

Worldwide Satellite Magazine – November 2015

SatMagazine

MENA + THE WORLD

**HTS KNOCKING ON
YOUR DOOR**

FAIRING WELL, INDEED

**SATISFYING MENA'S
CAPACITY NEEDS**

**EVOLUTION + IMPACT
OF ULTRA HD**

**HTS NETWORKS
TAKING OFF...**

**SES TECHCOM'S
BETHSCHEIDER**

**THE VALUE OF
SATELLITE RADAR**

THE NEW "NEW"...

**CONNECTING WITH
COMMUNITIES**

**FOSTERING THE
NEXGEN IN SPACE**

**FROM HUMBLE
BEGINNINGS...**

**A MAJOR
CELEBRATION...**

**The launch of Turksat-4B.
Photo courtesy of International Launch Services.**



SatMagazine

November 2015

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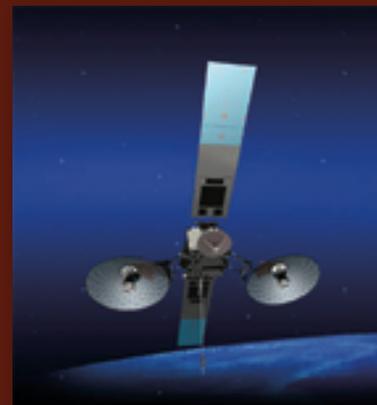
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InfoBeam: ULA To Launch TDRS-M Mission

NASA has selected United Launch Services LLC of Centennial, Colorado, to provide launch services for the agency's Tracking and Data Relay Satellite-M (TDRS-M) mission.



The mission will launch in October 2017 aboard an Atlas V 401 rocket from Space Launch Complex 41 at Cape Canaveral Air Force Station in Florida.

The total cost for NASA to launch TDRS-M is approximately \$132.4 million, which includes the launch service, spacecraft processing, payload integration, tracking, data and telemetry, and other launch support requirements.

TDRS-M will join other TDRS spacecraft of the NASA Space Network, which provides voice, data, video and telemetry services for low-Earth orbiting satellites, such as the Hubble Space Telescope, the International Space Station, weather and environmental monitoring satellites.

The Space Network also captures real-time telemetry data from expendable vehicles during launch and early orbit. Customers using data from scientific satellites can also take advantage of TDRS-M. Signals will be sent through the primary TDRS ground station located in White Sands, New Mexico.

NASA's Launch Services Program at the Kennedy Space Center in Florida manages and oversees the Atlas V 401 launch services for TDRS-M. The TDRS Project at Goddard Space Flight Center in Greenbelt, Maryland, manages TDRS-M spacecraft development for the agency's Human Exploration and Operations Mission Directorate in Washington.

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Smallsats = Huge Potential

For a thorough immersion in the smallsat market segment, consider attending the upcoming, two-day and extremely important SmallSat Symposium.

This highly informative symposium will be conducted on Tuesday, February 23, and Wednesday, February 24, 2016.

The event will occur at the **Hogan Lovells Conference Center** in Menlo Park, California, and is sponsored by Satnews Publishers and Hogan Lovells.

For further details and to register, please visit www.smallsatshow.com/?page_id=18



TURKSAT 4B Travels Safely To Orbit



International Launch Services (ILS) has successfully launched the TURKSAT 4B satellite into orbit via an ILS Proton launch vehicle.

The satellite was built by Mitsubishi Electric Corporation for Turksat Satellite Communication, Cable TV and Operation Inc. Co. (Turksat A.S.), one of the world's leading operators in the satellite communication business.

This was the 2nd Proton launch for both the satellite operator and the manufacturer; it was also the 6th Proton launch of the year.

The ILS Proton Breeze M vehicle launched from Pad 39 at the Baikonur Cosmodrome at 02:40, local time, on October 16 at 16:40 ET.

The first three stages of the Proton used a standard ascent profile to place the orbital unit (Breeze M upper stage and the TURKSAT 4B satellite) into a sub-orbital trajectory. From this point in the mission, the Breeze M performed planned mission maneuvers to advance the orbital unit first to a circular parking orbit, then to an intermediate orbit, followed by a transfer orbit, and finally to a geostationary transfer orbit.

Separation of the TURKSAT 4B satellite occurred approximately 9 hours and 13 minutes after liftoff.

TURKSAT 4B will provide telecommunication and direct TV broadcasting services over a wide geographic region between west of China and east of England, spanning Turkey, as well as Europe, Central Asia, the Middle East and Africa.



Launch of TURKSAT-4B photo is courtesy of International Launch Services.

TURKSAT 4B is a multi-band satellite with an expected on-orbit maneuver lifespan of 30 years. The satellite will provide high flexibility of switchability and connectivity among different service areas to its customers.

The satellite weighed more than 4.9 metric tons at liftoff and is the ninth satellite built on Mitsubishi Electric's DS2000 platform, a fully proven modular platform with the flexibility to handle a broad range of payload applications. The launch was carried out under a turnkey contract awarded by Turksat Satellite Communication, Cable TV and Operation Inc. Co. (Turksat A.S.) in 2011.

This was the 91st ILS Proton Launch and the 407th launch for Proton overall since its maiden flight in 1965. The Proton Breeze M vehicle is developed and built by Khronichev Research and Production Space Center of Moscow, one of the mainstays of the space industry and majority shareholder in ILS.

This was the ninth launch of a satellite based on Mitsubishi Electric's DS2000 satellite platform. All DS2000 satellites in orbit, including the TURKSAT-4A launched last year, continue to operate stably. Mitsubishi Electric plans to launch seven more DS2000 satellites by 2017.

ILS President Kirk Pysher said, "This is the second ILS Proton launch for Mitsubishi Electric and Turksat, following the launch

of TURKSAT 4A in February of last year. It has been an honor to be entrusted with these important satellites and to ensure their safe delivery to orbit. The teams at Mitsubishi Electric, Turksat, Khronichev, and ILS are to be commended for their tireless work and dedication."

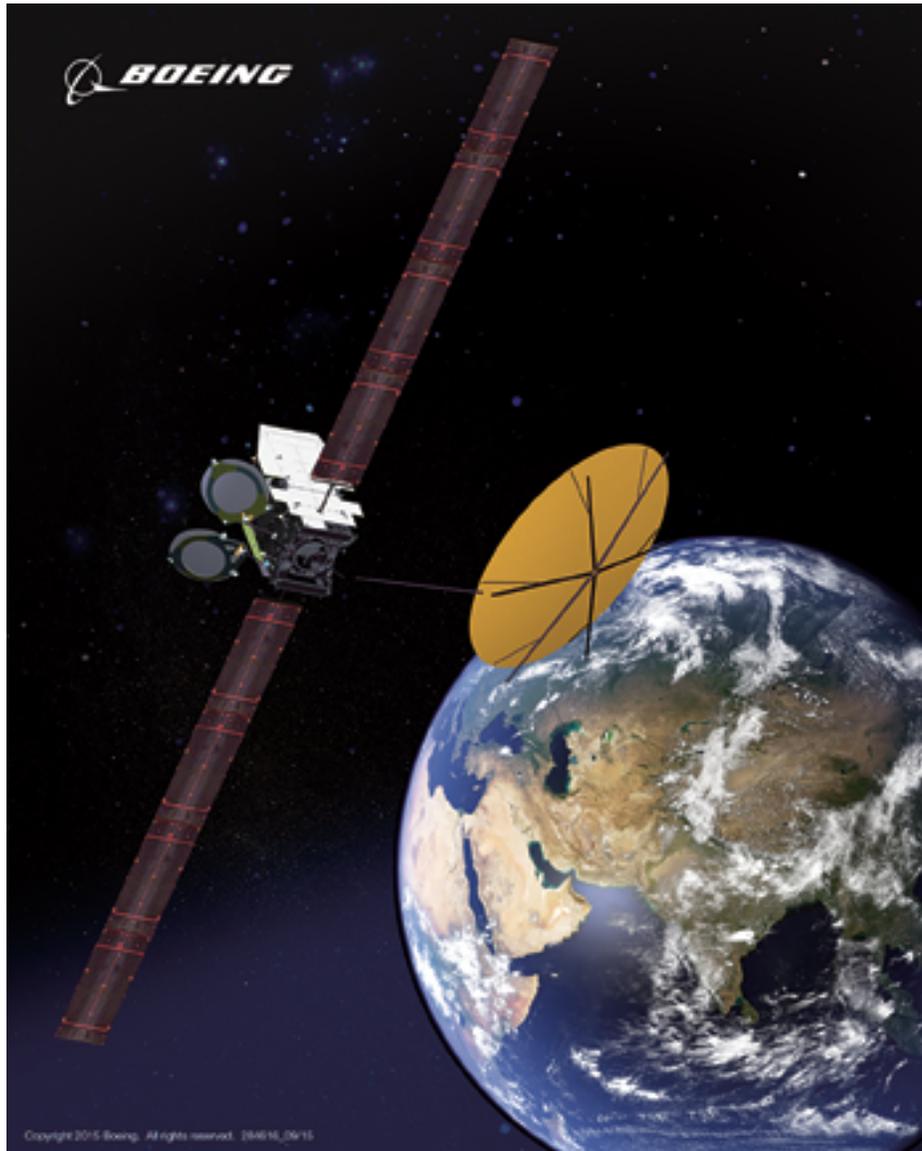
Professor Dr. Ensar Gul, Turksat A.S. CEO and Chairman of the Board, said, "The TURKSAT 4B satellite will enhance our direct TV broadcasting services over a wide geographic region including Turkey, Europe, Central Asia, the Middle East and Africa. This additional satellite capacity from TURKSAT 4B, enabled by ILS Proton, is a significant milestone achievement. We are grateful for all of those who worked diligently to ensure mission success."

Mitsubishi Electric General Manager of Space Systems Division, Yasunori Kamochi, said, "Our first Proton launch with ILS last year was flawless; we are very pleased that our second launch with TURKSAT 4B was equally as successful with an extremely smooth mission and execution of the launch."

ilslaunch.com/

turksatkablo.com.tr/

Boeing's Silkwave-1 Satellite Set For 2018 Launch



A Boeing 702 satellite will expand multimedia communications for mobile users in China, India and other markets in Asia when the craft enters service in 2018.

New York Broadband LLC (NYBB) is procuring the satellite, and will lease capacity to CMMB Vision to provide a comprehensive suite of media and information services to Asian customers.

Silkwave-1 will eventually take the 105 degrees East slot currently occupied by NYBB's AsiaStar spacecraft, along with its L-band spectrum rights.

Silkwave-1 will offer 100 times greater transmission power than the AsiaStar spacecraft being replaced.

A variant of the flight-proven Boeing 702 satellite family, Silkwave-1 will be equipped with highly efficient solar cells, generating 14 Kw of power and carrying a 9 meter reflector.

The Silkwave-1 is scheduled for launch in 2018, with the launch service provider to be determined by NYBB. Based in Denver, Colorado, New York Broadband owns and operates 12 UHF television stations in the United States.

CMMB Vision, based in Cyberport, Hong Kong, is a next-generation mobile multimedia service provider and a principal developer of leading mobile technologies as well as broadcast-unicast convergence technology.

CMMB stands for, "Converged Mobile Media Broadcasting," the mobile handheld TV technology standard in China.

"NYBB and CMMB Vision are breaking new ground in mobile media services," said Charles Naumer, managing director of NYBB. "With the finalization of this contract with Boeing for a 702 satellite, we have significantly moved forward in making next-generation mobile communications widely available in Asia."

"With this new Boeing satellite, Silkwave-1, we will realize a vision to deliver quality multimedia capabilities to the consumer on the move," said Charles Wong, chairman and CEO of CMMB Vision. "Video, voice, data and other new digital media will become more readily available than ever before along the Silk Road of Asia, one of the most historically significant routes for commerce in the world."

"The new Silkwave-1 spacecraft is designed to support broadband multimedia broadcasting to mobile users," said Mark Spiwak, president of Boeing Satellite Systems International. "It will have dedicated beams over China and India and a steerable beam over other Asian countries for independent services for different regions. This optimizes power based on regional needs and multiplies the overall bandwidth delivery capacity."

boeing.com/space/

Jilin-1 Jumping Off For China



On October 7, China launched a group of four, indigenous, remote-sensing satellites for commercial use, which official media said is an important step in the development of space technology.

The Jilin-1 satellites, launched from the Jiuquan Satellite Launch Centre in northwest China's Gansu Province, include one optical remote-sensing satellite, two satellites for video imaging and another for imaging technique testing, state-run Xinhua news agency reported.

All four satellites were developed and produced by Chang Guang Satellite Technology. The company will also take charge of commercial operations of the satellites to provide remote-sensing data and relevant products, which may be used for the monitoring, development, and surveying of resources as well as mapping and disaster prevention for domestic and overseas clients.

These satellites were carried aloft by a Long March-2D rocket. This is the 213th mission completed with a Long-March-series carrier rockets. Jilin, one of the country's oldest industrial bases, is developing its satellite industry as a new economic driver.

Chang Guang Satellite Technology, sponsored by the Jilin provincial government, the Changchun Institute of Optics, Fine Mechanics and Physics of the Chinese Academy of Sciences and some privately-owned companies, plans to launch 60 satellites by 2020 and 137 by 2030.

"Satellites are no longer far removed from people's lives. In the near future, more information provided by the satellites will be shared,



Illustration of a Jilin-1 satellite.

and more satellite functions will be explored," Chang Guang Satellite Technology board chairman, Xuan Ming, said.

Thuraya Signs On With Crisis Commitment

Thuraya Telecommunications Company—under the umbrella of the EMEA Satellite Operators Association (ESOA) and the Global VSAT Forum (GVF)—has signed a Crisis Connectivity Charter in Geneva.

The Charter was signed with the global humanitarian community represented by the UN Office for Coordination of Humanitarian Affairs (OCHA) and the Emergency Telecommunications Cluster (ETC).

The agreement embodies a commitment from the satellite community to enhance connectivity in humanitarian emergencies, and beyond.

It formalizes terms and protocols designed to accelerate the ability of emergency response teams to access satellite-based communications at times of disaster in 20 high-risk countries identified by the ETC within Thuraya's coverage area.

The principles of the Charter also include increased coordination to enable prioritization of humanitarian Internet traffic during disaster operations; pre-positioned satellite equipment and transmission capacity; and training and capacity building for the humanitarian community across all five continents during the initial phases of a disaster.

The Crisis Connectivity Charter creates an industry-led mechanism, which can be triggered by the ETC, leading to coherent, predictable, scalable and principled implementation of an end-to-end satellite-based response. It opens the door for more coordination among satellite operators, government and humanitarian agencies, thus allowing the humanitarian community to more

effectively plan, refine and ultimately improve its response to disasters.

Samer Halawi, CEO, Thuraya, said, "Our purpose at Thuraya is to save and improve lives, and this shapes how we think as a

business. So it is an exciting prospect to be able to save even more people, which the Charter will make possible. It is a humbling responsibility too, knowing that the best deployment of our technology can help people in their greatest need."

SatHealth™ Solutions From Thuraya + DigiGone With DigiMed

Thuraya Telecommunications Company has teamed with DigiGone to launch the communication solution DigiMed, a telemedicine solution to assist teams working in remote areas.

The cutting-edge DigiMed kit allows crucial face-to-face consults to take place between patients and doctors through 'real-time' teleconferencing enabled by Thuraya's portfolio of broadband terminals.

Ideal for workers in the Relief, Marine and Enterprise sectors, the cost-effective solution encrypts high-quality, real-time video using only a fraction of the available bandwidth.

Capable of streaming patient data in real-time and allowing medical professionals to make on-the-spot decisions in emergency situations, DigiMed can be used with the Thuraya IP, IP+, IP Voyager and Orion IP terminals to establish a secure, flexible platform that can be customized to a specific business.



The compact, lightweight, portable kits are designed and built for easy transport and storage and the coverage area includes 161 countries around the world and most major shipping routes.

Randy C. Roberts, Chief Innovation Officer, Thuraya Telecommunications, said, "Our partnership with DigiGone offers a solution that will revolutionize telemedicine and will serve as a vital lifeline for organizations working out in the field or at sea. To develop a solution for people who live, work or travel

in remote areas aligns with our mission to save and improve lives."

Michael Dunleavy, President, DigiGone, said, "Thuraya is a terrific partner, enabling DigiGone to reach more users across their

vast coverage area in need of our affordable and secure solutions for Health, Security, and Operational Support. Combining the extraordinary value of Thuraya with the efficiency of DigiGone delivers enhanced medical care to the remotest of locations at a truly affordable price.

Thuraya's portfolio of broadband data products meets the demands of end-users and is a favored companion of global media organizations, government entities and NGOs, as well as energy and maritime companies requiring a reliable, portable, secure and easy-to-use satellite broadband terminal."

thuraya.com/thuraya-ip

Gilat Is High On X-Architecture For HTS

Gilat Satellite Networks Ltd. announces the launch of X-Architecture for SkyEdge II-c, its revolutionary distributed Architecture to address the growing demands of High-Throughput Satellites (HTS).

The Software-Defined Networking (SDN)-based architecture enables satellite operators and service providers to support mobility, enterprise, cellular and consumer broadband applications and business models from a single platform.

The programmable, cloud-based architecture allows networks of any size, using traditional wide-beam and high-throughput satellites, to deliver managed services in hosted or virtual network business models. X-Architecture was built to support dynamic on-demand services, empowering service providers to broaden their offerings. Unique cloud bandwidth management capabilities enable both mobility and Virtual Network Operators (VNOs) services over spot-beam satellites.

Flexibility is enabled by the distributed architecture, which separates data center functions from baseband elements. The network is easily controlled by a global, unified and centralized network management system, Gilat's TotalNMS.

Total Cost of Ownership is significantly reduced with 1:N inter-beam redundancy, 30 separate VNOs per rack, automatic remote service provisioning, Cloud-VNO over multi-spot beams and SDN/NFV future-ready functionality.

With X-Architecture, satellite service providers can now easily expand their offerings to reach a broad range of up-and-coming markets for high-bandwidth satellite communications, including broadband access, 4G/LTE cellular rapid deployments, hardware and software enterprise VNOs, as well as mobility applications for in-flight connectivity (IFC), maritime and trains.

"We believe that X-Architecture is the only platform on the market capable of realizing

the full potential of HTS," stated Dov Baharav, Gilat's Chairman of the Board and Interim CEO. "In validation of the strength of our technology,

X-Architecture has already enjoyed early success in major deals with leading satellite operators in Europe, China and Latin America.

"Not only do we deliver the most innovative technology, we also are committed to our long-term partnerships with satellite operators and their continued growth with built-in support for next-generation HTS and satellite constellations," Dov Baharav concluded.

X-Architecture for SkyEdge II-c will be unveiled at Gilat's booth (J2) at the China Satellite Conference in Beijing, October 28-30, 2015, and will also be showcased at AfricaCom in Cape Town, November 17-19, 2015.

gilat.com/

Risky Business To Be Addressed — Also, A New Government Space Programs Report From Euroconsult

The World Space Risk Forum (WSRF) announces a strategic partnership with the Paris-based global consulting firm, Euroconsult.

As the leading consulting specialist in the space and satellite finance and risk market, Euroconsult will further underline the WSRF's commitment to the creation of a comprehensive platform for the global space risk community.

Since 2010, the WSRF has hosted a series of events attended by industry-leading space risk experts, including manufacturers, operators, underwriters, space agencies and Reinsurers.

The main forum event will be held in Dubai, November 2016, to coincide with other UAE based announced Space events including Abu Dhabi Global Space Congress 2016.

The alliance with Euroconsult will primarily be focused on developing valuable insights on space risk data, analysis of industry trends as well as providing a global networking platform for the space industry.

All sectors of aerospace, communications, Earth Observation, and other space-related industries, as well as representatives of government agencies, science organizations, academia, in addition to all the major global insurance brokers and underwriter companies, form part of the space risk community. The 2016 WSRF will develop existing and future themes and aims to attract new industry players to the space risk arena.

Identifying the wide range of space risks to be covered, Lucy Gilchrist, Head of the WSRF, said, "We have to open our minds to all the risks that could be out there for our industry, such as economic, geopolitical, technology, legal, regulatory, environmental and societal risks, to share knowledge and greater understanding. This is why we strongly believe in working with Euroconsult going forward. They share the WSRF vision that understanding risk is key to a safer space."

Euroconsult CEO, Pacôme Révillon, explained their decision to support the WSRF initiative, "The space sector is currently in a unique

transition period, which involves shortened innovation cycles and a larger number of public and private stakeholders around the world. These trends result in new opportunities, but at the expense of new risks for space projects. Our strategic partnership will aim at broadening the range of risks addressed throughout the event and across the space community to support the success of future space initiatives."

Additionally, Euroconsult's newly released report, Government Space Programs: Strategic Outlook, Benchmarks & Forecasts, a new growth cycle in government space spending is expected to start and average 2.1 percent over the next ten years worldwide, reaching \$81.4 billion by 2024.

"Despite budget cuts, governments should maintain high launch rates over the next decade: 856 government satellites are planned for launch between 2015 and 2024, a 32% increase from the last decade, driven by civil Earth observation, communications and satellite navigation missions," said Steve Boehinger, COO at Euroconsult and editor of the report. "242 defense satellites are expected to be launched over the next 10 years, an 11 percent increase compared to the past of which 40 percent will be launched for the U.S. government."

The report assesses key economic and program trends for each major space application, which include:

- » *Earth observation programs received \$10.9 billion in 2014, becoming the first application area after eight years of continuous growth driven by the combined investments of 52 countries.*
- » *Manned spaceflight comes second with \$10.8 billion in 2014, invested by only seven countries plus the European Space Agency. Budgets stabilized over recent years as the ISS program transitioned from development to exploitation phase.*
- » *The development of launch vehicles has received \$7.4 billion, growing at an average of 9% over the past ten years driven by investments required for next-generation launchers. Due*

to the high and long-term development costs, launchers can represent between 15 and 50 percent of an agency's budget.

- » *Satellite communications programs totaled \$5.9 billion in 2014, decreasing by 37% compared to 2010 essentially due to the cyclicity of the U.S. DoD's procurements. Civil programs are currently driving expenditures, with 51 countries investing in SATCOM programs and 62 expected by 2024.*
- » *Space science and exploration is estimated at \$5.9 billion and is expected to reach \$8.6 billion in 2024, i.e. a 3.4% CAGR driven by ambitious plans in Russia and Asia and a sustained high level of investment in the U.S.*
- » *Satellite navigation reached \$4.5 billion with only five countries, plus the European Union, investing in the development of costly systems. Funding is expected to remain at the current high levels until 2024 to support systems' deployment, with 124 spacecraft to be launched over the next ten years.*
- » *Space security programs received \$2 billion in 2014, with the U.S. accounting for two thirds of the expenditure. Security remains under the remit of the top 10 leading space nations, a situation which is not expected to change in the future.*

"The international landscape is experiencing profound mutations with a diversification of countries investing in space; the number of countries investing over \$10 million in space activities has grown from 38 in 2005 to 58 in 2014," continued Boehinger. "International suppliers are competing fiercely for these business opportunities, with China currently accounting for 28 percent of communications satellites ordered by emerging programs, and Europe for 54 percent of Earth observation satellites."

World Risk Forum additional information:
worldspaceriskforum.com/2016/

Euroconsult's infosite:
www.euroconsult-ec.com/

Additional report information here:
euroconsult-ec.com/shop/government-space/73-government-space-forecasts.html

Globecomm + NovelSat Are Happy Campers



Following the successful satellite distribution of a string of high-profile news and sporting events using NovelSat NS3, Globecast has decided to use NovelSat spectral efficiency software for global satellite video distribution of some of the major events that it covers.

Globecast distributes SD, HD and 4K video from the most watched live news and sporting events and will now be adding NovelSat satellite transmission solutions to its existing capabilities.

