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Arianespace's Soyuz lifts off from the Spaceport's ELS launch facility with four additional connectivity satellites for O3b Networks.
Photo is courtesy of Arianespace.

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The Soyuz Push By Arianespace For O3b Networks' Four Satellites



With the 11th launch of the year, Arianespace has established a new, all-time record since the introduction of its family of launchers, and has passed the cumulated mark of 500 satellites orbited.

This 10th Soyuz launch from the Guiana Space Center, Europe's Spaceport in French Guiana, occurred on Thursday, December 18 at 3:37 p.m., local time.

Arianespace continues to deploy the O3b satellite constellation into an equatorial circular orbit, to provide high-speed, low-cost, low-latency Internet access to emerging markets in Asia, Africa, Latin America, Australia and the Middle East. The coverage zone includes nearly 180 countries and the "Other 3 billion" (O3b) inhabitants of the planet who do not yet enjoy broadband Internet connectivity.

By adding these new satellites, the O3b constellation can increase capacity to address rising demand. O3b Networks initiated full commercial service on September 1, 2014.

This launch also marked the resumption of Soyuz launches from the Guiana Space Center, four months after an orbital injection anomaly occurred on the previous Soyuz mission. The European independent Inquiry Board named by Arianespace, and the Russian Inquiry Board named by Russian space

agency Roscosmos, submitted converging conclusions concerning the cause of the previous anomaly. Both boards issued a series of recommendations, which were implemented to ensure a fast, secure resumption of launches.

The four O3b satellite constellation was successfully acquired on their targeted orbit by the O3b Networks team.

As predicted earlier this year, Arianespace has set a new record for annual operations since the introduction of its complete family of launchers, logging a total of 11 launches in 2014. This impressive performance was

made possible by the unflagging effort of the Arianespace teams and its partners at the Guiana Space Center to reduce the time between two missions and optimize preparations for the launches.

- **11 launches (6 Ariane 5, 4 Soyuz, 1 Vega) in 2014: a record for the Arianespace family**
- **78.3 metric tons orbited from French Guiana in 2014 (versus 74.1 in 2012), setting an all-time record**
- **>500 satellites launched since 1980 (23 in 2014)**

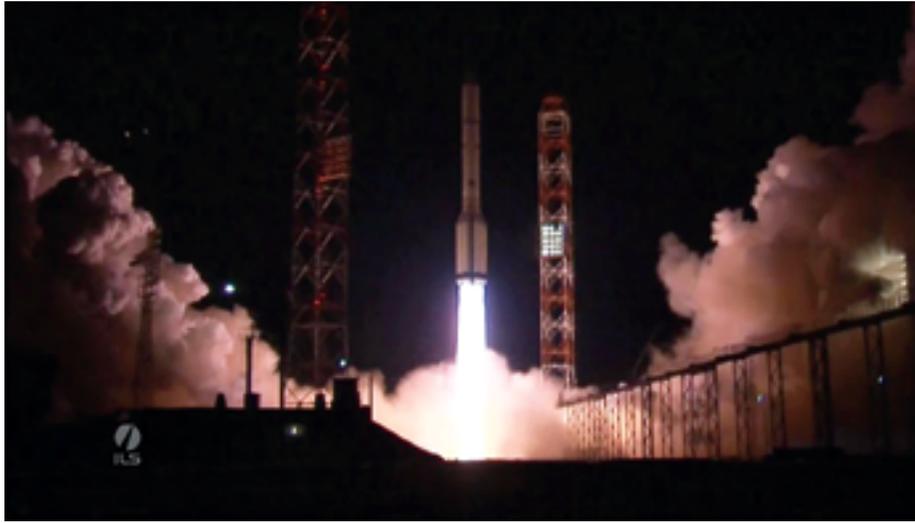
After the official announcement of the orbital injection of the four O3b satellites, Stéphane Israël, Chairman and CEO of Arianespace, said: "We are very proud of our role in continuing to support the growth of our customer O3b, following the start of commercial service on September 1st."

The Arianespace infosite:
<http://www.arianespace.com/>

The O3b Networks infosite:
<http://www.o3bnetworks.com/>



International Launch Services (ILS) Drives SES' ASTRA 2G Into Orbit



The launch of the SES ASTRA 2G satellite by International Launch Services (ILS).
Photo is courtesy of ILS.



The SES ASTRA 2G satellite roared into space on board an ILS Proton Breeze M booster at 03:37:49 Baikonur time, 22:37:49 CET and 16:37:49 EST, on December 27, 2014.

After a 9-hour, 12-minute mission, the Breeze M upper stage of the Proton rocket successfully released the ASTRA 2G satellite into geostationary transfer orbit.

ASTRA 2G will be deployed at the 28.2/28.5 degrees orbital arc.

The satellite was built for SES by Airbus Defence and Space. Based on the highly reliable Eurostar E3000 platform, the spacecraft carries 62 Ku-band transponders, as well as 4 Ka-band transponders. It will enable the delivery of next generation broadcast and broadband services in Europe, the Middle East and Africa.

ASTRA 2G, which had a launch mass of 6 tons, will feature a wingspan of 40 meters once its solar arrays are deployed in orbit, generating 13 kW of spacecraft power at the end of its 15-year design lifetime.

With the launch of ASTRA 2G, SES also supports SATMED, an e-health platform aimed to improve public health in emerging and developing countries, most significantly in isolated areas with poor connectivity. SATMED enables communication between doctors, thus enabling the transfer and exchange of medical knowledge and supporting tools for medical e-learning and e-teaching. The satellite-based solution is developed by SES and supported by the Luxembourg Government and the Ministry for Cooperation and Humanitarian Action.

Martin Halliwell, Chief Technology Officer of SES, said, "We would like to congratulate Airbus Defence and Space and ILS for the successful ASTRA 2G mission, a launch that marks the 24th SES satellite to be launched by ILS Proton, and the ninth Eurostar satellite in the SES fleet. The ASTRA 2G satellite completes our significant replacement investments at a strategic orbital neighborhood over Europe and provides 10 incremental transponders for expansion while cementing our unique co-positioning satellite back-up-scheme."

Detailing the program, Halliwell added, "The spacecraft furthermore includes the capability to connect West Africa to Europe via Ka-band. In combination with ASTRA 2E and ASTRA

2F which were launched in September 2012 and 2013 respectively, ASTRA 2G is the culmination of our fleet renewal program at the 28.2/28.5 degrees orbital arc. The new state-of-the-art SES satellites provide more focused and higher power to our broadcast customers, while the Ka-band on board supports the delivery of next-generation satellite broadband services as well as intercontinental connectivity between Africa and Europe."

Three additional E3000s by Airbus Defence and Space are currently in production for SES (SES-10, SES-11 and SES-12).

The SES infosite may be reached at
<http://www.ses.com/>

For further information regarding ILS, please visit <http://www.ilslaunch.com/>

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Improvement Of A Riyadh Hub Accomplished By Arabsat



As part of a long term partnership, ARABSAT has announced the successful accomplishment of its project with STC—a leading GSM operator in MENA region—to renew and upgrade their satellite hub in Riyadh (Dirab).

The upgraded satellite hub will eventually support STC in providing premium satellite communication and broadband services to private and governmental sectors.

Khalid Balkhayour, President and CEO of ARABSAT, said “The multi-million dollars renewal allows reliable communications throughout Arabsat Badr-5, the new state-of-the-art satellite at 26 degrees East, with an extensive footprint that will facilitate the operations of STC with high throughput links. ARABSAT and STC continue to work very

closely to enhance their presence in domestic and international markets.”

Abdul Aziz AlSugair, Chairman of the Board of STC, said, “The establishment of the station, in partnership with Arabsat, will endorse the depth of experience in both organizations, in the field of developing communications services provided via satellite throughout the Middle East.”

The Arabsat infosite may be accessed at <http://www.arabsat.com/>

A Hub Happening For Gilat Satellite Networks In LATAM



A Telecommunications Service Provider (TSP) in Latin America has selected the High-Throughput Satellite (HTS) Multi-Spot Beam solution from Gilat Satellite

Networks (Nasdaq:GILT) to provide Ka-band broadband services.

The TSP, which recently acquired five spot beams totaling 2.3GHz of capacity, intends to use its new HTS network to provide high-speed Internet service for multiple applications such as consumer, enterprise, mobility and airborne.

According to the terms of the agreement, Gilat will provide a SkyEdge II-c hub with multiple network segments, VSAT terminals and related equipment. Additionally, Gilat will provide cloud-based Network Operation Center (NOC) management services.

Roll-out of this project commenced during Q4 of 2014.

“Our technology supports multiple applications over the same platform very effectively,” said Russell Ribeiro, Gilat’s Regional Vice President in Latin America. “We believe that our strong local presence and support, combined with our knowledge and experience in network management, will provide our partner with a strong competitive advantage over the long term.”

Please head over to <http://www.gilat.com/> SkyEdge-II-c for additional information.

Twenty-Five Year HISPASAT Anniversary Could Earn Award Winners Thousands Of Euros



HISPASAT has extended the deadline for submitting work for entry into the company’s prize for Best Innovation Project in the satellite communication field, which will mark the firm’s 25th anniversary—the new deadline is February 28, 2015.

Requests were received from companies and research groups requesting that the deadline for submitting work be extended. In order to prevent unfair advantage, and to enable all entrants to benefit from the extended call, HISPASAT will invite all those who have already submitted their work prior to the publication of these amended conditions, ratified before a notary, to make any changes or improvements they deem appropriate to their entries.

The prize is open to all submissions from academic and industrial backgrounds

that offer a solid, innovative, satellite telecommunications project, which may be applied to, and constitutes a useful improvement in, any satellite communications related field. The projects, for example, could concern carrying capacity, flight systems or technologies dealing with on ground sector, and so on. The winning entrant will be awarded 12,000 euros, while finalist will receive 5,000 euros. Both will also be awarded with an accrediting certificate.

The HISPASAT infosite may be accessed at <http://www.hispasat.com/>

Fengyun-II 08 Satellite Sent Spacewards By China



China has successfully launched a new meteorological satellite named Fengyun-II 08 from the Xichang Satellite Launch Center in the Sichuan province, which is located in the southwest of the country.

China's previous weather satellite, Fengyun-II 07, took off in January 2012 and currently remains orbit.

A Long March 3A rocket delivered the satellite to near-Earth orbit. Both the satellite and the rocket were developed by China Aerospace Science and Technology Corporation (CASC), Xinhua reported.

The newly launched satellite is expected to collect meteorological, maritime and hydrological data, while also transmitting information that will be useful to forecast weather and monitor environmental changes.

According to a report from Xinhua, this was the 203rd time a Long March rocket has been used for a launch.

In November, CASC announced that it was planning to launch some 120 satellites in preparation for a national space infrastructure in the future.

RIA Novosti has reported that, according to the contractor, the space program will include 70 satellites for environmental monitoring, 20 communications satellites and 30 navigation satellites.

China is also planning to start operating its own space station in 2020.

Glowlink Continues Their Quest To Interfere With Interference



Glowlink has announced that the company has been awarded their third patent for the trademarked interference removal technology known as Communications Signal Interference Remover, or CSIR™.

This technology, already available in a number of advanced products marketed by the company, is a leap ahead in the ability to remove interference from communications.

Michael Downey, Glowlink's Chief Technology Officer, said, "This technology represents the future of interference mitigation, and this patent award timing is lining up nicely with our GS380 series product release this year.

"The truth is, CSIR has broad, powerful application beyond satellite comms. It can be applied to any digitally-modulated carrier and across a variety of communications platforms. These patents are just the first step to achieving its full potential."

In addition to U.S. patent awards, CSIR patents are currently pending in Patent Treaty Countries (PTC) around the world.

A technology overview of CSIR, authored by Michael L. Downey, Vice President of Engineering, and Bob W. Estus, Vice President of Sales and Operations, reveals that CSIR is the latest innovation from Glowlink that addresses some of the most vexing problems in communications systems. The technology re-defines the extent to which active interferences can be isolated and removed from a modulated communications signal, and by extension the separation of two or more signals in overlapping transmissions found in a variety of communications systems: space or terrestrial, fixed or mobile, wired or wireless, broadband or narrowband.

CSIR is a real-time streaming technology using state-of-the-art digital signal processing (DSP) technology and sophisticated communications algorithms that can be implemented on a variety of platforms that range from a

complete turnkey system consisting of multiple chassis (e.g., signal monitoring and analysis) to small form factor appliances (e.g., cable/satellite TV set top boxes), to VHDL core on a chip (e.g., smartphones). Its applications are equally diverse: communications signal interference removal and noise reduction, communications signal separation, signal monitoring and analysis, geolocation of satellite signal emitters, and so on.

In addition to streaming applications, CSIR can also support buffered or other types of non-streaming or non-real-time applications, making them more robust and efficient.

Some example applications include...

Interference Removal and Noise Reduction

One example of CSIR application is the removal of interferences from a communications carrier to improve the latter's signal-to-noise ratio. With CSIR, interferences—whether intentional or unintentional—can be removed in real time from the communications signal. This application is embodied in the Glowlink Model GS380X Interference Removal System.

The Glowlink GS380X Interference Removal System is designed to excise interferences in real-time, steaming fashion from a communication signal before the signal reaches the receiver. Thus, the demodulation part of the communications channel never "sees" the interference and is therefore never adversely affected by it.

Applications of the GS380X include the protection of airborne communications/telemetry, satellite/space communications, terrestrial communications, and shipboard

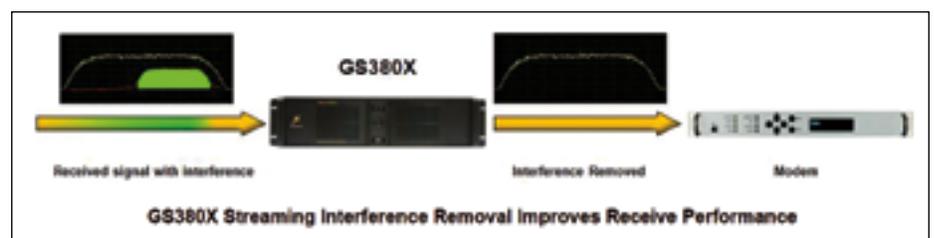
communications. The user of this technology does not need any a priori knowledge of the precise characteristics of the interference or the communications signal. The only information required is an approximate knowledge of the user's carrier center frequency, bandwidth and modulation. Armed with that information, CSIR will precisely measure these parameters, and proceed to remove in real time any interferences. The diagram below illustrates this application.

Satellite Interference Geolocation

Satellite communications are vulnerable to interferences, which can render an entire transponder or multiple transponders useless. The ability to find the source of the interference is the key to resolving the problem, especially in cases where the interfering signal is intentional or due to equipment fault. Furthermore, geolocation can be the only way to locate and mitigate rogue transmissions, such as pirating or unauthorized transmissions.

However, geolocation systems are constrained by the fact that interference, especially its weak replica on the adjacent satellite, can be masked by normal traffic carriers on the adjacent satellite. This makes geolocation inaccurate and quite often impossible. CSIR technology is used to remove the masking carriers so that the underlying interference and its replica can be exposed for geolocation.

This application is embedded in the Glowlink GS380L Geolocation Signal Enhancement System, which removes an obstructing carrier to expose the interfering signal so it can be better geolocated.



First Slot For Bangladesh

The Bangladesh government has green lighted a proposal to lease an orbital slot from Russia at a cost of Tk 2.19 billion to launch the nation's first satellite, 'Bangabandhu'.

The Bangladesh Cabinet Committee on Government Purchase (CCGP), at a meeting with Finance Minister AMA Muhith, gave the nod on Wednesday.

After the meeting, Cabinet Division Joint Secretary Mostafizur Rahman said the orbital slot at 119.1 degrees East would be leased from the Intersputnik International Organisation of Space Communication of Russia.

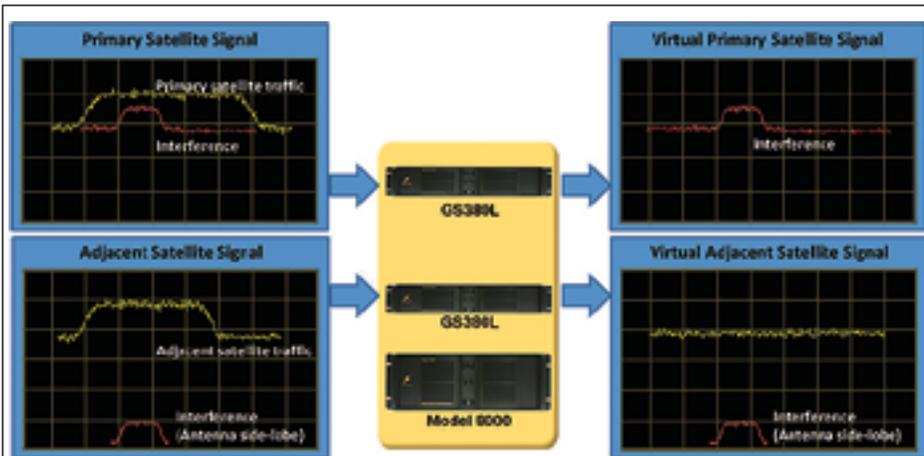
"Lease amount will be \$28 million (Tk 2.19 billion). VAT and tax will be added to it. The government will meet the expenses," Mostafizur said.

Executive Committee of the National Economic Council (ECNEC) at a meeting on September 16 gave the go-ahead to the nearly Tk 30 billion project that covers the manufacture and launch of the satellite and two ground stations. Of the total project cost, the government will provide a little over Tk 13.15 billion.

Bangladesh's first satellite will have 40 transponders to provide telecommunications and broadcast services.

The project is likely to be implemented by June 2017 by Bangladesh Telecommunication Regulatory Commission. The U.S. firm Space Partnership International (SPI), as a consulting firm, has already started designing the satellite.

Under the project, two Earth stations will be established, one at Joydevpur in Gazipur and one at Betbungia in Rangamati.



GS380L Removes Obstructing Signals To Enhance Geolocation Performance.

Used in conjunction with the Glowlink Model 8000 Geolocation System, the resulting performance improvement from the GS380L is 70+ dB, and when coupled with the processing gain offered by the Model 8000 itself, the net processing gain is in excess of 142+ dB.

This level of performance practically ensures that the interference geolocation operation will always succeed, even when other legacy geolocation products on the market fail to yield a geolocation result.

This application is illustrated in diagram above.

Another application of CSIR technology is in signal reception, monitoring and analysis, where it is desirable to separate a composite communication signal for further downstream processing.

CSIR can separate two overlapping communications carriers and preserve the fidelity of each. This can be used to separate signals that intentionally overlap, such as those found in paired-carrier transmissions used in satellite communications.

The separated signals can then be further processed downstream for a variety of purposes as shown below.

This application is embodied in the Glowlink GS380S Signal Separator System.

Working in conjunction with a Glowlink Model 1000x2 spectrum monitoring system, the GS380S takes two overlapping communications carriers and processes them in real time to produce two separate signals, while preserving the fidelity of each signal. This is illustrated in the diagram below.

