Satellite Executive BRIEFING

Vol. 10 No. 2 March 2017

SATELLITE Markets & Research

Industry Trends, News Analysis, Market Intelligence and Opportunities

The Middle East Satellite Market Trends

by Elisabeth Tweedie, Associate Editor

Two words spring to mind when thinking about North Africa and the Middle East, and satellite: ambition and optimism. The ambition is coming not just from the operators themselves, as they race to provide new capacity in the region, it is also coming from governments and regional councils. The African Space Policy and African Space Strategy which was approved by governments and heads of state last year, define the ambitions of the continent.

The Space Strategy sets out multiple goals, including one that states, that in ten years' time, Africa should have an orbiting constellation of earth observation satellites, designed and manufactured in Africa. The Space Policy aims to set a regulatory environment that is favorable for developing the strategy and one that also ensures that Africa is a responsible user of space.

On an individual basis, the UAE and Qatar, in particular deserve a mention. The UAE Space Agency was founded in 2014 to pull together all the sectors involved in space, in the Emirates. Promoting Science, technology, engineering and maths (STEM) education in schools, in order to develop the talent pool, is one aim of the agency. Educating engineers is another. DubaiSat-1 and 2, were jointly developed by Qatar and South Korea, with a knowledge transfer agreement from South Korea's Satrec. The UAE's third earth observation satellite, KhalifaSat, is putting this knowledge to good use. The satellite will be built by the Mohammed Bin Rashid Space Centre (MBRSC) with only oversight from Satrec. The satellite is expected to be launched next year. The UAE also has ambitious plans for a mission to Mars in 2020. The Hope probe, which will be used for this mission is being designed and built in the UAE, albeit with assistance from American Universities. The probe which is designed to provide a global picture of the atmosphere around Mars is described as "a gift from the UAE to the world" as the data will be given free of charge to organizations that can use it. MBRSC is also working on a solar high altitude platform (HAPS) and a cubesat project.

Among the Middle Eastern countries, Qatar is a relatively new entrant into the space business, (Es'hailSat was first announced in 2010), but it also has very big ambitions. Like the UAE, Es'hailSat also

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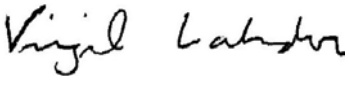
The Middle East /North Africa Market

As winter gives way to spring, the month of March marks a couple of some the most important trade shows in our industry: the Satellite conference and exhibition in Washington, D.C. and CABSAT in Dubai, UAE. Thankfully this year, the organizers of both events are holding these important shows two weeks apart, giving everyone the opportunity to participate in both significantly.

The Satellite show in D.C. is a must-attend event which will showcase global trends in the industry while CABSAT will focus on the important Middle East/North Africa (MENA) market—the subject of our cover story this month. The MENA market is a good bellwether of where the industry is going. As Elisabeth Tweedie writes in her article in this issue, the market is full of ambition and optimism—aiming very high in space.

As in previous years, Satellite Markets will be participating again as moderator and speaker at the CABSAT Satellite Hub Summit co-organized by the GVF. This year CABSAT's **SATEXPO** and the **GVF Satellite Hub Summit** will comprise mutually-reinforcing programs of satellite sector and satellite solutions end-user perspectives, with a day one emphasis on strategic analysis of various user markets and a day two and day three focus on interactive panel sessions which will offer detailed examination of core themes within today's industry environment, such as satellite spectrum, high throughput satellite technologies, low earth orbit satellite constellations, the VSAT mobility market, satellite interference and cyber security.

We look forward to seeing you at Satellite in D.C. and CABSAT in Dubai, UAE and covering those important events for you.



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Satellite Executive Briefing
is published monthly by
Synthesis Publications LLC
and is available for free at
www.satellitemarkets.com

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Middle East Satellite Broadcast Trends...From page 1

places great emphasis on education. Four engineers spent over two years at Space Systems Loral (SSL), the manufacturer of Es'hail-1, on an intensive training program. Similarly, trainee engineers were sent to Mitsubishi Electric Company (MELCO), the manufacturer of Eshail-2. The company also sponsors satellite communications engineering degrees at Surrey University in the UK. Having launched the first of several planned satellites, Es'hailSat is now building a teleport, with the intention of not only controlling its own fleet, but also offering services to other operators. This is an interesting decision, given that the existing single site teleports are facing unprecedented competition from the larger operators in the face of the trend towards managed services.

The teleport will also serve as back-up studios for broadcasters. According to Jarod Lopez, Director, Marketing and Business Development at Es'hailSat: "The need to build our own teleport stemmed from the need for us to have full control of the operations of the satellite for tracking, telemetry and control (TT&C)." He also stated that the decision to incorporate a broadcast center stemmed from customer requests for the facilities. "In the long term, we see the teleport business as a core part of the services we provide to our customers." However, Es'hailSat's ambitions are not confined to the Middle East. "Our aim is to be a global player in the satellite sector, hence our longer-term plan is to be active in new orbital slots with new satellites. The markets we see that have the greatest potential are South East Asia and Africa….We are in discussions with multiple parties on joint venture or condo satellites and also looking at acquisitions as possible options to enter these markets."

"...In the long term, we see the teleport business as a core part of the services we provide to our customers..."

-Jarod Lopez,* Director-Marketing and Business Development, *Es'hailSat

Operator's Future Plans

Future plans of the operators include multiple new satellites serving a region that many would say already has excess capacity. According to NSR, capacity pricing in the region has fallen by 2-3% every year since 2010. Nevertheless, all the operators interviewed for this article were united in their optimism and enthusiasm regarding the future potential of the region, and their own potential for securing a significant portion of this market.

With the loss of two satellites last year, Spacecom, probably had the worst year of any operator. This, however has not served to dampen its enthusiasm in any way. As Jacob Keret, Spacecom Senior Vice President North America, Europe and Middle East Sales and Marketing, said "Spacecom showed a great deal of resilience in 2016. We pushed forward through adversity, proving the depth and strength of our organization. Despite losing two satellites within 10 months, our management, sales and technical teams kept the company moving forward so that before the end of 2016 we signed an agreement with Boeing Satellite Systems International to construct and launch a new satellite, AMOS-17…….Spacecom, as a multi-regional supplier of broadcast and broadband services, continues to see these markets as healthy, growing and exciting businesses……We are really excited by our options throughout Europe and the Middle East."

Growth Areas

Certainly compared to many other parts of the world, there is plenty of growth potential, particularly in video, which is at the early stages of a transition to HD. However, the transition to HD is not without challenges. Although pay-TV is now gaining a foothold in the region, the majority of satellite channels are still free-to-air (FTA). Since advertisers rarely pay more for an advertisement in HD, this makes the economics of upgrading very questionable. Compounding the issue, according to research conducted by Eutelsat, 50% of TV households in the region still have a cathode ray tube (CRT) TV as the main set. Thinking positively, this points to significant numbers that will likely upgrade to a flat panel digital set in the next few years and these most likely will be HD not SD sets.

According to Arab Advisors Group, in 2016, only 18% of satellite TV channels provided by seven operators (Arabsat, Es'hailsat, Eutelsat, Gulfsat, Nilesat, Noorsat, and Yahlive) serving the region, are broadcast in HD. This is a 9% increase from 2015. However Eutelsat has experienced significantly better than 9% growth in HD channels. In the last year, it has seen a 40% increase in the number of channels broadcast in HD. However, even a 40% increase, only brings the total to 150 out of 1120, i.e. just over 10% of total channels. What is interesting is that according to Ghassan Murat, Vice President Business Development & Strategy, Eutelsat Middle East, more of these channels are FTA than pay-TV.

Other growth areas for the region are mobility and broadband. As in oth-


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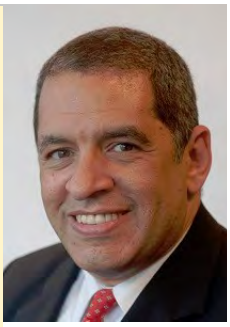
er parts of the world, aeronautical connectivity is increasing in importance as passengers are coming to expect the same connectivity in the air as on the ground. Eutelsat recently signed a contract with Saudi Arabia's Taqnia Space for spotbeam capacity on the EUTELSAT 3B satellite for in-flight connectivity services in Saudi Arabian Airlines aircraft flying over the Middle East, North Africa, Mediterranean and Europe regions. Also addressing the aeronautical sector, Yahsat, last year signed an agreement with Panasonic Avionics, to jointly explore the development of a Yahsat constellation to provide Panasonic aeronautical services across the region.

SES also sees a lot of potential in mobility, and not just from passengers on-board planes and ships. According to Hussein Oteifa, General Manager - Middle East at SES, Commercial: "Simultaneously, there is a heightened demand deriving from ship, rig, and airline operators who acknowledge the operational efficiencies that connectivity brings."

Broadband, provided by high-throughput satellite systems (HTS) is seen as another growth area. Certainly in terms of supply, the growth is significant, with the launch of the Intelsat 33E Epic satellite and HTS payloads on SES, Eutelsat, Yahsat, and Arabsat and satellites. Intelsat also launched its managed service IntelsatOne Flex for Enterprise, in the region and Quantis Global, a major broadband service provider in the North Africa and Europe, will be using the service to expand and enhance its network in the region. Although the venture with Facebook, to bring connectivity to Africa appears to be in abeyance, at least as far as Eutelsat is concerned, it has its own plans to bring connectivity to Sub-Saharan Africa. According to Ghassan, these involve leasing capacity from Yahsat, to replace the planned leased capacity that was lost when Amos-6 was destroyed. "Konnect Africa will shortly launch community and Direct-to-User Internet access in Sub-Saharan Africa using affordable, off-the-shelf user equipment. In the first phase, Konnect Africa will roll out services using capacity on up to 16 Ka-band spot beams on the Yahsat 1B satellite and will expand using 18 spot beams on Yahsat's Al Yah 3 satellite, scheduled for launch later this year. In the 2020 timeframe Konnect Africa will scale up with Very High Throughput capacity featuring more operational flexibility."

"...Simultaneously, there is a heightened demand deriving from ship, rig, and airline operators who acknowledge the operational efficiencies that connectivity brings..."

-Hussein Oteifa,* General Manager-Middle East, *SES



Market Outlook

Shahrokh Amiri, Director, Middle East and North Africa Sales, Intelsat is very optimistic about the prospects in the region, quoting the latest Cisco Visual Networking Index (VNI) which forecasts that mobile data traffic is expected to reach 7.7M TB in the MENA region by 2021. Obviously, this is not all satellite traffic, but in order to expand their networks beyond the main urban regions, many operators will be relying on satellite for backhaul. This is particularly true in landlocked countries. The continent is circled by fiber and in many of the major coastal towns and regions, fiber has also been laid. However, this is not the case in most of the landlocked countries.

There is a lot going on in the region. Will all these plans result in profitable businesses? It remains to be seen. Certainly, there is demand for services, but given the low GDP of many of the countries, there is no guarantee that this demand can be met without subsidies. In addition, whilst all the operators believe that their business, will not be impacted by excess capacity in the region, it is unlikely that they can all be correct. Interesting times indeed.

Elisabeth Tweedie is the Associate Editor of the *Satellite Executive Briefing*. She has over 20 years experience at the cutting edge of new communication and entertainment technologies. She is the founder and President of Definitive Direction a consultancy that focuses on researching and evaluating the long term potential for new ventures, initiating their development and identifying and developing appropriate alliances. During her 10 years at Hughes Electronics she worked on every acquisition and new business that the company considered during her time there. www.definitivedirection.com
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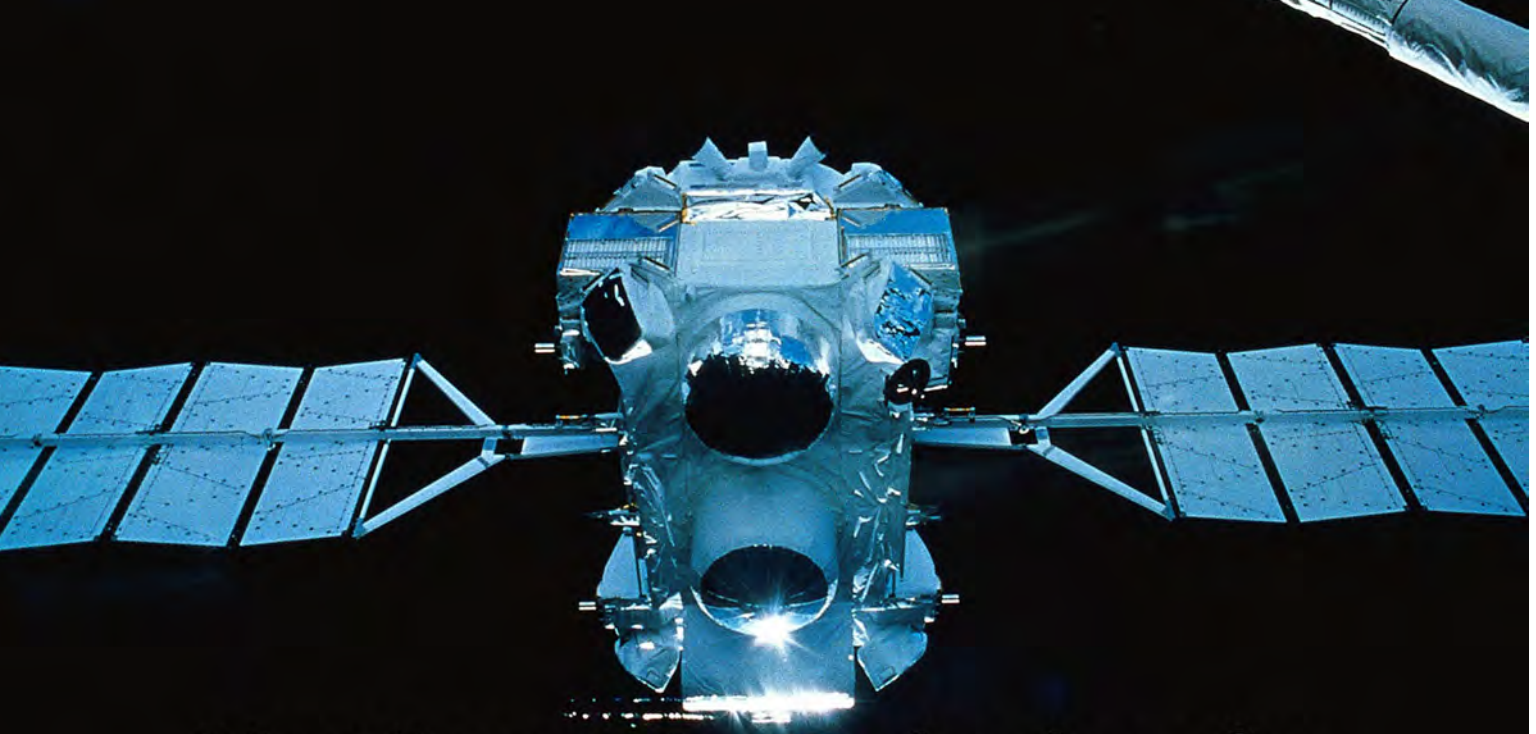

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Game Changing Trends in the Satellite Manufacturing Sector

by Dan Freyer, Contributing Editor

The promise of game-changing improvements in communications satellite performance has satellite operators excited, and they continue to drive demand for ever-greater capacity and efficiency from space systems suppliers. Satellite Executive Briefing spoke with key satellite builders about how current customer demand is driving their technical improvements and innovations, and what's next in terms of communications satellite technology improvements we can expect to see in products in the near future.