Globecast is a provider of media management, distribution, monetization and contribution solutions for broadcasters.

Using NovelSat NS3-based NS1000 and NS2000 Satellite Modulators and Demodulators, Globecast can consistently deliver more video services using less satellite bandwidth, creating greater efficiency.

NovelSat NS3 technology has been proven to utilize satellite spectrum far more efficiently than DVB-S and

DVB-S2 standards. NovelSat NS3 increases data rates by more than 30 percent compared with many existing modulators, demodulators and modems.

The advantage of this next generation technology goes far beyond capacity savings. In extreme conditions, NovelSat NS3 boosts network reliability and availability more effectively and efficiently handles channel impairments including phase noise, non-linearity, jamming and interference.

“As a key partner for our broadcast customers, we’ve built a reputation for delivering a high quality service, which allows broadcasters to ensure the best possible viewer experience,” said Liz McParland, Contribution Sales Manager of Globecast. “Using NovelSat NS3 technology for our high-profile broadcasts, Globecast can deliver consistently high quality content from start to finish with limited satellite bandwidth.”

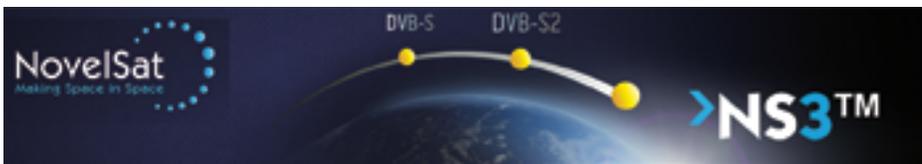
As display quality continues to improve, with

growing demand for 4K and UHD TV, viewers of premiere sporting events are increasingly expecting exponentially higher definition content.

This new demand could quadruple current bandwidth requirements, further increasing the necessity of technologies such as NovelSat NS3 to help control costs by optimizing the efficiency of costly satellite bandwidth.

“Globecast has been particularly successful in showcasing how NovelSat NS3 can help to streamline broadcast distribution operation,” said Dan Peleg, CTO of NovelSat. “Our NovelSat NS3 technology raises the standard of spectral efficiency and performance in the satellite broadcast industry, putting our customers at the forefront of broadcast technology and viewer satisfaction.”

NovelSat management will be SATCON 2015 in New York City, November 11-12 in the Israel Pavilion.



Telstar 12 VANTAGE Passes Tests



Airbus Defence and Space has successfully completed the final integration and testing of the new Telstar 12 VANTAGE satellite for Telesat, a global satellite operator headquartered in Ottawa, Canada.

Telstar 12 VANTAGE is being transported to Tanegashima, Japan from the Airbus Defence and Space facilities in Toulouse, France. The satellite is due to be launched in the coming weeks on an H-IIA launch vehicle built by Mitsubishi Heavy Industries.

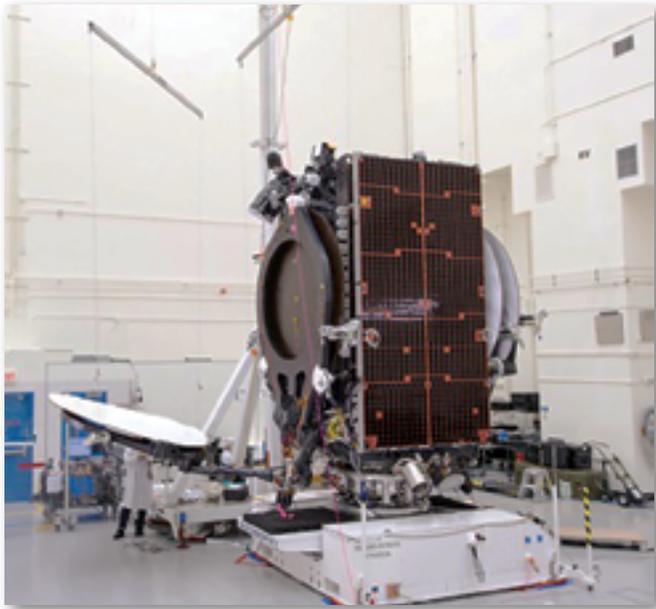
Based on Airbus Defence and Space’s Eurostar E3000 platform, Telstar 12 VANTAGE is fitted with more than 50 high power amplifiers that will operate in Ku- and Ka-bands over four regional beams and eight spot beams.

Telesat’s newest satellite will have a launch mass of 4,800 kg, spacecraft power of 11 kW and more than a 15 year design life. This is the fourth Eurostar E3000-based spacecraft built by Airbus Defence and Space to join Telesat’s fleet.

Telstar 12 VANTAGE will give customers greater flexibility in network design along with improved efficiencies and lower costs per bit, especially over the North Sea and the Mediterranean where the satellite’s high throughput capacity will support the latest mobility services for aero and maritime markets.

The satellite will operate at 15 degrees West in geostationary orbit and serve the growing needs of broadcast, corporate, and government users with powerful coverage of the Americas and EMEA regions as well as maritime zones in Europe, the Caribbean and South Atlantic.

Capacity Agreement For ABS-3A



*ABS-3A, a Boeing all-electric satellite, being tested by engineers.
Photo is courtesy of Boeing.*

ABS and Arab Satellite Communication Organization (Arabsat) announce both have signed an expansion capacity agreement on ABS-3A for a multi-transponder, multiyear deal for Ku-band payload.

The additional capacity will be used for different customer networks within the Middle East and North Africa regions, in particular Saudi Arabia.

Under the agreement, Arabsat will use the new bandwidth on ABS-3A at 3 degrees West, mostly for data services for enterprises, banking and government institutions.

ABS-3A, an all-electric propulsion satellite built by Boeing, entered commercial service on August 31. The satellite features 48 C- and Ku-band transponders (96 x 36MHz equivalent) and is equipped with high performance beams to support rapidly growing markets in the Americas, Europe, the Middle East and Africa regions.

ABS-3A provides expansion capacity to reach markets servicing high-growth data, video, mobility and government applications.

"This new contract reiterates Arabsat's confidence in ABS to support their business plan for this expanding market. We look forward to continually strengthening our relationship with Arabsat in the future," said Tom Choi, CEO of ABS.

Khalid Balkheyour, President and CEO of ARABSAT, said, "This agreement will enable ARABSAT to expand its customer base and provide more options and solutions."

Yahsat's Brazilian Plans Bring Newtec In As A Team Member



Masood M. Sharif Mahmood, Chief Executive Officer at Yahsat, and Serge Van Herck, CEO at Newtec, at the signing of the two companies' agreement.

UAE-based satellite operator Yahsat announced during the Latin America Satellite Congress a contract award to Newtec for the delivery of service platforms and operating systems in support of the company's planned extension across Brazil in 2017.

Yahsat has awarded a new contract to Newtec for their Newtec Dialog® multiservice VSAT platform, including VSAT baseband hubs, user terminals, as well as the Operating Support System (OSS) and Business Support System (BSS).

The contract also caters for the supply of various types of Customer Premise Equipment (CPE). The turnkey solution provided by Newtec, in partnership with Tech Mahindra, is integrated with an Oracle platform, bringing Tier-1 capabilities to the OSS/BSS layer.

Tech Mahindra comes with more than 20 years of experience in delivering OSS/BSS solutions to global telecom operators and has a strong presence in Brazil.

This partnership intends to maximize flexibility and innovation and will allow Yahsat and its customers to benefit from a broader product range and wider implementation, better serving the needs of its various markets—

from consumer and enterprise broadband customers, to the provision of backhaul services for telecom operators and ISPs.

Yahsat's third satellite, Al Yah 3, is scheduled for service launch in early 2017, extending the company's commercial Ka-band coverage to an additional 19 countries and 600 million users across Brazil and Africa. Al Yah 3 will cover more than 95 percent of Brazil's population.

This latest partnership is in preparation for these developments, and is in line with Yahsat's strategy to appeal to wider demographics in the markets in which it operates.

While Newtec is the preferred partner for the Brazilian market, the Newtec platform may also be deployed in other territories across Yahsat's footprint.

The partnership reinforces Yahsat's commitment to expanding its footprint in growing markets, strengthening Yahsat's position as the world's eighth largest operator in terms of revenue.

David Murphy, Yahsat Chief Commercial Officer, said, "This latest contract award to Newtec signifies the first time a satellite operator is set to integrate a fully-fledged

OSS/BSS into the VSAT service platform for both wholesale and consumer segments. By doing so, we are extending our service offering and ensuring a high level of customer experience for all."

Marcio Tiago, Yahsat's Brazil Country Director, said, "Yahsat is committed to addressing the market needs across Brazil by implementing a best-in-class platform, coupled with a flexible OSS/BSS platform, which together provide greater capacity and functionality for a wide range of customers. Yahsat's pre-defined high-speed broadband bundles will provide speeds up to 15-20 Mbps, while the platform will also enable customized solutions to meet wholesale and corporate requirements."

Serge Van Herck, CEO at Newtec, said, "As a multiservice platform, Newtec Dialog® guarantees optimal modulation and bandwidth allocation, whether it is being used for enterprise, consumer broadband, cellular backhaul or mobility on traditional or HTS satellites. The VSAT hubs also feature Newtec's patented return link technology, Mx-DMA™, which enables services to run more efficiently and reliably than ever before over satellite."

Newtec's Bart Van Utterbeeck, Vice President South America added, "Yahsat and its customers will be benefitting from high quality services through the advantages from the Newtec Dialog solution. It will allow Yahsat to build its network and to adapt the provided services as their business grows and diversifies across Brazil and abroad."

yahsat.ae/

newtec.eu/

European Parliament Resolution In Favor Of ADS-B Applauded By Aireon



Aireon LLC applauds the European Parliament for adopting a resolution to enhance aviation safety and efficiency through global flight tracking systems.

The resolution supports the assignment of primary radio spectrum allocation for satellite-based Automatic Dependent Surveillance-Broadcast (ADS-B). European Parliament's Commissioner for Transport, Violeta Bulc, called on all EU member states to welcome this resolution in order to ensure the objective of global flight tracking is supported in negotiations during the upcoming World Radiocommunications Conference (WRC).

Space-based ADS-B will allow for real-time air traffic monitoring, and provide performance-based enhancements in safety and efficiency, consistent with the International Civil Aviation Organization's (ICAO) objectives.

Members of the European Parliament across the political spectrum were universally supportive of the resolution, including the Chairman of the Transport Committee, Michael Cramer (Green Party, Germany), Marian-Jean Marinescu (PPE, Romania) and Lucy Anderson (S&D, UK) who detailed the importance of having a global solution given the geographical limitations of existing flight tracking systems and ensuring the ability to help aircraft navigate difficult weather conditions in ways that are challenging with current technology.

Roberta Neri, chief executive officer, ENAV, said, "A primary spectrum allocation will ensure that the world's aviation community has access to the next-generation air traffic surveillance capability of space-based ADS-B to improve global safety and

efficiency. It is imperative that we make safety a priority and it is encouraging that Parliament has made this critical issue a key objective during the WRC."

"The Aireon Partners are pleased with the support and commitment from the European Parliament to improve air traffic safety, as stated in the resolution. We see this as a strong endorsement of the need to improve global flight safety and efficiency using investments that are already being made by the airlines," said Eamonn Brennan, chief executive officer, Irish Aviation Authority (IAA).

"The European Parliament has set the standard in supporting this action and as the Air Navigation Service Provider in Canada, we fully support this initiative from the other side of the Atlantic," said John Crichton, president and chief executive officer, NAV CANADA. "Primary spectrum allocation for space-based global flight tracking is putting safety first. It is our primary goal and main objective in maintaining our airspace."

aireon.com/

Inmarsat's SAS Heads To Greece

Inmarsat will locate the Satellite Access Station (SAS) for its European Aviation Network (EAN) high-speed inflight connectivity solution in Greece, under an agreement with OTE, the largest telecommunications provider in Greece and member of the Deutsche Telekom Group.

The development of the SAS in Nemea, Peloponnese, will be a key infrastructure milestone for EAN, which was unveiled by Inmarsat last month as the first aviation

passenger connectivity solution in Europe to combine an advanced satellite network and LTE-based ground network, the latter of which will be operated by Deutsche Telekom. Aircraft will switch automatically between satellite and terrestrial connectivity using an onboard network communicator for optimal service delivery. As a result, airlines will be able to offer reliable, high-speed onboard internet access to passengers across Europe's high-traffic flight paths, using Inmarsat's 30MHz (2 x 15MHz) S-band spectrum

allocation in all 28 EU member states.

The new SAS at Nemea will serve as a gateway towards Inmarsat's advanced S-band satellite, which is currently being manufactured by Thales Alenia Space, and a compact, lightweight Mobile Satellite Services (MSS) terminal being produced by Cobham SATCOM. OTE will deliver and operate the satellite teleport facilities on the same site that has also hosted Inmarsat's Ka-band Global Xpress (GX) satellite access station since 2012.

New Territory To Be Accessed By Forthcoming Chinese Satellites

A series of scientific satellites, including one to probe dark matter, will be launched later this year and next year, said Wu Ji, director of the National Space Science Center under the Chinese Academy of Sciences (CAS), in a new report from Xinhua.

The development of four scientific satellites is going well, Wu said recently at an event to mark the 10th anniversary of cooperation between China's Double Star space mission and the European Space Agency's (ESA) Cluster mission to investigate the earth's magnetosphere.

The first of the series, the dark matter particle explorer, will be launched from the Jiuquan Satellite Launch Center in northwest China at the end of this year. All the major tests and experiments have been completed, and a mission control center for scientific satellites has been set up in Huairou, a northern suburb of Beijing, Wu said.

The dark-matter particle explorer satellite will observe the direction, energy and electric charge of high-energy particles in space in search of dark matter, said Chang Jin, chief scientist of the project. It will have the widest observation spectrum and highest energy resolution of any dark-matter probe in the world. Dark matter is one of the most important mysteries of physics. Scientists believe in its existence based on the law of universal gravitation, but have never directly detected it.

China will also launch a satellite for quantum science experiments next year. "It's very difficult to develop the payload of the satellite. We have overcome

many difficulties in making the optical instrument. We are confident of launching it in the first half of next year," Wu said.

A retrievable scientific research satellite, SJ-10, will also be launched in the first half of

2016. It will carry out research in microgravity and space life science to provide scientific support to manned space missions. The satellite is expected carry out 19 experiments in six fields.

AsiaSat Launches A Ginormous Footprint Via Their AsiaSat 4 Satellite



Artistic rendition of the AsiaSat 4 satellite. Image is courtesy of AsiaSat.

Asia Satellite Telecommunications Co. Ltd. (AsiaSat) announces the launch of its first Ultra-HD (UHD) television channel "4K-SAT" at 122 degrees East on AsiaSat 4.

This marks a new era for AsiaSat's satellite broadcasting services in the region.

This new UHD channel will be available free-to-air (FTA) across more than 50 countries and regions within AsiaSat 4's enormous footprint, spanning from New Zealand to Pakistan and part of the Middle East.

Asian TV operators and home viewers with an AsiaSat 4 C-band antenna and a HEVC set-top box (STB) will be able to receive the UHD channel directly.

The new "4K-SAT" channel broadcasts full UHD produced videos featuring fashion, lifestyle and documentaries from content partners including Hong Kong Cyberport Management Company Limited, FashionTV and Rohde & Schwarz.

The compelling UHD content from FashionTV includes major fashion shows from all over the world as well as features highlighting the latest in beauty and lifestyle trends, all delivered to Asian viewers in clear, ultra-high definition.

FashionTV, the global multimedia network leader in fashion and lifestyle content, also broadcasts its HD and SD channels on AsiaSat 5 and AsiaSat 7 in the Asia-Pacific.

"We are delighted to be at the forefront of next generation broadcasting technology, bringing to Asian viewers true UHD content. We look forward to working closely with our



content and technology partners to drive UHD audience penetration in Asia," said Sabrina Cubbon, Vice President, Marketing and Global Accounts of AsiaSat.

"The launch of this UHD channel on our new AsiaSat 4 UHD broadcast platform provides an opportunity for all stakeholders to experience and promote UHD content in Asia. This reaffirms our commitment to promoting leading edge technologies for the broadcast community. We shall continue to focus on compelling UHD content to enhance the quality of the television viewing experience."

The "4K-SAT" channel encoded in HEVC, is broadcasting at 50 frames per second (fps) with 10-bit colour depth.

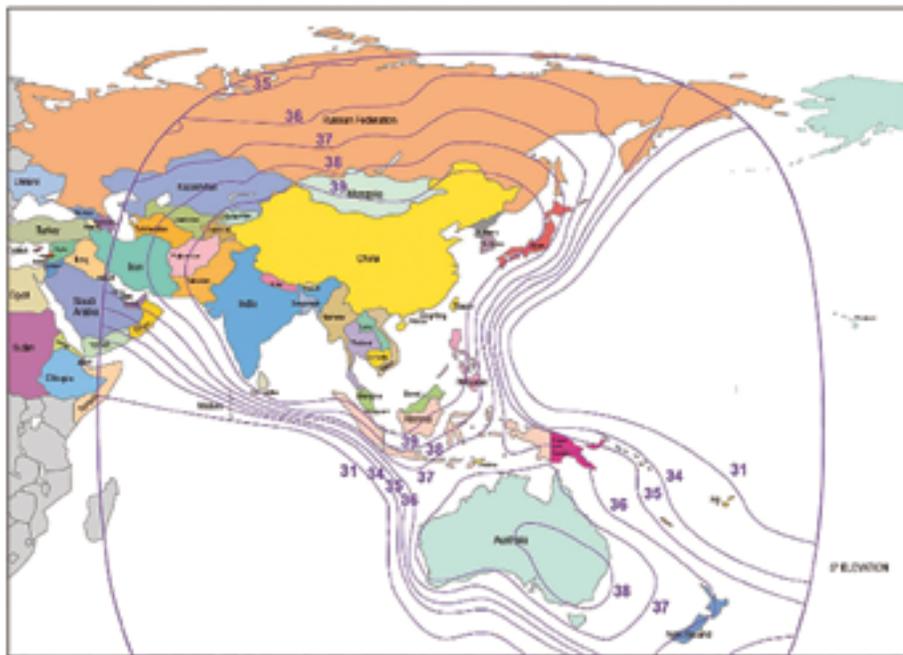
In addition to offering 3840 x 2160 pixels resolution, four times the resolution of the full HDTV, the UHD specification also means a richer color palette, with more saturated colours and fine colour gradations.

The superior quality of UHD broadcasting will deliver to consumers much better quality and more realistic picture and sound, offering an immersive viewing experience, particularly for sporting events and action movies.

The UHD channel is available free-to-air (FTA) on AsiaSat 4 with the following reception parameters:

- Orbital Location : 122 degrees East
- Transponder : A4-C13H
- Polarisation : Horizontal
- Frequency : 4120 MHz
- Video Format : HEVC DVB-S2
- Modulation : 8PSK
- Symbol Rate : 29.72 Msym/sec
- FEC : 5/6

asiasat.com



AsiaSat 4 C-band EIRP (dBW)

HTS Is Knocking On Your Door... Are You Ready? A Gilat Satellite Networks Perspective

By Doreet Oren, Director of Product Marketing, Gilat Satellite Networks



To articulate the impact of High Throughput Satellites (HTS) on the satellite ecosystem is a most challenging task. After years of satellite communications existing as a niche market, useful primarily where terrestrial communications solutions were not feasible, satellites can now compete in high-capacity markets.

Hastening this trend are the vastly larger amounts of capacity now available, thanks to HTS. This abundance has lowered the cost of satellite bandwidth where such can now compete with terrestrial solutions.

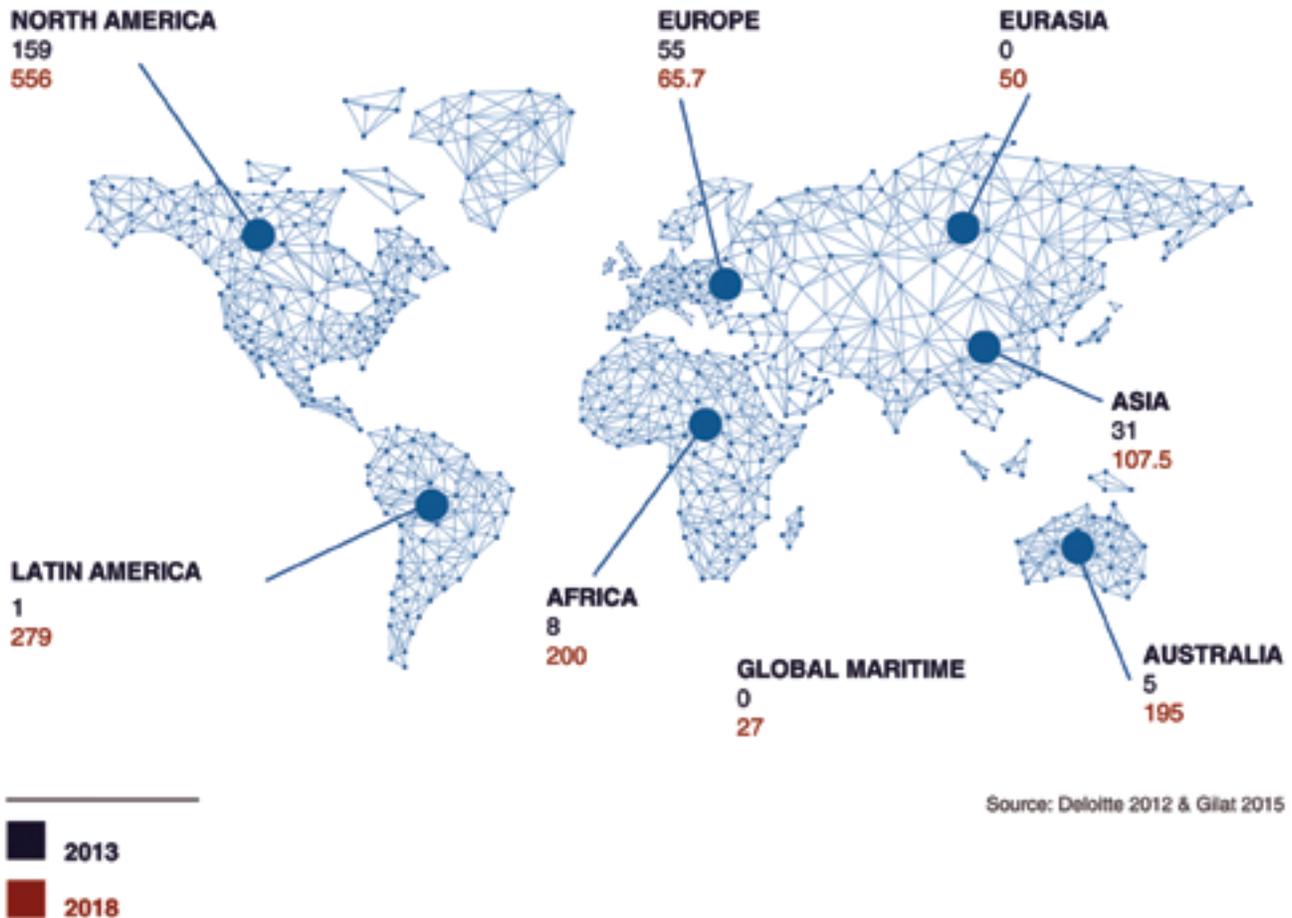
In parallel, increased worldwide demand for data services has opened the door for expansion to new markets and services. Along with the built-in strengths of a satellite solution—massive throughput capacity, a worldwide footprint and rapid deployment—HTS satellites benefit from faster data rates and a four-to-tenfold reduction in the cost-per-bit.

In this new era, the satellite industry is poised to rattle the traditional hegemony of terrestrial communications in non-rural markets.

