Worldwide Satellite Magazine – July / August 2018

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Table of Contents

Advertiser Index

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SES granted FCC authorization for O3b satellite constellation expansion

Artistic rendition of SES O3b mPOWER satellites. Image is courtesy of Boeing.

SES has been granted, by the U.S. Federal Communications Commission (FCC), authorization to serve the U.S. market using a significantly expanded O3b fleet in the Medium Earth Orbit (MEO).

The FCC grant opens significant additional frequencies to SES for use in its non-geostationary (NGSO) constellation and enables it to deploy O3b mPOWER satellites into inclined and equatorial orbits, delivering full global pole-to-pole coverage.

A total of 26 new O3b satellites are authorized, in addition to the 16 satellites already operational and on orbit.

The grant allows SES to add four satellites to their existing O3b constellation, which are scheduled for launch next year.

SES will triple its next-generation O3b mPOWER fleet by giving U.S. market access for another 22 super-powered satellites, of which seven are currently under construction and scheduled for launch starting in 2021.

The O3b mPOWER constellation will bring massive scale and flexibility to the proven O3b MEO model.

The seven O3b mPOWER MEO satellites that SES has ordered already will have more than 30,000 dynamic, electronically-generated, fully-shapeable and steerable beams that can be shifted and switched in real-time following customers' needs.

Each satellite boasts more than 10 times the capability of the current O3b satellites with unmatched flexibility.

Steve Collar, the President and CEO of SES, said that this important FCC grant provides SES with the means to grow and scale the firm's network, connecting the planet and delivering world class solutions to the company's customers globally.

He added that with the first seven O3b mPOWER satellites, SES will deliver a paradigm shift in performance, bandwidth and service. The FCC grant provides the platform to exponentially scale the network in response to surging demand for global data connectivity. The O3b fleet is the only NGSO system delivering fiber-like broadband services today. O3b mPOWER, when launched, will enable an even wider array of industries and customers to tap into this high-performance connectivity.

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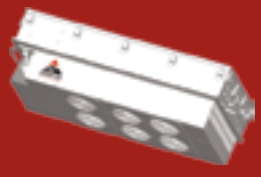

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Search and rescue satellite solution debuts from Thales Alenia Space — Canada and Togo sign on...

Thales Alenia Space is offering what the firm refers to as a breakthrough technology for Search & Rescue satellite solutions — the solution is named MEOLUT NEXT and is to be deployed within the scope of the global COSPAS/SARSAT system.

COSPAS/SARSAT is an intergovernmental organization founded by Canada, the United States, Russia and France. In operation since 1985, it provides a free global Search and Rescue service, using the infrastructures from 43 countries worldwide. French space agency CNES is the official French representative for this organization.

Today, some 500,000 ships and 150,000 aircraft are equipped with COSPAS/SARSAT distress beacons, allowing them to use this service. The service has saved more than 37,000 lives since the outset.

The beacon on a plane or ship is triggered, manually or automatically, and transmits a distress signal at a frequency of 406 MHz. This signal is picked up by surveillance satellites, which re-transmit it to a Local User Terminal (LUT).

This terminal processes the signal, calculates the position of the transmitting beacon, and sends this information to the Mission Control Center (MCC). The MCC is in charge of filtering out false alerts, and contacting the most appropriate Rescue Coordination Center (RCC), to save the persons in danger.

Until now, this system has called on secondary payloads on observation satellites in both LEOSAR and GEOSAR satellites, which will be reaching end-of-life towards 2020. Satellites in MEOSAR, with secondary payloads mounted on GPS, Galileo and Glonass positioning system satellites, will then take over

this task, improving performance, precision and responsiveness.

Due to the large number of satellites visible to a given beacon (up to 30), the MEOSAR service can indicate the position of an endangered person in less than 10 minutes (versus two hours for the LEO and GEO generations). Furthermore, the position-determination accuracy improves to just 200 meters, versus 5 kilometers previously.

Another major advantage is that moving beacons (typically in aircraft) can be detected, which was not the case previously. MEOSAR services will start operating by the end of 2018 and will be able to detect the locations of aircraft in trouble during their flight.

Thales Alenia Space's MEOLUT NEXT solution, with two small antennas located in less than 10 square meters, tracks as many as 30 satellites.

Thales Alenia Space already contributes to the COSPAS/SARSAT system as exclusive supplier of digital signal processors (DSP) on LEO satellites since the 1990s.

Thales Alenia Space now offers a brand-new solution concerning the Local User Terminals (LUT).

These terminals are in charge of processing the signals received from the satellites and calculating the position of the beacon, then sending it to the Mission Control Center.

The principle of Thales Alenia Space's solution is to use two small active antennas, each comprising 64 patches. These antennas are fitted with a high-performance RF (radio frequency) unit, for upstream digitizing of the signal, followed by a highly innovative algorithmic processing method.

Conventional MEOLUT systems, each fitted with six large parabolic antennas in an area about the size of a football field (or pitch…), are capable of tracking signals from six satellites (one per antenna).

Thales Alenia Space's MEOLUT NEXT solution, with its two small antennas located in less than 10 square meters, tracks up to 30 satellites, thereby significantly enhancing the distress beacon detection rate, while also expanding the coverage zone. Furthermore, as there are no mechanical components in these antennas, maintenance costs are the lowest on the market.

Initiated with support from French space agency CNES, this project was first validated from the technical standpoint and now allows Thales Alenia Space to offer a production version.

The MEOLUT NEXT solution from Thales Alenia Space boosts both precision and performance, and is easier to deploy and maintain, meaning that it will undoubtedly improve the COSPAS/SARSAT global system's performance.

A video of the Thales Alenia Space solution is available at ***https://youtu.be/2dP1maiB1RA.***

In a related event, the nation of Togo and Thales Alenia Space announced

they have signed a contract for a ground station to be installed in Lomé, Togo, to be used for the search and rescue (SAR) of persons in distress, mainly using the Galileo satellite positioning system.

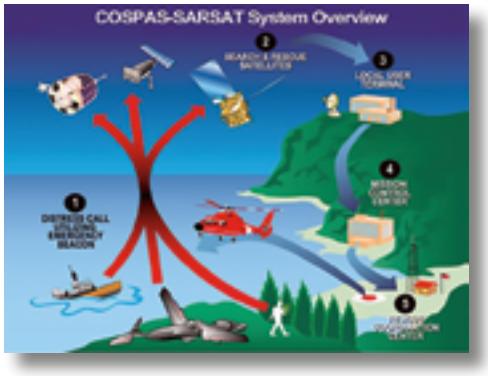
Based on Thales Alenia Space's MEOLUT Next* (Medium Orbit Local User Terminal), the latest-generation MEOSAR (Medium Orbit Search and Rescue) technology, this system will enable the instantaneous location, with unprecedented accuracy, of a distress call issued by a beacon operating through the COSPAS-SARSAT system.

The fully integrated ground station comprises a compact, high-tech beam-shaping antenna (capable of taking maximum advantage of Galileo's SAR service), a Mission Control Center (MCC) dedicated to managing and distributing alerts, and a Rescue Coordination Center (RCC), which interfaces with systems already in place locally or in neighboring countries (for fire-fighters, armed forces, coast guards, etc.).

The ground station will detect and locate any distress signal triggered by a ship, plane or land vehicle, thereby enhancing the safety of people and goods.

The coverage provided by the beam-shaping antenna will allow Togo to receive distress signals over a radius of more than 3,000 kilometers, which means it will cover the entire Gulf of Guinea and a large part of the African continent.

Mr. Ninsao Gnofam, the Minister of infrastructures and transports for Togo, stated that the Thales Alenia Space's MEOLUT Next station perfectly reflects the Togolese government's aim of guaranteeing maritime safety in the Gulf of Guinea, while also fostering a climate of security that is needed to underpin the economic development of the country and the entire region.



Canada has awarded Thales Canada Phase II of the MEOSAR (Medium Earth Orbit Search and Rescue) Ground Segment contract.

MEOSAR will support Canada's ability to respond quickly and effectively to distress signals from land, air and sea from coast-to-coast-to-coast; enabling Canada to meet its obligations under the International COSPAS-SARSAT Program Agreement.

This contract includes the procurement of two MEOLUTs and maintenance services for five years with options for an additional five years.

Using Thales Alenia Space's powerful and compact MEOLUT Next phased array solution, Canada will benefit from the world's first space borne search and rescue system of this type.

Thales Alenia Space designs, operates and delivers satellite-based systems for governments and institutions, helping them position and connect anyone or anything, everywhere. Since its commissioning in 2016, MEOLUT Next has delivered unrivaled performance, detecting distress signals more than 5,000 km away in distance.

On July 2, 2017, at 6:30 a.m., 70 kilometers off the coast of Sardinia, a 12 meter sailboat with three people aboard triggered their COSPAS/SARSAT beacon when the vessel's rudder broke and the engine failed.

The craft's VHF radio was out of reception range — the sailors quickly realized they were in a critical situation with waves more than four meters high and the wind blowing at 40 knots.

MEOLUT Next was able to receive and process their distress signals in less than five minutes, providing accurate positioning to authorities. An airplane identified the boat less than two hours after the beacon was triggered and a helicopter airlifted the crew to safety, saving all three lives.

COSPAS/SARSAT is an intergovernmental organization founded by Canada, the United States, Russia and France. In operation in 43 countries around the world, this satellite-based search and rescue distress alert detection and information distribution system is best known for detecting and locating emergency beacons activated by aircraft, ships and backcountry hikers in distress. Today, some 500,000 ships and 150,000 aircraft are equipped with COSPAS/SARSAT distress beacons. To date, the COSPAS-SARSAT service has saved more than 37,000 lives.

Philippe Blatt, VP Navigation France at Thales Alenia Space, noted that this solution will meet and exceed Canada's MEOSAR expectations, offering Canada a decisive technology for those decisive moments. MEOLUT Next is the only solution in the world capable of processing second-generation beacons in real-time. The product's operational efficiency was recently recognized by Space & Satellite Professionals International (SSPI) for its humanitarian contributions.

www.thalesgroup.com

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The integration of satellite and 5G showcased by SaT5G member companies...

VT iDirect, Inc. (iDirect), a company of Vision Technologies Systems, Inc. (VT Systems), has announced that VT iDirect, SES, Broadpeak, i2CAT and the University of Surrey, all members of the SaT5G consortium, have partnered to demonstrate a major milestone in the research, development and validation of key principles for satellite integration with 5G architecture.

The live, first-of-its-kind test marked a significant step forward in the massive transformation of the global communications industry, which will deliver enhanced security, ubiquitous connectivity and mobility, and expanded broadcast capabilities.

Taking place at the EuCNC2018 conference in Ljubljana, Slovenia, the live test demonstrated the integration of satellite into a third Generation Partnership Project (3GPP) network architecture, comprising a Software-defined Networking (SDN) / Network Functions Virtualization (NFV) / Mobile Edge Computing (MEC)-enabled pre-5G construction testbed, with a geostationary satellite.

It also showcased satellite backhauling features and efficient edge delivery of multimedia content in pre-5G networks, which act as Proof-of-Concepts for integration of those features into a full 5G network.

The SaT5G project is funded by the European Commission and its consortium brings together industry leaders across the ecosystem to promote the cost-effective “plug and play” integration of satellite technology into 5G networks.

The successful demonstration shows the first of the project milestones conceived to reach full seamless integration with 5G over the next few years.

Forming the partnership, VT iDirect provided a pre-5G enabled satellite hub platform and satellite terminal that incorporates SDN, NFV and MEC capabilities, and enables the satellite integration to a 3GPP network architecture.

SES provided end-to-end connectivity between the remote node and the core network via its geostationary ASTRA 2F satellite and its teleport in Betzdorf.

The University of Surrey provided its 5G Innovation Centre (5GIC) testbed element, located at Surrey in the UK.

Broadpeak supplied an MEC-enabled platform for Content Delivery Network (CDN) caching and Multicast Average Bit Rate (ABR) to optimize Satellite bandwidth usage, in order to demonstrate content delivery to demo attendees, via tablets and smart phones.

The Management and Orchestrator (MANO) system from i2CAT orchestrated the virtualized resources.

Aneesh Dalvi, VP of Strategic Initiatives, VT iDirect, stated that integrating satellite communications into 5G network architectures is critical to enabling telecommunication providers to support rapidly accelerating demand for bandwidth around the world, and for consumer and enterprise applications.

He added that VT iDirect and the firm’s SaT5G team members are fundamentally changing how satellite is deployed in order to match 5G infrastructure and validates the tremendous work the VT iDirect team has completed to hit this first, major milestone.

www.idirect.net/

www.ses.com/

broadpeak.tv/

i2cat.net/en

surrey.ac.uk/

5g-ppp.eu/sat5g/

InfoBeam

Hughes' JUPITER™ selected for satservices by PSN

During CommunicAsia2018, Hughes Network Systems, LLC (Hughes) was selected by PT Pasifik Satelit Nusantara (PSN), the oldest private telecommunication and information service provider in Indonesia, to provide the JUPITER™ System for broadband services over the PSN VI High-Throughput Satellite (HTS).

The comprehensive Hughes solution includes HG240 Gateways, a variety of remote terminals, and a central network management system, enabling PSN to deliver satellite broadband services to consumers and businesses across Indonesia.

The JUPITER System features enhanced networking capabilities and supports speeds up to 300 Mbps to an individual terminal. Powering HughesNet™, with 1.2 million subscribers, the JUPITER System is an ideal solution to support the high-growth potential of the PSN broadband offering. It incorporates a central network management system for efficient bandwidth allocation across multiple beams and operational control of remote terminals.

In 2017, Internet user penetration in Indonesia was only 39.7 percent, leaving approximately six million Indonesia households without internet connectivity.

With its PSN IV and the JUPITER system, PSN will deliver high-speed internet access, including Wi-Fi hotspots, helping bridge the digital divide in Indonesia, reaching unconnected households and businesses throughout the region.

Adi Rahman Adiwoso, CEO at PSN, said the company required a robust and scalable ground architecture to support the volume of users and traffic that the firm expects to serve with PSN V. Thanks to a long-standing relationship with Hughes and the proven capabilities of the JUPITER System, PSN looks forward to serving the growing data needs of customers in all corners of Indonesia.

www.hughes.com/

psn.co.id/

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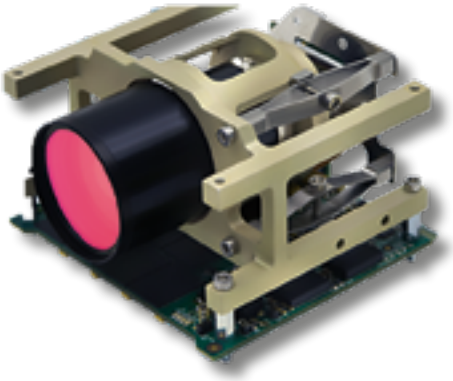
First year successes celebrated by South African firm



Bolstered by the anniversary of their first camera operating in outer space and being selected to develop space hardware for a unique science mission currently orbiting the moon, a South African satellite company is now poised to deliver the highest resolution hyperspectral camera yet to fit into a cubesat.

Last week, the Cape Town-based Space Advisory Company (SAC) celebrated the anniversary of the first image captured over Canada by their Gecko Imager from an altitude of 400 km. The Imager is still operating flawlessly from their satellite orbiting Earth. This anniversary follows hot on the heels of supplying a critical digital controller unit for a Dutch astronomy experiment hitching a ride on the Chinese Chang'e-4 satellite that is currently orbiting the far side of the moon.

The Gecko Imager won a prestigious innovation award at the 2017 Da Vinci Top Technology (TT100) Awards, South Africa's foremost technology innovation awards, with SAC being finalists in all of the qualifying categories and also a winner in the management of systems category. In addition, they were ranked in the Top 3 of the prestigious 2018 Innovation League Awards, for medium enterprises within South Africa.

The company's first, in-house, spaceborne hyperspectral imager, initially developed with support from the Aerospace Industry Support Initiative (AISI), had been delivered to SCS-Space by SAC during 2017 for testing and calibration in SCS-Space's recently commissioned facility.

Daniel van Niekerk, COO at Space Advisory Company, said that a final and crucial link in the chain has been added by SCS-Space. This means that essential facilities required during design, development, integration and testing are available within the SCS Aerospace Group. Having the major critical components, supply chain and facilities locally within South Africa, ensures that the company can deliver cutting edge technology, such as the Hyperspectral Chameleon Imager, to the local and international market.

The company also stated that the environmental constraints imposed on the in-house designed systems ensure that they will survive the harsh effects of vacuum, radiation, heat and vibration encountered en-route and in space. With an internal design philosophy focused on modularity, quality, high-performance, volume constrained systems their products are also suitable to opportunities closer to Earth on High Altitude Aerial Platforms such as UAVs/Drones or basically any area where remote observation is required.

Duncan Stanton, CEO of Space Advisory Company (SAC), said that the company's next step is to produce the Chameleon Imager for the standard CubeSat 2U volume, which will realize a ground resolution of 10 meters over a swath of 32 km. wide from a distance of 500 km. This means SAC will fit a camera into a box the size of two hands put together with a weight of 1.35 kg., which can recognize an object as small as a bus from 500 km. away. This camera is configured to store up to 160 GB of data onboard, in the RGB, Multispectral or Hyperspectral format with a multitude of potential applications, such as enabling food security programs through crop monitoring and bio-mass classification, mining and prospecting, fire detection and infrastructure monitoring.

The company is part of the SCS Aerospace Group (SCSAG) of three which consists of Space Advisory Company (SAC) (***www.spaceadvisory.com***) providing innovative satellite program and systems products, engineering consultancy and training solutions; SCS Space (***www.scs-space.com***) which provides satellite mission solutions as well as satellite systems; and NewSpace Systems (***www.newspacesystems.com***) which develops and manufactures high-quality space components and sub-systems.

The group employs some 90 highly trained satellite specialists including electronic, systems, software and mechanical engineers.

www.spaceadvisory.com/

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2018 Inductees: Otto Hoernig Jr., Gwynne Shotwell and Terry Hart

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Euroconsult reports passenger connectivity will be implemented by 23K+ aircraft by 2027

According to Euroconsult's newly released report, Prospects for In-Flight Entertainment & Connectivity, more than 23,000 commercial aircraft will offer connectivity to their passengers by 2027, up from 7,400 aircraft in 2017.

Pacôme Revillon, CEO of Euroconsult, said that in January of 2018, around 90 airlines had either installed or committed to installing in-flight connectivity (IFC) solutions. Offering connectivity was first seen as a differentiating factor; however, as more and more airlines provide connectivity, offering in-flight WiFi starts to become a must-have in order to keep a competitive positioning in the extremely challenging airline market.

Euroconsult's research confirms that installations will accelerate and that innovation will largely improve the in-flight experience. New generation satellite systems and air-to-ground networks will dramatically increase available bandwidth for aero customers.

The IFEC industry is highly competitive and this competition brings positive fallout from a passenger's standpoint: The cost of MB is continuously decreasing and customized value-added services allow an ever better customer experience.

The increase in connected aircraft and in bandwidth consumption per passenger will support growth. To that respect, the ability to support video streaming on a large scale shall be a game changer.

The revenue per aircraft per year will constantly rise in the coming years to match the ever-increasing need for bandwidth. Still, the need to improve

profit margins, and to benefit from economies of scale, will favor vertical integration and consolidation in the IFC value chain.

Competition will be strong between leading suppliers and new entrants, with our research benchmarking the positioning of main market players including Panasonic Avionics, Gogo, Thales InFlyt, Global Eagle, Inmarsat and Viasat.

Beyond cabin connectivity, the next 10 years will see the full emergence of the SmartPlane concept. Aircraft being more and more connected will start to support all the latest IT trends such as IoT, Big Data, analytics, cyber-security and so forth.

Intensifying competition among the different stakeholders of the IFC value chain, in order to offer more bandwidth to the aircraft, will allow aviation to enter a new era with connectivity at its heart. The research assesses the first signs and initiatives preparing for this major transformation in the aero sector.

In conjunction with the research report, Euroconsult is also publishing for the first time a Database of Connected Aircraft which will include a quarterly database update over a year-long subscription period. The Database of Connected Aircraft provides a list of more than 20,000 commercial aircraft, including information for every commercial aircraft currently flying, enabling users to determine whether specific aircraft provide in-flight connectivity and the corresponding connectivity solution.

The database allows users to see the evolution of connected aircraft on a monthly basis based upon the terms of contracts when the information is made available. The database may be procured in conjunction with the IFEC report or as a standalone item.

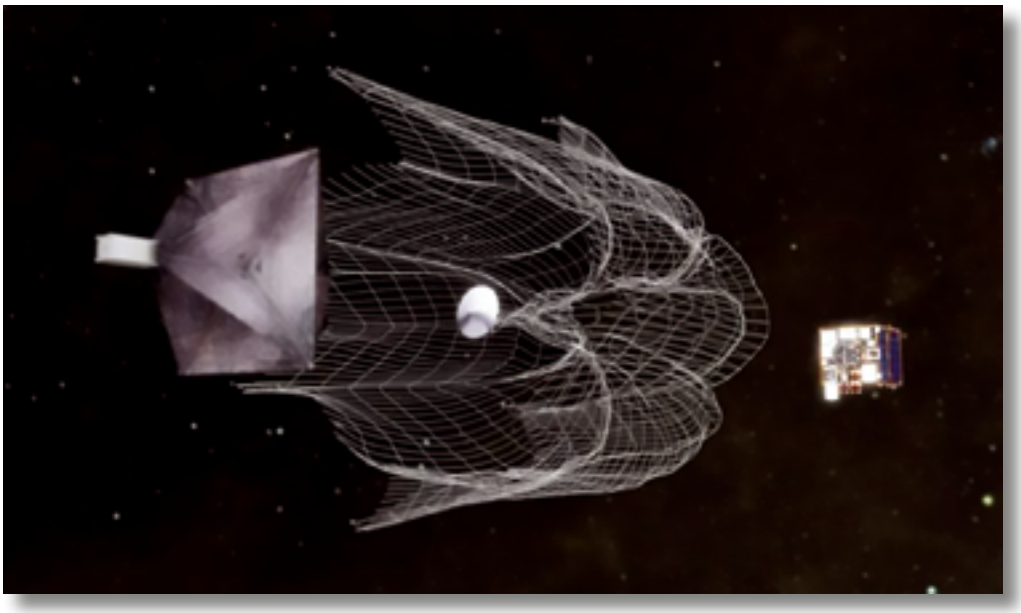
Mr. Revillon added that in the current take-up phase, an evolution of the pricing models applied by airlines to their passengers has been witnessed, from free access to a premium applied by the hour, by the flight or on a monthly basis, as airlines try to find the ideal business model to lighten the burden of connectivity solution provision.

For airline connectivity suppliers, Euroconsult estimates that revenues from IFC topped US$1.2 billion in 2017 and should reach US$8.7 billion by 2027 for commercial aviation alone.

www.euroconsult-ec.com/shop/index.php?id_product=92&controller=product

InfoBeam

The mission starts for RemoveDEBRIS



A spacecraft that will demonstrate a range of innovative technologies to clean up space debris has now been deployed from the International Space Station (ISS) and will soon begin its experiments in orbit.

RemoveDEBRIS, one of the world's first attempts to address the build-up of dangerous space debris orbiting Earth, was sent to the ISS via the SpaceX CRS-14 launch in early April.