"Exponentially more powerful satellites, startling efficiencies in production and operation, and new architecture in space will together generate the widest array of services and customer solutions, to leverage the enormous potential of space for the new century of connectivity," says an industry White Paper published in June. It discusses the promise of advanced digital payloads, software-adaptable payload subsystems, on-orbit re-fueling and on-orbit satellite modification via robotic docking missions. The White Paper comes not from a spacecraft builder promoting its space technologies, but a buyer of satellites, the global operator SES.[1] Around the same timeframe that SES published its White Paper, Eutelsat, announced plans to add to its fleet in Europe with a 1 Terabit/second capacity satellite by 2020, moving towards a future era of what it calls "VHTS" or a Very High Throughput Satellite. In the U.S., several months before, ViaSat had shared its plans for three Terabit/second-plus capacity GEO satellites it says would bring "more capacity than all other satellites in the world."

Is HTS Already Old School?: Introducing Super and Very-HTS (VHTS)

According to Didier Le Boulch, Director Strategy and Telecom Solutions of Thales Alenia Space, a joint venture between Thales (67%) and Leonardo-Finmeccanica (33%), "It is not a surprise to say that VHTS has become a center of attention for many customers. We are heavily involved in customizing our state-of-the-art technologies to meet their needs. A visible trend is to launch very massive " Terabit" satellites, reaching the aggressive end-to-end capex – satellite, launch and gateways -- of 1 M€ per Gigabit/s." "A less visible opportunity is to scaled down a version of huge VHTS solutions, offering exactly the same service over a reduced size coverage area, and for a fraction of the cost. To achieve this at minimum on-board capital expense, we developed a unique antenna technology enabling multi-spot coverages with only one reflector. We also developed and qualified Q and V band equipment, in order to minimize the number of gateways, favorably impacting grounds segment costs. We foresee a promising market both for Maxi -VHTS and mini-VHTS, depending on coverage requirements, market maturity, and risk-taking profile. The Terabit per second satellite is on the horizon."

To address the ground component of these architectures, the company has also launched its new Spacegate solution for VHTS (Very High Throughput Satellite), which according to the company, "Offers unprecedented value for money, based on a fully digital wideband implementation. With VHTS systems, the gateway ground segment tends to cost as much as the space segment. With Spacegate, the cost of the gateways comes back to a fraction of the system cost," adds Le Boulch.

Comms Payload Flexibility with Digital

Perhaps the most important key trend in next-generation commercial satellites is digital and more flexible payloads. Manufacturers are commercializing technologies used in military payloads and digital communications to new commercial realities which will make the traditional "bent pipe transponder" capacity concept even more obsolete.

Microprocessor Payloads: Digital Revolution?

Digital signal processors (DSPs) could revolutionize the way satellites perform and operate, dramatically increasing satellite capabilities by replacing a large portion of traditional payload hardware with chips. Next generation DSPs will be powerful enough to process hundreds of Gigahertz. A single DSP would replace hundreds of filters, frequency converters, switch matrixes, and output filters – *reducing the mass of the satellite by more than a ton, according to SES engineers.*

On top of the weight, mass and power savings, DSPs can support much more complex multiplexing options, and bring down the costs of continuously forming and shaping beams, or hopping between beams. This lets satellites adjust the capacity within beams, and even switch frequencies to maximize the use of spectrum. New satellites of this class are expected to multiply the on-board traffic capacity — *by one or more orders of magnitude*.

Benefits to operators are many. Since the technology

does not require customization of filters and receivers – which increases the cost of those components in today's satellites, it offers more flexibility in use of spectrum, whether for commercial or military applications. They promise for the first time to deliver long-desired ability to truly re-customize "transponder" capacity and bandwidth on orbit, as customer demands over a satellite lifetime, unlike today's satellites, where the frequency plan and payload must be mostly frozen before launch.

According to Mark Spiwak, President, Boeing Satellite Systems International. "We have invested heavily in digital payload technology, and this year alone, two Boeing-built Intelsat Epic Next Generation (Epic^{NG}) satellites were successfully launched, both carrying the most-advanced digital payloads available commercially. Before the end of 2016, a similar sixth-generation digital payload is scheduled to be launched on a government satellite."

"We're currently developing the seventh-generation digital payload design, which offers twice the capacity of previous designs. Global IP is the latest customer to adopt this next-generation technology. Boeing will build Global IP's satellite, GiSAT, to provide broadband coverage over Africa, helping to bring connectivity to this underserved region of the world."

"We've also delivered digital payload solutions to our U.S. government and mobile satellite system customers and continue to make these systems more affordable. In late August, we were proud to hand over the Boeing-built Mexsat telecommunications system to the government of Mexico. This nationwide system includes digital satellite technology and advanced grounds systems, making it one of the most advanced mobile communications systems in the world."

An Intelsat Epic satellite in production at Boeing Satellite Systems in El Segundo, California. (Image courtesy of Boeing)

According to Thales Alenia's Didier Le Boulch, "We are preparing for, in the coming years, a massive digitization of most of the payloads coupled with photonic technology. Before 2020, we will reach a point where fully flexible digital Payloads (SpaceFlex) come at zero additional cost compared to analog non-flexible implementations, which is a goal we have been pursuing during the past two generations of research and development. This huge step is based on state-of-the-art *rad-hard* technology, and will fly by end 2020," he says.

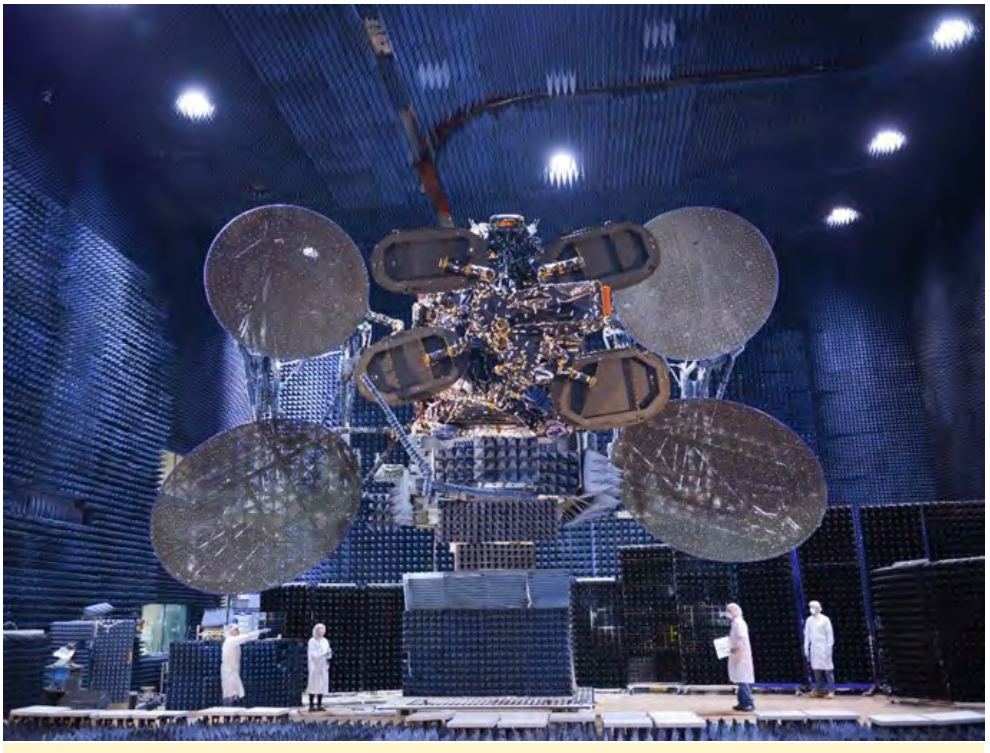
Q and V-Band: Next-Gen Spectrum Growth

Q/V bands (40-50 GHz), generally part of Extremely High Frequencies (EHF) are another area getting more attention among manufacturers as an enabler of next-gen capacity expansion, particularly for gateway and cross links. In addition to Thales-Alenia's development of flight hardware for these frequencies, SSL launched Q/V-band equipment to orbit for flight demonstration and validation recently.

According to Paul Estey, Executive Vice President, Engineering and Operations, SSL, "Earlier in the year a satellite that we built for Eutelsat was launched, which included our first on-orbit demonstration of Q/V-band. Use of these Extremely High Frequencies is expected to enhance the performance of the next generation of High Throughput Satellites by increasing the throughput of the gateways to the satellite. This will enable significantly more bandwidth to be available for users and it allows the number of gateways to be reduced, helping drive down cost per bit per second," Estey says. "On the communications side we are focused on both small satellites and super high capacity satellites. In addition to partnering with customers to develop Q and V-band capabilities, we are also working with photonics and

laser communications," he says.

Boeing's Spiwak is bullish on the potential to use other satellite bands to provide low-cost, high-throughput communications. "There is growing interest in using Q- and V-bands for this purpose. Currently, the space and ground hardware needed is not being built at high volumes, so achieving affordability will take investment and an increase in scale, very similar to the commercial development of Ka-band hardware that we saw 20 years ago. Though initially these bands will likely be used on GEO systems, the high bandwidth available at Q/V-band systems also makes them attractive for user and gateway links for medium-Earth orbit (MEO) or low-Earth orbit (LEO) systems, since these orbits have lower path losses."



Eutelsat 65 West, built by SSL, has a Q and V-band demonstration. (Image courtesy of SSL)

In June, Boeing filed with the FCC for a proposed constellation of over 1,300 LEO satellites using V-Band frequencies, and C-Band.

Software-Defined Regenerative Processors, Active Antennas, Laser Links

Today, a satellite operators needs to predict and freeze the service capabilities for a GEO satellite's decade-plus of operation three or more years before delivery. Even if flexible in today's sense, payload capabilities are largely locked in for the next 15 years. But manufacturers are commercializing and developing new technologies that offer performance, cost, and schedule benefits for commercial communications satellites, such as SDR in space. Software Define Radio (SDR) technology uses software to control of a variety of modulation techniques and waveform requirements over a broad frequency range, allowing a whole new ability to change payload features and functions post-launch, during a satellites a 15-year satellite life. SDR makes On-Board-Processing (OBP) a function of software not a hardware processor, and therefore permits the addition of new signal processing techniques and waveforms, re-configurability and re-programmability of the in-flight coms package via software upload.

Not without costs and risks, it is still a developing technology within commercial space. For example, in a public-private technology partnership, Eutelsat, the European Space Agency and Airbus Defense will deliver a "software-driven satellite," whose payload can be upgraded and reconfigured to adapt to new waveforms. The next-generation bird will be "the first satellite that can be fully reconfigured in orbit, Airbus Defense and Space said when it originally announced the partnership. Dynamic beam shaping can optimize power for throughput as required for coms-on-the-move networks.

Surrey Satellite Technology, Ltd. (SSTL), a private company with 99% of shares held by Airbus DS Holdings BV and 1% by The University of Surrey in England has been a builder of small satellites for over a decade for government and scientific missions. It recently won a subcontract to use its GEO Minisatellite Platform to carry a new generation "software-defined" digital payload to be built by prime contractor Airbus Defense and Space UK for the Quantum program. "Airbus has advanced digital process payloads, which is very exciting, with active transmit/ receive antennas and the great thing from our point of view is the ability to fly them, with projects like Quantum enabling us to do that. For that we have an Airbus payload, and the platform is

built by Surrey for Eutelsat, and its partners," says SSTL Group Managing Director, Patrick Wood.

Other manufacturers including Boeing has been active in this area. "Overall, Boeing is designing and building software-defined satellites that are long-lasting—withstanding the harsh space environment for 15+ years—yet adaptable to address changes in business needs and markets. We're able to reprogram satellites in orbit, adding significant value to our customers' business case, offering them the flexibility and ability to customize and optimize performance," says Boeing's Spiwak. Another area where Boeing is investing development budget towards are products that enable efficient sharing of spectrum, such as phased-arrays with adaptive beam-forming.

Laser Cross-links Making Progress

"Another really exciting area is the R&D in laser communications at the moment," says SSTL's Wood. Free-space optical communication (FSOC) using lasers offers the promise of breaking through RF spectrum and power spreading bottlenecks. Laser transmitters could offer lower size, weight and power requirements and higher bandwidth capacity than traditional RF links.[2] "There are really exciting architectural concepts, some being tested and maybe not commercial yet, but all the work is looking at how do you have highly efficient RF systems, but also R&D in laser communications, and mixed technology, to switch between RF and optical." The European Space Agency (ESA) experimental program called EDRS, Europe's first optical communications space network, is demonstrating the use of onboard laser beam terminals to relay earth image data from a smaller LEO satellite to the EDRS-A spacecraft in GEO orbit. The GEO satellite then relays the imagery data received via laser communications back to earth via Ka-Band. "We are seeing EDRS) being built with up to 1.8 Gbps for ESA, so future systems will be much more capable than that and we'll see very large amounts of data moving very efficiently," Wood says.

Improving on Production and Delivery Time

Thanks in part to the launch mass saved by electric propulsion and digital processing, the increased "real estate" on a satellite can allow for new modular designs so an operator could add new equipment to an existing satellite in orbit, equipment that was unavailable — unimagined even —at the time of the spacecraft's original procurement and launch.

With this approach, spacecraft would have a connector and docking mechanism, similar to those used for the International Space Station (ISA) and other national space agency programs. A new satellite could be launched with the assignment of delivering a new payload element to an existing satellite on orbit as part of the new satellites' interim mission before continuing to its final mission or slot.

In fact, SSL is developing these kinds of capabilities. "In partnership with NASA, SSL is working toward a ground demonstration of robotic on orbit satellite assembly," says SSL's Paul Estey. "Our Dragonfly program integrates a robotic arm with a spacecraft so that antennas that might not otherwise fit inside a typical launch vehicle fairing can be mounted after the satellite reaches its orbital location. This is part of a program at SSL to develop technologies and systems for a future ecosystem that will enable deep space exploration, habitats and missions. Through our heritage with MDA we are the only satellite manufacturer with the ability to build on the robotics technologies proven on the Space Shuttle, the International Space Station, and Mars landers and rovers."

"In 2017 we expect to demonstrate a new way for small satellites to get to orbit with our PODS technology. This payload orbital delivery system enables a satellite in the 100-kg range to hitch a ride to orbit attached to an SSL 1300 GEO. It is then released as a free-flyer in either GEO orbit or GEO transfer orbit. The benefit will be reduced launch cost for both the GEO and the small satellite and more frequent access to GEO and beyond for small spacecraft."

The "modular satellites" approach could even disrupt the market for today's static satellites, if they prove out.

Life-extension: Re-fueling and "Buddy" Satellites

Another active area that industry engineers advancing is methods for extending satellite lifetimes. One approach would provide a fuel vehicle that can connect to satellites and re-fuel them in orbit; another approach is to attach a new smaller "buddy" satellite system to an older orbiting satellite, where the "buddy" spacecraft — perhaps more appropriately named "tugboat" spacecraft — then takes over flight control and station-keeping functions for the older spacecraft to which it is attached.

Production and Process Improvements

The industry is changing, and today most satellite operators are concerned about competition driven by increased capacity on orbit and pressure coming from terrestrial infrastructure. Aside from the technical improvements in space equipment and product performance, satellite manufacturers are continuing to drive improvements in design and production processes that affect costs and schedule.

