading role in the emergence of private earth observation systems

The emerging, commercially operated, Earth observation satellite sector is dominated by two US companies, **DigitalGlobe** and **GeoEye** (the only other historical player being **Imagesat** of Israel). DigitalGlobe and GeoEye were the first companies to be awarded a high-resolution data license, with a first satellite launched in 1999. The companies were further supported by the US Government, through its commercial *Remote Sensing Policy* with the *National Geospatial-Intelligence Agency (NGA)*, which remains the companies' primary customer.

With a new generation of commercial earth observation satellites, **WorldView-1** was launched in 2007 (DigitalGlobe) while GeoEye-1 is planned for 2008 (GeoEye). Because of few commercial government satellites operating high-resolution systems, GeoEye and DigitalGlobe have emerged as clear leaders.

While the US government is acting as an anchor tenant, both companies look to explore further sectors. They have been given a boost by the emergence of virtual globes such as *GoogleEarth* and *Microsoft Virtual Earth* for which they both supply data. The benefits result in a mass exposure to their information and the capabilities of Earth Observation.

The most innovative market, presenting a large diversity of risk profiles

The North American market presents a significant risk profile, with a number of companies providing service in the region still not breaking even, or with large capex (capital expenditure) requirements for the coming years. Yet, it remains the most dynamic market worldwide and a test bed for most innovative commercial applications. Following the early com-

mercial success of digital radio and broadband access by satellite in the US, dedicated systems for those applications may be available in Europe by 2009 or 2010. Thus, North America remains the first one out of the gate, with Europe coming in as a cautious second.

Pacome Revillon is the Manager Director of Euroconsult. He has contributed to numerous consulting assignments in the satellite broadcasting and communications markets for international satellite companies, manufacturers, banks, private equity funds and public institutions. Pacome is also the editor of several Euroconsult research reports.



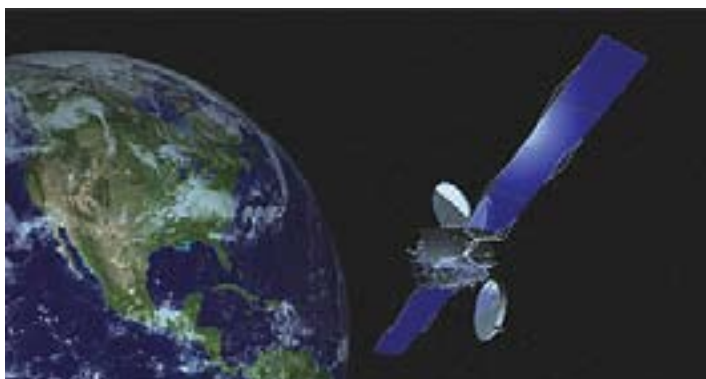
FEATURED SATELLITE

SES AMERICOM — AMC-21 SATELLITE



Mid-year, **AMERICOM-21**, known as **AMC-21**, should launch. The spacecraft, being built by **Alcatel Alenia Space**, incorporates **Orbital Sciences'** **STAR-2** satellite bus. The lift-off will be via an **Ariane 5** rocket from *Europe's Spaceport* located in French Guiana. This will be an all Ku-band satellite to operate from **125° W**, which is a new location for SES AMERICOM.

SES AMERICOM



AMC-21 will supplement SES AMERICOM's fleet of 16 satellites over the United States, Asia, and Europe. The company is part of SES' family of satellite operating companies and has been in business in the United States for more than 30 years.

Satellite Information

Spacecraft Design	Alcatel/Orbital STAR-2
Orbital Location	125° W.L.
Launch Date	Q3 2008
Design Life	15 years
Ku-band Payload	24 x 36 MHz
Amp Type	TWTA, 110 watts
Amp Redundancy	32 for 24
Receiver Redundancy	6 for 4
Coverage	50-States, Caribbean, Southern Canada, Mexico

AMC-21 Specifications

Spacecraft

Launch Mass	2,500kg (5,511 lbs.)
Solar Arrays	Four panels per array
Stabilization	3-axis stabilized, zero momentum system
Propulsion	Twelve 0.9N REA thrusters, IMPEHTs for NSSK
Batteries	Li-Ion 9680 W-Hr total capacity at EOL
Mission Life	15 Years
Orbit	125 degrees West Longitude

Payload

Frequency	Ku-band
Repeater	32-for-24 Ku-band TWTA's (of which 24 will be active)
TWTA Power	4.4 kW
Antenna	Two 2.3 m dual gridded shaped reflector antennas

Launch

Launch Vehicle	Ariane 5
Site	Kourou, French Guiana
Date	2nd Quarter 2008

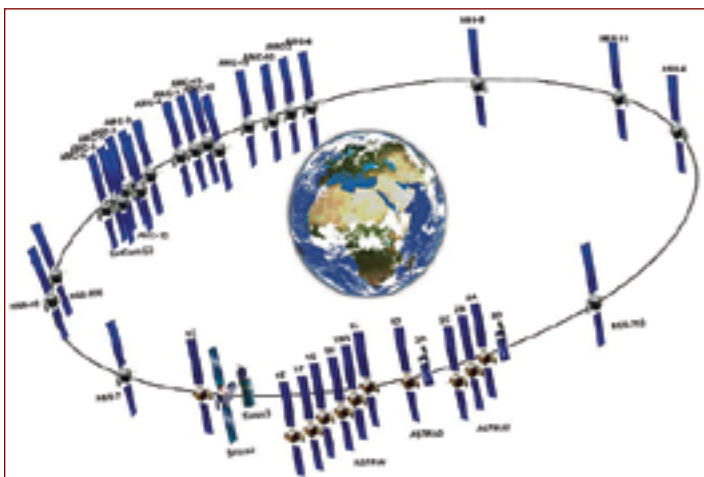
About SES AMERICOM

SES AMERICOM is the largest supplier of satellite services in the U.S. SES AMERICOM is an SES company and operates a fleet of 17 spacecraft in orbital positions. As a member of the SES family, SES AMERICOM is able to provide end-to-end telecommunications solutions to any region of the world via a fleet of more than 40 satellites. In addition, AMERICOM Government Services, a wholly owned subsidiary, is dedicated to providing satellite-based communications solutions to civilian and defense agencies of the U.S. government. With its combined operations, SES AMERICOM serves broadcasters, cable programmers, aeronautical and maritime communications integrators, Internet service providers, mobile communications networks, government agencies, educational institutions, carriers and secure global data networks with efficient communication and content distribution solutions.