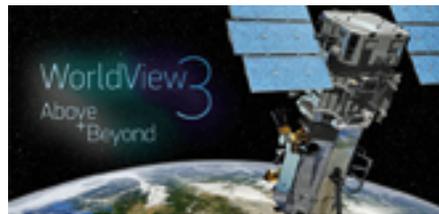
Please contact sales@glowlink.com for additional CSIR information.

The Glowlink infosite: <http://www.glowlink.com/>.



GS380S Separates Signals For Downstream Processing.

Two Satellites' Lives Have Been Extended By DigitalGlobe



DigitalGlobe, Inc. has reported that, as a result of its annual satellite life review, the company will extend the useful lives of two of its satellites: WorldView-1 and WorldView-2.

The company has also assigned an initial useful life to its newest satellite, WorldView-3, that is slightly longer than the original use lives assigned to WorldView-1 and WorldView-2.

The extended use lives will drive improved capital efficiency, lower capital expenditures, and better cash flows for DigitalGlobe. WorldView-1 will be extended by 2.5 years to 13 years, a 24 percent lifespan improvement, and WorldView-2 will be extended two years to 13 years, an 18 percent lifespan improvement.

"We have now completed an extended period of investment in building out the world's leading Earth Observation capability," said Jeffrey R. Tarr, CEO of DigitalGlobe. "Extending the useful lives of our satellites will further reduce the capital required to sustain this unmatched capability over the long

term. We expect this to result in a less capital intensive business model, improved free cash flow and returns, and improving shareholder value."

In addition, the use-life extensions will result in non-cash reductions to revenue and depreciation expense effective October 1, 2014.

WorldView-1, which was originally expected to reach its end of life in the second quarter of 2018, is now expected to reach end of life in the fourth quarter of 2020. As previously disclosed, the period of recognition of deferred revenue related to the NextView contract will be extended to reflect the new longer use life of WorldView-1.

Beginning in the fourth quarter of 2014, this change will reduce the non-cash amortization of NextView deferred revenue by \$10.4 million annually and \$2.6 million per quarter—from \$25.5 million to \$15.1 million per year, and from \$6.4 million to \$3.8 million per quarter. Depreciation expense on WorldView-1 will decrease by \$18.4 million per year and \$4.6 million per quarter.

WorldView-2, which was originally expected to reach its end of life in the fourth quarter of 2020, is now expected to reach end of life in the fourth quarter of 2022.

This change reduces non-cash amortization of deferred revenue related to certain Direct Access contracts by \$1.4 million annually and \$0.3 million per quarter. Depreciation expense on WorldView-2 will decrease by \$10.2 million per year and \$2.6 million per quarter.

WorldView-3, which was launched in August 2014, has been assigned an initial use life of 11.5 years through the first quarter of 2026, leading to depreciation expense of \$56.5 million annually beginning on Oct. 1, 2014.

The company continues to expect to report revenue for the full year 2014 in a range of \$640 million to \$660 million. EBITDA, Adjusted EBITDA and capital expenditure estimates also remain unchanged from expectations provided on the company's third quarter earnings announcement on October 30, 2014.

The DigitalGlobe infosite at <https://www.digitalglobe.com/> has additional information.

COM DEV's Higher Throughput



COM DEV International Ltd. has announced an expansion to a previously announced contract to provide Ku-band equipment for a High Throughput Satellite (HTS) communications.

Additional multiplexers, switches and ancillary equipment have been ordered for an approximate added value of \$7 million, bringing the total contract value to approximately \$13 million. The initial contract was announced in October 2014.

Work on the contract will be carried out at the Company's facility in Cambridge, Ontario with completion expected by January 2016.

"Our long-term relationship with the client, along with our acknowledged expertise in Ku-band components, has enabled us to win this expanded mandate," said Mike Williams, President of COM DEV International Products. "We are also very pleased to start 2015 with a strong order flow."

COM DEV International Ltd. provides space hardware and services. The company has a staff of 1,200, annual revenues of \$216 million, and facilities in Canada, the United Kingdom and the United States. COM DEV designs, manufactures, and integrates advanced products, subsystems and microsatellites that are sold to major satellite prime contractors, government agencies and satellite operators, for use in communications, space science, remote sensing and defence applications.

The company has won contracts to supply its equipment on over 900 spacecraft. COM DEV's majority-owned subsidiary, exactEarth Ltd., provides satellite data services for global maritime surveillance.

The COM DEV International infosite: <http://www.comdevinternational.com/>

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Dry Van Trailer Tracking Made Easier, Thanks To I.D. Systems

WIRELESS I.D. SYSTEMS SOLUTIONS FOR SECURING, TRACKING AND MANAGING ENTERPRISE ASSETS



The Asset Intelligence subsidiary of I.D. Systems, Inc. has a contract with a leading U.S. regional trucking company to deploy its newest VeriWise™ Dry Van cellular solution for tracking and managing fleets of trailers and their cargo.

The contract encompasses 400 tracking devices with a service term of five years. The VeriWise™ GSM-D300 Dry Van cellular system features:

- *Rapid, cost-effective deployment— one person can install the system in 20-30 minutes per trailer— with an all-in-one tracker assembly that can be*
- *Real-time location tracking via GPS satellites and GSM cellular technology, with automatic email/ text notifications of exception events*
- *Untethered data reporting for up to five months*
- *Patent-pending light sensor with the functionality of a wired door sensor, without the installation cost or risk of damage to exposed cables*
- *Rugged construction with IP69K and SAE J1455 environmental ratings*
- *Five-year rechargeable Li-Ion battery with intelligent power management, for*

serviced from outside a loaded trailer

long, low-maintenance product life.

- *Redundant 7-way tractor power hook-up to ensure reliable battery charging*
- *Unique design for easy external access/maintenance and swapping between trailers*
- *Optional advanced fleet data analytics*

Norman Ellis, I.D. Systems' COO, said, "We've combined a patent-pending light sensor with our ultrasonic cargo sensor to provide reliable, accurate reporting of trailer loading/unloading events and load status through the shipment cycle. Our technology has demonstrated the ability to reduce cycle times by an average of 72 hours per trailer per month, and increase shipment volume and revenue by 10 percent, without increasing fleet size."

I.D. Systems: <http://www.id-systems.com/>.

Satellite Structure Passes Qualification Testing For Millennium Space Systems



Millennium Space Systems has completed structural qualification of its AQUILA M8 satellite structure.

AQUILA M8, under development for a confidential customer, part of the company's AQUILA platform product line, supports missions of up to 3000kg. total mass in low, medium and geostationary Earth orbits.

Millennium manufactured a dedicated AQUILA M8 test vehicle and subjected it to a full suite of dynamic and static structural qualification tests at the National Technical Systems test facility in Santa Clarita (next door to the Santa Clarita Aquatic Center).

Engineers from NTS and Millennium collaborated throughout the month-long test campaign to develop novel test stand configurations for the massive platform.

The successful qualification tests mean that the AQUILA M8 platform can be safely launched on any Evolved Expandable Launch Vehicle class booster.

Scott Dow, Millennium's Director of Assembly, Test and Launch operations, said, "All of the structural modes measured during testing matched our pre-test analyses and models. Based on these excellent model correlations, we will now manufacture our flight model with very high confidence."

Millennium designed the AQUILA M8 to support imaging, communications and science missions with large payloads requiring precise pointing.

The fully loaded 3,000 kg. platform includes orbit-raising propulsion that can transfer the satellite from a typical elliptical geostationary transfer orbit to its final GEO orbital slot 36,000km. above the equator.

The first flight model AQUILA M8 is presently under construction at the new Millennium factory in El Segundo, California, and will be launched for a confidential customer in 2016. The AQUILA product line also includes the M1, M2 and M4 platforms, each tailored to a particular payload mass range.

For additional details, please visit the Millennium Space Systems infosite at <http://millennium-space.com/>

Turkey's First Indigenous Satellite Build Is Planned—TÜRKSAT 6A—Plus, GÖKTÜRK-2's 2nd Anniversary

Turkey's first indigenous satellite, TÜRKSAT 6A, will be built by TAI Facilities in Ankara.

The satellite program, fulfilling the requirements of Turkish Satellite Operator Company TÜRKSAT, will be coordinated by The Scientific and Technological Research Council of Turkey (TÜBİTAK).

The financial budget for the program has been granted by the Ministry of Transportation, Communication and Maritime Affairs, TÜRKSAT and TÜBİTAK under TÜBİTAK—Public Research Support Group (KAMAG in Turkish acronym) 1007 regulations. The entire preparation phase of the project was completed in only one year.

TÜRKSAT 6A as the first indigenous telecommunication satellite of Turkey and has been planned to be developed in cooperation with TÜBİTAK Space, TAI, ASELSAN, and CTECH, with a work sharing model that's based on the technical competencies of those involved in the project.



Artistic rendition of the GÖKTÜRK-2 satellite.

The assembly, integration and test activities of TÜRKSAT 6A Satellite will be performed at the TAI Facilities—Assembly, Integration and Test Center in Ankara.

Additionally, as of December 18th 2014, Turkey's first high resolution remote sensing satellite—GÖKTÜRK-2—completed its second year in space with success.

GÖKTÜRK-2 was designed by TAI—Turkish Aerospace Industries, Inc. and TÜBİTAK Space from and 2012. The spacecraft flight model was integrated and tested at TAI's AIT

Facilities in Ankara—the satellite launched from Jiuquan Satellite Launch Center, China, via a LM-2D Launcher.

After an official ceremony on December 18th 2012, GÖKTÜRK-2 started its space operations in LEO. In two years, the satellite recorded more than 10,000 passes, with nearly 5000 images and covered 9.850.000 km² ground surface.

GÖKTÜRK-2 continues to serve at its 684km altitude under the control of the Turkish Air Forces.

More information regarding TAI is available at <https://www.tai.com.tr/en/department/space-systems>

Broader Global Distribution For ORBCOMM Services Via SkyWave Acquisition

ORBCOMM Inc. completed the acquisition of SkyWave Mobile Communications (SkyWave) as of January 1, 2015.

SkyWave is the largest M2M service provider on the Inmarsat (LSE: ISAT.L) global L-band satellite network. Based in Ottawa, Canada, SkyWave adds more than 250,000 subscribers, 400 channel partners, annualized revenues of more than \$60 million and Adjusted EBITDA of more than \$12 million.

The acquisition of SkyWave furthers ORBCOMM's strategy to provide the most complete set of options and capabilities in the industry, while adding multiple synergies to strengthen its M2M solutions portfolio. With the addition of SkyWave, ORBCOMM now has one of the largest combined engineering teams in the M2M industry and gains significant economies of scale in operations and manufacturing.

SkyWave's robust distribution channels in South America, Asia and the Middle East, along with Inmarsat's support, provide ORBCOMM with even broader global distribution. ORBCOMM gains access to new geographies in Eastern Europe and Asia while adding diverse vertical markets such as security and marine. The addition of SkyWave's higher bandwidth, low-latency satellite products and services that leverage the IsatDataPro (IDP) technology, which is now jointly owned by ORBCOMM and Inmarsat, also further expands the breadth of ORBCOMM's solutions portfolio.

"This transformative acquisition creates the largest space-based global M2M company with unparalleled capabilities, established go-to-market channels and global network coverage," said Marc Eisenberg, ORBCOMM's Chief Executive Officer. "With our expanded scope

and scale, we are well-positioned to provide the industry's most diverse portfolio of M2M solutions and connectivity options that leverage both the ORBCOMM and Inmarsat networks."

Raymond James served as financial advisor to ORBCOMM on this transaction, and William Blair & Company served as financial advisor to SkyWave. For additional information on this transaction, please refer to ORBCOMM's SEC filing on Form 8-K regarding this transaction.

The ORBCOMM infosite may be accessed at <http://www.orbcomm.com/>

The SkyWave infosite is located at <http://www.skywave.com/>

M2M: Leveraging Auto “Mobile” Data To Enhance Business Effectiveness

By Cyril Zeller, Vice President of Global Telematics, Telit



With approximately 7.5 million units in service worldwide out of a total available market that is close in number to 300 million commercial vehicles, the Telematics industry shows huge business potential.

Among numerous industries, fleet management and vehicle leasing companies are deriving significant business efficiencies due to various telematics' applications.

For instance, one of the key concerns of fleet operators is managing unforeseen budgeting risks arising out of unscheduled maintenance of vehicles. Machine-to-Machine (M2M) technologies enable operators to provide real-time event monitoring with real-time information pertaining to transmission, engine performance and other pertinent vehicle health parameters.

Visibilities into these aspects allow operators to foresee probable maintenance events early on and help them budget maintenance costs. Leasing companies and fleet management companies can significantly reduce their business risks by reducing operating costs through focused budgetary management. Additionally, they can also pre-empt potential heavy vehicle maintenance costs by taking corrective repair measures before such issues arise, thereby preventing extensive damage to a vehicle or its parts.

Streamline Drivers—Increase Efficiency

M2M telematics applications and technologies can also help fleet management companies streamline their employee management processes through the regular monitoring of drivers and other staff that are associated with vehicles. These systems help operation managers understand driver behavior, which includes actions such as start and end of a work day, stops control, private activity time, speeding and unnecessary braking, improper shifting of gears, tire pressure and break down monitoring, and so on. Telematics brings to the forefront discipline and other driver training and development aspects.

Deliver In Time

Additionally, M2M will also help ensure timely delivery by effectively tracking the shipment and route optimization by using location based systems and GPS devices. This is possible as M2M technologies offer geo-fencing capabilities that enable corporations operating fleets to alert drivers, should that individual, or the vehicle, travel off limits geographically—this assists in ensuring more productive deliveries.

This can result in a huge potential business gain as operators will significantly reduce shipment delay penalties. Dispatch can instantly identify trucks in the vicinity of a new call for pick-up, enabling the business to achieve cost-efficient routing as well as meeting customer service expectations.

The need and cost associated with purchasing and maintaining cell phones for drivers is also eliminated.

Apart from fleet management and vehicle leasing companies, insurance companies, public transportation agencies, law enforcement and emergency response agencies are also turning to M2M technologies and applications to enhance efficiencies and business profitability.

Reduce Accidents + Insurance Costs

For instance, insurance companies are reaping significant benefits across the globe. According to one of U.K.'s largest insurance companies, M2M and satellite based technologies have led to a reduction of 20 percent in crashes that have involved young drivers. Insurance companies have started calculating their premiums based on driver behavior through an M2M device integrated into the vehicle. This includes collecting data on braking and acceleration, cornering, speed and what time of day the car is driven. The data is then used to calculate insurance premiums—the better the driver, the lower the premium. (See **Technology Is Reshaping Vehicle Insurance** later in this article.)

Solutions For A Market

Telit is already engaged in many solutions that help to solve the challenges modern fleet managers are facing. Consider, for example, a general preference for the use of CDMA over GPRS in some regions—or that the migration from 2G to 3G will happen faster than expected. Telit's new 910 family offers pin-to-pin compatible footprint in 2G, 3G, CDMA and EVDO modules, thereby allowing service providers to target all markets with just a single board.

Governments are imposing the use of one satellite positioning network over another, or ordering higher location accuracy for some markets, a situation that is of concern to service providers. Telit is able to solve that challenge, as the company's new Jupiter JN family offers GPS only and GPS/GLONASS modules with compatible footprints—this reduces even more the number of required boards.

Another key challenge for fleet managers is roaming and addressing new regions without going through time consuming carrier agreements and selection. Telit is able to provide, through our new business unit, m2mAIR, value-added services that include global coverage and flexible rate plans. Bundled with Telit's wireless module technology, these services enable M2M solution providers to easily create and manage their applications, reducing the total-cost-of-ownership (TCO) necessary to operate and support M2M user-applications, all the while ensuring highest quality and reliability.

Technology Is Reshaping Vehicle Insurance

The use of M2M technology is also more than evident with the use of usage-based insurance (UBI). UBI promises tangible benefits to consumers, the industry and society at large.

Usage-based insurance (UBI) represents a major shift in the way car insurance risks are assessed. Until now, these risks were assessed based on static, statistical data such as age, gender, car model and so on. The application of telematics technology enables insurers to make objective assessments of risk based on real-time, dynamic data-like mileage, areas traveled, time of day, keeping to speed limits, engine RPM and fuel level, as well as driver behavior.

Insurers benefit from the ability to detect and retain the majority of the lowest-risk drivers. In return, drivers can enjoy significant discounts on their premiums. Better yet, awareness of being assessed in real-time provides psychological conditioning—ultimately encouraging better driver behavior to the benefit of society.

When automotive satellite navigation (SATNAV) systems exploded in popularity, UBI apps for smartphones began to infiltrate the market. While smartphones possess the requisite functionality, including sensors to detect acceleration, braking and cornering, they suffer from usability and reliability issues. As a result, insurers tend to prefer in-vehicle, on-board diagnostics (OBD) dongles over the use smartphone apps. Here's why...

Smartphone Issues

For insurers, free UBI trials allow smartphone services to be employed as a "teaser" that: (a) introduces the concept; (b) allows drivers to see their driving behavior at the end of the trial; and (c) informs them about the potential reduction in their premium if they drive carefully.

Nevertheless, they remain problematic. A smartphone may not always be "on" when the car is driven. Or, the app may not be compatible and certified for use with the phone's operating system or platform. In addition, in almost all international jurisdictions, courts could find insurers liable for negligence and damages when there is a "better" solution available—particularly in the event of life-saving applications such as event emergency response.

Dedicated In-Vehicle Devices

By contract, in-vehicle OBD-II data loggers are unobtrusive, provide more accurate driving data, are inexpensive and easy to install. Used in tandem

with a smartphone, a hybrid solution can combine the data quality of the installed device with customer-friendly features like on-screen displays.

More importantly, UBI solutions based on OBD-II in-vehicle devices address the concerns of the insurance industry and regulators. For example:

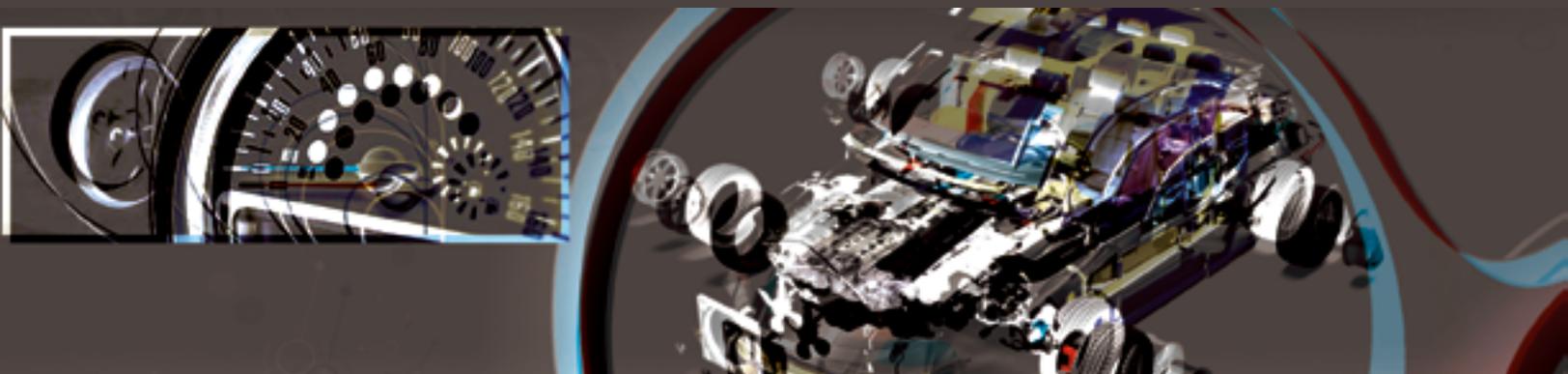
- **Fairness: Regardless of vehicle type, demographics or socio-economic status, all insured drivers are measured the same way**
- **Reliability: A dedicated hardware solution ensures that the connectivity between the vehicle and provider is controlled and timely**
- **Security: Dedicated hardware significantly reduces the potential for fraud**
- **Undistracted driving: Data loggers do not require user interaction—potentially preventing the disastrous consequences of cell-phone-induced distraction while driving**

Storing + Analyzing the Data

UBI can generate massive amounts of data. A single vehicle can produce nearly 200K data points in a year. Even with smart filtering of raw data, and/or sorting that information to reduce carrier costs, there's no doubt much UBI "Big Data" will be generated over the coming years. As a result, the number of innovative, cloud-based solutions which enable visual analytics are on the rise. Applied to the insurance space, they can present driver data in an easy-to-understand, graphical interface.