Consumer broadband is, by far, the most widely used market for HTS today and will most likely continue to be so. However, the capacity surge that HTS provides lends itself to a much broader set of applications, including those with the potential for higher margins than what consumer broadband can offer.

These other markets are maturing and are expected to grow significantly over the next few years, exploiting abundant HTS capacity. Cellular backhauling, and in particular 3G/LTE backhauling, is showing high growth as cellular networks expand to rural and remote regions worldwide. Another high-growth market is mobility, due to the increasing demand for passenger in-flight connectivity and communications for vessels at sea.

Worldwide HTS Capacity (Gbps): 2013 to 2018



Implications Of Increased HTS Capacity

HTS architecture is based on many spot beams (10-100 beams) covering a geographic area rather than the wide beams implemented in traditional satellites. By reusing frequencies, in a method similar to that of cellular networks, spot beam satellites are able to provide much more capacity than standard wide-beam satellites.

The primary impetus for developing HTS was to increase available bandwidth at a lower price per bit. A typical HTS system is capable of delivering 20 to 100 Gbps of data, servicing tens to hundreds of thousands of users. This provides 10 to 100 times the capacity of traditional wide-beam coverage satellites, all the while maintaining similar launch costs. The following example illustrates how the expanded capacity of HTS impacts ground segment equipment:

Scenario A: A traditional wide-beam satellite with a payload of 1.1GHz, or approximately 2Gbps, is composed of a single wide beam. Baseband equipment in one gateway lights up the wide beam.

Scenario B: A high-throughput satellite with a payload of 10.5 GHz, or approximately 21Gbps, is composed of 21 spot beams. Baseband equipment is spread over three gateways to light up the 21 beams.

Note that HTS provides huge growth opportunities thanks to the additional capacities. The initial CAPEX investment in scenario B, however, is significantly higher than in scenario A. This is due to the fact that hub baseband equipment deployment is required to support transmission in each of the spot beams rather than in just supporting a single transmission when using a wide beam.

For satellite service providers, this fact has implications for the business model. In many cases, service providers are unable to fund the initial high CAPEX investment for the hub baseband equipment that is required for HTS at its service start and during service ramp-up. This essentially forces satellite operators to partner with ground segment providers to deliver baseband transmission capabilities on all of the beams to ensure immediate coverage. The result is a shift in the satellite business model from purely selling capacity (MHz) to offering managed services (Mbps).

The need for virtual network operators (VNOs) with various business models that require support is also being witnessed. By equipping VNOs with a logical or physical separate network and independent management capabilities, they can manage their customer services and bandwidth requirements across multiple beams without the upfront investment in gateway infrastructure.

For satellite service providers to host VNO services in an HTS environment, greater ground segment architecture flexibility is required. One option for supporting this model is to move VNO management to a cloud service, which enables a cross-beam network view of all subscribers.

The Shifting Role Of Ground Segment Architecture

As HTS networks require deploying ground segment equipment to cover multiple beams, often in multiple gateways, a substantial initial investment is needed. This expense can be offset by new opportunities for using the large amount of bandwidth, increasing not only the satellite fill ratio, but more importantly, improving revenue-per-bit.

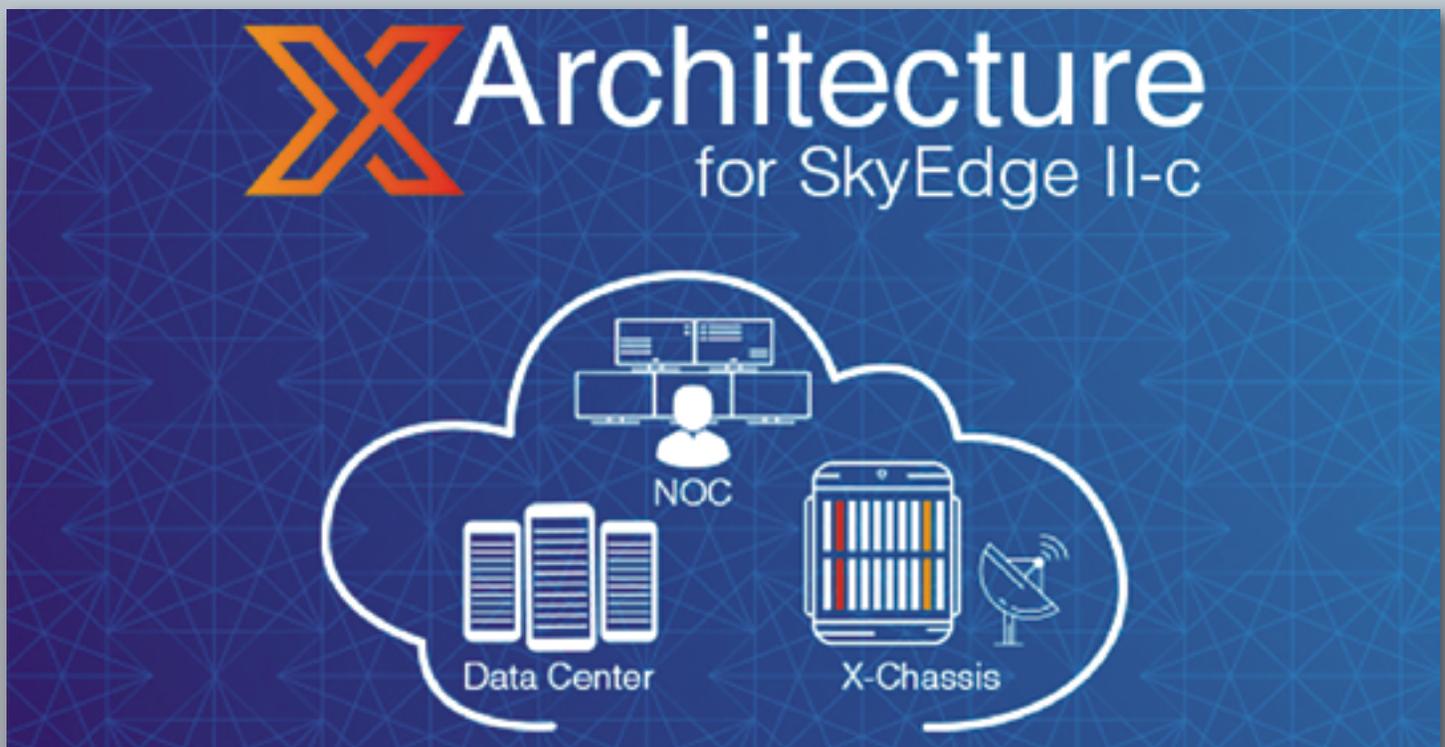


An architecture that addresses the unique opportunities and challenges of HTS include:

- **Bandwidth management**—Although HTS provides abundant aggregate bandwidth, it divides that bandwidth into many geographically separated beams. This has implications for fixed satellite services, providing multiple choices for beam selection due to adjacent overlapping beams. For service continuity in mobility applications, automatic beam-switching is required. To guarantee the expected bandwidth service level agreements, a flexible planning and allocation method should be in place.
- **Support for Multiple Markets**—The surge of capacity and the growing need for data connectivity brings opportunities for multiple new markets, each with its specific needs. The architecture must support fast-growing HTS markets such as consumer broadband, cellular 3G/LTE backhauling, mobility and enterprise. Ideally a single platform should provide support for service expansion to any fixed or mobility market. Tailored VSATs optimized for the various market needs must be available as part of the offering.
- **Cloud-based Distributed Architecture**—When planning support for dynamic resource allocation among applications or across beams, there is great value in rethinking the ground segment architecture. On one hand, the ground segment architecture must be sufficiently flexible to support baseband equipment located in multiple gateways. On the other hand, it is advisable to locate data processing servers (performing acceleration, routing, QoS and management functions) in a cloud data center to gain operational efficiency. This requirement is best met with a cloud-based distributed architecture and built-in support for next-generation software-defined networking.
- **Centralized Global NMS**—The network needs to be easily and remotely controllable by a single global and centralized network management system. It should enable full configuration, control and monitoring of all hub elements and remote terminals, regardless of their physical location.
- **Network Scalability and Flexibility**—The architecture must easily and cost-effectively facilitate business growth. It should be easy to provide additional geographic coverage or additional satellite bandwidth capacity to support a growing subscriber base or expand your business to new markets. The architecture should also present operations at a level of abstraction that makes the complexities of spot beam satellites transparent to the service provider.
- **Reduced OPEX/CAPEX**
Equipment must be carefully designed to support the skyrocketing need for additional capacity. Rack space and power costs can be significant, therefore a cost-effective ground segment should be sufficiently dense to minimize footprint and power consumption. Another cost reduction mechanism is remote operation, reducing the overhead of in-person site visits. This minimizes manual intervention in LAN and RF configuration, shortens activation time and improves reliability.

These attributes, implemented properly, can make all the difference when charting the course of your satellite network's growth. Gilat Satellite Networks has recently launched a new ground segment architecture designed to address the exciting opportunities that lie ahead with HTS. For information regarding X-Architecture for SkyEdge II-c, please access www.gilat.com/X-Architecture

Doreet Oren (doreeto@gilat.com) is Director of Product Marketing for Gilat Satellite Networks. In this role, Oren is responsible for defining product positioning, messaging and go to market strategies and is responsible for market research and analyst relations.



Spaceflight's Falcon 9 To Transport The Winners Of Google's Lunar XPRIZE "Ticket To The Moon"



Artistic rendition of the lander, courtesy of Spaceflight Industries.

In Jerusalem, Israeli President Reuven Rivlin, and Bob Weiss, vice chairman and president of XPRIZE, SpaceIL announced a significant milestone in its race to the moon: securing a "ticket to the moon" on a SpaceX Falcon 9 launcher, with a mission scheduled for the second half of 2017.

With this, SpaceIL becomes the first team to produce a verified launch contract in the \$30 million Google Lunar XPRIZE competition and aims to accomplish not only the first Israeli mission to the moon, but also the world's first private lunar mission.

"We are proud to officially confirm receipt and verification of SpaceIL's launch contract, positioning them as the first and only Google Lunar XPRIZE team to demonstrate this important achievement, thus far," said Bob Weiss, vice chairman and president of XPRIZE.

"The magnitude of this achievement cannot be overstated, representing an unprecedented and monumental commitment for a privately-funded organization, and kicks off an exciting phase of the competition in which the other 15 teams now have until the end of 2016 to produce their own verified

launch contracts. It gives all of us at XPRIZE and Google the great pride to say, 'the new space race is on!'"

To win the Google Lunar XPRIZE, a privately funded team must successfully place an unmanned spacecraft on the moon's surface that explores at least 500 meters and transmits high-definition video and images back to Earth, before the mission deadline of December 31, 2017.

"Only three countries have 'soft-landed' a rover on the surface of the moon: the United States, Russia, and China. Now the notion of the small state of Israel being added to this exclusive list look more promising than ever," said SpaceIL CEO Eran Privman.

"Last year we made significant strides toward landing on the moon, both in terms of project financing and in terms of the engineering design and now, we are thrilled to finally secure our launch agreement. This takes us one huge step closer to realize our vision of recreating an 'Apollo effect' in Israel: to inspire a new generation to pursue Science, Engineering, Technology, and Math (STEM)."



Signing the launch agreement was made possible due to the completion of an additional fundraising round led by the two major contributors of SpaceIL: Dr. Miriam and Sheldon G. Adelson Family Foundation and Morris Kahn's Kahn Foundation. SpaceIL has purchased launch services from Spaceflight Industries; an American space company who recently purchased a SpaceX Falcon 9 launcher and will manifest SpaceIL's spacecraft as a co-lead spot, which will sit in a designated capsule inside the launcher, among a cluster of secondary payloads.

Once the capsule separates from the launcher, it will automatically release the spacecraft, which will use advanced navigation sensors to guide it to the lunar surface, with engineers in a mission control room standing by to remotely send commands and corrections as needed.

"We're excited to work closely with the SpaceIL team to help them realize their mission of getting to the moon," said Curt Blake, president of Spaceflight's launch business. "It's very gratifying to play an integral part in SpaceIL's quest to win the Google Lunar XPRIZE."

Also, SpaceIL has unveiled a new and improved design of its spacecraft, completed by SpaceIL engineers with consultation from world-renowned Israeli industrial designer, Alex Padwa, regarding the spacecraft's exterior.

Airbus Defence & Space Goes With Advantech Wireless For BLOS



Advantech Wireless has been selected by Airbus Defence & Space to provide the Beyond Line of Sight communications solution as part of their very successful Border Control infrastructure.

Advantech Wireless have successfully partnered with Airbus to provide A-SAT™ technology capable hubs and remotes delivering a realistic, affordable and adaptable SatCom option where fiber or microwave links are unachievable in a Border Control and Security arena.

Andy Hide, Airbus Defence & Space Project Manager, said, "In looking for a partner for this project, our team looked long and hard at a wide range of options. I am delighted to confirm that Advantech Wireless has proven to be an excellent choice: Firstly, they clearly know their customer and their solution is not only a smart fit to requirements, they are also continually pushing to innovate. Secondly, their dedication to the project has been outstanding: results do not happen overnight and Advantech Wireless has remained consistently committed throughout, frequently going that extra mile to keep the project on track."

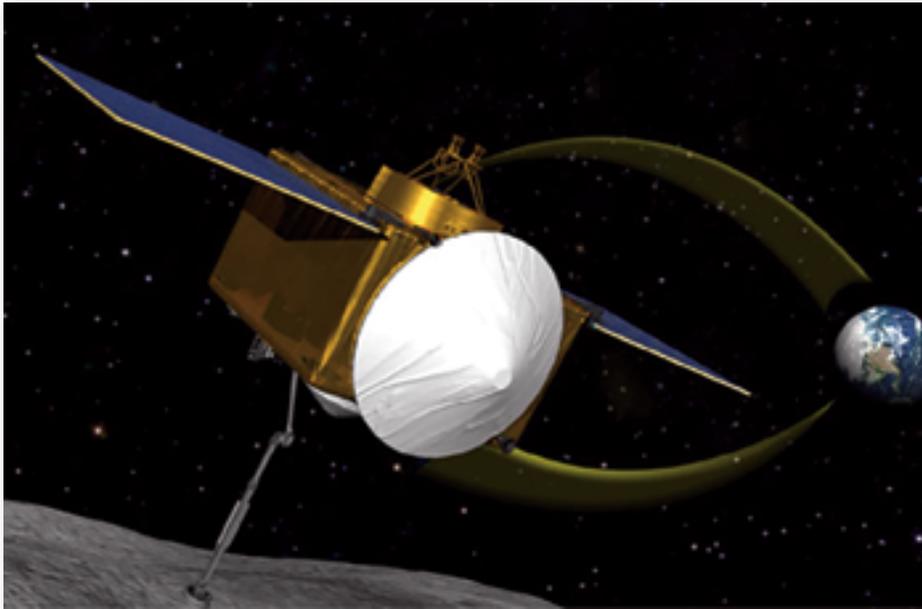
Advantech Wireless offers two-way, open standard (DVB-RCS), broadband satellite access system. Their hubs and terminals are highly flexible and several different network architectures are possible.

The award winning A-SAT™ technology provided in this deployment is beyond dual mode DVB-RCS/TDMA-SCPC. It monitors channel utilization and switches the satellite access method and MODCOD for the return channel in real-time to dynamically maximize the space segment utilization efficiency.

Additionally, by having TDMA and true DVB-S2 SCPC technologies in a single platform, the switch between traffic patterns is efficiently supported and all risks of equipment obsolescence are mitigated.

advantechwireless.com/

NASA's OSIRIS-REx Becomes A Viable Entity, Thanks To Lockheed Martin



Artistic rendition of NASA's OSIRIS-REx spacecraft. Image is courtesy of Lockheed Martin.

Lockheed Martin has completed the assembly of NASA's OSIRIS-REx spacecraft.

The spacecraft is now undergoing environmental testing at the company's Space Systems facilities near Denver.

OSIRIS-REx will be the first U.S. mission to return samples from an asteroid back to Earth. OSIRIS-REx, which stands for Origins, Spectral Interpretation, Resource Identification, Security, Regolith Explorer, is going to Benu, a carbon-rich asteroid that could hold clues to the origin of the solar system.

Over the next five months, the spacecraft will be subjected to a range of rigorous tests that simulate the vacuum, vibration and extreme temperatures it will experience throughout the life of its mission.

Specifically, OSIRIS-REx will undergo tests to simulate the harsh environment of space, including thermal vacuum, launch acoustics, separation and deployment shock, vibration, and electromagnetic interference and compatibility.

OSIRIS-REx is scheduled to ship from Lockheed Martin's facility to NASA's Kennedy Space Center next May, where it will undergo final preparations for launch.

After launch in September of 2016, the spacecraft will travel to the near-Earth asteroid Benu and bring at least a 60-gram (2.1-ounce) sample back to Earth for study.

Scientists expect that Benu may hold clues to the origin of the solar system and the source of water and organic molecules that may have made their way to Earth.

OSIRIS-REx's investigation will inform future efforts to develop a mission to mitigate an Earth impact of an asteroid, should one be required.

NASA's Goddard Space Flight Center provides overall mission management, systems engineering and safety and mission assurance for OSIRIS-REx.

Dante Lauretta is the mission's principal investigator at the University of Arizona. Lockheed Martin Space Systems near Denver is building the spacecraft and will provide flight operations.

OSIRIS-REx is the third mission in NASA's New Frontiers Program. NASA's Marshall Space Flight Center in Huntsville, Alabama, manages New Frontiers for the agency's Science Mission Directorate in Washington.

For more information about the OSIRIS-REx mission:

<http://www.asteroidmission.org/>
<http://www.nasa.gov/osiris-rex>
<http://www.lockheedmartin.com/osirisrex>

"This is an exciting time for the program, as we now have a completed spacecraft and the team gets to test drive it, in a sense, before we actually fly it to Benu," said Rich Kuhns, OSIRIS-REx program manager at Lockheed Martin Space Systems. "The environmental test phase is an important time in the mission, as it will reveal any issues with the spacecraft and instruments, while here on Earth, before we send it into deep space."

"This milestone marks the end of the design and assembly stage," said Dante Lauretta, principal investigator for OSIRIS-REx at the University of Arizona, Tucson. "We now move on to test the entire flight system over the range of environmental conditions that will be experienced on the journey to Benu and back. This phase is critical to mission success, and I am confident that we have built the right system for the job."



InfoBeam

Processing Continues On Cygnus For December 3 Launch Date



*Photo of the Cygnus spacecraft during approach to the ISS.
Photo is courtesy of NASA.*

Kennedy Space Center is reporting that the Cygnus spacecraft that will carry nearly 6,000 pounds of cargo on the next U.S. resupply flight to the International Space

Station has been moved from the Space Station Processing Facility to the Payload Hazardous Servicing Facility (PHSF) at NASA's Kennedy Space Center in Florida.

This was followed by the spacecraft's move into the building's high bay, where it will be uncovered, removed from atop its transporter, and placed into a work stand to begin preparations for propellant loading this week.

Developed and built by Orbital ATK, the Cygnus comprises the pressurized cargo module and attached service module, which houses the solar arrays and propulsion system.

The spacecraft is set to deliver equipment, supplies and research to the station on the company's fourth Commercial Resupply Services flight.

Launch aboard a United Launch Alliance Atlas V is scheduled for December 3 from Space Launch Complex 41 at Cape Canaveral Air Force Station.

Story by Anna Heiney.

Fairing Well, Indeed...

By Hendrik Thielemann, Vice President, Communications, RUAG Space

With two new, ultramodern production facilities, Swiss space-industry supplier RUAG Space will be able to manufacture payload fairings for launch vehicles much more efficiently and cost-effectively than previously possible.

RUAG Space is the world's leading provider of composite payload fairings. These structures form the nose cone of launch vehicles. They are designed to protect the fragile satellites they carry into space during the pre-launch and launch phases when they are exposed to high mechanical loads and extremely high temperatures due to frictional forces acting on the spacecraft as it passes through Earth's atmosphere.

As a partner of the first hour, RUAG Space supplied the fairings for all Ariane launch vehicles. The company has since expanded this activity and now also builds nose cones for the smaller European Vega launcher and for the US Atlas V-500.

The first of the two new RUAG factories, being constructed in the Swiss town of Emmen, is due to open shortly. The first payload fairings will be produced there in 2016.

The second factory, which is also RUAG's first production site in the US, is being built in Decatur, Alabama, in the immediate vicinity of America's number-one space launch provider, United Launch Alliance (ULA). At present, fairings for the US American market are still manufactured in Switzerland.

As of mid-2017, RUAG will be able to supply ULA with products made on American soil in Decatur. In the first instance, the factory will produce the inter-stage adapter that links the main and upper stages of the Atlas V-400 rocket. Payload fairings for the Atlas V-500 will be added at a later date.

Further into the future, RUAG plans to use the under construction Alabama facility to manufacture carbon-fiber-reinforced components for the new ULA Vulcan launcher.



Ultrasonic inspection of a Vega Fairing in RUAG's new robotic NDI facility. Photo is courtesy of RUAG Space.



A 21 meter long mould is needed to build half shells for Ariane and Atlas-V in a single piece.
Photo is courtesy of RUAG Space.

Manual Processes Give Way To Automation

The two new production facilities will operate according to an entirely new, semi-automated process. This will enable RUAG Space to substantially reduce the manufacturing costs of its payload fairings and other structural components of launch vehicles, without compromising quality or reliability. "It places us in an ideal position to consolidate our lead in the launch vehicle market, which is experiencing growing pressure on costs," said RUAG Space CEO, Peter Guggenbach. "Cheaper access to space is an imperative that applies both in Europe and in the United States. But this can only be achieved if suppliers to the space industry automate their manufacturing processes."

Until now, the outsized carbon-fiber-reinforced structures were mostly crafted by hand. The payload fairing for an Ariane rocket is composed of 14 separate elements, each one consisting of a honeycomb core made of aluminum and outer layers of carbon-fiber-reinforced polymer (CFRP) material.

Each layer of this sandwich structure is laid down manually. The laminated shell elements are subsequently hardened in an autoclave, then inspected and finished by hand. They are then passed to a vertical integration station where they are assembled into two half shells of seven elements each, in a meticulous manual process.

Giant CFRP Structures Manufactured In A Single Piece

This vertical integration stage will no longer be necessary in the future. In the new production facilities, RUAG will be able to manufacture half shells for payload fairings with a length of up to 20 meters in a single piece, instead of assembling them from separate elements. A brand-new building with a surface area of more than 5000 m² has been constructed for this purpose at the factory site in Emmen (*see photo on next page*).

In this new production center, the materials for the sandwich structure are cut to size using a numerically controlled process and then prepared on an automated lay-up table. The task of laying the sandwich structure onto the bonding mold is simplified by laser projectors, which project the lay-up plan onto the mold.

An air-cushion transport system is used to move the payload fairing and the bonding mold, which measures 21 meters in length and weighs 55 metric tons, on to the next step in the process: hardening the sandwich structure.

This step no longer requires an autoclave—instead, the structure is hardened in a conventional industrial furnace at atmospheric pressure. This so-called out-of-autoclave method is the result of advances in carbon-fiber technology, particularly with respect to resins.

After hardening, the structure is inspected using a non-destructive inspection (NDI) procedure—an essential part of the product quality assurance process at RUAG Space. This inspection, which used to be performed manually,



Today an Ariane Fairings is assembled into two half shells of seven elements each, in a meticulous manual process. Photo is courtesy of RUAG Space.

The greatly simplified integration process now merely consists of trimming and deburring and drilling holes for mounting the fairing separation system and sealing rails. These tasks are all computer-controlled.

The next stage in the process is machining, which involves cutting and milling all of the necessary openings in the half-shell structure, the adhesive bonding of all inserts and frames to accommodate access panels and interfaces to ground systems and the launch vehicle, and then finishing the work on the thermal shield and sealing elements.

A special machining station was designed to facilitate these manual tasks by enabling the half shell to be rotated around its longitudinal axis, thereby providing more convenient access.

