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# Wi-Fi and Ubiquitous Wireless Connectivity for People and Things

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Terrestrial network solutions don't typically work so well at sea and in the air. Simply put, moving (especially at high speed) and being distant from antennas and masts creates unique challenges for the delivery of reliable connectivity that meets the bandwidth requirements of a business' operating systems, crew, and passengers.

Satellite is a critical component to overcome these challenges and deliver a high-quality and high-capacity service that today's maritime and aeronautical companies require. Satellite can enable these businesses to implement digital transformations that bring enormous commercial benefits.

And, as we move into a new era of 5G-powered connectivity, the ability to marry these technologies into satellite will be key—moving beyond just the ability to provide reliable connectivity but implement economically competitive and efficient networks.

## What's the Wi-Fi password?

Customer requirements for reliable, residential-like connectivity speeds on passenger flights have risen over the past decade. The reality of 21st century life is omnipresent access to reliable, high-performing broadband, and savvy passengers are beginning to expect in-flight connectivity (IFC). We can get Wi-Fi in almost every other public space, so why not in an aluminum or composite tube moving at 600 mph while 30,000 feet in the air?

In an era of lower traveler numbers and increased competition in the market, it's critical that airline operators can set themselves apart and offer new and enticing experiences to their passengers, for whom Internet access is key. Respondents to a recent international Inmarsat

survey ranked passenger experience as the most important factor when it comes to the enjoyment of a flight.

Operational requirements such as maintenance, crew communications and applications also require high-bandwidth IFC. Leveraging top-performing connectivity can enable a strong business advantage in terms of customer loyalty, crew productivity, and company profitability.

But it's not just the global carriers that will benefit from IFC. Business aviation is actually leading the way in its willingness to pay for IFC service as long as it is high quality and always available. Similar to the yachting market in the maritime world, quality of experience (QoE) expectations are even higher than on commercial passenger aircraft.

Beyond the pure delivery of reliable in-flight Wi-Fi, or quality of service (QoS), the 'holy grail' of the highest degree of customer satisfaction is in a user experience that rivals that on land where connectivity seamlessly passes from airport to tarmac to in-flight and back again. Users don't want to log in to multiple interfaces as they go from home to school to the store. Rather, where technology is concerned, the more often things 'just work,' the better. Seamless connectivity therefore is the panacea. Cellular, wireless and satellite businesses see that, for their services to be useful, they need to be easy to use.

Therefore, telecom stakeholders are devising standards for the likes of automatic login on all devices, multi-system access points within the aircraft for LTE, Wi-Fi, IoT and 5G, and app servers that can enable unique passenger and operational applications. Invested stakeholders want to play a role in streamlining system integration and certification, enabling simplified billing across stakeholders, increased passenger accessibility, and open specifications for interoperability. The intended result of all this collaboration is passengers using their own devices in the air as easily as they do on the ground.

## Waving goodbye to choppy connectivity

Another key industry for connectivity on the move is the maritime industry. It can be divided into multiple segments such as merchant, fishing, passenger, leisure and offshore, each one showing different dynamics, growth prospects and requirements.

Demand in maritime passenger markets is expected to reach 47Gbps by 2026 according to NSR. As traffic demands surge, the number of devices per passenger per ship increases, and vessel numbers grow, value-added connectivity services are becoming a bigger selling point for the cruise market than ever before. Cruise ships are demanding hundreds of Mbps for passengers, who are often bringing more than one device onboard.

And while passengers expect bandwidth for entertainment, such as streaming video and high-speed Internet, crews on board these vessels are dependent on Internet, too. The crew and captain require more bandwidth for applications such as telemedicine, crew welfare, navigational charts, weather pattern monitoring, mechanical system monitoring, POS and inventory management, and more.

## Commercial interests

It's not just passenger vessels that are driving demand and standards. Connectivity is needed to enable greater operational agility and intelligence to cargo vessels navigating through busy shipping lanes. From factory or farm to the shelf, cargo tracking to ensure monitoring, surveying, asset management, regulatory compliance and theft protection is critical for logistics companies. Likewise, Smart Shipping, using real-time data from fleets, can provide information on tracking, route information, imagery, and monitoring to optimize journeys as well as the condition of goods in transit.

