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Teleports

# Satellite Evolution

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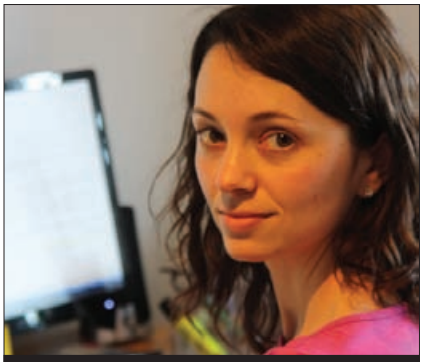

*Editor - Amy Saunders*

## Make way for another year of turbulence

New year, new lockdown! For the UK at least. Following the highly demanded and ill-advised loosening of restrictions over the festive period, the beginning of the new year has seen a flurry of activity regarding COVID regulations, culminating in Lockdown 3.0. Schools are now closed, and chaos ensues in family homes across the nation…

The good news is that, with vaccines being rolled out across the world (against current strains in any case) and a good year of pandemic experience under our belts, the new lockdown comes as an expected minor blow in comparison with Lockdown 1.0. While economies around the world continue to struggle on, businesses small and large alike try valiantly to make the best of things with the breadth of knowledge and experience gained throughout 2020.

So, what can we expect from this year? Recent reports indicate that the aerospace sector, while hit significantly by COVID last year, are rebounding now in broadband, mobility, and government/military areas, with a wealth of new deals signed. And while some companies with low cash reserves were unable to make it through 2020 – new growth by acquisitions and the upcoming LEO fleets are expected to bring new life.

In this issue, we've interviewed mobile satellite services provider Thuraya, which plans to transform its offerings in 2024; we've also spoken with Critical Software to discuss the company's key role in ESA's ClearSpace One project. We learn about the teleport of the future with Santander Teleports, Fincons Group opines on the latest in broadcast technology, while Vualto raises key points on digital rights management, a critical topic for DTH today and going forwards. Meanwhile, we've got some extremely informative articles exploring disaster recovery communications options and the role of satellite in a Big Data world.

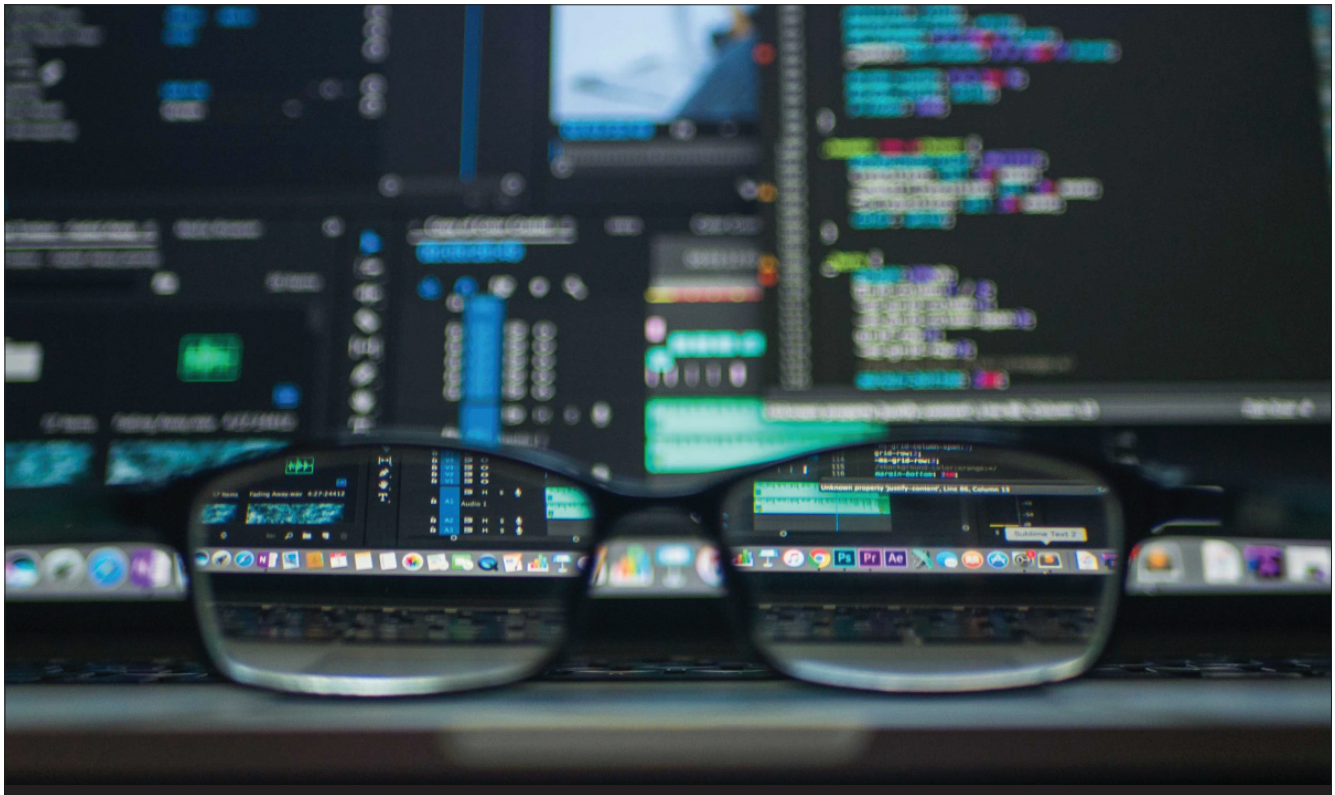

*Photo courtesy Kevin Ku from Pexels*

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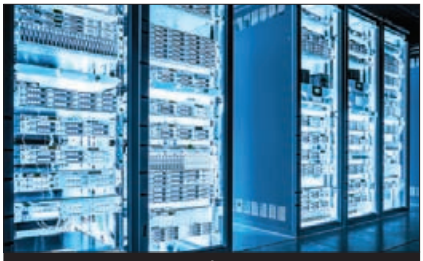









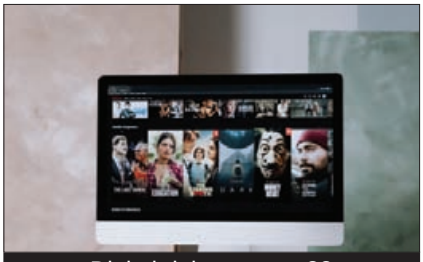



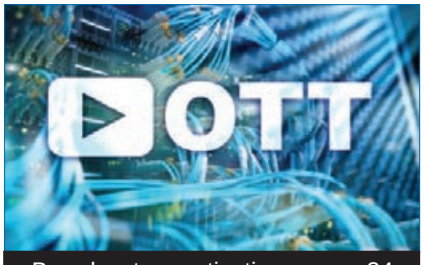




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## ESA's Copernicus captures the eruption of Mount Etna

Italy's Mount Etna, one of the world's most active volcanoes, has erupted twice in less than 48 hours during February, spewing a fountain of lava and ash into the sky. This image, captured on the 18 February 2021 at 09:40 GMT by the Copernicus Sentinel-2 mission, has been processed using the mission's shortwave-infrared band to show the lava flow in bright red.

After Etna's powerful eruption on Tuesday 16 February, the volcano produced another spectacular display of fire – with tall lava fountains shooting into the night sky, reaching heights of around 700m. The first eruption caused large lava flows to descend eastwards into the Valle del Bove, travelling for approximately 4km, but the second major explosion on Thursday 18 caused the lava also to run for about 1.3km down the volcano's southern flanks.

Ash from the eruptions covered the city of Catania and authorities have been monitoring developments in the nearby towns at the base of the volcano, including Linguaglossa, Fornazzo and Milo. The eruption also forced the temporary closure of Sicily's Catania Airport, which often happens when the volcano is active.

According to Volcano Discovery, which publishes frequent alerts about seismic activity, the volcano also saw activity on 19 February, with lava flows continuing to descend to the south and east. Mount Etna is the tallest active volcano in Europe and frequently erupts.

Satellite data can be used to detect the slight signs of change that may foretell an eruption. Once an eruption begins, optical and radar instruments can capture the various phenomena associated with it, including lava flows, mudslides, ground fissures and earthquakes. Atmospheric sensors on satellites can also identify the gases and aerosols released by the eruption, as well as quantify their wider environmental impact.

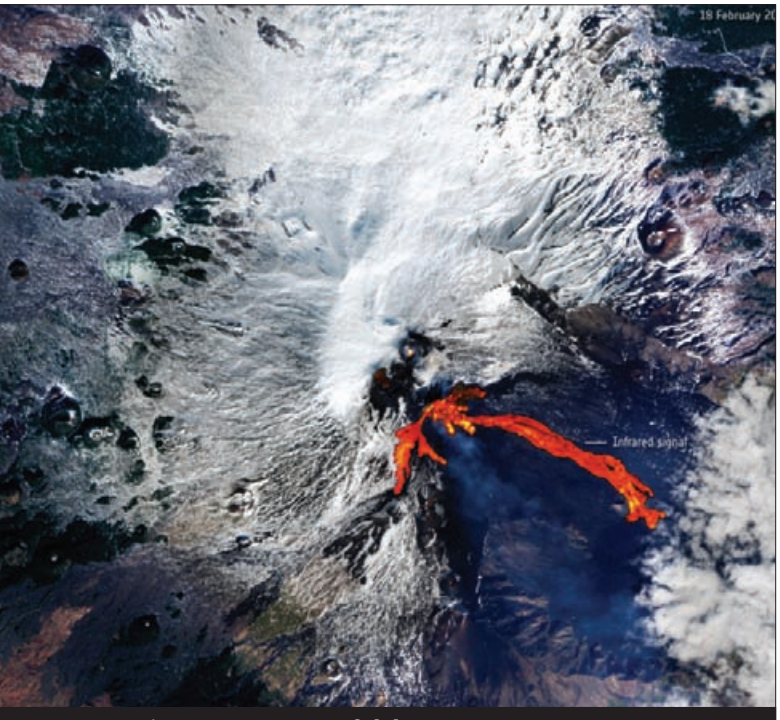


*Photo courtesy ESA*

## Cobham SATCOM appoints Tototheo Maritime as its new authorized agent and service partner in Greece

Cobham SATCOM, the market-leading provider of radio and satellite communications solutions, has appointed long term partner Tototheo Maritime, a leading maritime technology and services provider, to be its representative in Greece.

Tototheo has been the exclusive authorized agent and service partner for Cobham SATCOM in Cyprus for well over a decade, providing quality onboard services and equipment to its customer base. Based on the excellent partnership, Cobham SATCOM has expanded the cooperation to focus on high-quality service and customer support in the Greek market.

Tototheo Maritime established its presence in Greece in 2017 and has since gained the respect and trust of the local shipping industry. This was achieved through high-quality services and transparent transactions.

"We have no doubt that Tototheo is the right choice for us," said Christian Kock, SVP Maritime Sales & BD at Cobham SATCOM. "Our values of putting the customer and industry needs first, are fully aligned, and for this reason we could not be happier with this cooperation", he added.

Tototheo Maritime co-CEO, Socrates Theodossiou stated that: "It is a privilege to be so highly valued by an organization, which has shaped the technological face of our industry over the years. With Cobham SATCOM, we will continue to innovate and offer the solutions our industry needs today and for the future."

"With the appointment of Tototheo, we strengthen our position within SOLAS and GMDSS solutions in Greece even further," said Erik Nieuwmeijer, Sales Director EMEA at Cobham SATCOM. "Maritime safety has always been at the heart of everything we do right from the early beginnings in 1953 and continues to be a focus area as we enter the era of digitalisation in the future," he added.

