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Industry Trends, News Analysis, Market Intelligence and Opportunities

The Changing Video Market for Satellites

by Elisabeth Tweedie

While viewing habits may be changing, according to the latest Entertainment and Media (E&M) Survey from Price Waters Coopers (PwC), growth in the global entertainment and media market surpasses overall economic growth. The segment is forecast to grow at a compound annual growth rate (CAGR) of 3.9% in the five years to 2028, reaching a total value of US$3.4 trillion. From next year, the UK will overtake Germany to become the largest E&M market in Europe. Revenue will grow from £100 billion this year to reach £121 billion by 2028.

Advertising, the fastest growing segment of the global E&M market, is projected to nearly double from the US$601 billion that it was worth in 2020 to US$1.17 trillion in 2028. In the UK advertising accounts for 39% of total E&M revenue, significantly more than elsewhere in Europe, where the average is 29%. It is also forecast to have one of the highest growth rates, a CAGR of 8% in the five years to 2028, in the region.

Accompanying this trend, the way in which companies are using advertising is also changing. Personal advertising continues to be pushed, and at the same time, closer links between viewing and purchasing are emerging, with the insertion of QR codes not only into the advertisements themselves, but also into programming. For example, during a cookery program, viewers may have the option to click on the code to find out more about the ingredients, and purchase them from online or even local stores.

Revenue from online connected TV ads is projected to double from US$20.5 billion in 2023 to US$41.2

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EDITORIAL

The Changing Video Market

As we head to the IBC in Amsterdam this month, this issue focuses on the changing video market for satellites. Our Associate Editor, Elisabeth Tweedie gives a comprehensive overview of this important market in our cover story this month. Judging from the number of satellite companies that will be exhibiting at the IBC, the video segment continues to be an important market for satellite, albeit it it's changing dramatically. The question really is whether the industry will be able to adjust to these changes and find opportunities in the challenging environment.

We also have a good overview of the Satellite Internet of Things (IoT) market from Hub Urlings, among other features in this issue. There's also a good spotlight on a dynamic company iKOMG, which is making waves in the industry with their innovative service offerings.

As always we will be attending IBC and covering the key panels, exhibiting at the publications area between Halls 7 and 8 booth # P15. If you will be at the IBC, drop by our booth and pick up a copy of the magazine as well as our other publications such as MarketBrief reports and others.

Virgil Labrador

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Satellite Executive BRIEFING
Industry Trends, News Analysis, Market Intelligence and Opportunities

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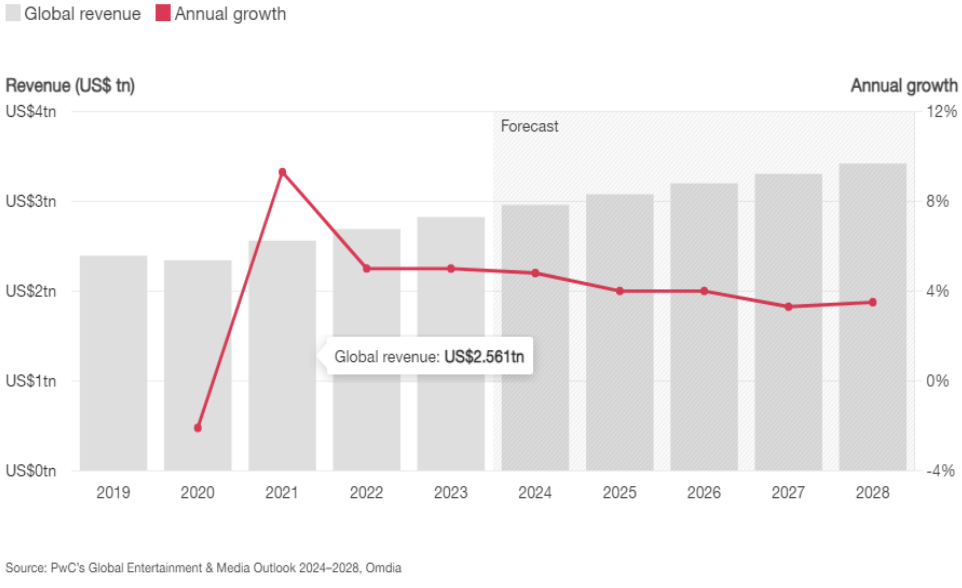
billion in 2028. Some of this growth is being propelled by TV manufacturers such as LG and Samsung, both of which offer their own bundles of free advertising supported TV (FAST) channels on their connected TVs. LG has partnerships with Lionsgate, Filmrise, NBC Universal and Freemantle. It has recently announced an expansion of its offering, taking its LG 1 channel, currently available in the UK and Germany, to Spain, France and Italy later this year. LG 1 is a time-shifted channel, allowing viewers to watch linear streamed content, one hour later, than originally streamed.



Source: PwC's Global Entertainment & Media Outlook 2024–2028, Omdia

These personalized or addressable advertisements are becoming an increasingly important way to engage viewers and monetize content. During the Olympics, according to data gathered by Yopace, a dynamic advertisement insertion company, four billion one-on-one addressable advertisements were shown around the world, clearly showing the growing importance of ad-supported streaming.

Interestingly, a German company, BeSpatialAI has developed a solution for Business-to-Consumer (B2C) companies to use for precision location of target customers. According to the website, machine learning algorithms are trained on 103 layers of satellite and geographic information system (GIS) data to estimate the likelihood of people in a 100 square meter grid, purchasing a particular product. This leads to identification of the best locations for bpth digital and physical advertisements. The first application is for the financial services industry (FSI) and the website states: "Good vs bad location classification model accuracy reached 91% for a given customer in FSI industry."

PwC is also forecasting that subscription-based streaming (SVoD) will continue to grow at a healthy CAGR of 5% from 2023 to 2028, to reach 2.1 billion global subscribers. Total subscription revenue will experience a similar CAGR to reach US$139 billion. Although advertising will account for only 28% of streaming revenue in 2028, it is growing at a much faster CAGR, 14%. As I've mentioned before, although the percentages vary by region, a growing number of subscribers are willing to adopt totally or partially supported advertising channels in order to reduce their monthly expenditure. The leading streaming providers, Netflix, Amazon Prime and Disney+ have recognized this and all of them now offer hybrid services, where in return for watching advertisements, subscribers pay a lower monthly fee.

The UK's streaming market is the third largest in the world after the US and China, with 68% of households using Subscription Video-on-Demand services (SVoD). Netflix, is by far the leader in this market, with 58% of UK household subscribing to the service. Amazon Prime takes second place with 46.7 percent of viewers, according to statistics from Barb, the organization that measures TV viewing in the UK. Of the 17.1 million UK households that subscribe to Netflix, 16% of them subscribe to the lower priced hybrid service. In the US the numbers are even higher, with 42% of streamers using Advertising supported VoD (AVoD) and/or Free Advertising supported TV (FAST).

It really does seem that the video market is coming full circle, not only do we now have FAST TV, essentially

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streamed linear content, akin to broadcast TV. Bundling is now also making a reappearance. In the US, Comcast is bundling Peacock, Netflix and Apple TV+ into one package known as StreamSaver. Similarly, Disney, Warner Brothers Discovery and Fox are bundling their sports programing together to launch Venu Sports, a live sports bundle.

As if that wasn't enough of a journey back to the past, co-viewing or watching with family and friends is also on the rise. The ability to watch content on demand, on phones and laptops, led to the demise of family viewing, and a rise of individual viewing. Now, research from Google in conjunction with Ipsos, indicates that in Europe, the shared experience is on the rise, particularly amongst connected-TV owners. However, this is less about watching linear TV, and more about watching VoD, and most importantly curated VoD. 75% of those surveyed said that they achieved a deeper connection with the people that they are watching YouTube with, as this is "personal" content that they have selected to share. An even higher percentage (80%) said that they felt good that they were sharing something they had chosen or were watching something that someone else had selected. One respondent commented: ""When I watch YouTube with my daughter I learn about her tastes, as she teaches me about the things she likes."

The key to this is the ability to build your own "favorites" list and/or specify genres. The more you do this, the more the search algorithms learn your taste, so that the content presented is much more tailored to your tastes. This is known as the "Ikea Effect."

"...Revenue from online connected TV ads is projected to double from US$20.5 billion in 2023 to US$41.2 billion in 2028..."

If you've had a hand in constructing your viewing list, or posted comments about something you've watched, you tend to become more attached to it, than watching linear TV, where there is no personal connection; hence the desire to share curated content with friends and family. For YouTube in particular, the option to engage with the content creators, adds another dimension, and even more interestingly, as far as the advertisers are concerned, a reason to watch the advertisements. One YouTube respondent commented: ""Most of the time ads on YouTube don't really bother me at all. With some creators, if you have the option to skip, I'll sit and watch it. I'll watch the ads because I want them to get the revenue as I really appreciate the effort and time they put into their content."

So where does all this streaming leave satellite? Firstly, it must be remembered that video markets in the developed and developing markets are very different. Traditional video remains important in developing markets, particularly in those where the mobile phone is the most common device used for internet access. Even in Europe, it is far too soon to dismiss satellite. The latest TV Monitor from SES, shows that Europe is by far the largest geographic segment. 175.8 million of SES' 369 million TV homes are located in Europe. Europe also accounted for most of the TV household growth, adding 6.3 million TV homes in 2022.

No article on Europe at this time, would be complete without some reference to the Paris Olympics. Unfortunately, for satellite, this is not good news. Satellite has been the backbone of Olympic broadcasting since 1964. This year Olympic Broadcasting Services (OBS) used OBS Cloud 3.0, an AI-enhanced platform, provided by Alibaba, as the primary distribution method. 54 broadcasters used this platform which transmitted 379 video (including 11 UHD) and 100 audio live feeds. The OBS Cloud was first demonstrated at the Tokyo Olympics, and used again at the Beijing 2022 winter Olympics when it was used by 22 broadcasters.

The 11,000 hours of content hosted on the OBS Cloud can be downloaded in three different resolutions, facilitating its usage on different platforms, including linear, digital and/or social media. It was also used for AI-enhanced 3D replays. Integration of AI and cloud-based technologies, enabled the generation of automatic highlight replays, and streamlined production to make it faster and more efficient.

The video landscape is a complex and evolving one. Connected or smart TVs, giving viewers the opportunity to curate their own content and see personalized advertising seem to be emerging as one of the keys to revenue growth. Given that according to

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Grand View Research Inc., the global connected TV market is expected to experience a CAGR of 11.4% to 2030, this is good news for the video industry. It is however, somewhat ironic, as one of the reasons for the initial growth of subscription streaming services was ad-free content!

And to end on a lighter note. Technology used to protect satellites from cosmic radiation in space, was incorporated into the swimsuits worn in this year's Olympics. The suits were coated in a durable water-repellent that enabled swimmers to glide more smoothly through the water. I wonder if there was a QR code letting viewers know where they could be purchased?

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

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FEATURE

The Satellite IoT Market

by Hub Urlings

The emergence of new generations of satellite Internet of Things (IoT) networks over the last years and their promise of low-cost and low-power global IoT connectivity is seen by many as the fuel for the global 4th Industrial Revolution (4IR).

With (satellite) IoT as a key driver for the 4IR, along with advancements in sensor miniaturisation, edge and cloud computing and AI, satellite IoT will enable it to expand globally and to all sectors of society.

No wonder market forecasts are bullish, and expectations for satellite IoT are high. Market research forecasts show strong growth, with satellite IoT subscriber numbers increasing by over 20% annually, from 4.5 million in 2023 to 30 million by 2030.

For years, we have seen satellite IoT in market segments like maritime, aero, government, land mobile logistics, or the corporate energy and utility markets, which require critical communications for high-value applications and assets. That market is also growing, but the bulk of the growth in the future is expected to emerge in new and larger market segments, like Environmental Monitoring, Agriculture, or Corporate and Private Asset Management. In these segments, non-critical applications like monitoring require lower-quality services, e.g., in terms of latency, and as such, they perfectly match the features of new generations of satellite IoT networks.

