Satellite Executive BRIEFING
Vol. 13 No. 5 June 2020
SATELLITE Markets & Research
Industry Trends, News Analysis, Market Intelligence and Opportunities

China's Space Industry in the Time of COVID-19

by Blaine Curcio

What a strange 2020 it's been so far. For the satellite industry. For the broader space industry. For the entirety of humanity. When we rang in the new decade just a few months ago, no one could have foreseen the enormous changes that were coming to the way we live, work, and geek out about space.

But indeed, we now find ourselves in the midst of a rapidly-changing world, and one that is, as of May 2020, still largely shut down. One of the places that is most "back to normal," however, is China, and its space industry is no different. My vantage point for this year has been the Fragrant Harbor of Hong Kong, but with daily contact with my business partner in Beijing and other colleagues elsewhere in China. From this slightly odd vantage point (Hong Kong has very little space industry of which to speak), I have been able to watch what has been perhaps the most dynamic half-year we have yet seen in China commercial space.

The Space Industry in China Pre-COVID

The Chinese space industry has been experiencing the beginnings of what may be a commercial renaissance of sorts, with more than 100 commercial com-

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What's Inside

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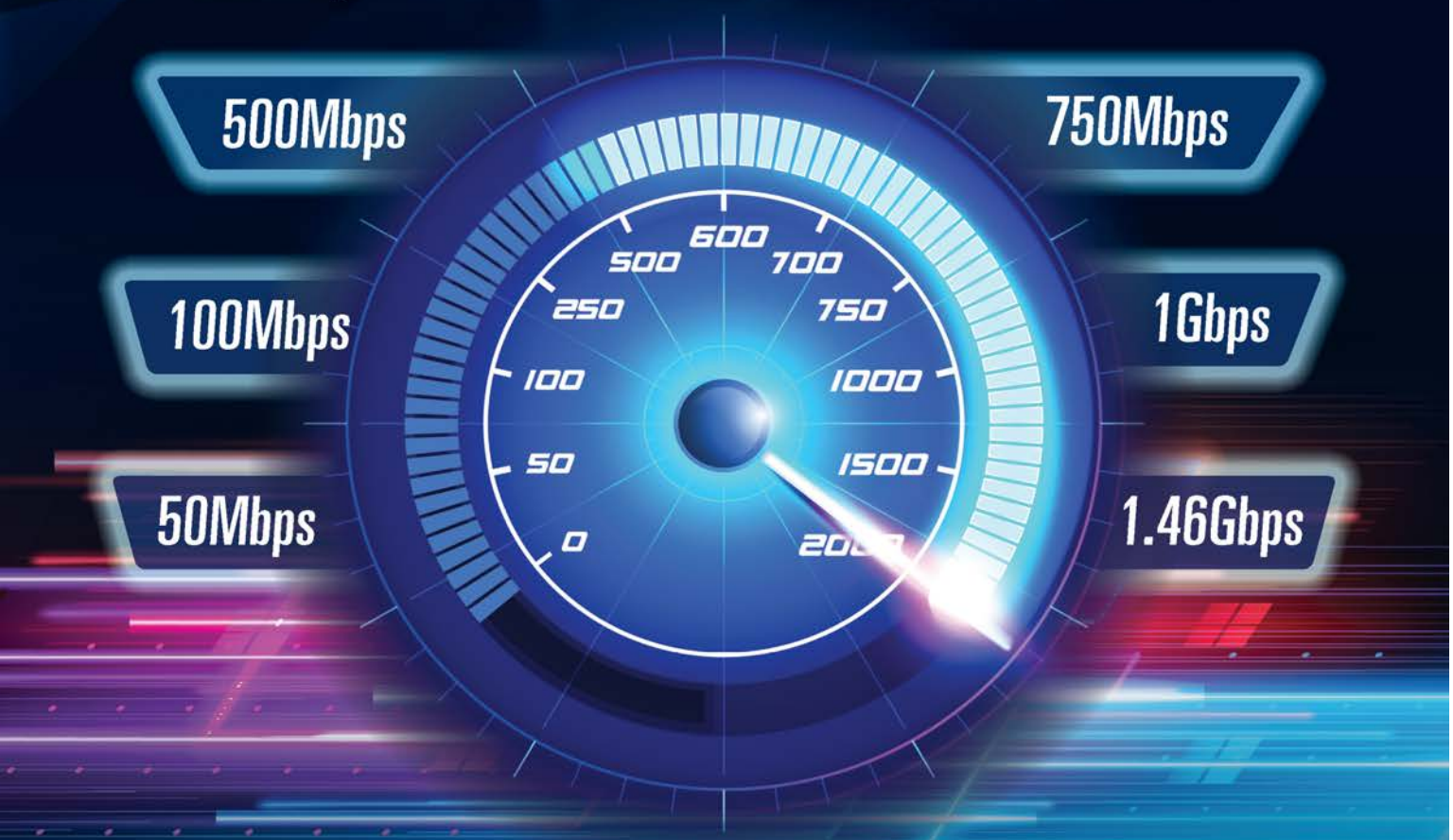

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EDITORIAL

The Asian Market

The month of June in the satellite industry calendar is usually punctuated by CommunicAsia, now ConecTechAsia show in Singapore--the most important show for the Asia-Pacific market for telecommunications. As I write this column, I get an e-mail from the organizers of ConnecTechAsia that they are turning the event re-scheduled for September 29-October 1 this year into a virtual one. I must say, it's a big disappointment.

After IBC announced the cancellation of their event this year, I was looking forward to ConnecTechAsia, especially after over two months in lockdown and not having to travel more than 10 miles from my home in Los Angeles. The Satellite show in Washington, D.C. last March was the last major show in the industry that I and everyone else attended and that seems like a distant memory now. The way things are shaping up, it looks like we will have to make do with virtual events for possibly the rest of the year, although I am hoping that other shows scheduled from October to December will still go through. Like most people, I miss the live, person-to-person interaction and the dynamism of trade shows.

This month, however, as we always do this time of year, we continue to focus on the Asia-Pacific market. It's the region first hit by the COVID-19 pandemic and seems to be recovering at a better pace than other parts of the world. The unique characteristics of the Asian market, where we find a lot of niche markets and nationally-supported satellite entities will probably put the region in a better position to weather this crisis. Shedding light on this, in this issue we have two excellent articles on the Chinese and Japanese markets by industry analysts Blaine Curcio and Naoakira Kamiya. Also, since there are no trade shows this month, we have a Product Spotlight section beginning on page 15 that highlight some of the latest products and services in the market today.

These are really extraordinary times. More than ever, it is vital to continue the engagement and interaction, virtually or otherwise and keep abreast of the continuing changes and developments that affect the industry. We will keep you informed and updated on the latest, so stay tuned.

Virgil Labrador

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China Space Industry

from page 1

"...due to the COVID-19 pandemic, many industries have slowed down, space being no exception. However, slowdown has not meant stoppage, and indeed, there are still a lot, lot of things happening in the space industry in China at the moment..."

panies having been founded since 2014, at which time the Chinese government relaxed restrictions on private investment into certain parts of the space sector. As part of our China Space Industry Report, Euroconsult tracks Chinese commercial space funding, and we calculate that since 2014, more than RMB 13 billion (US$ 1.9B) has been invested into commercial space companies in China, with around half of this figure coming from private funding (i.e. Chinese VCs and the like). This funding started to trickle in 2014 (around US$2 million of funding that year), and up to 2019 continued to grow, reaching nearly RMB 4.5B (US$650 million) last year.

Technologically, pre-COVID, we saw over 100 companies founded, roughly in two generations. Companies in the first generation, those founded between 2014-2016, have tended to focus on systems-level technologies, such as rockets. Companies in the second generation, those founded since 2017, have more often focused on sub-systems technologies, such as rocket engines (though several, such as Galactic Energy, founded in 2018, have focused on systems-level). Going into 2020, several launch companies were planning their first launch of a given rocket, several constellations were planning to launch their first satellites, and in general, many big plans were made. Which begs the question—how has that gone?

Which Brings us to 2020

2020 in the Chinese space industry has been unusual for sure. With the entire country shut down for most of February, March, and parts of April due to the COVID-19 pandemic, many industries have slowed down, space being no exception. However, slowdown has not meant stoppage, and indeed, there are still a lot, lot of things happening in the space industry in China at the moment.

In the last six months including the last weeks of 2019, fundraising has slowed, but not stopped. The last big round pre-COVID was Landspace's C-round in December 2019 for RMB 500M (US$ 71 million) from Country Garden Ventures. Since the beginning of 2020, we have seen six rounds of funding, with five of them occurring since March. This has included two rounds by satellite manufacturer MinoSpace totaling an estimated RMB 100 million (US$ 14 mil.), and one round by Commsat completed earlier in May for RMB 270 million (US$ 39 mil.), with the round valuing the company at RMB 2.1 illion (US$ 300 million). That is to say, despite the slowdown, funding has continued to flow. Total funds raised in 2020 as of mid-May was somewhere between RMB 500 million and RMB 640 million, around 15% of 2019 levels. This is partly, however, explained by the aforementioned several large rounds occurring just before 2020, which is to say that companies such as. Landspace (RMB 500 million in December), Galactic Energy (RMB 150M in October 2019), Galaxy Space (~RMB500-700 million in September. 2019), and others raised a lot of money shortly before the crisis.

Ultimately, while 2020 has unquestionably seen a slowdown in funding, it has not been a complete stoppage. Indeed, the past several weeks have seen, if anything, a major acceleration in funding, due to a major ruling by China's National Development and Reform Commission (NDRC).

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"New Infrastructures"

China's NDRC is a very powerful entity. In an economy where the majority of productivity is still controlled directly or indirectly by the state, and where there exists an organization that is only tasked with managing US$ 26 trillion in state-owned enterprise (SOE) assets (SASAC), the NDRC is the group that influences which industries will "develop" and "reform", and how that will happen. Develop in this context would mean develop economically, i.e. grow. Reform is a somewhat less straightforward term, but would generally mean allowing industries primarily controlled by SOEs to allow more private competition, more foreign investment, or otherwise proposing structural changes or these industries. So, given the size/influence of the state within China's economy, and the subsequent influence that the NDRC has over the behavior of the SOEs, any decision made by the NDRC carries significant weight.

