

Satellite Executive BRIEFING

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Industry Trends, News Analysis, Market Intelligence and Opportunities

New Space Ventures

by Elisabeth Tweedie

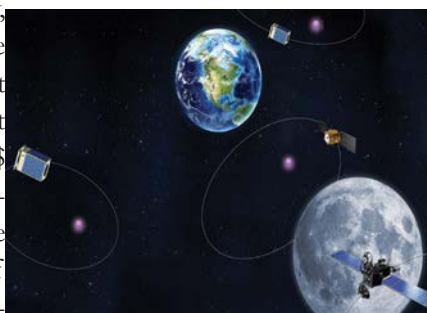
When I started doing research for this article on “new space,” I was spoilt for choice. There are so many relatively new companies, with innovative products and services. Where to begin, and how to choose which to highlight?

Seraphim Capital’s Space Investment summary, seemed a good place to start. Its latest analysis shows that a total of US\$ 6.8 billion was invested in New Space last year, with 127 of those deals occurring during the last

quarter. This is the highest number of deals ever recorded in a single quarter. Unsurprisingly given the number of “Moon” stories in the news recently, “Beyond Earth” accounted for 24% of investment and was the only sector showing significant growth from 2022.

Looking ahead, Euroconsult, in its recently published report “Prospects for Space Exploration,” indicates that global government investment in space exploration reached US\$ 26 billion in 2023 and is projected to rise to nearly US\$ 33 billion by 2032, largely fueled by lunar missions. In addition to na-

tional endeavors, there are two major international efforts underway; one led by the (US) National Aeronautics and Space Administration (NASA) in conjunction with the US Department of State, known as The Artemis Accords, and the other led by China and Russia known as The International Lunar



Research Station Cooperation Organization (ILRSCO). 36 countries have now signed The Artemis Accords, including Australia, Canada, France, Germany, India, Israel, Japan, Korea, Luxembourg,

Ukraine, UAE, UK and US. There are around 15 national signatories to ILRSCO including, China, Russia, Belarus, Pakistan, Azerbaijan, Venezuela, and South Africa.

Artemis Leads the Way

The overall goal of Artemis is to establish a long-term presence at the Moon for science and exploration. There are a few basic tenets including: peaceful exploration of space, transparency, interoperability and timely

Continued on page 4

What's Inside

From the Editor 3

Show Report: PTC'24
by Bruce Elbert.....10

The New Standards
by Lou Zacharilla.....22

Products and Services Guide
to SATELLITE 2024.....24

Satellite IoT and Environmental
Sustainability
by Alastair MacLeod.....30

Market Intelligence:
What to Expect from the
Satellite Industry in 2024
by Bogdan Gogulan.....36



Better Satellite World:
Bringing Oil Smuggling
Out of the Shadows.....39

Mergers & Acquisitions.....41

Executive Moves.....43

Market Trends/Vital Stats.....47

Advertisers' Index50

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The Race to the Moon: What's in it for Satellite?



In this issue we tackle the new space ventures that invariably involve lunar activities. There has been lots of activity in the lunar front recently, not the least of which is the first successful landing of a private spacecraft on the moon last month.

As part of the space ecosystem, the satellite industry stands to benefit from increased activities in space. As proven time and again, there has been many spillover effects of the space activities in the satellite industry. Elisabeth Tweedie looks at the key developments in new space activities in our cover story.

We also have a very comprehensive report on the PTC conference in Hawaii. As Bruce Elbert reports, this year's PTC featured a lot more panels focusing on the satellite industry. This only illustrates how vital satellite technology is for the Asia and Pacific region and beyond.

This issue also features op-eds from key industry leaders such as "What to Expect from the Satellite Industry in 2024" by Bogdan Gogulan from New Space Capital on page 32. As this month will feature the SATELLITE show in Washington D.C. from March 19-21, we have a guide to some of the key companies exhibiting at the show starting on page 24. We will be there at the show to report on the key issues. We hope to see you there.

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New Space Ventures

...from page 1

and safe disposal of debris. Currently, there are three defined Artemis missions. The first took place in 2022 when the unmanned Orion spacecraft orbited the Moon. Artemis II now planned for no earlier than September 2025 will take four astronauts to circle the Moon aboard the Orion spacecraft. Artemis III currently planned for 2026 will land four astronauts at the lunar South Pole. Subsequent missions will establish a base on the Moon and assemble sections of a lunar gateway. This will be a lunar orbiting space station similar to the ISS, although it is not envisaged that this will serve as a permanent base for crew in the way that the ISS is, more a stopping off point and a location for equipment. Contracts to work on Artemis will come from companies in the signatory countries.

Separately, but in conjunction with Artemis, NASA is also awarding contracts for the Commercial Lunar Payload Services (CLPS). This initiative is to deliver a commercial, end-to-end lunar delivery service. These contracts are only available to US companies. There are currently 14 providers on contract, a mixture of established space giants such as Lockheed Martin

"...global government investment in space exploration reached US\$26 billion in 2023 and is projected to rise to nearly US\$33 billion by 2032, largely fueled by lunar missions..."

and SpaceX and relative newcomers to the industry, such as Astrobotic, Firefly Aerospace and Intuitive Machines. CLPS contracts are indefinite delivery, indefinite quantity contracts, with a cumulative maximum contract value of \$2.6 billion through 2028. Being on contract simply establishes the right to bid for the different tasks. The first

Intuitive Machines' Nova-C lander, named Odysseus on February 15th, and it touched down at 6.23pm Eastern Time on February 22nd. Odysseus carried six NASA payloads including a camera to study dust plumes, a Doppler Lidar system, and an RF fuel tank gauge. The Doppler Lidar navigation beacon became particularly



The successful landing on the moon by Intuitive Machines' Nova-C lander named Odysseus is the first moon landing of a vehicle developed by a commercial company, and the first lunar landing by an American spacecraft in 52 years. (image courtesy of Intuitive Machines)

mission in January of this year, unfortunately was a failure, when a lunar lander from Astrobotic suffered a fuel leak and failed to reach on the Moon. However, as we all know, space is a challenging business and initial failures often lead to future success.

The second CLPS mission landed at the South Pole on the Moon as I'm writing this article. SpaceX launched

Intuitive Machines' Nova-C lander, named Odysseus on February 15th, and it touched down at 6.23pm Eastern Time on February 22nd. Odysseus carried six NASA payloads including a camera to study dust plumes, a Doppler Lidar system, and an RF fuel tank gauge. The Doppler Lidar navigation beacon became particularly important, as this had to be brought into use at the last minute, when Odysseus' ranging lasers, needed to land the craft failed. It also carried six commercial payloads, these included EagleCam from Embry-Riddle Aeronautics University, intended to be ejected before touchdown in order to capture images of Odysseus landing. After what appeared to be a near perfect, landing within two to three kilometers of the landing site, Odysseus then tipped over. Remarkably, all the scientific instruments on board are on the side facing up, which should allow them to continue to work.

This is the first moon landing of a vehicle developed by a commercial company, and the first lunar landing

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by an American Spacecraft in 52 years. However, it is not the first recent landing on the Moon. Earlier this year, Japan launched a lander known as Smart Lander for Investigating the Moon (SLIM), which unfortunately landed upside down, meaning its solar arrays were pointing away from the sun. It however, “woke-up” ten days later as the sun shifted and started transmitting images of spectral analysis of the composition of certain rocks on the Moon’s surface. Currently, it’s not known whether it will spring back into life when the sun shifts into the “right” inclination again.

Race to the Moon

There were two other Moon

landings last year, one by India, its Chandrayaan-3 spacecraft successfully touched down near the South Pole, making it the first craft to land there. Russia also attempted to land on the Moon, but lost control of its craft which made a crash landing.

Separately, but in coordination with Artemis and CLPS, last year the US Defense Advanced Research Projects Agency (DARPA) launched its own initiative, LunA-10. This is focused on pulling together companies that previously were working in isolation to develop different parts of a lunar infrastructure. The end game is to develop a commercial lunar infrastructure by the mid 2030s. In December, 14 companies were awarded contracts to work together for seven months, in

six different areas: communications and navigation, construction and robotics, market analysis, mining and in situ resource utilization (ISRU), power, and transit, mobility and logistics. These companies include three that are also part of the CLPS program, namely Blue Origin, Firefly Aerospace, and SpaceX. Other companies include Northrop Grumman, GITAI, Cislunar Industries and Sierra Space.

What is particularly interesting about the current race to the Moon, is that unlike the last Moon race, success in this one doesn’t just lie in the hands of governments, but in a myriad of commercial entities, some of which didn’t even exist a few years ago. Given the sheer numbers involved it would be impossible to mention them

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Challenge the limits

all in the confines of this article, so, given that the topic is “New Space,” I’m going to focus on just a few, all of them new entrants to the space industry: Firefly Aerospace, Green Launch, GITAI and SLI (Space Leasing International), a company that isn’t building anything, but has introduced an alternative way of financing assets, to the industry.

Firefly Aerospace

Firefly raised the largest investment in Q4 2023, garnering US\$300 million in Series C financing. The company was founded in 2017 and describes itself as an “end-to-end space transportation company, with launch, lunar and on-orbit services” and a “disruptor in space.” For such a young company, its achievements have been impressive. To date there have been four launches of its Alpha rocket, which is designed to lift ~1,000 kilograms to a low earth orbit. The third launch was for the US Space Force. The challenge was to demonstrate that private companies could meet launch deadlines in as little as 24 hours. The previous record was 21 days. Last September, Firefly met the deadline, completing all launch preparation in the 24 hours and successfully launching in the first available window. The fourth launch was not so successful, delivering its payload for Lockheed Martin outside of the intended orbit. A Mishap Investigation report has now been submitted to the FAA.

In addition to Alpha, Firefly’s product line includes MLV, a rocket capable of lifting 16,000 Kilograms to LEO. This was developed in conjunction with Northrop Grumman as

a replacement for the Antares rocket. The first launch is scheduled for 2025.

Blue Ghost and Elytra complete the current product offering from Firefly. Blue Ghost is a small lunar lander (2 meters high and 3.5 meters diameter) and forms the basis of Firefly’s three CLPS contracts valued at US\$230 million. Elytra is designed for on-orbit transfers, hosting, delivery and servicing to cislunar space and beyond. It can launch on both Alpha and MLV.

As well as the CLPS contracts, Firefly also has a contract with L3Harris for three launches to a LEO orbit in 2026.

Part of the reason for Firefly’s success is attributed to the fact that it uses common core avionics, power systems, propulsion components, and carbon composite structures across its launch vehicles, lunar landers, and orbital vehicles, to reduce costs and scale efficiencies.