"Our appointment as official Cobham SATCOM distributor in Greece is the next evolutionary step for us to meet the needs and demands of our customers. Through our closer collaboration with Cobham, we further enhance our dynamic approach to a very demanding market," said Tototheo Chief Commercial Officer, Constantinos Spyrou.

## Hiber successfully launches second generation satellite via SpaceX's Transporter-1

Hiber, the European satellite Internet-of-Things (IoT) company, announced that its most recent satellite, Hiber Four, has been successfully launched in space, via SpaceX's first rideshare mission of 2021 - Transporter-1.

Hiber Four is a second-generation satellite developed and assembled by Hiber's engineers in its Amsterdam office. Hiber Four, and its sister satellite Hiber Three (launching in March), are half the volume (3U) of the previous generation, which reduces the mass and decreases the launch costs by up to 50 percent. The newest generation of satellites also have an on-board propulsion system allowing Hiber's ground engineers to adjust the satellite's orbit. This ensures that Hiber Four, and its future descendants, avoid collisions and, importantly, de-orbit themselves at the end-of-life, making Hiber one of the most responsible CubeSat constellation operators in the world.

"This is just the start of what's coming," says Maarten

Engelen, MD Technology and Co-founder at Hiber. "We moved all of our integration and operations for satellites and end-to-end solutions in-house last year, which gives us greater control over cost, functionality, and speed of improvement. By controlling the full solution, we can innovate faster and respond quickly to customer needs."

Unlike the previous generation of satellites, which relied on external development and assembly, Hiber Four was developed in-house by Hiber's satellite team. The satellites and Hiber's end-to-end IoT solutions demonstrate the company's ability to develop technically complex systems and operate them in the harshest conditions. An example of this technical innovation is Hiber's most recent product, HiberHilo, a complete end-to-end wellhead pressure and temperature monitoring system for oil and gas companies. By moving development in-house, Hiber is able to develop innovative and secure solutions on demand at a faster and more affordable rate, benefitting both its customers and the industry as a whole.

"Hiber Four is the start of a new era at Hiber," says Erik Wienk, COO, Hiber. "Not only does Hiber Four mean we can give better service levels to our customers, but it also shows what we're capable of as a team."

Hiber Four is the first of two new satellites that Hiber plans to launch this quarter. The next satellite, called Hiber Three, will launch in a Soyuz rocket in March 2021. Hiber Four was launched before Hiber Three because of a delay of the Soyuz launch vehicle.

### Norway selects Space Flight Laboratory (SFL) to develop technology demonstrator microsatellite

The Norwegian Space Agency (NOSA) has awarded Space Flight Laboratory (SFL) of Canada a contract to develop the NorSat Technology Demonstrator (TD) microsatellite. With a primary mission of testing out new technologies in space, NorSat-TD will validate payloads and concepts from Norway, the Netherlands, France, and Italy. SFL, which developed the operational NorSat-1 and -2 microsatellites launched in 2017, as well as NorSat-3 expected to launch in Q2 2021, has been contracted to design and build the NorSat-TD spacecraft and perform integration and testing of all systems and payloads. NorSat-TD has completed its final design review and been slated for launch in 2022.

"The Norwegian Coastal Administration relies on NorSat-1 and -2 to accurately track large commercial vessels in its territorial waters and beyond," said SFL Director, Dr. Robert E. Zee. "NorSat-TD will fly technology that is planned to augment the ship tracking capability of Norway with a miniaturized AIS-receiver and aims to expand the technology available for future missions, including micropropulsion, precise point positioning and laser-based communications."

NorSat-1, 2 and 3 were built on SFL's 15kg NEMO microsatellite platform, measuring 20 x 20 x 40cm. Due to the additional payloads planned for NorSat-TD, the demonstration satellite will be developed using SFL's larger 30x30x40-cm DEFIANT microsatellite bus with a mass of 35 kg.

"You can think of DEFIANT as a NEMO platform that doesn't require a dispenser," said Zee.

NorSat-TD represents impressive technological collaboration among European nations. Multiple advanced or experimental payloads will see their first applications in orbit aboard the microsatellite:

- Fifth Generation AIS Receiver – An advanced version of the Automatic Identification System (AIS) receivers developed by Kongsberg Seatex of Trondheim, Norway, as primary instruments for the first three NorSats, this miniaturized device with CubeSat form factor will receive

AIS signals broadcast by large commercial maritime vessels. AIS enables the locations and status of ships to be tracked and monitored. The new NorSat-TD receiver will also be used to test the Internet of Things in the Arctic, according to NOSA.

- Small Communication Active Terminal (SmallCAT) – Developed by TNO, the Netherlands Organization for Applied Scientific Research, this instrument is also intended to support the Norwegian Defence Research Establishment's experiments with laser communications between the satellite their ground station, a potential gamechanger in the data volume that is possible from microsatellites in orbit.
- VHF Data Exchange System (VDES) – From Space Norway, an advanced communication system that first flew on NorSat-2 has been improved to enable higher bandwidth, more reliable two-way communications among and between satellites, ships, and land. Working together, NorSat-2 and NorSat-TD will provide greater communication capacity for ships in Norwegian waters, according to NOSA.
- Onboard Laser Reflector – A miniaturized laser reflector developed by the Italian INRI SCF research laboratory will be used to track NorSat-TD with ground-based lasers in Norway, France, and Italy.
- Satellite Collision Avoidance – Space Star, a space-based GPS instrument developed by Fugro will be tested as a highly accurate means of determining a satellite's position in orbit for improved situational awareness.
- Iodine-Fueled Electric Propulsion – ThrustMe, a French startup, has developed a new thruster designed to change a satellite's orbit, which will be tested on NorSat-TD. One potential future use of the thruster will be to move a spent satellite to a lower orbit, so it burns up in the Earth's atmosphere rather than leaving behind space debris.

NorSat-TD will be the seventh satellite developed by SFL for Norway. SFL built and integrated the AISSat-1 nanosatellite launched in 2010 to determine if reception of AIS signals in orbit was feasible. AISSat-1 proved so robust that Norway soon commissioned it as an operational ship-tracking mission. Subsequently, additional AISSats were built and launched and a new line of higher capacity microsatellites, the NorSats, were developed.

"NOSA is glad to be working with SFL on this demanding project. The flexibility of SFL and their micro-satellite platforms have met the varied and demanding challenges of this multi-mission technology demonstrator. We feel that this mission is again pushing the envelope for what we are able accomplish with these fast-paced low footprint projects," said NorSat-TD Project Manager, Tyler Jones.

SFL is a unique microspace provider that offers a complete suite of nano-, micro- and small satellites – including high-performance, low-cost CubeSats – that satisfy the needs of a broad range of mission types from 3 to 500 kilograms. Dating from 1998, SFL's heritage of on-orbit successes includes 65 distinct missions related to Earth observation, atmospheric monitoring, ship tracking, communication, radio frequency (RF) geolocation, technology demonstration, space astronomy, solar physics, space plasma, and other scientific research.

*NorSat-TD satellite. Photo courtesy Space Flight Laboratory*

In its 23-year history, SFL has developed CubeSats, nanosatellites, and microsatellites that have achieved more than 135 cumulative years of operation in orbit. These microspace missions have included SFL's trusted attitude control and, in some cases, formation-flying capabilities. Other core SFL-developed components include modular (scalable) power systems, onboard radios, flight computers, and control software.

## Kuwait 1st across GCC to launch NanoSatellite to track Climate Change & UV Radiation with KSF Space

KSF Space Foundation announced that the state of Kuwait will be the first in GCC and North Africa to send CubeSat to near space to measure climate change & Ultraviolet radiation in partnership with KSF Space next mission which is scheduled in June 2021.

(KCST) Kuwait College of Science & Technology in Kuwait, will be the leading across all universities in GCC & NA region to approach such experiment. The mission will be unique and distinguished due to the challenge and the expected results upon the mission completion.

Prof. Khalid Al-Begain, KCST President mentioned" The KCST & KSF collaboration entails training 12 KCST students, guiding them and recommending the proper hardware needed to build the 3D printed Space Capsule. Furthermore, conducting a research focusing on stratospheric studies on the Ozone Layer and beyond and conducting scientific experiments that estimate the seriousness of Global Warming and Climate Change"

"The purpose of the project is to better understand the reaction of climate change and measuring ultraviolet radiation in space. The expected results could prove valuable information for human and science" Said Dr. Kayyali, Chairman of the KSF Space.

The project is locally managed by KSF Space Officer in Kuwait, Eng. Loai Arnous along with KSF Space team officers. In an effort to give KCST students an outlet and a platform to actualize their aspirations and realize their dreams on a level yet to be explored. A global and international level not yet reached everywhere and so as not to limit our students' vision, and instead "take them to space". Kuwait College of Science and Technology is collaborating with the KSF Space

Foundation, which is a non-profit foundation that was founded to enable cost-efficient access to low earth orbit (LEO) with zero-environmental impact flying solutions. The foundation encourages universities to develop R&D missions using small satellites and microsatellites, where small satellites become one of the most important role in developing future scientific space missions. It is also steered by officers and members from major space agencies and industries like NASA, JAXA, SpaceX, ESA…etc.

The foundation offers space related training, NEP Certification, technology testing for satellites, ozone, and climate experiments to stratosphere, and much more, which in turn is of great value for our students. This would help them gain quality hands-on experience and a broad range of live examples for them to test in real life and extract as much knowledge as possible.

The mission will be carried on a small space capsule which was made by KSF Space Foundation, the nose of the capsule will be hosting the bacteria cells in a chamber, while the rest of the capsule will carry 5 Cubesats / Nanosatellites from 5 countries. This mission will be flying from the UK using a zero-pressure space balloon and will reach to near space.

## Airbus and University of Surrey develop nano-barrier to shield satellites from oxygen decay in orbit

Airbus Defence and Space and the Advanced Technology Institute, University of Surrey, have developed a breakthrough nano-barrier that can protect satellites in low-Earth orbit from ultraviolet radiation and atomic oxygen.

Atomic oxygen (O) is created when O2 molecules break apart, a process made easier in space because of the abundance of ultraviolet radiation. Atomic oxygen then reacts with organic surfaces on spacecraft and degrades them. Engineers from Airbus and the Advanced Technology Institute have developed a nano-barrier and custom-built deposition system that bonds to the surface of polymer or composite materials, protecting them from the erosion caused by atomic oxygen.

The new cutting-edge nano-barrier allows for large-area, conformal coating on complex 3D structures such as spacecraft and optical mirrors. This eliminates the risk of contamination and the need to wrap instruments with multi-layer insulation, opening up opportunities to increase satellite performance.

In a paper published by the scientific journal ACS Applied Materials & Interfaces, engineers showed how they have constructed the multilayer stack to overcome several issues previously reported in space, like coefficient of thermal expansion mismatch or surface undercutting erosion, as a result providing a complete nano-barrier protection for advanced polymeric and composite materials in LEO.

By applying a combination of a buffer and highly dense amorphous layers the thermal cycling and intrinsic stress effects are reduced. This enables moisture and outgassing protection in tandem creating a dimensionally stable platform, and thereby preventing material degradation. Further oxide nano-layers are used to both enhance atomic oxygen/UV protection and simultaneously improve thermo-optical properties of the substrates by controlling the optical band gap of the entire nano-barrier stack. This effectively facilitates radiative cooling by minimising the heat that could be built-up on the surface and degrade materials.

