

Satellite Executive BRIEFING

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Industry Trends, News Analysis, Market Intelligence and Opportunities

Update on the Chinese Satellite Market

by **Blaine Curcio**

As we've said for quite some time, the satellite communications market in China has historically been a pretty vanilla affair. On the Geostationary (GEO) side, the state-owned China Satcom runs an effective monopoly on the provision of satellite services, occasionally buying additional capacity from its partial subsidiary APT Satellite, and from foreign operators. On the non-GEO side, we've seen limited activity from state-owned China Satellite Networks Limited (China SatNet), a centrally-controlled state-owned enterprise (SOE) founded in 2021 with the purpose of deploying a "Chinese version of Starlink".

2023 has seen some changes in both GEO and NGSO satcom, with better-defined and somewhat bigger ambitions in the GEO space coming from China Satcom, and with significantly more dynamism coming in the NGSO space.

Bringing China into the VHTS Era

One thing that has not changed over the past couple of years in the Chinese satcom market is the nature of GEO competition: China Satcom maintains an effective monopoly. Up until recently (and even now to some extent), this has limited their incentive to innovate, however the past couple of years have seen too much high-level support for satcom, and they've had no choice. 2023 has seen this crystalize, with a few interesting announcements and events.



First, in February, the ChinaSat-26 satellite was launched, representing China's first satellite of ~100 Gbps capacity. With coverage extending from parts of Eastern Russia to the Horn of Africa and from Australia to Central Asia (blue coverage map below), the satellite represents by far China Satcom's largest on-orbit to

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date (next largest being ChinaSat-16, with 20 Gbps). With nearly 2 Gbps per beam and capabilities of bringing 450 Mbps of capacity to any single user terminal, ChinaSat-26 represents

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Hope Springs Eternal



“Hope springs eternal in the human breast; Man never is, but always to be blest,” said the poet Alexander Pope. 2023 was a challenging year, with a new war starting in the Middle East on top of the raging one in the Ukraine, but a new year always brings hope and optimism.

There is a lot to look forward to this year. Our first issue of the year features an update on the Chinese satellite market as well as key takeaways from World Radio Communication (WRC) 2023, which will have far-reaching implications for the satellite industry going forward.

As we enter into our 17th year of publication, our commitment to delivering actionable information to the satellite industry never falters. We will be at all the major trade shows starting with the Satellite show in Washington, D.C. next month as well as the NAB in Las Vegas in April, CABSAT in Dubai and Satellite Asia in Singapore in May and the IBC in Amsterdam in September, among others.

We look forward to serving the industry for yet another exciting year!

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China Satellite Market...
...from page 1

a major improvement in China Satcom's GEO-HTS offerings.

With that said, this year also saw China Satcom announce an even bigger satellite, ChinaSat-27. Planned for 2025, ChinaSat-27 will bring 300 Gbps of capacity to most of Africa and Eurasia (pink coverage map on the above image), with capabilities of bringing 1 Gbps to any single user terminal. As noted by a talk from China Satcom's Peng Tao at the 2023 China Radio Conference in September, ChinaSat-27 is a partially flexible GEO-HTS, bringing China to about the same level as Via-Sat-2 or Jupiter-2 in terms of large GEO-HTS technology.

In terms of total fleet capacity, in December this year, we saw an announcement from C A S C

that China Satcom would exceed 500 Gbps of total capacity by the end of the 14th Five-Year Plan period (i.e. end of 2025). China Satcom's HTS fleet will use Ka-band, with APT Satellite

"...One thing that has not changed over the past couple of years in the Chinese satcom market is the nature of GEO competition: China Satcom maintains an effective monopoly..."

of Hong Kong and its sister company, APT Mobile Satcom of Shenzhen using Ku-band on their HTS fleet. While much of this capacity would be covering China, as the coverage maps above show, a lot of it would be over the rest of APAC, Africa, and parts of Europe. Clearly a couple of major target markets would be Chinese airlines and Chinese maritime vessels, and in

demand that China Satcom can serve. Markets from the Pacific Islands to Africa may find additional capacity being dumped at highly competitive prices.

NGSO Broadening Out Beyond Just the State

Up until 2023, it seemed a lock that China's large Non-Geostationary Orbit

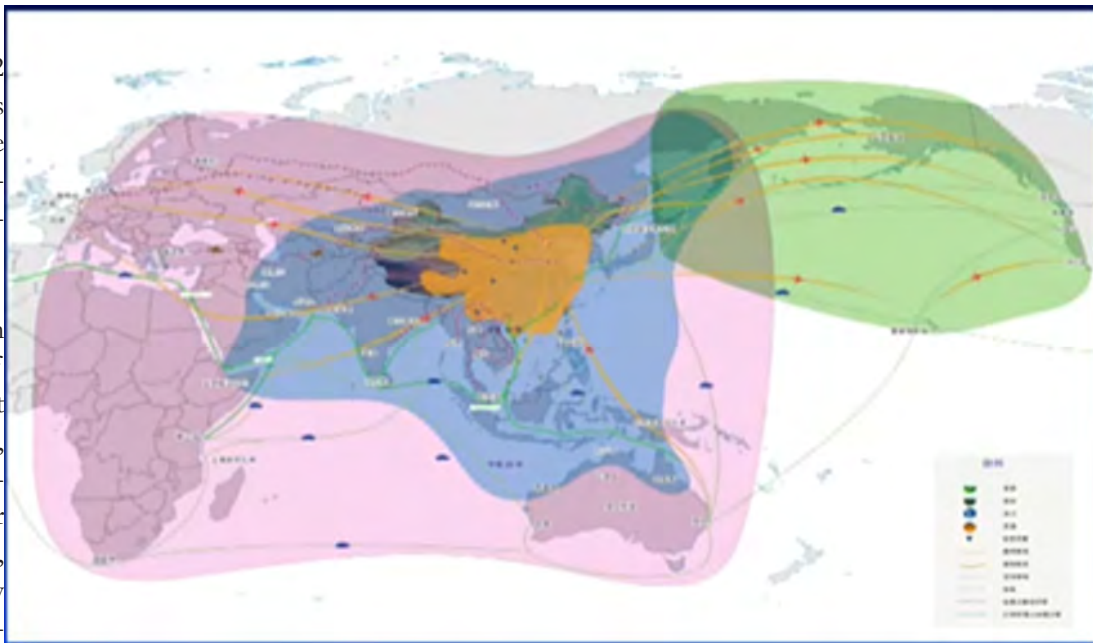


Figure 1: ChinaSat Current and Future Coverage, including ChinaSat-16 (orange), ChinaSat-19 (green), ChinaSat-26 (blue), and ChinaSat-27 (pink).

