

Rethinking Roaming

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Introduction: Connectivity is critical for sustainable social and economic development

In 2022, according to Omdia, mobile network operators (MNOs) will generate \$840bn in service revenue, equivalent to 1% of the world's nominal GDP. However, the benefits of connectivity stretch far beyond its direct economic contribution: it also helps to improve people's lives and to combat climate change.

The COVID-19 pandemic has reinforced the critical role that connectivity plays in our lives. Ongoing changes in consumer and enterprise behavior, such as the shift to entertainment consumption online, the migration of workloads to the public cloud, and the remote monitoring and management of things, will only increase the demands on connectivity.

The dual challenge for the telecom industry will be to bring connectivity to areas and people unserved today and to improve the quality of connectivity for urban, rural, and remote areas, including the seas and the skies.

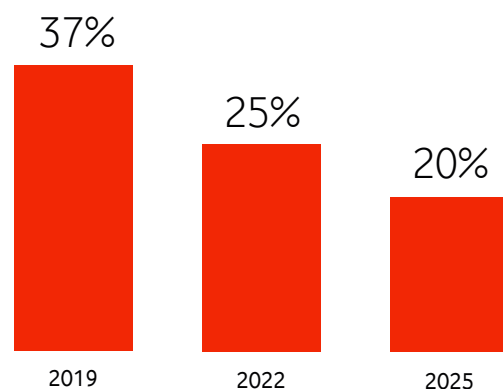
The lack of universal access to connectivity represents a missed opportunity for the telecom industry and impedes social and economic development in unserved or underserved regions.

Gaps in fixed broadband coverage and the need to connect remote or moving people and things mean that cellular technologies will play a central role in tomorrow's connectivity fabric.

In the future, mobile users will expect their devices to connect effortlessly wherever they are; switch seamlessly and securely between public and private cellular, Wi-Fi, and other types of network; and access the same applications and similar experiences at home and abroad. Likewise, enterprises will expect their Internet of Things (IoT) assets to work across the world, right out of the box.

The challenge for the mobile industry will be to deliver on these expectations and catalyze the promised socioeconomic and environmental benefits. To do so, collaborative innovation between MNOs and the wider technology ecosystem is a must.

Global unconnected addressable population % of total population



The revitalization of roaming

Lockdowns and restrictions on domestic and international travel for much of 2020 unsurprisingly meant reduced roaming activity and associated revenue for MNOs and their partners. But they did not curb all activity. Those that were able to travel used their smartphones to call or send messages to family, friends, and colleagues and to access important information and entertainment online more intensively than in prepandemic times.

The restrictions on human travel also had the unintended consequence of exposing low- or no-traffic roaming cellular IoT devices, including permanent roaming devices, that had fallen below the radar of MNOs' analytics tools and had not been monetized effectively.

Predictions of “a new normal” or a “recovery or rebound in roaming” tend to overlook the complex mix of commercial, regulatory, technological, cultural, and psychological factors that shape the decisions of enterprises on whether to travel abroad.

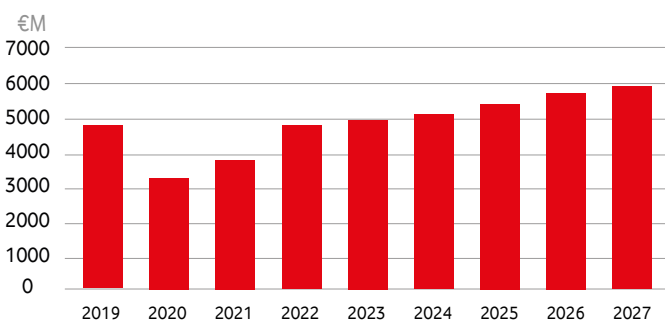


Resilient connectivity enabled colleagues to continue to collaborate and enterprises to stay connected with clients, suppliers, and partners during the pandemic. But the somewhat impersonal nature of interaction on communications platforms means that for many they are second best to face-to-face contact for critical activities such as contract negotiations, marketing a new solution, troubleshooting, or training.