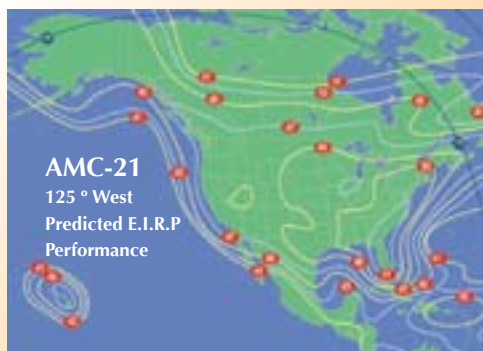
SES AMERICOM provides service throughout the Americas as well as into Africa, Europe, the Middle East, and Asia as well as over the Atlantic and Pacific oceans. SES AMERICOM's network ops centers and major earth stations collect as much

FEATURED SATELLITE

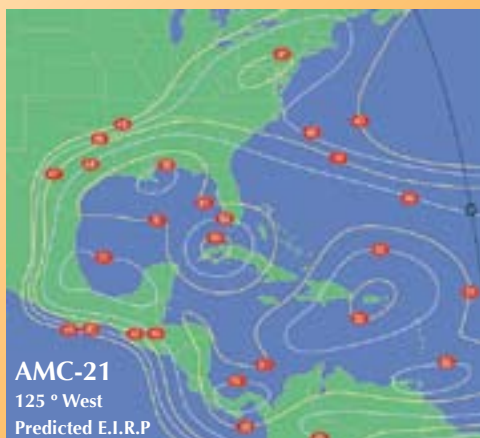
as 4,000 bits of data every other second from a single satellite. They track all components to make certain their fleet operates at optimal levels, 24x7x365, all around the world. Precision fleet management is the order of the day for their customers, handled by an experienced staff of operators who analyze the collected precision data points to ensure 24-hour satellite access, uplink services as well as fleet monitoring and control. The company's headquarters are in Princeton, New Jersey.



The SES AMERICOM satellite fleet



AMC-21 50-State Beam
Predicted EIRP Performance



Caribbean Ku-band Beam
Predicted EIRP Performance

SES AMERICOM is located at 4 Research Way, Princeton, New Jersey and the company's website can be accessed at <http://www.ses-americom.com>.

About STAR Bus from Orbital Sciences Corporation

Orbital's **STAR Bus** satellite platform is designed for 15-year missions in geosynchronous orbit. The structure itself consists of a rectangular body with a central, composite thrust tube housing the apogee kick motor. Payload equipment is mounted on the north and south side panels and on the nadir-facing deck. This provides excellent fields of view for Earth-viewing instruments and for thermal radiators. Articulated, sun tracking solar arrays are deployed in two wings from the north and south faces of the aircraft. The STAR Bus can be adapted to technology demos as well as as Earth and space science programs. Payloads up to 200 kg and 555 W can be accommodated for 15-year missions. Standard interfaces and protocols, such as MIL-STD-1553, CCSDS and 28V power simplify integration. STAR Bus is able to withstand the severe environments of high altitude orbits and provides the large impulse required to attain geosynchronous orbit. Orbital Sciences Corporation is located in Dulles, Virginia.





Executive Spotlight On...

TRISTAN WOOD

MANAGING DIRECTOR, LIVEWIRE DIGITAL LTD

Interviewed by Hartley Lesser, Editorial Director, SatNews Publishers

My initial contact with this company revolved around their planned hi-def coverage of the upcoming **Volvo Ocean Race 2008**, a broadcasting feat never before accomplished

using satcom technology. Livewire Digital provides video store and forward, video streaming, SNG (satellite news gathering), communications for the maritime industries as well as for the military and government agencies and custom hardware and software solutions.

Tristan Wood is the Managing Director for the firm and is a specialist in communications and video distribution products for use over both satellite and terrestrial links. Tristan founded Livewire Digital in 1991 and he established healthy relationships with Inmarsat and other satellite service providers. His expertise covers maritime computer network installations that included security and communication solutions for maritime voice, live and store forward video as well as data comms.

Hartley

Thanks for joining SatMagazine for this "chat", Mr. Wood... we know some of the basics regarding your company from your website... what else should we know regarding Livewire Digital?

Tristan

We are a leading provider of satellite communications solutions as well as a pioneer in the integral development of mobile communications, media distribution, and content gathering. Livewire Digital also undertakes R & D hardware and software contracts based on its expertise in terrestrial, satellite and wireless communications. That's rather

Executive Spotlight On...

succinct and to the point but certainly covers a great deal of business territory.

Hartley

Where is the company based?

Tristan

Our offices are in Epsom, Surrey, United Kingdom, with strategic distribution partnerships in Germany, Spain, the Netherlands, Australia, and Malaysia. By the way, Livewire Digital is privately owned, profitable, and, I'm pleased to report, growing rapidly.

Hartley

What markets do you address?

Tristan

Our key markets are the media, maritime, military and other government services, exploration and construction, humanitarian and telecommunications. Livewire Digital supplies Remote News gathering equipment and services to the mainstream broadcasters. These include Reuters, APTN, TVE, RTL, Sky, BBC, CBS, and others. This equipment is also supplied to special interest groups and humanitarian organizations who wish to publicize an event.



Rob Gauntlett and James Hooper are relaying footage of their world record attempt to travel from pole to pole using a broadcast system provided by Livewire Digital

All the of the United Kingdom's military forces (Army, Navy & Airforce) use our communications and video equipment, as do many other NATO forces. This extends to coastguard, search, and rescue.

Communications management products, such as the "Service Selector", are supplied to cruise lines and luxury yachts—the media related products for the high end yacht racing markets. Likewise, these products have applications in the exploration and construction markets.

The TCM telecommunications test equipment is used for the type approval of satellite terminals operating on the Inmarsat services, and supplied to **HNS, Nera, Thrane & Thrane, EMS, JRC** and so on.

Hartley

What are your key products or applications?

Tristan

Livewire Digital has products targeted at each of our market areas. In some cases, there is a lot of synergy between the different sectors. For example, the M-Link video product range has found ap-



Reporter filing story over M-Link

plication across all the markets areas, often customized to suit a specific requirement or to form part of a development project. Other products, such as the formal TTCN test tools, are aimed squarely at the telecommunications market.

Our experience with satcom has seen a range of interfacing and management products. This allows COTS equipment to be readily connected to such communications equipment. Some products have been developed specifically for a particular project or customer. An example of this would be the entire range of fully maritime-enabled HD cameras we have been developing for the Volvo Ocean Race. At that time, there was nothing else on the market that was compatible with such a race and the equipment involved. Our development involves, mechanical, electronic and software skill sets.

Hartley

What are the current projects you are working on?