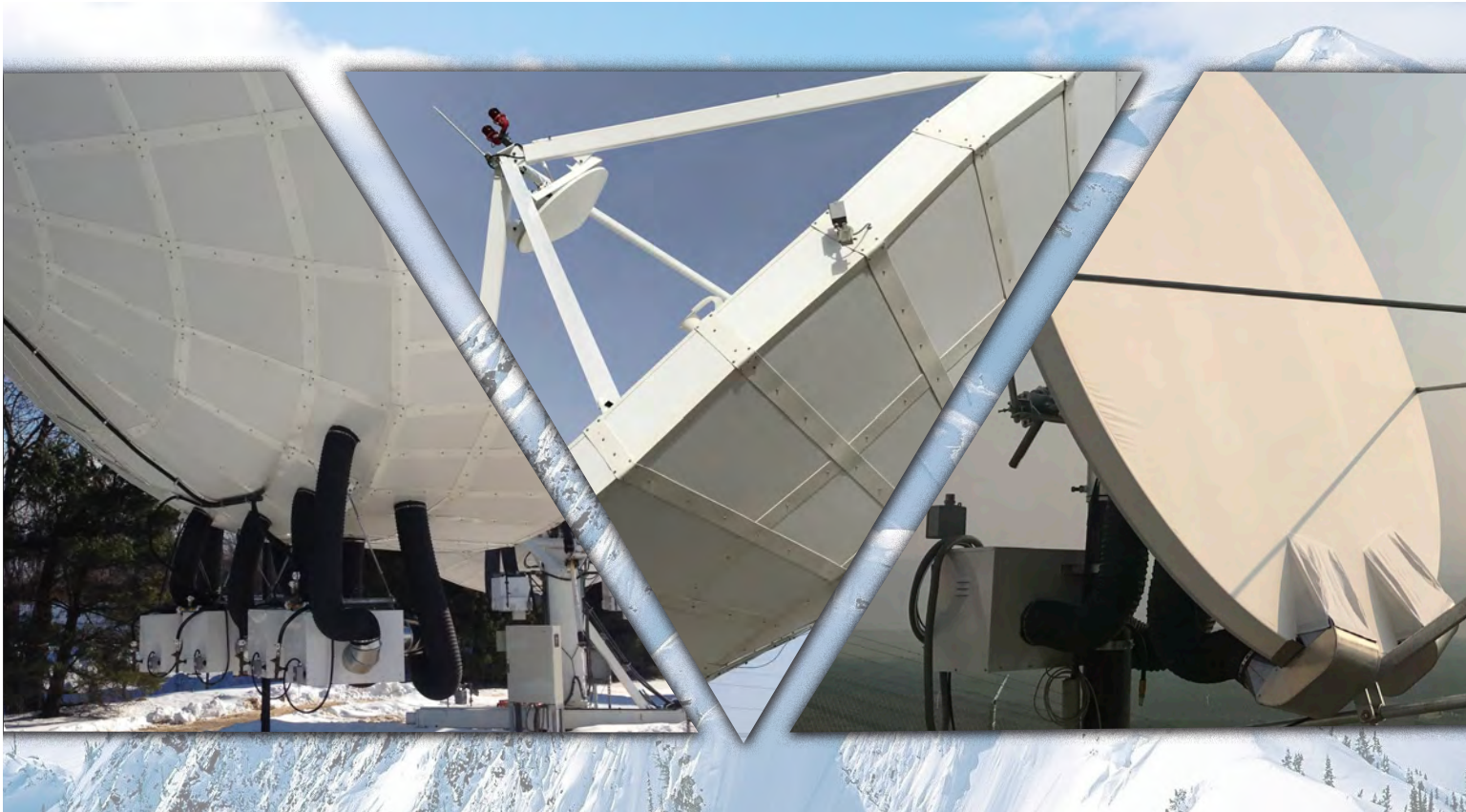
the medium-term, potential GEO/LEO integration with a Chinese constellation. For the next several years, though, it seems that there will be a lot of China Satcom capacity coming into markets where there is not immediate

ary Orbit (NGSO) constellation project would be developed by one company, and one company only: China Satellite Networks Limited (China Sat-Net). A centrally-controlled SOE established by the State Council in early 2021,

the company's sole purpose for existence was to develop China's answer to Starlink. And for several years, they have done not so much, beyond a disciplinary investigation and some moderately impressive progress on a

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headquarters building in Xiong'an, the newish capital district being built to the south of Beijing.

And so it is perhaps not surprising that during 2023, we have seen a change in tune with regard to NGSO constellations. Notably, it seems there is more room for other players beyond China SatNet, with evidence appearing from both a top-down and bottom-up perspective. Looking top-down, we saw more government support in 2023 for constellations that were not China SatNet. The most noteworthy pieces of support were several Shanghai Government announcements related to satellite internet, which specifically called for supporting the G60 constellation (Chinese NGSO broadband constellation that brings together many of the Chinese parts of the former KLEO Connect) and the Smart SkyNet constellation (“Chinese version of O3b”, i.e. MEO comms constellation).

Such explicit support for a constellation that is not China SatNet was a marked change of pace, and it was followed by more intrigue coming out of China. In August of this year, we saw multiple new ITU filings for Chinese NGSO broadband constellations, with two in particular standing out. First, a 1,804 “Black Spider Constellation” from Galaxy Space, and second, multiple constellations filed for SAIL-Space, a Shanghai entity affiliated with several former Chinese KLEO Connect shareholders. In a final indication of top-down support for opening up to the private sector, in October we saw an announcement from the Ministry of Industry and Information Technology (MIIT) titled “Opinions



Figure 2: Solar Panel on Lingxi-03 Satellite, Built by Galaxy Space.

on Innovating the Management of Information and Communications Industry to Optimize the Business Environment” (what a mouthful). In short, this called for the opening of the telecommunications business to private capital, and to promote the reform of the satellite internet business in steps and stages. Or, change is coming, and while it might come slowly, it is coming nonetheless. Companies, take note.

Looking from a bottom up perspective, we continued to see progress from commercial NGSO companies

developing their technologies. Most notably, Galaxy Space debuted a stackable satellite that mimics Starlink’s design in an effort to fit dozens of satellites on a single rocket, as well as a satellite with very thin, foldable solar panels. At the same time, the G60 Industrial Base near Shanghai, affiliated with the aforementioned constellation of the same name, has continued to progress, and both Galaxy Space and SSST have made efforts to branch out to international markets offering scalable NGSO satellite communications solutions.

Ground Segment

China's VSAT terminal manufacturers also made significant strides in 2023. The standout performer, particularly from an international perspective, was Starwin, a Chengdu-based VSAT manufacturer that appeared at countless international conferences in 2023 including Euroconsult World Satellite Business Week and Asia Tech X Singapore. More tangibly, the company also achieved certification with Hispasat's network, this coming a few years after similar collaboration with Intelsat.

With a suite of flat-panel electronically-steered antennas, Starwin fashions themselves as a competitor to the leading FPA manufacturers in the United States and elsewhere, and their track record in 2023 shows they are not kidding. In addition to fairly traditional FPAs, Starwin has developed a terminal specifically focused on connecting UAVs to satellite, and then allowing the UAV to broadcast connectivity, like a mobile 4G station in the sky. Other VSAT manufacturers including Cowave have broadened their international reach in 2023, though from a lower starting point. The company created a YouTube channel, for one, to advertise its various VSAT wares to a broader, more international audience.

China's Satcom Sector Moving Forward

By all accounts, China's satcom sector today is a largely domestic affair. China Satcom sells satellite capacity to Chinese state-owned broadcasters, state-owned telcos, the People's Liber-


ation Army (PLA), and the state at large (are you sensing a theme here??). The offerings tend to be relatively old tech, and apart from the occasional exception like APT Satellite doing a good business in Indonesia, the solutions are confined to the Chinese market.

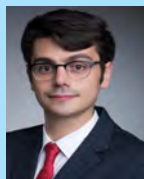
This is going to change. By the end of 2025, China Satcom will have more GEO capacity than any other satellite operator in Asia-Pacific, with the possible expectation of ViaSat if their 1 Tbps ViaSat-3 APAC launches over the region as planned. As noted, much of this capacity is covering China, but a lot of it is not. By end of 2025, we may also have the begin-



With a suite of flat-panel electronically-steered antennas, Starwin fashions themselves as a competitor to the leading FPA manufacturers in the United States and elsewhere. Pictured here is their portable Ku-Band flat panel antenna.

nings of a Chinese NGSO broadband constellation coming into the market, though the commercial impact would likely not be felt until later in the decade.

Overall, we cannot be sure what the future will hold for the Chinese satcom sector. However, if 2023 was any indication, we should expect to see a future that is more internationally-focused, and with a greater variety of players competing. 