*Jassem Nasser, Chief Strategy & Marketing Officer, Thuraya*

# Transforming its offering in 2024

Mobile satellite services (MSS) provider Thuraya, which covers more than 150 countries around the world, plans to transform its offering in 2024 with the launch of their next state of the art satellite Thuraya 4-NGS, developed with the help of Airbus. Jassem Nasser, Chief Strategy and Marketing Officer, speaks about the platform's capabilities, and what it will mean for Thuraya and parent company Yahsat.

*Laurence Russell, News & Social Editor, Satellite Evolution Group*

**Question: Thuraya has recently secured a partnership with Airbus Defence and Space in the construction of the Thuraya 4-NGS next-generation mobile telecommunications satellite set to overhaul your space and ground platforms upon its 2024 launch. Could you elaborate on the arrangement?**

**Jassem Nasser:** The 4-NGS satellite will make use of the newest Airbus platform Eurostar NEO, which is synonymous with flexibility, efficiency, and superior capability. The satellite will have a 12m L-band reflector with onboard processing to provide advanced routing for up to 3,200 channels as well as dynamic resource allocation over a wide array of spot beams. The satellite is designed to stay in service for at least 15 years, and we are looking for a launch window either late 2023 or early 2024 for the commencement of commercial services in 2024.

The Thuraya 4-NGS will be manufactured and tested in the Airbus facility in Toulouse, France. European and American manufacturers will supply the components while Emirati engineers work alongside the Airbus team on every step of the design, assembly, integration and testing up to launch.

**Question: What new applications will the technical sophistication of Thuraya 4-NGS make possible?**

**Jassem Nasser:** The satellite is designed for reliability, adaptability, and security, and is scalable with the horizon technologies we are predicting. One of


*Photo courtesy of Thuraya*


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The satellite will be able to support multiple ground technologies, with a design emphasis on capacity aggregation and bandwidth adaptability which is very useful for catering to products and service lifecycles over the 15 years of service we anticipate.

Innovations like this support the development of new solutions and product portfolios, but it will also support all our existing products, giving our existing partners and customers a huge boost in performance.

**Question: Across the four years between now and launch, what needs to happen to produce a market-leading platform like Thuraya 4-NGS?**

**Jassem Nasser:** Of course, the Thuraya 4-NGS satellite itself presents a significant evolution for our L-band capabilities enabling a wider range of inter-operable fixed satellite service (FSS) and MSS solutions for Thuraya and Yahsat customers, however there are many milestones to come.

We must ensure we have the complete ecosystem in place by 2024 including awarding the satellite launch, ground segment contacts, and signing up product vendors to make use of our capacity across land, maritime and aero.

There is a lot to do between now and system launch, which makes it important to highlight to our partners exactly what we will be able to deliver when the time comes.

In summary, there is a new world of opportunities available in this investment, so proactive involvement is key to capitalise upon them today.

**Question: What will this milestone mean for more diverse markets such as government, defence, or energy?**

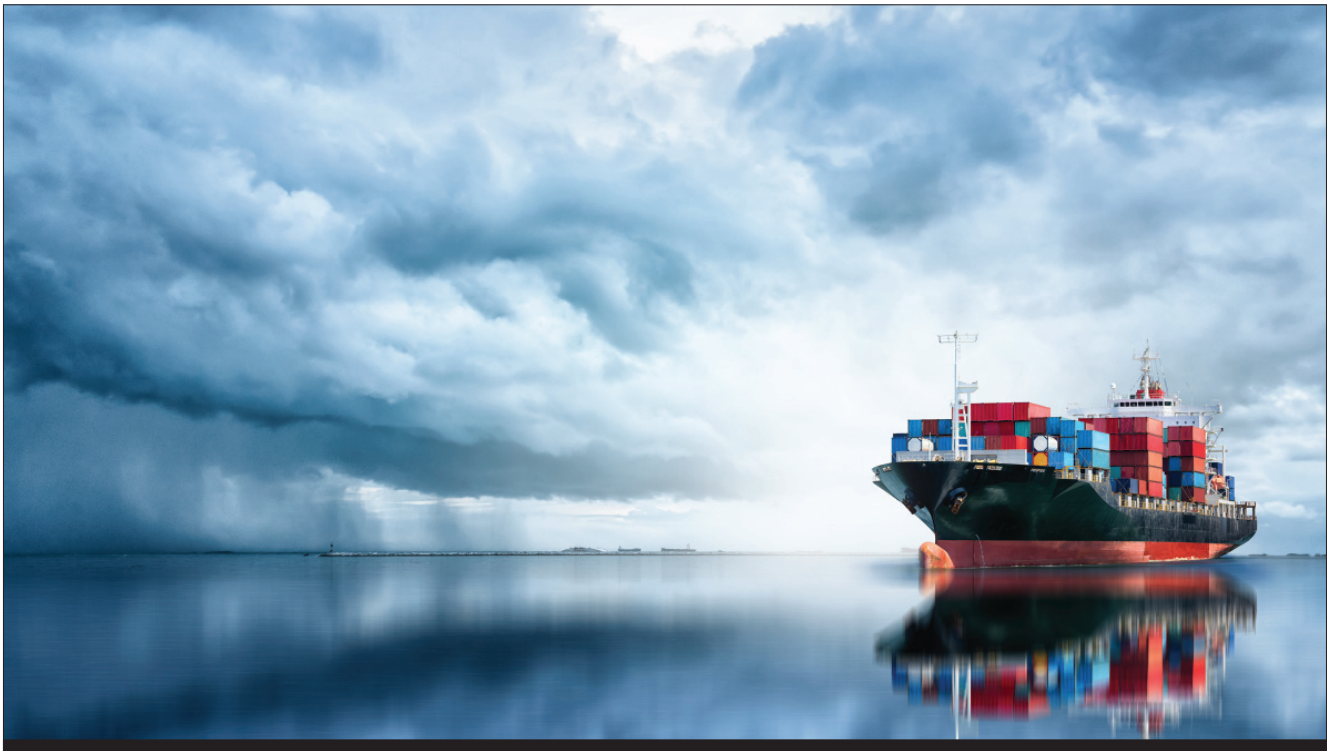
**Jassem Nasser:** In the coming years, the growth of operators will be determined by how quickly and efficiently they will be able to deliver a wide spectrum of specialised, technology-agnostic solutions. Maintain-ing a high level of service reliability is a key requirement for effective deployment in sectors like government and defence, that is something we can ensure very competitively with 4-NGS.

In particular, 4-NGS has a lot of focus on delivering capability optimal for voice, push-to-talk, UHF/VHF radio, narrowband, beyond-line-of-sight (BIRO) and high-bandwidth application technologies. Requirements in excess of 1Mbps such as high-quality video streaming and drone connectivity are well served here too.

Terminal variability is supported as well, ranging from smaller handheld devices up to larger vehicle-mounted systems. Custom solutions too, like those used within the government sectors, that use their own unique encryptions and technologies will find 4-NGS more than capable of delivering their requirements. Of course, all of this is built with security in mind, with strong, foundational provision in place.

We are looking to support hundreds of thousands of devices and users across diverse requirements from low-bandwidth, or bandwidth-hungry applications in land, sea, and sky.

**Question: This is one of many exciting developments coming out of the UAE. Can we expect this**



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**momentum to continue from the Emirati NewSpace sector?**

**Jassem Nasser:** We are committed to supporting the country's space program by nurturing new talent through research projects at Yahsat Space Lab. A good example would be the UAE's first CubeSat. MYSAT-1, which we organised, and was produced by Emirati students in partnership with the UAE space agency (UAESA) and Khalifa University, launched in 2018.

Over the years, both Yahsat and Thuraya have successfully trained schools of Emirati youth and have initiated vital knowledge transfer programs through partnerships with some of the world's leading global space enterprises, such as Northrop Grumman. Today, our efforts have paid off as Emirati men and women alike lead complex missions and critical teams. Yahsat signed an agreement with the Khalifa University of Science and Technology and the UAESA to establish and operate Khalifa University Space Technology and Innovation Centre, laying the foundations for the UAE's future endeavours in space. The centre will incorporate the existing Yahsat space lab and will focus on space exploration projects.

For the Thuraya 4-NGS, we are putting more emphasis on the responsibilities and expertise of UAE nationals as well as Thuraya and Yahsat systems engineers in driving the design and system architecture. This differs from some of our previous projects because here we are managing overall systems integration.

**Question: Yahsat has been collaborating with Airbus for over a decade now. With such a healthy partnership, what's the possibility of the development of a 5th satellite between you?**

**Jassem Nasser:** The agreement already signed includes an option to manufacture a second satellite, Thuraya 5, which would likely be conceived similarly to the 4-NGS we are developing now. Thuraya 5 would cover the Asia-Pacific region to replace Thuraya 3, which has many more years of life in it at present.

We are currently studying this opportunity carefully to ensure we can provide seamless support across coverage areas and expand our portfolio in the growing market of Asia, which we consider very valuable.

**Question: What else can we expect from Thuraya and Yahsat in the near future?**

**Jassem Nasser:** Yahsat's strategy is to ensure Thuraya strengthens its position as a leading international MSS player. We have already embarked on a very ambitious program to modernise and upgrade almost all of our capabilities at once, but this is also part of an even larger overhaul. Thuraya 4-NGS lays the ironclad groundwork for a massive phase of growth, enabling the innovation of next-generation satellites to be realised across many markets. Though, as mentioned previously, there are many milestones yet to be overcome.

Lastly, I would say that we are thrilled to be so busy delivering the future, including the launch of cutting-edge new services and products the like of which the world has never seen.


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# The growth of data networks – What are the contemporary priorities and risks

As the needs of data networks receives a shot in the arm courtesy of our lives moving online in 2020, the march of digitisation has leapt forward a few yards. With advancements have come certain challenges as new vulnerabilities and areas for improvement become clear.

*Laurence Russell, News & Social Editor, Satellite Evolution Group*

**2020 saw expectations for digital experiences leap** forward, nurturing working and purchasing habits that stretched existing systems to their limit and forced others to evolve. As staying home became the norm for professionals, consumers, and stakeholders worldwide, these habits became learned in a way we aren't likely to forget. Those sitting on the fence were toppled into the information age once and for all as those already relying on online systems invested themselves deeper.

This culture has lit the fire under our feet, inflating the demand for scaled end-to-end digital transformation to bring our world ever more online. Transparency Market Research's recent report tracking the data management market, published in June 2020, claims the market is set to almost quadruple in the next seven years, growing from US$6,000 million in 2019 to over US$20,000 million in 2027 at a CAGR of 16.5 percent over the forecast period.

With HTS and LEO fleets becoming more commonplace, capacity, throughput and pricing are looking more competitive than ever as trends like IoT, and cloud networks grow in reputation and investment. All this is to say that it feels as though the goalposts have been well and truly lain, and it has now fallen to enterprises to theorise and prove business cases.

## Hughes leads the pack with self-healing networks

Hughes is one such enterprise, recently recognised by top

industry research firms Gartner and Frost & Sullivan, premiering as a challenger in Gartner's 2020 Magic Quadrant for Managed Network Services, outranking other prestigious providers in five use cases, and a market leader in growth and innovation in Frost & Sullivan's 2020 Frost Radar, hitting their top three besides AT&T and Verizon. Both awards stressed Hughes' capacity to deliver outstanding customer experiences and commitment to innovation, particularly in its development in AIOps.

