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## Developing new satellite constellations

Q&A Intelsat

Delivering mobile military communications services

Broadcasting technology

Q&A ViaLite Communications

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## Second Generation GaN based SSPAs/BUCs in C, X, Ku and Ka-Band



250W C-Band  
2nd Generation GaN SSPA/BUC



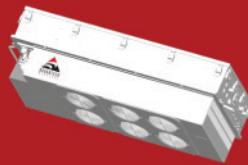
400W C-Band  
2nd Generation GaN SSPA/BUC



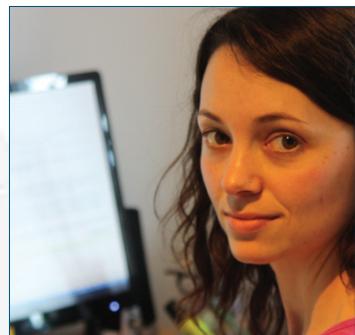
300W-400W C-Band Rackmount  
2nd Generation GaN SSPA/BUC



400W Ku-Band  
2nd Generation GaN SSPA/BUC



1,250W Ku-Band  
2nd Generation GaN SSPA/BUC



**Amy Saunders**  
Editor

## Happy holidays!

I can't believe it's this time of year again – Thanksgiving and Christmas are upon us, and we've successfully navigated our way through another twelve months.

It's been a pretty big year for the space sector. SpaceX has launched a Tesla Roadster with the 'Starman' mannequin into space during a Falcon Heavy test flight; the company faced some pretty big stock dives in the second half of the year, although successfully launched its Falcon 9 from the West Coast of the USA for the first time in October. The International Space Station (ISS) sprung a leak in September – at the time of going to press, no cause has been confirmed. Meanwhile, a Japanese team has taken another step forwards in the push for a space elevator with the launch of a new experiment to the ISS. In other news, the RemoveDEBRIS mission, which will explore methods for tackling space debris, reportedly captured its first piece of space debris back in September, using a space net. Richard Branson made the news in October with the claim that Virgin Galactic is just weeks away from its first trip into space, bringing his company's planned space tourism business that one step closer to reality. And at the end of the year, China announced plans to launch an artificial illumination satellite that will shine some eight times brighter than the moon, reportedly to reduce the cost of streetlights.

All in all, it's been a busy year. At *Satellite Evolution*, we've kept ourselves occupied attending all the major trade shows, catching up on the latest news and developments with anyone who's anyone in the space sector, and making sure to keep our readers up-to-date on technologies, trends and analysis. As always, we welcome feedback from our readers on any topics they'd like to hear more about, or any new projects they've been working on.

If you've been keeping your eyes peeled, you'll also have noticed the launch of our new sister publication, *NewSpace International*, back in March. With this new publication, we've expanded our focus beyond the traditional satellite sector to keep abreast of current NewSpace developments; small satellites, mega-constellations, asteroid mining, additive manufacturing, space tourism, etc. The NewSpace industry is deeply intertwined with the satellite sector, and we're really looking forward to seeing how it develops in the years to come.

As the proverb goes - which can apparently be traced back to 1659 - all work and no play makes Jack a dull boy. We've all worked hard for the last year, and it's time for a break to refresh ourselves, and start over again in 2019. So, from all the team at *Satellite Evolution*, we wish you a Happy Holidays! ■

**"It's been a pretty big year for the space sector. SpaceX has launched a Tesla Roadster with the 'Starman'....."**





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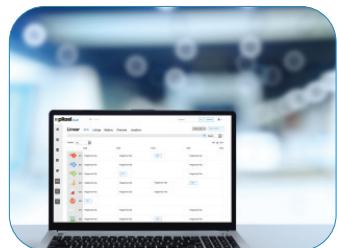
#### COVER STORY - 16

#### Developing new satellite constellations

Satellite constellations are big business right now. Gone are the days when constellations were strictly for Earth observation or telephony services, today's newcomers plan to bring broadband Internet connectivity to the masses, bridging the digital divide, or deliver high-quality, enterprise-grade connectivity services with unparalleled security.



*Front cover: Photo courtesy of LeoSat*



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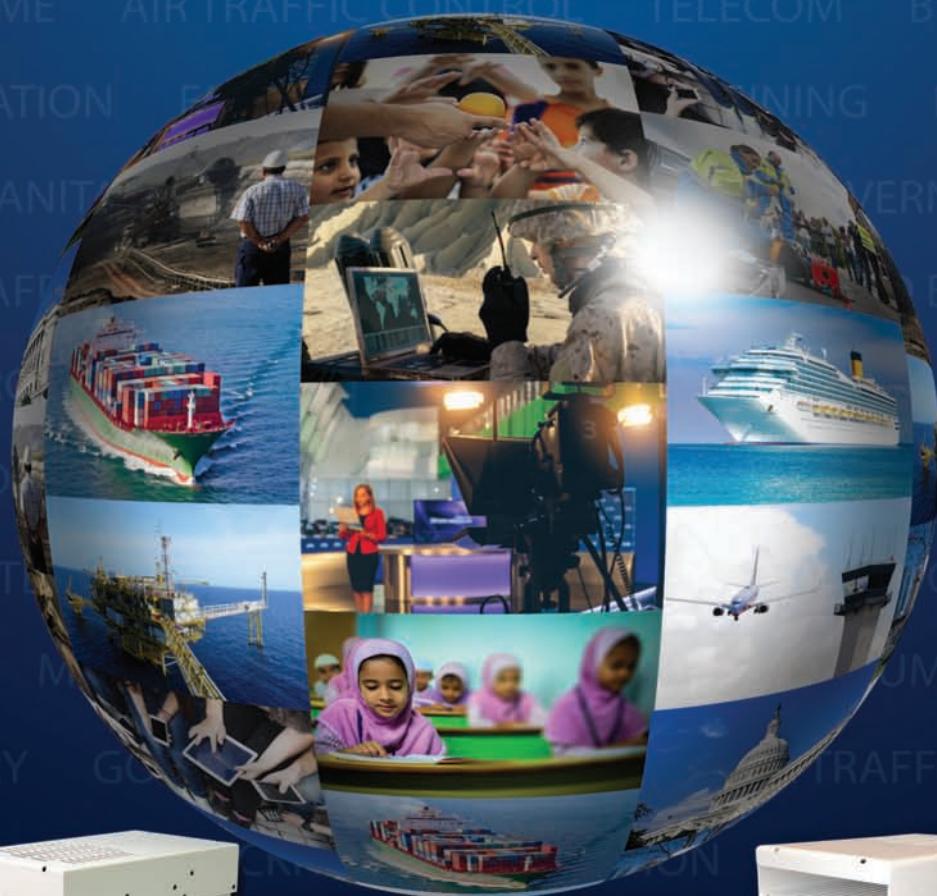


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## Inmarsat enhances cyber security offering for maritime industry

Inmarsat has introduced two new components to its maritime cyber security service, Fleet Secure, as it continues to develop solutions that combat ever-increasing cyber threats faced by ship owners and ship managers.

Vessel operators will benefit from a powerful, multi-layered endpoint security solution, Fleet Secure Endpoint, which is based on industry leading technology from ESET, a world leader in digital security, and powered by Port-IT and protects desktop computers and other systems connected to a vessel's network.

Fleet Secure Endpoint has been developed to remove infections and thwart hackers before damage occurs to onboard endpoints and connected systems. The solution will be available for commercial use from January 2019 and is compatible across Inmarsat's maritime portfolio of services, including Fleet Xpress, FleetBroadband and Fleet One.

It also complements the resilience of Inmarsat's own satellite and ground network enabling consistent cybersecurity standards to be maintained.

Peter Broadhurst, SVP of Safety and Security for Inmarsat Maritime said: "It is a priority for every fleet operator and ship manager - shore-side and at sea - to ensure their systems are properly protected. As this enhancement to Fleet Secure demonstrates, Inmarsat is constantly monitoring the ever-changing cyber security landscape and devising new tools and approaches for addressing potential problems; ensuring that ships and their crew remain safe –physically and virtually."

Inmarsat has also launched a training app for mobile devices, Fleet Secure Cyber Awareness. This enables seafarers to educate themselves on the tactics that cyber criminals might employ in attempting to infiltrate a company's IT infrastructure.

Addressing the human element is essential to maintaining a strong security posture, says Mr Broadhurst: "Many attempts to gain unauthorised access to IT infrastructure require some sort of activation by an end-user in order to infect a system and cause further damage. These attacks are often heavily disguised so as to trick and manipulate end-users into unwittingly granting permission.

"However, there are nearly always tell-tale signs that, if spotted in time, would prevent escalation. Crew education is therefore an indispensable component in realising a well-rounded security strategy and the reason behind teaming up with Stapleton International and Marine Learning Alliance to launch our Fleet Secure Cyber Awareness module." ■

## Satellite ground segment to generate \$162 billion in next decade

NSR's Commercial Satellite Ground Segment, 3rd Edition report forecasts annual global revenues for the Commercial Satellite Ground Segment will grow to \$15.71 billion by 2027. Set top boxes (STBs) and antennas capture the largest share of revenues, leveraging the volumes of Satellite TV.

The Ground Segment is a key enabler in the return

to growth for the satellite industry. As the focus shifts from "satellites" to "networks", VSAT platforms are more strategic than ever. Antennas have a critical role to play, unlocking verticals like Mobility or enabling new architectures like MEO and LEO constellations. With new bands growing in popularity, and throughputs skyrocketing, RF Chains need to evolve rapidly. Smallsat EO constellations are also building up demand for the EO Ground Segment.

"Terminals are to Satcom what picks and shovels were to the gold rush. During the HTS rush, it is a good time to be in the Ground Segment business," states Lluc Palerm, NSR Senior Analyst and report author. "From infrastructure use cases, like Earth Stations or Baseband Equipment, to emerging mass markets like Consumer Broadband; or high-end applications like Aero connectivity, HTS is the common denominator driving growth," according to Palerm.

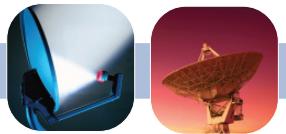
The entire satellite industry is in the midst of a profound transformation, and the Ground Segment is no different. New technological requirements (networking, higher throughputs, sophisticated traffic manipulation tools), new architectures (FPAs, V-HTS, Non-GEOs) and evolving business models ("infrastructure-as-a-service", risk sharing schemes, fewer-larger deals) will shape the future of the Ground Segment.

Multiple actors proposing revolutionary satellite systems often fail to recognize the importance of the Ground Segment. While committing billions to develop Space-segment technologies, they wrongly evaluate the state of development of the ground. The truth is that today, critical ground segment technologies are not ready for next-generation HTS systems (FPAs, SDN/NFV), and there will be a time lag while these technologies develop. ■

## Thailand's subscription video industry faces new threat as consumers' viewing habits shift to pirated TV boxes

In a recent study of the content viewing behaviour of Thai consumers, it was revealed that 45 percent of consumers use a TV box which can be used to stream pirated television and video content. These TV boxes, also known as Illicit Streaming Devices (ISDs), allow users to access hundreds of pirated television channels and video-on-demand content, usually with a low annual fee. TV boxes often come pre-loaded with pirated applications allowing 'plug-and-play' access to pirated content. The survey found that Mango TV, HD Playbox and U Play are among the most popular pirate applications amongst Thai consumers.

The survey, commissioned by the Asia Video Industry Association's (AVIA) Coalition Against Piracy (CAP), and conducted by YouGov, also highlights the detrimental effects of streaming piracy on legitimate subscription video services. Of the 45 percent of consumers who purchased a TV box or dongle for free streaming, more than two in three (69 percent) stated that they cancelled all or some of their subscription to legal pay TV services. Specifically, 24 percent asserted that they cancelled their subscriptions to a Thai-based online video service as a direct consequence of owning an ISD. International



subscription services, which include pan-Asia online offerings, were impacted the most – nearly one in three (30 percent) Thai users have abandoned subscriptions in favour of ISD purchases.

Cancelling legitimate subscription services and paying less for access to pirated content is fraught with risks, as Neil Gane, the General Manager of AVIA's Coalition Against Piracy (CAP), comments, "The damage that piracy does to the creative industries is without dispute. However, the damage done to consumers themselves, because of the nexus between content piracy and malware, is only beginning to be recognised. Piracy websites and applications typically have a "click happy" user base, and, as such, are being used more and more as clickbait to distribute malware. Unfortunately, the appetite for "free" or cheap subscription pirated content blinckers users from the very real risks of malware infection".