The satellite was designed, built and manufactured by a consortium of leading space companies and research institutions, led by the Surrey Space Centre at the University of Surrey. The project is co-funded by the European Commission.

The RemoveDEBRIS mission will perform four experiments, including the first harpoon capture in orbit and a net that will be used on a deployed target.

The team will also test a vision-based navigation system that uses cameras and LiDaR technology to observe smallsats that will be released from the main spacecraft.

Finally, the RemoveDEBRIS craft will deploy a large sail that will drag it into the Earth's atmosphere, where it will be destroyed.

This ISS satellite deployment opportunity was made possible thanks to NanoRacks and their Space Act Agreement with NASA's U.S. National Labs.

The consortium consists of:

- *Mission and Consortium coordination – Surrey Space Centre (UK)*
- *Satellite system engineering – ASF (France)*
- *Platform and Avionics – SSTL (UK)*
- *Harpoon – Airbus (UK)*
- *Net – Airbus (Germany*
- *Vision Based Navigation – CSEM (Switzerland)/ INRIA/ Airbus (Toulouse)*
- *CubeSat dispensers – Innovative solutions in space (Holland)*
- *Target CubeSats – Surrey Space Centre (UK)/ STE*
- *Dragsail – Surrey Space Centre (UK)*

Professor Guglielmo Aglietti, Director of the Surrey Space Centre at the University of Surrey and Principal Investigator for the mission, said that after almost five years of development, it is exciting to finally be in a position where these technologies can be tested in the field. If successful, the technologies found in RemoveDEBRIS could be included in other missions in the very near future.

Sir Martin Sweeting, Chief Executive of Surrey Satellite Technology Ltd. (SSTL), added that SSTL's expertise in designing and building low cost, smallsat missions has been fundamental to the success of RemoveDEBRIS, a landmark technology demonstrator for Active Debris Removal missions that will begin a new era of space junk clearance in Earth's orbit.

The project is co-funded by the European Commission and the research learning to the results have received funding from the European Union Seventh Framework Program (FP7/2007-2013) under grant agreement #607099.

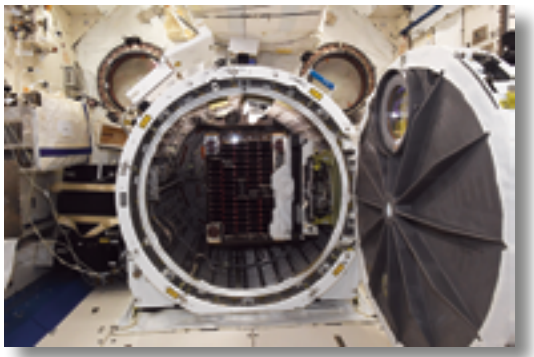


Photo of RemoveDEBRIS spacecraft prior to deployment from ISS is courtesy of NanoRacks.

www.surrey.ac.uk/surrey-space-centre

nanoracks.com/

Additionally, the spacecraft features three Airbus technologies to perform Active Debris Removal (ADR): a net and a harpoon to capture debris as well as a Vision Based Navigation (VBN) system to develop rendezvous techniques in orbit with space debris. The spacecraft itself was designed and built by Airbus subsidiary Surrey Satellite Technology Limited (SSTL) and also includes a drag sail to speed up deorbiting of the whole mission.

The mission timelines will see the net deployed in October this year, followed by the VBN test in late December and then the harpoon in February 2019. The experiments will all be carried out below the orbit of the ISS. The net experiment, developed by Airbus in Bremen, will witness a cubesat deployed from the main mission craft. When the cubesat is five meters away, it will then be targeted by the net and captured at approximately seven meters before it floats away to de-orbit.

The VBN system from Airbus in Toulouse will test 2D cameras and a 3D LIDAR (light detection and ranging) technology supplied by CSEM to track a second smallsat deployed from the main spacecraft. The VBN system will track its rotation and movement away from the main spacecraft. At the same time the cubesat will transmit its true position to the main spacecraft, enabling the performance of the VBN to be measured. This cubesat will then float and de-orbit naturally.

The Airbus Stevenage designed harpoon will see a 1.5 meter boom deployed from the main spacecraft with a piece of composite panel on the end. The harpoon will be fired at 20 meters/sec to penetrate the target and demonstrate the ability of a harpoon to capture debris.

After completion of the Airbus designed ADR, the main spacecraft will deploy the drag sail developed by SSC which will deorbit the craft in approximately eight weeks. Without the drag sail, deorbiting would take more than 2.5 years.

A video is available at ***www.youtube.com/watch?v=4ZFAkBMtcPo***

Russia successfully launches their next navigation satellite to oribt

On June 10, Russia successfully launched a Soyuz-2.1b carrier rocket from the Plesetsk space center to orbit a Glonass-M satellite, this according to the Russian Defense Ministry.

"*On Sunday, at 00:46 Moscow time [21:46 GMT]… the Space Forces of the Aerospace Forces successfully launched a middle-class Soyuz-2.1b carrier rocket with a navigation Glonass-M spacecraft*," the ministry said in a statement.

Hours later, the ministry reported that the satellite reached the designated orbit. "*The middle-class Soyuz-2.1b carrier rocket launched on June 17 at 00:46 [21:46 GMT on Saturday] from the Plesetsk space center (Arkhangelsk Region) successfully put the Russian navigation Glonass-M spacecraft to the designated orbit*," the ministry's press service said.

Artistic rendition of a Russian Glonass-M satellite. Image is courtesy of ISS Reshetnev.

Earlier, a satellite producer—Reshetnev Information Satellite Systems — reported that the signal interface control document for GLONASS would be updated in 2018, making radio signals to the satellite navigation system less susceptible to corruption.

During the soviet era, the GLONASS navigation system was intended to become operational in 1995, the same year that the U.S. launched its GPS; however, due to a lack of funding, the system was put on hold.

In the early 2000s the system was launched and, by 2011, the full constellation of satellites was re-established.

InfoBeam

SSL ships the first of three satellites for a SpaceX launch this summer

SSL, a Maxar Technologies company (formerly MacDonald, Dettwiler and Associates Ltd.) (NYSE: MAXR, TSX: MAXR), has shipped the first of three new satellites to the SpaceX launch base at Cape Canaveral Air Force Station in Florida that they will deliver over the next month. Driven by commercial advances, the three satellites will bring communications capability to connect people and transform lives around the globe.

The Telstar 19 VANTAGE satellite shown in antenna testing at SSL in Palo Alto, California, before being shipped to launch base. Image is courtesy of SSL.

Telstar 19 VANTAGE, an advanced high throughput satellite (HTS) built for Telesat, one of the world's leading satellite operators, marks the 50th SSL-built communications satellite to launch this decade. It arrived safely at the launch base this week for a launch scheduled next month.

Two more SSL communications satellites are scheduled to ship to SpaceX launch base over the next month, including a second HTS for Telesat, Telstar 18 VANTAGE, and the Merah Putih satellite (previously known as Telkom-4), for Indonesia's largest telecommunication and network provider, PT Telkom Indonesia (Persero) Tbk.

Dario Zamarian, group president, SSL, noted that the company has a long legacy of leveraging its commercial mindset to provide satellite operators with spacecraft systems that address their requirements and enable global transformation. The cadence this month of shipping out three satellites for launch demonstrates the firm's ongoing market leadership and commitment to quality, reliability, and performance.

Telstar 19 VANTAGE is one of a new generation of Telesat spacecraft designed to serve today's bandwidth intensive applications. It will support a range of services, including advanced broadband connectivity for consumer, enterprise and mobility users across the Americas and Atlantic from its prime orbital location of 63 degrees West, the same location used today by Telesat's Telstar 14R.

Like all Telesat VANTAGE satellites, Telstar 19 VANTAGE combines broad regional beams and powerful HTS spot beams enabling customers to maximize throughput and spectral efficiency while optimizing network performance. Its Ka-band HTS capacity will serve Telesat customers operating in Northern Canada, the Caribbean, the North Atlantic Ocean, and South America.

Additional Ku-band HTS spot beams will serve growing South American markets in Brazil and the Andean region. Telstar 19 VANTAGE will also bring new Ku-band broadbeam capacity over the North Atlantic Ocean enhancing Telesat's coverage of this important mobility market.

Telstar 18 VANTAGE, the third HTS in Telesat's global fleet, will be located at 138 degrees East, an ideal position for connecting Asia to the Americas. It will replace and expand on the capabilities of Telesat's Telstar 18 satellite through its extensive C-band coverage of Asia, its Ku-band HTS spot beams over Indonesia and Malaysia, and its six additional Ku-band regional beams. These high performance beams will enable Telstar 18 VANTAGE to meet growing demand for mobility, enterprise networks and telecom services across the Asia region. As previously announced, Telesat has partnered with APT Satellite of Hong Kong in the design and procurement of this spacecraft, which APT calls Apstar-5C.

Dan Goldberg, President and CEO of Telesat, said that company has worked closely with SSL and the Maxar family of companies for many years and are pleased to have collaborated with them on these new Telstar VANTAGE high throughput satellites. These state-of-the-art spacecraft are going to provide important competitive advantages for Telesat customers across the Americas and Asia. It's great news that Telstar 19 VANTAGE is now at the launch base and that Telstar 18 VANTAGE is nearly finished and in the queue to ship.

Merah Putih, a name which represents the red and white of the Indonesian flag, will be integrated into Telkom's greater telecommunications network to provide service throughout the 17 thousand islands of the Indonesian archipelago, as well as India and other parts of South and Southeast Asia. Satellite forms the telecommunications backbone that connects Indonesia, along with other technologies, such as submarine cable. Merah Putih, which was completed ahead of schedule, will replace Telkom-1, at 108 degrees East, where the satellite will expand on Telkom's coverage to serve new markets. Its all C-band payload will enhance both internet and telephone service for populations in remote regions and offload backhaul for cellular service.

Mr. Zulhelfi Abidin, Chief Technology Officer of Telkom, said satellite plays a vital role in the firm's telecommunications infrastructure. SSL has been an excellent spacecraft supplier and has completed the satellite construction ahead of schedule.

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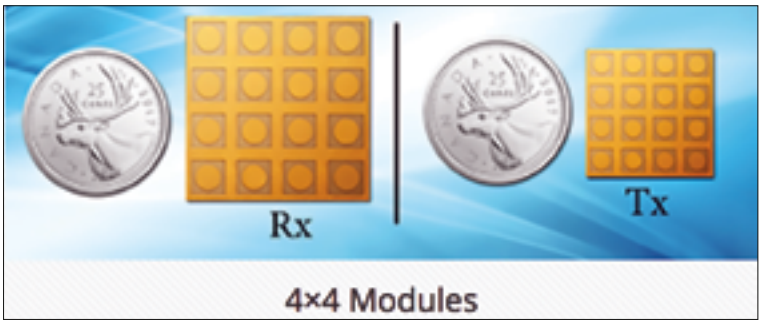
C-COM successfully tests new Ka-band Phased Array Mobile satellite antenna



C-COM Satellite Systems Inc. (TSXV: CMI) has successfully tested their 16x16 subarray phased array antenna using 4x4 Transmit and Receive building blockmodules — the panels were developed and tested at the Center for Intelligent Antenna and Radio Systems (CIARS) at the University of Waterloo.

The primary goal of the research project is to focus on the development of a new modular, low-cost, intelligent and conformal Ka-band antenna for the next generation mobile satellite communications.

The now proven modular approach allows antenna designers to develop any size and shape of phased array panels using the smallest intelligent active 4x4 subarray.

The developed antenna system uses a unique technique to adaptively control the antenna polarization in such a way that a prescribed quality of polarization can be guaranteed over the entire scan range.

Furthermore, the beam-processing unit and the antenna intelligent module can generate more than one radiation beam simultaneously and support multi-beam-tracking, a highly desired functionality in emerging LEO mobile networks.

By using a unique blend of low-cost but flexible/reconfigurable hardware and highly intelligent software, the modular technology platform developed at CIARS provides the most cost-effective evolution path towards any antenna system configuration with prescribed performance for a wide range of low-end to high-end applications.

The developed technology platform can be easily extended to the rapidly emerging millimeter-wave 5G and complex radar systems.

Bilal Awada, the CTO at C-COM Satellite Systems Inc., said that the company is pleased to have reached this important milestone in the firm's development of a fully electronically steered Phased Array Mobile Satellite Antenna operating in Ka-band.

The antenna will be able to track multiple satellites simultaneously and operate on the latest LEO, MEO and GEO constellations.

Professor Ali Safavi-Naeini, Director of CIARS, is in charge of the research team at the University of Waterloo responsible for this project. He said that measured lab results have demonstrated the high performance of the small modular scalable intelligent Transmit and Receive antenna modules and validated the simulation model for larger panels,

Additionally, he said, good beam steering up to 70 degrees from boresight was achieved, a significant achievement.

Dr. Leslie Klein, President and CEO of C-COM Satellite Systems Inc., added that the company is now a step closer to achieving the objective of developing and manufacturing an affordable, intelligent, antenna system capable of supporting the latest constellation of satellites, which will play a significant role in delivering high speed broadband solutions to mobile satellite communication markets.

www.c-comsat.com

InfoBeam

Garmin selects KVH for marine satellite TV antenna systems

Garmin International, Inc. a unit of Garmin Ltd. (Nasdaq: GRMN), and KVH Industries, Inc., (Nasdaq: KVHI), have announced an arrangement to offer two marine satellite TV antenna systems made by KVH as part of a Garmin marine network package.

The two dome products — the GTV5 and GTV6 powered by KVH — will be offered by Garmin to select recreational boat builders and select high-end installing leisure marine electronics dealers. KVH pioneered the field of mobile marine satellite TV with their TracVision® line of satellite TV antenna systems.

Garmin's marine products include chartplotters, multifunction displays, high-definition radar, sonar technology, autopilots and more.

These products will be Garmin's first satellite TV antenna dome products.

The GTV5 (45 cm/18 in diameter) and GTV6 (60 cm/24 in diameter) offer outstanding high-performance tracking and reception, and fast satellite acquisition, no matter the sea conditions.

These popular satellite TV domes for sportfishing and cruising boats are compatible with DIRECTV® U.S., DISH Network®, Bell TV, Sky Mexico, Sky Italia, and Sky U.K., and circular and linear Ku-band services worldwide. They can be used to receive HD satellite TV programming with Ku-band services and are fully stabilized to enable boaters to enjoy hundreds of digital TV and movie channels via regional satellite services around the world.

KVH's exclusive RingFire™ technology provides stronger signals, wider geographic coverage, and better reception, and KVH's IP-enabled TV-Hub is included with every system to deliver easy setup and operation.

Garmin was recently named Manufacturer of the Year for the third consecutive year by the NMEA.

Garmin's portfolio includes chartplotters and touchscreen multifunction displays, sonar technology, high-definition radar, autopilots, high-resolution mapping, sailing instrumentation, and other products and services that are known for innovation, reliability, and ease-of-use.

Other Garmin marine brands include FUSION Entertainment, and Navionics, a supplier of electronic navigation charts. Garmin serves five primary business units, including automotive, aviation, fitness, marine, and outdoor recreation.

KVH's TracVision line has been recognized by the National Marine Electronics Association (NMEA) with a product award for the past 20 consecutive years.

www.garmin.com/

www.kvh.com/

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Cog and FLEET to protect remote satellite-connected IoT devices from costly security attacks

Cog, a maker of Internet of Things (IoT) security solutions, has announced that Fleet, an Australian IoT startup, has partnered with the company to advance the security of satellite-connected IoT devices.

Fleet will deploy Cog's D4 Secure platform on trial projects around the world.

With the company's focus on satellite-enabled massive IoT devices, Fleet connects hundreds, thousands or tens of thousands of industrial devices in areas with no cellular or public low-power wide-area network (LPWAN) coverage.

Fleet's solution is especially effective for remote industrial agriculture, maritime logistics, mining and environmental applications.

The companies will install Cog's D4 Secure platform to provide proactive kernel protection, radio isolation for satellite communications, and a VPN tunnel to ensure secure data transport for Fleet devices.

As a final step, Cog will isolate other sensors so they only draw battery power when a specific event is executed.

cog.systems/

www.fleet.space/

NorthTelecom expands global satellite footprint for Omantel Wholesale

Omantel Wholesale has selected NorthTelecom to grow their satellite footprint with additional transponders to enhance the firm's Ku-band satellite capacity.

The agreement increases Omantel Wholesale's satellite capabilities and gives their customers increased redundancy and resiliency across the firm's global network and also enables Omantel Wholesale to add Ka-band network capacity if required in the future. Omantel Wholesale's satellite services are designed to ensure maximum uptime for customers and deliver a comprehensive suite of connectivity solutions. Its agreement with NorthTelecom builds on decades of development of both its terrestrial and satellite networks.

NorthTelecom was established in 2007 and is headquartered in Dubai, UAE. The company specializes in provisioning satellite communications and ICT services on land and at sea. The firm has a global reach, with operations and teleports in South Korea, Singapore, Dubai, Greece, Spain, UK and Cyprus. NorthTelecom is present in 12 international Points of Presence (PoPs) and seven teleport operations, as well as serving more than 100 partners around the world.

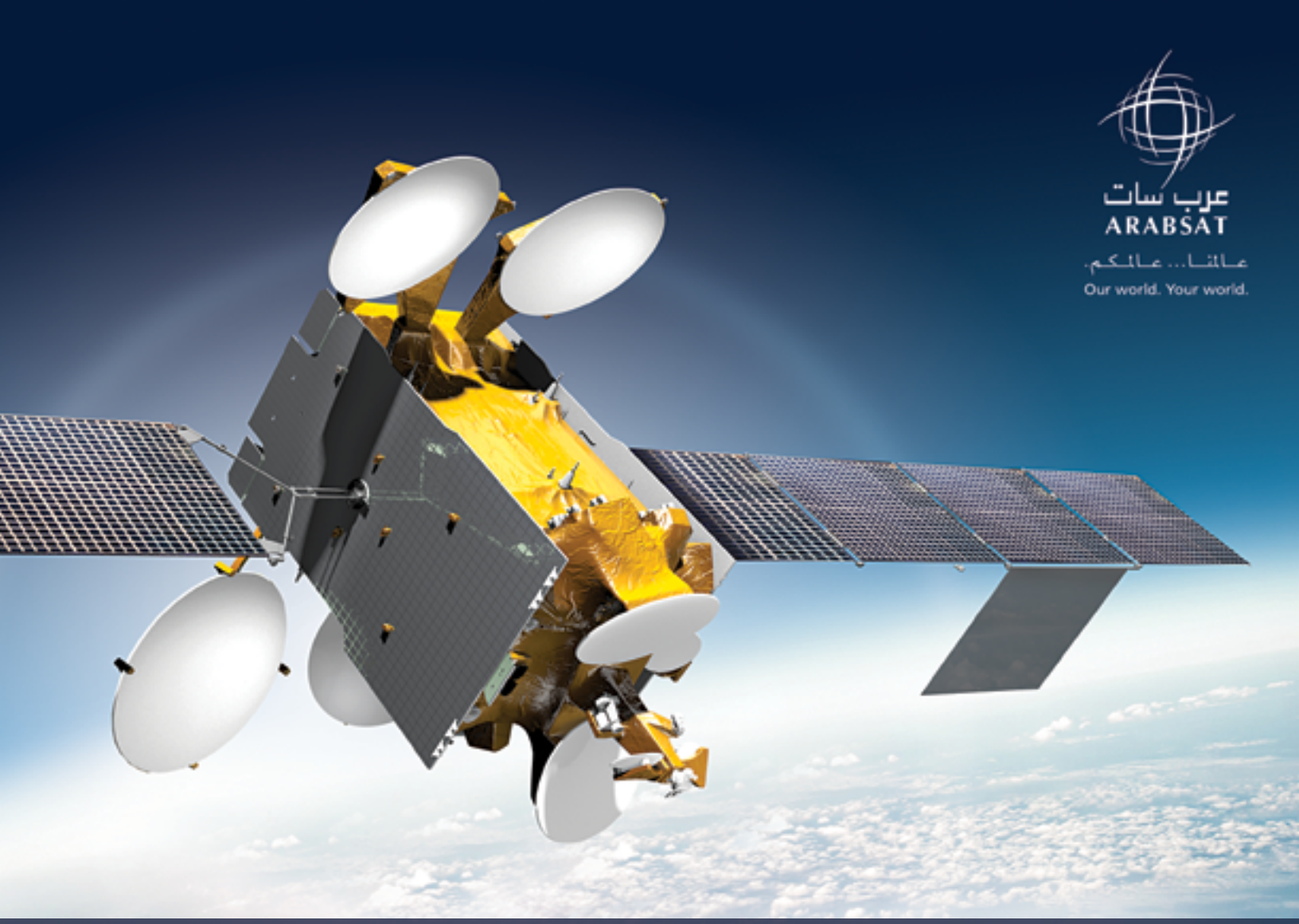
Omantel Wholesale's unique geographic position in Oman enables the firm to offer ultra-low latency networking to communications hubs in Asia, the Middle East, Africa and Europe. Ultra-low latency networking enables innovation in applications and services and provides a foundation for Digital Transformation globally.

Mr. Sohail Qadir, VP, Omantel Wholesale, noted that the company is continually developing and adding to the firm's satellite capabilities to give customers unique connectivity options as well as an exceptional networking experience. Satellite is an important element of Omantel's connectivity ecosystem and, by working with NorthTelecom, the company is adding capacity and growing its presence on the ground and in the sky.

Hadi Nazari at NorthTelecom added that satellite remains critical to global infrastructure and enables businesses across the globe to stay connected whenever they want and wherever they might be located. Growth of global internet means that applications and service have to be delivered with always-on performance. Together with Omantel, NorthTelecom is ensuring that end users get connected and have an optimal application experience.

www.northtelecom.com/

www.omantel.om/



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AsiaSat and KBZ plan to go over the top with satellite services in Myanmar

Asia Satellite Telecommunications Company Limited (AsiaSat – SEHK: 1135) announced their collaboration with KBZ Gateway Company Limited (KBZ) to explore business opportunities for providing OTT (Over-the-Top) via Satellite video service in Myanmar.

The OTT via Satellite video service is a solution to help broadcasters and content providers reach their audiences instantly and cost effectively.

The service aims to make content more available across platforms, whether it is for bringing content seamlessly to separated and rural areas via village Wi-Fi or for connectivity on the move, such as for cruise ships, planes and trains.

This initiative will initially support the free-to-air distribution of national TV channels, enabling audiences across the country to have access to free online video content via mobile and other connected devices regardless of their location.

AsiaSat will invest in providing space segments and ground facilities from its teleport hub in connection with the project. KBZ will invest in the supply

of the installation, servicing and roll-out of OTT boxes in Myanmar and securing licensing of the TV channels to be distributed on the OTT platform.

KBZ is a licensed VSAT operator in Myanmar, for the provision of, including but not limited to, internet broadband access via satellite.

KBZ's Chief Technology Officer and Head of Business, Virender Singh said that continuous innovation and excellence in service has been their motto from day one. This will help them bring OTT services to the remote regions of Myanmar and their customers will be able to enjoy content on any device via any platform of their choice. KBZ's close partnership with AsiaSat has helped them achieve a superior service quality in the VSAT space and they hope to bring even faster and better connectivity experience to remote and rural Myanmar.