When we asked Dan Rasmussen, Senior Vice President at Hughes, how the company managed to stand out, he told us: "In differentiating ourselves from the competition, it really came to using our technical abilities to make the customer experience better. You have a lot of managed services companies out there that don't have that kind of concerted priority. We stand out by putting the customer first and ensuring that we shape their experience to be the best."

In a world of ballooning use cases, diverse buyers, and complex processes in dire need of simplification, there is a great deal of ground to cover in the conversation of optimising end-user experience. Not only as a healthy area for technological growth in a rationalist sense but as a crucial driver for growing the market.

Hughes' AIOps feature was a powerful driver in their recent accolades. Integrated into their HughesON Managed Network Services, AIOps' algorithms predict and pre-empts action to avoid service disruption, absorbing and contextualizing petabytes of proprietary network data for anomalies, then assessing the risk-reward of potential corrective actions before autonomously applying solutions and tracking ensuing performance to ensure a return to steady-state parameters. The so-called 'self-healing' technique maintains return on investment for data network availability without user input, side-stepping issues before they occur.

"The Hughes AIOps innovation targets WAN edge systems, such as routers, SD-WAN devices and firewalls,"

*Photo courtesy of Pexels*

Dan explained at the launch of AIOps' commercial availability, "because a failure in those systems can be catastrophic for a site and cost hours of network downtime. We estimate that the 70 percent success rate for autonomous correction across the sites under our management has saved approximately 1,750 hours of network downtime in the first seven months of use. In the other 30 percent of cases, the system provided early diagnoses of potential hardware failure or chronic site issues so they could be addressed pre-emptively."

## The state of cloud

The cloud is another vital pillar of the data revolution. The exponential capacity of cloud accommodates for the dizzying degree of data volume and diversity contemporary companies and innovative new business cases deal in. Market Insight Reports sees the global cloud computing market to grow at a CAGR of 10.1 percent from 2020 to 2025, reaching an estimated worth of US$7,652.2 million.

The boons of remote working have been keenly felt this year, alongside the growing appreciation for the assurance of database backup. At the AWS re:Invent Virtual Conference, Amazon Web Services CEO Andy Jassy suggested a common speedbump for customers was in the process of the cloud transition, and the worry of performance loss or security risk.

AWS planned to answer the stumbling block with the rollout of a number of services including their own automation offering in AWS Proton, designed to allow the systematization of container and serverless application development and deployment, allowing for easier management of high complexity processes, saving costs by reducing manpower and speeding up existing processes.

However, cynics argue it's still quite difficult for clouds to talk to one another, as many use different syntaxes and network configurations. Though cheaper processing power may well be possible, it can often be at the risk of committing to a very proprietary service unfriendly to its competitors and difficult to transition away from. As each provider strives to widen the market share for themselves, their deliberate incompatibility with one another frustrates users.

It seems premiere cloud providers are still squeamish of streamlining systems that might complement one another, though with experts suggesting such an arrangement could deliver remarkable results, perhaps a symbiotic business case may one day emerge.

## The new reality of cybersecurity

The subject of cybersecurity goes hand in hand with innovations in data technology. Criminals, bad actors, and even inquisitive foreign states are getting better at accessing and manipulating data, benefitting from some of the same booms in technology that enterprises are. With ample reason to abuse data, businesses large and small need every defence they can to outpace the hacking capability of the black market.

Specialists have predicted that the remote working trend opens vulnerabilities for cybercriminals to exploit, as isolated workers sit outside the company loop. In remote working environments, employees use personal devices, domestic Wi-Fi connections and personal accounts. With many companies seeing no need to re-address their security concerns under the pandemic, several remain unaware of how the world online has fundamentally changed. According to VMware Carbon Black analytics, March of 2020 alone saw a 148 percent spike in ransomware attacks, a first strike in what continued to be an evolutionary year for cybercrime.

As digital transition takes off across the 2020s, galvanised by the effects of the pandemic, enterprises are well-served by providers with an understanding of the sector who can keep data networks simple, effective, and secure.


*Photo by Christina Morillo from Pexels*

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*Rodrigo Pascoal, Critical Software, Business Development Manager*

Q&A

# Developing software guidance systems

Critical Software is a software developer specialising in safety, mission and business-critical applications in aerospace, defence, telecom, and transport industries, though they have also served as a key partner to the space sector. Rodrigo Pascoal, Critical Software's Business Development Manager, explains Critical Software's role in ESA's ClearSpace One project, developing spacecraft software guidance systems.

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

**Question: Critical Software has an impressive history in the space sector, including collaborations with NASA beginning in 1998. Could you summarise the company's achievements?**

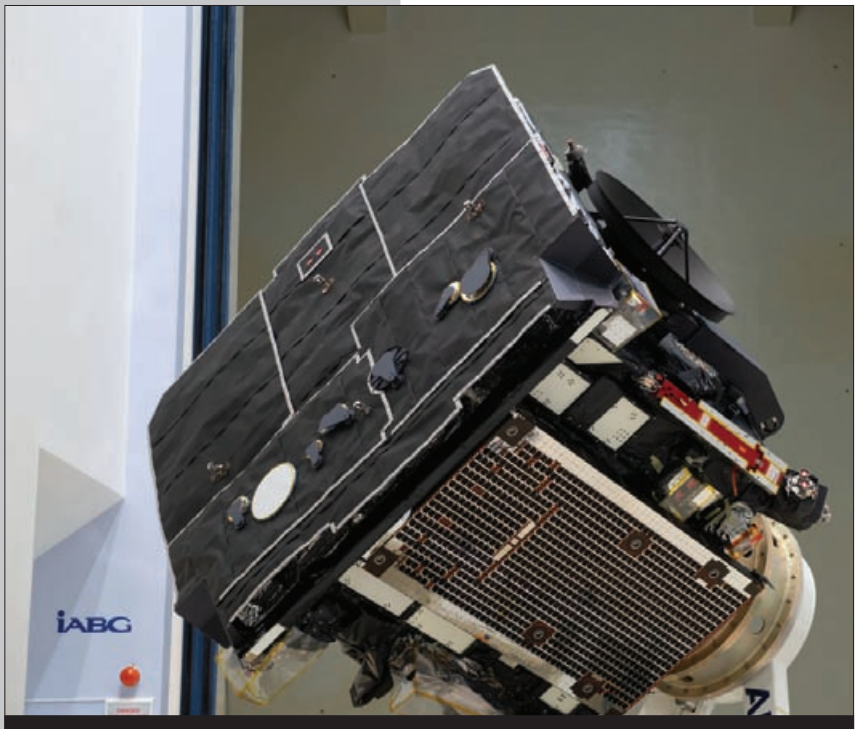
**Rodrigo Pascoal:** Critical Software's heritage in the space sector dates to the company's founding in 1998. Our first project dealt with fault injection for NASA's critical systems. With the Portuguese participation in ESA, our main market has obviously become Europe, but our track record is long and difficult to sum up briefly!

Critical Software has been involved in more than 25 space missions, providing onboard software development, validation, system engineering, independent software validation and verification, and the production of simulators.

Our history incorporates mostly sounding missions. We have worked on Galileo, LISA Pathfinder, CRYOSAT 1 and 2, EXOMARS, SOLAR ORBITER, BEPICOLOMBO and the SENTINELs 1, 3 and 6 – to name but a few!

Throughout the last two decades, Critical Software has established itself as a reliable partner to Europe's component integrators in the space sector.

Some of our most valuable assets, such as our Software Validation Facility, were originally conceived back in 1998 and are subject to continuous evolution. This has allowed it to cross markets into areas such as transportation or aeronautics. Forging the way ahead through a solid knowledge retention strategy not only makes us proud on an individual level, but it also constitutes the cornerstone of Critical Software's success story in the industry.




*Solar Orbiter at IABG. Photo courtesy of Critical Software*

**Question: Across industry and academia, the issue of space debris has been a common topic. What's Critical Software's view of the issue?**

**Rodrigo Pascoal:** The space debris issue is becoming more and more pressing. Estimates tell us that, today, there are about 8,800 tonnes of space debris orbiting the Earth and more than 34,000 objects larger than 10cm.

With in-orbit satellites predicted to

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increase by one order of magnitude within the next decade, decisive action must be taken to secure the safety of operational assets. The questions of ownership and responsibility remain, however: At a legislative level, there is currently no clear chain of responsibility for managing space debris nor an obligation on anyone to help create a safer space environment.

Critical Software believes that rapid legislative changes will happen soon and thus the route for commercial business applications of space junk removal may soon become clearer.

**Question: You're involved in ESA's ClearSpace One project to find and collect a 100kg debris object that has been orbiting Earth since 2013. Could you explain the mission?**

**Rodrigo Pascoal:** Up to now, abandoned, and damaged satellites in orbit have been manually captured and repaired through astronaut-led missions. ClearSpace aims to remove the human interface and build the technology needed to make these missions more autonomous, and therefore more realistic.

Although the mission will now target a relatively simple shape and sturdy construction (the Vespa – Vega Secondary Payload Adapter), it is similar in size and weight to an actual satellite and thus a good first step in this field.

The ClearSpace-1 lays the foundations for future commercial missions, but a strong business case is sure to depend on upcoming regulatory policy.


*Solar Orbiter ready for launch. Photo courtesy of Critical Software*

**Question: Your speciality is the development of GNC flight software. Could you describe what that involves?**

**Rodrigo Pascoal:** As in other sectors involving high-risk assets, the space sector is equipped with strong standardisation. In Europe, we use the ECSS (the European Cooperation for Space Standardisation).

Critical Software is CMMI level 5 certified for both Waterfall and Agile development processes. Our aim is always to complete projects according to these methodologies and respecting the standards and requirements.

On the surface, the development of software using Waterfall is not much different from other engineering disciplines.

It is a compromise between the requirements of engineering; the creativity of the design; the hard task of implementation; the discipline and force of rule when it comes to verification and validation; the joy of seeing the project go through assembly and integration; and the pride of seeing our work going up into space, perform as expected, and - when we're lucky - produce a positive impact on people's daily lives.

**Question: What's the process for verification, validation, and integration of the spacecraft software?**

**Rodrigo Pascoal:** Critical Software has an unmatched degree of maturity in the fields of verification, validation, and integration activities. These are the cornerstones of the work we do as a company. We ingrain 20 years of heritage with the know-how acquired in developing projects such as the Independent Software Verification & Validation guidebook and handbook. To help us achieve consistently positive results, we follow our own processes which are well defined within our Quality Management System.

**Question: What other space projects are Critical Software involved with?**

**Rodrigo Pascoal:** We have been awarded contracts including the new Sentinel missions and have achieved a major milestone in being responsible for

the ClearSpace mission flight software (except GNC).

It is also relevant to note Critical Software's role in observatory sciences. Our projects in this area include the European Extremely Large Telescope and the Square Kilometre Array, as well as our involvement in several contracts developing EUMETSAT and ESRIN downstream digital platforms.

