DIFFERENTIATED CONNECTIVITY SERVICES IN 5G STANDALONE ARCHITECTURE

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ABSTRACT

Standalone is a 5G network construction technology in which the network is deployed on completely new hardware with a separate core. This contrasts with Non-Standalone (NSA) mode, in which the 5G network is deployed on existing 4G network infrastructure (LTE is used for connection management, and 5G for data transmission). This technology enables the full benefits of fifth-generation networks: high mobile internet speeds, ultra-low latency, and more reliable connections. It supports high-density deployments, such as IoT scenarios with dense populations of sensors and controllers in smart buildings, ensuring full next-generation capabilities. This review is based on the "Ericsson Mobility Report 2025" and considers differentiated connectivity services in 5G standalone architecture, speed-based FWA offerings, standardization issues for 6G, the global momentum in commercial differentiated connectivity services, and modernizing enterprise IT with 5G. The result is a more dynamic balance, where networks must support both the growing appetite for real-time cloud and the efficiencies that keep bandwidth use sustainable. Understanding this interplay is key to preparing for the next wave of connected intelligence. The convergence of AI, cloud computing and mobile technologies represents one of the most transformative shifts in the digital era. Together, they create a powerful ecosystem where intelligence, scalability and accessibility reinforce each other: cloud platforms provide the computational infrastructure and storage capacity needed to deploy and train advanced AI models; mobile devices serve as both a data feed and the end-user interface to deliver these AI-powered cloud services, enabling personalized and context-aware experiences in real time; and networks provide ubiquitous and dependent connectivity between cloud and devices.

KEYWORDS: *Standalone, 5G, 6G, artificial intelligence, FWA, cloud computing, mobile technologies.*

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1 Introduction

Differentiated communications services in the standalone 5G architecture is a concept that allows operators to offer services tailored to the specific needs of consumers and enterprises. It is implemented through network slicing. Independent virtual segments (slices) are created on a single physical connection for different services or clients. Within a segment, the user is guaranteed the connection parameters they require - speed and latency - regardless of the overall network condition.

The purpose of network slicing is to provide dedicated virtual circuits that prioritize differentiated connection characteristics [7]. Some of these include:

- uplink and downlink bandwidth;
- latency;
- enhanced security and traffic isolation.

A single network slice can serve multiple applications if they have similar connectivity requirements. For example, a slice optimized for high downlink bandwidth can support ultra-high-definition video streaming (4K and above) and large-scale file transfers.

Service providers can monitor and scale the throughput of each segment to optimize network utilization.

Some use cases for which network segments are created:

- High-speed data services for consumers;
- Reliable, low-latency connections for mission-critical industrial applications;
- Massive Machine-to-Machine Communications (mMTC) – for devices where autonomy and a large number of network connections are essential (e.g., water, gas, and electricity meters, street lighting controllers).

Dedicated network segments for mission-critical applications, such as police departments, where flexibility and quality of service are essential.

The implementation of differentiated communications services in a standalone 5G architecture is regulated, for example, by the ITU recommendation IMT-2020 – a set of global technical standards for 5G. The recommendation defines the use cases for which network segments are created and the service performance requirements.

Network Functions Virtualization (NFV) is also used to implement network segments. This allows software to be installed on virtual machines deployed on a virtualized commercial server.

The concept of differentiated communications services in a standalone 5G architecture enables flexible and scalable deployment of services tailored to various scenarios. For example: Live broadcasting in crowded areas, where services can be tailored to audience needs.

A specialized network service for police departments that ensures flexibility and quality of service, increasing the effectiveness of law enforcement officers on the ground.

A dedicated network layer for critical communications, including internal corporate communications.

In 2025, the telecommunications industry made significant strides in deploying 5G standalone (SA) architecture, which is essential for supporting differentiated communications services.

The number of service providers deploying 5G SA has increased globally, with many companies moving from conceptual developments to commercial offerings based on 5G network slicing.

During the third quarter of 2025, 162 million 5G subscriptions were added, bringing the total to almost 2.8 billion - approximately one-third of all mobile subscribers worldwide. The share of traffic carried over 5G continues to grow, and by 2031, more than 1.2 billion people worldwide will be served by 5G fixed wireless broadband. 5G services are impacting the lives of people worldwide [1].