Though smartphone popularity continues to rise, the use of UBI smartphone apps will remain problematic. The regulatory climate is unfavorable and the legal risks are significant.

Dedicated solutions based on dedicated hardware provide an ideal alternative with robust results that address the requirements of both the industry and regulators.



SatBroadcasting™: The 'Big Three' Analyzed...

By Chris Forrester, Senior Contributor

Each of the 'big three' satellite operators—Intelsat, SES and Eutelsat—issued their quarterly results at the end of October, a terrific opportunity to compare and contrast each firm's progress.

Some major announcements from these respective operators causes concern, as two out of the three majors—in effect—downgraded their expectations and the third is under close observation for the next calendar year.

On October 30, Intelsat's Q3 numbers were released and issued what were, undoubtedly, disappointing results. CEO Dave McGlade took the news on the chin and admitted that Intelsat was in a "transition period" pending the launch of its three giant 'Epic' satellites. "The level of innovation that our sector is experiencing is at much higher level pace than it was at little as five years ago not only with respect to high throughput satellite design, but on other elements of the ecosystem as well," he told analysts, and stressed that Intelsat was aggressively engaged across the board to identify these new innovations.

He also said that bad (slow-paying) debts were being resolved and would help boost EBITDA margin guidance for the full year to move upwards from 79 to 80 percent. Intelsat's bad/slow debt burden was costing the company from \$8 to \$10 million a year—in 2013, that financial strain spiked up to \$30 million.

"With Intelsat 30 being placed into operations in the next several weeks [and shortly after to be handed over to DirecTV], we look forward to our three upcoming satellite launches in 2014, including the first Intelsat Epic satellite launching late in the second half of the year. These new assets, combined with new service offerings, will fuel renewed growth in the midterm. For now, we remain focused on reducing debt as an important near-term lever to equity value," McGlade said.

He also addressed the state of play over Africa, traditionally a stronghold for Intelsat, and said that increased deployment of fiber was one problem. "But it really has been the entry of new satellite operators, most of which have traditional capacity, that are putting the pricing pressures into the marketplace. And that has been most broadly seen through the second tier players. So, they have been the most aggressive in terms of pricing."

Of course, Intelsat isn't alone in terms of expansion plans and the threats from tough competition. There cannot be many satellite operators who do not wish expansion. Eutelsat is a perfect case in point, having absorbed Satmex a year ago and is now reaping the rewards of the Mexican acquisition.

Like Intelsat, Eutelsat is under a certain degree of pressure from the U.S. governmental downturn (although its Q1, to September 30, saw something of a bounce back of +2.8 percent in revenues). Overall, Eutelsat is doing extremely well. With revenues up 4.2 percent (on constant FX basis), and guidance for the

rest of its financial year to June 2015 staying at about 4 percent, with EBITDA margins of above 76.5 percent.

There was also positive news in the shape of its 'Value Added Services' up 14.5 percent and helped by Ka-Sat revenues which saw 12,000 terminals activated in Eutelsat's first quarter with marketing campaigns likely to build on momentum. The current position is that there are 166,000 activated terminals using Ka-Sat (up Year-on-Year from 108,000) with "a good uptake in France, Germany, Turkey and Italy." Revenue for the quarter stood at 26m euros (25m euros in Q4/2013), and 23m euros this same period last year.



The backlog position

- Intelsat \$10.1 billion
- SES 7.3 million euros
- Eutelsat 6.3 million euros

The channels carried...

Total HDTV

- SES 6,416 (up 8 percent, Year on Year)
- Eutelsat 5,788 (up 16 percent, Year on Year)

However, Eutelsat CEO Michel de Rosen pulled one fascinating rabbit out of his hat in the shape of a proposed Scrip dividend option/issue. Investment bankers Berenberg summed up the situation, and said, "Management was pressed on whether this implied it was under pressure from banks, or was planning further M&A. Certainly, as we have highlighted previously, there is no margin for error in the balance sheet if the group wants to maintain an investment grade rating (to which it reaffirmed its commitment). It will be interesting to see what take-up the scrip dividend receives."

The fascination will be to see whether the Scrip decision represents a preliminary move towards another acquisition by Eutelsat.





On October 31, in the busy cluster of announcements, Karim Michel Sabbagh, CEO at SES, was not helped by the admitted “strong headwinds” and miserable numbers from North America (revenues down 13.7 percent).

He was, nevertheless, buoyed by the opportunities that are now starting to kick in from O3b Networks. He wants to see further expansion at O3b, the

7, said that SES had a “hidden gem” and “a positive surprise” in O3b—“O3b has already stated that it is achieving higher throughput from the fleet than originally anticipated. Meanwhile, client feedback has been very good and early customers have already increased order size. Management is already talking about the need for incremental capacity, given the strong order pipeline.”

Sabbagh told analysts that despite a cautionary outlook, the past year had seen transponder capacity grow by 4.4 percent (to 1,534) and utilization grow 2 percent (to 1,110 transponder equivalents). European business is

satellite constellation that will serve the ‘other 3 billion.’

However, O3b has experienced technological issues with its first four satellites, which will mean a \$315 million insurance claim. The troubled satellites are still flying but will have shorter lives than expected. SES has an option to significantly increase its stake in O3b, which seems likely in the medium term, and Mr. Sabbagh hinted that SES might revise their current guidance toward the end of the year.

This author is also reminded of a report from bankers Morgan Stanley which suggested that—in its then model—the O3b stake might be worth an Enterprise Value of 4 billion euros and worth 3 extra euros a share. That’s appealing, and O3b’s agreement with Royal Caribbean’s Quantum of the Seas cruise ship kicked in on November 11, which should add more than a few dollars to the revenue picture.

In other words, all eyes will be on O3b as the company gets into gear with a working constellation. The constellation went ‘live’ on September 1 and Sabbagh says it is on track to “operationally” activate the majority of the 30 or so “committed” O3b clients by year’s end. O3b has significant growth potential, said Sabbagh. This comment was amplified by the market.

Sarah Simons of Berenberg, in a “BUY” note to clients on November



Arianespace's Soyuz lifts off from the Spaceport's ELS launch facility with four additional connectivity satellites for O3b Networks. Photo is courtesy of Arianespace.

SES president Karim Michel Sabbagh made no secret of his enthusiasm for the promising new capacity sales and contract activity at O3b, which one analyst referred to as “the next positive surprise” and “a hidden gem” for SES. The operator owns 47 percent of O3b, and investment costs in O3b have been at 40m euros this year and are expected to be identical in 2015.

The position at SES seems to be that once O3b is confident about their prospects, then SES will buy its minority shareholders out (Liberty, Google, and so on). Feedback from O3b management suggests that the first 12 craft

expanding well (up 11.2 percent), as is its “very significant” international revenues, which expanded 7.3 percent. SES specifically highlighted Yahlive’s progress, which was also moving forward well. Nevertheless, 2015’s growth was likely to be more modest.

One SES area that received mostly negative local press in its early period is their HD+ offering. Now in its fifth year of operation, HD+ (which delivers a modest fee to broadcasters for soft-encrypting their HD channels) now has 1.6m paying households and is gathering “a strong momentum,” said Sabbagh. There are now 19 private broadcasters in the HD+ consortium, with more than 30 other FTA channels in the system.

These were the good news elements, but those pesky governmental cut-backs and the revenue declines from North America meant that guidance for 2015 is being reduced to 4 percent, and with EBITDA growth to 5 percent, the next three year revenue/EBITDA pattern is expected to deliver a CAGR of 4 percent. Despite this downgrade, SES stressed they are committed to a “progressive dividend” and that the company expects operating free cash flow to continue improving into 2018-2019. This would allow “organic investment opportunities” and the construction of four, as yet unspecified, programs. There will be additional “inorganic” opportunities, and this included the option to take full control of O3b, which analysts expect to happen in 2015.

Not mentioned—and they never are—are future M&A opportunities for any of the ‘big three.’ Berenberg referred to the likelihood of further acquisitions for SES, although cautioning that “Overpaying for an Asian satellite asset, for example, would be dilutive to fair value.”

constellation is doing well, technically and in terms of client additions. The mini-fleet of MEO satellites is already earning its keep. Despite problems on the first set of four that will shorten their orbital lives, and with that problem creating more than a few headaches for CEO Steve Collar when

SES launch manifest

Satellite	Region	Launch Provider	Launch Date
ASTRA 2G	Europe, Africa	ILS	December 2014
SES-9	APAC	SpaceX	H1, 2015
SES-10	LATAM	SpaceX	H2, 2016
SES-11	N.A.	TBD	H2, 2016
SES-12	APAC	TBD	H2, 2017

Eutelsat launch manifest

Satellite	Region	Launch Provider	Launch Date
115WB	Americas	SpaceX	Q1, 2015
9B	Europe	Proton	Q2, 2015
8WB	MENA/LATAM	Ariane	Q3, 2015
36C	Russia, SSA	Proton	Q4, 2015
117WB	LATAM	SpaceX	Q4, 2015
65WA	LATAM	TBD	Q2, 2016
172B	APAC	Ariane	H1, 2017

the second batch of four satellites had to be returned to Thales Alenia Space's facility near Rome for corrective work, and the ensuing inevitable delays, the project now seems set for success.

In November, O3b announced a slew of deals and encouragement from investment bankers Berenberg Bank. "Management is already talking about the need for incremental capacity, given the strong order pipeline. This is likely to be funded with the insurance proceeds of \$315m."

- O3b's recent signature**
- *Raga Sat / Orange for the Congo*
 - *O3b—energy for Gulf of Mexico*
 - *Royal Caribbean's O3b Maritime*
 - *Harris CapRock doubling demand*

"As management has made very clear, it has a path to control of O3b and will look to exercise that option should it believe that the business model is working (i.e., that client business is ramping) and the technology is living up to expectations," said Berenberg.

"Based on comments regarding new business wins and the need for more fleet capacity, we believe that the first of these conditions has been satisfied, and it appears that the strong demand is based on the high quality of the service delivered, suggesting that the second condition has also been fulfilled. This implies that SES will seek to take control of O3b."

The bank suggests that O3b will be acquired at a 'fair value' to all concerned, which it suggests will be at 15 x 2018's likely net income, although at a 20 percent discount. The bank expects O3b to go EBITDA positive (at 55m euros) in 2016 and building EBITDA to about 435m euros by 2019.

Senior Contributor Chris Forrester is a well-known broadcasting journalist and industry consultant. He reports on all aspects of broadcasting with special emphasis on content, the business of television and emerging applications. He founded Rapid TV News and has edited Interspace and its successor Inside Satellite TV since 1996.



Germany's HD+ bouquet.

2015... A Year Of Unprecedented Promise For Satellite M2M

By David Wigglesworth, Vice President + General Manager, Americas + Global M2M Services, Iridium Communications



The industry is predicting monumental growth for satellite-enabled M2M over the next 10 years. In the near term, 2015 will be a pivotal year in the evolution of satellite's role in M2M.

One of several key factors shaping trends in satellite-enabled M2M includes the rise of Original Equipment Manufacturer (OEM) customers as a driver for satellite connectivity for asset tracking and telemetry applications. The fleet management market's desire to integrate satellite into existing cellular-enabled telematics solutions is another driver of growth. What's more, developments in 2014 have charted a path to lower the barrier to easily add satellite connectivity in 2015, enabling higher value M2M applications, and global coverage.

In the longer term, upcoming next-generation satellite networks will offer increased bandwidth, while evolving satellite M2M services to resemble cellular IP-based services. Satellite provides the ultimate wide area network (WAN), covering the more than 80 percent of the Earth's surface not covered by cellular.

What are some of the industries and applications that satellite M2M is powering? Here are just a few of the many M2M use examples:

- In the Oil and Gas industry, satellite-connected sensors on oil and gas wells transmit information about production rates and operational parameters.
- Fleets of trucks that move assets around the world use satellite-connected transceivers to connect to solutions that verbally coach drivers on improving efficiency in remote areas as well as providing security monitoring for the cargo. The produce that is in your local grocery store may have had its temperature monitored for freshness via satellite on part of its journey from the farm to the store.
- Workers in the logging industry use satellite-connected two-way devices for personal communication and safety, like transmitting SOS alerts.
- Heavy equipment, such as Earth-moving bulldozers, use satellite connectivity to monitor and transmit vehicle diagnostics in remote areas beyond the reach of cellular.



As emerging markets continue to seed demand for infrastructure building and other industrial development, OEMs need ubiquitous and reliable connectivity to support their products and services—not just the large OEMs, but also the smaller ones are realizing the potential of M2M by integrating satellite connectivity options. Applications range from tracking where something is located to more advanced telemetry and diagnostics to monitor the performance and condition of equipment.

The need for this type of intelligent data doesn't end at the boundaries of cellular coverage. Satellite connectivity plays an important role in enabling businesses to manage their operations more efficiently, wherever they are on the Earth. Satellite enables the customer to derive the full benefits of M2M even when a cellular connection is not available.

Fleet management solutions depend on reliable two-way communications for logistics. Moreover, the logistics are in a context of ever-changing business needs: The particulars of a transport might change between a truck leaving its depot in an area with cellular coverage and arriving at its destination outside of cellular coverage. Therefore, constant connectivity is imperative for enabling maximum return on investment. Many telematics providers already offer solutions that have cellular connectivity, and they want to be able to add satellite connectivity to their existing solutions rather than building a new solution from the ground-up.

As satellite transceivers have become smaller and more affordable in 2014, the barriers to entry for existing cellular telematics providers to quickly add satellite connectivity are now much lower. Antenna manufacturers such as Hirschmann and Taoglas have integrated satellite transceivers directly into their antenna packaging, enabling satellite M2M connectivity to be easily and cost-effectively added to an existing cellular solution in a small form factor. This approach, although incremental, represents an important shift in how companies can extend the capability of their fleet management solutions, and extend connectivity to their customers around the world.

Satellite is a key part of delivering the full investment of M2M. There is no one perfect technology or wireless network—M2M requires the integration of multiple wireless networks. While satellite doesn't drive the more diverse M2M applications, it drives much higher-value applications.

The diverse range of capabilities from low-cost asset tracking to advanced telematics, such as condition-based monitoring, demonstrates satellite M2M's vast possibilities. Satellite data connectivity is no longer confined to the realm of phones and large terminals. Today's satellite communications providers have extended their connectivity beyond the large terminals that are familiar to many in the industry.

Satellite connectivity has been scaled down to small modules, chips and antennas that fit in the palm of one's hand, enabling a larger scale of flexibility for satellite-connected solutions that were not previously possible. Moreover, satellite networks that are reliable and have low latency are well-suited for M2M applications.

In the next few years, next-generation satellite constellations that offer larger bandwidth and higher data speeds will foster richer satellite M2M connectivity services that more closely resemble cellular IP-based services. In truth, most end users do not care how a provider sends the data as long as they get what they expect, when they expect it, and at the agreed cost. Perhaps most importantly, satellite connectivity will be easier to integrate, which means that solutions providers and end users alike will have a larger realm of possibilities for their M2M applications. For those satellite networks that already have truly global coverage, this advantage will continue even as new constellations launch—providing M2M applications in areas that are underestimated and underserved hotbeds of industrial activity—like maritime shipping routes in the Arctic circle.

As the satellite industry and its technologies continue to involve, so will the possibilities for the Internet of Things (IoT)—connected vehicles, assets, and more—across the Earth.

For additional information:

The Iridium M2M infosite is located at

<https://www.iridium.com/about/IndustryLeadership/M2M.aspx>

David Wigglesworth is the Vice President of Data Services at Iridium Communications Inc.. He is responsible for business development and strategy for M2M markets. Mr. Wigglesworth holds Masters Degrees in Communications Engineering and Business Administration.



NSR Analysis: Big Data Moving Satellite M2M/IoT To New Heights

By Alan Crisp, NSR Analyst, Hong Kong



Transportation represents the lion's share of the satellite M2M/IoT market, with more than 44 percent of total units and over 20 percent of total satellite M2M/IoT market revenues.

With the mass market of deeper analytics tools now taking hold across the Transportation sector, its dominance affects the entire market more than ever. To what extent will big data push the limits of M2M via satellite? And what sort of bandwidth requirements are we looking at?

Using data from NSR's recently released *M2M and IoT via Satellite, 5th Edition* report (<http://www.nsr.com/research-reports/satellite-communications/m2m-and-iot-via-satellite-5th-edition/>), the Transportation sector is poised for strong growth, growing from \$245 million in annual revenues in 2013 to a forecasted \$625 million by 2023, for a CAGR of 9.8 percent.

North America continues to dominate here, taking up just under 61 percent of the market in 2013. However, this is expected to decline to 52 percent by 2023 as other regions of the world get up to speed in this industry, fleets continue to modernize, and global shipping and transport continues to shift focus toward APAC.

Growth within the M2M sector is expected to be particularly robust in regions that lack a developed terrestrial communications infrastructure, most notably Latin America and Africa/Middle East regions, with CAGRs of 9.9 percent and 8.9 percent, respectively. With the Transportation and Cargo sectors in control of high-value goods, high reliability with high-end SLAs are compulsory for most users of M2M services.

This requirement is forecast to rise in the future, with the increasing use of data analytics. In the Transportation sector, there is an increasing demand for keeping track of literally everything that's trackable, to discover any insight possible to assist in optimizing businesses—often referred to as 'big data' or 'deep analytics.'

Because of its nature, these requirements will drive up bandwidth needs for M2M services, as anything and everything will begin to be monitored, with reporting frequencies in minutes rather than in hours. Although specific platforms remain narrowband—and NSR believes this to remain the long-term case—the aggregate number of connections is pushing satellite requirements slowly higher. Packet sizes here continue to remain in the bytes to lower kilobytes range.