The continuing internationalization of business, including the globalization of supply chains, means that face-to-face contact will be as important as ever.

However, enterprises and their suppliers should think less about roaming in its traditional sense of access to voice, messaging, and data when abroad and more about what experiences and applications business travelers will require from connectivity when they are traveling, whether that is seamless access to cloud-hosted technical or customer data, the ability to run high-definition training videos, or low-touch switching between mobile and Wi-Fi networks.

Europe: Wholesale roaming-in revenue (€M)



Source: Omdia 2022

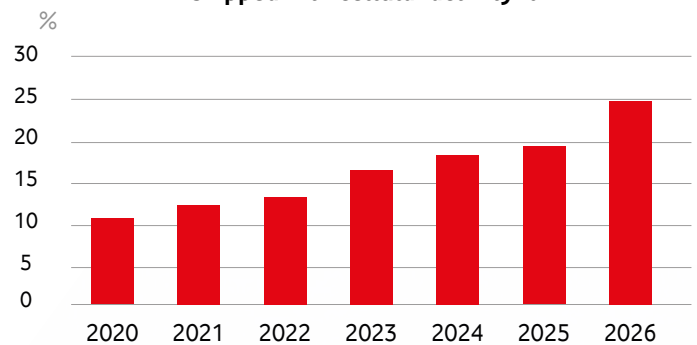
Enterprise priorities will continue to evolve

The need to be agile, flexible, and responsive to rapidly changing commercial and technical requirements during the COVID-19 pandemic drove the acceleration of several preexisting and related enterprise trends: first, the shift to remote or hybrid working; second, the digitalization of both internal processes and client-facing activities; and third, the migration of various types of workloads to the public cloud.

Omdia's Future of Work survey 2021 (August 2021) found that nearly 60% of the workforce of surveyed enterprises intended to work from home or remotely on a permanent basis, and another 18% would be hot-deskers. Work, therefore, will be a thing people do rather than a place people go. This shift in mindset will trigger increased enterprise attention to mobility among IT (and HR) departments: employee experiences, productivity, and security should be top of mind.

Enterprises need to think beyond the office/remote/hybrid thinking that was shaped during the height of the pandemic when international business travel was severely restricted.

Share of global notebook and tablets shipped with cellular activity %



Source: Omdia 2022


For enterprises, tomorrow's international business travel should encapsulate two things: first, the same level of technology-enabled employee experiences, productivity, and security when abroad as in the home country, and second, the enriching of in-person interactions with clients and prospective clients using digital technologies.

For employees, this will mean low-touch, secure roaming between Wi-Fi, public cellular, and the growing footprint of private cellular networks and seamless access to (coupled with robust performance in) cloud-hosted applications, services, and data.

Traditional thinking about work also tends to overlook the fact that the seas and the skies are workplaces for many. The seas are where much energy is extracted and routed and therefore where robust connectivity is required. Likewise, the skies represent major transport routes for people and goods. On the seas, as in the skies, employees, travelers, and IoT devices need to send and receive important information quickly and securely.

Close collaboration between the satellite industry, which specializes in building digital bridges to distant places, and the mobile industry, which builds the devices and connectivity for tomorrow's enterprise and consumer services, is required to extend robust and accessible connectivity to sea and sky.





Consumer services: The importance of quality of experience and quality of service

More than ever, the smartphone is the gateway to consumer services, entertainment, and experiences. Future enhancements in smartphone display and processing technology and in 5G's reach and performance will be the enablers.

A number of consumer trends will drive rapid growth in mobile data consumption. The latest Omdia consumer survey has found that today most consumers between the ages of 18 and 44 watch some form of live or on-demand TV/video content outside their home on mobile devices. Growing adoption of 5G smartphones will be one of the drivers of a doubling of consumer spend on cloud gaming between 2022 and 2026.

Today we are in the early days of consumer virtual reality (VR), augmented reality (AR), or mixed reality (MR) experiences. Getting the right balance between display, processing, and power consumption to bring ever more immersive, sensory, and interactive experiences to VR or AR headsets, smart glasses, or other standalone wearables remains a work in progress for the technology industry.