5G connectivity can simplify enterprise IT architecture while supporting zero-trust workflows and leveraging artificial intelligence (AI), which improves security and productivity.

5G-based solutions are reaching entirely new segments.

As for the next generation, the 6G standardization process has already begun. The first commercial launches are expected to be led by leading service providers in advanced markets. 6G networks, originally designed for artificial intelligence, along with new capabilities such as integrated sensing and communications (ISAC), will enable entirely new use cases and device classes.

The highest 5G subscription penetration is expected to be in North America with 79%, followed by North East Asia at 61% and Western Europe and the Gulf Cooperation Council (GCC) countries, both at 55%. Globally, 5G is anticipated to overtake 4G as the dominant mobile access technology by subscription by the end of 2027, nine years after launch [6].

Around 360 service providers have now launched commercial 5G services, and more than 90 of those have launched or soft-launched 5G standalone (SA).

As subscribers migrate to 5G, the number of 4G subscriptions continues to decline. During the third quarter, 4G subscriptions declined by 65 million, bringing the total below 4.8 billion. 3G subscriptions declined by 22 million during the same period, while 2G subscriptions dropped by 29 million.

2G and 3G network sunsetting continues around the world. The phasing out of 3G networks is anticipated to happen more quickly than that of 2G in the coming years, but the timeline for this transition varies based on country and service provider.

Two-thirds of all mobile subscriptions expected to be 5G at the end of 2031 Global 5G subscriptions are forecast to reach 6.4 billion in 2031 and will make up two-thirds of all mobile subscriptions. Deployment of 5G SA by leading service providers will continue, and 5G SA subscriptions are projected to account for more than 4.1 billion in 2031, making up around 65% of all 5G subscriptions at that time.

In 2031, it is projected that Western Europe, North America and the GCC countries will have 5G subscription penetration of above 90%.

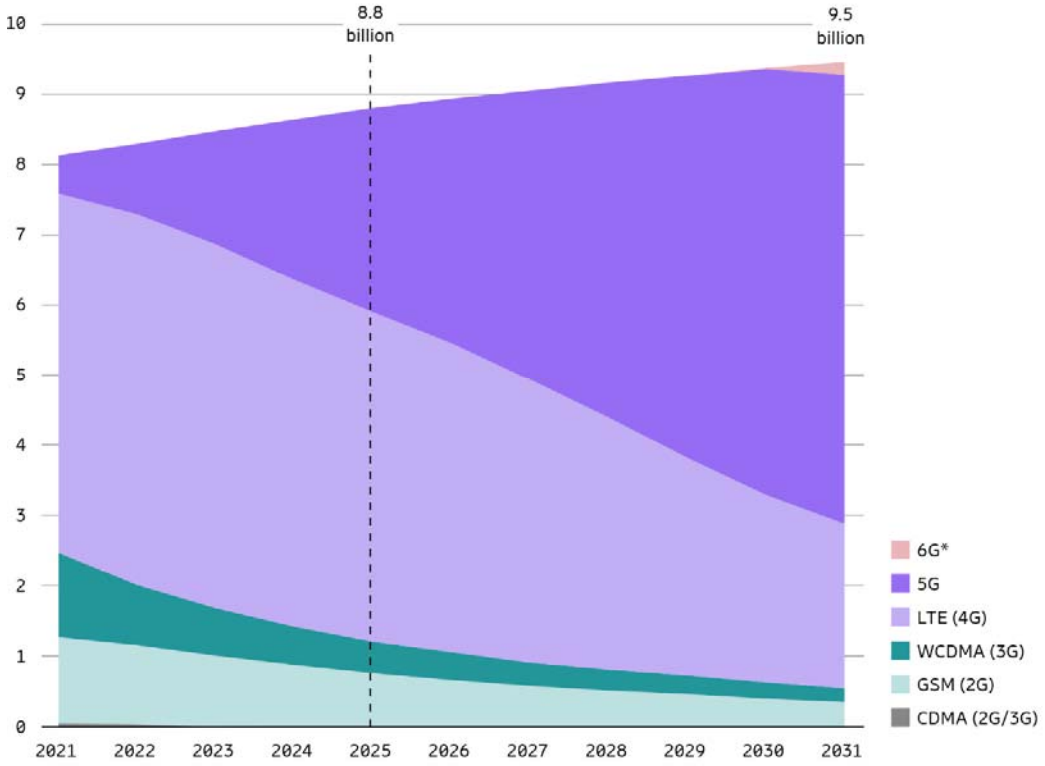

Figure 1. Mobile subscriptions by technology (billion).
*does not include early uptake of AI-enabled IoT devices such as autonomous vehicles, smart glasses and drones [1]

