

Worldwide Satellite Magazine

May 2014

SatMagazine



SatHealth™—ISPM engages in the work of eHealth
Executive Spotlight on Hughes India's Chatterjee
Airbus Defence & Space's Olsen explains the melding
Forrester listens to the "The Big Four"

KORE's Mack on the frontier of M2M

Haigh-Farr's Senior Executives on C-band telemetry

Martin Coleman with the IRG Digest...

Executive Spotlight on ORBCOMM's Eisenberg

C-COM's Drew Klein and traveling SatHealth

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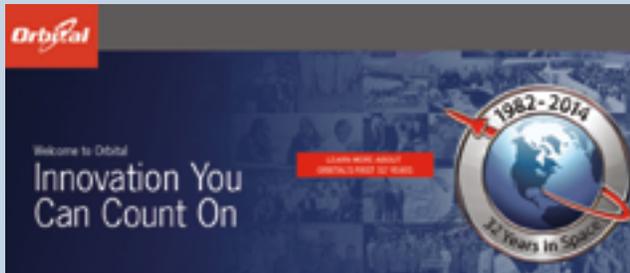
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Orbital Sciences + Alliant Techsystems (ATK)—Major Merger



Orbital Sciences Corporation has entered into a definitive agreement with Alliant Techsystems Inc., the result of which will be; combine Orbital and ATK's Aerospace and Defense (A&D) Groups; create a \$4.5 billion (combined calendar year 2013 annual revenue); create 13,000-person space; merge defense and aviation systems developer and manufacturer.

The new company, to be called Orbital ATK, Inc., will serve U.S. and international customers with leading positions in the markets for space launch vehicles and propulsion systems, tactical missiles and defense electronics, satellites and space systems, armament systems and ammunition, and commercial and military aircraft structures and related components.

As part of the transaction, ATK will spin off its Sporting Group, which focuses on commercial sporting equipment, to its shareholders.

The tax-free stock-for-stock merger-of-equals transaction, valued at approximately \$5.0 billion based on Orbital's closing stock price on April 28th, will combine Orbital's small- and medium-class satellite and launch vehicle

product lines with ATK A&D's rocket propulsion, composite structures and space power systems to produce even more capable and affordable space and missile defense products.

At the same time, it will enhance ATK A&D's strategic and tactical missile systems and propulsion, precision weapons and military armament, and commercial and military aircraft programs by leveraging Orbital's systems design, engineering and integration capabilities to provide greater value-added to current and future customers.

Orbital ATK will draw on a talented and experienced group of leaders from both organizations for key governance and management positions.

A 16-member Board of Directors will be led by Chairman Gen. Ronald R. Fogleman (U.S. Air Force, ret.) and will include seven directors from ATK's Board and nine directors from Orbital's Board.

Mr. David W. Thompson, Orbital's President and Chief Executive Officer, will be President and Chief Executive Officer of the new company; Mr. Blake E. Larson, President of ATK's Aerospace Group, will serve as its Chief Operating Officer; and Mr.

Garrett E. Pierce, Orbital's Chief Financial Officer, will hold the same position in the new company. Other key management positions will be determined prior to the transaction's closing, with an equitable and balanced selection of senior executives from each company expected in the new organization.

"This merger-of-equals combination of Orbital and ATK Aerospace and Defense brings together two of the space and defense industry's most innovative developers and cost-efficient manufacturers who have worked closely together for over 25 years. By building on complementary technologies, products and know-how and highly-compatible cultures, the new Orbital ATK will deliver even more affordable space, defense and aviation systems to our existing customers and be strongly positioned to expand into adjacent areas," said Mr. Thompson.

"The proposed merger will generate cost and revenue synergies and create a more streamlined and competitive operator," said Mr. Mark W. DeYoung, ATK's Chief Executive Officer.

"We see opportunities to build on ATK's success in Aerospace and Defense through a combination with Orbital's proven track record in creating new launch vehicles, satellites and other advanced space technologies. We are both focused on enhancing the capability of existing customer systems by developing solutions that can be more flexibly deployed to support their mission with enhanced cost-effectiveness. We also see significant opportunities for growth as new programs are initiated or begin to ramp up production."

Orbital ATK will employ about 13,000 people, including more than 4,300 engineers and scientists and 7,400 production and operations specialists, at engineering centers, research laboratories, manufacturing facilities, and test and launch sites in 17 states.

Employees will benefit from expanded long-term career opportunities and enhanced job stability by being part of a larger, more diverse and financially stronger enterprise dedicated to technological innovation, fast product cycles and operational efficiency.



Artistic rendition of Orbital's ISS Commercial Resupply Services Mission (Orb-2), scheduled for the week of June 9, 2014, from MARS Pad 0A at Wallops Island, Virginia.

The combined company will be headquartered at Orbital's existing Dulles, Virginia campus, with major employee sites in Utah, Missouri, Virginia, Arizona, Maryland, West Virginia, California and Minnesota.

Based on 2013 financial results, the new company would have combined annual

revenues of about \$4.5 billion, EBITDA over \$575 million and total contract backlog more than \$11 billion.

Net debt of Orbital ATK at closing is expected to be about \$1.4 billion, after taking into account combined cash balances of approximately \$300 million.

Annual revenue and cost synergies of \$220-300 million are expected by 2016, consisting of \$150-200 million of incremental annual revenue and \$70-100 million of annual cost reductions.

In the merger, ATK shareholders will own approximately 53.8 percent of the equity of the combined company and Orbital shareholders will own approximately 46.2 percent.

The combination, which has been unanimously approved by the Boards of both companies, is to be effected in a tax-free "Morris Trust" transaction structure.

A spin-off of ATK's Sporting Group to its shareholders will occur immediately prior to the merger of the companies.

The merger is conditioned on approval by the shareholders of both companies, the receipt of regulatory approvals, and other customary closing conditions. The transaction is expected to close by the end of 2014.

Citigroup acted as financial advisor to Orbital while Hogan Lovells US LLP acted as Orbital's legal advisor.

The Orbital Sciences infosite is located at <http://i/>

ViaSat + Xplornet—Gaining Canadian Coverage



Artistic rendition of the ViaSat-2 satellite. Image courtesy of Boeing.

Xplornet Communications Inc. has contracted with ViaSat Inc. for all of the residential capacity covering Canada on the ViaSat-2 satellite.

Already offering high-speed satellite Internet on ViaSat-1, Xplornet will be able to offer faster speeds and more data throughput for its customers with the doubling

of bandwidth efficiency expected from ViaSat-2, which is scheduled for a mid-2016 launch.

The commitment is for the life of the satellite and the value is up to \$275 million depending on options. In addition to bandwidth capacity for ViaSat-2, Xplornet is purchasing network operations, annual network maintenance, gateways, and ground equipment.

The contract also allows Xplornet to order ViaSat Broadband System subscriber terminals.

Allison Lenehan, president of Xplornet Communications Inc., said, "Our investment in the ViaSat-2 satellite will allow Xplornet to meet the future Internet needs of our rural customers throughout the country."

"The Xplornet team has performed exceptionally in Canada and we are very happy to extend our relationship with them on ViaSat-2," said Rick Baldrige, president and COO of ViaSat. "Our new satellite is expected to approximately double the bandwidth economics of ViaSat-1 while

simultaneously providing a coverage footprint that is seven times larger."

Boeing Space & Intelligence Systems is building ViaSat-2, which is based on ViaSat's next generation, Ka-band satellite technology and architecture. ViaSat-2 is expected to be, by far, the world's highest capacity satellite at the time of launch, achieving an unparalleled mix of capacity and coverage.

The new satellite is expected to approximately double the bandwidth economics of ViaSat-1 while simultaneously providing a coverage footprint that is seven times larger.

The expected coverage area for ViaSat-2 includes North America, Central America, the Caribbean, a small portion of northern South America as well as the primary aeronautical and maritime routes across the Atlantic Ocean between North America and Europe.

The ViaSat infosite is located at: <http://p/>

IDT—Providing Services To Grow The Market

With the world's eye drawn to Brazil for this summer's FIFA World Cup™, IDT's Jonathan Nierenberg says Value Added Services must be delivered to the maritime sector to secure potential revenues and to enable customers to fully enjoy the tournament.

Speaking at VSAT Latin America in Sao Paulo, he

told attendees that defining and delivering value added services and transparent connectivity solutions are key to improved outcomes.

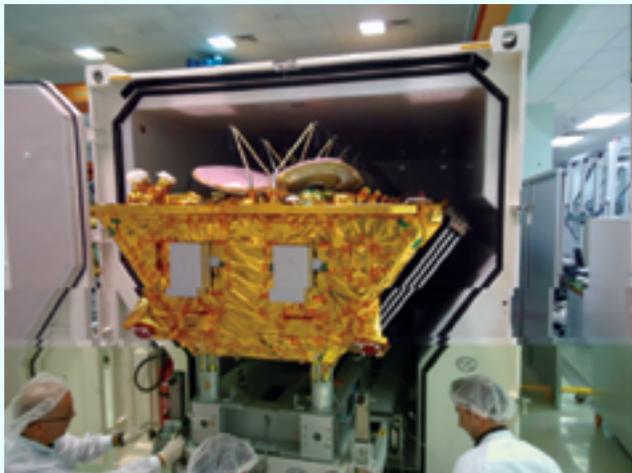
VSAT Latin America 2014 brings together leading satellite operators, systems integrators, VSAT service providers, analysts and regulators from across the Latin America region, covering

the VSAT market in detail. Jonathan Nierenberg, Senior VP, Business Development, IDT said, "The maritime sector has been getting stronger since 2009, so it is important that satellite companies look to grow revenues in this sector by providing vessel crew members with services that are better than what currently exist in the market. With the World

Cup on the horizon, this is a fantastic chance for satellite companies to deliver new services, which allow these isolated vessels and offshore facilities to fully engage with and gain a better experience of the tournament.

To find out more about IDT, please visit <http://www.idt.net/>.

O3b Networks—Four To Ship



*Satellites being prepared for shipment.
Photo courtesy of O3b Networks.*

O3b Networks Ltd. has reported that its second group of four satellites have successfully completed all required ground testing and are now ready to ship—the satellites will be launched from LeCentre Spatial Guyanais (CSG), Kourou, French Guiana.

The satellites will journey from the Thales Alenia Space facility in Rome to Kourou, to be launched as early as the first week of June, pending final confirmation from launch provider, Arianespace.

Following launch and with four more satellites in-orbit, O3b will start commercial

service for all O3b customers on a global basis.

Telecom Cook Islands is one customer who did not need to wait for the second set of four satellites in order to introduce O3b services.

Telecom Cook Islands has been working with O3b to validate the system performance since launch of the initial constellation in June 2013 and have now initiated full commercial operation via the O3b fleet.

More info at
<http://www.o3bnetworks.com/>

PocketQubeShop—Spatial Radio



Now being launched by PocketQubeShop is their PocketQube MiniSatCom, which features two radio and antenna Pocketboard Boards, each with room for one MiniSatCom transceiver and a supported dipole antenna (of your choice) with deployer.

The antenna is on the back of the transceiver adapter board (this product is pending a PocketQube standard interface).

The user will be able to easily reset the antenna deployment.

The MiniSatCom transceiver module is not intended to integrate directly to any PocketQube standard bus, however the profile area of 30mm by 45mm allows for a full set of data pins to be integrated past the transceiver.

This board will pair the radio to the PocketQube bus.

Feature highlights include...

- *Direct control of the RF amplifier power enable, a critical feature regarding radio licensing compliance.*

- *Powered by most satellites without customization, accepting anywhere from 3-5.5V.*
- *Data I/O interactions at a variety of voltages, accepting anywhere from 1.8-5.5V. (built-in voltage level-shifter)*

Satellite developers can use any of these communications protocols to interact with the radio:

- *SPI*
- *TWI*
- *USART*
- *MMCX, a reliable miniature coax connector. A bypass load protects the radio if transmission are sent without an external antenna engaged*
- *Rugged Case, the outer shell of the radio is a hard metal, ensuring durability in the lab, through launch, and in orbit*
- *Operates at 433MHz (900MHz version in development)*

Each kit includes four transceivers: Two development transceivers and two spaceflight-certified transceivers.

Special attention has been made to the spaceflight radios, individually testing them to ensure they are space-ready.

Each unit is programmed and a transmission checkout is performed, all in a class 10k cleanroom to protect the transceiver. The units are then sealed and labeled.

The MiniSatCom radios are small enough to fit in a PocketQube, leaving plenty of room for satellite systems and experiment.

The profile dimensions are 30mm by 45mm, and a thickness of approximately 6mm. Final specifications depend on the module.

The MiniSatCom transceiver is built to J-STD-001ES. This is the highest soldering standard recognized by industry, specifically oriented for long-duration spacecraft.

Additional info:

<http://www.pocketqubeshop.com/>

Avanti Communications + Avonline Broadband—A Broadband Blanket For Europe

UK-based satellite broadband company Avonline Broadband has announced a multi-million dollar contract extension with global satellite operator, Avanti Communications.

The new deal will provide a series of tailored broadband solutions to consumer and enterprise (SME) customers across Europe.

Avonline will offer primary broadband connections deployed via Avanti's HYLAS 1 and HYLAS 2 satellites.

Mark Wynn, Managing Director of Avonline plc, said, "These packages provide an instant broadband solution for the important minority of homes and businesses that remain neglected and unserved by the traditional providers."

David Williams, Chief Executive at Avanti Communications, said, "Avanti's flexible Ka-band technology will support

delivery of high-quality satellite broadband packages to Avonline's significant European consumer and enterprise customer base."

The Avanti Communications infosite may be visited at <http://www.avantiplc.com/>

For further information regarding Avonline, please visit <http://www.avonline.co.uk/>

Iridium + Rutgers University—Challenger Glider Mission Partnership



Iridium Communications Inc. and Rutgers University's Coastal Ocean Observation Lab (RU COOL) have announced Iridium will be a key technology sponsor to the Challenger Glider Mission.

The project, a symbolic re-creation of the first global scientific ocean survey conducted by the HMS Challenger in 1872, is led by Rutgers' students and faculty.

The mission plans to "fly" 16 autonomous underwater gliders worldwide, covering all five ocean basins, collecting an unprecedented undersea dataset to better equip researchers with the tools to predict the ocean's future and its impact on global weather.

Iridium, through its global satellite circuit switched data service, provides primary two-way communications.

"The health of our oceans is truly an indicator of the health of our planet, and the Challenger Glider Mission will provide the kind of high-resolution data desperately needed by researchers to evaluate and assess the

current ocean state," said David Wigglesworth, Vice President & General Manager, Americas and Global M2M Services, Iridium.

"We're thrilled to be associated with the project, and excited to provide connectivity via the Iridium® satellite network for this endeavor. Our products and services uniquely provide reliable and global coverage, with a small form factor, which are all obvious necessities for the success of this mission."

The Challenger Glider Mission will be conducted from 2014 to 2016 through coordinated flights of the core glider fleet plus volunteered gliders from other academic and government institutions.

Each glider will fly a 6,000 to 8,000 kilometer leg following the ocean gyre circulation around the five major ocean basins.

The global-class gliders used in the mission—the Teledyne Webb-Slocum glider—is a 2.2 meter autonomous underwater vehicle that collects data as it moves through the ocean in a saw-tooth shaped gliding

trajectory, achieving a forward speed of 25 to 35 kilometers per day.

The primary vehicle navigation system uses an onboard GPS receiver coupled with an attitude sensor, depth sensor, and altimeter to provide dead-reckoned navigation.

"We're pleased to be working with the Challenger Glider Mission and Iridium on what is an extraordinary project," said Bill Woodward, President and CEO, CLS America, Iridium's partner that provides the technical and administrative communications interface between the gliders and the Iridium system.

"The Teledyne Webb-Slocum glider, paired with the Iridium satellite network, is a fantastic solution for this kind of research. The results of this mission will be invaluable to the research community, which in turn will have a profound effect globally on many industries. For one example, a better understanding of the changing oceans will benefit the maritime industry, as it could lead to improved weather and ocean condition forecasting."

Each glider will capture continuous readings of ocean temperature, salinity and currents. This data will be transmitted to researchers via the Iridium satellite network when the glider surfaces. Iridium's network is uniquely suited to these kinds of applications, given its low latency, superior availability and reliability. Furthermore, Iridium's near-polar orbit means it is the only satellite network to provide truly global coverage,

an essential for projects that span the globe, such as the Challenger Glider Mission.

Additionally this is a great demonstration of the low power consumption of Iridium transceiver technology and its robustness in what can be an extreme environment.

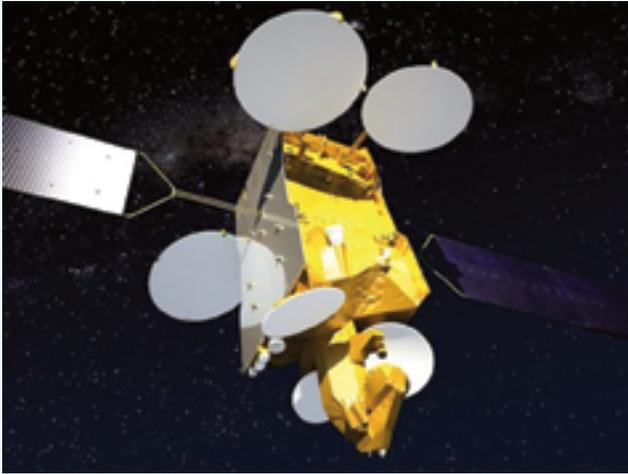
"The technology underpinnings of this mission are truly enabling our researchers to gather more and better data than ever before, enhancing the basis of knowledge for future generations," said Scott Glenn, Co-leader of the Challenger Glider Mission and Professor of Physical Oceanography at Rutgers University.

"Part of our goal with this mission is to increase global ocean literacy. This expanded dataset will enable students and researchers to focus on the science of their local waters, as well as be a part of a global research community, all working toward understanding the ocean's role in regulating the changing climate and weather."

For more information on Iridium and the Iridium satellite network, go to <http://iridium.com>.

More information on the Challenger Glider Mission can be found at <http://challenger.marine.rutgers.edu/>.