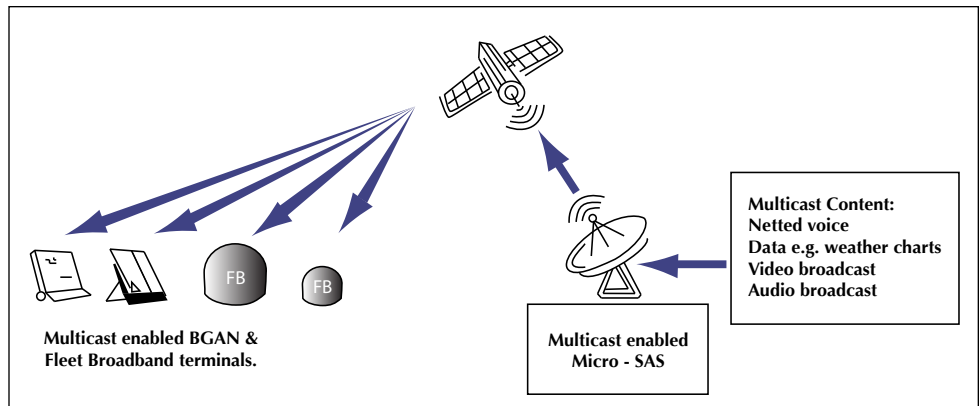
Tristan

We have been contracted by the Volvo Ocean Race (formally Whitbread)—for the fourth consecutive time—to provide the media systems for the yachts in their 9-month, around the world race. This will be starting on October 11th of this year.

Executive Spotlight On...

The race occurs along a 39,000 nautical mile track. South Africa, India, China, the Americas, and Europe are stopovers for the race.

The 2008-2009 race will see the move to HD (High Definition), which is technically incredibly challenging in such an extreme environment. The project will see the development of a range of HD cameras, including Pan-Tilt-Zoom (PTZ) and roll compensation plus special features such as the 'HD Delay Line'.



Example multicast configuration



Livewire to provide HD media systems for the 2008-2009 Volvo Ocean Race

The HD Delay Line offers the ability to maintain a rolling video cache. Should a dramatic event occur, such as the yacht's mast breaking, any crewmember can hit one of a number of buttons situated around the vessel and that footage is recorded, capturing the unique event for distribution. The media system is inter-connected to a range of satellite terminals, offering optimized delivery of weather data and HD media back to Race Office. When handling the in-port racing, the media desk can be remotely controlled from shore. Live video feeds are transmitted to the host broadcaster via the on-board microwave system. Aboard each yacht will be a media specialist whose job it will be to record, edit and deliver on-board footage through our system.

The new system includes H.264 AVC (Advanced Video Compression) live video encoding for team interaction as well as Inmarsat's high-speed maritime satellite services for high bandwidth media delivery.

Other large software projects include the development of a **Radio Access Network (RAN)** protocol stack for multicast services over BGAN. This is a development partially funded by the **European Space Agency (ESA)** and partnerships with other companies. The goals of the project are the realization of a **Micro-SAS** (Satellite Access Station) that can offer a private BGAN uni-cast and multi-cast enabled network for a closed user group. The Micro-SAS will have many applications, ranging from content delivery to a large user base (such as weather data), situation awareness, and Blue Force Tracking.

Hartley

The RAN project sounds extremely interesting... who are you working with and what applications will be required for these IP multicast services?

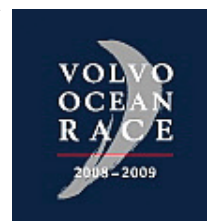
Tristan

The consortium includes **Inmarsat**, **EMS**, **LogicaCMG**, **Gatehouse** and, of course, **Livewire Digital**. We are responsible for the actual implementation of the RAN. This is the kernel component that models the IAI2 protocols as well as the resource allocation algorithms at the **Satellite Access Station (SAS)**. As far as the key applications are concerned, they include netted voice (push to talk net radio), situational awareness provisions, netted data services as well as weather and chart updates.

Hartley

Indeed, there are exciting times ahead for your company, Tristan. Thanks for speaking with us. And for our readers who may like to obtain more information regarding the Volvo Ocean Race, visit:

<http://www.volvooceanrace.org>



CRYSTAL BALLING THE TRANSFORMED WORLD OF KA-BAND BROADBAND SERVICES

Reprinted, with permission, from **Northern Sky Research** (NSR)'s Industry Status Briefing...



The word **Mark Dankberg** used on 8 January in describing the impact on ViaSat of their announcement of the new Viasat-1 satellite was “transformational”. In many ways, Viasat-1 has the potential to remake the company from a manufacturer of specialized satellite and wireless communications equipment to that of an infrastructure business that owns the underlying technological asset that gives rise to a large array of services, from consumer satellite broadband to mobile to video services possible.

It seems some on Wall Street are having a hard time swallowing this change. They hammered down ViaSat's stock price simply because they cannot see past the immediate capital cost impact this will have on the company. Though, in all honesty, it is hard to judge today just how prescient Mark Dankberg and the ViaSat team will be. More than one large new satellite initiative has been announced with great fanfare, only to stumble badly in the months and years ahead. Conversely, the industry and Wall Street have been too quick on numerous occasions to write off the efforts of true visionaries as they sought to “transform” a company and an entire industry sector. In the end, history will have to judge the ultimate success or failure of the endeavor—the rest

of us will just sit back and watch events play out. However, not everyone will have this luxury.

Clearly, ViaSat has its work cut out for it. Even though the list of partners that ViaSat has already lined up for this project and the coordination that is being demonstrated between it and Eutelsat is almost unprecedented in the in-

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dustry, the lack of WildBlue on the list is just as prominent. **NSR** expects that more details on exactly why WildBlue is not yet a key partner in the Viasat-1 project will surface in the days and weeks ahead. Without speculating on these reasons, NSR does believe that the sooner the position of WildBlue can be resolved, the sooner the industry as a whole, and Wall Street specifically, can better judge the true impact of the Viasat-1 project. Too many in the industry will remember the hype of the 1990s surrounding Ka-band satellite services. Whether WildBlue is in or out is critical as to

how the project will be ultimately received, most especially in the financial community.

Beyond ViaSat, a number of others will also be hard at work, with Eutelsat being far from the least of them. Being a well-established satellite operator (e.g. infrastructure company), Eutelsat has the advantage of not having to transform its company. It is doing what it has always done, but just in a different way. Still, the European market for consumer satellite broadband services is far from proven, even if few doubt that there is unmet demand. The dynamics of broadband services are different in Europe than North America with typical DSL and cable modem, where it exists, faster and less costly than in North America. Another challenge is the lining up of many service distributors in so many countries. This has been the Achilles heel of efforts in years past to sell satellite broadband services in the region.

Interestingly, another company that has its work cut out for it is SES. The combined investment being made by ViaSat and Eutelsat into the future of satellite broadband is well over US\$500 million. To date, SES's funding for its ASTRA2Connect offer pales in comparison. And importantly, a telco or major ISP that is trying to decide which service (ASTRA2Connect or Tooway) they wish to resell in their respective market checks how much capital a company has infused into their product as a direct measure of their commitment to the service.