Blaine Curcio is the Founder of **Orbital Gateway Consulting**. He's an expert on the commercial space and satellite industries with a focus on the Asia-Pacific region. He is also an Affiliate Senior Consultant for Euroconsult. Since joining Euroconsult in 2018, he has contributed to a wide range of consulting missions and research reports, primarily covering the satcom sector globally, and broader space industry in China. He can be reached at: blaine@orbitalgatewayconsulting.com

The Satellite to Phone Market

by **Bernardo Schneiderman**

Satellite connectivity direct to phone and devices is not new for companies like Iridium, Globalstar, Inmarsat that have been active in this market for the last 25-plus years but the new wave is the Low Earth Orbit (LEO) satellite constellations that are now targeting the cellular services and IoT with existing traditional companies already providing some services and new startup coming to this market.

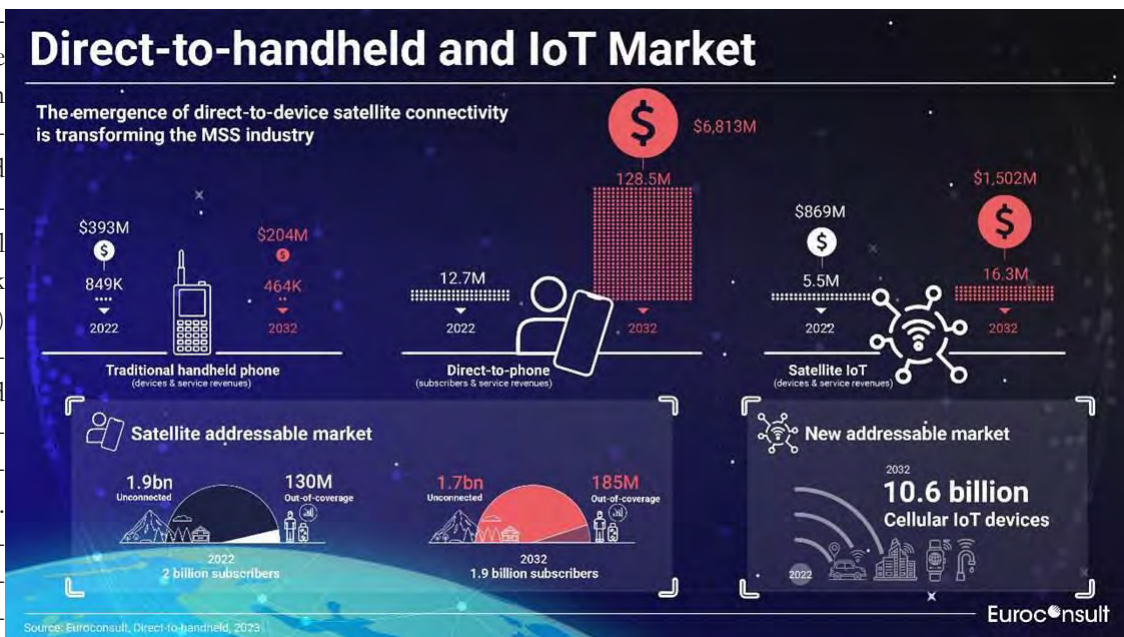
The Mobile Satellite Services (MSS) industry is undergoing a transformative shift due to the rapid rise of direct-to-device satellite solutions, primarily from direct-to-phone services, driven by the integration of terrestrial and non-terrestrial network (NTN) connectivity and technology developments.

Direct-to-phone satellite connectivity is expected to revolutionize the satellite communications industry, emerging as a billion-dollar market by 2027. The latest edition of Euroconsult's 'Prospects for Direct to Handheld and IoT Markets' unveils the developing potential of the satellite direct-to-device market, with projections indicating that direct-to-phone services could connect nearly 130 million average monthly users by 2032.

Euroconsult report move into the dynamic landscape of three crucial satellite communication market segments: traditional handheld phones, direct-to-phone connectivity, and Internet of Things (IoT). The report provides a new

level of detailed analysis covering market developments, major applications, equipment solutions, and the growth drivers and challenges inherent to each segment. Satellite cellular IoT is a niche market enabling hybrid solutions via in-market unmodified IoT devices with a high market potential due to the ease of implementation. Non-geostationary orbit (NGSO) satellite constellations are playing an increasingly pivotal role in creating new opportunities to seamlessly integrate satellite connectivity into existing devices.

Addressing the potential 'unconnected' population,



the direct-to-phone segment eyes a total satellite connectivity market of over 2 billion subscribers in 2022. This segment targets individuals without terrestrial network coverage (1.9 billion) and mobile users encountering connectivity issues due to poor terrestrial network coverage or travel to areas without coverage (130 million).

Expanding the market's horizons further, the IoT segment is set to substantially increase its potential as a revenue-generating force with satellite cellular IoT, anticipated to commence revenue generation in 2025. Key applications expected to drive this growth include 'connected cars' in transport/logistics, 'smart cities' in natural resources (oil rigs, mining sites, utilities) and personal tracking assets like

smartwatches. Projections forecast a substantial addressable market of 10.6 billion cellular IoT devices by 2032. Sumaiya Najarali, Euroconsult senior consultant, emphasized: “Continuous technological improvements have bolstered satellite capacity and enhanced device capabilities, hastening the adoption of direct-to-device satellite services. Despite the strong prospects for the direct-to-handheld and IoT markets, success will be largely influenced by external factors, particularly securing spectrum rights and overcoming regulatory barriers, and internal forces, including funding initiatives to support planned satellite infrastructure and commitments from MNOs. Additionally, affordability of services and customer willingness to pay will be pivotal in this cost-sensitive market.”

The existing satellite Phones in the Market are Iridium and Globalstar (Low Orbit Satellite Constellation) and Inmarsat and Thuraya (GEO Satellites). We have a brief description for each company what is available in the global level for personal use, enterprise, government and defense and what they are planning to the new trends to connect with cell phone services devices.

There is currently no shortage of satellite businesses looking to tap into satellite phone demand. There’s Iridium, for example, which already has a full-fledged service in operation although mostly appealing to military and disaster relief clients. Apple has also contracted with Globalstar to supply emergency Text-based cellular connectivity to iPhones, although has admitted that a full satellite-to-phone service is one of its aims. Other companies such as AST SpaceMobile is also pursuing a full-fledged cellular service, while UK-based Bullitt Group says it is working with Taiwanese chip company MediaTek to build a handset that could link to satellites to send and receive text messages.

Iridium

The Iridium satellite constellation provides L band voice and data information coverage to satellite phones, satellite messenger communication devices and integrated transceivers. Iridium Communications owns and operates the constellation, additionally selling equipment and access to its services. The constellation consists of 66 active satellites in orbit, required for global coverage, and additional spare satellites to serve in case of failure.

Iridium provides mobile voice and data satellite com-

munications network that spans the entire globe. Iridium enables connections between people, organizations and assets to and from anywhere, in real time. In 2019, the company completed a generational upgrade of its satellite network and launched its specialty broadband service, Iridium Certus®. Iridium Communications Inc. is headquartered in McLean, Va., U.S.A.,



Iridium early in 2023 announced that it entered into agreements with Qualcomm to enable satellite messaging and emergency services in smartphones powered by snapdragon® Mobile Platforms using Iridium's satellite network. The companies successfully developed and demonstrated the technology; however, notwithstanding this technical success, smartphone manufacturers have not included the technology in their devices. Due to this, on November 3, 2023, Qualcomm notified Iridium that it has elected to terminate the agreements, effective December 3, 2023. With the termination of these agreements, Iridium informed to the market they will be free to directly re-engage with smartphone OEMs, other chipmakers, and smartphone operating system developers that the Company had been collaborating with previously. Iridium will also be pursuing new relationships with smart device OEMs, chipmakers, and developers for its existing and future service plans

Iridium Extreme® is the new satellite phone of Iridium. (photo courtesy of Iridium)

Globalstar

Globalstar, Inc. is an American satellite communications company that operates a low Earth orbit (LEO) satellite constellation for satellite phone and low-speed data communications. The Globalstar second-generation constellation consists of 25 low Earth orbiting (LEO) satellites.