According to Paul Estey, Executive Vice President, Engineering and Operations of SSL, "For us, one of the biggest game changers in terms of lowering cost and shortening schedules comes from optimizing testing requirements. Even for GEOs that need to provide service from 22,300 miles above Earth for 15 years or longer, we are able to op-

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Spacecom's AMOS satellite constellation, consisting of **AMOS-2** and **AMOS-3** co-located at 4°W and **AMOS-4** at 65°E, provides high-quality broadcast and communications services across Europe, Africa , Asia and the Middle East. With **AMOS-7** due in 4°W in March 2017 and **AMOS-17** at 17°E in 2019, Spacecom will further expand its reach, reinforcing its position as a leading satellite operator.

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timize testing and reduce redundant activities in areas where we have never detected any failures for many years." SSL has an ongoing comprehensive program to streamline is operations.

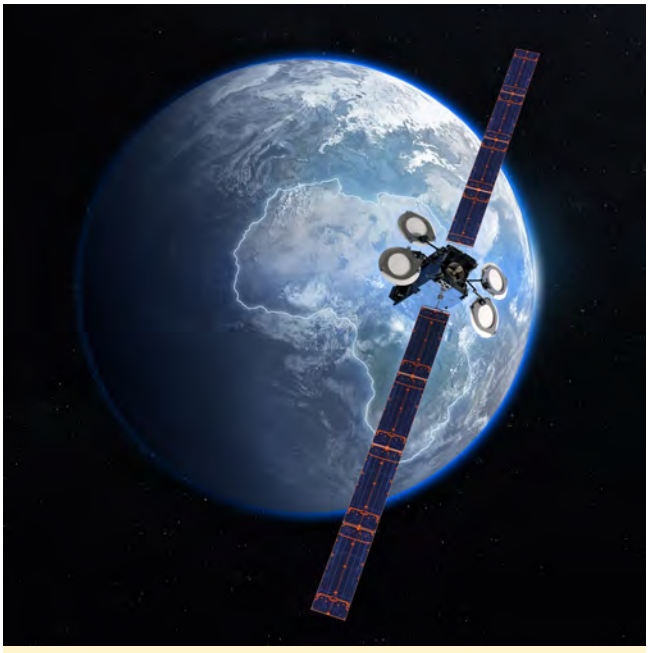
Automating Design and Testing

"We are also automating design and documentation processes which shortens both the design and construction phases of satellite production. Satellite operators that embrace advances such as the use of electronic systems to record production quality, and optimized testing are benefiting from shorter delivery schedules and reduced cost. For example we have delivered several satellites ahead of schedule this year. BRIsat is a good example. The first satellite ever built for a bank was delivered in just 23 months. Intelsat 36, which launched in June is another example. It was delivered in just 24 months," says Estey.

Boeing has similar efforts underway. According to Boeing's Mark Spiwak, "In addition to our digital payload advances, we are also simplifying and reducing the complexity of all of our spacecraft systems, which provides our customers with a lower-cost system, quicker delivery and improved first-time quality. For example: we are enhancing commonality in our satellite platforms; automating manufacturing and test; eliminating test equipment by enabling our complex satellites to test themselves with a Built-In-Test (BIT) functionality; and applying additive manufacturing, or 3-D printed, parts to simplify what were previously very complex part designs."

Supply Chain Automation & Efficiency Gains

Patrick Wood of SSTL says interest coming from non-GEO missions and mega constellations has sparked its increased efforts to develop faster and lower costs small satellites. "One thing we've been working hard to do is to make sure we have a rapid low-cost approach to small satellites, which requires we manufacture the structure as late as possible in the process. We have been working with the supply chain to enable a rapid build in a way that allows us to supply an electronic file to suppliers and almost within days, get a honeycomb panel with all the inserts in the right positions. This lets us be much faster in response as to how we mount the payload in the structure. It lets us be more efficient as we've finished the design heading towards CDR (critical design review) and towards building the spacecraft. The best example, of a rapid satellite production was for a low-cost experimental LEO satellite built in just 7 months. The company had a launch booking that offered extra capacity capable of launching a 120 kg class of mass satellite on the launcher. In 7 months, we finished design and manufacture from blank paper to build of spacecraft, and an imager for the LEO experimental mission. That was a very rapid turnaround. You need an organization optimized to do that with a small core team," says Wood.



Artist rendering of GiSAT, the satellite we are building for customer Global IP that will carry the latest Boeing digital payload technology. It will

3D Printing For Speed and Structure Design Efficiency

New "3D Printing" technology, also known as additive manufacturing, is being used to more efficiently design structures. At Surrey Satellite Technologies Ltd, Wood says "We're using quite a bit of attitude layer manufacturing, aka 3D printing, which is proving key for us in terms of rapid prototyping, but also allowing us to design structures within spacecraft we've never used before." The technology helps R&D on optimization of the mass of structures inside of the spacecraft, and SSTL is looking to use it in areas where it enables major savings in spacecraft mass, or reduction in time to prototype or build."

Boeing is also using 3D printing, as well as SSL. "We have also recently implemented a new design for the structure that attaches to the Earth facing deck of the satellite that holds multiple antennas," says SSL's Paul Estey. "By using additive manufacturing for this 'tower' structure we have been able to significantly reduce mass, which broadens launch vehicle selection or enables our spacecraft to support more payload capability.

Non-GEO and LEO

A new study by NSR "Small Satellite Markets, 3rd Edition," predicts the market for small satellites from 1 to 100 kg will more than double to 375 spacecraft per year, with cumulative launch and manufacturing revenues approaching $7 billion between 2015 and 2015.

"As the non-GEO segment is maturing, we expect the satellite in this range to boost capability by a factor of 3 to 4 in power and capacity, increase their rate of interconnection with Optical Inter-satellite links, and also benefit electrical propulsion to optimize launch costs," says Thales-Alenia's Didier Le Boulch. "After decades of analog supremacy in space, next years will see a massive shift to digital payloads, offering flexibility at zero extra cost. Our next very significant step into orbit will be the first batch of 10 Iridium NEXT satellites. They are ready for launch, and will fly as soon as SpaceX restarts operations. Those satellites employ receive and transmit active antennas, inter-satellite links and a fully software defined regenerative processor. They will smoothly integrate into the current Iridium generation and offer brand new services as the Iridium NEXT constellations grows. As far as other constellations are concerned, we are also boosting the O3B constellation capability with additional, slightly more capable, spacecraft."

In the non-GEO technology field, SSL began building innovative small LEO satellites for Terra Bella (formerly Skybox Imaging) in 2014, four of which launched in September. "We have announced a couple of other small satellite programs for both Earth observation and communications as well. These projects require very innovative systems and a different approach from the way we build traditional GEOs. We have a dedicated team and facility focused on LEO manufacturing. We are developing mass production techniques including standardization, automation and a streamlined flow that will be applicable to small and large constellations," says Paul Estey of SSL.

In the non-GEO segments, Boeing offers its 502 product line, a configurable line of small satellite prototypes for diverse geosynchronous, medium- and low-Earth orbit missions. According to Boeing's Spiwak, "With the smaller size of these satellites, we can offer faster, more affordable mission-based configurations to a variety of potential customers. To add to these benefits, the satellites share a common architecture, flight software and simplified payload integration options across the product line, allowing for rapid manufacturing and deployment.

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Propelling Forward: Electric Power

Saving weight and mass by more efficient solar power and electric propulsion techniques has helped manufacturers boost spacecraft lifetimes, increase power, and shave costs. "To help improve reliability and reduce operational costs, we continue to offer new features and capabilities to our customers that advantage them in their marketplace," says Boeing's Spiwak. "For example, we're extending the life of satellites by using the efficiency of electric propulsion. In fact, we are the only satellite manufacturer to date to have built all-electric propulsion satellites that have been launched and are in operation."

"…We're currently developing the seventh-generation digital payload design, which offers twice the capacity of previous designs. Global IP is the latest customer to adopt this next-generation technology. …"

-Mark Spiwak,* President, *Boeing Satellite Systems

For its part, SSL is also progressing in these areas. "We are continually developing new technologies to make spacecraft more flexible, less costly and more reliable," says SSL's Estey. "On the spacecraft side, we are leaders in solar electric propulsion, with 25 satellites that employ solar electric propulsion on orbit today. We are developing increasingly higher power capability including a Roll Out Solar Array that was developed in conjunction with NASA."

According to Le Boulch from Thales-Alenia, "On our platform side, we foresee significant effects of electrification on the full satellite range, on the high end side, the feasibility of satellites employing 2 tons of Payloads, and on the low end, we foresee satellites —even smaller than the ones we have built so far — but nevertheless offering capabilities above 50 Gbit/s of VHTS service On the geostationary side, we are currently deploying our next-generation fully electrical SpaceBus NEO platform, already with three customers (Eutelsat, SES and the French MOD), Electrification enables us to boost payload capability (power and mass), delivering more capacity and flexibility for a lower injection cost (launcher and platform)."

Space Subsystem In-sourcing: Anomaly or Trend?

Traditional satellite builders are not the only ones investing in manufacturing facilities. Different dynamics and challenges of manufacturing large constellations of 100s of spacecraft, new architectures, and the new generation of space entrepreneurs have encouraged new approaches. Some satellite ventures have plans to manufacture space systems, payloads, or subsystems and components in-house. This changes the traditional business transaction between commercial satellite manufacture and operator.

For example, OneWeb Satellites, a joint venture startup constellation with Airbus announced in April plans to build most of its 900 satellites at a new facility in Florida. The U.S.-based Ka-Band HTS operator ViaSat said in May that it would build the payloads for its next-gen ViaSat-3 mission in -house. Some observers speculated the reason for this may relate past legal issues with prior procurements, although the company has said that it is drawing on its contract experience providing Iridium payload subsystems. In any case, ViaSat will employ its own clean room and high bay factory in Arizona to build two ViaSat-3 payloads, with over $100 million budgeted towards R&D for the program. The payloads will then be integrated by the satellite prime contractor, Boeing, onto Boeing-build spacecraft buses for the program.

Whether these examples represent a trend, or unique cases remains to be seen. One thing seems clear: even as today's high-throughput satellites shatter bandwidth records with capacities that dwarf traditional "bent pipe" FSS systems, satellite manufacturers are already working to take capacity of future communications in space to a whole new level, and at an accelerated pace of technical innovation.

Notes

[1]"Satellite Evolution Sparks a Service Revolution," published by SES, June 2016.

[2]"Space-Based Laser Communications Break Threshold", by Donald Cornwell, NASA, in http://www.osa-opn.org/home/articles/volume_27/may_2016/features/space-based_laser_communications_break_threshold/

Dan Freyer is the Principal of ***AdWavez Marketing*** (www.AdWavez.com), a Los-Angeles-based boutique PR and marketing agency uniquely focused on helping space and related technology organizations expand their customers and markets. He brings over 20 years of experience helping leading satellite manufacturers, operators, and service providers grow their businesses. He can be reached at dan@adwavez.com.

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How to Thrive as the Rules Change...Again!

by Robert Bell

It is no secret that the satellite-centric communications business is entering a period of unprecedented change. What was once a predictable and slow innovation cycle in GEO is accelerating into a GEO-MEO-LEO future of massively greater bandwidth offered through drastically different business models. As new operators like ViaSat, O3B Networks and OneWeb enter the market – and many more queue up behind them – the established operators of traditional wide beam satellites are diversifying businesses that have long been based on successfully managing scarcity. In 2015, Intelsat invested $25 million in the OneWeb LEO constellation and, in 2016, SES acquired all of O3B Networks. In both cases, the companies were acquiring satellite operators whose services have the potential to displace their own. It is the same strategy that big technology companies have long used to maintain their dominance as technology shifts beneath them.

Revolutionary it may be, but it is just the start. Next year, a new generation of flat panel antennas will go commercial. Over time, they will transform the economics of data networks by drastically reducing terminal cost and complexity. Meanwhile, new launch companies led by SpaceX are pounding away at the costs of access to space, and the software-defined satellite – of which the Eutelsat/ESA Quantum is the first example – will reduce the risk of designing and flying satellites that nobody wants.

Intelsat's Fuchstadt teleport, Germany.

The Teleport of Tomorrow - Today

It is easy to conjure up enthusiasm – not to mention terror, if you are an incumbent in the market – for new technology. But when we have businesses to run, what decisions need to be made today to ensure we stay in business tomorrow?

One of the sectors most likely to be affected by satellite innovation is the teleport industry, the operators of ground networks that connect the information highway to the skyway. The World Teleport Association began 2016 by publishing a report called *The Teleport of Tomorrow*. It asked teleport operators to share their vision of the future and explain what they were doing now to ensure their success in it. The developments of the past year make those executives look like expert prognosticators.

Mind-Boggling Complexity in Networks

At the start of 2016, they predicted that the mix of high-throughput spot beams and wide beams will require revolutionary change in how service providers operate their networks. A complex service in the future could include a third-party gateway on a vertically-integrated system selling Mbps rather than MHz and a growing range of communica-tions carriers, who integrate this service into a more comprehensive offering.

Networks will not only be designed differently, they will need to be managed more transparently. "Providers are going to have to give each other more visibility into their networks," one executive told us, to ensure end-to-end quality, and that is going to have a drastic impact on their rules of engagement. Technology companies will help teleports, satellite operators and fiber network operators to find smarter, faster and more automated ways to trade information on network status and performance.

Striving for Economies of Scale

In this new world, economies of scale provide the overwhelming competitive advantage: a single, cost-efficient infrastructure that serves multiple applications, markets

and regions. The drive for greater scale has already led to mergers and acquisitions among teleports, with the leading acquirers of 2016 being SpeedCast, Encompass Digital Media and Global Eagle Entertainment. It has also raised the value of strategic partnerships for those companies unwilling or unable to join the M&A game. As one executive said in a report being published at the end of 2016 (*The Effective Strategic Partnership for Teleport Operators*), partnerships are "fundamental to us and to any serious teleport wanting to compete in the future."

….Technology companies will help teleports, satellite operators and fiber network operators to find smarter, faster and more automated ways to trade information on network status and performance…

In 2016, the top three satellite operators made new commitments to partnering with teleport operators, creating formal structures for informal relationships that had long benefited both parties. But partnerships extend beyond satellite to terrestrial telecom and technology. One executive told us at the beginning of the year that his company's future was "getting inside the telcos and convincing them that we are part of the customer solution, so that we enhance their capabilities. Big telcos may have 10,000 sales people. I have fifteen. We can only win by using their people."

Software and Services

Back in January, a satellite vendor noted that "we once needed 70 people to manage 500 services across a hand-ful of analog antennas. In today's world, you manage thousands of services across dozens of antennas, and you might have 20-30 people to manage it. The hard-ware will become less of a differ-en-tiator and the software will become increasingly im-portant." In 2016, contributors to our report on *The Internet of Things Opportunity* saw expertise in software as the only way to truly capture the value of the IoT revolution.

What customers want from IoT is information on performance, trends and correla-tions. In 2017, teleport operators will partner with technology companies to begin taking on that opportunity, rather than just passing traffic to the customer or a data analytics company.

At least one technology provider is making significant investments in real-time data analytics and off-line predictive analytics so that it can make this functionality avail-able to the operators. "Machine learning and data analytics may look like a discrete service today," a company executive told us, "but in the future, they will be part of everything."