Of those consumers who own an ISD, about half of respondents (47 percent) claim to have purchased their ISD from two of the largest Southeast Asia-based ecommerce stores. Close to one-third (31 percent) of ISD owners say they acquired their devices via one of the world's most popular social media platforms.

In addition to the short-term problem of cancelled subscriptions is a longer-term problem – namely, many of the people using ISDs are young. The survey found that ISDs are particularly favoured among 18-24 year-olds, with more than three in four (77 percent) cancelling legitimate subscription services as a result of owning ISDs, especially international online subscriptions (40 percent).

The Department of Intellectual Property (DIP), Ministry of Commerce, who oversees the Copyright Act, commented that "to enhance the efficiency of enforcement action, the DIP has proposed the amendment of the Copyright Act by adding provisions on the manufacture, sale, import, or traffic into the country of devices or any parts or components of a device, for the purpose of circumventing a technological measure. These amendments were approved by the Cabinet on 16 October 2018 and will shortly be presented to the State Council. The amendments are explicitly targeted at the manufacture and distribution of pirated TV boxes. This is a crucial step to address the current piracy problem".

"This high rate of piracy is concerning for a number of reasons", says Sompan Charumilinda, Executive Vice Chairman at True Visions. "First is the danger to consumers through the use of malware and spyware embedded in these illicit sites and applications. Second is that supporting these criminal enterprises does real damage to legitimate businesses that are struggling to survive. Third, it also undermines the Thailand 4.0 initiative and the country's aspiration to become counted among the world leaders in the new digital economy by showing Thailand to have made little progress in terms of its acceptance and tacit approval of these criminal networks. Consumers should care about piracy personally because of the harmful effects of malware and spyware, and also because of the damage that it does to our country. As a leading media company in Thailand we

are happy to work with the Department of Intellectual Property, CAP and all relevant stakeholders to help continue to educate the public about these dangers." ■

### AAC Microtec formalizes collaboration with Mauritius Research Council for MIR-SAT1 1U mission

AAC and the Mauritius Research Council, MRC ([mrc.org.mu](http://mrc.org.mu)), have signed a contract to formalize the collaboration to deliver a 1U CubeSat and mission services for their pioneering Mauritian Infrared Satellite (MIR-SAT1) mission.

The company will supply a fully integrated 1U CubeSat alongside a comprehensive mission service which includes, training, ground station delivery and operations support.

The contract value amounts to £325,000 (approx. 3.8 MSEK) and will be delivered during 2019.

AAC Clyde will support the development of the payload and will integrate the spacecraft in its Glasgow facility whilst training the MRC engineering staff on Assembly, Integration and Test (AIT) of the spacecraft. This is supplemented by a comprehensive support package that includes the supply and installation of a ground station in Mauritius and support for the launch activities and Early Orbit Phase operations.

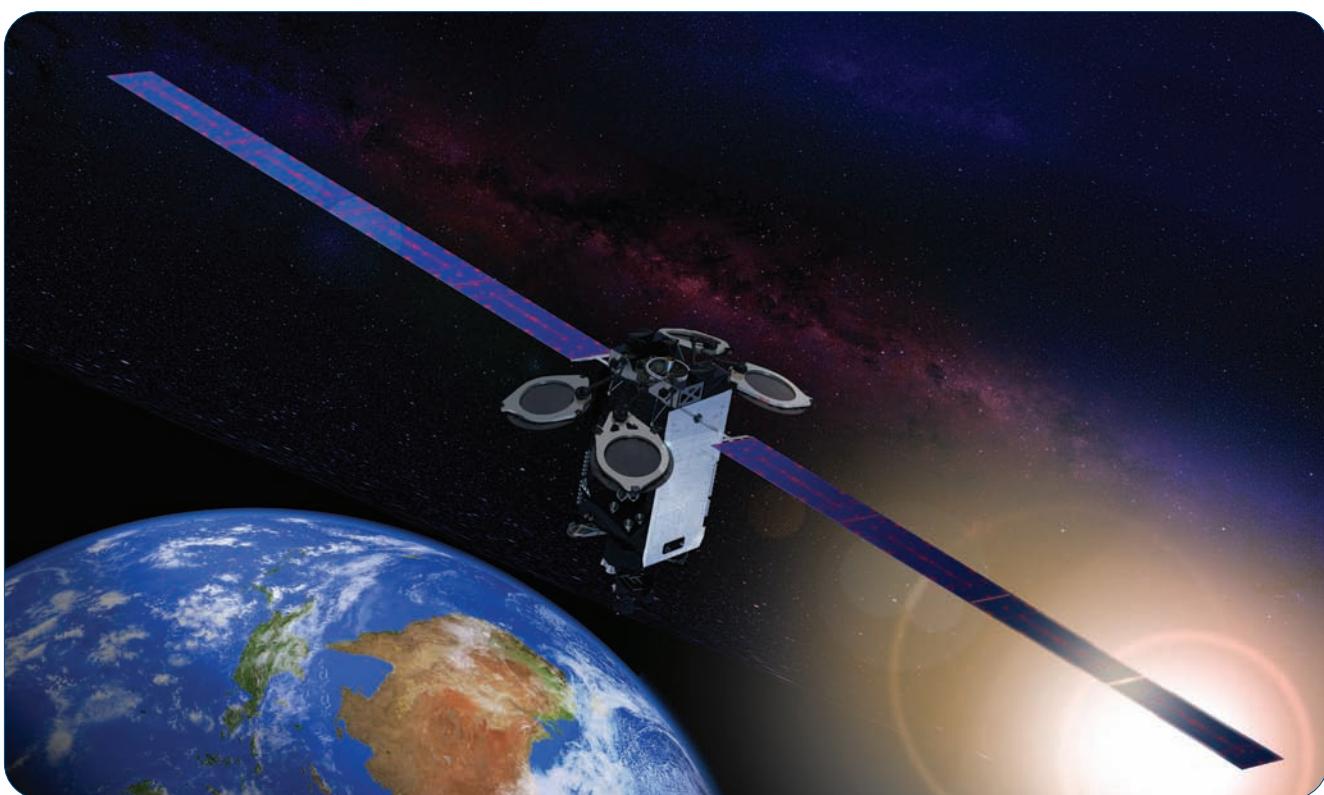
The training will leverage the AAC Clyde 13 years' experience in delivering nanosatellite solutions and aims to ensure the long-term presence of MRC in the international space community. It will significantly contribute to the knowledge of nanosatellite technologies in Mauritius.

"We're delighted to be part of this collaborative project which is a key enabler for space-based activities in the region. This project illustrates the accessibility of small satellite technology as well as its usefulness, as it transforms Mauritius into a spacefaring nation," says Iraklis Hatzithanasiou, VP Business Development AAC Clyde.

The Republic of Mauritius's pilot spacecraft is primarily a technology demonstration mission which will use a longwave infrared (LWIR) thermal camera (main payload) to collect images of Mauritius and the surrounding regions.

The mission also incorporates a secondary payload aiming to demonstrate communications capabilities through an S-band transmission system that will broadcast an update to an islet of the Republic of Mauritius using the on-board communication subsystem. The 1U satellite, MIR-SAT1, will be deployed from the International Space Station (ISS) through the Japanese experimental deployment module "Kibo".

"This is a key milestone in the development of our space-based capabilities, resources and networking within the global space industry. This project will promote and accelerate interest in small satellites technology in our country and would enable Mauritius to develop innovative solutions through data analytics and take informed decisions for a number of societal challenges, such as, connectivity with remote islands, active management of the Exclusive Economic Zone (EEZ) and crop yields improvement," says Dr Arjoon Suddhoo, Executive Director of MRC. ■



## Expanding your presence on a global scale

Intelsat, operator of the world's first globalized network, delivers high-quality, cost-effective video and broadband services anywhere in the world. With a fleet of around 50 satellites, Intelsat provides the most extensive and secure communications network. Kurt Riegelman, SVP of Sales and Marketing, outlines Intelsat's recent achievements in inflight connectivity, bridging the digital divide, and expanding its presence on a global scale.

**Question: It's been a busy year for Intelsat so far: Can you sum up the key achievements and landmark deals?**

**Kurt Riegelman:** We've come a long way in the past few years. We've talked a lot about trying to improve our performance, our economics, and our accessibility.

This year, we've launched and really taken to market Intelsat Epic<sup>NG</sup>. We've launched the fifth Epic<sup>NG</sup> satellite recently, and Horizons 3e, the final first-generation Epic<sup>NG</sup> satellite, was launched in September. It'll round out our global footprint and bring a huge amount of capacity and coverage over the Asia Pacific and the Pacific Ocean.

We've done a lot so far with Epic<sup>NG</sup>.

On the megahertz side, our customers have been seeing the gains that we expected, in throughput and efficiency, some 3-5 times more than their standard network was achieving. That's on both media and broadband. On the media side, Canal + has been put onto Intelsat 35e, and they've been able to bring more content and improve their value proposition over terrestrial competition. On the broadband side, we've moved forward with Vodacom Nigeria to help them with banking, oil and gas, and other corporate services. They'd been using different satellite services before but had really struggled in Ku-band in Nigeria with rain fade and other problems. With Epic<sup>NG</sup>, they've been able to go to smaller kit, so they're

now using 75cm and 1m antennas to really drive new service packages, and their customers are delighted. We're also working with Q-KON, which, relying on Intelsat 33e and IntelsatOne Flex for Enterprise, will rapidly deploy high-quality broadband that enables new services and applications for smaller businesses in several countries across the continent.

On the cellular backhaul side of things, we're looking at 5G, 4G, 3G and 2G. We've had several partners lining up 3G proof of concept sites with solar power. Because we can use smaller kit with lower power requirements, they don't need generators, and we can reduce the price. The recently-announced strategic investment in AMN



*Kurt Riegelman, SVP of Sales and Marketing, Intelsat*

(African Mobile Networks) will help develop mobile coverage in sub-Saharan Africa, starting with 2G, but with the ability to upgrade to 3G and 4G with minimal OPEX and CAPEX. Leveraging the power, performance and efficiencies generated by Intelsat Epic<sup>NG</sup> satellites, as well as the 23 Intelsat satellites covering the continent, AMN will connect sites, relying on a low-cost, small cell solution that is powered by a highly reliable solar-based system which can be rapidly deployed and installed in less than six hours.

On the services side, we've been rolling out IntelsatOne Flex globally, so as the Epic<sup>NG</sup> satellites came online, the platform has been right behind it. We've had huge growth with KVH, our maritime provider partner, from merchant ships to small vessels, and Marlink has been using it too. We've also just finished a demonstration with Speedcast showing 3.4Gbps delivery to a ship. A cruise connection five years ago may have been 10-20Mbps for 5,000 people, and now we're doing 3.4Gbps – that's pretty amazing. Also, Intelsat recently launched FlexExec, a managed end-to-end service that ensures a best-in-class connectivity experience to business jet passengers. FlexExec is unique in the sense that the network is committed to the business aviation sector, ensuring that service providers such as Satcom Direct - the first solution partner and master distributor to market FlexExec - provides business passengers with the same high speed, reliable broadband connectivity in the sky as they would at

home or in the office

In terms of what we're doing with initiatives, there's the 5G initiative in the USA, there's our work with OneWeb, Kymeta and Dejero. There's a lot of accessibility platform work that we've been advancing this year, and we're very excited about how 2018 is lining up.

**Question: The Horizons 3e satellite was recently launched into orbit. What can you tell us about the completion of Intelsat Epic<sup>NG</sup>'s global coverage, and the capabilities it will provide to clients?**

**Kurt Riegelman:** Horizons 3e is an Epic<sup>NG</sup>-class satellite, with a digital payload on board. That means it has ultimate flexibility between the C and Ku-band payload; a customer can upload in C-band anywhere in the

footprint and come down in Ku-band, in one beam or all the beams. It used to be that you'd have to connect the transponder to another transponder to make a physical linkage, but now it's all dynamic. We also have the ability to move power and capacity throughout the system. Most of our customers won't contract for that, but it allows us to move things around to be more flexible and meet changing demands. It allows us to do a better job for our customers overall.

**Question: Horizons 3e is a joint venture satellite between Intelsat and SKY Perfect JSAT Corporation, the fourth to date. Can you tell us about the benefits delivered to Intelsat by partaking in joint venture satellites?**

**Kurt Riegelman:** JSAT is a great partner. Typically, what happens with



*Photo courtesy of Intelsat*



JSAT is that they have their desired frequencies, we have ours, and we come together to build a more efficient satellite. In this case, we put the satellite up, and they wanted access and to better understand the Epic<sup>NG</sup> technology, the digital payload technology, but they didn't want to take a full step into that domain just yet. They also had some specific customers that they wanted to address and needed more capacity in that region, so we've been able to bring a joint demand model, a joint financing model, and also a joint technology model, and expand both of our businesses. It's always a great experience working with the JSAT team.

