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Troubling times

It's been quite an historic time of late. We're now six months into the coronavirus pandemic, and the world is still reeling from its impact on our daily lives.

The world's working population has been divided into never-before-seen subsections: Frontline workers, including care workers, people in the food supply chain, essential service providers and delivery businesses are under mounting pressure to keep going despite the considerable risks; non-essential workers who are required to work from home, many juggling full-time childcare for small children or dependent relatives with no relief; and the furloughed, those placed on leave at 80-100 percent of their wages (depending on how generous their employer feels), who are either deemed unessential or whose businesses cannot operate remotely, and who may have no job to go back to after the virus retreats.

It's a difficult time for everybody, and all of us have troubles that are unique to ourselves. We at Satellite Evolution are in a fortunate position that we can continue our work from home – where some of us mostly work from anyway – and continue to engage with our industry colleagues by voice, video, or email. We will continue to strive towards delivering relevant, excellent content to our readers, while helping our friends and colleagues with innovative new opportunities and ideas to stay ahead during the outbreak.

In this issue we have features covering cybersecurity from Trusted Computing Group, hosted payloads and cellular backhaul from ST Engineering iDirect. We have detailed interviews with Hughes, Santander Teleport, Forsway and Avanti. We've also taken an in-depth look at all the latest developments in hosted payload systems.

Hopefully, the coronavirus will soon pass and some level of normality resume for us all without causing too much irreparable damage. In the meantime, we hope you enjoy this issue. Feel free to reach out if there's any way we might be able to help you or your company!



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Photo courtesy of Shutterstock ●●●

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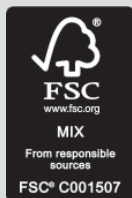
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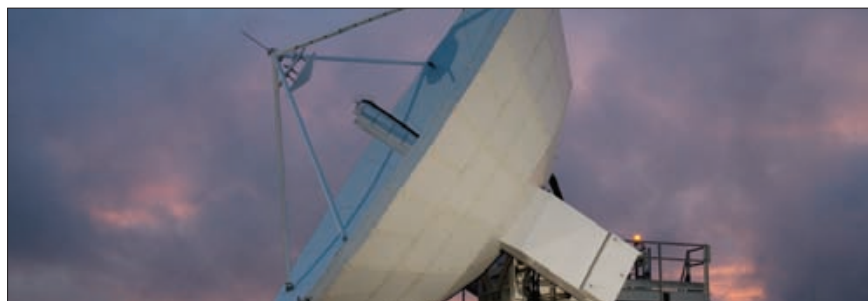
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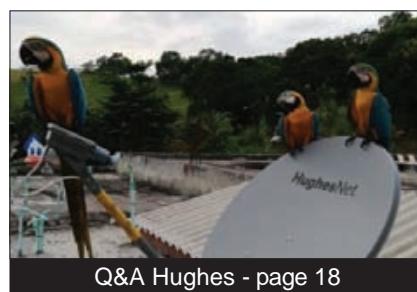
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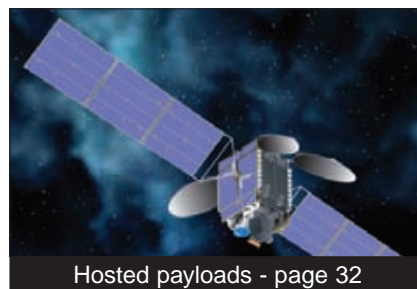
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Making Missions Possible

Atlantic Offshore protects against cyber threats with Inmarsat's Fleet Secure Endpoint

North Sea operator Atlantic Offshore has put its levels of cyber resilience substantially ahead of approaching International Maritime Organization requirements for ship owners, after adopting Fleet Secure Endpoint from Inmarsat to protect against ongoing cyber threats.

The state-of-the-art cyber security solution was installed to coincide with a Fleet Xpress bandwidth upgrade across its fleet of offshore support vessels. All vessels now use Fleet Xpress to achieve maximum upload/download speeds of 4MBps/2MBps, with the Ka-band/L-band solution delivering committed information rates of 256kbps.

"The shift towards digitalisation, crew welfare needs and demand for greater vessel efficiency are all drivers for reviewing and upgrading our ship/shore connectivity needs, says Roy Wareberg, CEO, Atlantic Offshore. "Meeting next year's IMO cyber security rules in the same step was an opportunity too good to miss."

Fleet Secure Endpoint defends ship networks at their vulnerable 'endpoints', which can be anything from a business-critical PC to a crew laptop. The multi-layered protection solution scans the network and eliminates malicious encryption, blocks forbidden sites, shuts down malicious connections and runs anti-spyware/anti-phishing software. It only allows trusted endpoints to interact with the network, with new devices labelled rogue until verified. Malware introduced by infected USBs also prompts 'guardian portal' intervention.

"We are seeing data usage on board ship doubling roughly every eight months and owners develop a competitive edge

by upgrading connectivity to anticipate crew welfare and vessel operational needs," says Eric Griffin, Vice President, Offshore & Fishing, Inmarsat Maritime. "Forward-looking companies such as Atlantic Offshore recognize that the threat from the cybercriminals is also rising, which is why they choose Inmarsat as a secure connectivity provider across all touch points, including endpoints."

Available for use with Fleet Xpress, FleetBroadband, and Fleet One, Fleet Secure Endpoint covers 10 of the 20 detection, reporting and recovery criteria defined by the SANS Institute as essential for cybersecurity without requiring hardware adjustments or awareness training.

Shipowners and managers must incorporate guidelines relating to cyber risk management into their safety management systems by 1 January 2021. Fleet Secure Endpoint provides a cost-effective cyber security product for the maritime market that helps support compliance, in a single solution that protects vessels and the communications network.

"The Fleet Secure Endpoint Security report gives the owner and a clear overview of the security status of the vessel in a format that is fully compliant with IMO 2021," says Eric Griffin.

Liverpool Hope University finds solar powered high-altitude platforms could solve the problem of rural connectivity in communities across the globe

Dr Ogonnaya Anicho, a scientist at Liverpool Hope University, has called for the systems to form part of all future pandemic strategic planning.

According to UNESCO, around 45 per cent of the world's population still has no access to the Internet.

In recent weeks, the World Economic Forum warned how the Coronavirus pandemic had exposed the digital divide 'like never before', with billions unable to access school coursework, or to work from home.

And where there's no terrestrial communications infrastructure, a High-Altitude Platform Station (HAPS) – or sometimes called a 'Pseudo-Satellite' – could be the answer.

A single HAPS flies around 20 to 25km high in the Earth's stratosphere, avoiding air traffic and adverse weather conditions.

It is capable of providing wireless broadband coverage, via 4G from mainstream networks, to the ground below, covering a radius of around 100km.

Platforms vary, with firms like Google-backed Loon favouring a network of balloons, while Airbus Defence has spawned the 'Zephyr' – an unmanned, carbon fibre UAV with a 25-metre wingspan.

Now Hope's Dr Anicho has developed a unique software platform that simulates a 'swarm' of autonomous fixed-wing solar powered HAPS with self-organising capabilities – meaning coverage areas can be extended significantly.

And Dr Anicho says these multiple HAPS systems, and HAPS generally, could prove crucial in coping with the next viral outbreak or natural disaster.

He explains: "In my humble opinion, I think Governments should acquire HAPS infrastructure for those strategic planning reasons. When there is a natural disaster and the terrestrial infrastructure is compromised, first responders can quickly begin to use HAPS instead, as it can be set up on an



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ad-hoc basis. And in a pandemic, it is essential you get emergency messages to people, so they know how to stay safe. How do you do that if there are rural connectivity problems? This connectivity is also essential for industry and productivity, too. You can see that in most of the developed nations people have found it easy to migrate their work online during the Covid-19 crisis because there's instant connectivity. Without connectivity, that does not happen, and entire regions suffer."

Dr Anicho, of Hope's School of Mathematics, Computer Science and Engineering, knows only too well the dangers of a pandemic.

In 2014 he was working with a telecommunications services firm in Guinea, West Africa, when the Ebola outbreak was at its peak.

He adds: "We were mandated to remain active so that the country could keep its telecommunications infrastructure operational - as a key service to support the effort to combat the epidemic. It meant that first responders and medical practitioners could do their jobs. And right now, during Coronavirus, telecommunications allows the UK Government to provide daily advice updates and to share new insight from researchers. This crucial information does not get through to people if they cannot access the internet. At Hope, the multiple HAPS coordination capabilities we're developing is a small contribution to this field, but it's also crucial. And on the pandemic management side of things, it's really important."

HAPS themselves first entered the scientific lexicon in the 1990s. But as Dr Anicho points out, it's still very much a work in progress and there are still hurdles to commercial viability.

One of those barriers is keeping HAPS in the air for as long as possible.

Dr Anicho is hoping to get to a point where fixed wing HAPS can remain in the sky for months or even years.

He adds: "There are different HAPS technology problems to address. Some might look at how to optimise materials in order to save weight. Others want to find the right kind of platform, whether fixed wing, balloon, or aerostat. What makes our software and simulation platform unique is that we're looking at the multi-HAPS concept – because to cover a country or wider region, you need a swarm. You can't do it with just one HAPS. And we're developing the capability for multiple HAPS to coordinate autonomously. Practically, to operate one HAPS you need up to four people, or perhaps even more, depending on the type of platform, mission profile and other operational requirements. For HAPS to become truly commercially viable and realistic, this human price component needs to fall. We're finding algorithmic or technology-based solutions to coordinate several HAPS with minimal human input."

Dr Anicho is quick to point out that solar powered HAPS – which cruise at speeds of around 110 km/h, or around 68 mph - won't work everywhere.

There are constraining solar variations across seasons and geographical areas.

But HAPS will be relevant for many of the developing nations who need it most.

And for Dr Anicho, it's now a question of raising awareness about what HAPS can achieve – and changing government policies to improve adoption.

He adds: "HAPS technology is still not common


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knowledge. And it's my view that we need to get the message out there. One of the main reasons why there are rural connectivity challenges is that operators are not interested in building terrestrial infrastructure because of the high investment cost and very poor commercial viability of doing business in those places. They're reluctant to invest. There are also relevant policy challenges. Our approach is to address both the technology and policy questions in order to reduce the barriers, enabling operators to scale up easily into those areas. This is my vision. This is what we're trying to achieve."

At this point Dr Anicho's research is looking at four or more HAPS to create a 'swarm' - as well as how to improve power management - in his simulations.

HAPS use energy from the sun to charge the batteries during the day, which in turn powers the craft at night.

Long term, the University's HAPS research team also hope to build a prototype of a solar-powered UAV, subject to funding.