Superior Satellite Engineers, Viking Satcom + SES—A Proper Grounding For SES-6



Artistic rendition of the SES-6 satellite. Image is courtesy of Airbus Defence & Space.

Culminating a multi-year effort, Viking Satcom and Superior Satellite Engineers have begun deploying ground station equipment in support of SES's new satellite at 40.5 degrees West—SES currently operates 55 satellites.

The new SES-6 satellite is unique in that it transmits in standard 3.7-4.2GHz and provides an additional 10 transponders at 4.5-4.8GHz, for a total capacity of 40 available transponders in dual Circular-Pol configuration that covers the Americas, Europe and Atlantic Ocean regions.

Current equipment shipments are for Mexico, Brazil and Peru with more Latin America countries expected to sign on in the near future.

Superior Satellite Engineers, with electrical specifications and technical oversight provided by SES, developed a new Feed system that supports the modified 800MHz frequencies operations.

The LNB development and productions tasks were provided by Norsat of Canada under contract with Superior Satellite Engineers. This new LNB accepts input frequencies



of 3.625-4.8GHz. The output frequencies are 900-1825MHz.

Based on their extensive history of program management with SES and Superior Satellite Engineers, Viking Satcom of Albion, Michigan, was selected as prime contractor to coordinate equipment in support of SES's antenna program associated with the new satellite.

"This is another exciting antenna program that combines efforts for SES and Superior Satellite Engineers and coordinated by Viking Satcom. We look forward to

our continued partnership with SES and Superior Satellite to deploy the satellite antennas and ancillary equipment for the new satellite" said Steve Pokornicki, Vice President at Viking Satcom.

Complete electrical specifications for the modified-frequencies Feedhorn and LNB are available at <http://www.superiorsatelliteusa.com/>.

More information regarding Viking Satcom is available at <http://www.vikingsatcom.com/>

MITEQ—More Uniform Uplinks

The nexgen in uplink power control has debuted from MITEQ and the UPC2 is a rack-mountable unit, designed to adjust the strength of uplink signals to compensate for varying weather conditions.

The UPC2 can control as many as 10 uplink channels. The attenuator channels

are available for L-band or 70/140MHz IF frequencies.

The UPC2 can adjust up to 30dB of uplink power correction for each channel. The UPC2 can be setup completely from the front panel or over a remote bus via a host computer.

All monitor and control functions are accessible at the

front panel as well as over the remote bus.

The UPC2 protocol set is backward-compatible with the well-known MITEQ UPC-A and UPC-L products. As an option, MITEQ offers the UPC2 with Remote Site Diversity Switching supporting applications that employ geographically separated

redundant uplink systems such that uplink signals will be transmitted from the site experiencing the most favorable weather conditions.

For further information, please visit the MITEQ infosite at <http://www.miteq.com/>

Honeybee Robotics + NASA—Six Projects Funded



Honeybee Robotics Spacecraft Mechanisms Corporation has received six NASA awards for technology development through the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs.

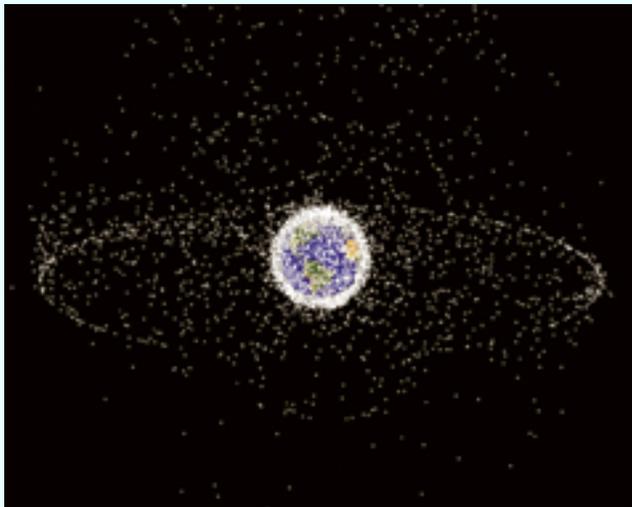
The awards will fund new approaches to planetary sampling systems, spacecraft mechanisms, and unmanned ground vehicles for Earth and Lunar applications. The six awards cover the following research areas:

- Adaptive LIDAR Vision System for Advanced Robotics (SBIR Select Phase I project) to create a new compact technology for navigation of unmanned ground vehicles.
- High Temperature Venus Drill and Sample Delivery System (SBIR Phase I project), which will create a hybrid system combining a Venus Drill and Trencher capable of acquiring surface and subsurface regolith as well as pulverized rocks (i.e., cuttings) for scientific analysis.
- Pyramid Comet Sampler (SBIR Phase I project) to develop an Inverted Pyramid sampling system, in which each face of the pyramid includes an independently-actuated cutting blade to pierce into the surface of a comet at a steep angle and sample the material with minimal tangential forces.

- Extreme Environment Sampling System Deployment Mechanism (SBIR Phase I project), which will integrate previously-developed extreme temperature actuators with functional elements to demonstrate a complete multi-DOF deployment mechanism suitable for candidate surface missions to Venus or a comet.
- Flywheel Energy Storage for Lunar Rovers & Other Small Spacecraft (SBIR Phase I project), a project to explore alternatives to radiological thermal control systems, instead using an extreme environment flywheel energy storage system that could supply enough power to heat the critical electronics during the Lunar night.
- Free-Flying Unmanned Robotic Spacecraft for Asteroid Resource Prospecting and Characterization (STTR Phase I project), under development with Embry-Riddle Aeronautical University (ERAU) to create an integrated autonomous free-flyer robotic spacecraft system that supports the exploration and subsequent resource utilization of asteroids and other planetary bodies and moons.

To learn more, visit Honeybee Robotics' infosite at <http://www.honeybeerobotics.com/services/space/>

University of Alabama in Huntsville—Cleaning Up The Spatial Junkyard



The biggest-sized junkyard anywhere orbits the Earth, and a University of Alabama in Huntsville (UAH) aerospace systems engineering graduate student says it's time to get active about reducing the debris field before we reach a tipping point beyond which we may not be able to do much.

"Debris is the hot topic that nobody wants to touch," said Tom Percy. Percy is the primary author with his advisor, UAH Mechanical & Aerospace Engineering professor Dr. D. Brian Landrum, of a paper that outlines methods and policies that could be employed to mitigate space debris.

"I saw a need in the space community, with my systems engineering background, to walk people through the thought processes of how you apply a systems engineering approach to policy questions," Percy says. "How do we bring the discussion to a subset of solutions we can ultimately implement?"

In early April, according to

news reports, the International Space Station (ISS) had to change position to avoid a space debris field of parts from an old Ariane 5 rocket launched by the European Space Agency that came within 1,000 feet of the station. It was the second time in three weeks ISS had to sidestep space junk.

Everything that gets shot into LEO eventually becomes junk—even, one day, ISS itself. It's just a matter of time.

Time is also a factor that can work against proper disposal of satellites nearing the end of their lives. Satellites now in orbit have been designed to carry a bit more fuel in their tanks for use when they get old, to propel them into an orbit where they will re-enter the atmosphere and burn up within 25 years or so.

However, because the current standards for being a good space neighbor by taking out your garbage are guidelines rather than mandates, there's nothing in place now to prevent the owner of a

communications satellite from using that last bit of fuel to reboost its orbit and add more years to its longevity.

That's one way Percy says we get large space debris from dead satellites, along with spent rocket stages and panels and other big parts that come off in flight, or when space junk collides with other space junk or orbiting working satellites.

In 2009, the Iridium 33 and Cosmos 2251 satellites hit in the first accidental hypervelocity collision between two intact artificial satellites in Earth orbit. Iridium was an operational communications satellite. Cosmos was Russian space junk and no longer actively controlled.

From the perspective of populated areas on Earth, big space junk is a worry.

"What we're really concerned about is the big stuff that comes in uncontrolled and breaks up in the atmosphere into big chunks," Percy says. Larger objects are more likely to have parts survive re-entry, posing a potential risk to people on the ground. Think Skylab, big parts of which were strewn across Australia, if it had landed in New York.

But the biggest worry for satellites operating in orbit comes from the smaller debris, the stuff that's 1 centimeter to 10cm in size—from marble to softball sized.

"We can't see that stuff from the ground, we can't see it with radar and we can't see it with satellites," Percy says. Yet small debris has the greatest potential to damage working

satellites, rockets in flight or even the ISS. The big stuff we have a pretty good handle on, as far as where it is, he says. In the U.S., the Dept. of Defense tracks it. If we know where it is, we can move to avoid running into it, Percy says. Because we can't see the smaller stuff, NASA predicts where it is but avoiding it is nearly impossible right now. Of course, tracking and removal are two very different things.

In 1978, NASA scientist Donald J. Kessler proposed a scenario now known as the Kessler Syndrome or Kessler Effect, where the density of space junk reached a point that collisions between objects would cause a cascade that would generate further debris to promote added collisions, potentially rendering space exploration unfeasible for generations.

In his paper, Percy outlines policy initiatives and engineering solutions that could prevent that tipping point from being reached.

The keystone issue is how to achieve a balance between commercial economic interests, practicality, regulation and global governmental cooperation, he said.

Working to equip future craft for their eventual removal could have a large impact, he says, because the size of the space community is growing quickly, from 16 nations two decades ago to 46 now.

Getting relatively new and emerging spacefaring countries like Saudi Arabia and India onboard with debris control that starts at the

design and launch phases will do much to reduce the future problem, according to Percy.

Engineering solutions for future spacecraft depend on type and size, as well as orbit.

A deployable sail attached to a satellite could gradually slow it in LEO so it eventually burns up in the atmosphere. Or a small and light dedicated ion propulsion pack can nudge a craft into contact with the atmosphere.

"Implementing these engineering solutions on satellites before launch is becoming more critical in the burgeoning age of cube satellites, when scores of satellites can be launched from a single rocket," says Dr. Landrum.

Pre-launch engineered solutions will probably have to be coupled with some form of active debris removal system to clear older debris and avoid the Kessler Syndrome, Percy said. "We're investing some time and resources into active debris removal and how that can be accomplished now."

It's the point where the technology interfaces with governments and policies that still has to be mapped out.

"The way the regulations are now, they are more like guidelines," Percy says. So should the U.S. work with entities like the United Nations, which has a committee working on space use, or unilaterally go ahead with its own efforts?

"One possibility is that, yeah, we just go ahead and do it and show that it can be done," said Percy.

In space, once a craft is launched it is the country that launched it that carries the

responsibility for it and not any commercial entity. China and Russia are the biggest owners of space junk. Should the U.S. only concern itself with its own debris? Despite these difficult questions yet to be answered,

Percy says he's optimistic that a set of solutions will be in place one day.

This story is based on materials provided by University of Alabama in Huntsville
<http://www.uah.edu/>

Lockheed Martin + NOAA—Modules Movement Completed For GOES-R



The large System Module was shipped by truck from Newtown, Pennsylvania, where it was developed to a Lockheed Martin facility near Denver.
Photo courtesy of Lockheed Martin.



The Propulsion Module (left) and System Module (right) of the first GOES-R series weather satellite arrived in Lockheed Martin's cleanroom near Denver where they will now undergo integration and testing.
Photo courtesy of Lockheed Martin.

The two large modules of the first GOES-R series weather satellite spacecraft were delivered to a cleanroom at Lockheed Martin's [NYSE: LMT] Space Systems facility near Denver—the Geostationary Operational Environmental Satellite-R series (GOES-R) is NOAA's next-generation geostationary weather satellites.

With the delivery of the system module and the propulsion module, the weather satellite will now undergo the important integration and testing phase so that it can be available in late 2015 for a launch in early 2016.

"The arrival of the propulsion and systems modules in Denver represents a significant milestone for the program. We are looking forward to the initial power up of the combined modules in a few weeks," said Tim Gasparrini, vice president and program manager for the GOES-R series at Lockheed Martin Space Systems Company.

The system module of the A2100-based satellite was built at Lockheed Martin's Newtown, Pennsylvania, facility. It houses the three major electrical subsystems, Command and Data Handling, Communication, and Electrical Power.

The propulsion module recently underwent integration of its engines, fuel tanks and various propulsion components at the company's Mississippi Space and Technology Center on NASA's Stennis Space Center.

Once the system module and propulsion module are mated in July, the spacecraft will move onto the payload integration, functional testing and environmental testing phases of the program.

Data from NOAA's GOES satellites provides accurate real-time weather forecasts and early warning products to NOAA's National Weather Service and other public and private sectors.

The advanced spacecraft and instrument technology on the GOES-R series will vastly improve forecasting quality and timeliness, generating significant benefits to the U.S. and Western Hemisphere in the areas of public safety, severe weather monitoring, space weather prediction, ecosystems management, commerce and transportation.

In addition to four satellites in the series (R, S, T and U), Lockheed Martin is also designing and building the Solar Ultraviolet Imager (SUVI) and the Geostationary Lightning Mapper (GLM) instruments that will each fly aboard each of the spacecraft.

The SUVI was recently installed on the GOES-R satellite's sun pointing platform.

The NOAA Satellite and Information Service funds, manages, and will operate the GOES-R series satellites. NASA oversees the acquisition and development of the GOES-R spacecraft and instruments for NOAA.

The program is co-located at NASA's Goddard Space Flight Center in Greenbelt, Maryland.

For further information, please visit <http://www.lockheedmartin.com>

NOAA—Primary Placement For Suomi NPP

The NOAA/NASA Suomi NPP satellite is now the primary operational polar-orbiting spacecraft for NOAA's operational weather forecasting mission.

The National Weather Service (NWS) uses Suomi NPP data in its numerical weather prediction models. Observations from the satellite are improving the accuracy and extending the range of global forecasts three to seven days in advance of significant weather events, including hurricanes and winter storms.

Suomi NPP has priority within the day-to-day operations of NOAA's Satellite and Information Service (NESDIS) and replaces NOAA-19 as the primary satellite. NOAA-19 will remain a critical part of NOAA's polar constellation and provide valuable contributions to NWS forecasts.

Designating new satellites as primary is a regular part of NESDIS' satellite lifecycle. As a new satellite and instruments become available and are proven, they rise to the primary position.

"The sounding sensors on the Suomi NPP satellite provide data that extend the legacy of previous operational and research satellites to support operational medium-range numerical weather prediction (NWP) modeling," said Dr. William Lapenta, Director of NOAA's National Centers for Environmental Prediction.

Suomi NPP is part of NOAA's next generation Joint Polar Satellite System (JPSS) constellation of polar-orbiting environmental satellites. These satellites gather global measurements of atmospheric, terrestrial and

oceanic conditions—including atmospheric temperature, atmospheric moisture, hurricane intensity, clouds, rainfall, dense fog, volcanic ash, fire locations, smoke plumes, sea and land surface temperatures, vegetation, snow and ice cover, and ozone.

Suomi NPP also provides continuity for NASA's Earth Observing System (EOS) and is a bridge between NOAA's legacy Polar Orbiting Environmental Satellites (POES) and the JPSS-1 satellite, which is scheduled to launch in 2017.

NWS uses JPSS data in models for medium- and long-term forecasting. JPSS also enables forecasters to monitor and predict near term weather in polar regions, particularly Alaska. Weather is tracked at night, and allows scientists to monitor and predict weather patterns with greater accuracy. They can also study long-term climate trends by extending the more than 30-year satellite data record.

Suomi NPP was launched from Vandenberg Air Force Base on October 28, 2011, and has since logged more than 12,000 orbits. The instruments on board the satellite are: Advanced Technology Microwave Sounder (ATMS), Cross-track Infrared Sounder (CrIS), the Visible Infrared Imaging Radiometer Suite (VIIRS), Ozone Mapping and Profiler Suite (OMPS) and Clouds and the Earth's Radiant Energy System (CERES).

More info

<http://www.noaa.gov/>

Hunter Communications + Nanometrics—Sensing Seismicity



Hunter Communications has teamed with Nanometrics, one of the world's leading manufacturers of seismology systems and instrumentation, to develop an induced seismic and microseismic monitoring application via satellite for oil and gas drilling sites where hydraulic fracturing ("fracking") is employed.

The application is deployed by the Nanometrics LIBRA very small aperture terminal (VSAT) system to monitor oil and gas drilling sites in real-time to determine whether fracking is triggering or inducing seismicity, either on the drill site or within the region. Exploration geophysicists and seismologists use the LIBRA system to make strategic, real-time decisions about their operations based on the data and analysis they receive from the new application.

Nanometrics initially developed the LIBRA VSAT system specifically for ultra-low power usage, a critical factor when installing systems far from any electrical grid.

The LIBRA technology has been deployed at hundreds of remote locations globally to provide real-time monitoring of volcanoes, earthquake zones and fault lines, including diverse locations such as volcanoes in Peru and Cyprus

and geological fault lines stretching from Trinidad to Ghana.

The critical seismic data is collected by Nanometrics seismometers with its proprietary instrumentation and networking technology and transmitted by satellite through the LIBRA networks. It is delivered in real-time to scientists at universities and governmental organizations across the globe..

"Oil and gas companies are now proactively establishing monitoring sites surrounding their wells, and we are partnering with the scientific community to delve deeper into the science of microseismicity," said Neil Spriggs, Nanometrics CEO of Global Operations.

"Ultimately, we believe that many more of these firms will choose to closely monitor their operations using the real-time data that we provide, which enables them to stop operations if induced events approach the threshold of felt earthquakes."

The microseismic monitoring system application is currently in use in Northeastern British Columbia where there are a significant number of well operators.

Nanometrics and Hunter Communications Canada provide scientists with real-

time satellite access to all the data collected from these wells. The data is being analyzed as part of an ongoing research project to study both the short-term and long-term effects that fracking will have on seismic activity in that area.

"It is critical for the scientific community to learn about the effects of hydraulic fracturing and obtain factual data instead of anecdotes and conjecture on whether fracking does indeed cause meaningful effects to the surrounding area," Spriggs said.

"Obtaining this information is a significant benefit, not just for local populations, but also for oil and gas companies, who will use this information to improve their technologies and procedures."