The following technologies are used to implement differentiated services in 5G networks:

– Massive MIMO. Using this technology, telecom operators can ensure full 5G network coverage, improve service quality, and reduce costs.

– Dynamic Spectrum Sharing (DSS). Spectrum resources are allocated in milliseconds depending on LTE and 5G services and the required traffic.

– Network Function Virtualization (NFV). 5G functions are implemented in virtual network functions (VNFs) that run on the NFV infrastructure.

– Software-defined networking (SDN). Aimed at creating flexible and scalable networks, sharing physical infrastructure with virtual overlays, and automating network management and administration.

– Adaptive antennas with BeamForming technology. Enable direct communication between devices, thereby reducing interference between devices.

– Support for stateless network functions. 5G network functions do not store user and session data internally, accessing it from external storage when needed. This approach increases network flexibility and resiliency [4, 5].

– Edge Computing. Large volumes of data are analyzed and processed directly at their source – from industrial sensors to autonomous vehicles – using AI, eliminating the latency of cloud data centers.

– Use of digital twins. This technology allows companies to model all network scenarios, enabling proactive network maintenance and moving from passive response to proactive prevention and ensuring continuous service access.

2 Standardization for 6G

3GPP Release 21, based on ITU IMT-2030. 6G is expected to have only a standalone architecture with a core network built on the architectural principles of 5G SA, extended with new capabilities such as AI and integrated sensing and communication (ISAC). A new Radio Access Network (RAN) architecture will be defined, including a new radio interface. For traditional use cases like enhanced mobile broadband (eMBB), Fixed Wireless Access (FWA) and the Internet of Things (IoT), 6G will advance the performance, service differentiation and guarantees. As these network technologies open up new service possibilities, use cases like massive digital twinning, autonomous mobility and wide-area mixed reality are likely to gain broader commercial adoption [7-9].

Global 6G subscriptions3 are forecast to reach 180 million by the end of 2031, not including early uptake of AI-enabled IoT devices such as autonomous vehicles, smart glasses and drones. If 6G subscription uptake happens earlier, the current forecast could be surpassed significantly [1]. The timing of commercial launch will vary between regions and countries:

• In the US, China, Japan, the GCC countries and South Korea, the launch of commercial 5G services took place relatively early compared to many other countries, and it is expected that these countries will be among the first to roll out 6G commercial services.

• India has been vocal in its ambition to lead in 6G technology, and it is expected that the timing of the commercial 6G launch compared to other countries will happen earlier than it did for 5G.

• In Europe, the launch of commercial 6G services is anticipated to be about one year later, relative to other countries, than was the case for 5G, due to the later roll out of 5G SA.

In recent years, there has been a growth will all be crucial to support an in satellite networks. Globally, large constellations of low-Earth satellite broadband subscriptions are orbit (LEO) satellites [3]. These networks forecast to increase from around can provide multiple services such as 9 million by the end of 2025 to around direct-to-device connectivity and fixed 30 million by the end of 2031. For broadband internet (that is, fixed comparison, there will be a projected satellite services). To meet the 350 million FWA subscriptions on fixed broadband connectivity needs mobile networks by 2031. The total as we approach 2031, the mix of fiber, number of fixed broadband connections 5G FWA and satellite technologies will be around 2 billion by 2031.

3 Speed-based FWA offerings

Service providers are capitalizing on consumer preferences for fast, reliable services; the proportion of Fixed Wireless Access (FWA) service providers offering speed-based tariff plans has increased from 43 to 54% in one year.