Usage of deep analytics data can pay huge dividends for end-users. In the aeronautical sector, for instance, tracking of near real-time engine telemetry to see continuous performance of an engine using M2M via satellite, can assist in reducing maintenance from a fixed schedule to times when maintenance is actually required—a 'just-in-time' model, in other words. These savings can be huge and are driving up M2M units across the board.

Fleet management companies are also implementing satellite M2M technologies for the same purpose of maintenance, and in some cases this is combined with broadband access for drivers' entertainment in long-distance hauls. This is critical to reducing employee churn, which annually can amount to over 100 percent of the workforce—a significant investment with a significant return.

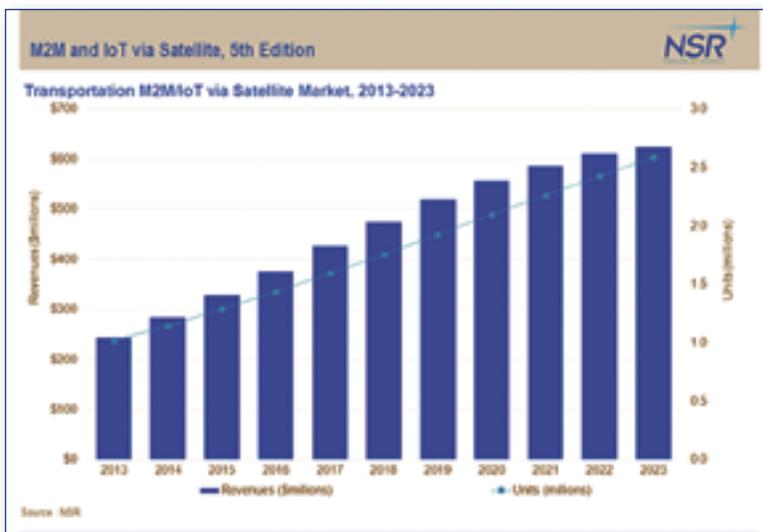
What does this mean for operators? Satellite M2M providers will need to get on board and develop, or acquire, deep analytics application layers in order to thrive in this sector in the future. In terms of frequency, HTS usage is still forecast to remain minimal for the M2M sector—approximately 1 percent of revenues in 2023—next generation L-band systems such as Iridium NEXT having the advantage for big data in the Transportation vertical, in order to handle higher volumes of narrowband connections.

Despite M2M/IoT often being considered more of a "niche" market for satellite operators, the sheer size of the total addressable market moving forward means that even a small percentage of the total leads to significant revenues.

While a number of different applications will see demand growth, Transportation, in particular, does offer significant opportunities through the consistent need for companies to innovate and improve processes through tracking and the use of "big data," where higher numbers of narrowband connections will become the new normal.

The NSR infosite is located at <http://www.nsr.com/>

Mr. Crisp joined NSR in 2014, following a Hong Kong based engineering role at Aurecon. Mr. Crisp is the co-author of NSR's annual Direct-to-Home (DTH) Markets report. As a member of NSR's Fixed Satellite Services (FSS) group, Mr. Crisp's areas are comprised of M2M communications, including the terrestrial M2M landscape.



The Seven Oil & Gas Assets That Need Remote Monitoring

By Sue Rutherford, Vice President, Marketing, SkyWave

Operations at oil and gas sites require lots of equipment, and the complexity and cost involved to keep these sites operating can be challenging. Add remote distances with the drive for profitability and you have a potential operations nightmare.

Nonetheless, these challenges are not insurmountable. More and more oil and gas sites are equipped with field measurement instruments, and when critical data is transmitted in a reliable and timely way, actions can be taken to ensure continued operations in a safe and profitable way.

The key to attaining a high level of equipment dependability and profitability from distant sites is to remotely monitor vital equipment. Using a carefully selected system that works across all operations, energy companies can have predetermined production information when they need it as well as notifications on important events sent to the device of their choice without dispatching any technicians.

Here are seven oil and gas assets that can result in optimized operational efficiencies and cost savings when remotely monitored.

1—COMPRESSORS

Uninterrupted operation of this vital equipment is imperative for profitability. Compressor downtime can cost thousands of dollars per hour in lost production. Often energy companies don't know when their production wellhead compressors have stopped functioning unless someone actually drives to the site and checks on their status. Remote monitoring of compressors ensures energy companies that their equipment is working at peak capacity. Pressure and temperature readings, as well as reliable, timely information on run-time hours, help to manage production and schedule maintenance activities. By adding the tracking of shutdown codes using Modbus protocol, energy companies have the added benefit of being able to remotely diagnose any problems with their compressors before dispatching a technician. With increased "first-time fix", where the technician has the right parts, procedure and equipment to fix the compressor upon first visit, energy companies can save on labor and vehicle costs.



2—TANKS

The Environmental Protection Agency (EPA) estimates that there are approximately 1.3 million regulated underground storage tanks in the United States while the American Petroleum Institute (API) estimates there are about 700,000 petroleum storage tanks. Whether they hold oil, condensate liquids or saltwater, tanks can leak, overflow or spill. When this happens, not only do the tank owners have the social and environmental responsibility to clean up the damage, they may also be subjected to regulatory fines. Both above and below ground tanks can be remotely monitored in order to avoid these costly problems. Level sensors connected to communication terminals can report when the contents of a tank have reached a high level and need to be emptied. These sensors can also be used to detect possible corrosion and leaks when unexplained low levels are detected. Also, remotely monitoring pumps and their power sources can be a cost-effective way to ensure that an overflow situation does not happen.

3—LACT METERS

Lease Automatic Custody Transfer (LACT) meters are critical instruments in the ownership transfer of petroleum products from production to gathering companies. Their volume readings help companies determine how much oil is being moved and what to charge. According to the U.S. Energy Information Administration (EIA), in 2009 there were over 363,000 active oil well sites throughout the United States. Many of these sites are located in remote areas where there is little infrastructure and it takes many hours (even days) of driving to reach the sites. Remotely monitoring the LACT meters at these sites is the only cost-effective way to accurately bill customers based on volume without physically visiting the site.

4—RECTIFIERS

Used in cathodic protection systems for pipelines, tanks, wells and other critical equipment, rectifiers send a current through the exterior of the pipe to keep it from corroding. It is important to monitor the current and voltage sent from these rectifiers in order to lengthen the life of the pipeline and reduce the risk of leaks. Remote monitoring of cathodic protection systems also helps to maximize the life of the pipeline network preventing premature failure by corrosion. Through remote monitoring of rectifiers, pipeline companies reduce the need to physically drive to remote

sites to take voltage and current readings. Automated remote monitoring also creates an auditable record trail of pipeline health data, which is legislated in most countries.

5—TEST POINTS

Test points measure pipe-to-soil potential to certify effective cathodic protection. Like rectifiers, test points need to be monitored and configured on a regular basis to lengthen the life of underground pipelines and tanks, as well as to reduce risk of leaks. According to the U.S. Energy Information Administration (EIA), there are over 305,000 miles (488,000 km) of interstate and intrastate transmission pipelines. The cost to drive to the sites and check the test points along this large network can be a big part of operational budgets. That is why automated remote monitoring of these pieces of equipment can pay off very quickly. Remote monitoring solutions can collect data from multiple rectifiers and test points, and send this data as frequently as required to increase the efficiency of the system and comply with regulations.

6—PIGS

Pipeline Inspection Gauges (PIGs) are devices that run inside the pipelines and take readings and pictures to detect anomalies or corrosion that may lead to leaks or bursts. Using GPS-synch time and location features in remote monitoring units located along a pipeline, technicians can align PIG readings with its location. This also helps technicians stay ahead of the PIG during a run and locate it when it is stuck for recovery. These activities can increase the effectiveness of the PIG readings and reduce the time and costs to complete a "PIG run."

7—GAS METER

For large commercial and industrial consumers, a continuous and guaranteed supply of natural gas is a must to keep the business operating. For suppliers of natural gas, being able to predict demand helps them balance how much product they need to purchase and deliver against cash flow. The remote monitoring of gas meters can help to meet the demands of both consumers and suppliers. By gathering daily usage data, supply companies can use the information to forecast purchases by date, quantity and cost. Not only does this enable efficient cash flow management, but it also increases customer satisfaction by allowing suppliers to ensure steady supply at the most competitive rate.



Which Remote Monitoring System?

There are many remote monitoring systems in the market and it is important to choose the one that best meets your operational needs. Some considerations when selecting a solution include:

- **Equipment Interface:** Reliable and accurate collection of data from equipment is critical for a remote monitoring solution to meet its promised value. Look for solutions that connect to multiple equipment interfaces and can be configured to report at the frequency that meets your company requirements.
- **Human Interface:** Look for a solution that offers a web interface so that an authorized user can view the data from a mobile device. Also, a solution that allows notification of equipment events by email, text message or phone ensures the appropriate personnel are notified.
- **Power:** Not all remote sites have access to power. Look for monitoring solutions that use a power source that works with the equipment already in use. For example, a unit paired with a rectifier can run off the rectifier's power source or a tank level monitor can be solar powered. Also, having a back-up battery or a solar option is important in remote monitoring where power loss might occur.
- **Costs:** Evaluate the initial and ongoing costs when evaluating a remote monitoring solution. The remoteness of a location and number of assets to be monitored must be taken into account when selecting a solution. Often, deploying a full-scale SCADA system in a remote area can be cost prohibitive. Look for a solution that can still meet the local monitoring and control functions that the company requires, without the financial burden.
- **Communications:** There are many communication options in the market. Look for a remote monitoring solution that functions with multiple communication modes. A solution

that includes cellular and satellite messaging will provide cost-effective options for both areas with and without terrestrial coverage. Back-up communication in the event of failure of the primary system to ensure complete visibility of all assets at all times is another critical function that needs to be addressed.

- **Reports + Data Integration:** A solution with customizable reports will convert data into important information. Integrating data into existing enterprise systems will also ensure that everyone from accounting, production and maintenance departments can understand what is happening at remote sites in order to increase profitability.

A good remote monitoring solution that includes satellite communications will address the requirements of energy companies for complete and cost-effective visibility of all their assets, regardless of location. It allows notification of equipment issues in a timely manner. It can also help to demonstrate regulatory compliance as well as maximize the life of assets.

Finally, remote monitoring solutions can improve overall employee, public and environmental safety. To find out more about remote monitoring solutions for the oil & gas market, read about the Bullhorn Remote Monitoring System at <http://www.aiworldwide.com>.

To find out more about satellite messaging terminals and their uses in the remote monitoring and SCADA market, visit <http://www.skywave.com>.

As the Vice President of Marketing for SkyWave, Ms. Rutherford is responsible for advancing the strategic direction of SkyWave marketing and its leading satellite/cellular products and services portfolio. She has more than two decades of global technology marketing expertise in the telecommunications, software, SaaS and industrial automation industries.



Facing The Inevitable: The Challenges Of Inclined Orbit

By John Vezmar, Director of Technology, Viking Satcom



In a world that is constantly in motion, industries must find ways to accommodate the adaptation of obsolete products as well as the introduction of new, more advanced products.

The SATCOM industry is no exception. One particular challenge faced by satellite equipment manufacturers, distributors, and consumers alike is a satellite's decay into inclined orbit. This inevitable obstacle is brought on by the constant force of gravity on the satellite, which subsequently pulls it from its geo-stationary orbit over the course of time.

Satellites possess a station keeping ability that uses engines to return the satellite to its geo-stationary orbit as it is shifted by gravitational pull. The engine's thrust corrects the angle of inclination so that it remains as close to 0 as possible. However, the fuel used to support this process is a finite resource and will eventually be depleted. Once all of the remaining fuel has burned up, the satellite no longer has the capacity to correct itself and decays into inclined orbit.

The link will not disconnect immediately. Rather, the signal quality will fluctuate, increasing when the angle of the satellite is favorable and decreasing when it is not. A satellite forced into inclined orbit for an extended period of time will completely lose its link connection and be rendered useless.

"Inclined orbit: is the term used to describe a satellite whose position has tilted off of its initial position of 0 degrees in relation to its orbital location. Movement of the satellite is anticipated due to the constant gravitational pull of the Sun and Moon, but it is minimal and must only be occasionally corrected. Station keeping is achieved using thrusters on the satellite that burn rocket fuel in small bursts to readjust the angle of the satellite and return the craft to its original position. The fuel is eventually depleted, but the satellite will still be constantly affected by gravitational pull.

The challenge presented by satellites in inclined orbit is that, once the thruster fuel is totally consumed, the satellite no longer has any means of maintaining a link with corresponding antennas on the ground. If left in inclined orbit for a prolonged period of time, the link is completely lost and the entire system is rendered useless. This not only wastes physical space on Earth, but bandwidth area is also compromised in orbit by the immobile satellite.

The decay into inclined orbit has been a constant challenge for the SATCOM industry, as all satellites eventually lose station keeping and fixed antennas lose their links to their satellites. Without intervention, the communication link remains unresponsive—wasting resources, physical space, and limiting usable bandwidth.



The solution to this industry-wide hurdle can be implemented in various ways, but the premise of the answer is simple: mobility. At the core of the hindrance, there is also an advantage. If satellite antenna movement interrupts an antenna's connection to the satellite, a corresponding movement from the antenna on the ground will correct it.

This can be achieved through two separate methods. A new, motorized antenna can be installed in place of a fixed system, or the existing fixed antenna can be upgraded with a motorized mount. This provides the system with the Azimuth and Elevation movement necessary to maintain its link, tracking a satellite that is physically moving so that the link will never be lost. Both new and upgraded systems effectively track the moving satellites, and each carries a distinct advantage.

Installation of a new, motorized antenna ensures that there is no disruption once the system is in operation. Routine inspection will keep the antenna functioning properly and the system will require little to no maintenance. Initial cost is the largest consideration of purchasing a new motorized antenna, as the technology involved in the manufacturing of the system is considerably more complex than that of a fixed antenna.

Upgrading existing systems to Motorized Dual-Axis can significantly reduce the initial cost, but there are potential hazards. The operator incurs the risk of upgrading an antenna with pre-existing complications, such as physical damage to the reflector or other surfaces. Attached RF equipment can also be compromised and limit the effectiveness of a newly upgraded antenna.

Finally, there are environmental limits that must be considered, such as the growth of trees or other natural obstructions that could hinder the antenna's movement presently or in the future. These hazards can predominantly be prevented, however, by closely inspecting the condition of the existing fixed antenna system for any indications of potential failure and surveying the field site thoroughly to determine if motorization is possible prior to upgrading.

Currently, there are no alternative solutions for satellites that have fallen into inclined orbit other than manual or remote adjustment. Despite this, the solutions provided by a new motorized system or an upgraded fixed antenna have proven very reliable over the years and offer an exceptional extension to the usefulness and longevity of the antenna. By manufacturing products that adapt to the inevitability of a satellite in inclined orbit, the SATCOM industry is able to maintain the use of previously obsolete systems and develop and incorporate new antennas into a motorized product line. This constant challenge to remain relevant is what makes the SATCOM industry a foundation of world communication. Through innovation, obstacles are overcome and the process of change is forever in motion.

This influx of continual product evolution is further facilitated by the nature of the manufacture and distribution of satellite antenna products and RF accessories. Consumers from various industries all over the globe seek out companies to supply their satellite antenna equipment and their buying preferences are equally diverse.

Over the years, many antenna and RF equipment businesses have become less specialized, increasing their product lines to include a wider range of products to suit many industries, such as broadcasting, military, and disaster relief, as opposed to just a single niche market. This transformation has made the acquisition of equipment for consumers significantly easier. Instead of purchasing products or parts for a motorized system from several specialized vendors, the entire order can be placed with one company. This decreases the possibility of ordering and shipping errors and provides a central contact for technical support when needed.

Viking Satcom has been able to ship customer orders quickly and effectively because of an extensive in-stock product line and experienced technical staff. This structure has proved extremely successful, proving that the SATCOM shift of providing a better customer service experience will no doubt play a huge role in the future of the industry. There are many aspects of the SATCOM industry that are met with the acknowledgement of inevitability. Only one such example is the decay of a satellite into inclined orbit.

However, as new systems are created and old systems are redesigned, solutions are available in the form of innovative motorized antennas and upgrade kits to adapt pre-existing fixed antennas. Both of these options have revolutionized the opportunity for manufacturers, distributors, and customers to have a positive impact and reduce the waste of physical space, resources, and bandwidth area that satellites in inclined orbit inhabit.

As the future of the SATCOM industry itself evolves to further acknowledge the needs of the consumer by providing more products, better service, and an overall positive experience, challenges like inclined orbit satellites will evolve with similarly improved solutions.

For additional information, please visit <http://www.vikingsatcom.com/>

John Vezmar is the Director of Technology at Viking Satcom and has been in the SATCOM industry for the last 19 years. He is responsible for a variety of successful antenna and accessory designs and currently holds seven U.S. patents.



Redefining Optimization + Efficiency In An HTS World... A Comtech EF Data Focus On Technology

By Steve Good, Vice President, Marketing, Comtech EF Data



When discussing the topics of “optimization” and “efficiency,” many in the satellite industry head directly to the ongoing bits/Hz and physical layer debate.

There are a multitude of vendors that each claim they have the best physical layer optimization available. Physical layer is certainly important, and we (Comtech EF Data) continue to innovate in this area. While the word ‘efficiency’ in the satellite industry has historically equated to pure spectral efficiencies, what we really need to start discussing is the ‘net efficiency’ of a network. Let’s delve into exactly what net efficient really entails.

Continued fiber and microwave infrastructure build outs have increased the number of competing alternatives for satellite industry service providers. The insatiable increase in end user demand and potential revenues has enticed terrestrial providers to go deeper into remote areas to increase market share. These new alternatives, on a macro level, continue to reduce overall network costs, which is forcing our industry to focus on overall net efficiencies, not just pure spectral efficiencies.

In response, the satellite industry is fighting back, introducing a number of High Throughput Satellite (HTS) options that offer the promise of meeting these user demands at the correct price points. In addition to lower prices, a constant theme in the connectivity business is more throughput, more throughput, more throughput.

The combination of these trends has brought our industry to a tipping point—ground equipment manufacturers need to prepare themselves to support the sheer throughputs needed by service providers, end users, governments and enterprises today and into the future. The way we tackle this challenge is by combining our technological efficiencies with applied intelligence, all the while providing the levels of horsepower that are required to provide the most net efficient solutions in a high throughput

world. Let’s examine the five steps involved and then review our approach to meeting the increasing demands of satellite networking in particular.

Step 1: Modulation and Coding

The DVB-S standard accelerated the industry forward at the physical layer. Then, the DVB-S2 and DVB-S2X standards pushed us even further by increasing the number of Mbps that could be transmitted through a given amount of MHz on a satellite link. Each vendor now has its own flavor of DVB-S2X. For high data rates, Comtech increased spectral efficiencies via the introduction of our DVB-S2-EB1 & EB2 (Efficiency Boost) waveforms. Our Efficiency Boost technology enables users to achieve a 10 to 35 percent increase in efficiency over the DVB-S2 standard, without an increase in power or occupied bandwidth. We have virtually doubled the number of available MODCODs, provided better Rolloff figures and minimized implementation loss to near theoretical operation.