Several Canadian networks have deployed LIBRA satellite systems, including GeoScience BC, Alberta Energy Regulator and the University of Ottawa Yukon Network.

The University of Ottawa turned to Nanometrics and Hunter for a turnkey, real-time seismic network consisting of seven Libra VSAT stations as part of a five-year study to better understand seismicity and crustal behavior in the Mackenzie Mountains and River Basin region of the Yukon. This area is known to be the most seismically active in Canada.

Pascal Audet, Assistant Professor, Faculty of Science, Department of Earth Sciences, University of Ottawa, will use the seismic data to determine earthquake patterns and map faults in Canada's northwest.

"Despite being one of the most seismically active regions in Canada, this area remains very poorly studied due to a lack of seismic station coverage," Audet said. "This new network bridges that gap and allows us to determine the location and magnitude of small earthquakes very accurately and estimate seismic hazard in this area."

Brent Perrott, President of Hunter Communications, stated that working with Nanometrics on the many seismic monitoring systems is of critical importance: "These networks enable real-time scientific monitoring, which is improving industry standards and translating into a safer industry."

For further details, please visit the Hunter Communications infosite at <http://www.huntercomm.net/>

The Nanometrics infosite is located at <http://nanometrics.com/>

Advantech Wireless—The Newest Jewel Debuts

Advantech Wireless Inc. has announced that it has successfully introduced the New SapphireBlu™ Series 6.6kW X-Band Rackmount UltraLinear™ GaN SSPA/BUC, the ultimate solution for wide bandwidth, ultra high power satellite teleport uplinks.

Awarded as Most Innovative Product of the Year 2013 and Teleport Technology of the Year 2014, Advantech Wireless' SapphireBlu™ Series of UltraLinear™ GaN based High Power Amplifiers are leading the way with ground breaking performance and pioneering technology.

High power density GaN Technology based SSPA concept, in a compact, indoor modular package with Built in Redundancy and Built in Arc Detection Circuitry.

The Highest Linear Power Available "Our new high power density, GaN based SSPA concept, offers the maximum power/bandwidth combination," stated Cristi Damian, VP Business Development at Advantech Wireless. "We are helping our customer save Millions of dollars in Energy Cost, Satellite Bandwidth and CAPEX."

The New SapphireBlu Series of UltraLinear GaN technology

based SSPAs and BUCs from Advantech Wireless, exceed all barriers between Klystrons, TWTs and SSPAs, backed by over 25 years of Outdoor SSPA design and manufacturing, combined with the traditional Advantech Wireless features.

Advantech Wireless, an ISO 9001: 2008 certified corporation, is a leading-edge wireless broadband communications solution provider.

Advantech Wireless designs, manufactures and deploys networking for broadband connectivity, broadcast solutions, video contribution and distribution, mobile 2G, 3G and LTE backhaul and DTH

& DTT video distribution, using satellite and terrestrial wireless communications.

The products include VSAT Hubs and Terminals, world-leading GaN technology High Power Amplifiers (SSPAs), Block-Up Converters (SSPB), Frequency Converters, Satellite MCPC/SCPC Modems, fixed and deployable Antennas, Antenna Controllers, Terrestrial Microwave Radios, Routers and ruggedized military products.

Learn more at the company's infosite:

<http://www.advantechwireless.com/>

In Support Of Global Well-Being: SatHealth™

By Lorenza Brescia, Business Development Solutions & Services, ISPM

According to the World Health Organization, by 2020, the majority of diseases worldwide will be caused by chronic pathologies such as diabetes, hypertension or cardiovascular conditions (see Figure 1 on the following page). The treatment of such diseases requires frequent and expensive care.

As a result, there is a clear and growing need to introduce more home care in order to offer more convenient therapy for patients as well as to reduce the cost and necessity of treatment in hospitals and health centers. In turn, this calls for an increase in support capabilities, such as remote medical monitoring and assistance.

This problem is certainly not endemic to developed societies. According to recent reports, chronic illnesses are likely to surpass maternal, child and infectious diseases as the biggest killer in sub-Saharan Africa by the year 2030. Most of these illnesses are preventable, as they arise from the consumption of sugar and fat; smoking; and sedentary lifestyles [Source: *The Economist: Growing Pains*, 24 September 2011] Improvements in Information and Communications Technology (ICT)

are enabling the provision of more effective and powerful remote healthcare solutions. For example, the use of high technology body sensors (i.e., to take measurements, such as pulse, blood pressure, body temperature, ECG, and so on); developments in wired and wireless communications technologies; real-time data processing; and interactive interfaces allow healthcare providers to deliver improved quality of care—especially for those patients with chronic or genetic diseases. Collectively, these initiatives are contributing to the emerging field of eHealth.

Emerging eHealth/SatHealth™ Services

Originally, eHealth was defined as the application of traditional computing to medicine. Today, however, the scope of eHealth is broadening, extending to a wide range of devices and platforms, including those used for home/hospital diagnostics and monitoring; imaging techniques; and patient-owned technologies for supporting self-management and healthcare improvement. All of these innovations are data-enabled, generating streams of vital information that should be part of all-encompassing healthcare systems.



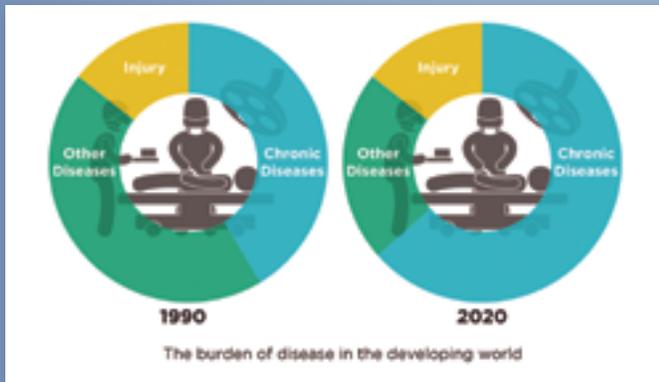


Figure 1. Growth In Chronic Diseases, 1990 to 2020. Chart courtesy of ISPM.

However, eHealth services are entirely dependent on the availability of reliable, secure communications infrastructure. While in many parts of the world such infrastructure is ubiquitous, in others areas of the globe such may only be available intermittently, or is completely absent.

The provision of eHealth is limited by the reach of conventional terrestrial fixed and mobile networks. In other words, many patients who today would benefit from eHealth services, such as those in remote regions—which includes much of sub-Saharan Africa, for example—are outside regions that can be covered by such systems. There are clear gaps in the provision of remote eHealth solutions. This could lead to a digital divide between those within the reach of eHealth services and those that are not within such communication boundaries.

In this context, the use of satellite communications can fill gaps in terrestrial networks by providing access to remote areas that are beyond the reach of land or mobile communications systems. Satellite technology provides the means to extend such networks and ensure closure of the digital divide. What *SatMagazine* calls SatHealth™ can be a crucial enabler to support countries and agencies in the further development of health systems.

Satellite technology can improve access to, and the quality and efficiency of, healthcare systems. Universal satellite coverage is already possible via the networks already deployed. A simple infrastructure can be leveraged in order to achieve true global coverage for the provision of SatHealth services.

Telemedicine via satellite can help ensure equal access to medical expertise, irrespective of geographical location. Satellite-based broadband (fixed and mobile) access for data transmission and communication is the most suitable way to deliver a host of SatHealth services to remote areas in a fast, efficient, reliable and cost-effective manner.

Today, the broader realm of eHealth, and the more channeled SatHealth, can be said to encompass interaction between patients and health-service providers, institution-to-institution transmission of data, or peer-to-peer communication between patients and/or

health professionals. Such also includes health information networks, electronic health records, telemedicine services, and personal wearable and portable communications systems for monitoring and supporting patients. In the absence of conventional networks, satellite technology can be a key enabler for remotely delivering the benefits of eHealth on a truly global basis.

One example of current developments is that of a patient connected to a workstation, such as a home PC or any medical module that is designed for the processing of medical data (e.g., ECG or EMG), to which medical professionals have complete access (remotely or locally) in order to plan and provide healthcare.

In this case, monitoring of patients' conditions is enabled by the continuous recording and processing of vital signs and/or activity, at pre-defined time intervals (for example, each day or hour). Data from patients' body sensors (See Figure 2) may be transferred (in real-time or at pre-configured intervals) via wired or wireless communication to the appropriate platform (Figure 3 on the following page). Here, the data can be analyzed, monitored and managed by medical professionals who can then take appropriate action.

In the absence of local fixed or mobile coverage, such data transfer can readily be facilitated by satellite transmission. The simple provision of satellite modems or other access points can be an enabler for the delivery of eHealth solutions—both simple, as in the example above, or, in the future, more complex applications—to ensure comprehensive coverage in both developed and developing regions.

Although these complex systems and data integration challenges offer significant opportunities, they also require thoughtfully designed technologies that can manage and deal with a growing number of stakeholders in an increasingly complex ecosystem.

The eHealth + SatHealth Ecosystem

The eHealth and SatHealth ecosystem is complex and includes, among others, patients; medical devices performing required measurements and providing data output; a telecommunications network that performs data transfer; platforms that collate, enrich and interpret data collected and provide diagnoses; and finally, the doctors and clinicians able to perform the correct action, or issue relevant prescriptions, in

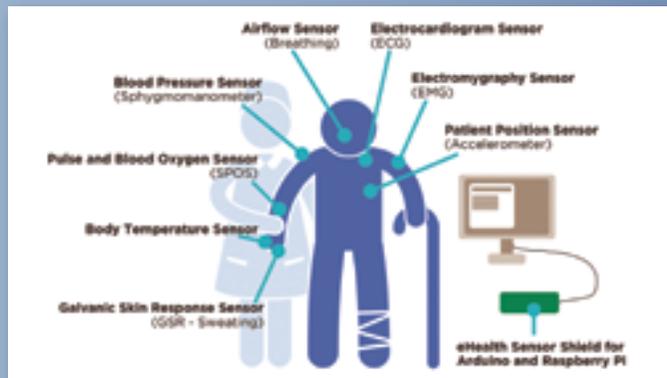


Figure 2: Remote Body Sensors

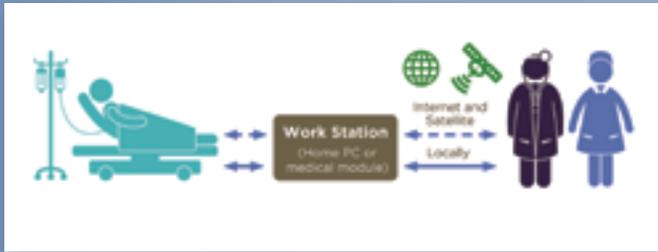


Figure 3:
End to End Connectivity in eHealth

order to improve the health of the patient. In this context, the term eHealth/SatHealth comprises the following stakeholders (Figure 4):

- CSPs (fixed and/or mobile)
- Satellite network operators
- Patient and family
- Clinicians
- Healthcare providers
- Health insurance companies
- Diagnostic centers

Such an ecosystem is dependent upon the infrastructure to deliver and exchange information between different entities as well as on the ability to ensure that the data and systems perform with the required quality of service to sustain optimal performance levels. The presence of a partner with proven expertise in service management, delivery and assurance is absolutely essential to the success of the process.

Prerequisites For Successful Service Delivery

Delivery of an eHealth/SatHealth service is complex and encompasses a number of areas. Required is interoperability between different stakeholders, as well as a management system that controls and monitors the transmission of the data collected from the patient to the practitioner and the diagnostic system. The key needs, according to care providers, are standardization and interoperability to improve patient care and experience.



Figure 4.
eHealth Stakeholder Ecosystem.

The most important requirements for this health-based ecosystem can be defined as follows:

Systems Interoperability

To provide an eHealth solution, the data collected must travel from monitoring devices to multiple providers, which, in turn need to interoperate with their own platforms.

Complex Network Collection

Different data types generated by multiple devices delivered through various networks need to be collected, aggregated and monitored. This must include the means to deliver and collect information from any location, which, in turn, means that satellite operators will become significant stakeholders in the eHealth community.

Multi Provider Environment

An eHealth/SatHealth solution is comprised of multiple providers, each with its own platform that needs to seamlessly interoperate and interact to deliver the expected service.

Data Analysis

Services generate data that must be managed, aggregated and analyzed separately, or in combination with, data from other sources.

Operations

Dashboards must be presented to doctors or patients in order to allow them to take actions that result from analysis of data collected.

The ISPM Solution

ISPM, a leading vendor of flexible service assurance and management solutions for telecommunications and IT infrastructure, is an active player in the TM Forum's Digital Health Initiative. TM Forum has established the "eHealth—Curing the Complexity" Catalyst project (<http://events.tmforum.org/digital-disruption-2013/catalyst-ehealth.html>).

The goal of the project is to develop a set of common practices and processes, based on the Business Process Framework (eTOM) model. These goals support each domain and activity in the eHealth/SatHealth environment. Importantly, the project involves multiple stakeholders, collaborating to create a viable ecosystem for the delivery of services. Such an ecosystem must now be extended to include satellite network operators and the suppliers of satellite connectivity equipment.

The 'Curing the Complexity' project demonstrates how, through the application of eTOM, partners from different industries can meet the challenges of interoperability to provide healthcare to patients. The project uses the need to deliver enhanced care to elderly patients in order to demonstrate the applicability of eTOM to healthcare scenarios. Outpatient care of the elderly can benefit from remote monitoring of medical indicators, enabling both medical professionals and family members to be updated with relevant information regarding the patient's health.

In addition, the solution provides the means to perform remote diagnostic tests and to monitor the efficacy of prescription medicine. The team has been able to present a solution that combines hardware and software with the ability to generate real-time information from each patient. Follow-up services and advice can also be delivered, together with the capture of mobility and location data through a range of different visualization tools.

The challenge of interoperability between the partners is overcome through the use of the Standards Information (SID) and Integration (TIP) capabilities of Frameworkx. Crucially, the same procedures used in the telecoms industry are reused for medical procedures with little adaptation. Similarly, the same processes can be extended to the enlarged ecosystem that includes the satellite community.

ISPM, through its NetVision solution (Figure 5), is responsible for the implementation of Service Assurance and Orchestration capabilities, managing quality levels both between each of the partners individually as well as for service as a whole. NetVision is also used to provide Medical Service Assurance capabilities for the overall solution in order to orchestrate the monitoring of remote devices; collection of indicators and medical events; the co-ordination of medical management and control of the processes of medical care. The project is a successful application of familiar concepts and processes from the telecoms industry in a new and vital market segment: Health.

The Advantages Of The Technologies

The advantage of offering eHealth/SatHealth services is becoming increasingly clear. Interesting to note is that one of the principal benefits identified is cost reduction for healthcare providers, due to fewer face-to-face appointments. As stated in the introduction, with an increasing percentage of patients suffering from chronic diseases, this is a hugely important aspect of emerging eHealth services.

However, of greater importance are benefits to patients—in particular, in the provision of services to areas that are inadequately equipped with conventional facilities and healthcare providers and which are also beyond the reach of conventional networks. There is a clear and compelling case for satellites to play a key role in delivering eHealth services and extending healthcare provision possibilities. Indeed, it could be argued that satellite technology is of fundamental importance to future eHealth provisions and development goals.

In order to successfully deliver such services, Communications Service Providers (CSPs) must be able to manage complex ecosystems, shaped by a multitude of actors: devices, networks, platforms, patients and clinicians.

The inclusion of satellite transmission for these services is expected to deliver a range of additional benefits. In particular, SatHealth will provide end-users with sustainable telemedicine services of sufficient quality to enable the delivery of improved healthcare services to populations living in remote areas.

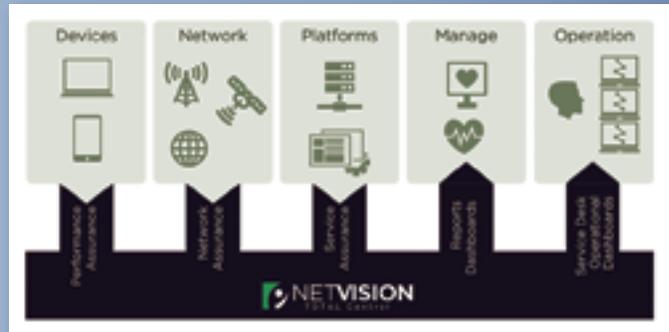


Figure 5: NetVision Solution Focus

As demonstrated in the Catalyst project, ISPM, through its NetVision solution, has been able to implement Service Assurance and Orchestration capabilities, managing quality levels between each of the partners individually as well as for the service as a whole.

ISPM is the ideal partner to connect, monitor and troubleshoot all the different devices, platforms and networks involved, including satellite transmission, and to ensure the smooth and efficient flow of data among them, while reporting the correct status of data to patients, clinicians and all stakeholders in the ecosystem.

NetVision can also be used to provide Medical Service Assurance capabilities for the overall solution in order to orchestrate the monitoring of remote devices; collection of indicators and medical events; the coordination of medical management; and control of the processes of medical care.

Please contact ISPM to discuss how a successful application of familiar concepts and processes from the telecoms industry can help evolve your network and introduce offerings for a new and critical market segment: **SatHealth**.

For additional details regarding ISPM, please visit their infosite at <http://ispm.com/>

About the author

Lorenza Brescia is based in London, England, and has responsibility for Business Development activities for ISPM's solutions and services. Lorenza brings considerable senior-level experience to such companies as Alcatel-Lucent, Telecom Strategy Partners, and a range of TMT start-ups. Lorenza has an MBA from London Business School and a degree in OpticoElectronic Engineering from the Politecnico of Milan.



Executive Spotlight: Shivaji Chatterjee, Business Head, Enterprise Business, Hughes Communication India

Mr. Shivaji Chatterjee is the Business Head of the Enterprise Business Unit at Hughes Communications India Limited (HCIL). He leads the functions of the Enterprise Business Unit that encompasses various aspects of sales and marketing, operations and program management at the company.