Green Launch

Green Launch, an early-stage company, at the beginning of its funding cycle, has a totally different approach to accessing space and reducing the costs of doing so.

Green Launch uses hydrogen to launch. Hydrogen is the lightest and fastest gas and environmentally friendly as it produces no carbon dioxide. The rocket is ejected from a barrel, in a manner similar to a cannon, which is reusable. Whilst hydrogen is in plentiful supply, Green Launch intends to capture and reuse it, further reducing launch costs. Obviously, there is limited amount of control that can be applied to something launched in this



Firefly Aerospace's Alpha rocket designed to lift ~1,000 kilograms to a low earth orbit. (image courtesy of Firefly Aerospace)

manner, so there will be a rocket motor on top of the launcher for control, and to provide additional speed.

The company is looking at delivering small cargo such as cubesats and also packages up to 10 kilograms to the Moon. Eric Robinson, President, Green Launch, believes that ultimately it will be delivering these packages to the Moon in 24 hours.

Although it is an early-stage company, it has a contract with the National Science Foundation for Atmospheric Sampling. One of the issues with current methods of sampling is cost, according to Robinson, each sample costs around US\$5 million. Using Green Launch, this can be reduced to US\$175,000 which of course will enable far more samples to be taken and provide a more accurate picture of what is really happening in the atmosphere. The first sample is scheduled for Q3 this year.. Funding has been the issue limiting its progress, but it now has a new investor onboard, and is expecting to receive US\$1-2 millions from this investor, which will also bring a new CEO to the company.

Green Launch, also has a contract with the US Space Force, but can't reveal any details about this.

Lack of funding is also hampering its ability in other ways. The highest altitude reached to date is 33 kilometers, a very long way from the Moon or even LEO, but Robinson is supremely confident that it will reach its goal to be the Fedex of Space.

GITAI

GITAI is another young company, founded in 2016 by Sho Nakanose who built his first robot at age seven, and has been passionate about them ever since. The company started in Japan, but moved its headquarters and many of its staff to Torrance, California, last year when Nakanose got his US "Green Card" in record time, and became a US permanent resident.

The company's vision is to partner with launch companies, "To provide a safe and affordable means of labor in Space," and reduce operational costs by 100 times. To this end it is developing robots to help build and maintain satellites, space stations, lunar bases and cities on Mars.

Although a much smaller company than Firefly, GITAI has also made impressive progress in just a few years. As already mentioned, it is one of the 14 companies selected to take part in DARPA's LunA-10 project. The company's proposal revolved around a concept for deploying modular, multi-purpose robots, known as Inchworm robots, for labor on the Moon's surface. The Inchworm is a modular "arm" equipped with tool-changeable end effectors that can handle multiple tasks from construction to maintenance

and adaptation. "We're both humbled and thrilled to be chosen for DARPA's LunA-10 program," said Nakanose, Founder & CEO of GITAI. "This mission goes well beyond robotics; it's about forging a new era of lunar infrastructure. Our innovative approach, leveraging modular robotics, is a catalyst for reshaping how we envision the Moon." The company is actively developing spacecraft that can assemble solar panels, antennas, habitation modules and fuel generators, in addition to performing exploration, resource extraction and maintenance and inspection tasks on the Moon.

Prior to being included in LunA-10, in 2021 GITAI successfully concluded a technology demonstration inside the ISS. Its autonomous robot, assembled both panels for in-space assembly (ISA) and operating switches and cables for intra-vehicular activity (IVA). However, as Nakanose is quick to point out, there is no point in doing this inside the ISS, the real test comes when this occurs outside the space station, in the harsh atmosphere of space. This is about to happen. In February of this year, its autonomous dual robotic arm system (S2) arrived at the ISS to conduct an external demonstration of in-space servicing, assembly and manufacturing (ISAM). At the conclusion of this demonstration GITAI aims to achieve Technology Readiness Level (TRL) 7 and establish its ISAM capabilities.

Looking further ahead, the company plans to operate a Robotics-as-a



GITAI's 1.5-meter-long autonomous dual robotic arm system (S2) has successfully been deployed to the International Space Station (ISS) to conduct an external demonstration of in-space servicing, assembly, and manufacturing (ISAM). (image courtesy of GITAI).

Service (RaaS) model, so that customers will not need upfront capex to utilize its products and can grow business in line with demand.

Unsurprisingly, given its achievements, GITAI has been successful in raising capital, garnering US\$67.6 million in various funding rounds since 2019. It also has contracts with Toyota, the Japanese Aerospace Exploration Agency (JAXA) and the (Japanese) Ministry of Economy Trade and Industry (METI).

Space Leasing International

While these three new companies are driving down the costs of space projects, space nevertheless remains an expensive and capital-intensive business. One company intends to change that. SLI (Space Leasing International). SLI is part of the international Libra Group, which has been successfully providing leasing to the aviation industry, amongst others, for many years. SLI brings that expertise to the satellite and space industry, and works with both manufacturers and

operators across the entire value chain. SLI was created only eight months ago, and already has a number of transactions closed and a strong pipeline.

One example is its relationship with RBC Signals. Last year SLI acquired a ground station in the Alaskan arc that RBC Signals is leasing from the firm. SLI is partnering with the company to acquire or build a total of 20 ground stations around the world and lease them back to RBC Signals. However, SLI has no intention of confining itself to the ground segment. It currently has an extensive pipeline of transactions related to assets both in the ground segment and on orbit. CEO Alex Kerschen, commented, "Leasing assets gives companies the opportunity to focus on what they're good at: running their business, rather

than raising capital, which can be a challenging and time-consuming practice, sometimes resulting in loss of control. Companies in the space sector are all too familiar with this scenario, and have been very receptive to the concept of leasing assets."

Many times in the past, I've written about the speed of change and how exciting this industry is. I'm

going to say it again! In only a few short years, these new entrants to the industry have succeeded in changing the dynamics, distances traveled and the financial structure. Doubtless with some casualties on the way, these companies and many others are likely to continue doing so, well into the future. What an exciting industry we work in!



Elisabeth Tweedie has over 20 years experience at the cutting edge of new communications entertainment technologies. She is 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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PTC'24 Highlight Developing Trends in the Satellite Industry

by Bruce Elbert

The Pacific Telecommunications Council (PTC) Conference (PTC'24) held in Honolulu, Hawaii from January 21-24 continues with the same format post COVID and maintains its position as the primary event in the Asia-Pacific Region for telecommunications via fiber, satellite and cellular wireless. The satellite presence is about 25% of the sessions and attendance, yet the level of individuals and the topics covered are very germane to understanding the state of the satellite communications industry and what we expect in coming years.

Outside of Japan, Korea, Singapore and possibly China and India, the Asia-Pacific region has been challenged to keep up with the western world as far as innovation in telecommunications. However, the role of satellite communications has been important in delivering basic services

across the broad region and vast expanses of water. The one MEO constellation, O3b, has a solid foothold in some of the Pacific Islands and the LEO constellations, especially Starlink, are in use in some of these countries. Still GEO

satellites and their operators remain solid in their commitment to this technology and maintaining the capacity needed to address this demand for bandwidth.

PITA Meeting

This is the annual meeting of the Pacific Islands Telecommunications Association (PITA) held during PTC'24 and attended by telecom representatives from various Pacific island nations. Only one of the presentations related to satellite communications and it dealt with a specific implementation of a diversity link to back

up the fiber cable connection to Palau. This happens to be an independent nation that is tied to the US for various support. What is encouraging is that the provider, Intelsat, has made a commitment to Palau in a new strategy for them. Rather than just offering transponder capacity, they have engi-

neered the ground facilities and worked in conjunction with a local company to implement this service. The local partner, Palau National Communications Corporation (PNCC), is the Republic of Palau's national carrier for local and international telecommunications services. They are based in Airai, Palau.

Intelsat is providing capacity on two different satellites: IS-18 satellite (180.0 EL) C-Band and Intelsat H3e (169.0 EL) Ku Band. The objective - bring reliable Internet connectivity to remote islands. This was presented by



If you missed the PTC in Hawaii this year, the PTC will have a booth at SATELLITE 2024 in Washington, DC, from March 18 – 21, 2024 (booth # 905). Members and supporters may have use of the booth through the reservations system.

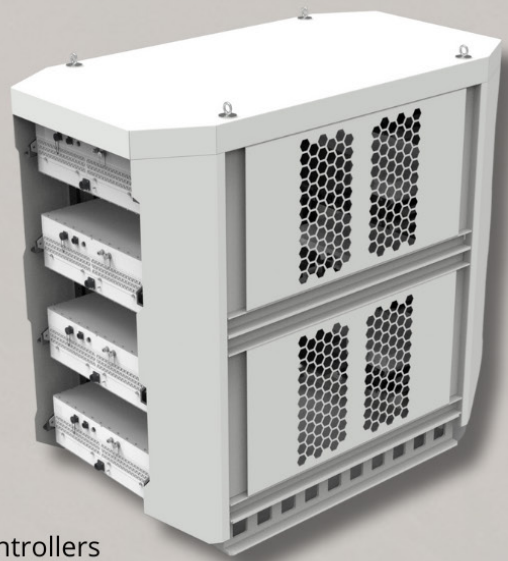


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SHOW REPORT

Robert Suber, Intelsat regional marketing manager. Intelsat blended managed trunking services with thin route terminals on remote islands. Suber showed a solution for new connectivity and resilience for satellite backup design for submarine cables, involving hosted FlexEnterprise fully managed network configurations and single end-to-end solutions for SD-WAN, IP trunking, dual satellites, and dual teleports. SD-WAN is a terrestrial standard for broadband wide area networks that has been adapted to satellite links. The standard is applied broadly for private networks over IP infrastructure, but the satellite angle had not been resolved until recently. The integration this offers is demonstrated by the Intelsat dual path to overlay fiber connectivity.

The representative from PNCC expressed pleasure with what Intelsat has done for Palau. The dual path network (C and Ku band) serves small island communities with as few as 100 inhabitants. The total population of the Palau nation is approximately 14,000.

Designing the Digital Ground Segment of the Future

The World Teleport Association (WTA) held the ground-segment related session on the Sunday of PTC'24 week and is usually attended by companies engaged in satellite services and new applications. The panel was a blend of these organizations and the discussion was focused on various parts of the system, including ground networks, teleport services, mobile antennas and high power amplifiers (HPAs). The discussion was timely and pointed in regard to current trends in the market.