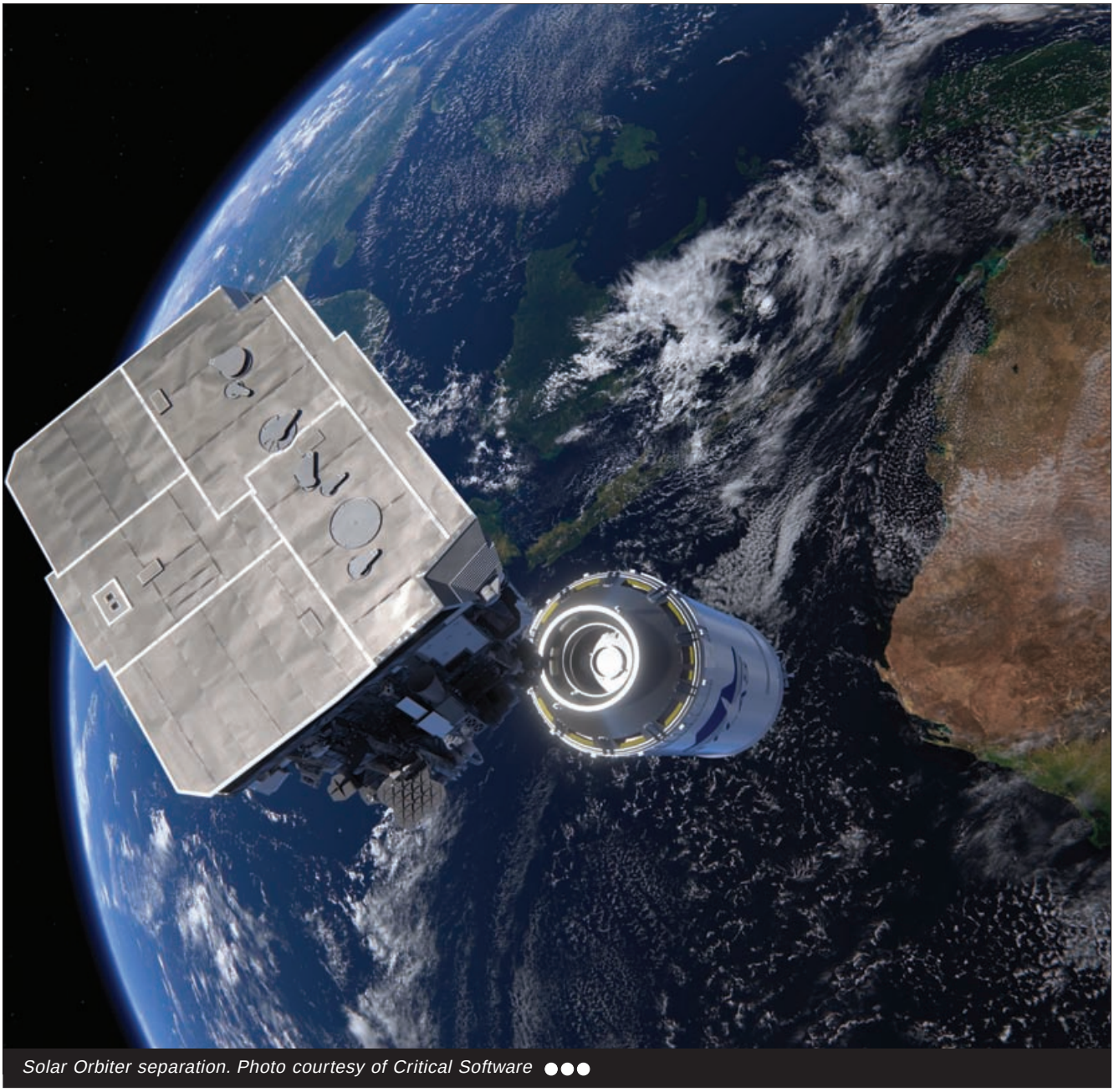
Critical Software is active in many other sectors and one of our strengths is our ability to transfer the skills and techniques we have adopted in space and other industries and apply them elsewhere in unique and innovative ways.

Our work in space has gone on to influence projects in fields as diverse as railway, aerospace, and medical devices.

**Question: Across technology and legislation, what do you see as our most valuable tool against the issue of space debris?**

**Rodrigo Pascoal:** Legislative action is undoubtedly an urgent issue. Although ClearSpace is only the first step towards a technological solution, future successes within the project are well within reach. Continuous development and improvement may only be achieved by the existence of a real market fostering multiple players which competition and collaboration in the interest of a common goal.

Critical Software's work to date has placed us in the proud position of being a pioneer in the sector, and with this responsibility we recognise and embrace the challenge of helping and supporting other industry players to bring about many more 'giant leaps' in space.



*Solar Orbiter separation. Photo courtesy of Critical Software*

*Santander teleport facilities. Photo courtesy of Santander Teleport*

# Reflecting on the teleport of the future

With the face of the satellite sector changing so rapidly and innovation after innovation flooding into the world, ground station teleports are hard pressed to stay up to date with the latest developments. Technology that just five years ago was 'pie in the sky' thinking is now well and truly here, requiring teleports to rapidly adapt for the now and the future.

*David Andres, VP Sales and Business Development, Santander Teleport*

**The world of satellite communications is evolving far** more rapidly in the last 5-10 years than it has done in the previous 50. Breakthroughs in space and IT technologies have finally started to impregnate the satellite ecosystem nurturing many areas of innovation.

If you have worked in the satellite industry for as long as I have (over 20 years), you are probably impressed by these changes. Only a few years ago, terms such as SDR, SDN/VNF, in-orbit services, Q/V frequency bands, HTS/VHTS, broadband LEO/MEO constellations, ESA/ESMA, GSaaS, SmallGeo, Small/Micro/Picosats… were barely spoken in conversations amongst satcom professionals unless you were involved in R&D projects. These terms cover a range of technical advancements that are being rapidly adopted by the satellite community today.

As a teleport operator we must constantly ask ourselves how we think the future is going to look in a few years, how this is going to affect us, how do we adapt our company strategy to the new paradigms? As we monitor the progress of our industry without the luxury of a crystal ball, one can only imagine what a future teleport could look like in a few years' time.

## New constellations

Not so long ago - 4 or 5 years - when attending one of the many satcom conferences or seminars, the overly optimistic view of the new companies planning LEO constellations and

electronically steerable antennas seemed to indicate that the world of GEO satellites and parabolic dishes would be over in 3-4 years, that the current status quo was doomed. After the initial hype, early promises have faded away and the reality is now more realistic and pragmatic. The next future years will undoubtedly see changes in our industry, but it seems that existing systems will coexist with some new ones.

Nevertheless, the arrival of broadband LEO/MEO constellations has started to change the landscape of some teleport facilities. More accustomed to accommodating medium and large size GEO antennas, one per satellite or orbital location, LEO constellations require in the order or 10-20 medium-size antennas at several teleport locations scattered throughout the world in order to support the transmission of tenths of Gigabits of data to several satellites of the same constellation simultaneously. This has big implications in terms of the real estate space required to host these antennas, as these gateways need to have access to large parts of the sky free of any obstacles to track LEO satellites without obstructions.

*Photo courtesy of Santander Teleport*

*Photo courtesy of Santander Teleport*

Access to resilient, high bandwidth backhaul connectivity to data centres is also a must to support the exchange of large amounts of bandwidth with the rest of the network and the Internet.

## GSaaS

The explosion of the Earth observation sector has traditionally been served by a selected group of ground stations linked to national governments and international institutions. The current explosion of activity in this area has attracted hundreds of private constellations planning to launch in the next few years. The final objective consists of empowering the development of multitude applications in all areas of our society by monitoring our planet from the sky in different ways (optical, radar, radio frequency surveillance, etc.) and as close to real-time as possible.

This has brought to life a new kind of actor that we can call Ground Station as a Service provider (GSaaS). Through agreements with several owners of ground stations around the world and some clever automation software, the idea is to virtualise the traditional single-site teleport facility to enable regional or global teleport 'clouds' (to use the modern term). The advantages that this may bring are reduced time to access data from satellites and a single stop shop to managed data downloads. The traditional GEO satcoms teleports have an opportunity here as well, as the number of satellites being launched and requiring ground station facilities is growing exponentially.

## Spectrum

As data-hungry applications take over the world, the use of higher frequency bands to support the insatiable demand for bandwidth is key. Access to Ka, Q and V frequency bands are becoming more important, as the only way to support a high density of Gigabits per second per $km^2$ is through dense spot beams operating in these bands where large blocks of spectrum are available. Other more traditional bands like C and Ku will also be made more efficient by the reuse of frequencies that spot-beam architectures.

It is important to remember though, that these millimetre-

wave bands are shared with other fixed services and 5G operators are claiming a share of them too.

## Cloud, 5G and The Edge

The arrival of the cloud and 5G ecosystems are pushing our market to integrate itself with the terrestrial telecoms' world. Integration, a word that has appeared many times in our vocabulary but has failed any past attempts, now seems to be put in practice for good. Satellite operators and service providers, starting with O3b´s MEF Carrier Ethernet certification in 2017 and more recently through agreements with the large cloud service providers like Amazon and Azure, are serious examples of this.

The incorporation of non-terrestrial networks (NTN) in the 5G NR standards (see 3GPP release 17) is a far more ambitious plan to include satellites and HAPS in the 5G cellular ecosystem to form a cohesive and seamless network transparent to the mobile user. This is not a feat for the faint-hearted as expectations are high and challenges are huge, but the will of execution seems to be there, with the support of the mobile operators of the world. We will probably see IOT applications under the massive machine-type communications (mMTC) classification of services appear first.

On the other hand, reducing the latency of certain applications as well as the amount of bandwidth used in backhaul and access networks forces a natural tendency to bring data processing to the edge, i.e., as close as possible to the end user.

## Conclusions

If we put together all the elements that we have discussed herein, one could imagine the teleport of the future a facility hosting a variety of GEO but also LEO/MEO antennas, serving not just the satcoms but also the Earth observation markets. Uplinking and downlinking data in frequency bands that could potentially go from lower Earth observation UHF/L/S/X to the satcoms C/Ku/Ka/Q/V-bands. Large power-hungry rack rooms hosting edge servers and virtualised applications, with the ability to adapt quickly to changes in networking architectures and waveforms (a 'black box' SDR modem perhaps?). Connectivity to data centres would be orders of magnitude (100s of Gbps) of what is typical today. All this supported with resilient and secure environmental and power facilities and operators with backgrounds beyond radiofrequency communications. And let us not forget the importance of a good framework for manage information assurance and cybersecurity, which will soon be enforced to the industry working on government programs, and tomorrow will become the norm in the enterprise world.

Quiet a ride and many potential changes. How soon? Time will tell.

*Virtualisation will become a part of the teleport of the future. Photo courtesy of Santander Teleport*

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# Addressing rising demand for disaster recovery solutions

With the devastation of climate change harshly proven by the catastrophes of 2020, we survived severe damage across the world, threatening underserved communities, small business and developing economies. As disaster recovery solutions see increased funding to keep pace, opportunities are arising for the tech sector to lend a hand.

*Laurence Russell, News & Social Editor, Satellite Evolution Group*

**If nothing else, the turn of the decade has taught us** the lesson that it pays to prepare for the worst. Amid rampant forest fires, horrific tornadoes not to mention a global pandemic, the world rather abruptly battened down its hatches in 2020, and those without adequate provision suffered terribly.

Rapid deployment, emergency communications and the ongoing work of rebuilding communications infrastructure always follow in the wake of the more destructive disasters of recent memory, although such incidents are growing in intensity and frequency in pace with the accelerating climate catastrophe.

On the 9th of December, the members of the Public Finance Authority (PFA) Board diverted US$1 million additional funds out of internal government accounts into the office of Disaster Recovery for a total 2021 budget of US$5 million after they were denied an increased allocation by the US legislature.

"[The Office of Disaster Recovery] is not something that is going away anytime soon," said PFA Board Chair Gov. Albert Bryan Jr. "It's something that we need in the government." The office is currently continuing to coordinate recovery efforts in the wake of hurricanes Irma and Maria, besides preparations for additional catastrophes.