In the meantime, it is procuring small-sized drones for use in the experimentation of multiple UAV-type problems, like routing and coordination.

The cost of a Zephyr is said to be around £4.3m – significantly cheaper than the cost of an orbital telecommunications satellite, which can cost between £40m - £325m to build and launch.

HAPS meanwhile has uses beyond communication.

The Ministry of Defence has purchased several Zephyrs for surveillance purposes, while they could also be utilised for everything from mapping to weather prediction services.

Dr Anicho has also garnered interest from the Commonwealth Telecommunications Organisation (CTO), where he engages representatives of governments, policymakers, and regulators on the strategic position of HAPS for addressing rural broadband connectivity challenges.

SES selects two US companies to build four new satellites as part of accelerated C-band clearing plan

SES has selected two US satellite manufacturers, Northrop Grumman and the Boeing Company, to deliver four new

satellites as part of the company's accelerated C-band clearing plan to meet the Federal Communications Commission's objectives to roll-out 5G services.

Northrop Grumman will deliver two flight-proven GeoStar-3 satellites, each equipped with a high-quality C-band payload to deliver the superior customer experience that end users are accustomed to. The two satellites – SES-18 and SES-19 – will be designed, assembled, and tested in Dulles, Virginia.

The Boeing Company will deliver a pair of highly efficient all-electric 702SP satellites. The two satellites – SES-20 and SES-21 – will be manufactured and assembled in Los Angeles, California.

These four C-band only new satellites will enable SES to clear 280MHz of mid-band spectrum for 5G use while seamlessly migrating SES's existing C-band customers. Each satellite will have 10 primary transponders of 36MHz plus back-up tubes so they can enable the broadcast delivery of digital television to more than 120 million TV homes as well as provide critical data services. The satellites, when launched in Q3 2022, will be positioned at 103 degrees West, 131 degrees West and 135 degrees West orbital slots. The cost of manufacturing these four satellites is part of the US\$ 1.6 billion investment envelope that SES has announced in May.

SES is committed to investing in America by procuring services and equipment needed for the C-band transition from large and small businesses across the US, and these significant partnerships with Northrop Grumman and the Boeing Company are cornerstones of that commitment.

"Given the FCC's strong leadership in providing for accelerated clearing of precious C-band spectrum in the US, our focus is on delivering on our commitment and making the spectrum available in the shortest possible time while ensuring that we protect the broadcast customers and communities that we have built over 35 years," said Steve Collar, CEO at SES. "To meet our deadlines to clear C-band spectrum, we have selected established American satellite manufacturers in Northrop Grumman and Boeing with their focus on heritage, reliability and minimal risk to build these four satellites, enabling us to fully support the FCC's 5G Fast initiative."



Artist's rendition of the Boeing satellites. Photo courtesy of Business Wire ●●●

Astranis passes major technical milestone

Microsatellite developer Astranis has successfully concluded thermal-vacuum testing of a qualification vehicle developed for their MicroGEO product line of small communication satellites. This critical test validates the technology's ability to operate in the harsh environment of space and marks a major milestone on the path to delivering low-cost broadband internet to underserved populations around the world, starting with Astranis's first commercial satellite that will provide broadband internet in Alaska.

"This is the single largest technical de-risking milestone for this product and for our first commercial program," said Astranis CEO John Gedmark. "To get to this point, all the different aspects of the vehicle had to come together and work as a system—avionics, power electronics, the payload, the structure, the software, and more. Then we really pushed it to the limits. The fact that we passed this test with flying colours speaks volumes to the dedication and talent of our team. And it brings us one step closer to helping hundreds of thousands of Alaskans gain reliable access to broadband internet."

A qualification vehicle test accomplishes two things. First, it allows the engineering team to characterize the thermal behaviour of the vehicle. Second, it pushes the vehicle to significantly higher levels than it will expect to see on orbit to ensure the vehicle can continue to operate. Astranis succeeded on both counts.

Astranis made use of a highly-specialized vacuum chamber at an NTS Space center-of-excellence facility in Los Angeles, California. This thermal-vacuum chamber, paired with a custom-designed shroud, was able to simulate both

extreme hot and cold temperatures needed for qualification testing.

The chamber was pumped down to near vacuum, and Astranis engineers then powered up the vehicle, ran through a series of functionality checks, and began to operate the vehicle as the test environment was adjusted across a wide range of temperatures. The spacecraft was exposed to pressures as low as 7×10^{-6} Torr (about one one-hundred-millionth the density of Earth's atmosphere).

After the success of this test, the Astranis team will complete a final wave of system-level and unit-level tests before commencing with the build of the first MicroGEO flight vehicle.

Astranis will ship its first commercial satellite early next year for a mission to provide broadband internet to the State of Alaska, with service beginning in summer 2021. The company has signed a contract to launch the satellite on a SpaceX rocket from Cape Canaveral, Florida. Astranis is partnering with Pacific Dataport Inc., a subsidiary of Microcom, Alaska's largest satellite TV and internet provider, to deliver affordable broadband internet to Alaska, and this new satellite will more than triple the satellite bandwidth serving the state.

"We have to turn away customers every day who want more bandwidth," says Chuck Schumann, CEO of Pacific Dataport Inc. "This first satellite from Astranis will enable Alaskans living in remote locations to get reliable access to the internet for the first time and will reduce internet prices across the state. The success of this qualification TVAC test shows that Astranis and Microcom can deliver on their promise to the people of Alaska."

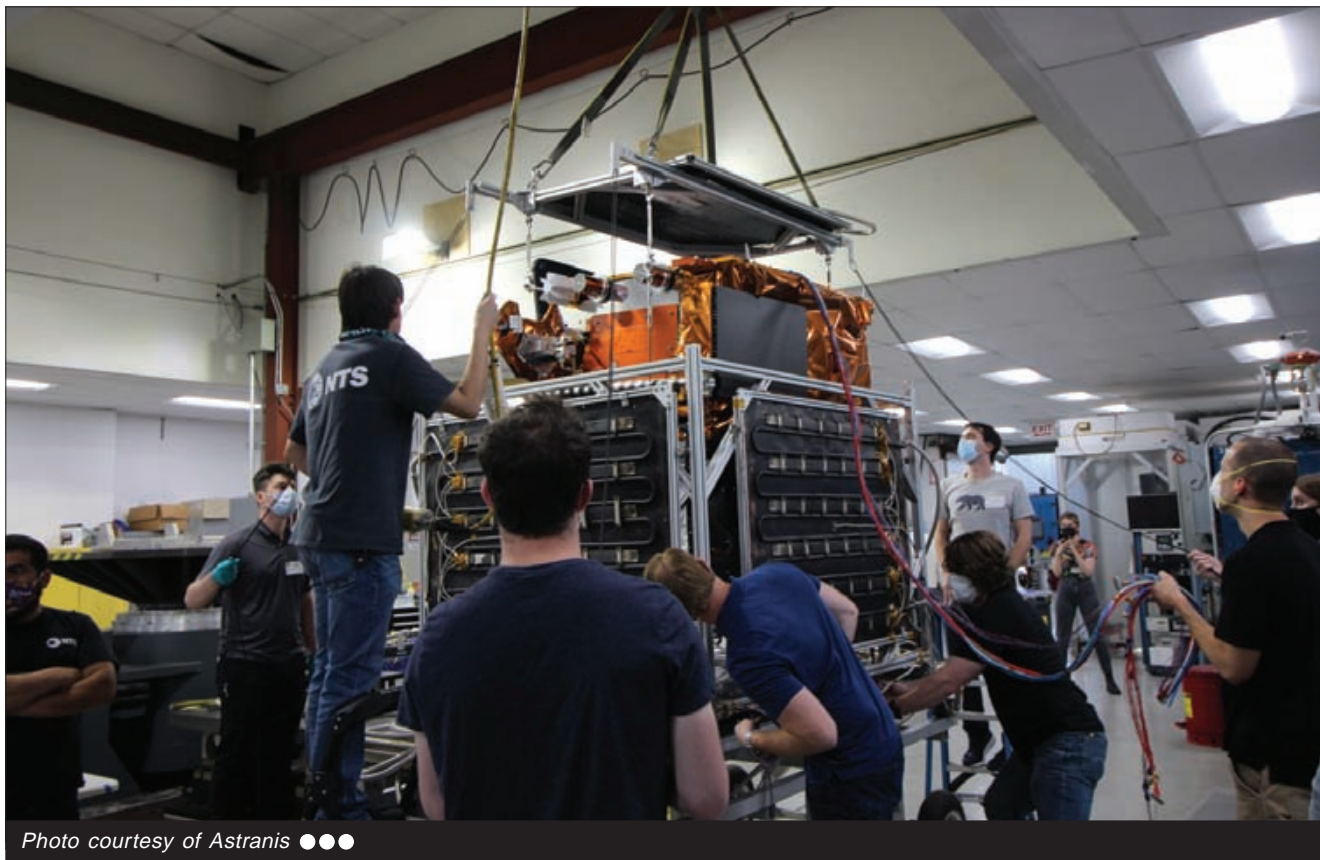


Photo courtesy of Astranis ●●●



Kyle Whitehill, CEO of Avanti Communications ●●●

Q&A

Popular player in EMEA satcoms

Avanti Communications is a leading EMEA Ka-band high-throughput satellite capacity partner to the communications, defence, enterprise and critical public service sectors. With the power to connect over 1.7 billion people across 118 countries and a belief that everyone should have an equal opportunity to be more secure, empowered and prosperous, Avanti has made a name for itself as a popular player in EMEA satcoms. Kyle Whitehill, CEO of Avanti Communications, discusses the economic and technological state of the industry.

Laurence Russell, News & Social Editor, Satellite Evolution Group

Question: What are some recent challenges the company has dealt with?

Kyle Whitehill: The biggest challenge we had was that we were struggling to find the right customer segments for the network we'd invested 10-12 years in developing. Our original business case was based around supplying rural broadband, which is a frontier which is quickly growing in the UK and around the world but isn't quite where we'd like it to be right now.

We needed to find buyers that worked in the short term, people who

were consuming Ka-band capacity. We identified three fertile demographics. The first of those is the satcoms industry, which requires infills to connect to global audiences. The second was the US military, which consumes more than 25 percent of the world's global commercial capacity – we're able to provide good connectivity across the Middle East and Africa to this group. And thirdly, mobile operators who are now using satellite capacity for backhaul and community Wi-Fi, the latter of which I believe will be a big growth market in the future.

Question: In 2019, you equipped the Cornish Space Observatory with your superfast satellite broadband. With so many promising space projects projected, do you anticipate seeing the UK become a more prominent player in the world of space launch?