Participants include: John Brader, EVP Satellite Services, SageNet (a major VSAT network operator), Chris Faletra, President, COMSAT Teleports, A Goonhilly Company (an operator of two US teleports that has merged with UK teleport operator, Goonhilly), and Steve Richeson, VP Sales & Marketing, Mission Microwave Technologies (a leading manufacturer of Ku and Ka band solid state HPAs). The moderator was Michael Kreiner of Intellian (a supplier of auto-pointing antennas recognized for its support of LEO operator OneWeb).

The intended topic relates to integrated networks and earth station automation involved with teleports and ground segment. As such, software would be a natural topic. The first question addressed the interface between the earth station and the Internet, described as that be-



Intellian is working on flat panel antennas with separate surfaces for transmit and receive, on display at the PTC.(photo by Bruce Elbert)

tween IP and RF. This is critical because the uplink/downlink chain starts with data at the input, which is IP, and converts and adapts it to the RF link from ground to space. However, the issue here is how you properly interface customer IP information and applications to the ground station and ultimately the satellite. True, it is a difficult matter since many problems arise when this interface is ignored until the last minute or the design of the RF portion does not support the intended network and purpose. It could be a matter of writing and verifying the proper software for control and adaptation, provided that the ground station has the needed capabilities internal to it.

The comment was made that the engineers who design and test ground segments don't actually point the antennas themselves, as might have happened in years past. Automation performs this function since it is generally known where the satellite is located at any given time. Faletra of COMSAT said that the Goonhilly station has the needed software engineers to support software development to



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meet the various deep space missions that they support. He said that the two COMSAT stations in the US are being upgraded to support deep space as this is the Goonhilly strong suit.

Kreiner of Intellian stated that the market wants a small antenna and terminal that covers Ku and Ka bands, and can be applied to LEO, MEO and GEO, “but we are a few years off.” Richeson of Mission Microwave correctly pointed out that the RF requirements for the different orbits differ greatly (by as much as 30 dB between LEO and GEO), “so if you design for GEO you may be overdesigned for LEO.”

Brader of SageNet explained that the trend for him is to reduce the number of teleports to be more efficient. Richeson said his company supplies the majority of solid state Ku and Ka band HPAs to earth stations, and sees how predistortion of waveforms helps compensate for amplifier nonlinearity, which can improve efficiency by many percentage points. “You can have a basic amplifier but compensate using predistortion.” He said that Mission Microwave produces good HPAs that are based on the yield of production and are not mass produced like cellphones. “It’s not like the chip business. More quantity means greater expense.”

Faletra was asked about putting a data center at the teleport and he explained that COMSAT has been doing this for some time. Kreiner of Intellian, which had produced reflector antennas with mechanical steered mounts, is working on flat panels with separate surfaces for transmit and receive. They are working with SageNet.

Satellite Leaders Luncheon

This is the principal event related to satellite communications as it is always well attended, including senior managers and executives from many organizations from the US, Europe and Asia Pacific. The nature of PTC is that people feel more at ease and willing to be pretty open in their questions and comments. This year, the industry faces challenges from the apparent strength of the NGSO sector and from the maturity of the GEO markets. C band still exists in the backbone across Asia but Ku and Ka bands are now a mainstay for broadband services to remote locations. New GEO satellites are less in the making although Viasat 3 can potentially lift the prospects for applications to aircraft and vessels which are open to any orbit. The

representation on the panel was primarily from the GEO sector and there appeared to be no one that could speak for NGSO operators other than one audience participant from Montana who loved his Starlink terminal.

Panel participants include: Mark Dankberg, Chairman of the Board and Executive Chairman, Viasat Inc., Daniel Gizinski, Chief Strategy Officer – Defense, Comtech, Katherine Gizinski, River Advisors, Kozo Ibata, Deputy Director-General for Global Strategy, Global Strategy Bureau, Ministry of Internal Affairs and Communications (MIC), Fred Kua, Vice President Sales – Asia & Oceania, ABS, Jeremy Rose, Partner, COMSYS LLP, and Brandon Seir, Chief Commercial Officer, Kacific Broadband Satellites Ltd.

The panel led off with a conversation about the big picture for the industry. Rose of COMSYS said that it is “celebrity driven” by the likes of Elon Musk and Jeff Bezos. “NGSO constellations are having a big impact.” Dankberg of Viasat stated that the broadband LEOs have an issue with capacity density. That is, their capacity is distributed across the globe with most of it over oceans and not enough of it available to serve peak demand. In his words, “too much capacity is where there isn’t demand.” The representative from Japan, Ibata of MIC, pointed out that satcom is vital in case of emergencies and disasters, like the earthquake in Japan.

Katherine Gizinski, moderator, asked if “linear TV” is dead. Dankberg said that IP TV (mainly streaming) is going on and in fact satellites can deliver this as well. Seir of Kacific said that all of these investments in space “are expensive” and that there is a concern in developing countries that it is eclipsing local telecom infrastructure. An example might be Cook Islands with 50K inhabitants that has difficulty affording basic IP infrastructure. He highlighted how Kacific introduced low-cost Ka band VSAT terminals costing around US\$700. Kacific has been successful with this offering in India, Papua New Guinea, and Philippines. “We are connecting 500 schools in PNG and Philippines, partnered with Microsoft. We build on this, then find a business in the same community.” He said that they are working on a condosat (shared satellite) for Pakistan.

Dankberg said that 2023 was a difficult year for the industry but he sees progress. His company completed the major acquisition of Inmarsat and is now a global operator



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with Ka and L band satellites. Recent reports said that Inmarsat produced a significant increase in Viasat revenues. “There is elasticity of demand – we drive down costs (per Mbps) and demand increases.” Viasat 3 with its projected capacity of 1,000 Gbps was intended to contribute to this. However, its launch on May 1, 2023, resulted in a substantial impairment in its service capability due to an “antenna deployment issue”. There are two more coming, he said, and “we will uncover the cause.” He said that they tested “everything else” and it all works. He indicated that he does not like software defined satellites (all the Viasat satellites are pure analog designs, but the Inmarsat 4 and 5 series have transparent digital processors) because he doesn’t like “operating software in space – better to do that on the ground.”

He said that politically it is important to have a gateway in the country being served. While the existing Viasat satellites all employ Ka band (they do use Ku band satellites from other operators), the Inmarsat satellites include L band, “which is a valuable

asset, particularly for government services.” He added that countries need control of their space systems; this came up in the context of the Ukraine war. His general statement was, “We need a thriving ecosystem of suppliers, insurers, etc.”

Kua of ABS explained that ABS no longer stands for Asia Broadcast Satellite. Due to a repositioning by the new owners, it now stands for Agility Beyond Space. This means that they are aggressively pushing ground segment and NGSO as compared to their previous focus on GEO satellites in the Asia Pacific region.

The discussion about the impact of NGSO gave Dankberg the opportunity to explain that SpaceX “threw an enormous amount of capital at (Starlink).” They offer their service at a low price. He believes that the trend for broadband is “more for terrestrial and less for space.” This affects the military, too. For a satellite system to provide capacity where it is needed, “you need more beams”. The big consumer demand is for streaming video (70% of Internet traffic by his estimate). It may be that multicast data will end up an important approach for streaming to commercial aircraft. Rose said that the wireless operators “stole C band” and that Starlink terminals are “amazing.” But, Sier of Kacific claimed that their GEO customers are “sticking with us for customization.” He said that they have 15K terminals in

New Zealand for emergency services.

On crossing the digital divide, Dankberg said that it’s a money issue. He’s looking at ways to make it affordable. Kua of ABS clarified that “it’s not a network gap, it’s a knowledge and investment gap.” For Starlink, there is the open question



Panelists at the Satellite Leaders' Luncheon include (from left): **Fred Kua**, Vice President Sales – Asia & Oceania, **ABS**; **Daniel Gizinski**, Chief Strategy Officer – Defense, **Comtech**; **Mark Dankberg**, Chairman of the Board and Executive Chairman, **Viasat Inc.**; **Brandon Seir**, Chief Commercial Officer, **Kacific Broadband Satellites Ltd.**; **Jeremy Rose**, Partner, **COMSYS LLP**; **Kozo Ibata**, Deputy Director-General for Global Strategy, **Global Strategy Bureau**, **Ministry of Internal Affairs and Communications (MIC)**, and **Katherine Gizinski**, **River Advisors**.

as to if that system can become profitable after half a decade of investing and growth. Daniel Gizinski of COMTECH correctly stated that they must close the business case – the need for \$1 billion plus profit. “When will they get there?”

The panel reviewed the recent World Radio Communication (WRC’23) conference, which closed in Dubai in December last year. Dankberg said that there is still a serious issue with the restriction on Power Flux Density (PFD) from NGSO satellites into areas services by GEO satellites. GEO satellites have priority over NGSO satellites because

the NGSO are employing frequencies previously dedicated to satellites in GEO, which operate at fixed longitudes. He expressed concern about Starlink operating outside of the box posed by all of the regulations and assignments. “Now coming to light that Starlink is not following its constraints.” Rose said that it may be time for binding regulation on debris. Dankberg said that Starlink is up against the following: (1) financing – unlimited access to capital, (2) profit, (3) regulatory, and (4) debris.

Question from the audience, “To what degree can operators of large constellations control it all – a sustainability question.” Dankberg said that his company will focus on special sectors as opposed to consumer broadband. One is aviation, where Viasat is strong. An attendee discussed his use of Starlink on a mountaintop in Montana, where the temperature dips down to -68F. His Internet service was working great while neighbors lost their cable connection. But, the Starlink satellite design is evolving as requirements increase. Dankberg pointed out that the first generation of which there are 3,000 weighs about 500 kg while the next generation came in closer to 1,200 kg. Increased mass means increased cost of the spacecraft and the launch. “Their driving down the cost of service could result in domination and non-sustainability.” Chris Baugh of NSR Research spoke from the audience saying that there is a perception that Starlink doesn’t have to be profitable. Starlink dominance is a perception based on how many launches and satellites continue to be introduced by Starlink and that current customers seem very satisfied. Ultimately, the finances of Starlink will come back to the margins obtained from service to all customer groups, which is why they are pursuing every market, both civilian and government.

Satellite Mobile in Your Pocket

This panel explored the emerging service of device-to-device (D2D) communications with representatives from across the emerging ecosystem for D2D communications, particularly to non or lightly modified mobile phones.

Panelists include: Brian Aziz, Executive Director, Direct-to-Device, Iridium, Christopher Baugh, Partner, NSR (an Analysys Mason Company), Mark Dankberg, Chairman of the Board and Executive Chairman, Viasat Inc., Dan Dooley, CCO, Lynk, and Phillip Henderson, CEO, Vodafone Cook Islands. Chris Baugh of NSR acted

as panel moderator.