On these cargo ships, it's also critical that crew welfare is prioritized. Crews that might be away from shore for up to six months at a time—or sadly stranded even longer in recent Covid-related scenarios—need access to connectivity for Internet entertainment, email, chat applications, and social media to stay connected with friends and loved ones.

## Maximizing the role of satellite with 5G

In mobility markets, satellite is almost unchallenged as the primary deliverer of connectivity. This is understandable given its multiple inherent benefits; the remote location of maritime vessels and airplanes coupled with satellite's near-ubiquitous coverage make it the obvious option. Yet, the "hybridization" of connectivity—choosing the optimal access network for mobility as it allows users to stay connected while moving from place to place—and 5G is the next evolution for mobility.

Satellite service providers do an excellent job stitching together different networks today. In the future, however, they will be able to offer a much wider range of services in a 5G environment. 5G is more than just the next generation of networks. It is a network of networks with standards developed to integrate different access networks, whether cellular, satellite, Wi-Fi, or others into a seamless operating environment.

Hybrid connectivity will benefit mobility users, both near shore and at sea, and from the ground to the sky, leading to great improvements in operational efficiency, quality of experience for crew and passengers, and situational awareness. The adoption of standards will also bring down the costs of equipment and service in what has traditionally been an expensive niche.

## Hybrid networking

5G is a core component of network hybridization. This is the ability to intelligently switch between transport technologies, or in some cases even bond transport technologies. Not only should this deliver least-cost routing solutions, but multiple access networks will deliver a more reliable androbust service. This includes not only satellite connectivity, but the ability to also incorporate cellular and Wi-Fi or Wi-Max, depending on the vessel's location.

5G also provides the option to deliver different types of data over different access networks if required. To do this, satellite technology needs to integrate into core "telco network" initiatives and standards**.** 5G standards adoption delivers seamless handover between these networks so

that the user experience is enhanced, and service level agreements (SLAs) can be maintained. Satellite technology needs to enable 3GPP networking and orchestration technologies to work in unison across multi-orbit satellite, terrestrial and mobile networks to enable truly seamless service.

To do this, many companies in the satellite industry are adopting standards-based technologies from the telco and IT world into the satellite world. By adopting virtualization best practices, the satellite industry will play a key part to enable network operators to build out massive networks in less time, enabling faster, more cost-effective scale and operations based on dynamic, consumption-based options. New satellite technology standards will enable cloud applications through cloud-based architectures.

## Standardizing the ecosystem

Through standardization, 5G will enable mainstream integration of satellite and other non-terrestrial networks into terrestrial networks where they have previously been more complicated to integrate, highly customized, and therefore, more expensive. The proliferation of new satellite technologies such as software-defined satellites and new NGSO constellations will increase choice, access options, and available bandwidth, to make the economics in our part of the industry more competitive.

The merger of satellite, mobile cellular, fixed broadband, and local area networks into converged solutions will support faster speeds, greater capacity, massive scalability, ultra-low latency, and high reliability. This will create a seamless environment with vastly improved QoS based on maximum bandwidth for the applications running in real-time.

Through satellite 5G, service providers will be able to exchange inflexible, hardware-based networks for reconfigurable, software-based networks. This will bring real benefits to the mobility sector that will enable reduced lower total cost of ownership, easier compliance, greater visibility, and quicker, centralized decision-making. It will enable operation from the cloud and reduce implementation from weeks to minutes. Furthermore, users will be able to access the networks from anywhere and edge computing can enable higher performance and a better experience.

## A vision for the future

The importance of driving the new 5G standards for satellite networks means building the principles of Evolved Packet Core (EPC), multi-waveforms, edge computing and cloud into VSAT platforms to develop a satellite 5G architecture. It means fostering collaboration and standards through industry bodies like the 3GPP and driving 5G satellite innovations in trials with NGOs and governmental organizations alike to ensure security and compatibility.

The 5G standard can virtualize, automate, and streamline service delivery, and this standards-based access is the path to fully converged end-to-end networks. For the mobility industry—for which reliable connectivity is so critical, for passengers, crew, and operations—this means better, more efficient networking. And it means a new standard of connectivity on the move.