The finished half shell is then transferred to the paint shop, where a special white coating that provides thermal and electrostatic protection is applied. The final stage after painting involves installing various additional subsystems such as electrical wiring, instruments, an acoustic shield, the pyrotechnic ignition system and mission-specific access panels and devices.

The payload fairing is then ready for handover to the customer and shipment to the launch pad.

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

As Vice President Communications, Hendrik Thielemann is responsible for internal as well as external communications at RUAG Space. Prior to joining RUAG, Hendrik Thielemann spent nearly a decade in various corporate communications positions pertaining to the space division at the Swiss Oerlikon Group and at European Aeronautic Defense and Space Company (today Airbus Defence & Space). Hendrik Thielemann completed his studies in communication sciences at the University of Münster (Germany) with a master's degree and subsequently worked as a newspaper editor for several years.

is now carried out by an industrial robot.

The automated scanner supports the NDI specialists using air-coupled ultrasonic through transmission technology. The result is a C-scan image of the part, enabling convenient and reliable detection of defects. After inspection, the half shell is passed to a horizontal integration station.



An outside view of the new RUAG Composite Center in Emmen, Switzerland. Photo is courtesy of RUAG Space.

“Space For All” Vision To Occur In The UAE



Swiss Space Systems (Holding) SA, through its subsidiary S3 Middle East, announces a major partnership with D&B Group to deliver access to space with the Middle East.

The goal is to develop, manufacture, certify and operate unmanned suborbital shuttles to locally launch small satellites up to 250 kg by 2019.

Swiss Space Systems (Holding) SA has announced the signature of a major investment and partnership agreement from D&B Group to open an S3 Middle-East subsidiary, and to develop access to Space from the Middle East. This investment has far-reaching implications for S3’s continued global expansion plans.

The “Space for All” vision of S3 is progressively earning its reputation through a commitment to aerospace excellence. For this, the ambitions of Middle Eastern countries are complementary and appreciative of Dr. Amin Abbas Forati chairman of the D&B group for his efforts and selecting the UAE from among the Arab countries to become the first country to have this technology, and with the opening of S3 Middle East, the D&B group will introduce the UAE to the prestigious clan of future space launcher countries.

The advanced technology of reusable spacecraft launching systems, combined with recent small satellite innovations, enable applications such as analytics and monitoring of primary resources, pollution, migrations, natural disasters, strategic asset surveillance, and global Internet connectivity.

The D&B Group specialize in financial consulting, natural resource trading and ecology. Today, they are expanding the scope of their activities into space, through their key collaboration with S3.

The D&B Group was founded in 1999 by Dr. Amin Abbas Forati, and it has strong presence in Middle East and Africa.

According to D&B Group CEO, Dr. A. Forati, “I live in Dubai and I have seen the country’s spectacular transformation over the last 15 years. The UAE is the country where everything is possible, a country where the vision of a man—of many men—can become reality, a bit like S3. I would like, modestly, to provide the UAE, with the possibility to become the first Arab Nation to own its own spatial technology, not only in the field of launching satellites but in the conception of revolutionary satellites, as well.

The UAE is the leading country in the region, look at “the Louvre Abu Dhabi” opening the European Culture to Arab Culture, “Emirates” has the biggest airline in the world one of the top Airline Companies such as Emirates airline.

“I could tell you a number of such examples. To close, I would like to talk about Africa. At my very modest level, I would like to offer to this great continent the means to develop its own energy resources, to own its own communications systems at a wide extent. This is something that S3 can allow Africa.”

Through a recent campaign of seeking for strategic investors, S3 has now signed a partnership agreement with D&B group to work towards building a successful partnership with the D&B Group.

Pascal Jaussi, founder and CEO of Swiss Space Systems, said, “We are delighted that S3 and D&B have joined hands to develop the “Space for All” philosophy in the Middle East. This highlights how S3 is becoming a trusted partner of the United Arab Emirates, where independent access to space is a key priority. I am convinced that S3 and D&B will work successfully towards the goal of opening a new vision for a common space future in the region.”

The official inauguration of the S3 Middle East office will take place during the Dubai Air Show in November 2015, at the Emirates Tower on Sheikh Zayed Road, Dubai (UAE), with a live video transmission from S3 Headquarters in Payerne, Switzerland.

Swiss Space Systems partnerships include space industrial companies such as Dassault Aviation, Kuznetsov, RKK Energia, Thales Alenia Space, as well as academic and scientific networks worldwide.

The academic network of S3 will also be opened to Emirati students in the near future.

s-3.ch/en/home

African DTH Network Uplink System Selects CPI Satcom Products' SuperLinear® TWTA

The Satcom Division of Communications & Power Industries LLC (CPI) has been awarded a competitive contract valued in excess of \$600,000 (at list prices) from an African integrator for the company's new, 1.25 kW, DBS-band SuperLinear® traveling wave tube amplifiers (TWTAs) and related system hardware.

CPI's products will be part of a primary uplink system in a well-established, DTH network in Africa.

CPI's SuperLinear high-power amplifier (HPA) was selected over competing products in part because of its patented LifeExtender™/LifePredictor technology, which can result in an increase of up to 50 percent in tube longevity.



In addition, the customer chose CPI because CPI manufactures both the TWT and the amplifier and because CPI's SuperLinear® TWTA high-power efficiency results in significant power cost savings for the end user.

CPI is one of the largest manufacturers of high-power communications amplifiers. CPI's broad line of HPAs includes solid-state power amplifiers (SSPAs), TWTAs and klystron power amplifiers (KPAs).

CPI's amplifiers are used around the world in fixed and mobile gateways for both military and commercial applications.

CPI offers amplifiers in frequencies from S-band to V-band and supports its fielded products through more than 20 service centers around the world.

cpii.com/division.cfm/4

Satisfying The Capacity Needs Of MENA An ETL Systems' Perspective

By Esen Bayar, Chief Technical Officer, ETL Systems

The number of subscribers signing up for payTV services is rapidly growing across the globe.

Consumers are now more willing than ever before to spend their money in order to receive the latest in broadcast programming. One particular region where the rate of growth is escalating rapidly is the Middle East and North Africa (MENA), where demand for these services has been, and continues to be, on a steep upward trajectory.

According to a Middle East and North Africa PayTV Market Monitor report, published by IHS¹, the MENA payTV market saw an increase of 12.4 percent between 2013 and 2014. This, among other revealing statistics, has led IHS to predict that, between 2015 and 2019, the MENA region will experience a growth rate five times higher than the growth rate of Western markets—that includes the US, UK, Germany, France and Italy.

The reason for this unprecedented growth is due to the region's firm anti-piracy measures, the high quality of the payTV offerings, and the investment in local (Arabic) content. IHS expects primary payTV households in MENA to accumulate 6.6 million subscribers and reach revenues of 1.7 billion euros in 2019.

Furthermore, according to a 2015 report by Arab Advisors Group², as of April 2015, there were 14 service providers in nine countries in the MENA region who offered commercial IPTV services. With this number only expected to grow, and IHS's predictions on track, satellite operators need to start thinking about how to future-proof their technology ahead of rapid customer gains and the associated increase in demand for capacity.

Many of the television services in demand within this region are derived from IPTV (Internet Protocol Television) and Direct-to-Home (DTH) satellite services that include hundreds of local and international channels. Many of these services are received by service providers via satellite link before being re-transmitted over the related cable and fiber network to customers.

While the increasing demand for content over mobile devices and DTH is undoubtedly driving growth, implementing the correct infrastructure is key, not just for the development of individual businesses, but also for the continued expansion of the entire satellite market.

Currently, satellite technology is the only broadcast solution that can provide connectivity anywhere and everywhere in the world, no matter how remote a location is requesting services. However, if operators cannot guarantee their customers the backbone to deliver new services and to handle the increased traffic those services will bring, all that could change—and quickly.

Building Without Rebuilding

To support the on-going growth in the MENA region, ETL has opened a sales office in Dubai. This has enabled the company to work closely with operators and service providers in the MENA region and to understand the challenges of delivering content by satellite.

Television service providers in the region, including du, one of ETL's customers, want to build extra capacity in their IPTV networks to further extend subscriber bases as well as to ensure full network resilience.

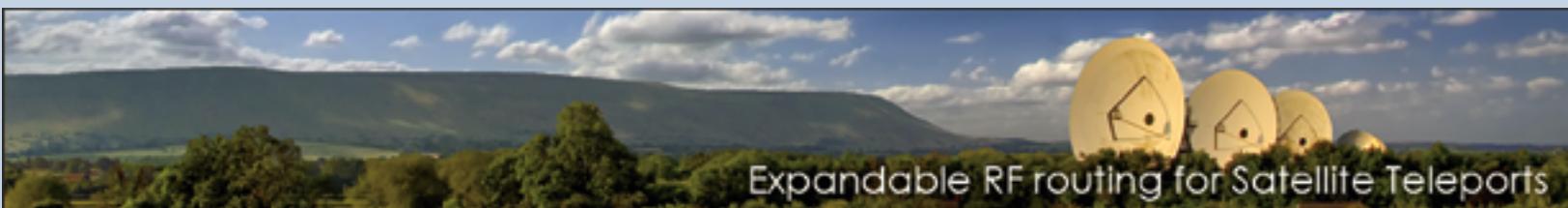
To accomplish this goal, service providers need to invest in bespoke, scalable solutions that are highly adaptable in order to build precise network

capacity. For du (www.du.ae), ETL delivered 3 RF matrices, which included two 32 x 128 Vortex Matrix systems and one 64 x 128 Vulcan Matrix system (pictured left). These matrices were selected for their performance and reliability with dual redundant, hot-swap power supplies and CPU modules, with real-time performance monitoring. ETL's matrix designs can also be easily expanded for future growth.



At ETL, with technology continuously advancing, standing still is simply not an option nor a sound business decision. The firm's products evolve as the industry changes and flexibility and the ability to respond quickly to changing technologies and conditions are paramount to business success. Seventy percent of ETL's largest orders in 2015 were bespoke engineered to meet specific customer requirements and the challenges to design new products for shifting industry needs was always accomplished.

For example, increases in High Throughput Satellite (HTS) launches means that new ground segment equipment products which ETL are designing (such as the Dextra splitters, StingRay RF over Fiber, *photo on next page*, and matrix range) are enabled to be Ka-band ready. New products have an operating frequency range up to 2450 MHz, making them ideal for new HTS applications.



Expandable RF routing for Satellite Teleports

The Correct Infrastructure

In addition to building extra capacity into already existing IPTV



networks, any operators wishing to remain ahead of the curve must invest in tomorrow's technology today through the upgrade of teleports. Teleports play a crucial role in providing technical services for the delivery of IPTV transmissions, as well as the transmission and contribution for DTHBH, cable and digital-terrestrial networks.

As the company's products have seen incorporation into many satellite teleports worldwide, the necessity for teleport operators to upgrade their ground stations inter-facility links (IFLs) is of continual concern. The development of HTS which operate over Ku- and Ka-band frequencies, and requirements for increased bandwidth, have played a major role in this evolution.

ETL's latest new RF technologies in RF over Fiber provide a reliable solution for teleports looking to advance their ground station signal links. The StingRay series is the most compact unit of its kind and offers hot-swap, fiber optic link modules and dual redundant, hot-swap power supplies in

the smallest capacity possible. There are also continued improvements in satellite downlink designs, where operators are improving their monitoring, redundancy and signal quality. Multiple layers of redundancy have been developed at ETL Systems, with hot-swap and remote control and monitoring facilities on RF distribution equipment able to provide peace of mind during live satellite feeds. In addition to built-in reliability, there have also been big breakthroughs in RF performance, such as isolation.

With the correct infrastructure, then, continued success can be guaranteed for the satellite industry. That being said, the major driving force behind the constant refinement and reinvention of technologies remains the huge demand for new and exciting technologies, such as satellite-driven IPTV services.

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¹ Arab Advisors Group, *IPTV in the Arab World 2015*, May 2015.

² IHS, *Middle East & North Africa Pay TV Market Monitor report: 2014*.

Dr. Esen Bayar has more than 25 years experience in satellite communication systems and hardware design and development and he joined ETL as Chief Technical Officer in June 2003. He is proactively engaged in developing ETL's operational procedures and technologies which have played a pivotal role in transforming ETL to a global leader in RF engineering and custom build.

ETL Systems is privately owned and has been designing and manufacturing RF equipment since 1984. The company's growing global presence accounts for 80 percent of the firm's total exports from the UK, where ETL is based. ETL designs and manufactures professional RF distribution equipment for satellite ground stations and other microwave users. The product range includes L-Band Routers, Switches, Splitters, Combiners and Amplifiers covering DC-40GHz. Reliability, resilience, and RF performance are the core customer requirements which drive ETL's product innovation and development.

Adaptability and scalability combine with these to provide future expansion. With its dedicated in-house engineers based in Herefordshire, UK, ETL Systems has seen an average growth of 20 percent in the last five years and has won three Queens Awards for International Trade.

SatBroadcasting™: The Evolution + Impact Of UltraHD

By Captain Ip, Communications Systems Engineer, Asia Satellite Telecommunications Company Limited (AsiaSat)

Ultra High Definition (UltraHD) is a breakthrough in video technology and for the broadcast industry and the technology delivers more than four times the resolution of Full HD TV with more vibrant colors and higher frame rates, providing much better viewing quality especially in sporting events and action movies than has been previously possible.

Delivering UltraHD via satellite has become a hot topic in the community of broadcasters and industry partners. *Table 1* on the following page shows the comparison between Full HD and UltraHD.

Is Satellite-Delivered UltraHD Feasible?

Enormous data bandwidth (over 10 Gbps for uncompressed material) is required to deliver UltraHD video. The transmission of UltraHD video via any traditional delivery infrastructures, such as satellite links, over-the-air, cable channels and Blu-ray discs, is a challenging task.

An indoor transmission of UltraHD through a simulated satellite link was performed by NHK in May 2007¹. An UltraHD TV signal (7680 x 4320 at 60 fps) was compressed into a 250Mbps MPEG-2 stream and transmitted through a 300 MHz carrier using a wideband modulator in 21GHz. Although the transmission distance was only two meters, it was the first demonstration on the technical feasibility of delivering UltraHD TV signal through a satellite

transmission model. *Figure 1* on the following page shows the experiment setup.

With evolutions in compression standard, UltraHD and RF equipment, an UltraHD channel (3840 x 2160) was first broadcasted on satellite in 2013. The video was split into four sections and compressed individually. MPEG-4 compression standard was used in such UltraHD transmission, with a data rate of around 80-100 Mbps and four HD professional IRDs were required at the receiving end (See *Figure 2* on the next page for details).

An HD to UHD combiner was needed to reconstruct the UltraHD video. Subsequently, this approach was used in many experimental or trial UltraHD transmissions but not commercialized due to its high cost and inefficient use of equipment rack space. The cost barrier was lowered with the launch of High Efficiency Video Coding (HEVC) video compression solution which can fully support the UltraHD resolution instead of combining four MPEG-4 encoded HD videos.

HEVC, New Standard For Video Compression

High Efficiency Video Coding (HEVC), the latest generation video compression standard, debuted in 2013. Compared to H.264/MPEG-4



AsiaSat Tai Po Earth Station

	Full HD	Ultra HD 1 (4K)	Ultra HD 2 (8K)
Commercialization	2008	2015-2018	2020
Pixel count Horizontal × vertical	1920 x 1080	3840 x 2160	7680 x 4320
Scan mode	Interlace or progressive	progressive	progressive
Bit depth	8 bit, 10 bit	10 bit, 12 bit	10 bit, 12 bit
Frame frequency (Hz)	60, 50, 30, 25, 24	60, 50, 30, 25, 24	120, 100, 60, 50, 30, 25, 24
Color Space	Rec. ITU-R BT.709	Rec. ITU-R BT.2020	Rec. ITU-R BT.2020
Optimal viewing distance	Three picture heights	1.5 picture heights	0.75 picture height

Table 1. Comparison between Full HD and UltraHD.

AVC, HEVC at least doubles the compression efficiency while maintaining the subjective quality of the video. HEVC can also support the higher UltraHD (8K) resolutions, up to 8192×4320.

HEVC is still under development. The latest version was published in early 2015 and supports format range extensions, scalable coding extensions, multi-view extensions² and 3D-HEVC extensions³. Further screen content coding (SCC) extensions are still in the development stage and are expected to be completed in early 2016. These extensions will improve compression capability for video containing rendered graphics, text, or animation, as well as (or in place of) camera-captured video scenes⁴.

By using HEVC, the bandwidth requirement of an UltraHD channel can be reduced to around 20 Mbps per channel, a mere quarter bandwidth of employing MPEG-4 in the aforesaid case. With the well developed satellite digital transmission technology DVB-S2, the broadcast of three to four UltraHD channels over a 36 MHz C-band transponder becomes quite feasible. In addition, limited selection of HEVC decoder embedded

UltraHD TV and UltraHD set-top-boxes (STBs) are gaining momentum in developed countries. Figure 3 on the next page shows the block diagram of a HEVC solution.

UltraHD HEVC Transcoder, STBs Are Ready In The Market

Many UltraHD file transcoders (support up to 2160p, 60fps) are available in the market but most of them are software based non-real time, off-line encoders. Professional grade servers with tens of processors are required to minimize the prolonged processing time. In addition to off-line transcoder, more and more vendors, e.g., ATEME, Ericsson, Harmonic, NEC, Rohde & Schwarz, and so on, are starting to provide real-time, UltraHD, broadcast solutions.

UltraHD satellite STB is another key element required to realize 4K video distribution through satellites. However, in Europe, a handful of models of UltraHD TV with built-in HEVC full framerate decoder and satellite tuner are available in the consumer market—currently, most commercial HEVC satellite STBs are aiming at the half framerate video.

Until at least 60 fps commercial STB has become more common in the market, the full quality of UltraHD cannot be realized. Fortunately, semiconductor vendors such as Broadcom⁵ and ViXS⁶ are starting to offer a range of HEVC products that include entry-level, satellite system-on-a-chip STBs which support 60 fps. The expectation is that the penetration of UltraHD into homes will ramp up when UltraHD STB featuring HEVC and 60 fps becomes affordable to the consumer market.

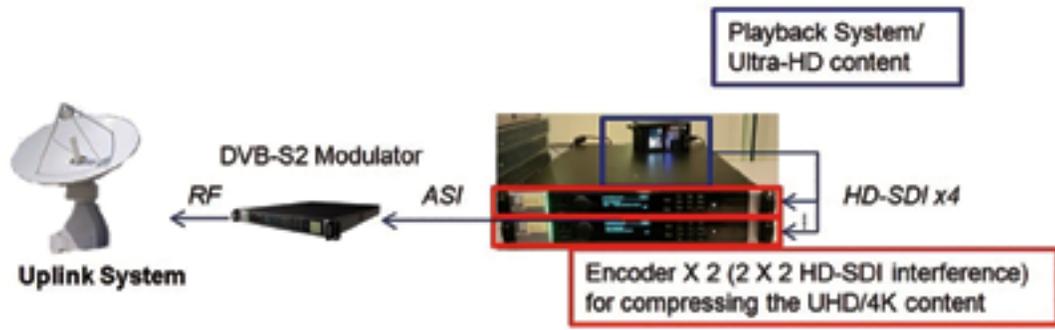
What Is AsiaSat Doing On UltraHD?

AsiaSat has taken great effort, since 2014, to promote knowledge and awareness of UltraHD in Asia. In January of 2014, AsiaSat cooperated with Hong Kong Cyberport Management Company Limited to demo a live UltraHD broadcast through the AsiaSat 3S satellite.



Figure 1. Setup of NHK indoor experiment.

Uplink:



Downlink:

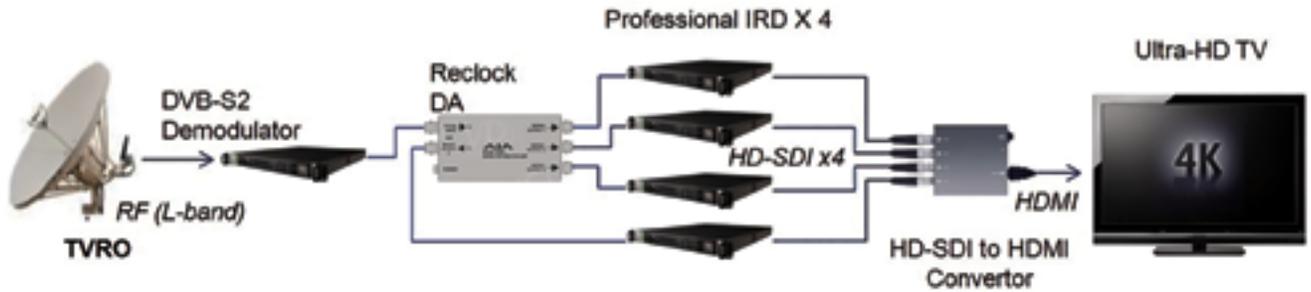


Figure 2. MPEG-4 approach for UltraHD transmission.

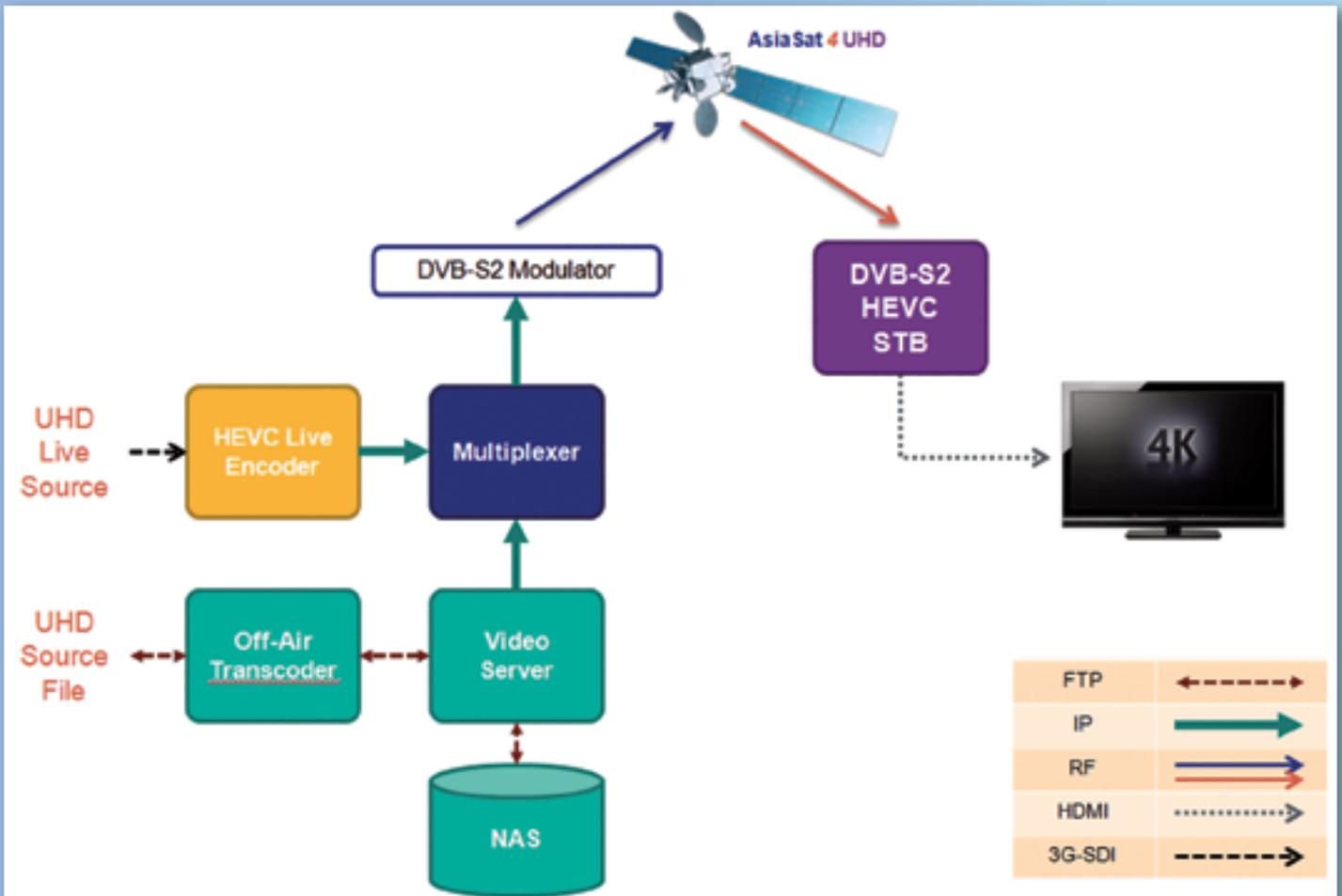


Figure 3. HEVC solution for UltraHD transmission.