AsiaSat's CCO, Barrie Woolston added that innovation continues to push AsiaSat forward, and they are keen to explore new and dynamic ways for people to enjoy services that otherwise could not be possible due to geographical restrictions.

www.asiasat.com

www.kbzgateway.com/

Vessel comms for Singapore's MSI completed by Satcom Global

Singapore-based MSI Ship Management Pte Ltd., selected Satcom Global's Aura VSAT service to provide high quality communications to a fleet of new-build cargo vessels, which came under their management in 2017.

The client-focused company, which manages various types of wet and dry ships for customers all over the world, were looking for a new reliable and cost-efficient solution for business and crew communications for the fleet, to meet the high service standards demanded by their customers. Satcom Global is meeting MSI's fundamental requirement for system reliability with its high-performance Ku-band VSAT service, Aura, which boasts 99.5 percent network uptime and assured levels of bandwidth, guaranteed by a Committed Information Rate (CIR); standard across all Aura service plans.

The Aura VSAT service is proactively supported by a range of monitoring and diagnostic tools, including automatic alerting from the integral IPSignature 4 smart box, which triggers priority investigation by Satcom Global's 24/7 technical support team, should a problem occur. In many cases, a resolution for an issue can be well underway before a vessel notices and reports it.

Satcom Global engineers completed the installations on MSI vessels in Singapore between December 2017 and March 2018. As well as installing market-leading Intellian v100 antennas to deliver the Ku-band service, they updated the vessels' WiFI networks.

www.satcomglobal.com/aura-vsat

www.msiships.com/

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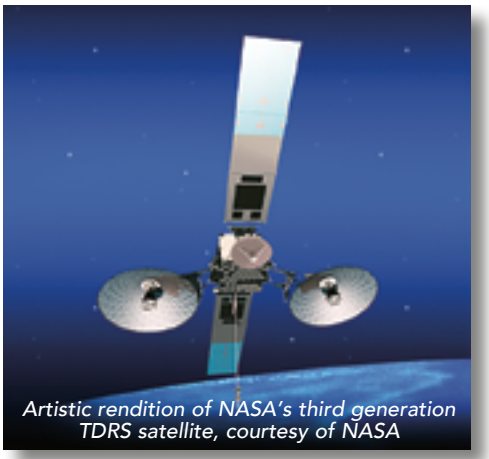
General Dynamics Mission Systems successful ground terminals upgrade completed for NASA



Artistic rendition of NASA's third generation TDRS satellite, courtesy of NASA

A General Dynamics Mission Systems and NASA team have successfully completed a milestone with the installation and initial checkout of equipment needed to upgrade two NASA Space Network ground terminals at NASA's White Sands Complex in New Mexico.

Site integration readies the updated ground terminals for 'end-to-end' communications testing scheduled for later this year. The installation, integration and testing are part of the NASA Space Network Ground Segment Sustainment (SGSS) program. The Space Network ground terminals provide command, control, communications and operations management for the Tracking and Data Relay Satellite (TDRS) constellation, the space element of NASA's Space Network.

The TDRS constellation is responsible for communicating with more than 40 space-client missions including the International Space Station and Hubble Space Telescope.

General Dynamics is also working with the NASA team to complete 40 individual mission transition plans, defining the specific steps needed to move the operation of each TDRS client satellite from the legacy ground system to the new system. With the technology updates, the ground system will have greater resiliency to secure and manage unanticipated disruptions of the Space Network. It will also be able to expand and manage new NASA missions, in addition to those currently operated by the Space Network.

General Dynamics Mission Systems is a business unit of General Dynamics (NYSE: GD).

gdmissionsystems.com/

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WBU-IMCG Publishes Proposal for C-Band

The World Broadcasting Unions International Media Connectivity Group (WBU-IMCG) Intentional Interference to Satellite Services Working Group (IISS) has drafted the following proposal for a WBU position on C-band.

In producing the proposed position below, the group referenced and updated the 2015 WBU-ISOG1 position on C-band. Examples of the impact on broadcasters of interference to their C-band downlinks were invaluable in industry defense of C-band spectrum at ITU WRC-15.

WBU C-Band Position

WBU members welcome technological change and the benefits it brings to both audiences and broadcasters.

At the same time, many tried and tested technologies continue to deliver reliable and efficient services for WBU members.

Satellite services have long provided valuable broadcasting services and remain an essential part of often complex broadcast supply chains serving their audiences, both nationally and internationally, for public service and commercial broadcasters.

C-band FSS downlink frequencies between 3,400 to 4,200 MHz, have been and are extensively used throughout the world by WBU members for Fixed Satellite Services (FSS) applications and will continue to be used for the foreseeable future, in particular above 3,600 MHz.

As FSS downlink sites receive extremely weak signals from satellites in geosynchronous orbit, they are particularly fragile and susceptible to interference.

WBU members have experienced serious interference to services where this spectrum has been opened up to other users and, because few countries require these receive-only downlink sites to be licensed or registered, little recourse is available. The WBU encourages our members to register their downlink sites.

WBU members have been, and will continue to be, highly dependent upon the use of satellite services using C-band spectrum to hundreds of thousands of FSS downlink sites for contribution and distribution. C-band allows the operation of reliable, efficient and cost effective global and regional contribution/ distribution systems and is also ideally suited to delivering media services into rapidly developing regions of the world.

The potential allocation of C-band FSS spectrum to Mobile Services will create chaos to the economics of broadcasting by satellite, potentially interrupting services to audiences around the world. Furthermore, C-band is critical for satellite services in tropical regions as it suffers less from the attenuation effects of heavy rainfall than higher frequency bands.

WBU members, therefore, call on satellite service providers and government regulators to protect the availability of the upper part of the C-band spectrum. This is where the band has been allocated to satellite services and is currently used to provide many broadcasting services, enabling broadcasters around the world to continue to provide vital broadcasting services to billions of people worldwide.

www.worldbroadcastingunions.org/

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  NORTH AMERICAN BROADCASTERS ASSOCIATION
  - Toronto, Canada

What's In The Cloud...

For teleport operators...

By Robert Bell, Executive Director, World Teleport Association (WTA)

Worldwide, cloud service providers generated US$220 billion in revenue in 2016, according to Gartner, and will nearly double that to US$411 billion by 2020.

With acres of server capacity and sophisticated systems to manage it, cloud providers offer their customers flexibility, scalability to burst traffic for high demand, and pay-per-use pricing.

The most profound impact of the cloud may be its ability to turn capital expenses into operating expenses. This offers a major advantage when starting up a service and substantially reduces the risks to the business in the event a new service fails to meet its objectives.

The Cloud Strategy

WTA will soon publish the organization's first report on the adoption of cloud services, ***Clear Skies or Stormy Weather?***

The report will argue that every teleport operator today needs a cloud strategy because of the impacts the cloud can have on a teleport's business.

In the media space, interconnection with a cloud provider allows one teleport operator to offer more flexible occasional-use video services, including the ability to quickly scale up during peak demand, along with a better cost structure.

Using a public cloud to encode video may cost more per hour than on-premise technology, but it is well-suited to the unpredictable demand of occasional-use.

"As our business transitions from long-term commercial contracts to customers only willing to commit to three months of service at a time," said an executive, *"we can use a cloud solution to spin it up, deliver service and walk away without worrying about capex. Where it could take months to set up a channel before, we can literally set it up faster than the customer can make the final decision. Time-to-market shrinks from 30 days to under 60 minutes."*

New Markets

Partnering with cloud providers can provide access to new customers and new opportunities from existing ones.

The big cloud providers have a massive network of customers and can help them market services to each other. The cloud operators also need what teleport operators have: the ability to connect to satellite and other dedicated transmission paths, and data processing capacity that puts workload closer to end-users.

Their rich software toolkits can also help expand existing business. *"A broadcaster needs multiple ways of getting content to the consumer,"* said a contributor, *"and lots of different ways to monetize the content to pay for the additional distribution cost. As their service provider, we need to offer IP delivery across all formats and networks. We need to master analytics so that we become their source for answers about viewer demographics and viewing habits, which is so critical to monetization."*

Getting More from IT

The cloud offers teleport operators the same potential value as any other enterprise: the chance to reduce costs, increase agility and gain access to valuable applications.

One respondent turns to cloud providers for special IT requirements. *"If we are doing a customer-facing portal website for their services, often we will host it in the cloud, rather than us spinning up database and web servers in-house. It's faster and takes advantage of the database, web hosting and other services the cloud provider already offers."*

A cloud provider can also act as a highly secure platform for a teleport operator and customer to interconnect systems that need to talk to each other.

One respondent described a customer's request to integrate its in-house scheduling system with the playout system at the teleport. Directly connecting the platforms would create staffing, operational, legal and security issues for both companies; however, by interfacing the systems through an application programming interface (API) in the cloud protects both companies' IT infrastructure while meeting the customer's requirements.

You Must Be In It to Win It

Cloud providers also represent a new source of competition. Media-centric operators already report that transcoding, packaging, playout and workflows are beginning to migrate to the big cloud providers.

Integrating cloud services into your operations also requires new skills to manage properly and the right approach to integration. Operators today have no choice but to understand the cloud thoroughly, adopt it intelligently and adapt to the changes it will bring to the business.

worldteleport.site-ym.com/

Robert Bell has over 30 years of experience as an association manager and business consultant for both nonprofit and profit-driven and organizations operating in the IT outsourcing, telecommunications, and financial services industries.

Mr. Bell has led business development missions and conducted workshops and Master Classes in the Americas, Europe and Asia. A regular blogger, he has written for The Municipal Journal of Telecommunications Policy, IEDC Journal, Telecommunications, Asia-Pacific Satellite, Digital Communities, and Asian Communications. He is a frequent speaker and moderator at industry conferences including SATELLITE, NAB, SATCON, ICF's annual SUMMIT and the Global Forum.

A co-founder of the Intelligent Community Forum, he is also the author of market studies and reports including Benchmarking the Intelligent Community, Teleports in a Gigabit World, and How to Buy Satellite Capacity. He is the co-author, with Louis Zacharilla, of B2B Without the BS, a guide to sales and marketing in the unique business-to-business sector; of Broadband Economies: Creating the Community of the 21st Century; and of Seizing Our Destiny.

Virtualized SmallSat Ground Systems

New alternatives for government and IC programs

By Jordan Klepper, Kratos Defense

For a number of years, small satellites have been seen as a way to provide low cost solutions for technical demonstrations. Only recently, have smallsats been viewed as mission-ready for government and IC programs. The commercial world has been quicker to adopt these new platforms than government and IC.

Now, however, the advent of virtualized ground system environments that feature plug-and-play design for simplified setup, automation tools for lights-out operation and complete situational awareness have opened new alternatives for government and IC programs.

While virtualized environments allow IC programs to stand up new ground stations quickly and efficiently there is still some resistance to migrating legacy systems for a number of reasons, time and effort to prepare and complete a successful migration being chief among them. New programs, with no legacy systems to migrate, have been quicker to embrace virtualized environments.

What Does it Mean to be Virtual?

Webster defines virtual as "being on or simulated on a computer or computer network."

For the purposes of this article, virtual is further defined as a system or piece of equipment requiring only Commercial-Off-The-Shelf (COTS) hardware in standard configurations to run. Applying this definition to ground equipment, a virtual ground system or piece of ground equipment can run on a standard server or in a cloud instance with no special or system specific configuration of the underlying hardware.

A Virtual Architecture

Before discussing virtual architectures, a quick synopsis of existing ground architectures is insightful. A traditional satellite control ground system requires basic elements to perform three general functions: Command and Control (C2), Baseband, and Radio Frequency (RF).

Legacy Architectures

The architecture shown in *Figure 1* below is generally common and known to be reliable among many satellite programs that are operational today.

In a traditional architecture, antenna systems tend to be more expensive and inflexible than the other pieces of ground equipment. In order to mitigate the need for every satellite program to build its own antenna farm, shared antenna systems, such as the Air Force Satellite Control Network (AFSCN), were created to provide a common, distributed antenna system through which multiple Department of Defense (DoD) programs could interface for antenna uplink and downlink services.

Shared antenna systems also exist in the commercial market as well with companies such as Kongsberg Satellite Services AS (KSAT), Swedish Space Corporation (SSC) and Atlas providing services to commercial entities as well as some national programs.

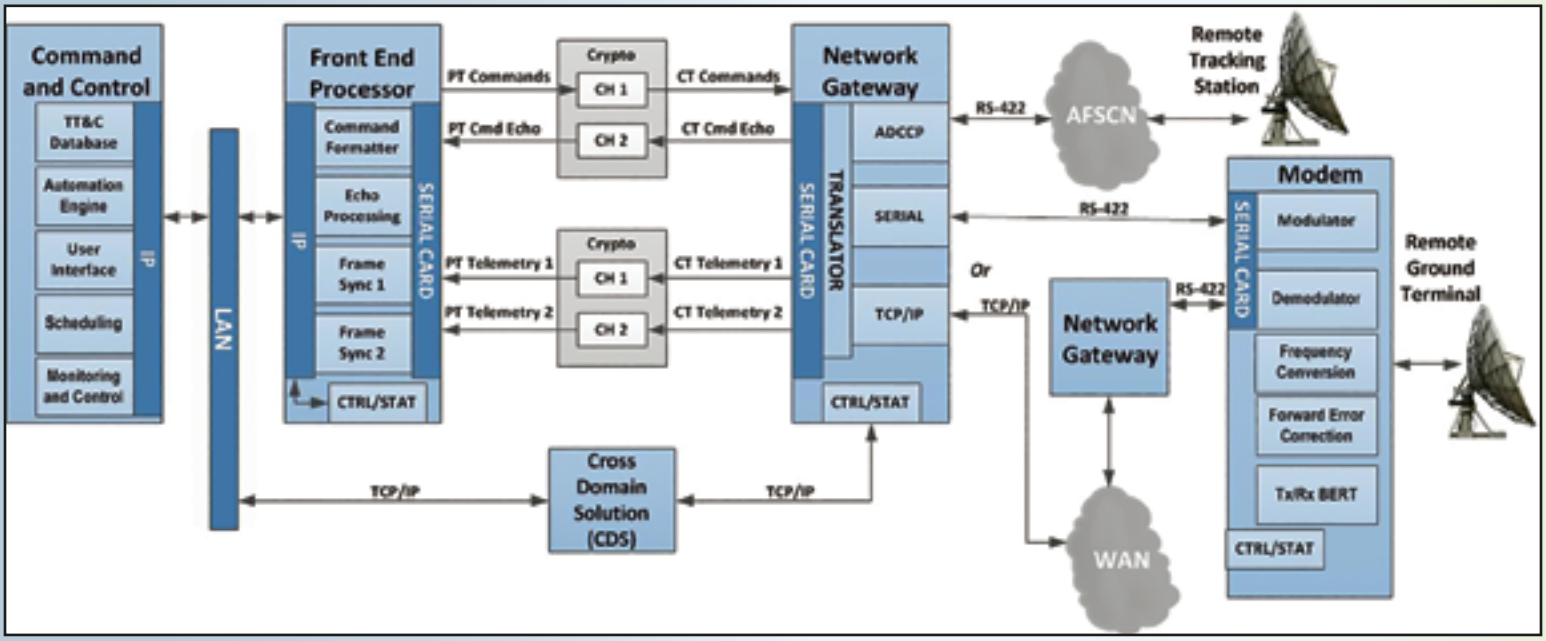


Figure 1: Typical Traditional Ground System Architecture

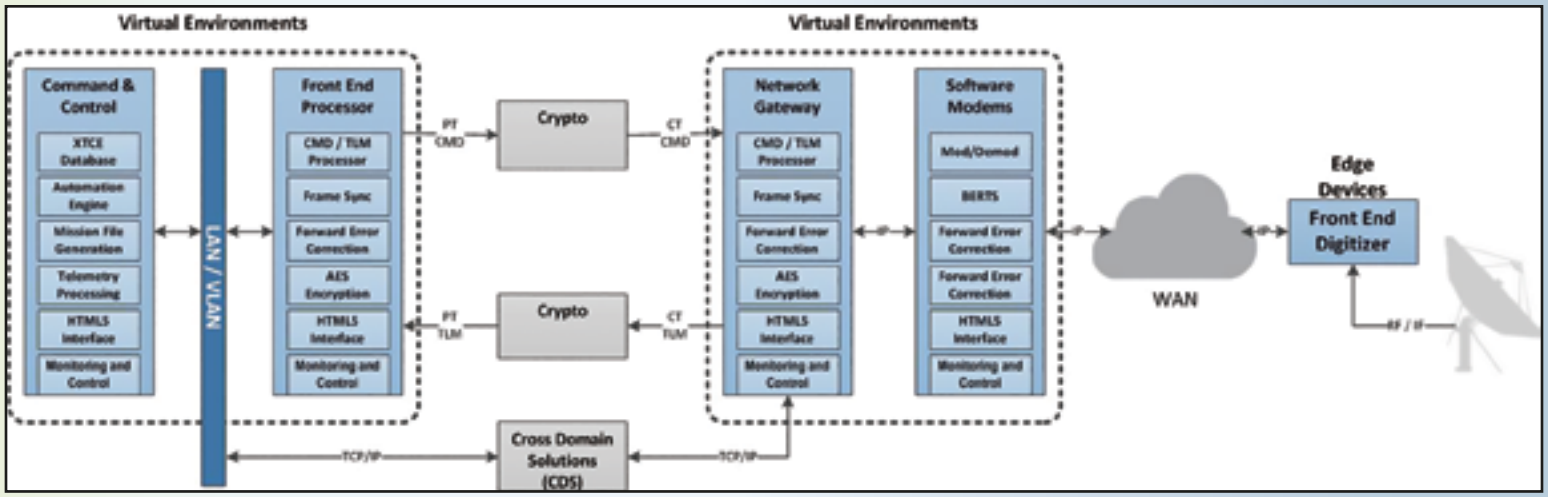


Figure 2. Virtual Architecture.

While shared antenna systems reduce the antenna expense, mission specific hardware or systems may still be required to be co-located at the antenna site. Such co-location increases hardware investments and expands datacenter floor space. Using edge devices, virtual architectures, and even architectures augmented with virtual solutions can result in a reduction in overall operating costs.

Virtual Architectures

Virtual architectures look very similar to the "traditional ground system architecture", yet there are some major differences:

- *Hardware platforms*
- *Data interfaces between components*
- *Configuration flexibility*
- *Cyber security considerations*
- *Reduction in integration labor*

In traditional architecture, the edge device or digitizing front end and modem are in the same hardware package. In a virtual architecture (***see Figure 2 above***), the edge device is a hardware piece that could be co-located at the antenna site.

Now separated from the digitizing front end, the virtual environment could host the modem (software). This lends itself to unique architectures such as distributed ground sites with consolidated processing through RF transport.

Serial communications, as shown in ***Figure 1*** on the previous page, are common in traditional ground systems. Virtual environments by their nature do not support serial interfaces. However, by using serial to IP converters, items such as legacy serial cryptographic devices can be used in a virtual environment. This is one example of how a current architecture can be augmented with virtual solutions.

There are a number of pros and cons to a virtual architecture and not all differences are listed here. When it comes to small satellites, many of the benefits discussed later drive a small satellite program to a virtual architecture.

A Virtual Ground System: quantum®

For this article, smallsats are defined as "a small satellite being nominally 500 kilograms."

Smallsats require ground systems that match the rapid rate of innovation and reduction in cost that COTS products give them on the spacecraft side. As traditional architectures are unable to rapidly meet the ever-changing needs of small satellites, a virtual ground system environment is the perfect solution for small satellite users.

quantum is the Kratos smallsat virtualized product family that is intended to solve small satellite ground system requirements. The quantum system consists of narrowband and wideband offerings. The system has been designed to support missions through various stages; *i.e.*, development, integration, launch and operations.

Multi-mission and re-use were major development requirements for the quantum system. By ensuring the developed ground system could be used for the current missions, but also for the next several missions, the quantum system is a virtualized solution meeting the majority of users needs. While many users can use a COTS ground system out of the box, provided the system has enough configurability, there will always be those users who need something special.

A virtual environment provides the flexibility for ground system developers to create custom patches to standard baselines allowing them to adapt quickly and efficiently to special customer requests.

While the majority of the quantum ground system is virtualized, there are pieces, which for different reasons, consist of hardware units. These hardware pieces are further discussed in their respective sections.

Narrowband Systems

The quantum narrowband system, in its typical configuration, consists of a digitizing front end or edge device (SpectralNet® Lite), a quantumRadio, quantumFEP (quantum Front-End Processor), and quantumCMD (quantum Command). The quantum system is fundamentally designed to support virtual environments.

The edge device or SpectralNet Lite brings a tunable range of RF frequencies, from IF up to S-band, into the digital domain. For small satellites, this is significant as they only need a single device located at the antenna and can potentially remove block converters from their budget.

The SpectralNet Lite supports the Vita-49 interface to transfer the digitized data into the digital domain, *i.e.*, to a software modem. By embracing open standards, the SpectralNet Lite could theoretically interface with any software modem (supporting the open standard) and as such is a modem agnostic edge device.

The software modem or quantumRadio provides a wide range of modulation and forward error correction schemes. Currently, supporting up to 10 MHz of bandwidth, the quantumRadio is designed to handle narrowband commanding and telemetry links but can also be used for narrowband payload links. This flexibility makes it ideal for supporting a small satellite program.

The front-end processor or quantumFEP handles all of the baseband processing. Supporting a range of data protocols, the quantumFEP also provides encryption services at many different levels. Management of AES keys, their storage, and over the air rekeying (OTAR) are functional capabilities baselined into the quantumFEP.

quantumCMD provides central data management of all core command, telemetry and ground Monitor and Control (M&C) needs common to small satellite missions. (***See Figure 3*** below.)

Wideband System

The quantum wideband system, in its typical configuration, consists of quantumMR (quantum Mission Receiver) and quantumDRA (quantum Digital Recording Application).

quantumMR is a COTS hardware solution tailored specifically to meet data rates of small satellite payload downlinks. The quantumMR can support two independent receive channels, each capable of processing up to 600 Msps, making it a power house in the smallsat receiver market. While the quantumMR is a hardware solution, it was developed with a virtual architecture in mind. By embracing standards such as Vita-49 and CCSDS, quantumMR is highly compatible with a virtual environment.

The quantumDRA is a virtual recording application that also provides some high level processing.

Edge Devices

Edge devices will continue to play an important role in virtual architectures. Somewhere in the system, the RF signals have to get into the digital domain. Edge devices perform the function of analog to digital (A/D) and digital to analog (D/A) conversion.

The quantum edge device (SpectralNet Lite) supports an open standard on its data interfaces. This is a key feature that must be supported by edge devices wishing to exist in a virtual environment. By open supporting standards, these devices (along with the antenna system) begin to look like nodes on a network and can be used by just about any software modem anywhere to take a pass.