SES and Eutelsat have had a history of trying to gain an advantage over the other, and SES is now faced with the decision of how, or even whether,

they want to match Eutelsat's latest move. SES could essentially imitate Eutelsat and launch a Ka-band satellite for broadband services on its own because it seems unlikely that Ku-band services based on classic FSS satellite designs will be sufficient for the long haul. However, this runs the detrimental risk of overbuilding for the satellite broadband market in Europe, especially if the companies have overestimated the true potential for satellite broadband uptake. On the other hand, SES might cede the Ka-band market to Eutelsat if they don't believe the returns justify the investment. Yet, this does not appear to be a path that would be typical of someone like *Romain Bausch*, who has never been known to take a backseat in the industry. Perhaps a third option would be a joint effort such as Eutelsat and SES agreed to on S-band services. Moreover, of course, SES also must decide on its course of action in the North American market for Ka-band services.

Another company that may come into play in the coming months is Intelsat. It is yet unclear if Intelsat's financial stake in WildBlue played some role, or not, in WildBlue's visible absence from the Viasat-1 announcement. Still, the upper management will no doubt be seriously considering if now is the time to get into the Ka-band market on the same level as ViaSat or Eutelsat. Some will certainly claim that Intelsat simply does not have the financial wherewithal at the moment to jump into the still risky Ka-band market, and any available capital in the company is better spent on its core C- and Ku-band fleet. Conversely, failing to act now may mean that Intelsat will effectively forfeit the North American Ka-band market for years to come. There are certainly no easy decisions for the world's largest satellite operator.

Finally, the Viasat-1 announcement will put an enormous amount of pressure on Hughes to perform on its plan to migrate its business to the new Spaceway-3 satellite. With WildBlue faced with capacity constraints in key markets and Viasat-1 probably not becoming operational until the second half of 2011, Hughes essentially has a 3-1/2 year window within which to build on its current lead in the consumer satellite broadband market. It is unlikely that the market will be very forgiving to Hughes for any slips it may have in the coming years. Still, a strong showing by Hughes could do much to take the sheen off ViaSat's plans for this market. Mark Dankberg clearly alluded that there was little compatibility between ViaSat's service and HughesNet, so one can expect to see a classic free market battle build up between Viasat-1/SurfBeam and Spaceway-3/HughesNet in the coming years as

each company tries to dissect the competitor and put its own strengths to the fore.

Overall, the coordinated ViaSat and Eutelsat announcements of Ka-band satellite construction contracts plus ground infrastructure and mutual partnerships stands a good chance of shaking up the satellite industry. It is critical for the industry to avoid over speculating on what the eventual impact will be as more than one large satellite project launched to great fanfare in the past has come to naught. Still, one must give credit to Eutelsat and ViaSat and in particular, ViaSat, which for over a year has made no great secret of the frustration it has had with the unwillingness of the industry to move to meet the future bandwidth needs for the rapidly growing consumer satellite broadband market. ViaSat has proven that it is willing to put "its money where its mouth is" and, hopefully, the end result will turn out to be beneficial for entire industry, maybe even in some completely unexpected ways. ■



Information for this article was extracted from a new NSR report entitled: Broadband Satellite Markets, 6th Edition

To order, access... http://www.nsr.com/Reports/SatelliteReports/BBSM6/BBSM6_ISB4.html

CROSSWORD SOLUTION

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THE DRAGON LIVES!

A few months ago, **NASA** approved the critical design review (CDR) for the initial flight of the company's **Dragon** spacecraft on the Falcon 9 rocket booster. F9/Dragon is intended to provide crew and cargo service to the **International Space Station (ISS)** after the Space Shuttle retires in 2010—passing this review was no small matter.



NASA COTS CDR Photo For SpaceX

Apart from the flight itself, this was, arguably, the most important mark of progress in the *NASA Commercial Orbital Transportation Services (COTS)* program.

In addressing NASA's requirements, SpaceX submitted a package of 486 documents encompassing every aspect of the F9/Dragon—design, engineering, testing, manufacturing, and flight operations. In terms of overall design maturity of the Falcon 9 project, we are ahead of the curve for a typical program of this size. It is unusual for a CDR to feature this quantity of hardware in fabrication, assembly, integration, and test phases.

Progress Highlights

- About 95 percent of F9/Dragon drawings (actually 3D CAD models) released
- First stage:
 - Propellant tanks passed pressure and leak tests
 - Thrust structure and composite skirt proof tested
 - Plumbing and wiring for all nine engines installed
 - First stage fully assembled and lifted atop the big test stand

- Stage and test stand cold flow tests completed
- Electrical, data and sensor system integrity verified
- Merlin 1C regeneratively cooled engine finished development, now in qualification phase
- Avionics architecture developed; triple redundant for F9, and quadruple redundant for Dragon
- Avionics board level testing underway, including flight and engine computers, valve controllers, communication systems, power, lithium polymer batteries, etc.
- Wind tunnel testing completed

The Falcon 9 program remains on track for demonstration of cargo delivery to the International Space Station by the end of 2009.

Big Dragon Update

The **SpaceX Dragon Spacecraft** will carry up to seven crewmembers, or over three metric tons of cargo, to the International Space Station as well as to future private destinations such as those envisioned by **Bigelow Aerospace**. Like **Apollo**, **Soyuz**, and the future **Orion** spacecraft, Dragon is a capsule design.



Transparent Falcon 9 with cargo carrying Dragon spacecraft

Some may wonder if the lack of wings represents a step backwards. Fundamentally, for orbital vehicles spending the vast majority of their time in space, the arguments against wings are strong (although for low energy, sub-orbital craft such as **SpaceShipOne**, which spend most of their journey in the atmosphere, there are still good arguments in favor of wings).



*The Dragon spacecraft in orbit
Artistic rendition courtesy of SpaceX*

Wings have a performance penalty on the way up, are useless in the vacuum of space, and become a hazard on reentry, due to the fragile nature of the high temperature material protecting the wing's leading surface. In addition, returning as a glider offers only one chance at a safe landing. If any problems develop with the control surfaces, you're out of luck.

Finally, consider how, with years of **Shuttle** experience, NASA chose to return to a capsule architecture for the **Orion** lunar spacecraft. Thus, we favor the capsule design for reliable and economical transport to and from Earth orbit.

Dragon on the Road to the ISS

Several months ago, we completed the first of three phases of review required by NASA's **Safety Review Panel (SRP)** to send the Dragon spacecraft to the ISS. The review covered 23 specific hazards, with extra attention paid to the danger of collision, one of the most complicated hazards to mitigate, and generally considered one of the most difficult areas for "visiting vehicles". The fact that we passed in under a week speaks well of our team's capabilities.