Globalstar provides reliable and portable satellite communication solutions that keep you connected in areas without cellular coverage. Check in via talk, text or email and relay important information quickly, or trigger Search & Rescue services in the

GSP-1700 handheld portable satellite phone. (photo courtesy of Globalstar)

event of an emergency from your vehicle, vessel or building.

During 2022, Globalstar struck a deal with Apple to power the iPhone maker's emergency-texting system, a partnership that gave Globalstar a deep-pocketed customer and a steady stream of revenue. Apple's emergency-texting system, called Emergency SOS, enables all iPhone 14 and 15 models to send messages to emergency services via a satellite connection when outside of a cellular range.

Apple said it would invest some \$450 million in infrastructure for its emergency-satellite service, with most of that going to Globalstar to upgrade aging satellites. The deal also kicked off a race for others to develop and commercialize comparable technology. Globalstar and Apple aren't alone in pursuing the technology. So-called direct-to-device satellite communications have attracted new entrants in recent years. Elon Musk's SpaceX is working with cell carrier T-Mobile to test the technology while AT&T is working with AST SpaceMobile

Inmarsat- www.inmarsat.com now is part of Viasat since the acquisition last May 2023. Inmarsat headquarter is based in London and is a satellite telecommunications company, offering global mobile services. It provides telephone and data services to users worldwide, via portable or mobile terminals which communicate with ground stations through fifteen geostationary telecommunications satellites. [3]Inmarsat has a Satellite Network and provide Global Communications via a GEO Satellite Network and provide voice services via Isaphone 2 showed in the picture below:

ISATPHONE 2

Inmarsat with the merger with Viasat didn't announce any intention to provide any solution integrate with direct to cell phone services and the main reason for this purpose they need to implement a Low Orbit Satellite Constellation and Viasat didn't have any plan and at this time about the Inmarsat Plan for the Orchestra LEO satellites. Viasat announced that is launching



ISATPHONE 2 portable satellite phone. (photo courtesy of Inmarsat)

direct-to-device satellite service with Skylo and Ligado's SkyTerra satellite network.

Skylo has a tech stack that connects standard IoT devices directly to satellite, compatible with 3GPP release 17 standards. Skylo has been operating its service over Inmarsat's L-band satellites since 2021. Now post-Inmarsat acquisition, these satellites are part of Viasat's network. This official rollout means that Skylo has access to Viasat's global L-band capabilities, including Viasat's local and global partners, like Ligado. Initial deployments are planned for early 2024 in North America, using the Ligado SkyTerra satellite network, followed by a global rollout.

Thuraya

Thuraya, is the mobile satellite services subsidiary of the UAE-based Al Yah Satellite Communications Co. Uses two geo-synchronous satellites over Singapore and East Africa, offering global coverage of up to 79% (including Europe, Asia, Africa, and Australia). US, New Zealand, and South America are not covered. Voice, SMS, and data supported, depends on the handset. Satellite broadband terminals available offering speeds of up to 444kBps for downloads, at an additional price.



THURAYA XT-PRO DUAL-satellite phone and GSM Connect to Satellite and GSM networks to enjoy connectivity in any location and include Two SIM Card Slots Use any combination of satellite and GSM SIM cards with 'Always-on' capability. (photo courtesy of Thuraya)

Thuraya XT-Pro Dual- Satellite Phone and GSM Connect to Satellite and GSM networks to enjoy connectivity in any location and include Two SIM Card Slots Use any combination of satellite and GSM SIM cards with 'Always-on' capability.

Thuraya released a new generation version of its XT-PRO DUAL satellite phone. It is a dual-mode, dual-SIM satellite-cellular phone that allows users to move in and out of terrestrial coverage and seamlessly connect regardless of their location. The Thuraya XT-PRO DUAL will be available from mid-December 2023. Thuraya announced the new model on Dec. 13.

Thuraya XT-PRO DUAL has been developed to meet



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the needs of a growing market and was upgraded to support terrestrial 4G LTE networks for flexible connectivity. Catering for users in harsh environments, the ingress protection was increased to the IP65/IK05 standard, which makes the phone dust- and water-resistant as well as shockproof. Thuraya is targeting the XT-PRO DUAL satellite phone to sectors such as first responders, but also for officials managing disaster relief efforts as well as border controls and coast guards. Other sectors targeted include oil and gas, mining, and infrastructure development,” Ali Al Hashemi, group CEO of Yahsat, said in a statement. “Coupling our advanced technology with a robust satellite network spanning more than 150 countries, this handset offers us a unique competitive advantage that enables our customers to freely move in and out of terrestrial coverage areas where they can use GSM when available, and switch to satellite whenever they are out of GSM coverage.

Beyond the existing Satellite Phone companies we have now the Low Orbit Satellite Constellation that is moving to this market starting with the announcement of Starlink (Space X LEO Satellite Provider) and two other constellation AST Spacemobile and LinkGlobal active in the market at this time.

Starlink

Starlink is a satellite internet constellation operated by US aerospace company SpaceX, providing coverage to over 65 countries. It also aims for global mobile phone service after 2023. As of November 2023, it consists of over 5,500 small satellites in low Earth orbit (LEO) that communicate with designated ground transceivers.

SpaceX is targeting end of December 2023 for a Falcon 9 launch of 21 Starlink satellites to low-Earth orbit. This launch will include the first six Starlink satellites with Direct to Cell capabilities that will enable mobile network operators around the world to provide seamless global access to texting, calling, and browsing wherever you may be on land, lakes, or coastal waters.

Sara Spangelo, SpaceX’s co-lead on the sat-phone scheme, mentioned: “SpaceX is developing a breakthrough new direct to cell satellite network to bring ubiquitous cellular connectivity worldwide via the Starlink constellation. She mentioned that Starlink are partnering with telecom-

“..Space-based D2D players have struck multiple partnerships with terrestrial telcos keen to fill their network’s coverage gaps. D2D advocates are quick to highlight how these partnerships would help them tap into the trillion-dollar-plus telecoms market, which easily eclipses the \$464 billion that the global space industry made in 2022, according to analysts at Euroconsult...”

munication companies around the world to bring this service directly from satellites to existing cell phones, with the goal of providing coverage anywhere a phone can see the sky.” The SpaceX project could see it further its work with T-Mobile which it recently said would lead to cover most of the US with satellite-based cellular connectivity especially in remote areas.

During the Launch of these services by CEO of Space X Elon Musk and CEO of T-Mobile shared their vision for expanding coverage above and beyond globally, issuing an open invitation to the world’s carriers to collaborate for truly global connectivity. T-Mobile committed to offer reciprocal roaming to those providers working with them to enable this vision. “The important thing about this is that it means there are no dead zones anywhere in the world for your cell phone,” said Musk. “We’re incredibly excited to do this with T-Mobile.” They announced that SpaceX will use a portion of T-Mobile’s existing 5G spectrum, the ‘mid-band Personal Communications Service’ to allow Gen-2 Starlink satellites to connect directly to cell phones.

This satellite connection will be limited at only 2-4 megabits per cell area – but it will be enough to allow T-Mobile customers on a standard plan to send text messages or make phone calls even in some of the most remote areas of the globe. Musk said this speed is enough to support one or two thousand phone calls per cell area.