Dankberg offered that D2D is about connectivity to the standard device you use for mobile services. It can be automotive, IoT, SOS services, etc. Texting, possibly voice and images. It’s a question of the \$ per month for the service. “This is not in the same ballpark as terrestrial cellular or broadband.” Dooley of Lynk (a potential D2D satellite provider) agreed and claimed that it is “here now but will take time and funding, we are doing it today for small messaging and periodic.” Aziz of Iridium said that their second-generation constellation provides D2D “on a global basis” and probably in real time with their 66 satellite constellation. The second generation, called Iridium NEXT, is backward compatible with the original system initiated in 1998 and has additional features that have not been widely reported. Aziz said that they now support safety messaging and SoS to call centers. Iridium announced an agreement with Qualcomm for Snapdragon. “The issue is the manufacturers don’t want to change their design (and have to incorporate more components at increased cost). Apple has control of all aspects of their hardware and software, but Google and Android is “fragmented”. He cited a pricing hurdle in Africa where subscribers are paying about \$2 per month.

Henderson of Vodafone Cook Islands insisted that subscribers should not have to use a different device. If it’s a roaming service then the local mobile operator can make a charge for it. He wants the cost to him of D2D to be zero and that they cannot add any investment cost on their end. A question from the audience about service in Australia, where there is a “lot of white space”. The rancher wants to automate but there is no coverage. I asked how Iridium can provide this new service since their only spectrum resource is the original L-band assignment of 10 MHz worldwide. Aziz said they can support 100K of users and that Qualcomm would not have supported this effort if the spectrum was inadequate. Dankberg again made the point that national operators, like in Cook Islands, don’t like satellite providers bypassing their system. There is even concern about terrorists.

Observation about this discussion: other than mention of limitations of service (texting, voice and SoS messaging), there was no mention of the limitations of the satellite to ground link. Basically, you must be outside so the antenna on the phone can see at least parts of the sky for a clear line

of sight path. Operation inside of buildings is not assured except possibly at windows.

The New Market Pioneers

This plenary panel addressed the digital infrastructure sector, which historically prioritized developed markets and experienced a substantial pivot toward emerging markets and their central hubs in the early part of this decade. “This transformation is propelled by factors including the swift pace of digitalization and governmental efforts to stimulate economic advancement in these areas. Leading the way in this transition are forward-thinking enterprises aiming to harness the yet untapped opportunities presented by emerging markets.” The panel addressed how trends are affecting new investment in this broad region primarily in data centers and cables. Satellite was considered and Mark Dankberg of Viasat was the only participant from the satellite sector.

Panelists include: Mark Dankberg, Chairman of the Board and Executive Chairman, Viasat Inc., Tony Rossabi, Founder & Managing Member, OCOLO, Craig Scroggie, CEO & Managing Director, NEXTDC Limited, Jeff Tench, Executive Vice President, North America and APAC, Vantage Data Centers, Guy Willner, Chairman & Co-founder, IXAfrica, and Joe Zhu, Founder & CEO, Zenlayer.

The challenges addressed by the panel relate more to investment in telecom resources in the various nations of Asia Pacific; no longer can you count on being profitable simply by spending on resources to reach populations, businesses and governments who themselves are strapped for cash. The panel considered the importance of electrical power in developing countries. Some have been blessed with adequate geothermal power, hydroelectric power and even nuclear in some cases. Data centers are particularly hungry for this power which they turn into stored data and information; one can even consider how power and computing are also monetized through cyber currencies like Bitcoin. Satellite communications has been a main stay as the investment is made by others and the resources reside in space. But, the countries are jealous of their prerogatives, which is an impediment to proliferation of broadband services from Starlink, Viasat and others.

With the emphasis of this panel on power demands of telecom infrastructure, Dankberg correctly pointed out the satellite facilities have relatively low power demands.

Interesting that the major radio resources in space are all powered by solar panels and backed up by batteries. Ground facilities can be relatively large in power demand but less so for small antennas and terminals. These antennas can be placed directly on user premises and do not require extensive terrestrial facilities such as fiber cables.

In terms of inhibiting issues, data sovereignty and privacy were cited. There is also the need to cool the processors in data centers, which brings in water resources. Dankberg responded to a question about the impact of Starlink on his GEO broadband business by stating that GEO has the advantage of being able to satisfy the peak demand on the ground where it occurs without wasting resources across wide bodies of ocean and desert. He also pointed out that 85 to 95% of traffic is not latency sensitive (e.g., streaming video). He added that the one issue from the WRC late last year is the uncertainty that still surrounds the issue of power flux density limits to protect GEO networks from NGSO satellites that are closer to the earth and required to prevent RFI to GEO terminals and satellites.

Integrating Satellite and Terrestrial Services in Asia/Pacific

The final satellite industry panel at PTC’24 examined the next steps in integrating and harmonizing satellite and terrestrial infrastructures and services. “For too long, communications satellite systems have largely operated as parallel communications universes and not as components of a shared ecosystem. Historically, satellites were used to supplement terrestrial networks and extend/backhaul telco and cellular coverage but were viewed as just filling in the gaps of the terrestrial systems. Today, satellite industry players are actively participating in the standards bodies designing next generation fixed and mobile systems. Further integration can be foreseen as satellite operators seek partners to roll out more direct-to-consumer broadband services, including direct-to-device mobile services soon. In this way, satellites are becoming more integrated/harmonized with the operations of telcos, cable systems, and mobile service providers.” This panel offered an intermodal review of the expanded integration of these networks and the new roles for satellites in the global network infrastructure. It ended up addressing some strategic issues as well as practical lessons learned with integrating satellite with other facilities.

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Panelists include: Gregg Daffner, Emeritus President / CEO, APSCC / GapSat, Timothy Logue, Principal, TJLNova Consulting, Josh Reed, Principal Solution Sales Specialist, Telstra InfraCo, Alexander Schumann, General Manager, Microcom, John Turnbull, Vice President, Enterprise & Cloud, Australia & Pacific, SES, and Ronald van der Breggen, Chief Commercial Officer, Rivada Space Networks.

The presenters represent organizations that either employ satellites as a part of their networks or are dedicated to provide satellite-based resources, in space and/or on the ground. Reed of Telstra, the Australian primary telecom operator with business operations throughout Asia Pacific, said that they offer “a one stop shop”, for international communications through ground stations they own and operate. They do not own their own satellites but rather employ the resources of domestic GEO operators as well as foreign operators such as Intelsat. They address corporate and government needs through SD-WAN and MPLS wide area networking over fiber and satellite. He said that they now offer Starlink LEO to consumers where Telstra handles customer needs. They intend to explore D2D and want to see business-grade LEO services in the future to address business needs. His objective is to give a “seamless experience to customers” out in the country. This is where he sees D2D in the future. Australia is an “open market to foreign satellites, with appropriate licenses.”

Schumann of Microcom, an Alaska-based provider of satellite and TV services, said that it is “tough work with local telcos who rely on Federal subsidies to keep their obsolete networks going”. His company is reselling Starlink terminals with 5,000 currently installed. Their Pacific Dataport subsidiary has announced its relationship with OneWeb to operate an Alaska gateway.

Van der Breggen of Rivada Space Networks said his organization is “pushing lower latency compared to fiber.” He said that their system offers high security and the ability to put together private networks to link from the European region to remote locations such as Bogotá, Colombia. “It’s tough to align circuits” for a direct connection that extends beyond the primary region. He was asked about the bypassing of the networks of foreign telcos who jealously guard their prerogatives. He admitted that yes, you can go rooftop to rooftop. But this will interface with terrestrial networks using Link Layer switching, but not Ethernet or IP. He asserted that it was a mistake in the year 2000 to “emphasize the last mile to the consumer – it’s difficult to

offer service to customers using expensive satellite infrastructure.” He said that Rivada would provide “well-paid for private networks (for industry and government) and then help address the digital divide”.

Turnbull of SES Australia said that SES has learned over time about the value of MEO service from O3b. He initially had 10 beams over Asia Pacific which allowed them to land a beam and provide a “large pipe, then we roll out services to subscribers until the fiber arrives”. From there, O3b provides a reliable backup to protect that fiber, which is likely to be single string in the beginning. With the newly launched mPower series, the satellite can produce “thousands of beams”. He expressed the opinion that it is “hard to work with telcos” if you’re offering Starlink. His approach is to work with the local telco, as in their previous success with the original O3b satellites. In general, the cable addresses the main population but not the secondary. “When we look for a customer, we want someone who needs rugged capacity, with service level agreement (SLA) and a support structure around it.” This sounds a lot like the Intelsat approach to the dual satellite network for Palau, discussed previously.

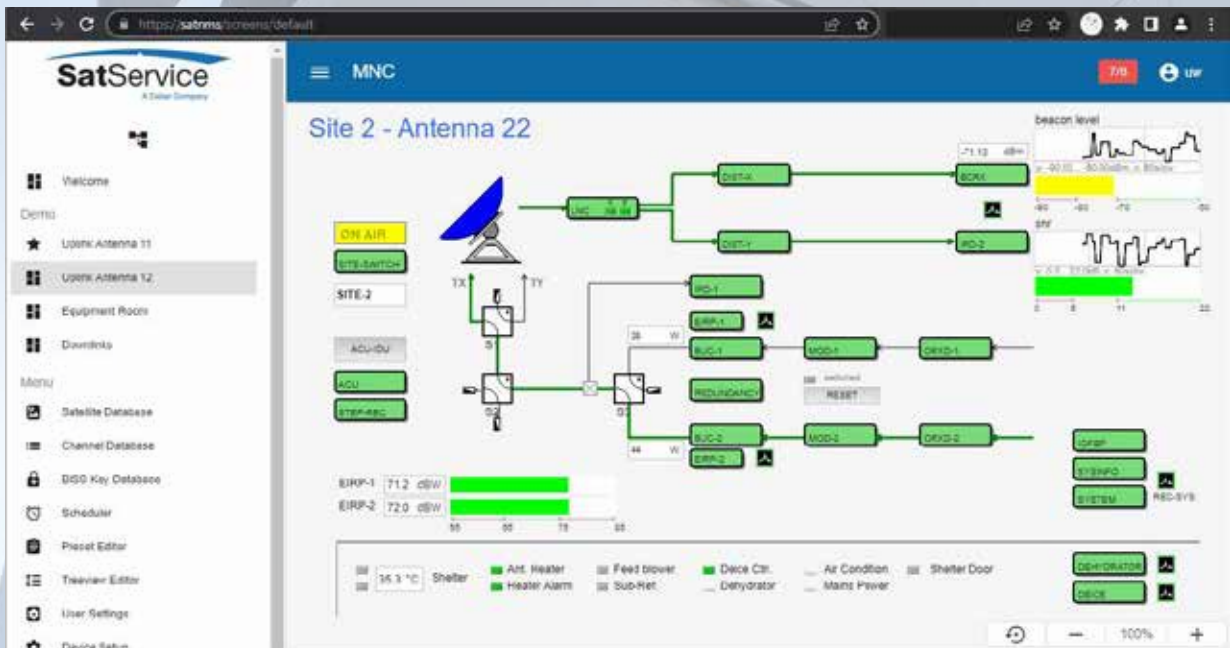
Tim Logue noted that the PTC organization will have a booth at Satellite’24 in Washington, DC, March 18 – 21, 2024. Members and supporters may have use of the booth through the reservations system being set up.