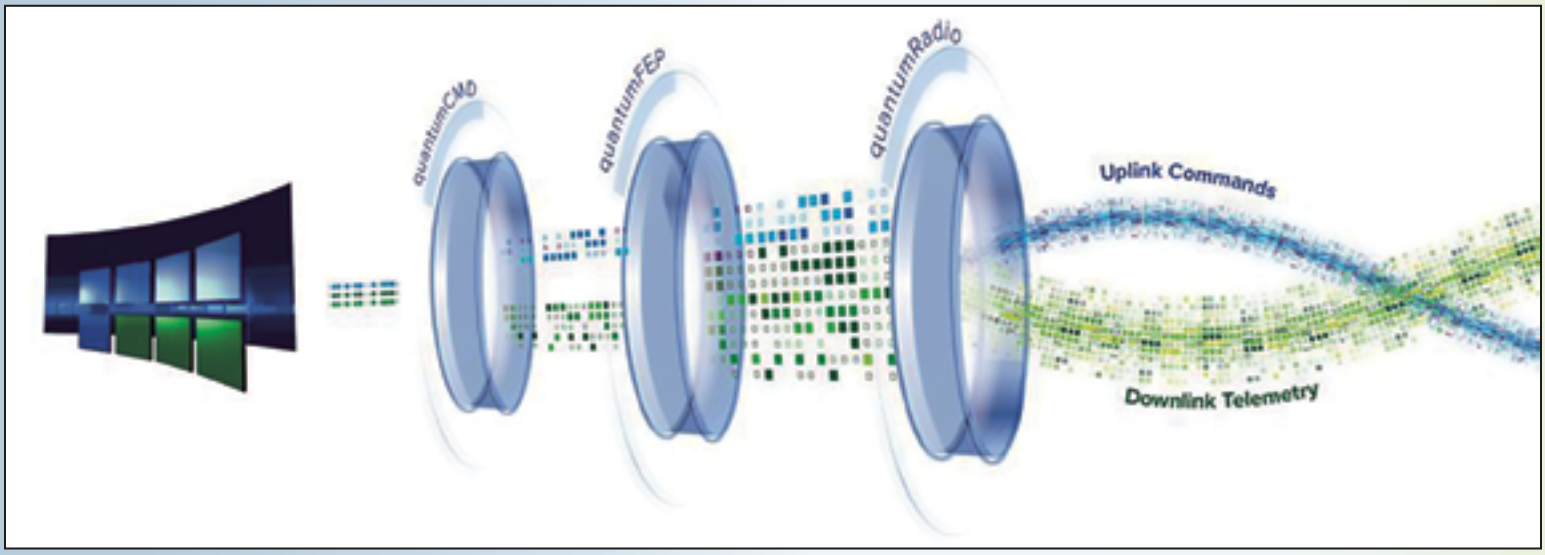


Figure 3. Narrowband Virtual System

Benefits of Virtual Ground Systems

While there are the obvious benefits to virtual ground systems, like total cost of ownership, benefits such as configuration management in a multi-mission environment may not be as obvious.

Multi-Mission

A virtual architecture lends itself well to a multi-mission environment where multiple assets are trying to use the same ground system. Configuration management of ground systems for the multi-missions becomes very important.

The quantum applications allow for application level configuration management. Additionally, VMs have tools (*i.e.*, snapshot and templates) that provide the ability to control configurations at the system level.

Virtual environments allow for ground network service providers to onboard customers quickly and cost effectively. End customers can develop against an instance of the virtual solution and then pass along system configuration files to the network provider. Issues such as different hardware configurations and incompatible pin outs on serial lines that plague hardware solutions do not have any impact on virtual solutions. Additionally, multiple network providers or ground networks can all share the same configuration or even the same instance of the solution (contained in either a virtual machine or container).

Several quantum users today have end customers who use their own instances of quantum that deliver configurations of quantum they have tested. These end customers are able to refine their configurations through various stages of the program, including development, integration and test, through launch and on-orbit testing.

Cost

Virtual solutions allow ground systems to scale exponentially with minimal hardware investments compared to hardware solutions. Additionally, cloud computing introduces architectures that reduce the initial capital costs of ground equipment to near zero and missions or programs run entirely on operating budgets. With all that being said, software solutions are not free. Lots of time and effort goes into ensuring virtual products work consistently and that they perform to the same level as the hardware solutions before them.

Delivery

System delivery tends to be the next major pain point. With many hardware based ground systems, typical delivery time frames of three to six months (sometime longer) are not uncommon, whereas quantumRadio has an advertised lead time of less than 30 days.

The ability to deliver virtual ground solutions allows for the rapid deployment of ground sites. Programs that would have taken several years can be deployed in several months. Additionally, new capabilities can be delivered either as updates or as patches to existing systems.

Redundancy and Resiliency

Virtual systems are able to leverage the work going on in other software based environments, one of which is redundancy. With virtual machines (VMs), whole systems can have fail-over capabilities with systems monitoring each other and even fail-over between COTS servers. Kratos has government users who have deployed these architectures to increase the resiliency of their systems today.

Virtual Considerations

Crypto

While many aspects of the small satellite ground architecture have been virtualized, there are a number of things that are much more difficult to virtualize (i.e. serial interfaces). Cryptographic devices used to encrypt commanding data and decrypt telemetry data, especially in the government and IC programs, are hardware systems that are tightly controlled. Virtual systems have the ability to interface with these devices and programs requiring their use.

Many commercial customers today use commercially available AES encryption and decryption to secure their links. quantum supports commercial AES and can support secure links in cloud-based architectures. Small satellites, especially in government programs, have been seen as a way to demonstrate technology. These "tech demos" often have little to no security on the link. quantum offers a way to provide an additional layer of security to these demonstrations.

Virtual environments allow for the deployment of new ground stations quickly and efficiently. Virtual solutions can also be used to augment existing traditional systems, as well.

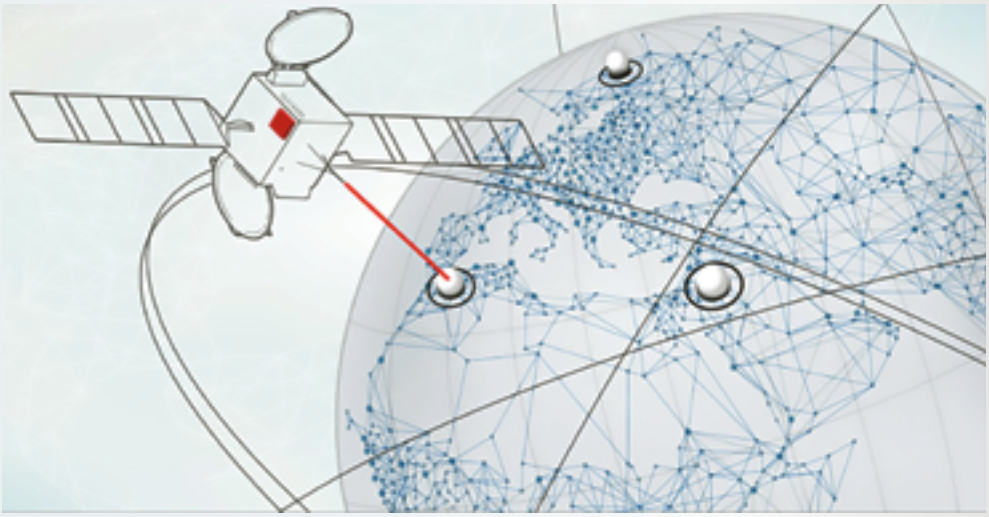
www.kratostts.com/solutions/satellite-and-space/smallsats

Author Jordan Klepper of Kratos Defense may be contacted at jordan.klepper@kratosdefense.com

Building an Optical Comms Network

The whys and how...

By Barry Matsumori, Chief Executive Officer, BridgeSat



When governments and the telecom industry talk about the spectrum shortage, they always fixate on the terrestrial impact: cellular and WiFi struggling to keep up with consumer and business demand.

Satellite has an equally chronic shortage, and although the reason is the same — exponential traffic growth — the best solution is different. In 2016 alone, the FCC received 11 LEO constellation filings. *Figure 1* illustrates how this segment will grow through 2024.

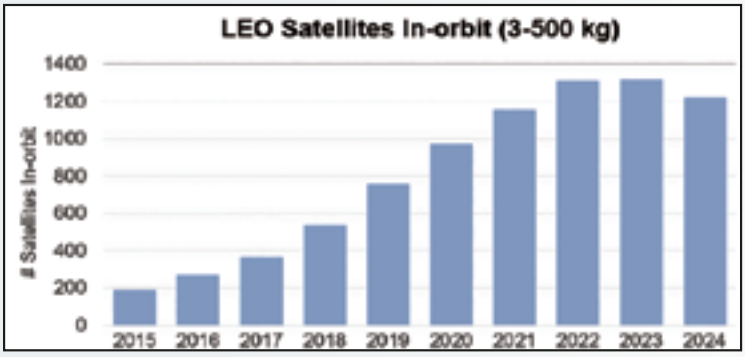


Figure 1.

More satellites mean more competition for a finite amount of spectrum. The existing and forthcoming capacity won't lie fallow, either.

Pricing is trending 35 to 60 percent lower than it was just two years ago, this according to Northern Sky Research. Those discounts will prompt more businesses and government agencies to consider satellite, such as for Internet of Things (IoT) applications that require a fast, reliable connection in places where cellular is slow or unavailable.

Even cellular itself will use more satellite, such as for backhaul, where high-throughput satellite pricing has declined by more than half.

What all these numbers add up to is more consumer, business and government applications relying on satellite. The corollary is that they'll expect satellite to provide reliable service, especially for mission-critical applications. That's tough to do when interference levels will increase as more satellites compete for a finite amount of spectrum.

Granted, satellite technology will continue to advance in ways that enable more efficiency frequency reuse and greater ability to work around interference. But that goes only so far. What's needed is a fundamentally different approach, where free-space optics augment, or even replace, RF communications.

The Business Case for Going Optical

Optical communications are a viable option today. For example, NASA has launched and tested optical technology, and in ways that show it's capable of supporting all space links.

Other successful missions have been conducted by The Aerospace Corporation, the National Institute of Information and Communications Technology, the European Space Agency, Japan Aerospace Exploration Agency and the German Aerospace Centre DLR.

The success of these science-mission applications is a major reason why commercial satellite operators increasingly see optical communications not only as viable, but necessary for accommodating growth over the long term.

Examples include Facebook, OneWeb, LeoSat, Inmarsat Communications Evolution and SpaceX. There are many more exploratory projects that are being conducted in stealth mode for obvious reasons.

Optical Ground Station (OGS) site diversity is critical for ensuring Quality of Service (QoS), both by working around adverse weather and providing redundancy as a hedge against natural and man-made disasters such as hurricanes and terrorist attacks. That's why BridgeSat, for example, has an initial OGS network of 10 sites, with more planned for further enhanced QoS.

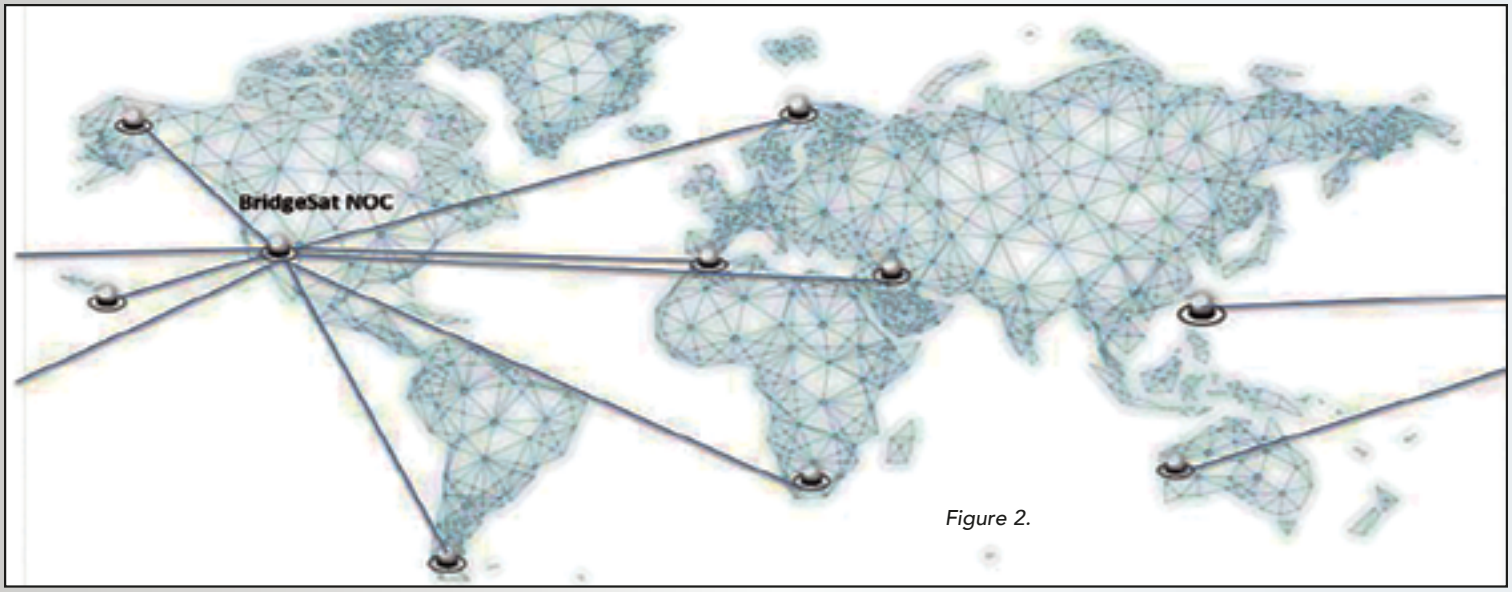


Figure 2.

The ideal OGS sites have access to high-speed terrestrial networks to support the high data rates from space and are generally in places with low cloud cover. The OGS locations well support Earth Observation (EO) missions that use high inclination orbits, but also are usable for LEO and GEO telecom applications.

For example, together, the BridgeSat OGS sites are designed to deliver over 2 TB of data downlink per LEO Earth observation satellite per day. That's welcome news for satellite operators that can't downlink all the data their constellations generate.

For example, roughly 27 percent of smallsat EO missions generate more than they can downlink. ***Figure 3*** shows how this challenge will increase through at least 2024.

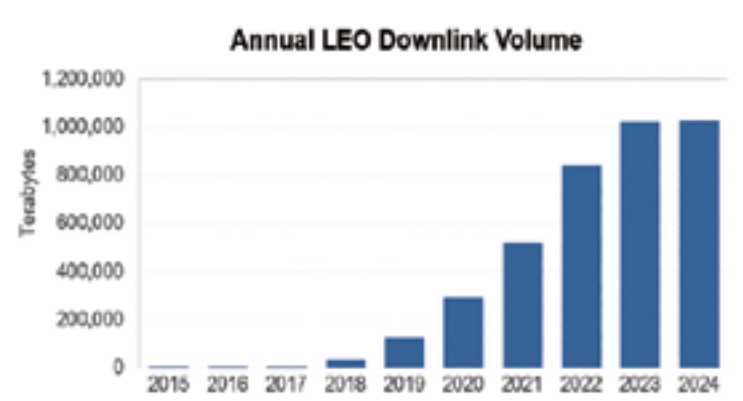


Figure 3.

An important perspective on all this capability is that optical communications need to deliver this data at a lower cost and in a secure fashion. Given that optical communications will deliver in excess of 10 Gbps, the performance is there, but also this performance is delivered at a cost per bit that is lower than what RF can provide — if RF could even match those data rates from space.

Also, the very nature of optical communications is secure. That's because a laser's coverage spot on Earth is very narrow compared to the wide propagation that is inherent for RF signals. This narrow signal provides the security that makes optical communications difficult to detect or intercept. For certain applications, this unique characteristic is paramount to maintaining secure communications.

The global network of OGS provides coverage for satellites, but in order to support the customer with the best experience, the network management ability of the BridgeSat Network Operations Center (NOC) is key. This NOC will take information from all of the OGS and manage them as well as interface with the customer.

For example, an OGS in a given region will be able to take meteorological data and deliver that data to the NOC. The NOC will determine the best strategy for use of an OGS or RF site for a given satellite in a customer's constellation to assist the determination of the best QoS.

For satellite operators, optical communications provide an option that enhances the overall service experience with the benefit of much higher performance and security delivered at lower cost.

When combined with RF in a hybrid system, high QoS maintained and the benefits of both systems are realized. It's a system whose time has come — and considering how the satellite market is evolving, optical communications have arrived just in time.

www.bridgesatinc.com/

The author, Barry Matsumori, is the Chief Executive Officer at BridgeSat.

Build Enterprises, Not Satellites

An AGI Perspective

By Patrick North, Development Lead, EOIR Module, AGI

Innovation involves dreaming up architectures of coordinated satellites brimming with the latest and greatest hardware and software.

Engineering is balancing all of those lofty goals with the integration nightmares of what is both physically and practically realizable. If dreaming big is the catalyst of innovation, then lessons-learned are the bedrock of good engineering discipline.

AGI's Systems Tool Kit (STK), shown below, was built to help bridge that gap.

Northrop Grumman Aerospace Systems faced a two-week system capabilities challenge to perform a payload trade study. In order to maximize their time they found that rather than modifying their own tools they were able to use STK to save 80 percent of their spin-up and analysis time.

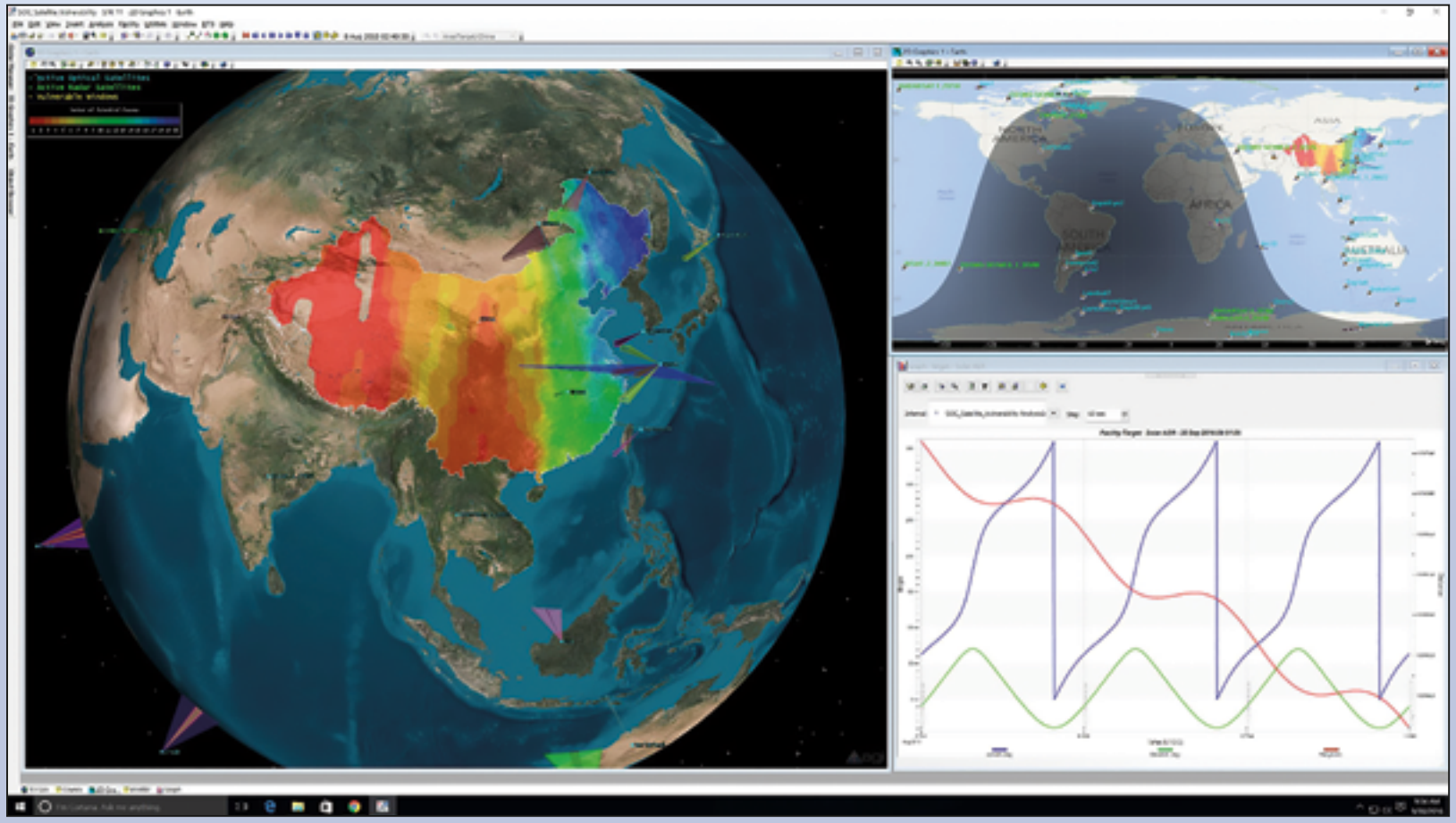
According to Chris Champagne of Northrop, "*STK provided superior qualitative and quantitative results as compared to our customer's and competitor's results.*"

Similarly, in 2016 NASA Glenn Research Center found STK was their integration tool of choice to model enterprise architecture options for their Space Communications and Navigation program.

The United States Air Force's Space Superiority Wing out of Space and Missile Systems Center also found that STK allowed them to rapidly conduct orbit trades, assess sensor performance, and simulate ground operations for their Space Based Space Surveillance program.

The traditional systems engineering approach to building satellite systems involves using the System-V as an attempt to balance these two opposing perspectives by adding some rigor and formality to the process. System level requirements capture the big picture, which is then broken down into subsystems that can be further refined and specified.

This breakdown of a large system into smaller subsystems is where designs can become stove-piped, causing problematic changes to the requirements. A payload-focused design might over-allocate resources to their



primary mission while leaving the rest of the spacecraft starved for resources with stricter requirements, thus resulting in an inferior overall design.

Break-Out Example

If you have a payload-oriented program that's designed around an imaging system, you could set aggressive requirements for area coverage and maximum resolution capability that, with sufficient budget for this subsystem to meet, would require larger optics, larger focal plane, and more on-board data processing.

However, to meet these more ambitious requirements, the heavier duty imaging payload would put additional stress on the thermal management, power, communications, and attitude/stability subsystems. With smaller satellites the requirements could be broken down into perhaps two imaging payloads, perhaps even breaking them up across multiple satellites and adding enterprise resiliency and redundancy, these same imaging requirements for area coverage and maximum resolution could still be met while putting less stress on all the other subsystems.

Even with some of these potential risks, the System-V process works well for accomplishing the objective of building an overall system. However, all too often when this discipline is applied to a single system the opportunity to create a coordinated enterprise can be lost.

Ideally, the entire constellation and supporting architecture would be included in the design from the inception of the mission onward, with full-lifecycles for each spacecraft, communication link, and ground processing segment carefully defined with consideration for both potential and pessimistic future budget allocations.

Break-Out Example

When looking at problems from an enterprise perspective it opens the door to new possibilities beyond just a single system's capabilities. As an example, consider how a small satellite system approaches knowing its position and orientation. For a precise orbital position it would require more sophisticated hardware that might be prohibitive for a small satellites design (consider the additional weight, power consumption, data processing needs, and system complexity).

However, if external observation measurements could be made from the ground with an inexpensive optical network, such as the Commercial Space Operations Center (ComSpOC), and precise orbit determinations made, then the overall enterprise could achieve the same fidelity through an entirely different means.