AST SpaceMobile

The company is building the SpaceMobile satellite constellation, a space-based cellular broadband network that will allow existing, unmodified smartphones to connect to satellites in areas with coverage gaps Its BlueWalker 3 pro-



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AST SpaceMobile's BlueWalker 3 test satellite is 693 square feet in size, designed to generate power from space and deliver cellular broadband directly to your phone. (photo courtesy of AST SpaceMobile)

prototype satellite is the largest commercial communications array in low Earth orbit after launch in 2022.

AST SpaceMobile's BlueWalker 3 test satellite is 693 square feet in size, designed to generate power from space and deliver cellular broadband directly to your phone.

AST SpaceMobile is the only DTD (Direct to Device) startup to be listed publicly following its 2021 merger with a special purpose acquisition company (SPAC), announced in June 2023 its engineers had achieved 4G LTE download speeds during tests that month with BlueWalker 3, its prototype in LEO. The venture, which made its first voice call in April with a standard smartphone using BlueWalker 3, plans to start deploying commercial satellites in 2024.

AST SpaceMobile announced in April that the startup had made its first voice call with a standard smartphone using its BlueWalker 3 test satellite in low Earth orbit.

A space-based overlay could ensure phone connectivity immediately after a natural disaster takes out terrestrial networks, he said. Government agencies could use satellites to push mass texts to areas needing emergency information, such as weather alerts, the location of shelters, and whether borders are open or about to close.

Scott Wisniewski, chief strategy officer for AST SpaceMobile said: "We believe emergency crews could potentially benefit from this service in many situations, any time they are out of coverage, in remote areas, on the water, or in

the case of natural disasters."

AST SpaceMobile has partnered in the United States with AT&T, which operates the country's FirstNet communications network for emergency responders. AT&T has access to deployable cell towers for when natural disasters knock out terrestrial wireless systems; however, these take time to deploy. In extremely rural areas of the United States where FirstNet cannot reach, first responders currently use low-bandwidth wireless services, including VHF radios and bulky, specialized satellite-enabled handsets.

AST Space mobile informed last November 2023 that their first five commercial satellites expected to be launched in Q1 2024 and Manufacturing at full speed in Midland, Texas facilities.

Lyнк Global

Lyнк Global is a company developing a satellite-to-mobile-phone satellite constellation that aims to provide a "cell tower in space" capability for global mobile phone service coverage, including in underserved rural areas without cellular coverage. Lyнк has requested a license from the US Federal Communications Commission to launch up to ten test satellites as early as 2022, with the goal to begin continuous global coverage in 2025 using a constellation of several thousand satellites.

Lyнк Global launched initial services in June 2023 from a constellation aiming to use spectrum from terrestrial cellular partners to reach the billions of smartphones already in consumer pockets.

With just three of a proposed network of 5,000 Lyнк satellites in low Earth orbit (LEO), the startup is currently enabling texts to be sent and received from three satellite overpasses per day in part of the Pacific Island nation of Palau, in partnership with a local telco.

Lyнк announces the successful launch and deployment of two more satellites (pictured) in the company's commercial cell-towers-in-space constellation. These satellites are covered by the world's first and only commercial satellite-direct-to-standard-phone license that Lyнк received from the FCC in September 2022.

The service has started on three islands where Palau National Communications Corp. (PNCC) customers previously relied on VHF radios popular with boaters.

Lynk CEO Charles Miller said the venture has “seen, in the wild, as many as 4 texts per overpass from a single user.” As Lynk grows its constellation, it expects to improve latency and expand satellite-enabled coverage over two more islands before the end of 2023 and then across Palau’s more than 300 islands and surrounding waters by March. While the startup is starting with text services, it expects to add voice and other capabilities as it densifies its planned global network.

Another event Lynk Global & Rogers Communications completed the first satellite-to-mobile phone call in Canada, using Samsung Galaxy S22 smartphones for the feat alongside testing SMS, data and emergency alert services. The phone call was made using Lynk Global’s low-earth orbit (LEO) satellites and the operator’s national wireless spectrum.

In their announcement, Rogers Communications and Lynk Global noted wireless spectrum ensures the service works on existing smartphones. The operator plans to launch the technology in 2024, beginning with SMS, mass notifications and machine-to-machine AI applications.

Conclusion

Many more DTD ventures are also on their way, including Switzerland-based Salt, and One New Zealand.

Space-based D2D players have struck multiple partnerships with terrestrial telcos keen to fill their network’s coverage gaps. D2D advocates are quick to highlight how these partnerships would help them tap into the trillion-dollar-plus telecoms market, which easily eclipses the \$464 billion that the global space industry made in 2022, according to analysts at Euroconsult.



AST SpaceMobile’s BlueWalker 3 test satellite is 693 square feet in size, designed to generate power from space and deliver cellular broadband directly to your phone. (photo courtesy of AST SpaceMobile)



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Key Takeaways from WRC 2023

by **Ehtisham Siddique**

The World Radiocommunication Conference 2023 (WRC-23) held in Dubai from November 20 to December 15, 2023 addressed the increasing demand for spectrum and the evolving technological landscape in the digital era, with a particular focus on cybersecurity. The article explores the impact of WRC-23 on 5G and 6G, the Internet of Things (IoT), satellite communications, and the crucial role of cybersecurity in shaping the future of radiocommunications. The conference's decisions on spectrum allocation are set to influence the characteristics, potential benefits, and challenges of future networks, ensuring secure operation. The article concludes that WRC-23 has laid a comprehensive framework for a secure, resilient, and innovative radiocommunications infrastructure, enabling new technologies, enhancing cybersecurity, and supporting growth across industries and societies.

ITU WRC-23: Shaping a Secure Future for Radiocommunications – Balancing New Technologies with Legacy Services

WRC-23, marked a pivotal juncture in the evolution of radiocommunications. With the world embracing digital transformation, WRC-23 focused on allocating spectrum for new technologies, developing harmonized technical

standards, and ensuring cybersecurity, all while considering the needs of existing services. This article analyzes key outcomes and implications, focusing on 5G, 6G, IoT, and satellite communications, with particular attention to potential interference between GEO and LEO constellations.

Key Outcomes and Cybersecurity Considerations

Table 1: Spectrum allocations and cybersecurity considerations for key technologies at WRC-23

