Shaping the future of satcoms

Satellite has played vital role for decades, whether it's for communication or entertainment - but is it in danger of being left behind? Robert Shepherd asks the experts

Satellite has attracted many favourable column inches of late. From Starlink, SpaceX's much-hyped satellite internet service to China's mission to dominate space internet, you'd be forgiven for thinking that the technology is going through a renaissance. Indeed, the opportunities afforded by this method of communication is moving at speed in military and defence applications and broadband IP services, to name a few. However, the challenge has been that these advancements have coincided with performance gains enjoyed by other telecommunications systems.

So, with satellite having long been viewed as a technology belonging to a different era, is it going to be playing catch up for a long time?

Sharyn Nerenberg, senior director, corporate marketing communications at Hughes, the broadband satellite networks and services provider, is the first to admit that "unfortunately, satellite has a PR problem", primarily as a result of two misconceptions.

"The first misconception is that satellite is slow – which is a holdover from the early days of the technology and not a reflection of today's satellite capabilities," she says. "Today's satellite technology is much more sophisticated, fast and dependable, able to support speeds of 25 Mbps (the FCC's definition of "broadband") and higher for consumer plans and capable of handling thousands of simultaneous sessions (16,000 in the case of the Hughes Jupiter System)."

Another key player in Asia is Yahsat, a satellite communications company based in Abu Dhabi. Its chief commercial officer Farhan Khan, says satellites "might seem outdated, after all, it's close to 70 years since the first satellite launched into space.

"The Sputnik was a surprising accomplishment for many during the late 1950's and as a result of that success, we have plenty of satellites orbiting the earth's atmosphere enabling humanity to live safer and more connected lives," Khan says. "With rapid development over the past few years in the satellite technology industry, it would be unfair to say that satellites have the same limited functionalities as those launched during the mid-20th century. Like several small and large-scale devices used in the past, scientists and engineers have always found ways to significantly overhaul the functionalities of satellites to make them more efficient, easily

deployable as well as maximising their capabilities."

Khan further argues that "with indispensable functions and a growing range of services", satellites will support disruption on ground, furthering movements like the advancement of autonomous vehicles and other interoperable devices as such which will use satellite connectivity to transfer data, communicate and make decisions. "Private enterprise is investing heavily in R&D and the likes of SpaceX are accelerating the volume of satellites to be deployed. We do not expect the trajectory to change anytime soon, as the future is dependent on better connectivity that is not necessarily dependent on terrestrial networks," he says.

Intelsat I was the first commercial communications satellite to be placed in geosynchronous orbit in April 1965. Terry Bleakley, the current Intelsat regional vice president of Asia Pacific sales, says it wasn't long afterward that satellite moved beyond sending transmissions covering the Apollo 11 moon landing in 1969 over local news stations, to transmitting news and entertainment from around the world directly into homes (mostly rural) via very large, clunky satellite dishes in the backyards along with complicated tuning hardware.

"Eventually the large clunky home satellite systems were made smaller and easier to use, but as time went on and as more people moved from rural areas to urban and suburban areas where cable television was available, people began to view satellite as limited to government and science projects as well as global news feeds by media companies," Bleakley continues. "And since the launch of high-speed internet and the various access technologies, including mobile broadband, high quality transmission of news and entertainment is available anytime, anywhere, even on the move. Quickly, satellite became something viewed as outdated, limited largely to home internet and entertainment in places without access to cable networks." Indeed, satellite technology has clearly come a long way over the decades and Nerenberg cites HughesNet, its flagship satellite internet service, as an example.

"When it first launched, HughesNet enabled service at speeds of around 5 Mbps down," she continues. "HughesNet Gen4 offered download speeds of 15 Mbps. HughesNet Gen5, our current service, offers download speeds of 25 Mbps. Our next satellite, JUPITER 3, will enable service plans with speeds of up to 100 Mbps down."

She says that comparing today's satellite with the satellite service of the past "is like comparing dial-up internet access (remember 56 Kbps service?) with fibre-optic cable services", which are now capable of gigabit speeds. Both are wired services to the home or business, but the technology is drastically different.