We have a lot of customers now in Japan that will be using Horizons 3e for cellular backhaul services, and we're looking throughout the region for media and data services. In the mobility area, our primary customers Gogo and Global Eagle Entertainment are looking into how to utilise that capacity for their route. It's going to be a workhorse satellite for us in terms of the coverage area.

**Question: C-band spectrum in the USA has been a hot topic in recent months, with Intelsat, SES and Eutelsat aligning on a market-based proposal for its future use. Can you outline Intelsat's stance on this development, and your expectations on 5G roll-out?**

**Kurt Riegelman:** We teamed up with Intel to take a leadership position in trying to manage this process to give our current customers clarity around the C-band spectrum, and also to accelerate 5G so that our current customers can use that as a distribution means for content. Our content customers over the last 3-5 years have said that 95 percent of the revenues are coming from programming that is distributed on our satellites, around US\$85 billion a year in the USA. Yes, they'll be doing OTT and other things in the future, but that's the situation right now. They want to know whether that spectrum will be there for the next 10-20 years because they need to plan. They also want to know what's going on with 5G.

We saw a mounting pressure from various parts of the Government who wanted that spectrum. The USA has to get into the 5G game, we have to start producing chipsets, we don't want to get behind on a global scale. We recognised this as a national imperative along with Intel, that we need to help this process move faster and protect our customers. We didn't want the FCC to shove something on us when we could instead be part of the solution.

What we proposed was pretty simple. We envisaged a market-based activity, which is going to take real Dollars to make real solutions to repack our customers, move things, and we're going to have to put up different kinds

of satellites, and do a lot on the ground to help get ready for a 'noisy neighbour.' We can't share that spectrum, but we can free up some of it because of what we're seeing our domestic customers do with compression. We're able to free up some of the spectrum and accelerate 5G.

When we first filed that, people were taken aback, but now, we have everyone on board with us; SES is on board, Eutelsat is on board, and Telesat is talking about it. We're putting a consortium together, so we can sit at the table and really work out the solution with the mobile wireless guys. We all have to implement this, and for us, as we go forwards, the key thing will be that we've got to file and go through the process with Congress. We've advocated for all of our customers to go to the FCC and register their downlink sites; one of the key things that the FCC is trying to determine is what the real penetration and use of C-band is today.

For us, it's all about making sure our customers have a non-interference environment to continue to work in. When we filed, we did so on the basis of three core principles; satellite has to remain primary in that spectrum, that there can't be interference, and that it must be market based. We won't let go of those principles.

**Question: What are the 5G implications for the rest of the world?**



Photo courtesy of Intelsat

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**Kurt Riegelman:** In many places, it's a different dynamic. The USA is unique for two reasons: There are two operators who control 95 percent of the licenced spectrum, and the bulk of programming distributed on C-band doesn't necessarily exist in other places.

In Latin America, there are different parts of the spectrum that have been assigned for mobile, and we expect that they'll focus on that first, and you don't have the recreation of that 95 percent between two players. No single country has that in Latin America. There are six or seven players, which is going to be much tougher to make this happen.

In Europe, it's already kind of happened. A lot of the spectrum is already on mobile, and it's the same situation in Japan. We're seeing Dubai take some steps at the moment to clear up some spectrum space. We're seeing other parts of the world advance, but in those cases, C-band wasn't used as much as it is today in the USA.

**Question: In June, Intelsat joined Smart Africa, a commitment to accelerate sustainable socio economic development on the continent through affordable access to broadband and ICT. Bridging the digital divide is a worthy aim: How exactly will Intelsat be getting involved?**

**Kurt Riegelman:** Intelsat has been a leader in Africa for 50 years. You can't lead if you're not at the table when people are making decisions about standards and programmes to enable world connectivity. We all know the statistics; four billion people are unconnected. Everybody is talking about 5G and IoT, and that's great, but we're still rolling out hundreds of 2G sites, which is why we're doing this initiative around solar.

How can we connect these villages and people that have never had connectivity before? It's not just about getting them on the Internet, it's about e-money, distance learning, e-health, it's all those things that come with it to help them build that infrastructure and lift up those villages. We want to be actively involved in that process and help them better look at funding sources and get that service running in the right way.

In Smart Africa, you've got governments, regulators, policy makers, entrepreneurs, technology companies, all working together. Everyone is going

to need to invest to develop this network. It's one thing to bring this technology in, but we need to close the business case for the MNO, and make sure it's sustainable for the people, and affordable long term.

If you look at what we're doing with Coca Cola, it's an all-round EKOCENTER. You have to bring a hub to the community, which as well as acting as a communications hub, is also supplying energy through the solar panels, fuels clean water, and boosts entrepreneurship for women, who are enlisted to own and operate these kiosks. These government programmes that drop off a terminal and walk away just don't work; a life has to be created around these systems. Making them a centre of commerce boosts growth and keeps them entrenched in the

community. That's true in Africa, Latin America and parts of Asia.

This is also what we're doing with AMN (African Mobile Networks) in which we've invested, as we believe that innovative models will help bridge the digital divide in the region. AMN provides MNOs with a network-as-a-service (NaaS) solution in which AMN will fund, build and operate the ultrarural network for the operators. As a result, African mobile operators will be able to extend their coverage with minimal OPEX and CAPEX risk, enabling them to grow their subscriber and revenue base, and better serve all their customers.

**Question: Back in July, Intelsat joined the Seamless Air Alliance, a consortium dedicated to the**



Photo courtesy of Intelsat



**development and promotion of standards to facilitate a better inflight connectivity experience for passengers. What can you tell us about this move, and your expectations of the inflight connectivity market going forwards?**

**Kurt Riegelman:** Within our industry, everyone is seeing growth in mobility. For us, it was important to be at the table with the Seamless Air Alliance because we're going to be setting standards around 3GPP in the plane. We are the distribution arm for OneWeb in aero, so we need to be involved in that discussion so that we can understand.

Our view is that it's a hybrid service going forwards, a LEO/GEO service. We like OneWeb because it's in our roadmap in terms of Ku-band technology, but it's also a differentiated service in the sense that it's not just more; it does have a lower latency, some unique capabilities such as pole-to-pole coverage that we can tie with our GEO coverage to do some unique things.

What I like about the Seamless Air Alliance is that the working groups are where we're going to make a difference, because one of the key working groups

is the user experience. It's about making it easier, seamless, for a consumer to board an aircraft and just turn on and be connected on any device.

The whole point is to stop the on-board fuss with a credit card and setting up accounts. We need a seamless back office so that we can get the different standards and scale, reduce the costs, and also improve the reliability of service.

**Question: What are your expectations for 2019 and beyond?**

**Kurt Riegelman:** We're going to continue our march on Epic<sup>NG</sup>, and we'll be looking at Epic<sup>NG</sup> 2.0. As we look at all the manufacturers and think about software defined satellites, the ability to reduce the cycle time and increase the flexibility for ourselves and our customers, that's something we'll be working on.

We're going to continue to execute on the programmes we have today. IntelsatOne Flex is our managed services platform, so we'll be driving our customers to that, as well as expanding our maritime, broadband and enterprise services worlds. We're also going to be

pushing further into the things we're doing with Kymeta, helping them get those terminals out. With Dejero, we'll be forging ahead with that bonded cellular product that we're adding satellite to, and we're looking to move that into OneWeb as well so that we can have a really flexible hybrid solution.

Regarding our cellular backhaul customers, we'll be doing more around 2G and 3G, and helping expand those footprints.

We also have our first mission extension vehicle (MEV) coming online with Orbital ATK, which will be launching in 2019. The MEV will connect with one of our nine series satellites out of orbit, and then move back into orbit. The second MEV will connect directly in orbit. It's going to be another industry first. Those satellites are still performing very well, and we're waiting for other technologies to mature just a little bit more before we move onto Epic<sup>NG</sup> 2.0 in a year or two. We'll probably end up with the new satellites at the same time anyway because these software defined satellites are much faster to produce. It's a much better economic system for everybody. ■



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# Meeting the needs of the customer

ViaLite Communications, a division of Pulse, Power & Measurement Ltd (PPM), designs and manufactures RF over fibre links and systems to meet a wide range of applications, including satellite teleports, downlinks, VSAT, inter-facility linking, cellular network timing, broadcast and GPS timing signal distribution. Gary Wade, Product Manager at ViaLite, comments on recent developments in the satellite sector, and ViaLite's evolving role within it.

**Question: It's been a busy few years for ViaLite – Can you share with us some of the highlights and key milestones you've achieved?**

**Gary Wade:** A few years ago, we created objectives for the ViaLite business to increase our coverage in the top teleport operators globally, and to be able to support customers locally in the most active regions; USA, Europe, Middle-East and Asia-Pacific. We've made significant progress against both these objectives with key achievements including supplying the top seven teleport operators worldwide and adding excellent customer channel partners such as Eurosatcom in France.

In terms of products, the market continues to develop towards wider bandwidths, higher frequency and superior dynamic range.

Over this period, we've made a number of announcements around our Hyper Wide Dynamic Range (HWDR) products, Ultra-wideband products which reach C-band downlink, and adjacent products to support the implementation of long-distance links up to 600km for K-band systems.

As higher frequencies such as Ka, Q and V-band systems become more commonplace, rain fade is going to be a bigger and bigger problem, so I think we'll see more fibre installed between diverse sites.

Whether this will be done at L-band as it is currently done, or native frequencies, is yet to be seen; we hear that the first of these Q/V-band satellites will be going up in a couple of years, so

it's important that we're ahead of the curve. No one makes Q/V-band RF over fibre yet, and I'm interested to see whether it's even possible. This is very high frequency we're talking about, after all.

**Question: In August 2018, ViaLite launched its new ODE-A4 range of outdoor enclosures. What can you tell us about this new family of products?**

**Gary Wade:** This has been one of the key areas we've been focusing on; ensuring that we have ViaLiteHD product replacements for our older ViaLite Classic range. We have essentially upgraded our existing outdoor product, which was only designed to house our ViaLite Classic product. We took that older tried and tested package and improved it to have more functionality and higher module density using our ViaLite HD range. This is both a benefit to our customers and

also allows us to move towards an end of life for the Classic product line that we have been manufacturing since 1999.

The ODE-A4 is a simple turnkey solution. There's a VSAT version with up and downlinks and a 10MHz reference option. The connectors on the bottom are all plug and play rather than having to splice delicate fibre optic cables in the field, which are tricky and can also be quite expensive. We've also got a Quad LNB version. This basically takes all four polarizations from LNB straight into the enclosure and sends those signals over fibre. The ODE-A4 was designed with the intention of making RF over fibre easier for our customers to install.

**Question: The satellite market is key to ViaLite's ongoing success, but it's in a major state of flux right now as we move from high throughput satellites (HTS) to extreme**



ViaLite VSAT package



ViaLiteHD 3U Rack Chassis

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Gary Wade, Product Manager at ViaLite

### throughput satellites (XTS), CubeSats and mega-constellations. What impact do these changes have on ViaLite's operations?

**Gary Wade:** Our high dynamic range link is being utilised for HTS globally; we created wider dynamic range products specifically for that application, to meet the new bandwidth demands. In the past, the small dynamic range was fine for 36MHz carriers, but we've now got customers using 1,200-1,500MHz, which needs that higher dynamic range. The change to HTS has really played to our strengths there and we have a good foothold in the market.

Low Earth orbit (LEO) constellations are coming to life, with the first iterations being launched recently. A lot is changing as that comes to fruition. The complications with the number of sites and antennas mean that we hope to be seeing a lot more fibre transmissions to keep those sites connected. It should be a great opportunity for us.

Although satcom remains a large

market for us, we are also doing a lot in non-satcom markets as well right now. We have a GPS product which is being used a lot more in banking and finance institutions, where new rules about GPS timing have come into play. There's also the broadcast solutions sector, where our wireless camera and microphone link products are doing very well right now. It is really helpful to us that we can do a lot with similar products in different vertical markets.

**Question:** We understand that ViaLite has also recently launched a new local RF distribution unit; can you give us more detail on this product?

**Gary Wade:** The idea is that we have a GPS antenna outside, attached to the ODE-A4 enclosure, with one or two antennas for redundancy. The system uses an optical lossless splitter which means the RF over fibre signal can be split out to multiple locations, floors or rooms – up to 64 ways. Optical splitting is ideal when you want to create a wide area signal distribution. When you get into a room, for example, you can then add our second new RF splitter product which takes in the RF over fibre and outputs up to 32 separate GPS signals to go into customer equipment. So, the RF splitter product is a local (sub 20 meter) distribution of the signal so works within the constraints of higher coax losses.