Figure 4: UltraHD demo room in AsiaSat's Tai Po Earth Station in Hong Kong.

AsiaSat satellites also supported UltraHD broadcast of international sporting events; for example, the first-ever live telecast of the 2014 FIFA World Cup matches held on June 28 (Round of 16), July 4 (Quarter-Final) and the Final on July 13, 2014, in Brazil.

Furthermore, AsiaSat believes an in-depth knowledge on the actual performance of equipment and thorough understanding of different compression technologies will be highly beneficial for our customers to identify the best possible solution and the support they need. With that, AsiaSat established an UltraHD research laboratory in 2014 and joined hands with various partners in promoting and accelerating the reception of UltraHD content in Asia.

The laboratory is tasked to evaluate end-to-end UltraHD solutions that include playout, compression technologies, compatibility of satellite transmission and reception, as well as different types of content through on-air satellite transmissions. A series of tests were successfully conducted using different HEVC encoding equipment, including off-line and real time solutions, in order to determine the optimum configuration and to understand the limitations of the existing systems.

These tests enabled AsiaSat to optimize the data rate required and to understand how to provide the most effective solution for our customers. Furthermore, AsiaSat evaluated the user interfaces of different UltraHD equipment, such as file transcoder, playout, etc., to assess user friendliness of the equipment. AsiaSat will continue to test and evaluate new UltraHD equipment in the AsiaSat research laboratory as they develop and provide update to the market.

To promote the reception of UltraHD and to allow broadcasters to validate the economic feasibility of satellite-delivered UltraHD broadcasting in Asia, AsiaSat has set up a Free-to-Air UltraHD platform based on DVB-S2 and HEVC solutions on AsiaSat 4 at 122 degrees East with the launch of its first UltraHD channel "4K-SAT" announced on October 22, 2015. The platform

can deliver two to five full time UltraHD channels, available for reception by terrestrial TV stations, payTV platforms and home viewers across Asia using C-band antennae as small as 2.4 to 3 meters in size.

The "4K-SAT" channel, encoded in HEVC, is broadcasting at 50 frames per second (fps) with 10-bit color depth. In addition to offering 3840 x 2160 pixels resolution, four times the resolution of the full HDTV, the UHD specification also means a richer color palette, with more saturated colors and fine color gradations. The new "4K-SAT" channel broadcasts full UHD produced videos featuring fashion, lifestyle and documentaries.

AsiaSat welcomes customers and partners to join in this exciting development of UltraHD—please contact our team of industry experts. Tel: **(852) 2500 0888**; Fax: **(852) 2500 0895** Email: **as-mkt@asiasat.com**; Infosite: **www.asiasat.com**

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Captain Ip is AsiaSat's Communications Systems Engineer. He received his B.E. Degree and M.Phil. Degree in the Department of Electronic Engineering from the Chinese University of Hong Kong in 2009 and 2011, respectively. Mr. Ip, a member of AsiaSat's UHD Research Laboratory, is responsible for technical evaluation of different UHD solutions including the compatibility of satellite reception and transmission, playout and compression technologies.

HTS Networks Are Taking Off

By Steve Good, Vice President, Marketing, Comtech EF Data and Alvaro Sanchez, Sales and Marketing Director, Integrasy

The satellite industry has changed dramatically over the past few years, thanks to the advent of the first High Throughput Satellite (HTS) systems and the commitment of satellite operators both large and small to roll out their own unique HTS designs that promise much higher capacity at a much lower cost per bit being delivered to the user.

The first HTS offerings allowed service providers to compete with terrestrial connectivity in the direct-to-consumer market and were primarily rolled out in North America and Western Europe. As new HTS design concepts become reality, the range of target markets significantly increases for service providers who are seeking to leverage the new economical models that HTS provides. The new spacecraft innovations being rolled out will allow service providers to cost-effectively support the high throughput, carrier-grade applications that are common within the oil and gas, cruise and cargo, premium enterprise and cellular backhaul markets.

The emergence of these current and impending HTS implementations provide the potential of Very Small Aperture Terminal (VSAT) modems that are being used within a satellite network to be much more efficient and to also support the increased throughputs that users demand, all the while providing high availability and reliability. As such, HTS has already had an impact on VSAT deployments as satellite service providers look to the skies for innovation and to the ground for future-proof technology that allows them to unleash the potential of these next generation spacecraft when they are available.

This forward-looking optimism is set to increase further—Northern Sky Research estimates that the broadband VSAT market will reach \$10 billion by 2021. Similarly, IT Market Research Reports estimate that the enterprise VSAT market will grow at a CAGR of 10.49 percent between 2015 and 2018, a period that will see a significant increase in space segment supply due to HTS rollouts during this time period.

A successful HTS-based service must be based on scalable, flexible network solutions that are easily deployable and can allocate higher throughputs when and where the demand is highest at any specific time. The scalability of a ground platform is key, as the capital expenditure

(CAPEX) costs to build out the network over time must mirror incoming revenues as much as possible.



Comtech EF Data has designed its new Heights Networking Platform with the HTS service provider in mind, teaming the ground equipment scalability and flexibility required in a spot beam environment with the horsepower, efficiency and intelligence to leverage the full range of next generation spacecraft design advantages, thereby enabling service differentiation. The most net efficient and powerful platform in the industry, the Heights Networking Platform leverages a single comprehensive user interface combined with a powerful traffic analytics engine that enables the service provider to easily design, implement, monitor, control and optimize their entire satellite network.

As a satellite network grows and multiple remotes are concurrently brought onto the network, it is imperative to minimize the difficulty associated with the commissioning of a remote as well as for the long term performance of the network—all must be of the highest quality in terms of satellite link integrity and interference mitigation. Only through the proper remote commissioning solution can the utilization of costly network resources be maximized while also maximizing the Quality of Experience (QoE) of the end-user.

To this end, Comtech EF Data has teamed with Integrasy to develop the Comtech remote commissioning system, Satmotion Pocket. This offering has already received widespread industry acceptance, having been named the recipient of both the Most Innovative Product at SatCon and the Most Innovative Technology award at VSAT 2015.

Simply put, Satmotion Pocket allows satellite service providers to save both time and money when deploying remotes on satellite networks. Traditionally, accessing a satellite has been a labor intensive process as remote installers needed to interact with satellite operators in real-time to achieve certain interference isolation thresholds.



Integrasy's SatMotion Pocket.



Comtech EF Data HEIGHTS Networking Platform illustration.

The process of antenna repointing and remote carrier level checking required a significant amount of manual labor and waiting on-site, keeping the costs of remote installation high and the number of remotes that an installer could bring onto a network in a day at a low rate. The Satmotion Pocket solution significantly simplifies this process and minimizes the back-and-forth required to attain a quality installation.

This quick installation time benefits the satellite operator, the satellite service provider and, most importantly, the end-user. The use of Satmotion Pocket makes each installation simpler as well as minimizes the chance for post-installation issues onsite that may require a site revisit to troubleshoot the problem.

HTS maximize throughput through frequency re-use. A given range of spectrum (Ka-, Ku-, C-band) is re-used several times into multiple, geographically disperse, beam locations. Each range of frequencies within the band can be used in different beams with the beam locations determined by the desired level of interference for the given application.

The more tolerant an application is to interference, the closer two beams using the same spectrum can be located to one another. Highly oversubscribed, consumer-based offerings fall into this category and, therefore, beams using the same frequencies can be placed closer together. This allows the spacecraft to re-use the band many more times, creating a more “sellable” bandwidth from a macro-level, satellite perspective.

This type of design works well for low availability applications but does not work for carrier-grade applications that require a higher “quality” of bandwidth. These applications demand much higher spectral efficiencies to/from individual remote sites with much higher link availabilities than consumer-grade applications.

In those cases, interference must be minimized to create better spectral efficiencies and higher availabilities and, therefore, beams sharing a common range of frequencies must be placed further apart. The teaming of the Satmotion Pocket and Comtech EF Data Heights Networking Platform solutions allow each remote installation to maximize long-term link performance to each site on a network.

Three types of topologies are possible in an HTS design:

- *Star: Provides interconnectivity between user beams and gateway beams*
- *Mesh: Provides connectivity between user and/or gateway beams*
- *Loopback: Provides connectivity within the same beam.*

The benefits of Satmotion Pocket can be leveraged for any of these network topologies. In addition, Satmotion Pocket can be customized to fit any business models. In the case of a vertically integrated (full managed service) model, Satmotion Pocket service would be provided through all satellite beams as the satellite operator owns the network and ground infrastructure—this equates to the requirement of a single Satmotion server unit at each gateway.

This configuration would allow the automation of lineups for all user beams to be accomplished, as each user beam is connected to a gateway beam. For hub co-location and VNO models, a Satmotion server will be required only in the gateways which manage the target user beams. This is an economical cost option for service providers that will not be installing units on each gateway.

The Satmotion system is a software-based tool that allows VSAT installers to autonomously measure their uplink test signal in the field with no need to coordinate with NOC personnel. Uplink signal measurements are taken at the NOC site with a spectrum analyzer along with a controlling software server.

The installer receives measurements from the target satellite through the same VSAT that is being commissioned. He or she is then able to point the antenna properly during transmission versus the traditional method of performing this task during reception, which results in a higher quality link. The traditional method of reception-based pointing is adversely affected by squint error along with possible transmission issues during installation. The Satmotion Pocket solution avoids the long-term, network-wide costs associated with such issues.

In summary, the introduction of next generation spacecraft into the satellite communications market is well underway, with these new spot beam HTS offerings promising more capacity, higher throughputs, stronger efficiencies and a lower cost per bit delivered.

Only through the proper selection of complementary ground equipment solutions will higher performance levels and more cost-effective economics become a reality. Service providers that hope to penetrate or continue success within the oil and gas, cruise and cargo, premium enterprise and cellular backhaul markets must wisely select the appropriate ground equipment solution providers to succeed in this HTS new world.

Ground solutions must be scalable and flexible enough to grow and adapt while offering the combination of horsepower, efficiency and intelligence to support tomorrow's traffic mix reliably today.

The combination of Comtech EF Data's Heights Networking Platform with the award-winning Satmotion Pocket commissioning tool enables the service providers that will be successful in these markets to tie infrastructure and operating costs to revenue while providing the differentiated service that is needed today to stand above the noise of “me-too” offerings.

An Ingtegrasys SatMotion Pocket Datasheet PDF is available for viewing or download at

www.integrasys-sa.com/datasheets/satmotp.pdf

For additional information regarding Comtech EF Data's Heights Networking Platform, please visit

www.comtechefdata.com/products/heights/

Steve Good is Vice President, Marketing for Comtech EF Data, leading the company's marketing, market development and business development functions, objectives and initiatives based on long-term product and profitability goals. Steve has held senior management, marketing, product management and engineering positions with Intelsat, most recently as Vice President, Network Services, along with Verestar, Viacast and Hughes Network Systems. Also a former member of the Comtech EF Data team, Good previously held the position of Vice President, Sales Engineering.

Alvaro Sanchez is Sales and Marketing Director at Integrasys. Alvaro is responsible of Satellite Carrier Monitoring at Integrasys for providing most innovative solutions to satellite operators and service providers. Currently Alvaro is the head of the USA office in DC area. Prior to joining Integrasys, Alvaro was a signal analysis expert at CERN European Organization for Nuclear Research.

Executive Spotlight: Gerhard Bethscheider Managing Director, SES Techcom Services

Gerhard Bethscheider has more than 30 years of experience in the domain of Satellite and Ground Segment Engineering. His experience extends to the fields of Research and Development, System Engineering and Management. He joined SES in 1990 as Manager of the "Earth Station Engineering" section. Since January 2008, Gerhard has held the role of Managing Director of SES Techcom Services, which commercializes satellite solutions and services to an international customer base.

SatMagazine (SM)

Good day, Mr. Bethscheider, and thanks for taking the time to chat with SatMagazine. Would you please explain how you became involved in the communications market segment and then how you decided to focus in on the SATCOM side of this huge industry?

Gerhard Bethscheider

When I was a young boy, I received a shortwave receiver as a birthday present and was fascinated by how I was able to listen to all these radio programs from around the globe. I was driven to understand the technology behind this magic and started to repair old radio receivers and television sets. From there, I chose to study electronics, which I completed with an engineering degree in communications.

The APOLLO program—especially Armstrong's moon landing—was another exciting event which strongly influenced my professional interests. I started my career as a microwave engineer at Dornier System GmbH, a German company which traditionally builds airplanes and had successfully

started to develop innovative scientific satellite solutions. Here, the development of miscellaneous ground infrastructure for SATCOM applications was among my responsibilities.

On December 10, 1988, SES launched its first satellite ASTRA 1A, changing the European SATCOM landscape and making "Television sans frontiere" a reality. The launch marked the start of SES' transformation from a start-up organization to the SATCOM market leader it is today. After the fall of the Berlin Wall in 1990, I joined SES, where I supported the technical SATCOM development of SES which today has more than 50 satellites in orbit.



SM

One of your earliest projects involved a subsystem for ERS1, the first Earth Remote Sensing Satellite. What was involved for this project and what was your role?

Gerhard Bethscheider

The European Remote Sensing satellite ERS1 was launched in July 1991 and was Europe's first environmental monitoring satellite with a C-band Synthetic Aperture Radar System and included other scientific measurement subsystems, such as a radar altimeter and radar interferometer, which allowed wind and wave, sea level and surface temperature measurements.



This very successful satellite—developed by Dornier System GmbH as the European Space Agency's (ESA) prime contractor—pioneered ESA's vision of today's operational Sentinel satellites for the Global Monitoring for Environment and Security (GMES).

During this satellite program, which was developed over five years, I project managed the on-board Satellite Data Transmission System. During each satellite pass, on-board scientific data was formatted, modulated and transmitted to dedicated satellite ground stations where it was then processed. This role included coordinating and managing the development activities of an international expert team.

SM

At the start of this year, SES Techcom Services merged with SES Broadband Services. How is the integration going and what impact will this merger have on your firm's products and services?

Gerhard Bethscheider

Integrating SES Techcom Services and SES Broadband Services aimed to create synergies and increase our capabilities to develop new products and services faster and more efficiently. The integration increased our critical mass and created economy of scale and scope effects which will augment our competitiveness in the SATCOM market.

The new SES Techcom Services structure will also allow us to better support new SES strategies and better serve its vertical markets, namely Video, Data, Government & Institution (G&I) and Mobility. Within these areas, we are working to identify new products, services and global SATCOM solutions, including ones based on High Throughput Satellites (HTS).

Following the integration, we already have promising new products and services in the pipeline and under development. In Germany, we are deploying our new Wi-Fi-based Astra Connect Sub-Distribution Network (SDN) solution—an efficient technology which will fill the digital gap in underserved regions in Europe, the Middle East and Africa—while in the UK the same technology is being piloted as part of a Government-funded initiative. In the future we hope to implement the product in other international markets. Indeed, integrating the core competencies of both organizations was an obvious decision and the fact we have completed the integration in less than six months speaks for itself.

SM

What is the scope of your responsibilities in your new position as Managing Director of SES Techcom Services?

Gerhard Bethscheider

With the first phase of our new venture successfully completed, the management team will now prioritize commercializing our solutions and positioning the company as a provider of innovative, state-of-the-art SATCOM products and services.

We plan to grow the existing Astra Connect platform business, which provides broadband Internet via satellite, and remain committed to developing the G&I part of our business, where we see the highest growth potential for our organization.

New platform solutions which will leverage our experience from **emergency.lu** and SATMED are also in the pipeline. Additionally, we will engage in upcoming ESA activities and support the future growth of Redu Space Services (RSS). This is our joint company with QinetiQ which operates ESA's teleport in Redu, Belgium under a long-term management and operation agreement. In addition, we are involved in the current Galileo program phase and committed to playing an even more important role in the future.

In these plans, I will lead the SES Techcom Services team and work with SES to ensure we have the resources and support to take up these fantastic opportunities which will help grow our organization. It will be my role to ensure we have the right blend of skilled and talented people in our teams and that we build and maintain distinct capabilities to reinforce our position as a SATCOM industry leader.

SM

What is SES Techcom Services relationship to SES Platform Services? What does the latter SES subsidiary provide as opposed to your company's offerings?

Gerhard Bethscheider

Together with SES Platform Services and HD+, we represent the SES service cluster which generates substantial revenue for the SES group and which will increasingly contribute to the top line in the near and long-term future. All SES service companies share the same go-to-market mindset and have developed the same service culture required to be successful in today's highly competitive SATCOM market.

SES Platform Services plays an important role in SES' Video business and together we jointly define and develop ground solutions from play-out facilities over transportable or temporary uplink solutions to fixed uplink stations and complete satellite teleports. We have also built such infrastructures at several locations in Europe, Africa and the Middle East, supporting SES customers using the SES space segment.

SM

An area of increased focus for SatMagazine is in what we call the SatHealth™ arena. Would you please tell us about SATMED, what this program offers, and why SATMED is unique?

Gerhard Bethscheider

When using Health IT applications, four major barriers currently exist in emerging countries and resource-poor areas: The cost of secure data management and purchasing and maintaining software, low user-friendliness, poor interoperability between IT solutions and limited availability in remote areas. In these remote areas, where there is often a lack of trained health professionals, simplicity and ease of use is of paramount importance.

Multiple applications with different data formats are also coming to the market, leading to a lack of interoperability. This lack of standards, and more importantly shared standards, presents problems for doctors wishing to access shared medical records and data for patient care across multiple applications.



SATCOM preparations by emergency.lu during the Nepal disaster. Photo courtesy of SES.

SATMED uses satellite Internet connectivity and cloud technology to address these fundamental issues. As a multilayer e-health platform, which is already making significant strides in medical advancement in developing nations, such as Sierra Leone, SATMED provides medical professionals with vital applications and tools for day-to-day tasks. It is supported by Luxembourg's government, includes input from health professionals and forms part of the disaster recovery platform emergency.lu, which was developed with our partners in Luxembourg to provide worldwide coverage and humanitarian aid in times of need. By integrating multiple applications into one platform, it shares and transmits information quickly and easily, bringing significant advances to healthcare professionals, including doctors, nurses, health managers, health IT personnel and epidemiologists.

In addition, SATMED can record and analyze individual patient data, including medical images, and document disease in public health, while its integrated e-learning tools can be used to train medical students, physicians, nurses and health workers.

Earlier this year, SATMED was deployed in West Africa, to help improve childbirth conditions at Benin Maternity Hospital. Training delivered online across Africa will also enable trainee midwives' and health workers' performances to be monitored and evaluated.

Building on this experience, we also plan to launch a standardized satellite-based disaster recovery solution which will further support the first aid and rescue activities of non-governmental and institutional organizations.

SM

You're currently working with UK ISP Satellite Internet to provide Internet via a single satellite to an entire community in Luxborough village, in Somerset, as part of a Government pilot looking at technologies to connect the country's final five percent. Would you please tell the readers about this program?



SES Techcom Services at work in Bangladesh. Photo is courtesy of SES.

Gerhard Bethscheider

As more of the world moves online, there is growing pressure on Governments to ensure even the most rural locations are connected. In the UK, the Government and local authorities are investing £1.7 billion to improve broadband and mobile infrastructure and aim to provide superfast broadband to 95 percent of the UK by 2017.

While this is fairly straightforward in most urban areas and achievable through fiber installations, this is often not possible in the UK's most rural parts due to inaccessibility or low cost-effectiveness. With that in mind, in early 2014, the Government acknowledged other technologies must be considered if it was to achieve 100 percent connectivity. It announced its £10million Innovation Fund to explore ways to reach premises in the final five percent. Satellite Internet was selected as one of eight successful bidders last June—bringing satellite into the mix of potential technologies to connect the UK's final five percent for the first time.

Satellite Internet proposed an SDN and Wi-Fi head-end solution, based on the 'Astra Connect for Communities' model, to provide homes with Internet speeds of up to 25Mbps. The ISP has worked closely with Connecting Devon and Somerset (CDS) and a feasibility study and community engagement was carried out towards the end of 2014, ahead of the first villages to benefit from the pilot been announced.

Fast-forward to 2015, and the first headend is now up and running in Luxborough, Somerset. Overseen by engineers from SES Techcom Services and Satellite Internet, the headend was fitted and successfully configured on Friday, January 23, with around 109 homes now in the service area. Two more installations are due to take place in Simonsbath and Somerset later this year.

SM

Can we expect to see similar projects in the future? If so, where might we note such projects being initiated?

Gerhard Bethscheider

Similar projects can only happen in countries with Government-funded schemes which allow alternative technologies, like satellite, to compete. Normally, these funding schemes come after attempts to connect areas with terrestrial technologies. Broadband programs need to be very advanced and countries highly developed.

What we are doing in the UK with 'Astra Connect for Communities' is an example of this. Since this pilot and the installation of the solution in Germany, there has been growing interest in 'Astra Connect for Communities' and a lot of positive feedback from customers. As the broadband connection is usually supplied to end-users via Wi-Fi and one or two headends would

be enough to cover a whole village in most situations, the product could, in principle, be commercialized to any rural area without high-speed connectivity, although this does depend on the geographical location. In this way, it would complement local businesses by enabling various online services, for example, banking, education and shopping.

SM

One of SES Techcom Services' latest innovations is Passive Correlation Ranging (PaCoRa), a satellite tracking tool used for determining the orbit of an operational geostationary satellite. Can you tell us more about how this works, what applications the tool can be used for and why such a tool is needed?

Gerhard Bethscheider

PaCoRa (Passive Correlation Ranging) is a satellite tracking tool used for determining operational geostationary satellites' orbits. As well as being highly accurate and cost-effective, the solution does not need to transmit an uplink signal and can, therefore, be used on any operational geostationary satellite, irrespective of the operator or region.

The technology monitors a satellite's downlink signal through multiple ground stations within the satellite's footprint, determining the signal's Time Difference of Arrival (TDOA) for each station. Based on the geographical coordinates of these stations, PaCoRa uses the TDOAs to determine the satellite's position and predict its orbit.

Previous state-of-the-art tracking systems based on tone-ranging required active uplinks and large antennas, while prevalent solutions, such as dual tone-ranging or trilateration, require two or three uplinks. In comparison, PaCoRa only uses the downlink signal for its calculation and its position error signal is much lower than tone-ranging systems and expensive trilateration ranging systems.

Operators can use PaCoRa to provide tracking data of operational geostationary satellites, back-up other satellite tracking systems, cross-calibrate existing satellite tracking systems and ensure operational geostationary satellites are at a given slot. In addition the system offers regulatory support to national or international regulatory agencies, such as the Federal Communications Commission (FCC) or the International Telecommunication Union (ITU), and supports interference measurement/localization systems.

We developed PaCoRa to address the increasing need for highly accurate Orbit Determination (OD) which has come from the growing number of satellites in geostationary orbit. Consequently, some satellite operators now share orbital slots, while others, like SES, co-locate multiple satellites in one orbital position to provide more capacity and/or have in-orbit satellite redundancy. New satellite payload applications, such as remote sensing from geostationary orbit, also require highly accurate and cost-effective OD. Accurate data also reduces the danger of collision which is greater due to the density of satellites in geostationary orbit.