"The second misconception about satellite is that it's a substitute for wired technologies like cable and fibre. That is simply not the case," adds Nerenberg. "Where terrestrial connectivity is available, it is always going to be the faster form of connectivity. However, where terrestrial services are not available, satellite offers the best solution for high-speed, reliable connectivity."

Song Lee Meng, director of FSS product and marketing, Singtel

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Now, we're in 2021 and newer technologies are always on the horizon. One of those is 5G, which has been lauded as the step towards a fully interconnected society. Nerenberg argues that satellite is perhaps more relevant than ever in 2021. That's because, she says, the demand for internet access has never been higher and will only continue to grow. "No single transport can meet all of the need for connectivity, and satellite is an essential service in the network mix, enabling access in places where other technologies do not reach," Nerenberg says. "Aeronautical and maritime applications, which wired technology cannot serve, are the most obvious instances. Remote and rural places are also ripe for satellite connectivity. In fact, the GSMA predicts that 5G will cover one-third of the world's population by 2025, leaving two-thirds of the world unserved by 5G."

Khan adds the need for satellite services is not eliminated with the introduction of 5G, "as both can work in a symbiotic relationship", serving the same and different purposes. The next generation of satellites will be equipped to cater to 5G platforms that enhance mobile broadband, better mission critical services, and enable the greater deployment of IoT systems across numerous sectors.

"Our satellites come with the flexibility of catering to 5G platforms and our most recent agreement with Airbus on the Thuraya 4-NGS satellite, will be best suited for a GEO mission, maximising capabilities, cost-effectiveness, security and reliability," he adds. "Reducing costs and increasing benefit to rural communities and non-urban communities which have limited access to 5G connectivity. Working to serve the unserved who might not be able to migrate easily to 5G. This flexibility still exists with satellites. While the industry has anticipated this transition, we have taken action to ensure that 5G was considered seriously with the evolution of our services." He adds that when the Thuraya 4-NGS satellite goes live in 2023, it will be able to cater to enterprise and government clients who have made the transition to 5G networks.

It may also come as a surprise that while 5G is a wireless service, unlike satellite, it doesn't function entirely without wires. That's because the fifth-generation technology depends on cell towers, which connect to the network core.