Comtech EF Data’s Efficiency Boost provides the pure physical layer efficiencies required for links in the 10’s or 100’s of Mbps. However, not all links out there are in the 10’s and 100’s of Mbps.

One area where the standard falls short is in latency performance for lower data rates. The standard’s large block size requires a large amount of data to be received before coding and transmission. For high data rates, this is not a huge deal. However, for low data rates, this results in additional latency and a lower level of application performance. We already deal with the latency associated with transmitting up to a geosynchronous satellite and back down, so any additional latency should be avoided.



The company's VersaFEC-2 Modulation and Coding scheme was designed for low to medium data rates, which is where many of our customers are operating, especially those in the mobile backhaul and premium enterprise space. These users have 5, 2 or even down to 1 Mbps links. If a standard is being used that is designed around hundreds or tens of Mbps to handle data at 1, 2 or 5 Mbps, the application support and performance needed at those lower data rates is not being received. VersaFEC-2 provides the spectral efficiencies of the DVB-S2X standard with 80 to 90 percent lower latency. This is one example of innovation that meets the changing needs of our customers.

Step 2: The Re-use of Bandwidth

Many in the industry are familiar with the DoubleTalk® Carrier-in-Carrier® bandwidth compression technique developed by Comtech EF Data. Essentially, this technology allows full duplex satellite links to transmit concurrently in the same segment of transponder bandwidth. By using this intelligent method of overlaying carriers within the same bandwidth resource, users are able to maximize the use of the space segment they procure to drive net efficiencies even higher.

Step 3: Adaptive Coding and Modulation (ACM)

ACM changes the modulation and coding of a link dependent upon atmospheric conditions of the two sites being connected. When a rain condition occurs, a less aggressive modulation and coding method is used to ensure connectivity. During clear sky conditions, a more efficient method can be leveraged to maximize efficiency. ACM becomes particularly important in a point-to-multipoint network because weather conditions are geographically dependent. In the example of a 10 site network, odds are that there wouldn't be a rain condition in all 10 of the sites simultaneously. Designing around the worst possible case for all sites simultaneously is inefficient. The ability to perform ACM on the outbound link is a method leveraged by many to ensure maximum use of the satellite resource in the hub-to-remote direction. An often overlooked efficiency gain occurs when one can use this same ACM method on the inbound link. The ability to consider each individual link independently, and not as a group (either large or small), intelligently assigning the best modulation and coding for the link at that particular time creates additional efficiencies while still maintaining a given SLA.

Step 4: Packet Processing

The IP protocol was designed for a many hop terrestrial network that consists of a series of devices having to make next hop routing decisions to move individual data payloads to the proper destination. To allow each device along a path to make an intelligent decision on how to forward the payload, additional information was included in the packet header. In the satellite networking world, this "extra" information is still required, but does not need to be transmitted over the satellite link. Through intelligent packet processing, satellite platforms can further increase net efficiencies.

The applied header compression technique looks inside the IP headers and examines the data flow to determine what we can remove unimportant data before we send that information over the satellite, and then intelligently reinsert that data on the receiving end. For small packets, as is the case with voice, over half of the information within an IP packet can be removed and reinserted on the distant end, creating as much as 60 percent in savings. In addition, there is a lot of redundancy in data streams, some of which can be removed before transmission. Every bit can be examined and a decision can then be made as to whether or not a bit stream has been previously seen. If a stream of data has been transmitted in the past, a much smaller representative set of data is sent along with a lookup location of past bit streams. By removing this unnecessary data, users can realize additional savings, increasing net efficiency even further.

A key consideration on data removal and reinsertion is the category of compression. Lossy compression occurs when bits are simply discarded without reinsertion on the remote end. This works for web browsing. If I am browsing a news site from a smartphone or laptop and looking at a picture with a million pixels, I don't need all million pixels. If nine out of ten pixels were dropped, the picture would get somewhat blurry, but I would still be able to recognize the image.

For mission critical data, however, this is not acceptable and lossless compression is required. Comtech EF Data ensures the complete accuracy of each bit on the remote end of the link. Of note, this type of accuracy requires significant horsepower on board the platform to be able to process this data at tens or hundreds of Mbps, which is what has been designed into the



platforms. The result by leveraging this intelligent compression techniques is the conversion of a given number of “router bits” (those packets delivered to our units) into the least “satellite bits” (those transmitted through the spacecraft). Our equipment does all of this while providing the proper application-based and protocol-dependent Quality of Service (QoS) throughout the network—at the throughputs being made available on new HTS designs.

Step 5: Dynamic Bandwidth Allocation for Satellite Networks

Once you have the most optimally net efficient links leveraging many of the techniques above, you want to be able to dynamically assign bandwidth to remote sites within a satellite network to get you to the right economics. This is done by inspecting the data flow across the network and allocating bandwidth to the sites, or more importantly, to the applications at the sites that require it. Different platforms do this in different ways.

When considering satellite network options, two approaches typically come to mind. Both leverage a shared outbound carrier of some sort, dynamically inserting traffic destined for remotes into a common data stream. For the inbound direction, the paths of approach diverge, however. A TDMA approach can be implemented or a static SCPC approach can be taken. TDMA offers the benefit of sharing at the cost of efficiencies. Many remotes share an inbound carrier that has the overhead required to meet the demands of multiple geographically disperse users. SCPC provides better efficiencies at the cost of an inability to dynamically reassign bandwidth. The always-on inbound connection is potentially not always required. There are tradeoffs that should be evaluated as to whether or not the sharing of a TDMA channel outweighs its less efficient transmission method. Often, both options leave an amount of potential efficiency gain on the table.

Our approach to this dilemma is to bridge these two worlds by combining an intelligent sharing concept with the net efficiencies achieved on individual SCPC links via several of the above mentioned steps. Performing these multiple layers of optimization require a high horsepower engine operating at high data rates. This is where many TDMA options of today fall short, especially when handling high throughput inbound links.

Comtech’s approach to shared bandwidth builds on our innovative purpose-built designs to support high-end users, incorporating dynamic demand-based allocations upon this solid foundation. Approaching the increasing throughput demands of satellite network end users from the higher end of the performance spectrum is a better path to take than attempting to stretch a platform designed for lower throughput use to the higher throughputs of tomorrow. This is mainly due to the significant processing power (horsepower) and intelligence required to support these high throughputs efficiently and reliably. This approach by Comtech EF Data provides the best option for service providers who wish to future-proof their networks.



Comtech EF Data’s CDM-625A Advanced Satellite Modem

The HTS Industry Push

Satellite operators continue to innovate in the sky, launching new HTS designs that promise increased performance and better economics. HTS really is pushing us forward as an industry. With the new economic model and enhanced performance levels, users will be poised to penetrate new markets, increase subscriber base, offer enhanced services and minimize subscriber churn through differentiated service offerings. The “me-too” offerings and competing on prices can be scenarios of the past. But, in order for this to be a reality of the future, it is imperative that ground equipment manufacturers challenge themselves to provide new, purpose-built and future-ready HTS-optimized solutions that allow users to unleash the potential to deliver new levels of services. Customers want the assurance that the CAPEX (equipment) investment they are making will work three, five, even seven years from now on traditional beams, but also on high throughput beams.

Differentiation comes through innovation, and we continue to innovate. In a recent announcement, the company introduced feature enhancements across the entire satellite modem portfolio that focus on efficiency, intelligence and horsepower to best leverage new spacecraft designs, provide the best net efficiencies and enable service differentiation. The groundbreaking technologies are all in direct response to spacecraft innovations and market requirements for service differentiation.

Steve Good is Vice President, Marketing for Comtech EF Data. Good leads the divisional marketing functions, objectives and initiatives based on long-term product and profitability goals. A satellite industry veteran, he has 20+ years experience in a variety of positions in which he has bridged sales and engineering organizations to create and implement marketing plans around product, pricing, placement and promotion strategies. During his career, he has held senior management, marketing, product management and engineering positions with Intelsat, Verestar, Viacast and Hughes Network Systems. Good previously held the position of Vice President, Sales Engineering.

Comtech EF Data Corp., a subsidiary of Comtech Telecommunications Corp. (NASDAQ: CMTL), offers advanced communication solutions that encompass the Advanced VSAT Solutions, Satellite Modems, RAN & WAN Optimization, Network & Bandwidth Management and RF products. The Company is recognized as a technology innovator, and has a reputation for exceptional product quality and reliability. The solutions enable commercial and government users to reduce OPEX/CAPEX and to increase throughput for fixed and mobile/transportable satellite-based applications.

For more information, please visit <http://www.comtechefdata.com>.

A-SAT-II™: An Advantech Wireless Focus On Technology

By John Landovskis, Vice President, PLM + Business Development, VSAT + Modem Products, Advantech Wireless



Throughout the evolution of satellite communications, various technologies have been presented as best suited to the users' needs.

In reality, the maturation of SCPC, SCPC DAMA, TDMA and MF-TDMA technologies have provided point solutions to specific needs. These needs have ranged from best possible power and bandwidth efficiency for fixed traffic loads (SCPC) to highly flexible bandwidth assignment (short-burst MF-TDMA), to priority and jitter free burst mode SCPC (BM-SCPC) among a large population of remote terminals.

This technique, called Adaptive Satellite Access Technology (A-SAT-II™), trades off the high power/bandwidth efficiency of DVB-S2 SCPC with the statistical multiplexing capability of MF-TDMA and jitter free BM-SCPC according to the instantaneous conditions being presented to the remote terminal.

Advantech Wireless has increased the flexibility and responsiveness of A-SAT™ with the introduction of A-SAT-II™. This next generation of Advantech Wireless' A-SAT adds a third access scheme dubbed Burst Mode SCPC (BM-SCPC™). BM-SCPC provides highly responsive, low jitter, high throughput channels for critical applications, such as voice and tele-conferencing.

While designed for today's satellites and VSAT networks, A-SAT-II is also developed for the emerging High Throughput Satellites (HTS) and to what degree they will change the overall VSAT landscape and how to take advantage of that change.

A-SAT-II Overview

1. The Basics of A-SAT-II

Modern bandwidth-on-demand satellite networks have provided broadband access to users previously unable to participate in the information age. These improvements have been made possible by the rapid evolution of affordable processing power. Such evolution was necessary to enable the use of short-burst MF-TDMA approaches.

Short burst MF-TDMA systems are optimized for flexibility and responsiveness to changing traffic demands among its users. As an example, such systems excel at addressing scenarios where the user rapidly switches from web browsing (infrequent, small transmissions of data) to sourcing streaming video (near-constant, high rate transmission). SCPC continuous carrier systems trade the above-described flexibility in favor of strong physical performance, a.k.a. power/bandwidth efficiency.

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This physical performance arms system network designers with the ability to select between reduced operational costs (through increased bandwidth efficiency) and increased robustness of the communications link. The monthly operational costs of a typical satellite network is dominated (typically up to 65 percent of the recurring costs) by the price of the satellite space segment.

The physical layer power/bandwidth efficiency is, however, only one part of the picture. Continuous (SCPC) carriers are semi-permanently assigned to particular connections—any unused capacity is wasted. MF-TDMA allows sharing of the total system capacity among all connections according to instantaneous bandwidth needs. This results in multiplexing gains that can reach a factor of 4 for telephony and even higher values for interactive traffic. All else being equal, this outweighs the factor of 2 loss of physical layer efficiency sometimes experienced by MF-TDMA when compared to SCPC.

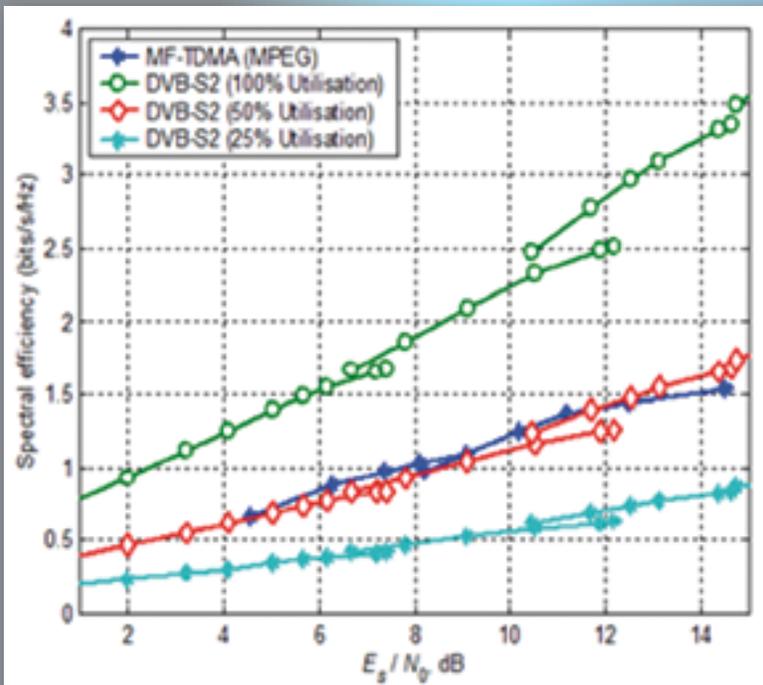


Figure 1. Spectral Efficiencies: MF-TDMA versus SCPC.

Among SCPC technologies, DVB-S2 is the best modulation and coding scheme available today. The results for DVB-S2 are shown in *Figure 1* for varying degrees of actual utilization, from 100 percent (e.g., a constant rate video stream just filling the carrier) down to 25 percent (an optimistic value for Internet traffic). It can be seen that the SCPC carrier needs, on average, to be at least 50 percent full in order to perform better than the MF-TDMA. Therefore, with any substantial variability in traffic, MF-TDMA is the better choice.

In real life, the situation depends on the traffic statistics and communication link conditions. When the traffic is highly variable, the trade-off always comes out in favor of MF-TDMA. However, when the traffic demand is less variable, and/or when the satellite link conditions may degrade, it becomes attractive to use continuous carrier DVB-S2 SCPC.

The Advantech Wireless A-SAT terminals can support both MF-TDMA and DVB-S2 SCPC mode, allowing the dynamic transition from one mode to another without requiring any hardware changes at the remote site.

The Adaptive Satellite Access Technology architecture combines the best properties of the MF-TDMA and DVB-S2 SCPC approaches in a single architecture, which can adapt its operation in real time to the needs of individual terminals, their current link conditions and of the overall network. In parallel with this, A-SAT provides on-the-fly re-configuration of the system frequency plan, so that bandwidth can be moved between MF-TDMA and continuous carrier operation.

The objective is to use the most appropriate combination of access schemes for any terminal at any time: MF-TDMA will be used when the traffic demand is low or for a highly variable component of a total demand, while continuous DVB-S2 carriers will be used for a more constant or minimally variable traffic demand.

2. Enhancing A-SAT™ with Burst Mode SCPC (A-SAT-II)

From the information above, the responsiveness of MF-TDMA has many benefits to the user. This is especially true for real time applications, such as voice and tele-conferencing.

One shortcoming of regular MF-TDMA may be the possibility of jitter in the transmission. Applications such as voice are sensitive to jitter and impairments on the transmission are readily perceived by the user.

Another possible shortcoming of MF-TDMA is the shared nature of the resource. This is generally of great benefit when the transmission bit rates are low and there is unused capacity on the MF-TDMA carriers that can be assigned to different users. However, high priority users may experience reduced transmission rates due to congestion or simply the transmission requirements of the application exceed the normal capacity assigned to that user.

BM-SCPC overcomes these issues by incorporating a priority scheme into the typical MF-TDMA assignment algorithm. High priority users are identified at setup time by the network operator. When the high priority user requests capacity for an application such as voice, the Network Management System (NMS) identifies its priority status. If necessary the NMS will shed assignments to lower priority users in order to fulfill the request of the high priority user. At the end of that application session (i.e. end of the voice call) the NMS restores the typical assignments to all users. The capacity of the assignment can be up to the full capacity of the MF-TDMA carrier.

3. The Benefits of A-SAT-II™

Carrier Access Efficiencies

As shown earlier in *Figure 1*, both DVB-S2 SCPC and MF-TDMA have varying carrier access efficiency performance depending on the degree of occupancy of the carrier. Expressed as bits/s/Hz, the carrier access performance is the throughput achieved in available bandwidth. SCPC is

highly efficient if the carrier is fully utilized, whereas MF-TDMA is more efficient than SCPC when the carrier utilization is 50 percent or less.

Network Throughput Efficiency

A key element in the A-SAT performance is the network throughput efficiency experienced when multiple sources of traffic can share a common MF-TDMA carrier. We define the throughput efficiency as a measurement of access performance (bits/s/Hz) in real networks with mixed traffic sources. It compares network throughput to required overall bandwidth when statistical multiplexing of incoming traffic is considered.

The following figure depicts the access performance of MF-TDMA, SCPC and A-SAT-II techniques as a function of network traffic density. The following are definitions of the terms used in the figure below:

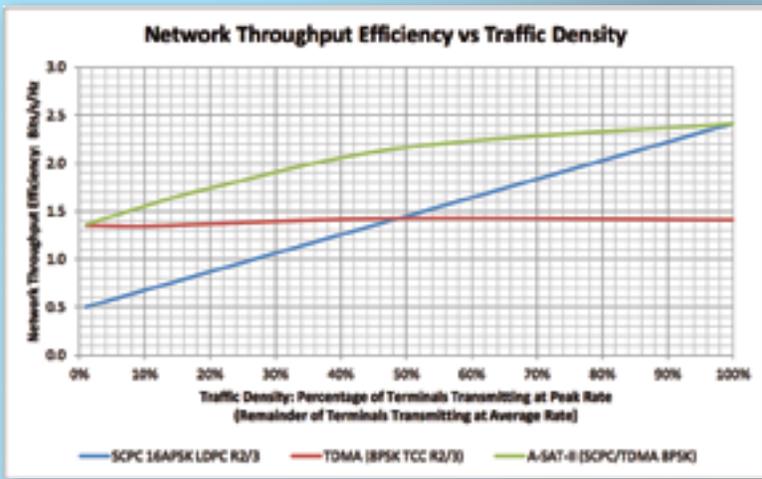


Figure 2: Network Throughput Efficiency versus Inbound Traffic Density

Network Throughput Efficiency: Ratio of inbound network throughput to the occupied bandwidth at various traffic densities. **Traffic Density:** Percentage of terminal population operating at peak data rate. Remaining terminals are operating at the average data rate.

Average Data Rate: Data rate assumed per terminal averaged over extended time. In this example, average data rate is assumed to be 20 percent of peak data rate.

Another way of showing the performance of the A-SAT-II technology is to compare the performance as a percentage of the SCPC-only scenario. The figure at the top of the next column (Figure 3) depicts this concept.