He is a gold medalist in computer engineering from Pune University. Subsequently, he completed his post graduation in marketing from NMIMS in Mumbai. Of his 17-year career 15 of those years have been spent at Hughes during which time he has won several sales and marketing accolades, including three awards as the International Marketing Person of the Year at Hughes Network Systems USA. In January of 2012, he was also awarded "Hughes CEO's Honor Award" which recognized his achievements globally.



Having begun his career at Hughes as an Account Manager in 1997, he has grown to head the Enterprise Business Division and has spearheaded many achievements for Hughes and for the VSAT industry in India. His areas of expertise include satellite communications, broadband networking and business solutions—across diverse industry segments—with many firsts in the areas of Digital Cinema, eGovernance, Banking and Distance education.

SatMagazine (SM)

Mr. Chatterjee, would you please tell our readers about the Hughes Communications India (Hughes India) operation and its mission and goals? What is your role with the company's Enterprise Division and what are your responsibilities?

Shivaji Chatterjee

Hughes Communications India Limited (HCIL) is the leading satellite broadband company in India, having started its commercial operations in the country 19 years ago. HCIL has steadfastly held its leadership position in the Indian satellite market, with more than a 40 percent market share, as per the official TRAI reports.

I currently head the functions of the Networks Business Unit, which is a truly interesting and challenging role as I must keep in mind the entire Indian market; demanding Indian customers, a tumultuous economy and an extremely high level of competition.

SM

There is a great need in India, as is the case in many countries, to reach underserved populations with communication capabilities. How is Hughes India addressing these needs?

Shivaji Chatterjee

We believe satellite technology can be a great equalizer when it comes to served and underserved populations. Over the last two decades, we have consistently reached remote locations by way of our different service offerings, whether in Education, Healthcare, Banking, etc. In the Education sector, Hughes has powered different Edusat projects of the government and has also made distance learning a possibility, both in the public and private sector. In Healthcare, Hughes has helped doctors transform eLearning—a distance learning platform, to pursue their higher degrees by way of powering medical coaching classes.

Satellite technology has played a major role in financial inclusion, as well. Banking has been a focus area for us. Hughes has helped the banking institutions successfully execute a large portion of the Ministry of Finance (MoF) project.

In rural and remote areas of the country, for example, a high percentage of the population is considered "under-banked," an industry term that means that the average branch office in these areas serves a larger population than the national average. What's more, every one million people in India are served by a mere 39 ATMs, translating to a vast underserved segment that offers enormous potential for growth.

There is also a strong correlation between under-banked areas and low tele-density areas where the reach of terrestrial telecommunications is low. This lack of infrastructure and services creates a significant digital and financial divide among Indian people.

Fully managed satellite and terrestrial broadband solutions from HCIL are helping to close that divide. As the leading provider of satellite broadband solutions in the Indian financial sector, Hughes today supports more than 28 nationalized and private banks with nearly 35,000 branches and 20,000 ATMs .

SM

In relation to the previous question, technologies are becoming available to bring SatHealth™ capabilities to patients and health providers. What role do you see for satellite communications for the delivery of crucial medical care throughout India?

Shivaji Chatterjee

India with its vast population still has a skewed doctor to patient ratio. This ratio becomes worse as we move from the metro areas toward rural and underserved areas. Satellite communications are capable of connecting the doctors and healthcare providers to far flung areas in normal times and in emergencies using broadband technology.

Government and healthcare providers can make good use of this technology to propagate healthcare in a cost-effective manner. Patients do not have to rush to tier 1 / metro cities to avail themselves of quality healthcare, thereby saving time and cost. There can be different applications relating to SatHealth, such as tele-medicine, second opinion services, disease surveillance, and mother-child and birth data records.

SM

Does Hughes India have a program in place for such good works? If so, would you please tell us about the project and, if not, is such in the planning stage?

Shivaji Chatterjee

Hughes has been servicing the Health industry for many years now. We set up the Integrated Disease Surveillance Program (IDSP) for the Ministry of Health in 400 locations across India. This network was set up to provide early warnings for disease outbreaks—so that they can be controlled and confined to a limited geographical area within the country. We are providing network services for the National Rural Health Mission (NRHM) in various states in the country.

The National Rural Health Mission (NHM) was launched in April 2005. The NRHM focused especially on 18 states with poor infrastructure and low public health.



SM

What type of Hughes equipment is, or will be, used for connectivity?

Shivaji Chatterjee

With more than 4 million satellite terminals shipped to customers in over 100 countries, the Hughes HN and HX Systems are the most advanced and widely deployed around the world. Optimized for broadband IP services, Hughes Broadband Satellite Systems support a wide variety of applications from high-speed Internet/intranet access, to video conferencing, to voice (VoIP). These technologies have been deployed for the above projects. Where broadband access is required, the HN System is used. Where higher QoS services are required for voice/video, then the HX System is deployed.

SM

How does SATCOM deliver data to and from patients and doctors in a secure fashion? Are there any current projects you can discuss that reveal the security and efficacy of SatHealth?

Shivaji Chatterjee

Hughes satellite technologies have extremely high levels of security. The entire system is encrypted with 3DES encryption. Over and above, we have conditional access (CAC) implemented which permits only authorized VSATs to get established onto the network. We also have IPSEC encryption on an end-to-end basis to ensure the data is further encrypted.

This combination of secure technologies has been deployed at the programs previously mentioned for IDSP and NRHM.

SM

Has Hughes India developed relationships and partnerships with medical service and bandwidth providers to further the company's involvement with SatHealth solutions for the country? What additional connections need to be made to help move SatHealth projects forward?

Shivaji Chatterjee

We are actively engaged with the Ministry of Health, which is the key ministry for all health projects in the country. We have extensively promoted the use of SATCOM in the health industry in the country due to the characteristics of India and the criticality of such communications for this sector.

We work with tele-medicine companies to find an optimal solution (technology, low bandwidth/high QoS video quality) to penetrate tele-medicine throughout the country—as that will address the poor doctor to patient ratio in the country.

The penetration of mass e-governance through common service centers and other kiosk networks into rural India will spur the penetration of SatHealth—as these key health applications can ride over the e-governance networks and centers effectively. We are working extensively on rolling out SATCOM-powered e-governance networks to more than 250,000 rural locations in the country.

SM

One concern may be the ongoing need for training and support for SaHealth programs, both internally and by users. How is Hughes India addressing this need?

Shivaji Chatterjee

India has the highest number of medical institutes in the world, yet many students around the country are not able to access quality education due to geographical limitations. With a network of over one million schools, and 18,000 higher educational institutions, India has one of the largest educational systems in the world, and the online education market is forecast to grow to USD 40 billion by 2017. As the leading satellite communications provider in the country, HCIL is helping such institutions expand their reach and accessibility across India, and already runs its tele-education solutions to other renowned medical institutes.

This initiative represents a paradigm shift in medical education, as it will dramatically increase the accessibility of knowledge to every corner of the country—employing our latest, most cost-effective and user-friendly technology platforms.

We currently have established two large medical training networks for the Dr. Bhatia Medical Institute and Delhi Academy of Medical Sciences—connecting over 100 locations across the country. Hughes provides a turnkey service here enabling the entire solution—studios, classrooms, audio and video equipment, training and recording software, and VSATs, of course.

SM

What can we expect to see from Hughes India over the next few months in regard to the company's commitment to SatHealth?

Shivaji Chatterjee

We will continue to work closely with the Ministry of Health, various healthcare technology companies and providers, medical training companies to further the cause of SatHealth in the country. We will also actively promote e-Governance networks as they will set up the infrastructure platform on which various SatHealth applications can effectively ride.

We are currently deploying a 106-site network in the state of Meghalaya specifically for NRHM applications over the next two months (as of this writing).

For additional information regarding HCIL, please visit

<http://www.hughes.in/>

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Editor's note

The introductory image of the subcontinent of India is courtesy of the NASA Earth Observatory. The image is by Jesse Allen and Robert Simmon, using VIIRS Day-Night Band data from the Suomi National Polar-orbiting Partnership (Suomi NPP). Suomi NPP is the result of a partnership between NASA, the National Oceanic and Atmospheric Administration, and the Department of Defense. Caption by Adam Voiland.

SatBroadcasting™: The Industry Must Change— More Innovation Needed, However, Terrific Times Ahead...

By Chris Forrester, Senior Contributor



The annual 'Big Four' gathering at the recent satellite show in Washington D.C. (SES' Romain Bausch, Intelsat's Dave McGlade, Eutelsat's Michel de Rosen and Telesat's Dan Goldberg), delivered some powerful, home truths to the industry. Each of these luminaries combined to praise the innovation that's come from Elon Musk and his SpaceX low-cost rocket venture, saying the degree of imagination and fresh thinking that's come from Musk was a benchmark that fellow rocket builders—and satellite suppliers—need to embrace.

The panel agreed that SpaceX had the ability through lower launch costs to materially impact the cost per transponder of launching satellites and could change the economics of the satellite business. "Satellite builders need their own SpaceX," said McGlade. "We need to move from expensive hand-built cars to high production value, mass-production [vehicles]."



The Big Four
L-R: Romain Bausch of SES, Michel de Rosen of Eutelsat, Dan Goldberg of Telesat + Dave McGlade of Intelsat

"SpaceX is redefining our industry" was the message from Romain Bausch. "Their industrial process is very different and there must be similar changes across the industry."

Questioned whether the satellite building industry needed an 'Elon Musk' approach, the panel wholeheartedly agreed. "We need someone with that sort of entrepreneurial approach and thinking," said Intelsat's Dave McGlade.

Musk has "shaken the launch industry to its very roots and in a very positive way," said Eutelsat's Michel de Rosen. "Arianespace is certainly challenged and needs to respond to that challenge. They need to do a lot to stay competitive, and I am sure they will do what is needed to give us a launcher that we want to buy. Satellite manufacturers are like us. They respond to us, their customers, and to competition."

Romain Bausch said that new applications and business segments were evolving, thanks to the growing availability of High Throughput Satellites (HTS). An example offered is the SES-backed O3b constellation, which was delivering 1.6GB/s with a latency of just 122 milliseconds and which "represented a huge new opportunity for satellites." Bausch told the packed hall at the event that O3b was already being used for on-board connectivity for the Royal Caribbean cruise line aboard its 'Allure of the Seas' vessel.

McGlade said he was looking forward (as were all of the participants) into 4K happening soon, "and then 8K at a later date." He was also anticipating procurement reform at the Department of Defense (DoD), where he felt Intelsat would thrive as the operator could speedily bring on more capacity as needed, as well as faster and more cost-effectively than the government could manage the same efforts. He

also welcomed the blurring of lines between the FSS and MSS sectors of the satellite industry. "This trend will continue," he said.

Dan Goldberg, the CEO at Telesat, said he had a "ton going on, and it was fun being in the industry just now. Our challenge at the moment is meeting the growing demands of our customers. Our fleet is pretty full and we are seeing strong demand, which means we are designing and procuring new capacity. We are looking at how our satellites are designed, and how our launch demands might be met."

Goldberg said that he expected to order new satellites this year, and Telesat subsequently went on to announce its relationship with the now, Arabsat-owned, HellasSat. Goldberg added, "We are pretty thin in Asia," adding that Asia was probably not the most likely place for expansion by Telesat.

Michel de Rosen, Eutelsat's CEO, said that revenue growth in Western Europe was not doing as well as the rest of the world. "There is growth in the emerging markets, and estimates suggest that 80 percent of future growth will come from the southern Hemisphere markets. Contrary to our friends at SES, Intelsat and Telesat, we had no presence in Latin America [other than its shareholding stake in Hispasat's Amazonas craft] and we see this continent as providing growth for a number of years. We saw SatMex as a brilliant company, with growth potential because of its relationships with its customers, its orders with Boeing, and with a great leadership team. We are also excited by the future prospects of what is this industry's Number One revenue stream—broadcast video—where there's a lot going on. We are seeing the beginning of the expansion of HD broadcasting, and where we have more than 10 percent of our channels now [transmitting] in HD, which suggests plenty of growth potential. We are also seeing the arrival of UltraHDTV, which will ensure more growth for the next 20 years. We anticipate terrific times ahead."

Romain Bausch was making his final appearance at the show as the CEO of SES. At the end of the session, he was given a standing ovation by the giant crowd and some highly complementary words from his fellow-panelists. However, prior to this demonstration, he told delegates that he was still excited by the satellite industry, not the least of which by the new demands and applications that are now emerging into the marketplace. "The geographic perspective is also getting larger, helped by new emerging satellites. I believe that Q3b and its 1.6Gb/s throughput and very low latency of 122 milliseconds represents a huge advantage for the industry." He added that this was also true of video, where new developments such as SES' Sat-IP and IP-LNB products would make a material difference to operator's business models.

"Emerging countries are generating the highest growth operators," he added, saying that it was time for the established players to cooperate, or consolidate, with the growing number of national satellite operators.

Warc 2015

Described as a "hot topic" for the industry, the battle over C-band and other frequency rights also generated heated discussion. McGlade denied that the industry was 'sleepwalking into disaster,' arguing that, as a whole, satellite operators were quite aware of the risks. "We are very active, both individually as well as through the various cooperating organizations. Telcos and the cellular industry are attempting something of a land grab. Google is talking about Wi-Fi in dense urban areas, but we have to prove that cellular operators and others do not actually need all of their target capacity. We also have to improve our own message communication to the industry as to what we are doing in general, and we need to drive that message forward."

Michel de Rosen agreed that while C-, L- and S-band were all on the agenda for Warc15 and Warc18, and that the industry "cannot be passive—we as an industry must think ahead, otherwise, there will also be threats made on Ku- and Ka-band. We need to explain that the mobile sector has made some extremely flawed and incorrect assumptions. The ITU's demand for spectrum is simply flawed, and there's a major problem in that the demand for spectrum [has been grossly exaggerated] by between 10 times and 100 times the actual demand. We are all committed to fight these plans, and we can see a positive outcome for us if we educate the ITU, governments and other policy makers what the real figures are."

SES—By The Numbers

A few days after the Washington show, SES unveiled its global reach numbers. Counting individuals around the planet, SES now touches almost 800 million viewers. Expressed as a global reach at the end of 2013, SES is now present in 291m TV homes. Expressed as individuals, SES suggests that the total number viewing one or more of its clients' channels is close to 800m. The data comes from SES' annual Satellite Monitor study, with information gathered at the close of last year.

Europe, alone, reaches 151m TV homes. SES claims market leadership by some considerable margin over its arch-rival, Paris-based Eutelsat. SES says it has a 60 percent market share as compared with all other satellite operators (Eutelsat, Telenor, Amos, HellasSat, etc.), and up from 58 percent a year ago. Some 75 percent of satellite homes are serviced by SES craft (up from 73 percent) operating at its five, key, European positions.

Its European satellite viewership is up seven percent year-on-year to 106m homes (up from 99m), while its indirect reach via cable has also grown by 1 percent to 153m connected homes. IPTV-based viewership has shown the largest growth, albeit from a lower base, of 27 percent, from 25m to 31m homes.

There has been y-o-y growth for each of the SES regions. Its North American reach is up by 3 percent to 75m homes, Africa/India/MENA region is up an impressive 18 percent to 31m, while LATAM has seen growth of five percent, from 21m to 23m homes. The APAC region has expanded 7 percent, from 11m to 12m homes.

SES also stated that 35 percent of European TV homes are receiving signals by direct satellite (up from 34 percent). This places satellites at the top of the distribution tree, ahead of terrestrial (29 percent), Cable (27 percent) and IPTV (9 percent). When European digital reception is measured, SES says there are 210m digital TV homes in Europe, and satellite leads the market with 41 percent, ahead of digital terrestrial (30 percent) and cable (19 percent), while IPTV delivery has a 10 percent market share.

- *Biggest satellite market is Germany (18m)*
- *Biggest satellite market share is Ireland (65 percent)*
- *Biggest increase in satellite homes (Ukraine)*
- *Biggest satellite HD market is the UK (9m, and 73 percent)*

Of those European numbers, some 86m homes are watching HDTV services, again with satellite leading in terms of market share (38.3 percent) ahead of cable (21 percent), digital terrestrial (15 percent) and IPTV (12 percent). This equates to 81 percent of satellite TV homes in Europe being serviced by SES satellites. SES' European satellites are carrying more than 488 HD channels, up from 356 a year ago.

Remarkably, the SES Satellite Monitor also reveals several notable trends. First, in many markets, the importance of terrestrial TV is less for y-o-y. In the UK, for example, there are only 9.87m terrestrial TV homes (analog and digital), down from 10.32m as at two years ago, and well down from the 2009 position of 11.65m homes. The position in the Irish market is even more marked, where terrestrial viewing is down from 410,000 homes in December of 2008 to just 180,000 today. Satellite has grown significantly during the same period, from 680,000 in 2008 to 1.02m today.

"The results of this year's SES Satellite Monitor and market research confirm, again, the strong role that SES is playing as a high performing video and TV broadcasting infrastructure," said Ferdinand Kayser, Chief Commercial Officer (CCO) of SES. "Our strong growth is a direct result of our significant investments in new satellites, especially in the highly important and dynamic emerging markets. We could also further take advantage of our strong infrastructure and service offerings in mature markets and realize further gains, on a high level, in Europe and North America. As a leader in video broadcasting, DTH, digital transmission and HD, SES plays a critical role in the provision of communications infrastructure globally and the company is well positioned to further drive digitalization and the deployment of high performing video neighborhoods in mature as well as demanding emerging markets."

| | Total SES reach | SES direct reach (DTH) |
|-------------------|-----------------|------------------------|
| Europe | 151m | 65m |
| North America | 75m | 6m |
| Latin America | 23m | 50K |
| Africa, India, ME | 31m | 31m |
| Asia-Pacific | 12m | 5m |

Data: SES Satellite Monitor, Mar 18 2014

Eutelsat Tops 50m From 7-8 Degrees West

Not to be outdone, Eutelsat has also claimed some remarkable numbers. Eutelsat used the locally important Dubai CabSat show to unveil its last MENA numbers, which are impressive. When taken together with Nilesat (and in recognition of its joint venture operation) at the adjacent 8 degrees West slot, the combined reach for Eutelsat and Nilesat now tops 50m homes in the MENA region and stands at 51.5m.