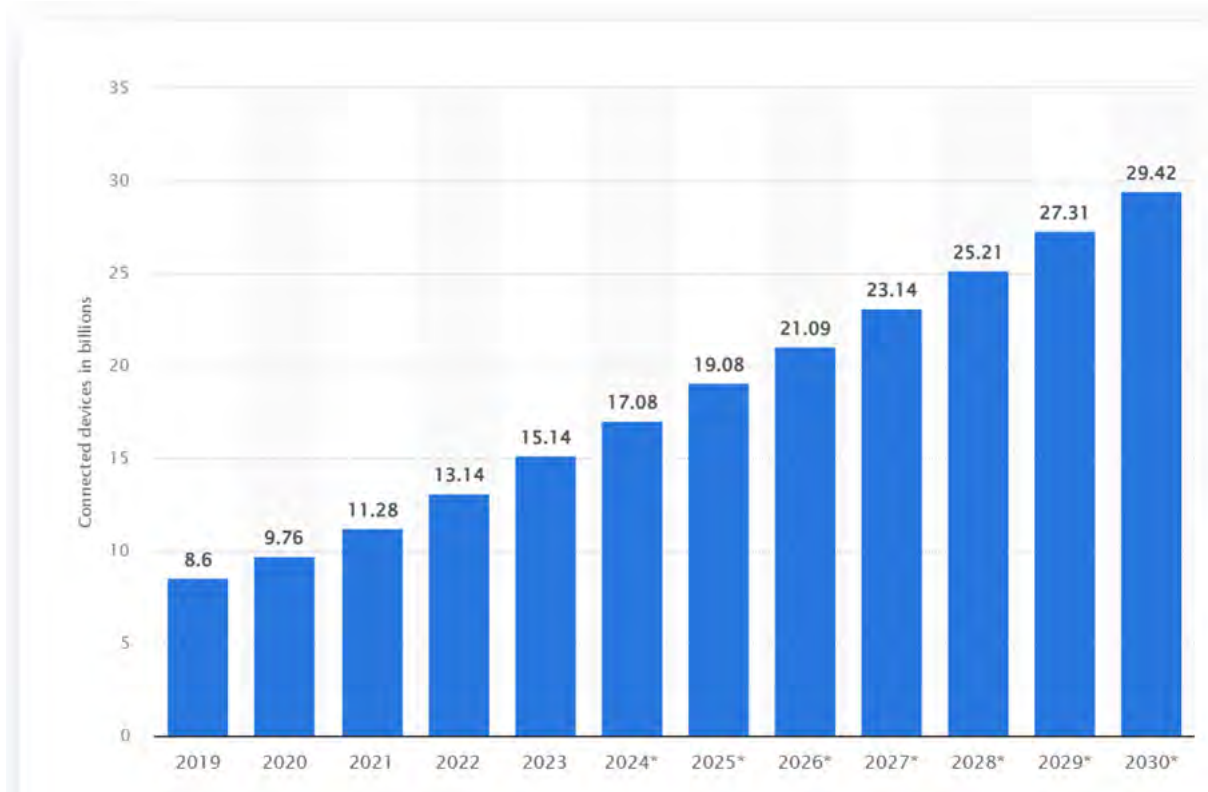
Technology	Frequency Band (MHz)	Primary/Secondary Allocation	Purpose	Cybersecurity Considerations
5G	3500-3800	Primary	Mobile broadband	Harmonized spectrum allocations, robust technical standards, industry security awareness
6G	5200-5600	Secondary	Mobile broadband	Future-proof security strategies, vulnerability assessment and mitigation plans
IoT	410-470	Primary	Low-power, wide-area networks (LPWANs)	Secure protocols like TLS, device-level security features, data encryption
Satellite Communications (LEO)	2600-2665	Primary	Mobile broadband	Cybersecurity guidelines, encryption, enhanced system resilience
Satellite Communications (GEO)	10.5-11.75 GHz	Primary	Fixed satellite service (FSS)	Interference mitigation with LEO constellations, secure communication protocols

•5G/6G: Spectrum allocations were finalized for 5G and 6G, paving the way for faster speeds and wider connectivity. However, cybersecurity needs paramount attention, with harmonized spectrum allocations, robust technical standards, and industry awareness playing crucial roles.

•IoT: Recognizing the vast potential of IoT, WRC-23 allocated additional spectrum for LPWANs. Secure protocols like TLS and device-level security features are essential to protecting IoT data and mitigating risks.

•Satellite Communications: New allocations were made for both LEO and GEO constellations, enabling broader reach and diverse applications. Cybersecurity guidelines, encryption strategies, and enhanced system resilience are critical for securing these systems.

Balancing Innovation with Legacy Concerns



Number of Internet of Things (IoT) connected devices worldwide from 2019 to 2023, with forecasts from 2022 to 2030 (in billions) . Source: Statista.

WRC-23's emphasis on new technologies like 5G and LEO constellations must be balanced with the needs of existing satellite services, particularly GEO constellations. Concerns emerged regarding potential interference between GEO and LEO, with GEO operators expressing anxieties about spectrum sharing. Addressing these concerns necessitates:

- Technical mitigation measures:** WRC-23 adopted technical measures to minimize interference, such as guard bands and power limits. Further studies and collaborations between

stakeholders are crucial to refine these approaches.

- Spectrum sharing frameworks:** Developing flexible and efficient spectrum sharing frameworks can enable the coexistence of GEO and LEO systems, benefiting both parties while ensuring overall spectrum utilization.

- Collaborative dialogue:** Continuous dialogue and information sharing between GEO and LEO operators, regulators, and other stakeholders are essential for achieving mutually beneficial solutions and ensuring a smooth transition towards a shared spectrum landscape.

Table 3: Potential interference concerns between GEO and LEO constellations

GEO Service	LEO Service	Potential Interference Mechanism	Mitigation Measures
FSS (Fixed)	NGSO (Non-geostationary) Broadband	In-band and adjacent band interference	Guard bands, power limits, dynamic spectrum sharing
BSS (Broadcasting)	NGSO Broadband	Co-channel interference	Channel allocation planning, frequency coordination, interference cancellation techniques
MSS (Mobile)	NGSO Broadband	Inter-system interference	Frequency hopping, signal shaping, spectrum sharing agreements

Real-World Impact of WRC-23 Decisions

- 5G Deployment in Remote Areas:** The additional allocation of mid-band spectrum at WRC-23 facilitates the expansion of 5G

networks in remote and rural areas, improving connectivity and enabling new digital services.

- IoT in Smart Cities: Similarly, the exponential growth of IoT in smart city initiatives, highlights successfully integrated IoT solutions for urban management, such as traffic control, waste management, and energy efficiency.

- Satellite Communications in Disaster Management: The use of LEO and GEO satellite services in disaster management, focusing on real-time communication and data transmission during emergencies and disaster relief operations.

Beyond WRC-23: Addressing Challenges and Embracing Opportunities

WRC-23 laid the groundwork for a secure and resilient future of radiocommunications, but challenges remain. Cybersecurity threats require ongoing vigilance and adaptation, demanding international cooperation and industry-wide commitment. Further research and development efforts are needed to address technical aspects of spectrum sharing and interference mitigation. Embracing innovation while responsibly integrating new technologies with existing services will be crucial for continued progress in the dynamic world of radiocommunications.

Conclusion: Looking Ahead

WRC-23 delivered significant advancements in shaping the future of radiocommunications. Balancing the needs of new technologies with existing services, including satellite constellations, while ensuring cybersecurity, will be paramount in the years to come. Through collabora-

Table 2: Major Spectrum Assignments during the Quadrennial WRC

Year	WRC Conference	Frequency Band (MHz)	Previous Allocation	New Allocation	Reason for Reassignment
2007	WRC-07	3.4 – 3.6 GHz	Fixed Satellite Service (FSS)	Mobile Broadband	Growing demand for mobile broadband spectrum
2012	WRC-12	604 – 790 MHz	Fixed Satellite Service (FSS)	Mobile Broadband	Growing demand for mobile broadband spectrum
2015	WRC-15	2300 – 2400 MHz	Broadcasting Satellite Service (BSS)	Mobile Broadband	Growing demand for mobile broadband spectrum
2019	WRC-19	600 MHz	Broadcasting Satellite Service (BSS)	Mobile Broadband	Growing demand for mobile broadband spectrum
2023	WRC-23	2600 – 2655 MHz	Fixed Satellite Service (FSS)	Mobile Broadband	Growing demand for mobile broadband spectrum, especially for LEO satellite constellations

tion, innovation, and responsible spectrum management, radiocommunications can continue to fuel communication networks, unlock new possibilities, and bridge the digital divide for a more connected future.



Ehtisham Siddique, a seasoned SATCOM professional and author, has 13 years of experience in the telecom industry, with a focus on international projects. His expertise includes RF Architecture, RF Frequency Planning, Microwave, Teleport RF Operations, Network design, and Project management. Siddique's education in Electronic Engineering and certifications have given him a unique skill set in satellite communication, wireless technologies, and network design. He is currently pursuing a Master's research project on the progression of satellite and IoT technology. He can be reached at : e.ehtisham@gmail.com

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Hardware to Software: The Ground Segment Evolution

by **Robert Bell**

Innovations taking place in the satellite sector continue to reshape the satellite services market. First it was HTS massively expanding the supply of bandwidth and reducing the cost per bit. Then it was LEO broadband, which made dynamic software-based management critical to connectivity.