For this reason, when the NDRC announced in April 2020 that they were adding satellite internet, internet of things, and 5G to their list of "new infrastructures"(新基建), I felt it might open the floodgates. The "new infrastructures" list, as the name suggests, is a list of types of infrastructure in which the NDRC encourages investment/development. Within a week of the announcement, China Unicom Airnet—the satcom subsidiary of China Unicom—announced 4 new satellite products, 3 of which were broadband-related, specifically mentioning the NDRC ruling. Roughly 10 days after that, Commsat announced a RMB 270 illion(US$ 39 mil.) round of funding, with the announcement mentioning the NDRC ruling, and with the money specified as being earmarked for building a satellite manufacturing line for communications satellites in line with the new infrastructure plan.

The National People's Congress is a major political event in China. Originally scheduled for March 2020, it was postponed until May due to COVID-19. One of the attendees will be Lei Jun, CEO of Xiaomi, a major tech firm, and a major investor in Galaxy Space--a proponent of space more broadly. In this correspondent's opinion, Lei Jun is the closest thing that China currently has to Elon Musk, so his word may carry some weight. As well, despite being relatively young, he is a longtime Beijing heavyweight, having made his fortune as a tech whizkid at a formerly state-owned software giant Kingsoft before branching out into VC and other businesses, most notably Xiaomi. He is now worth US$12 billion. Kuaizhou-1A rocket commemorating first responders

Prior to the Congress, Lei Jun published a document with four main proposals, including incorporating satellite internet as a key strategic emerging industry in China's 14th Five-Year Plan, reform domestic satellite frequency coordination and adopt more international standards, further liberalize access of private enterprises, and establish a large-scale national-level development fund.

Kuaizhou-1A rocket commemorating first responders.

If any of Lei Jun's proposals come close to being adopted, it would be significant. We will find out to some extent. in the coming weeks, but it is also possible that the Congress will involve the planting of seeds of reform that may come about later on. Either way, the atmosphere in Beijing will be exciting, with the NDRC ruling fresh in people's minds, and with extraordinary feats being accomplished by Starlink….of which the United States military would be a major user. In short, from a policy perspective, 2020 has thus

far been about as exciting as policy can get, and amazingly, we might be at just the beginning.

Finally, What are the Companies Actually Doing?

Now that we have covered all the exciting stuff like policies and financing, we arrive at the tedium of launching rockets. Similar to funding, 2020 has thus far seen a slowdown, but far from a stoppage in launches. Most noteworthy was the launch in May 2020 of a Kuaizhou-1A rocket from Expace, with a payload of 2x satellites for CASIC's Xingyun narrowband constellation. Both Expace and LEObit Technologies (the operating company for Xingyun) are headquartered in Wuhan, and the launch was indicative of the speed at which the city has seemingly sprung back to action.

The rocket was decorated to commemorate the first responders to the covid-19 epidemic in Wuhan, and was also sponsored by Guangqi, a major car company. The launch put the two ~200kg satellites into orbit as the first two of the 80-satelltie constellation. Both companies will be utilizing the Wuhan Aerospace Industrial Base, a major initiative that will be coming into operation during 2020 and which includes rocket manufacturing facilities for 20x Kuaizhou rockets per year, and a satellite manufacturing line for ~120 smallsats per year (assumed to be ~200kg i.e. "Xingyun-sized" satellites).

Apart from the successful launch, Expace had another eventful moment in 2020. April 1 is "April Fool's Day" in the west,

An online auction of a Kuaizhou rocket launch generated 500 million search hits and millions of viewers watching it live. It just shows the immense popularity of space in China today.

but in China it is slightly different, insofar as it is "Crazy Day". That is, you can do crazy things that may or may not be jokes. With this in mind, Expace conducted an online auction for a Kuaizhou rocket launch, and the winning bidder offered US$ 5.6 million. Rumors were later confirmed that the bidder was Charming Globe, a large Earth Observation (EO) constellation operator and service provider. More importantly, the online auction was a massive viral hit, generating over 500 million searches and several million people watching live. I recall my first space conference inside of China in 2017, at which time they live-streamed the event with many people online sending in questions. It occurred to me then that space in China today is probably a bit like space in the United States in the 1960s—that is to say, it's pretty darn popular. The fact that half a billion people searched for a rocket auction is yet another example of the apparent mass popularity of space in China today.

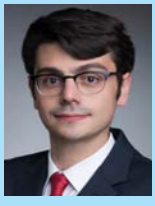
Other major events in China in 2020 have included the launch of Galaxy Space's first satellite. Galaxy Space is likely China's most well-funded private constellation, having likely raised more than US$200 million, at a most recent valuation of RMB 5 Billion (US $700 million). The company plans to launch a LEO comms constellation of several hundred, and eventually more than 1000 satellites to serve 5G, IoT, and

satellite broadband. If those three things sound familiar, they should—they are the three things added to the new infrastructures by the NDRC earlier this year. And the main investor in Galaxy Space? Our friend Lei Jun. What a time to be in China.

Other activities among Chinese space companies in 2020 have included the successful first launch of the Long March-5B, a variant of the Long March-5 heavy lift rocket. The LM-5B involves removing a 2nd stage and adding larger payload to LEO. The launch also involved the non-crewed test of a crewed spacecraft, with the spacecraft orbiting. For several days then returning to earth. The rocket success is a major step for China's space program, insofar as the LM-5B will be used for the Chinese Space Station and other major missions.

Conclusion—What a Half a Year

Incredibly, we have only scratched the surface of the half-year that was in Chinese space. Despite a pandemic and ensuing total shutdown, the industry moved along at a solid pace, and we have seen projects continue to move forward. The second half of the year may, if anything, be even more eventful after seeing the full impact of the NDRC decision, and the ongoing Congress. Until then, you can find my LinkedIn (where I regularly publish short updates on China space) using any search engine and searching the hashtag #ChinaSpaceGuy



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FEATURE

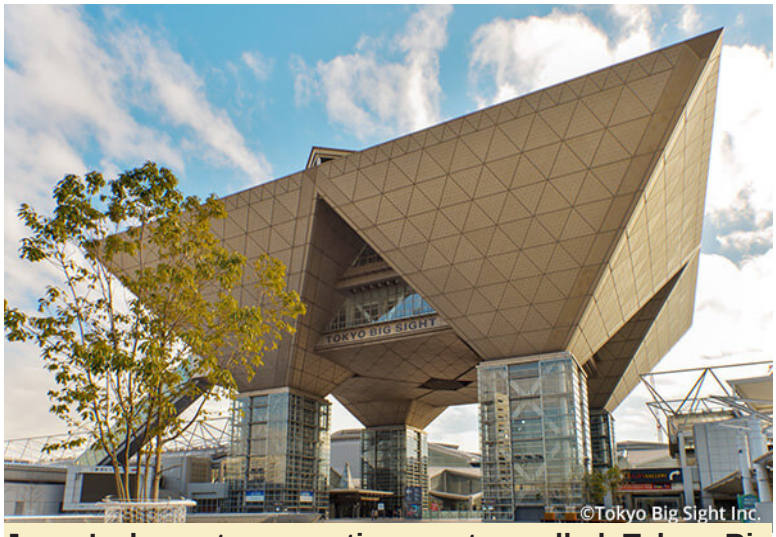
Update on the Japanese Satellite Market

by Naoakira Kamiya

The postponement of the Tokyo Olympics to 2021 due to the COVID-19 pandemic is impacting heavily on various industries in Japan including the satellite business.

The flame for 2020 Tokyo Olympics arrived from Greece to Japan on March 20th and Japanese leg of the torch relay with the concept of "Hope Lights Our Way" was scheduled to begin on March 26 from J Village in Fukushima prefecture. However, on March 24 Prime Minister Shinzo Abe asked the International Olympic Committee (IOC) to postpone the Tokyo Games due to the spreading of the novel coronavirus. Consequently IOC made a decision to accept it.

Later on March 30th, the IOC approved the new date for Tokyo Olympics from July 23 to August 8, 2021 and the Paralympics from August 24 to September 5, 2021. Such date was proposed jointly by Japanese Government, Tokyo Metropolitan Government, and Japan Olympic Committee on March 30 and was immediately approved by IOC.



Japan's largest convention center called Tokyo Big Sight, where the International Broadcast Center and Main Press Center for the Olympics will be located.

It seems that the torch will remain in Fukushima prefecture for the time being.

As a consequence, the Japanese satellite industry with particular reference to the occasional use segment of professional video was seriously impacted by the postponement of the torch relay and games. Satellite operators, OB van owners, mobile equipment renters, and so forth lost business opportunity for at least one year. One of the OB van operators who was contracted to cover the torch relay commented that he counted his chickens before they are hatched. It seemed that about half of the contracts were postponed for one year and the remaining contracts were tentatively cancelled.

Besides the satellite industry, one of the most seriously ipacted is Japan's largest convention center called Tokyo Big Sight, where the International Broadcast Center (IBC) and Main Press Center (MPC) for the Olympics will be located. IBC needs a large space for Olympic Broadcasting Services with 17 Rights Holding Broadcasters and so many sub-license holders. To meet such purpose, Tokyo Big Sight has not been used for exhibitions since last year and some construction works started in line with the requirements of IBC and MPC.

If the venue has to be reserved until next year, it would further take away business opportunities and the damages would be catastrophic. According to the Japan Exhibition Association, the loss would be about Yen 2.5 trillion (approximately US$ 22 Billion), even if the games had been held as originally scheduled. Supposing the venue has to be closed until next year, the association members will face

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another significant loss.

Under such circumstances, Japan Exhibition Association submitted a strong petition to Tokyo Metropolitan Government requesting that Tokyo Big Sight be available for exhibition business use as many days as possible.

OneWeb Bankruptcy

In the meantime OneWeb announced on March 27 that the company has voluntarily filed for relief under Chapter 11 of Bankruptcy Code in the US Bankruptcy Court for the Southern District of New York. According to the announcement the reason for such filing is that the financing process did not progress because of the financial impact and market turbulence related to the spread of COVID-19.

One of the few bright spots recenly is the successful launch of the JCSAT-17 satellite aboard an Ariane-5 rocket in February.

About two weeks later on April 13 SoftBank Group forecasted a record Yen 1.35 trillion operating loss for the fiscal year ended March 31. The company said it expects Yen 800 billion losses on the basis of FVTPL from its own investment to such companies as OneWeb, WeWork, and so forth. Another Yen1.8 trillion in losses is expected from its Vision Fund Investments. They said that total consolidated revenue is estimated at Yen 6.15 trillion and net loss Yen 750 billion.

Surprisingly enough SoftBank Group said on April 30 that its net loss would be increased from Yen750 billion to Yen900 billion.