Michel de Rosen, the company CEO, commented on the figures. "Our new survey confirms the exceptional dynamics of the video market in the Middle East and North Africa and the key role played by satellites, that now reach into more than nine out of 10 homes in the region. This result reflects longstanding partnerships between Eutelsat, Gulfsat, Nilesat, Noorsat, Viewsat and anchor media groups, including Al Jazeera, MBC and OSN, that are experiencing strong commercial success and are well placed for further expansion in the region."

The two operators (plus the wholesaled capacity to the likes of Noorsat) are now carrying more than 1050 channels. He added, "Going forward, we believe that the move to higher quality afforded by HD and, for the future, 4K, will further consolidate satellite as a core infrastructure in the region."

Overall, the MENA satellite TV universe continues to expand and satellite is the first choice for multi-channel viewing. Out of a population base of 77.1m TV homes across 15 countries, more than nine out of 10 (92 percent) favor satellite reception for payTV or Free-To-Air (FTA) viewing. In 2010, satellite reception accounted for 67 percent of TV homes in the region, showing like-for-like increased penetration of 25 percentage points over the last three years.

Over the same period, the number of homes receiving analog terrestrial TV slumped from 18.2 million in 2010 to 4.1m in 2013, confirming satellite as the most popular route to digital switchover. IPTV has gained some ground in the Gulf region with 0.7 million households that are exclusively equipped for IPTV.

Indeed, terrific times ahead.

About the author

Senior Contributor Chris Forrester is a well-known broadcasting journalist and industry consultant. He reports on all aspects of broadcasting with special emphasis on content, the business of television and emerging applications. He founded Rapid TV News and has edited Interspace and its successor Inside Satellite TV since 1996. He also files for Advanced-Television.com. In November 1998 he was appointed an Associate (professor) of the prestigious Adham Center for Television Journalism, part of the American University in Cairo (AUC), in recognition of his extensive coverage of the Arab media market.

Executive Spotlight: Marc Eisenberg, CEO, ORBCOMM

Marc Eisenberg joined ORBCOMM in 2002 and has served in a variety of roles, beginning as the Executive Vice President of Sales and Marketing. Mr. Eisenberg was promoted to Chief Executive Officer in 2008.

Prior to joining ORBCOMM, Mr. Eisenberg was a Senior Vice President of Cablevision Electronics Investments, where he was responsible, among other duties, for selling Cablevision services including video and Internet subscriptions through its retail channel. Previously, as Senior Vice President of Sales and Operations at the consumer electronics company, The Wiz, he was responsible for more than 3,000 employees and more than \$1 billion in annual sales.

SatMagazine (SM)

Good day, Mr. Eisenberg. Would you please tell our readers of your background, and how you decided to further your career by joining ORBCOMM.

Marc Eisenberg

I started my career in consumer electronics retail at The Wiz right out of college in a stockroom, pulling boxes. I worked my way into sales, then sales management and eventually, I was responsible for Sales and Operations for the entire chain of 53 stores and \$1.2 billion in annual sales.

The Wiz was eventually acquired by Cablevision. Selling electronics at retail was interesting, but my real passion wasn't in retail, it was in technology and in creating a business. ORBCOMM gave me an opportunity to do both. Prior to acquiring ORBCOMM in 2001, my family had an investment in a company that owned licenses to sell ORBCOMM services into Europe. When ORBCOMM got into financial trouble, some of the license owners, including ourselves, got together to acquire ORBCOMM.

One of our closest partners at the time was OHB out of Germany. They are still a close partner today, and their CEO, Marco Fuchs, serves on our Board of Directors. Having a management, operations and sales focus made me a good candidate to play a key role at ORBCOMM. At the time, ORBCOMM seemed like a pretty risky career choice but it worked out very well.

SM

As the CEO of ORBCOMM, you have seen significant company growth since joining the firm in 2002. To what do you attribute this strength?

Marc Eisenberg

We've certainly had an interesting ride. There were a number of peaks and valleys along the way. Through it all, one of ORBCOMM's greatest strengths is our ability to analyze the marketplace, take a high-level look at the role we play, and adapt to the conditions, or changes, in the market.



There are many examples I can point to where we've done this and changed our path. Some examples include adding AIS capabilities to our spacecraft; teaming with cellular carriers to offer multi-mode products; entering the solutions business through the acquisition of a number of resellers and then combining them to add scale and create a market leader in the commercial transportation market; partnering to create an M2M standard with other satellite players that were previously thought to be competitors; and so on.

Making significant changes to the business is not easy. It typically has a ripple effect through the company that affects the corporate culture as well as almost every aspect of the how we operate, account, report and distribute.

Fast forward to 2014, and the culture of ORBCOMM is that of constant change and adaptation. I would not be able to do it without the exceptional team we have built at ORBCOMM and the support we receive from our Board of Directors. We've got a core creative team that can execute, and we believe we have a lot more to come.

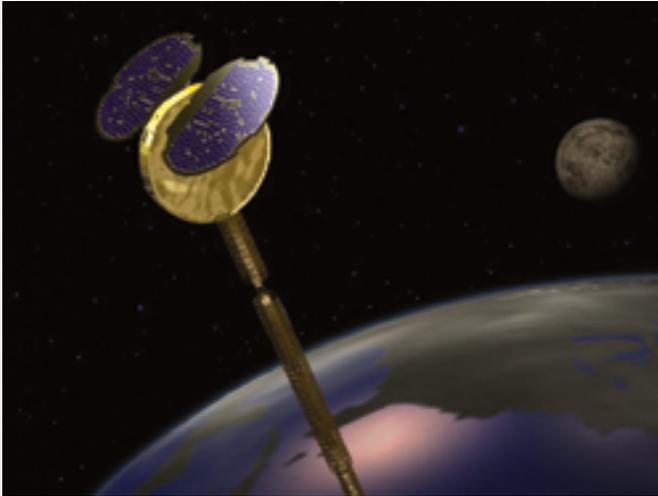
SM

How difficult was it to move from, basically, a consumer electronics company into a satellite communications-based business? What challenges did you personally have to overcome to become successful?

Marc Eisenberg

Retail was about people, processes and products. If you didn't have the right combination of the three, the customer was lost. You missed your opportunity. It instilled in me the urgency of having what the customers' need, when they need it.

Retail may be a different environment and the way the business delivers value to customers may differ, but the business principles are similar. Selling services, managing people and accounting for



Artistic rendition of ORBCOMM's first generation satellite.

the results are basically the same. What you bring from retail is the agility to juggle many balls in the air and the ability to operate very efficiently (knowing that retail margins are very thin). No matter what the business, those are great skill sets to bring. If you were to ask me what I am now, I'd say I'm an "M2M guy" or a "satellite guy"—retail seems like a long time ago.

SM

Please explain the importance of the M2M market segment to the global business, government and military environments? Why is this technology only now coming into its own?

Marc Eisenberg

As business becomes more global and in real-time, it becomes increasingly important for companies to better monitor and control their assets. The success or failure of a business can come down to which company can best identify critical situations, understand present conditions, automate and optimize processes or manage their assets remotely. These opportunities can result in improved safety or productivity while having a significant effect on the bottom line.

Technology has made a huge impact on the M2M market. Computing power becomes smaller, cheaper and more ubiquitous over time. Marry a microprocessor to a machine, and you unlock a whole new universe of potential applications. The result—M2M is born.

As price points continue to fall, it becomes more and more practical to incorporate these M2M technologies into less expensive assets. With lower cost comes wider deployment, and today people are using terms like "big data" and "Internet of Things." There are also more choices for connectivity—getting that data to where it needs to go. Wireless companies are recognizing that the rate structures that are suitable for these machines transmitting their bits and bytes are much different than those necessary for iPhones and their gigabytes per month usage profiles.

ORBCOMM was early to recognize this, and the other networks seem to be catching on, which is helping to drive adoption. Typically, there is a value to controlling or monitoring assets in the field. The question is at

what price level and degree of difficulty does it become cost effective to do so? Government and commercial applications have a lot of common use cases: trucks, trailers, containers, etc. exist in both worlds. What makes them different is the value or the sensitivity of the cargo on board. For this reason, we monitor a good amount of U.S. Government cargo.

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What is the status of your upcoming OG2 satellite launch and how will it impact your M2M business?

Marc Eisenberg

We are looking forward to our upcoming ORBCOMM Generation 2 (OG2) Mission 1 launch scheduled for mid-May from Cape Canaveral, Florida. We will launch six OG2 satellites aboard a dedicated SpaceX Falcon 9 rocket. Our satellites have arrived at the Cape, and we are continuing our preparation for launch.

We've been working with a great group of vendors, SpaceX, Sierra Nevada Corporation, Boeing and Moog and we are extremely excited that we are less than two weeks away from getting our first mission airborne. We anticipate launching the 11 remaining OG2 satellites in the fourth quarter of 2014 to complete our next generation constellation.

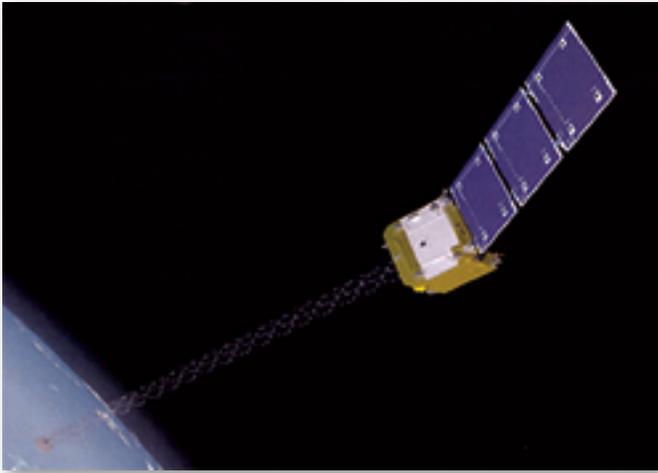
I think it's important to talk about our OG2 satellites and how we incorporated customer input into their new design and capabilities. Over the past 12 years, we've learned a lot about what our customers wanted from OG2.

First, we needed to make the packet sizes bigger. M2M has really grown from just a location-based start. Now, we are taking full diagnostic readings from our customers' global assets. Applications that are usually manned want to be meatier in terms of data, so we needed to raise the bandwidth. We also needed to consider the speed of service.

When we started off, our concentration was mostly in logistics applications where it didn't really matter if it took a minute or 20 minutes to transmit a message. Few customers were waiting for the data in real-time. Today, we're into more and more real-time applications, so the new OG2 service will be much quicker than our current OG1 service. Our OG2 satellites will also fill the gaps in coverage, so the speed of the network is going to be drastically different just after the Mission 1 launch.

Our customers were also looking to see an improvement in our network's efficiency around battery power. With our current network, if there is a gap in coverage, the modem keeps trying, but with OG2, the modems are going to know where the satellites are. The modem won't try to transmit unless it knows a satellite is overhead. We also needed to shrink the size of the antenna for covert or hand-held applications. We've covered their requests with our new constellation, and there's a lot of excitement in getting it airborne.

Another step in preparing for our OG2 launch is the commercial availability of our OG2 satellite modems. We are offering two versions of the modem—the OG2-M, which is solely focused on satellite



Artistic rendition of an ORBCOMM's second generation satellite.

communications, and the OG2-GPS, which adds an on-board, three-axis accelerometer and built-in GPS. The modems are 100 percent backwards compatible. With a footprint smaller than a credit card, the modems feature a single, wide-range power supply, which provides significant flexibility for product designers.

We're also offering a turnkey OG2 Developer's Kit that is designed to reduce development time and expedite the deployment of ORBCOMM solutions in the field. We've already started shipping Developer's Kits and are seeing a favorable response from system integrators and resellers who are interested in using the new modems to build OG2-ready applications.

Overall, our new OG2 satellites are far more advanced than our current OG1 satellites and will provide our existing customers with significant enhancements, including faster message delivery, larger message sizes, and better coverage at higher latitudes, while drastically increasing network capacity.

The OG2 launch will also benefit our Automatic Identification Systems (AIS) customers, who will have more frequent visibility of the vessels they are monitoring and a higher probability of detection. Our customers are excited about our new constellation, and we are confident that there will be significantly more demand for the new OG2 services.

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What role is ORBCOMM trying to fill in the M2M industry?

Marc Eisenberg

There are four types of core capabilities that are key to enabling M2M solutions: network service, hardware, customer portals for managing deployed units and web applications that take the data transmitted and make sense of it. There are companies that can offer one or two of these capabilities, but ORBCOMM can do it all. Over the last few years, we have accelerated our transition from a wholesale satellite network operator to an integrated, multi-network provider using our satellite constellation as a key enabler.

Today, ORBCOMM is the only company in the M2M industry that provides complete end-to-end telematics solutions by uniquely offering all four capabilities at competitive price points—satellite, cellular and dual-mode network service, state-of-the-art devices ranging from modems to turn-key solutions (both internally designed and acquired from our acquisitions) and web applications for reporting and analytics.

We can also offer components of these solutions for companies who may have developed their own technology and may just need some of these capabilities, such as network service and a modem. We've got a strong advantage in the M2M market. In 2013, ORBCOMM signed some of the biggest deals in the M2M industry, such as Doosan, and the Hub Group, and we're planning on additional wins on the horizon.

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Why did ORBCOMM develop an alliance with Inmarsat, and what are the benefits to the satellite M2M industry?

Marc Eisenberg

If you look at the satellite world a few years ago, there were nearly one million annual M2M installations, of which about 10 percent were satellite. Last year, the number of M2M installations grew closer to 10 million with only approximately five percent being satellite. While the M2M industry is growing rapidly, satellite is losing share. We need to understand why satellite, despite its advantages, is losing market share. After all, assets on satellite have a far greater M2M life based on the satellite life and backward compatibility. Satellite has superior geographic coverage and roaming is far simpler. What cellular networks have is greater throughput and a significant price advantage. We believe the largest reason for the falling market share was the various standards in the satellite world and a severe lack of scale.

We decided to take the lead on developing a standard satellite M2M platform to ignite the industry's future. We forged strategic alliances with MSS industry leaders, Inmarsat and Globalstar, which we announced last November. Together, we are collaborating to create a series of interchangeable modems powered by the ORBCOMM, Inmarsat and Globalstar networks that will have the same footprint, connectors, power input and programming environment, thus expanding the capabilities developers can utilize, while sharing scale among the key players in the satellite industry.

Not all satellite networks are the same; they can differ based on the technologies and add complementary features that can align differently based on the needs of the application. Some of these needs are based on location, power requirements, size of the message, regulatory approval, view of the sky, the speed to completing a message and cost. However, when an M2M service provider needs to select multiple satellite networks to solve different needs, it is difficult to switch due to the lack of standards and scale. The M2M service provider is concerned about different programming environments, different power requirements, multiple hardware footprints, multiple provisioning formats and managing across billing platforms, all while trying to hit price points.



The ORBCOMM OG2 satellite coverage map.
Illustration courtesy of ORBCOMM.

We expect to offer these modems in large quantities for less than \$100, providing our customers with unrivaled performance, coverage and flexibility at a competitive price. We started shipping the ORBCOMM modem in the first quarter of 2014 to be followed by the Inmarsat and Globalstar versions in late 2014. Working with industry leaders like Inmarsat and Globalstar, we believe we can turn the tide on market share.

SM

Why does ORBCOMM need to offer services from other networks?

Marc Eisenberg

ORBCOMM is focused on providing the best M2M solutions for our customers. That means matching the right communications method to the right technology. Every M2M application has different requirements—from large message sizes to instantaneous delivery to global coverage, and we are in a strong position to meet all of those needs.

ORBCOMM is a multi-network, multi-carrier provider. We offer connectivity services from three global satellite networks, including our own network, and six Tier One cellular networks. We partner with industry leaders like Inmarsat and Globalstar to provide global one-way and two-way satellite data communications services. We also resell cellular service through our partnerships with premier wireless carriers, including AT&T, Rogers, T-Mobile, Telefonica, Verizon and Vodafone. This allows us to offer our customers a variety of data plans and CDMA or GSM networks. Some of these carriers are also co-marketing our M2M solutions through their distribution channels direct to end-users. In other words, we sell their airtime, and they sell our products, which will significantly further the speed and scope of our product distribution.

By offering both satellite and cellular coverage, ORBCOMM makes it easy to track assets as they move between network coverage areas, which is ideal for fleet management and asset tracking applications. Our dual-mode services leverage the speed, bandwidth and reduced cost of cellular connectivity when the assets are located within cellular range and the global coverage of satellite in the most remote parts of the world. It's the best of both worlds for optimal flexibility, coverage and price.

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What are ORBCOMM's plans for global expansion?

Marc Eisenberg

We definitely have our sights on growing our geographic distribution. We recently acquired Euroscan, a leading global supplier of cold chain temperature compliance recording systems and Europe's market share leader in refrigerated transportation. Euroscan has not only enhanced our cold chain market leadership but also enables us to penetrate markets in Europe and other key geographies, such as the Far East, South America and South Africa, where we currently don't have strong distribution channels for our solutions business.

While our core satellite business is global, today 90 percent of our current M2M solutions business is based in the U.S. but with Euroscan, we now have distribution on multiple continents. Another advantage is that Euroscan is based in the Netherlands, which gives us on-continent resources for customer service, installations, technical support, etc. Euroscan will be selling our entire suite of M2M solutions through their established distribution channels, which really enhances our international growth platform. Euroscan's temperature compliance product portfolio also launches ORBCOMM into a new market focused on addressing future FDA food safety regulations, which is

timed perfectly with the imminent enforcement of the Food Safety Modernization Act. Euroscan checks a lot of boxes for us, and we are excited about being able to provide an even greater level of value for a broader set of customers in the global M2M market.

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Companies involved in M2M are sprouting up all over the world, certainly an indication of this technology's market strengths. In addition to your constellation, what other benefits are there in dealing with ORBCOMM as opposed to other offerings?

Marc Eisenberg

That one is easy—ORBCOMM gives you the most choices. There are many capabilities in M2M, including networks, device management, hardware and customer interfaces. ORBCOMM is the only company that can give you one, a combination or the whole package. Just look at our network offerings, we offer six major cellular networks, including AT&T, Rogers, T-Mobile, Telefonica, Verizon and Vodafone.