The HTS Winners

High-throughput satellite can come in two flavors: a vertically-integrated service controlled by the satellite operator and sold by the megabit, or massive bandwidth sold by the megahertz in the traditional style. In 2015, the only satellite operator with a megahertz-based business plan, Newsat, went bankrupt.

That left teleport operators staring at a potentially huge disruption in the way they do business. Instead of carving up bandwidth to meet complex customer needs, they would resell bandwidth solutions provided by the satellite operator. Simple resale of capacity has never been a sustainable business model for teleports.

How will this play out as HTS becomes a larger and larger part of the bandwidth mix? Teleport operators will need to target new value-added services like data analytics and metadata management for video distribution. They will have to continually sharpen their expertise at mixing and managing network typologies to ensure that they still do it better than any other players in the market. This is the heritage of teleport operators, who got their start when liberalization of uplinking changed the rules of the game in the 1970s and 1980s. There is every reason to expect them to find success under the new rules of 2017.

Robert Bell is Executive Director of the World Teleport Association, which represents the world's most innovative teleport operators, carriers and technology providers in 46 nations. He can be reached at: rbell@worldteleport.org

The reports mentioned above are available free to members and for sale to non-members.

NOTE: The World Teleport Association (www.worldteleport.org) has published white papers on teleports and cybersecurity and the teleport of tomorrow.

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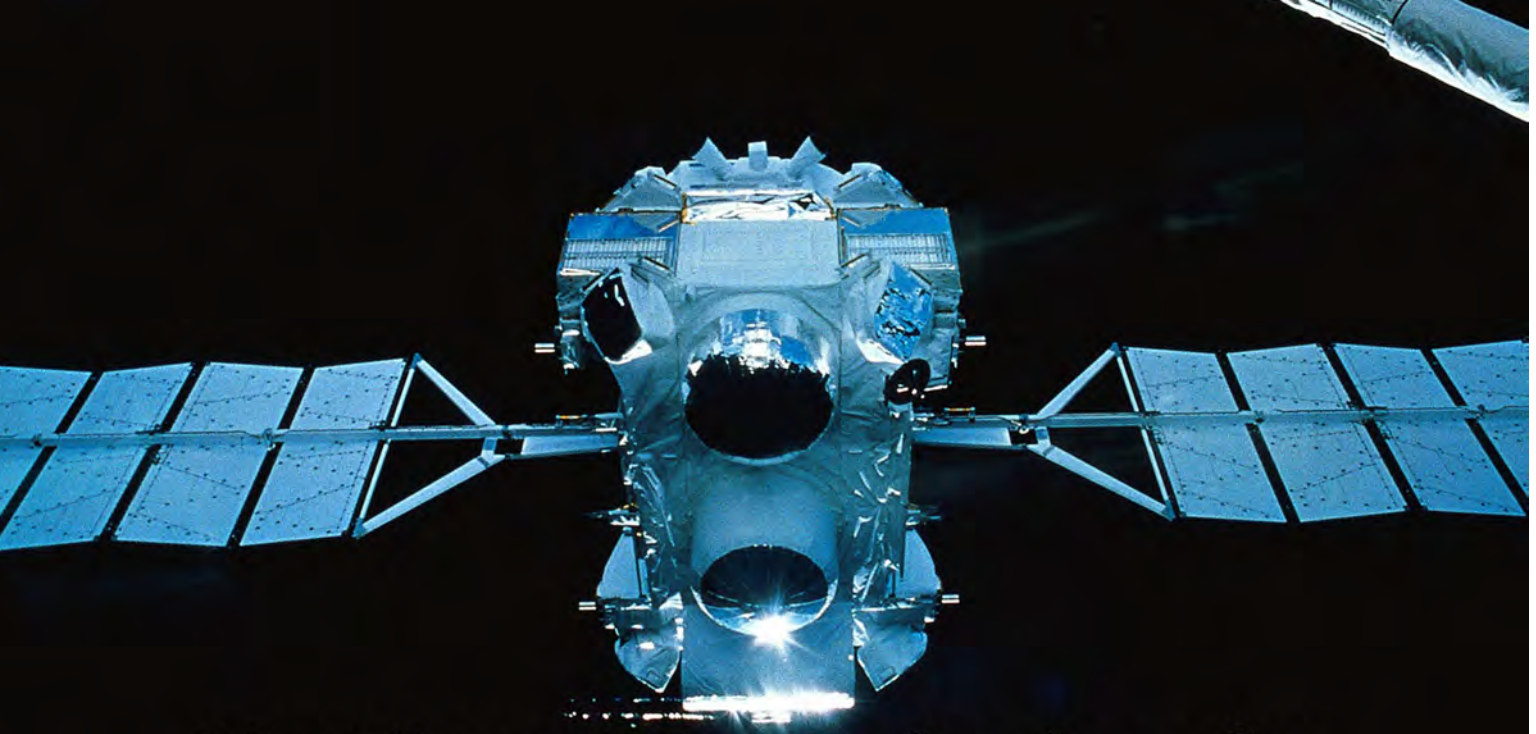

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Seamless Network Maintenance for Today's and Future Smaller Satellites

by Alvaro Sanchez

VSAT is used for a huge variety of diverse applications all across the world from cellular backhaul to disaster recovery, and the advent of High Throughput Satellites (HTS) is also fuelling the numbers of deployed sites, and latest smaller satellites.

VSATs operate with no requirement for terrestrial infrastructure and are therefore often located in remote, difficult to reach areas. This can cause problems for network operators in terms of maintenance. Once a VSAT is installed, it is often unmanned and left to operate unsupervised for years. Any misalignment during installation or adverse weather can then cause problems, not only for that single VSAT, but for the entire network with negative and costly effects on the operators and the network users.

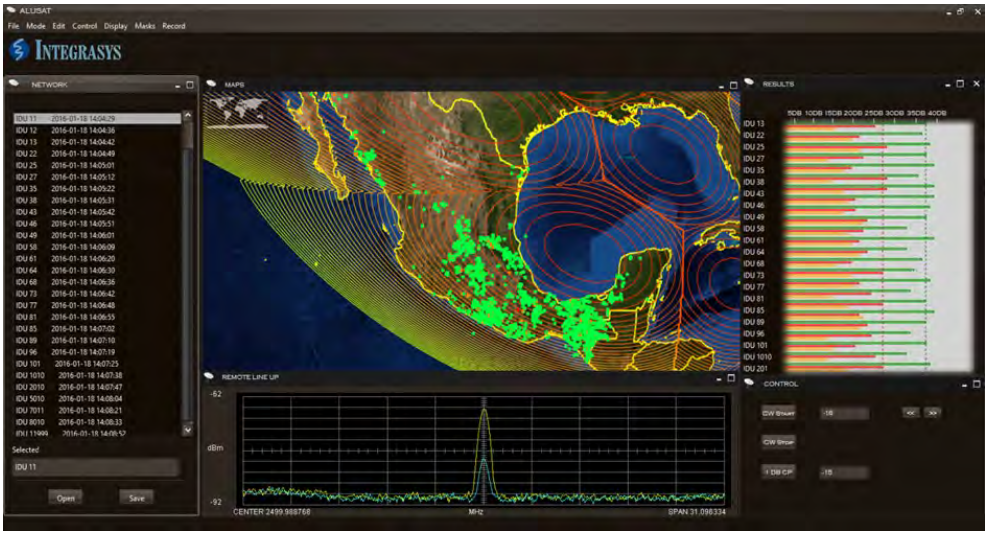
Nowadays, satcom satellite are being launched in low and medium orbits as previously were been launching just geostationary the main majority. LEO and MEO satellite bring multiple challenges as not only satellites move, also the antennas.

These new satellite will cause multiple interference and service degradations were we are planning to release multiple products to tackle them.

To tackle this problem, Integrasys has developed Alusat the latest product to be showcased at Satellite show2017. This automated tool combines traditional equipment management with spectrum monitoring and measurement in a unique way; accurately derives the remote terminal RF status and pinpoints which terminals are not functioning properly. In certain conditions, it can even recover out-of-service or service-degraded terminals.

"Alusat is an evolution of Integrasys' industry-leading Satmotion Pocket tool, which allows accurate installation during remote commissioning. Alusat allows a virtual visit to every site on the network, reducing or even eliminating the need for a physical presence at certain sites. Alusat also allows the consistent monitoring of a VSAT site after installation to ensure optimisation of operation and the minimisation of costs caused by service failures."

Alusat offers VSAT network operators significant benefits in terms of reduction of OPEX and the simplification of the entire maintenance process. Alusat significantly reduces the need to deploy personnel to individual sites and minimizes maintenance time and effort, freeing up personnel and making the whole network much more efficient, with rapid Return on Investment. Features such as One Touch Calibration and a simple interface also make



Alusat extremely simple to use.

The operator is able to determine the different thresholds for Rx and Tx and the actions to be taken automatically by the system in different circumstances to rectify problems. Alusat checks all of the terminals in the targeted VSAT community, analysing the Rx and Tx measured values of copolar power, cross-polar isolation, adjacent satellite interference and 1dB compression point to detect failures and raise any necessary alarms. This technology is critically important for networks with adaptive power adjustment capability, as it is able to calibrate the saturation point for each remote, maximising the overall network performance. This is fully automated from the Network Operations Centre (NOC).

We are delighted to bring this exclusive product to the market, to help simplify VSAT network maintenance for operators at any satellite and to reinforce our commitment to the reduction of satellite interference by making life easier for hub operators.

Additionally to Alusat, Integrasys has been working in supporting with its wide range of Carrier Monitoring and VSAT tool product line specially built for wide beam and High Throughput Satellites, in GEO, MEO and LEO. So we have been making our products extremely flexible for the desired payload.

One of the examples is Satmotion Pocket for HTS that Yahsat is currently using for the iDirect VNOs, and the development done for seamless VLAN management for this product for beam selection capabilities.

Alvaro Sanchez is Sales & Marketing Director at **Integrasys.** Alvaro is responsible for Satellite Carrier Monitoring at Integrasys, providing most innovative solution to satellite operators and service providers. Alvaro prior to join Integrasys was signal analysis expert at CERN European Organization for Nuclear Research. He can be reached at: alvaro.sanchez@integrasys-sa.com

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ABS operates a global fleet of satellites including ABS-2A at 75 °East the latest addition to the satellite fleet. ABS provides capacity to support video and television distribution, cellular backhaul, broadband trunking and maritime connectivity. Its extensive teleport network provides comprehensive coverage to 93% of the world's population including Africa, Middle East, Asia Pacific, Russia/CIS and the Americas. ABS has strategic alliances and partnerships with state-of-the-art communication hubs to deliver the best possible satellite solutions.

ACORDE Technologies
Satellite booth # 2123
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ACORDE Technologies, a NATO AQAP 2110 certified company**,** since 1999 designs, develops and manufactures RF front-ends for satellite communications systems from S band up to Ka band, in which the company is a world reference, or even Q-band, providing robust, reliable and field proven solutions to customers worldwide in Military, Space, Telecom and Broadcast markets.

The company manufactures compact and lightweight BUCs and LNBs, introducing new and efficient technologies such as GaN, and versatile approaches such as dual and quad sub-bands integrations. ACORDE's RF equipment features the latest control technology, ranging from a simple hand-held system up to remote control systems via IP (offering a wide number of possible protocols, such as Telnet, SNMP, SSH, etc.). Equipment can be certified, at customers' request, in accordance with the MIL-STD-810G (environmental testing) and MIL-STD-461E (electromagnetic compatibility) U.S. military standards.

In addition, ACORDE offers built-to-spec solutions to its clients, among which there are several international space agencies, DoDs from several continents and large system integrators.

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CABSAT Hall 8 booth # B8-10
www.arabsat.com

Founded in 1976, **Arabsat** has been serving the growing needs of the Arab world for over 30 years. Now one of the world's top satellite operators, it carries over 500 TV channels, 160 radio stations, pay-TV networks and wide variety of HD channels reaching tens of millions of homes in more than 80 countries across the Middle East, Africa and Europe—including an audience of over 170 million viewers in the (MENA) tuned into Arabsat's hotspot at 26° E. Operating a growing fleet of owned satellites at the 20° E, 26° E, 30.5° E and 34.5° E, ARABSAT is the only satellite operator in the MENA region offering the full spectrum of Broadcast, Telecommunications and Broadband services, making Arabsat satellites' fleet the youngest in the region.

AQYR
Satellite booth # 2226
www.aqyrtech.com

AQYR is a land terminal provider of Tactical SATCOM Solutions, used by Military & Defense, Public Sector, Foreign Governments, Commercial & Enterprise markets. AQYR designs and manufactures highly portable GBS and 2-way Ku/Ka-band full auto-acquisition, single case portable ground terminals. These intuitive, patented, auto-acquire terminals are developed from our 14 years' experience as the Tactical SATCOM Systems Provider.

AVCOM of Virginia
Satellite booth # 1236
www.avcomofva.com

Avcom will be highlighting its EVO Series of high performance RF spectrum analyzers at Satellite 2017. The first in the series of model, EVO-RSA-6001, will be debuted at the Satellite Show 2017.

The analyzers are the next generation of proven products from Avcom serving the satellite industry for over 35 years will be on display at Booth 1236.

The EVO Series products are based on digital swept FTT technology and will be available in a convenient 1RU enclosure. The analyzers provide reliable performance over a wider frequency range than previous products. With models available in frequency bands, ranging from 70 MHz to 6 GHz, the EVO series acquire an accurate measurement of signals with higher resolution bandwidth and faster sweep rates. A web-based GUI provides the user with a clear, intuitive and multi-function display. Remote control of all settings and functions, such as data logging, stream recording, and shape alarms are easily accessed via the standard GUI.

AvL Technologies
Satellite booth # 917
www.avltech.com

At SATELLITE 2017, **AvL Technologies** will launch a new line of flyaway antenna systems, designed to accommodate current and future modem, RF and satellite frequency options. On display in AvL's booth will be three aperture sizes – 0.75M, 0.98M & 1.35M. This new line of user-configurable, IATA checkable and carry-on satellite terminals are ultra-compact, ultra-lightweight, ultra-high performance fully integrated systems, which can be upgradeable from the baseline manual-point configuration to a motorized, auto-acquisition platform.

Also on display will be a 1.2m O3b MEO tracking Ka-Band antenna. The antenna offers the power of O3b's high throughput, low latency connectivity. These tactical terminals are easily transportable, rapidly deployable and operate in tandem pairs (same size) with make-before-break communications and can be set-up and on-the-air within two hours.

AvL also will show the 85cm auto-deploy fully-integrated flyaway system, featuring a mission-configurable weatherproof electronics enclosure and the latest power efficiency technology.

C-COM Satellite Systems Inc.
Satellite booth # 1319
CABSAT Hall 7, booth # 711
www.c-comsat.com

C-COM Satellite Systems Inc. is a pioneer in the manufacture and design of mobile, auto-deploy antenna systems. The iNetVu® brand, available in vehicle mount, flyaway, and fixed motorized format, is sold in over 100 countries, and is considered the most reliable and advanced product in the market today. More than 8,000 C-COM antenna systems have sold into the military, oil and gas, SNG, disaster management, mobile banking and telecom verticals, among others. C-COM is also engaging in the design and manufacture of next generation, 'Comm-on-the-Move' antenna systems, including a land-based, Ka-band COTM antenna, as well as a phased array, electronically steerable solution.