JSAT

During the past six months SKY Perfect JSAT Corp (JSAT) launched two new satellites, JCSAT-18 and JCSAT-17. JCSAT-18 made by Boeing Space Systems, is a joint satellite with Kacific Broadband Satellite and was launched aboard Falcon-9 rocket on December 16, 2019.

JCSAT-17 was lifted off aboard Ariane-5 rocket on February 18, 2020. This satellite is a state-of-the-art multi-beam high throughput satellite of S-band transponders, and was built by Lockheed Martin Space Systems. At the time of this writing JSAT said that in-orbit-tests have been successfully completed and a contractual delivery has been made from JSAT to NTT DoCoMo for their use.

In addition to these new GEO satellites, JSAT started operating a LEO satellite named SDS-4 (Small Demonstration Satellite 4) from December 2019. The small three axis spacecraft of 50kg was originally launched aboard H-2A rocket in May 2012 and operated by JAXA at the altitude of 696km for about seven years. JAXA handed it over to JSAT for extended operation. Its main mission, Space-based Automatic Identification System, is continued to be experimented by JSAT at their Ibaraki Satellite Control Center.

All in all JSAT is operating a large fleet of 16 satellites at the end of April 2020. Their active satellites are located from 85 degrees east where JCSAT-85 is operated to 169 degrees east where JCSAT-12 is located. Furthermore JSAT and Intelsat jointly own and operate Horizons-1 satellite at 127 degrees west, Horizons-2 at 85 degrees east, and Horizons-3e at 169 degrees east. Newly launched JCSAT-18, which is now called JCSAT-1C, is located at 150 degrees east. Newest satellite, JCSAT-17, is operated under the new name of N-STAR-d at 128 degrees east.

B-SAT

Another satellite operator in Japan, Broadcasting Satellite System Corp (B-SAT), currently operates four satellites, BSAT-3a, -3b, -3c and -4a, at 110 degrees east. Unique feature of BSAT-4a satellite is that it carries 12 left-hand circularly polarized Ku-band transponders in addition to the traditional 12 right-hand version.

B-SAT ordered one more satellite, BSAT-4b, from Space Systems/Loral in March 2018. The satellite is already completed and scheduled for launch aboard Ariane-5 rocket in June 2020. However the launch operation at Guiana Space Center is presently suspended due to COVID-19 and the liftoff may be delayed. BSAT-4a and 4b are mainly intended for unprecedented live transmission of Tokyo Olympic and Paralympic Games by NHK in 2K, 4K, and 8K Super High Vision.

In terms of 4K, B-SAT said such companies as SC Satellite (Shop Channel 4K,), QVC Satellite (4K QVC), and Tohoku-Shinsya Media Services (Cinema 4K) have already started broadcasting via BSAT-4a transponders and NHK also uses one more transponder for their 8K Super High Vision premium entertainment service. Actually NHK is broadcasting its 8K content every day for 12 hours from 10 A.M. to 10:10 P.M..

(On May 1 Arianespace Tokyo Office announced that Guiana Space Center will resume launch service from middle of June and BSAT-4b launch is scheduled towards the end of July)

With regard to the government satellite operation in Japan, Quasi-Zenith Satellite System (QZSS) is in the spotlight. Presently four Quasi-Zenith Satellites (QZS) named "Michibiki" in Japanese, are under operation. Three satellites, QZS-2, QZS-3, and QZS-4, were launched aboard H-2A rocket during 2017 and full operation including QZS-1 officially started from November 1 2018. Unique features of QZSS operation are sub-meter signal called L1S and sub-centimeter signal called CLAS. In addition iPNT (Indoor Position, Navigation, and Timing) is now available.

For future deployment Japanese government placed an order of three more satellites with Mitsubishi Electric Corp. These are QZS-1R (QZS-1 Replacement), QZS-5 and QZS-6. QZS-1R is scheduled for launch in 2021 and QZS-5 & QZS-6 in 2022.

Due to the uncertainties caused by COVID-19 pandemic, even the postponement of the Tokyo Olumpics to 2021 does not assure that Japan will be able to hold a safe and complete event

Coming back to the subject of 2020 Tokyo Olympics, Japan Consortium (NHK and Japan Commercial Broadcasters Association) and IOC agreed on broadcasting rights in June 2014. Since then the remarkable advancement has been seen in Japanese video market.

First, 4K HDR has come into wide use. Accordingly OBS said it will contribute and distribute about 9,500 hours of Tokyo Olympic Games in 4K HDR format. A specialist in this sector said OBS is going to use thirty two 4K HDR OB vans. The merit of Tokyo Olympics is surely the spreading of 4K HDR quality video all over the world.

Second, NHK started broadcasting 8K TV channel from December 1 2018. To meet 8K video requirement, NHK said they have built four 8K OB vans. These vans were built on SDI/IP hybrid basis. Furthermore NHK is operating three 4K OB Vans, which is based on Sony's IP live production system for delivery interface. It seems more than twenty 4K and 8K OB vans are available in Japan.

Last but not least it is a pity that Japan looks like being far from staging a safe and complete Olympics and Paralympics in Tokyo in the summer of 2021 in view of the coronavirus pandemic.

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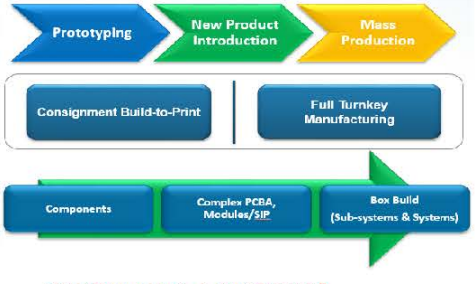

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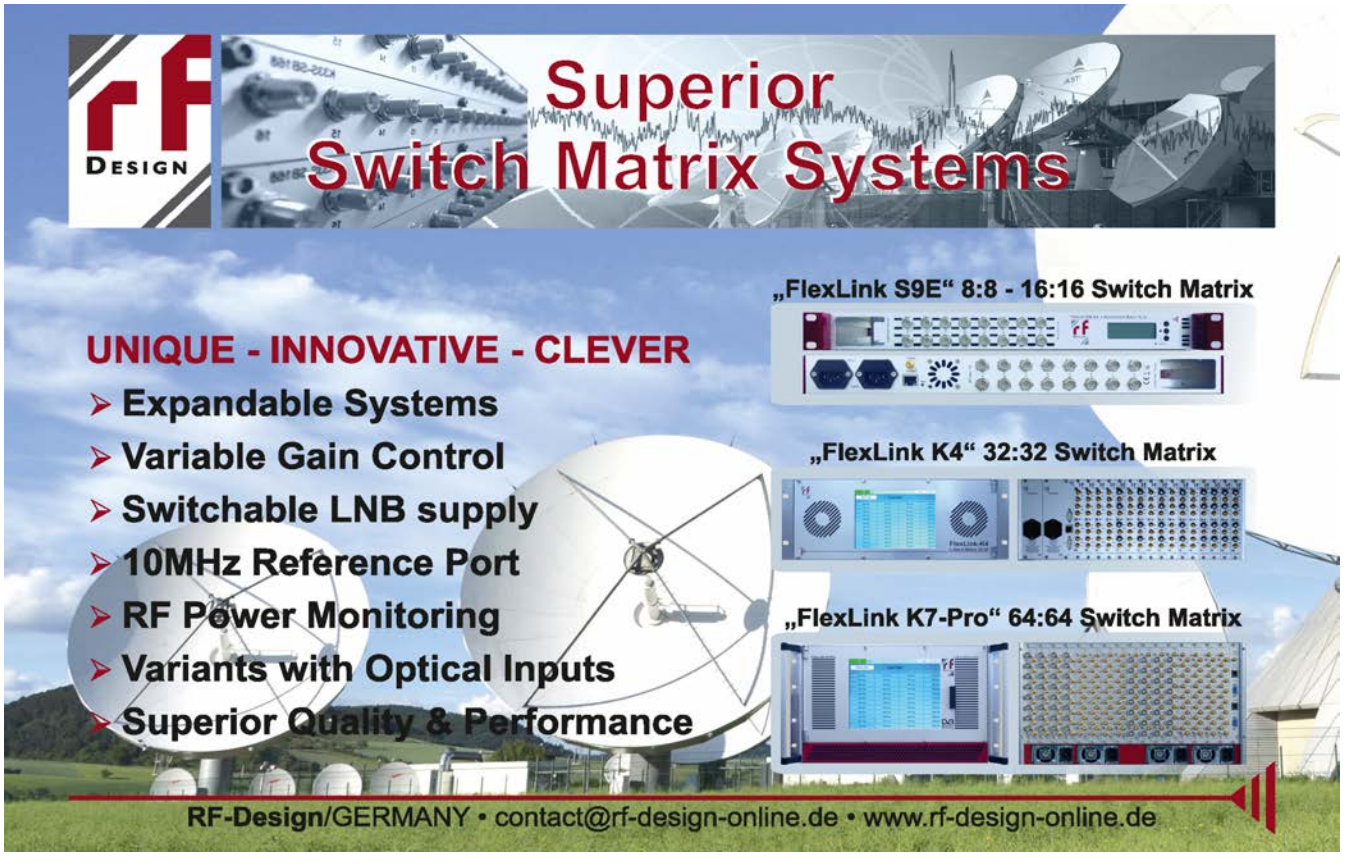
RF-Design Switch/Routing Matrix solutions are available in different sizes and configurations as full fan-out/distributive or full fan-in/combining systems. All our Switch Matrix units are excellently suited for flexible RF signal distribution applications e.g in Teleports, Satellite Earth-Stations, DSNG vehicles, Broadcast stations and Cable/IPTV headend infrastructures. The FlexLink Switch Matrix systems are future proof covering the standard L-Band 950-2150 MHz and also for extended L-Band applications 850 - 2450MHz in several standard equipment and on request.

Our Switch/Routing Matrix systems are distinguished by excellent RF performance, operational stability and support switchable LNB-supply, variable gain control, RF power-monitoring and other advantageous functionalities while our FlexLink K7-Pro, the FlexLink S7B-8:16 and FlexLink S7B-1616 can also be equipped with optical inputs...We also have the flexibility to develop and to manufacture custom-made Switch/Routing matrix systems. Simply send an e-mail to contact[at]rf-design-online.de and tell us your individual requirements. For more information go to: https://rf-design-online.de/products/switch-matrix-router/



ND SatCom's SKYWAN 5G

The SKYWAN 5G satellite router is a reliable, flexible and versatile satellite communication platform for customer centric networks. It is a bi-directional MF-TDMA plus DVB-S2X system that supports voice, video and data applications in the most bandwidth efficient manner combined with unrivalled real-time performance.