We offer three major satellite networks—ORBCOMM, Inmarsat and Globalstar. In our device management portal, you can choose any one of these, combine two for dual-mode and switch offerings depending on the part of the world you are deploying and the needs of the various applications.

Through all of this, you have one point of connectivity, ORBCOMM—and you receive only our invoice. To help customers through development, they can use our modems or our partners' modems and add them to their own hardware configurations. Or, if they like, they can buy an off-the-shelf solution that ORBCOMM has already developed, sharing scale and significantly improving time to market.

ORBCOMM has multiple hardware solutions in M2M that are configurable on multiple networks independently or dual-mode. We have multiple portals tailored for the transportation and heavy equipment industries that are highly customizable and are among the most sophisticated in the industry. As we have all of these capabilities and they are in house, we can hit price points that others would find unachievable. We have nearly 100 in-house technical resources that support our customers, new deployments, customization and development on the product side alone. I think it's pretty evident that we are on the right track as you look through our web site and see the significant customer wins and the product awards we've reported over the past few months.

SM

What's next for ORBCOMM?

Marc Eisenberg

We are focused on growth by adding capabilities, vertical markets and geographic expansion. We typically leverage a build, buy or partner strategy based on the markets we are looking at. Over the last three years, we've built a second generation of satellite modems, an award-winning trailer monitoring product and an intermodal container solution.

We've closed on six acquisitions over that period and have partnered

with industry leaders like Inmarsat, Flextronics, Quake Global and Rogers to provide one of the most complete M2M offerings in the industry... and let's not forget, after nearly 10 years of preparing to launch our next generation constellation, we are scheduled to launch less than two weeks from now.

SM

As you review your already successful career, what projects that you have already completed truly bring a sense of satisfaction to you, and why?

Marc Eisenberg

ORBCOMM in itself was an unbelievable project. I remember showing up the first day as we were burning through hundreds of thousands of dollars in cash on a monthly basis and wondering how we would get through it. Every step along the way was a project in itself to get us where we are today. In stage one, we stabilized the business and brought the costs in line.

Stage two was centered on building a marketing plan around our wholesale business, and we built a dominant position around the Original Equipment Manufacturers (OEMs). In stage three, we financed the company, setting the stage for our next generation OG2 constellation. In stage four, we worked through the economic issues of 2008 and 2009 while building the business plan around OG2. In stage five, we created an end-to-end solutions entity through acquisition and internal growth capable of taking a major role in the transportation and heavy equipment M2M markets.

I'm proud of our company across all of these stages. It's tough to select one since each of them was so necessary to get to the next stage, but if I had to choose, I'd choose stage six. That's the stage where we launch OG2, sell the heck out of the services, execute on our key partnerships with companies like Inmarsat and Verizon and take the business to a new level.

Additional information regarding ORBCOMM may be accessed at <http://www.orbcomm.com/>

The IRG Digest: Satellite Interference—It's Not Just CID Anymore...

By Martin Coleman, The Colem Group, and Executive Director, IRG



Over recent years, there has been a great deal of focus on the implementation of Carrier ID, in part, because it is an extremely effective tool for mitigating interference, by pinpointing the source quickly.

That said; it is all too easy to forget that it is just a single piece of the interference puzzle and there are many other initiatives, technology and processes being developed and refined just out of the limelight. This article will look at those tools and developments and see how they can help the industry.

Improved Detection + Monitoring Technology

IRG is very much focused on improving technology to combat satellite interference, and there have been many technology improvements over the past year, especially relating to detection and monitoring.

According to Roger Franklin, CEO, Crystal Solutions: "Over the last year, a lot of the focus has been on Carrier ID, and therefore the main technological advancements are currently around better CID transmission, detection, and resolution technology." At Satellite 2014, Crystal Solutions launched its CID Detection System, which enables users to verify they have the correct ID allocated to their carrier. It will also interface with the new CID database currently being built, which will be managed by the Space Data Association (SDA). This will enable operators and access centers to automatically extract any given ID and populate the database using this system.

The system will also interface with the new CID database currently being built, which will be managed by the Space Data Association (SDA). This will enable operators and access centers to automatically extract any given ID and populate the database using this system.

Another company active in the control and monitoring of interference instances is INTEGRASYS. Alvaro Sanchez, Sales and Marketing Manager, INTEGRASYS, explained that the system is able to analyze the detail, record and playback any alarms as well as demodulate the interference instances, which are being measured. "This capability allows the operator to have the most accurate measurements that they could have to be able report the interference quickly via email," Sanchez said.

INTEGRASYS is heavily focused on VSAT interference. This is an area which has caused much speculation over recent months. It is estimated that more than 45 percent of interference comes from VSAT burst mode systems. However, the VSAT industry is uncertain whether Carrier ID is the correct solution. Therefore, finding other ways to combat interference for VSAT companies is key.

An example of this is INTEGRASYS' Satmotion Pocket solution that gives VSAT operators the ability, via a smartphone, to measure the transmitted

carrier (Co-polar), the Cross Polar and Adjacent Satellite Interference, enabling the operator to minimize the problems by rotating the feed or by slightly moving the antenna.

SAT Corporation, a leading provider of RF Interference Detection, Geolocation, and other RFI mitigation solutions, has been another major player in reducing interference. SAT Corporation has a comprehensive product suite that supports satellite operators and ensures they are able to provide the best service quality possible, including the capability of being able to quickly detect and reduce satellite interference.

Indeed, SAT products and services are used by 90 percent of the world's largest satellite operators in more than 57 countries to help mitigate costly RF interference events. According to Greg Caicedo, President, SAT Corporation, "Identifying and reacting to these events quickly ensures satellite operators provide the best quality of service to their customers."

SIECAMs is a fully integrated Carrier Monitoring and Geolocation tool developed and offered by Siemens Convergence Creators. Siemens has also implemented a dedicated foreground mode for Adjacent Satellite Interference Measurement, which greatly supports operators in their investigation of these events. Kevin Haymes, Director of Global Sales, Space, Siemens Convergence Creators, said, "Siemens has been at the forefront of interference reduction for almost a decade with our industry leading SIECAMs products."

Improved Geolocation Technology

At IRG, our next big focus is around improving Geolocation technology, tools, and standards. There are some major players, such as SAT Corporation, Siemens and Zodiac Aerospace, already doing some great work in the Geolocation field, and we are working with them to help make it even better.

Kevin Haymes, Director of Global Sales, Space, Siemens Convergence Creators, said, "CID is a first important step, but we at Siemens realize that we cannot stop there. We are working alongside the ITU and IRG to implement a Geolocalization output standard so that intentional interference can be readily addressed by regulatory authorities worldwide." He also exclusively told IRG that Siemens is nearing the release of a wholly new and novel technology that will obviate the need for the use of a nearby satellite for interference localization. This will be previewed at major industry shows in the coming months.

Greg Caicedo, President, SAT Corporation, added, "Protecting satellite bandwidth by quickly identifying and accurately Geolocating the causes of costly interference helps reduce the impact of RFI. Each of the initiatives aid in mitigating the effect of interference, but there isn't a single solution for this issue. There are some interesting theories as to how to mitigate RFI coming down the line over the next few years."

Prevention Is Better Than The Cure

It is widely regarded that, although reactive initiatives are important, preventative measures are vital and more attention needs to be paid to them. Systems and technology that prevent human errors are an important component to reducing and eliminating RFI. I have provided suggestions and guidance to the VSAT Working Group about creating smarter hub systems that should be able to identify remote sites that have degraded performance over time.

For example, when the average clear-sky transmit power for a remote site drifts higher, that remote site is not performing as it should. The hub can conclude that power is being robbed due to retransmission of FM or GSM signals or the remote site has become mis-pointed.

SAT Corporation's Greg Caicedo also feels preventative measures are key. "Much of RFI is caused by accidental operator error and poor installation of VSAT terminals. Working toward equipment and installation standards would help alleviate the headaches accidental RFI causes." Greg also believes training has an important part to play. "Human performance is something that is often overlooked in reducing RFI. Better training of operators would allow for Level 1 operators to do more to mitigate the interference before escalating the problems to Level 2 operators."

For Siemens' Kevin Haymes, learning from incidents is also important for future prevention. "Perhaps IRG, in conjunction with SDA, could store data pertaining to certain incidents of concern in order to learn more about the nature of these serious incidents and to teach operators to more readily identify such. It will become essential that monitoring systems have direct access to the SDA."

Measurement is also important, according to INTEGRASYS' Sanchez. "Measuring interference is essential; for example, satellite operators must monitor their satellites to measure if the transponder plan matches the real communication, then measure any forms of interference that may be affecting that transponder, and report to the customer or other satellite operators to find the source. Also the broadcaster and service providers should provide some basic monitoring capability of their carriers to know if they have an interference or problem and whether the service is degraded or not, then report to the satellite operator with recorded measurements."

Future Technology

There are a number of exciting developments in the pipeline for Carrier ID and Geolocation, which I anticipate to be the next major advancement area, and there are other new technology innovations already on the horizon.

Alvaro Sanchez believes that the industry should simulate communication and interference scenarios before selecting beams, coverage and antenna sizes. Such a procedure would minimize interference effects and, perhaps, allow all the time to improve the satellite service area through ITU.

According to Roger Franklin, other preventative initiatives that will be gaining in popularity involve smarter transmission systems that can prevent human errors. These systems will be able to understand

the potential for conflicts, require closed-system authorization before transmitting, and detect inaccurate antenna pointing. He also believes that improved filtering capability should become available that will enable a receiver to filter out unwanted RF signals so it can demodulate the desired RF signal.

Kevin Haymes believes the advent of more Ka-band uplink spot beams and steerable beams should alleviate some instances of interference. He added, "Looking to the horizon, Q-band on top of Ka-band will provide even more throughput and will likely result in less expensive solutions."

Many manufacturers have improvements to mitigate interference on the horizon. Siemens will be rolling out advancements to its standard ILS capabilities, improving accuracy in detection. INTEGRASYS intends to add capabilities to its product line-up that include Carrier ID support. Crystal Solutions has a patent for a system that looks for, and prevents, transmission conflicts from two or more Earth stations that are connected to the system.

The Next Steps

We have achieved so much over recent months, but there is still so much more to be completed. As I have said many times, we need to achieve widespread implementation of Carrier ID across the globe. We also need to improve Geolocation tools and processes. These are just the basic needs.

Moving forward, we need better automation and intelligent control, something all of the aforementioned companies are involved in instituting. These types of systems will help prevent errors before they occur. Above all, we need the continued support from across the entire industry and further engagement from users—after all, they are the ones that will see and experience the benefits of interference-free communications!

About the author

Martin Coleman started Coleman as an engineering services and design consultancy. Coleman now supplies a unique satellite and broadcast control system design based on the industry standard GE Proficy iFIX Process Control platforms. Martin has worked with numerous broadcasters and satellite operators, improving their process control, including BSkyB, Reuters and YLE. Prior to setting up Coleman, Martin was involved in the engineering and operations of various BT satellite projects for Madley and Goonhilly ground stations in the UK. His background is both satellite and international telecommunications.

For further information regarding IRG, please visit

<http://satirg.org/>



Satellite M2M: The New Frontier?

By James Mack, Marketing & Channel Development Manager Asia-Pacific, KORE Wireless

Accessing satellite services for M2M is becoming less of a “nice to have” feature and more of a necessity in many M2M applications. Recently, KORE Wireless added Inmarsat Satellite Services to the company’s M2M Global Connect product range. This action has, once again, sparked a number of questions from customers regarding the decision—“Should I be adding satellite to my current M2M device range?”

A typical scenario customers have been thinking about is the addition of satellite services for a short period of time—however, this consideration for such services, in many cases, was several years ago and, at that time, they ultimately decided it was too difficult and expensive to implement.

Now, the good news is that the technology has become far more cost effective and easier to incorporate and satellite capabilities are only going to improve with time.

There are a number of benefits for satellite incorporation...

- *Truly Global Coverage*—Reduces the need to worry about crossing borders or operating devices in remote areas that may not have cellular coverage. This is, of course, network dependent, as some are fully ‘pole to pole,’ such as Iridium, while others focus more on populated latitude bands (e.g., Orbcomm and Inmarsat).
- *Single SKU*—Satellite devices are not region dependent. Unlike GSM, where a company shipping globally may have several different SIM cards or modems with different operating frequencies, they can be deployed anywhere and with the same modem.
- *Single Data Price*—With satellite, the data fee is the same, regardless of where your device is located. Once testing is complete, you will know exactly how much a device will cost you to operate per month, regardless of the location.



Yes, there are also challenges to consider...

- **Cost**—Despite hardware and data costs dropping significantly in the past few years, satellite is still more expensive than GSM. For example, hardware for the Iridium Short Burst Data (SBD) Network can range from around \$200 to \$1,000, depending upon the type of device and volumes ordered.
- **Size**—While many GSM modules are adhering to a fairly similar form factor, satellite hardware comes in all shapes and sizes (usually substantially larger than a GPRS module). This often means re-engineering your product to incorporate a modem into your current housing. Size can also expand to “sprawl,” as your device will often need to be connected to an external antenna that has a clear view of the sky.
- **Programming**—I know a few engineers who might mark this as a positive as they love a challenge, but I’ll keep it in the “Challenges” department for now. One of the major hurdles we come across is customers trying to translate what they do over GSM to satellite; this is often why people view satellite as an expensive alternative.

If you want an effective solution, spend time reprogramming the behavior and data delivery methods you currently incorporate on GSM. For example, one of our customers had a GSM device that roughly transmitted around 2 to 3MB of data per month. The customer asked how much that would cost on our Iridium SBD service and promptly crumpled upon being told the price. With a better understanding of how to use satellite and some smart changes to their device, they now use around 20 to 30KB per month over Iridium SBD, which is far more practical.

Once you’ve decided that the benefits outweigh the potential challenges, it’s time to decide on the network that will provide the type of connectivity you need. This comes down to the type of data you want to transmit and how you want that data to behave.

What follows are some of the basic factors involved in transmission and how each application can be used when making the move from GSM to satellite.

Transmission Types

- **One Way (Simplex)**—Simplex services can only broadcast data, they cannot respond to it. This type of communication is typically seen in simple alert systems for distress or location.
- **Two Way (Duplex)**—Duplex allows devices to communicate in both directions between the server and the device in the field. This is becoming the preferred design for Satellite M2M devices as it allows the receiver to respond with a command or message.
- **Short Messaging**—This system is more analogous to SMS than GSM data transmission as it allows short packets of data to be sent across a satellite network. These strings are often a few bytes to a few kilobytes depending on the payload (typically used for location strings, alerts, messages and data collection). Examples of this are the Iridium SBD and the Inmarsat IDP services.
- **IP Communication**—This is essentially the GPRS or 3G equivalent communication over a Satellite Network. This allows for longer communication sessions and larger amounts of data to be passed between devices. This is typically used for remote device operation, large data transfer media and continuous communications. Examples are the Inmarsat BGAN and Thuraya IP+ services.

Now a provider must be selected. Keep in mind that all satellite providers behave slightly differently and there are very few devices that support multiple providers, so once you’ve made the decision, transitioning to another provider can be a costly operation.

Here are some examples of M2M satellite providers in alphabetical order (This list is in no way exhaustive and is not designed to be a replacement for your own research)

- **Globalstar** (<http://www.globalstar.com/>)—The Globalstar Simplex messaging system is a cost effective way to send single transmissions from remote locations. Globalstar is most recognizable for its support of the SPOT emergency personal communications system.

- **Inmarsat** (<http://www.inmarsat.com/>)—There are a variety of Inmarsat communication options for M2M devices that include IP Communication using their Broadband Global Area Network (BGAN) service or a short messaging service using their IsatData Pro (IDP) service. (KORE recently signed an agreement to add Inmarsat services to our Global Connect Service and they will be available in 2014).
- **Iridium** (<http://www.iridium.com/>)—Iridium delivers a Short Burst Data (SBD) messaging service for M2M via 66 Low Earth Orbit (LEO) satellites. Iridium allows duplex communication between devices and is ideal for most remote M2M applications that require small to moderate amounts of data. (KORE provides Iridium SBD airtime through the Global Connect Service).
- **ORBCOMM** (<http://www.orbcomm.com/>)—ORBCOMM provides a duplex short messaging service capable of sending short alphanumeric packets of data between six bytes and several kilobytes, in near real-time, allowing users to access critical information readily.
- **Thuraya** (<http://www.thuraya.com/>)—Thuraya provides a satellite IP communication service that covers Asia-Pacific, The Middle East, Africa and Europe. Thuraya terminals allow speeds of up to 444kbps and are typically used in media and maritime applications. This network is essentially GPRS over satellite.

Once you've selected your provider and completed a considerable amount of homework, deploying a satellite device is usually a fairly simple process. After your device is calibrated for your selected network, you can purchase a monthly or pay per use data plan (much like GSM) and start deploying services.

About the author

James Mack is responsible for expanding the KORE brand across APAC through advertising, sales engagement and digital marketing. James comes from a B2B software and infrastructure background having worked on marketing strategies with leading companies from the USA, UK, Singapore, Japan & Australia.

The Logic Of BGAN

BGAN M2M uses the Inmarsat satellite network in the same fashion as the way KORE uses 3G, terrestrially. It is a full 3G core network in the air, delivered over satellite radio, although there are some differences between the two in operation, due to their delivery methods.

To engage BGAN, a customer must port their GPRS or 3G apps to satellite. KORE can assist by merging your BGAN M2M data with your GPRS/ 3G data streams into one VPN traffic path.

BGAN M2M latency is excellent for a satellite network, so there's no major change from using cellular. I'd suggest allowing similar extra timeouts like you would, or should, do normally if using a roaming sim.

Inmarsat M2M Sales Manager for APAC, Clifford White, has emphasized many of the same considerations I have mentioned for some time—the traffic that you send is your payload plus TCP/IP overheads. These overheads can, and usually are, a significant part of your total traffic amounts (e.g., an 8 byte payload can have as much as 80 bytes of TCP/IP message and ACK details (yes, 10 times the payload). You will always seem to be billed more than what you initially may expect.