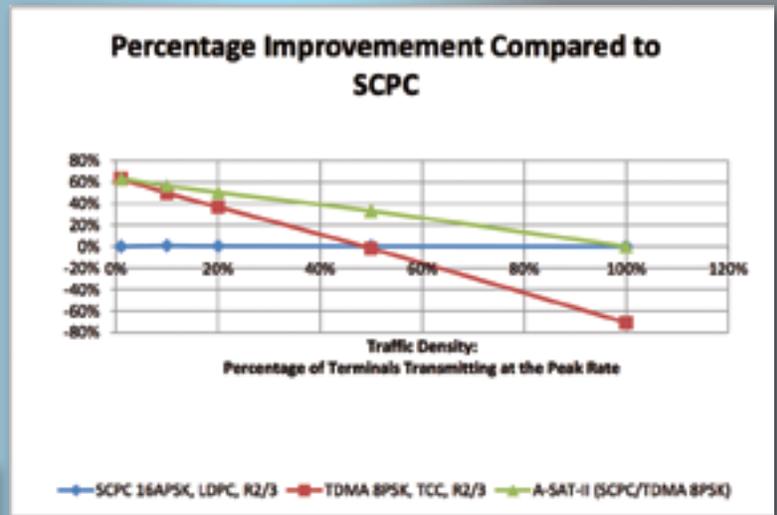


Figure 3: Comparison of Access Techniques

The MF-TDMA approach is not as efficient as SCPC when the traffic density exceeds 50 percent, while the A-SAT-II performance exceeds that of SCPC—at all traffic densities except 100% when A-SAT is equivalent to SCPC.

The Advantech Wireless second generation Advanced Satellite Access Technology (A-SAT-II) provides the satellite operator with a superior means of designing his network to efficiently meet all varying traffic types. Whether the traffic is bursty Internet exchanges or large file transfers, the A-SAT-II access techniques ensures the most efficient transport. This minimizes the operating expense (satellite resource lease) while providing a flexible approach that will adapt to changing traffic patterns and priority.

Mr. John Landovskis has worked in the space industry for more than 30 years. He has been involved in TDMA product development since 1981 first with Spar Aerospace and then with Comtel and ComStream. Mr. Landovskis was instrumental with his team in the development of the DVB-RCS standard. He assumed increasingly more senior positions and was the CTO for EMS Satellite Networks when it was acquired by Advantech Wireless. At Advantech Wireless Mr. Landovskis has led the development of numerous innovative products. He is Member of the Order of Engineers of Quebec and holds a Bachelor of Electrical Engineering and Post Graduate courses in Management, from McGill University in Montreal.

The Gap—TDMA Versus SCPC... A Teledyne Paradise Datacom Focus On Technology

By Tony Radford, Vice President, Sales + Marketing, Teledyne Paradise Datacom



When the company launched Q-NET earlier last year under the portraiture of ‘Solving the VSAT vs. SCPC Dilemma’, I had no idea that this release would spark such vehement debate from some of my esteemed competitors who claim ascendancy when it comes to cellular-backhaul.

The intent wasn’t to step on anyone’s toes by alleging that their products were in some way inferior or that they lack relevance. After all, I’m the first to toss kudos at the begetters of burst-technology—the perfect solution for the conveyance of thin-route transactional data across hundreds or thousands of users.

Despite the fact that manufacturers of TDMA/VSAT products have been pushing their technology into the SCPC market space by increasing throughput and enhancing link efficiency—or that some manufacturers of SCPC modems have developed platforms that allow dynamic bandwidth-assignment and ‘network-level’ monitoring and control, the absence of a true, one-size-fits-all solution suggests that the question of TDMA or SCPC is definitely alive and well. To say that the question is “wrong” or that the decision is “simple” fails to give credence to the weight of the considerations faced by service providers when adopting the best architecture for their specific needs.

Being the purveyor of perhaps the world’s most versatile SCPC satellite modem, we were merely casting light on the fact that a gap exists between the peripheries of conventional SCPC and TDMA/VSAT domains, due to the applications for which they were originally designed. By ‘gap,’ I refer to that dilating divide that lies just beyond the reach of either architecture in its traditional form—that once shaded area now being illuminated by the need to adjust bent-pipe capacity as demand for access increases and as it shifts about the network by the hour of day and day of the week.

Networks come in a variety of flavors, varying by the number of remotes, geographic-spread, subscriber-base and offered services. Those that occupy ‘the gap’ have some common characteristics that prevent them from being fully facilitated by TDMA/VSAT or static SCPC terminals. These networks might span multiple time zones or at least have a mix of urban and rural customers whose access-points change depending on whether they’re at work, at home in the suburbs or on the road in-between. They will need to move higher volumes of traffic than TDMA can accommodate, and if the network is heavily ‘IP-centric’, they’ll probably need considerable packet-processing power and embedded optimization tools such as link acceleration, carrier-grade Ethernet and 3G/4G deep packet inspection.

Regardless of technology, satellite-modem aficionados are cognizant of the unrivaled performance that today’s high-end SCPC modems deliver when it comes to link efficiency, throughput and raw processing power. The backplane of the SCPC modem screams versatility with its broad array of terrestrial interfaces and, in our case, the ability to combine multiple

formats into a single carrier. Of course, with all of this power and sophistication, one can expect a high-end SCPC modem to cost a bit more than a typical VSAT modem. However, that additional cost can be more than offset by the savings from improved space segment utilization, thanks to higher modulation schemes, sharp roll-off filtering and carrier cancellation. For point-to-multipoint and Mesh applications, there are 8- and 16-stack multi-demodulators for the return traffic and the Q-NET network manager is a fraction of the cost of most VSAT hubs.

The Q-NET™ Satcom Bandwidth Manager Starts Where VSAT Stops

As VSAT links must draw their resources from a shared pool, the amount of capacity that is available on a per link basis may vary greatly, depending on the number of active users. Subscribers may be underserved if their service providers set optimistic expectations of the amount of link capacity that will be available to them at any given time. An increase in the number of subscribers, combined with the proliferation of bandwidth-hungry applications, makes it even more likely that customers will feel underserved. What service providers and users really need in this situation is the best of both the VSAT and SCPC worlds.

With the Q-NET BW Manager, bandwidth is dedicated, not shared, so the needs of medium-to-high-throughput users can be easily and reliably accommodated with greater efficiency. Unlike the case with typical VSAT products, the Q-NET BW Manager guarantees that you have the bandwidth you need—whenever you need it—without worrying about contention and inefficiency as you do with TDMA.

As an added benefit, with Q-NET comes the ability to monitor and control the entire network—including any system component that has a remote control interface. A powerful suite of graphing and scheduling tools gives operators the ability to automate and generate reports that capture network performance statistics and provide situational awareness.

Service providers can now get “unleashed” bandwidth around the clock and stand prepared for a future of network growth without the disruption and outages that invariably result during hardware changes and upgrades. With Q-NET BW Manager, the hardship of managing a mixed TDMA and SCPC network disappears.

The Heart of Q-NET—The Q-Flex™ Satellite Modem

Q-Flex™, Teledyne’s flagship satellite modem, could be referred to as the heart of the Q-NET Bandwidth Manager. After all, this is the modem that manages a lot of the heavy lifting when making the most efficient use of the satellite. Far more than just a cache of high-end FPGAs and a powerful main processor, Q-Flex™ is the culmination of more than ten years of innovations and refinements. Thanks to the long list of features inherent to Q-Flex™,



**Teledyne Paradise Datacom's
Q-Flex™ Satellite Modem**

costs associated with the operation and maintenance of a satellite-based network can be greatly reduced.

The Q-Flex™ modem is built upon a LINUX-based, open architecture where the vast majority of the unit's features reside as digital code, unlike competing ASIC-based alternatives. Additional features be installed long after the modem has been placed into service and features yet to be designed can be uploaded via USB at some point in the future. The list of currently available features is extensive.

- *High-order modulation schemes (up to 64 QAM) and a large selection of FECs allow the user to attain some of the highest 'bits per hertz' densities in the industry*
- *Five percent roll-off filtering allows tighter carrier spacing to the tune of 20 percent spectrum savings over standard filtering*
- *Embedded Paired Carrier technology from ViaSat reduces bandwidth needs on a per carrier basis by up to 50 percent*
- *Teledyne's proprietary FastLink LDPC gives the user the option of optimizing each link for best Eb/No or best latency performance*
- *Adaptive Coding Modulation improves link integrity during rain-fade conditions*
- *The onboard Internet Protocol (IP) engine can pass up to 100 Mb/s WITH internal link acceleration enabled*
- *XStream IP™—an integrated suite of advanced IP optimization and traffic management features including TCP acceleration, header and payload compression, dynamic routing, traffic shaping and AES encryption*
- *Reversionary Control is a proprietary feature that prevents operators from losing communication with an unmanned remote station when changing a modem's operational parameters. When a remote station is monitored and controlled via the satellite link, a configuration mistake can cause a link interruption. The interruption causes a loss of communications, thus prompting the need to send personnel to reestablish communications manually. Reversionary Control will force the modem into a pre-established configuration in the event communications is lost, and thereby negate the need for a costly trip*
- *Dual IF Interfaces—switchable L-band and 70/140MHz IF interfaces are available on every modem.*
- *The Q-Flex™ modem contains a suite of powerful diagnostics tools designed to maintain not only link performance, but the health of the entire network*
- *Bit Error Rate Test Set (BERT)—will link with a Fireberd BERT located at the other end of the link. Communications can be established via the overhead channels so as to be transparent to actual traffic*

The exceptional performance, flexibility and simplicity of the Q-NET Bandwidth Management Platform delivers real value: costs can be more easily controlled, time saved and new revenue opportunities leveraged by its reduced bandwidth requirements, increased throughput, automation features and higher network utilization. The conundrum of continual capital investment is addressed by its programmability. The familiar patterns of small gains being obviated by new technologies, and of short shelf life for evolving hardware, are mitigated by Q-NET's long hardware life.

The time has come to dispel old notions about TDMA-VSAT vs. SCPC and to, instead, attain the best of both worlds. Three significant challenges are overcome by the Q-NET Bandwidth Manager.

1. *The need to make ever-greater capital investments that increase costs and reduce profits—the ability to upgrade and expand the Q-NET Bandwidth Manager eliminates the need for periodic hardware replacements as new features and technologies become available. Embedded diagnostic tools reduce the need to purchase test instruments to maintain network health, and reversionary control will reduce the number of field trips when services are accidentally interrupted during routine maintenance.*
2. *The need to create new revenue streams from existing space segment—the powerful satellite bandwidth-savings features of Q-NET will greatly reduce space segment costs that can account for as much as 30 percent of the total operating expense of a satellite-based service provider.*
3. *The need to mitigate low QoS due to network-traffic congestion and service-outages during component replacement.*

Service outages, slow services, service degradation, etc., can cause customer dissatisfaction, which can in turn lead to low customer retention.

By combining the best features of both VSAT and SCPC technology and removing their inherent limitations, operators no longer need to make the Hobson's choice between high-throughput and high network utilization. Q-NET Bandwidth Manager supports both, helping users to maximize profitability.

Tony Radford holds the position of Vice President of Sales and Marketing for Teledyne Microwave Solutions, which is comprised of seven Teledyne Technologies business units. Mr. Radford's tenure in the Satellite Communications Industry spans more than 30 years and his book—Satcom Guide for the Technically Challenged—is used by companies around the world as a primer for new employees.



Greater Accessibility Capabilities For RFI Geolocation

By Dr. Rob Rideout, Director of Strategic Planning, SAT Corporation, a KRATOS Company



Radio frequency interference (RFI) has long been an issue that has to be managed by the satellite communications industry. This is an issue that will continue to grow as the demand for satellite bandwidth increases, driven by technology advances that, in turn, create new bandwidth-hungry applications. The issue was certainly of concern in 2014 and will definitely present a crucial challenge in 2015.

Operators and industry groups report that signal interference significantly impacts profit margins, quality of service and operational efficiency. As our Year In Review offering, we'd like to take a closer look at satellite interference and how such can be remediated.

The first step toward neutralizing the disruptive effects of satellite interference is the rapid detection of that interference via effective monitoring. Today, there are numerous carrier signal monitoring systems and services that can be of significant help in this regard. The next step is to geolocate the interfering signal; however, satellite signal geolocation systems have often been considered expensive, difficult to use, and often thought of as a scientific tool, as opposed to an operational one. Because of this perception (and in the past, some reality), a satellite signal geolocation system was often the solution of last resort.

Recent advancements in geolocation systems have changed this situation. Changes in architecture have resulted in global systems that are much more affordable than in the past, and increases in usability have enabled systems that are much easier to use.

Greater Affordability=Greater Accessibility

By taking a modular approach to the architecture, the logic and control components are separated from the acquisition capability. This allows for deployment of logic and control components in a central operations center, thereby minimizing hardware and software requirements at data acquisition sites—this makes multiple site deployments more affordable.

In addition to less expensive deployment costs for multiple data acquisition sites, usage at each site can be maximized. By separating the main system capability from the data acquisition sites, the data acquisition sites can actually be shared by multiple entities. When two organizations share a deployment, they reduce costs through the deployment of a single geolocation acquisition system.

Additionally, there is a potentially significant saving on antennas, which are often more costly than the geolocation system. These shared acquisition systems contain only non-proprietary data, ensuring operations from both organizations are completely separate.

A typical scenario might be where organization (A) has a geolocation system and one or more acquisition sites but needs temporary acquisition capability at another site. If organization (B) has acquisition capability at that site, and has the willingness and capacity to share, organization (A) can access organization (B) site via establishment of a WAN connection and then transmit the data to its geolocation system. (See Figure 1 on the next page.)

This new modular architecture is designed for hardware acquisition sharing, making data sampling interleaving possible. This feature also enables sharing of the acquisition hardware on a sample interval timeframe and it is handled automatically. Whether the acquisition site is shared by multiple operators within a single organization, or by multiple organizations, the hardware can be used more efficiently.

Today's geolocation systems are generally integrated with carrier signal monitoring (CSM) capability. Integration with CSM capability, at a minimum, saves the cost of hardware common to both capabilities.



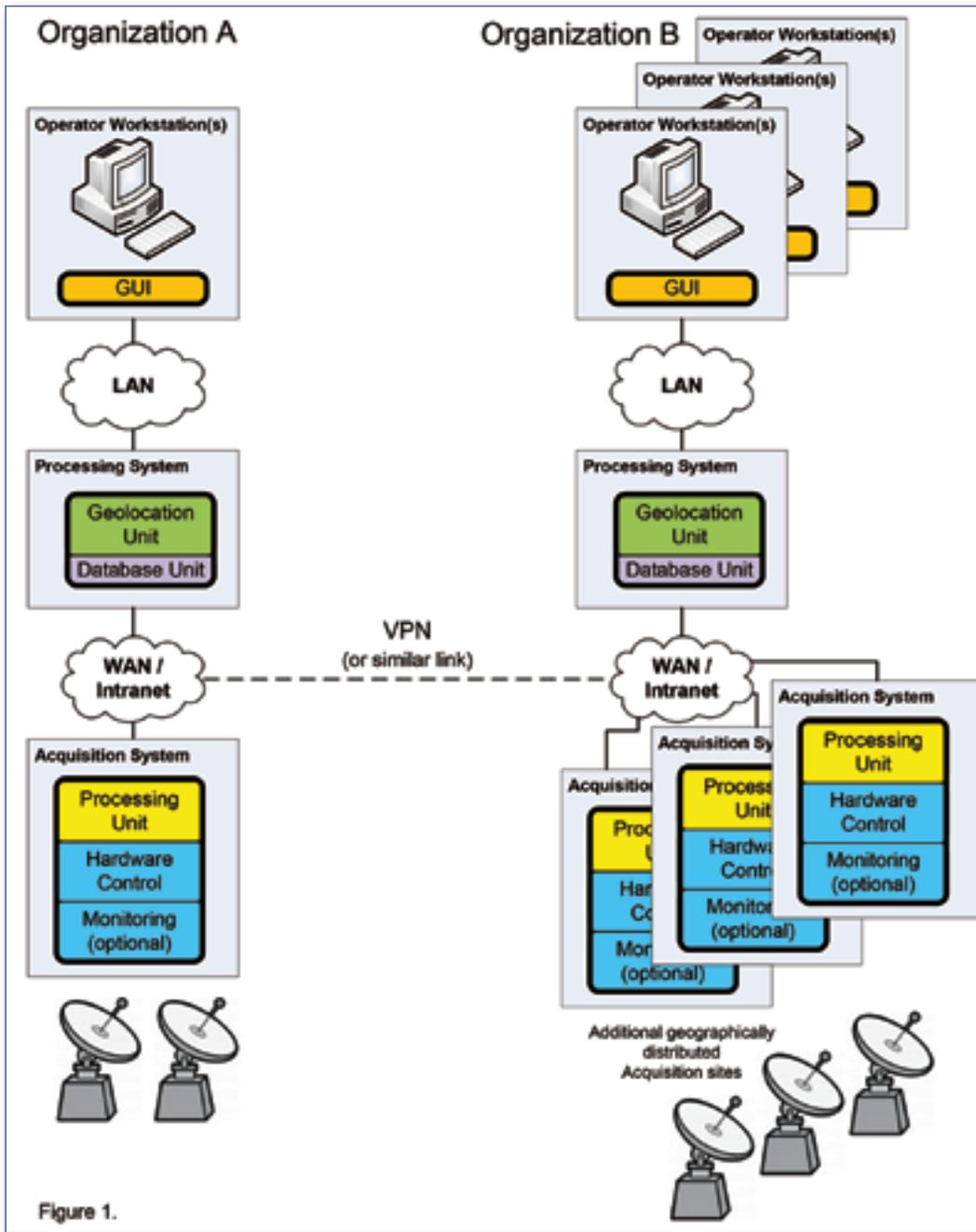


Figure 1.

By separating the main system capability from the data acquisition sites, the data acquisition sites can actually be shared by multiple entities.