PaCoRa is capable of adding significant value for satellites operators co-locating satellites or sharing orbital positions with others. Governments and institutions, both civil and military, will also benefit, while the apparent plan in Europe to have a control center for preventing satellite collisions should also have a need for PaCoRa.

SM

Given your wealth of experience, what are your thoughts regarding the High Throughput Satellites (HTS) and their impact upon our industry?

Gerhard Bethscheider

HTS are certainly the talk of our industry these days; the global proliferation of devices and cloud-based applications, particularly video, means consumers and businesses want more data, cheaper data and data-delivery to every possible device. In essence, HTS are the industry's answer to meeting these demands—providing higher throughput and meeting expectations of more 'terrestrial-like' pricing.

Most operators today, including SES, have deployed or will deploy such satellites, so we will certainly see a surge in supply. Meanwhile, the order-of-magnitude increase in throughput and the reduction on cost-per-bit will 'unlock' new demands, helping to develop innovative new business models that were impossible with wide-beam technology just a few years ago. Aeronautical broadband is an excellent example of this effect but a range of different verticals will power this demand.

SES is well positioned for an HTS world. Our HTS strategy pre-dates many others, beginning with our investment in the path-breaking O3b system in 2008. We are now adding a new GEO-HTS layer with our upcoming SES-12, SES-14 and SES-15 payloads which represent the next phase of our strategy. Let's also not forget that, in this environment, there is still an important role for GEO-wide-beam capacity to fill. With our triple architecture, which combines GEO-wide-beam, GEO-HTS and O3b's one-of-a-kind low-latency, ultra-high throughput and global flexibility, SES is—and will remain—the only FSS operator capable of addressing every customer vertical.

SM

Will we see an even greater implementation of hosted payloads throughout the coming months? Is this the panacea needed by the Military/Agency/Government interests to help them reduce time to launch and implementation costs all have been requesting?

Gerhard Bethscheider

Using hosted payloads is an innovative means of accessing space at a lower cost than building, launching and operating satellites themselves and, to put simply, offers a faster and more cost-effective solution. SES already has three hosted payloads in orbit and extensive experience for such programs. These include two payloads for the European Commission, with SES hosting European Geostationary Navigation Overlay Service (EGNOS) navigation payloads, in an ongoing program and an infra-red sensor for the US Air Force. This was initially a one year test and was so successful the US Air Force extended it for a further two years.

With SES alone having seven launches planned over the next few years, hosted payloads are a great opportunity for Governments, institutions and others to take advantage of the conveyor belt of launches. Our US colleagues were also recently awarded two more hosted payloads, for NASA and the Federal Aviation Administration. This demonstrates the growing interest in hosted payloads and in getting fast affordable access to space which seems to be exactly what Governments and Military/Agencies require.

SM

What market segments does SES Techcom Services focus on and in which regions?

Gerhard Bethscheider

The SES business is built on four pillars: Video, Fixed Data, Mobility and Government. The main focus of SES Techcom Services is on Fixed Data, Mobility and Government markets, with a strong focus on the latter. As a reliable technology partner of SES customers, our business is global by nature and we are present in all regions served by SES satellites—including Antarctica.

SM

Looking forward, what do you anticipate as the next technological step forward for SATCOM?

Gerhard Bethscheider

I would like to mention two important developments, which will have a tremendous impact on our future SATCOM industry.

First, with the European Data Relay Satellite (EDRS) program, headed by Airbus, ESA will demonstrate laser communication between geostationary (EDRS) and Low Earth Orbit (Sentinel) satellites, allowing the seamless transfer of Earth observation (EO) high data rates in real-time. SES Techcom Services is a reliable partner of Airbus in this EO high data program and is developing large parts of the required ground infrastructure, including the Mission Operation Center. This is developed by our company Redu Space Services in Belgium.

I strongly believe that inter-satellite laser communication can be augmented by ground-to-satellite laser communication feeder link systems and we are currently studying the boundaries of such solutions with our partners. Atmospheric cloud conditions will certainly require a large network of ground laser terminals to achieve comparable link availabilities but the technologies are mostly developed and successfully used in today's terrestrial fiber networks.

Lasercom would open the Sky for Tbit satellite solutions, further improving the performance of future HTS. These satellites would become a network hub in orbit. From a service point of view, we would no longer differentiate between LEO, MEO or GEO orbits as this technology will establish a global satellite cloud, where, depending on the service criteria, consumers will request and receive services from the best-positioned satellite.

Laser communication will support the same backbone data rates as provided by terrestrial fiber infrastructure and will make satellites immune to satellite interference and jamming. There is also the potential to dramatically increase data security by applying quantum key distribution technologies. All in all, Lasercom will be a disruptive new technology that will drastically change our SATCOM industry in the long run.

Also set to dramatically impact the SATCOM industry is ADS-B (Automatic Dependent Surveillance – Broadcast). This cooperative surveillance technology determines aircrafts' positions through satellite navigation and a periodic signal which is broadcast from the aircraft, enabling it to be tracked. Air traffic control ground stations receive the information, removing the need for a second radar. As ADS-B is a connectionless broadcast technology, other aircrafts can also receive the signal to provide

situational awareness and allow self-separation. It is also automatic and does not require any pilot or external input.

The signals continuously broadcast by the aircraft via ADS-B include several information types, such as the precise aircraft position, which is transmitted every second. The equipment is being introduced on aircrafts as a supplementary data source to the ground-based radar currently used to monitor air traffic and will become mandatory equipment for aircraft from 2020. ADS-B is set to replace radar as the primary tracking technology due to the advantages it offers over radar, including greater accuracy and consistency.

Due to the fact it relies on GPS, which allows aircraft to fly closer together in congested airspace, it also broadcasts information about an aircraft's speed, position and altitude, among others. Tracking from space in this way could close the gap that currently exists due to the lack of continuous air traffic surveillance by terrestrial radar over oceanic airspace or in regions with limited air traffic surveillance infrastructure.

SES Techcom Services, in conjunction with the DLR Institute of Space Systems, the DLR institute of Flight Guidance, and ESA, trialed the technology over a year, capturing 165 million Mode-S traffic data and decoding 30 million positions. The mission demonstrated that ADS-B signals can be received from space very efficiently and statistical and analytical results are being provided for the design of a global space-based aircraft monitoring solution.

SM

As you review an already stellar career, what project(s) that you have been responsible for truly bring you a sense of satisfaction?

Gerhard Bethscheider

Marcus Bicknell, SES' Commercial Director from 1986 to 1990 and a member of the SES Board of Directors, made the following statement: "In 1985, SES had no money, no frequencies, no regulatory approval, no satellite, no rocket, no TV channels, no clients, no reception equipment and no viewers. Our critics said the company was fragile and the foundations hollow."

If I have to be selective, it is my contribution to the ASTRA project which brings me the greatest satisfaction. Over the past 25 years, this has transformed the SES in Marcus' true statement into the global SATCOM market leader it is today. The development and implementation of disruptive technical solutions, like the satellite co-location principle, our leading role in introducing DVB digital television via satellite in 1994 and our unrivaled service quality have also led to SES evolving into the satellite operator of quality and choice, overcoming any political nonsense.

It was a period of intense work, late nights, great teamwork which brought huge achievements and is responsible for more than a few grey hairs. Having witnessed this success, I am convinced that SES' new strategy will be equally successful.

www.ses.com/techcom

The Economic Value Of Satellite Radar Imagery An EARSC Report Now Available...

The EARSC (European Association of Remote Sensing Companies) has published their first report in an ongoing series which will look at the way Earth Observation (EO) data and services contribute to developing economic value.

Previous analyses have always been top-down where the large-scale economic benefit has been assessed; for example, the Spacetec partners report of 2013 which predicts 30 billion euros of benefits. In this new approach, a single EO product is examined and the impact it makes on a chain of users is traced. In this first case, the use of satellite radar imagery to support the work of the icebreakers keeping the ports of Finland and Sweden open throughout the winter is considered.

Not many people know that “Finland is an island.” Clearly, the country is not an island in a classical sense; however, since more than 90 percent of the nation’s imports and exports travel by sea, Finland possesses one of the key characteristics of an island.

The country also has another important characteristics—all of its ports freeze over during a normal winter. Hence, the issue of sea ice is of strategic importance to the Finnish government and people.

Sweden is also seriously affected by sea ice and most of the ports on the Sea of Bothnia also freeze over. This has led to a close co-operation between the two governments to run an effective and efficient ice breaking service to keep the sea lanes open throughout the year.

Other Baltic countries face some identical problems, but none co-operate as closely as do Finland and Sweden. Presently, Estonia is interested in joining the effort, but no other Baltic States are seemingly yet ready to commit to the program. This article focuses, then, on Finland and Sweden.



The story starts with the decision taken by the Finnish government in 1971 to keep 25 major ports open throughout the year. This led to investments in ice breaking ships and the development of technology—Finland is now a world

leader in ice-breaking technology.

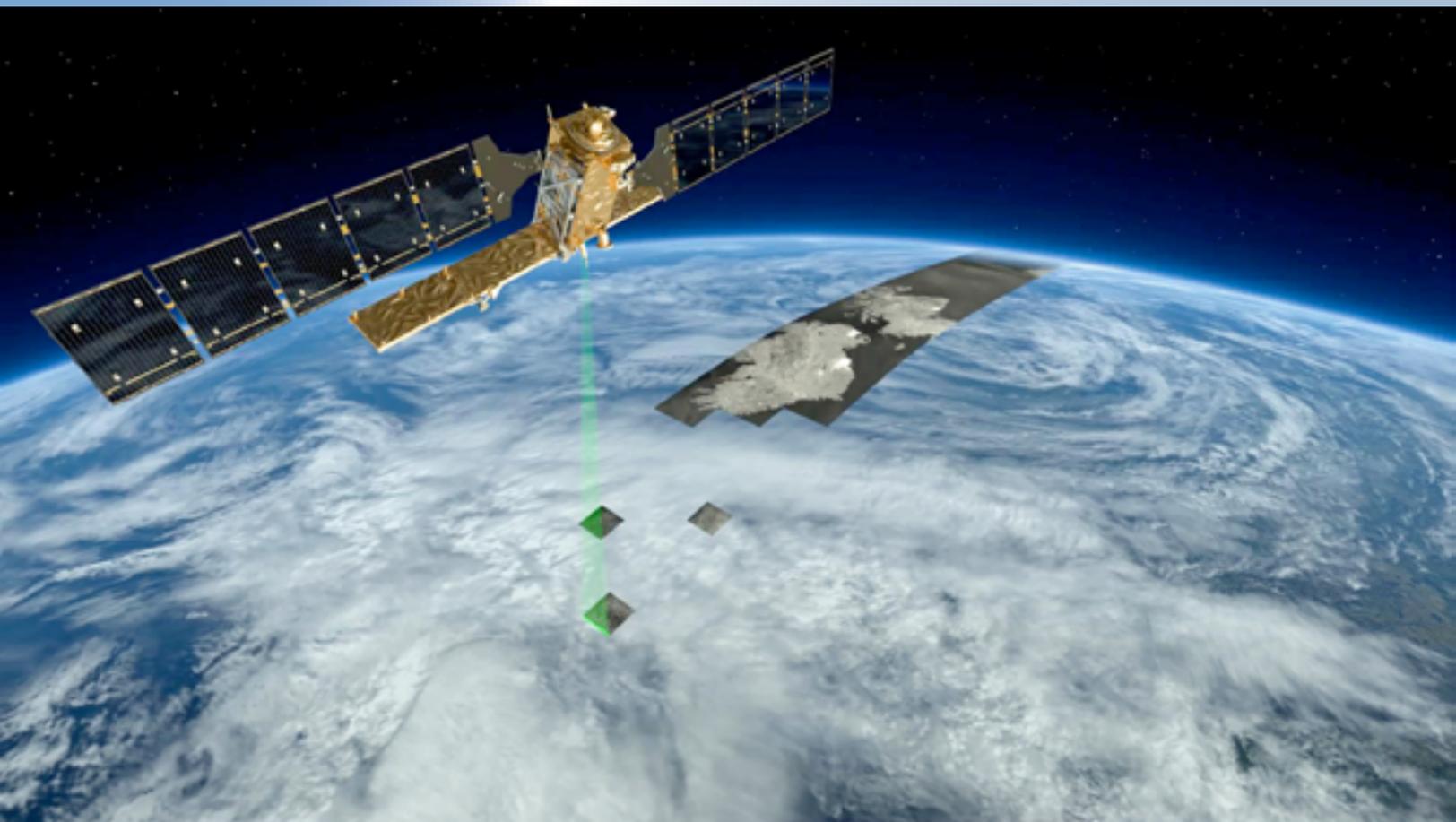
This leadership extends to the use of satellite imagery, which was adopted in 2003. Prior to this, each ice-breaker was equipped with its own helicopter which was used to fly over the sea ice and seek out the best route. While it is a powerful tool, a helicopter has a number of disadvantages that are overcome by the use of satellite images.

First, only a limited area around the ship can be flown by a helicopter, whereas satellite images show a synoptic view of the entire Baltic. This allows routes to be plotted which are optimal directly to the port, a major benefit to the operation. Secondly, when the weather gets bad and the ice conditions are at their most changeable, helicopters cannot fly. With satellites, images can also be captured at night. Third, the cost of the imagery is now a lot less than that of helicopter operations.

After a period of trials in the late '90s, the decision was taken to remove the helicopters and to rely on radar imagery. This decision also reflected that more radar satellites were operating; ERS, Envisat and Radarsat at the time and their imagery became more assured. Now, with Sentinel 1A operating and further Sentinels to follow, this is no longer a concern.

Interestingly, ice breaker captains use the imagery itself and not an ice map that is generated by the Finnish Meteorological Institute (FMI). The ice map is used by others, but the captains prefer to have the satellite imagery as





An advanced radar mission, Sentinel-1 can image Earth's surface through clouds. Image is courtesy of the European Space Agency (ESA).

they can “ground-truth” by looking over the side of their vessel as well as against comparisons with the conditions they know existed yesterday.

The use of the imagery allows the captains to plot shorter or more efficient routes to the port, which helps the ice breakers and the guided ships save fuel. The ships are also saving time, which translates into lower charter costs and better use of the ship to carry cargo.

Without the use of icebreakers, ships can become stuck in the ice and take many days to reach their port of destination. The opening of sea lanes (DirWays) allows operators to know the time of a ship's arrival with more certainty. This enables ports to operate more efficiently and, in turn, the factories which are being served by the ports to better plan their production cycles.

Of course, without the icebreakers, the factories would probably not be able to operate at all. At best, they would be working eight or nine months of the year, so the impact of the ice breaking services on the factories and on the local economy is a boon.

The impact on the factories and the local economy is significant. Timber, paper and steel are the main industries in this area of Finland and Sweden. There are no refineries, but there are depots of petroleum products which are shipped from southern Finland. Just-in-time production methods require confidence in both the arrival time of raw materials and what the possibility is to ship finished products.

Delays to shipping can have significant impacts. In example, a paper company had to fly out newsprint during a particularly hard winter at greater cost or risk losing their contract with a European newspaper.

How much is all of this worth? The methodology which The EARSC is testing takes each step in the value chain and, through an understanding of what is happening, is able to derive methods to analyze the benefits.

For the case of winter navigation in the Baltic, the organization was able to do so with the results as shown in *Figure 1* on the following page. This shows each step in the value chain and the economic benefit that can be calculated for each step.

The steps are at least partly defined by the type of information that is relevant and the changes between each one. For the ice breakers, the SAR image is used; for ships, they use the routes designated by waypoints defined by the ice breakers; for the ports, the time of the ship's arrival is



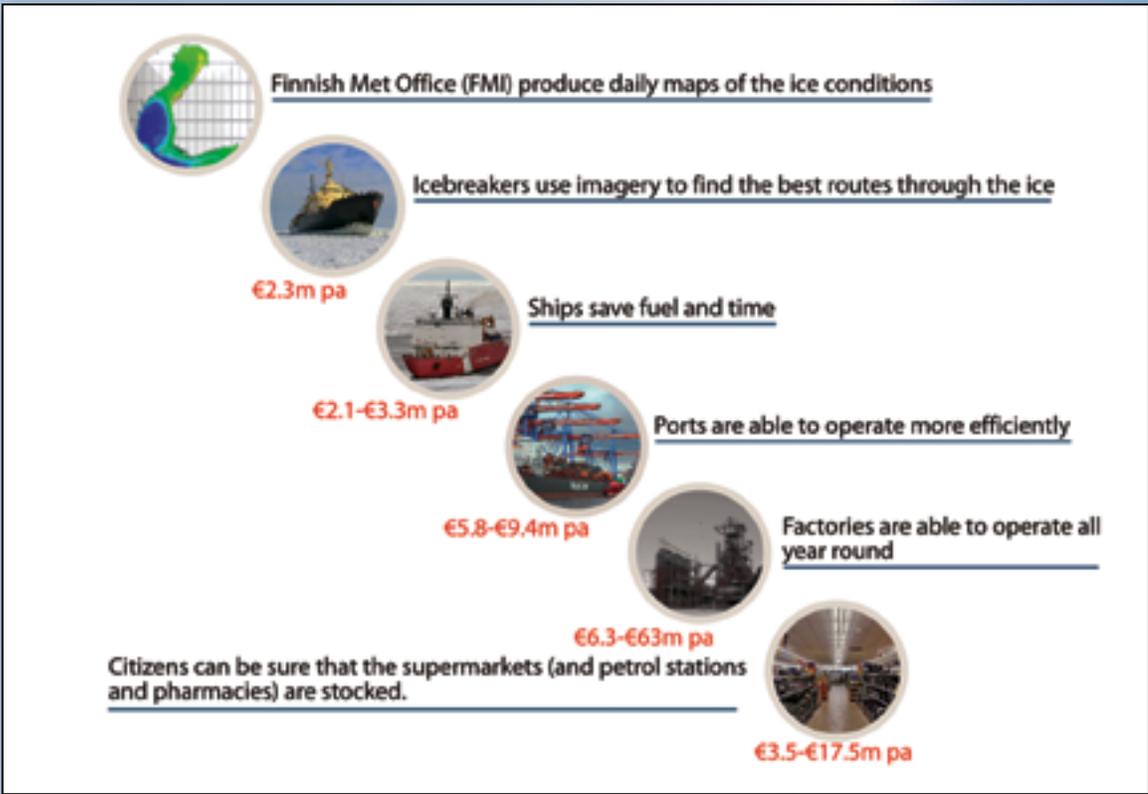


Figure 1.

the important criteria; for the factory, they are concerned with the arrival or departure of their goods. These are the parameters used to assess the value as shown in Figure 2 below.

The overall benefit is quite surprising. Lacking any prior analysis of the impact of the ice breaking services on the Finnish economy forced the EARSC to develop a new model and to make a number of assumptions. None of these conservative assumptions have been challenged. Nevertheless,



Finland as an island. Image courtesy of EARSC.

EARSC analysis reveals an overall economic benefit of between 24 and 116 million euros per annum. The range is due to the cascading effect of using ranges of values for certain steps in the value chain.

At the outset EARSC considered that each value chain derived from a single EO product would demonstrate value of several 100,000 euros and perhaps up to 1 million euros.

The impact of EO is touching every citizen living in Finland and especially those living on the Sea of Bothnia. With greater certainty of the arrival of the ships, citizens are employed throughout the year in working factories and can be more assured of

having fuel to heat homes and power their cars as well as being able to visit fully stocked supermarkets and pharmacies.

How much are they prepared to pay for these necessities? The EARSC make a simple estimate in the report, however to know an actual cost factor and to validate further assumptions will require a much larger study.

The EARSC shows how the images generated by satellites are benefiting the citizens whose taxes have helped to pay for their on orbit capabilities. The level of economic benefit from this one service is quite high. The benefits extend from the cost of operating ships through to the local economy, including the local citizens. Indeed, satellites touch the everyday lives of all of us.

For additional information regarding this organization, please visit:

earsc.org

Managed Capacity / Managed Services, The New “New”... A Hughes Perspective

By Vaibhav Magow, Regional Director, Asia/Pacific, Hughes Network Systems

Traditional satellite service business models are evolving. As a result, Managed Capacity, or Managed Satellite Services, are generating great interest as a new offering.

Managed Capacity is buying satellite capacity purchased as an IP cloud and selling it in the form of Mbps rather than in the traditional MHz model. In this model, the provider packages satellite capacity with network infrastructure to make IP capacity available.

Purchasing capacity in large quantities allows providers to aggregate demand across a large subset of market segments and sites, support a more diverse range of requirements and simplify rolling out IP VSAT (Very Small Aperture Terminal) networks.

However, is this really a new business model? If so, then why are we are talking about Managed Capacity as a service? How does Managed Capacity differ from the traditional Satellite Service model?

The Managed Capacity model has existed in the form of outsourced contracts by customers who could not operate and maintain a network on their own, but who need a turnkey network rollout as opposed to buying individual circuits. In other instances, telecommunications companies that did not want to operate satellite network infrastructure have executed satellite managed capacity contracts with remote terminal installation and support.

Typically, these models have been limited to large committed contracts and restricted to singular requirements. The Managed Capacity model is a derivative of these earlier models. It provides more flexibility to address a larger set of

market segments, customers, and channels. It also allows for rapid expansion of service revenues by resorting to a wholesale model for bandwidth.

FSS Or HTS?

There is discussion within the satellite industry as to whether Managed Capacity contracts (Mbps) will be the way High Throughput Satellite (HTS) capacity is sold. Hughes Network Systems believes this scenario is not limited to satellite providers; service providers, too, could evolve their business models to offer IP VPN-like services, as well as Managed Capacity to aggregate greater bandwidth demand. By aggregating demand, service providers would be in a better position to negotiate bandwidth (MHz) pricing.

Typically, a Managed Capacity provider offers wholesale amounts of IP capacity and leaves end service offerings, as well as the day-to-day operations of the network and customer interface, to channel partners, systems integrators, and even VPN or MPLS providers.

Hughes also recognizes that the Managed Capacity model is not limited to HTS. Even FSS capacity could be easily available under this model. Let's take a brief look at the factors driving the adoption of these models.

Managed Capacity: Trends Driving The Change

As most industry reports indicate, satellite capacity over the Asia Pacific region is increasing. There is an increasing need for HTS and FSS bandwidth as more data is sent over the Internet and enterprise networks.

New players and capacity are also emerging, as traditional players look to expand into new geographies and frequency bands. In general, capacity availability creates pressure on MHz prices. To extract higher



value, operators may begin to offer Managed Capacity to change the price from MHz to Mbps, and by providing IP capacity, lower the barrier to entry for customers.

Service providers who were once restricted to serving a limited number of customers are forming marketing partnerships where they can offer a Managed Capacity model, leverage their infrastructure, and gain access to new market segments.

For example, a USO service provider acquires a greater number of sites and achieves lower service pricing by bidding directly and by supporting smaller operators who stand a chance of winning contracts. This is known as “white labeling” the network service to gain the aggregation needed to achieve a price advantage.

In certain instances, service providers are unable to sell circuits or priced bandwidth models and compete with terrestrial providers. Providing Managed Capacity and enabling the enterprise to leverage the larger IP bandwidth cloud can deliver increased value to chief technology officers who can then decide how to allocate bandwidth across their applications and sites.

In essence, a Managed Capacity model offers advantages when entering a new, highly competitive market. Aggregating demand helps achieve economies of scale, and when there is a strategic goal to acquire customers in new market segments beyond those associated with traditional service providers.