At Satellite and CABSAT, C-COM will be showcasing its Ka-98H/JUP , a 98cm, auto-deploy antenna approved for operation on Hughes Jupiter System. It comes with the one-button, auto-pointing 7710 controller system to acquire satellite in under two minutes. The system can be converted in the field to operate on other available approved Ka-band services, including Eutelsat KASAT, Yahsat YAHCLICK, and Avanti (iDirect/Gilat service), and also to Ku-band.

COMTECH EF Data
Satellite booth # 1401
www.comtechefdata.com

Comtech EF Data Corp. is the global leader in satellite

bandwidth efficiency and link optimization. Our integrated SatCom infrastructure solutions encompass Advanced VSAT Solutions, Satellite Modems, RAN & WAN Optimization, Network & Bandwidth Management and RF Products. The offerings feature groundbreaking efficiency (industry-leading coding, modulation, compression and physical layer operation), robust intelligence (traffic shaping, dynamic bandwidth allocation and integrated network management) and unparalleled horsepower (processing power for your pps and Mbps transmission requirements).

At Satellite, join us for a 30 minute briefing about an evolution in satellite access technologies. In the briefing, we will share how our new H-DNA technology:

- Rapidly adapts to changing environments
- Delivers superior efficiency & quality of experience
- Instantly assigns capacity based on network-wide demand
- Intelligently utilizes total network bandwidth at all times

Stop by the Comtech booth #1401 to secure your seat.

COMTECH Xicom Technology
Satellite booth # 1401
CABSAT Hall 7, booth B7-32
www.xicomtech.com

Comtech Xicom Technology provides a broad product line of KPAs, TWTAs, SSPAs and BUCs for worldwide satellite uplink covering C-, X-, Ku-, DBS-, Ka-, Q-band, Tri- and Multiband with power levels from 8 to 3,550 watts and available in rack-mount and antenna-mount ODU packages.

Comtech Xicom Technology will be showcasing its SuperCoolTM family of amplifiers which has many practical advantages over traditional air-cooled amplifiers including: ambient noise reduction, ease of service and maintenance, higher reliability, reduced heat load in hubs, flexible and compact installation and gain stability over ambient temperature. The Comtech Xicom design incorporates integrated cooling channels in the amplifier baseplate, external to the high voltage and RF circuitry and drip-free connections. Liquid cooling is available across the high-power end of the product-line, including: the new SuperPower 2000W, and 1500W products; the 1250W, 750W, 500Ka and 250Ka family of amplifiers

Crystal
Satellite booth # 2031
www.crystalcc.com

Crystal Control enables multi-site NMS & Control, Metadata applications for Linear to OTT, Streaming with DRM & DAI. Serving satellite, broadcast and video for 30 years: *Spectrum Monitoring & Recording, * Metadata applications, * Ad Insertion Verification & Reconciliation, * Site Diversity Switching, * Network Management Systems.

DataPath
Satellite booth # 309
www.datapath.com

DataPath leverages over 25 years of experience across 40 countries to bring best practices to everything "From Terminals to Teleports and all the Tools In Between™." We focus on remote, distributed or at-risk environments, where reliable communications are a must. This includes government, broadcast, emergency response, and industrial markets.

Gazprom Space Systems
CABSAT Hall 7 booth # E7-30
www.gazprom-spacesystems.ru

Gazprom Space Systems (GSS) – one of two Russian national satellite operators which holds 30% of the satellite capacity market in Russia. At IBC2016 GSS presents new opportunities of its space telecommunications system based on four satellites: Yamal-202 (49E), Yamal-402 (55E), Yamal-401 (90E), and Yamal-300K (183E). Total Yamal satellite constellation capacity amounts to 248 equivalent transponders of 36MHz and about a third of it is concentrated in beams pointed over territories outside Russia.

INTEGRASYS
Satellite booth # 106
www.integrasys-space.com

INTEGRASYS is the satellite carrier monitoring technology leader for telecommunication and broadband Markets. INTEGRASYS is highly specialized on Carrier Signal Monitoring, Interference Detection and VSAT autocommissioning systems and SNGs.

Our software products are the state-of-the-art in Control Systems in terms of speed, flexibility, efficiency and scalability and introduces a new concept in signal monitoring communications

Hispasat/Hispamar
Satellite booth # 933
www.hispasat.com

The **HISPASAT Group** is composed of companies with a foothold in Spain as well as in Latin America, where its Brazilian affiliate HISPAMAR, sells its services. The Group is a leading Spanish- and Portuguese-language content broadcaster and distributor, including over important direct-to-home television (DTH) and high-definition television (HDTV) digital platforms. HISPASAT is one of the world's largest satellite companies in terms of revenue in its sector, and the main communications bridge between Europe and the Americas.

LP Technologies
Satellite booth # 236
www.lptechnologies.net

LP Technologies (LPT) is an industry leader in affordable spectrum analyzers and powerful carrier monitoring - interference detection systems company headquartered in Wichita, KS. LP Technologies has been a pioneer of multi port remote-controlled spectrum analyzers; they set the pace of innovation for satellite communication. LPT combines the latest signal processing technology, customers' input, common sense, and their two decade industry experience to make revolutionary products. They are innovators who understand the market, customers and their respective applications. LP Technologies Makes Spectrum Monitoring Easy. For over 20 years broadcast, wireless, manufacturers, and satellite companies have relied on LP Technologies' spectrum analyzers to never miss a trace. Across the RF spectrum customers agree that LPT offers the best products for the right price along with a support is second to none. LPT makes long-term partnerships, instead of customers. So as LP Technologies partners' applications become more complex so become LPT's solutions.

Newtec
Satellite booth # 2001
CABSAT Hall 7 booth # B7-20
www.newtec.eu

Newtec, a specialist in designing, developing and manufacturing equipment and technologies for satellite communications, will be showcasing at Satellite and CABSAT its most advanced VSAT modem to date – the first on the market to support wideband DVB-S2X , the Newtec MDM5000 Satellite Modem. The MDM5000 is capable of receiving forward carriers of up to 140 MHz, and processing over 200 Mbps of throughput. On the return channel, it supports SCPC, TDMA and Newtec's unique Mx-DMA™, up to 75 Mbps.

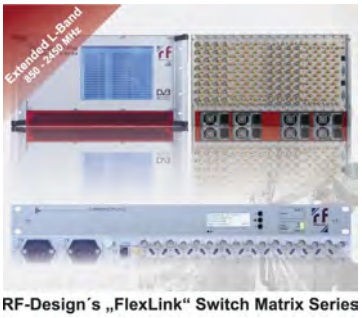
ND Satcom
Satellite booth # 118
CABSAT Hall 6 booth # F6-20
www.ndsatcom.com

At Satellite and CABSAT **ND Satcom** will be showcasing its SKYWAN modem family— a reliable, flexible and versatile satellite communication platform for customer centric networks. It is a bi-directional MF-TDMA plus DVB system that supports voice, video and data applications in the most bandwidth efficient manner.

The new SKYWAN **5G** unlocks new business opportunities for service providers. Total cost of ownership is significantly reduced thanks to the fact that only one type of device is needed for all roles in the network.

RF-Design
Satellite booth # 2511
www.rf-design-online.de

RF-Design is specialized in developing, manufacturing and marketing high quality RF distribution solutions for the international Satellite-, Broadcast- and Broadband commu- nications market. Our product range includes a wide range of **Switch Matrix systems, RF-over-Fiber solutions, Splitters Combiners, Switches/Redundancy Switches, Line Amplif ers, RF/DVB Signal Quality Analyzers** and **LNB-supply control systems**...perfectly suited for applications in Teleports, Satellite Earth-Stations as well as Broadcast- and Broadband RF distribution infrastructures.



RF-Design´s „FlexLink" Switch Matrix Series

We also have strong capabilities to design and to ma-nufacture custom-made RF distribution solutions for your individual needs. All our products are developed, manufactured, tested and approved in our own facilities in Lorsch, Germany and characterized by high quality, reliability and superior RF performance.

Santander Teleport
Satellite booth # 1700
CABSAT Hall 8 booth # 800
www.santanderteleport.com

Santander Teleport is an independent teleport operator offering satellite communication services in C, X, Ku and Ka bands for service providers, enterprise and government organisations in a number of markets including maritime, enterprise, broadcast and defense.

Santander Teleport owns its own satellite teleport facilities in Spain with access to a global terrestrial network and works with partner teleports to provide global reach.

RSCC
Satellite booth # 2113
CABSAT Hall 8 booth # F8-30
www.rscc.ru

The Russian Satellite Communication Company (RSCC) is the national state satellite operator whose spacecraft provide a global coverage. RSCC belongs to the ten largest world satellite operators and owns five teleports and its own optical fiber infrastructure. The company possesses the largest satellite constellation in Russia located in the geostationary orbital arc from 14 West to 140 East and cover the whole territory of Russia, the CIS, Europe, the Middle East, Africa, the Asia Pacific region, North and South America, and Australia. RSCC offers a full range of telecommunications services such as TV and radio broadcasting, data transmission, telephony, multimedia and others using its own terrestrial engineering facilities and satellite constellation.

Terrasat Communications, Inc.
Satellite booth # 422
CABSAT Hall 7 booth # 701
www.terrasatinc.com

Terrasat began in October, 1994, specializing in engineering design and manufacturing of advanced radiofrequency products for satellite and terrestrial microwave communications systems. Today, the company is focused on innovative RF solutions for satellite communications. The ground-breaking IBUC – Intelligent Block Up converter – brings full-featured, carrier-grade performance to commercial and military satellite communications terminals.

UHP Networks
Satellite booth # 119
CABSAT Hall 8 booth # G8-31
www.uhp.net

UHP Networks, formerly known as Romantis Inc, is a leading manufacturer of high-performance VSAT network equipment. Our solutions are field proven with over 170 networks and 11,000 remote terminals installed, many operating in most demanding applications with Tier 1 enterprise, broadcast and government customers. The company has its headquarters in Montreal, Canada, with manufacturing operations in Germany and sales and support offices worldwide.

Walton De-Ice
Satellite booth # 1619
www.de-ice.com

Walton De-Ice, the world's leading designer and manufacturer of satellite earth station antenna (ESA) weather protection solutions, Walton will showcase its latest Ka-Band satellite ESA weather protection solutions, **Ice Quake, Rain Quake**, and **Snow Shield** at Satellite.

Work Microwave
Satellite booth # 633
CABSAT Hall 6 booth # F6-21
www.work-microwave.com

At Satellite and CABSAT, **WORK Microwave** will demonstrate the latest innovations in analog and digital satcom solutions, increasing flexibility, bandwidth, and margins for satellite operators while reducing their operational costs. Key highlights at the show will include the company's new A-Series IP-based DVB-S2X family of modems, demodulators, and modulators, along with the debut of greater design options for frequency converters based on market demand.

Xiplink
Satellite booth # 2108
www.xiplink.com

XipLink is the technology leader in wireless link optimization using industry standard SCPS TCP acceleration, UDP enhancements, data/header compression, link bonding and Internet optimizations to deliver a better wireless experience over stressed communication links. XipLink is a privately owned company with headquarters in Montreal, Quebec Canada and filed personnel worldwide.

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ND SATCOM

Extending Satellite Dialogs @ CABSAT: Over 40 Speakers at GVF Satellite Hub Summit

by Martin Jarrold

A **Dubai World Trade Centre** (DWTC) and **Global VSAT Forum** (GVF) enhanced partnership agreement is bringing a program of strategic debate on key issues for the current satellite industry technology and service marketplace to **CABSAT 2017** in Dubai. This year **CABSAT** will again feature the **GVF Satellite Hub Summit** on the second and third days of the event, but for the first time it will be preceded on the first day of the show by a new feature – the **SATEXPO** conference.

SATEXPO and the **GVF Satellite Hub Summit** will comprise mutually-reinforcing programs of satellite sector and satellite solutions end-user perspectives, with a day one emphasis on strategic analysis of various user markets and a day two and day three focus on interactive panel sessions which will offer detailed examination of core themes within today's industry environment, such as satellite spectrum, high throughput satellite technologies, low earth orbit satellite constellations, the VSAT mobility market, satellite interference and cyber security.

With both days of the **Hub Summit** featuring a wealth of panel session moderating expertise – including **Stéphane Chenard**, Senior Analyst, Euroconsult; **Virgil Labrador**, Editor-in-Chief, Satellite Markets & Research; **Torsten Kriening**, Editor, SpaceWatch Middle East; **Kevin French**, Publisher, talk Satellite; and, **Riaz Lamak**, Lead, International Programs, GVF – day one (22nd March) will begin with an exploration of MENA's regional telecommunications market dynamics, providing a preliminary overview of current key dynamics & forecasts for near- and medium-term evolution across the Middle East and North African telecommunications sector and analyze the ongoing major & expanding role of the satellite solution. Contributors to the session will include **Riyadh Al Adely**, Managing Director, SkyStream; and, **Tom Loi**, Sales Director, AsiaSat.

Panel discussion on ***'Spectrum: Satellite & the Next ITU World Radiocommunication Conference'*** will then address the next phase of the spectrum allocation dynamic. The agreements reached by national administrations at WRC-15 reflected a comprehensive strategy in which the unique value proposition of satellite-based connectivity is an integral part of a portfolio of synergistic technologies. Now, the industry is preparing for WRC-19, and this session will take a strategic overview of the key agenda points in which the providers of satellite-based communications technology and service solutions have a vital interest. The panel will feature **Tariq Al Awadhi**, Executive Director, Spectrum Affairs, TRA, United Arab Emirates; **Dongsik (Thomas) Kim**, Senior Engineer, Space Systems Coordination Division, Space Services Department, Radiocommunication Bureau, ITU; **Patrick van Niftrik**, Vice President, Spectrum Development, EMEA, SES; **Kumar Singarajah**, Director, Regulatory Affairs & Business Development, Avanti Communications; **Laith Hamad**, Director, Middle East & North Africa, Access Partnership; **Ammar Hamadien**, Head of Strategic Engagement, MENA, GSMA; and, **Guido Baraglia**, Director, Business Development EMEA, Kratos Networks.

'Leveraging Advancing Technologies & Scaling Innovative Services to Evolve Larger & Emergent Markets' will be the focus for the 2017 **Summit** dialogue on high throughput satellites. With the advantages of HTS over traditional fixed satellite service (FSS) now clearly recognized as including considerable reduction in the average cost per Gbps (gigabit per second) of bandwidth in orbit, the session dialogue will encompass such questions as: "The Operators… What is their new focus from orbit?"… "What are the new challenges, in the new markets?"… "What are the evolved dynamics for ground segment?"… "Is Mobility All That Matters Now?"… and, "Is the value-chain being reinvented?" The discussion will also cover the A… B… C… of growth, with Aeronautical, Backhaul & Consumer Broadband having been recognized as key applications stimulating continued HTS market expansion.

With the aeronautical market being subject to detailed analysis on Day Two of the **Satellite Hub Summit** program, this session will also focus on the satellite industry's capabilities and further potential to deliver on the kind of advances necessitated by the backhauling requirements of the wireless data environment, including the provision of enhanced clarity in its value proposition, using the language of the wireless sector, and, as wireless continues to advance through successive technology generations, to deliver clear technology upgrade paths. Panelists will include **Nile Suwansiri**, CCO, Thaicom; **Mohaned Juwad**, Senior Manager, Spectrum Policy, Intelsat; **Soheil Mehrabanzad**, Vice President, Hughes; **Freddie Caldwell**, Sales Manager, Paradigm Communication Systems; **Majdi Atout**, Vice President of Sales, Middle East, iDirect; **Julian Crudge**, Managing Director, Telenor (UK) Limited; and, **Alessandro Caranci**, Vice President Sales & Business Development Networks & Connectivity, Telespazio.