Bruce Elbert is the Founder and President of **Application Strategy LLC**. He is a satellite industry expert, communications engineer, project leader and consultant with over 50 years experience in communications and space-based systems in the public and private sectors. Areas of expertise include space segment design and operation in all orbit domains, systems architecture and engineering, ground segment systems engineering, development and operation, overall system performance improvement, and organizational development. He has been an expert witness in legal proceedings related to radio communication system performance, patents, construction contracts, service agreements, RFI identification and resolution, and taxation. He can be reached at: bruce@applicationstrategy.com

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It Ain't Standard Oil...It's the New Standards

by Lou Zacharilla

In 1910 the Supreme Court of the United States found Standard Oil Company of New Jersey guilty of monopolizing the petroleum industry through a series of abusive and anticompetitive actions. The Court's remedy was to divide Standard Oil into several geographically separate and eventually even competing firms. Reacting to the size and scale of this unfavorable ruling to the company he had founded, the head of the greatest business monopoly in history, John D. Rockefeller, allegedly said, "I expected it, but did not think it would be so BIG!"

Sometimes you get surprised in life. Sometimes, however, pleasantly.

When I look at two of the most important, fastest-growing communities within our industry, diverse as they are, I sense the dynamism and changes taking place that make 2024 a special year. Both are yet another demonstration of what I call "the Better Satellite World" we are shaping.

DIFI is a Great Acronym Making a Difference

It is generally agreed throughout hallways here at Satellite 2024 that the industry needs an open and transparent standard that if developed and adopted by users, operators and vendors working together will meet the broadest range of needs without becoming too complex and costly to implement. The industry was seeking a standard to reduce the total cost of ownership and boost network and terminal agility, performance and resilience to enable the all-important - but often ugly-child of the industry - the ground segment, to seamlessly adapt to rapidly changing space-layer payloads, orbits and constellations.

That is why a lot of buzz is around the work and the mission of the Digital Intermediate Frequency Interoperability (DIFI) Consortium. (<https://dificonsortium.org/>) The young consortium, led by Stuart Daughtridge, Vice President for Advanced Technology at Kratos Defense, is to enable the digital transformation of space, satellite, and related industries by providing a simple, open, interoperable

Digital IF/Rf standard to replace the natural interoperability of analog IF signals and to prevent vendor lock-in. Today ground segment relies on coaxial cable to transport RF at intermediate frequencies, such as L-Band, between antennas and modems and through multiple analog devices. Analog IF systems, with their inflexible chain of hardware, are difficult to scale and complex to operate. They are struggling to handle capacity demands and cannot scale up. Innovation gets the door shut in its face as a result.

DIFI, whose 60 members include some marquee names, including NATO, Microsoft, Intelsat, ViaSat, World Teleport Association and the United States Navy has working groups that focus on specifications and certifications. Recently, DIFI established a new working group to focus on a fast-emerging challenge to the spike in advancements in ground segment technology. Electronically-steered flat-panel antennas (ESAs) are on a clear evolutionary path from high-cost terminals for single-beam/single-use applications to increasingly affordable offerings, many with some combination of multi-beam, multi-band, and multi-orbit capabilities. Supporting these flexible antenna systems will drive demand for digital-based ground systems for signal routing and processing.

Last year the consortium released version 1.2.0 of the DIFI Standard to set up industry-wide standards to help the deployment of key technologies going forward.

DIFI, which sounds like a new brand of peanut butter, is growing faster than a kid's appetite for a sandwich and is one of the industry's BIG success stories. Daughtridge, who is its current Chairman, was nominated as Industry Executive of the Year.

Wisdom and Growth SSPI-WISE

Another community with a familiar acronym is SSPI's WISE (Women in Space Engagement). Gender relations are an interesting dynamic anywhere. In the space and satellite industry the general collegiality that exists – and MUST exist – has helped women move deeper into the ranks of leadership and participation. Finally. However,

OPINION

ask a guy if women have caught up in this regard and you will generally hear, “yes.” Ask women and it is a resounding “no.” Obviously there is work to do.

But SSPI-WISE, the fastest growing special interest group among SSPI's chapters and affiliates – by far – has been programming events, providing mentorship and attracting members to SSPI at an accelerated pace. The need is there. It too is a new “standard” that was much in need. <https://wise.sspi.org/cpages/wise-home> SSPI's Director of Engagement, Tamara Bond-Williams, a driving force at WISE, was recently celebrated in Via Satellite's special report on women in the industry. SSPI-WISE encourages women to join.

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<https://www.sspi.org/events/nysbr-2024-q1-ep3-live-what-did-we-hear-at-satellite-conference>

Within the last few weeks, I have been lucky enough to record a series of Podcasts called “The Promise” with young men and women in the industry to discuss many of these issues AND also one with Stuart Daughtridge to discuss the all-important topic of interoperability! (<https://www.sspi.org/cpages/podcast>)

To be able to have these conversations with these gifted folks and to be engaged in this big-time transformation of our industry is a great gift. I expected I would do a lot of these things in my job, but I never expected they would get so BIG and successful!



Lou Zacharilla is the Director of Innovation and Development of the Space and Satellite Professionals International (SSPI) and the host of the "Better Satellite World" podcast. He can be reached at: LZacharilla@sspi.org

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Beyond Borders: Satellite IoT's Crucial Role in Driving Environmental Sustainability

by Alastair MacLeod,
CEO, Ground Control

In the face of unprecedented global environmental challenges, the Internet of Things (IoT) has the potential to be the catalyst in driving sustainable development. Satellite IoT, a means of communicating with very remote assets and sensors, holds tremendous potential in monitoring, managing, and mitigating environmental issues.

The World Economic Forum's IoT Guidelines for Sustainability report states that 84% of IoT deployments are addressing or have the potential to address the UN's Sustainable Development Goals. Satellite IoT's capacity to collect and transmit data, even in remote locations, holds immense potential for reshaping global sustainability initiatives. Through intelligent communication between devices and utilising real-time data, Satellite IoT helps to address environmental issues and promote sustainable practices.

But How and Where? Satellite IoT and Sustainability in Practice

One area where we are seeing Satellite IoT driving sustainability forward is in wildlife conservation and environmental monitoring. This offers a highly efficient and impactful method for gathering and transmitting essential data. A common scenario sees a form of LPWAN used for networking multiple sensors across a wide area.

The data is aggregated in a gateway, and optimised for transmission over satellite. Because it has no reliance on cellular infrastructure, LoRaWAN is increasingly paired with satellite to build a fully wireless communication network. Characterised by their capability for long-range connectivity with minimal power consumption, these are particularly well-suited for tasks involving the transmission of modest data volumes across expansive distances.

A notable advantage of LoRaWAN lies in its capacity to cover extensive areas with minimal infrastructure requirements. Unlike traditional cellular networks, which often encounter limitations in delivering coverage to remote and challenging terrains like dense forests, mountains or deserts — habitats where numerous endangered species thrive — LoRaWAN excels, with the ability to span hundreds of square kilometres using just a single base station, or gateway, connected to satellites for data backhaul. This data is gold dust for environmental agencies and policymakers.

The concept of Satellite IoT using data to empower environmental conservation efforts can be seen in the "Digitalization of forest" which encompasses the integration of cutting-edge technologies into forest environments. The initiative aims to improve existing methods in monitoring, data acquisition, and research and

development. Notable technologies in this endeavour comprise the IoT, Wireless Sensor Networks, Internet of Trees, and Deep Learning. For instance, satellite-enabled sensors can be deployed in forests to detect signs of deforestation, monitor wildlife movement, and measure carbon dioxide levels. This data helps in making informed decisions for conservation efforts, preventing illegal activities, and preserving ecosystems. These sophisticated systems are designed for intelligent sensing, monitoring, and analysis, specifically targeting applications like forest fire detection, illegal logging, and poaching, and enabled by satellite IoT.

Satellite IoT connectivity also contributes significantly to smart agriculture and precision farming, optimising resource usage and reducing environmental impact. Farmers now harness IoT sensors to oversee environmental factors, manage livestock, and enhance decision-making across all facets of agriculture, transforming it into a "smart" endeavour. Given the expansive nature of farm operations, LoRaWAN paired with a satellite enabled gateway emerges as an ideal technology to facilitate efficient IoT solutions within the agricultural sector. Effectively networked IoT sensors can monitor soil moisture levels, assess crop health, and provide farmers with actionable insights even if the farm is in an extremely remote location.



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Precision agriculture, a farming management strategy based on observing, measuring and responding to temporal and spatial variability to improve agricultural production sustainability, holds the potential to significantly reduce the environmental impact of the agricultural industry, currently responsible for a quarter of global greenhouse gas emissions. Adopting precision agriculture technologies can increase crop production, reduce resource usage, and have positive economic impacts. The Association of Equipment Manufacturers estimates current precision agriculture usage at 10-60%, predicting that a 90% adoption rate could lead to substantial benefits. However, slow adoption is attributed to challenges, with connectivity being a prominent issue, especially in remote farm areas.

Satellite IoT, therefore, is crucial in areas lacking traditional, cellular connectivity. For example, Synnefa, which facilitates remote farming for smallholders in rural Kenya, provides cost-effective, reliable, and efficient data for farmers to make educated decisions about when to irrigate or fertilise their crops; or to use Synnefa's smart greenhouses and drip kits which will automatically fulfil these tasks based on sensor data. The gains are spectacular: Farmers are saving water by over 50%, reducing fertiliser application rates by 41%, and increasing production by 30% when compared to yields prior to the use of their smart sensors.

The Thorny Climate Change Issue

Looking at climate change, satellite IoT contributes to climate change

"...As technology continues to evolve, Satellite IoT is poised to play an increasingly crucial role in encouraging a harmonious relationship between human activities and the environment. By leveraging the capabilities of Satellite IoT, we can create a more sustainable future..."

mitigation by providing invaluable data for monitoring and understanding environmental changes. Remote sensors deliver accurate real-time data to help us understand how we affect the environment. These sensors can track changes in sea levels, measure atmospheric carbon concentrations, and monitor deforestation patterns, and their data can be securely, reliably and cost-effectively delivered over satellite. This data is crucial for climate scientists and policymakers in formulating evidence-based strategies to mitigate the impacts of climate change and adapt to evolving environmental conditions.