As such, Satellite IoT is expected to be a game changer for global sustainability initiatives. It will enable monitoring of environmental variables (water, air, soil) and provide essential data for climate change adaptation and addressing the UN's Sustainable Development Goals. This will also benefit the 570 million farmers worldwide who could use better information about their soil condition, local weather conditions, water levels or nutrient distribution over their land, and more to improve their crops and food production.

At M2sat, we focus on new satellite IoT applications for the environmental monitoring market, particularly Hydro Observations. We do this with partners from the hydrological world, like Tahmo.org, which runs a large hydro-met observation network in Africa, providing critical data to national and local governments, hydro dam operators, and weather institutes. This article is written from that perspective.

In this article we will first examine the more than 40 satellite IoT network operators and then discuss market growth and the downstream value chain in those new satellit IoT market segments.

The Evolution of Satellite IoT Networks

Satellite IoT networks have existed for more than 25 years. During the last decade new technology, such as the use of CubeSat-based satellites and the miniaturisation of electronic equipment, combined with lower satellite launch costs and increased data processing power, has disrupted the market.

Satellite IoT networks can be summarised across five key generations:

First Generation: The Incumbents (1990s -Present)

Dominated by major players like Inmarsat, Iridium, Globalstar, and Thuraya, the incumbent networks provide highly reliable IoT services for critical communication in sectors such as government, military, and maritime. They rely on proprietary protocols and own valuable L- and S-band MSS spectrum bands.

Second Generation: Low Power Global Area Networks (2018 - Present):

Triggered by advances in smallsat technology and lower launch costs, about a dozen new start-ups emerged, promising low-cost/low-power services with global coverage. Only about half of these networks offer commercial services today (e.g. Astrocast, Myriota, Head Aerospace).

Third Generation: Piggyback networks (2021 – Present):

Some new operators opted to "piggyback" on existing satellites to provide IoT services. Here, the costs of adding

a dedicated IoT payload to satellites stands versus the costs of a dedicated satellite IoT network.

Examples here are Skylo, which works over any "bent pipe" L-band satellite network (e.g., Inmarsat); HiSky, which similarly works with Ku-/Ka-band Geo and LEO satellites; and eSat, which plans to use the L-band-based Thuraya satellites. Future broadband satellite operators like Iridium, Starlink, and OneWeb are also considering adding a dedicated IoT Payload to their constellations.

Fourth Generation: Hybrid terrestrial-satellite networks (2021 – Present)

Some new operators' focus on standardisation led to hybrid networks that integrate terrestrial standards like 5G and LoRaWAN offering seamless connectivity between cellular and satellite services, reducing costs and simplifying deployment for applications.

An early example is Lacuna, which has existed since 2019 and is developing a LoraWan-based satellite IoT network platform with payloads on its own or third-party satellites, like Omnispace and OneWeb.

In 2022, Ireland-based Echostar Mobiel successfully launched its IoT services in Europe based on the LoraWan protocol and using S-band frequencies over the Echostar 21 satellite. Other examples from this generation are Sateliot (Spain), OQ Technology (Luxembourg), and Kineis (France).

Fifth Generation: Direct to Cell (2023 - Present)

The latest generation of satellite IoT features Direct-to-Cell networks, like the Globalstar/Apple and the T-mobile / Starlink combinations, will extend connectivity to standard mobile devices Other initiatives include AST Space Mobile and Lynk, which are in an early development phase and still struggling with funding and licensing.

And what to think of innovative satellite IoT networks using “license-free” ISM spectrum and new satellite technologies, like the PicoSat-based networks under development from Apogea (Italy), Hydra Space (Spain), Innovaspace (Argentina). Or the Ingenu and Totum satellite networks (US) working in the unlicensed 2.4 Ghz spectrum. In March 2024, US-based Hubble Network launched and successfully tested its first two satellites and received signals from a simple 3.5mm Bluetooth chip.

Choosing the right Satellite IoT Network

Investing in developing a global satellite IoT application is expensive and only viable in the long run. Sensors must be connected, modems configured, and data analytics servers and dashboards programmed, not to mention the challenge of lifecycle support for units in the field.

How can service providers, sensor manufacturers, system integrators, IoT solution providers, and new customers choose among more than 40 networks? Each has its own service quality, pricing, coverage, protocols, hardware, and licenses/landing rights, making the market difficult to oversee.

Most importantly, the satellite IoT network of choice needs to be future-proof and financially stable. Doubts are especially strong for networks claiming low-cost/low-power connectivity but yet have incomplete constellations. Will they survive and find investment money to complete their constellation?

Of course, as an IoT solution provider, you can choose the safe way and the incumbent networks, but what if your competitor perseveres in innovation and succeeds with a lower-cost network based on next-generation IoT technology?

Satellite IoT Market Expansion

The diversity of networks described above makes the market highly competitive, drives down costs, and promotes technological innovation, which is good news for customers and market segments that previously have not been able to afford satellite connectivity.

The figure below shows how the market will expand from the niche markets for critical communication segments like government, aero, maritime or the utility/energy/mining sectors in the corporate market at the top of the pyramid to the much larger markets for Wide Area Monitoring /Telemetry, Environmental Monitoring, Agriculture and other non-critical corporate applications at the bottom of the pyramid.

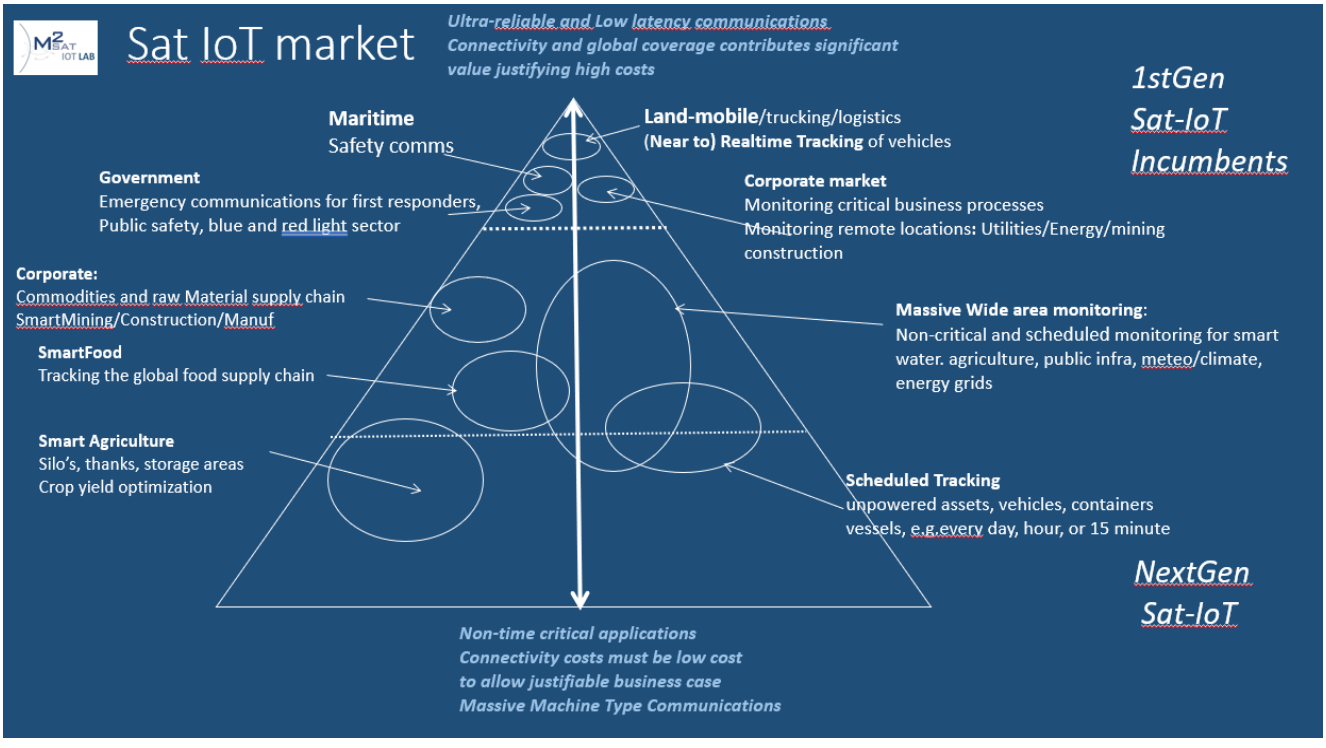

Figure 1: Satellite IoT Pyramid market model (Source M2sat)

Satellite IoT currently focuses on the niche markets at the top of the pyramid, with approximately 4.5 million units. Advancements in 4IR technology and data analytics, combined with lower connectivity costs and power consump-

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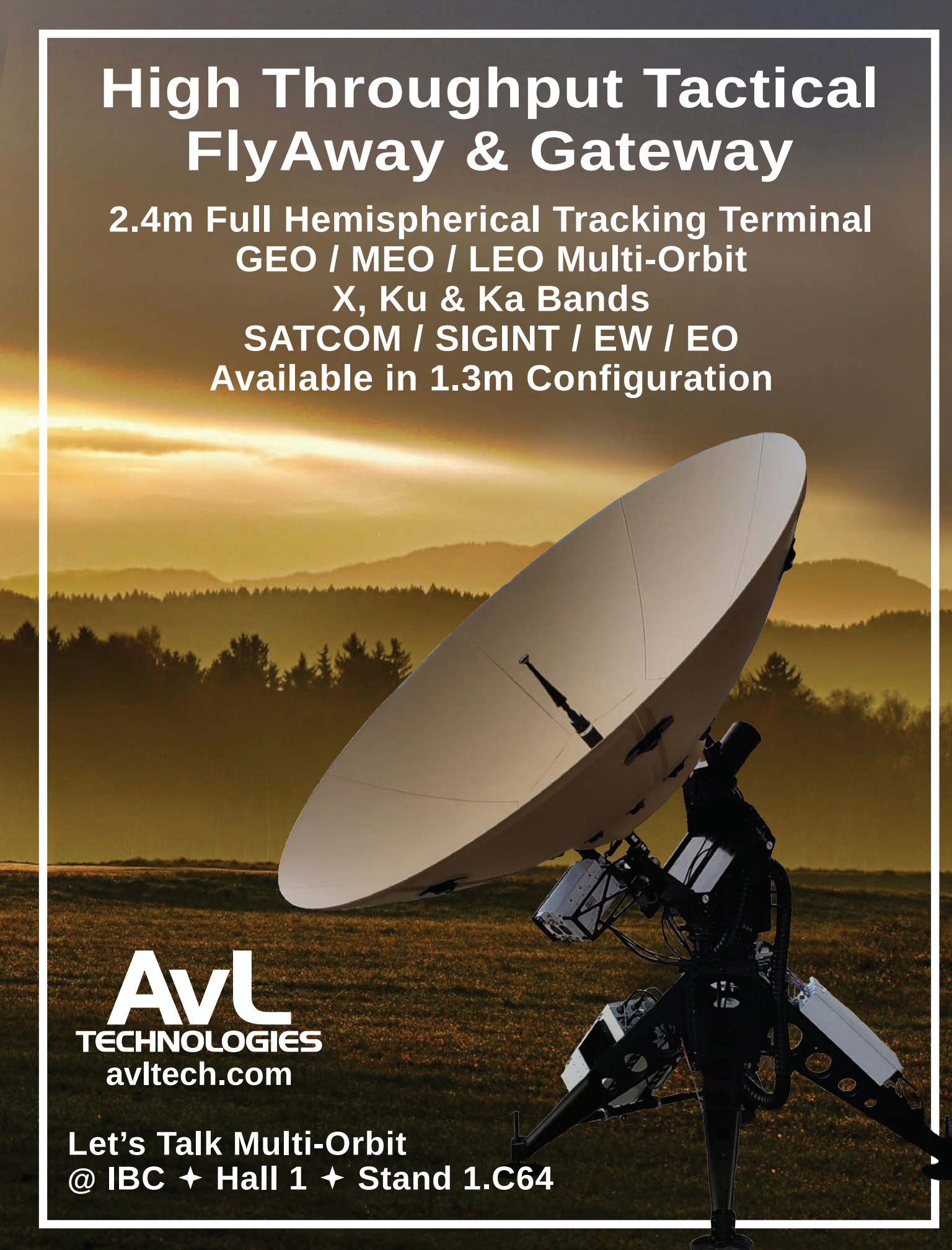

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tion, will expand the market to 30 million units in 2030.