SKYWAN 5G unlocks new business opportunities for service providers e.g.in enterprise networks. Total cost of ownership is significantly reduced thanks to the fact that only one type of device is needed for all roles in the network. Each SKYWAN 5G has the full functionality on board and specific features are unlocked by a license key. One small hardware for all network roles simplifies logistics and unprecedented scalability enables the growth of your network in a very cost efficient manner. This saves costs in terms of logistics, certifications, network configuration and maintenance. Measuring in at only 1 RU the SKYWAN 5G is the smallest hub device on the market.

SKYWAN 5G enables star, mesh, multi-star and hybrid topologies. Each unit can act either as a hub or master station, therefore adding agility in terms of its network role. Geographical redundancy of the master station is already built-in and a DVB-S2X outbound can be added easily at every station. Network virtualization allows seamless integration into all IT infrastructures. The device is so flexible: the customer can change the topology anytime, or cascade units to increase traffic volume per site according to business growth. For more information go to: https://www.ndsatcom.com/en/s_c1056i/SKYWAN_Satellite_Router/SKYWAN_5G/

Spacebridge's SBM-90X Wideband GEO/LEO/MEO SCPC/MCPC Modem

Spacebridge's SBM-90X is a telco grade modem that enables unparalleled high throughput for the most demanding applications supporting Software Defined Network to offer enormous flexibility and dynamism.

This 19" rack-mountable unit with LCD Active Front panel for easy configuration is suitable for flexible vast deployments supporting hubless point-to-point as well as point-to-multipoint topologies. Features include :

- Software Defined Network
- Hub less Point-to-Point as well as point-to-multipoint support.
- Layer-2 and Layer-3 support
- Advanced Quality of Service (QoS)
- Built-in PEP (Performance Enhancing Proxy)
- OpenAMIP antenna interface support for SATCOM on the Move (SOTM) applications

For more information go to: www.pacebridge.com/product/sbm90x/

MULTI-BAND FLYAWAY TERMINAL MFT 1500 +++ SEVERE STORMS ++ GALE-FORCE WINDS +++ READY TO COMMUNICATE ANYTIME

Send and receive where other systems have already given up. Discover the new ND SATCOM Multi-Band FlyAway Terminal ***MFT 1500*** with integrated SKYWAN technology, which is revolutionizing the market with its unique robust design. Whether you are experiencing severe storms or gale conditions, this terminal is extremely reliable, ready for immediate action, and raises the bar worldwide in terms of communication security. Plus, its light and durable components enable easy transport and a long product life.

Stay tuned to learn more about our new Multi-Band FlyAway Terminal ***MFT 1500*** launching soon!

Making Missions Possible

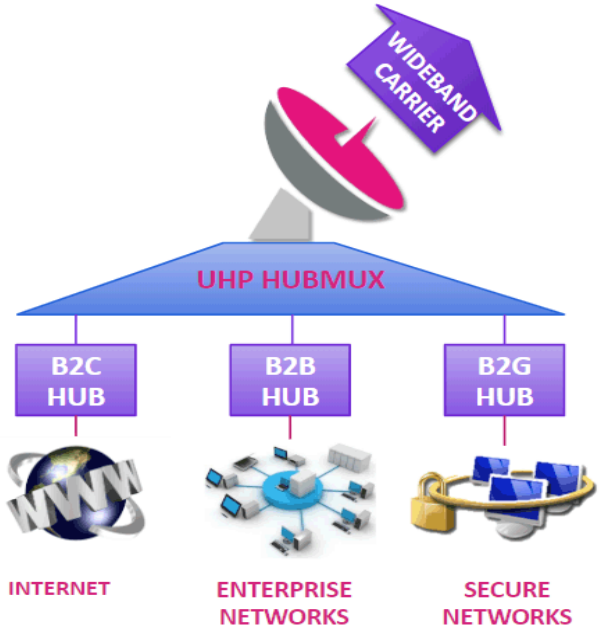
Terrasat's New Ku-Band IBUC 3 is Available Up to 40W

Terrasat Communications presents the latest state-of-the-art IBUC for Fly-Aways & COTMs; the IBUC 3. The latest in Terrasat tech is now ultra-lightweight, super compact, available up to 40W & comes with a 3-year warranty. All IBUCs allow the operator to customize configurations & manage alarms & sensors for real-time network management and control. IBUC reliability is baked into the IBUC 3 design and verified through intensive individual unit testing. For more information go to:

For more information on the available units, go to:

www.terrasatinc.com

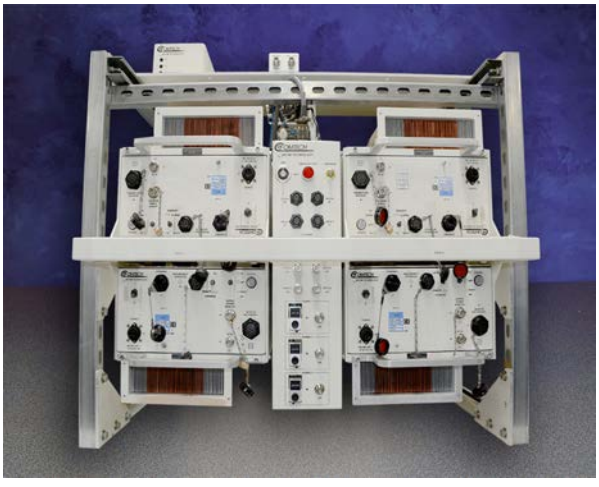
UHP Product Release 3.6



The newest software Release 3.6 from UHP Networks provides major improvements in the performance and functionality of the award-winning UHP line of VSAT equipment. First there is an up to 3 times increase in data throughput. The Forward carrier from the Hub can now operate up to 200 Msps (or 650 Mbps) DVB-S2X with Time Slicing. The Return TDMA carrier runs up to 11 Msps (or 35 Mbps). Second, the UHP Hub has innovative HubMux feature which multiplexes multiple services and supports virtualization of the Hub. Third is a slew of new design features to support On the Move connectivity. This includes enhanced Automatic Beam Switching mechanism which utilizes satellite coverage maps, stored locally in each remote. Sophisticated algorithm for fast assignment and release of bandwidth to the remote crossing the beam boundary maximizes spectrum use. The load balancing feature facilitates traffic distribution across multiple overlapping beams. Last but not least, there is a new global multi-beam NMS with up to 60% faster operation.

For more information go to: www.uhp.net/

New 2kW Outdoor Soft Fail Redundancy Systems from Comtech Xicom Technology



Hot-swappable continuous power systems offer reliability, efficiency and high linear power!

Using Comtech Xicom Technology's standard power amplifier building blocks including L, S, C, X, Ku, DBS, Ka-bands, these systems are available in antenna-mounted continuous power configurations offering minimal transmission line loss with soft-fail hitless redundancy. All HPAs contribute to the system power and efficiency. Output power only declines 2.5 dB in off-line state. Auto recovery can drive remaining amplifiers back to the full power point.

Click here to get the FREE White Paper: https://xicomtech.com/Portals/0/Documents/WhitePaper/Continuour%20Power%20System%20(2018-03).pdf

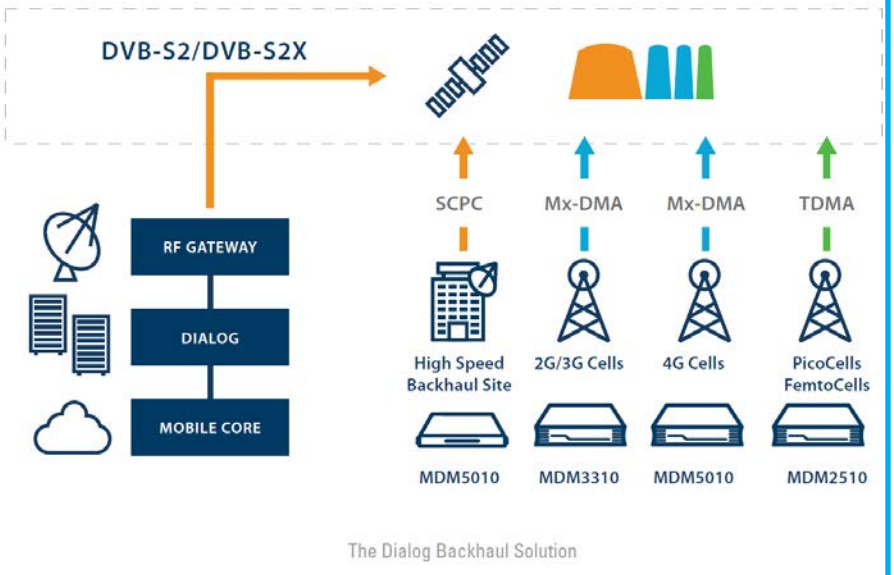
ST Engineering iDirect's Cellular Backhaul Solution

ST Engineering iDirect's backhaul solution, Newtec Dialog®, leverages multiple components which interact dynamically and provide the industry's highest efficiency performances. It is based on the Cellular traffic management which focuses on cellular backhaul advanced processing, as well as the Dialog function components which empower the core Dialog platform. Combined, these components provide the best backhaul service to Mobile Operators.

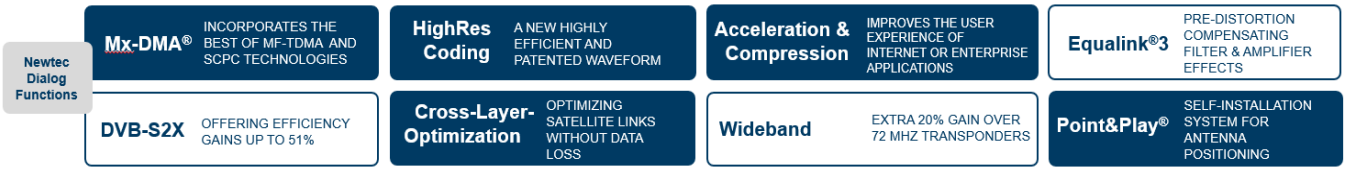
The Cellular traffic management encompasses the functionality dedicated to bandwidth optimization for mobile voice and data traffic, while accelerating 4G LTE. These functions provide the components which are at the heart of the Dialog platform and ensure the high-performance of satellite services.

Dialog® and Mx-DMA®

Mx-DMA® is the best fit for the mobile backhaul traffic as it can constantly provide the highest spectral efficiency based on real-time traffic and fading conditions. Mx-DMA's seamless dynamic adaptation ensures that the mobile voice, signaling and data traffic (including video) are always preserved. Mx-DMA's flexibility also ensures that low throughput 2G networks with symmetrical traffic patterns are accommodated equally as well as demanding 3G/4G networks with higher asymmetry. Mx-DMA therefore contributes to a very high Quality of Experience (QoE) for users. In addition, the implementation of Mx-DMA can result



The Dialog Backhaul Solution



in the doubling of the transponder throughput while using the same bandwidth, or, alternatively, it can reduce the required space segment capacity by 50%.