Kyle Whitehill: The status of the UK space industry is something we're quite involved with, particularly because we have an Earth station in Cornwall of our own. The fact is the UK has been one of the biggest contributors to the European Space Agency (ESA), and continues to be. The UK government has even agreed to increase their investments into that partnership in 2020.

I know something that's been very important to Europe is the development of a satellite constellation that's globally competitive, and I believe the UK will

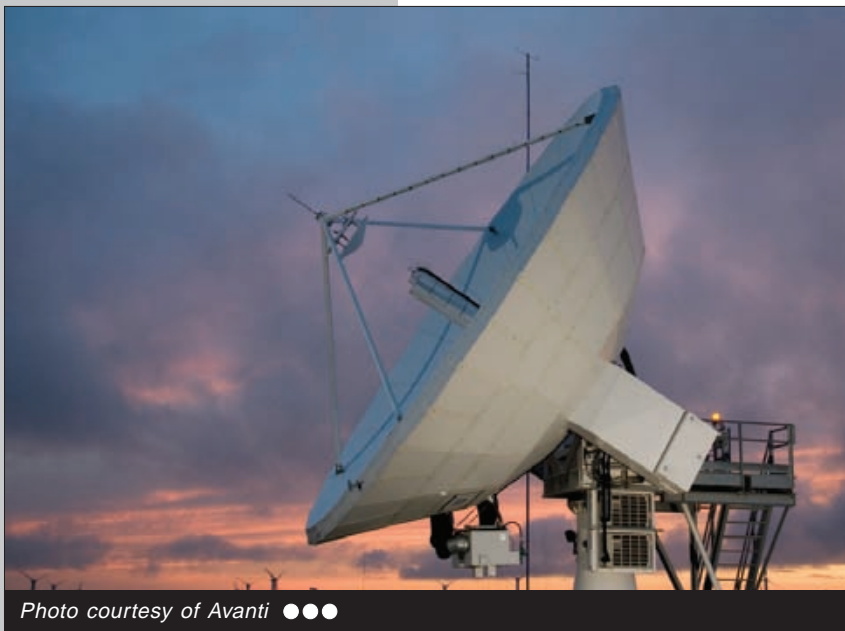


Photo courtesy of Avanti ●●●

have to play a strong role in delivering an achievement like that. That's the main reason why I feel optimistic about the UK Space Agency (UKSA) and Britain's growth as a growing player in the space industry.

Question: We've heard from a number of UK space industry executives that the UK will be best placed as a set of complementary, or disruptive developing forces. Do you agree?

Kyle Whitehill: The world is pivoting towards a dramatic investment in space businesses from the US and China. Those budgets dwarf not just the UK, but even Europe. So, I would say the question is more about Europe's role than the UK's specifically.

But yes, our work will need to be agile, flexible, and innovative to contribute to those powers. Europe will never be able to compete with the sheer CAPEX, but of course that doesn't mean there aren't a number of opportunities to really leave their mark.

I believe that Europe's satellite manufacturers are world class, which demonstrates the sophistication of our technology. Complimentary and disruptive success is on the cards for the UK and Europe, so I believe partnerships and innovation will be the best uses of our energy.

Question: With recent rumblings over increased interest from defence

forces toward commercial networks, do you predict seeing less friction between those two worlds?

Kyle Whitehill: About a year ago we went and met the US Space Command in Los Angeles, who had taken responsibility for both military and now commercial satellite capacity. They were figuring out how to combine both networks into a single offering to create the most compelling service to their customers. That's a very strong opportunity to remove the friction between the two worlds, though in my experience many commercial and military entities often collaborate without a great deal of red tape.

Question: We've been seeing increasing demands coming out of the defence sector to migrate communications from Ku-band to Ka. How is Avanti equipped to serve that market?

Kyle Whitehill: This is probably the thing that's been the most significant change for Avanti over the last two years. Earlier on we were very focussed on rural broadband, and though we haven't been distracted away from that goal, we've certainly worked to target more lucrative sectors recently, namely the US military.

The challenge there is in switching someone from one band to another. Of course, that's not just the actual satellite capacity itself, but rooted into the Earth station and terminal infrastructure

dependant on it. In order to address that we've worked to find the areas where people are expanding but can't get Ku-band capacity and need a solution.

Now it's tough to replace a provider, but when a provider offering Ku-band can't do the job, it's necessary to find suppliers that can and move forward with them. There are a variety of solutions in that instance and you need to work with people with the expertise to address them.

We see 2020 as being the fastest growing period for transitioning the Ka-band into military user demographics.

Question: With the critical moments of the 5G revolution set out before us, what role will satellite communications play as we shift generations?

Kyle Whitehill: This is a fascinating movement. My background is in the mobile sector - I joined Vodafone in 2001, at which time which we were in a 2G world. I can remember it vividly; the revolution of texting had overtaken us all. It was only at 2.5G when we gained the game changing ability to send an email on a phone, which would then take 15 minutes to process. Still, another revolutionary concept we simply take for granted just a few years later.

Right now, Avanti is delivering 3G and 4G to Africa for satellite backhaul. Delivering these kinds of speeds to developing areas has a hugely positive impact to the community.

I believe the role of satellite in 5G is going to include less consumer applications and more industrial ones, as the higher throughput gains the power to deliver increasingly staggering standards of transmission speed and size, which has the greatest applications for machine to machine tasks. This isn't because M2M requires high bandwidth consumption, but rather because it demands a huge amount of points of presence.

Of course, experts have long been predicting the actualisation of industry 4.0, but I believe satellite delivered 5G will offer the magic words necessary to give the incredible robotics we already have to respond as intelligently as the next steps of the automation revolution requires.

In terms of agriculture for instance, the ability to provide sophisticated IoT



Photo courtesy of Pexels ●●●

in very rural environments over terrestrial networks has the potential to significantly change the nature of our food production systems.

Question: How has Avanti responded to the emerging technology trends we've seen rising with 5G?

Kyle Whitehill: We've certainly made moves to lead the thinking behind the new standards and regulations required for 5G's great applications. A member of my team actually sits on the EMEA Satellite Operators Association (ESOA) board which is a working group which strives to understand the precise role of satellite in 5G and ensuring the stability of the companies working to deliver the new applications it will bring.

When you look at all the PR that's come out about 5G, it's the mobile operators that have taken the moral high ground in trying to deliver 5G on a global

scale, which is disappointing for me because satellite players hold such an integral role in delivering that movement too.

The closer we are to the broader discussions around these all-important topics the better we can express our intentions.

When it comes to customers in Africa, often the demographics we see are in a prime position to skip generations. Jumping from 3G straight to 5, or even from nothing right up to 3G. Satellite is the industry best placed to deliver that change.

Question: What are your targets for the future, and is there anything that you're particularly hoping to see manifest in the satcom sector?

Kyle Whitehill: I've only been around the satellite sector for a couple of years. When I first joined, something that

struck me was that the satellite industry was a fraction of the telecoms sector, though we still deliver an essential service that terrestrial networks can't because of our reach. Affordability and speed have always been a mainstay topic over the last 20 years, and for a long time, low costs and high speeds just simply weren't practical.

In 2020, that's starting to change as you see better availability and price points are becoming more competitive besides record breaking technology. In my eyes the future is now asking if LEO is the key to unlocking a new world, what with the incredible business case challenges involved in that market.

I do agree though that watching these more agile satellites will be prudent. Platforms that take far less time and money to develop while delivering competitive performance could really change the world. 🌟



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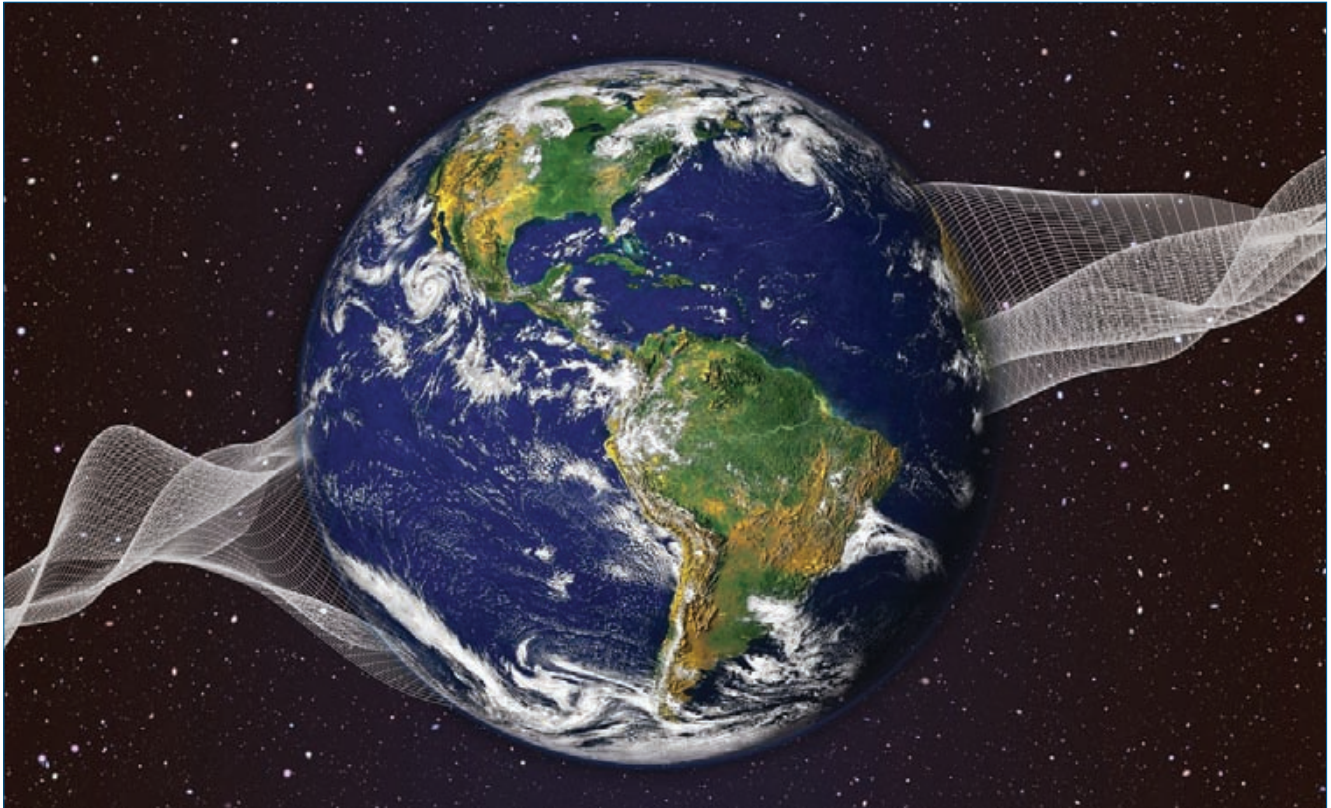


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Marrying satellite with security innovation

Cybersecurity is not limited to the computer domain alone; more so now than ever before, cybersecurity has become a pressing topic for much of the satellite sector, in particular, satellite operators and defence sector users. On board cybersecurity innovations must be married with terrestrial technologies to create a truly secure ecosystem.