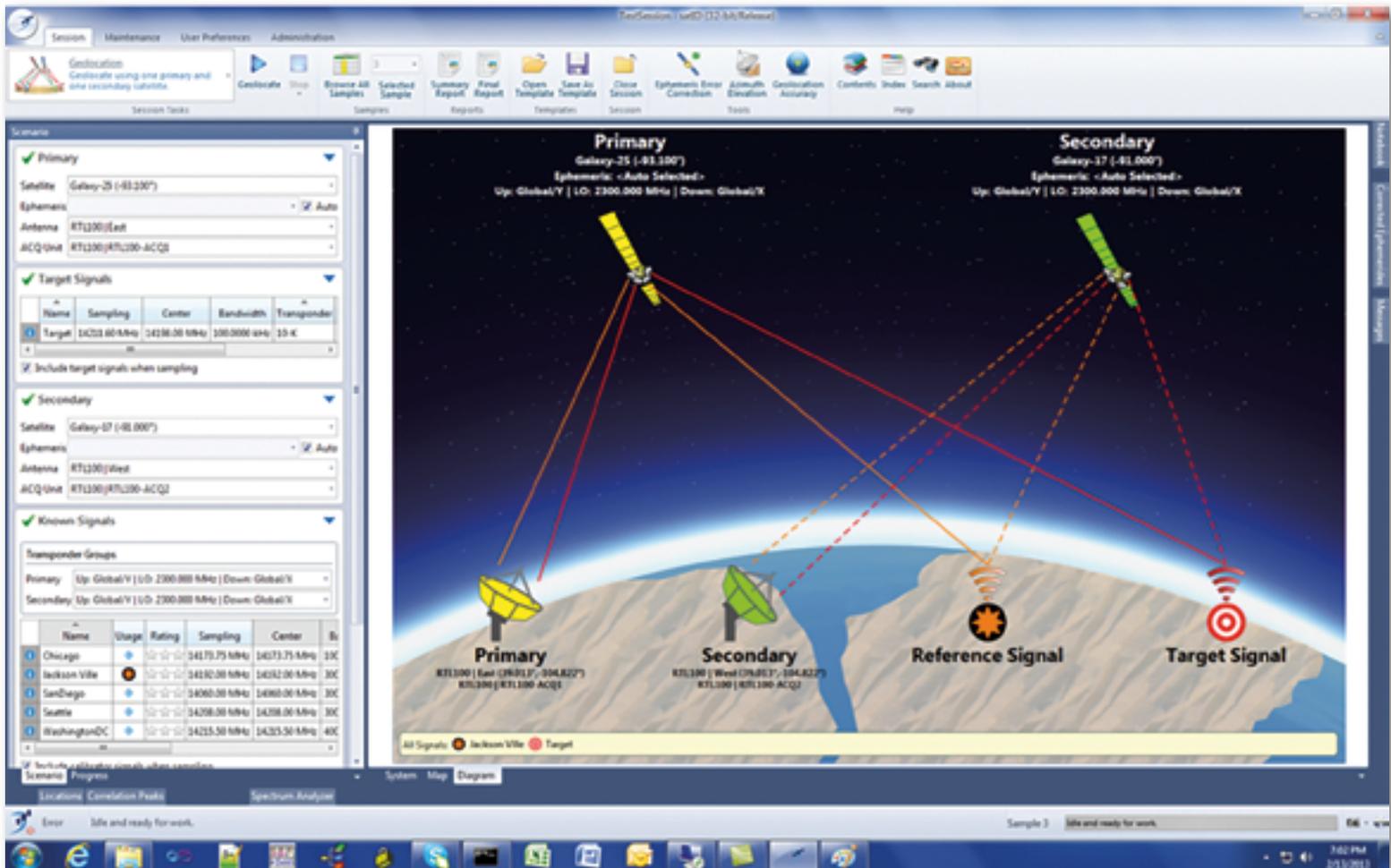
Ease-Of-Use

Modern geolocation systems have new features and capabilities that are designed to save operator effort and cost. Features such as scenario templates, higher levels of automation, improved reporting capability and integrated operator notebooks enable geolocation to be performed by more operators with less experience. This not only improves the efficiency and return from the system but can represent a significant financial savings to the organization.

Geolocation scenario templates are designed to allow a Level 1 geolocation operator to perform the scenario investigation, determine the secondary satellite, best reference signals and other settings to use for a given scenario. All of this information can be saved in a template. Later, when an operator has an interfering signal to geolocate, s/he simply provides the satellite, transponder and frequency of the interference to the template in which all other parameters were previously loaded. The operator can then start taking geolocation samples within seconds.

Improved operator documentation functions within the geolocation product also improve ease of use and efficiency. When novice operators perform a geolocation, they can more easily take notes and save screenshots from the process within the geolocation session. This has some benefits: the information is saved with the session so it can be recalled, instead of in a paper notebook or separate documentation. As the information and notes are within the session, they can be included in a geolocation report at the completion of the campaign. Operators can generate a report of the geolocation results and have their work reviewed by a geolocation expert. This helps to distribute the geolocation responsibilities among more people within the organization, increasing the effectiveness of the system.

Many geolocation systems have increased the amount of automation within the system and geolocation process. Recent advances in automation include sampling and processing, such as ephemeris correction and result averaging. By automating more of the process, operators are less likely to make mistakes and the overall geolocation process is performed more quickly. A geolocation of an interferer can be started as soon as possible following the identification of the interference. When the tools are easy and efficient to use, operators will take advantage of them, and the system becomes more efficient.



This "Diagram View" of the satID user interface shows the current measurement scenario. This includes the signals being measured, the satellites being used, and the ground station(s) used to receive those signals

No Longer A Solution Of Last Resort

Developments such as these in geolocation system affordability and ease-of-use have made satellite signal geolocation systems more accessible, enabling more operators to better manage increasingly congested bandwidth. Geolocation systems are no longer considered the tool of last resort.

Dr. Rob Rideout is the Director of Strategic Planning for SAT Corporation, a subsidiary of U.S.-based Kratos Defense and Security Solutions and a leading supplier of innovative satellite monitoring and interference geolocation systems for the space and aerospace industry.

Rob spent 12 years working in the U.K. defense sector before moving to SAT Corporation and to-date has dedicated the last 16 years of his career investigating and developing technologies to combat the ever increasing and disruptive effects of interference to satellite communications. Rob has promoted the benefits of interference detection and mitigation techniques around the world to military, government and commercial satellite operators at international forums, and has regularly been called upon to advise government departments and their key advisors, and regulators.

Rob obtained a Ph.D. from the University of Birmingham (UK) in the field of high energy astrophysics in 1995.

ID'ing Interference

Powerful, flexible, and modular, satID from SAT Corporation, a Kratos Company, is an easy-to-use package for locating and identifying sources of RF interference. Now, with its unique antenna sharing capability, operators can reduce capex by distributing antenna capacity with another party who has extra capacity and the willingness to share that capacity.

New, innovative scenario templates created by higher level operators can be used by lower level operators to ensure the accuracy of results. In most cases, scenarios can be created and begin receiving pinpointed geolocation results displayed on a map within minutes.

satID employs a map-driven user interface to giving operators the ability to perform geolocation scenarios more efficiently and effectively. Geolocation operations can be conducted directly from the map, removing the reliance on less intuitive menu selections for geolocation scenarios.

The satID infosite is located at <http://www.sat.com/products/satid>

Smaller, Lighter + Efficient TWTAs: A Tango Wave Focus On Technology

SATCOM service providers and operators today want more power out of the uplink power—however, if they are operating within the guidelines of most satellite system standards, they will never operate above maximum linear power.

At the same time, what the industry's customer base is looking for is high output power with less "attached" volume and weight. Available solutions include Tango Wave's SATCOM power amplifier designs, which are meeting such customer needs by offering 10 percent less volume and weight with their 400W Ku-band offering, 35 percent less volume and weight with the 250W Ka-band product, and 40 percent less volume and weight with their 750W Ku- and DBS-band systems.

Tango Wave's compact and ultra-compact TWTa designs have common technology and modules (power supply, control and cables) and custom configurable components (RF, TWT, HVPS and cooling), all leading to better products and service for SATCOM system integrators and service providers.

Amplifier solutions for operating in Ku-band, ranging from power levels of 400 watts (peak and CW), 750 watts (peak and CW), and up to 1250 watts (peak), have been developed by the company. Amplifiers are also available for operating in at power levels of 750 watts (peak and CW) in DBS band, and a full lineup of 11 peak and CW amplifiers that range from 120 watts to 550 watts peak, in Ka-band. The smaller, lighter and more efficient amplifier designs are a highly positive delineator for customer consideration.

Smaller and Lighter

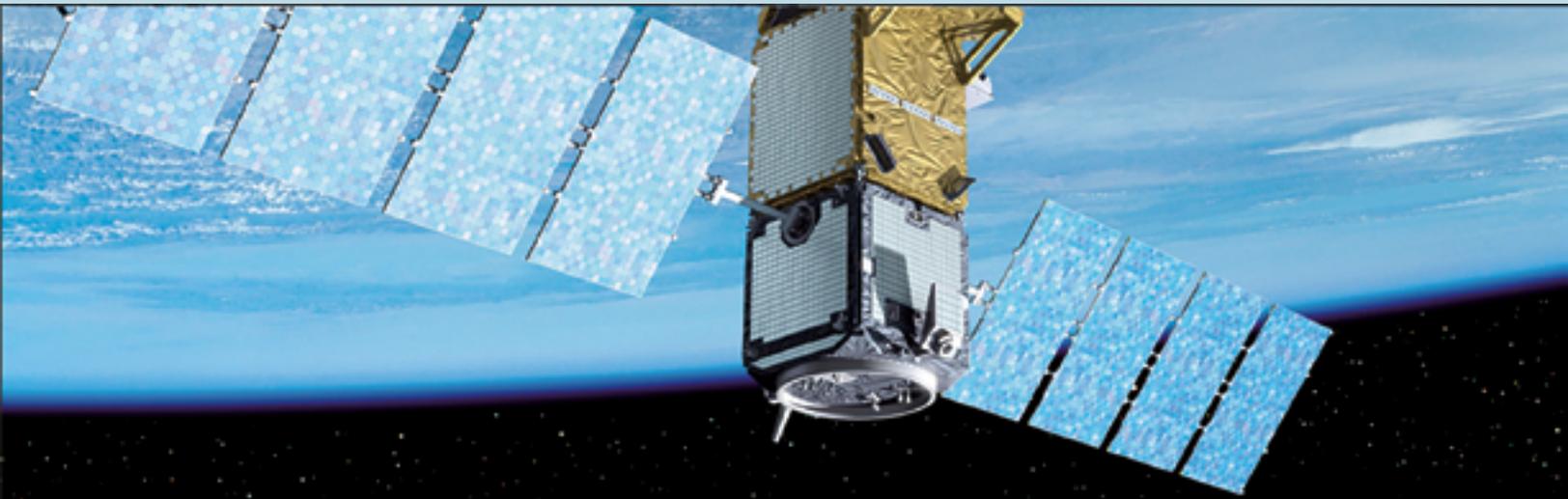
Tango Wave has developed two compact platforms that are the basic building blocks of their amplifier designs. The compact PA20 Series measure only 20 x 10 x 10 inches (50.8 x 25.4 x 25.4 cm) and weigh in at just 44 pounds (20kg., typical).



Tango Wave's PA17 Series Ku-Band TWTa Platform.

As examples, Model PA20-Ku400 (400W Ku) and Model PA20-Ku750 (750W Ku) amplifiers have the option to operate from 12.75 to 14.5 GHz (extended Ku-Band). These amplifiers are both PA20 Series platform products, which makes these PAs completely interchangeable from a systems upgrade point of view

The ultra-compact PA17 Series amplifiers measure 17 x 8.5 x 8.5 inches (43.2 x 21.6 x 21.6cm) and weigh in at 32 pounds (14.5kg., typical). The Ultra-Compact Model PA17-Ku400P (400W peak) is a more compact product that offers the equivalent performance of the Model PA20-Ku400. The PA17-Ku400P is tuned to limit CW carrier power to values just above the maximum linear power of the amplifier. The amplifier does not have a limiter and can operate to saturation.





Tango Wave PA20 Series Ku-Band TWTA Platform.

The reason for using a limiter is to optimize the TWT collector performance for efficiency. Again, to be clear, operating in peak mode increases amplifier efficiency. With the design of this particular amplifier, the prime power, thermal power dissipation and physical size of the product are all reduced.

Efficiency

TWTA performance advantages are driven by efficiency, which reduces the physical size, unit weight and power consumption down, with the end results being lower operational expenses—UPS, HVAC and electricity usage.

System Solutions

Tango Wave compact universal solutions are specifically designed to be re-purposed with value-added, low loss systems. Redundancy, power combining, polarity switching and load switching functions are compact and broadband in operation—with HPA having integrated system control

built-in. Simply put, a 1:2 system can be installed and operated as a 1:1 system until the second polarization is required. The upgrade is achieved by adding just one HPA to be operational as a 1:2 system.

Tango Wave’s affordable line of amplifiers are able to address the global demand for broadband solutions and are designed for Direct-to-Home (DTH), global up-linking, Digital/Satellite News Gathering (DSNG/SNG), broadcasting, voice/data, mobile up-linking and maritime applications.

A company tagline encompasses their product efforts: “Smaller, Lighter and Better SATCOM TWTA: It’s in Our DNA.”

For further information regarding Tango Wave, please visit <http://www.tango-wave.com/>

Tango Wave’s objectives are to develop products for commercial platforms that deliver continuous wave (CW) power amplifiers and peak power amplifiers operating in the Ku-, DBS- and Ka-bands. These HPA designs use modern TWTs and linearity pre-distortion techniques for achieving cutting-edge SATCOM uplink amplifier products with high linearity and high efficiency. These technologies also enable the development of compact HPAs that offer advantages in size, weight and power over products currently available in the market. Additionally, these innovative, safe and reliable products, with value-added solutions, are exactly what the Global SATCOM Market demands.

Just recently, Spacepath Communications and Tango Wave agreed to collaborate across marketing activities, service support and new product development solutions. Spacepath Communications, the U.K. company behind the Stellar family of high-power outdoor amplifiers (HPA), has joined with Tango Wave to market a range of new high efficiency SATCOM amplifiers for the global HPA market. Walt Wood, CEO, Tango Wave, said, “The Spacepath team has immense experience in the EMEA satellite arena, and Tango Wave’s new high efficiency products augment the Spacepath range of products perfectly by providing customers across the region with fixed and transportable solutions for commercial and military applications. With the use of Ka-band for SNG applications, where small, high efficiency, lightweight packages are essential. Our new products have been designed especially for this and other high powered gateway applications.”



Hybrid Satellite + Cellular Systems— Providing Certainty In Transport For OH&S

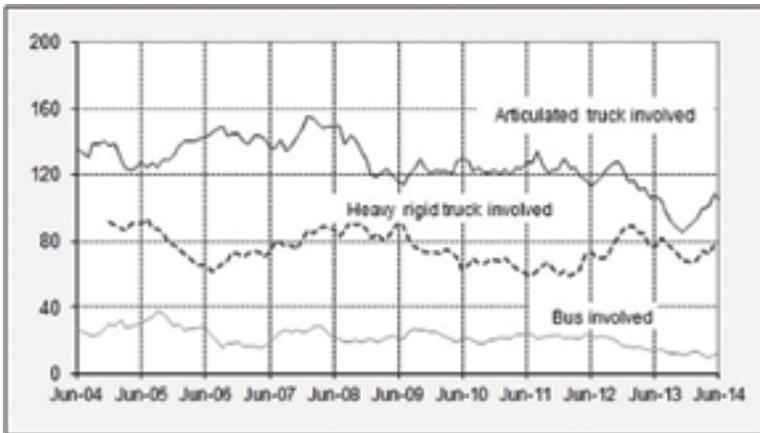
By Shane Murphy, Vice President + General Manager, KORE Wireless Asia Pacific



Over the last decade or so Australia, like many other countries, has moved to ever more vigilance in the safety of transport drivers, especially on long hauls.

The number of accidents involving heavy vehicles has failed to dramatically improve. The graph below shows that although there has been consistent movement on articulated transport recently, rigid vehicles are still hovering at the same disastrous levels as a decade ago.

Fatal crashes involving heavy vehicles, Australia—moving annual total
(Each point shows the number of fatal crashes during the preceding 12 months)

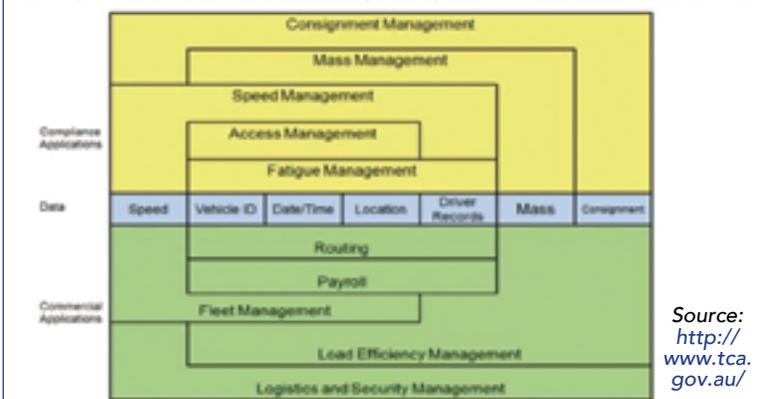


Source:

https://www.bitre.gov.au/publications/ongoing/fatal_heavy_vehicle_crashes_quarterly.aspx

KORE Wireless partner, Melbourne-based Mobile Tracking and Data Pty Ltd (MTData), has been working on solutions to these challenges for some time. Coming from a background in providing some of the first and most ubiquitous two-way radio based, taxi dispatch terminals during the 1980s and 1990s, the MTData team first worked with a cellular based set of solutions, which has again become a dominant feature of the taxi dispatch market. In the last year or two they have turned their attention to Australia's Transport Certification (IAP/TCA) and compliance challenges.

Telematics can support multiple regulatory and commercial applications



Source:
<http://www.tca.gov.au/>

MTData have developed a solution which combines cellular and satellite connectivity to address a range of issues that are common to the fleet tracking industry such as compliance with OH&S regulations, Driver safety and vehicle management. Put simply from a device view, they have developed a number of algorithms that detect when cellular coverage has been dropped for a certain amount of time and, if that connection cannot resume, it then switches to satellite mode to operate. The satellite connection uses Iridium's Short Burst Data (SBD) service. To explain how this works, we often compare SBD to sending an SMS message (if, say, something such as Inmarsat's BGAN service is a 3G or GPRS equivalent, for example).

The challenge for MTData in using SBD for this operation is that it functions in a different way from how the devices normally work in cellular mode. SBD sends messages limited to—usually under—1000 bytes at a time, with no headers (well, no chargeable headers, in any case). This means that the data payload has to be extracted and treated separately from the data delivered by terrestrial networks and, in fact, arrives via a different path.

KORE delivers these messages to MTData's servers via our IP Gateway, a service that takes these SBD text messages and delivers them in a format and method that can be successfully integrated into the IP data stream from cellular. It's like having dedicated VPN delivery of text messages that can be delivered as a TCP/IP Packet, or xml, or other formats suited to IP transactions. The positive side of this type of delivery, is that the messages are limited in size, so it is much harder to send very large (=expensive) amounts of data over SBD.

A key part of the MTData solution is to ensure that only essential data is relayed in real-time over satellite. Other important, but not time critical, data can be reserved for sending over the more cost effective cellular signal when the vehicle reaches terrestrial coverage. Vitrally important is obtaining the correct balance—sending the critical information as necessary and holding the balance for later. Failing to get this right can mean either a dangerous situation is left unattended for an extended period, such as driver fatigue or an engine alert. On the other hand, sending all of the data can mean expensive satellite data costs.

KORE has created specific pooled SBD data plans for MTData that enable data usage from multiple users to be aggregated into a single billing pool. Take, for example, large trucking fleet companies who rotate their trucks to maximize mileage across the fleet. Bundled (pooled) plans can manage the data between these trucks across the fleet. This means there is a significant reduction in price—if one truck is resting, the other truck effectively uses "its" monthly data, as all the data is shared.

The key result is a significant savings for the customer. This work around has directly resulted in a dramatic price drop for the customer who previously had to select which trucks to put the devices in, leaving some of the fleet vulnerable.