A Proven Platform

Dialog® and Mx-DMA have been successfully deployed commercially for mobile networks in Asia, Africa and Latin America. The platform has gone under thorough testing with the infrastructure equipment from main manufacturers such as Huawei, Ericsson, Nokia and ZTE, for macro cells and small cells. For reference, Dialog is currently empowering one of the world's highest capacity mobile backhaul over satellite projects. There are currently more than 20 mobile backhaul networks deployed over the Dialog platform in the world.

Future Proof Technology

The Dialog® platform benefits from ST Engineering iDirect's continuous investments in R&D. Customers are always guaranteed to get the most advanced platform in the market, but also one which is field-tested and which incorporates the ingredients of tomorrow's technology. As an example, the increasing utilization of virtualization technologies and the high performances further facilitate a smooth transition to 5G. ST Engineering iDirect is also heavily involved in initiatives with European Space Agency (ESA) and other industrial consortiums for 5G proof of concepts and interworking scenarios.

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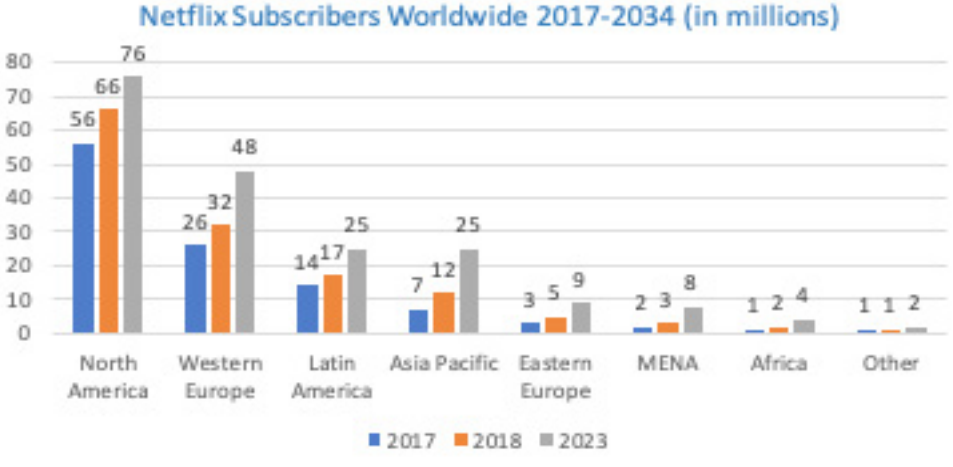
OPINION

Will Satellite-Delivered TV Go the Way of the Dinosaurs?

by Robert Bell

I joined the ranks of cord-cutters back in 2014. It was an easy decision. I don't watch most network TV, rely on newspapers for my daily news and find televised sports a yawn. I am, in other words, a weirdo. But in the past six years, I have gained a lot of company.

The Motion Picture Association of America reported in 2018 that subscriptions to streaming services like Netflix and Amazon Prime surpassed cable subscriptions for the first time, reaching 613 million compared to the 556 million US cable subs. The lion's share of revenue still comes from cable and satellite but the consultancy Informitv estimated in Q1 2019 that pay TV providers all together were losing 14,000 subscribers per day. And this was before the US FCC ordered 300 MHz of C-band spectrum to move from the "satellite" to the "mobile" column.



In its recent report, Finding Growth in Media Services, the World Teleport Association takes a hard look at the future of the business of media contribution and distribution, for which teleports and satellite operators have been the backbone for decades. Its conclusion is that media and entertainment companies will continue to have major needs that teleport operators can serve – they are just different needs than in the past.

Regional Differences

Those needs are not everywhere the same. No surprise: the conversion of network TV viewers into online viewers closely tracks the availability and cost of broadband, whether wired or wireless, as well as the country of origin for content.

What this chart tells you is that DTH will remain a core distribution platform for television content in the Asia-Pacific and Latin American regions for many years to come, and even more so in Eastern Europe, the Middle East and Africa. But the trends are similar. The appeal of content available when you want it, on any device you want, at an attractive monthly cost is so strong that resistance is – in the long term – futile.

That said, teleport operators are helping legacy programmers to continue extracting the maximum revenue and profit from their existing business of satellite contribution and distribution for homes, cable headends and network affiliates. They are helping broadcasters get greater transponder efficiency with higher order modulation and coding. They are employing more efficient IP encapsulation protocols over satellite DVB-S2 pipes, such as Generic Streaming Encapsulation, MPEG DASH and Adaptive Bit Rate. They are also helping customers take advantage of cloud capacity to introduce channels at lower risk and scale quickly in the event of success. The combination of efficiency and flexibility can put an extra spring into the step of broadcasters.

The Jump to Cyberspace

That said, today's media customers want OTT

to complement satellite distribution. That is, paradoxically, increasing the importance of the teleport in content acquisition and aggregation. Media customers are challenged to efficiently manage the ever-growing number of content acquisition sources, including traditional contribution as well as streaming channels, with metadata, formatting, transcoding, security and digital rights management (DRM).

In its 2018 report, The Over-the-Top Video Distribution Opportunity, WTA noted that most contributors reported that OTT services were not a significant revenue generator. This is no longer the case – and the gap is closing.

Teleports are in a prime position to provide OTT versions of linear programming content for which they are currently managing traditional playout. Success with an OTT strategy is about leveraging existing customer relationships, services and assets to invest in future customer solutions. For example, the objective is not to sell more downlink services and hope to add transcoding for streaming. It is to use the downlink capability as a differentiator in selling next-gen OTT services to new growth customers.

Other teleport operators are re-configuring their facilities into "on ramps" to the cloud and commercial CDNs. This kind of platform can host multiple customers' content and apps on the same infrastructure, allowing scale efficiencies, and support larger traffic and revenue potential.

OTT video is consumed on many types of devices, which makes distribution far more complex than the traditional linear flow. Content is dynamically repurposed based on the user device, end-to-end bandwidth quality, DRM and more. Teleport operators have the opportunity to bring automation technology to the orchestration and management of all the operational and technical workflows for multiple customers on a shared management platform. If you can manage the complexities of workflow better than customers can do it themselves, you have a significant opportunity to deliver compelling services at a profit.

Any teleport providing playout for multiple OTT distributors has an even bigger value-added opportunity: the insertion of metadata, descriptive markers, and advertising. Media companies need help with regionalizing content, handling blackout requirements and replacing ads with local, national, or regional spots as required. Significant money is attached to each of these, whether in potential penalties for rights violations or in revenue. Teleport operators using the right technology solutions can provide high-quality management of these processes on the one hand and deliver OTT viewer analytics for advertisers on the other.

"...Teleports have a viable future, but only if they keep adapting in how they market, sell and deliver services..."

What's in Store?

Most observers expect that satellite will remain essential for distribution to large, rural markets, which is why its future remains bright in the less-developed regions of the Asia-Pacific and Latin America. But for broadcast distribution to the primary urban and suburban markets in industrialized nations, a contributor to the report predicted that "there will be no satellite five year from now."

Another contributor summed up both the peril and opportunity. "The future growth for us and the industry in general is about being flexible, adaptable, listening to clients' requests, and being able to make quick zigs and zags as the market evolves. We see market consolidation with programmers, which can change facilities and requirements among customers. Teleports have a viable future, but only if they keep adapting in how they market, sell and deliver services."

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. Finding Growth in Media Services s available for free to members and for sale to non-members at https://www.worldteleport.org/store/ViewProduct.aspx?id=16313838

He can be reached at: rbell@worldteleport.org

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Capacity Building with Satellite for Disaster Response: Pacific Endeavor 2020

by Martin Jarrold

I opened my previous column for this publication one month ago with the following statement: "In starting to draft this column it was impossible not to be affected by the news that the official global figure for Covid-19 fatalities was approaching 200,000. The zoonotic – interspecies – jump to humans and subsequent pandemic spread of the novel coronavirus (SARS-CoV-2) has badly impacted many of the world's most advanced and richest countries, but the epidemiology tells us that the worst of the impact, on the less-developed world, is still to come."

The worst of the impact of Coronavirus on the developing world is still, "still to come", and it will very likely be catastrophic. The impact of pandemic globally has now exceeded 360,000 fatalities, and the death toll in the world's richest nation has been a disaster, with more than 104,000 fatalities at time of writing.

This is a humanitarian crisis, but not one that can be characterized by familiar notions of events needing disaster response. However, there have been commonalities, including the requirement for rapidly and much enhanced broadband connectivity infrastructure to meet the demands of extended medical services for diagnosis of infection and treatment of disease, and to support the new social isolation/working from home paradigm.

Natural disasters around the world take many forms: earthquakes, tsunamis, cyclones/hurricanes/typhoons, volcanic eruptions, floods, droughts, and famine. These, and such human-made disasters as war, and displaced and refugee populations, are the events which usually grab the headlines. It is these events which require the kinds of solutions for immediate response logistics operations and longer-term recovery programs that only satellite can provide. This is particularly the case when terrestrial communications infrastructures are knocked-out by the nature and magnitude of a disaster itself, and just at the time when they are needed most.

Of course, whilst Covid-19 continues its current grasp of the front pages (and their social media equivalents), other disasters do not stop. Currently, a "plague" of locusts is consuming its way across eastern Africa, the Arabia peninsula, and south Asia; and, Super-Cyclone Amphan has wreaked havoc in Bangladesh and north-eastern India. The recurrence of these disasters only serves to exacerbate both the instance and effects of pandemic as, again as I wrote last month, "…infection takes hold in lower-income countries, affecting communities with weak health systems, affected by conflict, comprising displaced peoples, or which are permanent high-density slums,…".

The third, and final, citation of my previous column here is to reiterate that GVF is the only globally-based representative body for the satellite industry that is – along with a number of its member companies – signatory to the UN Crisis Connectivity Charter, and is the only private sector representative entity in the World Food Program administered Emergency Telecommunications Cluster.

This pedigree is further augmented by GVF's long-standing collaborative partnership with the annual Pacific Endeavor program, the next of which – pandemic circumstances permitting the current schedule arrangements to proceed – will take place in early August this year.