Thorsten Stremlau, Marketing Work Group Chair, Trusted Computing Group

The satellite sector is seeing a wave of innovation as 5G is set to pervade and transform all sectors with higher data rates, reduced latency, energy and cost savings and higher system capacity. More so, the development of the Internet of Things (IoT) and Artificial Intelligence are ever-increasing trends which will only continue to boom and according to Gartner, 14.2 billion connected devices were forecast to be active by the end of 2019, reaching 25 billion by 2021.

5G is highly relevant to the milsatcom industry, and information from satellites fuel a great deal of today's technology. From the intelligence gathering conducted by nation-states, to military operations such as the tracking of planes, or whether used for maritime industries and the tracking of boats, all companies who are deploying assets into space should be made aware of the cyber risks involved,

especially those who are racing to be first-to-market with a unique satellite-based application.

The handling of this dataset is important and crucial to mission critical communications, so organizations need to consider how their systems may be potentially compromised by hackers.

Challenges of satellite

Security is the most significant area of technical concern for most organizations deploying IoT systems, and with 5G on the horizon, this presents a golden opportunity to connect end-users across networks, devices, and platforms, for example military vehicles. In mission critical communications, security and resiliency are essential, and the loss of a satellite link during a government or defence operation has a direct impact on the operational efficiency of the deployment and can result in cancelling the operation or even jeopardizing human lives.

In terms of security, one of the main challenges for satellite



Photo courtesy of Pixabay ●●●

is that they are potentially a larger target for attacks, given the size and scope as well as the number of Earth station access points. The IoT complicates this matter further if the device isn't encrypted or the communication isn't protected; then an individual can manipulate the device by intercepting data or changing physical attributes such as turning on cameras, sending the satellite off course, or turning off solar panels. At the same time, the content of the transmission over satellite needs to be protected against eavesdropping or monitoring of activities during government and defence operations.

However, legacy satellite communications are not easily

updated and must complete significant testing to ensure that upgrades for communication with next-generation platforms will not interfere with other, possibly critical system functions. As a result, weak encryption and old IT equipment are key vulnerabilities for satellite networks which are a prime target for hackers to exploit.

Needs of satellite

Looking back, satellite was previously a government research department and was a nation state requirement, which wasn't driven by private sector initiative. Today, satellite is becoming mainstream for corporate ventures and it is crucial that individual companies make sure that data is protected. Therefore, cyber-resiliency needs to be a requirement of the owner of the satellite, and organizations cannot leave it in the hands of the creator.

Especially as we become more reliant on this information that the next generation brings, there needs to be a focus on equipment producers and launch projects to ensure that all equipment provides sufficient protection. As a result, having an understanding where attackers originate provides an insight into what their capabilities and motives are.

Some of the recommended measures to better protect these crucial assets include the intrusion, detection and prevention onboard spacecraft, by using lightweight cryptographic solutions or software assurance methods within the software supply chain to reduce the likelihood of cyber weaknesses in flight software and firmware. By identifying



the device and its weaknesses and threats, we can increase the cyber-resiliency in remote satellites to avoid the worse kind of attacks such as organized distributed attacks which pose significant risks to a fleet.

Marrying satellite with ground innovation

The good news is a solution to meet this challenge can be easily achieved using technologies that exist today. TCG's security standards are all based on the concept of Trusted Computing where a Root of Trust – for example, Roots of Trust for Measurement (RTM), Storage (RTS) and Reporting (RTR) – forms the foundation of the device and meets the specific requirements of the device or deployment.

With a wide range of security options on offer, TCG provides building blocks to create secure systems. In the case of a high-risk system, for example, an industrial-grade discrete TPM hardware can be built in, not just into the plant's firewall, but also into the control system. This will enable these systems to be monitored in real-time and even for sophisticated attacks to be identified and prevented. For devices which are less high-risk, TPM firmware can be created which has the same set of commands but is less rigorously secured and therefore more cost-effective. Finally, for very tiny devices that cannot afford TPM firmware, DICE offers a good alternative.

By adopting cryptographic solutions and implementing

solutions such as TPM, and establishing proper security protocols, this will allow for a trusted relationship between interconnected devices. Now, if cybersecurity solutions are not able to operate in real-time, they are significantly less effective because cybercriminals can attack a system and be out in seconds. Cybersecurity needs to be comprehensive and future-proof, able to keep up with the fast-pace of technological development.

Evolving innovation

Satellite communication devices are becoming more and more common, as launches occur frequently and carry a much more diverse payload of benefits. From satellites that monitor farming, land-use, and irrigation, to rural broadband, and logistics tracking for fleet, the risk plane continues to expand. Therefore, it is the duty of those who expand into the satellite industry to protect their equipment.

With this in mind, satellite ground technology is also evolving with more innovation, flexibility, and scalability, leveraging virtualization, orchestration, and network slicing. All of this is highlighting that satellite, more now than ever, is an essential component in the overall 5G connectivity map and plays a crucial role in the operation of mission critical communications. More importantly, cyber-resiliency needs to be a strict requirement of the owner of the satellite and organizations cannot leave it in the hands of another. 🌟



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Ramesh Ramaswamy, Senior Vice President and General Manager of Hughes' International Division ●●●

Q&A

High-speed satellite Internet services

Hughes is an international leader in high-speed satellite Internet services. Its HughesNet network currently boasts 1.4 million subscribers in the Americas alone and connects people all over the world. With the new JUPITER-3 satellite set for launch in 2021, the company is poised to provide for a new era of connectivity. Ramesh Ramaswamy, Senior Vice President and General Manager of Hughes' International Division opines on how they've performed.

By Laurence Russell, News and Social Editor, Satellite Evolution Group

Question: What are some recent highlights and challenges Hughes has faced?

Ramesh Ramaswamy: We're continuing to grow our consumer broadband business. We're at 1.4 million subscribers, which includes the growth that's starting from our recently expanded business in Latin America. We think that's going to be a very strong investment in the long run.

We're also making our service more affordable for people who cannot afford a monthly subscription with Hughes Express Wi-Fi. This is our shared VSAT solution that lets local store owners in

rural towns set up their own satellite-powered Wi-Fi hotspots and sell Internet access on a per-use basis. The solution uses Facebook Connectivity's Express Wi-Fi platform on the backend to make managing the hotspot turnkey for the merchant. We've crossed a 1,000-site milestone with this offering in Latin America.

Looking ahead, our JUPITER-3 program is on track. The satellite should be launched in 2021 and will greatly reinforce the capacity we already serve over the Americas, almost doubling it in fact, allowing us to achieve greater feats of connectivity and giving us the momentum to continue growing our broadband business for consumers, enterprise and mobility.

We've also begun our joint venture with Yahsat in Brazil bringing us greater connectivity in that region, which is fantastic because we were nearing the limit of our capacity there. More importantly, that partnership has opened up new markets for us such as cellular backhaul.

Finally, one of the cornerstones of our strategy is building partnerships globally and using our technology to pave such relationships. The Hughes JUPITER™ platform is truly becoming the de-facto ground system standard for operators, and a number have become our partners on the strength of that platform. For example, Yahsat used the JUPITER System in Africa, which laid the foundation for our first joint venture with them in that region. I don't think they'll be the last to collaborate with us on the basis of our JUPITER ground system expertise.

In terms of challenges, we currently



Hughes Express Wi-Fi Hotspot - Santa Barbara Village Brazil ●●●

possess three satellites serving the US which are nearing their capacity limits. This is fantastic for business, but it also means we're eagerly awaiting the launch of our JUPITER-3 satellite to enable us to expand our broadband offerings across the Americas.

Question: From your perspective, what do people demand from satellite networks and services most frequently?

Ramesh Ramaswamy: When we look at the market in the vertical segments, we find it primarily divided into consumer broadband, which includes providing services via Wi-Fi hotspots; enterprise, which includes mobile network operators; and so called 'on the move,' which includes aeronautical broadband. There are variances in what each of these markets require but they all require highly available, flexible bandwidth offerings on an instantly available basis with more and more bits every year.

The consumer broadband business

is a simple one. Wherever consumers are unserved or underserved, which often means anyone without cable or fibre access, satellite Internet is a great solution. That market has been something we've been involved with for years now, so we're quite experienced with it and we feel like we address it well. By expanding our offering to include Wi-Fi hotspot services we can also address the lower end of this market.

The enterprise business contains various tiers, one being the corporate market where there are opportunities for network connectivity across businesses with many locations, such as banking and retail. This business has become more complex over time, especially as more and more businesses centralise operations across a cloud-based architecture. Enterprises like this generally looking for highly available, secure SD-WAN networks for which our multi-transport offering plays very well using a mix of satellite, terrestrial and wireless connectivity.

The second aspect of enterprise for us is in connecting schools, government offices, and so on. This is where people are looking for highly-available connectivity – similar to the distributed enterprise but with a focus on social and community services.

The third aspect of the enterprise is the mobile network market. This is comprised of cellular carriers and mobile network operators looking to expand their markets and connect more subscribers. Here we help them go into new areas by providing satellite backhaul across 2G, 3G or 4G networks, connecting base stations in less-populated areas back to the core network over satellite. Many of these base stations are well placed to later jump to the 5G standard – and our technology will be ready to support that.