An Evolutionary Step Forward

While customers would continue to purchase capacity in MHz, Managed Capacity models can play an important role in the market's evolution. Smaller operators do not need to purchase, operate, and maintain their own ground systems. Managed Capacity models can provide a simpler, and better, cost model for them. This would help them retain customers in a competitive market and provide the capacity to grow their businesses.

Aggregating demand brings economies of scale, increasing providers' ability to compete with alternative technologies. This is the most likely step in the evolutionary process as operators try to achieve maximum revenue from their infrastructure investments and acquire more customers.

There are also technical benefits from aggregating demand. Rather than having multiple forward DVB-S2 channels, aggregating demand into a single forward channel can unlock transponder power allowing the network to squeeze more bits by running a higher modulation, or coding, or both. That often sparks demand consolidation and reduces risk for satellite operators. Faster adoption of fresh capacity will likely also prompt operators to deploy Managed Capacity models as they enter new geographical areas.

Ground Segment Choice For Managed Capacity Providers

The success of the Managed Capacity model depends largely on the ground systems' capabilities. This makes choosing the right system as important as choosing the correct marketing model. Some of the capabilities necessary in a ground system are:

- 1. Network Management Systems (NMS) that support and run all types of VNO (Virtual Network Operator) models. A Managed Capacity provider should be able to extend the NMS easily to multiple customers. The NMS needs to be robust and able to target a diverse set of networks simply and efficiently, and to support a large number of remotes.**
- 2. Scalable architectures capable of growing seamlessly without encumbrances of software or throughput licenses. Lights-out operation is important to enable remote maintenance and allow the infrastructure to be operated from any physical location.**
- 3. Flexible architectures that allow selling IP capacity to a mix of end customer requirements (e.g., 3G/4G mobile backhauling, ATM and branch banking, maritime customers, in-flight broadband, consumer/small-to-medium enterprise broadband).**
- 4. Billing systems that can connect to different providers' OSS/BSS systems or a cloud-based OSS/BSS for those without their own systems.**
- 5. Support for multiple layers of Virtual Network Operator models. Creating VNO models should be possible without procuring multiple NMS systems. All ground system features should be accessible within the VNO and able to support various hierarchies.**

Managed Capacity models have been around for years. Yet the evolution of the Satellite Service model and of the marketplace have prompted the emergence of Managed Capacity as a means to deliver greater value than is typically possible from a pure MHz model or CIR circuit-based approach.

A Managed IP Pool offers customers flexibility, allows for faster adoption and more sites in the network. Broadband satellite solutions provide operators the ability to implement a mix of business models simultaneously, without the encumbrances of software licenses. Ultimately, this gives operators the opportunity and the means to expand their own business offerings.

Creating Educational Opportunities In Haiti

An iDirect Case In Point

In October 2014 the doors to the Kay Anj Village School in Cap-Haitien, Haiti, opened for the first time.

This facility is part of the first phase of development for the Kay Anj Village, which sits on 40 acres of land in the small village of Dekle. When complete, the village will provide homes, schools, playing fields and a church for orphaned and abandoned children in the Kay Anj D'ayiti (Angel House of Haiti).

The project is the vision of Debbie and Bill Harvey. The couple founded Helping Haitian Angels (HHA), a non-profit organization, in 2008 to provide medical care, shelter, food and clean water for the children of Cap-Haitien.

The Kay Anj Village School will provide 121 children from pre-kindergarten through sixth grade, the opportunity for education—and for a promising future.



However, being able to provide the opportunity associated with education requires resources—resources that are not so easily at their disposal as they are to the rest of the world. Foremost, that means overcoming one fundamental challenge: the fact that only 10.6 percent of the Haitian population had access to the Internet, according to the ITU.

A Generational Change

Access to quality education is essential to both the social and economic development of Haiti. Yet, the majority of schools in Haiti receive minimal government support, lack qualified instructors and are a significant financial burden on low-income families. Furthermore, according to statistics from USAid:

- *Haitians aged 25 years and older receive on average only 4.9 years of education and only 29 percent attend secondary school.*
- *More than 80 percent of primary schools are privately managed with minimal government oversight*





The Kay Anj Village School is part of the first phase of development for the Kay Anj Village, which sits on 40 acres of land in the small village of Dekle in Haiti.

- *Half of public sector teachers in Haiti lack basic qualifications and almost 80 percent of teachers have not received any pre-service training*

This introduces the risk that a generation of Haitian youth will not have the necessary knowledge and basic skills to succeed in the work force.

Reaching Out With VSAT

In this region of Cap-Haitien, fiber and cellular connections are scarce at best. In areas where they are available, the time and costs associated with installation can be prohibitive.

Satellite is a key enabler for this region since it is easily deployable, provides a reliable connection and is cost-effective when compared with other access technologies.

For the children of Kay Anj Village, access to the Internet not only means hope for education, but hope for a more successful future. According to the Center for Global Development, in developing, low-income countries, every additional year of education can increase a person's future income by an average of 10 percent.

To help bring the Internet to the children of Kay Anj Village, HHA has partnered with satellite technology providers iDirect and LBiSat to deliver broadband connectivity to the Kay Anj Village.

Combining an Evolution® X3 satellite router from iDirect with Ku-band bandwidth from LBiSat, Debbie and Bill Harvey have taken a major step in providing the children of Kay Anj Village with the value of distance-learning, which includes:

- *The ability to access world-class educators and collaborate with other students, all of whom are located around the world, via teleconference*
- *Real-time access to the latest learning resources and capabilities made available via the Internet*
- *The benefit of tapping into social networks and other digital resources that enable them to advance their communications skills, both personally and professionally*
- *The opportunity to learn and develop reading and writing skills that can be passed down to next generations, as well as previous generations*



iDirect Evolution X3 Router.

“Providing education not only changes the lives of this current generation of the Haitian population, but future generations to come,” said Debbie Harvey. “Parents of students of the Kay Anj Village School, who themselves were never taught to read and write, have come up to us to tell us that their children can now educate them, too. That is a true generational impact.”

A Generational Connection

"The power of connectivity comes not only in the technology being provided, but in the form of knowledge that we can leave behind with the community. In essence, this is a whole new opportunity for information," said Rob Kilroy,



regional vice president, Americas, iDirect. "The more power we put into the hands of the people of Kay Anj D'ayiti, the better their ability to leverage this powerful connection for generations to come."

Changing Lives

The residents of the Kay Anj Village worked side-by-side with iDirect and LBiSat to establish the VSAT connection.

When iDirect and LBiSat first arrived in Kay Anj D'ayiti, priority number one was getting power to the buildings in the village. Historically, the challenge for Cap-Haitien was that residents typically only experienced one or two hours of electricity per day. That is slowly

changing as a local power facility is providing immediate and ongoing power—critical to the big plans that Debbie and Bill Harvey have for the 40 acres of land that comprise the Kay Anj Village.

Following the work of a master electrician who wired up the buildings in the village, iDirect personnel worked alongside local villagers to assemble the VSAT equipment and prepared for connection. Power was finally turned on at 4:00 p.m. on the last day that the group was on the ground. One hour later, connectivity was live.

From there, LBiSat worked from the LBiSat network operation center to commission the Evolution remote. The team trained a local Haitian named Wilson Chery on details of the system. This would allow him to help with any issues that may arise with the system in the future—essentially putting the power and control of the connection into the hands of the community of Kay Anj D'ayiti.



Technology holds the power to change lives and truly makes a difference for those who previously had no access to information. The day that connectivity was turned on at Kay Anj D'ayiti was one that marked a major turning point—not only for this small region of Haiti, but for the entire country.

"The day we opened the doors to Kay Anj Village School was a day that changed the lives for hundreds of individuals in Cap-Haitien. The dedication and generosity of both iDirect and LBiSat cannot be understated in helping HHA build a brighter future in Haiti," said Debbie Harvey.

www.idirect.net/

lbisat.com/

Rodger M. Lyman is the CEO/President of LBiSat, LLC. His business experience spans more than 28 years. He joined LBiSat, LLC in January 1997, and has been instrumental in positioning LBiSat, LLC, as a leader in the satellite market. Under Rodger's leadership, the company has achieved consistent revenue growth and has built a roster of customers worldwide. Rodger has developed an exceptional background in people and a professional style based on excellent inter-personal communications.



LBiSat delivers secure voice, data, video and media services around the world. We support our remote applications with flexible, scalable and affordable packages. The company offers: Advanced IP network solutions with QoS/prioritization for seamless integration with existing or planned IT equipment; Managed networks scalable up to 20 Mbps are managed securely from end-to-end with critical reliability; Emergency Response and Contingency Services providing the only source of communications in the hours during and the days following catastrophic events; more than 30 years of custom manufacturing, equipment integration and successful installations in over 100 countries around the world.

LBiSat also provides Media and Event Management services and solutions for projects including OU Satellite Space Segment, Event Management, Uplink Trucks, Mobile Production Trucks, HD Encoding & Encryption Services as well as Downlink/Uplink Turnaround.

LBiSat's technical staff maintains a level of knowledge and understanding that is seldom duplicated. Our Network Operations Center provides outstanding 24x7 customer service and technical support wherever projects take you around the world. Current and past clients include: USAID, Cobham, Boart Longyear, NASA, Boeing, FEMA, Northrup Grumman, US Army, US Navy, US Department of State, the National Guard, General Electric, Lucas Oil, Red Bull, ExxonMobil and more.

Connecting With New Communities... A Yahlive Perspective

By Sam Boustany, Chief Executive Officer, Yahlive

Broadcast technology is progressing at such a pace that the focus has shifted from the underlying solutions themselves to the way in which people's lives are impacted and improved by them.

This has never been truer than for Yahlive, which operates a leading-edge network to broadcast quality satellite television yet measures its success through the communities it serves and enables. Connecting with communities is at the heart of Yahlive's business and has been fundamental to its success.

Yahlive is a broadcast satellite company that provides quality satellite data and broadcast services to corporations and to a mosaic of different communities in the Middle East, North Africa and Europe. Yahlive also brings communities closer by delivering their favorite local and international TV entertainment.

Yahlive's East, MENA, and Europe Ku-band beams provide access to more than 160 satellite television channels, of which more than 70 are exclusive to Yahlive. The company broadcasts in both Standard and High Definition, with powerful signal strengths allowing it to be received on dishes as small as 50 centimeters.

Yahlive has come a long way since its inception in 2011, and strives to positively impact the lives of people wanting to remain connected through language and content. Yahlive works hard with broadcasters to ensure specific bouquets of channels are put together that most suit each community's viewing tastes and habits.



"Delivering relevant and bespoke infotainment means that the viewers get to watch what they understand and relate to, allowing them to stay tuned-in"

said Sami Boustany, the CEO of Yahlive. The company also works closely with broadcasters and relies heavily on market research to assess gaps in community and viewership trends.

Earlier this year, global research company IPSOS published a survey into the viewing habits of the Farsi speaking community. The survey consisted of several thousand interviews and produced 1,200 successful results used for onward analysis. The survey highlighted a number of key findings, including that there are an estimated 25 million Farsi-speaking viewers watching channels beamed by Yahlive, viewers who have come to expect high-quality content and delivery. Connecting with these communities remains the backbone of Yahlive's business, and offering viewers the content they desire is a contributing success factor.

According to the IPSOS survey results, 81 percent of Yahlive users intend to continue using the service and Yahlive was rated by viewers as having the highest retention and satisfaction ratios among all other satellite providers targeting the same Farsi speaking communities of the region.

Yahlive's value proposition is multi-dimensional, and the intention is to maintain it as such for as long as possible. While technical excellence is one of the company's driving selling points, it is not the only one. As such the satellite service provider has raised its focus on audience needs, and the regional communities in countries covered by its East, MENA, and Europe beams. Previously parts of this region have been underserved, with language and local content via satellite being limited in some areas.



QUALITY SATELLITE
BROADCASTING



This is where Yahlive is building deep, lasting relationships. In addition to reaching the target communities with the right programs, Yahlive also works to evolve its broadcast service quality. With the current demand for enhanced picture quality Yahlive will soon be delivering several 4k channels.

The ongoing deep dive analysis of viewers and their preferences has resulted in the Yahlive proposition evolving over time. In the past, Farsi, Afghan and Kurdish channels were spread across multiple satellites, thereby delivering a fragmented source of regionalized satellite TV channels from different orbital neighborhoods.

With its Yahsat's Y1A satellite Ku-band payload, the company has successfully consolidated existing and new exclusive channels, thus providing premium content that appeal to these markets and acts as a powerful viewership growth catalyst. This has resulted in Yahlive possessing the fastest growing community of Direct-to-Home (DTH) viewers and channels serving the Farsi, Kurdish, Dari and Pashto audiences across the Middle East, South West Asia.

Extending its reach further, Yahlive recently announced signing a capacity deal with Adriatic Tours S.L—Alpha One RTV Network, with the two companies set to collaborate on the broadcast of channels to the Balkan communities in the Middle East, North Africa and Europe in eight languages; Bosnian, Serbian, Croatian, Albanian, Turkish, Spanish, English and Arabic. These free-to-air (FTA) channels will be available to Yahlive viewers who reside within the MENA footprint pointed at the Yahsat 1A satellite located at the 52.5 degrees East orbital location.

Yahlive also announced that it has signed a deal with Sahili Media Group to serve other communities in their MENA footprint with a rich bouquet of existing and exclusive local and French TV content from the Maghreb and elsewhere in the world bringing Algeria, Tunisia and Morocco their favorite news and entertainment channels.

"Yahlive's trajectory is based on regionalizing its service offering. This entails creating multiple hotspots one for each community in its coverage, and it compels us to diligently cater to the specific requirements of both broadcasters and viewers. There can be no bigger long-term plan than to offer broadcasters what they want. And for Yahlive viewers, the pledge is to continue fostering a sense of individuality and togetherness combined, irrespective of cultural diversity and distance," said Boustany.

Yahlive is a joint venture combining the visions, energy and values of Yahsat and SES, and has been enhancing the viewing experience of many communities, crafting a dynamic satellite television neighborhood across its coverage area.

www.yahlive.com/

Prior to his appointment as CEO of Yahlive, Sami was the Chief Strategy Officer of Yahsat and was responsible for developing and implementing the long-term strategic business and regulatory roadmaps of the company.

Before joining Yahsat, Sami was a Senior VP at Mubadala, a leading investment arm of Abu Dhabi as well as Yahsat's parent company. Previous to his work with Mubadala, Sami was a Senior Associate with Booz & Co. where he helped develop and grow the firm's MENA satellite platform from 2006 until 2008.

Sami started his career in the satellite industry with Northrop Grumman in the US and as a Senior Systems Lead Engineer, he co-led several satellite ground software programs for more than 6 years.

Sami holds MS degrees in Electrical Engineering and Management Information Systems, both from the University of Central Florida.

Blazing New CDN Support Channels... An STN Perspective

By Jurij_Blažin, Technical Director, STN

STN PLC offers their insight into some of the company's more recent technical implementations to ensure the firm remains at the top of its game and continues to offer the services expected of a strong industry competitor.

With all the various conversations and presentations over the last few years, *Satnews* readers are familiar with CDN services; however, let's proceed with a memory refresh.

CDN video services are divided into two basic types—Video on Demand (VoD) and live streaming. VoD services are provided by CDN edge servers that deliver static pre-encoded video files to client video players. Live streaming services are provided by CDN edge servers that deliver live content—dynamically generated video files or network data streams—that originates from video encoders and is transported to client video players through the backbone network of the CDN. In most cases, these processes are transparent to the encoder source and client player.

With the new Elemental head-end equipment installed, STN now supports all of the major CDN networks and network protocols, such as HTTP or RTMP, as well as streaming delivery architectures and Apple HLS or Microsoft Smooth Streaming. No matter what the client wishes to achieve with Over-

The-Top (OTT) services, STN can assist to tailor requirements and offer consulting services to match the expectation of each individual client.

Elemental Live can provide real-time video and audio encoding for linear payTV broadcast and live streaming to new media platforms over CDN's of a customer's choice or preference. With Elemental Server and Elemental Delta origin and its edge functionality, STN can integrate and seamlessly include VoD services into the company's portfolio of services. Such allows payTV operators and content providers to monetize assets by deploying video delivery infrastructure that expands content delivery, enhances OTT services and capabilities and reduces video distribution costs.

Recently won projects are now successfully on air using the new, state-of-the-art headend services, which are already proving to be a most prudent investment.

STN PLC continued to modernize and has also invested in major Internet and L2 PoP's infrastructure upgrades. These upgrades include the investment into the new ASR 1000 Series Aggregation Services Routers, Cisco ASA



STN large antenna. Photo courtesy of STN.



The reasoning behind this move was to satisfy the ever increasing demand to migrate contribution path from traditional satellite to the more cost effective fiber / IP contribution. Over the last couple of years, STN has seen a huge rise in the number of clients who are investing in the products/ services for fiber /IP delivery systems. This migration into the ‘terrestrial/ cable’ contribution will on a long term save content providers/TV stations a great deal of money.

STN has also concluded this phase by moving to a purely IP-based infrastructure that eliminates and bypasses the need for ever-so-costly (3/6/12HD)-SDI routers and ASI switches. The new IP based infrastructure will provide the company with extremely flexible and robust solutions, while retaining the maximum possible quality both for SD/HD/UHD formats as well as for MPEG-2/MPEG-4 AVC/HEVC video codecs.

The core of the head-end consists technology from the Cisco Nexus Family of data center switches, offering the capabilities of the comprehensive Cisco NX-OS feature set. The switches are renowned for their high scalability and unparalleled performance and are designed to meet the scaling demands of traditional and cloud deployments.

5585-X models with FirePOWER Services, which includes a Security Services Processor (SSP) for maximum protection against any potential threats on the Internet lines.

Simultaneously, STN has upgraded and increased all international traffic capabilities on various PoP's around the world. Simultaneously, STN has increased their diverse path/dual ISP provider public Internet line by 1000 percent from 1 Gbps redundant connection to 10 Gbps fully redundant public Internet line.

The new data center switches are now based on the Cisco Nexus series of switches and Catalyst 6500 series switches. All of these devices operate in full active/active redundancy mode enabling maximum resiliency without single point of failure.

With throughput of a staggering 2.56 Tbps (Layer 2 and 3 hardware based) and 96 10GE ports and 8 true 40GE QSFP ports, these behemoths now stand and serve the core of STN's new advanced head-end based on the Ericsson's Multi-Platform Head-end architecture.

The new IP based infrastructure is up to the latest technological standard and is also enables STN to offer customers even higher reliability and flexibility—all this at the most competitive pricing, as the costly routing and switching equipment will be completely eliminated.

“STN continues to thrive and has retained its original working principles, one of which is to be technically prepared to offer its clients not only

personalized but optimized services, and it delivers,” said Jurij_Blažin, Technical Director at STN PLC. “We consider our practice of fast turnaround personal one to one client service evaluation through to finalization unique. Researching Market trends is extremely important but a lot can be gained by listening to clients, working with them and realizing their ambitions.

“Through in-depth analysis of infrastructure upgrades and potential, STN is already prepared for the next phase of company expansion. Technically prepared for the future and ready to expand not only structurally but globally, as well.”

Additional information at:

stn.eu



NSR Analysis: EO – The New Playground for UAS and SmallSats

By Prateep Basu, NSR Analyst, India



Though commercial Earth Observation (EO) represents a small part of the satellite industry, this sector has grown at a CAGR of 8.3 percent since the year 2008.

Thirst for data-driven decision making in various sectors like oil & gas, infrastructure, agriculture, forestry and wildlife, and emergency response is expanding the reach of the EO industry beyond the traditional government customer. These are the areas where the traditional satellite-based EO industry will compete directly with other platforms such as Unmanned Aircraft Systems (UAS) and smallsat constellations providing high temporal resolution.

NSR's recently released report, **Satellite-Based Earth Observation, 7th Edition** (www.nsr.com/research-reports/commercial-space/satellite-based-earth-observation-eo-7th-edition/), found the decision making that goes into acquiring data and data products usually depends on the 4C's—Cost of acquisition, Coverage of the platform, and Compatibility of data to meet Customer requirements. All these factors are intertwined, as higher coverage implies higher cost, which in turn means large datasets (in both medium or high resolution) and, thereby, a set of boundary conditions for the customers to select, as per their requirement.

An example of the 4C's is illustrated in the table below, which compares the utility of satellites and UAS in different vertical markets on a relative basis. A classic example would be the Defense and Intelligence market, which is well established for both satellite and UAS-based EO.

Though satellites cost lower than UAS in the long run for ISR purposes, primarily due to the operational expenditure associated with flights, they are still used only for strategic planning purposes—the on-demand, real-time UAS imagery and video are the areas that provide the key battlefield inputs and where this platform offers advantages over satellite.

This is, however, not the case in the Energy and Natural Resources vertical market, as satellite imagery requires substantial post processing and integration with other data sets (seismic, geological, etc.). This leads to a preference for lower-cost, sub-50 cm imagery provided by small UAS. The energy market is actually one of the biggest promoters of UAS applications in monitoring off-shore pipelines, change detection in the nearby environment, and live-video feed relay of plant operations.

On the other hand, small satellites and their constellations deliver a different value proposition, which is strongly reliant on powerful algorithms based on machine learning, pattern recognition, and other image analytics methods. Most small satellite platforms under 50 kg launch mass are unable to produce the same image characteristics as that derived from a sophisticated satellite such as Digital Globe's WorldView-3.

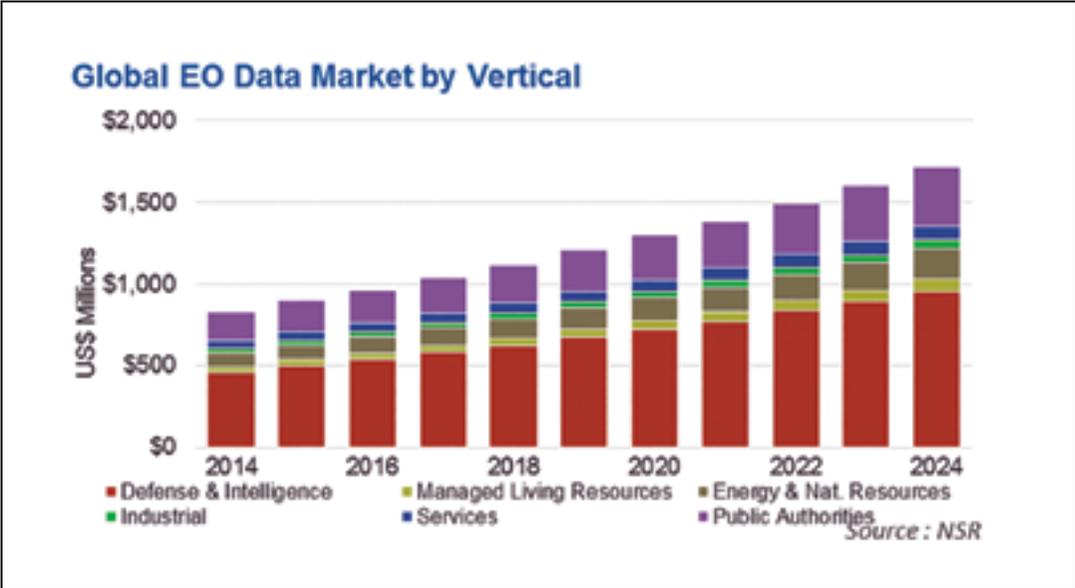
However, large constellations of these smallsats will provide high revisit rates, leading to useful time-series data generation. Such data products are useful in vertical markets like Managed Living Resources (agriculture, forestry) and Industry (Construction, Transportation) due to the correct match between cost, coverage, and compatibility of datasets with the customer's requirements.

NSR's **Satellite-Based Earth Observation, 7th Edition** report took into account the impact of smallsats and UAS, among many other factors, on the global commercial satellite EO industry and modeled the market across six industry verticals to find that the satellite EO data market will grow from \$833 million in 2014 to \$1.72 billion by 2024.