Satellite IoT for Good?

Thanks to satellite IoT, more segments of society than ever will be able to join the 4IR and enjoy its transformative benefits. One major area, and not only in a commercial way, will be climate change adaptation. Current environmental in-situ (on the ground) observation networks are limited to areas with terrestrial (GSM) coverage. Satellite IoT will change that, providing monitoring data from meteo, hydro, air quality, and pollution sensors on a truly global scale.

Or consider what IoT can do for the approximately 570 million farmers worldwide. They can significantly benefit from improved information on the soil moisture, water level, and nutrition distribution in their fields, enhancing their crops and helping feed the world. Satellite IoT has the potential to revolutionise global agriculture, inspiring a new era of productivity and sustainability.

Figure 2. The IoT value chain and application components.

Don't forget asset tracking either: in the future, every asset, such as a camper, leisure boat, or car, worth more than a couple of thousand Euro/Dollar and that might roam outside terrestrial network coverage will be tracked via satellite.

What are the growth drivers in the new Satellite IoT market segments?

There are two critical factors for growth:

1. Low Cost-of-Ownership of end-to-end satellite IoT applications.

Low Satellite IoT Connectivity cost alone are insufficient to drive market growth, as they are only a minor part of the total IoT application costs. IoT is not a basic data or standard IP connectivity service that you can sell in bulk and compete on price. It is an application-driven business with a complex mix of sensors, connectivity, data processing, and dashboard technologies, all nicely wrapped in an easy-to-install-and-maintain package at a competitive price.

Nearly all satellite IoT application components show strong technological growth with an impact on costs. Sensor technology is developing fast, with sensors becoming smaller and offering more functionality for lower prices; edge processing is reducing sensor data volume and, thus, connectivity costs. And is the true customer value not with the insight generated in the data analytics and displayed on a smart dashboard, using the increased cloud processing power and AI?

Important here are also lifecycle costs. How easy is installing the unit, particularly in remote areas, and how can it be maintained? Having an installer drive up to the unit along the Black Volta River in Ghana for maintenance can be costly.

2. Building a strong value-chain/Eco system for the new market segments

Incumbent satellite IoT networks had 25 years to build their value chains. They are often organised by vertical market segments and with applications based on deep knowledge of the service provider of customer needs and requirements.

Before new markets can be opened up and growth can happen, working application value chains are required for new markets like environmental monitoring or agriculture, with ecosystems and partnerships to provide and integrate sensors, modems, satellite services, application servers, and dashboards into a complete end-to-end application.

As with building satellites, and satellite constellations, this will take investments and time.

Conclusion

The satellite IoT landscape in 2024 shows that the incumbent oligopoly of incumbent satellite IoT networks is still going strong, but new generations of innovative satellite IoT network operators are aiming to offer low-cost/low-power global connectivity to extend and grow the market.

Combined with reduced technology costs, e.g., for sensors, edge computing, and cloud data processing power, satellite IoT will fuel the proliferation of 4IR to new and

larger segments of society.

Incumbent satellite IoT operators will benefit from strong growth (15% per year) in the traditional critical communications segments. However, the strongest growth is expected in wide-area monitoring/telemetry segments, such as the environmental monitoring, agriculture, or asset management markets.

For these new markets, two key factors will be critical for growth:

1. the low total Cost-of-Ownership for Satellite IoT applications

2. a strong partner ecosystem of satellite IoT network operators, service providers, system integrators, and solution providers with market knowledge

This means that after a phase in which the satellite IoT market focused on the upstream market (spending hundreds of millions building innovative satellites and launching satellite IoT constellations), the focus and investments now need to shift to the downstream. In the wake of the 4IR, and together with an ecosystem of solution partners, new satellite IoT applications need to be developed to serve the needs not only of customers in the traditional but also those in new market segments. We might change the world by doing so.

A challenge that we gladly will take up.

Hub Urlings was one of the pioneers of Satellite M2M/IOT as Product Manager Inmarsat-C at the famous KPN Station 12. This "small data" satellite service's success, global coverage, and reliability made Inm-C the service of choice for many applications: from sending messages to truck fleet management to pipeline monitoring and bringing back data from all types of sensors. Now, 25 years later, he is still involved in developing a new generation of Satellite-IoT applications. He can be reached at: urlings@m2sat.com

Latin American Broadband Satellite Market

by Bernardo Schneiderman

The Latin America broadband satellite market in 2024 is a Multi-orbit environment with a mix of Low-Earth, Medium-Earth and Geostrationary Orbits (LEO, MEO and GEO) Satellite operators offer a diversity of broadband satellite solution for this demanding market.

Since we published in 2022 an article covering Latin America Broadband Satellite market, Starlink (LEO operator owned by SpaceX) started offering services and is now the main player in the LEO Constellations providing Internet and penetrating fast in Latin America both residential, business and maritime markets. As of May 2024, there are 6,078 Starlink satellites in orbit, of which 6,006 are working, according to Astronomer Jonathan McDowell who tracks the constellation on his website.

As of May 2024, SpaceX' Starlink satellite internet service has over 2.7 million subscribers across 75 countries. (We don't have the exact number but we estimate around 15% of terminals of Starlink are based in Latin America). Starlink's user terminals, also known as consumer Starlink antennas, are sold to residential, business, mobile, maritime, and aviation customers. The price of a consumer Starlink antenna is US$ 599 for residential use in the USA but in Latin America Starlink has a lower price, while more demanding business customers may pay between US$ 2,500 and US $150,000 in the USA but Starlink to gain more market are lowering the price for enterprise clients in Latin America.

The other companies in LEO that is implementing solutions in the market at this time is EutelsatOneweb that starting deploying some Business-to-Business Solutions with some major Global solution providers in the region. (See more info in our roundtable)

Another major new player in the LEO coming to the market is Amazon's Project Kuiper that just announced during the month of June 2024 plans to jointly with telecommunications firm Vrio to launch a satellite internet service in seven South American countries. Vrio manages the Latin American branch of American multichannel video programming distributor DirecTV as well as direct broadcast satellite company Sky Brasil.

The partners will offer the service to customers in Argentina, Brazil, Chile, Uruguay, Peru, Ecuador and Colombia. The announcement reports that Amazon's satellite subsidiary Project Kuiper will provide internet using satellites in low Earth orbit. The service is set to come online in mid-2025, starting in Argentina.

Project Kuiper as a whole will eventually involve 3,236 satellites and an estimated US$10 billion of investment to provide broadband internet access across the globe.

In the GEO satellite we have Hughes and Viasat already in the market using their GEO Satellites fleet providing broadband solution for residential, business and enterprises markets. Historical in the Latin America GEO market we have the main Global Players: ABS, Hispasat/Hispamar, Intelsat, Telesat, SES and Regional Players ARSAT and StartOne.

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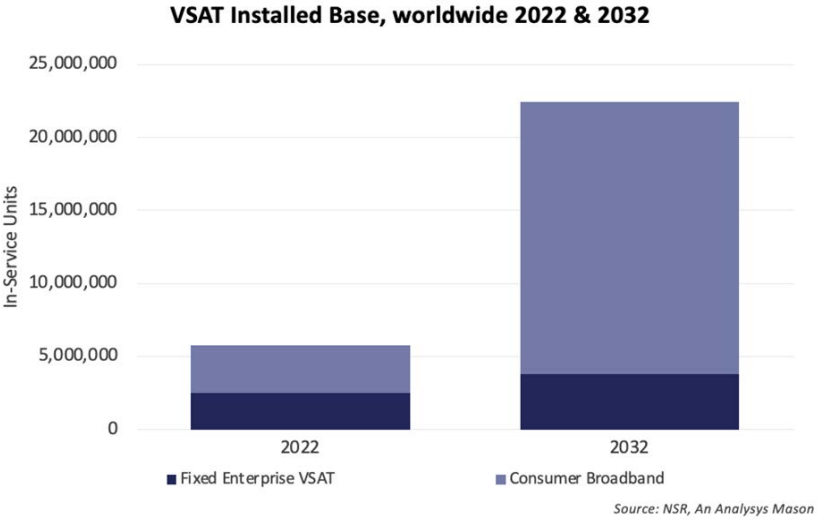

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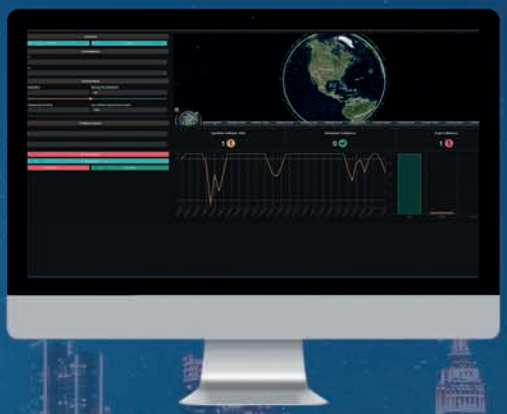

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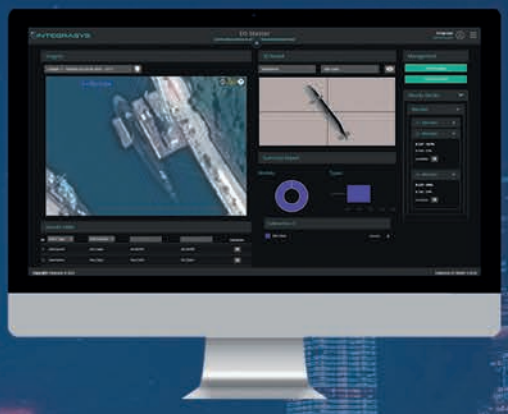

GEOINT

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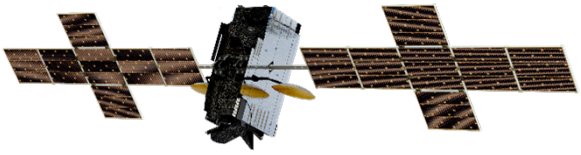
Satellite, 22nd Edition" revealed that the consumer and fixed enterprise VSAT broadband segments are experiencing significant transformations, driven by evolving end-user demands, the infusion of innovative solutions, and a consolidating industry landscape The graphic below show worldwide the growth of Consumer broadband via satellite is a key element in the Satellite Broadband Business.

Governments in major countries in Latin America are continuing to support the satellite market to expand the penetration in remote and rural areas that are not being served by terrestrial networks with major plans are being implemented in Argentina, Brazil, Ecuador, Peru, Colombia, Mexico and some Caribbean countries.

Satellite Executive Briefing (SEB) invited executives from the key satellite players in the region in a virtual executive roundtable to shed light on the Latin American satellite broadband market. We received feedback from **Juan Pablo**, Regional Vice President, Americas, **Eutelsat Group**; **Daniel Losada**, VP International Division at **Hughes**; **Dolores Martos**, Regional VP Sales Latin America & Caribbean, **Telesat**; and **Leandro Gaunszer** – General Director of **Viasat Brazil.** Excerpts from the virtual roundtable are as follows:

How is your company addressing the Broadband Satellite Market in Latin America. (GEO, MEO and LEO)?

Eutelsat: Eutelsat Group is the world's first GEO-LEO operator – we have a GEO fleet of 35 satellites and a LEO fleet of more than 600 satellites. Our combined satellite solution offers customers the high-bandwidth capabilities of GEO and the low latency and high-speed service from a LEO constellation. Together, these networks are delivering broadcast and connectivity services around the world.