Also, from the world of mobility, of course, people are looking for connectivity everywhere all the time. We're providing to not just mobile devices, but connections for close to 1100 aeroplanes globally through our



HT2000L. Photo courtesy of Hughes ●●●

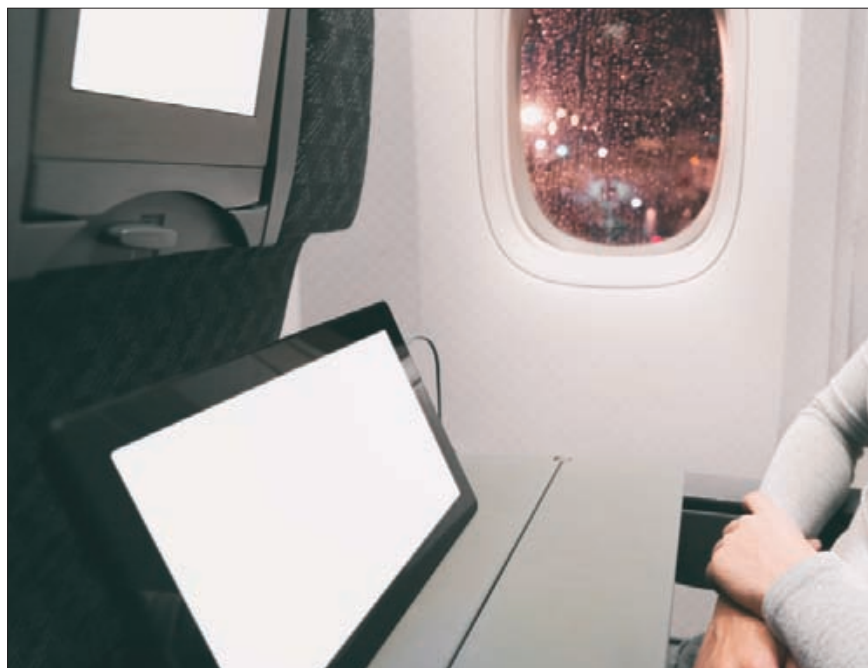
partners. Our technology is now able to seamlessly work between NGSO and GEO constellations.

Technologically, practically, and collaboratively, I think Hughes is well suited to deliver to all these areas.

Question: You completed a test flight with JUPITER's new roaming system in which an aircraft sustained 265Mbps of concurrent throughput. How will high-speed inflight connectivity change the world?

Ramesh Ramaswamy: I hope this does not sound trite, but we all know that being connected in the air is likely to be tomorrow's necessity, perhaps even something of a prerequisite. Future generations will be no less connected than we are, and for them, being unplugged for the duration of a transoceanic flight may not warrant the journey.

From that perspective, the anticipation of every airline soon requiring fast, reliable connections quantifies the heavy investment we've seen into satellite aero broadband connectivity. And LEO/MEO constellations



Inflight connectivity. Photo courtesy of Shutterstock ●●●

bring global coverage so these should play an important role in the future.

The 265Mbps threshold quoted in

the story you mentioned was just a limitation of the antenna used in that instance; the technology itself allows up to 600Mbps into the plane. Of course, that scale is only going to increase as time goes on, so I think our solution is a fantastic offering for realising strong inflight connectivity.

Question: What do you see as the future of satellite networks and services? Will we ever live in a fully connected world?

Ramesh Ramaswamy: Absolutely. I think we're in a business with a long runway. There are just under eight billion people in the world and perhaps only half are connected.

Still more are underserved compared to what most people consider to be broadband.

Then of course there are all the separate devices any one person may possess, for any collection of applications and purposes, which all require a connection, sometimes simultaneously.

I think it's perhaps one of the goals of human existence to connect all of them to a quality network. How, and who's going to make that happen, is the question, not if. I think we'll be living in a fully connected world before long, and I think satellite will be a big piece of that, which means Hughes has a lot of work to do.

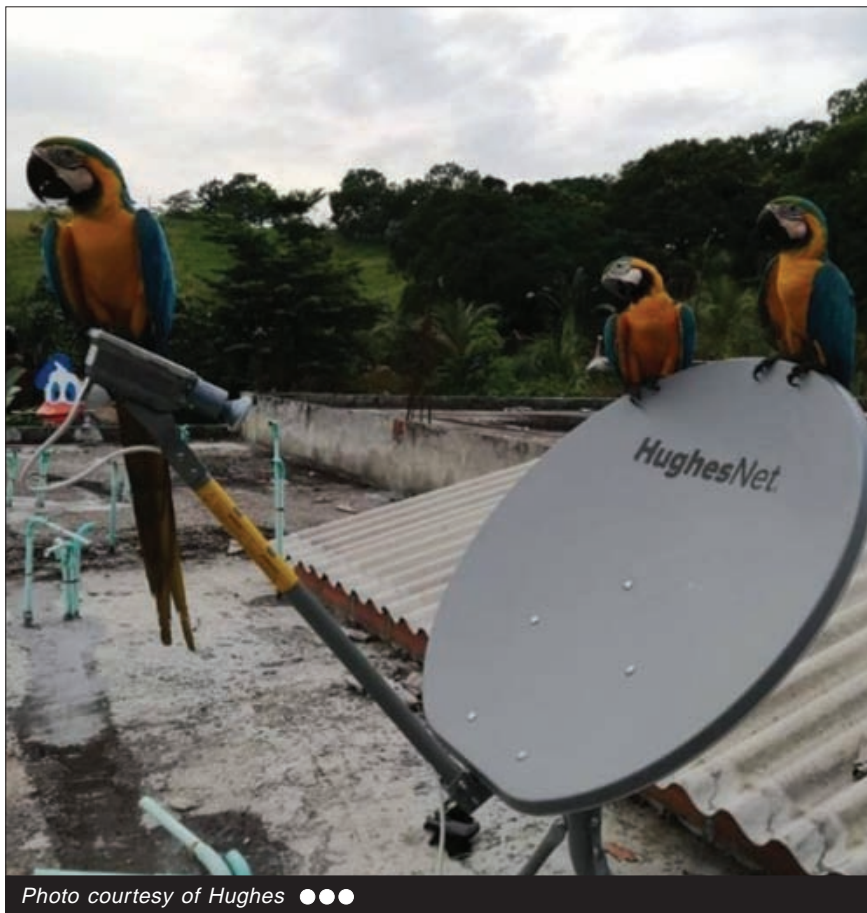


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WALTON De-ICE



New LEO / MEO Design

The **Portable Radome** makes satellite networks more survivable and deployable into extreme and harsh environments. Protect transportable antennas and equipment from, snow, ice, burning sun, sandstorms, torrential rains, up to 85 mile-per-hour winds, and more.

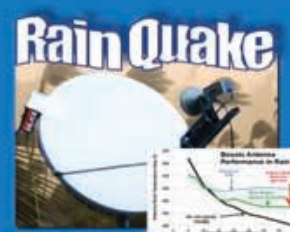
- Single-person setup in less than an hour — conventional radomes can take days.
- New LEO/MEO design for full-arc / elevation angle performance. L, C, Ku, X, & Ka Bands.



The industry's most powerful, cost-effective De-Icing. For antennas from 3.7 to 32 meters.



Sheds off snow before ice forms. Huge — up to 100 X — energy savings compared to conventional systems. 0.6 to 6.3 meters.



Minimize Signal Loss due to Rain Fade. Reduce data loss — by 20X or more.

Building digital bridges with backhaul

Cellular backhaul is making huge strides right now with the promise of supporting the 5G advancement and helping bridge the digital divide. Offering so much to so many different segments, we can expect to see this connectivity area really heat up in the years to come.

Semir Hassanaly, Market Director Cellular Backhaul and Trunking, ST Engineering iDirect

As markets mature and governments begin to enforce Universal Service Obligations (USO) to bridge the digital divide, mobile operators in emerging markets find themselves under increased pressure to extend their services in rural and untapped areas. By now, a world without the Internet is unimaginable, however, a staggering 41 percent of the global population still do not have access to the Internet. In the context of the current global coronavirus pandemic, connecting the unconnected becomes even more important, with access for every citizen, no matter where they are in the world, needed to ensure access to rapidly changing information and vital services.

Set to revolutionize all aspects of our lives across all sectors, 5G will facilitate a huge shift towards a landscape dominated by wireless connectivity, with satellite set to become an essential part of that infrastructure. Promising to advance network capabilities and offer an exciting opportunity for a plethora of new applications, satellite backhaul has gained rapid pace in the market. Mobile operators are moving towards satellite solutions as they provide wide area coverage at an effective cost, crucial for delivering cellular backhaul services.

A new era

In today's increasingly connected world, mobile connectivity is one market which satellite operators would do well to capitalize on by providing cellular backhaul. In remote areas, satellite backhaul is often the only mobile transport available, providing reliability and quick service roll-out. However, it also brings increased latency and operational costs which must be mitigated with the right solutions.

As user habits change, and connectivity levels reach unprecedented amounts year on year, the demand for 4G/LTE backhaul is growing, with 5G also on the horizon. Northern Sky Research (NSR) forecasts that the deployment of satellite backhaul sites will reach approximately 160,000 units by 2028.

This represents a golden opportunity for the expansion



Semir Hassanaly, Market Director Cellular Backhaul and Trunking, ST Engineering iDirect ●●●

of the number of sites which could be economically served using satellite backhaul from current levels of coverage.

MNOs are looking for satellite solutions which offer improved efficiency, performance, flexibility, and scalability. They want a reliable service to easily extend connectivity to rural sites and integrate seamlessly within their terrestrial network.

They are looking for multiservice capabilities, which allow access to multiple market verticals to increase revenue, and scalable solutions for large point-to-multipoint networks and for demanding high-speed trunks.

Keeping connected

In remote regions, cellular backhaul over satellite allows people to remain connected and keep pace with the fast-developing technology landscape. With the majority of people accessing the Internet via a mobile phone or tablet, rather than desktop computers or laptops, more than 65.5 percent of people have a mobile device. This figure is only set to grow at an exponential rate in the coming years.

To give an example, Intelsat and Andesat are collaborating to bring an end-to-end mobile broadband (3G) service to remote communities in Peru. With the help of ST Engineering iDirect and ZTE, they are extending life-changing 3G access to 154 rural Peruvian communities in 2020, and as many as 400 remote sites across the country over the next 18 months. Here, satellite-based backhaul solutions provide the answer to bridging the digital divide.

The aim for the Te Conectamos Perú project is to ensure people are connected, which is essential for the economic and educational development of the country. Research shows that connectivity can have life-changing impacts for unconnected remote communities. The World Bank estimates that for every 10 percent increase in high-speed Internet

connections, a country's gross domestic product rises approximately 1.4 percent.

Industry pioneers

Looking ahead, to successfully realise the full potential of the new 5G era, MNOs also need satellite to complement their terrestrial networks. This enables access to applications such as multicasting, as well as enabling the rerouting of non-latency-sensitive services such as broadband applications or the Internet of Things (IoT) data via backhauling 5G traffic from remote areas. That is why global players across the satellite industry, including ST Engineering iDirect, are transforming the network to better align with 5G standards, making it easier for MNOs to adopt and sell satellite services in the 5G future.

For example, in a live demonstration at the FOKUS FUSECO Forum, ST Engineering was joined by SES and Fraunhofer FOKUS to showcase how several satellite use cases integrate into the 5G network architecture. ST Engineering iDirect provided the ground segment equipment and satellite communications, operating over a satellite network with 5G and Multi-Access Edge Computing (MEC) integration. This milestone testing demonstrates how the industry can work together on important projects and highlights satellite as an essential component in future 5G networks.