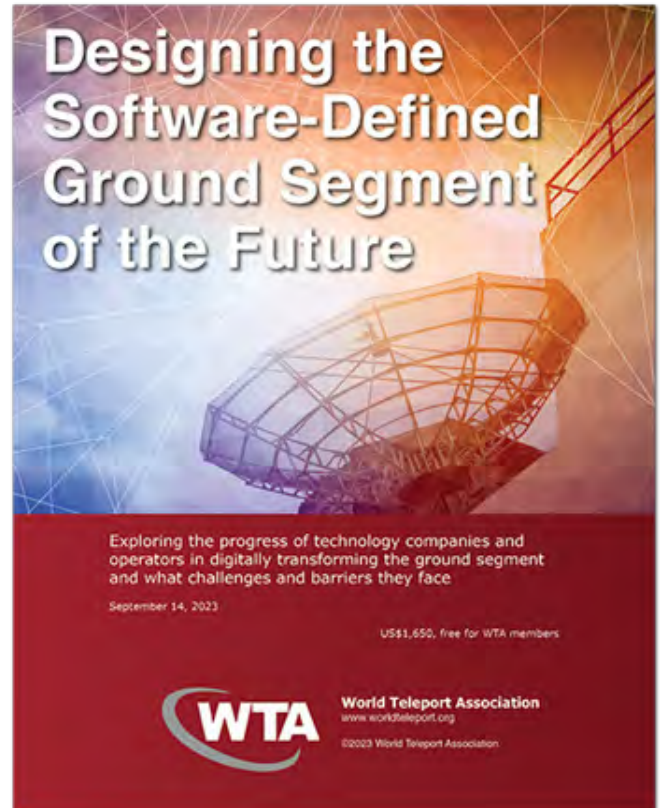
Looking forward, the next generation of satellites will be defined by software, designed to serve a market in which IP content is the dominant traffic. Software-defined satellites are fully reconfigurable in orbit, allowing bandwidth to be dynamically adapted and flexibly reconfigured, so coverage, frequency and bandwidth allocation can be changed to meet demand. This enables even greater flexibility, scalability and cost-effectiveness in satellite communications.

From Sky to Ground

This digital transformation in the sky is creating immense pressure for a similar transformation on the ground, which was the subject of a recent WTA report, *Designing the Software-Defined Ground Segment of the Future*. Based on interviews with teleport and technology executives, it aims to separate the reality from the hype and uncover both the promise of digital ground segment and the challenges in delivering it.

Today, most ground systems remain largely hardware-centric facilities. These legacy architectures are often proprietary and designed for bent-pipe, fixed satellite delivery models with relatively static payloads. This infrastructure developed because it was the most efficient, cost-effective means to serve the older generation of satellites in orbit. As the satellite layer becomes more complex, more dynamic and more flexible, the ground segment needs to transition to a software-based infrastructure to match those capabilities.

The transition to digital operations is underway, but



how fast or slow organizations proceed – or how far they go down the path – can depend on business models, customer mix and applications, as well as the current infrastructure and partners. “The ground system will remain analog for the foreseeable future. It’s not going to be a complete change by 2023,” a technology provider executive said. “The reality is it will be gradual over many years. But some applications are making the digital transition faster.”

The digital transition is being factored into the value of the ground segment economy, Euroconsult said in a 2022 forecast. The market will reach a value of \$3.6 billion by the end of the 10-year window, driven by the growing demand for data and services. The transformation towards very high throughput connectivity and non-geostationary constellations is already counting for most of the growth, and “the deployment of software-definition in both satellite

systems and within ground infrastructure will also stand as a key item in the product roadmap. Satellite operators are relying more and more on virtualization in place of physical hardware, reducing expenditures and improving ground segment flexibility.”


To take full advantage of the innovations in orbit, the ground segment needs to more fully integrate with the satellite layer to become one synchronized system. To achieve this, teleport operators need to incorporate open, flexible, automated software.

“We are seeing every day with the growth of AI that operations need to change; to be more managed and faster. AI is the new way to say automation – an evolution of automation. It’s moving from manual operations to operations being done by machines,” a technology provider executive said. “In that regard, it’s a similar scenario in the satellite domain. What has been analog for years is now becoming digitized. What has been digitized can be better. We see how both technology and teleports are being digitized with more software and see how operations are being much more managed with AI, with machine learning or just automation from the previous generation.”

To enable this, teleports must convert analog RF signals to digital packets and virtualize operations via software. This will make the ground station more agile and efficient, enabling easier management of optimization of network traffic as well as deliver more cost-efficient operations. It will also create opportunities to provide new services and enter new markets that are rising up due to the changing communications needs.

“...The drivers of multilayer connectivity include the ongoing decline in satellite bandwidth costs, technical advances that make it much easier to seamlessly switch between different pathways, and customer demand....”

“There is a lot of talk about what is happening in space – multiorbital constellations, the flexible satellite, more capacity. If you have a completely static ground segment, all of that is of no use,” a technology provider executive said. “If want to create a new beam but have to bring new hardware into the teleport to do it, that’s not really flexible. Teleports need to digitize so they can reconfigure the ground segment with just a few clicks. We need ‘new ground’ to enable the new capabilities in space,” the official said.

“A few years ago, there were conversations about digitalization and virtualization, and everyone was wondering what was going on,” another technology provider official said. “This year, everyone seems to be onboard. They can see this as the future, but now the questions are ‘When is the future? How will I make transition? When will I make it? What does it mean? How does it work?’ Over the last year, the satellite sector has turned the corner on recognizing that this is the future. Now people are wondering about the details,” the executive said. 



Robert Bell is Executive Director of the World Teleport Association, which conducts research into the teleport and satellite industry and offers a Teleport Certification program to service providers. *Designing the Software-Defined Ground Segment of the Future* is available for free to members and for sale to non-members at <https://www.worldteleport.org/store/viewproduct.aspx?id=22701240>. He can be reached at: rbell@worldteleport.org

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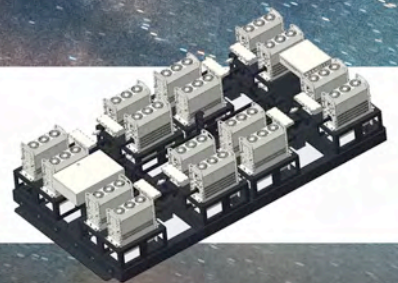
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MERGERS & ACQUISITIONS

Imagine Communications Acquires Marketron REV Sales Platform for TV Broadcast

Denver, CO., January 16, 2024 — Imagine Communications, a provider of ad tech solutions for TV broadcast, has signed a definitive agreement to acquire Marketron REV's broadcast sales and order management platform. By integrating the powerful sales growth engine into its core ad tech portfolio, Imagine now offers a comprehensive monetization solution that enables North American broadcasters to transform daily sales operations, maximize revenue and prepare for a future of converged orders and expanded audience measurement. The product will be re-released as CrossFlight™ after some key enhancements for broadcast TV and is expected to be available in early 2024.

CrossFlight is a cloud-based broadcast sales platform that automates management of ad sales, proposals, pricing and audience forecasting. The platform integrates with Imagine's widely deployed OSITM traffic and billing solution, providing a modern, unified monetization solution that enables salespeople to deliver more revenue more effectively. As development continues, the rapidly evolving platform will enable

broadcasters to make more money in a cross-platform world by selling an audience across linear and streaming from a single, converged system.