While US civil service bodies like the PFA have been making do under the Trump administration, many expect public spending to increase under the Democrats, shoring up disaster relief measures as the Army and National Guard's continuing expansion of their remits in regard to disaster response.

## The growth of disaster response

The escalating relevance of disaster mitigation isn't only compelling the expansion of government initiatives though, as opportunities also emerge for non-governmental organisations and solutions providers.

On the first of December, Trimble, the multifarious digital solutions provider, announced that it would be partnering with Team Rubicon, a non-profit group mobilizing military veterans and first responders with communities to aid in preparation,


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response, and recovery from disaster and humanitarian crisis free of charge.

The partnership was accompanied with additional support from the Trimble Foundation's donor-advised fund, which made out a grant to Team Rubicon's The Ready Reserve Fund, enabling them to expand training and deployment of their members into vulnerable areas. Rubicon's sphere encompasses underserved communities and low-attention disasters as well as high-profile international emergencies. In 2019, 82 of their 101 operations were in response to lesser-known disasters, which expanded to 370 operations in response to the challenges of 2020.

"In a year of historic hurricanes that became low-attention disasters before making landfall and a pandemic that put additional stress on underserved populations, Team Rubicon is more committed than ever to meet the needs of communities across the country," said Art DelaCruz, President and COO of Team Rubicon. "With Trimble joining us as a strategic partner, their investment to train and equip our Greyshirts ensures they are ready to help in the disasters that are certain to come our way. They are fuelling our operations."

### Emergency cloud backup

Amazon Web Services has offered AUS$5,000 in credits to Australian small and medium organisations, including schools and local government administrations to invest in their data backup services, offsetting the cost of investing in the solution which ensures data recovery in the event of hardware destruction and spikes in network demand caused by emergency events, as well as provide early warning systems and damage analytics.

The initiative, named Project Resilience, was proposed to assist vulnerable Australian communities in taking steps to prepare for the worst, particularly front-line police, fire, and emergency response efforts.

"One of the most critical tasks during a disaster is to ensure that data regarding people, assets and services remain safe and accessible," said Iain Rouse, Country Director for AWS Public Sector in Australia, and New Zealand. "Data can play a vital role in coordinating relief efforts, especially when it relates to the locations of people in danger, or to assets that might be used in disaster response. For example, data can be used to model the progress of fire fronts and predict the location of hotspots, or to model the impact of a flooding river."

AWS also introduced a partner competency programme in the region, identifying consulting partners that implement cloud solutions for public safety and disaster response. The Australian start-up Whispir took advantage of the scheme to develop a cloud-based communications platform built using AWS technology, which merged communications services across email, text, and chat into a single application.

"Whispir's platform is being used by the Western Australian Department of Fire and Emergency Services for its Emergency WA website," explained Rouse, "where it has increased the efficiency of incident and warning notifications to the media and residents in Western Australia."

Similarly, in New South Wales, AWS partner Arq Group worked with the NSW Rural Bushfire Service to produce the Fires Near Me app, which can set watch zones and receive breaking alerts about nearby fires. The app saw over three million downloads and sent twelve million notifications to Australians in danger of fire events.

### Earth observation for disaster relief

Since 2019, Airbus' use of Earth observation imagery from satellites such as Pleiades, as part of the Airbus foundation for post-disaster impact assessment, has been supporting the response of African communities, particularly with respect to mudslides and floods during the two rainy seasons.

By comparing before and after captures, satellites can construct hazard exposure analysis to chart mudslide and flooding hazards, compiling lists of affected buildings and roads, with more detailed analyses carried out to assess the extent of damage to each location identified. The information informed recovery interventions such as search and rescue missions, emergency shelter placement and the prioritising of re-construction efforts.

A study produced by the International Center for Humanitarian Affairs (ICHA) compiled Airbus' history of intervention and concluded that their use of satellites in assisting disaster response efforts offered both invaluable information about remote and inaccessible areas as part of a cost-effective service, leading to strong recommendations that humanitarian groups form lasting connections with earth observation service providers to better inform their efforts, particularly in isolated locations.

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*Exciting new content from streaming platforms like Netflix cause huge spikes in consumer demand. Photo courtesy VUALTO*

# Putting content to (digital) rights

Content piracy has been a challenge for content owners and distributors since video first came onto the scene many decades ago. As technology has advanced, so too have the methods used by pirates everywhere to illegally gain access for consumption and redistribution. Digital rights management is today a key aspect to consider for broadcasters everywhere.

*James Burt, CTO & Co-Founder, VUALTO*

**In just a few short years, there has been a proliferation** of online content. A case in point is the world of video on demand. This exponential growth has seen Netflix shift from DVD mailing service to creator of original streamed TV programmes and films for its significant global subscriber base (167.1 million at the end of 2019). The COVID-19 pandemic and resulting restrictions have only accelerated this shift of big blockbusters to the small screen. With this, rise in consumer demand has been an increasingly saturated market of content providers, all looking to provide unique value.

It is now more crucial than ever for content providers such as streaming services to protect their users' access to such assets in order to maintain a sustainable and profitable business model. By monetising existing content, the basis can be built for more valuable content to be created in the future. Unauthorised access and piracy is not just confined to on demand video, with live events and businesses in sectors such as education realising the need to manage their content to create or protect revenue streams. With this in mind, how can content owners best protect their valuable video assets?

## The concept of digital rights management

Digital rights management (DRM) tools provide a systematic approach to copyright protection of digital media, restricting how consumers can view, copy, and redistribute purchased content. For any business that wants to monetise its content, considering DRM from the outset of content creation is vital. But implementing this technology isn't as simple as flicking a switch to turn it on. There are numerous factors that content distributors need to account for when successfully protecting their content.

One consideration for example is the variety of devices and software types available to consumers that they may utilise to consume content. Encryption standards can vary by country, while compatibility with different browsers can be impacted by regular updates and changes. While encryption standards such as CENC have gone a long way in creating aligned rules, content providers also need to be aware of slight differentiations between the way Apple, Microsoft and Google run their servers, via FairPlay, PlayReady and Widevine respectively, to ensure effective DRM integration.

With such a fragmented landscape and myriad ways for consumers to be consuming content, it is important for content

*James Burt, CTO & Co-Founder, VUALTO*

providers to partner with the right supplier that fully understands the complexities and challenges presented.

## Navigating a challenging landscape

The challenge of varying devices and servers is not the only obstacle facing efficient DRM implementation, with subscription services flexible by nature in their offering to users, and huge spikes in demand anticipated around the launch of exciting new content. For content owners, this means that a rigid one-size-fits-all approach to DRM is not feasible and could prove damaging in such a competitive landscape.

Therefore, flexibility and scalability are key. A sophisticated token system could be crucial in helping content providers traverse this complex minefield. This system gives true flexibility, enabling the business to grant specific rights to specific users for a particular piece of content. As an example, for video on demand, if a user switches from consuming a video via pay-per-view, but soon after changes to a subscription model to view that same piece of content, the new rights that now apply to that user can be instantaneously delivered to them by the content provider.

This enables content providers to lure consumers in with competitive entry-level offers, and then seamlessly switch their access when needed.

A token system also plays a key role in restricting content in instances where geographical requirements may need to be considered. A recent example of where geographical restrictions needed to be implemented was the launch of Disney+. Subscribers in the UK and other territories were not able to access new content such as 'The Mandalorian' until the end of March 2020, with the platform having already launched in the US a few months prior, which led to non-US viewers searching for ways to access the series ahead of time.

Using token can help inform licence servers to implement the appropriate geo-location standards for each user, apply rules based on whether the rights allow viewers to access content based on their location.

In addition to geographical demands, content providers also need to ensure that they are prepared to cater for peak times in demand, which for example could include live events such as World Cup games. Utilising a hosted system that provides scalability, redundancy and flexibility via clusters dotted around the globe allows content providers to deal with these huge increases in demand, even if they have limited resources in their own workflows. This also allows content providers to pre-scale in advance of an event that is anticipated to be popular.

## On-Premise versus Cloud

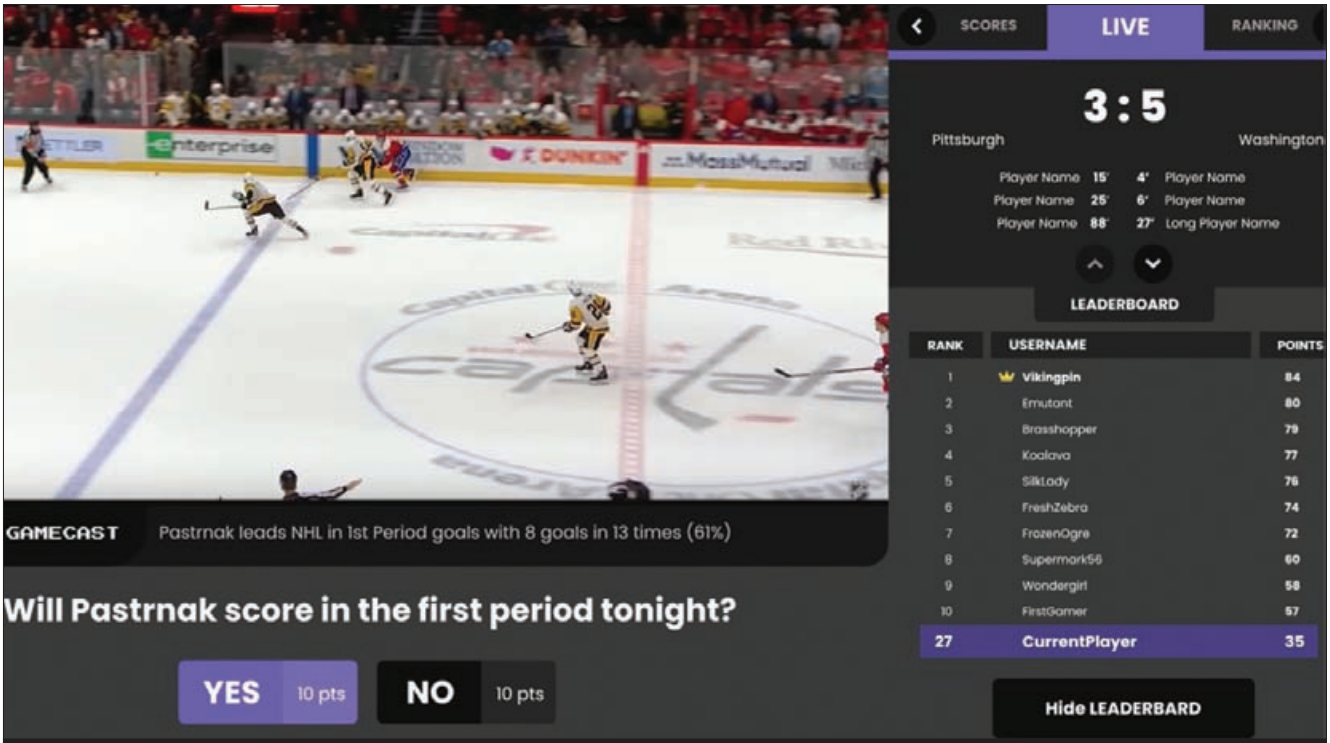
Using a DRM system that sits in the cloud enables content providers to benefit from the expertise and management of their supplier, which is lost if this is hosted on-premise, plus greater access to scalability and reduced costs from efficient use of licences. Along with the inclusion of geo-location services through the DRM system, providers can also utilise a cloud-based service to check the IP address of a user to determine their location. Flexibility sits with the content provider in how they would like to implement this.