Finally, the incorporation of Satellite IoT also plays a role in disaster management, enhancing early warning systems and boosting response capabilities. Satellite-enabled sensors can monitor various natural disasters like hurricanes, floods, and wildfires, supplying real-time data to emergency responders. This facilitates prompt evacuation, optimal resource allocation, and efficient post-disaster recovery efforts, helping to reduce the environmental and human impact of such events. Satellite-empowered technology means that disaster management crews can comprehend their available resources, enabling them to coordinate actions effectively. Asset trackers fixed to vehicles and equipment can provide precise GPS

coordinates at varying frequencies, depending on the disaster's scale, offering a tailored level of insight for swift and efficient relief efforts.

While Satellite IoT presents numerous opportunities for environmental sustainability, challenges such as data security and high implementation costs must be addressed. Ground Control has written more on this topic where they discuss how to overcome infrastructure obstacles and make the benefits of IoT available to all. Future developments in satellite technology, including the deployment of smaller, more cost-effective satellites and advancements in machine learning for data analysis, hold promise for overcoming these challenges and further enhancing the impact of Satellite IoT on environmental sustainability.

As technology continues to evolve, Satellite IoT is poised to play an increasingly crucial role in encouraging a harmonious relationship between human activities and the environment. By leveraging the capabilities of Satellite IoT, we can create a more sustainable future.



Alastair MacLeod is CEO of remote connectivity provider **Ground Control**, a Group comprising three companies - Wireless Innovation, Rock Seven and Ground Control (US).



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 Making Missions Possible

What Can We Expect from the Satellite Industry in 2024?

by Bogdan Gogulan,

Managing Director of NewSpace Capital

Readers of this magazine will know that behind (or rather, above) many areas of modern life is satellite technology. 5G phone networks. Location tracking. Precision farming. Disaster prevention and response. Without satellites, next to none of this could exist or exist at the level of sophistication we enjoy now. The technology is so deeply integrated into modern life that if all the world's satellites were to vanish tomorrow, we would be in serious trouble. And it's why, despite the volatility of the past few years, the industry has continued to expand. In 2024, we can expect another big year.

Questions around Starlink

Much ink has been spilled around Starlink, the satellite internet constellation operated by Elon Musk's SpaceX. It now has roughly 5,000 satellites in orbit and provides coverage to more than 70 countries. But there are questions around it – questions often overlooked in the mainstream discourse. There is, for one, a question around its long-term sustainability, given the constant stream of large-scale launches needed to get its satellites into space.

There is a question, too, around its role in the Ukraine conflict, and a potential backlash from government bodies and international regulatory entities cannot be ruled out. Its involvement in that conflict casts light

on the relationship between technology, global politics and governance, which is only going to get closer.

We also need to be mindful of the risk of one company monopolising critical infrastructure, such as satellite internet. It is essential that there is a diverse range of service providers and a healthy, competitive market to reduce the dependence on a single entity.

Competition and diversity

Happily, diversity and competition in the sector is growing, and growing fast. ETL/OneWeb, SES, Telestat, Rivada and Mangata – all of these companies are showing potential. ETL/OneWeb, for instance, intends to send more than 600 satellites into orbit, while Telesat's Lightspeed constellation will comprise 298 satellites and provide global internet coverage, especially to remote areas.

The critical industry bottleneck at the moment is launch capacity, which is limited. But here, too, the market is changing. It's expected to grow to reach \$30 billion by 2026; SpaceX's Falcon 9, partially reusable and with an excellent safety record, has been a game-changer. Diversity is growing thanks to new entrants to the market, including Blue Origin and Arianespace. It remains to be seen what impact and influence Starship, designed to supplant Fal-

con 9, will have in the coming years.

Sustainability Above and Below

In 2024, satellites will play an increasingly key role in sustainability. The Earth observation market in particular is projected to reach US \$8 billion by 2025.

In this area, there are a number of companies to watch. ICEYE is using advanced SAR technology to image the Earth at high resolution, regardless of weather conditions, supporting environmental monitoring and disaster response. The digital MRV company Kayrros is using AI to process satellite data and provide insights into emissions and other climate events to private and supranational organisations. Cailabs, a pioneer in laser beam-shaping technology, is using optical technology to improve communication from satellites to earth. And Simera Sense, with its optical payload systems for small satellites, is making key contributions towards cost-effective, detailed Earth monitoring.

But the need for environmental protection extends to space, and the satellite industry will have to consider the sustainability of its own activities. There are now over 2,000 active satellites, 3,000 dead satellites, and 128 million pieces of smaller debris in Earth's orbit, and initiatives like the European Space Agency's (ESA)



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Clean Space have been launched to deal with this 'space junk'.

Internet Connectivity

Innovation in the satellite sector is by no means limited to providing internet access. There have been advances in satellite-based solar power, shown in China's ambitious plan to build a space solar power station by 2035. Satellite propulsion, too, is evolving, with electric propulsion systems increasing efficiency and longevity.

But internet connectivity nevertheless remains a key part of the conversation, and it's to a large extent because of this – and, in particular, the power of satellites to bring internet access to underserved communities – that the growth of the sector has such profound economic and social implications. Projects like Amazonas Nexus, for example, are aiming to close the digital divide by improving connectivity in remote areas, such as rural parts of Latin America. It could change lives.

Elsewhere, consumer markets are adapting quickly to satellite-based internet services. As of December, Starlink had racked up more than 2.2 million subscribers worldwide. And in the maritime and aviation sectors, where consistent coverage is key, demand for satellite services is growing.

Ground Station Technology

There's a great deal of movement underway in ground station technology. AI and cloud computing are being integrated for the purpose of processing data, as Microsoft's Azure Orbital project shows. Amazon Web Services is now offering

"...the need for environmental protection extends to space, and the satellite industry will have to consider the sustainability of its own activities..."

a network of ground stations, improving data download and processing power and allowing for more efficiency and greater frequency of satellite communications. This service is especially useful for Earth observation and global communication networks, since it offers scalable solutions for the vast volumes of data satellites generate. By integrating AWS Ground Station with other AWS services, Amazon is not just providing an end-to-end solution for satellite data processing and storage, but showing how space tech is converging with cloud computing and data analytics.

Emerging Economies

Emerging economies are playing a bigger and bigger role in the satellite sector. India, with its Indian Space Research Organisation (ISRO), is taking remarkable steps forward. The ISRO has launched 431 satellites for 34 countries as of 30th July 2023. Setting a new record, their PSLV-C37 mission deployed 104 satellites, showing off the growing capabilities of emerging space nations.

Conclusion

Given the sweeping changes afoot in the satellite industry, regulation, both to manage satellite traffic and ensure safety, is essential. It requires global cooperation, and here, the United Nations Office for Outer Space Affairs and ITU are key players. Markets will have to adapt, too. Technological innovation in the satellite industry must go hand in hand with robust market strategies. This will need to be ongoing, because satellites have shown the wide range of applications they offer, from communication to environmental sustainability. It is an industry that is diverse and dynamic – increasingly so.

With respect of satellites, and the space technology that's downstream from it, it's likely to be an eventful year.



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, UN-HCR, IOM) and security organisations (NATO, OSCE, ISAF).

Bringing Oil Smuggling Out of the Shadows

In 2017, North Korea shocked the world by launching tests of two ballistic missiles able to cross the Pacific and strike the US. One just missed hitting a commercial passenger flight headed for Tokyo.

The UN Security Council slapped a severe penalty on the rogue nation: a limit on the amount of fuel and crude oil it could import.

The hope was that, with no oil reserves of its own, North Korea would soon feel the pressure to change its ways.

Except it didn't. Two years later, the country conducted no fewer than 20 missile tests. What went wrong?

Demand Meets Supply

There is high demand for black market fuel from East Asia. Price differences between nations make it profitable to buy low in one place and sell high in another – if you can do it without getting caught. But with oil traders operating in the shadows, it's impossible to stop the trade or even slow it down.

Or is it? A British charity, the Royal United Services Institute, decided to try.

The Institute turned for help to Planet, a leading provider of satellite imagery. The Institute then worked with global security nonprofit C4ADS to review hundreds of images from Planet's global archive. That painstaking work identified at least 100 oil deliveries that North Korea failed to report to the UN. Overall, the Institute estimated that

North Korea imported four times more fuel in a single year than it should have.

Dispelling the Shadows


Planet operates about 200 satellites in low Earth orbit. Together, they take pictures and download images of

the entire Earth's landmass every day. Those images proved key to uncovering smuggling in action. They showed big tankers docked in East Asian nations where they legally bought fuel. Out at sea, the ships rendezvoused with smaller tankers and transferred the fuel to them for delivery to North



Korean ports, in violation of the law.

Using Planet's high-resolution images, the Institute was able to identify individual ships. News stories followed, bringing attention to the United Nations investigators – and North Korea found it harder and more expensive to smuggle its way to success.

Year by year, companies like Planet are dispelling the shadows where illegal activity hides. Day by day, satellites bring a bit more of the Earth into the light. 



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MERGERS & ACQUISITIONS

Iridium Acquires Satelles

March 4, 2024 - Iridium Communications Inc. (NASDAQ: IRDM), announced that it had entered into an agreement to acquire Satelles, a provider of highly secure satellite-based time and location services that complement and protect GPS and other GNSS-reliant systems. This acquisition continues Iridium's philosophy of investing in differentiating technologies uniquely suited to its network that significantly outperform competing solutions according to the company.

The market for assured Positioning Navigation and Timing (PNT) ser-

synchronization and can benefit from the in-server room efficiency and resilience delivered by Iridium STL.

"This market is growing; it's a perfect application of our network, and this solution solves a problem for critical industries better than anything else," said Iridium CEO, Matt Desch. "Acquiring Satelles makes perfect sense for Iridium and is consistent with what our strategy has always been, which is to take advantage of our unique network to do what others can't or do it better than anyone else can. STL is the superior solution available

cial markets, governments, and major corporations.

STL will become a new business line of Iridium, led by Satelles CEO, Dr. Michael O'Connor who will report to Iridium CEO, Matt Desch. "Bringing STL into the Iridium family is going to be a supercharger for this capability that will benefit our customers and our society. I look forward to a bright future together," said O'Connor.