'In Constellations for Connectivity: The Low Earth Orbit Solution Re-born?' discussion will address the myriad of questions that have arisen since the announcement of the OneWeb, SpaceX and LeoSat plans to build hundreds of new satellites for orbiting to LEO.

These questions include: "How will the HTS and Mega-LEO services compete… or will they be complementary?" "How will they be differentiated and priced?" "How will they be contracted and regulated?" "How are the new constellations going to be launched?" "How will the systems satisfy end-user requirements?" "Who will come out on top?" Not just among the satellite operators, but everyone in the value chain: Manufacturers, integrators, network licensees and, ultimately, the users – wireless operators, maritime & aeronautical interests, oil & gas companies, military, civil government agencies, and not least the individual consumer. The dialog will also ask "Just what are the mobility and interference challenges?" and "Are New Apps Driving New Satellite Designs?" The participants in this dialog will include **Patrick Kariningufu**, Vice President, MEA, OneWeb; **Paul Febvre**, CTO, Satellite Applications Catapult; **Julian Kell**, Director, Sales, EMEA, Telesat; **Diederik Kelder**, Senior Vice President, Corporate and Business Development, LeoSat, and **Fred Morris,** Vice President, Satellite Operators Market Vertical, **Comtech EF Data.**

The ability to communicate is essential to humanitarian emergency operations, and ***'Mission Criticality: The Satellite Solution & the Humanitarian Crisis'*** will explore this ecosystem. In Dubai itself, the home of CABSAT, during mid-2016, some of the world's-leading satellite operators and integrators – Arabsat, EMC, Eutelsat, Hispasat, Inmarsat, Intelsat, SES, Thuraya and Yahsat – conducted technical training for humanitarian personnel to support the provision of communications to all those responding to emergencies including affected populations. This training emanated from the Crisis Connectivity Charter, a set of commitments to enhance communications in times of crises, signed by the satellite operators and integrator community and the United Nations in October 2015, and established by the EMEA Satellite Operators' Association (ESOA) and the GVF with the support of the United Nations World Food Programme (WFP)-led Emergency Telecommunications Cluster (ETC), and the UN Office for the Coordination of Humanitarian Affairs (OCHA), and providing ETC responders with the skills and experience to deploy, manage and support satellite solutions, facilitated through the Crisis Connectivity Charter, during humanitarian emergency operations. Contributions to this dialog will be heard from **Christian Cull**, Vice President, Marketing & Communications, Thuraya; **Koen Willems**, Market Director for Government & Defense, Newtec; **Anthony Baker**, CEO, Global Satellite Vu; **Abdul Aziz Al-Feel**, Regional Director MENA, Enterprise Business Unit, Inmarsat; and, **Andrew Burdall**, Senior Vice President, Enterprise & Emerging Markets, SpeedCast.

Day Two of the **GVF Satellite Hub Summit @ CABSAT 2017** (23rd March) begins with ***'Into the Mainstream: VSAT Communications-on-the-Move & the New Strategic Marketplace'***. This panel session will address the communications on the move (COTM) ecosystem and the emergent rapid growth of the aeronautical connectivity market and its inter-relationship with further growth of high throughput satellite system deployments, together with analysis of the increasing demand for high-performance satellite communications on the move (SOTM) earth stations and the industry's endeavors to improve the way that terminal specifications, testing, and approvals are applied, aiming to achieve breakthroughs which reduce 'time to market'.

In the aeronautical space, GVF has worked with the Airline Passenger Experience Association (APEX) to examine the "in-flight online revolution", focusing on the very latest developments in the new broadband communications dimension to contemporary commercial air travel. The airliner seat is becoming a fully functioned extension of the office desk and domestic living room, with the passenger as consumer of in-flight entertainment and connectivity (IFEC). Additionally, the airline carrier (and its employees) are also users within the new paradigm of the in-flight connectivity ecosystem which is enabled by the greater availability of broadband satellite capacity over the world's commercial air corridors. The final **Hub Summit** session, ***'Perspectives & Strategic Take-Aways: The Satcoms Dynamics of a Connected World'***, comprises an open forum where speakers, moderators and attendees will have the opportunity to engage in a frank and open dialogue about the key points raised during the two-days of **Hub Summit** discussions, and will provide attendees with key take-aways on which to further reflect. The moderators will be joined by **Akshat Jain**, Sales Director, MENA & India, ND SatCom.

As noted above, in addition to the **GVF Satellite Hub Summit** program is **SATEXPO**. This program will open with keynotes from the **UAE Space Agency** and **Virgin Galactic**, followed by a series of presentation and panel sessions covering: **The Entrepreneurs & Financiers of Satellite Start-ups** (A Case Study - The successful partnership between government, and small companies for Brazilian Space Program, and its Small Satellite projects); **Space & Enterprise Partnership** (Exploring the importance and relationship between commercial business enterprise and space); **Opportunities and challenges for using satellite communications for military operations**; **Aviation** (Improving connectivity in the cockpit & cabin); **Satellite Broadcasting** (Idea Swap Regional Focus: What is the state of play in the MENA Satellite broadcasting market?); **Regional technology, challenges and opportunities for Satellite Communications** (Case study); **Contribution and distribution challenges in the Middle East during crisis**; and, **The Satellite Synergy: Broadband telecoms for a mobile world**.

Martin Jarrold is Director of International Programs of the GVF. He can be reached at

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Entrepreneurs Acquire NETIA from Globecast

Claret, France, January 11, 2017--NETIA, the French Media software solutions company, announced that its sole shareholder Globecast (part of the Orange group) has sold all its shares in the company to two French media entrepreneurs, Anthony Savelli and Vincent Benveniste.

The acquisition was made via Radio Act SAS, their consulting and services agency.

Both businessmen exceed 25 years of experience in media IT and have an impressive and recognized track record in successfully transforming technology businesses in synergy with customers, partners and staff.

NETIA's CEO Thierry Gandilhon explained: "Having now private owners committed to our roots in the south of France and to our core business, will give us the autonomy to focus on a more efficient operation. Our teams have already started a dialog with several customers and we are confident that they will benefit from this new setup, particularly from a user experience and lifecycle management standpoints"

"NETIA has very talented people working with the best media professionals across the world" said Vincent Benveniste, Radio Act's President. "We're honored to lead its development from here on as a customer focused, agile, creative and autonomous organization" he added.

SpeedCast Completes Acquisition of Harris Caprock

Sydney, Australia, January 3, 2017– SpeedCast International Limited (ASX: SDA), a global satellite communications and network service provider, announced it has completed the previously announced acquisition of Harris CapRock in a cash transaction valued at US$ 425 million.

The combined entities create a global and diversified leader in remote communications and network services. SpeedCast will service thousands of vessels, hundreds of rigs and platforms, and enterprise and government customers around the world with a wide portfolio of communications and IT services, and an industry-leading global support network.

This expanded global footprint and infrastructure, with over 240 field engineers around the world, is unique and will enable SpeedCast to provide best-in-class services and support to our customers in over 100 countries. The Harris CapRock integration planning phase is well under way and SpeedCast expects to deliver US$24 million in cost synergies over the next two years. "

With the closure of the Harris CapRock acquisition SpeedCast is now the global leader in our industry. The combined product portfolio and scale enables us to deliver innovative new solutions and world-class support to our customers around the world," said SpeedCast CEO Pierre-Jean Beylier. "I am excited to start the new year by welcoming the Harris CapRock team to SpeedCast. Our people are our biggest asset and the strong talent of the Harris CapRock team will help us take SpeedCast to a new level of industry leadership."

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Download our white paper on 'Insuring' Operational Resiliency:
www.crystalcc.com/landing-page/insuring-operational-resiliency

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The Power of Targeted Advertising

by Roger Franklin, CEO, Crystal

Advertising has suffered some initial setbacks since the increasing popularity of online and time-shifted viewing. Gone are the days when the ad break is forced upon viewers in the middle of a program. Consumers are increasingly choosing to view content in a way that enables them to simply skip ads. With a massive potential revenue loss for the content providers, this has clearly caused major concern across the industry. However, it has also led to some great innovation and advertising is better today than it has ever been.

The OTT Opportunity

Once you step past the initial fears of ad skipping, OTT gives advertisers so much more potential than previously possible. With OTT suddenly comes data. Content providers know so much more about consumers than imaginable from the days of linear TV. From knowing what TV shows, films, and sports a consumer likes to watch, they can already build up a pretty good picture about that individual. If I spend every weekend watching soccer, it is fairly certain that ads about soccer kit or local soccer games will be appealing to me.

Those services which enable social sharing can also glean even more information based on who their friends are and their consumption habits.

Targeting advertising will undoubtedly increase value for advertisers who will get much more click through if the ads are getting in front of the right demographic. Contextual advertising, where the ads fit the mood and context of the program, will also be a key part of the future to be considered by broadcasters and OTT providers. If the actors on screen are enjoying a takeout pizza, an advert for a pizza chain local to the viewer would be timely.

Using Ads to Target Ads

OTT also means ads can be clickable and interactive. So, if something comes up that looks appealing, I may consider clicking away from the content I'm watching and purchasing it there and then. From that, my content provider then knows that item or type of item is appealing to me and can push other similar suggestions. It also associates my viewing preferences with that particular item, so other people with similar preferences may be interested in that same thing and will likely get pushed that advert. Again, social sharing means that if I bought it, my friends may want it too.

Getting it Right

OTT certainly opens up opportunity to be more personalized with advertising but it also comes with its challenges.

Using metadata, content providers can build a comprehensive picture of unique consumer viewing habits, preferences, and even likely shopping habits based on viewing history and a comparison to others with similar viewing habits. However, in order to do that, a content provider first needs to define the boundaries of the streamed content, making it easy to simply pull an advert out and replace it with an alternative. This can again be managed with metadata and ideally a decent monitoring system to help get the boundaries spot on. Get it wrong, and the content may stop in an awkward time and make the viewing experience much less comfortable for the viewer.

Once the boundaries are set and the criteria worked out for which ads should be targeted to which criteria (e.g. people with certain viewing preferences, or people in a certain geographic area), it can be challenging to know whether the right ad was actually inserted at the right time. Of course, if the first you know about it is a phone call from an irate advertiser, that will be less than ideal, so proper monitoring is a must. That's why our company has spent several years building a comprehensive set of software tools for metadata insertion, quality control and validation.

The Value for Advertisers

Targeted and personalized advertising has real potential to increase click through for advertisers, revenue for content providers, and satisfaction for consumers, who will be much more prepared to sit through an advert if it is relevant to them and their interests. Content providers who properly embrace the power of targeted advertising will undoubtedly come out on top.

Roger Franklin is CEO of **Crystal,** a provider of network monitoring and management solutions . Cyrstal won the "Most Promising Company' award in 2015 given by Satellite Markets and Research. He can be reached at: roger.franklin@crystalcc.com

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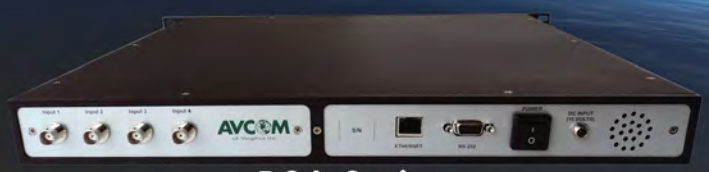

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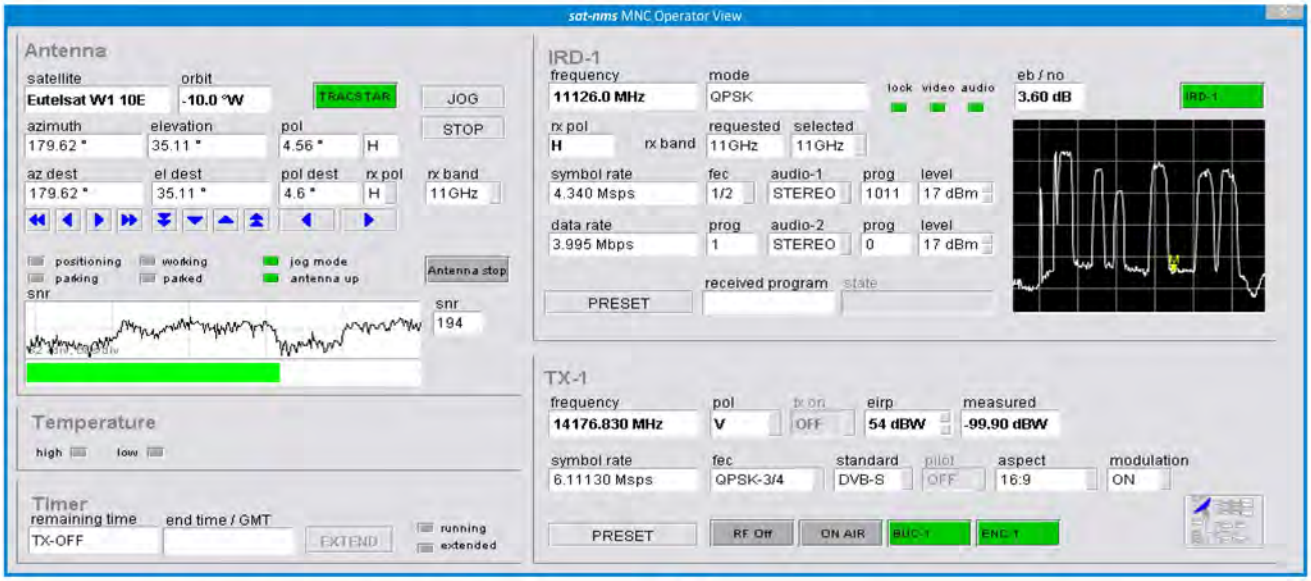

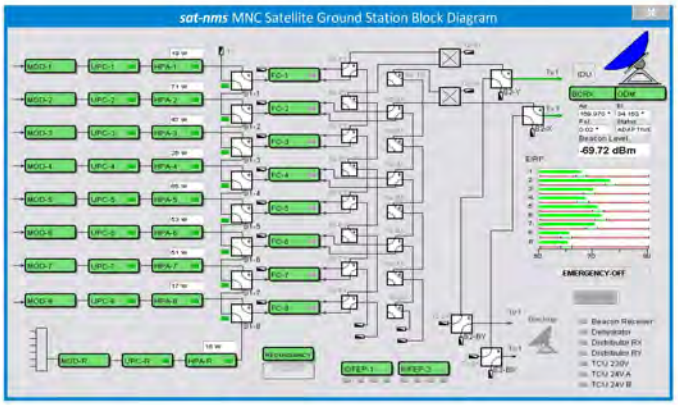

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Thaicom Appoints New Chief Strategy Officer

Nonthaburi, Thailand, February 6, 2017– Satellite operator **Thaicom** announced the appointment of satellite industry veteran **Dr. Supoj Chinveeraphan** as its Chief Strategy Officer (CSO). Among Dr. Chinveeraphan's responsibilities will be leading the growth of Thaicom as an Asian brand, inclusive of marketplace strategy, market positioning, partnerships, and operations.