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Since 2012 GVF has engaged with the U.S. Department of Defense Indo-Pacific Command (US-INDOPACOM, formerly PACOM) Multinational Communication Interoperability Program (MCIP) for Humanitarian Assistance & Disaster Response (HADR) – Pacific Endeavor. Over the years we have variously conducted presentation sessions, and hands-on practical training workshops to certify J6 military officials of participating nations in the installation and maintenance of satellite terminals to ensure that during crisis or disaster GVF-certified first responders are on the ground, across the Indo-Asia-Pacific region.

In 2020, the primary element of the Pacific Endeavor mission to bring communications capacity building to the militaries of over 25 nations and their civilian partners – to advance reliable and interoperable communications and cyber operations – will be Satcom Endeavor. At the request of MCIP, GVF has been tasked to coordinate capacity building initiatives for Satcom Endeavor 2020 over the two-week period 3-14 August. Military communications and signals personnel, United Nations agencies, the international humanitarian community, academia, as well as industry, will gather in San Diego, California, U.S.A., for this important high-visibility event.

I first had the opportunity to personally contribute to a Pacific Endeavor program in August 2019, when I had the experience and privilege of visiting Port Moresby in Papua New Guinea. Together with my GVF colleague, Riaz Lamak, GVF's Pacific Endeavor Lead who acts as point of contact with MCIP, I had the pleasure of working with the MCIP team (which is based out of Camp H. M. Smith in Hawaii), and met the senior officers of many Indo-Pacific militaries.

During natural disasters, satellite technology can be the only means of communications with areas sticken with calmities. Pictured here is a mobile satellite terminal being set-up in a remote area of the Philippines after a devastating typhoon. (photo courtesy of Inmarsat)

In San Diego, satellite industry organizations, GVF Members and others, will have the opportunity to showcase new solution innovations, equipment and systems, case studies, and best practices. In supporting Satcom Endeavor companies will benefit from having their product and service solutions seen in action by militaries and disaster preparedness agencies, through: Participant practical hands-on experience in on-site "live" set-up of equipment; Static displays during a "Tech Demo Day"; Speaking slot(s) for technical presentations on new technologies and solutions; Mentored online classroom training modules with one-to-one and group interaction; Face-to-face networking opportunities with military signals officers responsible for solutions specification, evaluation, and final procurement; Products/solution promotion through GVF press and social media; Distribution of product/service collateral; Coverage by the military media; Exposure via de-classified press releases by U.S. DoD and coverage of systems and solutions through internal DoD communications; and, Coordination with U.N. agencies, academia, and NGOs.

As we all focus on the current pandemic – and look forward to a global mass vaccination program when the virologists and pharmacologists triumph over the Coronavirus – it is important not to lose sight of other disasters, those arising from the forces of nature and from the mistakes of human action. For more information Riaz Lamak can be contacted at riaz.lamak@gvf.org

Martin Jarrold is Vice-President of International Program Development of GVF. He can be reached at:
martin.jarold@gvf.org

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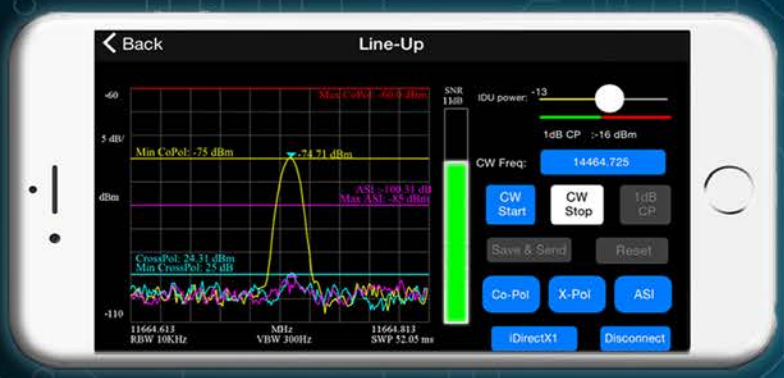

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Satellite: Keeping the Lights On

Flip a switch and amazing things happen. Dark to light. Cold to warm. Things open and things close. Yet no one thinks twice. Each flip of the switch is a small miracle, brought to you by billions in investment and the hard work of millions. Brought to you, too, by satellites circling the earth far out of sight, helping to make life electric.

Keeping the Balance . . . and the Lights On

Electricity is the only product we buy that must be used instantly. The electric grid works because the power going in balances the power being used. When supply and demand go out of balance, so do our lives. Gadgets burn out, neighborhoods black out, cities go dark. Keeping the lights on is like walking a high wire. The balance changes every second.

To keep the balance, utilities synchronize all the equipment across the grid. They use GPS, the satellite technology that puts maps on your phone. GPS satellites are clocks with radios that send signals with the exact time everywhere. Turn off GPS, and power grids start to fail.

Clean Energy with a Little Help from Satellites

Satellites also help power the clean economy. Most electricity used to come from stations belching smoke. Today, more is coming from sunlight and wind. Clean energy is our future – but it also makes it harder for the acrobat to stay on the wire. Electric companies can't control when the sun shines or the wind blows. So they turn to satellite for help.

The French city of Lyons has invested heavily in solar power. To keep the system working, the city uses satellite image data to measure how much sunlight it receives. It calculates what the solar panels should be producing and, if production falls short, work crews pay a visit.

In California, grid operators use satellite data to track the motion of clouds that block sunlight. This helps predict how much power they can expect from solar panels across the state, and how much more power will be needed to keep the balance.

Smart Grids the Smart Way

Satellites are making the grid smarter, too. Utilities are spending heavily on remote sensors to find trouble and remote-control switches to deal with it.

Click here to view a video on how satellite technology eeps the lights on:

www.youtube.com/embed/cq9yJ8TWvTQ

Many operate over satellite. Disasters that take out power lines also take down communications, but whatever the weather, satellites keep delivering. They're secure against cyber-threats, and satellite networks are the cheapest way to reach wherever the grid reaches.

Flip a switch and amazing things happen. Behind that tiny switch are people working to keep the lights on. Above them is the world's satellite network, keeping the balance, keeping earth cleaner and making a better and smarter world.

Produced for Satellite Executive Briefing by Space & Satellite Professionals International. See more stories and videos of satellite making a better world at: www.bettersatelliteworld.com

Semir Hassanaly, Head of Cellular Backhaul and Trunking, ST Engineering iDirect

With the combined company, ST Engineering iDirect, how do you see your position in the Cellular Backhaul market going forward?

While there's more opportunity than ever for growth, service providers and operators require state of the art solutions but also a deep experience in cellular backhaul as well as established relationships with key mobile operators. The combination of our two companies has brought together the strong focus that we both have always had on the customer with our hunger for innovation. Our integration means that ST Engineering iDirect is now a leader in satellite ground infrastructure and solutions and further strengthens its position in the cellular backhaul and trunking markets.

For cellular backhaul specifically, we see an increased need in the market. We have been aggressive in the market and very successful in acquiring additional market share over the last couple of years. In the future, we expect to see this demand for satellite cellular backhaul growing steadily and we also see very large projects being planned that will use an increasing amount of cellular backhaul capacity. Our experience with 5G projects is also giving us a head start to the upcoming widespread usage of this ecosystem.

ST Engineering iDirect is uniquely positioned to answer demand across the entire cellular backhaul market, from price-sensitive to premium applications with our advanced technology and a strategy for growth that is future proof.

What differentiates your company's solutions from your competitors' in this segment?

We cover all aspects of the cellular backhaul market and we have an extremely strong and very unique offering. We provide high performance, very efficient, very flexible, very scalable solutions so that we can cater for almost any type of mobile network today. That applies to the hub offering as well as the remote modems. We have developed unique and advanced technology that we have taken to the market and that is proven.

We help mobile network operators grow their subscribers in remote or unreachable areas, ensure mobile connectivity in emergency situations, and build 5G-compatible networks.

Our efficient, high-performance platform enables mobile network operators and service providers to cost-effectively manage a multitude of small, medium, or large networks, including 2G, 3G, 4G/LTE, and 5G and also allow cost-effective media distribution. We enable high QoS and high QoE through patented sophisticated QoS engines and technologies

Semir Hassanaly

and advanced acceleration and compression technologies while maximizing an operator's business profitability, encouraging the critical expansion of mobile connectivity around the world.

We have also helped pioneer the cellular backhaul solution and have bolstered its growth with numerous successful commercial deployments. Major mobile operators trust us.

Along with cellular backhaul, our experience and footprint in the broadcast, government, mobility and enterprise markets has given us an edge with cross-vertical and multiservice solutions. This is what we are also leveraging for 5G.

It is this whole combination that differentiates us from our competitors.

What are the key applications you are targeting for your cellular backhaul solutions and what

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advantages and benefits do you provide for each application?

In terms of applications, we are targeting 2G, 3G, 4G, rural, ultra-rural and ultra-ultra rural deployments, 5G, first responder community, private networks, high-speed trunking and fiber restoration and OTT content distribution. Our Dialog platform and its associated technologies provide a solution that is built for today and tomorrow and supports all of the above applications.

Dialog is a multiservice VSAT platform that allows operators and service providers to build and adapt their infrastructure and satellite networking according to business or missions at hand. Cellular Operators and Service Providers particularly value the enablement of high QoS and QoE while lowering OPEX through the flexibility, scalability and efficiency that the Dialog platform can offer while paving a way to take advantage of 5G in the future. Dialog can also offer very high speed trunking and fiber restoration capability.

The Dialog platform can be configured to match the size and the satellite network configuration for any customer application. A vast choice is available in terms of satellite bands, transmission speed, power, modulation and amount of forward and return links. The hub scales smoothly and cost effectively from small (few terminals) to large networks (hundreds of thousands of terminals) and from single coverage area to multiple coverage areas on any frequency band. It can serve one or multiple satellites, including high-throughput spot beam configurations.

In addition, our recently introduced MxDMA MRC technology adds the scalability for ultra-rural and small cell networks where the number of sites is traditionally very high, and it also allows the deployment of multiple services where high scalability is sought along backhaul services.

What are the key trends you see in the cellular backhaul market and how is your company positioned to meet the opportunities and challenges in this market?

At present, we see the opportunity in an expanded market for satellite connectivity. We are seeing exponential demand for mobile connectivity which is covering every region. Demand is growing from the most urban to the most rural areas. The opportunity for expansion is huge. Mobile networks are poised to become the primary way in which we connect, especially as 5G comes online with new use cases. Mobile network operators will need satellite and its inherent capabilities to help with this tremendous surge in demand, in both rural and urban areas.