“We are excited to integrate Marketron’s innovative technology into our ad tech portfolio, which will enable us to deliver the exact right solution at

powerful sales tools designed to help broadcasters maximize revenue. Built-in pipeline management capabilities allow salespeople to easily manage prospects and customer accounts. Avail requests and proposals can be converted with one step, and orders are executed in TV traffic systems using a modern, web-based user interface (UI). Dynamic pricing capabilities enable inventory to be sold at the best possible price point. Sales performance is easily monitored via an interactive dashboard that provides visibility into pipeline, committed orders, top sellers, and how stations are performing against targets.



The merger empowers North American broadcasters to transform daily ad sales operations and enable a converged audience-first future.

the right time for the North American broadcast market,” said Rob Malcolm, general manager of Ad Tech at Imagine Communications. “Our OSI customers will realize immediate benefits from this extension to our core solutions, allowing them to reduce the workload on their sales teams and run their businesses much more efficiently — while at the same time preparing to successfully navigate a converged linear/digital future.”

CrossFlight delivers an array of

“With Marketron REV, our team built an unrivalled platform for sales efficiency, and we are confident that Imagine is the ideal partner to take the platform to the next level of success, while we focus on bringing innovation to the radio industry,” said Jimshade Chaudhari, CEO at Marketron. “Imagine’s deep customer relationships in broadcast TV will enable them to move quickly on development to further meet the industry’s requirements for audience-based and converged linear and CTV sales solutions.”

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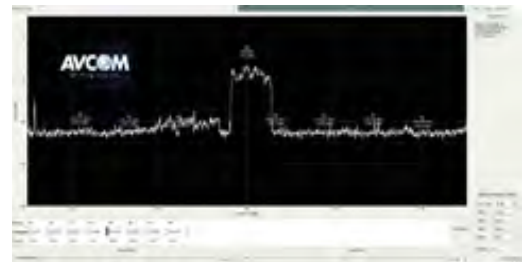
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Pedro Duque, New President of Hispasat

Madrid, Spain, December 19, 2023 -The Board of Directors of **Hispasat**, Redeia's Spanish satellite communications operator, approved today the appointment of **Pedro Duque** as the company's new president. This decision came after an extraordinary Shareholders' Meeting in which the Sociedad Estatal de Participaciones Industriales (SEPI), a shareholder of Hispasat with 7.41%, proposed Pedro Duque as president of the operator, replacing Jordi Hereu. Aero-



Pedro Duque

nautical engineer from the Technical University of Madrid (UPM), as an astronaut for the European Space Agency (ESA) he made two space flights in 1998 and 2003. From then until 2018, Duque continued to be linked to space, performing different functions, both management as operational, at ESA and as executive president of the private satellite company Deimos Imaging. Between 2012 and 2014 he was member of the board of AENA Aeropuertos, until its partial privatization. Between June 2018 and July 2021, the new president of Hispasat was Minister of Science and Innovation of the Government of Spain.

New Members of the Board Likewise, the Board of Directors of Hispasat approved the appointment of two new members: Therese Jamaa, proposed by Redeia, and Carlos de la Cruz, proposed by CDTI. Jamaa is vice president of the Spanish Red Cross Foundation (since

May 2022), member of the Board of Directors of Aigües de Barcelona (since June 2023) and member of the Diversity Advisory Committee of Caixabank (since December 2022). Carlos de la Cruz is an Industrial Engineer from the Polytechnic University of Madrid and Master's degree in Business Management "International MBA" from Escuela de Negocios.

Redeia's satellite operator Hispasat is the main driver of innovation in the Spanish aerospace sector and is committed to helping citizens overcome the digital divide and promoting sustainable development of society. It is the main communications bridge between Europe and America as a provider of broadband and connectivity services through its companies in Spain and Latin America. In addition, it leads the dissemination and distribution of audiovisual content in Spanish and Portuguese, including the transmission of digital platforms for Direct Home Television (DTH) and High Definition Television (TVAD). These activities make it one of the world's leading companies by revenue in its sector.

AvL Technologies Appoints Ivester as CCO, Larry Watts as CSCO

Asheville, N.C., December 8, 2023 – **AvL Technologies** has appointed **Jerry Ivester** as Chief Commercial Officer, effective immediately. Mr. Ivester succeeds Tony Wilkey who is retiring from AvL after 15 years with the company.

Ivester brings to AvL more than 22 years of military experience and



Jerry Ivester Larry Watts

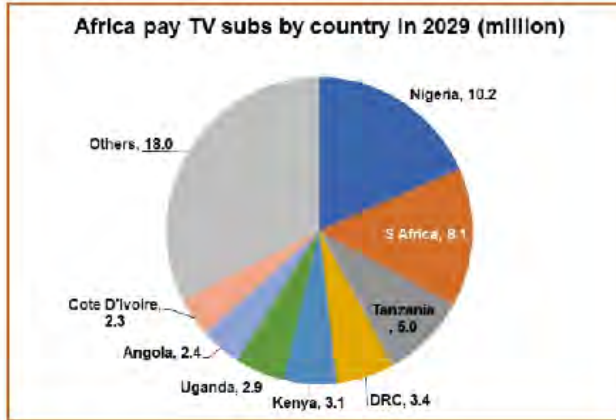
12 years of business development and strategy experience in the satellite communications industry, most recently as the Director of Government Business Development at Communication & Power Industries (CPI). Prior to CPI, Mr. Ivester served as the Director of Sales and Business Development for General Dynamics Satcom Technologies. His military experience includes serving as the Director of Communications Planning and Senior Communications and Intelligence Analyst for U.S. Special Operations Command, and as an Officer for the U.S. Army. Mr. Ivester holds a Bachelor of Science degree in Business Administration from the University of Tennessee at Chattanooga.

"AvL is grateful for Tony Wilkey's 15 years of leadership; he will be missed by AvL team members and customers alike," said David Bowne, President and COO of AvL Technologies. "We're excited for Jerry Ivester to step into the CCO role and continue to grow the business. His military service and deep SATCOM and MILCOM industry experience uniquely positions him to lead AvL's strategic sales and business development."

Several other key leaders at AvL have moved into new roles. **Larry Watts** has moved into the newly created role of Chief Supply Chain Officer and is streamlining and improving AvL's vendor relationships and supply chain. Zach Akridge is

Africa to Add 12 million Pay TV subs

London, UK, January 7, 2024 -- The number of pay TV subscribers in Africa will climb by 12 million between 2023 and 2029. This means an extra 7 million pay satellite TV subscribers and 5 million more pay DTT homes according to Digital TV Research. The pay total will reach 55 million by 2029, with satellite TV contributing 33 million and DTT 21 million. From the 43 million pay TV subscribers at end-2023, 26 million were satellite TV and 16 million DTT.



and eight countries will account for two-thirds of the total. Nigeria will provide 10 million subscribers – having overtaken South Africa in 2022.

Simon Murray, Principal Analyst at Digital TV Research, said: “Despite a recent slowdown in new subscriptions, Africa still has plenty of pay TV potential. Between 2023 and 2029, 27 million TV households to be added – taking the total 130 million.” For more information

Four countries will supply nearly half of the pay TV

on the Africa Pay TV Forecasts report, please contact: Simon Murray, simon@digitaltvresearch.com

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Key findings



DIGITALIZATION

- Access democratization
- Geospatial-GPT
- Cloud computing
- Virtual realities and Premium products
- Hybrid systems and mesh networks



SUSTAINABILITY

- Regulation enforcement for Greening practices
- More diversified sensors



SECURITY

- Coming back to fundamentals with large Defense procurement
- Regulations easing, capturing a part of the aerial market.

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