Diversification beyond the smartphone is a key strategic goal for chipset vendors, tech giants, and major hardware manufacturers alike. This represents an opportunity for MNOs: they will need to think carefully about how to meet the heightened technical requirements of such extended reality (XR) experiences and about avenues to monetization from both consumer (B2C) and content providers (B2B2C).

The growing importance of a consistent level of performance for consumers has already prompted an increasing number of MNOs with commercial 5G services to introduce pricing based on speed tiers or hybrid pricing based on speed tiers and data tiers. Such performance-based pricing, as well as the concept of shared data plans (allowing data to be shared across multiple devices), needs a rethink for tomorrow's roaming environment.



Average global cellular
data traffic per subscription
per month will nearly

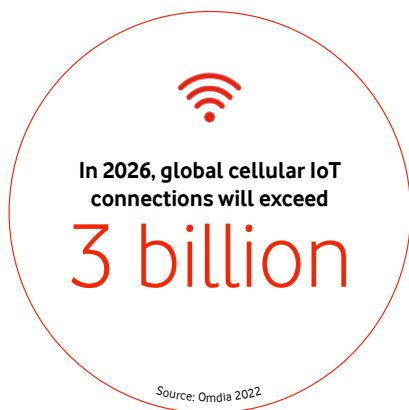
triple

between 2022 and 2027

Source: Omdia 2022

Cellular IoT: Proliferation and interaction with the physical world

It took around 25 years from the introduction of the world's first cellular module for M2M for global cellular IoT connections to hit the 2 billion milestone. According to Omdia forecasts, it will take another five years from now to connect an additional 1 billion cellular IoT devices.



Several interrelated drivers will be behind the acceleration of cellular IoT. An aging population and skills shortages will increase the need to automate previously physical processes. The requirement to conserve energy and reduce waste and emissions—be that in the supply chain, factory, or farm—will require the ongoing monitoring of the location, condition, and performance of all manner of infrastructure, machines, and vehicles.

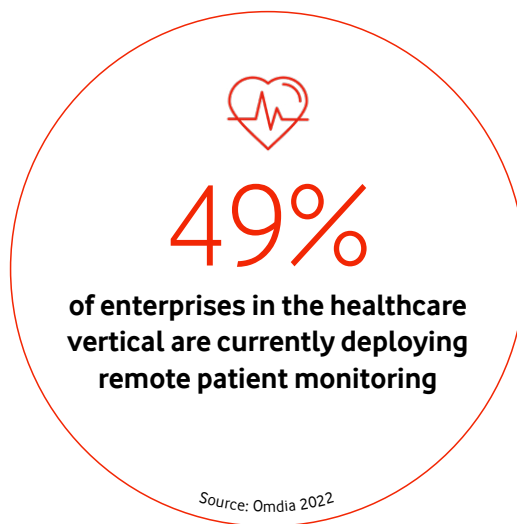
One of the historical challenges for multinational companies (MNCs) has been the cost and complexity involved in deploying and managing their IoT estate across diverse geographical regions. For the cellular IoT to scale further, we need to get to a point where cellular IoT modules can be integrated at the time of device production, work globally right out of the box, and be configured and managed by nontechnical specialists at MNCs.



Big policy changes across the world in areas such as transportation, urban planning and governance, and healthcare, will have a seismic impact on the technical requirements of cellular IoT in both domestic and roaming environments. For instance, MNOs, car manufacturers, and other partners will need to prepare for a future in which cars can not only roam across borders but also interact with local infrastructure in nondomestic environments. This will raise the bar on network availability and low latency when roaming.

Remote healthcare monitoring and initiatives such as the European Health Insurance Card (EHIC), which provides free healthcare to EU citizens in other EU countries, have already transformed the care of sufferers of chronic diseases such as diabetes and given peace of mind to travelers.

Early interventions, based on timely and accurate information about patients' medical histories, are critical to achieving a positive outcome when they fall ill. A future challenge for the healthcare industry, in partnership with insurance companies and the telecom and technology ecosystem, is to not only digitize healthcare records but be able to expose them securely to qualified people in roaming environments while respecting privacy.