Iridium is assuming all rights to the Satelles patent portfolio and anticipates the Iridium STL line of business




vices, estimated to reach is evolving to require integrated small-form-factor devices instead of the server rack-size solutions connected to outdoor GPS antennas that are available today. Time synchronization and location data play an important role in the global economy, particularly in the commercial sector for major industries supported by critical infrastructure, such as financial services, telecommunications, cyber security, and transportation. These industries and others rely on an estimated 10,000 data centers globally and their hundreds of millions of data processing and storage servers. Each of these servers requires time

today, and we have been following and investing in Satelles's technology roadmap to allow us to create even more opportunity. We're excited to formally bring the Satelles team "in-house," to the Iridium family."

The STL service utilizes the stronger broadcast paging channels of the Iridium satellite constellation to deliver precise timing information, which provides truly global, secure time and location signals that are 1,000 times more powerful than GNSS constellations. The service is resilient to regional GNSS outages, works inside buildings and is being used today to secure digital infrastructure for finan-

will generate over \$100 million in service revenue per year, by 2030, and additional revenue from equipment and engineering.

A long-standing investor in Satelles, Iridium had an ownership stake of around 20 percent from three previous investments in the company. For the remaining approximately 80 percent, Iridium will pay about US\$ 115 million, net of cash remaining in the company, which will be financed through a tack-on to its term loan. Iridium expects to complete the acquisition in the next few weeks. 

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Bitcentral Announce New Leadership and Growth Capital Investment

Newport Beach, Calif., March 6, 2024--Media software solutions provider **Bitcentral** announced new leadership in the form of **Sam Kamel** as CEO and **Fred Fourcher** as Chairman. This marks a return for Bitcentral founder Fourcher, evolving Bitcentral from an essential software platform for nightly news preparation to a leading company in streaming media. Under Fourcher's guidance, Bitcentral will continue to redefine audience engagement, offering scalable solutions from traditional broadcast newsrooms to



Fred Fourcher

Sam Kamel

dynamic streaming online talk shows.

Bitcentral has provided software solutions to over 300 television stations and 1,000 media operations, including Fox, CNN, and Hearst. The company's mission is to democratize content creation and distribution, enabling storytellers everywhere to reach and engage audiences with unparalleled efficiency, expanding the landscape of media consumption and monetization.

"Joining Bitcentral represents a thrilling new chapter. I'm committed to leveraging our broadcast and streaming prowess, to driving innovation and excellence, and to building the best team in

the industry," said Sam Kamel.

Kamel has served on Bitcentral's board since March 2023. He has played transformational roles at companies such as Netscape, Microsoft, Fox and Ingram Micro, and spearheaded rapid growth at data analytics company iinside / CrowdVision. His background also includes consulting experience at McKinsey & Co. and service as a US Naval Officer. He has a BS in electrical engineering from Cornell University and an MBA from Harvard Business School.

Bitcentral was also fortunate to welcome a new private investor that recapitalized the business, replacing the previous private equity fund which held a significant stake in the company. This new investor will be joining the board of Bitcentral and maintains an enthusiastic long-term view of the company's growth potential. "Discovering Bitcentral was a revelation – a bright beacon lighting the path toward digital media's future. It's a privilege to champion a platform that empowers important voices and narratives that need to be heard across today's busy media landscape."

Hanwha Phasor Targets US Expansion with New Senior Hires

Washington, D.C., March 6, 2024--**Hanwha Phasor**, a UK-based satellite communications company, has announced two new key hires as part of the business' expansion into the US market. Richard LePage joins the organization as a Business Development Director, United States Government (USG), and Scott McCobb joins as Hanwha Phasor's



Richard LePage

Scott McCobb

Commercial Director, Aviation – both positions will include a seat on Hanwha Phasor's leadership team.

The new leadership roles will see LePage tasked with executing marketing strategies, plans, and programs aimed at key US Government prospects, whilst McCobb will execute marketing strategies, plans and programs aimed at key aviation organizations. Alongside this, both LePage and McCobb will support the R&D team with product roadmaps by providing market trends and analyzing competitors for business development. Both new members of staff will report directly to the Vice President of Business Development to ensure a seamless international strategy for Hanwha Phasor's wide portfolio of satellite communications solutions, as Hanwha Phasor enters into the US market.

LePage had a decorated 21-year career in the US Armed Forces, spending 16 years focusing on satellite communications and R&D for US Special Operations with his career culminating as part of the Joint Special Operations Command. Following this, he joined the industry with numerous senior business development roles in companies including Ultra Intelligence and Communications, and Envistacom.

McCobb has an extensive career in program management, working previously at Raytheon Technical Services for over five years, as well as six years at Astronics AeroSat Corporation. Further to this, Mc-



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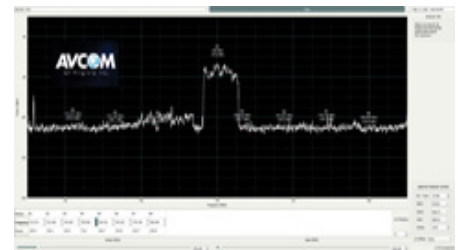
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- Integrates with AVCOM's EVO-GUI
- Comprehensive API protocol support for Easy Integration
- Extended Temperature Range
- Wider Frequency range from 400-3000MHz



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tors to guarantee business success.

Hanwha Phasor has previously indicated its interest in the US, and these hires mark the formalization of the start of its operations in North America.

Michael Young, Vice President Business Development at Hanwha Phasor said: “We are pleased to welcome Richard and Scott to our team, their experience will be a significant addition. These new hires mark a key point for the business as we look to expand into the US, working with commercial and government customers who will all benefit from improved mobile connectivity capabilities offered by our family of satellite communication solutions.”

ST Engineering iDirect Appoints New Senior VP of Sales

Herndon, VA., February 6, 2024 – ST Engineering iDirect, announced the appointment of **Tami Dias** as Senior Vice President of Sales as part of the company’s leadership renewal to sharpen focus on strategic partnerships, customer engagements and growth.

Dias, an accomplished sales executive with over 20 years of experience, will be responsible for leading the organization’s global sales function to bring the company’s solutions to global customers. She will partner with key stakeholders to develop and execute a comprehensive go-to-market strategy while forging strategic partnerships and ensuring customer satisfaction.

Previously Vice President of Global Sales at Aeris Communications, Dias has over a decade of experience in the IoT and space sectors, holding

a variety of sales and sales leadership roles in companies including Verizon, Cobham, Marlink and RingNet. Dias

excels in driving revenue growth, building high-performance sales teams and fostering customer relationships.

“As a proven change facilitator, I am excited to join a company with a track record of providing best-in-class technologies which underpin its offerings to many of the world’s satcom networks. As we navigate the dynamic satcom landscape, my focus will be on go-to-market strategies to ensure we remain at the forefront of industry advancements, and the continued introduction of ground-breaking products that will not only meet but exceed the evolving needs of our customers,” said Dias.

Mission Microwave Appoints New Regional VP for EMEA

Cypress, CA., February 1, 2024 – Mission Microwave Technologies, LLC, a manufacturer of highly efficient Solid State Power Amplifiers (SSPAs) and Block Upconverters (BUCs) announced that **Alex Fitzgerald** has joined the company as Regional Vice President of Sales for the Europe, Middle East, and Africa Region.

Mission Microwave has estab-



Tami Dias

lished an industry leading market presence with customers in the US and has built a globally recognized brand of solid-state amplifiers used in satellite communications networks. This expansion of the company’s sales team will generate new opportunities for customers to use the company’s SSPAs in the growing UK, Europe and Middle East Markets. Recent products focused on this market include high power SSPA designs used to replace legacy traveling wave tube amplifiers up to 1,000 watts for gateways and broadcast hubs.

Steve Richeson, Mission Microwave’s Vice President of Sales and Marketing stated, “We are delighted to welcome Mr. Alex Fitzgerald to Mission Microwave as Vice President of Sales EMEA. Alex’s experience in winning the confidence of customers by advising them on highly complex technology choices is very much in line with our history of working closely with customers to bring the most reliable and advanced solid-state amplifiers to solve our customers’ most challenging system design opportunities. Alex’s presence within the region will make it easier for customers and partners to work with Mission Microwave on the state-of-the-art challenges that define today’s SATCOM market.”

Fitzgerald holds an MBA from the University of Essex and has over twenty years of experience working with satellite industry customers supplying SATCOM solutions. Most recently Alex worked for Comtech Telecommunications where he served as Vice President of Sales covering the EMEA region supporting both commercial and government customers. 

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US Streaming Revenue to Overtake Pay TV in 2024

London, UK, February 26, 2024 - The latest research from Ampere Analysis finds that total revenues from streaming (including advertising revenue from hybrid streaming subscription tiers) will overtake revenues from pay TV subscriptions in the US for the first time in Q3 2024. Streaming will continue to race ahead as traditional pay TV declines - with the value of pay TV in 2028 expected to fall to half the value it saw at its peak in 2017. The new analysis comes from Ampere's continuously updated Markets Operators data service.

Streaming subs overtook pay TV in 2016, but revenue is catching up

While streaming subscriptions overtook pay TV subscribers back in 2016 in the US, streaming's lower average revenue per user (ARPU), which currently sits

at around 1/10th that of pay TV, means that revenue is only now catching up.

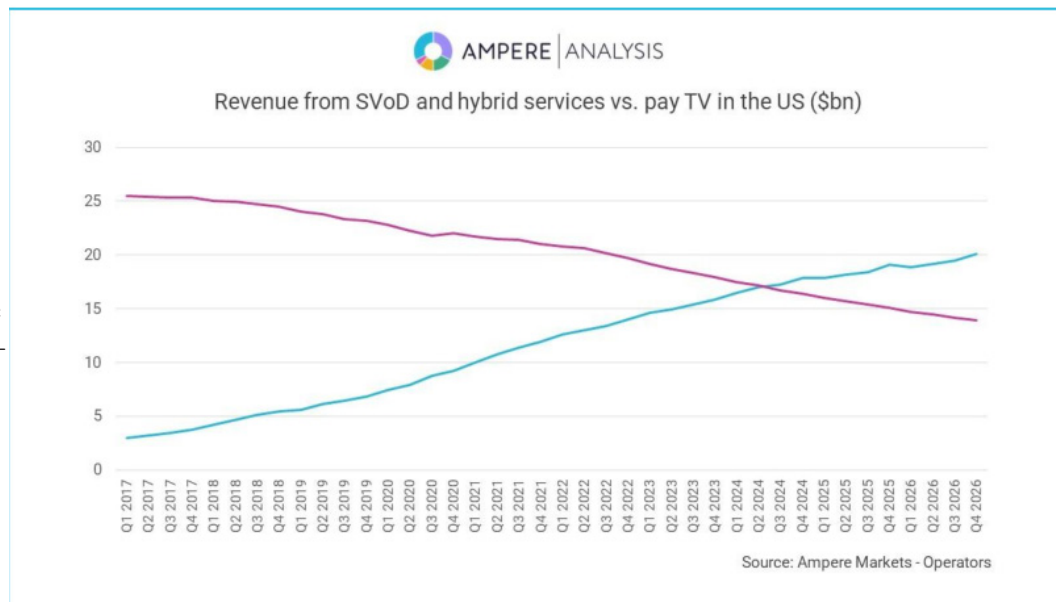
Streaming advertising revenues will pass \$9bn in the US this year

A slowdown in the growth of subscriber numbers in markets such as the US and UK has driven a shift in focus from the streamers towards revenue growth, and eventually, profitability. As a result, the introduc-

tion of cheaper ad tiers has been successful not only in increasing new subscriber growth in previously saturated markets, but also in acting as an additional revenue source for streaming services. Revenues from ad tiers will pass \$9bn in the US this year, bolstered by Amazon Prime Video's new advertising tier which launched this quarter. Increased revenue from advertising and a boost in subscriber growth, alongside the decline in traditional pay TV, has led to this important inflection point being reached.