On the satellite side, the same system can be used for 10MHz distribution. That means that, in the teleport, there could be one master station clock that everything gets timed and synchronised to, supplying 10MHz reference signals all over a site; to shelters and antennas via optical splitting.

Then locally that is split down further



into short lengths, into the satcom elements in the chain that need reference timing. The distribution unit can interconnect antennas, modems, LNB's, BUC's - everything really. The important thing is that there's no loss because it's over fibre, so the same level and the same reference signal can be provided to every piece of equipment simultaneously.

**Question:** What's on the horizon for ViaLite in 2019 and beyond?

**Gary Wade:** Referring back to the first question about our key achievements in the last few years, you can see we are a market and customer-led business. Right now, what we can see is a continuing trend to work in higher frequencies, provide easy-to-implement long distance links to enable antenna diversity, and provide more visibility and control across the entire link. And then to do this in a smaller, more cost-effective, and faster turnaround solution. This is what our customers ask for! ■



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*LeoSat low Earth orbit satellites*

## Developing new satellite constellations

Satellite constellations are big business right now. Gone are the days when constellations were strictly for Earth observation or telephony services, today's newcomers plan to bring broadband Internet connectivity to the masses, bridging the digital divide, or deliver high-quality, enterprise-grade connectivity services with unparalleled security.

**Constellations of small satellites have proven** extremely newsworthy in recent years as several private companies have decided to get in on the action. The attraction is clear; medium Earth orbit (MEO) or low Earth orbit (LEO) satellites can be launched in series to provide ubiquitous, global coverage of the Earth, offering fibre-like connectivity speeds and lower latency than traditional GEO satellites.

We talk about satellite constellations with the same reverence as 5G, 4K and reusable launch vehicles, but they're not really that new. The Global Positioning System (GPS), Galileo and GLONASS constellations have all been providing essential services for some time now, while the Iridium and Globalstar constellations have been utilised for years to provide telephony services.

Today's new wave of constellations are more of a concept revival than a brand-new innovation. A rebranding, if you will. We're moving on from essential services, with most of the latest constellations focusing instead upon delivering next generation fibre-like services from space; Internet for everyone, connecting the unconnected, is the main focus.

MEO and LEO constellations offer a number of

advantages over GEO satellites. The main advantage, the one that everyone seems to have a very definite opinion on, is latency. With GEO satellites, latency is around 125ms, compared with about 1-4ms (in theory) for LEO satellites. Supporters believe that this lower latency, delivering 'terrestrial connectivity from the sky' will be absolutely vital for certain services going forwards, such as banking, betting, and military applications. On the other hand, naysayers argue that latency is a red herring, that it is unimportant for most applications. Whatever your point of view, there's no denying that there is a significant latency difference.

On the flip side, LEO constellations are much more complex operationally speaking. Near-global coverage can be provided by three GEO satellites, whereas for LEO satellites, tens are required to deliver the same coverage. Of course, with more satellites and smaller beams, more handovers are required, and more technologically-advanced antennas and tracking capabilities are an absolute must to enable these constellations.

Launch opportunities are another significant challenge. While several small satellites can be launched simultaneously



on the same vehicle, with more than 5,000 small satellites expected for launch in the next few years, launch providers are currently unable to meet demand. Additionally, MEO and LEO satellites have much higher refresh rates – we're talking about 1-5 year lifetimes per satellite, compared with 15-20 years for GEO satellites, placing further pressure on launch providers.

There's also the known unknowns. A number of experts have voiced concerns over the 'shielding effects' of LEO constellations. In a world where satellite interference remains a constant challenge, no one is really too sure how the introduction of thousands of small satellites into MEO and LEO will affect existing GEO satellites. Concerns over signal shielding and interference have been raised, but accurate modelling of these potential challenges has yet to be completed.

It's true that bringing new MEO and LEO constellations into operations is no simple project. However, that hasn't put off today's group of intrepid satellite operators from making plans.

### O3b Networks augments capacity, prepares for mPOWER

O3b Networks Ltd. is a unique MEO satellite constellation, and the only modern-day small satellite constellation currently operational. O3b ('the Other 3 Billion') aims to deliver voice and data communications to mobile operators and Internet service providers, helping bridge the digital divide. The company was acquired by SES back in 2016.

The most recent four Ka-band O3b satellites were launched to augment the existing constellation in March, bringing the total number of satellites up to 16. The addition has added 38 percent more capacity across the globe, helping to grow O3b's market from +/- 45 to +/- 50 degrees latitude. Like all the other O3b satellites before them, the newest four satellites were built by Thales Alenia Space, and are now orbiting some 8,062km above the Earth. The next four satellites are expected to augment the constellation in the first half of 2019.



In March, ALCAN, Isotropic Systems and Viasat were introduced as new technology partners for SES' upcoming next-generation O3b mPOWER constellation. The three companies have been contracted to develop smart, high-throughput terminal solutions, a building block in the system's ground infrastructure innovation roadmap.

The unique O3b mPOWER system, announced in 2017, will be based around seven 'super-powered' MEO satellites, with more than 30,000 dynamic, electronically-generated fully-shapeable and steerable beams that can be shifted and switched in real time. Delivering multiple Terabits of throughput globally, the Boeing-built fleet is scheduled for launch in 2021 and is scalable to multiple terabits of throughput globally, providing coverage to an area of nearly 400 million square kilometres.

Developed with leading technology partners, O3b mPOWER Customer Edge Terminals (CET) will combine innovative steerable antenna technology with functionality spanning modem, networking and edge compute capabilities. The O3b mPOWER CET will deliver advanced network capability in form factors optimized for market specific cost, performance and power that are quick and simple to install.

"O3b mPOWER is designed to provide cloud-scale connectivity through a 'virtual fibre' network for application-aware services on a global scale," said John-Paul Hemingway, Executive Vice President of Product, Marketing and Strategy for SES Networks. "We believe that working closely with partners like ALCAN, Isotropic Systems and Viasat in a robust development ecosystem will enable us to introduce the latest innovations and greatest cost-efficiencies across multiple market segments at great scale."

Further expanding O3b's reach, in June, SES was granted authorization to serve the US market using a significantly expanded O3b fleet in MEO by the FCC. The FCC grant opens significant additional frequencies for use in SES' NGSO constellation and enables it to deploy O3b mPOWER satellites into inclined and equatorial orbits, delivering full global pole-to-pole coverage. A total of 26 new O3b satellites are authorized, in addition to the 16 satellites already operational and in orbit. The grant allows SES to add four satellites to its existing O3b constellation, which are scheduled for launch next year, and provides the framework for SES to triple its next-generation O3b mPOWER fleet by giving US market access for another 22 super-powered satellites.

"This important FCC grant provides SES with the means to grow and scale our network, connecting the planet and delivering world class solutions to our customers globally," said Steve Collar, President and CEO of SES. "With the first seven O3b mPOWER satellites, we will deliver a paradigm shift in performance, bandwidth and service. The FCC grant provides the platform to exponentially scale the network in response to surging demand for global data connectivity."

### OneWeb ramps up preparations for first launches

OneWeb Satellites, a joint venture between OneWeb and Airbus Defence and Space, will see the installation of a constellation of LEO satellites to provide a global broadband Internet service to consumers starting in 2019. The joint venture aims to bring affordable broadband to millions of households, schools and other end users around the world; with more than half of the world still lacking access to affordable, reliable Internet, OneWeb's service is demonstrative of its commitment to bridging the digital divide.



## ....Satellite Constellations

The constellation will consist of around 882 Ku-band satellites orbiting some 1,200km above the Earth, at an estimated cost of US\$3 billion. According to reports, most of the capacity on the initial 648 satellites has already been sold. Launch of the first satellites for the constellation was expected to start in 2018, with services starting up in every rural home in Alaska 2019.

Back in June 2017, OneWeb made history with the launch of its assembly line in Toulouse, to begin end-to-end validation, testing, and integration of its first satellites. The 4,600 square meters Toulouse facility will serve to validate the production methods necessary to manufacture high-performance satellites at a scale never achieved before, de-risk any potential issues, and lay the framework for the larger multi-line OneWeb Satellites factory near the Kennedy Space Center, Florida. The initial 10 pilot and Toulouse-built satellites, after having undergone a comprehensive set of tests, will become the first of OneWeb's fleet.

The assembly line includes state-of-the-art automation, test equipment and data acquisition capabilities to shorten assembly times and provide means to analyse factory performance and process improvements. The satellites will

provide valuable in-orbit data to confirm the design of the spacecraft and proceed with fine tune adjustments if necessary. They will also enable nearly real-time detection and correction of any anomalies in the manufacturing process.

"We have just about nine months until the first of our fleet launches into orbit," said Greg Wyler, Founder and Chairman of OneWeb. "Then, if all goes well, we will begin the world's largest launch campaign, sending new satellites up every 21 days, and building not just a fleet but a digital bridge to enable affordable broadband access for the billions of unconnected around the world."

As well as building the fleet of satellites, OneWeb Satellites will provide customized versions of these ultra-high-performance satellites, platforms and core technologies to Airbus to support their third-party sales to other commercial and government operators globally. The mini satellites, coming from the huge production line, will enable new cost and performance paradigms for those looking to benefit from the advantages satellites can bring to Earth observation, sensor and telecommunications markets.

In December 2017, Hughes Network Systems, LLC signed a US\$190 million contract with OneWeb for the



Telesat constellation



production of a ground network system to support OneWeb's satellite constellation. The contract builds on the original system development agreement between the companies signed in June 2015, bringing the total value of both to more than US\$300 million. It includes production of the gateway sites each with multiple tracking satellite access points to support operation and hand-off of high-speed user traffic between satellites.

"Designing a ground system capable of supporting hundreds of LEOs with seamless hand-off of broadband traffic between satellites presented a significant challenge," said John Corrigan, Senior Vice President of Engineering for Hughes. "But our team was up to the task, and we are proud to be partnering with OneWeb on realizing this revolutionary satellite communications system to close the global digital divide."

Later in March, the shipment of the first gateways was reported. The Gateways feature multiple tracking antennas to support operation and hand-off of high-speed user traffic to and from the LEO satellites, as well as a custom switching complex, outdoor modems and power amplifiers. Each gateway will handle up to 10,000 seamless terminal hand-offs per second, a technological and engineering breakthrough.

**Telesat makes first steps in bringing constellation to life**  
Telesat is developing a global LEO constellation that will, according to the company, revolutionize broadband communications services. Telesat's state-of-the-art LEO constellation will combine the company's global spectrum rights in Ka-band, granted by the FCC in November 2017, with Telesat's proprietary LEO architecture to transform global communications. Telesat LEO will offer an unsurpassed combination of capacity, speed, security, resiliency and low cost with latency that is as good as, or better than, the most advanced terrestrial networks. The company aims to accelerate 5G expansion, bridge the digital divide with fibre-like high speed services into rural and remote communities, and set new levels of performance for commercial and government broadband on land, sea and in the air. The initial constellation will consist of approximately 120 satellites by 2021 and Telesat is evaluating options to expand its system beyond this initial configuration.

Telesat's first LEO satellite, Telesat Phase 1, was transported to the Vostochny Cosmodrome in Eastern Russia for launch on board a Soyuz-2 vehicle in November 2017. However, towards the end of the month, the SSL-built satellite's launch vehicle failed. Indeed, it wasn't until January when Telesat was able to get started with the launch of its first Telesat Phase 1 LEO satellite on board a Polar Satellite Launch Vehicle (PSLV) with the Indian Space Research Organisation (ISRO). The company's Phase 1 testing will demonstrate key features of Telesat's LEO system design, in particular the capability of the satellite and customer terminals to deliver a low-latency broadband experience that MEO and GEO satellites reportedly cannot provide. Telesat has installed ground infrastructure at its teleport in Allan Park in Canada to support testing and has customers in growing enterprise segments who will be participating in trials during 2018.

"Telesat has a long record of industry firsts that have brought major satellite innovations to market and our LEO constellation will be another breakthrough that transforms global communications," said Dan Goldberg, Telesat's President and CEO. "The launch of our Phase 1 satellite is

the starting point in making our next generation LEO system a reality and we thank SSTL and ISRO for the success of the mission to date. Telesat is uniquely positioned to deliver the world's most advanced and capable LEO constellation given our deep technical expertise, strong track record of innovation, senior spectrum rights, and laser-like focus on customer service and support. We look forward to beginning customer trials on Telesat LEO and continuing to collaborate with industrial partners as we work to deploy a state-of-the-art, high capacity network that will deliver transformative, low latency, fibre-like broadband to commercial and government users throughout the world."