Figure 2 shows the block diagram of the second block, the response signal generator, with the specified input parameters of the signal from the output of the first block and the frequency synthesizer (FS). However, in this circuit, filters have been replaced with attenuators in order to demonstrate the signal spectrum in the absence of filtering.

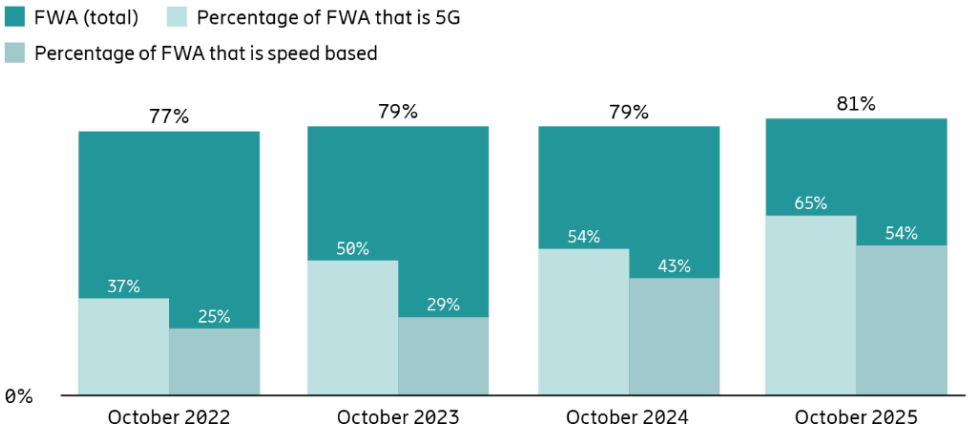

Figure 2. Global FWA service provider adoption 2022-2025

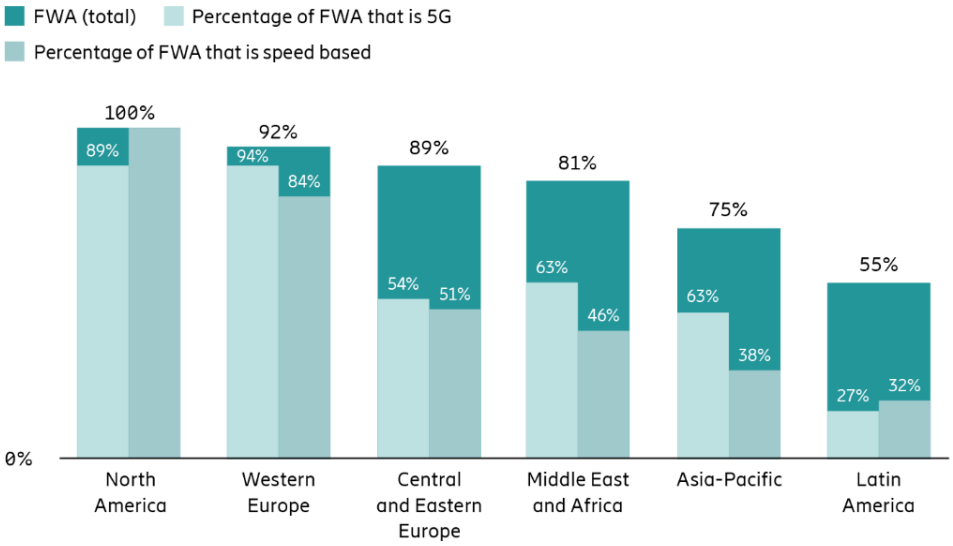

Figure 3. Regional FWA service provider adoption 2025

Over half of FWA service providers now offer speed-based tariff plans Speed-based tariff plans are commonly offered for fixed broadband services, such as those delivered over fiber or cable (offered by 54% of FWA service providers, up from 43% a year ago). The remaining 46% offer only volume-based tariff plans (buckets of GB per month).

FWA adoption is widespread globally. Number of service providers offering speed-based plans, driven primarily by Western Europe. Latin America has the most potential.

There is robust demand for FWA in India, with the combined number of connections from Jio and Airtel reaching 12 million as of September 2025.

In the US, the three largest service providers achieved all-time-high quarterly FWA net adds of 1.04 million connections in Q3 2025. As a result, their combined FWA user base stands at 14.6 million connections.

