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Virtualizing Satellite Communications

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Digital transformation, also known as Industry 4.0, is taking place across businesses around the globe, and the stats prove it. According to Flexera, 74 percent of organizations consider digital transformation a top priority. Accenture says that Cloud, AI, and the Internet of Things are the top three areas companies are scaling up. Baker McKenzie states that a huge 77 percent of companies have already embarked on their digital transformation journey.



Our world is already connected to some degree, but this is now set to turn into hyper connectivity, where everyone and everything is connected, monitored, and optimized to make the world run more efficiently through 5G and the network of networks. To enable this, ubiquitous connectivity must be achieved with different access technologies interwoven, interoperable, and working together in a seamless manner to provide the most suitable communications access for the use case in hand. This will ensure that seamless connectivity is made available to all, and that a user can move between each access technology without so much as noticing it.

A New Connectivity Era will Need Satellite

In parallel to the changes that are engulfing industry, the satellite sector is also undergoing the biggest transformation in its history. Previously a technology that stood on its own, satellite is now beginning to integrate itself into the wider telecommunications fabric, bringing its unique capabilities of scale, reach, and reliability. No other technology has the capabilities that satellite brings to the table. Unbound by terrestrial limitations, it can take connectivity to anywhere, no matter how remote. With [2.6 billion people](#) on the planet still unconnected, this capability is priceless.

As cloud adoption increases, and there is a move from traditional analogue to IP, satellite will allow access anywhere, bridging gaps that currently exist in cloud infrastructure. However, to make this transition to the cloud, the satellite industry must make fundamental changes, and it's a complex journey that's being embarked upon.

Previously dependent upon physical hardware, the satellite sector must now virtualize itself to enter this new cloud era. It must also embrace standards from the telco world. This transformation will open up broad avenues of opportunity for satellite service providers, satellite operators, enterprise customers, and everyone in between.

Satellite's Renaissance

The satellite sector has stood somewhat alone in the world of connectivity. It's very often misunderstood as simply last mile connectivity that is latent and comes with a big price tag. However, this is simply not the case. As previously stated, satellite technology has advanced a long way in a short time and is going through its own period of transformation which, in turn, is positioning it for the future.

The last decade has seen the emergence of new, High Throughput Satellites (HTS) that have both increased bandwidth and performance and lower price per bit. Satellite platforms are also becoming software defined and therefore highly flexible, able to serve many use cases with a single payload. They are reconfigurable, unlike traditional satellites built for a specific application areas. Satellites also feature steerable and splittable beams that can be directed to cover different coverage areas, thereby enabling ultimate flexibility.

Then there is also the advent of multi-orbit constellations in LEO, MEO, and GEO, comprising hundreds and even thousands of small satellites that offer low latency, high performance connectivity.

These changes are allowing satellite to rival terrestrial technology. It's finally moving into the mainstream, having to adapt and transform itself to fit into the advancing world of communications that we live in today. As we move towards a fully networked world, the satellite industry is starting to embrace the telco world, along with its standards, so that it can integrate much more easily into the wider connectivity landscape.

Digital Transformation – Enabling the Cloud

The stats shared earlier in this article illustrate that the majority of industrial sectors are beginning to use revolutionary technology such as the cloud to enhance and empower their businesses. The cloud enables service providers to scale up massive networks in reduced time with less capex and faster, more cost-effective scale. It also facilitates a distributed, reliable architecture with access to greater security, proven management tools and streamlined operations. Through cloud-based services, providers and satellite operators can gain access to a complete family of networking applications and can then package them into advanced service offerings that will provide customers with not only satellite connectivity, but also cybersecurity, hybrid networking, application-based QoS, and end-to-end service orchestration. The cloud is transforming the business connectivity landscape. It makes data available anywhere, but it's

critical that there are access technologies that ensure that this data is available ubiquitously. Satellite is needed to achieve this. It's the only technology that can reach any region.

What does Virtualize Mean?

Virtualization in the satellite sector will have to be embraced if it is to break away from being a niche communication method compared to the broader telco market. Satellite must be a transparent communication method in larger network solutions. At present, it's not trivial to integrate a satellite link into those wider solutions, both from a technical and business model perspective.

The priority for satellite ground infrastructure providers will be to match new on-orbit capabilities with those on the ground. Without ground segment technology, the benefits of NewSpace can't be realized and, as with satellites, the ground segment must also become software defined, agile and flexible. To do this, it will need to be virtualized by a move from physical hardware to software to enable it to embrace new use cases and improve overall operational efficiency. This process will involve every aspect of the satellite ecosystem: teleport, gateways, operators, service providers, and ground system vendors. It will ultimately result in reduced costs and complexity and create opportunity to expand markets.

Given that the sector has been slow to adopt an open architecture, by assuming best practices from the telco and IT worlds, the satellite industry can adapt to the needs of the market and advance to adoption much more quickly. Creation of a fully digital ground segment also means that it can also better integrate to enable 5G and the network of networks.

Establishing a Standard

Standards are a critical part of ground segment evolution. Converting hardware into software where it is installed and managed remotely via third-party data centers will give satellite operators more flexibility over their networks and speed up how quickly they can respond to customer demands.

The digitization of teleport infrastructure will mean that their functionality can be run on private or public cloud platforms. Cloud Service Providers (CSPs) are preparing to accommodate satellite technology and standards will be a big enabler in making this happen.

The telco industry embraced standards such as 3GPP and MEF long ago and runs on an open architecture. The Digital Intermediate Frequency Interoperability (DIFI) Consortium was created to develop a standard that will enable the digital transformation of space, satellite, and related industries by providing a simple, open, interoperable digital IF/RF standard that replaces the natural interoperability of analogue IF signals and helps prevent vendor lock-in.

Members of DIFI have already worked to create an open and transparent standard, developed and adopted not by vendors alone but by users, operators and vendors working together. It's critical that the standard meets the very wide range of needs but without becoming too expensive or complicated to implement. Instead, it must reduce total cost of ownership whilst

boosting network and terminal agility and must be able to allow the ground segment to deal with evolving payloads, orbits and constellations. Kept simple, the standard will be rapidly adopted.

Leveraging the DIFI standard, the management of the teleport will be simplified. The standardization will result in flexible delivery over IP connectivity; in simplified maintenance as teleports will draw upon one common pool of human resources; and will also allow for the use of COTS hardware which in turn will result in lower costs.

A New Golden Era

Though this is the start of a journey for the satellite sector, the virtualization and standardization that will transform it will open up a world of opportunities for the entire satcom industry, enabling use cases that are only just emerging – and some that haven't even been anticipated yet! However, to make this happen, the industry has to come together and work as one to establish the standards that need to be put into place to achieve success. Once realized, the virtualization of the sector will open the door on a new, golden era for satellite communications.