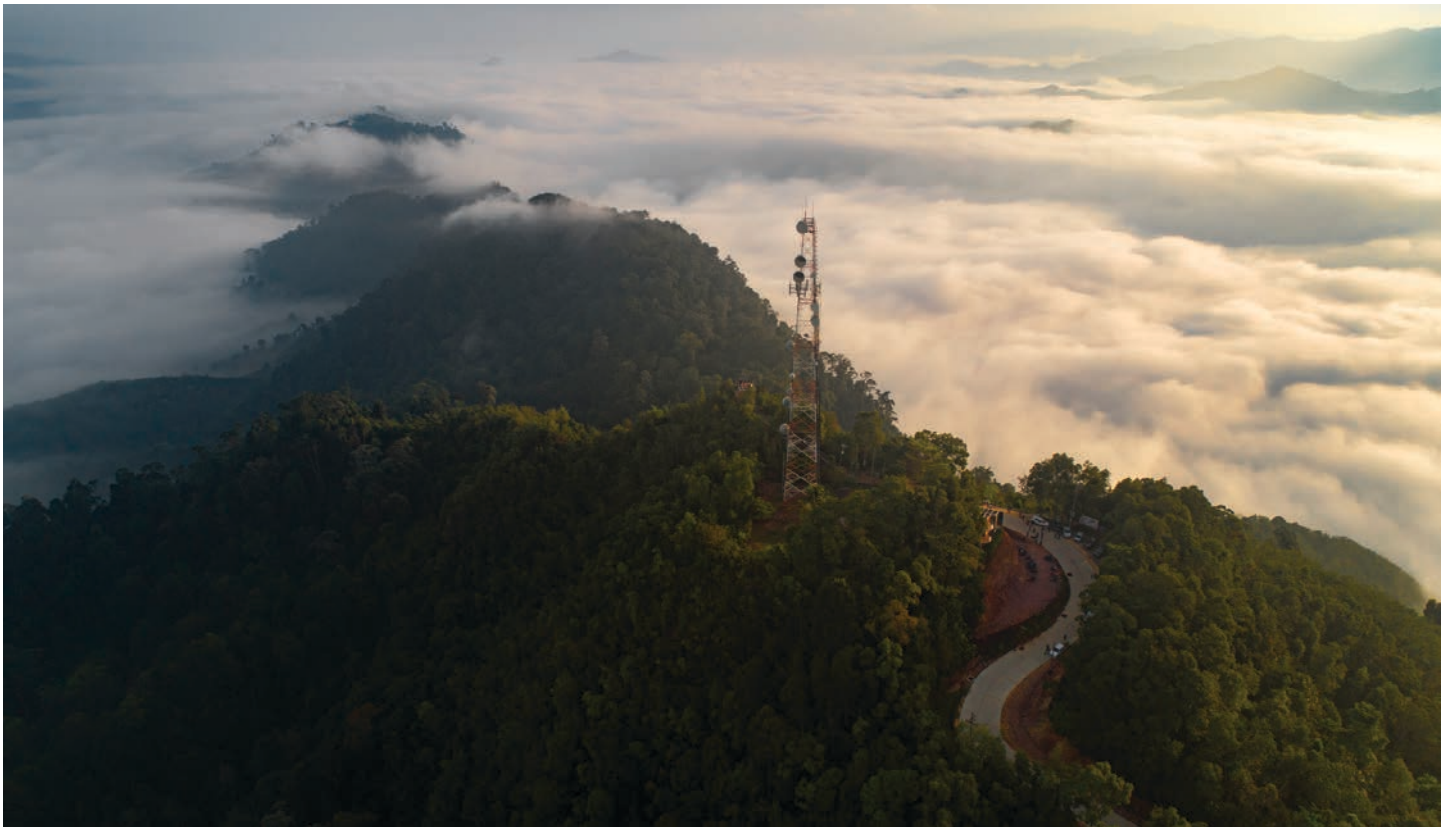
"In urban and suburban areas, that connection comes through fibre or cable," says Nerenberg. "In rural and hard-to-reach places (e.g., islands, mountains, forests, jungles), cell towers are connected by satellite for backhaul to the network core. According to NSR, more than 70,000 wireless towers are backhauled by geostationary satellite today, and that figure is expected to grow as wireless providers extend their networks to serve more people in hard-to-reach places." She says this is why companies like Hughes are working with standards bodies to ensure that satellite technology fits seamlessly into the multi-transport networks that make up what we call "5G" service.

Another satellite provider with a large Asian footprint is Singtel Satellite, a unit of Singapore Telecommunications (Singtel). Song Lee Meng, its director of FSS product and marketing, explains what technology the satellite sector is introducing in order to improve its performance and make it more affordable to compete with small cells towers. "Satellite communications technologies have achieved remarkable breakthrough efficiencies and increases in performance in nearly a half century," he says. "High Throughput Satellite (HTS) can enable high performance and cost-effective links. In addition, the LEO satellites will offer low latency and higher throughput in future which will introduce new capabilities for satcom services. One key technology that will improve satcom capabilities is flat-panel antennas which will be 'a game changer' for expanding the role satellites play in connecting devices to the internet-of-things, assuming the price is right."

For Nerenberg, "our aim is not to compete with small cell towers", but rather to deliver value as part of the networking ecosystem. "To that end, our equipment is in use around the world backhauling more than 12,000 cellular sites across Africa, Asia and Latin America, powering satellite internet services for millions of people and enabling more than 40,000 community Wi-Fi hotspots across the same regions," she continues. "In fact, our JUPITER System is the leading satellite ground system in the world, with more than 50% market share. As the de facto standard for satellite implementations, the JUPITER System powers broadband solutions on more than 40 conventional and high-throughput satellites globally."

Nerenberg argues how continuous innovation has kept the JUPITER System "at the forefront of the industry", from DVB-S2 and DVB-S2X to more recent innovations like return channel adaptive coding and modulation (ACM) to yield up to 30% bandwidth savings, and support of Layer 2 transport – essential for cellular backhaul implementations.