Cellular and satellite will be partners in tomorrow's connectivity fabric

Physical, environmental, regulatory, and financial barriers mean that no single telecom operator or connectivity technology can provide ubiquitous coverage by land, sea, and air.

Domestic and international cellular roaming plugs many gaps but by itself is no panacea in areas of zero coverage or weak coverage and quality of service (QoS).

Improvement in the economics of satellite technologies, particularly launch costs, and their technical performance in terms of bandwidth, capacity, and latency have made them a viable option for telecom operators seeking to extend broadband to rural and remote areas and improve the capacity of cellular backhaul links into remote base stations.

However, today's GEO (geostationary orbit), and non-geostationary satellites (NGSO) such as those in MEO (medium Earth orbit) and LEO (low Earth orbit), may not reach the areas where it is either cost prohibitive or almost physically impossible to deploy, provide power to, and manage terrestrial mobile infrastructure.





These physically challenging areas, such as mountainous areas and remote coastal locations, are also home to more than their fair share of natural disasters including avalanches, wildfires, flooding, and landslides. Technology advancements have improved our ability to predict and respond to impending natural disasters. The challenge lies in communicating urgent information to local inhabitants before or after a natural disaster so they can act appropriately.

This is one of the reasons why MNOs are showing growing interest in companies such as AST SpaceMobile and Lynk, the latter of which plans to offer commercial services via an MNO partner before the end of 2022, having completed precommercial tests involving live connections to thousands of unique devices including smartphones, tablets, and IoT devices earlier in the year.



**An ever-growing
array of Tier 1 telcos are**

**investing
in satellite**

**technology or partnering
with satellite operators.**

Source: Omdia 2022



**Cellular and satellite will
be allies in bringing the**

**social and
economic**

**benefits of connectivity to
unconnected regions
and people.**

Source: Omdia 2022

Though the technology behind these companies (and their rivals) is different, both aim to provide connectivity directly to standard mobile handsets via “cell towers in space,” satellites in LEO that replicate the functions of terrestrial mobile cell towers. Such technology is still at an early stage in terms of deployment and the range of services it can offer.

The potential socioeconomic impact of connecting the quarter of the world’s addressable population that is currently unconnected is immeasurable. The ability to receive emergency alerts, send and receive messages, and access mobile money services is taken for granted across much of the world but can be life changing for the unconnected.

Rethinking roaming for tomorrow

Both the roaming ecosystem and enterprises need to rethink roaming for tomorrow.



Roaming requirements will diversify

Over the next decade, the types of devices connecting to cellular networks will become much more diverse, and so will the areas where cellular connectivity is needed, from challenging remote or rural areas to the seas and the skies. At the same time, the performance requirements of mobile services and applications will grow, requiring MNOs and their partners to work closely together on how heightened QoS and quality of experience (QoE) demands will be met in both domestic and roaming scenarios.



Abstract complexity for the end user

The diversification of roaming requirements means increased complexity for MNOs. Meeting challenging end-user requirements will require much “under the hood” reconfiguration involving enablement of local breakout (LBO) and integration of artificial intelligence (AI) and machine learning (ML) to handle increased complexity, including the management of different types of traffic. This will require MNOs to deepen their collaboration with each other and, as in other areas of their business, with network equipment providers, cloud players, independent software vendors, and analytics providers. Technical complexity will also make for more complex total cost of ownership (TCO) considerations. MNOs must abstract such complexity for enterprise and consumer end users and articulate what types of connectivity they can offer, at what ranges of performance, and with what type of pricing.



Enterprises must also “rethink roaming” and take a partnership approach with MNOs

The restrictions on international travel during the pandemic forced enterprises to quickly equip remote workers with the digital tools they needed to collaborate with colleagues and interact with clients and partners. Now enterprises need to think about how to enrich international travel and face-to-face interactions with digital tools. Enterprises will need to consider what experiences they require in roaming environment and how they expect their services and applications to perform. As they plan for the future, they should engage closely with MNOs on their performance and commercial requirements.





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