Several companies took part in the testing of the Telesat Phase 1 satellite. OmniAccess and Optus both came on board for the trials to test whether the ultra-low latency and high speeds could be successfully incorporated into their existing infrastructure. In March, Telesat announced that it had completed its orbit raising and payload testing for the Phase 1 satellite.

"Telesat is pleased to have signed a number of highly

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respected, industry leaders who are eager to participate in live trials on Telesat's Phase 1 LEO satellite," said Dave Wendling, Telesat's Chief Technical Officer. "We're equally pleased to begin Phase 1 LEO testing and demonstrate the transformative capabilities that Telesat's LEO constellation will deliver, including far higher data rates with superior latency at low cost. Not only will the broadband experience of Telesat's LEO system be on par with advanced terrestrial networks but, for the first time ever, it will enable the availability of high performing broadband on a global basis. We look forward to beginning customer trials and continuing to collaborate with industrial partners in optimizing our space and ground capabilities as we work to deploy a high capacity network that will deliver low latency, fibre-like broadband to commercial and government users throughout the world."

Later in May, Telesat and Global Eagle Entertainment agreed to collaborate in optimizing the capabilities of Telesat's LEO constellation to serve growing broadband requirements of maritime and aeronautical markets. The collaboration will include user terminal development, service-offering design, marketing, in-flight testing and at-sea performance testing. Telesat and Global Eagle will work together on design and testing activities for Telesat's planned LEO constellation using Telesat's recently launched Phase 1 LEO satellite. The parties will focus on airline and large cruise ship applications in polar and high-latitude regions, and passenger use-cases globally that leverage sub-50ms latency for data-intensive applications. For aviation, Global Eagle will be testing its newly-developed Ka-band antenna.

More recently in August, Telesat entered into an agreement with Airbus Defence and Space to further develop the system design for Telesat's LEO constellation. This followed closely on Telesat's July announcement that it has signed the consortium of Thales Alenia Space and Maxar to undertake a similar scope of work on Telesat's LEO program. Telesat now has two separate teams, comprised of industry leading satellite manufacturing companies, which will work in close cooperation with Telesat over the following months

in a series of engineering activities and technical reviews. These efforts will culminate in each team submitting a firm proposal for final design and manufacture of Telesat's LEO satellites and ground system infrastructure. Telesat anticipates deciding by mid-2019 on a prime contractor for Telesat's LEO program – space segment, ground segment and system integration.

"Airbus has built a tremendous record in satellite manufacturing and Telesat is pleased to have concluded this agreement that will result in Airbus further developing their design and submitting a final proposal for Telesat's full LEO system, both space and ground segment," said Erwin Hudson, Vice President of Telesat LEO. "We now have two outstanding teams – Airbus and Thales Alenia Space-Maxar – supporting Telesat LEO. Each brings a broad range of technical skills and experience along with a strong belief in the project and a commitment to its success. Telesat looks forward to this next phase of the program and to selecting a prime contractor to develop our LEO space and ground infrastructure."

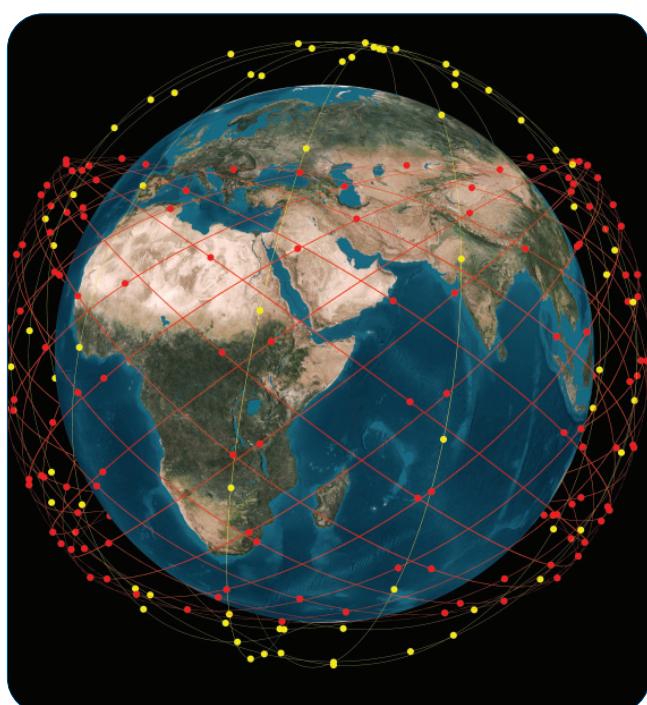
#### **LeoSat Enterprises gains global support and key investors**

LeoSat Enterprises is another start-up company planning to launch a constellation of small satellites in LEO. Unlike other LEO constellations, LeoSat's system will feature a unique architecture utilizing inter-satellite laser links to connect the satellites, creating fibre-like symmetry at Gigabit speeds, while providing total security as the data is encrypted and secured from end-to-end across the network, with no terrestrial touch points.

"We believe that what we're doing makes sense because we're trying to replicate what's happening on the ground, in space. We're taking switches, routers, and putting them into space. That's so unique in this industry that I'm sometimes surprised to find out that we continue to be the only ones taking that approach. We're taking routers into space, and we're doing all the packet switching up there – we're essentially combining the good things of fibre with the good parts of satellites and turning that into something that I think will be a game-changer in this transition period. It's a technology that is relevant for data, and that opens a whole new market for satellite that the industry has been struggling to get into," said Ronald van der Breggen, Chief Commercial Officer at LeoSat.

LeoSat is currently working with Thales Alenia Space to finalize the manufacturing plan for the production and deployment of the entire constellation. According to van der Breggen, the constellation will consist of 78 satellites, divided into six polar orbits 20 degree apart. Each orbit will have 13 satellites in it, 12 functioning and one spare – that's 84 satellites in total. Each satellite can handle almost 30Gbps of full duplex data. "The reason we're working in duplex is because if you want to be relevant to any terrestrial advancements, you need to be providing full duplex synchronous capacity," explained van der Breggen. The full constellation is expected to provide about 2Tbps of capacity. Launches are expected to begin in 2021 and be completed in 2022.

Despite still working on its Round A funding, LeoSat has secured two extremely respectable investors. The first came back in May 2017, when it was announced that SKY Perfect JSAT Corporation (SJC), Asia's largest satellite operator, had invested in LeoSat, making it the first Asian operator investing in LEO capabilities. The investment in LeoSat and the



Telesat constellation

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## ....Satellite Constellations



agreement to jointly market this new system allows SJC to pursue new business opportunities in the data and mobility markets in sectors such as telecommunications, multinational enterprise, maritime and government services by providing previously unavailable levels of network performance combined with worldwide reach and allows the company to further study the additional applications of LEO communications in pursuit of its global ambitions.

"SJC sees the strategic importance of aggressively participating in the LEO/HTS business and we see the LeoSat solution as a key opportunity to opening up new markets and delivering business growth. With the current and future growth of data traffic and the unique nature of the LeoSat system and its focus on the business market, we believe there will be very strong demand for the LeoSat solution. This investment and development partnership with LeoSat will allow SJC to expand and complement our existing GEO satellite services and beyond by enabling us to respond to customer needs which are not being met by today's technology," said Koki Koyama, Senior Managing Executive Officer of SJC.

The second investment came in July 2018, when Spanish satellite operator Hispasat announced plans to invest in LeoSat in order to future-proof its communications solutions through the development of LEO capabilities. With the investment in LeoSat, Hispasat finds a perfect complement for its geostationary fleet and expands its scope significantly towards new verticals that will define the data market over the next years. The investment in LeoSat underlines its firm belief in the unique attributes of LeoSat's new LEO network architecture to ensure further growth in the future. Hispasat will work with LeoSat to accelerate a number of key activities including, vendor selections for customer premise equipment and ground operations, as well as further optimization of the satellite platform.

"With the current and future growth of data traffic, we see the strategic importance of investing in new infrastructure to enable our existing and future customers to substantially increase their communications capabilities," said Carlos Espinós, CEO of Hispasat. "LeoSat has distinguishing features from the other constellations that makes it especially interesting: high capacity, low latency, high security and a meshed network that simplifies its architecture. LeoSat's system design, combining satellite and networking technology

to provide a network in space, is a departure from existing solutions today and we see this as a key opportunity for us to open-up new markets and deliver business growth. This investment in LeoSat demonstrates our belief that there will be very strong demand for LeoSat as it is the best solution to address the enterprise market. It will allow Hispasat to strengthen and expand our existing GEO satellite services and position the company at the forefront of the new digital infrastructure."

Considering that LeoSat has yet to make the first steps in launching its constellation, the company has an impressive number of deals already lined up.

LeoSat has entered into a strategic agreement with Supernet, Pakistan's leading satellite network service provider and systems integrator specializing in end-to-end satellite-based GSM backhaul and enterprise networks. Through this agreement, LeoSat will provide Supernet with over 3Gbps of capacity on its unique LEO network infrastructure, enabling Supernet to offer a full portfolio of local to global integrated communications solutions to facilitate the key business processes of corporate, SME and individual customers.

In December 2017, meanwhile, LeoSat entered into an agreement with DCS Telecom, a leading telecoms provider of satellite and networking solutions in the Middle East, Africa and Asia, to upgrade its existing satellite solutions, giving customers access to a unique low-latency network which is expected to revolutionize data connectivity. For DCS' enterprise customers, the key attributes of the LeoSat system can be used for a number of applications, for example, to give banks secured networks with their foreign offices, provide enormous uploading bandwidth for oil and gas exploration, enable seamless connectivity for shipping and fleet management or provide the only native 4G and 5G satellite backhaul connectivity for cellular operators. LeoSat can not only offer competitive advantage in existing satellite services markets in the MENA region and beyond, it will help expand these markets by enabling new opportunities through previously unavailable levels of performance combined with worldwide reach.

In the same month, LeoSat signed a Memorandum of Understanding (MoU) with Globecomm Systems Inc., which provides global connectivity services to the enterprise, oil and gas, maritime and government markets. "We strongly believe in offering the smartest connectivity solutions to our customers, and with capabilities beyond satellite and fibre, LeoSat represents the next generation of high-performance communications networks," said Chief Commercial Officer Bryan McGuirk of Globecomm.

Another interesting deal was announced in March, when Phasor and LeoSat announced their entry into a milestone agreement to serve a broad range of mission-critical enterprise network markets with an ultra-high throughput, low latency network infrastructure solution. As part of the collaborative alliance, Phasor will develop a powerful Ka-band, Non-Geosynchronous (NGSO) –ready version of its breakthrough low-profile electronically steerable antenna (ESA), scalable to virtually any use-case requirement.

"This landmark agreement between LeoSat and Phasor opens the door to a whole new level of high-powered communications networks capable of unleashing unprecedented connectivity for enterprise network markets around the world," explained David Helfgott, Phasor CEO. "Phasor's electronically-steered antenna technology is

## Satellite Constellations....



incredibly versatile and scalable – a perfect match for LeoSat's constellation in meeting diverse demands for big data and high-speed connectivity."

In the same month, network solutions provider Signalhorn and LeoSat entered into yet another impressive services agreement. "At Signalhorn we believe in doing everything we can to make the network solutions we offer to our customers better. This drive for excellence fuels our choice of products and we are therefore delighted to add LeoSat's next generation architecture to our existing portfolio of innovative communications solutions. By combining the best of satellite with the attributes of terrestrial networks we see a whole host of new opportunities for our customers," said Michael Biederer, VP Operations & Customer Care of Signalhorn.

### SpaceX launches Starlink demonstration satellites

Never one to be left behind when it comes to the next 'big thing,' SpaceX too is getting in on the small satellite constellation action. The company announced plans for its Starlink constellation back in 2015, and more details have emerged over the years.

In 2017, SpaceX submitted regulatory filings for the launch of almost 12,000 satellites into orbit by the mid-2020s. This 12,000 included 4,425 satellites for the Starlink constellation, to orbit at around 1,200km above the Earth, and an additional 7,500 V-band satellites, to orbit at around 340km above the Earth, to provide communications services.