Dragon Details

When we fly the three COTS cargo missions to the ISS, we will also be flight qualifying a huge number of systems that will eventually support passenger space travel. Whether we're flying cargo or crew, the essential systems for Dragon remain the same:

- A pressurized interior section for the people or pressurized cargo
- An unpressurized service section ring around the base of the capsule
- Protective layers for aerodynamic and thermal forces
- A Passive Common Berthing Mechanism (PCBM) for mating with the ISS
- 18 bi-propellant thrusters for orientation and orbital maneuvering
- Eight propellant tanks and two pressurant tanks
- Redundant drogue and main parachutes
- Base and backshell heat shield
- Micrometeorite shields
- Proximity operations navigation and berthing system
- A trunk section to hold unpressurized cargo, solar panels and thermal radiator



*Left: Dragon with pressurized section filled with cargo
Right: Dragon with pressurized section fitted with seats, people, and life support*

Draco Thrusters Take Shape

We're developing a small rocket engine called **Draco** that generates 90 pounds (400 Newtons) of thrust, using monomethyl hydrazine as a fuel and nitrogen tetroxide as an oxidizer. These are the same propellants used for orbital maneuvering

FEATURES

by the Space Shuttle. Dragon will have a total of 18 Draco thrusters for both attitude control and orbital maneuvering.



Small but efficient – getting around becomes easier once you're in "zero" gravity

Our propulsion team has completed the first Draco development engine, and it will soon begin testing at our new MMH/ NTO vacuum test chamber in Texas.

Dragon Heat Shield Shapes Up

The base heat shield is an extremely important part of Dragon's design. Although one can do a lot of testing on the ground with plasma torches and arc jets, nothing on the surface of the Earth can test for the actual conditions that are encountered upon reentry at 25 times the speed of sound. Considerable safety margins must be applied to address the model uncertainty, which leads to a relatively heavy heat shield. However, as we are able to anchor our models with empirical flight data, the mass efficiency of the heat shield can be much improved.

A few months ago, we completed the full-scale engineering unit of Dragon's heat shield. Shaped like the heat shields that protected the **Apollo** capsules during their high-speed returns from the Moon, Dragon's heat shield uses phenolic impregnated carbon ablator (**PICA**), the highest heat resistance material known. At heat fluxes that would vaporize steel, PICA is barely scathed.

Developed by the **NASA Ames Research Center**, PICA demonstrated its abilities in protecting the **Stardust** sample return mission. Stardust holds the record for the fastest mission reentry speed—nearly 28,000 miles per hour. Dragon will return at under than a third of that speed.



Dragon Makes a Big Splash

Dragon will return to Earth and land in the ocean (although it can be modified to land on land, as well). As with the Falcon 9 wind tunnel testing described above, we're using scale models of our Dragon capsule to verify our digital models of recovery and splash down.



*One-third scale Dragon capsule model drops into testing pool
Photo courtesy: Space X*

Dragon will be steerable during reentry, allowing us to hit a target zone of under 1 mile in radius. Initial splashdowns will occur off the California coast.

Article and illustrations excerpted from Elon Musk's web update at SpaceX.com

Courtesy of:

Space Exploration Technologies

1 Rocket Road

Hawthorne CA 90250

SATFAX

by Riley W. Tookey

THE PROBLEM

Have you ever had one of those days when you absolutely, positively had to get a fax copy to someone and the fax machine simply refused to cooperate in any way, shape, or form? Throwing the machine out of a window may be one solution... putting your foot through the fax another...

Most of us have experienced “issues” when using the facsimile machine in the office. Yet, when at a remote site, the frustrations incurred while at the office when using the machine could, actually, become the norm. Most attempts at faxing over an IP connection... or even worse, a satellite link... are at the least unreliable and, more often than not, seemingly impossible!

Whether you use a satellite or cellular connection, or even a VoIP telephone system, faxing becomes a substantive issue. If you remained near your office fax machine and counted how many times a day coworker’s use the item, you would quite quickly realize faxing is not an endangered activity... it’s not going to go away in the near future.

At **SatFax Networks**, we had challenges faxing documents via the satellite IP connection. We quickly understood destroying, or otherwise instigating a vendetta against the fax machine, simply was not a reality. We needed the machine.

THE SOLUTION

We asked our software designers to find a viable solution. They accepted the challenge and created

today’s only true fax machine to fax machine solution that will absolutely, positively, fax over almost any IP connection with a realistic bandwidth. The end user simply places his or her document into the fax, enters the receiving fax number, pushes the send button, and walks away. It really is that easy.

The *Fax Terminal Adaptor*—**FTA**—emulates the dial tone of the receiving fax machine and receives the fax from the sending fax machine. The FTA converts the fax into a data transmis-

PRODUCT PERSPECTIVE

sion and sends the data to the SatFax Gateway. The gateway back office records the transaction and copies the fax for storage. Subsequently, the SatFax servers convert the data back into a standard fax transmission, which is sent to the destination fax over the public switch telephone network. The SatFax system is not affected by latency, jitter, packet loss or any other issue related to faxing over the Internet.

The Internet was invented after the fax machine, and it became the ideal tool for business and personal communication. Many thought email would eliminate the need for faxing, and the fax would become a technology of the past. Unfortunately, the Internet has no provisions for facsimile transmission protocols. We continue to need the fax copy for a variety of reasons, ranging from legal signatures to supporting other offices and staff not as IP-capable as today's average 20-year old.

After our fax machine discovery, we thought it highly advisable to see if other wished to share our solution to the fax dilemma. We discovered the entire world, seemingly, requires this solution. We met with networks operators and service providers—everyone agreed—our solution works for them.

The SatFax is the first device solving three, persistent, satcom problems...

- Superior quality voice calls using minimal bandwidth
- Reliable faxing each time; every time
- Efficient VPN connectivity regardless of carrier

The SatFax eliminates any risk of eavesdropping or message interception through the application of advanced encryption technology applied to all transmissions. The procedure is secure; the United States Army uses the identical compression and encryption in their **Land Warrior** system that's deployed in Iraq and Afghanistan.



VoIP - In the past, customers had to choose between call quality and bandwidth when selecting a VoIP solution. The SatFax delivers audio quality equal to a major telephone company's service, but at a fraction of the bandwidth required by any but the lowest quality audio codecs. Bandwidth economy compounds as the number of lines running over the system increases. SatFax simplifies setup and administration because calls automatically traverse NAT at the firewall (unlike the popular VoIP transport SIP which requires additional

procedures to NAT). This VoIP system is so efficient that the savings on bandwidth alone could cover the cost of the telephone service.

Fax - Studies report that 30 percent of all IP faxes fail. Faxing over satellite is even less reliable, with results varying greatly, based upon the quality of the satellite link. The SatFax employs proprietary procedures to send and receive fax messages across any IP network successfully, 100 percent of the time. Faxes reliably arrive regardless of whether or not the network is optimized for VoIP; regardless of packet losses, jitter, or latency. Drop a document in a standard fax machine and dial a number. It's that easy. Never re-send a fax with the SatFax unit.