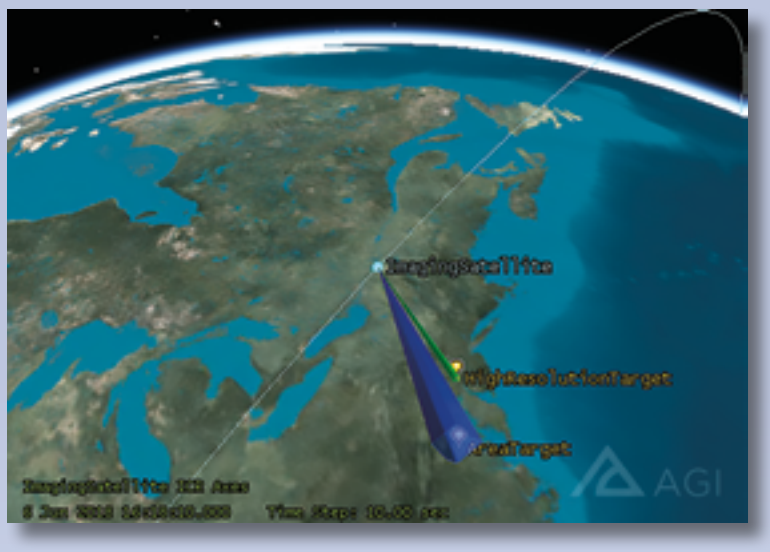


Image courtesy of ComSpOC

The problem with both the traditional System-V and enterprise level design perspectives is that building either a full system or enterprise modeling tool to do this analysis is prohibitive for both new programs just starting up as well as for smaller owner operators. That's where commercial-off-the-shelf (COTS) modeling and simulation solutions such as STK come into play.

Using an enterprise modeling capability that can accurately model low-level subsystems, interactions between systems, and can propagate future performance allows users to get started sooner and work faster while also reducing overall program risk and cost* (**To Be Resolved reference Frost and Sullivan*: ***p.widencdn.net/gehfgb/Frost-and-Sullivan-ROI-AGI-Software***).

For single systems, one can focus on evaluating high level system designs or dive into integrating industry standards or proprietary subsystem models. With an enterprise modeling capability, one can move right into modeling an entire constellation and supporting architecture over decades to characterize true integrated system performance over the full potential life-cycle.

This capability is even more important upfront to bridge the gap between innovation and engineering by allowing users to design entire constellations quickly with accurate constraints in place to perform both system-level and enterprise-level design trades early on and throughout design, build, test, and finally operations.

Imagine looking into the future and being able to enjoy the benefits of hindsight from day one of your concept of operations. Rather than just performing early system level design trades and analysis of alternatives for a single satellite an enterprise modeling user can perform quantitative analysis twenty years or more out into the future to see how their growing and evolving enterprises can someday look and start building to those requirements today.

Break-Out Example

This full enterprise perspective lets you step out of the completely hypothetical innovation space and start quantifying future research and development needs in areas such as technology, automation, scalable manufacturing options, redundancy, resiliency, reusability, and so on. With the right modeling capabilities a system design can easily turn into an enterprise design that allows for enterprise level what-if scenarios. Rather than just looking at the budget of a single system one could look at budgetary impacts, both positively and negatively, across the entire enterprise rather than on a single satellite-by-satellite or program-by-program basis.

This allows research and development efforts to impact across programs and missions, for example the Johns Hopkins University Advanced Physics Laboratory uses STK to perform test collections from a multitude of sensor configurations to evaluate payload performance that can be applied to many future systems across an enterprise.

Putting a system or multiple systems into an enterprise model that projects performance out for years to come also allows engineers to hammer on the enterprise design with all of the potential curve balls that could happen during the lifetime of each system.

In addition to the design and build phases and evaluating potential future capabilities, one can also focus on the present day-to-day operations. With a full enterprise perspective and the right modeling capabilities, more realistic inputs and outputs can be used during dry runs and rehearsals to be more prepared for operations.

Pre-initialization stress tests can flesh out problems much earlier in the development cycle and lead to more confident Go/No-Go decisions at each progress gate. Once the rubber hits the road and new systems become operational, enterprise modeling capabilities allow for analysis of empirical performance. This allows for updates on future models and improvements on daily calibration and operations scheduling. Anomalous events can be analyzed quickly with an enterprise model to perform forensic model-based investigations to cut through the what-if haystack and narrow down the most relevant hypotheses.

All of this systems engineering work still requires the talented, experienced, and innovative engineers to perform the work, but with a good system and enterprise modeling capability the team can feel confident that each piece of the complicated puzzle is accurately represented and working together to keep the entire team moving in the same direction.

This can perhaps help everyone mov e from the day-to-day System-V execution to a true enterprise level perspective because, at the end of the day, if we can all think big and work together that's a true innovative engine.

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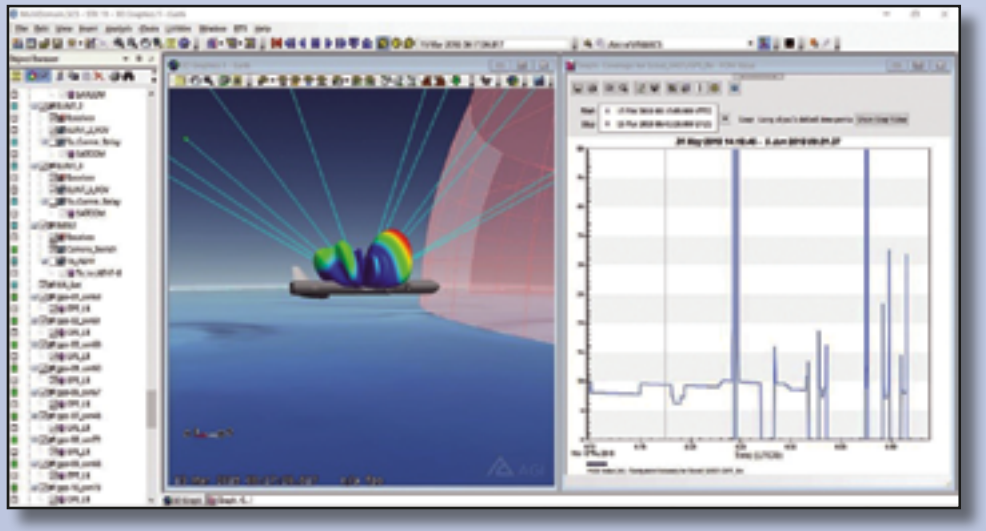

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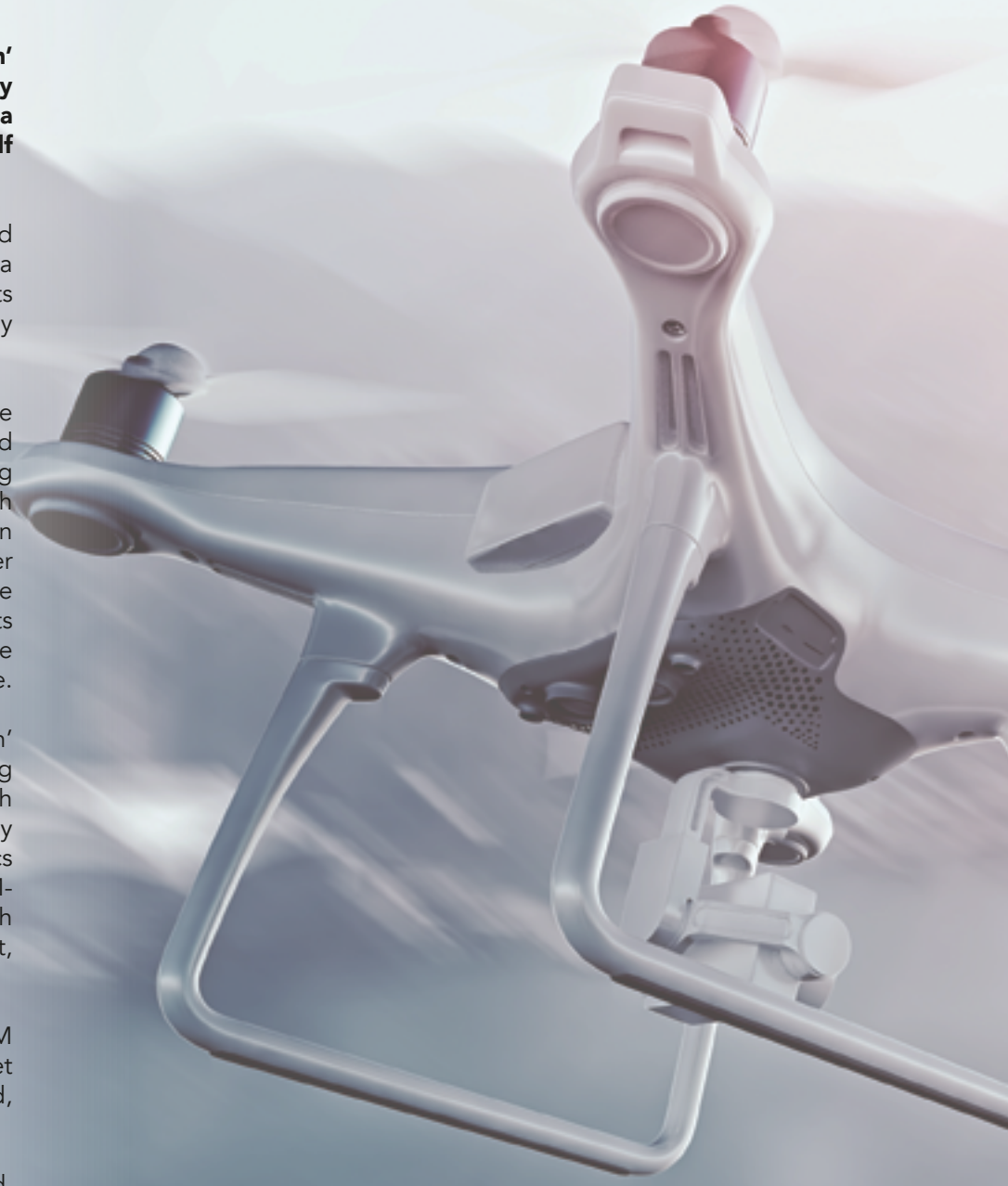
A “Sparrow” That Would Be An “Eagle”

SATCOM RF testing by drone

By Geoff Burling, Chief Executive Officer, AtlanTecRF



Off-air testing of ‘ground station’ equipment has come a long way since the dawn of communication via geostationary satellites nearly a half century ago.

In those early days, the term ‘ground station’ meant precisely that — a large parabolic antenna along with its transmit and receive electronics, firmly anchored to the Earth’s crust.

Each element of the station, more often than not a one-off design, would be tested individually before being assembled into a system, at which point an occasional test on a less than overcrowded satellite transponder might be the final set up check before going live. Makeshift loop back tests using a basic RF mixer and microwave signal generator were also in evidence.

Today, the term ‘ground station’ has grown significantly in meaning to include any part of the link which is non-satellite. Mobility is the key word and, aided by the electronics miniaturization revolution, SATCOM-On-The-Move (SOTM) is a reality, with platforms now including ships, aircraft, road vehicles, trains and manpacks.

Likewise, the testing of SATCOM systems has had to evolve to meet the needs of the modern user and, indeed, manufacturer.

Equipment is now mass produced, on-satellite testing is frowned upon and the range of test parameters has outstripped the capabilities of that ‘good old’ mixer/LO check.

For the major terrestrial teleports, the rack mounted loop test translator still provides a very cost-effective, easy to use, wired-in facility, but attempting to use these, where the whole station is compact and mobile, can be rather cumbersome.

AtlanTecRF Ka-band Satellite Simulator Drone Payload

What is required here is a device that can quickly and efficiently test the entire system by doing just what the satellite transponder does, but locally and at a small fraction of the cost.

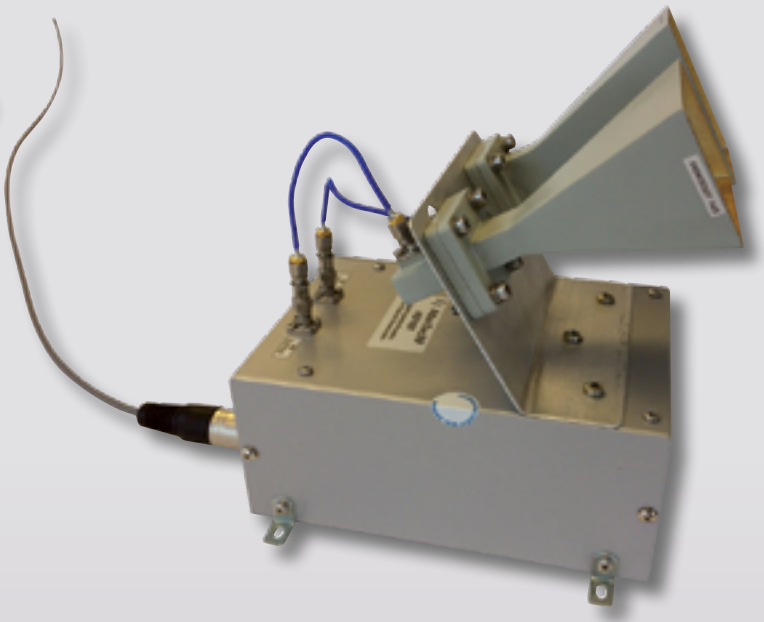
The U.K. based SATCOM RF Test company, AtlanTecRF, has pioneered the development of such instruments for several years with their Satellite Simulator product range. The product family includes the company's LSS series that was originally designed to tackle airborne, internet connectivity systems. Plus, AtlanTecRF's SNG series is driving down the cost of checking out van mounted news gathering rigs ready for broadcast, while still in the depot.

However, as has already been stated, movement is the essence of the majority of current satellite communications systems and, therefore, test products have literally had to keep track with the trend.

Carrying out the RF test while the platform is in transit has now become the order of the day as antennas are often steerable, either mechanically or electronically, in order to keep the 'Bird' in view under all likely aspects.

To meet this challenge, AtlanTecRF has taken to the air with their Satellite Simulators. New, compact, lightweight and high efficiency flight models for battery or solar operation are now being produced for carriage by airplanes, helicopters and balloons (low and high altitude), in all cases pretending to be a satellite for the purposes of testing the full capabilities of the ground/ mobile based terminal.

However, there are further complications — suppose your surface based platform is large and set on a course — a train or a large ship, for example. Going through the entire envelope of orientation of antenna pointing, while mounted on such a moving platform, would be unbelievably time-consuming and costly. If the platform cannot be easily maneuvered, then the test gear must be agile.



AtlanTecRF Ku-band Satellite Simulator Drone Payload

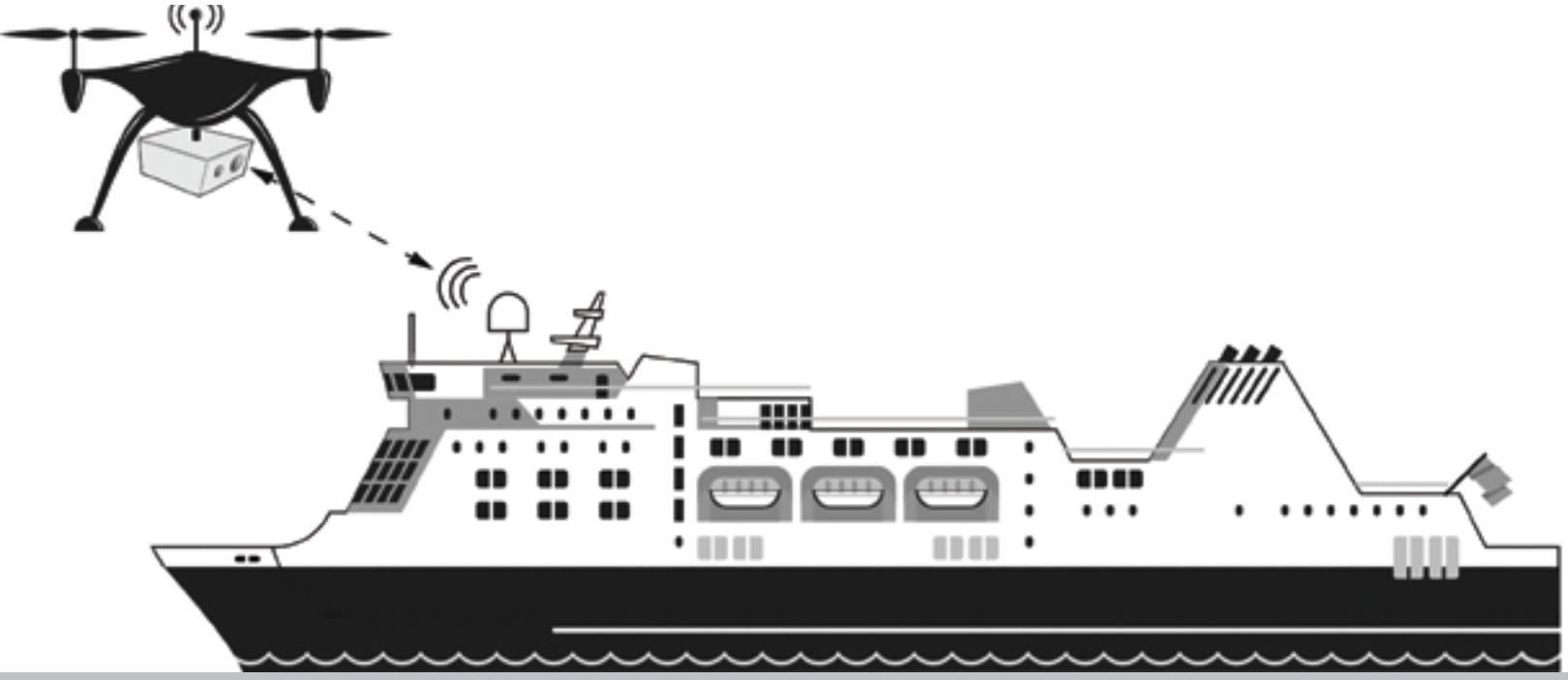
Enter the drone. These Unmanned Aerial Vehicles (UAVs) have the ability, under control from the ground, to dance around the sky, or more accurately, fly around an antenna platform in a way that directly mimics the altitude change of that platform in service, but without the need for extraneous diversions from the UAV's normal course.

Designated the Drone Satellite Simulator (DSS) Series, AtlantecRF's addition to its growing family of Satellite Simulator and Loop Test products has become the 'Sparrow' fluttering around, close in, essentially emulating the 'Big Birds' that sit at 22,000 miles away.

The current product range of drone-mounted Satellite Simulators operates in either Ka-band (30 GHz uplink and 20 GHz downlink) or Ku-band (14 GHz uplink and 11 GHz downlink), with options for both circular and linear polarization.

As market and business needs evolve, so, too, will AtlanTecRF's DSS products as they become even lighter and smaller as well as offering additional band compatibility including Q-, as needed.

In order to cover all the probable operating frequencies of the antenna or system under test (AUT or SUT), the Drone Satellite Simulator may have a fixed turn-around or local oscillator (LO) frequency. However, in many cases, there will be a requirement for LO frequency tuning, which is effected by means of a low frequency command radio link to the drone. Data relating to the length and quality of the transmitted signal can also be gathered at the drone and returned to base by a telemetry channel.



The Drone Satellite Simulator in action. It is maneuvered to align with the ship's antenna prior to testing. Maneuvering the drone enables the testing of the terminal satellite tracking function.

In some cases, the Drone Satellite Simulator will draw power from the same batteries providing lift to the UAV, but it can also be supplied as self-sufficient with an integral, rechargeable power storage.

AtlanTecRF's DSS products are already taking to the skies following their first successful maiden flights. In the tests, the Ku- unit received a signal while hovering above a ground terminal similar to the type that would be used on ocean going liners and large cargo ships. The Satellite Simulator then transposed that signal and sent it back at downlink frequencies, thereby simulating the satellite and allowing the testing of the ship's antenna without the ship having to alter course.

Such agility in SATCOM testing has many applications including shipping, on airlines and trains and, more specifically, the military. The vast majority of systems for the army, navy, air force and marines are constantly on the move with little or no time available for testing and set up. Steerable antennas are commonly part of the kit and, therefore, AtlanTecRF's DSS 'Sparrows' fulfill the test function in all respects of agility and speed.

Further, the Drone Satellite Simulator can have additional value in actually transmitting a signal from point A to point B, without using a satellite at all, across a small footprint, as might be found in an operational situation. If, in that situation, there is no GEO or LEO 'bird' available, the DSS 'Sparrow' is launched to bridge that short-hop communications gap.

AtlanTecRF's 'Sparrow', a would-be 'Eagle', brings greater versatility and a uniqueness to the satcom market, providing a neat and economical solution to the testing of satellite communications terminals 'on-the-move'.

AtlanTecRF is a leading global manufacturer of RF and microwave equipment, components and interconnects to the Satellite, Broadcasting, Aerospace, Telecommunications, Defense and Scientific Research industries.

AtlanTecRF specializes in providing Satcom RF test equipment to the Military, Government and Commercial organizations. Its comprehensive range of equipment includes Loop Test Translators, Frequency Converters, Signal Generators, Noise Injection Translators, Noise Generators, Line Amplifiers and Satellite Simulators. Equipment covers bands L-, S-, C,- X-, Ku-, DBS, Ka- and Q-. For further information on AtlanTecRF's comprehensive range of Satcom RF Testing Equipment visit ***atlantecrf.com/products/satellite_communications_equipment/index.htm***

The author, Geoff Burling, is AtlanTecRF's CEO. His role is to drive growth across all aspects of the business by bringing to market a range of new and high quality RF and microwave components, interconnects and equipment.

Geoff sets the company's long-term business strategy and takes the lead in building customer relationships and developing employees.

A passionate engineer, who uses his in depth knowledge and market expertise to ensure AtlanTecRF delivers the highest quality products, technical expertise and customer service demanded by today's engineers.

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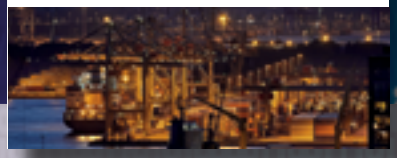

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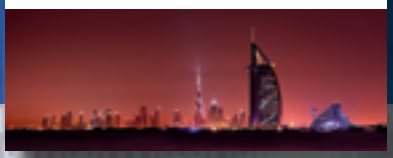

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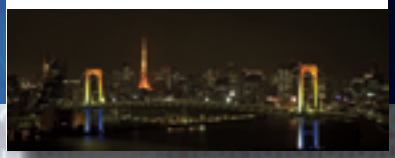

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It's A Small [Satellite] World

A Roccor Perspective

By Dr. Mark Lake, Vice President of R&D, Roccor

About 100 years ago, Hungarian poet *Frigyes Karinthy* **and English writer** *G. K. Chesterton* **invented the "***Chain-Link Game***" with a group of close friends[1].**

The rules of the game were simple. One player would identify any two people in the world, and the other players would compete to see who could construct the shortest linkage between those two people through a network of individuals, each of whom should know the next one through a shared experience.