Starlink's raison d'être is to support a low-cost, satellite-based broadband network capable of delivering Internet access to the entire world, costing around US\$10 billion in total. Like LeoSat, SpaceX plans to utilize inter-satellite links between its Ka and Ku-band Starlink satellites, in addition to phased array beam forming technologies. Latencies of 25-

35ms are expected for the so-called 'mega-constellation.' SpaceX Founder and CEO Elon Musk has previously commented that Starlink's services will help raise funds to support his longer-term mission to Mars.

In February, SpaceX successfully launched Tintin A and Tintin B, the first two demonstration satellites for the Starlink constellation. Launched on the Falcon 9 vehicle, Tintin A and B are expected to orbit for 6-12 months, communicating with three testing ground stations in Washington and California. Following the demonstration, in March, the FCC approved the official request for the Starlink constellation, with some conditions. SpaceX also has yet to gain separate approval from the ITU.

### Rumours of Facebook's Athena constellation confirmed

Another company keen not to be left behind, and now talking about planning its own constellation, is Facebook. In July, Facebook announced plans for its first constellation of LEO satellites, called Athena.

In response to a Freedom of Information Act request filed by American technology magazine WIRED, Facebook's plans to launch Athena were confirmed. The constellation is designed to 'efficiently provide broadband access to unserved and underserved areas throughout the world,' according to an application filed by Facebook with the FCC.

Responding directly to a request for further details from WIRED, a Facebook person stated: "While we have nothing to share about specific projects at this time, we believe satellite technology will be an important enabler of the next generation of broadband infrastructure, making it possible to bring broadband connectivity to rural regions where internet connectivity is lacking or non-existent."

To date, no further information has been reported, so we'll have to wait and see what Facebook is cooking up. ■

SpaceX's first two Starlink prototype satellites





Photo courtesy of Shutterstock

## Businesses save millions with just a few lines of code

Broadcasting technology has advanced significantly in recent years, while flexibility for consumers has boomed. Dmitry Shubaev, Co-Founder of Teleport Media, outlines the challenges of delivering content effectively to a large number of consumers, and presents a ready-made solution already utilized by many leading broadcasters.

**A naturally growing audience is a welcome result** for any owner of streaming services. Preferably the growth is predictable and manageable, as it can be detrimental when growth is out of control, leading to unexpected resource drains. Such spikes in demand can downgrade the quality of service, which can result in service interruptions, which in turn diminishes the user experience. There are solutions on the market which manage media content streams without straining the delivery infrastructure.

### Media content is king

For Internet broadcasters, media content is king, thus delivery quality is a critical parameter. Media formats are evolving constantly, adapting to new delivery channels, which are in turn evolving as well. Often media formats evolve more rapidly than delivery channels, with new and complex media formats challenging the broadcasters, who are always striving to grow and retain their audiences.

Broadcasting executives are therefore constantly thinking about how to achieve unparalleled global reach, improved scale, and higher viewing quality, while at the same time significantly reducing the operational expenses associated with running their online video platform.

Clearly, the cost of the broadcasting infrastructure is one of the largest operating costs for any Internet broadcaster. Foremost is the cost of content delivery services (or networks - CDNs), and, therefore, of the resulting traffic, which increases exponentially as the video stream quality (bitrate) increases. Each online video streaming website and application is faced with the same challenge – how to deliver substantial traffic to every user with the highest quality at the best price. In general, there are two ways to achieve that: Either to build in-house data-centers and manage the connection with ISPs or to use third-party CDNs.

Today, the majority of media companies that supply Internet broadcasting services for video streaming to end

## Broadcasting Technology....



users employ standard CDNs, which have a number of obvious restrictions of scale: Decreases in quality during spikes in usage, limited capacity, and high costs of growth. Having huge numbers of users is both a blessing and a problem. Despite the obvious benefits of audience growth, live streaming participants are faced with problems of image quality degradation, frame freezing and glitching, and CDN performance slumps during demand spikes.

### A ready-made solution

However, there is already a solution that makes converting a huge number of online viewers into an advantage and a reason for ensuring a stable and completely balanced delivery channel. All users who participate in a network 'organically guarantee' the capacity of the whole delivery network, increasing it when demand grows. Thus, a distributed P2P network becomes a pledge and guarantee of high quality video delivery through a decentralized or peer-to-peer network, no matter how large the audience.

This solution already works on hundreds of thousands of devices every day. Online TV and video streaming services that purchase this type of service save money on traffic delivery, handle spikes during major events and maintain a high-quality level of service. This type of service delivers video streams to end users through a P2P-distribution layered over the broadcaster's existing CDN topology, that is built in real-time as the network of simultaneous consuming browsers and devices grows.

### Moving from CDN to P2P

Teleport Media is one such company specializing in delivering a stable solution, currently utilized by a significant number of leading Internet broadcasting services.

A couple of lines of JavaScript (JS) code are integrated into the broadcasters site and the P2P platform immediately starts to build a highly distributed mesh architecture network in order to relocate most of the bandwidth from the CDN to the P2P. This ensures more reliable, scalable delivery while managing spikes in audience growth and provides the viewers with better video quality. Moreover, integration by using JS plugins allows the user to connect any HTML5 player with zero or minimal customization.

The solution is based on the Google-supported WebRTC protocol, which is already implemented in more than 75 percent of modern browsers and mobile devices, as well as the latest generation Smart TVs. It allows browsers to connect with each other and enables direct file transfers between them without the involvement of the server-based delivery infrastructure. For example, this protocol is used in all conferencing and telephony services and webinar platforms.

Using this type of P2P delivery can offload up to 80 percent of the traffic, thereby using 15 times less server capacity and bandwidth to deliver the same content for all kinds of media event broadcasters: Live News, Entertainment, Sports, etc. At the same time, no media company using these technologies accrues any extra costs for additional infrastructure development. This technology optimizes the existing infrastructure ideally and maximizes delivery capacity, and the user pays only for the actual bandwidth usage.

One of the most important competitive advantages of the solution is that its integration with any TV-channel takes no more than 15 minutes, so the user can start to benefit from all the advantages within one day. As a result, there is an

immediate improvement in the quality of media content delivery with simultaneous savings on broadcasting costs.

### Looking ahead

Teleport Media's next step to achieve its goal of scaling existing performance is creating a framework that enables the construction of P2P CDNs while utilizing regular customer-level devices (PCs, mobiles, STBs, etc.) as distribution nodes. These devices run special software that uploads certain video content of a certain CDN customer and then uploads it multiple times to multiple content viewers. While uploading the content, the distributing node will consume outgoing Internet bandwidth that is currently not in use by the distributing node owner. The owner gets a reward that depends on the volume of the traffic transferred and the price of the traffic unit.

We believe that in the near future, the described technology will take a strong place in the infrastructure of online broadcasting companies worldwide and will contribute to the robust optimization of resources used for live streaming. This will help achieve unparalleled global reach, improved scale, and higher viewing quality, while drastically reducing the operational costs associated with running a successful online video platform. ■

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## Delivering mobile military communications services

Secure, reliable communications on the move (COTM) plays a critical role in the government and military sectors the world over. Satellite, of course, plays a major part in keeping people connected, delivering ubiquitous quality of service the world over. When COTM accessibility can mean the difference between mission success and mission failure, companies across the globe are eager to develop and improve service offerings to the best of their abilities.

**The ability to communicate on the move is** something we take for granted, but it's also a fairly new development. It's not so long ago now that we didn't have access to mobile phones and other mobile communications technologies in our everyday lives. Today, however, it seems that most of us are communicating in one form or another for almost all our waking hours. With phones and tablets almost permanently attached to our hands, we interact with hundreds of people every day over social media, for work and for pleasure.

The ability to communicate while mobile is an essential part of battlefield operations. Way back when, messengers would travel to and fro, relaying vital information between troops and commanders. This method, along with messenger birds and shouted orders, was eventually replaced by radio and Morse code, and more recently, personal role radios (PRRs).

As technology developed, so too did communications capabilities; in addition to PRRs, battlefield satellite

communications, utilising a mobile antenna, either flyaway or installed on ground vehicles, became commonplace. This new era of satcom on the move (SOTM) allowed new, secure messaging capabilities, with real-time updates in a way that had never been seen before. Development of more advanced communications on the move (COTM) systems, with increased security or with SWAP (size, weight and power) improvements, is ongoing to this day.

### Viasat ramps up military offerings

Global communications company Viasat has operated in the satellite sector for more than 30 years, delivering services to government, commercial, enterprise and military customers the world over. It's been a significant year for the company, which is currently working to expand its presence in the government and military markets.

In January, Viasat was awarded an indefinite delivery/indefinite quantity (IDIQ) contract with an initial ceiling

## Military Communications....



of US\$350 million for advanced equipment, systems, services and support to significantly modernize ground/air situational awareness, tactical data links, terrestrial networking, intelligence, surveillance, and reconnaissance (ISR), tactical satellite communications, information assurance, network management and cybersecurity for Special Operations Forces.

The IDIQ contract is structured to expand and evolve over time, keeping pace with rapid technology advancements in mobile networking, cybersecurity and broadband satellite communications technology sectors. The flexible nature of the IDIQ will allow Special Operations Command (SOCOM) to rapidly acquire, deploy and evolve a wide variety of new operational capabilities, terminals, products, systems, services, support and sustainment in support of current and future SOCOM missions.

"We at Viasat have a deep and enduring commitment to our growing partnership with SOCOM. As a part of that commitment we continue to exploit opportunities to apply our cutting-edge commercial technologies to rapidly develop and deploy new and advanced military operational capabilities in support of SOCOM's most critical missions," said Ken Peterman, President, Government Systems Viasat. "This sole source award establishes a comprehensive contract vehicle enabling SOCOM to rapidly acquire and deploy these new and modern capabilities in support of evolving mission scenarios faster than ever before."

The contract award is aligned with current Department of Defense (DoD) initiatives to modernize the military's tactical network. In recent statements to the Senate Armed Services Committee, General Raymond A. Thomas, III, Commander USSOCOM discussed this need to be able to rapidly transform capabilities: "While we are fully committed to winning the current fight, we are simultaneously working to prepare for the conflicts of tomorrow. We are always searching

for improvements and relentlessly pursuing our next advantage."

This contract vehicle will help ensure SOCOM has a modern network with tactical systems that are agile and responsive to the complex requirements of the multi-domain battlespace, while assuring that deployed systems remain flexible enough to continuously evolve and adapt today's rapidly advancing technologies associated with mobile networking, information technology, cybersecurity and broadband satellite communications.

Later in March, Viasat announced that services over its ViaSat-2 communications satellite were now available for government, defence and military applications. The service leverages the world's most advanced communications satellite, ViaSat-2, along with innovations in ground networking technologies, that will deliver significant performance advantages over any other commercial or DoD satcom system.

In early March, Viasat conducted a ViaSat-2 satcom system demonstration, attended by representatives from the US armed forces, where they demonstrated a number of cloud-based government applications. The speeds on the ViaSat-2 satellite system demonstrated the industry's fastest broadband connections, exceeding 100Mbps during the demonstration day.

The ViaSat-2 satcom system has the ability to:

- **Transmit bandwidth-intensive, media-rich cloud applications:** Fast data rates and more satellite capacity will enable 4K and HD video streaming to thousands of electronic devices simultaneously for greater operational capabilities at the tactical edge.
- **Conduct more simultaneous operations:** Abundant capacity will enable warfighters to capture and send Intelligence, Surveillance, and Reconnaissance (ISR) sensor data; transmit live two-way video conferencing and Voice over Internet Protocol (VoIP) calls; as well as conduct Command and Control (C2) and Situational Awareness (SA) communications as prioritized traffic to many more platforms in a region.
- **Continue operating through an electromagnetic, terrestrial or cyber-attack:** Resiliency is provided through the ViaSat-2 system's exceptional anti-interferer performance, Viasat's unique Satellite Access Node (SAN) gateway diversity, seamless satellite switching and assured pattern re-routing to operate through gateway failures, and through Viasat's Active Cyber Defense, which automatically detects, mitigates and attributes Distributed Denial-of-Service (DDoS) attacks against the network's infrastructure. The resilient nature of the Viasat network will enable mission-critical communication packets to be protected and distributed safely, even in highly contested combat environments.
- **Provide assured communications:** Viasat's Best Available Network concept provides a global, redundant system for military to access Viasat's global Ku-band networks, its more advanced Ka-band networks, as well as the Wideband Global SATCOM (WGS) system. The Best Available Network allows terminals to roam across multiple networks to maximize resilience and collaboration for ground fixed, transportable, mobile, maritime and airborne platforms.