Doing a Wireshark™ analysis of real data confirms that this is the case in more than 99 percent of BGAN M2M bill shock inquiries. Cliff's team recommend that you do this when you first start using BGAN M2M as a sanity check on your usage. Wireshark™ shows all traffic sent, including the overheads. By the way, Wireshark is a foremost network protocol analyzer that allows you see what's happening on your network at a microscopic level. Wireshark is the de facto (and often de jure) standard across many industries and educational institutions.

Using UDP/IP can reduce overheads by as much as 80 percent. In our experience, UDP/IP users in mobile applications use around 1/5 to 1/3 of the traffic of TCP/IP users.

Given that satellite is, by its very nature, a more expensive per byte proposition than cellular, it becomes critically important to watch every byte.

Inmarsat's Australian Support Engineer, Mark Brockman, offers some practical and informative information regarding BGAN M2M setup, such as—BGAN terminals can use multiple APNs—it is critical that the update APN is installed in them to allow for free OTA firmware updates from the terminal manufacturers.

The Inmarsat network is geostationary. BGAN M2M, in its current format, is a fixed product. It is critical that the antenna be correctly adjusted and aligned using the internal software tools, not simply just pointed roughly at the sky—this "commissioning" makes a huge difference to overall performance.

If you would like some additional information, please contact us. You can access KORE on Twitter @KOREWireless, on LinkedIn at KORE Wireless Asia Pacific, or at our website

<http://www.korewireless.com.au>

Sidebar by Shane Murphy, VP & General Manager Asia-Pacific, KORE Wireless

Airborne Antenna Considerations For C-Band Telemetry Systems

By David Farr, Chief Executive Officer (left), Haigh-Farr, Inc.
and
Dr. William Henderson, Chief Technology Officer (right), Haigh-Farr, Inc.



The changeover of many test ranges from S-band to C-band telemetry implies the need to modify or replace current systems. Several antenna-related issues need to be considered in order to facilitate a smooth transition to C-band. Among these are changes in vehicle-induced pattern degradation, the effect of increased propagation loss on link budgets and the potential need for multi-band antennas that also support legacy systems during the transition.

This article discusses these issues for both existing telemetry systems modified for C-band and for new systems. We will also address conformal and non-conformal antennas in this discussion.

It is fairly well known within the aerospace community that telemetry is moving from the traditional L-band and S-band frequency ranges up to C-band. It is widely understood that the reason for this push to C-band is two-fold. First, traditional L- and S- frequency bands have been greatly reduced through re-allocation, for a variety of reasons by different markets, and second, the bandwidth required for most applications has seen exponential growth. This has not only been seen in military applications but in civilian aerospace platforms as well.

This article focuses primarily on airborne antenna considerations resulting from moving to the higher C-band region, specifically two types of airborne antennas—conformal and non-conformal.

Conformal antennas come in a variety of different shapes, sizes and configurations from discrete radiators such as a Flexislot™ (Figure 1) or a patch antenna (Figure 2) to arrays such as a Wraparound™ (Figure 3).

The Flexislot- or patch-style antennas provide hemispherical coverage while the Wraparound provides omnispherical.

In telemetry applications, it is usually desirable to cover as much of the radiation sphere as possible to ensure data is received during an abnormal event. This is why the Wraparound configuration is often the optimal solution. There are times, however, where it is not feasible to use a Wraparound.



Figure 1. Flexislot™ Antenna



Figure 2. Patch Antenna



Figure 3. Wraparound™ Antenna

For example, it might not be feasible when there are obstructions on the vehicle that will prevent the utilization of the full circumference, or when the vehicle geometry is non-circular or physically so large that a Wraparound is simply not possible. As discussed below, the use of discrete elements on large geometries is but one consideration that must be taken into account in this transition to C-band telemetry.

Antenna Construction

For Wraparounds, there are two construction techniques, namely microstrip (Figure 4) and stripline (Figure 5). Microstrip has typically been the more popular technique and generally works well for L-band and S-band applications. The circuitry used to feed the multiple elements of a microstrip Wraparound is unshielded. The feed is reasonable in size at S-band or L-band. When the frequency is increased 2.5 times, however, this is no longer the case. Unlike the resonant patch, which decreases in size with an increase of frequency, the feed network is nearly invariant with frequency.

At C-band, the feed network is physically large as compared to individual patches. It is common for high field areas to exist on the feed network itself (Figure 6). Given that the feed network on a microstrip design is unshielded, spurious radiation will occur. The radiation pattern is no longer strictly a result of the energy coming from the individual patches, but is also a function of this parasitic or spurious radiation from the feed network.

This can result in a very messy radiation pattern (Figure 7). While there are certain design techniques that can be used to reduce the amount of this spurious radiation, it is still unshielded. Stripline construction is fully shielded. It radiates through a series of slots cut out in the ground plane, and can be superior in

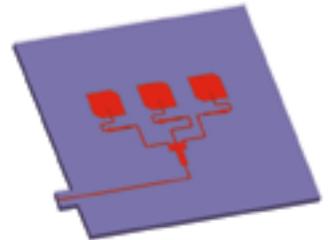


Figure 4. Typical Microstrip Circuit



Figure 5. Example of Stripline (Circuitry is Shielded)

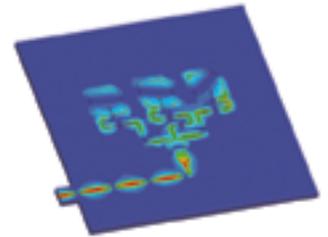


Figure 6. Microstrip Circuit with Fields

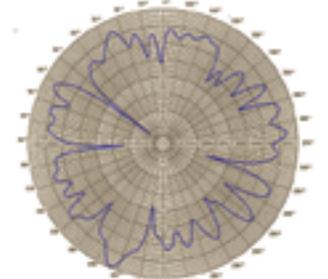


Figure 7. Radiation Pattern of Microstrip C-Band Wraparound™ Antenna

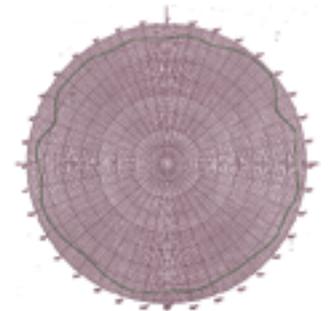


Figure 8. Radiation Pattern of Stripline C-Band Wraparound™ Antenna

terms of radiation characteristics (Figure 8, previous page). Control of the pattern shape is one of the most important parts of antenna design.

Vehicle Influence On Radiation Pattern Characteristics

Antennas that provide omnivisibility induce surface currents on the ground plane (vehicle). When these surface currents hit a discontinuity, such as a wing, fin or ground-plane edge, they can radiate. The resulting antenna pattern is then not only due to the contribution from the antenna elements directly, but also the contribution of these additional sources. This can be demonstrated by mounting a hemispherical radiator on a cylinder of 1 meter in diameter. The elevation pattern (with defined ends) contains a ripple (Figure 9) while the roll plane (without defined ends) is smooth (Figure 10). While the changes shown here are not necessarily detrimental, it demonstrates that ground-plane or vehicle effects need to be considered.

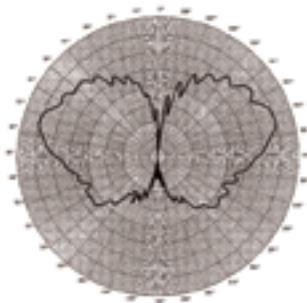


Figure 9. Pitch Plane Pattern of an Omni on a Cylinder

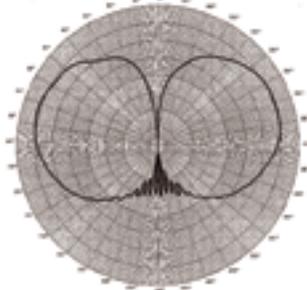


Figure 10. Roll Plane Pattern of an Omni on a Cylinder

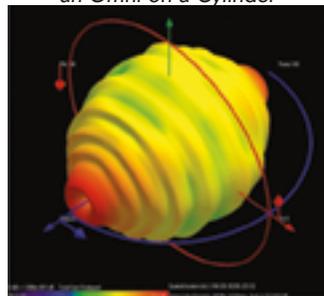


Figure 11. Smooth Cylinder No Fins

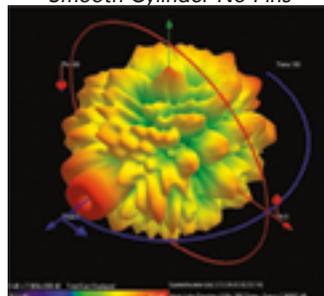


Figure 12. Smooth Cylinder With Strategically Placed Fins

To further highlight the impact vehicle geometry can have, the radiation patterns of a Wraparound were calculated when mounted, first on a smooth cylinder, then with strategically shaped and placed fins near the antenna. The patterns for both cases are given in Figures 11 and 12, respectively.

While this is certainly a dramatic case, it is not out of the realm of possibility. It is the authors' experience that these types of parasitic structures can have a dramatic effect on pattern characteristics and the pattern needs to be considered up front through simulations of the antenna on the vehicle geometry. This will help optimize the

antenna design and/or location of the antenna on the vehicle before it is too late.

The effect the vehicle's geometry has must be considered, regardless of what frequency you are using. It becomes even more important as frequency increases, since fins, wings or other parasitic structures are electrically larger at C-band than at L- or S-band.

Optimal Number Of Elements To Use

When a full array such as a Wraparound cannot be used, it is widely thought that more is better—this is certainly not the case, as is shown in the following examples.

We start with a single element (Figure 13) and two hemispherical radiators on a cylinder, 180 degrees apart (Figure 14). With the exception of the area directly above and below the pattern, coverage is reasonably good. Adding additional elements results in a precipitous drop in pattern coverage, which can clearly be seen in the eight element example (Figure 15), as this results in rather wide, deep nulls. Eventually there are enough elements added to achieve the optimal number of elements and an omni-spherical pattern is obtained. This is the Wraparound configuration (Figure 16).

As discussed above, it is not always possible to utilize a full circumference Wraparound and so, the next best thing is almost always the two element case. Certainly two S-band elements will have far fewer nulls as compared to two C-band elements on the same diameter cylinder. There are limitations on the number of elements that can be utilized for a given configuration.

Positive Effects Of Moving To C-Band

Due to the small wavelength, C-Band antennas can be made considerably smaller and lighter than their L- and S-band counterparts. In addition, not only does the bandwidth grow proportionally with frequency, but percent bandwidth is actually greater. This means that if you have 100MHz at S-band you will have more than 250MHz at C-band, most likely in the order of 300 to even 400MHz with the same type of design, just scaled up in frequency.

Link Budget Considerations

Not directly related to the airborne antennas, but certainly important enough from a system standpoint, are the effects on link budget when

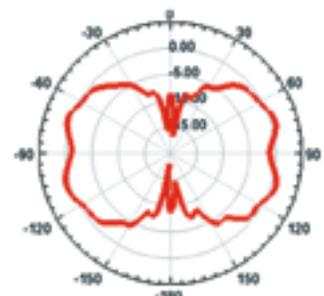


Figure 14. Two Elements

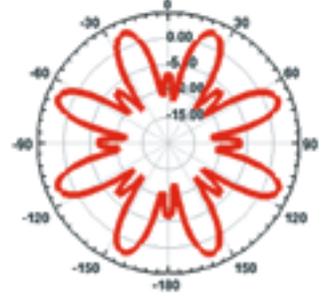


Figure 15. Eight Elements

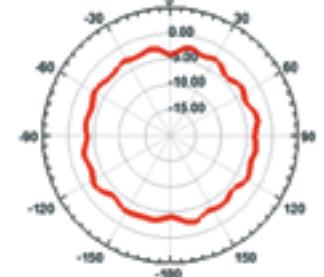


Figure 16. Optimal Number of Elements, Wraparound

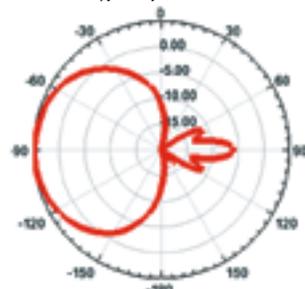


Figure 13. Single Element

changing from S-band to C-band. The following briefly discuss effects on typical link budget parameters.

Free Space Propagation Loss: There will be a link degradation of approximately 7 dB. Since the free space propagation loss is given by:

$$10 \log (4\pi d^2/\lambda^2) [1]$$

The difference in propagation loss at two different frequencies is equal to:

$$20 \log(f_2/f_1) [2]$$

Precipitation: The loss due to precipitation will certainly vary with rain intensity; however, you can reasonably expect to realize an additional 2dB degradation at C-band over S-band in moderate rain.

Cable Loss: Typically with airborne applications, especially with small missiles, it is desired to use the smallest and most lightweight cables possible. If we take a look at a relatively large cable, RG-142, for example, the additional loss associated with 5 GHz versus 2 GHz can be in the order of .5 to 2 dB, depending on the cable length.

Transmitter Efficiency: The transmitter power amplifier tends to be less efficient at C-band so we can add anywhere from 0 to 3 dB degradation attributed to the transmitter as compared to use at S-band.

Total Degradation Delta: Considering all of the above items can result in a total degradation in the link, between 7.5 to 14 dB, when comparing C-band to S-band. While this is not meant to focus heavily on any specific link, it should not be overlooked. While it is not the intention to discuss ground antennas, it should also be noted that an increase in ground antenna gain can make up some of these differences in link degradation. This does, however, result in a much narrower beam, which can cause some tracking issues if not handled correctly.

Transition Antennas

While the transition to C-band is taking place, certain areas are still utilizing L-band and S-band. It is, therefore, highly desirable to have an antenna that will handle all three—L-, S- and C-band—as using a one antenna solution simplifies system change over.

Monopole and dipole antennas naturally provide multi-band performance with regard to voltage standing wave ratio (VSWR), however, only the lowest frequency band provides the desired radiation pattern, as illustrated in Figure 17. A common mistake observed by the author is utilizing the VSWR solely to evaluate antenna performance. To get the full picture, radiation patterns must also be considered.

There are antennas specifically designed to maintain radiation pattern characteristics over frequency. An example is shown in Figure 18. The radiation patterns of this antenna are essentially invariant as a function of frequency (Figure 19). The minor differences observed are actually caused by the ground plane changing in electrical size as we go from 1.4 to 5.25MHz. The VSWR of this antenna is well under 2:1 over all of the telemetry bands, as indicated by the yellow highlighted areas (Figure 20).

Conformal Multi-Band Antennas

There are several ways that both S-band and C-band or all three (L-, S- and C-band) can be achieved in a conformal design. Certainly, the simplest is to have a dual-band antenna with two distinct arrays within the same physical package and two distinct connectors as shown in the block diagram (Figure 21). This would result in possibly having to change to the correct RF connector (band) before use. An alternate approach embeds a diplexer inside a conformal antenna, L- or S-band radiators for legacy systems and C-band radiators, which are all fed through the embedded diplexer. This results in a single port design. It is also possible to do this with a tri-band configuration L-, S- and C-band.

Given that the C-band, L-band and S-band radiators are optimized for their respective bands, pattern characteristics would be the same and there would be no degradation. This multi-band conformal antenna would require additional space over the legacy L- or S-band antennas. In some cases it may not be feasible to change the vehicle geometry to accept this larger antenna, but a C-band antenna can always be packaged to replace the lower-frequency legacy units.

Conclusion

There are several antenna considerations when changing from the legacy bands to C-band for telemetry. Choosing the wrong construction type, number of elements and/or placement can have a major impact on overall performance. While all of the effects cannot be fully mitigated, in most cases performance can be optimized, which will result in a successful link.

More information is available at the Haigh-Farr infosite at (<http://www.haigh-farr.com/>)

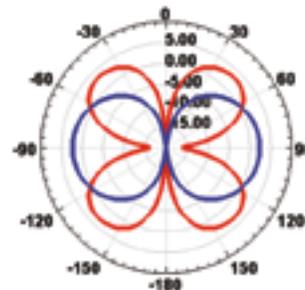


Figure 17. Broadband Response of a Dipole



Figure 18. Pattern Optimized Tri-Band Antenna

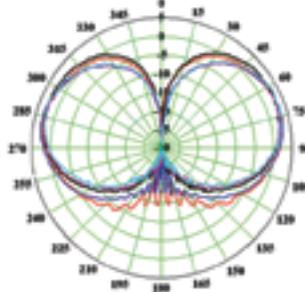


Figure 19. Patterns of Optimized Antenna

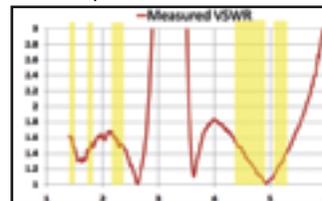


Figure 20. VSWR of Optimized Antenna

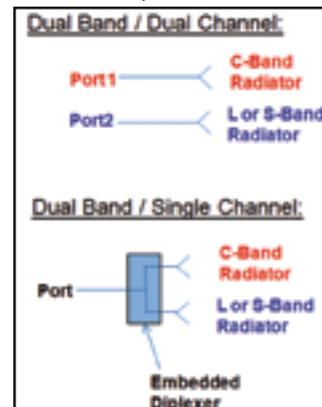


Figure 21. Conformal Multi-Band Antenna Block Diagram

Focus: A Major Transformation + A Powerful Debut

By Tore Morten Olsen, Head of Maritime, SATCOMs Business Unit, Airbus Defence and Space

Airbus Defence and Space has mapped out its new organization and has also introduced AuroraGlobal, the 'network of networks.'

The company now encompasses the former Astrium Services, which will now be known as Airbus Defence and Space. The same team and global network of suppliers and partners remains in place to deliver satellite solutions to service providers and end-users on land, at sea and in the air.

As one of the three Divisions of the Airbus Group, Airbus Defence and Space is Europe's Number 1 defence and space company and is the world's second largest space company as well as one of the top 10 defence companies globally with revenues of around 14 billion euros per year. The new Division began operating as of January 1, 2014.

The Lay Of The Land

The Chief Executive Officer of Airbus Defence and Space is Bernhard Gerwert.