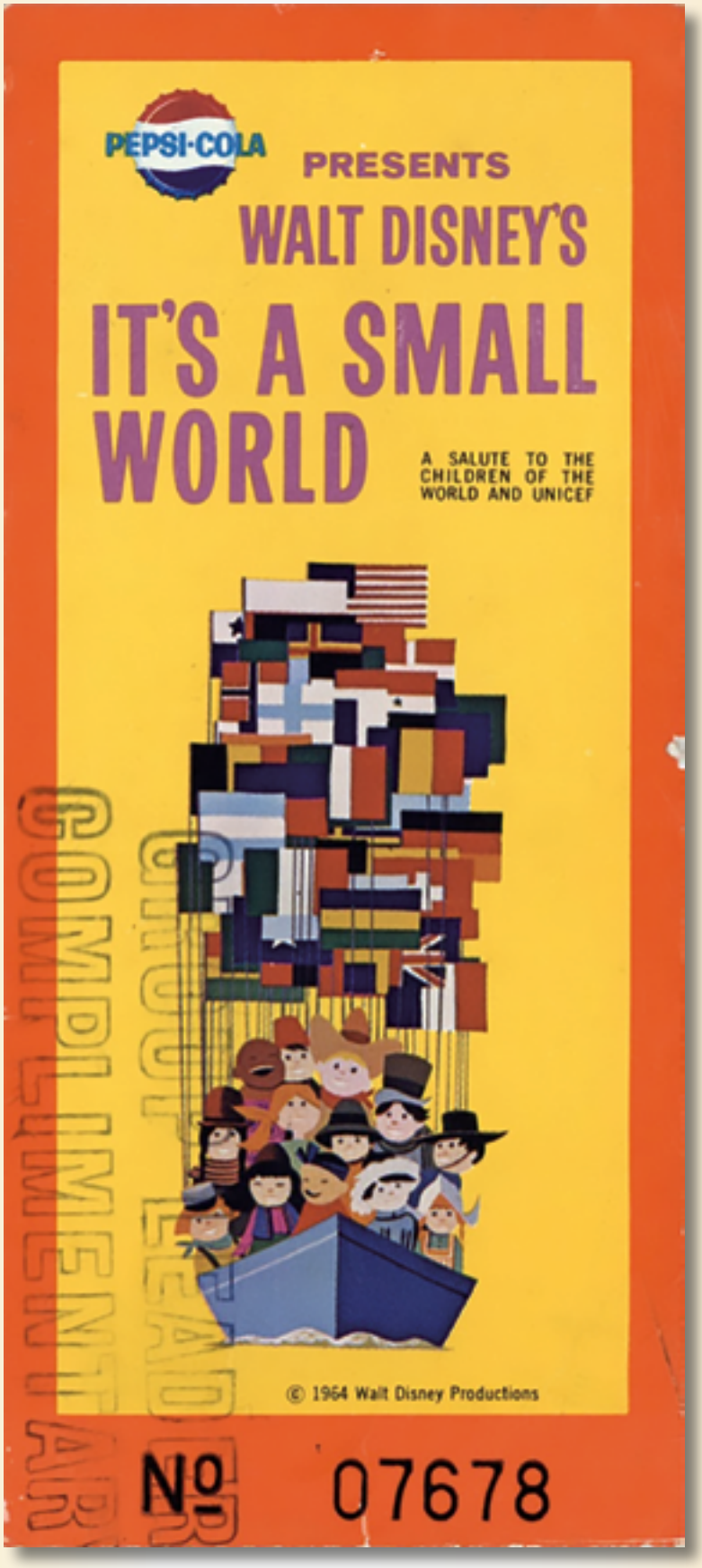
No matter how long they played, or how distantly removed one person was from the other, the friends never needed more than six links to connect the chain.

From this early-20th-century parlor game arose the college drinking game "*Six Degrees of Kevin Bacon*[2]" and the small-world phenomenon of six degrees of separation.

Coincidentally, just a few years earlier in 1909, Italian inventor *Guglielmo Marconi* had estimated he could link the globe with a network of only six wireless telegraph radio repeater stations[3].

Decades later in 1967, American sociologist *Stanley Milgram* showed that on average it takes only about six links to relay a letter from any randomly selected individual to any random recipient — given that each intermediary was told to forward the letter to the person he or she personally knew who was most likely to know the recipient[4].

In 2008, researchers at Microsoft found that 80 percent of the 180 million Microsoft Messenger users at the time could be connected by six or fewer personal links[5].



Paradoxically, while the world's population has exploded to 8 billion people, each of us has become closer to one another than ever before. As explained by *Karinthy* and *Chesterton*:

> "*Julius Caesar, for instance, was a popular man, but if he had got it into his head to try and contact a priest from one of the Mayan or Aztec tribes that lived in the Americas at that time, he could not have succeeded — not in five steps, not even in three hundred. Europeans in those days knew less about America and its inhabitants than we now know about Mars and its inhabitants.*"

One hundred thousand years ago, on the windswept plains of sub-Saharan Africa, Homo sapiens emerged with the uniquely human desire for prosperity and a better future. Those passions launched our species on multiple divergent paths of nomadic exploration and colonization, which have now fully encircled our planet.

Now, the Space Age has given all the technological means for instantaneous global communication and, with those capabilities, the means to connect as one global tribe in a way that has not been possible for 100,000 years. This has created the small-world phenomenon of six degrees of separation.

At the start of the Space Age, the City of New York hosted the 1964 World's Fair that enveloped the theme of *Global Peace Through Understanding* and showcased Space Age technological advancements that were shrinking the globe, all the while expanding Homo sapiens connection with the universe.

With sponsorship from Pepsi-Cola and as a salute to the children of the Space Age, Walt Disney debuted an interactive exhibit at the fair with animated children frolicking in miniature settings from many lands. The fanciful creation of multi-cultural imagery sent a message of peace and brotherhood harmonized by a soundtrack entitled "***It's a Small World (After All).***"[6]

Those children have now become the leaders of today's space industry and they are re-inventing the industry's mid-20th Century values and visions with a fresh focus on the human elements of the space business, such as work-life balance, cultural diversity and the importance of the social network.

New space magnates like *Jeff Bezos*, *Greg Wyler*, *Elon Musk*, and Richard Branson are pouring $billions into small-world business ventures such as global internet and space tourism that will help people to stay even more connected to one another.

What does this mean for all humankind?

Personal differences aside, we all hunger to be a part of the Space Age. I don't think it's just because we think rocket science is cool. I think it is because only six Homo sapiens separate us from each of the 8 billion others in the world — somehow space helps us feel the goodness in the 100,000-year-old tribal connection we have with one another.

www.roccor.com

References

[1]Frigyes Karinthy, "Chain-Links," 1929
[2]www.sixdegrees.org
[3]Guglielmo Marconi, "Wireless telegraphic communication," Nobel Prize Acceptance Lecture, December 11, 1909
[4]Stanley Milgram, "The Small World Problem". Psychology Today, May 1967. Ziff-Davis Publishing Company.
[5]Peter Whoriskey, "Instant Messagers Really Are About Six Degrees from Kevin Bacon; Big Microsoft Study Supports Small World Theory," The Washington Post, Aug 2, 2008
[6]Dave Smith, Disney A to Z: The Official Disney Encyclopedia, 2006

Mark Lake is Vice President of R&D at Roccor where he oversees technology and advanced product development efforts, multi-organization cooperative ventures and strategic partnerships for technology capitalization.

Roccor is an aerospace supplier providing low-cost, high performance deployable structure and thermal management systems technology for government and commercial space customers.

Dr. Lake started his career as a research engineer and program manager for NASA. He has published more than 50 research publications in the field of aircraft and spacecraft structures and a book entitled, ***The Inventor's Puzzle: Deciphering the Business of Product Innovation.*** *He is also an Associate Fellow of the American Institute of Aeronautics and Astronautics and an adjunct member of the graduate faculty of the department of Aerospace Engineering Sciences at the University of Colorado.*

Communication For Upstream Operations

Making a mesh of things, for safety, security and crew welfare

By Paul Scardino, Senior Vice President, Sales Operations/Engineering and Marketing, Globecomm

After a multi-year period of contraction, the oil and gas business is on an upswing and back in action.

Recovering onshore activity in the U.S. is already boosting demand for oilfield services and analysts expect that recovering markets outside the U.S. will add to the momentum.

Already, the rise in crude prices boosted revenues 15.1 percent at Schlumberger and 47.7 percent at Halliburton in Q4 2017 alone, according to the research firm BMI. The business press is full of stories about labor shortages in the wake of severe cutbacks three years ago.

The increase in drilling and production will drive greater demand for the connectivity on which the modern wellhead depends. The industry's recent experience with crisis has driven many firms to increase their use of digital technologies to drive greater productivity.

A well-designed network keeps remote rigs and exploratory vessels connected and their operations safely in sync.

Communication service providers are expected to play an important role in helping the industry accelerate the shift to the digital oilfield, where connectivity allows secure, real-time collaboration and the use of data analytics.

The research firm NSR forecasts that the oil and gas business will spend a billion dollars per year on satellite connectivity alone in 2027, up from US$700 million in 2017. Demand will be greatest in the Atlantic Ocean Region, North America and Europe.

This article explores how expanding upstream operations can make the best use of all forms of communication to deliver the high-productivity, safety and reliability that oil and gas companies demand.

The Connectivity Challenge

Upstream operations in oil and gas rely on a mix of communications solutions for efficient production, safety, site security and remote connection to enterprise services.

They also turn to communications for the internet access and video content that supports the morale and retention of crew members.

Whether on land or sea, however, those operations are typically in remote locations beyond the reach of ground-based networks or poorly served by local providers. It falls to the company to provide the services that are needed for efficient operations and for connectivity to the outside world.

There are two fundamental communications requirements: backhaul communications to the enterprise network, public switched telephone network and the internet; and onsite communications connecting workers and, increasingly, equipment that is part of machine-to-machine networks.

Backhaul Communications

Connectivity to remote sites may be achieved in several ways, including satellite, terrestrial microwave, fiber and, increasingly, LTE.

A subset of these approaches or all of these approaches may be used over the lifetime of the site. This type of backhaul communications is critical for keeping the site connected to the corporate network, for site management activities, for supply chain management, for site and worker safety, and for heavy equipment lifecycle support.

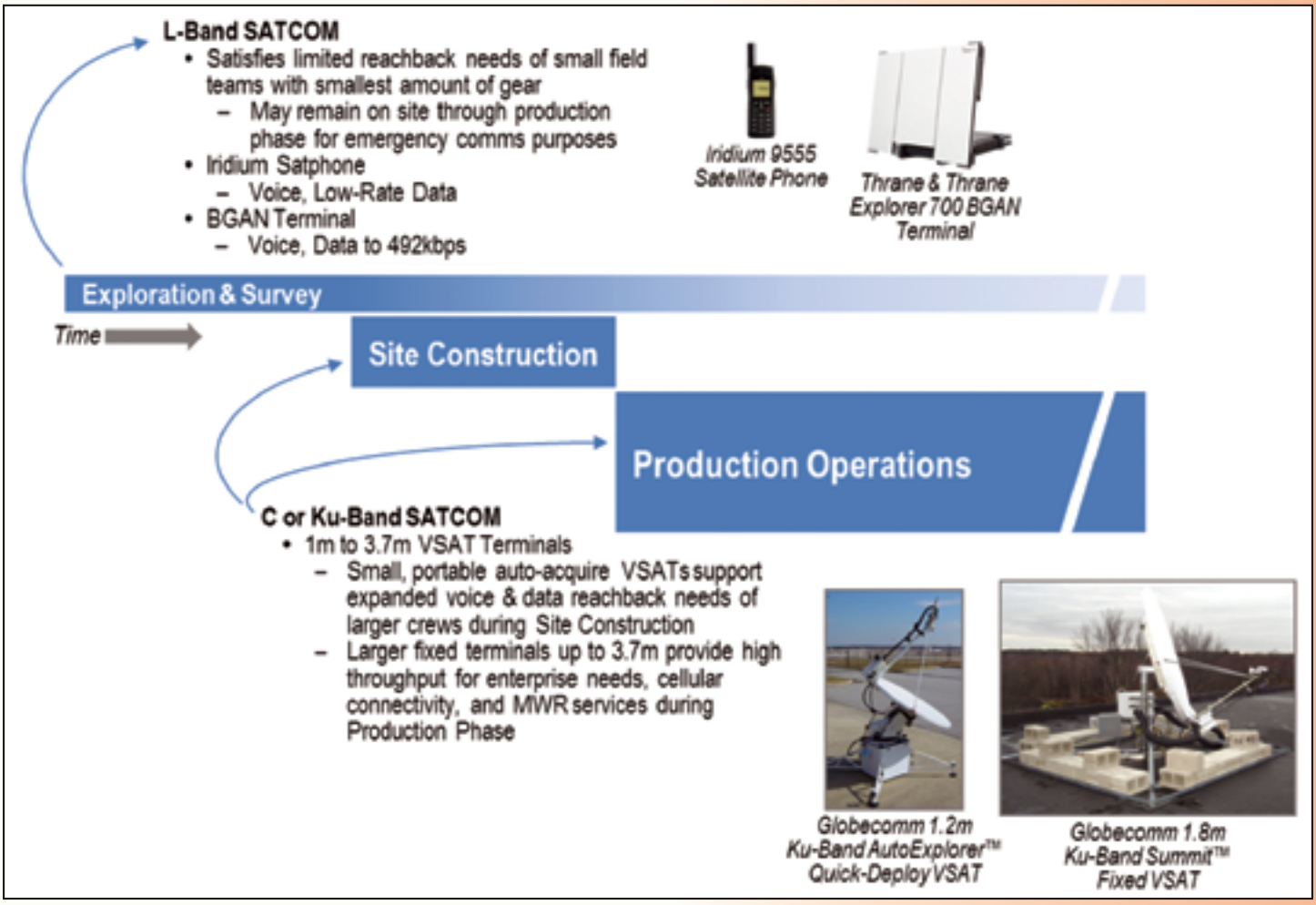


Figure 1. Use of SATCOM for Reachback During Mine Development & Operations – Communications needs scale over time and so should the SATCOM terminal and service approach. Timeline bar height conveys increase in net reachback data rate in different mining phases.

Satellite Backhaul

Satellite communications is typically the only practical way to connect a remote site to the outside world — especially during the initial exploration and production periods. Operators use dedicated satellite links with guaranteed data rates, as shown in ***Figure 2*** below, to support communication needs.

At the outset, when exploration is under way, field crews may use satellite phones or small terminals that furnish voice and data services. Here, equipment portability and ease of set up and use are important.

The comparatively low data rates available from these small L-band frequency terminals suffice for the small field teams. ***Figure 1*** shows Iridium satellite phones and Inmarsat Broadband Global Area Network (BGAN) terminals as the equipment of choice.

The figure shows that the L-band satellite solution may be practical over the life of the operation with use focusing on emergency or backup communications in later phases.

While L-band technology (**Inmarsat**, **Iridium**, **Globalstar** and others) answers many of the requirements, construction and operation typically demand higher-capacity and more cost-effective solutions.

While higher-capacity VSAT equipment cost more than the L-band terminals, users achieve significant operating cost savings over time, as the monthly recurring service cost per Kbps for the VSAT solution is much lower than for the metered L-band pricing.

Production involves a considerable increase in personnel on site, which boosts the number of users and applications that must be supported by the satellite connection. Portable, quick set-up terminals may be ideal for the start of production.

Here, "one-button" terminals, which automatically aim their antennas at the correct satellite and stay locked-on, are often the best choice. They offer multi-megabit per second (Mbps) capability without the need to dispatch a satellite field engineer to set up and operate the unit.

When site construction is complete, this type of unit can be repackaged in its ruggedized transit cases, stored and deployed to another construction site.

Figure 1 on the preceding page shows two types of Globecomm satellite terminals suitable for the construction and operations phases. Specific terminal design attributes (*e.g.*, antenna size, power amplifier rating, etc.) are selected after thoroughly defining current and projected site communications requirements and conducting detailed communications link analysis for derived data rates.

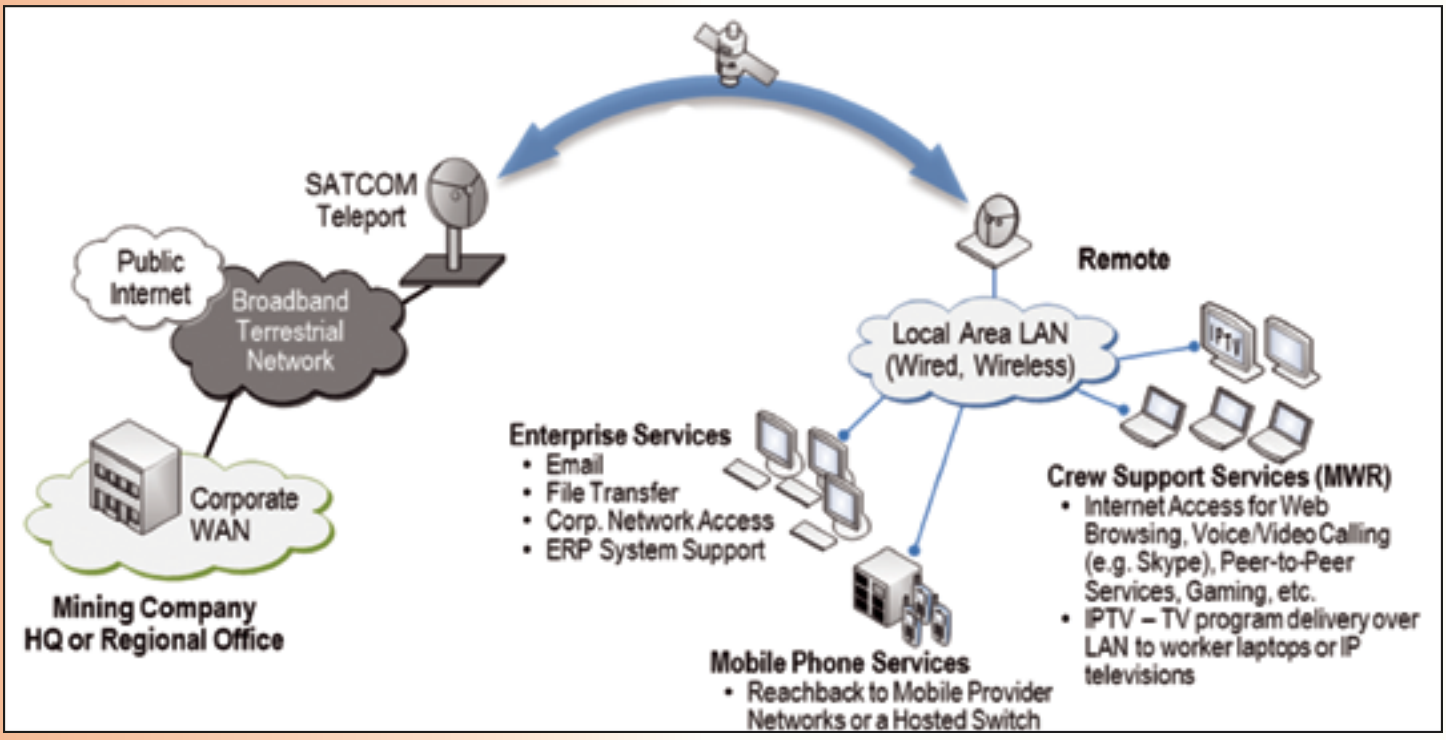


Figure 2. Satellite Backhaul Connectivity for Enterprise, Mobile Phone and Crew Support Services

Backhaul connectivity accomplishes multiple critical objectives. As shown by the blue arc in *Figure 2* on the previous page, satellite backhaul provides enterprise, mobile communications and crew support services connectivity.

The combination of satellite communications and an interconnection to a global terrestrial network can also connect an exploration or energy company with its remote operations anywhere in the world.

Connectivity to a drill site, rig or corporate WAN is then simply a matter of establishing connectivity to a local peering point via the internet or leased line services. In most cases, this element of corporate connectivity already exists.

Satellite connects the remote site to the corporate network to support day-to-day business functions. Enterprise applications may include email, file sharing and transfer, access to specialized corporate applications, internet access and enterprise resource planning (ERP) systems.

Workers at the remote end are connected to a wired/wireless LAN, which in turn connects via the satellite link with the distant corporate facility or WAN.

Where LTE mobile service is available, backhaul can combine satellite and cellular technologies to provide failover and least-cost routing, thus increasing performance and availability while minimizing overall communications costs.

Satellite is also used to furnish internet access for workers who stay at or near the remote for extended periods. Internet access connects separated families through use of Skype and other VoIP calling as well as instant messaging.

Workers gain access to a wide range of news, entertainment, music and shopping sources when broadband connectivity is available. This has significant positive impact on crew morale and well-being. In this scenario, worker living quarters are equipped with a wired or wireless LAN and they can use their own or a company-issued tablet or laptop for internet access.

With a satellite broadband link, it is also possible to provide Internet Protocol TV (IPTV). Here, TV programming is delivered to viewers over the housing facility LAN to set top boxes (STBs) in worker dormitory rooms and common areas.

From the STBs, content may be viewed on laptops, tablets, or IP-compatible TVs. IPTV service is particularly beneficial to workers stationed at remote locations for extended periods. Programming content can take the form of channel packages containing a mix of news, sports, movie, and network or cable TV programs, as well as video-on-demand options.

Cellular LTE

Satellite's ability to provide coverage has no peer. However, LTE cellular has become increasingly popular in recent years. For land drilling applications, the higher network speeds offered by LTE are generally preferred, if available, despite the high metered bandwidth costs as compared to VSAT.

In some drilling regions, niche infrastructure-based LTE providers offer flexible billing options similar to managed satellite bandwidth. In most land drilling configurations, auto-deploy VSAT antennas are utilized for hot-standby failover from LTE, or as the primary method of backhaul when LTE is not available.

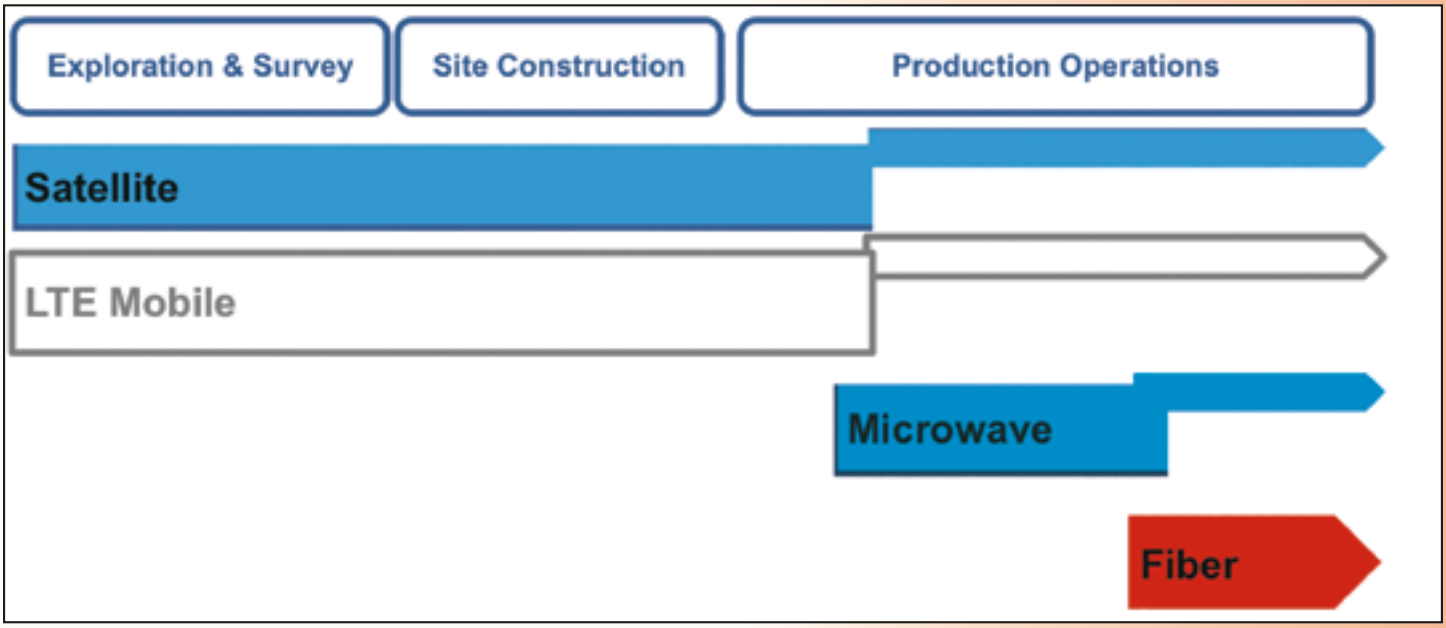


Figure 3. Notional Remote Site Backhaul Solutions Over Time

Microwave and Fiber Backhaul

Satellite is a viable backhaul approach, but it is typically more costly than microwave or fiber. While satellite can solve the connectivity problem from day one, communications infrastructure build-out by local providers over time may make lower-cost alternatives feasible.