Hybrid networking is presenting new use cases for satellite service providers to help mobile network operators to handle the demands of the connected world. Satellite can help in so many ways, from offloading congested networks to enabling media distribution for OTT services to enabling continuous operations in the event of network disruption and to playing a key role in the evolution of mobile networks and integration into the 5G model.

Satellite must be complementary to the terrestrial infrastructure. It must blend in and be totally seamless. It's all about providing the ideal connectivity based on cost and availability requirements, based on latency requirements, so any application should be able to get the connectivity they need based on the characteristics of the application. Satellite will also continue providing connectivity to where it is difficult to reach – remote and geographically challenging areas and also for mobility markets such as maritime and aero. It will still be the key transport solution.

ST Engineering iDirect is ideally positioned to offer a future proof cellular backhaul solution through our multi-service platform that expands market reach, offering the efficiency, performance and service capabilities that our customers need to win today's opportunities, multiplied by the scale and innovation required to expand into tomorrow's markets.

To read or download a pdf of the full report on Satellite Cellular Backhaul sponsored by ST Engineering iDirect: http://www.satellitemarkets.com/pdf/pdf2020/cellular-backhaul-marketbrief.pdf

Comtech Acquires NG-911

Melville, NY, May 26, 2020-- Comtech Telecommunications Corp. (NASDAQ: CMTL) announced that during the Company's third quarter of fiscal 2020, it closed an acquisition of NG-911 Inc., a pioneer of Next Generation 911 solutions for public safety agencies in the Midwest. NG-911 is one of the first Next Generation 911 solution providers in the Midwest and has successfully deployed regional Comtech Solacom systems in the past.

In connection with the acquisition, Comtech was awarded several contracts to deploy Comtech's Solacom's Guardian Call Handling solutions to the 9-1-1 Northern Illinois Next Generation Alliance Consortium ("NINGA"), valued at more than US$ 15.0 million over a multi-year period.

Fred Kornberg, Chairman of the Board and Chief Executive Officer of Comtech Telecommunications Corp., stated, "The acquisition of NG-911 allows us to cost-effectively deploy our industry leading Guardian call management solutions for public safety answering points across Illinois and Iowa and enhances our relationship with existing customers."

The operations of NG-911 have been immediately combined with Comtech Solacom (a leading provider of call handling solutions) and the financial impact of the acquisition was not material.

Ameringent Acquires Tethers Unlimited

Colorado Springs, Colo., May 6, 2020--Amergint Technology Holdings announced it has acquired Tethers Unlimited, Inc. (TUI), a leader in new space solutions for the small satellite market. The transaction will bring together Amergint Technologies, Inc. and TUI to provide integrated end-to-end solutions for satellite communications and in-space services to the space market.

Terms of the transaction were not disclosed.

"Joining forces with Amergint makes tremendous sense for Tethers Unlimited," said Dr. Rob Hoyt, TUI's CEO. "Combining Amergint's ground-based processors and modems with TUI's software-defined satellite radios and mesh network solution enables us to provide flexible, affordable, secure and resilient end-to-end communications services that scale to meet the needs of the hybrid space architectures under development by the Space Force, the Space Development Agency, DARPA, USAF and the Intelligence Community."

Founded in 1994 by technologist Dr. Hoyt and the renowned science fiction author Dr. Robert L. Forward, for more than 25 years TUI has pioneered an array of innovative space technologies, including software defined radios for satellite communications and mesh networks, robotic systems for in-space servicing and manufacturing and assembly, and advanced propulsion solutions for orbital maneuvering and orbital debris mitigation. TUI supplies the space industry with high-performance satellite components including the SWIFT® software defined radio, the Terminator Tape™ Deorbit Module, the HYDROS™ water-electrolysis thruster and the COBRA™ gimbal as well as research and development into robotics and in-space manufacturing systems.

Moving forward, Amergint and TUI will increasingly offer integrated satellite communications offerings combining software-defined satellite radios with software-defined ground stations. The two companies will also build upon the full suite of technologies and products at both companies around space servicing and test systems to offer a wide range of solutions for government and commercial customers, according to the company.

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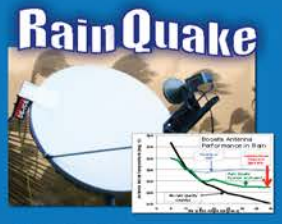

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Senior Executives from North America and Europe Join WTA Board

New York City, May 26, 2020– The World Teleport Association (WTA) announced the election of two new members to its Board of Directors for three-year terms beginning April 1, 2020: Jay LaPrise, Senior Vice President, Global Transmission Operations, Encompass Digital Media and Guido Neumann, Chief Development Officer & President EMEA, AXESS Networks.

In addition, the election returned one board member for a second term: Mitja Lovsin, General Manager, STN. José Sánchez Ruiz, Director of Service Operations at Eutelsat was also named Chair by a vote of the Board at its March 9 meeting.

Continuing to serve on WTA's Board of Directors are:

- José Sánchez Ruiz, Director Service Operations, Eutelsat
- Ron Busch, Senior Vice President, Network Services, ABS Global Ltd
- Keith Frost, Media and Data Networks Director, Arqiva
- Marzio Laurenti, CEO, Telespazio Brasil S.A.
- Samuel Lemercier, Managing Director UK, Globecast
- Mitja Lovsin, General Manager, STN
- Bill Marks, Chief Strategy Officer, Kymeta
- Scott Mumford, Group Managing Executive - Satellite & VSAT, Liquid Telecom
- Matthew Prange, Vice President, Strategic Teleport Partners & Implementation, SES
- Kheng Ghee Ng, Head, Satellite, SingTel
- Ron Storie, VP, Network Operations, Intelsat
- James Trevelyan, VP, Sales, EMEA, Speedcast
- Koby Zontag

Directors on the WTA Board serve three-year terms, and are elected by the membership.

Thales Alenia Space Appoints Valorge as CTO

Cannes, France, May 13, 2020--Thales Alenia Space has appointed Christophe Valorge as Chief Technical Officer (CTO), effective on May 1st, 2020. He succeeds to Patrick Mauté who will be retiring.

Christophe Valorge

Valorge has been Director of R&D and Product Policy at Thales Alenia Space in Toulouse since 2016. He has a long and proven track record in space industry.

Holding degrees from the Ecole Polytechnique (1987) and the Sup'Aero aeronautical engineering school (1989), Christophe Valorge started his career in 1989 as an engineer at CNES, the French Space Agency. He was promoted to various management positions, from Advisor on Technical Policy in 2005 up to the roles of Deputy Director of Scientific Payloads and Imaging in 2008 and Deputy Director of Orbital Projects in 2011.

Minciacchi Named New CEO of e-GEOS

Rome, Italy, May 10, 2020--The Board of Directors of e-GEOS, a joint venture between Telespazio (80%) and the Italian Space Agency (20%), has appointed Paolo Minciacchi as the new CEO.

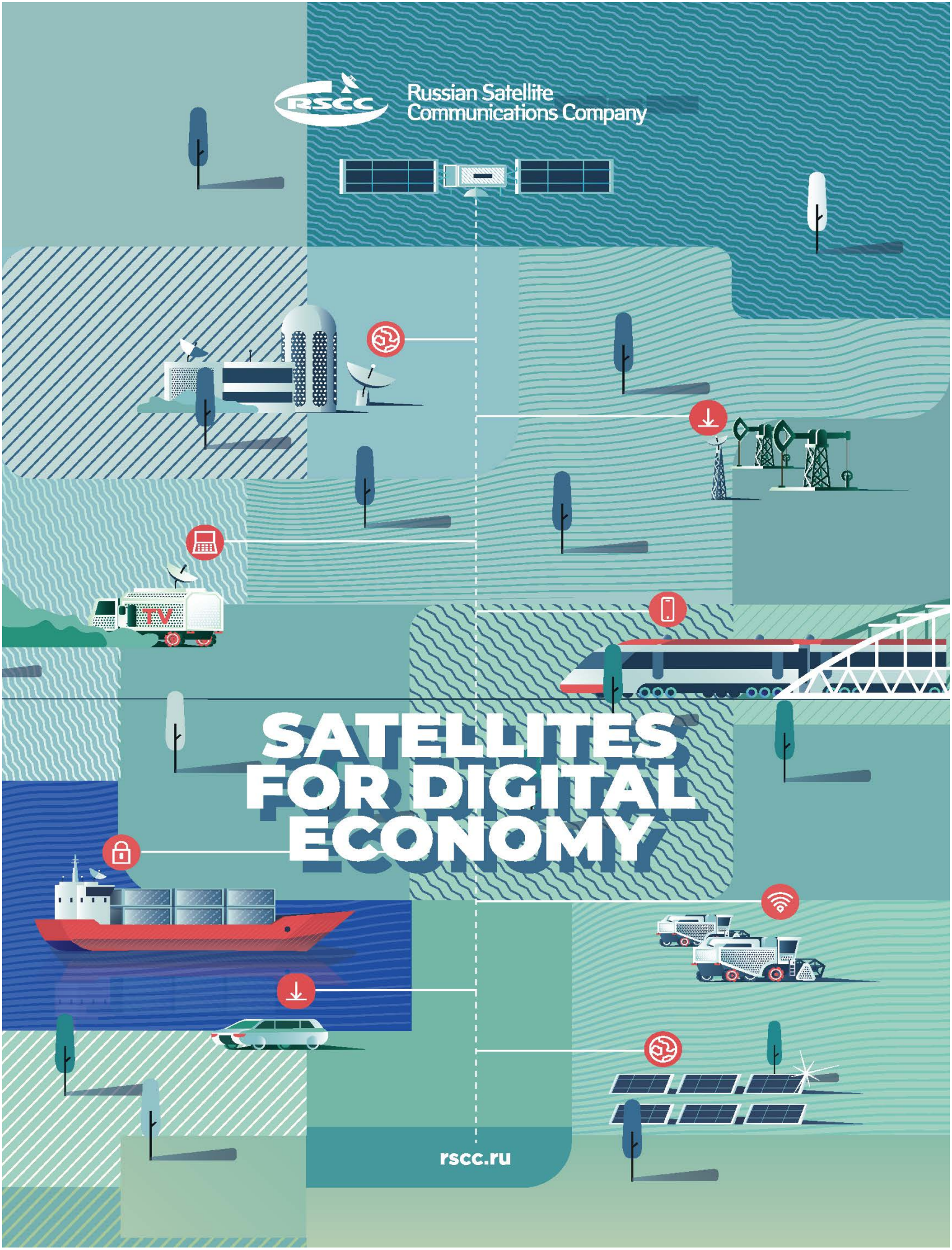
Minciacchi, born in Rome in 1963, graduated in Electronic Engineering from the La Sapienza University of Rome in 1989.