High-growth markets are leveraging FWA to drive revenue expansion. For example, Smart Philippines reported a 12% year-on-year increase in 5G FWA connections, with FWA revenues emerging as the fastest-growing segment of mobile revenues with an increase of 22% year-on-year.

A recent FWA customer premises equipment (CPE) survey, which encompasses insights from 17 leading vendors, projects shipments of 35 million CPE units in 2025, representing a 26% year-on-year growth. Notably, 57% of these shipments are expected to be 5G-capable.

Cosmote, Greece, has introduced differentiated 5G FWA connectivity, reaching 19,000 connections at the end of Q2 2025. This enabled the total fixed broadband segment to achieve growth and reverse the negative trajectory seen from previous quarters.

In the US, FWA is a major factor in 5G standalone (SA) traffic growth, primarily driven by leading service providers.

Markets with strong 5G FWA growth excel in two areas:

– 5G deployment maturity: Characterized by broad 5G population coverage, in particular 5G mid-band coverage, as well as adoption of 5G SA and 5G Advanced.

– FWA monetization maturity: Refers to a variety of 5G FWA offerings, in particular speed-based FWA such as tiered speed plans. More advanced service providers are offering a premium experience FWA based on differentiated connectivity.

Considering a global average household size of about four people, this equates to approximately 1.4 billion individuals being served by FWA broadband by the end of 2031. Half of global FWA connections to be in Asia-Pacific by 2031. Higher volumes of 5G FWA in populous, high-growth countries can drive economies of scale for the overall 5G FWA ecosystem, resulting in even more affordable CPE.

Asia-Pacific's share of global FWA connections is expected to increase from just over 40% in 2025 to 50% by 2031.

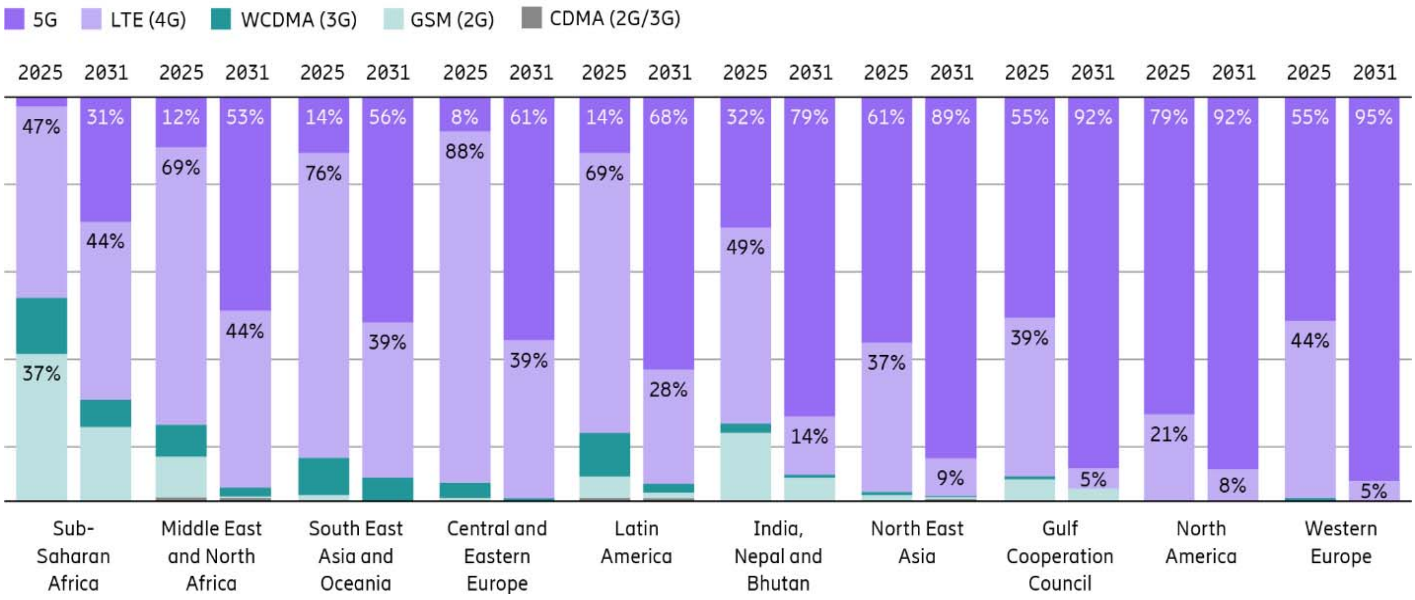

Figure 4. Mobile subscriptions by region and technology (percent)