With the seamless interworking of 5G and satellite, a new unified network will unlock a multitude of new applications and services in a fully connected world. Satellite will also become more prevalent in this new connectivity era, opening significant business opportunities for the entire industry.

The best of both worlds

However, bridging the digital divide in the outmost rural corners of the world requires more than just technology. A



Photo courtesy of ST Engineering iDirect/iStock ●●●



Photo courtesy of ST Engineering iDirect/iStock ●●●

continued partnership between satellite and MNOs is also key in creating opportunities and changing the landscape of the cellular connectivity market for the better. With satellite at their disposal, MNOs have more room to extend the reach of their services and address new use cases, such as over-the-top (OTT) content distribution, and critical connectivity for disaster response efforts.

High throughput satellites (HTS) and ground equipment with the ability to support hundreds of Mbps of capacity for backhaul, along with attractive price points, are also crucial in enabling service providers, telcos and MNOs to not only connect the unconnected but also bridge the bandwidth gap between urban and unserved and underserved areas.

As we enter the 5G era, satellite connectivity is particularly crucial for the next stage of the evolution for MNOs. In fact, NSR estimates that 5G-differentiated applications – such as 5G backhaul and hybrid networks – will generate close to one-third of net satellite capacity revenue growth in backhaul over the next 10 years. This is due, in part, to the fact that 5G backhaul capacity demand will consume four to five times the bandwidth of a 4G site, according to NSR.

A glimpse of a satellite future

Connecting billions of people worldwide, Internet connectivity is a core pillar of modern society and the next stage of evolution for mobile networks calls for a total integration of satellite connectivity with the 5G network model. So as demand for mobile connectivity surges, there remains a huge gap in the market for satellite connectivity that is available in every region, standard and application.

In order to ensure they serve their customers in an efficient way; operators should consider migrating their operations to one multiservice platform to allow them to serve numerous markets at the same time and grow their network with their business. More so, by connecting the unconnected, users in remote, rural areas will have the same opportunities that are available in more developed regions and communities, creating connectivity for all.





David Andres, Business Development Manager, Santander Teleport ●●●

Q&A

Staying ahead in a challenging market

Santander Teleport is an independent teleport operator offering satellite communication services to satellite operators, service providers, enterprise and government entities. These services include antenna hosting, uplink/downlink, custom VSAT services, satellite capacity, project engineering and consultancy. David Andres, Business Development Manager, discusses how the company manages to stay ahead of the increasingly challenging teleport market.

By Laurence Russell, News and Social Editor, Satellite Evolution Group

Question: What's new for Santander Teleport in terms of projects?

David Andres: For the last few months we've been very busy implementing the project we won last year to provide the Spanish Armed Forces installations across Africa, Europe, and the Middle East with welfare and recreational services.

That's been a major project for us, which has kept us concentrated on ensuring the requirements of the many land and maritime sites the contract comprises have been appropriately met as we've connected them. This service provides Spanish military personnel

deployed abroad with linear television channels, on-demand content, voice calls, Internet access, and even some e-learning applications.

We've also been occupied with acquiring two new antenna assets, one in X-band, and one in Ku-band. That's going to increase our capacity in line with the growing demand we've been getting from partners and customers through those bands.

Question: Let's talk more about supporting advanced welfare and recreation services to the armed forces. How big is the demand for providing enlisted personnel connectivity, to commercial services or otherwise?

David Andres: As the younger generations come along, the demands for this sort of provision has only grown. Millennials are getting to an age when they're becoming a very significant presence in military demographics, and they're quite hooked to the services of the online world.

When personnel are deployed to isolated areas or are on boats in the middle of the ocean, data access and strong Wi-Fi aren't available through traditional terrestrial networks. Every year the demand for bandwidth to support new applications increases, which we don't have any reason to suspect won't continue.

These sectors encounter problems with maintaining their talent due to underserved areas they need their staff to serve in. Connectivity is becoming key to making us who we are, so depriving people of it just isn't sustainable anymore. We're very



Photo courtesy of Santander Teleport ●●●

interested in addressing that problem and being a standout provider in that market.

Question: You were recently nominated for the independent Teleport of the Year Award. What do you think made you stand out to the World Teleport Association (WTA)?

David Andres: We have been nominated as a finalist for this award for the last three years and won the award last year, which are both outstanding achievements that speak to the qualitative standard of our work.

Being a teleport business these days is not easy, but we think we've got the right strategies to succeed and thrive. That's helped us grow year by year recently, in fact, this year we topped the WTA Fast 10 list, which ranks the most successful teleports on the planet by revenue growth.

We've measured our key performance indicators regularly to understand accurately where we could improve, and we've acted on the results of those reviews. That work has helped us to exceed 99.995 percent average availability.

We've put a lot of work into our standards, so the recognition we've earned is very gladly received.

Question: What distinguishes Santander Teleport from its competitors?



Photo courtesy of Santander Teleport ●●●

David Andres: We're a relatively young company that started in 2010, and since then there has been a very clear focus from our leadership to only offer top quality service. We hired very highly skilled and experienced engineers that are capable of going beyond what's required.

Our network operations engineers resolve the kinds of difficult issues where you'd usually call a specialist further up the chain. Over 80 percent of all service issues that are handled by

our engineers are actually resolved by the first engineer to observe the problem.

Those are just a few reasons why we offer such a good service to our partners and customers, which in turn nurtures our relationships with them and ensures return business and faithful collaboration.

We've been investing in delivering well for certain niches in the industry such as government and mobility. Of course, we're primarily a teleport

leading in VSAT antenna innovation

eutelsat
type approved
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operator, we're only a managed service provider when we can really stand out against the rest and deliver a demonstrably superior service.

The teleport market is generally quite saturated, so it's bad business engaging unless you know how you can provide an edge, which we've consistently done. We focus on what we're good at, which has garnered very healthy success.

Question: We've heard some executives in the NewSpace sphere who have suggested ground stations and teleports are behind the curve next to the cutting edge world of satellites, especially in the recent LEO/MEO boom. Would you agree with that, and if so how can you close the gap?

David Andres: I don't think this is the case. I could see how NewSpace providers may think that some service providers or satellite operators are behind the curve because they're offering a completely new way of using satellite technology to provide new services.

In terms of the teleport itself and their gateway between the sky and the terrestrial networks, I don't believe there's a discrepancy between technological standards to speak of.

LEO operators are reliant on teleports to find secure, specialised

ground station infrastructure. Teleports are the answer to that, and I'm confident that everyone on the ground station will be able to keep up with their requirements.

Not all teleports are the same, but I believe the majority of them will be able to keep up, Santander Teleport included.

Question: What do you believe is the future of teleport technology and business?

David Andres: I believe there's likely to be consolidation across the satcoms market as interests group together to survive in a high-risk environment. Horizontally and vertically, we're going to start seeing businesses start to merge, as soon as the next few months.

How that'll affect teleports is difficult to say. Of course, consolidation will touch the ground segment, especially the entities that happen to be struggling, but I think for the ones that survive they'll be great opportunities, especially as the demand booms as a result of the LEO, MEO and new-gen GEO revolution.

There's of course a bright future for the ground segment, but we're going to see some snapped up before long.

Question: What can we expect to see from Santander Teleport in the near future?

David Andres: We're quite focussed on

government and mobility, so we're going to be developing for both of those. We're taking steps in terms of security and information assurance management, which are aspects that are becoming increasingly important and will be essential to integrate in the processes, infrastructure and culture of any company doing business with governments. That's been an objective we've been preparing for longitudinally for delivery in 2020.

Our teleport business will grow it's managed services and specialist engineering provision in the markets that make sense for us where we're distinguished. Where agility and high skill really stands out in a niche area. We'll continue working closely with our customers as we welcome in new prospects from LEO, MEO and new-GEO as well and progressing forward in the most sustainable way that we can.

There are more than a few companies you see growing very quickly in a short amount of time, developing fragile success which time and again tends to fall apart overnight. Unsustainable, disruptive strategies that make a mark, but simply don't weather the test of time.

Santander Teleport takes it slow in the interest of balanced growth, so we can ensure that we'll be there for our partners and customers tomorrow and the day after that.

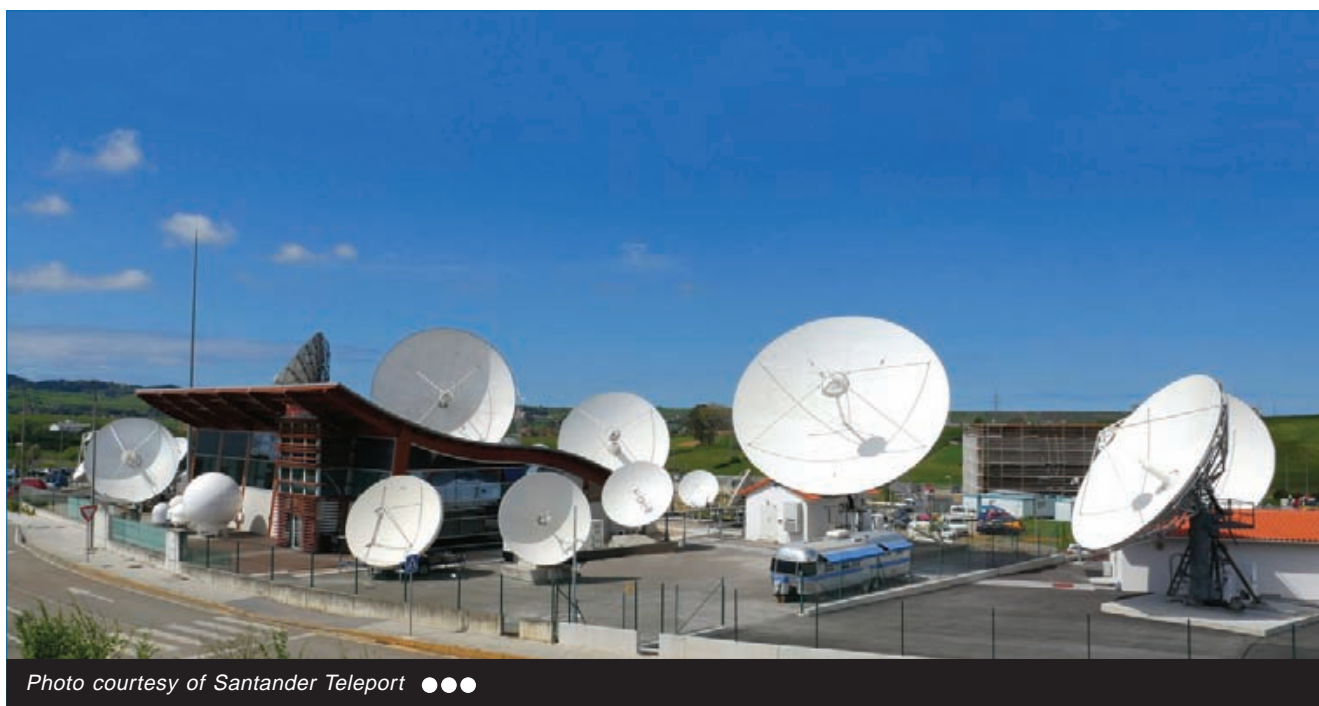
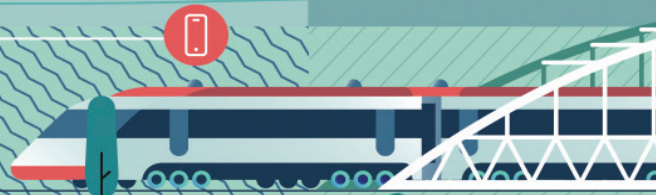