He joined Telespazio in 1990, taking on roles with increasing responsibilities. In 2000, he was appointed as head of the technical services for engineering and operations at the Fucino Space Centre.In 2002, he joined the Earth Observation division of Telespazio, holding several management positions that will lead him to work to the plan for the inception of e-GEOS. In 2009, he took up the position of head of operational planning, industrial management and added value production in the newly created company.

Paolo Minciacchi

In 2011, he joined Spaceopal, an equal joint venture between Telespazio and DLR-Gesellschaft für Raumfahrtanwendungen, as technical director and member of the executive committee. In 2019, he is appointed as Chief Executing Officer of Spaceopal.

eGEOS offers a complete range of products and services in the Earth Observation and in the spatial application domains, based on both optical and radar satellites as well as on aerial surveys.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Satellite Cellular Backhaul Market Poised for Growth

According to the Ericsson Mobility Report, at the end of 2019 there were 7.9 billion mobile subscriptions, projected to grow to 8.9 billion by 2025. In spite of these large numbers, in 2020 over three billion people in the world, still have no access to any kind of fixed or mobile service. Usually mobile networks are the first step in providing connectivity to unserved areas. Unserved means no fiber or terrestrial backbone. Satellite is the ideal way to connect these regions.

Absolute numbers of subscriptions may be experiencing only single digit growth, but data usage is accelerating at a far greater pace: growing 49% between 2018 and 2019. Going forwards Ericsson is predicting mobile traffic to experience an annual growth of 27% to 2025, from 38 to 160 exabytes per month. A lot of this increase is due to the increasing amount of video being viewed on mobile devices. Video is forecast to account for 78% of overall traffic in 2025.

For many years now, Mobile Network Operators(MNOs) have relied on satellite for backhaul in more remote and less developed regions of the globe. In fact, without satellite it would have been both a logistical nightmare and prohibitively expensive to connect these networks to the backbone. Compared to laying fiber or installing microwave links, satellite is quick and easy to deploy, being indifferent to both inhospitable terrain and line of sight restrictions.

Several factors have now combined to make satellite backhaul an attractive proposition for MNOs. On the supply side, the advent of High Throughput Satellites (HTS) caused bandwidth prices to fall dramatically, changing the economics entirely. In most parts of the world, bandwidth is now priced at US$ 200-300 per Mbps, about a third of what it was a few years ago. According to analysis by NSR, this means that when a base station throughput is more than 600GB per month, satellite becomes the cheapest solution for backhaul. To put this into perspective, data consumption in Sub-Sahara Africa is typically 0.6GB per month. So, if a base station supports 1,000 users, even in a low-revenue developing economy, satellite would be the most economical solution.

To read or download a pdf of the full report on Satellite Cellular Backhaul go to:
www.satellite-markets.com/pdf/pdf2020/cellular-backhaul-marketbrief.pdf

NSR's Wireless Backhaul via Satellite, 14th Edition report, forecasts US$ 39 billion in 2019-2029 cumulative capacity revenues for Satellite Backhaul. With backhaul networks rapidly transitioning to 4G and the installed base continuously expanding, Mobile Backhaul via Satellite offers sizable opportunities in all regions. Small cells will play an increasingly important role in this growth, as lower costs expand the addressable market to areas previously uncovered due to industry cost metrics, according to NSR.

Additionally, as MNOs are increasingly willing to outsource network management, multiple entities are moving into offering end-to-end services.

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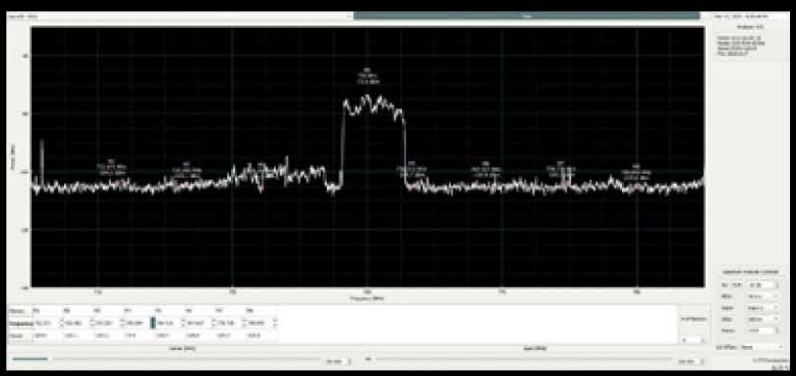

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The Satellite Markets 20 Index™

Company Name	Symbol	Price June 2	52-wk Range	
Satellite Operators				
Thaicom Public Company Limited	THCOM.BK	3.72	2.14	6.30
Eutelsat Communications S.A.	ETL.PA	9.74	8.00	18.67
APT Satellite Holdings Limited	1045.HK	2.45	2.24	3.94
Echostar	SATS	32.14	25.23	45.15
SES S.A.	SES.F	7.26	4.88	18.03
Satellite Manufacturers				
The Boeing Company	BA	154.77	89.00	391.00
Maxar Technologies	MAXR	15.99	5.79	21.45
Lockheed Martin Corporation	LMT	391.98	266.11	442.53
OHB SE	OHB.DE	39.2	25.65	48.65
Honeywell International Inc.	HON	148.45	101.08	184.06
Equipment Manufacturers				
C-Com Satellite Systems Inc.	CMLV	2.02	1.44	2.18
Comtech Telecommunications Corp.	CMTL	18.31	11.48	38.00
KVH Industries Inc.	KVHI	9.07	6.36	11.64
ViaSat Inc.	VSAT	44.60	25.10	91.95
Gilat Satellite Networks Ltd.	GILT	8.05	4.70	10.76
Service Providers				
DISH Network Corporation	DISH	32.53	17.09	44.66
Globalstar Inc.	GSAT	0.33	0.23	0.63
Orbcomm Inc.	ORBC	3.10	1.24	8.44
Sirius XM Holdings Inc.	SIRI	6.01	4.11	7.40
RigNet Inc.	RNET	1.01	0.77	11.34

The Satellite Markets 20 Index™ is a composite of 20 publicly-traded satellite companies worldwide with five companies representing each major market segment of the industry: satellite operators; satellite manufacturers; equipment manufacturers; and service providers. The base data for the Satellite Markets Index is January 2, 2008 - the first day of operation for Satellite Markets and Research. The Index equals 1,000. The Satellite Markets Index™ provides an investment benchmark to gauge the overall health of the satellite industry.

INDEX	Index Value May 5, 2020	Percentage Change Last Month	Percentage Change Jan. 2, 2020
Satellite Markets 20 Index™	2,367.25	9%	-18%
S & P 500	3,067.29	8%	-6%

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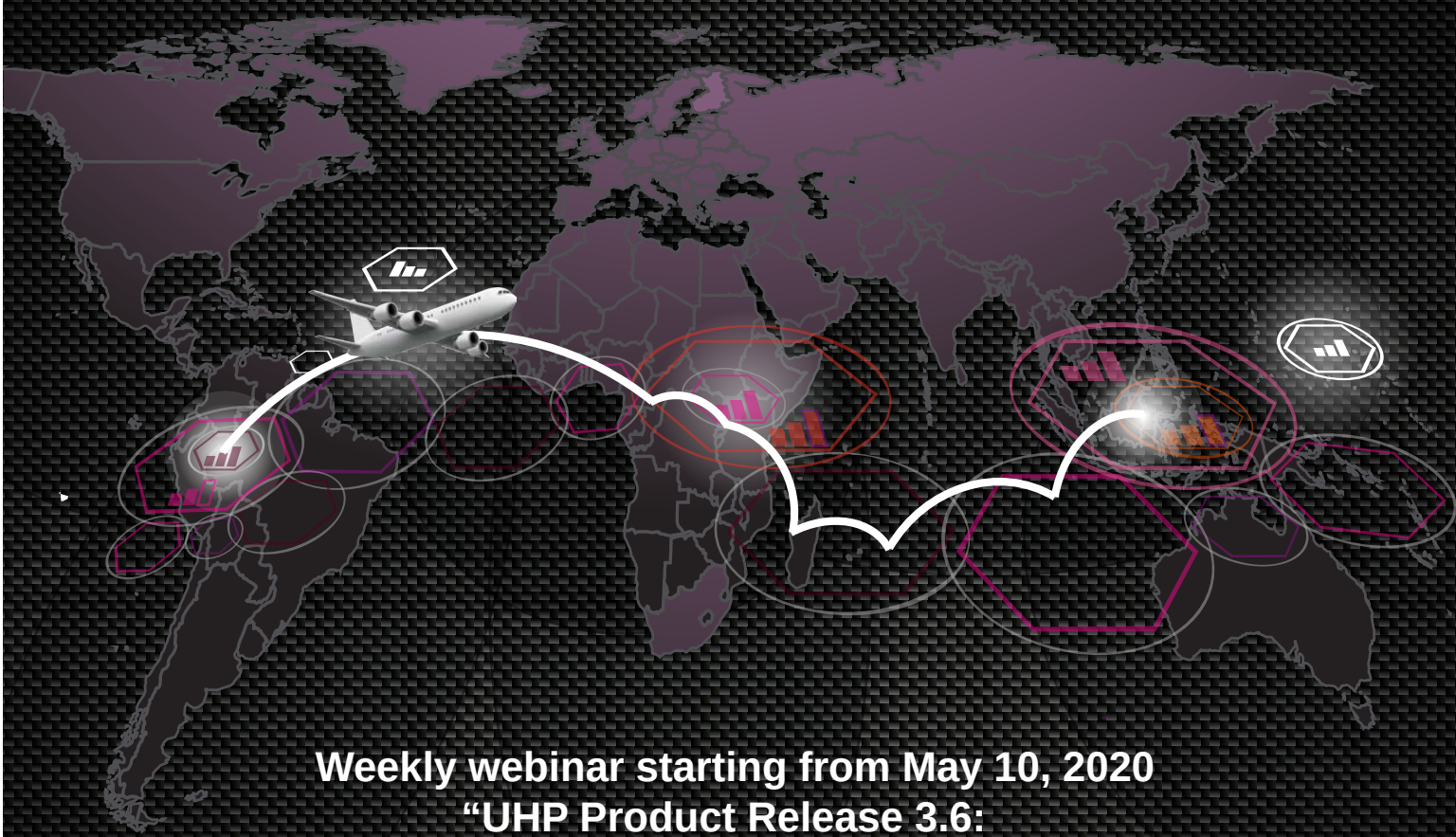

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