"We are proudly demonstrating emerging US government





## ....Military Communications

concept of operations requiring bandwidth-intensive, cloud-connected military applications with our latest high-throughput commercial satellite, ViaSat-2," said Ken Peterman, President, Government Systems, Viasat. "The innovations in the new ViaSat-2 satellite and network show that we can dramatically improve operational capabilities for military missions. This satcom system is the first in our series of ultra-high-capacity global satellite networks, which will enable superior reach, readiness, and resiliency for global military forces."

Meanwhile, in June, Viasat acquired UK-based Horsebridge Defence and security, which focuses on design, system integration and support of deployable secure networks, in order to enable Viasat to continue to grow its business in the UK defence market by delivering mission-critical ground-based communication networks and services. Horsebridge Defence and Security has developed robust relationships with the UK Armed Forces, supporting a number of UK Ministry of Defence (MOD) programmes.

"By acquiring Horsebridge Defence and Security, we hope to accelerate the trajectory of our ability to support UK defence operations," said Peterman. "Viasat builds best-of-breed technology solutions that leverage commercial innovation; and by combining our strengths with the deep domain expertise of the Horsebridge Defence and Security team, we intend to reliably extend commercial, military or emergency service networks to the tactical mobile edge."

The Horsebridge Defence and Security team will be integrated into Viasat's already established and growing Farnborough, UK-based organization. They will have immediate access to Viasat's full communications portfolio from the company's most advanced satellite communication and Link 16 mobile networking solutions to its innovative cybersecurity and information assurance capabilities.

"Viasat is a strong match for the Horsebridge Defence

and Security team; we are aligned both culturally and in our technical vision for how to bring secure ground networks to UK MOD and adjacent markets," said Martin Flather, Director, Horsebridge Defence and Security. "Having access to Viasat's broad portfolio of technologies and capabilities will enable us to create new secure communications and mobility platforms that leverage high-capacity mobile networks with assured availability—with accredited secure voice, video and messaging services—whenever and wherever military forces require it in the UK or overseas."

Horsebridge Defence and Security develops and integrates technologies under its Kestrel II-branded services portfolio. The Kestrel brand has a strong reputation with MOD through successful delivery of a high-capacity ground network for a specific operational mission. The Kestrel II portfolio offers a range of complementary secure network products, solutions and services that are specifically targeted at today's UK Defence requirements and are continuously integrated and continuously developed (CI/CD) to stay at the forefront of technology.

### GetSAT delivers high speed mobile communications for military applications

USA-based GetSAT is an innovator in small, lightweight satellite communications terminals for airborne, ground and maritime applications. Serving the commercial and government sectors, the company has been ramping up its presence in the military sector in recent years.

In March, the US Government selected GetSAT's MicroSAT and MilliSAT L/M (land and maritime) terminals for providing maritime and ground-based secure COTM applications.

GetSat's micronized communications terminals are based on the company's patented fully-interlaced InterFLAT panel technology for transmitting and receiving signals on the same



## Military Communications....



panel. Meeting the demanding requirements of full time usage in harsh environments, these rugged SOTM terminals offer significant savings in size, weight, and power usage.

"Our selection by the US Government is not a surprise. Rather it is a testament to our platforms meeting a myriad of mission critical operations parameters. Soon, GetSat's InterFLAT panel technology, as well as our platforms, will become common names throughout the industry as we continue to provide leading edge communications on the move solutions, platforms and technologies," said GetSAT CEO, Kfir Benjamin.

Constructed in a super-light compact installation, GetSAT's L/M platforms are micronized, fully integrated, on the move rugged terminals. Based on built-in InterFLAT panel technology, all L/M terminals are easy to deploy and integrate and can be outfitted with various antenna sizes in accordance with bandwidth requirements of ground, air and marine applications. Its unique all-in-one design including BUC and modem is optimized for harsh environments specs and its ultra-low power consuming platform is compatible with Ka and Ku-band applications.

MicroSat L/M has options for both the Ka and Ku-bands, providing autonomous operation for transmitting and receiving bandwidth data rates at more than 10Mbps. This midsized terminal offers unprecedented bandwidth that can be hand carried in any environment. Meanwhile, MilliSAT L/M Ka is a medium lightweight portable on-the-move Ka-band satellite terminal solution. MilliSat enables fully autonomous transmission and reception of high bandwidth data rates of

more than 20Mbps.

In August, GetSAT and Avanti Communications Group successfully demonstrated the outstanding potential of SOTM capabilities. Utilizing GetSAT's MicroSat terminal installed on a vehicle, GetSAT's Microhub modem installed in Avanti's Gateway Earth Station in Cyprus, and Avanti's HYLAS 2 Ka-band satellite, data traffic rates reached up to 8.5Mbps from the moving vehicle, thus showcasing Avanti's network ability to stream live HD-quality video or surveillance imagery and data traffic for military and government users.

The strategic partnership between Avanti and GetSAT offers significant capability enhancements to support military and government organisations in the provision of very small, flexible, agile and portable satellite communications. The collaboration will enable military and government users to maximise the benefits of high throughput satellite (HTS) broadband and take full advantage of high capacity data traffic, including full motion video and other C4ISR applications, even when on the move. Having successfully demonstrated the exceptional throughputs achievable, both companies will now seek to further develop the capability. The US Army has recently chosen GetSAT's MicroSat terminal as a critical enabler for mobile satellite connectivity.

"The partnership between Avanti's High Throughput Ka-band technology and GetSAT's ground-breaking Satellite on the Move technology provides a capability that has enormous potential for military and Government users. We are proud to be working with GetSAT and look forward to collaboratively supporting our Government and Military customers,"

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commented Graham Peters, Managing Director of Avanti Government.

"Avanti's Ka-band satellite broadband has allowed us to fully demonstrate the capability of GetSAT's technology," added Kfir Benjamin, Chief Executive Officer of GetSAT. "We are extremely proud of the equipment we have created, and it is therefore extremely important to be able to find a carrier that allows us to fully maximise its potential. The combination of GetSAT and Avanti will add real depth and much higher capacities to our existing offerings and allow us to support the needs of our users for high data C4ISR traffic in remote locations and while on the move."

### Comtech Telecommunications achieves large COTM orders from US Government

Comtech Telecommunications Corporation is famous the world over for its top-of-the-range satcom equipment, with which it serves the commercial, enterprise, government and military sectors. Thanks to its unique solutions, Comtech Telecommunications achieves an extraordinary amount of work with the US Government, for COTM, as well as its 9-1-1 platform and Blue Force Tracking programme.

In March, Comtech Telecommunications' Command & Control Technologies group received a US\$123.6 million, three-year contract award to provide ongoing sustainment



GetSAT's MillisAT L/M terminals

services for the AN/TSC-198A SNAP (Secret Internet Protocol Router (SIPR) and Non-classified Internet Protocol Router (NIPR) Access Point), Very Small Aperture Terminals (VSATs). SNAP terminals provide quick and mobile satellite communications capability to personnel in the field, and Comtech Telecommunications will be the sole provider of these sustainment services. The contract was initially funded at US\$3.1 million with additional funding expected to occur across the performance period; this came later in July, when an order in excess of US\$12.5 million, on top of the US\$123.6 million contract, was placed, bringing up the funding to date to US\$29.5 million.

"We are pleased that we have won this competitive solicitation to provide sustainment services for the SNAP satellite Earth station terminals. We are pleased that the US Army has selected us to continue to perform this important work," said Fred Kornberg, President and Chief Executive Officer of Comtech Telecommunications Corp. "We believe the award of this contract further validates our strategy of putting more emphasis on important contracts and working closely with the US Army."

In the April, Comtech Telecommunications' Comtech Xicom Technology, Inc., subsidiary received a follow-on contract for more than US\$4.2 million from a US military integrator for high-power satellite communication travelling wave tube amplifiers (TWTAs). This is the third instalment of a multi-year program for these power amplifiers used in tactical transportable SATCOM terminals. "We are pleased to receive another follow-on order for this highly advanced multi-band SATCOM system. Our outdoor TWTAs are proven to be robust and reliable," said Kornberg. "We have ramped up our manufacturing capacity to meet the customer's aggressive schedule and anticipate shipping the entire order this fiscal year."

July, meanwhile, saw more work for the Command & Control group, when new orders totalling US\$10.6 million came in for the US Army PM Tactical Network, to provide Manpack Satellite Terminals and networking equipment to the Defense Logistics Agency SATCOM Program Office and Headquarters United States Marine Corps. "We are pleased that we have the opportunity to provide this mission essential equipment to our government customers," said Kornberg. "These orders through the Global Tactical Advanced Communication Systems (GTACS) contract reinforce our partnership in supporting our warfighters." ■



ViaSat 2

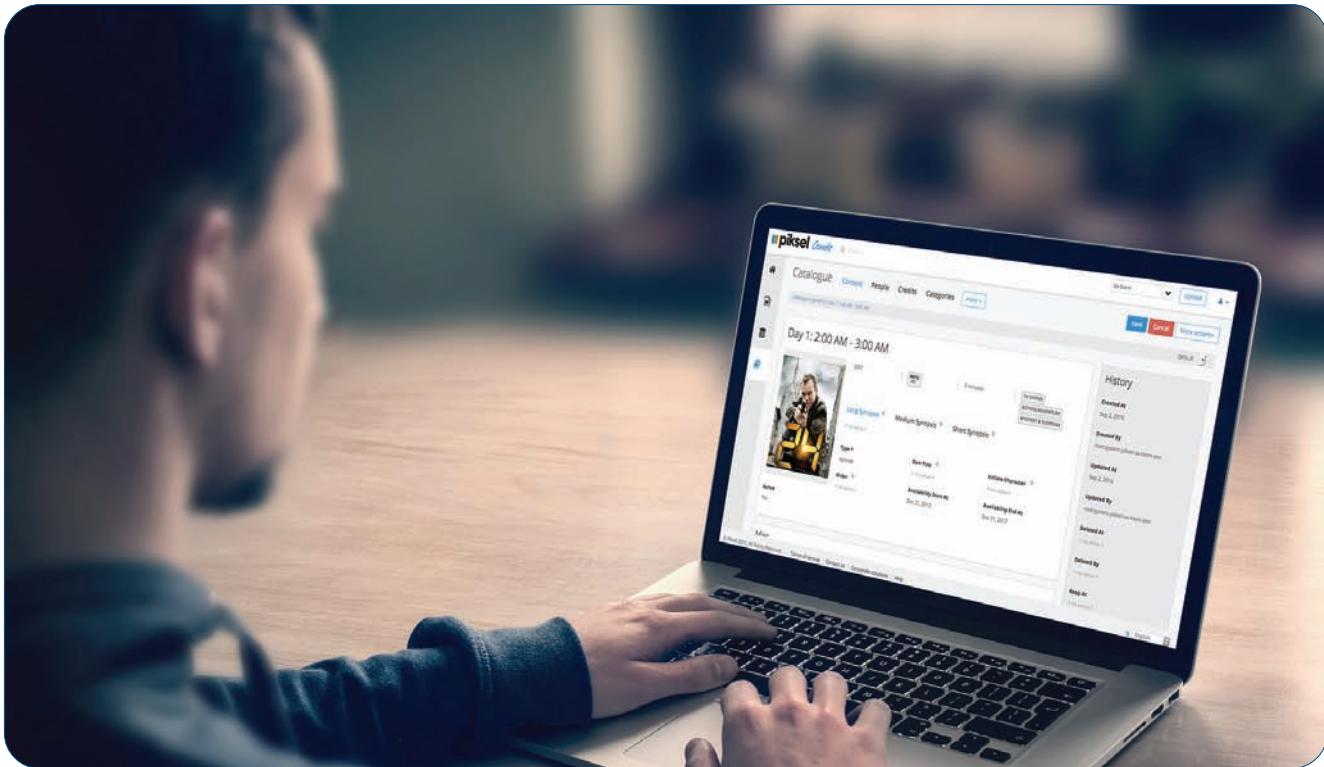
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## Managing metadata

Piksel has delivered online video solutions for more than 15 years, tracing its history back to the advent of online video. Its video solutions sit on the foundation of the Piksel Palette micro services architecture, enabling clients to pick and choose the right features for them. Kristan Bullett, Managing Director of Piksel, opines on the current status of the online video market, and opportunities for the future.

**Question: Can you provide an overview of Piksel's capabilities and expertise?**

**Kristan Bullett:** Piksel is a products-led service organisation. We primarily focus on adding value to the supply chain. We have a number of products which focus on metadata management around the media supply chain, as well as asset management; transcoding, quality control, workflow management, ultimately providing distribution mechanisms. We also have our own OTT platform called Digital Showcase. These groups of products are all fully cohesive and interrelated. As part of the challenges we're trying to resolve within the industry, we're looking at automating many existing manual tasks, removing inefficiencies within the industry, reducing silos of processes and information, and providing the ability to scale to demand.