Hughes' Jupiter-3 satellite

In Latin America specifically, we already have a robust presence with our GEO satellites delivering a range of broadcast and connectivity services:

- EUTELSAT 117 West A. Provides hemi coverage in both C and Ku-band, as well as high-power regional coverage in Ku-band over North and South America.
- EUTELSAT 117 West B. Strengthens Eutelsat's capacities offering key services to Latin America clients in the field of telecommunications mainly cellular backhaul in Mexico, Colombia and Perú and social inclusion broadband access to government services such us Pronatel Conecta Selva in Perú, including DTH. This satellite features four regional beams in Ku-band with exceptional coverage of each territory.
- EUTELSAT 115 West B. Provides satellite capacity to reach markets serving high-growth data, video, mobility, and government applications. Ku-band resources, connected to three fixed beams cover the Americas and provide optimized regional coverage of Canada, Mexico and South America for data services including broadband access, government connectivity for Ecuador and Colombia and corporate networks. A semi-hemispheric C-band beam provides groundbreaking coverage from Alaska to Peru particularly for enterprise, backhaul over Galapagos Islands in Ecuador and mobility services over the Pacific Ocean.
- EUTELSAT 65 West A. Its high-power Ku-band payload enables DTH reception of digital and HD channels across Brazil and the Caribbean region. It provides a unique solution for live TV transmissions from Brazil. It also features a transatlantic C-band coverage for cross-continental video contribution and distribution and a multi-spotbeam Ka-band payload for broadband access across Brazil, Mexico and Perú.

Our LEO constellation, is also commencing services in the region, enhancing connectivity with low latency and high-speed internet bundling to our GEO offer.

Hughes: Hughes enables universal connectivity, from internet access for homes and rural communities to sophisticated multi-transport enterprise networking, and secure defense communications, to a global, converged satellite-terrestrial 5G network. We provide broadband equipment and capacity; managed services featuring smart, software-defined networking; and end-to-end network operation for millions of consumers, businesses, governments, airlines, and communities worldwide.

Realizing the connected future requires multiple orbits and types of transport, combined with intelligent

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- **fiber and**
- **free-space optical communications.**

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- **IP Core Developement** according to customer's requirements
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and enabling technologies, fully integrated into services and solutions. For Hughes, these include a fleet of geostationary satellites based on the JUPITER system technology, including JUPITER 3, the world's largest commercial communications satellite launched in 2023, a LEO constellation in partnership with OneWeb, 5G networks, and LEO 5G-NR-NTN capacity.

JUPITER 3 is the highest capacity and performance satellite that Hughes has launched, doubling the capacity of the current fleet. With 500 Gbps capacity, we can serve more customers and give current customers a better experience across the Americas. This capacity supports customers across a wide range of verticals, including consumer, enterprise, aeronautical, maritime, government, cellular backhaul and it also enables our continuing efforts to bridge the digital divide.

With Hughes LEO managed service we deliver reliable, low-latency, enterprise-grade service. Available for global mobility services, businesses, government, and defense application, cellular backhaul and digital divide programs, across the Americas, India and globally. A key advantage of the Hughes and OneWeb solution is the availability of service level agreements (SLAs), which means the customer is not left with a best effort service that competes with general user usage on consumer grade LEO services.

Satellites in service today:

•JUPITER 3: coverage in North, Central and South America - Orbital position of JUPITER 3: 95°W

•JUPITER 2: coverage into Colombia and Mexico. - Orbital position of JUPITER 2: 97.1°W

•Hughes 65°W (hosted payload on Eutelsat 65°W): coverage into Brazil

•Hughes 63°W (hosted payload on T19V): coverage into Brazil, Colombia, Ecuador, Chile, Peru and Argentina

•Hughes 20°W (Brazil payload on Al Yah 3): coverage into Brazil

Telesat: Telesat is proud to continue our longstanding collaboration with customers in Latin America. Our connectivity solutions are helping to solve this growing region's most complex communications challenges, improving operations for the providers that are linking the continent to enable development and growth.

We are working with our partners in Brazil, Colombia, Peru and Venezuela to deliver very high throughputs at a lower cost-per-bit for backhaul, enterprise, oil & gas and government applications. This is enabled through the innovative design of Telesat's Telstar 19 VANTAGE satellite and its high-power Ku-band spot beams. The high throughput spot (HTS) beams, combined with regional C & Ku-band beams, provide the optimum coverage to connect all corners of the continent, including the insular and coastal areas.

Telesat is also providing resilient, reliable GEO capacity to support multiple universal connectivity programs that address the digital divide in rural areas throughout Latin America. These include Telefónica's Peruvian connectivity initiative Internet para Todos (IpT), the Colombian Ministry of Telecommunications' (MinTIC) Centros Digitales, and Brazil's Caixa Economica Federal program to bring connectivity to bank offices in remote locations.

When our highly advanced Telesat Lightspeed LEO constellation, currently in development, begins deployment in 2026, it will provide even greater capabilities for Latin American enterprises to leverage. Telesat Lightspeed will deliver cost-effective, fibre-like connections with lower latency and higher data rates, thanks to the constellation's closer proximity to Earth than today's current GEO satellites. Telesat Lightspeed will provide superior connectivity with 30-50 millisecond latency and multi-Gigabit per second speeds, with committed information rates and guaranteed SLAs.

Viasat: Viasat is strategically positioned to address the broadband satellite market in Latin America using a combination of GEO, MEO, and LEO satellites. Currently, we operate a fleet of 19 satellites in orbit, covering the Ka, L, and S bands. With the acquisition of Inmarsat, we have significantly enhanced our network capabilities, including GEO satellites that provide wide coverage and high capacity.

Our latest launch, the ViaSat-3, is part of a Ka-band satellite constellation designed to cover almost the entire planet. Despite the detected anomaly, ViaSat-3 is operational and delivering high-speed connectivity, particularly for aviation. Additionally, we have 11 satellites on order or in production, including two Highly Elliptical Orbit (HEO) satellites for connectivity in polar regions.

Our services in Latin America include residential broadband plans with speeds up to 35 Mbps download and 3

Mbps upload, as well as solutions for aviation, government, and businesses. Viasat also offers connectivity through partnerships, such as our collaboration with Telebras in Brazil, to operate the SGDC-1, ensuring 100% coverage across the Brazilian territory.

What country(s) or region(s) in Latin America are you expecting more potential long-term growth in the next 2-5 years?

Eutelsat: Connectivity demands are soaring around the world and this is true in Latin America as well. We see long term growth in a number of areas including Mexico, Brazil, Colombia, Ecuador, Argentina and Peru, which are key markets for the development of connectivity solutions in which our LEO fleet will have an important role within the next 2-5 years.

Hughes: At Hughes, we are committed to offering a more accessible service that contributes to the democratization of internet access in Latin America, which has a positive impact on the social and economic development of the region, by promoting education, trade, business, and the productivity of people and companies.

In recent years, we have been working in Latin America to bring broadband internet where other technologies have not been able to reach, operating and connecting countries throughout the region, and prioritizing its most underserved areas.

We have connected more than 34,000 rural schools - for example, almost 9,000 in Colombia with some ecosystem allies, thousands of corporate sites with managed services, and 4 satellites for the region with one more under construction.

In Latin America, we own satellites that allow us to provide terrestrial segment infrastructure and operate a mix of broadband services for consumers and businesses. Also, HughesNet has nearly 400,000 subscribers in seven countries: Brazil, Chile, Colombia, Ecuador, Mexico, and Peru. In addition, more than 2,500 access points to our community Wi-Fi, HughesXpress Wi-Fi, provide shared Internet access to thousands of people.

Telesat's Lightspeed Constellation

Telesat: We see exponential growth opportunities across the entire Latin America region. Multiple national governments have officially recognized a constitutional right to internet access, leading to IP data traffic forecasted to double every three years. 5G and the required spectrum allocation will play a critical role in driving that exponential growth, which is expected to reach over 35 GB mobile data traffic per smartphone each month. Brazil, Chile, Colombia and Uruguay are already seeing accelerated 5G adoption, with more countries soon to follow. As governments award 5G spectrum, many do so on the condition that the telecom operator expands connectivity to rural and remote regions.

Satellite backhaul will be key to expand the 5G network reach in remote locations. Traditional fibre backhaul connectivity will be prohibitive due to the high cost of installation across Latin America's challenging geography. The next-generation Telesat Lightspeed LEO constellation offers an alternative for bringing multiple-Gbps data links to remote Latin American communities, with fibre-like performance at far lower cost.

Viasat: In the next 2-5 years, we see significant long-term growth potential in Brazil and Mexico. These countries are pivotal to our expansion strategy in Latin America due to the ever-increasing demand for high-quality connectivity. In Brazil, our pioneering coverage with Ka-band satellite and partnership with Telebras uniquely position us to expand our presence

in both urban and remote areas, providing high-speed internet access to millions of Brazilians.

In Mexico, we are heavily investing in infrastructure and new technologies, such as D2D connectivity, to meet the connectivity needs of rural regions and key sectors like agriculture and automotive. These efforts, combined with our global investments in fixed broadband (GFB), will not only solidify our leadership position but also drive economic and social development in these markets, ensuring robust and sustainable growth in the long term.

Do you have any specific solutions for the Enterprise/Government and Residential market for Broadband via satellite (ie., OTT, IOT, DTH, Internet direct to user, Backhaul, Aviation, Maritime or others)?

Eutelsat: At Eutelsat Group, we have a business-to-business approach and we offer our GEO-LEO services through a wholesale model. Our customers are local providers including satellite companies, telecommunication companies and internet service providers who take our services and integrate them into their offering – extending broadcast services to homes in rural areas or delivering connectivity to businesses and local governments where terrestrial options are not available or resiliency and redundancy is paramount.

Our connectivity services are targeted to meet a range of customer needs including enterprise solutions such as community wifi and cellular backhaul as well as mobility solutions to offer connectivity on trains and vehicles. We are also connecting ships onshore and offshore and in the coming year will launch our aviation services as well.

Regarding our video services, the latest advancements in satellite streaming solutions, specifically based on the DVB-NIP standard, are designed to support companies and governments focusing on the Ministries of Education and of Health to distribute content effectively and efficiently via Native IP. This innovative approach will significantly benefit rural areas by enabling seamless IP Native content distribution and facilitating efficient file transfers

Hughes: Hughes is global managed services provider (MSP) that supports over half a million enterprise sites with enterprise technology solutions, which includes Managed Network Services, Digital Signage and cybersecurity. We have been recognized by industry analysts as a leader and an innovator, with more than 50 years of experience.

Hughes provides the technology and managed services that aid enterprises to secure, transform and grow their businesses. Hughes was named a 2023 Leader in the Gartner® Magic Quadrant™ for Managed Network Services.

We offer a suite of in-flight connectivity (IFC) solutions for commercial aviation and government/military applications for over 20 years, leveraging cutting-edge satellite engineering and proven expertise in managing networks at scale. Our offerings include the latest LEO-only and hybrid capabilities on the market, leveraging the small, lightweight, low-power ESA developed and manufactured by Hughes.

Hughes operates the world's leading satellite broadband system, Hughesnet®, connecting people across the Americas. We offer Hughesnet to small business and residential customers in the U.S., Canada, Brazil, Chile, Colombia, Ecuador, Mexico and Peru.

Telesat: For over 55-years, Telesat has been delivering enterprise-class satellite connectivity to leading media, telecom, government, maritime and aeronautical customers throughout

Continued on page 28

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AvL Technologies

visit AvL at Hall 1booth # 1.C64

AvL Technologies, Inc. is a privately held US company specializing in the design, development and production of mobile satellite antennas and positioner systems. Based in Asheville, NC, AvL offers superior service and support to customers around the world. AvL provides customers with positioner and complete antenna system products, product development and services that maximize the technical and commercial benefits for their customers with cost, performance, quality and reliability requirements. AvL supplies commercial organizations and defense agencies with unique, robust terminals, which combine rugged packaging, stout wind performance, ease of operation and customer support at a competitive price. As an engineering-focused company, AvL often collaborates with customers and is requested to push product performance boundaries with new innovations. AvL leads the industry in the delivery of systems that operate with the next generation of satellites in GEO and MEO orbits.ing tripod. The antenna operates in X-, Ku- or Ka-band with AvL's AAQ controller embedded in the base positioner.

For more information go to: www.avltech.com

Es'hailSat Qatar Satellite Company

visit Es'hailSat at Hall 1 booth # 1.F68

Es'hailSat, the Qatar Satellite Company, is a communications satellite operator headquartered in Doha, Qatar. Established in 2010, Es'hailSat delivers services to broadcasters, enterprises and governments in the MENA (Middle East and North Africa) region and beyond. With the goal to become a world class satellite operator and the foremost satellite services provider in the MENA region, Having both Ku-band and Ka-band payload on satellites co-located at 25.5°E / 26°E broadcast hotspot enables Es'hailSat to provide the region with the most advanced and sophisticated services including broadcast, telecommunications and broadband.