## Removing the complexity

Digital rights management is a complicated business, and with the right external support, the hassle can be taken away from the content providers to focus on what they do best. Although these complexities have been exacerbated by contrasts between how Apple, Microsoft and Google manage DRM technologies, the right technology partner can act as the go-between to help simplify these differences.

Despite these differences, the industry is likely to become more aligned as demand and understanding of DRM increases hand-in-hand with the growth of content available. Online video continues to dominate, with the 2019 Global Internet Phenomena Report finding that video accounts for a staggering 60 percent of downstream traffic on the internet. The COVID-19 pandemic has shown video content to be a force for good in keep people connected, entertained, and educated at home, and so more than ever there is an awareness from content owners of all shapes and sizes of the value their content holds.


*Token systems can help to restrict access to content where geographical requirements may need to be considered. Photo courtesy VUALTO*




*Screenshot derived from a Fincons Group developed application*

# Right here, right now: Next Gen connected TV and the monetisation opportunity

The broadcasting sector is in a major state of flux right now. From the one side, serious advances in technology are fast-tracking exciting new developments like 8K, OTT and mobile gaming, while on the other, the COVID-19 pandemic is driving demand with huge rises in viewership numbers. New opportunities in monetisation mean that there's some serious money to be made for those early adopters.

*Oliver Botti, Strategic Marketing and Innovation Executive Director, Fincons Group*

**Embracing new technologies that support the very** latest developments in digital TV is within the immediate grasp of satellite operators and is becoming ever-more urgent as the expectations of viewers, broadcasters, rights holders and advertisers evolve and monetisation opportunities crystalise.

The European HbbTV standard opens the doors to creating a more hybrid business model that integrates satellite and OTT, a move that is particularly imperative in the sports entertainment market. Sports content distribution is changing rapidly and becoming highly fragmented. 77 percent of sports fans already watch sport regularly on online streaming platforms, 68 percent on pay-TV services and 66 percent on social media - trends that are accelerating sharply during the COVID-19 pandemic with viewers confined to home. The global eSports market – also boosted hugely during the pandemic - is contributing to the shift towards online media consumption, with revenues predicted to soar from just over US$950 million in 2020 to nearly US$1.6 billion in 2023. The roll-out of 5G will further boost video consumption via mobile devices.

## Matching audience expectations

First movers in the satellite communications sector are already capitalising on the digital opportunity and framing on-demand content via OTT as complementary, rather than competing, with satellite's key advantages – such as high bandwidth to support 4K Ultra HD channels. Indeed, image

*Oliver Botti, Strategic Marketing and Innovation Executive Director, Fincons Group*

quality is an important factor for avid sports fans; research has shown that two thirds would choose picture quality over reduced latency. In addition to this, evidence shows that linear broadcast remains strong – but broadcasters and the wider ecosystem do not want to choose between linear and OTT, they want a more hybrid offering that reflects the choice, flexibility and on-demand nature of today's world.

What precisely are the expectations of the modern sports fan? They expect to watch the action seamlessly across multiple platforms and devices, anytime, anywhere, regardless of the streaming or broadcast services they choose. Research from Verizon Media tells us that 42 percent of live sport viewers want highlights on demand, 35 percent want replay controls and 30 percent want the option of different camera angles. Also growing in popularity are customised on-screen player and game statistics, immersive experiences such as VR-enabled 360-walkthroughs of a stadium and features from the world of gaming such as quizzes, pre-game wagers and contests with leaderboards. With COVID-19 curbing real social interaction, demand is skyrocketing for enhanced virtual interaction characterised by participation rather than passivity.

## Data holds the key

Delivering the connected TV promise requires – and generates – a wealth of data. In fact, the access and analysis of data that AI and Machine Learning can provide is a key enabler for new TV capabilities in many areas of the sports entertainment market.

Take the rise of eSports. Gaming is no longer the solitary activity of a single player. It has evolved into a series of connected and interactive professional activities, and full-blown community events that rely on OTT-technology and specific apps to analyse gamer behaviour and performance. The sophisticated data engines behind these events enable eSports to be streamed across a range of devices and platforms offering interactive overlays with in-depth player and game statistics and content matched to user preferences - while providing insight into viewing habits, devices used, second screen usage, content preferences, demographics and in app purchasing habits.

AI and Machine Learning technologies can be deployed to transform this data into powerful marketing intelligence for advertisers and merchandising partners who stand to gain a more accurate understanding of their audience.

## Game on!

Incorporating elements of gamification, where fans participate in a 'game within a game,' is a prerequisite to fuel increased engagement and a heightened sense of competition in both real and fantasy sports and to deliver the depth of data required to maximise commercial opportunities.

Contests and leader boards can create highly engaging and sticky experiences, keeping fans' interest active and introducing a new (virtual) social dimension to sporting events. Pre-game wagering on live sporting action - and fans pitting themselves against other fans in their predictions - is a burgeoning market. This is especially the case in eSports, with consulting firm Eilers & Krejcik Gaming predicting that even post-pandemic eSports will account for 10 percent of the legal online sports betting market.

Advertisers are rapidly switching on to gamification. In 2019 online streaming platform Twitch secured a multi-touch advertising and sponsorship deal with the US brands Hershey's and Reese's, which kicked off with an Easter-themed stream from a leading Twitch influencer where viewers could collect digital eggs and win Twitch Bits, the platform's virtual currency.

Gamified features rely on interactivity and accurate, granular, real-time information. The use of HbbTV and the integration of Gaming and Video Platforms along with AI is critical to gather and interpret the necessary data from multiple sources, automatically analyse content and deliver a high quality, seamless, engaging experience.

## Viewing gets smart

Smart watching is already revolutionising viewer experiences, online and – when spectators can return to live events in the real world - in stadium.

Machine Learning, with the ability to deliver a better understanding of the viewer, is a powerful tool to enable recommendation-based content discovery and customised experiences matched to individual preferences. Next generation-features such as selecting specific action to replay, extracting personalised highlights and providing direct navigation to preferred content through a smart player enhances both live and VOD experience and makes a more efficient use of the masses of content rights owners hold.

The application of these tools also supports enhanced in-stadium experiences with instant replays, live-TV graphics, third party merchandise and food or beverage ordering via mobile devices. Immersive, added-value broadcasts delivered through VR and streaming will provide another technological edge for content owners. Connection to VR and ticketing applications ensures that the viewer experience is always tracked and driven from one stage to the next – from ticket purchase right through to pre-game contest and in-stadium

refreshment availability or merchandise purchasing.

### Targeted advertising and commerce

The opportunity provided by Next Gen TV for advertising in the sports entertainment market is huge. Greater targeting, based on geography, demographics and actual viewer preferences provides an efficient opportunity for third parties wanting to target viewers with merchandise or products commonly associated with the specific sports experience, such as energy drinks and coffee for eSport gamers.

The advertising potential of Connected TV translates directly into ecommerce potential as each advert, banner or inlay easily opens up into specific landing pages or in-app purchase opportunities.

Introducing Click & Buy into the mixture can help drive the impulse purchase of third-party products without the viewer ever having to exit the viewing experience or switch device. Similarly, this high level of multichannel interactivity can be leveraged to provide viewers with product recommendations based on customer data analytics, and even provide redirection to betting sites where legislation allows.

### Conclusion

IHS Markit in its report '*The New Frontiers for Distribution of Sports Content'* states that: "OTT live streaming will not replace linear broadcast. It has the potential to provide a significantly enhanced experience for viewers and used in conjunction with linear broadcast as a value-add reducing churn and generating additional revenue in content monetisation." Indeed, early adopter satellite operators are already seizing the opportunity. By leveraging smart technologies that combine the capabilities of Next Gen TV, AI, Machine Learning and VR, they are providing type of modern, dynamic and interactive TV experience that targets fans in engaging and personalised ways and opens up exciting new monetisation opportunities that will prove transformative for their business.

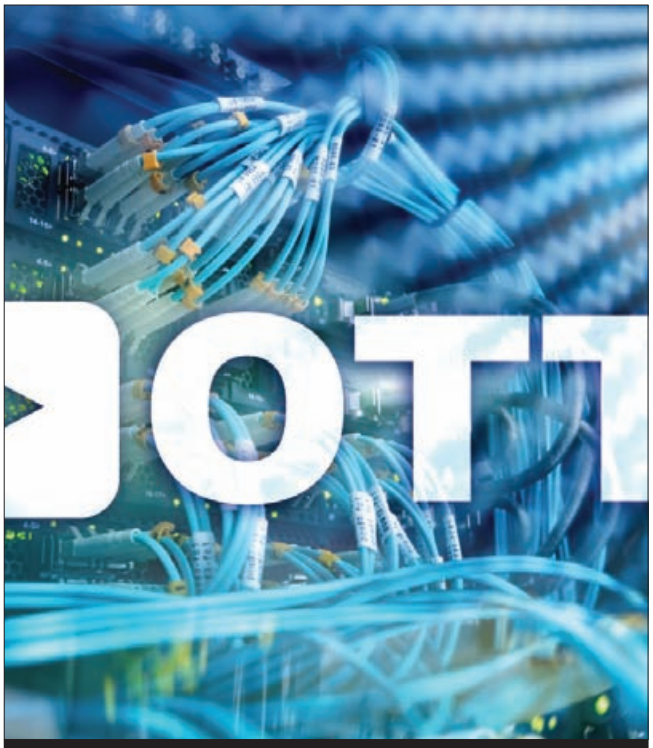
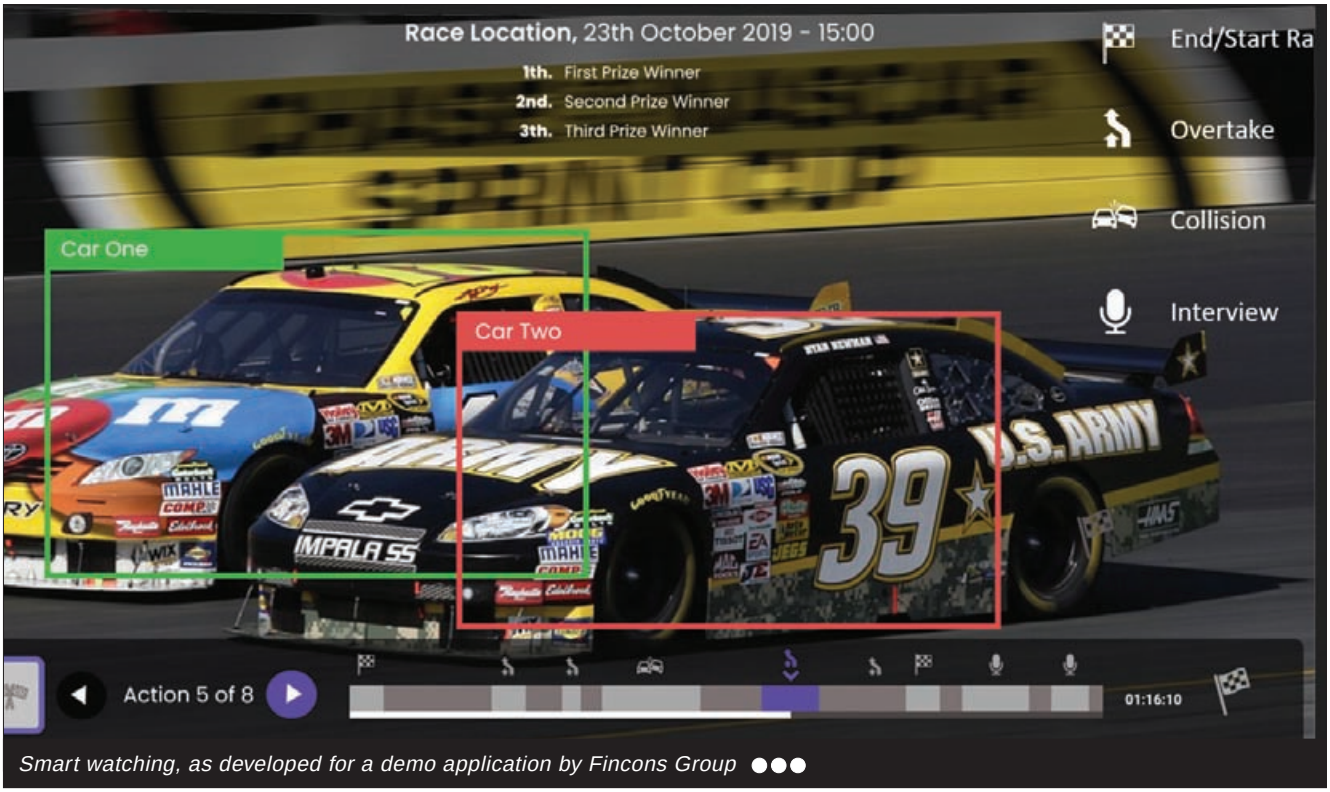