"On the horizon, we are innovating enhancements to the system such as software-defined networking, mobile edge computing, and virtualization with a private cloud to support



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scalability and efficiencies," she continues. "This kind of innovation is essential to support the new class of software-defined and flexible satellites."

It's often said that fibre is cheaper, faster, more reliable and carries far lower latency than satellite. It sounds like a no-brainer when it's put like that, but Lee Meng finds holes in the argument.

"Fibre is subject to terrestrial disruptions and cuts, where satellite has just three potential points of failure: the satellite, the hub and the satellite terminal, each of which has built-in redundancy in case of failure," he says. "It is also difficult to lay the last mile fibre due to challenges on the ground.

Most enterprise applications are not time sensitive. Therefore, satellite can be a good alternative as the main or backup connectivity but when companies are located in remote places, satellite communications can be the only option in providing ubiquitous and instant coverage in these zones."

In fact, there are those who are of the opinion that not only is satellite a viable alternative, to fibre, but it's actually more reliable. Nerenberg says that is most certainly the case when it comes to manmade and natural disasters, to which fibre is vulnerable. "This is why satellite makes the ideal transport for disaster response and recovery as well as critical back-up to enterprise and government fibre networks," she adds. "Then, I would say that we do not intend for our satellite services to compete with fibre. They are different - just the same way that a pick-up truck and a sedan serve different needs. Both forms of transportation have their own specific benefits and trade-offs. You probably wouldn't use the sedan to haul construction debris or landscaping equipment, or to traverse a mountainous dirt road or through a jungle. And the pick-up truck would be unwieldy and uncomfortable (not to mention inelegant!) in a city centre. Satellite-based internet goes where fibre providers do not.

It's a view shared by Martin Jarrold, chief of international programme development at satellite body, GVF. "Copper or fibre lines are most applicable for urban areas and not economically viable for rural areas due to distance and terrain," he says. "For microwave transmission, line of sight and flat terrain needed to be cost-effective, with limited rural/remote application. Satellite is increasingly the backhaul of choice and only solution for rural/remote deployments."

Looking ahead, data consumption is only going to grow and it's no secret that satellite faces challenges in this space.

However, Khan says that while there are limitations, network infrastructure and capabilities continue to mature and develop at such an incredible rate. Yahsat, for example, is developing ways to overcome the obstacles that are posed by satellite data limits. "We remain committed to R&D in the field of satellite communication, and the development of new features and functionalities that meet the requirements of today's users," he adds. "With new emerging data requirements, at Yahsat, we have been developing next generation systems that will have a wide spectrum of data services catering to throughout requirements ranging from low (20 kbps) to high (more than 1 Mbps) for various verticals and applications. To this end, our next generation satellite system has nearly doubled throughput of data products as the MSS/L-Band design offers optimised data rates."

Nerenberg agrees that the challenge "and the opportunity" for satellite providers is to serve the growing demand for bandwidth with a finite resource. She warns that serving more customers is not as easy as running a connection to new customers' homes – it requires building and launching a new satellite. "That said, Hughes has been in the business of supplying satellite internet longer than any other provider, and we have learned a lot along the way," she says. "We are constantly improving and advancing our offerings to better serve our HughesNet customers, who have been largely overlooked by other providers. This is why we continue to innovate and implement network optimizations, such as automatically saving data when streaming video or using artificial intelligence to detect and triage potential network issues."

Yahsat's Thuraya 4 – NGS is an example of how the operator is overcoming data limit challenges, as the satellite is designed to be highly flexible and agile. "This is so that we can integrate new technologies on the ground, which provide considerable edge, given the challenges and dynamics in the industry which includes a wide spectrum of data service," says Khan.

Hughes is equally optimistic about what lies ahead. "Looking to the future, we see many opportunities to continue enhancing our service – from the launch of our JUPITER 3 satellite... to implementing multi-transport solutions combining a low-latency transport such as LEO or wireless as a complement to the high-capacity/ low-cost GEO service," concludes Nerenberg. ■