For more information go to: www.eshailsat.qa

Mission Microwave

visit Mission Microwave atHall 1 booth # 1.F66

Mission Microwave Technologies supports the satellite terminal industry with high performance X-, Ku-, and Ka-band products from highly integrated transceivers in the 10-80 watt range to large-scale amplifiers up to 400 watts for gateway installations. Customers rely on Mission Microwave to provide the highest level of capability, reliability, support, and on-time delivery.

Mission Microwave X-, Ku-, and Ka-band GaN BUCs

For more information, go to: www.missionmicrowave.com

ND SATCOM: The future is Now. The Future is SKYWAN 5G

visit ND Satcom at Hall 1 booth # 1.D30

With over three decades of experience, **ND SATCOM**, headquartered in Germany, is the premier supplier and integrator of innovative satellite communication systems and solutions to support customers with critical operations around the world. Customers in more than 130 countries have chosen ND SATCOM as a trusted and reliable source of high-quality, secure turnkey and custom system-engineered communication solutions. The company's products and solutions are used in more than 200 transnational networks in government, military, telecommunications and broadcasting sectors. The flagship of ND SATCOM, the SKYWAN platform, enables international users to communicate securely, effectively and quickly over satellite. ND SATCOM's core technologies and diverse applications are: • SKYWAN, an advanced MF-TDMA VSAT system for establishing wide area networks for military, governments and enterprises. • FlyAway antennas for various commercial and military uses. • Tactical Communication-On-The-Move (COTM) for high-security missions on land and sea, enabling mobile command and control. • Tailored communication solutions for embassy networks, disaster relief and emergency operations, oil and gas explorations, and maritime locations. • Leading supplier of ATC networks across the globe. • Specialized solutions for military and defence operations such as mobile and transportable satellite ground terminals.

For more information, go to: www.ndsatcom.com

Revgo Global

visit Revgo Global at Hall 1 booth # 1.D21

RevGo Global Inc. was founded by senior satcom executives from US and Canada with more than 100 years of combined experience at Satcom RF system design. We combine the new generation GaN technology with unique power combining capabilities, designed for high volume production with strict reliability and quality control to create the most compact, cost-effective, field-proven, reliable BUCs, LNBs and Transceivers. Manufactured to the stringent quality standards of ISO9001:2015. All at the highest value available and the shortest lead times.

For more information go to: http://www.revgotech.com/

RF-Design

visit RF Design at Hall 1 booth # 1.F46

For more than 25 years **RF-Design** is developing, manufacturing and marketing technology leading satellite ground segment products and solutions offering a wide range of premium class RF-distribution, RF-over-Fiber, RF amplifying and RF monitoring systems. High-quality products, many years of know-how, flexibility and the ability to customize products to individual customer requirements as well as a unique customer-oriented service approach have made us a respected partner in this demanding industry worldwide. Meet us in Amsterdam at IBC 2024 (Hall 1 / Booth 1.F46) and learn more about our latest products such as the highly flexible and secure "Fiberlinkplus CompactLine" system, our innovative space-saving handheld Extended L-Band and Broadband "Ecoline Fiberlink", the switch matrix system "FlexLink R25", and the dual RF power meter "PwrM70G". We look forward to talking to you personally about your individual requirements.

For more information, go to: www.rf-design-online.de

PRODUCT SPOTLIGHT

Satservice GmbH

visit Sateservice at Hall 1 booth # 1.F47

For over 25 years, **SatService GmbH** from Steisslingen/Germany has beenoperating as a system integrator, manufacturer and provider of hardware and software for satellite ground segment applications. We provide competitive and customer dedicated products as well as system solutions with high quality and quick reaction time. Our strength is the combination of system engineering and integration know-how merging with highly sophisticated products. Our sat-nms product line includes Monitoring & Control NMS/M&C systems, Antenna Control Units, Beacon Receivers, RF-over-Fiber solutions and various other equipment. We are proud to say that our products and systems are running at major satellite operators, teleports, broadcasters and other communication providers around the globe. Meet us and our experts at our booth 1.F47 during IBC2024 and learn more about our latest technologies, services and sat-nms products!

For more information, go to: **www.satservice.gmbh.de**

Terrasat Communications

visit Terrasat at Hall 1 booth # 1.C64

Looking for reliable, high-performance connectivity? Discover **Terrasat Communications'** Ka-band Intelligent Block Upconverter solutions, designed with precision and versatility in mind. Whether you need Single, Dual, Tri, or Wideband options, our units offer power levels from 5W to 160W, ensuring top-tier signal transmission tailored to your needs.

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For more information go to: www.terrasatinc.com

WORK Microwave

visit WORK Microwave at Hall 1 booth # 1.D20

Headquartered in Holzkirchen, Germany (near Munich), and comprised of four operating product lines —Satellite Communication, Navigation Simulators, Defence Electronics, and Sensors and Measurement — **WORK Microwave** leverages over 35 years of experience to anticipate market needs and apply an innovative and creative approach to the development of its technologies while maintaining the highest standards for quality, reliability, and performance. WORK Microwave's Satellite Communication product line develops and manufactures high-performance, advanced satellite communications RF- and optical ground segment hardware and software for earth observation, NGEO constellations, direct-to-home broadcast, IP networks, teleport management, government communications, and many more applications.

At **WORK MIcrowave,** we have the solution. Our mission is to help your data to cross the edges between Space and Ground. RF and digital. Optical and digital. Virtual and hardware on your ground station. We develop ground segment equipment for any of your mission.

For more information, go to: www.work-microwave.com

Visit us at IBC2024 - Booth 1.F47

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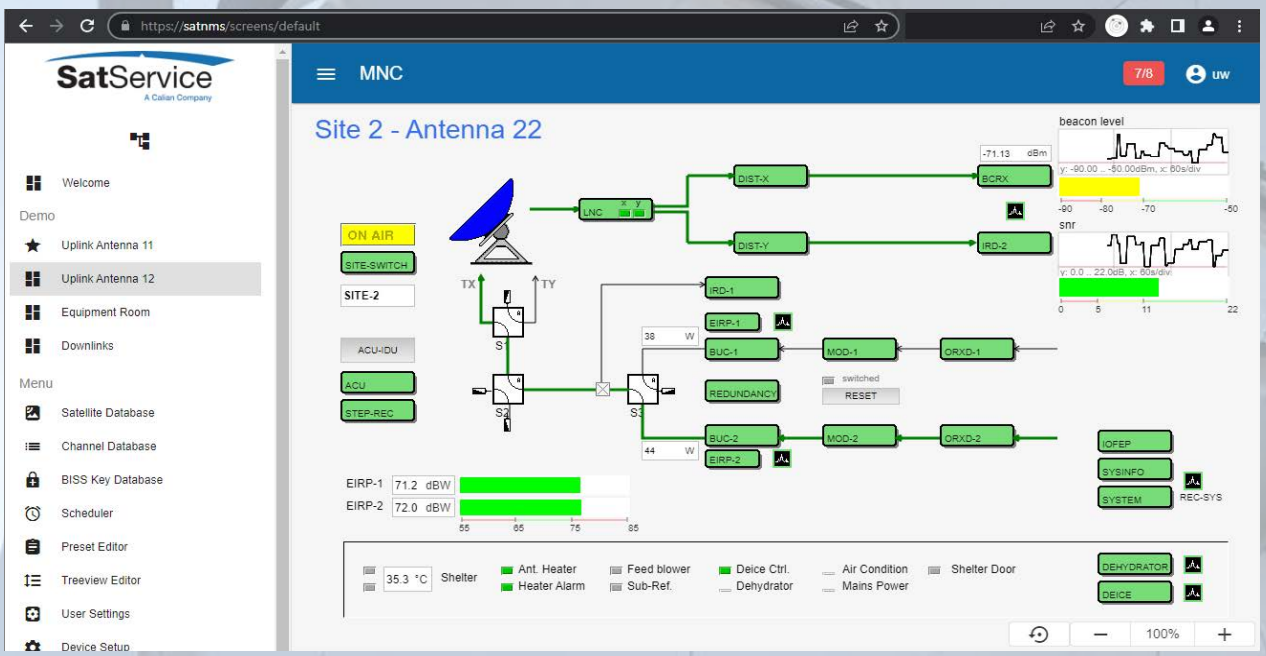

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Latin America market.... from page 23

the world. Our business model is built around working with local telecom operators, service providers and governments to expand the reach of their networks. We provide backhaul connectivity as well as enterprise and DTH residential services via our existing GEO satellites. We will follow the same business model with Telesat Lightspeed. Our Telesat Lightspeed satellites will begin launching in mid-2026, with service trials beginning in 2027, and full global service available in late 2027.

Viasat: Yes, Viasat offers a wide range of specific solutions to meet the needs of the Enterprise/Government and Residential markets in the satellite broadband sector. For the residential market, we provide high-speed internet plans with 100% coverage across Brazil, offering speeds of up to 35 Mbps download and 3 Mbps upload. These services are ideal for users in rural and remote areas who lack access to other forms of connectivity.

In the enterprise and government markets, our solutions include connectivity for aviation, with partnerships with airlines such as Azul and Embraer, and maritime services for ships and vessels. Additionally, we provide backhaul for telecommunications operators, supporting the necessary infrastructure to expand mobile and fixed network coverage. We also offer IoT (Internet of Things) solutions for agriculture and industrial automation, enabling remote monitoring and control of devices in hard-to-reach locations.

Our OTT (Over-the-Top) and DTH (Direct-to-Home) solutions allow for the digital content delivery directly to end consumers without the need for terrestrial infrastructure. Viasat is also exploring D2D (Direct-to-Device) connectivity to provide internet access directly on mobile devices, further enhancing our ability to connect people and businesses throughout Latin America.

With the implementation of 5G in Latin America, what kind of solution are you bringing to the market to address this development with the local operators in the Region?

Eutelsat: To address the implementation of 5G in Latin America, Eutelsat Group has been supporting, through our partners, key MNO´s in the Americas to deploy their 3G, 4G and even 5G networks. Our LEO fleet will play an important role in 5G rollout enabling low latency and high throughout requirements.

For our Video Business, the deployment of 5G technology is impacting C-Band distribution services across Latin America in several ways. In Brazil, broadcasters are grappling with the challenge of maintaining their DTT distribution networks via satellite amidst the expanding presence of 5G. Similarly, countries like Peru and Uruguay are reallocating up to 100 MHz of traditional C-band for distribution, which limits their regional reception capabilities. Without question, the reallocation of C-band frequencies, particularly around the 3.5 GHz band and above for 5G networks, poses a risk of signal reception issues for satellite dishes, potentially causing interference both in and out of band.

Therefore, the EUTELSAT 65 West A satellite, offers a robust solution for broadcasters to avoid 5G interference. This satellite provides planned C-band capacity that ensures interference-free transmission for TV signals across the region, providing a reliable and secure broadcasting solution for the future.

Hughes: As providers gradually roll out the extended 5G network, satellite will be essential to fulfilling the requirement of the 5G Public Tenders to reach underserved areas. Rugged terrain and far-flung communities can be cost prohibitive to connect with terrestrial backhaul when considering infrastructure, maintenance, and reliability. To address these gaps, only high-throughput satellite communications can most cost effectively bring equity and narrow the digital divide to connect cellular voice and data to the core network. As mobile network operators shift their focus from saturated urban and suburban service locations to find new customers in remote locations, extending network reach with satellite is a clear choice.

Hughes technology powers over 12,000 cellular backhaul sites (2G, 3G, and 4G/LTE) worldwide, including Telefónica Perú, Vodacom, Entel Bolivia, and Turkcell. The JUPITER system supports what we believe is the world's largest Layer 2 cellular backhaul deployment for the BAKTI program in Indonesia.

Hughes has successfully conducted 5G satellite backhaul tests with the JUPITER™ System ground platform. In these tests, engineers connected 5G smartphones to the internet with the JUPITER System infrastructure,

which includes a very small aperture terminal (VSAT), a gateway, and a high-throughput satellite.