Sub-Saharan Africa

The ongoing rollout of 4G and the early stages of 5G deployment are expected to gradually phase out legacy technologies. Sunsetting of 3G networks is anticipated to happen sooner than for 2G networks, with 3G subscriptions expected to decline by 8 percent annually over the forecast period, to a total of 89 million in 2031. 2G subscriptions are projected to fall by 7% annually to a total of 243 million. In 2031, 4G is set to account for 44% of all mobile subscriptions, while 5G is expected to grow significantly to around 400 million subscriptions. Smartphone subscriptions are projected to rise to 960 million in 2031. Notably, around 42% of these are expected to be 5G subscriptions, reflecting the growing consumer demand and evolving mobile ecosystem.

Middle East and North Africa

Regional efforts to diversify economies and drive digital transformation are helping to stabilize the sector and sustain investment momentum. Mobile subscriptions are projected to grow at an annual rate of 1% up to 2031, reaching a total of 780 million. Notably, 5G subscriptions are forecast to rise with a CAGR of around 30 percent over the same period, signaling a shift in how users engage with digital services. In 2031, 4G is anticipated to make up 44% of mobile subscriptions, while 5G is set to dominate with 53% of the total subscriptions. 5G FWA is also gaining traction as a key enabler of next-generation connectivity, complementing traditional broadband offerings.

South East Asia and Oceania

5G subscriptions in the region are forecast to reach around 680 million in 2031. 5G is evolving beyond coverage to prioritize performance, differentiated connectivity and high-value use cases. Service providers across the region have launched experience-led differentiated connectivity offerings, such as boost packs and network slices, for consumers and enterprises.

Singapore offers tiered 5G experiences for consumers and enterprises, delivering differentiated connectivity based on user needs for speed, priority and security.

Meanwhile, Australia is rolling out service level agreement-backed 5G for mission-critical enterprise workloads. In Malaysia, network slicing capabilities are now available for 5G consumers.

5G has become a significant driver of data consumption and increased ARPU in Thailand, with service providers reporting 10–15% ARPU uplift among 5G users. Vietnam's government is driving accelerated 5G deployment of 90% population coverage in 2025, through a mix of targeted subsidies for service providers and spectrum reforms.

Central and Eastern Europe

Technology adoption and subscription uptake has historically been slower here than in Western Europe. 5G deployment varies by country, partly due to slower spectrum allocation processes. However, the region has seen several accelerated 5G deployments, driven by growing demand. For example, Croatia leverages 5G for tourism and smart cities, while 5G in Hungary is going beyond smartphones to the automotive sector and other use cases. Regionally, 5G subscriptions are expected to reach 45 million during 2025. 4G is currently the dominant technology and is expected to account for 88% of all subscriptions at the end of 2025. It is estimated that this share will decline after a peak in 2025, as subscribers migrate to 5G.

Latin America

5G is gaining momentum in Latin America after a slow start. Although the region currently has a small base with 106 million 5G subscriptions, the large overall subscriber base is projected to enable Latin American 5G subscriptions to reach 553 million by the end of 2031. Throughout this period of growth in number of 5G subscriptions, the mobile infrastructure is anticipated to mature significantly with the adoption of 5G standalone (SA) architecture, 5G Advanced technologies, network slicing and open programmable architectures. This will fuel digital transformation in the region.

India, Nepal and Bhutan

5G adoption in India is growing rapidly. The expansion of 5G networks, availability of affordable 5G FWA customer premises equipment (CPE) and high data consumption from FWA users is fueling the data traffic growth in India. 5G FWA allows for rapid deployment of broadband services to homes and businesses, especially in rural and semi-urban areas where fiber optic cable installation is slow and expensive, and is helping to bridge the digital divide. Regionally, 5G subscriptions are expected to reach 394 million at the end of 2025, accounting for 32% of total mobile subscriptions. More than 1 billion 5G subscriptions are expected by the end of 2031, reaching 79% subscription penetration. 4G is currently the dominant subscription type, making up 49% of total mobile subscriptions. 4G subscriptions are forecast to decline from around 600 million in 2025 to around 190 million in 2031, as subscribers migrate to 5G.