Due to what has become effectively a significant price drop, they can now place devices in all their trucks to comply with OH&S (Occupational Health & Safety) regulations and maximize driver safety. There is a small possibility they will go over their individual data allowances, which used to be a very high rate, but now with pooling, this is unlikely to happen and, if it does, the cost is significantly lower overall.

Direct applications for this solution include:

- **OH&S regulations**
Compliance is particularly beneficial in the mining industry, where drivers need to be tracked constantly (as above per the TCA system).
- **Driver alerts / fatigue regulations**
To address these situations, the system sends a message to the driver to alert them that they need to take a break. The driver takes his break and logs it in the system, which sends a message to the base to confirm that the required break was taken. This is beneficial for compliance and is also essential to ensure driver safety and well-being.
- **Duress alarms**
A switch located in vehicle's cabin sends an urgent alert via satellite to the base to request someone be sent directly to the vehicle to assist the driver.
- **Man down alarms**
The driver has a pendant that, if activated, reports the location to base so they can send someone to assist immediately. This is especially useful if loading or unloading at a remote terminal that may be unmanned. This allows more much more efficient allocation of staff, without compromising safety.
- **Engine critical alarms**
In many systems, it is highly desirable to incorporate interfaces into the vehicles EMS (Engine Management System)—these are, after all, hundreds of thousands to multimillion dollar assets. Timely alarming can be the difference between a tow truck fee and a complete new engine in, for example, an overheating situation, or between recapping or replacing a worn tire (Mining truck tires can cost many thousands of dollars).

The pooling of ideas and technology between software, hardware and communications providers—both satellite and cellular—has led to a reliable, comprehensive and integrated transport safety management system that:

- Ensures that transport operators' legal obligations are fulfilled
- Improves Driver road safety and lessens accidents through effective fatigue management
- Improves efficiency through integrated dispatching and transport systems software integration
- Allows for much improved maintenance and life of assets (trucks/tires etc.) through effective alarming and targeted preventative maintenance programs
- Has lowered operational costs by such a significant amount that the solution can be rolled out through entire fleets
- Combines the cost effectiveness of terrestrial networks with the superb coverage performance of satellite to give "go anywhere" peace of mind to drivers and transport operators

The solution that MTData and KORE has developed is an example of harnessing the ever-evolving power of technology. By creating and implementing a reliable, cost-effective and practical solution, MTData has addressed the critical issues of safety and performance that are vitally important to the fleet logistics industry. With continuing advances in M2M technology enabling the ability to combine the best of satellite and cellular, it won't be long before we see many more operators taking advantage of the complementary technologies to improve their businesses.

To learn more about the MTData solutions fleet tracking solution, please visit:

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

For additional information regarding KORE Wireless solutions:

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

Shane Murphy is the Vice President and General Manager of KORE Wireless, the world's largest M2M provider. He is an accomplished business strategist and development executive with extensive experience in mobile communications, commercial two way radio, M2M and the Internet of Things.

Executive Spotlight: Dr. Ali Ebadi, Senior Vice President, Space Systems Development, MEASAT Satellite Systems Sdn. Bhd.

Dr. Ali R. Ebadi is the Senior Vice President – Space Systems Development of MEASAT Satellite Systems Sdn. Bhd and member of the Radio Regulations Board (RRB) of the International Telecommunication Union (ITU). He has more than 30 years' experience in the field of Radio Engineering, Spectrum Management and Satellite Communications besides being actively involved in ITU's activities.

Dr. Ebadi is a member of the Institution of Engineers Australia (IE Aust) as a Chartered Professional Engineer, a member of the Institution of Engineering and Technology (IET) U.K. as a Chartered Engineer, and a member of the Institute of Engineers Malaysia (IEM).

SatMagazine

Dr. Ebadi, congratulations on the September launch of MEASAT's largest and most advanced satellite to date, MEASAT-3b. What prompted the decision to procure and launch MEASAT-3b?

Dr. Ebadi

MEASAT-3b, a Ku-band satellite that is designed to provide video and data services across Malaysia, India, Indonesia and Australia, was initiated in response to the needs of MEASAT's existing DTH customers for greater Ku-band capacity in order to expand their DTH businesses with more service offerings and greater HD content. The addition of an Australian beam further expands our coverage.

SatMagazine

Would you walk us through the procurement process? What special considerations does MEASAT make when selecting the satellite's design and manufacturer?

Dr. Ebadi

MEASAT has developed a comprehensive risk-averse approach to satellite procurement. This approach has been followed since the procurement and launch of our first satellites and includes:

- Detailed contract that covered all risk and anomalies and enabled us to ensure the satellite was built according to our exacting specifications
- Multiple redundancies to minimize single points of failure
- Rigorous testing requirements (beyond industry norms)
- Onsite MEASAT engineers and consultants throughout the satellite's manufacture and testing

The manufacturer, Airbus Defense and Space, was selected based on their understanding and commitment to the standards we have developed at MEASAT.

SatMagazine

Could you tell us more about MEASAT's risk-averse procurement focus?

Dr. Ebadi

Risk mitigation in satellite design and manufacture is a MEASAT priority. During the satellite procurement process, we make multiple demands at the satellite, subsystem and component levels to support this. Our requirements range from incorporating multiple redundancies, the use of flight-proven components, the critical selection of sub-contractors, and the choice of the team that will build the satellite.

MEASAT's approach is among the most conservative in the industry. We have adopted this approach due to the key role our satellites play as the core communication infrastructure for our customers' businesses.

SatMagazine

What about the testing requirements for MEASAT's satellites?

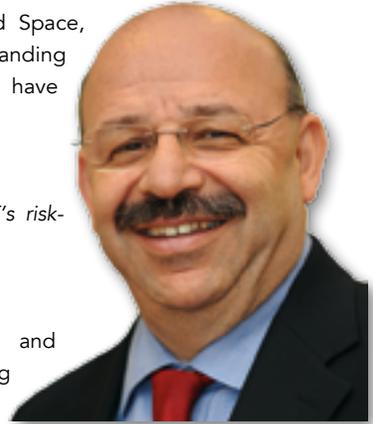
Dr. Ebadi

MEASAT's test plans are some of the industry's most rigorous and go beyond what most manufacturers are accustomed to working with during a satellite build.

MEASAT demands tests for unlikely events as well as tests that push the limits of satellite endurance and reliability. MEASAT's conservative approach serves us well in the reliability and uptime of our satellites.

SatMagazine

MEASAT has come far since your MEASAT-1 satellite. How has the business changed for MEASAT since the 1996 launch of that satellite?





MEASAT-3b global beam coverage map. Image courtesy of MEASAT

In Asia, MEASAT has built 91.5E into Asia's key video hot slot. From 91.5E, we provide DTH services for award-winning broadcasters in Malaysia, India and Indonesia. 91.5E also leads Asia in HD channel distribution, with 57 HD channels. MEASAT will continue to develop 91.5E with the launch of MEASAT-3c in 2016, which will add even more in-orbit redundancy.

MEASAT also looks toward new areas of growth, such as UHDTV and satellite broadband. 91.5E is already prepared for the UHDTV explosion. MEASAT-2a, a C-band and satellite broadband satellite, is expected to be contracted in the first part of 2015.

As MEASAT continues to grow our fleet with new satellite launches roughly every 1.5 years up to 2020, we are confident of sustaining our success and delivering even greater value to our customers

SatMagazine

Given your noteworthy career, especially your procurement of five MEASAT satellites, what project or projects truly bring a sense of satisfaction to you?

Dr. Ebadi

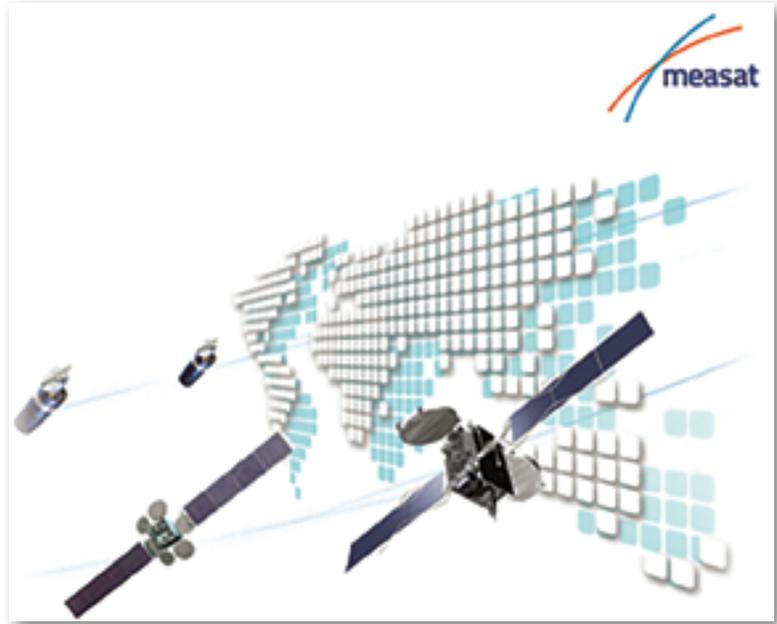
There are a few projects that stand out. MEASAT-1 and MEASAT-2, as they were Malaysia's and MEASAT's first satellites. AFRICASAT-1a, which was our first JV project. MEASAT-3b, as this is MEASAT's largest and most advanced satellite to date.



However, the project that gave me the greatest sense of achievement was MEASAT-3, as this was a tremendous technological leap from the previous MEASAT-1 and MEASAT-2 satellites.

Dr. Ebadi

MEASAT has achieved much success since that launch—we have grown from providing domestic satellite communication services to regional operations and internationally across Asia, Africa, the Middle East, Europe and Australia. Our fleet of six satellites has coverage across more than 150 countries and more than 80 percent of the world's population.



We went from procuring a small, 1200 Watt satellite, to a large 12000 Watt satellite equipped with six antennas and more than 500 switches. There were several challenges that we successfully overcame. These ranged from the incorporation of new technologies, manufacturing workmanship, craft design, heritage of components, subcontractor selections and assignments, and other challenges. The experience that MEASAT engineers gained was then applied towards the successful procurement of MEASAT's subsequent satellites.

For additional information regarding MEASAT, please visit <http://www.measat.com/>

Just recently, MEASAT appointed Jarod Lopez as the company's Vice President. Broadcast. In this role, Jarod will be responsible for overseeing the sales and marketing efforts of MEASAT in the broadcast industry. His focus will be on growing MEASAT's C-band broadcast business and maintaining MEASAT's leadership in HD video distribution within the Asian region.

Jarod is rejoining MEASAT after a brief sabbatical. He originally joined MEASAT in 2006 and has worked in the Sales & Marketing and Engineering & Operations departments, developing extensive experience in these areas. Jarod holds a B. Eng degree from the University of Northumbria, Newcastle, U.K.



Shielding Schiaparelli: A Mini-Interview With Aurélien Pisseloup + Yann Mignot, Airbus Defence & Space

These two professionals recently offered some thoughts regarding Airbus Defence and Space's upcoming ExoMars mission and the work involved in atmospheric re-entry and heat protection systems for this mission in a mini-interview published at the company's infosite.

Aurélien Pisseloup heads up the advanced projects and orbital services in the 'Orbital Systems and Exploration' business division. Yann Mignot leads the Protection Materials and Advanced Processes Department. Both work at the Airbus Defence and Space site at St-Médard-en-Jalles, where atmospheric re-entry and heat protection systems are developed and built.

Aurélien Pisseloup: The Exomars Missions

ExoMars comprises two missions, one in 2016, the other in 2018. In 2016, the Schiaparelli capsule will re-enter the Martian atmosphere carrying a lander and electronic equipment. The capsule will be launched atop the Trace Gas Orbiter (TGO) satellite on January 7, 2016, on a Russian Proton launcher. The TGO will remain in orbit for two years to act as a telecommunications relay for the second mission, which will be run by the Russian space agency, Roscosmos, and will entail sending a probe to deliver the European Mars rover, developed by Airbus Defence and Space.

Last July, we delivered the heat shields to Thales Alenia Space, prime contractor for the program, on behalf of the European Space Agency (ESA). These shields are designed to protect the Schiaparelli capsule during re-entry into the Martian atmosphere. Needless to say, these are key elements of the mission. We were responsible for the heat shield—structure, thermal protection and instrumentation—as well as the thermal protection and some of the atmospheric re-entry instruments for the rear shield, with the structure having been designed and built by Thales Alenia Space France.

Yann Mignot: Post-Delivery Support Until Final Assembly

After delivery we intervene, as and when needed until launch, during the flight model assembly, integration and testing. For example, last October, we spent two weeks at the Thales Alenia Space site to integrate the SLI insulation designed to protect the outside of the probe during the nine month cruise through space.

We will then be called upon after the test campaign when the probe and satellite are disassembled and sent to Russia in mid-2015. Thereafter, we will be involved during the final assembly campaign in Russia in late 2015. This will entail assembling the final heat shield elements, for example, once the fuel tank doors have been closed.

The thermal protection tiles are made of a material which absorbs some of the energy it receives by losing thickness when subjected to the extremely high heat caused by kinetic heating during the re-entry through the Martian atmosphere. This highly insulating material is affixed to large surface areas using a silicon glue.

When the project started, there were no plans for Airbus Defence and Space to handle this activity. However, as the project progressed, it became clear to the customer that assembly of the heat shields could not be left to chance and that our know-how was the valuable legacy of a long line of previous projects.

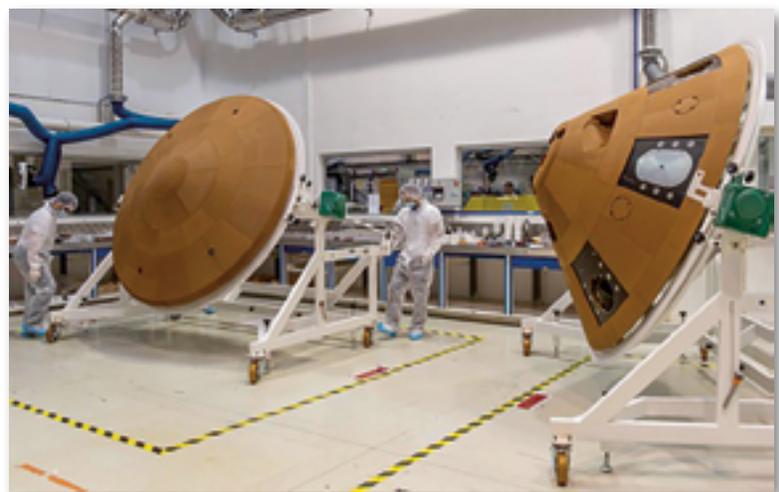
Aurélien Pisseloup: One Successful Challenge...

All the teams involved successfully met the challenge, which was to deliver a product compliant with the time, quality and cost requirements of our customer in a complex industrial context: four partners—Thales Alenia Space France, Thales Alenia Space Italia, Airbus Defence and Space France and Airbus Defence and Space Spain—are all linked to the Europe-wide nature of ESA.

The mission is not over, but we are already eagerly looking ahead to the next step: a Martian sample return mission. In technical terms, we are ready. We are capable of ensuring entry into the Martian atmosphere and the return voyage with re-entry to Earth.

ExoMars is not yet a success, but we must take advantage of this wonderful experience immediately, to avoid having to relearn in the future what we already know how to accomplish today.

The Airbus Defence and Space ExoMars infosite:
<http://www.space-airbusds.com/en/programme/exomars-l95.html>



Careers, The Road To The Future— Growing Your Business To The Next Level

By Bert Sadtler, Senior Contributor



Do you remember the 1984 science fiction movie “Terminator”? Think of the Cyborg Assassin as the singularly focused force determined to keep your business from growing.

In the movie, The Terminator arrived from the future to terminate the life of Sarah Connor. Nothing could stop that thing!

Kyle Reese, soldier in the human resistance from the post-apocalyptic future, came to the rescue of Sarah Connor. During one of the many attempts by the terminator to kill Sarah, Kyle said, “Come with me if you want to live.”

The audience knew this was Sarah’s best option. However, Sarah Connor accepted Kyle’s help on nothing more than blind faith, at best.

For a business to reach a level of success today, leadership has to overcome tremendous odds and must listen to that inner voice that drowns out all the distractions that say, “this won’t work.”

Once the business has reached critical mass, the forces of stagnation arrive to attack and retard growth. The business terminator is knocking at the door. If he can’t get in on the first try, don’t worry, “he’ll be back!”

This is a pivotal point for many businesses. What to do?

For most companies, the way forward is through having the correct talent. Some business leaders feel that managers who once meant so much to the company in the early stages of development have earned the employer’s loyalty. This level of emotion can blind the leadership from seeing the business objectively. The business’s status quo is the best friend of the business terminator. Remember, without Kyle Reese, Sarah Connor would not have made it out alive.

While the unstoppable force of the business terminator is doing everything possible to slow the growth of the business, there is an answer that says “Come with me if you want to live.” This is a frightening option that absolutely requires blind faith.

Think about the skills and attributes needed by key employees during the earliest stages of the business. Now that the business has grown, have those required skills and attributes changed in order for growth to reach the next level?

Of course, the requirements to attain the next level are quite different than those need at the earlier business stages. While this is a hard choice for



many business leaders, developing a process and approach to add new skills is a clear path forward.

In some cases, the original leadership team is no longer as excited with their roles once the company has reached a more substantial stage. This is a delicate area. Nobody said that growing a business was easy. Hard decisions are required if you want to defeat the terminator.

Perhaps using a 1980's era science fiction movie may be an extreme way to offer a business comparison. However, thinking your business will prosper with clients simply falling into your lap only happens in fairy tales, not real life.

In reality, hard choices and sacrifices have to be made everyday for a business to experience growth and prosperity.

The terminator of your business is lurking around your door. Have you developed a plan for your business to succeed as you move toward the future? Have you thought about the sacrifices that may be needed?

For example, in the movie "Terminator," hero Kyle Reese—while saving the life of Sarah Connor—is killed by the cyborg assassin.

Have you invested the time in your employees to ensure they understand what is required for the company's growth to occur? Does your business have career paths for employee development and success? Are you prepared to address the hard decisions that will be necessary concerning employees who are unable to develop or advance with the growth structure of the company?

The "sacrifice" or tough business decision could mean that an employee who was once highly productive during an earlier phase of your company is no longer effective dealing with the tasks necessary to help the business forge ahead.

Growth may require acquiring new talent that is capable of supporting the company as it steps forward into additional growth areas—employees who could only succeed in a smaller business setting need to be transitioned to other career paths.

Running away from the business terminator is not a solution—that is a reaction. What is the plan your business has developed that implements a focus on growth each and every day?

Good hunting!

Editor's note:

Opening image is courtesy of Universal Studios from their Terminator 2 feature film.

Bert Sadtler is the President of Boxwood Search and a Senior Contributor for SatMagazine—There is an ongoing battle for senior level talent. A great hire can make a long term positive impact and a failed hire can prove to be very expensive. How does a company recruit and hire the right talent? It is more than just networking within the community of friends and business associates. It requires focusing on results through a process oriented approach. We are committed to reaching a successful outcome. Our recruitment method has repeatedly proven to deliver very qualified senior talent. Contact Bert at BertSadtler@BoxwoodSearch.com for more information.