Telesat: 5G holds tremendous promise for enhancing connectivity reach and bandwidth for enterprises and end users. Robust connectivity is needed to accommodate the delivery of 5G's significant backhaul-traffic and fronthaul-network segments that will connect remote Latin American communities to a mobile operator's core network. Achieving that level of terrestrial connectivity can be slow and costly, especially when extending to rural locations.

Telesat's current GEO-based HTS capacity already serves Latin America's evolving 5G backhaul requirements. Moreover, our highly advanced Telesat Lightspeed network will provide multiple-Gbps of low-latency capacity to meet 5G backhaul requirements while enabling telecom operators to buy satellite service in the same way they would buy any other carrier Ethernet service.

The Telesat Lightspeed satellite network is unique; unlike other LEOs designed for consumers, we have created a satellite-based, optically-linked wide area Layer 2 Ethernet network. It's a fiber-like Ethernet connection with a Service Level Agreement (SLA) that guarantees committed information rates (CIR), including latency, jitter, and packet loss. It's compliant with MEF 3.0 Carrier Ethernet service and relies on the same Ethernet protocol that carriers use, so is simply an extension of their existing infrastructure. Telesat LightSpeed carriers can easily backhaul to remote locations where fiber or microwave is not economically viable to deploy. Because Telesat LightSpeed connects their towers by Ethernet-compatible protocol, it doesn't matter if it's 3G, 4G, or 5G traffic. We carry those protocols at Layer 2 over our satellite network.

Eutelsat service in Guyana

Viasat: With the implementation of 5G in Latin America, Viasat is bringing innovative solutions to support local operators in developing this new technology. One of our key offerings is satellite backhaul, which provides the necessary infrastructure to connect 5G networks in areas where fiber optics and other terrestrial technologies are impractical or too expensive. This solution allows operators to rapidly expand their 5G networks, ensuring high-speed and low-latency connectivity.

In addition, soon in Latin America, we will explore D2D (Direct-to-Device) connectivity to complement 5G networks, offering direct internet access via satellite on mobile devices. Viasat is also collaborating with local operators to integrate our IoT services, enabling the connectivity of smart devices in areas where 5G is being implemented. These combined solutions help accelerate 5G adoption in Latin America, ensuring that more people and businesses can benefit from this advanced technology.

Bernardo Schneiderman is the Principal of Telematics Business Consultants. He can be reached at: info@tbc-telematics.com

OPINION

How Satellite Technology is Transforming Climate Action

by Bogdan Gogulan

Wildfire season is upon us, and due to global warming, we can anticipate one of the worst on record. Canada, which is training extra firefighters, warns of an 'explosive' season. Greece is doubling its firefighting crew and adopting new tactics. Portugal has banned bonfires, barbecues, and the use of machinery that can trigger sparks, such as chainsaws and trimmers. And it isn't just wildfires that are cause for concern. The risk of massive floods in cities like New York, Shanghai and Kolkata increases each year. Summers get hotter, winters get colder. Hurricanes and cyclones get stronger – and more destructive.

But we're not passive players in the climate crisis. With each passing year, entrepreneurs and innovators dream up new tools and technologies or build on existing ones with the potential to make a meaningful difference on our warming planet. More and more, these tools and technologies appear in the space sector, which is already playing an outsized role across countless industries around the world.

Bringing Down Emissions

We know that a major reason why the planet is heating up is because of greenhouse gas emissions, with carbon dioxide being the most widely known. For the time being, machinery and vehicles that run on fossil fuels – and therefore emit CO2, will continue to be used; but the more efficiently they run, the less fuel they need, and less CO2 they contribute.

Satellites are currently bringing down CO2 emissions globally by the equivalent of nearly four times what the entire UK put out in 2021. That's 1.5 billion tonnes – and that doesn't scratch the surface of what satellites could do if used fully. The research firm Globant calculated that if only existing satellite technology was deployed to its greatest potential, we can save an additional 4 billion tonnes of CO2. The 5.5 billion tonnes of carbon dioxide saved if this were to happen would amount to one-sixth of the total carbon emissions needed to limit the rise in global temperature to below 1.5°C by 2030.

Carbon dioxide isn't the only GHG of concern; methane also poses a significant problem with a much greater short-term climate impact. Satellite technology is aiding in reducing methane emissions by providing reliable data from third-party companies mapping global methane emissions. With accurate, verifiable information, policymakers can address methane leaks, penalise offenders, and enforce new policies. In the US, companies now face hefty fines for excess methane emissions, made possible by satellite data.

Predicting, Preventing and Putting out Fires

As I've already mentioned, countries around the world are steeling themselves for wildfire season. They're wise to do so: wildfires are getting worse, emitting around 8 billion tonnes of CO2 per year, according to the International Energy Agency. Accounting for CO2 offsetting, that amounts to annual net emissions of between 5% and 10% of all CO2 emissions globally.

The cost of wildfires is financial, too. The total cost of wildfires in the United States is between $394 billion to $893 billion each year – which is equivalent to between 2 and 4% of U.S. GDP. This is spread across diminished real estate values, lost income, damage to watersheds and aquifers, insurance payouts, timber loss, property and infrastructure damage, electricity costs, evacuation costs, federal wildfire suppression costs, school and learning losses related to wildfires, insurance premium increases, and tourism loss.

Space-enabled technology is helping. By tracking forests through various metrics—vegetation density, rainfall, and wind patterns—companies use satellites to analyse past wildfires and predict future ones, identifying potential breakouts and at-risk assets. This benefits individuals,

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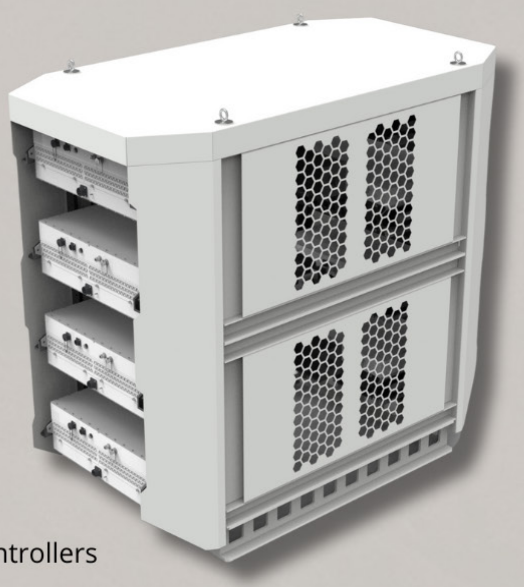

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- Advanced Web Interface for entire system monitor and control
- Automatic Gain Adjust to compensate for loss of amplifiers

companies, and emergency services, enabling more effective responses and saving lives and money.

Healing the World's Lungs

If we reflect on the past, it's easy to see what a vital role forests play in maintaining stable global temperatures. For over 10,000 years, due largely to the robust health of the natural world, average temperatures remained within the one-degree Celsius range. Throughout this period, dense equatorial jungles layered plants to absorb sunlight, contributing moisture and oxygen to the air worldwide.

To restore equilibrium, we must turn our attention to our forests. Rainforests, in particular, capture carbon dioxide and cool the planet down, all while supporting the livelihoods of billions and being home to more than three-quarters of the world's biodiversity. By bouncing signals off the rainforest canopy, satellites are able to monitor the height of trees, reveal illegal deforestation, and track the progress of reforestation initiatives with rising accuracy.

This, in turn, is helping us to understand whether carbon projects are working, and therefore put trust back into the carbon market – now widely seen as essential to facilitating the movement of financial resources from companies in the Global North to protectors of the world's rainforests in the Global South. A functioning carbon credit market could be worth more than $50 billion. Thanks to satellites, that looks increasingly likely.

Producing Food and Improving Farming

Agriculture finds itself in the unusual position of being projected to eat up some 70% of our GHG emissions budget by 2050 while failing to produce enough food for the world's population to eat. A $7.8 trillion global market that employs 40% of the world's workforce, agriculture still left around 2.3 billion people moderately or severely food insecure in 2010, the WHO found, with a 56% gap between food needed and food produced expected to appear in 2050. Agricultural practices also lead to soil erosion and a 60% loss of organic carbon from the soil. Increasing productivity, optimising yields and boosting overall sustainability is a pressing need.

Satellites are beginning to do this. They're tackling waste throughout the supply chain and using digital agronomy tech for precision farming and natural capital management. They're helping farmers to estimate and optimise yields, increase soil quality, and use only the water and fertilise they need for the best results. Satellites are involved in pest detection, which could save up to 0.8 billion tonnes of crops annually, and irrigation, reducing water usage by up to 50%. That's the equivalent to saving up to 2.8 billion litres of freshwater.

A byproduct of this, according to the UN Food and Agriculture Organization, is savings in the region of $175 billion for producers. It's no surprise that McKinsey & Company predicts the market for space-enabled insights in agriculture will double by 2030, hitting almost US$ 1 billion.

Better quality, lower costs

Satellites are Transforming Climate Action

They're giving humanity a powerful means to confront the challenge of the warming planet and come out on top. There is a long way to go, of course, but satellite technology is improving all the time, empowering individuals, companies, countries and global institutions to make the right choices. Better yet, as the technology improves, costs are also going down. That gives us every reason to be optimistic. Thanks to the ingenuity of those working in the space tech sector, we have more than a fighting chance of resolving what, many agree, is one of humanity's greatest ever challenges.

Bogdan Gogulan has 20 years of experience in finance, product and business development. Before initiating NewSpace Capital, he had accumulated a unique combination of cross-border experience in communication, security and defence industries. He served as VP of international operations and business development for AT Communication (Switzerland), Defendec (Baltics) and Katmerciler (Turkey), managing breakthrough projects for security and defence agencies in the Middle East and Central Asia. For years, he managed alignment and cooperation with UN agencies (BOMCA/UNDP, BOMNAF, UNODC, UNHCR, IOM) and security organisations (NATO, OSCE, ISAF).

CASE STUDY

Maximizing Uplink Performance: TEAM:MEDIA's Collaboration with Orbital Connect and Terrasat

When TEAM:MEDIA Teleport from Bosnia and Herzegovina partnered with Eutelsat twelve years ago to launch the country's first satellite multiplex for Direct-to-Home (DTH) TV channels, it set the stage for a technological shift in the broadcasting industry nationwide. This pioneering move, which led to the widespread adoption of Multi-Channel Per Carrier (MCPC) mode by other TV stations to minimize interference and maximize bandwidth, didn't just change how content was delivered—it earned TEAM:MEDIA Teleport a second transponder from Eutelsat (C5), filled with attractive channels and HD content from the region, Europe and beyond, solidifying their role as a leader in regional broadcasting technology.

Today, TEAM:MEDIA'S diversified services include SD/HD distribution, SD/HD playout, TV signal encryption, overlay, equipment collocation/hosting, and occasional use services over satellite. In a recent project, TEAM:-MEDIA Teleport successfully deployed a satellite-based solution to power DVB-T2 transmitters across the region, expanding their impact on content delivery.

The Challenge

TEAM:MEDIA Teleport faced the technical challenge of ensuring uninterrupted delivery of a diverse lineup of TV channels for DVB-T2 distribution via satellite while meeting rigorous industry standards for reliability and performance. The solution required overcoming adverse weather conditions and maintaining high service availability. To address these needs, TEAM:MEDIA sought a partner with specialized technical expertise capable of providing a solution that could function effectively under these challenging conditions and comply with a strict project timeline.

Solution

Orbital Connect®, a trusted partner of TEAM:MEDIA Teleport, plays an essential role as an authorized distributor and system integrator of satellite products, broadcasting equipment, and RF components for their Teleport operations. Since the initial collaboration four years ago, Orbital Connect has become one of TEAM:MEDIA'S key suppliers of satellite equipment, thanks to their extensive hardware portfolio and support for leading industry brands.

TEAM:MEDIA relies on Orbital Connect's expertise to select the most suitable hardware that meets its precise technical requirements and offers high reliability.

To meet these needs, Orbital Connect provided two Terrasat IBUC R Low-Ku Band 100W AC power BUCs and a Terrasat IBUC R Ku-Band 100W Tx Redundancy System. These components were installed on the uplink antenna at TEAM:MEDIA's Teleport premises, ensuring the reliability and resilience required for the project.