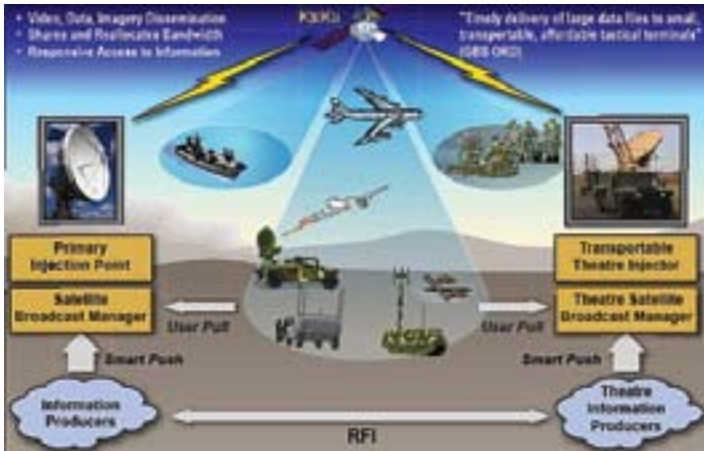
VPN - In the past, a secure connection meant required users selecting between encryption devices that cost thousands of dollars or by sacrificing performance. Worse, the expensive boxes often required a separate entry point from the outside, raising serious concerns about network vulnerability. The SatFax costs a fraction of those other systems and delivers standard IP sec tunnel traffic to the corporate firewall. No special treatment required. No security issues. The unit supports AES, 3DES, and other encryption schemes in addition to full dynamic routing (RIP, OSPF, BGP, etc.), plus data compression, and web caching for extra efficiency. The SatFax works equally well over cellular, Wi-Fi, and WiMAX... certainly a logical choice for most remote communication needs. ■

Riley Tookey worked for many years within Telco and Mobility companies before moving to the RF side to consult on Radio and Satellite system solutions. When asked to join the SatFax team, as Vice President of Sales & Marketing, the concept of recreating the fax to work over IP struck him as a natural evolution. A long-term member of the communications industry, he is called on regularly to assist in designing and implementing systems that will bring 'downtown communication features' to remote locations in support of Forestry and Oil & Gas Industries throughout Canada.

RECENT NEWS

Raytheon Broadcasts Super Bowl To Troops!

Raytheon was granted approval to broadcast *Super Bowl XLII* on February 3rd to our highly deserving and valiant sailors and marines at sea in the Pacific region. The technology enabling such to occur was developed, maintained and operated by **Raytheon Company** [NYSE:RTN]. For more than 10 years, the Raytheon-developed **Global Broadcasting Service (GBS)** military satcom system has provided high-speed, multimedia broadcasts of mission critical info to military and government decision makers. In coordination with the **Navy and American Forces Radio and Television Services**, GBS was able to broadcast Super Bowl XLII to military service men and women stationed away from home, who would not be able to enjoy this celebrated American event. Raytheon has developed and sustained the GBS program into what the Air Force has declared to be one of its best-managed military satellite communications programs—*Garland, Texas*



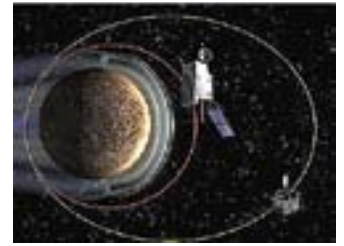
ASC Signal Corporation Given Birth

All of the Satellite Communications business components of **Andrew Corporation** have now been sold to **Resilience Capital Partners**, a private equity firm based in Cleveland, Ohio. These elements will comprise a newly formed, independent company named **ASC Signal Corporation**, and operations will continue from its current facilities in the United States, Canada, the United Kingdom, Germany and other regions around the globe. The headquarters of ASC Signal Corporation will be in Garner, North Carolina. A 17.9 percent share of ASC Signal will become a minority ownership position for Andrew and they will also provide some support services to the new company. At closing, Andrew received \$8.5 million in cash and a \$2.5 million note from ASC Signal with maturity in 39 months. Additionally, Andrew could receive an additional \$25 million in cash after three years, based upon ASC Signal's achievement of certain financial targets—*Hickory, North Carolina*



Astrium Probing For ESA

BepiColombo is a Mercury probe that is going to be built by **Astrium** for the **European Space Agency (ESA)**. Representatives of ESA and Astrium signed the main industrial contract worth 350.9 million euros for this mission to our solar system's innermost planet today. BepiColombo should begin the journey to Mercury in 2013. This is certainly considered to be the most sophisticated scientific mission in European space exploration history. There will be three modules. The European "*Mercury Planetary Orbiter*" (MPO) will be packed with 11 scientific instruments. This vehicle will orbit Mercury for a minimum of one year and will image the surface of Mercury, generate height profiles, and collect data on the planet's atmosphere and composition. Another module is the Japanese "*Mercury Magnetospheric Orbiter*" (MMO), which will investigate the magnetic field of Mercury via the readings from five onboard scientific instruments. The third module is the transfer orbiter itself that will carry the two spacecraft to Mercury—*Friedrichshafen, Germany*



NASA's LCROSS To Moon Crash—On Purpose

The validation tests have been completed on the cameras and sensors that will be used to hunt for water presence on the Moon and these crucial ele-



ments have now been shipped to the **Northrop Grumman Corporation's** facility in Redondo Beach, California, for integration into the **LCROSS** satellite. The vehicle is NASA's *Lunar Crater Observation and Sensing Satellite* and the instruments left NASA's **Ames Research Center** in Moffett Field, California, on their trip to southern California. LCROSS is set to launch with the *Lunar Reconnaissance Orbiter* aboard an **Atlas V** rocket from Cape Canaveral in Florida by the end of this year. The plan is, in 2009, for LCROSS to separate into two parts to impact on the permanently dark floor of one of the Moon's polar craters. The upper stage of the Atlas V rocket will hit the Moon, causing an explosion of material from the crater's surface. The satellite instruments will analyze that plume for water ice or water vapor presence, hydrocarbons and hydrated materials. The satellite will then fly through the plume on a collision course with the lunar surface. Both of the impacts will be visible to Earth and lunar-orbiting instruments—*Moffett Field, California*

SES Is Very Serious About Sirius

SES [Euronext Paris and Luxembourg Stock Exchange: SESG], which provides satellite com-



munications solutions via a fleet of 38 satellites in 25 orbital positions around the globe, and the **Swedish Space Corporation (SSC)** have exercised a 'put option', transferring to **SES ASTRA** an additional 15 percent equity stake in **SES SIRIUS**. The result of this transaction increases SES' existing shareholding interest in SES SIRIUS from 75 to 90 percent. Since October 2000, SES has been a shareholder in SES SIRIUS with the integration of SIRIUS satellites into SES' global fleet of 38 satellites. Financial terms for the exercise of the existing option were not disclosed. The result of this recent cooperative move has created a stronger market presence for SES over the Nordic countries and Eastern Europe, benefiting customers in those regions.