Dr. Chinveeraphan recently joined Thaicom after holding a number of high-ranking positions within the telecommunications industry, including the role of Director and General Manager of IPSTAR Australia and New Zealand from 2009 to 2015.

Paiboon Panuwattanawong, CEO Thaicom, commented on Dr. Chinveeraphan's appointment: "Dr. Chinveeraphan combines a wealth of experience in all areas of the satellite industry. As Thaicom continues to expand, Dr. Chinveeraphan's business savvy and industry experience driving business and brand strategy will only accelerate our momentum. He will help us push new strategic initiatives and pursue new business development opportunities. I am certain Dr. Chinveeraphan will be a great asset for Thaicom to stay ahead of the curve."

Dr. Chinveeraphan holds a Bachelor degree in Engineering from Chulalongkorn University, Thailand. He holds a Masters degree from Tokyo Institute of Technology where he also earned his PhD at the Department of Intelligence Science. He is 48 years old.

Asiasat Appoints Woolston as New CCO

Hong Kong, February 1, 2017–Asia Satellite Telecommunications Company Limited (AsiaSat) announced the appointments of **Barrie Woolston** as new Chief Commercial Officer (CCO) and **Sabrina Cubbon** in a new role of Vice President, Business Development & Strategy.

Starting February 1st, 2017, Woolston in the newly created role of Chief Commercial Officer, will integrate and lead all sales, marketing and commercial activities of the company. Mr. Woolston will lead a strong team that will search to understand and meet customers' needs, and continue to develop new businesses worldwide.

"We welcome Barrie on board, bringing with him strong leadership, expertise and substantial marketing and customer service experience. I am confident that with an experienced and integrated sales team, Barrie will take AsiaSat's commercial and customer activities to the next level," said Andrew Jordan, President and Chief Executive Officer of AsiaSat.

"I'm delighted to take up this new commercial role and work closely with our customers and partners to provide enhanced service portfolio that meets customers' changing needs. I join at an exciting time with the upcoming launch of our new satellite AsiaSat 9 and other new services later this year, and I look forward to partnering with our customers to face the challenges and drive our growth together," said Woolston.

Woolston has 30 years of experience in the technology，media，melecom sectors, with a wealth of experience in managing sales teams and driving new business, most recently as Chief Commercial Officer with Encompass Digital Media based in Atlanta, GA, 13 years as Commercial Director of Arqiva's satellite and media business, and various global sales, marketing, product management and operations positions with leading brands globally.

In the role of Vice President, Business Development and Strategy, Cubbon will be responsible for developing strategic initiatives to drive company's business growth.

Alan Young Joins Crystal as COO

Duluth, Georgia, January 17, 2017— **Crystal,** advanced monitoring and control software provider for video distribution over satellite, cable or the Internet, announced that **Alan Young**, former Chief Technology Officer of Encompass Digital Media, has joined Crystal as Chief Operating Officer.

Alan brings with him a wealth of experience in the broadcast and satellite industries. At Encompass, Young was responsible for advising the Executive Committee and customers on all matters relating to media technology, including leading the development of the company's over-the-top (OTT) service offerings.

He developed and implemented an OTT strategy that complemented and seamlessly integrated with the existing broadcast systems and satellite distribution.

Prior to Encompass, he held senior technology executive positions with the satellite operator SES as well as Citigroup and Viacom.

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The Final Battle to End Polio

In 1988, a meeting of the World Health Assembly set a mind-boggling goal: to eradicate the ancient scourge of polio.

At the time the goal was set, the polio virus was endemic in 125 countries and about 350,000 people, mostly children, were paralyzed by polio each year. It was an audacious goal – but 24 years later, the number of polio cases worldwide had fallen by more than 99 percent, saving more than 10 million children from paralysis.

How to End a Plague

The near-eradication of polio took big public investment in vaccine. Polio is highly infectious, and entire vil-lages and districts had to be vaccinated to stop the chain of transmission. Stamping it out meant recruiting and training hundreds of thousands of vaccinators and sending them into the field with millions of doses of vaccine, which had to be kept cold in foam-plastic boxes. The goal was to vaccinate every child in the country several times, with a month or so between each round.

It was this kind of unprecedented effort that allowed India to declare itself polio-free in February 2012. India was long considered one of the most unlikely places to eradicate polio, because of its high population density, high rates of migration, poor sanitation, and low rates of route immunization. But data -driven planning, well-trained and motivated staff, rigorous monitoring and political will at all levels made the difference.

So did satellite technology. According to Bill Gates, whose Gates Foundation is funding the battle against polio in nations around the world, satellite imagery and mobile phones equipped with GPS are instrumental in the fight. India is now sharing its best practices with Nigeria, Afghanistan and Pakistan – coun-tries where polio remains endemic – and the Nigerian experience shows just how technology can help a person-to-person effort achieve national scale.

Satellite Maps and Cell Phones

Mr. Gates outlined the ba-sics in a 2012 interview with author Rick Smolan. "The Environmental Systems Research Institute (ESRI) creates these incredibly detailed satellite maps for governments," he said. "They found that there were villages in Nigeria, which has the highest rate of polio resurgence in the world, that have never shown up on any map. No one in the government knew they were there. ESRI can recognize the shape of huts and pathways. They updated the satellite maps and handed out 10,000 GPS-enabled cell phones to polio workers. They could see where the workers were in real time, and make sure they got to each of the houses."

Satellite technologies feed into many steps in the process. Space-based imaging is used to update geographical information systems (GIS) that generate maps for the field workers. Using GIS as a tool, supervisors plan how to deploy their teams in order to cover every village and settlement. Each morning, the teams receive their GPS-equipped phones and start their

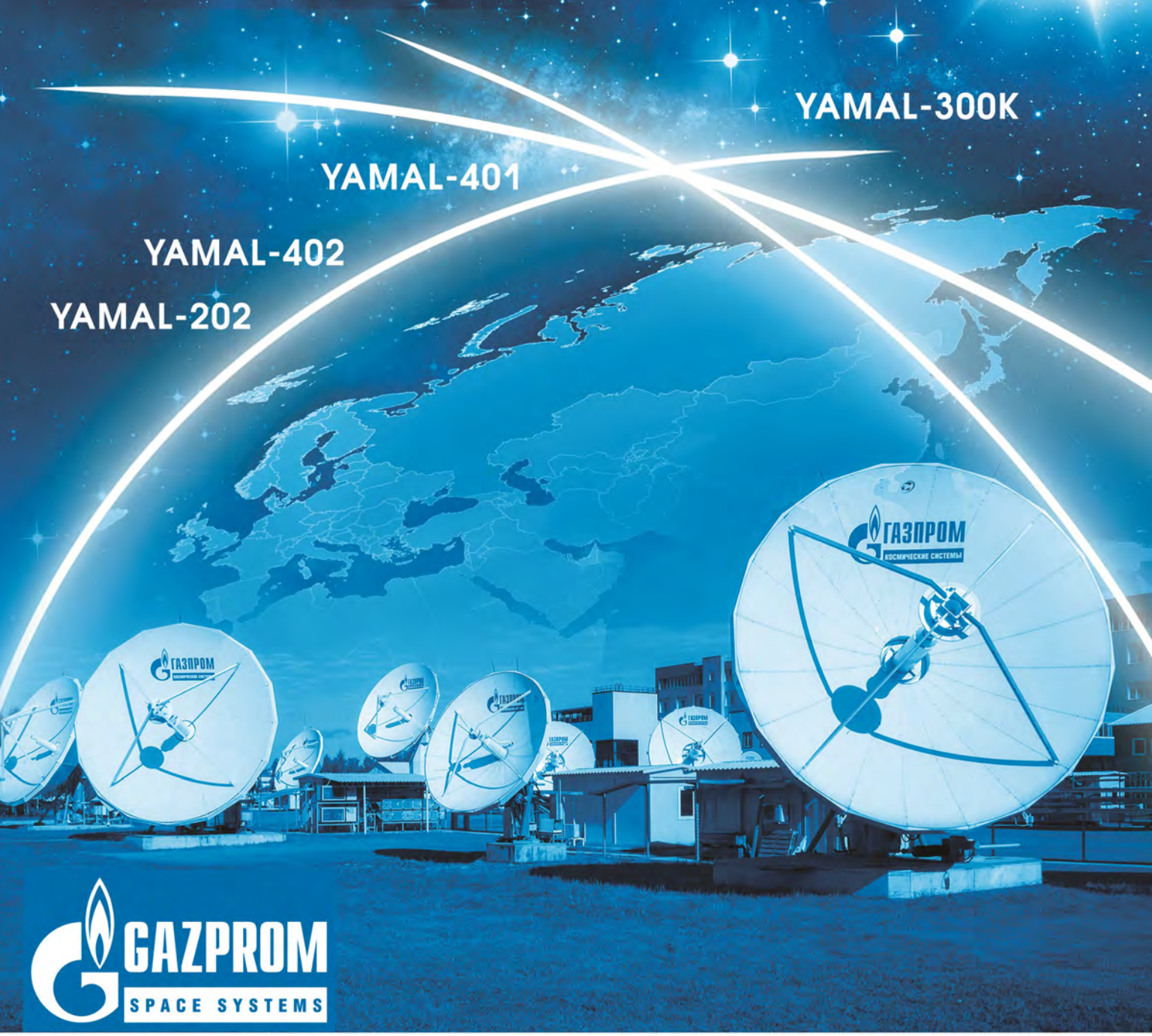
visits. In the villages, with the help of local guides, they visit health facilities, schools, markets and mosques, where they vaccinate both children and adults.

At the end of the day, the phones are collected for charging, which lets supervisors download their tracking data and match it to the GIS system. The results are tracks showing where every vaccinator has been as well as updated map coordinates for important buildings. Every few days, the teams receive summaries of missed or partially-covered settlements that need a return visit.

As impressive as this effort has been, the battle is not yet won. The 2012 World Health Assembly declared that the complete eradication of polio was "an emergency for global public health." That is because the disease is making a comeback in nations where civil unrest and war are making it impossible for vaccination programs to function. But it is a battle worth fighting. In addition to the relief of human suffering, experts believe that eradicating polio will gen-erate US$40 to $50 billion in benefits, with most of it going to low-income countries. Winning that prize is a cause to which the satellite busi-ness is proud to contribute.

———————-

Sources: Polio: Strategy Overview, Bill & Melinda Gates Foundation, 2012. *The Human Face of Big Data,* by Rick Smolan and Jennifer Erwitt, Against All Odds Productions, November 2012. "Use of GPS Tracking of Vaccination Team Activities in Polio NIDs in Nigeria," by Dr. M.Z. Mahmud, project presentation.



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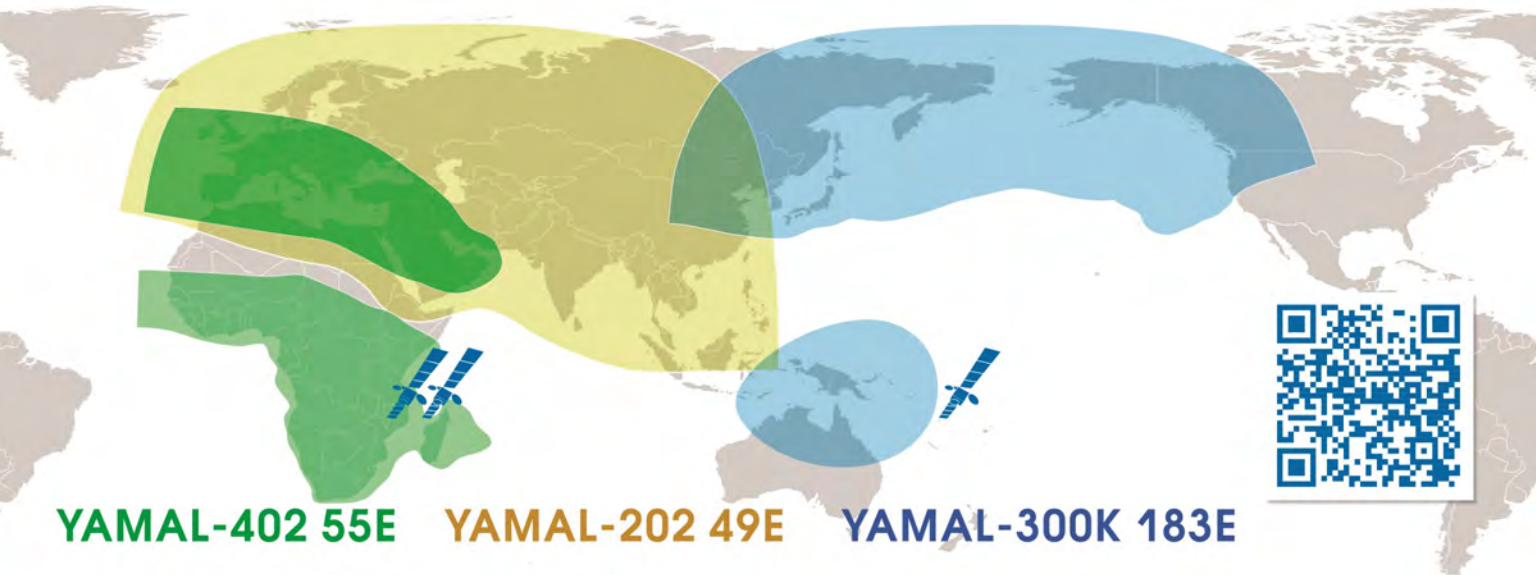

Pay TV Operators Neglect Customer Experience at their Peril

London, UK, January 26, 2016–Pay-TV operators can no longer simply rely on the strength of their content offering to maintain subscriber loyalty but must raise their customer relationship management game to gain ground in an increasingly competitive marketplace, new global research from subscription, billing and CRM specialist Paywizard shows. The survey of more than 6,200 consumers reveals 24% have cancelled a digital Pay-TV service in the previous 12 months because of poor customer experience, while 84% say they would terminate a relationship with a TV provider if service and support were lacking and the company seemed out of touch with their needs.

The survey, which includes findings from Australia, Brazil, Germany, Singapore, the United Kingdom and the United States, also reveals 46% of consumers have retained a digital Pay-TV subscription they might otherwise have cancelled because of positive customer experience. The findings show younger consumers place greater value on customer experience when it comes to sticking with a provider, as 57% under age 35 say this has been a factor in keeping a service over the past year.

Bhavesh Vaghela, Paywizard's Chief Marketing Officer, says: "We are seeing a fundamental shift taking place in the pay-TV marketplace, with customer experience emerging as critical to television service providers' success – in many cases, their very survival. While content and cost are often cited as the elements influencing Pay-TV uptake and cancellations, the survey findings demonstrate that customer experience has undeniably emerged as a major driver. This is particularly true for operators of over-the-top (OTT) services, as simply relying on a decent content offering is no longer nearly enough to build loyalty to your brand."

He adds: "With industry projections indicating roughly a billion Pay-TV subscriptions are up for grabs this year – and billions in revenue are on the line – it is clear from the research that Pay-TV operators today ignore customer experience at their peril."

The research also demonstrates that to be on the winning end of consumers' decisions regarding their TV and entertainment budgets, Pay-TV operators must overcome a 'dip-in, dip-out' attitude on the part of subscribers. The survey reveals most consumers intend to drop some Pay-TV services – for instance, cutting part of a cable or satellite package – if they take another, such as an on-demand video subscription. The research shows 64% of those who have not taken a new subscription in the past would cut back on other digital subscriptions or downgrade a general package to bring down the cost if they were to sign up to a new or additional pay-OTT service.