From a product perspective, we talk about the Piksel Palette, which is our microservice architecture. It's cloud-native and hosted on Amazon Web Services (AWS), has all the capabilities in demand in our sector, and is self-scaling and self-healing. Self-healing is one of the core engineering principles of our platform; because we host within AWS, if something goes wrong in our services, we can automatically spin up a new service and remove the old service, so things don't fall apart and there's no need to call out an engineer. It will resolve the problem itself.

For metadata management, we have our Fuse product suite, which provides back office services for our customers.

There's Fuse Metadata Manager, which is our core metadata management solution. We provide metadata ingestion which is high

volume metadata management, providing visual tooling to support our customers to manually enrich or augment and further manage that information, and then providing the API so that their client interfaces can use that data. Amongst others, we currently provide this service to Liberty Global, who use our platform for very rapid, very high-performance ingestion of metadata. For Liberty Global, their descriptive and offer information, across both linear and VoD, is ingested onto our platform very quickly. It used to take more than 10 hours for data to be processed by metadata providers before it was in a usable state for set top boxes or OTT platforms, but we've reduced that down to about 30 minutes.

We also have Fuse Publisher, which uses some of the same services. When I say it's cohesive, the Fuse Publisher side is really about a title-centric view



*Kristan Bullett, Managing Director of  
Piksel*

to workflow management. You still need all the descriptive metadata so that you can see what's happening to your content, but it's more focused around content supply chain management. As an example, it takes in master assets, transcodes them into mezzanine assets, performs quality control against them, and performs actions such as EDL stitching, adding and removing markers, close caption information. We don't do all of this ourselves, we use a lot of tools from third parties to do the encoding and the marker insertion and

providing the tooling that enables people to see what they need with that information. If a client wants to distribute 3,000 titles to a distribution partner, we can do that in a very visual fashion for them.

I look at our three core go-to markets, Digital Showcase, Fuse Metadata Manager, and Fuse Publisher, and if the industry moves in the direction I hope it does, they can all be used as a single product. We recently won business with RTL, which is now using two of those products in a very cohesive fashion, using just one interface.

**Question: OTT operators have gone from strength to strength, with many smaller players making headway into the market. What's your assessment of the market opportunities right now and in the future?**

**Kristan Bullett:** When we at Piksel first started building OTT platforms, no one really knew what they were trying to build. Sky's offering started out as Sky By Broadband, and they were very much pioneers in the field. We worked with Sky to try to figure out what they wanted to do; it was assumed that Sky was never going to make any money out of their product, they were simply putting it into place for their customers. Today, we're already into the second generation of architectures, so that work

that we programmed back in 2002 for Sky has been replaced by something else that Sky has built itself. We're going to get to the third iteration soon, which is concerned with consolidating more and more tooling across the media supply chain.

I look back at the first generation of OTT platforms, where we built something from scratch just for that purpose, and with the second generation, companies typically bought a platform with a little more functionality and a number of other services. As we go into the third round of architectures, we're going to stretch further into the supply chain, and there's a lot of broadcast infrastructure there to cover linear playout, as an example, that's going to become further consolidated.

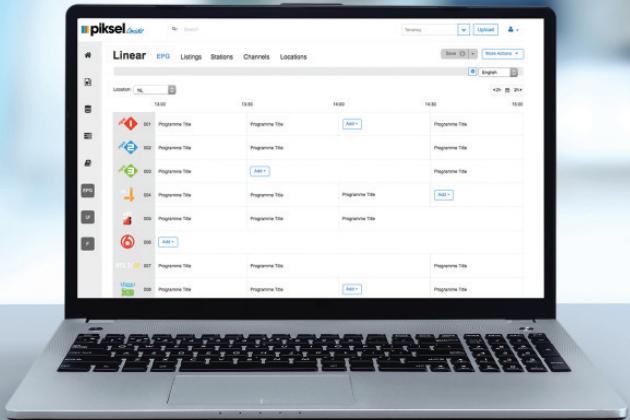
**Question: The online video sector has seen massive developments in the years since its inception. What's the next big thing in online video, in your opinion?**

**Kristan Bullett:** Online video is a really broad term. When I think about metadata, I see that lots of people have had problems managing metadata and working with it. One of the things that I think is going to become very important is using automation as much as possible. I think that will cause quite a shift in the industry. We can do things faster, cheaper, and with less people. We've all read about computers replacing people, and I think that's where we're headed now. Back office automation will replace a lot of traditionally manual tasks, which is going to improve throughput and necessitate autoscaling mechanisms. If you can do more, your platform needs to support doing more as well.

I envisage a centralised platform that everybody can use. There's a lot of waste and expense in the industry around building tooling, so why can't everyone share one? It doesn't mean sharing information or data, but if you look at AWS as an example, the sheer scale of their operations means that they can massively reduce costs and they can do things far quicker. I think that model can be duplicated.

**Question: Why is metadata utilisation becoming increasingly vital in today's video industry, and how do clients stand to gain from its appropriate application?**

**Kristan Bullett:** There are a number of aspects to metadata. It's all about



*Photo courtesy of Piksel*



removing disparate silos within organisations and consolidating them. We very often see one silo for descriptive metadata, another for technical metadata, etc., and why can we not bring those all into one central place, and present the correct view depending on who is utilising that information?

A linear schedule operator wants to be able to visualise all their information in one place. Indeed, a centralised view across metadata-related information is key. When it comes to markers, there are standards that exist for in-band and out-of-band markers, and with our platform, it's about bringing all that information together and modelling it in a very visual way. I can go into the Fuse Metadata Manager user interface, click on a title, and then view the segmentation information to see line by line exactly where the close captions are, exactly where the ad markers are, where the different break points are. That's a way to visualise and understand what we're doing with our data.

**Question: In August, Piksel announced updates to its Fuse**

**Metadata Manager to enable customers to leverage metadata across their entire ecosystem. What can you tell us about the system and updates?**

**Kristan Bullett:** We spent three and a half years building the baseline of a platform, which has given us very strong foundational components that do the things our platform needs to do. As part of that journey, we've been trying to build best-of-breed, trying to do things correctly from an engineering perspective. As part of the major update, we've introduced some significant new components. Our customers can now do a lot more self-service, and a lot more self-management with script interfaces. Previously, we had to do that for our customers.

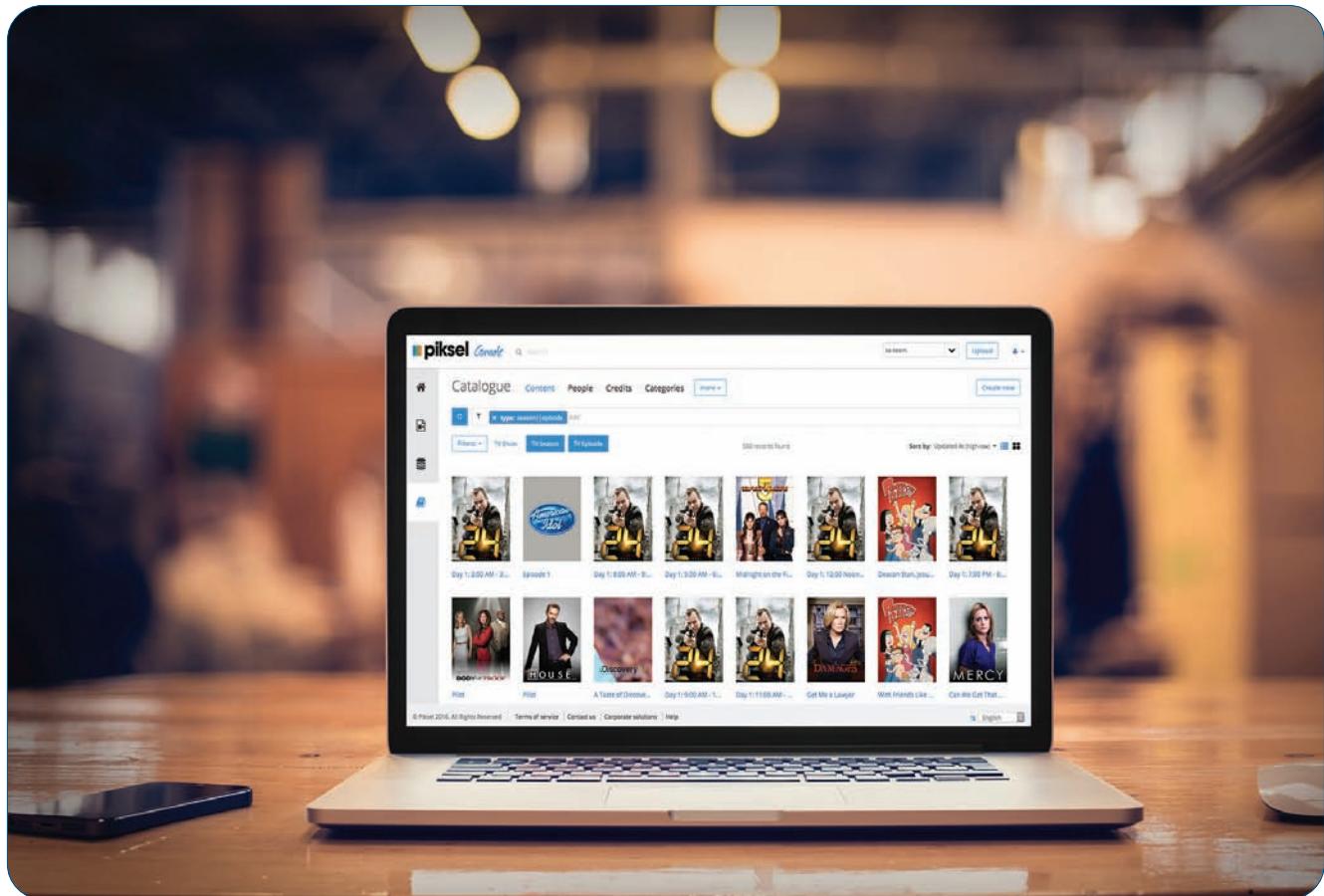
As part of our journey, we've been using some progressive toolings to build our admin interface, and we've completely rebuilt that now. That might sound surprising as it's only a three-year old product, but we believe we need to continue to maintain the technology that we're building on to remain competitive in the market. So, we've completely rebuilt the user interface, introduced a number of

additional views to support managing linear metadata, VoD metadata, and all in a very rich visual fashion. As part of that, it's helping us to build more, more quickly.

We've struggled with comparing it to other products on the market, because we compete with some things, but we have a level of uniqueness. People often talk about unique value propositions, and I don't think that anyone else really has a platform that is centralising metadata like we do. We are taking a title-centric approach to metadata management.

**Question: What do you expect Piksel to achieve in 2019 and beyond?**

**Kristan Bullett:** I'd like to see us start to consolidate live metadata side-by-side with linear and VoD metadata. We're talking about live events, sports data. I've not seen anyone unify that yet; there are bolt-ons, and integrations with other companies, but I think we need to further galvanize that centralised view of information. I think that's going to be a really big challenge. Knowledge is one of the challenges within that, and there are a lot of organisational and technical complexities.

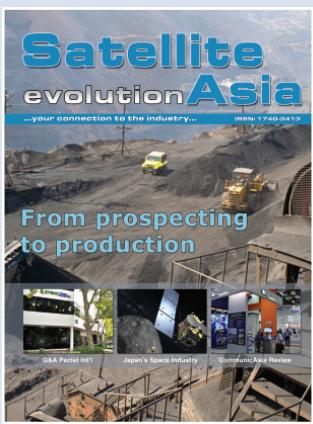
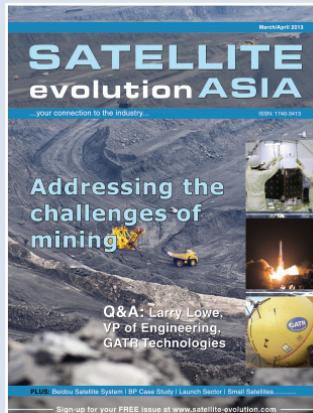
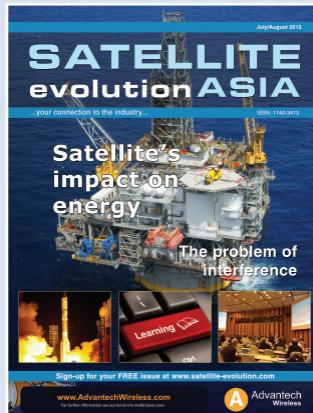




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