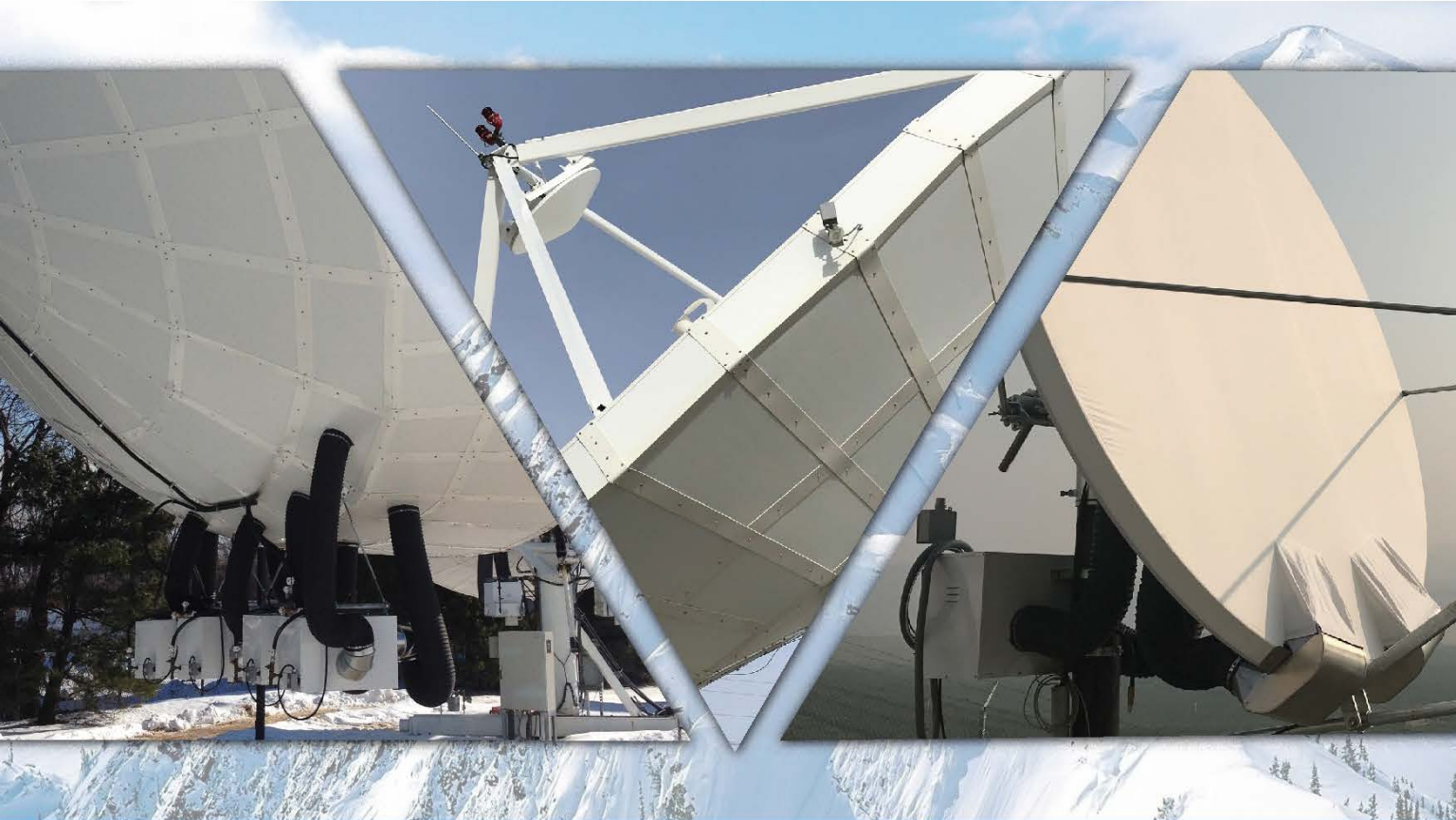
Rory Gooderick, Senior Analyst at Ampere Analysis says: "Most major streaming services in the US have launched their hybrid advertising tiers, which, along with increasing clamp-downs on password sharing, have been successful at reigniting growth in the streaming market.

There is still a way forward for pay TV, however. Disney and Charter's recent deal in the US, which gave almost 15 million Charter subscribers access to Disney+'s advertising



tier, shows how the two businesses can work together to maximise streaming's reach to domestic subscribers, and highlights the importance of traditional distribution platforms as service aggregators. Longer term contracts and the reduction in churn makes this an attractive proposition for streamers, while control over the billing relationship also means there's something in it for the pay TV provider too." 

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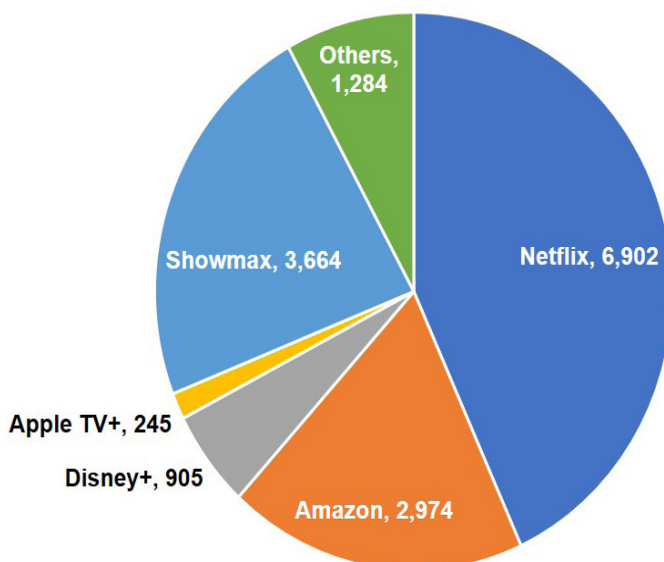
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Africa SVOD to add 9 million subscriptions

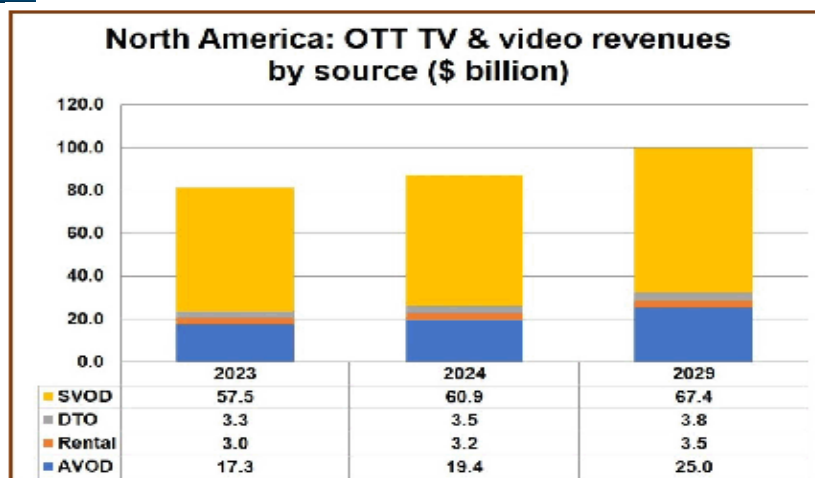
London, UK, February 10, 2024—Sub-Saharan Africa will have 16 million paying SVOD subscriptions by 2029, up from 7 million at end-2023. South Africa and Nigeria will supply 59% (9.4 million) of the region's total. However, SVOD penetration will still be low by 2029, with only 7.1% of TV households paying for at least one subscription – although this is up from 4.7% at end-2023 according to Digital TV research.

Netflix will remain the SVOD market leader, with 6.9 million subscribers by 2029. Showmax will be the second largest platform with 3.7 million paying subscribers. With its roll-out expected to be limited to South Africa, Disney+ will only have 905,000 subscriptions by 2029.

Simon Murray, Principal Analyst at Digital TV Research, said: "SVOD is a battle between Netflix and regional player Showmax. Rich in local content and sports rights, Showmax now has access to NBCUniversal, Sony Pictures and HBO content. Showmax's parent MultiChoice recently rejected a takeover bid from Canal Plus.".



VITAL STATS



North American OTT TV episode and movie revenues will reach US\$ 100 billion in 2029; up from \$81 billion in 2023. The US will contribute \$16 billion from the \$19 billion additional revenues, with Canada supplying the rest. US revenues will be \$92 billion in 2029 according to new research from Digital TV Research.



ADVERTISERS' INDEX

| | |
|---|--|
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| Advantech Wireless.....11 www.advantechwireless.com | RF Design.....41 www.rf-design-online.de |
| AVCOM of Virginia.....44 www.avcomofva.com | SatService GmbH.....21 www.satservicegmbh.de |
| AVIA Video Summit 2024.....34 www.aviavideosummit.com | STN.....42 www.stn.eu |
| AvL Technologies.....51 www.avltech.com | Terrasat Communications.....2 www.terrasatinc.com |
| CABSAT 2024.....33 www.cabsat.com | Walton Enterprises.....48 www.de-ice.com |
| Creonic.....37 www.creonic.com | WORK Microwave.....23 www.work-microwave.com |
| IBC 2024.....31 www.show.ibc.org | Xiplink.....9 www.xiplink.com |
| iKO MG.....15 www.ikomg.com | |
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| Jonsa Technologies.....19 www.jonsa.com.tw | |
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