The findings indicate, however, that in practice Pay-TV operators providing a positive customer experience can beat the odds. In fact, the survey reveals 74% of consumers who have added a digital Pay-TV subscription over the past year end up increasing their overall spend on television and entertainment. On the other hand, more than a quarter still reduced total TV spend by downgrading their general pay-TV package or cutting other subscriptions – making clear that there are losers among operators that fail to build strong bonds with their customers.

Vaghela notes: "The research leaves no doubt that to stay on the right side of the TV spend equation as more options emerge for consumers, all Pay-TV operators – particularly those that don't tend to lock subscribers into fixed-term contracts, such as many OTT providers – need to ensure they take their brand beyond its content offering by providing consistently excellent customer experience. In other words, providers of all stripes need to be proactive in engaging consumers at each key decision moment along the customer journey."

He points to the survey figures showing that 78% of consumers say, while good content is important in choosing a digital TV service, factors such as brand reputation, flexibility, attention to customer preferences and understanding of their needs are crucial to retaining their business.

"Consumers have more options than ever and they are not afraid to use them," Vaghela says. "For cable and satellite players moving into OTT as well as pure-play digital brands – whether global players such as Netflix and Amazon Prime, or local challengers such as Hulu in the US, Now TV in the UK and Foxtel Play in Australia – using consumer data and the right subscriber management tools has become vital. Not only will great customer experience be critical to future success for Pay-TV providers; the research proves it's already essential."

Download the full report, *Facing the perils of failed customer experience: Why pay-TV operators need to love their subscribers*: https://www.paywizard.com/customer-experience/

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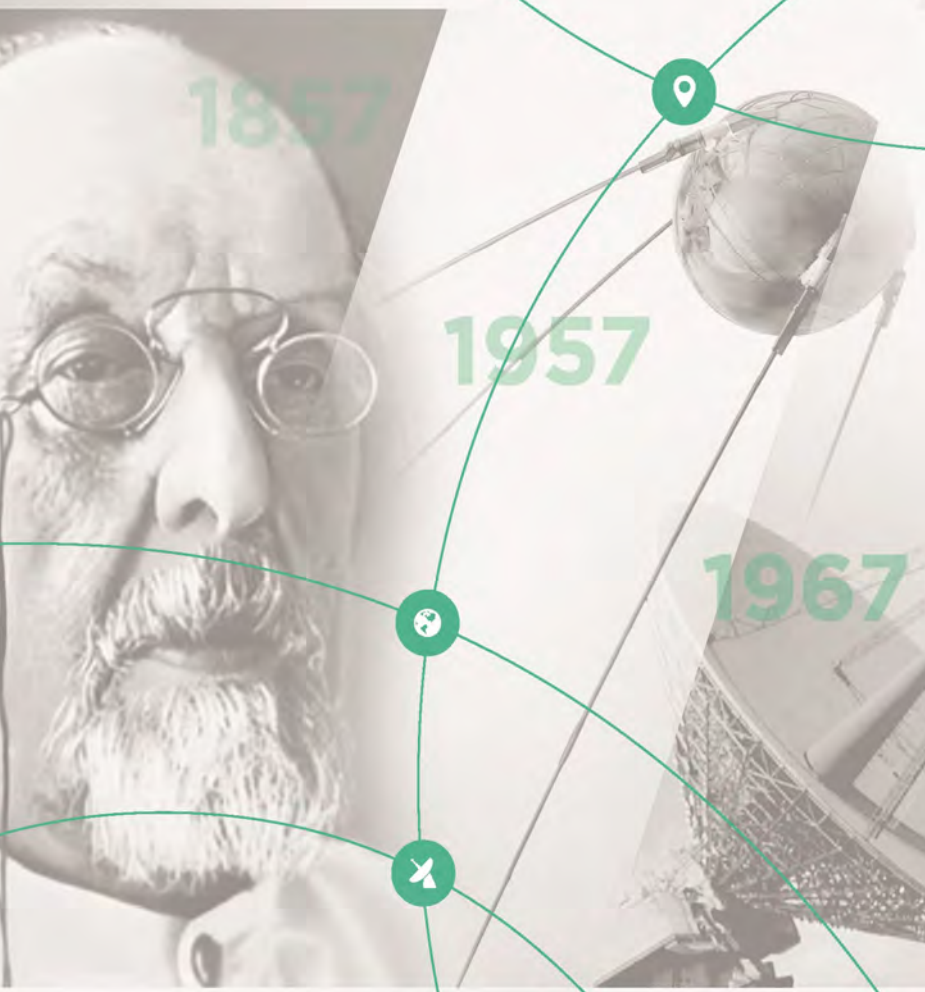

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MENA Pay TV Revenues Downgraded

London, UK, February 7, 2017--Pay TV revenues for the 20 countries in the Middle East and North Africa covered in the new edition of the Middle East and North Africa Pay TV Forecasts report will reach US$ 4 billion in 2021 – down from $5 billion forecast in the last edition.

Turkish pay TV revenue forecasts for 2021 are down $361 million on the last edition, with Israel falling by $220 million, the UAE $174 million and Saudi Arabia $149 million. So, these four countries will account for 90% of the revenue shortfall between the two editions.

Simon Murray, Principal Analyst at Digital TV Research, explained: "Along with long-running conflicts and slower economic growth, several countries (notably Turkey and Egypt) have suffered substantial currency devaluation. OTT is creating competition to traditional pay TV operators, especially in Israel. It's not all bad news, with Kazakhstan, Kuwait, Qatar and the UAE enjoying good growth."

Legitimate pay TV revenues will reach $4.12 billion for 20 countries in the Middle East and North Africa by 2022, up by 17% from $3.52 billion in 2016. Five countries will contribute more than three-quarters of the region's pay TV revenues in 2022.

The number of pay TV homes will increase by nearly 5 million between 2015 and 2022 to 19.52 million. About 18.7% of TV households paid for TV signals by end-2016, which will climb to 22.2% by 2022.

Digiturk will remain the region's pay TV operator leader in subscriber terms - by some distance. Second-placed beIN formally acquired Digiturk in September 2016.

beIN is forecast to have 1.67 million satellite TV subscribers by 2022 – ahead of OSN's 1.50 million [so excluding subscribers to their channels on other platforms such as IPTV and cable]. beIN will overtake OSN in 2019.

However, OSN is the largest pay TV operator when measured in revenue terms. OSN's packag-

The Satellite Markets 20 Index™

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Eutelsat Communications S.A.	ETL.PA	18.82	0.01	15.19	28.80
APT Satellite Holdings Limited	1045.HK	4.12	0.12	3.64	6.73
Inmarsat Plc	ISAT.L	699.00	-0.08	594.50	1024.00
SES S.A.	SES.F	19.45	-0.09	17.90	26.10
Satellite Manufacturers					
The Boeing Company	BA	183.91	0.16	118.25	184.80
MacDonald, Dettwiler and Associates Ltd.	MDA.TO	67.24	-0.02	63.52	92.92
Lockheed Martin Corporation	LMT	268.38	0.06	210.90	270.00
Orbital ATK, Inc.	OA	94.61	0.05	67.04	94.79
Honeywell International Inc.	HON	127.25	0.09	105.25	127.41
Equipment Manufacturers					
C-Com Satellite Systems Inc.	CMI.V	1.02	0.04	0.90	1.29
Comtech Telecommunications Corp.	CMTL	11.50	-0.08	9.52	25.09
Harris Corporation	HRS	110.91	0.07	73.32	111.67
ViaSat Inc.	VSAT	69.02	0.05	63.00	82.19
Gilat Satellite Networks Ltd.	GILT	5.22	0.03	3.84	6.19
Service Providers					
DISH Network Corporation	DISH	61.99	0.03	43.29	64.74
Globalstar Inc.	GSAT	1.43	-0.16	0.63	3.00
Orbcomm Inc.	ORBC	8.94	0.06	7.15	10.98
Sirius XM Holdings Inc.	SIRI	5.1650	0.14	3.74	5.22
Sky plc	SKY.L	998.50	0.01	560.00	1069.00

The Satellite Markets 20 Index™ is a composite of 20 publicly-traded satellite companies worldwide with five companies representing each major market segment of the industry: satellite operators; satellite manufacturers; equipment manufacturers; and service providers. The base data for the Satellite Markets Index is January 2, 2008 - the first day of operation for Satellite Markets and Research. The Index equals 1,000. The Satellite Markets Index™ provides an investment benchmark to gauge the overall health of the satellite industry.

INDEX	Index Value (Mar 01)	% Change from (Jan 03)
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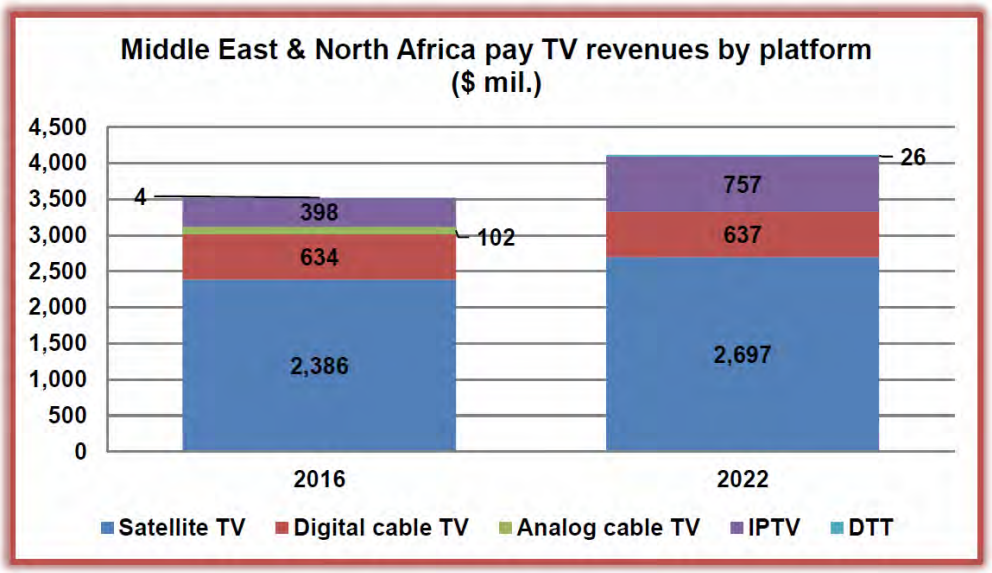
Vital Statistics

MENA Pay TV Stats



Source: Digital TV Research Ltd

Legitimate Pay TV revenues in the Middle East/North Africa region (MENA) will reach US$ 4.12 billion by 2022, up by 17% from $3.52 billion in 2016. Five countries will contribute more than three-quarters of the region's Pay TV revenues in 2022.

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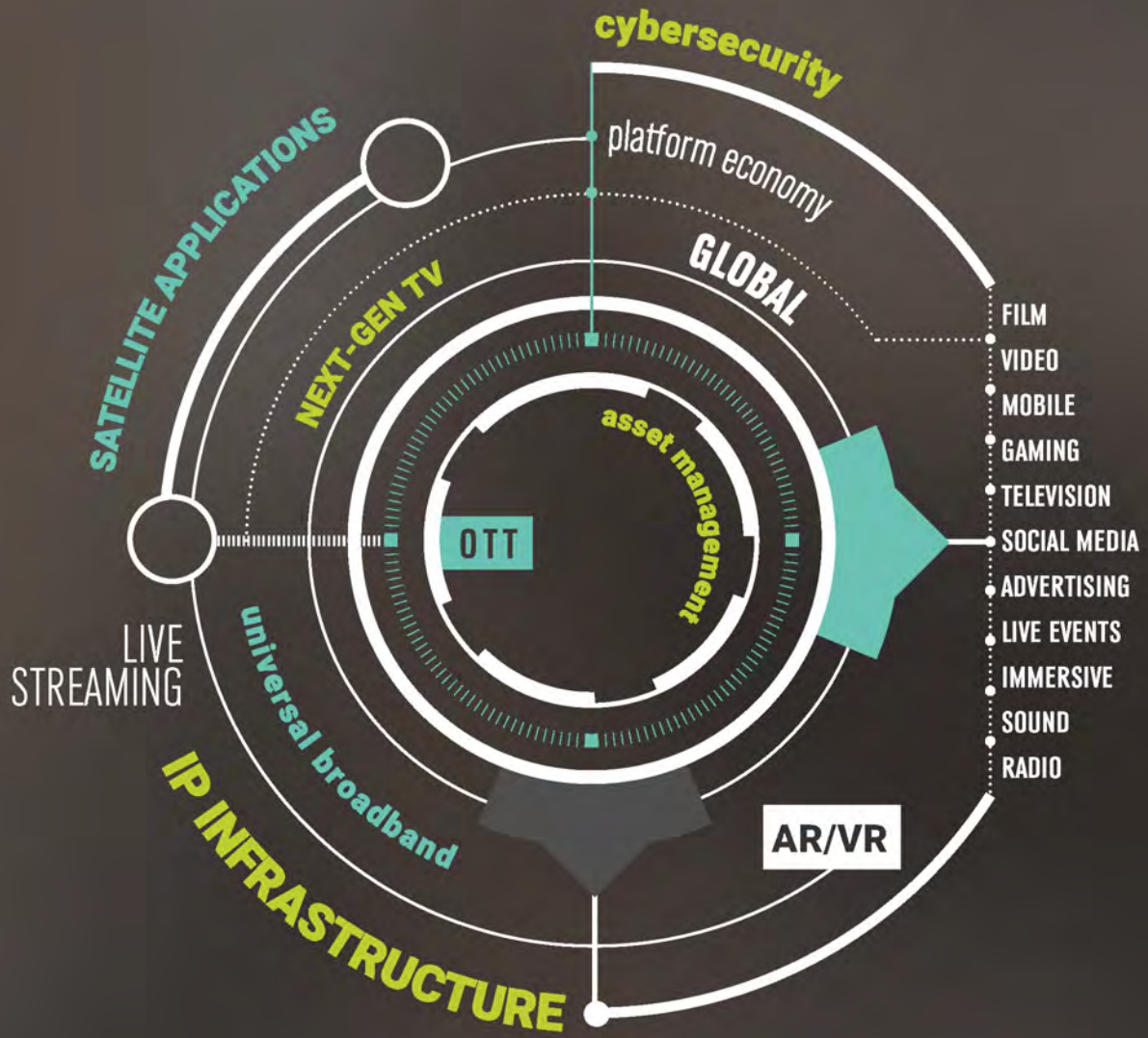

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Calendar of Events

Satellite Markets and Research will be participating in various capacities as exhibitors, conference panelists at the following trade shows in the first half of 2017:

March 6-9, 2017, Walter E. Washington Convention Center, Washington, D.C. **SATELLITE 2017**. http://2017.satshow.com/

March 21-23, 2017, Dubai WorldTrade Center, Dubai, UAE, **CABSAT 2017.** www.cabsat.com

Conferences: April 22 - 27, 2017, Exhibits: April 24 - 27, 2017, Las Vegas Convention Center, Las Vegas, Nevada. **NAB show 2017.** www.nabshow.com

May 22, 2017, **CASBAA Satellite Industry Summit**, Singapore. www.casbaa.com

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