Rapid progress in the commercial UAS sector (more so during 2014 to 2015), especially in the computing and image processing software part, is adding to the competitive environment for satellite-based EO. This is especially occurring as entry barriers to the industry are lowered due to

Sl. No	Vertical Market	Coverage		Cost		Compatibility		Impact of UAS on Satellite EO revenues (-)	Customer Requirement
		Satellites	UAS	Satellites	UAS	Satellites	UAS		
1	Defense & Intelligence	High	Low	Low	High	Medium	High	~15%	Very high-res real time data, cost not a barrier
2	Managed Living Resources	High	Low	High	Medium	High	Low	~10%	Medium to low res data, long time series
3	Energy & Natural Resources	High	Medium	High	Low	Medium	High	~30%	High-res data with high temporal res

Source: NSR



Based in Bangalore, the silicon-valley as well as the space city of India, Mr. Basu joined NSR as an analyst in 2014. He has authored the first edition of NSR's Unmanned Aircraft Systems study and has been a co-author of the fifth edition of Satellite Manufacturing and Launch Services report. His area of expertise and interest include launcher and satellite manufacturing, UAVs, Earth Observation, and Fixed Satellite Services markets.

Mr. Basu comes to NSR after completing a 'Masters in Science' from the International Space University, Strasbourg, in the area of 'Space Studies'. Prior to attending ISU, Mr. Basu had a two year term with the Indian Space Research Organization (ISRO) as an engineer at the spaceport of Sriharikota, where he worked on six launch missions of the PSLV, and as a system engineer for the GLSV MK-III project. He has also worked closely with ISRO as an intern in the areas of launch vehicle engineering and business development at various centers across India, like the Vikram Sarabhai Space Centre (VSSC), Liquid Propulsion System

technological innovation and 'trickle-down effect' from other sectors such as consumer electronics, cloud computing, and powerful analytics.

The traditional satellite-EO industry is, therefore, at the cusp of major shifts in business models for adapting to threats from smallsats and UAS, which now seem more real than ever before.

Centre (LPSC), and the commercial wing of ISRO, Antrix, while pursuing his 'Bachelors in Technology' in the field of 'Aerospace engineering' from the Indian Institute of Space Science and Technology (IIST), Trivandrum.

Mr. Basu has collaborated with research labs in India and abroad in varying capacity, and has published his works in international journals and at conferences on subjects ranging from computational fluid mechanics to space policy and climate change. He holds international certifications in the field of Supply chain management and project management, and has been a speaker at various industry organized user meets.

For information regarding this report, please visit:
www.nsr.com/research-reports/commercial-space/satellite-based-earth-observation-7th-edition/

Fostering The Next Generation In Space... The Future Space Leaders Foundation

By Nancy Nolting, Marketing Programs Manager, Intelsat General Corporation (IGC)

With permission from Intelsat General Corporation (IGC), we present one of the company's latest SatCom Frontier blogs.

Often discussed by the SatCom Frontier team is how the commercial space industry delivers innovation to government SATCOM clients. To maintain technological innovation, as an industry, all need to ensure that we are fostering the next generation of space professionals.

This issue is particularly challenging due to the low graduation rates in science, technology, engineering and math (STEM) fields. Intelsat General Corporation has invested in an active internship program and works with groups such as The Future Space Leaders Foundation (FSLF), a tax exempt 501 (c)(3) non-profit organization dedicated to the career development of young space and satellite industry professionals.

Two of our interns recently completed their summer programs. Frank Preston is a student at Towson University pursuing an IT major and Steven Thai is a computer engineering student at the University of Maryland – Baltimore Campus. SatCom Frontier spoke with both of them before they returned to their respective schools.

Steven has family members working in the commercial satellite industry and has decided to pursue some an aerospace career. He said he was kept quite busy and learned a great deal about how satellite communications operate.

"I worked on a number of projects given to me by IGC engineers. I especially enjoyed modeling satellite systems and teleport maps using software development kits," Steven said. "SATCOM is so essential to so many things today but not very well known. I learned a lot about things such as frequency loss and reuse and the pros and cons of various frequency bands. IGC seems like a close-knit operation and I was taken in and given the chance to be a real contributor."

Frank was given his own projects to manage as part of his internship and is very interested in a job in the commercial space industry after his graduation next year.



"I was expected to provide ideas to my team, and I worked on improving work flows and refining presentations," Frank told SatCom Frontier. "I learned a lot about how the space segment connects to the terrestrial infrastructure, and the constant challenge of optimal constellation management. It was interesting to learn more about other challenges facing the industry, such as managing the increase in space debris."

Through our internship program and support of organizations such as FSLF, Intelsat General is working to ensure a pipeline of future space professionals. To maintain our nation's technological edge in space, the industry must stimulate the growth and development of students into tomorrow's space leaders.

The FSLF connects current space professionals with graduate students seeking careers in space, and assists students and young professionals in attending space and satellite industry conferences and events through grants covering travel and registration expenses.

These efforts benefit the entire industry and our customers. More young people such as Steven and Frank need to be exposed to the vitality and innovation of the commercial satellite industry.

The Future Space Leaders Organization mission is as follows...

- *To advance learning and professional enrichment of young space professionals and future leaders pursuing careers in the fields of space and satellites.*
- *To stimulate the professional growth and enhancement of future space professionals and to foster cooperation and interaction among current leaders in the space field with graduate students and young professionals seeking to pursue careers in the fields of space and satellites.*
- *To assist graduate students and young professionals in attending space and satellite industry conferences and events through grants covering legitimate travel and registration related expenses.*

The Foundation organizes events and raises funds for grants to deserving graduate students and young professionals. FSLF works in cooperation with other non-profits, companies and government agencies on space-related educational events. FSLF is also actively promoting the professional development of young Americans targeting careers in the academic fields of Science, Technology, Engineering, Art and Math ("STEAM"). Through its annual Future Space event, FSLF advances learning and fosters interaction among current space and satellite industry leaders with graduate students and young professionals.





The Foundation made eight grant awards in 2013-2014 to outstanding American graduate students and young professionals and enabled them to attend and present papers at major space-related symposia and conferences that included the IAF International Astronautical Congress, SGAC Space Congress, AAS Goddard Memorial Symposium, NSC Goddard Dinner, Satellite 2014, SSPI Gala, AIAA Spotlight Awards and ISPCS.

In July of this year, the FSLF hosted their 4th Annual Future Space event at the Reserve Officer Association building, at the Top of The Hill, 1 Constitution Ave NE, in Washington DC. The event explored cutting edge technologies and new applications that are poised to transform the space and satellite industry.

Future Space 2015 will raise funds to support educational programs and networking opportunities for graduate students and young professionals pursuing careers in the space and satellite industry.

During 2015, the FSLF Grant Winners included....

Dr. Justin Atchison

He received his PhD in Aerospace Engineering at Cornell University in 2010. Dr. Atchison served as a graduate exchange researcher at JAXA in 2008 and now works at the Johns Hopkins University Applied Physics Laboratory as a mission design and navigation engineer. He is the Mission Design Lead for the Double Asteroid Redirection Test (DART), which aims to test and characterize asteroid impact mitigation techniques, making our local solar system more accessible and secure.

Sarah Hefter Flanigan

She is a member of the Senior Professional Staff at the Johns Hopkins University Applied Physics Laboratory and holds degrees in Aerospace Engineering from both Virginia Tech and Cornell University. She was the Lead Guidance and Control Engineer on the MESSENGER mission whose spacecraft was the first to orbit Mercury. She is also the Deputy Lead Guidance and Control Engineer on the New Horizons mission whose spacecraft will fly by Pluto on July 14, 2015. She plans to share a paper on the much-anticipated New Horizons mission at the IAC.

Raphael Perrino

He is an M.A. student in International Science and Technology Policy with an emphasis in Space Policy at George Washington University and plans to graduate in August 2015. He holds an M.S. in Technical and Scientific Communication from James Madison University and is an Eagle Scout. Mr. Perrino is an Aerospace Analyst at The Tauri Group and has worked on the GAO 2015 NASA Quicklook, FY16 NASA Budget Request, and Start-Up Space study. He has authored and co-authored several papers on Space Policy, including one on NASA's Commercial Crew Program that he has submitted to this year's IAC.

Ms. Jillianne Pierce

In her position as Government Affairs Associate for the Space Foundation, Jillianne regularly interfaces with the Administration, Congress, and various federal and international departments and agencies to educate key decision-makers on issues of importance in the space policy arena. A member of the Florida bar, Jillianne earned a J.D. from the University of Miami and a B.A. from the University of Central Florida. Her IAC presentation will focus on how commercial imaging satellites can provide evidence of human rights abuses, and how such image-gathering influences the evolution of the "Responsibility to Protect" doctrine.

Ms. Julia Stalder

She is a young professional who plans to complete her M.S. in Mechanical Engineering at UCLA in June of 2016. She currently works at the California Institute of Technology's NASA Jet Propulsion Laboratory, where she has had the opportunity to work as a mechanical engineer on the Surface Water and Ocean Topography program for CNES and the ISS instrument RapidScat. Julia is a recent recipient of the NASA Early Career Achievement Honor Award. She is also the only applicant who is a panelist at the Next Generation Plenary.

Mr. Paul Warren

He is a student and young professional at Stanford majoring in Computer Science. He has helped organize and has participated in numerous space and zero gravity experiments, and is now the co-president of the Stanford Space Initiative (SSI). SSI will send the first university-built rocket to space, launch two satellites, send a weather balloon across the United States, and has generated enough interest in space for Stanford to create a new Aerospace and Aeronautics program within the next three years. Warren continues to use his experience and contacts within the space industry to help fellow students develop space related careers.

You can register to receive, or view the company's SatCom Frontier blog, at www.intelsatgeneral.com/blog/

For details regarding FSLF's good works and their support of STEAM, please visit www.futurespaceleaders.org/

From Humble Beginnings... A NorthTelecom Perspective

By Mahdi N. Mehrabi, Chief Technical Officer + Managing Director, NorthTelecom

Having high-quality managed network services available for clients from east to west, NorthTelecom is delivering leading edge, satellite communication services and solutions to meet customer demands across all spectrums.

Present in 12 international points of presence and with seven teleport operations, the company serves more than 100 global partners. NorthTelecom is leveraging the most recent and up to date ICT concepts to deliver the most reliable and efficient services and solutions to key industries, such as GSM operators, ISPs, NGOs, media broadcasters, Maritime, Oil & Gas, mining, Government and more.



NorthTelecom's achievements today are a far cry from the firm's humble beginnings in September of 2007. NorthTelecom has, indeed, attained a global reach, now with offices in Dubai, Germany and Singapore, with operations and teleports in South Korea, Singapore, Dubai, Greece, Spain, the UK and Cyprus.

The NorthTelecom corporate mission is to provide communications all over the world. Combining the strengths of their core professional team, NorthTelecom offers a plethora of services that include a 24/7 Networking Operation Center (NOC) and a presence in all of the continents. This ensures service flexibility for valued clients.





The company's service portfolio includes...

MVSAT

NorthTelecom extends onshore and offshore operations via maritime VSAT, with coverage from Asia Pacific to the Middle East and Europe.

With MVSAT as a high-speed, two-way, IP broadband, ship-to-shore, satellite telecommunications service, NorthTelecom produces email, Internet, fax, VoIP, SIP phone services and more.

IP Trunking

NorthTelecom offers the option of HTS satellite connectivity services, providing customers end-to-end solutions that cover all equipment needs and ensures reliable connectivity. The corporate vision is offer cost-effective opportunities for medium to large-scale service providers who wish to expand their services.

Furthermore, NorthTelecom is a leading global provider of Internet connectivity solutions via satellites and has many years of experience in installing and servicing ground station operations, as is evidence by the company's Earth stations and teleports in Germany, Greece, Spain, Cyprus and Singapore.

TV Broadcasting (DTH)

Realizing the increasing role that media plays in daily life today, NorthTelecom's media network solution meets the requirements for an integrated transmission and management system, which processes diverse, bi-directional traffic types while automatically controlling multiple space and ground segment resources. The services are ideal for high-speed contribution and distribution of any live or on-demand data as well as audio or video content ranging from IPTV to HDTV.

These solutions cater to various choices for transmitting video or streaming data in combination with telephony and production intercommunication. Likewise, NorthTelecom also has provisions for SNG systems for broadcast in remote areas.

Mastering all phases of ground systems engineering, NorthTelecom offers consultancy through design to final turnkey delivery of uplink and downlink stations, control centers, teleports, video and data management platforms and network operations centers.

Oil and Gas

The oil and gas sector's remote locations often mean heavy dependence on satellite solutions. Minimizing costs is key for most companies in this field, particularly when bandwidth demands continue to increase, due to technological advances in exploration and production.

Complex data from remote drilling sites is transmitted to corporate head offices for analysis by way of NorthTelecom's Internet service solutions.

Construction Sites

NorthTelecom integrates instant connectivity at construction sites and, once development is complete, satellite becomes an ideal solution for new urban developments or for deployment in a city's outskirts.

Construction companies and master developers are able to receive regular updates from their construction sites through high-speed Internet access.

NorthTelecom has a composite track record of achievements in satellite connectivity. Through consistent levels of quality service and upgrade of networking solutions, the company hopes to be a frontrunner in deploying various telecommunication services as satellite beams extend further to greater horizons.

NorthTelecom has also recently announced they are expanding their facility in Singapore. This will allow the company to extend its operation into APAC, as well as to other emerging markets that need to have more stable solutions within the eastern locations of the globe and, ultimately, to bridge west to east with the firm's solutions and service portfolios.

For more information, please visit northtelecom.com/

A Major Celebration: One Hundred 1300s

By Wendy Lewis, Director of Communications, Space Systems Loral (SSL)

When Space Systems Loral (SSL) shipped a high performance broadband satellite for Australia to launch base in late August 2015, the company reached an unprecedented milestone of providing 100 GEO communications satellites built using the SSL 1300 platform.

As satellite technology has advanced, and demand for capabilities such as UltraHD television and high speed broadband to ships and planes has grown, the 1300 has evolved incrementally and has proven to be an exceptional platform for innovation.

Satellite operators value heritage and on orbit reliability, combined with payload performance. Reaching this milestone provides tangible evidence of the 1300's performance and reliability over the years and its value for demanding next generation applications. There are more SSL 1300s currently providing service on orbit today than any other model of GEO communications satellite.

The first 1300, called SUPERBIRD-A, was launched in 1989 for Space Communications Corporation (SCC), a Japanese provider of commercial satellite services that subsequently became SKY Perfect JSAT. Named after its original dry mass of roughly 1300 kg, the satellite platform evolved out

of a project to develop a 3 kW satellite, which was the highest power ever achieved at the time.

Compared to SUPERBIRD, today's 1300 provides eight times the power, 30 percent longer life, and can accommodate four times as many transponders. However, despite increasing complexity, each generation of the 1300 has proven to be more reliable than the last.

Today's broadband satellite for Australia provides a crucial service that hadn't even been considered in 1989. The flexibility of the 1300 means that this will be a platform for future applications as well, including applications that we may not even conceive of today.

Innovation

As a company that embraces innovation, in the 1980s the SSL engineering team was forward-looking in creating a platform that allowed new technologies to be introduced incrementally. This highly successful approach maintains heritage and carefully manages risk for innovative new subsystems and design variations.



Sky Muster, the 100th 1300, built for Australia's new broadband network is shown here at SSL's Compact Antenna Test Range in Palo Alto, California, where all the 1300s have been built. Photo is courtesy of SSL.

Over the past 25 years, the 1300 was the first to incorporate many new technologies. Some highlights follow:

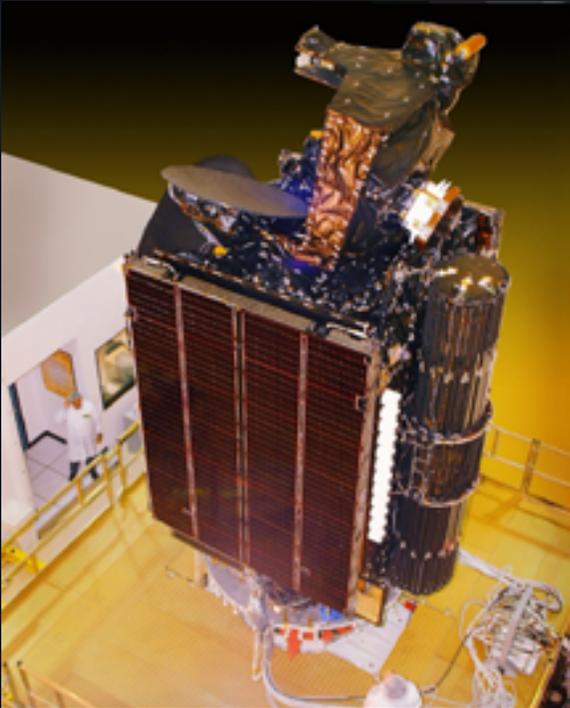
TEMPO-2

This satellite was launched in 1997 and was the first SSL satellite built for Direct-To-Home (DTH) television service. The satellite was enabled by the 1300's first 100 volt bus and Direct Radiating Collector (DRC) amplifiers, which provided the power and heat dissipation necessary to transmit DTHTV.

Sirius XM Radio

In the year 2000, SSL launched its first satellite built for Sirius XM Radio. This was the first 1300 to be launched into an innovative Highly Inclined Elliptical Orbit (HIEO). Together with two additional radio satellites, Sirius FM-2 and Sirius FM-3, the three satellite constellation has provided uninterrupted radio service. A fourth satellite, Sirius FM-4, was built as a ground spare; however, due to the constellation's reliability, this satellite was never needed and may now be viewed at the Smithsonian National Air and Space museum's Udvar-Hazy Center at Washington Dulles International Airport in Washington DC.

MBSat



Now known as ABS-4, this is a 1300 satellite currently providing service at the 61 degrees East orbital location. Launched in 2004, this was the first Western satellite to use electric propulsion, which is now regularly used in 1300 satellites to reduce propellant mass and allow for more revenue generating payload. In October 2015, SSL had 19 satellites with electric propulsion on orbit. MBSat was also the first 1300 to incorporate a large unfurlable antenna to enable it to broadcast to small mobile devices. The mesh antenna reflector measures 12 meters in diameter.

IPSTAR



Launched in 2005, this was the world's first high throughput satellite (HTS). IPSTAR was built using the SSL 1300 for Thaicom Public Company Limited (Thaicom), a company based in Thailand that provides satellite communications services. Over the past ten years, the IPSTAR satellite has provided advanced broadband service in the Asia Pacific region. An advanced satellite of the time of launch, IPSTAR offered 112 spot and regional beams that delivered 45 Gbps capacity.

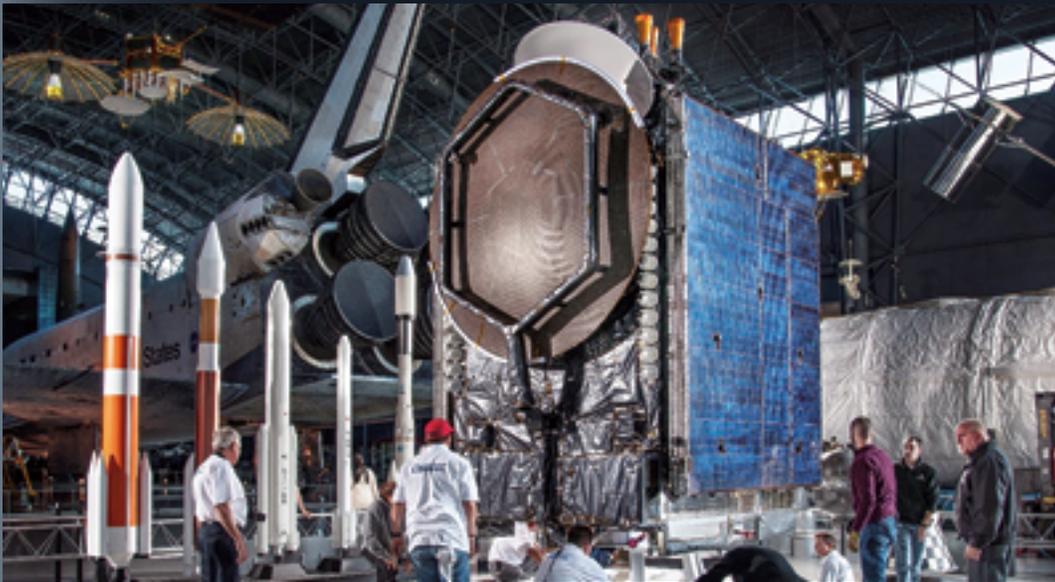
In order to meet Thaicom's requirements for the satellite, which was the first to help bridge the digital divide by bringing Internet connectivity to remote areas, the 1300 supported a number of technology advances. This was the first SSL satellite to use Lithium Ion batteries which are lighter and smaller than the older Nickel-Hydrogen batteries that have been commonly used on communications satellites. This was part of a new power electronics subsystem. This meant that more of the solar panel generated power was available to the payload and this technology has been incorporated into all subsequent 1300s.

EchoStar XI

In 2008 SSL's first 20-kW class 1300 was launched by EchoStar. EchoStar XI was built on the SSL 1300 platform for DISH Network and helped the DTH content provider roll out some of the first high definition (HD) television programming.

ViaSat-1

ViaSat-1 was the world's first satellite to provide more than 100 Gbps throughput. Built on the SSL 1300, this satellite was launched in 2011 for broadband service in North America.



An SSL 1300 satellite was installed at the Smithsonian National Air and Space Museum in 2012. Sirius FM-4 was a ground spare for the original Sirius satellite fleet. Photo is courtesy of Dane Penland.

Other significant SSL 1300 advances include...

- The first satellite platform to provide two-way ground based beam forming which increases a satellite's flexibility to meet changing market requirements.
- One of the first to incorporate shaped antenna reflectors, which enable precisely defined coverage areas.

The 100th 1300

The platform's ability to incorporate the most innovative technology continues to be evident on the one hundredth 1300, which was built for the new broadband network **nbn**TM, Australia's broadband network.

Originally called NBN Co 1A, the satellite was renamed Sky Muster by the six-year-old winner of a country-wide contest. The young girl, who depends on satellite Internet for her education, selected the name for the name's reference to the gathering of cattle, which captures how

includes new, advanced low noise amplifiers to improve radio frequency (RF) performance. The satellite also uses a new, third generation, high capacity Li-ion battery for reduced mass. SSL is building a second satellite for nbn, which will launch in 2016—this will be one of the first 1300s to use 3D printed flight parts.

As a platform that has the ability to accommodate the most innovative satellite technology, the 1300 can meet the demands of future applications, such as 4K/8K ultra-high definition television (UHDTV), communications services for ships, planes, buses and trains and the Internet of Things (IoT). SSL continues to qualify advances for future use on the 1300 with a focus on adding standardization and flexibility.

SSL works closely with customers to incorporate innovations that will support the high performance, better economics, and increased accessibility that will broaden the appeal of satellite-based solutions. The 1300 will continue to provide the value and adaptability that satellite operators need to support next generation applications. SSL is working to ensure that the next one hundred 1300s reflect dramatic improvements in cost, schedule, mass, and flexibility.

Beginning with SUPERBIRD-A, more than 25 years ago, the 1300 has an incomparable history of success. Through incremental changes, the 1300 has maintained a successful heritage, while at the same time evolving into a powerful, flexible, and reliable platform for the world's most advanced applications.

SSL thanks and congratulates all of its customers who have helped it achieve the goal of 100 1300s.

Additional information regarding SSL's 1300 platform is available at:
ssmda.com/html/products/1300.html

The press release regarding SSL's 100th 1300 is available at:
<http://www.ssmda.com/html/pressreleases/pr20150914.html>



A comparison of the first 1300 and the 100th 1300—Sky Muster is nearly six meters taller than SUPERBIRD-A. The images are courtesy of SSL.