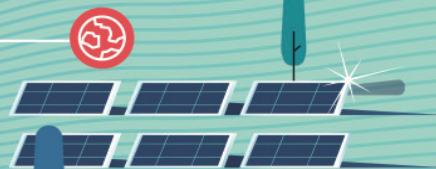
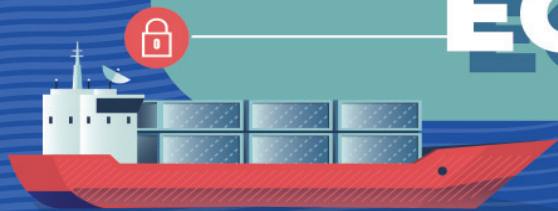
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Russian Satellite
Communications Company



SATELLITES FOR DIGITAL ECONOMY



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Tobias Forsell, CEO of
Forsway ●●●

Q&A

Bridge the digital divide

Forsway was established in 2004 with a vision of cost-effective, efficient delivery of broadband services to regions with limited infrastructure or capacity. The company plans to bridge the digital divide with its pioneering technology, delivering innovative hybrid satellite internet solutions that combine the benefits of satellite and existing terrestrial networks, as outlined by Tobias Forsell, CEO and Founder, Forsway.

Amy Saunders, Editor, Satellite Evolution Group

Question: You've considered 2019 a breakthrough year for the company from a technology perspective. What innovations helped you achieve that?

Tobias Forsell: While previously the market was still focusing on legacy solutions instead of looking at a new way to solve a long-standing challenge, in 2019 Forsway experienced that a record numbers of operators, large and small, acknowledged that the hybrid technology really can be a game changer for them in their broadband activities in both high-end and emerging markets. These include Mobile Network Operators (who previously were cautious primarily due to high satellite rates), US fixed line operators (envisioning Forsway Xtend as THE solution for poorly performing ADSL networks in large rural regions of the

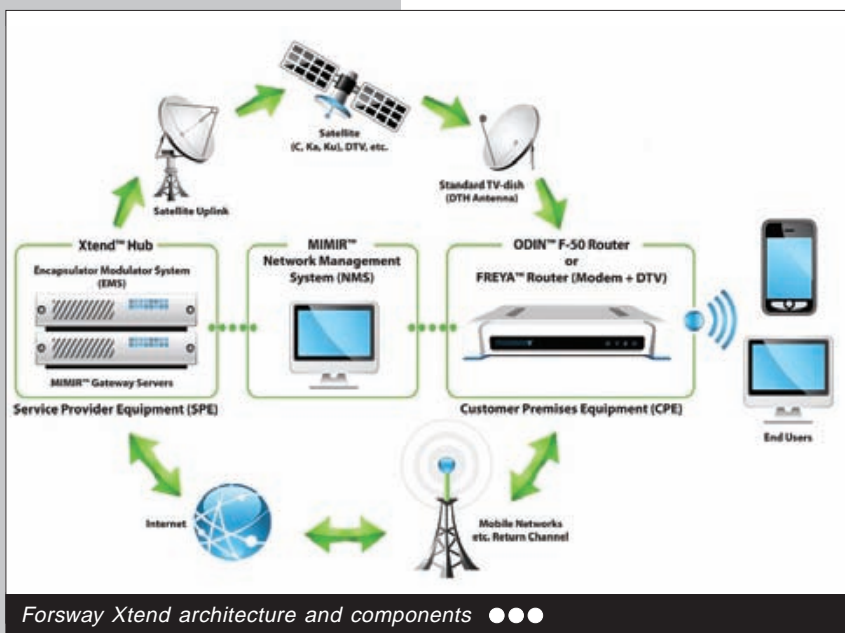
US) and large satellite operators (seeing that Forsway Xtend can help them monetise idle satellite capacity). In addition to Arabsat and PhilSat, Forsway is involved in a ground-breaking project in the US to serve rural areas.

Question: Forsway Xtend was nominated for Via Satellite's 2019 Satellite Technology of the Year Award. What set your technology so far apart from your competitors?

Tobias Forsell: No other company has demonstrated that they have advanced as far as Forsway in providing viable, cost-efficient solutions to reduce the digital divide. New HTS GEO satellites need large numbers of subs to sell their enormous capacity and low-cost satellite terminals to attract a large base.

A Forsway hybrid ODIN F-50 terminal costs 5 to 10 times less than a VSAT, including installation. Downlink performance is at approximately the same level. Forsway provides the solution for very affordable HTS terminals and LEO systems. In short, with Forsway Xtend, Forsway has the solution to make both the new HTS satellites and the LEO systems commercially successful.

Forsway is truly reducing the digital divide: Forsway's Xtend solution improves broadband in underserved areas where better connectivity will make a significant difference for economic development – both for under privileged populations and in rural areas in highly developed countries, such as large farming regions in the US. It also provides an easy-to-deploy, cost-efficient solution that enables operators and service providers to open a new



revenue stream tapping unused satellite capacity.

Forsway roll-outs with Arabsat and regional partners in Africa, such as CSS, and Philsat in Asia demonstrate using a hybrid solution is a cost-effective way to expand services and reach, while enabling large populations with access to new business prospects, health services, education and more - life altering for building a more sustainable future.

Question: What are some of your latest product releases, and how have they been performing?

Tobias Forsell: Forsway launched the Forsway Xtend ecosystem including the Xtend Hub in 2019. The Forsway hybrid technology used for Xtend combines high speed satellite downlinks with cost effective terrestrial links in existing infrastructure (primarily cellular and ADSL), as well as boosting low-performance VSAT systems. Our most exciting prospects in H1-2020 are rural US ADSL operators with millions of underserved (about 1Mbps) customers.

Forsway Xtend - a complete ecosystem for a service provider to roll-out a complete hybrid internet over satellite service - comprises the Forsway Hub, customer premises equipment (Forsway Odin F-50™ satellite router or Forsway Freya™ home interface to HD satellite TV) and numerous features and functionality.

Whether combined with mobile or ADSL, Forsway Xtend Hub is a hybrid satellite broadband extension connecting hard-to-reach regions and the most cost-effective satellite extension for terrestrial broadband networks. Key features include:

- Satellite broadband services based on Forsway Xtend can reach everywhere.
- Enables broadband access without additional infrastructure investments (fibre, cables).
- New generation GEO satellites in Ka-band can provide hundreds of thousands of new subscribers with high-speed data. Forsway Odin F-50™ end-user routers/receivers can handle more than 50Mbps of high-speed data
- Broadband service and equipment charges will be considerably lower than competing technologies, including CPEs, with costs at around US\$100 including installation - compared to several hundred USD for traditional VSAT equipment.

Question: How does your technology deliver a return on investment?

Tobias Forsell: Communications service providers can, without investing in additional expensive (often fibre or LTE) networks, provide broadband to new areas and customer groups. Thus, as more advanced services can be

provided, higher and new revenues can be achieved without costly CAPEX considerations. While using satellite capacity has traditionally pushed up OPEX, with the advent of vastly expanded capacity satellite is rapidly becoming financially viable when used in Forsway's Xtend.

Our technology provides cost-efficiency:

- Combining existing infrastructures (mobile networks, satellite) to enhance or provide connectivity with low operator investment in hardware;
- Easy to deploy and maintain, enables rapid roll-out of reliable, highly cost-efficient broadband;
- Reduces TCO using considerably less satellite capacity than VSAT.

It also helps tap unreached markets via:

- Fast deployment of hybrid technology to offer broadband and IP services to underserved;
- Build infrastructure where previously not viable due to financial and/or technical restrictions; and
- Uses existing assets & maximizes benefits of complementary technologies.

Question: You pride yourselves on being a company delivering to underserved regions. How is

What do you want from your PR?



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Forsway working to confront the digital divide?

Tobias Forsell: Forsway is solving a challenge. The satcom industry faces overcapacity and is undergoing a transition. Existing solutions are not capable of reaching enough numbers of people in a cost-effective way; 45 percent of the global population (3.4 billion) do not have Internet access – particularly outside of urban areas in emerging and established markets.

Forsway has developed a solution that benefits underserved regions and creates a new business opportunity for operators and service providers to monetise unused bandwidth – The Forsway Xtend ecosystem and satellite extension.

As an example, Forsway tests have boosted downlink capacity in rural areas from < 1Mbps to > 40Mbps, using satellite when needed, while on average using less than 20 percent satellite capacity compared to VSAT. This is possible as broadband traffic in Forsway's hybrid Forsway Xtend ecosystem is predominantly run over low-cost and low capacity (about 1Mbps) ADSL or 3G/4G networks. These results generated a huge interest in our Xtend solution with ADSL operators, especially in rural USA. Forsway is currently preparing a large-scale trial to connect rural towns, villages and Indian reservations in one of the larger western states in the US. This makes us confident that the number of people connected via Forsway Xtend will rapidly increase in the next few years to many millions only in the USA.

In addition, Forsway deployed Forsway Xtend Hubs in Asia, the Middle East and Africa together with strategic partners Arabsat and PhilSat. We demonstrated Forsway's capability to



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not only augment broadband capabilities in underserved areas, but also demonstrated that boosting legacy VSAT systems can significantly improve connectivity in unserved areas. Strategic partner Arabsat began OEM'ing Forsway Xtend in their new Xtend Africa offering from 2019.

Question: What can we expect from Forsway in the near future?

Tobias Forsell: In furthering our work with partners and the Forsway Xtend solution, Mauritanian satellite services provider CSS and Forsway recently joined forces to augment West African broadband connectivity. Together we are further building on successful trials of Xtend Africa managed service from Arabsat and Forsway.