AFRICASAT-1 Is Now "For Real" With MEASAT



MEASAT supplies satcom services to Asian broadcasters, DTH platforms and telecom operators. The company has just expanded their MEASAT satellite network into Africa with the commissioning of the **AFRICASAT-1** satellite at 46° E. Operating in inclined orbit, AFRICASAT-1 provides

twelve (12) high powered, C-band transponders, and as many as four (4) high powered Ku-band transponders, for telecommunications and broadcasting apps. The satellite will be operated from the MEASAT satellite control facility located just outside of Kuala Lumpur, Malaysia. Capacity on AFRICASAT-1 will be marketed through the MEASAT sales team and select partners in the region—Kuala Lumpur

Industry WOW Factor Winners To Be Awarded At SSPI Gala Event

The Society of Satellite Professionals (SSPI) is a nonprofit, member-benefit society that serves satellite professionals throughout their working lives. The organization has announced the winners of its *2008 Industry Innovators Awards* which were introduced in 1993 to recognize new and different designs, applications, activities and contributions to the satellite industry from the private and public sectors. Honorees are selected by a committee of industry experts for accomplishments that range across a broad spectrum of advanced satellite technology and business applications. The 2008 Industry Innovators Awards will be presented at a ceremony,

sponsored by **Booz Allen**

Hamilton, on February 26 at 6:00 p.m., immediately before SSPI's **Gala 2008** at the Grand Hyatt in Washington DC.



SERVICE DEVELOPMENT & APPLICATIONS

- **Wildblue**—For the successful introduction of two-way broadband Internet service to homes and businesses across the United States via Ka-band satellite. In the process, the company has developed new satellite technology, featuring extensive reuse of frequencies in narrow spot beams, and led the commercial introduction of the Ka frequency band. This combination substantially lowers the cost of serving each subscriber, making an affordable service possible.
- **Global VSAT Forum**—For its leadership role in the successful effort to protect C-band satellite spectrum at the ITU's 2007 World Radiocommunications Conference (WRC-07). GVF began an educational campaign for regulators and member companies, and led a group of associations including SSPI in issuing position papers and filing regulatory briefs with the ITU. Spurred by these efforts, the industry developed a united position and, on November 16, 2007 four weeks of negotiations in Geneva led to approval of a "no change" motion by the Conference.

SYSTEMS DEVELOPMENT & APPLICATIONS

- **Hughes Network Systems**—For the development and initial deployment of the Spaceway 3 satellite, the next-generation Ka-band satellite that is the first in the world to employ on-board traffic switching and routing capability. With 10 Gbps of overall capacity, which is 5 to 8x that of today's Ku-band satellites, it employs fast-packet switching, dynamic beam forming and other advances to make possible bandwidth-on-demand services with true site-to-site, single-hop networking.
- **Edusat and Mindset Networks**—A joint award to two projects that are using satellite communications to transform education on national and international levels

TECHNOLOGY DEVELOPMENT & APPLICATIONS

- **ATCi**—For the introduction and successful deployment of Simulsat, the world's only true full-arc multiple antenna system. Capable of receiving satellite transmissions from 35 or more satellites across 70 degrees of arc simultaneously, Simulsat improves users' ability to take advantage of immediate and future revenue op-

RECENT NEWS

portunities without the need for an antenna farm or the challenges of additional permits.

- **Motion Picture Experts Group of ISO/IEC**—For the development of the MPEG digital video compression and transport standards. With each succeeding generation, standards-based digital compression has further increased the volume of available media content, reduced distribution costs, boosted throughput (of particular importance to HDTV) and provided higher transport speeds that make possible more accurate live transmission.

SPECIAL AWARD

- **Sputnik 1 and Explorer 1**—The mid 1950s gave birth to today's vital space industry with the launch of Sputnik 1 by the USSR (now Russia) on October 4, 1957 and Explorer 1 by the US as its contribution to the International Geophysical Year on January 31, 1958. Together, these two fierce Space Age competitors gave birth to today's vital space industry so critical to global news, entertainment, education, health care, economic development, and international business.

SatTV Piracy Gets Under ICASA's Purview



The regulator of the telecom, broadcasting sectors and postal services in South Africa is **ICASA** and the agency has more than passing concerns regarding free digital satellite service

Free2View and their satTV freebie

broadcasts into sub-Saharan Africa which, of course, are also received in South Africa. Free2View has no broadcast license for South Africa. The service is alleged to be ignoring the regulations instituted by ICASA for such services. Free2View acquired the rights to **MSNBC**, the US news channel, tossing them into mix and the company hopes to have 36 channels in place over the next three years. According to the agency, any company intending to provide a broadcast service that can be received within the borders of South Africa requires a license to do so, issued by ICASA. Free2View's response remains that there's nothing the agency can do to halt them from freely distributing the programming, short of shooting a satellite out of the sky or arresting people who have a satellite dish and a decoder. Free2View plans to drive their income from advertising. They claim they are bringing content to a continent starved for such. The ICASA may



have little control over what they claim is pirate broadcasting, given that the uplink site to the **Eutelsat WSA** at 7° E is in Paris and the company is registered in the United Kingdom.

SSTL Pumps Up Students With Awesome Sat Creation Contest



British space engineering company **Surrey Satellite Technology Limited** (SSTL) and the **British National Space Centre** (BNSC) are challenging teams of 14-18 year olds to fly a lunch-box-sized experiment on a future space mission, supported by expert scientists and engineers. Entrants will be judged on a 5-page mission experiment proposal for The Space Experiment. The experiment could measure some aspect of the space environment, monitor the Earth in a novel way, or test out new satellite technology. The winning experimental package should measure no more than 10x10x10cm, weigh no more than 1 kg and consume no more than 1W of average power per orbit. There's no scrimping with the experiment though—it will be given a developmental budget of up to £100,000 (just under US\$2K). Budding young scientists need to jump to it, though, as the deadline for receiving initial proposals is February 28th! The semi-final will be staged at the prestigious UK Space Conference at Charterhouse School, Godalming, Surrey in March of this year. Here, celebrity judges will select the final six teams who will be helped to provide a more detailed experiment proposal. The successful team will be awarded in a special ceremony at the International Astronautical Federation Congress in Glasgow, Scotland September 2008. Details of the competition and an overview of satellite technologies are at <http://www.spaceexperiment.info/> and at <http://www.makeyourmark.org/space>—Guildford, United Kingdom

SWE-DISH Suitcases Are Packed for Romania

SWE-DISH Satellite Systems AB, a **DataPath** company, has turned an order around in a speedy manner to keep their Eastern European partner, **ADISAM Telecom S.A.**, very happy. ADISAM, Romania's largest private satellite operator, in partnership with SWE-DISH, delivered a number of **IPT-i Suitcase** satellite terminals to ADISAM's government and broadcast customers. SWE-DISH, well known for their IPT Suitcase, is the market-leading ultra-portable, fully integrated broadband satellite terminal. Their clients include special operations units within military, police and rescue organizations, as well as fast-moving correspondents and media crews of commercial broadcasting companies. The IPT-i version of the Suitcase uses an integrated iDirect modem that enables data rates up to 4.2 Mbps and provides advanced bandwidth sharing for de-

creased costs. This is SWE-DISH's first foray into the Eastern European market. The IPT-i Suitcase satellite terminals that have been delivered are fully operational—*Stockholm, Sweden*

Net & Wireless Development For Space Involves ISRO + Boeing + Others...