Terrasat iBUC Ku-Band Amplifiers: The Backbone of TEAM:MEDIA's Technological Solution

Terrasat iBUC Ku-band amplifiers, crucial for ensuring stable and high-quality signal transmission, are a cornerstone of Team: Media's technological solution.

The IBUC R is an integrated smart BUC/GaAs SSPA designed for higher performance under challenging operating conditions. These BUCs deliver exceptional performance guaranteed through individual unit testing over temperature. An essential feature of the IBUC R series is its superior linearity and minimal backoff requirements, resulting in maximum useable output power. These features make Terrasat IBUC an ideal solution for higher-power Satcom terminals transmitting multiple carriers.

Redundant iBUC System: Uninterrupted Reliability in Broadcasting

The Teleport implemented a redundant iBUC system using Terrasat amplifiers to enhance system reliability further. This system automatically switches the signal to a backup amplifier in case of a failure, enabling continuous broadcasting without interruption. This technology is essential for Teleport's clients, as it ensures a stable signal

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TEAM:MEDIA's teleport in Bosnia Herzogovina

transmission to end-users, which is crucial for maintaining a connection with a broad audience. Terrasat IBUC 1:1 Redundant System uses innovative hot-standby technology and IBUC intelligence without an external logic controller. An Eco-mode option for warm standby using less energy is also included.

Benefits:

- A compact, integrated system
- Significant reduction in energy consumption
- A stable uplink service to the satellite platform
- Superior linearity for maximum useable output power
- 1:1 redundancy and automatic switchover in the event of BUC failure
- Reliable operation in harsh conditions
- Cyber Security for Hardware and Software

TEAM:MEDIA's Teleport's innovative satellite-based solution has impacted the region's broadcasting landscape by expanding access to diverse programming, enhancing viewer satisfaction through reliable service, and strengthening the local broadcasting industry's growth. Through its successful collaborations, TEAM:MEDIA Teleport has not only elevated the viewing experience for consumers but also played a pivotal role in driving progress and innovation within the broader broadcasting ecosystem of the region.

"Through our collaboration with Terrasat and Orbital Connect, we have achieved exceptional results in delivering television content to a broad audience," said Samir Ligata CTO and Co-Owner of TEAM:MEDIA.

Orbital Connect® is a channel partner and authorized distributor of global leading satellite ground equipment manufacturers. Our product list includes over 3,000 satellite products and RF components, solutions, and terminals, such as Earth station antennas, fixed and maritime VSAT or receive-only antennas, terminals on the move and on the pause, high-power amplifiers, modulators, de-modulators, redundant systems, modems, RF products and matrices, RF over fiber solutions, LNBs, BUCs, BDCs, LNAs.

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iKOMG: From Trailblazing Startup to Market Leader in Content Distribution

In 2016 two young entrepreneurs Shmulik Koren and Shlomi Izkovitz left RR Media to start their own broadcast solution company: iKO Media Group (iKOMG). At the time they were regarded as the upstarts, or in the words of Koren,"a couple of crazy people." But they were two people, with a vision and big ideas.

It was apparent to the founders that the DTH and cable businesses were going downhill. They were expensive services, as bundling meant that viewers were inevitably paying for additional content that they didn't want. From day one, iKOMG's key focus was on the viewer and the viewing experience, even though it was not selling directly to the viewers, but to the content owners and channel providers.

The vision - that providing a superior viewing experience, means that everyone wins, simply because if audiences are engaged, they won't churn away to other channels – is what has driven the growth of the company. With this focus iKOMG has been responsible for introducing several innovative services.

One of the company's most visionary ideas, was the introduction of e-Sports to the television. Previously confined to computers, laptops and mobile devices, e-sports is a market experiencing rapid growth. According to Mordor Intelligence, this year the global market is valued at US$2.11 billion, and projected to grow to US$5.27 billion by 2029, a compound annual growth rate (CAGR) of 20.5%. No longer an amateur pastime, playing e-sports is a serious global business, with amateur, local and professional leagues, as well as international championships, attracting sponsorships from global brands and celebrities. In addition, traditional sports clubs are forming their own e-sports teams. In the US, several universities and colleges, including Shenandoah University in Virginia, Ohio State University and Becker College in Massachusetts, are offering degrees in e-sports. The University of California, Irvine is even offering scholarships to the top six players each year.

Shmulik Koren

The idea for taking e-Sports to the TV came about because iKOMG became aware that many of its IPTV and DTH customers were having a major issue with churn. Given its focus on the consumers' viewing experience, it wanted to find a way to help with that. The solution was to offer an entirely new service: a bouquet of HD e-Sports TV channels, including video-on-demand (VOD) channels, free advertising supported TV channels (FAST) and a live eSports channel. Although launched only a few months ago, on several Eutelsat satellites, eCLUTCH, as the service is known, is already getting a lot of interest, which is hardly surprising given how innovative this approach is. iKOMG is already in discussions with over 30 IPTV and DTH players. Currently only available in the Middle East and Europe, it is planned to be launched in North America next year.

Currently, eSports and games are primarily distributed via streaming platforms and social media, so by integrating a comprehensive multiscreen strategy, encompassing both linear and video-on-demand (VoD) channels, and live events, eCLUTCH sets a new standard, and creates a new environment for consuming eSports and games. This multi-screen approach, not only facilitates a seamless viewing experience across multiple devices, it also brings eSports into the living room, creating the possibility for a shared experience. As Koren said, "you watch movies with your kids that you don't necessarily want to see, but because you want to spend time with them. Bringing e-Sports to the TV is another way of sharing experiences with them."

"The eCLUTCH platform represents a groundbreaking hybrid approach to delivering eSports content directly to the primary screens in households across Europe. This initiative is particularly innovative because it transcends the traditional

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eCLUTCH MENAFLIX STN PADELTIME TV

limitations of eSports and gaming content, which was predominantly distributed via streaming platforms and social media. By integrating a comprehensive multiscreen strategy that encompasses linear channels, Video on Demand (VOD) content, FAST (free ad-supported streaming TV) channels, and live events, eCLUTCH is setting a new standard for how eSports content is consumed. This multiscreen approach not only facilitates a seamless viewing experience across different devices but also ensures that high-quality, engaging content is accessible on the main screen of the house, bringing the excitement and community feel of eSports into the living room," added Koren.

Unsurprisingly, e-Sports is a young person game, with 24% of players being under 18. Part of the rationale for bringing e-Sports to television, was not directly aimed at those teenagers, who tend to prefer mobile devices anyway, but was aimed at their parents. As Koren said, "you watch movies with your kids that you don't necessarily want to see, but because you want to spend time with them. Bringing e-Sports to the TV is another way of sharing experiences with them."

It seems obvious now, as it has become so universal, but iKOMG was also responsible for the introduction of the on-screen electronic program guide (EPG) for satellite viewers, so that viewers would be able to see the schedule of up-coming programs on the TV screen. This service is still offered as part of a bundled package free-of-charge to all its customers.

Other innovative services include iKOQ and iKOPLUS. The former lets viewers click on a QR code to find out more about a topic. For example, during a travel program, a viewer would be able to find out more about a location or hotel and even make a booking. The latter, essentially moves the Master Control Room (MCR) to a channel owner's laptop or PC. A return link from each location is shown, so that any glitches in playout in a particular geographic area, can be swiftly identified and corrected, before irate viewers take to social media to vent their annoyance.

Although iKOMG has a strong presence in Europe, Middle East and the Americas, it is also focused on expansion in North America, playing a significant role in the growing evangelist TV niche.

No longer the upstart, iKOMG is one of the major players in the media services market, offering up and downlinks to over 40 satellites as well as global fiber connectivity. With over 620 customers for ground services, iKOMG is a one-stop shop, providing content ingest, aggregation and distribution services. A year ago, iKOMG merged with STN, a leading teleport media services player in Slovenia. Mitja Lovsin, CEO, STN. Became a partial owner of the newly consolidated company under the iKOMG banner. This merger benefitted customers from both companies, offering them an expanded coverage and range of services, including satellite broadcasting, cloud services, playout management, disaster recovery, OTT and advanced solutions for channel monitoring as well as additional ways to engage viewers, so reducing churn for channel providers. The merger is going well, common back-office systems are in place, and all occasional use (OU), sporting events and major outside broadcasts have been moved to Slovenia.

From two people with a vision, iKOMG is now a significant force in media services. No longer restricted to the Tier 3 and 4 channels, but with the resources, skills and technology to bid for major projects. iKOMG has been bidding to provide services to a major French broadcaster, since its inception. This year, it won the contract.

The playout market is expanding. According to Technavio, the market will grow at a compound annual growth rate of (CAGR) of 22.26% between now and 2028, adding US$3.43 billion to its value. iKOMG with both the vision and technology is well positioned to take a significant portion of that growth. In the words of David Treadway, Chairman of iKOMG, "Innovation is not just about new technologies. It's also about new ways of thinking about the way we do business. We need to be willing to challenge the status quo and come up with new ideas." So far, iKOMG is doing very well on that score.

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Arabsat Appoints Bader R. Bahaian as VP-Marketing and Customer Services

Riyadh, Saudi Arabia, July 10, 2024- The Board of Directors of satellite operator **Arabsat,** has announced the appointment of **Bader R. Bahaian** as the Vice President of Marketing and Customer Services.

Prior to joining Arabsat, Bader R. Bahaian held the position of General Manager at SAS, a prominent global company specializing in artificial intelligence and data analytics. He has also served in several leadership roles across various international companies, significantly contributing to their transformation into high-performing organizations and forging strong partnerships, even amidst global economic challenges.

Bader R. Bahaian

Commenting on the appointment, Eng. Alhamedi Alanezi, CEO and President of Arabsat, said, "We at Arabsat are delighted to welcome Mr. Bader AlBahaian to the Arabsat family. His leadership skills and extensive experience have enabled him to drive significant development at the different companies he has been with over the years. We are confident that his contributions will be vital in executing our strategy, reinforcing our position as leaders in the global satellite and telecommunications sectors."

Bahaian expressed his enthusiasm about joining the Arabsat team during a transformative period for the telecommunications and satellite broadcasting sector. "As the world shifts towards complete digital transformation, our sector is experiencing rapid growth, driven by advanced technology and artificial intelligence that have revolutionized communications and bridged distances between people."

AvL Technologies' CEO Retires

Asheville, N.C., July 10, 2024 – AvL Technologies owner and founder Jim Oliver announced the retirement of **Guy Clerici**, AvL's Chief Executive Officer (CEO) and the appointment of **Shannon Smith** to Chairman of the Board. Mr. Oliver semi-retired in 2022 and appointed Guy Clerici as CEO. Mr. Clerici served as interim CEO during this transitional period and while a new Chairman of the Board was selected. In 2023 David Bowne was appointed President and Chief Operating Officer (COO). Mr. Bowne continues in this role, assuming all operational responsibilities, and now reports directly to the Board of Directors.

The Board of Directors provides guidance and oversight to the company, which operates as an S-Corp. Mr. Oliver chose this system of governance for longevity and sustainability of the company. Shannon Smith is Mr. Oliver's nephew and joins the Board along with members of the Oliver family and satellite industry leaders. Mr. Smith was selected by Mr. Oliver to lead the board due to his experience serving on the boards of family-owned companies and his background as an Investor and Entrepreneur.

Guy Clerici

"I'm honored to serve as Board Chairman for AvL Technologies and ensure AvL continues my uncle's core values of providing industry and government with extraordinary service, great products and continuous improvements, while maintaining an excellent work environment for employees," said Shannon Smith. "I look forward to working closely with David Bowne and the AvL senior leadership team. David's leadership and operational expertise will ensure AvL continues to lead the industry with the rugged and reliable SATCOM products our customers expect."

The transition, which occurred over the past two years, included the retirement of several senior leadership team members who remain engaged and consult. To ensure continuity in the organization many key vacancies were filled from within with the promotion of numerous talented individuals.

FiberLink*plus* CompactLine

The new FiberLink*plus* CompactLine is a very compact and modular 1U/19" RF-over-Fiber system that enables flexible and secure optical transmission of up to 16 links over distances of up to 20 km. The system supports both redundant configurations (2+1, 4+1) and 16 non-redundant links. It offers hot-swappable modules (Controller, PSU, Ethernet, TX/RX) that can be exchanged without interruption. Automatic switching in the event of module errors guarantees uninterrupted signal transmission.
The system can be used in a broadband range from 10MHz to 3.25GHZ.