In some areas of the world, extensive microwave radio networks may ultimately reach an onshore site — or within range of a near-shore platform — if the economics to the network provider are favorable. In this case, a remote site operator would switch the bulk of its traffic from satellite to microwave to lower operating expenses. Some satellite capability may be retained for backup purposes in the event that microwave service is interrupted.

In a similar manner, if a local provider installs optical fiber in the area of the site, users typically transition from satellite or microwave to this lower-cost, higher-capacity alternative.

In highly developed markets, such as the U.S. Gulf Coast, optical fiber has become a standard means to provide connectivity to offshore platforms. Again, some degree of satellite or microwave service would usually be retained for backup and disaster recovery purposes.

Figure 3 on the previous page illustrates a backhaul scenario where initial satellite service and LTE mobile, if available, is first supplanted by lower-cost microwave service. Thereafter, a transition to fiber takes place to again lower OPEX and/or to achieve higher communications throughput. Connectivity at any site over time may use a different mix of these technologies.

Onsite Communications

At an onshore or offshore exploration or production site, communications typically depend on a mix of wireless technologies, from WiFi and cellular to mesh radio networks, which combine voice, data and video to support the varied demands of remote sites.

Wireless Communications

To keep crews and control rooms connected, oil & gas sites typically establish IEEE 802.11 WiFi networks, and WiFi can also provide the local area networks (LANs) within the site office buildings and in worker living quarters.

WiFi networks are also well suited for site security purposes where perimeter and onsite security cameras and access control systems relay information to a central guard station.

Figure 4. Typical Site Perimeter and Access Control Outdoor Elements Suitable for Wireless Connectivity to a Central Security Station

Figure 4 on the preceding page illustrates typical outdoor perimeter security sensors and access controllers that support this functionality wirelessly. This type of network can be easily secured to ensure the integrity and confidentiality of company information.

Onsite and Backhaul Cellular Communications

Upstream sites may be geographically remote, but they do not have to be cut off from the advanced communications services that power business and connect employees to the world.

Onshore wells have the option of deploying a specialized hybrid satellite-cellular ("SatCell") solution that doubles as onsite and backhaul communications infrastructure.

The SatCell solution places equipment at the site that supports local calling and automatically hands offsite and long-distance calls to a satellite link.

Offsite calls routed over the satellite are landed at a teleport and routed to the public-switched telephone network (PSTN). The power of this SatCell solution is that the satellite link, with its comparatively expensive satellite bandwidth, is only used for offsite calling. Onsite calls stay local.

Operators can fully integrate their sites into the global communications network with a remote hosted switching infrastructure that supports the full range of 3G and 4G LTE cellular voice and broadband data.

This infrastructure offers the same capabilities and complies with the same service requirements that govern the major cellular communications providers and it supports call routing to users on all provider networks.

Mesh Radio Communications

Personnel managing operations need reliable voice, video and data communications to optimize efficiency and production rates. These requirements can be met most successfully using a mesh wireless network approach.

A full mesh wireless network is characterized by its ability to allow any node in the network to communicate directly with any other node in the network. This type of network offers a critical advantage: there are usually multiple paths available for communications to pass through the network, which greatly improves the likelihood that communications between nodes will be successful. In some cases, deployed radios may act solely as relays for communications traversing the network.

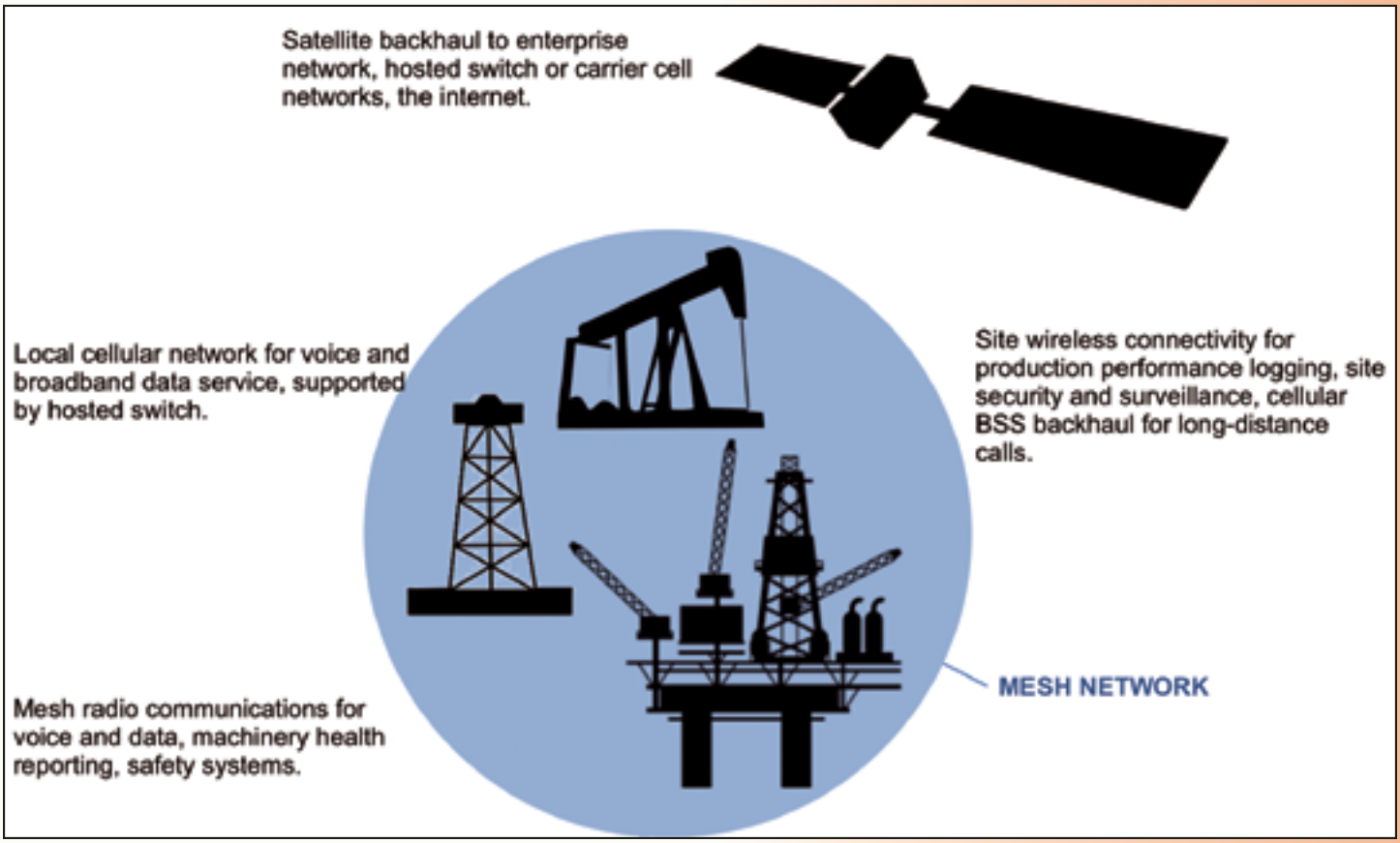


Figure 5.

This capability is important in a complicated upstream operation, where the environment may change frequently. This makes self-configuring mesh networks a good choice for this part of the operation. These systems provide broadband capability for voice, data, and video transport.

Given the harsh and potentially explosive environment, upstream sites require ruggedized, intrinsically safe (IS) radios, cell phones, PDAs and laptops for voice and data communications carried by the mesh network. These devices are full-featured and certified under the UL 913, ATEX or other international standard for safe use by workers in this environment.

Mesh networks also support automated, machine-to-machine (M2M) data communications between heavy equipment and an integrated monitor and control (M&C) system. This capability is important for monitoring how well machines are performing their jobs.

Performance monitoring is critical in obtaining targeted yields over time, and in being diligent and proactive about maintenance. The right M&C solution will alert operations and maintenance personnel to upcoming scheduled maintenance and more importantly, about potential equipment problems before they become critical and costly. M2M capability is also useful for tracking heavy equipment at the site. Equipment asset tracking is particularly important for managing traffic, so that work flow at the site can be scheduled to minimize equipment idle time.

The self-configuring mesh wireless network also provides a good communications solution for safety equipment. These communications are critical in the event of an incident where access to compromised areas is restricted and crew members are unaccounted for.

Enough of the multi-node mesh network may be intact to permit communications from cut-off areas, and additional radios can be quickly brought to bear in re-establishing communications if additional assets are needed.

Mesh network connectivity and applications are illustrated by the light blue shading and the callout text in ***Figure 5*** on the previous page.

Putting It All Together

The mesh radio, WiFi, cellular and satellite communications systems must be integrated into an overall solution in order to be effective. Globecomm specializes in exactly this demanding work for complex networks.

As a major satellite services provider, the company offers a full range of global satellite terminals, onsite communications infrastructure, the firm's unique SatCell system, and global service solutions.

Globecomm engineers all satellite solutions to be highly efficient, and specialized equipment is used to optimize the amount of information that can be transported in a given amount of satellite bandwidth.

The upstream site solution uses a converged Internet Protocol (IP) architecture in order to optimize performance and to achieve interoperability of communication services. This means that all communications between disparate systems or between on-site and off-site points ultimately generate IP traffic that is routed over the local LAN.

Depending upon the types of communications devices present at the site, this may require use of dedicated radio over Internet Protocol (RoIP) interoperability platforms, use of special-purpose interface hardware configured within site routers, and use of a dedicated voice over IP (VoIP) system.

The IP network equipment suite also includes routers, switches, accelerators and firewalls. Globecomm's capabilities extend to implementing the on-site wired or wireless LAN and provision of user desktops, laptops, VoIP phones and peripheral equipment.

Globecomm architects the overall system and integrates the required equipment in one or more equipment racks installed onsite, as well as provisioning terminals, radios, cellphones, PDAs and laptops ruggedized for wellhead operation.

If such a facility is unavailable, a container-based equipment-room solution may be viable. Here, all IP and communications network equipment is integrated into ruggedized equipment racks installed in purpose-built ISO shipping containers. External masts, towers and antenna/RF systems are connected to the rack-mounted equipment in order to realize on-site and backhaul communications capability.

Rack-mounted equipment also supports the on-site LAN. This approach offers the advantages of rapid fielding after initial factory integration and scalability for capabilities growth over time.

System integration is followed by rigorous testing to ensure that all site communications systems are operating to predicted performance levels. Successful testing results in commissioning the network into service and turning operations over to the onsite operators.

When Making A Mesh Makes Sense

This article has described various types of communications that may be used to conduct essential operations at an upstream exploration or production site.

Author Paul Scardino is GLOBECOMM's Senior Vice President, Sales Operations/ Engineering and Marketing.

Globecomm is a trusted global connectivity partner for designing, managing, and distributing voice, video, and data solutions to the most remote locations on Earth, under the most treacherous conditions. The company's multi-network satellite, fiber, and cellular infrastructure is the backbone of mission-critical RF and IP communications for government, maritime, media, enterprise, and oil and gas markets in over 100 countries. In addition to operating managed network and hosted switch services, Globecomm designs and integrates best-of-breed broadcast and OTT media solutions; complete enterprise communications and data management systems, including Internet of Things applications; and on-premise and cloud-based enterprise video platforms. The company proudly supports U.S. government and NGOs around the world with Morale, Welfare, and Recreation (MWR) services and assists with enterprise and government disaster relief efforts.

Satellite is typically used to connect the remote site to the outside world. Mesh radio-based communications using self-configuring radio technology are ideal for the ever-changing environments at these sites.

Mesh communications may be used for a variety of functions and may carry voice, data, and video information. Secure wireless communications based on WiFi and/or WiMAX technology are well-suited for broad area site coverage for general communications needs and for site security and surveillance.

Wireless technology is also applicable to establishing site office LANs and, where applicable, worker living quarters networks. Cellular capability based on SatCell technology provides economical on-site voice and data connectivity and the ability to connect via satellite backhaul for long-distance calling purposes.

www.globecomm.com

The Time Is Now...

for Satellite IoT...

By J. Alberto Palacios, Chief Executive Officer, Globalsat Group

The last 12 months of Internet of Things (IoT) forecasts and market estimates have suggested that there are increased expectations for scale, scope and return on investment from IoT initiatives.

This increase is being advanced in under developed rural areas around the globe. As potential business benefits and profitable outcomes are what drive organizations to experiment with technologies, IoT and M2M are an easy choice, as their business benefits have now been well established.

Accordingly, it is not surprising that significant investments are being witnessed in large-scale initiatives. Data connectivity is quickly permeating industries across the board and the expectation is that there will be an increase in demand for quite some time to come.

It's Happening.
Companies within almost every industry are starting to improve their processes, increase their efficiencies, decrease their costs, and drive their revenue growth by making use of M2M / IoT services.

Major companies around the world are using real-time data as a way of streamlining operations and saving costs. Take a look at the following two examples:

- *Intel saved US$9 million by integrating IoT technology into a Malaysian manufacturing plant*

- *Microsoft cut power consumption by 30 percent by implementing an IoT facility management system*

The global IoT market is expected to reach 50 billion connected things by 2020, with this market dominated by smart cities (26 percent), industrial IoT (24 percent) and connected health systems (20 percent).

Following this trend, the satellite M2M / IoT market is expected to grow at a faster pace than any other satellite segment and will reach 5.96 million (12 percent of total M2M connected devices) via satellite connected terminals by 2020.

Globalsat Group expects Latin America (LATAM) to lead the satellite IoT / M2M growth trends as that region brings together three key conditions:

1. *Many geographic areas throughout LATAM possesses large populations that are currently underserved by traditional, land-based*

telecommunications infrastructure, which, in and of themselves, present costly maintenance challenges

2. *LATAM countries are seeing a surge in increased economic activity and, as a result, companies are looking as to where they can best invest their budgeted dollars in communication and information technology*

3. *Small business owners, even in the most rural and backwards territories, are also coming to understand the value of real-time connectivity to their data*

With a compound annual growth rate (CAGR) of 19.9 percent, the IoT market will provide new growth and opportunities for mobile satellite service providers that have struggled with the stagnant development in the satellite phone market. Current and upcoming satellite capabilities will be better used in real-time data collection and asset monitoring rather than traditional voice services. The main M2M application verticals in LATAM are as follow:

- *Energy consumption monitoring*
- *Smart monitoring of asset levels*
- *Wide area controls such as vehicle/device management*
- *Employee tracking and safety through wearables*
- *Business process automation*
- *Product usage monitoring and smart security management*

However, there is far more to this market segment than only automation.

Today's companies are thriving on optimization by increasing the transfer and processing of big data into useful information they can use to make timely decisions. It is not enough anymore to have access to data after the fact; what used to be a competitive advantage for leading edge companies in the most developed countries is now becoming a competitive necessity that can be attainable by most companies. This means even more demand for constant and reliable mission-critical connectivity that can provide timely and useful information

Globalsat Group expects Brazil to lead M2M growth in the LATAM region, and the company is prepared to assist a growing number of customers to make use of this technology in the most cost-effective manner.

Toward this end, the company's presence in Brazil has been increased. The firm has recently moved into a new state-of-the art facility in Brazil that symbolizes the firm's commitment to the region and to boosts sales and client-care capabilities. Similar plans are in the works for the company's offices in other regions, such as Chile and Colombia where significant M2M growth is expected and where Globalsat Group already has developed considerable relationships with key government agencies and businesses.

Any successful strategy in the world of M2M / IoT today needs to include handing over as much control as possible to the client. This philosophy has been embraced by the firm, as it aligns perfectly with the company's policies and long standing tradition of providing self-service capabilities in order for customers to manage their own assets through highly functional and secure online dashboards.

Also, in a service-oriented company such as Globalsat Group, an important part of delivering highly customized and resilient solutions is the capability to monitor and adapt services in real-time. In this regard, a new 7x24 NOC has been installed at the company's most recently opened offices in Brazil. This allows the group to showcase an unprecedented level of service monitoring and control, which is also available for the regional customer base, thanks to AirtimeSat.

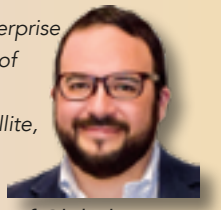
The AirtimeSat platform allows Globalsat Group's customers to have an increase level of granular hands-on experience which includes activation, establishing credit control perimeters, usage alerts and monitoring capabilities for M2M / IoT services, as well as traditional data and voice satellite services.

The company believes this approach is key to success in today's rapid mission-critical business environment, helping clients transition toward an increasingly satellite-connected landscape — that's better for them, better for us... and better for the world.

www.globalsat.com/

References

Inmarsat Research Program, The Future of IoT in Enterprise
2017 Growth Enabler, Market Pulse Report, Internet of Things (IoT)
Northern Sky Research (NSR) "M2M and IoT via Satellite, 7th Edition M2M report; GSMA Intelligence



J. Alberto Palacios is the Chief Executive Officer of Globalsat Group, the first pan-American group to provide Mobile Satellite Services (MSS). Mr. Palacios is well known for his extensive experience in the industry with particular focus on emerging countries.

The Perfect Combination...

Satmotion and smart antennas

By Alvaro Sanchez, General Manager, Integrasys

Seems as though, these days, satellite is considered a difficult to use communications solution; many users consider satellite as a last resource — however, satellite has its own set of advantages when compared to any other communications solution and, at Integrasys, the company offers a key piece of advanced technology to "simplify satellite".

Antennas need to be certified before they can become operational — from time to time, antennas are required to be calibrated. Integrasys offers a set of tools for auto-commissioning and maintenance for Satellite-on-the-Move (SOTM) and Satellite-on-the-Pause (SOTP) antennas through user interaction via a cool app.

Multiple service providers have demanded even more automation and Integrasys built a custom API for integration within the antenna control unit itself.

VSAT installation is a complex task. Often, the technician handling the install does not have the qualified training and knowledge to complete this work. Pointing to the correct azimuth, elevation and polarization is crucial — these specifications are often not met during VSAT installation. That inaccuracy drives severe interference and generates multiple attenuations and service failures due to the attendant atmospheric events and human factors that occur that are the result of an incorrect installation.

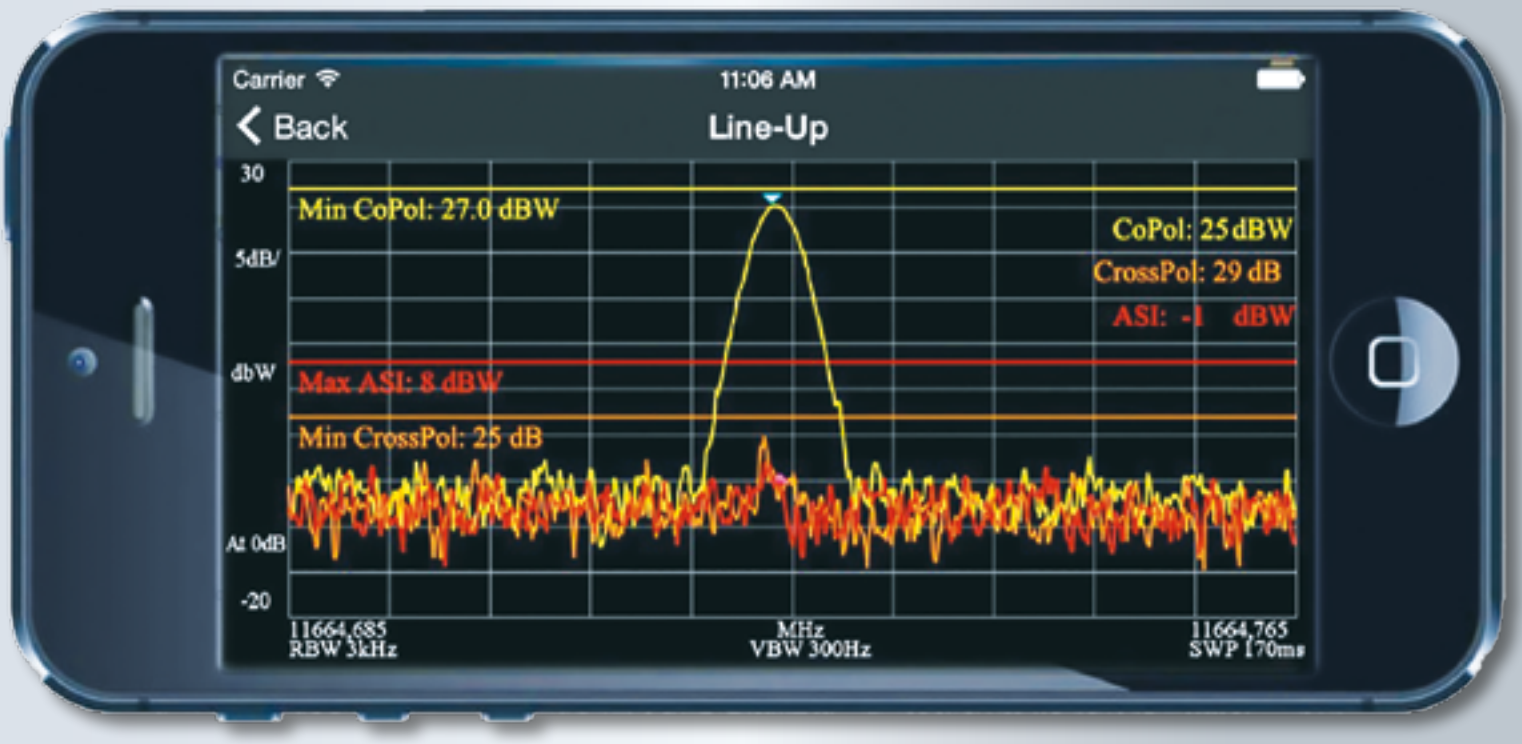
The smarter the antenna gets, the easier the pointing... however, no matter how intelligent antennas become, they still cannot certify themselves or complete the correct measurement procedures. As satellite operators demand full compliance with their specifications, the human element is required to ensure the reliability and viability of a VSAT installation.

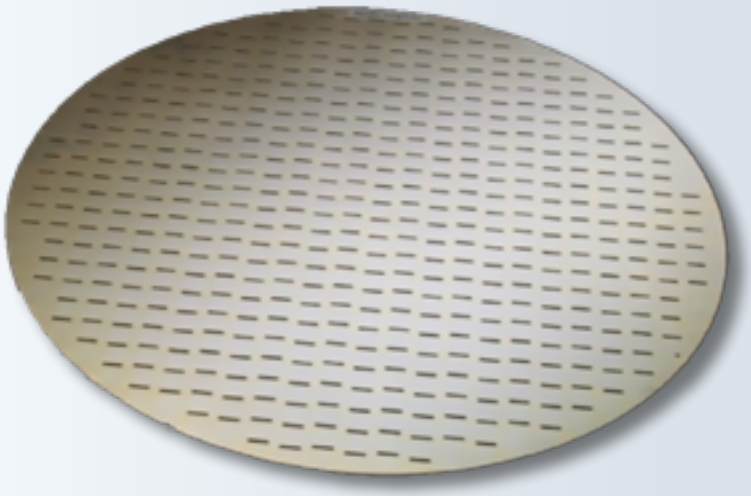
Smart antennas function like computers, automatically pointing the antenna to the target satellite. In many cases, this is accomplished with decent accuracy and reception is locked in for the VSAT.