Boeing [NYSE: BA] has an agreement with the **Indian Institute of Science** (IISc) plus two leading Indian information technology companies to develop wireless and other network technologies for aerospace-related applications. The agreement, signed by representatives from Boeing, IISc's Society for Innovation and Development, **Wipro Technologies** and **HCL Technologies**, forms the **Aerospace Network Research Consortium** (ANRC). Led by Boeing, the ANRC is India's first public-private aerospace research consortium. Researchers from **Boeing Phantom Works**, the company's advanced R&D unit, and **Commercial Airplanes** will represent Boeing—*New Delhi, India*

SkyPort Global Communications Connects to Oil and Gas

SkyPort Global Communications signed a three-year contract, valued at US\$1.7 million, to provide satellite connectivity to the customers of **Digital Networks LLC**, an Oklahoma City-based firm that provides communications services to oil and gas clients. Under the terms of the contract, SkyPort will provide voice, data, video and broadband services to Digital Networks' clients at energy facilities located in, Oklahoma, Arkansas, Louisiana, North Dakota, New Mexico and Colorado. SkyPort operates a teleport and NOC (Network Operations Center) at **Ellington Field Joint Reserve Base** in Houston, providing satellite communications connectivity to government, military and Fortune 1000 organizations worldwide. Digital Networks provides mobile communications solutions to oil and gas facilities in isolated areas—*Houston, Texas*

Earth Station Management Gets Allot Enforcement

Allot Communications announced **NSSL Satcom Solutions** has deployed their **NetEnforcer** traffic management devices at its satellite Earth station in Florida, controlled via its Network Operations Centre in Redhill, Surrey. The NetEnforcer guarantees the optimized delivery of SLA-defined bandwidth and a consistent high quality of experience at all times for NSSL's super yacht customers. NSSL's customers require continuous broadband access for the reliable transfer of data on board some of the most exclusive motor yachts in the world. The Allot NetEnforcer has allowed NSSL to offer a bespoke managed data service capable of guaranteeing the delivery of pre-defined bandwidth for its fleet of customers, Premium Plus, (a dedicated broadband channel), Premium (2 MB), Standard (1 MB), and Economy (512 kbps). The solution also prioritizes network traffic, manages peer-to-peer, regulates applications, and enforces SLAs. The NetEnforcer has enabled NSSL to sig-

nificantly upgrade its customer service by providing real time solutions for network issues—*London, United Kingdom*

Globecommm Signs On With Smithsonian Channel

Globecommm Network Services Corporation, which provides satellite-based communications infrastructure solutions and services, has been signed to a multi-year contract from **Showtime Network Inc.** to provide the new hi-def **Smithsonian Channel**, as part of the Showtime family of channels. Globecommm also upgraded Showtime 2 from a standard-def channel to hi-def, part of Showtime's evolution in their content platform. The agreement twixt the two companies includes Globecommm providing origination, monitoring and uplink services for Showtime, as well as the design and construction of a network operations center and dedicated uplink facility at the company's world headquarters. The broadcasts can be viewed from authorized sites throughout the U.S. Globecommm designs, install, integrates, supports manages and operates client systems and networks, and delivers turnkey services—*Hauppauge, New York*

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CALENDAR OF EVENTS

Visit: <http://www.satnews.com/calendar.shtml> for additional listings

Date	Event	Location	Contact	Web Address
March 4-6, 2008	CABSAT	Dubai International Convention and Exhibition Centre, UAE	CABSAT Tel (+971) 4 308 6077 / 6048 Email: cabsat@dwtc.com	http://www.cabsat.com/
March 5-6, 2008	GVF MENASAT @ CABSAT 2008	Dubai International Convention and Exhibition Centre, UAE	Tel: + 44 1923 839414 Email: paul.stahl@uk-emp.co.uk	http://www.gvf-events.org
March 10-11, 2008	Oil & Gas Satellite Communications	Copthorne Tara Hotel, London, United Kingdom	Mr Andrew Gibbons Tel: +44 (0) 20 7827 6156 Email: agibbons@smi-online.co.uk	http://www.smi-online.co.uk/oilsatcom3.asp
March 12-14, 2008	IPTV World Forum 2008	Olympia, London, England	Tel: +44 (0)117 3116 22 Email: markj@junction-group.com	http://www.iptv-forum.com/
March 18, 2008	Mobile Satellite 2008	London, England	Heidi Garrett Tel: +44 (0) 207 963 7584 Email: heidi.garrett@pabusiness.co.uk	http://www.satellite-springforum.com/
March 27-29, 2008	Sat Expo Europe, International Exhibition about Space and Advanced Telecommunications	Rome, Italy	Matteo Sassano Tel: +39 0444 543133 Email: matteo.sassano@pentastudio.it	
April 7-10, 2008	Satcom World Africa 2008	The Sandton Convention Centre, Johannesburg, South Africa	Brian Shabangu Tel: +27 11 463 6001 Email: brian.shabangu@terrapinn.co.za	http://www.terrapinn.com/2008/satcomza/
April 11-17, 2008	Las Vegas Convention Center, Las Vegas NV.	Las Vegas Convention Center, Las Vegas NV.	Tel: 800-342-2460 Email: nab@nab.org	http://www.nabshow.com/
April 17-18	Caspian Telecoms 2008	Hilton Istanbul Hotel, Istanbul, Turkey	Acelya Bayraktar Tel: + 90 212 291 83 10 Email: acelyab@ite-turkey.com	http://www.caspiantelecoms.com/en/2008/
April 22-25, 2008	The International Conference on Space Applications (SPACEAPPLI 08)	Toulouse - France	Carte Blanche Tel: +33 5 63 72 31 00 Email: contact@toulousspaceshow.eu	http://www.toulousspaceshow.eu/
April 23-28, 2008	The Annual European Navigation Conference – Global Navigation Satellite Systems (ENC-GNSS 08)	Toulouse - France	Carte Blanche Tel: +33 5 63 72 31 00 Email: contact@toulousspaceshow.eu	http://www.toulousspaceshow.eu/
May 12-15, 2008	ITU TELECOM AFRICA 2008	Cairo International Convention and Exhibition Center		http://www.itu.int/AFRICA2008/
May 12-15, 2008	OIL & GAS: DIGITAL APPLICATIONS & COMMUNICATIONS DYNAMICS	Marriott Hotel, Aberdeen, Scotland	Tel: + 44 1923 839414 Email: paul.stahl@uk-emp.co.uk	http://www.uk-emp.co.uk/index_files/Page332.htm
May 15-16, 2008	IPTV World Forum Eastern Europe 2008	Corinthia Towers Hotel, Prague	Tel: +44 (0) 117 3116 220	http://www.iptv-easterneurope.com/