Tapping CSS' local expertise, Arabsat's Xtend Africa managed service, and Forsway's unique satellite broadband extension, the partners came together to provide emerging economies in Africa with access to affordable satellite Internet services and opportunities aimed at help build a

productive economy, business, education and access to health services and information.

Trialling the Xtend Africa managed service from Arabsat/Forsway during a first assessment phase, we have boosted poorly performing mobile and VSAT links in an affordable and dynamic way enabling an expansion of CSS' West African service offering to provide affordable broadband in local markets.

Teaming up with Arabsat, using our Xtend satellite extension platform and BADR-7, provides managed, pan-African broadband services to local and regional communications service providers like CSS. With people restricted in their mobility due to the corona crisis, affordable broadband is more critical than ever. Today over 3 billion people lack reliable Internet access, and Forsway is working hard to do our part in making connectivity accessible to all.

We are also rolling out trials in the Americas, additional services in Asia and discussing with operators across the CIS.



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200 W Ku-Band



50/80/100 W X-Band



150 W X-Band

The New Shape of Solid State

Hosted payloads: On the road to failure?

The hosted payload model offers a great many benefits to any commercial, military or government entities who utilise it, including significantly more affordable access to space. While all indications over the last decade pointed to a model ready to boom, the reality has fallen far short of expectations.

Amy Saunders, Editor, Global Military Communications

The world of satellite is an expensive, risky, and complicated business, more so than the casual observer might realise. Large communications satellites operation in geostationary orbit often run into the hundreds of millions of dollars – and that is just for the spacecraft, long before launch, operational, insurance costs, etc. are considered – and the risk is not negligible. While today's launch companies are, on the whole, reliable industry experts, even for those with a stellar record and decades without incident, accidents happen, delivering naught but chaos and destruction. The timelines involved can make your head spin, with next-generation satellites taking years to go from the design stage to operational and frequent launch delays, causing ever-rising costs.

The hosted payload model, therefore, is an excellent route to entering the space domain, while bypassing many of the costs and some of the timescale. If a company, government, or private entity wishes to attach an individual module on board a commercial satellite, utilising the satellite's power supply and transponders but otherwise acting independently, they stand to gain significantly over launching their own satellite. A model utilised by military, government, commercial and scientific research customers the world over, hosted

payloads are the (arguably) ultimate answer for those with budget constraints.

There are many pros to utilising the hosted payload model:

- **Cost.** A single payload is far more affordable than the design, construction, launch and operation of an entire satellite.
- **Speed.** Hosted payloads can progress from the planning stage to active within 30 months, a far shorter time period than a complete satellite programme.
- **Flexibility.** The hosted payload owner can operate their module through the host satellite operator, or else retain independence with a separate, dedicated system.
- **Resilience.** A large number of hosted payloads spreads potential government and military targets to a greater number of locations that are harder to identify, compared with a small number of dedicated satellites.

A damp squib?

The hosted payload model was expected to boom in popularity in the last few years, with NSR predicting back in 2012 that the total number of active hosted payloads would grow from 13 to 184 in 2022. The first military hosted payloads were expected to be experimental rather than operational, with that market driving revenues across the sector.

However, the predicted number of hosted payloads has failed to materialise, with the model not making much progress at all in recent years. One contributing factor is the slowdown in geostationary satellite orders; typical order numbers have been 15-20 per year over the last couple of decades, but only seven were ordered in 2017, and five in 2018. With fewer commercial satellites coming online each year, opportunities for hosted payloads have shrunk significantly. Orders have picked up since, although are expected to remain at 10-15 annually going forwards, as the industry changes to accommodate more very high throughput satellites (VHTS) and fewer traditional geostationary satellites. The massive growth in the small satellite area has also changed things; prices for construction and launch have shrunk and technical capabilities have grown, meaning that the pricing for small dedicated small satellites and hosted payloads are now comparable.

Other factors limiting the hosted payloads model are not unforeseen, but nevertheless seem to have hindered growth, particularly for military hosted payloads, which were expected to make up a major proportion of hosted payloads. Hosting fees due to the commercial satellite are often higher than expected, failing to meet military budget constraints.



An artist's impression of TEMPO on Maxar's 1300-class satellite platform ●●●



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“The hosted payload model was expected to boom in popularity in the last few years, with NSR predicting back in 2012 that the total number of active hosted payloads would grow from 13 to 184 in 2022.”

Meanwhile, military programmes tend to be much more slow-moving than their commercial counterparts, meaning that the budgeting, contracting and construction of the hosted payload may not meet the required timeline for integration with the host satellite. There is also the question of orbital positioning and coverage area, which need to meet the hosted payload owner's requirements precisely; this is easier said than done, as each commercial satellite has its own very specific needs to fulfil.

One major hosted payload programme, too, has stalled in the interim years. The US Air Force's Hosted Payload Solutions (HoPS) contract vehicle selected 14 companies back in 2014 to help the US Government launch military hosted payloads on board commercial satellites. However, the five-year contract has now expired and will not be extended, reportedly because the payloads requiring a host satellite were axed due to budget constraints.

Not an entire loss

That is not to say that the hosted payloads model has failed completely and utterly. Recent years have seen several interesting hosted payload projects announced or brought into realisation.

In January 2019, Iridium completed its Iridium NEXT constellation with the launch of the last cluster of satellites, which carried 32 hosted payload sensors for the US Air Force. The Responsive Environmental Assessment Commercially Hosted constellation (REACH) space radiation sensors were produced in a partnership between the US Air Force, The Aerospace Corporation, Johns Hopkins Applied Physics Laboratory (APL), Iridium Communications and Harris Corporation. The program, managed by SMC's Advanced Systems and Development Directorate, provides an unprecedented capability to monitor the Earth's radiation environment in LEO. REACH represents an innovative, low-cost, and rapid fielding of space radiation sensing technology to provide resilient detection and characterization of space weather hazards. The data will be applied to looking at current and forecasted space weather phenomena, determining the role of charged particles in upper atmosphere chemistry, and the dynamics of the Van Allen radiation belts. Applications of the data include monitoring the radiation environment for aircraft at high latitudes as well as for crewed missions in Earth orbit. This 2019 launch followed a similar successful project in 2017, when 64 REACH sensors were launched on earlier Iridium NEXT satellites, saving an estimated US\$230 million compared with a dedicated constellation.

In other news, January 2019 also saw the announcement from General Atomics Electromagnetic Systems (GA-EMS) that the United States Air Force Space and Missile Systems Center (SMC), on behalf of the National Oceanic and Atmospheric Administration (NOAA), had awarded the company a HoPS Mission Delivery Order for the Argos

Advanced Data Collection System (A-DCS). Under the Indefinite Delivery Indefinite Quantity (IDIQ) contract, GA-EMS will launch a 110kg Orbital Test Bed (OTB) satellite and integrate the Argos A-DCS payload, which will be provided by the French Space Agency. The Argos programme collects data from thousands of sensors and transmitters located around the world for use in numerous applications, including ocean buoy tracking, wildlife and fishery monitoring, and maritime security, as well as non-environmental uses.

In August 2019, it was revealed that the USA and Japan plan to sign a new agreement to place US space situational awareness (SSA) payloads on board Japan's Quasi-Zenith Satellite System (QZSS), the regional equivalent of GPS. The four QZSS satellites providing positioning, navigation, and timing (PNT) signals to users in Asia; one satellite is in geostationary orbit and three are in highly elliptical orbits. The deal would see the expansion of the US Space Surveillance Network (SSN) by providing observation data on satellites and space debris in a region now under-covered by US radar and telescopes. Under the planned agreement, the payloads would be launched in 2023 as Japan replaces its current constellation.

In February 2020, Maxar Technologies revealed that it will integrate and fly NASA's Tropospheric Emissions: Monitoring of Pollution (TEMPO) instrument on board Intelsat 40e, Intelsat's next-generation Epic satellite destined for geostationary orbit. NASA relied on the HoPS contract vehicle to solicit proposals for satellite integration, launch services and ground operations. The TEMPO hosted payload will be the first space-based instrument to provide hourly monitoring of major air pollutants during the daytime across the North American continent at high spatial resolution. TEMPO is a UV-visible spectrometer that will observe Earth from a vantage point about 22,000 miles above Earth's equator. It will detect pollutants by measuring sunlight reflected and scattered from Earth's surface and atmosphere. The resulting data from TEMPO will be used to enhance air quality forecasts, enabling more effective early public warning of pollution incidents. The launch is expected in 2022.

An uncertain future

Despite the slow uptake, the hosted payload model has a lot to give. For military clients, hosted payloads offer fantastic space situational awareness (SSA) and intelligence, surveillance, and reconnaissance (ISR) capabilities without the huge expense of launching and operating a dedicated satellite system. Meanwhile, governments with hosted payloads on board commercial satellites stand to gain with data collection, Earth observation, debris monitoring, climate change mapping, traditional fixed and mobile communications, disaster response applications, etc. In the wider space segment, hosted payloads are also excellent for research and development and scientific technology demonstration programmes.

Government and military spokespeople have reported that many remain suspicious of the motivations for commercial satellite operators which offer hosted payload opportunities. The pros and cons can be discussed endlessly, and it is true that both sides hold merit, however, reluctance to change is the single biggest factor holding back the hosted payload model and all that it offers.





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Advantech announces technology partnership

Advantech Wireless Technologies has signed a sales and distribution agreement with TXMission, a designer and manufacturer of high performance SmallSat modems for the NewSpace Industry. The companies will together develop a comprehensive suite of SmallSat, Airborne and Comms-On-The-Move (COTM) communication products for markets requiring versatile, extremely low size, weight and power (SWaP) products that provide leading-edge performance. The range of fully integrated SmallSat and UAV/Airborne products to be developed will include advanced RF transceivers, multi-gigabit modems for onboard and ground segment applications, low SWaP satellite terminals, antennas, network management systems and 5G technology solutions.



1.35m Flexible Integrated Terminal (FIT)

AvL Technologies' new 1.35m Flexible Integrated Terminal (FIT) offers a flexible, user-defined terminal platform with a 12-piece reflector and an integral tripod for a small pack-up in two IATA-compliant checkable cases. The manual-point version operates with manual point assist software and can be upgraded to motorized operation with AvL's AAQ antenna control system. The terminals operate in X, Ku and Ka-band with new bayonet-style feeds and feed kits for quick RF changes. The terminals have a built-in tuner and beacon receiver, are scalable with 75cm, 98cm and 1.35m reflectors, and are flexible with modem, BUC and LNB options and an AvL ARSTRAT-compliant ODU.

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