*Photo courtesy of Shutterstock*




*Smart watching, as developed for a demo application by Fincons Group*

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**Advantech Wireless Technologies releases Ultra-High Power SSPA System for TT&C and Deep Space Communications**

Advantech Wireless Technologies announced the release of its DeepBlu-Series 8.5kW Wideband C-band Modular SSPA System for LEO, MEO and GEO applications that include Satellite Telemetry, Tracking, and Control (TT&C) and Deep Space Communications. The newly designed DeepBlu-Systems consist of multiple high-power SSPAs packaged in ruggedized, outdoor enclosures and integrated into a single frame structure that includes combiners, loads, power distribution and M&C – perfectly suited for fixed and full motion antenna installations. Modular architecture with 1:N built-in redundancy and field replaceable amplifiers minimizes downtime, resulting in the highest service availability in the industry.

"Our DeepBlu high-power SSPA systems are designed to produce the high levels of EIRP necessary for the simultaneous control of multiple satellites, while facilitating communications with assets in Deep Space. Today's satellite modem technology can generate links with modulation schemes of up to 1024 APSK that, when combined with solid state power amplifier technology, can achieve extremely high levels of bandwidth efficiency. DeepBlu is an excellent enabler for critical operations. As the consumption of bandwidth from the expansion of 5G accelerates, traditional teleport operators will be able to accommodate more users in less C-band spectrum," said Cristi Damian, VP Business Development at Advantech Wireless Technologies.

For further information visit: https://advantechwireless.com

**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.


For further information visit: https://www.avltech.com

**Isotropic Systems has cracked the code for next-gen connectivity**

Isotropic Systems' transformational terminals feature patented optics and beamforming technologies capable of unleashing the full potential of new satellite constellations set to come online in the next two years. The roadmap features a converged antenna that operates in multiple frequencies and multiple beams, meaning commercial and government users of the platform can completely arbitrage all the capacity in space through a single terminal.

Isotropic Systems' first-generation multi-beam terminal is a Ka-band platform set to serve Non-Geostationary Orbit (NGSO) constellations. The company has contracts with SES and Inmarsat, as well as US Defense organizations ready to leverage the breakthrough terminal.

For further information visit: https://www.isotropicsystems.com

**Intellian's v60Ka 2 and v100NX Ka antennas gain type approval from Telenor Satellite**

Intellian is pleased to reveal that two of its industry-leading antenna systems, the v60Ka 2 and v100NX Ka, have gained type approval from Telenor Satellite for use on their THOR 7 Ka-band GEO satellite network. This means that the systems are now officially certified to take their place in service alongside Intellian's v85NX, the first 85cm antenna to receive type approval on the network.


The Intellian v100NX Ka delivers market-leading RF performance and is future-proofed with a specially-tuned radome and reflector in anticipation of forthcoming 2.5GHz wideband Ka network services. Like all NX Series antennas, the v100NX Ka supports multi-orbit operation and can be simply converted between Ka and Ku bands, allowing owners of existing v100NX Ku-band antennas to easily switch to the THOR 7 network if desired. An optional 10W BUC upgrade provides a straightforward means of further boosting the antenna's performance.

For further information visit: https://www.intelliantech.com

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**Integrasys Beam Budget is the Link Budget calculation tool ideal for Satellite Operators and Service Providers**

Beam Budget provides the most accurate Link Budget which includes graphical beam representation. Its friendly interface makes it easier for Sales Representatives providing Automatic & Graphical reports and the possibility to export Excel & PDF reports with an executive summary and a complete report for forward and return link.

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- USB Dongle Key.
- License Certification.
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- Installation and Configuration (in *VMWare remotely).

**VMWare not included*

Network License (Upgrade)

- Perform several link budgets inside a selected region in one calculation.
- Select the region drawing a rectangular area on the 3D globe.
- Select the region depending on the satellite EIRP or G/T value of the uploaded footprint.
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For further information visit: https://www.integrasys-space.com

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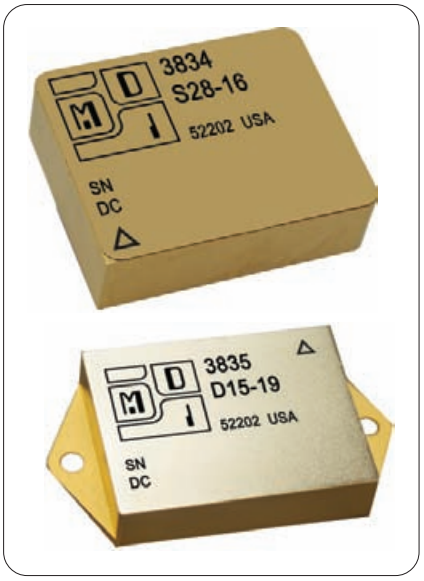


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For further information visit: http://www.mdipower.com

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For further information visit: http://www.satgroundapplication.com

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Terrasat Communications designs and manufactures innovative RF solutions for satellite communications systems. The ground-breaking IBUC - the Intelligent Block Up Converter - brings advanced features and performance to C-band, X-band, Ku-band, & Ka-band satellite earth terminals and VSATs. Terrasat Communications offers the IBUC (Intelligent Block Upconverter) brand RF solution for MILSATCOM terminals. Building on the company's reputation as an innovator in the RF space, Terrasat has launched several IBUC models that play a key part in ruggedized tactical satellite terminals. All IBUCs are engineered and manufactured in the company's modern Silicon Valley facility and are backed by a 3-year warranty.

For further information visit: https://terrasatinc.com

**Thuraya is collaborating with FrontM** to launch Thuraya SatTrack, a cloud-based tracking and monitoring service that significantly increases operational efficiencies on board fishing vessels. Designed for the top-selling Thuraya MarineStar voice, tracking and monitoring solution, SatTrack will be available to users very soon.

In spite of digitalization and increased influx of information, the high cost of integrating third-party services and solutions is limiting the growth of the fishing industry. Thuraya SatTrack is a low-cost turnkey subscription service that provides interactive, real-time fleet tracking to monitor vessels. It enables operations with detailed maps, up-to-date weather layers and customized alerts with position reporting. Thuraya SatTrack helps MarineStar users stay in command, gain vital market advantage and contribute to sustainable fisheries by improving compliance with national and international regulations.


For further information visit: https://www.thuraya.com

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For further information visit: http://www.de-ice.com

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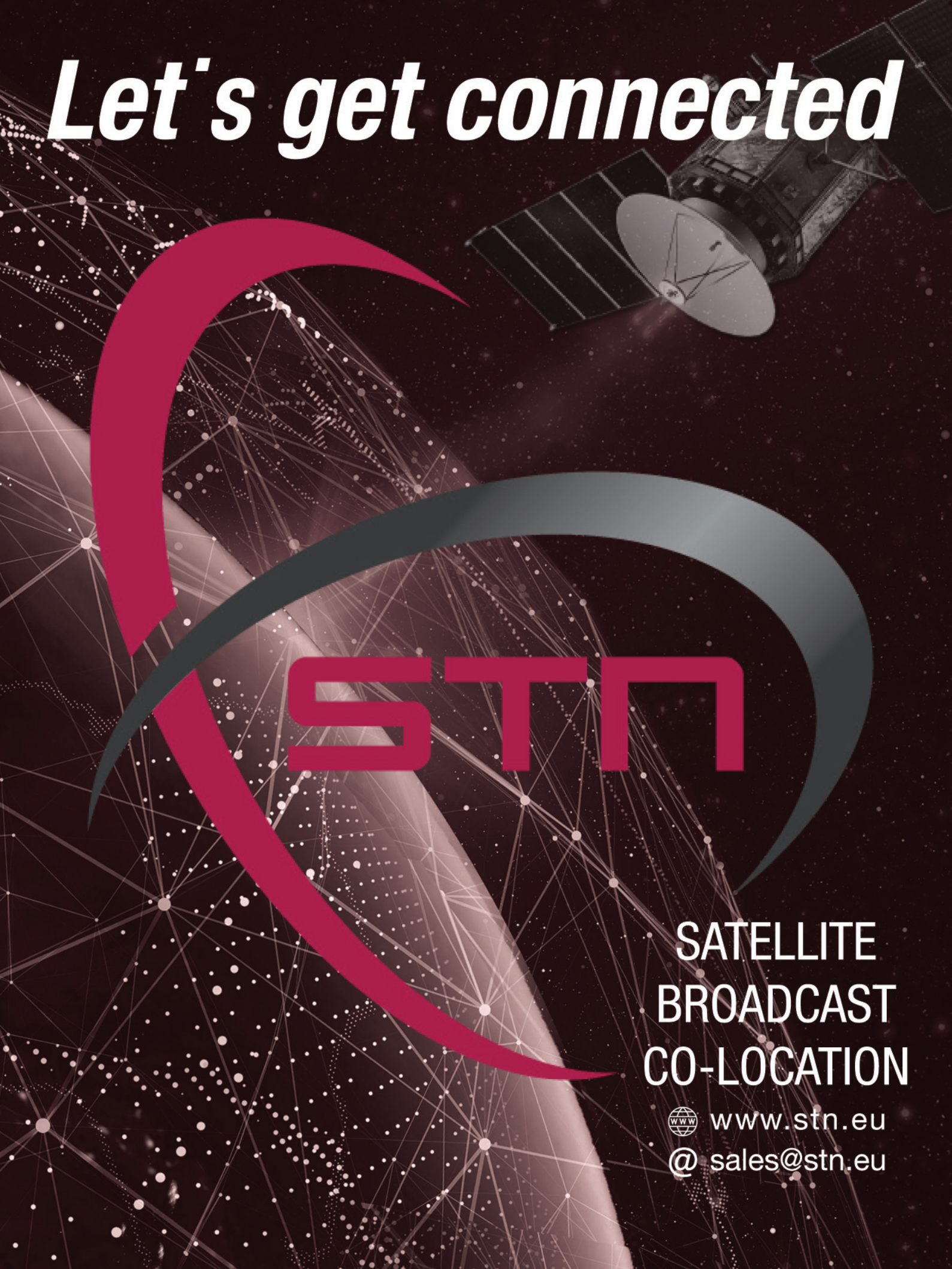
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