Airbus Defence and Space is composed of four business lines: Military Aircraft; Space Systems; Communication, Intelligence & Security (CIS); and Electronics. The company brings together a wide portfolio of services to continue meeting the complex needs of its customers around the globe, all the while contributing to Europe's defence and security, and as a technology force in securing Europe's sovereign and independent access to space.



François Auque

Space Systems, headed by François Auque, covers the full range of civil and defence space systems: Satellite system solutions for telecommunications, Earth Observation (EO), navigation and science include spacecraft, as well as ground segments and payloads. As the European prime contractor for launchers, orbital systems and space exploration,



Evert Dudok

the firm's key systems include Ariane launchers, the French deterrent force and European space cargo vehicle, the ATV.

Communication, Intelligence & Security (CIS), headed by Evert Dudok, is the new 'one-stop-shop' for satellite and terrestrial communication, intelligence and security services and solutions and is where the former Astrium Services organization and portfolio resides. The customer base encompasses both the government sector—notably defense and security forces—and commercial sector that includes transportation (maritime, airport, metro), energy (oil, gas and electricity), mining and agriculture. Key services and solutions include: Military and commercial satellite communication services, professional mobile radio communication, emergency response centers (such as 9-1-1/112), border surveillance systems, command & control (C4I) systems, cyber security solutions and services and observation satellite based geo-information services.

Electronics, headed by Thomas Müller, provides high-performance equipment for system integrators serving Airbus Defence and Space within the Airbus Group, as well as external customers worldwide. Products are mainly for civil, defense and security markets covering ground, maritime, airborne and space applications. Key products include radars and IFF systems, electronic warfare devices, avionics, space platform electronics, space payload electronics as well as optronic sensors.



Thomas Müller



Domingo Ureña-Raso

Military Aircraft, headed by Domingo Ureña-Raso, designs, develops, delivers and supports military aircraft and is the leading fixed-wing military aircraft center in Europe and one of the market leaders for combat, transport and tanker aircraft worldwide. Key products include the Eurofighter, A400M, A330 MRTT and C295/CN235 as well as



the development of unmanned aerial systems. Airbus Defence and Space's reorganization means that the SATCOM business line will leverage technologies developed within other departments and units. Further to that, the financial strength of the company will be providing ship owners with the security to select a long term SATCOM partner within the volatile shipping business. This is important for predictability and clients will benefit from future proof solutions, such as the new AuroraGlobal concept.

The Network Of Networks

Airbus Defence and Space CIS has introduced a whole new concept for its approach to the land, maritime and aeronautical SATCOMs markets. Dubbed AuroraGlobal, it is a 'network of networks'—a global multi-band portfolio of high throughput SATCOMs services for government, maritime and enterprise customers.

This is the first portfolio of satellite services to combine all networks across all market segments, from state to private, government and commercial. AuroraGlobal features services and bandwidth capacity that are provided on military and commercial satellites to service provider partners and end-customers, including the forthcoming High Throughput Satellites (HTS)—Inmarsat Global Xpress and Intelsat's Epic NG.

The AuroraGlobal portfolio is technology agnostic, with services being offered on Ku-, Ka-, L-band and, for defence and government customers, X-band, through the Skynet satellite constellation. A key driver of the new network is that Airbus Defence and Space can provide customers with throughput comparable to nexgen HTS services—today.

AuroraGlobal works with all established electronics and on existing and forthcoming antennas from all manufacturers. This means that users can experience increased throughput without the need to change out their antennas.

As part of AuroraGlobal, Airbus Defence and Space has significantly revamped its maritime SATCOMs services offering. Now known as AuroraMaritime, this network of networks will host existing maritime services while offering significantly more value and flexibility with more throughput, higher data allowances as key benefits.

The headline here is that AuroraGlobal features Ku-band services with throughput comparable to forthcoming nexgen services, available now—using existing antennas. Shipowners will obtain comparable speeds to HTS services immediately, and they can later decide if they wish to make the move to Global Xpress or EpicNG, an easy conversion under AuroraMaritime.

New VSAT services have been introduced as part of AuroraMaritime; Pharostar Plus and WaveCall Plus (offered to end-customers via Airbus' direct-to-market provider, Marlink) are based on Ku-band VSAT today,

with possible transition to Ku- and Ka- based HTS satellites in the future. The services offer double the value for money. Featured is high speed broadband with increased data allowances or throughput speed to meet the growing demand for IP applications and Internet connectivity on all types and sizes of vessels. For instance, if a shipping company already has a 10GB monthly data allowance, this could double to 20GB (if they move to this package). Or, if a shipping company has an agreed 128kbps bandwidth, it could double to 256kbps under the new 'Plus' services.

The idea is to enable higher data allowances or higher speed throughput to meet the growing requirements on ships for use of IP applications or improving crew and passenger communications without incurring the need for extra investment. AuroraMaritime also places users in a strong position to select nexgen services.

Changing from Ku- to Ka- is straightforward, giving service providers



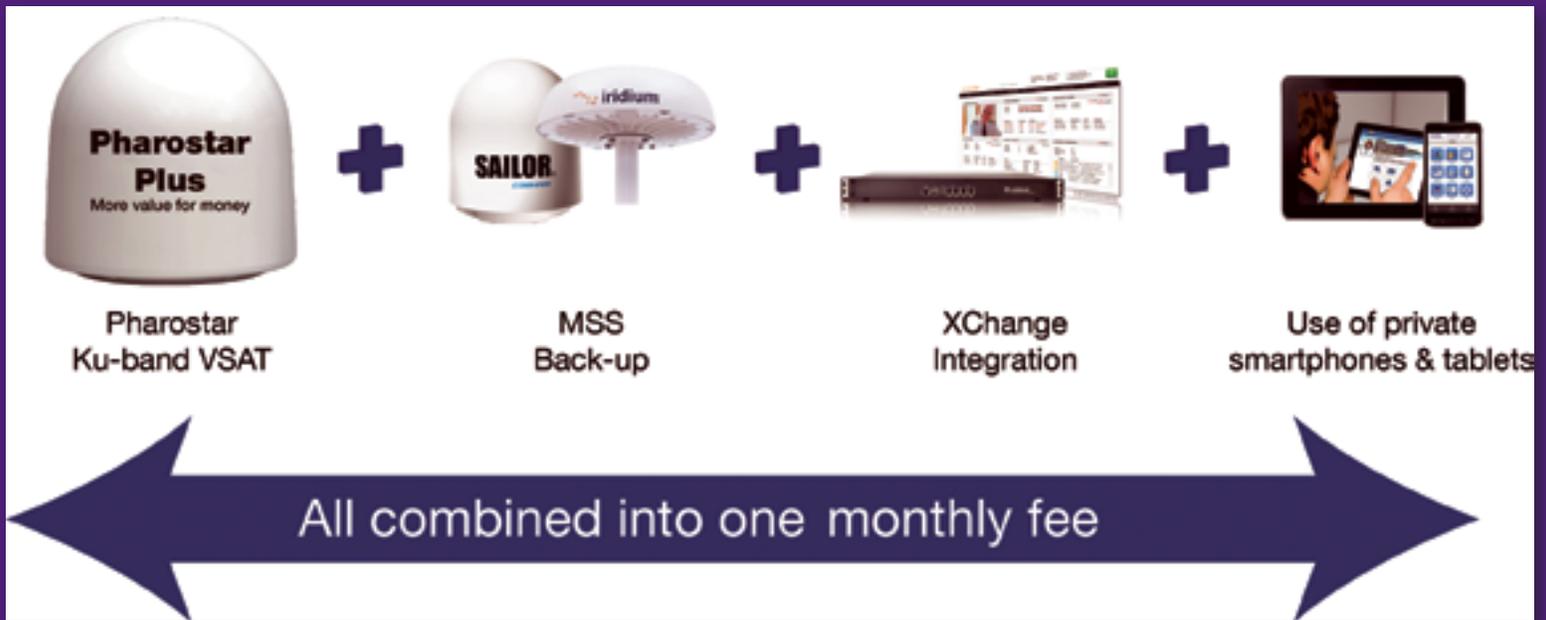
much more flexibility in the services they shipowners. It's possible to change Global Xpress without changing on board antennas. If the vessel is already using specific antennas from Cobham SATCOM or Intellian, it's a simple case of installing a field upgrade kit, which is much more cost effective and less time consuming than an entirely

new antenna installation. For those customers wishing to move to the EpicNG platform, this can be done without even touching the on board antenna.

With the speeds possible on Ku-band under AuroraMaritime already pushing an HTS like experience, many shipowners will be happy to adopt today's VSAT services, especially as L-band back-up systems are standard as part of the offering. Airbus Defence and Space has the most complete Ku-band coverage; however, it is vital to ensure that vessel owners are confident in their ability to communicate anywhere at anytime. Including L-band back up as standard is a logical step in that direction.

Importantly, Airbus Defence and Space takes the on the risk of the L-band service costs, as vessels on AuroraMaritime will not pay per MB if they switch to L-band, as those services are included in the fixed monthly fee.

AuroraMaritime also gives access to XChange v3, the latest evolution of Airbus Defence and Space's communications management platform, which is set to further improve the flow of operational data between ship and shore through sophisticated voice and connectivity service management. As an all-in-one solution to manage communications services in an easy and intuitive way, XChange offers more control with less operational overhead, while on board administrative tasks can also be out-sourced to onshore offices. XChange v3 is fully integrated



with the VSAT services, with improved features including an ability to flexibly prioritize traffic, in order to give corporate traffic priority over crew traffic, thereby securing delivery of critical data.

XChange has full VSAT and MSS compatibility and works seamlessly with the largest range of VSAT terminals—shipping companies can use the antenna system available on board and can simply integrate XChange as the optimal network management device. As a single, powerful device that offers complete connectivity control, regardless of a vessel's existing network configuration, it enables easy, reliable access to the preferred SATCOMs connection. Configuration of XChange v3 only takes a few minutes to enable access to the innovative new features.

Voice functionality has also been significantly enhanced on XChange v3, with the choice of VSAT voice and up to three MSS optimized voice connections. Available lines are automatically selected for more convenience and it equally improves network access for end-users. Crew members benefit from a single account with an automatically remembered login for data and telephone services on their individual devices. All data and voice costs can be charged to each crew member's account.

Maritime service providers and end-users stand to benefit as Airbus Defence and Space introduces its own nexgen network. AuroraGlobal increases bandwidth or data allowance for operational and crew requirements on existing technology, with the added flexibility to change services easily in the future. Low capital outlay through the use of existing antennas and full coverage on the latest satellites with integrated back-up to ensure communication and connectivity is always available.

AuroraMaritime and its associated services are a complete platform today and are ready for shipowners who, later, might wish to make the move to HTS services.

About the author

Tore Morten Olsen possesses 20 years of experience in the satellite communications sector working for Telenor, Marlink, Astrium Services (now Airbus Defence and Space). He started in 1994 as a technical product manager and moved into the commercial field and was responsible for the government market sector in 1997.



In 1999, Tore moved to Slovakia to lead the international satellite communications activities of Telenor and he returned to Norway to take responsibility of Telenor Satellite Networks AS in 2004. He has held several senior positions within the company, to include CEO Telenor Slovakia spot.s.r.o, Chairman of the Board of Directors in several other Telenor Satellite Network Companies, Country Manager for Telenor in Slovakia, CEO of Telenor Satellite Networks.

Following the establishment of Vizada, Tore took responsible of the Maritime VSAT and Mobile Satellite Services retail activities at the company, operating under the Marlink brand. He is now head of Maritime activities at Airbus Defence and Space, with responsibility for the direct service provider channel and direct-to-customer channel (Marlink).

Saving Lives, Time + Money... Thanks To Today's SatHealth Vehicles

By Drew Klein, Director, International Business Development, C-COM Satellite Systems

More than ever, companies rely on broadband access, with high quality voice, video and data to successfully operate their businesses. From communications to research; from database management to disaster recovery; two-way, high-speed Internet is an absolute must no matter the location. This is especially true in the emergency medical field where access to communications is crucial as lives are at stake.

The integration of Satcom technology into vehicles is revolutionizing the way rural communities and individuals living in disaster stricken areas receive healthcare. Often times, people in remote locations aren't willing or financially able to travel the 25+ km from a peri-urban area to a hospital so that they may receive assistance. Telemedicine can alleviate this burden to the patient and ultimately mitigate the overall costs that surround this global problem.

Vehicles equipped with mobile satellite antennas such as C-COM Satellite iNetVu Auto-Deploy VSAT systems along with medical equipment can now provide isolated patients with quality care no matter where they live. iNetVu antennas allow physicians access to broadband Internet, online patient database management, real-time diagnoses and specialist support anytime, anywhere. Online guidance in emergency situations can save lives without the delay of long ambulance rides while a patient deteriorates.

Clinical media contain information in various forms such as text, graphics, medical images, audio and video signals, that cannot be sent any way other than by satellite. X-ray images, clinical EEG signals, ultrasonic scan results, and many more can be diagnosed in real-time. Also, data compression for reduced volume of transmitted data, data encryption for the protection of the privacy of patients, and the obtaining of instantaneous frequency data





- Vital monitoring
- Ultrasound scanning
- HIV testing
- Pregnancy testing
- Immunizations and basic check ups
- Incubation and monitoring of the infant
- Natural birth

Vehicles are fully staffed with professional doctors and volunteers, stocked with high grade medical supplies, in constant communication via satellite, and on the road as often as possible.

Time-Efficient....Cost Effective....Life Saving

In Nigeria, once the full program has been rolled out, the plan is to see over 1,000,000 pregnant peri-urban women per year, and drastically reduce maternity mortality rates.

are made possible by mobile communications. If governments, NGO's and medical officials want to improve their knowledge and effectiveness in the industry, telemedicine is the broadest leap into 21st Century Health Care.

MST Specialised Vehicles has jumped in with both feet, improving the lifestyles of rural communities by building mobile servers suited to their needs. Currently operating approximately 20 such vehicles on the road in South Africa with plans to deploy 20 more in South Africa and 20 in Nigeria, these initiatives are clearly having a positive impact on the population.

- The cost of this mobile clinic is estimated at \$500,000.
- Monthly maintenance costs are est. \$20,000 / month.
- Henceforth, the cost to build, operate & maintain one vehicle for 3 years = est. \$1.2 million.
- To purchase and operate 72 vehicles (2 for every state in Nigeria) over 3 years = \$86 million.
- To see 1,000,000 women / year (38 / day / mobile clinic), would cost \$86 / woman / year.
- Hospitals are always the largest percentage of health care costs, and with building prices rising,
- ONE state-of-the-art hospital might cost \$100 million just to build.



The Mobile Maternal Healthcare mobile clinic, Africa's first such full care unit.

Let's take a look that the Mobile Maternal Healthcare Clinic which is Africa's first Mobile Maternity Unit equipped with satellite communications, deployed in Nigeria, by Bayelsa Hospital.

Designed, integrated and maintained by MST Specialised Vehicles, Cape Town, South Africa, and this fully operational mobile maternity clinic is equipped with state-of-the-art equipment and consumables with the ability to connect with specialists worldwide no matter the location. This vehicle offers...

Another exciting project headed by MST Specialised Vehicles includes supplying 6 mobile clinics to Nigeria Customs Service as part of their Border Patrol Healthcare Programme. The clinics will provide services to staff and people crossing the borders such as vaccinations, provide optical, dental and other general primary healthcare to staff, and set-up support and maintenance infrastructure in Nigeria.



A Nigerian Customs Service Border Patrol Healthcare unit.

In the medium term, telemedicine will be a key focus area for MST's mobile clinics that will use the iNetVu 1200's

"It is estimated that approximately 74 percent of maternal deaths could be prevented if all women had access to services which would prevent or treat such complications associated with pregnancy and birth. It is therefore clear that access to, and

provision of, emergency obstetric care, family planning services and ante-natal and post-natal care are key determinants of maternal health.”—Amnesty International, 2009.

There are many other examples of mobile telemedicine (eHealth) using satellite technology to save lives all over the globe. Mobile Surgical Vehicles in California, Mobile Breast Cancer Screening Clinics in New Zealand, for example, are innovative and advanced creations that are changing the landscape of the patient-doctor environment.



A mobile breast cancer screening clinic in New Zealand.

Another pioneering example of telemedicine has been implemented by Saab Grintek, a partner of C-COM Satellite Systems, from South Africa. The company has integrated iNetVu VSAT antennas to help create the Transnet-Phelophepa Healthcare Train. Read more about the Health Train at http://www.rocke.com/responsibility/access_to_healthcare/developing_countries/transnet-phelophepa_healthcare_train.htm.

The Train will stop at very remote railway stations to serve under developed communities. The train connects via the satellite platform in the back of vehicle to the Academic Hospital of UCT. Services such as Internet Access, DSTV, Video Transfers, X-Ray scan's and Internet will be send over the Platform.

The Transnet-Phelophepa Health Care Train is a mobile clinic bringing medical care to rural South Africa, where there is just one doctor for every 5,000 patients. Phelophepa has 18 coaches and is equipped to provide general health, dental, eye and psychiatric care, as well as cancer screening tests, diabetes prevention and counselling sessions. It also provides community education on general health issues, such as hygiene and nutrition, as well as an outreach programme visiting local schools and villages to deliver vital health checks, medicines and education.

The train has reached out to over 5.4 million people to date—many people who otherwise would have no access to basic medical services. While satellite connectivity is a small portion of the overall cost of the solution, it's the easiest way to connect doctors and specialists with patients, from any location, at a fraction of the cost.



People in queue outside the Health Train waiting for screenings.

For further information, please visit the C-COM infosite at <http://www.c-comsat.com/>

About the author

Drew Klein oversees and assists the sales and marketing departments at C-COM and is responsible for the promotion of the iNetVu mobile antenna. Since graduating from the University of Waterloo, earning his Bachelor of Honors Science in Biology, he has worked as a commodity broker and developed a keen interest for the telecommunications industry in business and sales. Drew promotes and directs global sales via the firm's existing worldwide dealer network and also reaches new resellers who wish to promote C-COM's iNetVu product.