Important functions:

- **Automatic link redundancy switching**
- **Optional "automatic link alignment function" for best transmission characteristics**
- **User can choose between LNA and high dynamic mode**
- **Laser, link and RF level monitoring**
- **Front LC display for configuration**
- **Remote monitoring via Ethernet (WebGUI, SNMP)**
- **Mixed flexible TX/RX module configuration**

Available types / variants:

- **FCLS FCLS1161-50S: 16 RF-over-Fiber TX/RX slots, not redundant**
- **FCLR FCLR1241-50S: 2 x 4+1 redundant**
- **FCLR FCLR1421-50S: 4 x 2+1 redundant**

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BETTER MADE IN GERMANY

RF Design GmbH

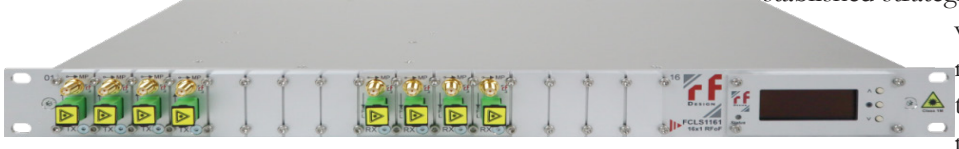
RF Design Gmbh based in Lorsch, Germany, is a leading provider in the field of high-frequency technology, specializing in signal distribution and management for satellite communication and broadcasting industry. The company recently celebrated its 25th anniversary last year and is now embarking on an aggressive expansion of its product lines with several new innovative solutions.

RF Design Founder and CEO (third from left,standing) with members of their team at their headquarters in Lorsch, Germany near Frankfurt.

The company has gone a long way since its humble beginnings as a start-up to its current leading position in the RF segment. A major development is the newly launched **FiberLink CompactLine System**, which is noted for its versatility and high performance. It includes three base systems: a **16-channel Link System** designed for single signal distribution, a **quad 2+1 System** and a **dual 4+1 System** offering reliable signal transmission with an additional redundancy link, all in a compact 1RU chassis and ventilated Outdoor-Box with modular power supply and controller.

In addition to the FiberLink systems, RF-Design has redesigned expanded its offerings for flexible rf distribution and combining matrices with the **K7 and R25**, providing cost effective and comprehensive signal management solutions.

The **PwrM Device Family** enables precise rf level monitoring up to 70 GHz in teleports and satellite ground stations, which is crucial for quality assurance and system stability. Five models (200MHz, 3GHz, 8GHz, 40GHz and 70GHz) are available, all with two inputs each.



At the IBC show in Amsterdam this month, RF Desgin will be showcasing it's new FiberLink CompactLine System. Visit RF Design at Hall 1 booth # 1. F46 to view a demo.

"RF Design is also advancing in digitalization and has significantly expanded its research and development department, particularly in **FPGA design**, to develop and deliver advanced, customized RF over IP solutions," said Ralf Mayr, Founder and CEO of RF Design.

To accommodate their growing product portfolio and increasing demand for their products, the company will be moving in early 2025 to a new state-of-the-art facility with approximately 1000 square meters, doubling its current space. This expansion will allow RF-Design to significantly enhance its development and production capabilities, together with expanding the engineering team.

In addition "RF Design has restructured its distribution network and established strategic partnerships with system manufacturers to strengthen its market presence and explore new business opportunities. These comprehensive measures solidify RF Design's position as a niche market leader and technological pioneer in an increasing competitive environment," added Mayr.

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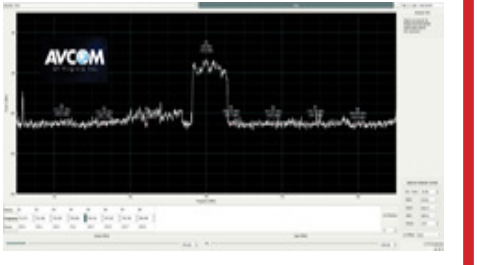
- Comprehensive API protocol support for Easy Integration
- Extended Temperature Range
- Wider Frequency range from from 400-3000MHz



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MARKET TRENDS

High Throughput Satellite Market: US$ 58.5 Billion in 2032

Dallas, Tex., July 2, 2024 - A new report titled "High Throughput Satellite Market Size" from Adroit Research revelaed that the High Throughput Satellite Market will be worth US$ 58.5 Billion in 2032 at CAGR of 20.17%.

The high throughput satellite market is experiencing rapid expansion within the telecommunications field. These advanced satellites provide high-speed internet access and increased data capacity, facilitating the provision of services like broadband, video streaming, and data communication on a worldwide basis. Their importance stems from their capacity to narrow t he digital gap, particularly in remote and underserved regions, by offering dependable and affordable internet connectivity. As the need for high-capacity applications grows and industries require seamless connectivity, it is anticipated that the global high-throughput satellite sector will see considerable growth in the foreseeable future.

A High Throughput Satellite (HTS) is a sophisticated communication satellite engineered to deliver significantly greater data transfer speeds in comparison to conventional satellites. HTS leverages cutting-edge technology such as spot beams, frequency reuse, and multiple-spot beam technology to enhance the capacity and efficiency of data transmission. By employing numerous smaller beams that can target specific regions or areas with high demand, these satellites enable more precise and higher bandwidth communication services. The improved capabilities of HTS support quicker, more dependable, and cost-efficient internet connectivity, voice communication, video streaming, and other data-heavy applications. This aids in fostering global connectivity and reducing the digital gap.

In 2023, the market for high-throughput satellites reached a size of US$ 15.3 billion. Adroit Market Research projects that the market will grow at a compound annual growth rate (CAGR) of 20.17% from 2024 to 2032, when it reaches US$ 58.5 billion.

Low Earth Orbit Satellite Market

Dublin, Ireland, August 14, 2024-- The Low Earth Orbit (LEO)Satellite Market grew from US$ 14.33 billion in 2023 to US$ 16.17 billion in 2024. It is expected to continue growing at a CAGR of 13.28%, reaching US$ 34.33 billion by 2030 according to new research from Research and Markets.

This proximity to Earth allows LEO satellites to provide lower latency communication and higher speeds, making them particularly advantageous for telecom services, earth observation, and various scientific endeavors. The expanding use of LEO satellites is largely driven by advancements in satellite miniaturization, reducing launch costs, and increasing demand for high-speed internet access in remote areas. Furthermore, the global push for improved global connectivity and the need for real-time earth monitoring for climate and disaster management support this expansion. However, space congestion and

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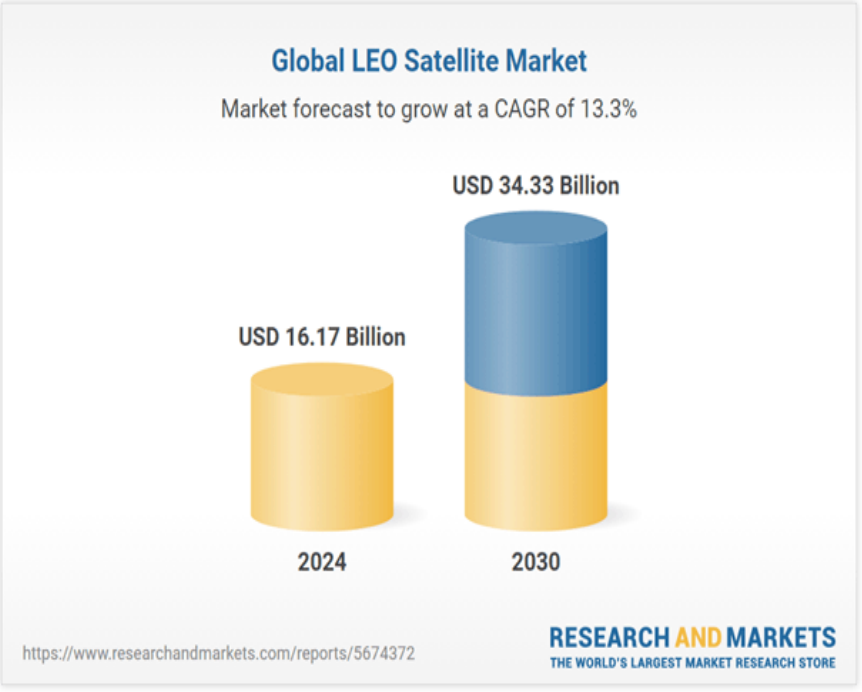
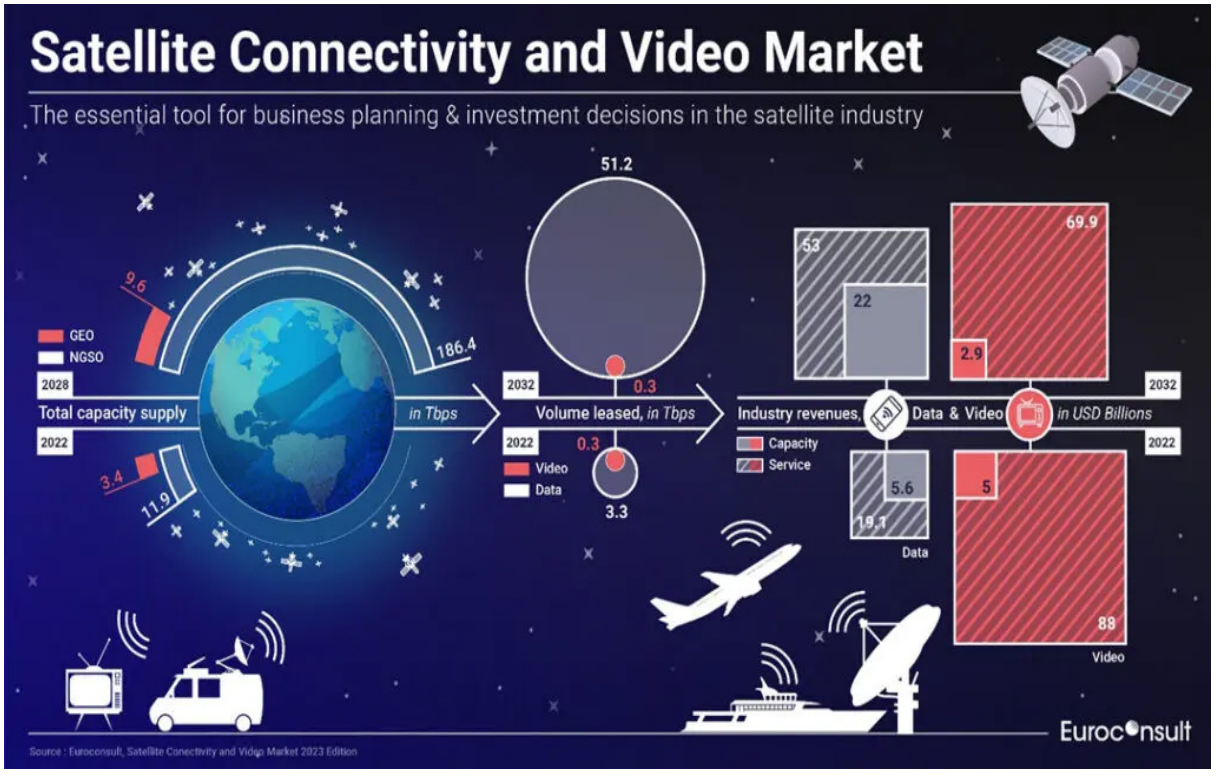
the potential for orbital debris pose significant challenges, as the increasing number of satellites can lead to crowding and an elevated risk of collisions. Moreover, the relatively short orbital lifespan of LEO satellites necessitates frequent launches to replace or augment constellations, potentially increasing operational costs and environmental impact. Addressing these challenges requires enhancing satellite durability and lifespan, developing more sustainable launch technologies, and implementing comprehensive space traffic management practices to mitigate collision risks and space debris. Emerging technologies such as satellite-based quantum communication and on-orbit satellite servicing present new avenues for growth and innovation in the LEO satellite sector.



VITAL STATS



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