If the signal decreases in power, the motor or software looks for alternatives and searches for a satellite visible for a connection. The antenna has an autonomous computer system to obtain the most effective communication pathway.

However, terminals can be quite remote and tend to have their RF settings misconfigured and that results in the unit not being able to connect the network to the target satellite.

Introducing Satmotion from Integrasys, a grand solution to these problems. Satmotion is a helpful device that optimizes the power of the transmitter and negates interferences or RF misconfiguration.



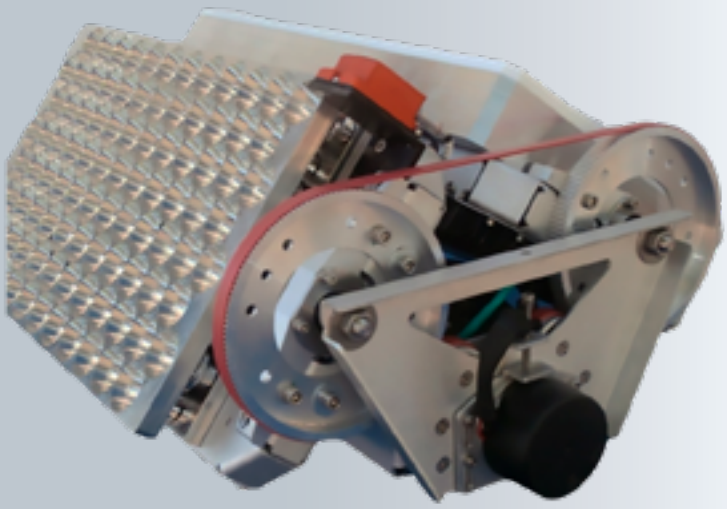


Satmotion has high end equipment at the hub which replaces Network Operations Center (NOC) personnel as well as incorporates a new API (Application Programming Interface) that replaces the physical installer.

Integrasys' Satmotion is an unmanned solution for calibrating a particular antenna with any BUC, in any frequency and certifies satellite providers with the correct Crosspol and 1dB Compression Point test. This functionality saves a great deal of time and drives cost savings — obviously good news for any company.

As mentioned, Integrasys developed the API that enables auto-acquire antennas to auto-certificate themselves. The company provides a simple, embedded PC that runs simple code with which any antenna is able to understand and interact.

The Satmotion API provides pointing accuracy, CrossPol Isolation, Adjacent Satellite Interference Power, 1dB Compression Point and PASS /FAIL results.



This product affords one-touch commissioning (OTC) and enables anyone to complete this process with the press of a single button. The terminal is registered into the target network just as an Apple iPhone is registered in a terrestrial network, all completed seamlessly.

The information is displayed form either a small, USB-sized computer — Integrasys also provides a cost effective option to install the computer on the antenna ACU (Antenna Control Unit). Both options are offered to customers who demand varying requirements for different applications, such as maritime, aircraft, trains or connected cars.

Satmotion is the perfect solution for automating access to the satellite in a manner that is similar to an iPhone being authenticated in a cellular network. Any interference or misalignment issues are negated. Satmotion adds extra value, thanks to reducing the time previously required for VSAT install. The app also provides more and more finely tuned information.

The product's quality, price and unique position are making this offering the standard de-facto on the market as the VSAT auto-commissioning solution... making "***satellite simple***."

www.integrasys-space.com/

The author, Alvaro Sanchez, is the General Manager of Integrasys.

Satellite IoT...

The solution to global connectivity challenges

By Amruta Joshi

The projected growth in the Internet of Things (IoT) can potentially transform numerous applications and end-user markets through the application of this technology.

In the context of satellite communication (SATCOM) choices, the global market is expected to grow at a rapid pace. IoT relies heavily on connected devices, networks as well as the Internet. However, most importantly, IoT relies on SATCOM technology.

IoT has played a pivotal role in developing global economies by connecting businesses, devices, and services. While numerous consumer-centric devices use terrestrial-based mobile or cellular networks, business-centric applications sometimes require greater reliability.

Satellite technology can offer such needed reach and consistency. The rising adoption of IoT in business will drive the importance of SATCOM over the years to come.

Five Advantages of SatIoT

The rising deployment of wireless communication and data transmission systems in the home as well as for industrial applications is creating high demand for IoT and satellite technology.

In the recent past, satellite swarms and constellations have witnessed rapid evolution owing to a variety of space-based innovations. Yet, all realize that there are various areas where mobile networks cannot reach end-users.

At such remote locations, deployment of satellite is the easiest and the most cost effective solution at hand. This factor has made IoT ubiquitous across numerous business processes.

Here are some of the major advantages of satellite Internet-of-Things (satIoT):

#1 — Reliability
Network congestion and locational and environmental conditions can hinder the effectiveness of any cellular network, which brings SATCOM into play, especially outside the boundaries of an urban area. SATCOM provides an enhanced reliability factor that is a dealmaker for many business processes and industries, such as oil and gas, agriculture, automotive, and the energy market segments, among others. Satellites offer redundant and consistent channels for crucial, uninterrupted connectivity.

#2 —Proximity
While various options such as private RF networks and cellular towers, are available when it comes to communication in remote areas, most of them are quite costly and time consuming when it comes to the deployment of the required infrastructure. SatIoT, on the other hand, simplifies the issues regarding deployment. This is a huge advantage for small and medium businesses seeking stable sources for their communications and networks.

#3 — Lifecycle
Another essential aspect that makes satellite-based IoT a winning environment is the longevity of the networks when compared to mobile networks. Some satellite networks have lifecycles that last as much as 20 years — this is of vital consideration when deploying a network that requires stability and durability over the long term.

#4 — Multicasting
Owing to technological advancements, satellite-IoT can send large amounts of data to numerous users simultaneously. The large beam size and ability to distribute data across multiple units make these networks a cost-effective option in business settings. The ability of satellite networks to multicast is advantageous when it comes to deployment across large organizations and their separate offices.

#5 — Coverage
Coverage determines the value proposition for most organizations selecting satIoT over other connectivity options. A broad range of technological innovations are further anticipated to encourage the installation of these networks in the near future.

The New Focus of Enterprises
Satellite networks are increasingly being adopted in enterprise domains. This factor is likely to create novel opportunities for the adoption of satellite gateways, such as hybrid Low-Power Wide-Area Network (LPWAN).

These gateways bring connectivity to remote areas. The sweet spots for hybrid satellite-LPWAN systems are remote locations that lack cellular and other terrestrial communication networks.

These services use underground penetration or buildings to provide the required connectivity to the remote areas. Internet giants such as Google, Apple, Facebook, and LinkedIn, among others, are adopting this option for global proliferation of their services. This trend is reflected by the rising demand for data bandwidth on global scale.

However, the cost for backhaul is expected to keep increasing, with the struggle for the network operators being the absorption of these additional charges to ensure ongoing service to their customers. This factor is reducing profit margins for many.

Tech giants and other players are on the lookout for new business models for end-to-end networking and a new charging pattern based on a per-connected LPWA device. The new solutions can deliver better system and autonomy in the industry through the support of cost-effective and power efficient devices with direct connection to IoT. This is possible through the use of satIoT and supportive devices that can offer the much needed terrestrial connectivity.

Apart from enterprise settings, satIoT finds applications in a variety of industrial sectors. Reduced costs are expected to boost the adoption of satIoT across multiple industries such as healthcare, agriculture, civil engineering, and logistics, among others.

Essential Industrial Applications of SatIoT

Healthcare
Healthcare is anticipated to offer a promising future for the satIoT segment. Innovations like smart bandages enabled with IoT sensors can be a major boon for the industry, especially across developing markets such as Asia Pacific, Latin America, and the Middle East and Africa.

Satellite IoT and M2M are being used to generate advantages such as reduced cost, advanced data analytics and improved management of patients and healthcare providers. Along with developed economies, this factor is anticipated to bode well for the adoption of IoT across developing regions.

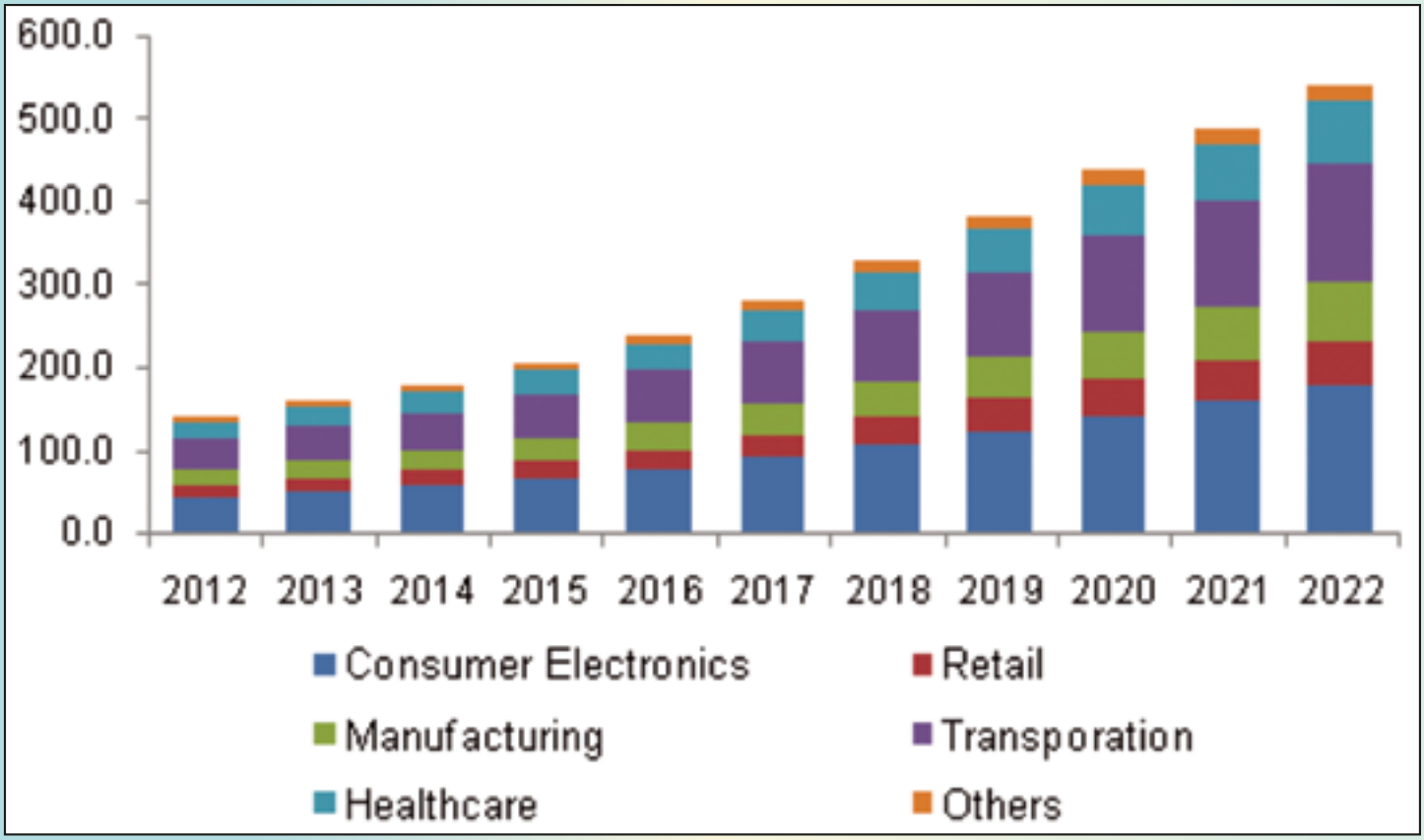


Figure 1. Essential Industrial Applications of Satellite-IoT
North America IoT market revenue by application, 2012 - 2022 (USD Billion)
Image Source: www.grandviewresearch.com

Expanding healthcare services for remote areas and government funding for diagnosis and treatment of serious illnesses across these remote communities can boost business opportunities for any number of key players.

Agriculture

Increasing yield, productivity, and quality of crop are the primary agendas for the agriculture sector.

Internet of Things in agriculture can assist in reducing capital costs and enhancing distribution and storage. Across the developed markets of North America and Europe, deployment of IoT can create growth opportunities for satIoT in the years to come, especially for the end-user who is in need of thousands of sensors and IoT devices. Rising adoption of precision farming and smart farms can further drive the deployment of satIoT.

Satellite-IoT Value Proposition for Future

The entire value chain for IoT is dominated by some of the top players in the industry, such as Vodafone, Telefonica, SES, Eutelsat, MDA, and Orbital ATK, among others.

Along with Research and Development (R&D), Mergers and Acquisitions (M&A) and business collaborations seem to be the go-to strategies for a majority of the top actors. Businesses are focused on developing advanced products and services to design and develop innovative services that can offer value proposition as far as satIoT is concerned. These value propositions include:

- *Cost-effective*
- *Energy efficient*
- *Excellent coverage*
- *High security*
- *High speed*
- *High-availability*
- *Highly reliable*
- *Internet of everything, everywhere*

In a recent turn of events, SAT2M2M and Fujitsu Electronics announced they will be collaborating to develop a dedicated module that will offer satIoT services. The two companies will collaborate on the design, production, and development of novel IoT low power, wide area (LPWA) modules. These modules can enable LEO SATCOM. The modules will be able to serve thousands of connected objects and can distribute numerous IoT messages each day.

Grand View Research, Inc., suggests that the global market for IoT will attain approximately USD$1.88 trillion by 2022. The increasing popularity and adoption of connected devices is poised to substantially propel the global IoT market.

From connected cars, home appliances, smartphones, and navigation systems, to connected homes, IoT can offer numerous advantages to consumers as well as IoT vendors. Satellite technology often plays a crucial role in the development and deployment of IoT. This factor is likely to trigger business collaborations and investments in research and innovations. Expect an integration of hybrid networks that combine satellite, mobile and wireless networks.

The demand for L-band and other narrowband providers is relatively high. Vendors are focused on developing satellite technologies that are more accessible for a larger consumer base. Innovation is the key to improved ability and access to IoT based on satellite technology.

Most market leaders are investing in meta-material-based antenna-technologies and are collaborating with such providers. Improving bandwidth is a vital focus area for companies, which is quite evident from the rising adoption of LTE networks and hybrid technologies. Hybrid networks can help achieve global coverage and, in example, allow vehicle manufacturers to manage all of their vehicles via a single network.

IoT and Satellite Technology

Rapid adoption of IoT-enabled devices and automation across healthcare, agriculture, building and construction, oil and gas, transportation has made IoT a growing and dynamic industry.

India, Japan, and China are some of the major regional drivers for this technology. These regions are home to the major manufacturers of vital components, devices and technologies. Hence, the Asia Pacific region is anticipated to witness the fastest growth in the coming years, both in terms of revenue and demand.

The rise in low bandwidth applications can further impel adoption of this technology throughout the years to come.

www.grandviewresearch.com/

Amruta Joshi is a Content Writer specializing in varied industry verticals including personal care, healthcare, chemical and technology. Her work includes market research and writing blogs, PRs, guest posts, etc,. on all the latest innovations and up-to-date events in her field. She has also freelanced for an IT and software firm and has also worked as a full-time Copy Editor for a renowned German publisher — STM books.

Grand View Research, Inc. is a U.S. based market research and consulting company, registered in the State of California and headquartered in San Francisco. The company provides syndicated research reports, customized research reports, and consulting services. To help clients make informed business decisions, they offer market intelligence studies ensuring relevant and fact-based research across a range of industries, from technology to chemicals, materials and healthcare.

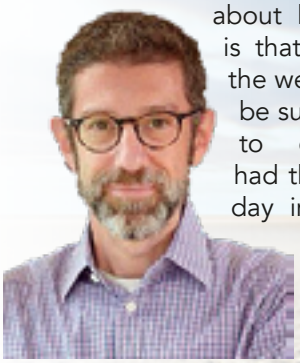
AN MSUA LEADERSHIP INTERVIEW

with Andrew Faiola, Director, Mobility Solutions, EMEAAP, Intelsat

By Catherine Melquist, President, Mobile Satellite Users Group

Catherine Melquist (CM)
Andrew since you're living and working in London, I need to first ask you about the weather. How is it today?

Andrew Faiola (AF)



One of the great things about living in London is that no matter how the weather is, you can be sure it is just about to change. We've had the warmest April day in 70 years, and are just about to receive a months' worth of rain in one day. There is no such thing as bad weather, just bad clothing choices!

CM
*Moving forward, I especially enjoyed the recent panel you moderated, "**IoT on the Road: Connected Consumer Vehicles, OTT, and the Self-Driving Car**", with panelists from Kymeta, Globalstar, Strategy Analytics and Aptiv. As Intelsat's Director of Mobility Solutions for EMEAAP, does the Connected Car and IoT program fall under your remit? What are your other priority areas of focus for the mobility business?*

AF
From a sales standpoint, yes, it does. My responsibilities cover just about anything that requires a remote stabilized (or electronically steered) antenna for operations.

Maritime and Aeronautical are more mature, but we are starting to focus much more attention on Land Mobile — and that can be anything from the Connected Car to Rail to Agriculture — due to several technology innovations that are now making those segments possible to serve with broadband connectivity.

CM
Thinking back to the panel, what were your key take-aways from the discussion about IoT and the Connected Car and was there anything mentioned that surprised you?

AF
Both at the panel and over the course of the last year, I have been pleasantly surprised with the traction that satellite has gained in terms of acknowledgement that it must be part of the connectivity landscape for Connected Cars.

However, in the words of Arthur C. Clarke, "A*ny sufficiently advanced technology is indistinguishable from magic.*" If we as an industry want to play a meaningful role in connecting the Connected Car, we need to integrate into the vehicle and with terrestrial networks seamlessly.

CM
One thing that interested me was the notion of cities becoming a new data customer for car companies. I believe it was Jada Tapley, from Aptiv, who suggested that data captured by connected cars could provide real-time traffic updates to cities that they could use to control traffic lights and flow patterns. And, in anticipation of this, Aptiv has purchased several data processing companies that are working on capturing and packaging data for potential new customers types.

Given MSUA's focus on mobility market development, are you aware of other prospective new customer types coming from the connected car or other IoT applications?

AF
No matter what the platform, whether an automobile or other vehicle, they are generating masses of data like never before. This creates challenges as well as opportunities. As a communications industry we need to identify those companies who are working on ways to not only transfer data, but who also have the expertise to analyze it and act on the results.

CM
Also in reference to the connected car, Jada mentioned that different user groups (e.g.. Operators, Tier 1s, OEMs and Consumers) want to own different aspects of the end-to-end connected car system. For example, OEM's want to own the "engine operations" and the "HMI (human machine interface) or customer experience". What aspect of a connected car system does an operator, such as Intelsat, want to own?

AF
Traditionally, it has been other parts of the satellite industry that have been touching Connected Cars — GPS and satellite radio, and to a much lesser degree, narrowband L-Band services.

Now that satellite and antenna performance is increasing so rapidly, there is a real opportunity to package a hybrid connectivity solution for automobiles that incorporates GEO and LEO satellites, as well as terrestrial wireless, into a seamless, ubiquitous network so that vehicles are connected and have access to services wherever they are located.

CM
Let's shift back to a broader view of market development. What other market segments do you believe are ripe for satellite mobility solutions and why?

AF
As I mentioned earlier, Maritime and Aeronautical are rapidly maturing, but there is still a lot of growth from both existing ships and aircraft, as well as new builds. However, in terms of greenfield opportunities, I am a firm believer that the correct hybrid network business model and lower-cost terminals can unlock tremendous near-term opportunities in rail and long-distance bus services, as well as agriculture and construction.

CM
Any emerging new or unique use cases for mobile satellite connectivity in the regions you oversee? Any new or unique challenges that stand out?

AF
Certainly in Europe as well as in parts of Asia, where train travel is much more prevalent than in many parts of the world. Many high-speed, long-distance services advertise WiFi, which is often provided free of charge.

It is typically free because the service is terrible. Augmenting terrestrial wireless with satellite would enable train operators to provide a new, much higher-quality level of service for their customers that would enable new business models to be exploited. But, certifying antennas for use on rail is no easy task, and those antennas must also be flat in order to fit under tunnels. Opportunities for certain, but numerous challenges remain to be overcome before this segment can be unlocked.

CM

What new innovations (e.g., LEO constellations, terminal innovations, data analytics and / or cybersecurity applications, etc.), are you most eager to see come to market with the hope of spurring new growth in the EMEAAP region?

AF

I've already mentioned a few, but I am looking forward to a trifecta of complementary technologies — broadband LEO systems to augment look angles in urban areas and northerly latitudes from OneWeb and others, truly cost-effective electronically steered antennas from Kymeta and others, and the bonding and aggregation technology to tie it altogether such as we are seeing from companies such as Dejero Labs.

CM

Andrew, you've worked for Intelsat and in the satellite industry for many years. How did you get involved in satellite and what's your career path been?

AF

This may sound corny, but growing up in the Washington, DC area, one of my formative experiences was watching the nightly news updates for STS-49, the maiden voyage of the Space Shuttle Endeavour. This was the famous Intelsat 603 re-boost mission.

I've always been a bit of a space geek, but that pretty much sealed my desire to get into the aerospace industry. During grad school, I had a chance to intern at NASA, then wound up working for a start-up teleport operator where I was consulting for a number of first-wave LEO constellations, and then onto NewSkies Satellites, and now here I am at Intelsat.

CM

Careers in satellite tend to lead to interesting travel and people-meeting opportunities. Have you had a stand-out event or experience along the way?

AF

I think that this is one of the reasons why the satellite industry seems to have its own gravitational pull. Once you're in, you're in!

You are correct that there have been many opportunities to travel to weird and wonderful places and meet weird and wonderful people! One standout memory for me would be getting to experience a launch in Baikonur in the dead of winter. It's hard to forget standing directly on the launch pad in -30C weather while a Russian Orthodox priest blessed the Proton rocket with holy water that froze before it hit the launch vehicle.

CM

My final signature question — also a personal one — what is your favorite form of recreational mobility when you're not at work focused on satellite mobility?

AF

I like keeping mobile with my own two feet. I'm a fair-weather runner, and I'm not the fastest, but I do like to get out there. Over the past couple of years, I've started to try to travel around Europe for the odd 10K or half-marathon. There is a real buzz from soaking up the atmosphere, sights, and camaraderie of a race in a totally unfamiliar place.

CM

Andrew, it has been a pleasure to re-connect with you. Thank you for taking time to share your thoughts and perspectives.

President of the Mobile Satellite Users Association, Catherine spearheads the group's mission to promote mobility market development and mobility innovation. With over 25 corporate and small business members representing all levels of the satellite value chain as well as end-users, MSUA collaborates with conference organizers around the world to facilitate panels and keynote speakers that decipher mobility market dynamics including: growth opportunities, strategic partnership, barriers to progress, application aspirations, adjacent market influences and more.

Catherine Melquist is a strategic marketer with more than two decades of experience developing marketing and public relations strategies for global companies in the satellite and space-based market.

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