North East Asia

The region has the second-highest 5G subscription penetration globally, and is expected to reach 61% at the end of 2025. Adoption of differentiated connectivity is expanding across the region, enhancing user experience and creating opportunities for service providers to monetize personalized services. In mainland China, 5G subscriptions are expected to reach 1.2 billion at the end of 2025, and over 90% of smartphone shipments are anticipated to be 5G-capable.1 5G Advanced is becoming more widely available, including functionalities such as support for reduced capability (RedCap) and high-order carrier aggregation [2].

In Japan, progress in 5G SA is improving consumer experiences, and service offerings that leverage differentiated connectivity are emerging. Service providers are also increasing investments in areas such as AI, to support future monetization strategies. South Korea continues to offer high average 5G throughput while expanding coverage, including in rural areas, through network sharing. Service providers remain focused on improving user experience and preparing networks for increased importance in the AI era, alongside efforts to monetize 5G services.

In Hong Kong, service providers report a substantially increased ARPU from 5G compared to 4G, contributing positively to financial performance. In Taiwan, service providers have begun testing differentiated connectivity offerings in specific segments, such as live entertainment, with commercial 5G SA services expected to launch within the next one to two years.

Gulf Cooperation Council (GCC)

The region, while small in terms of subscribers, is notable for its high penetration, high levels of urbanization and robust consumer spending power. Service providers are transitioning from traditional telcos to digital service providers. This is enabled by extensive 5G deployment and the adoption of technologies such as AI, cloud computing and edge solutions. Network slicing, supported by programmable networks and open APIs, is expected to be a cornerstone in delivering customized and performance-sensitive services.

In 2031, mobile subscriptions are expected to reach 97 million. Subscriptions for legacy network generations will decline sharply as users migrate to next-generation connectivity. By the end of 2031, 5G subscriptions are expected to comprise 92% of all mobile subscriptions, totaling 89 million. FWA adoption is driven by demand for high-speed alternatives to fixed broadband and national initiatives aimed at reaching underserved areas and supporting smart-city ambitions.

North America

5G subscriptions are expected to reach 359 million at the end of 2025, accounting for 79% of all mobile subscriptions at that time, and to further reach around 450 million in 2031. Leading service providers anticipate continued growth for FWA and are introducing differentiated connectivity to offer tailored experiences. Extensive mid-band 5G network coverage is the foundation for new consumers, enterprises and government innovations across the broader tech ecosystem. The innovations are created at the intersection of AI, cloud and mobile.

Western Europe

5G subscription growth is strong in the region, and is expected to rise from 227 million at the end of 2024 to 307 million in 2025, equaling a penetration of 55%. 5G subscription penetration varies between countries, where markets that launched 5G early, such as the UK and Finland, have already achieved high penetration relative to other markets. Going forward, 4G is expected to decline in favor of 5G. 5G subscriptions are anticipated to reach around 540 million at the end of 2031, representing 95% penetration at that time, which is in line with other leading 5G markets. 5G mid-band and SA are gaining traction in the region, with leading service providers launching new offerings based on differentiated connectivity in areas such as payment terminals, live broadcasting and photojournalism.

4 5G standalone

5G standalone (SA) is playing a central role in improving wearable devices. Smartwatches are leading this development with integrated connectivity, with smart glasses expected to follow in the future.

Some benefits of differentiated services:

– Providing higher quality to those services that require it for a better user experience.

– Avoiding inefficient resource usage by selecting a configuration that best suits a specific service based on customer needs.

– Simplifying network operation.

– Scalabili y, as resource allocation is based on the granularity of the class.

– Eliminating the need to upgrade applications for use on a differentiated services network, unlike networks with integrated services.

RedCap wearables supported by 5G SA

The first widely used smartwatch supporting 5G SA reduced capability (RedCap) is now supported by over 20 service providers, underscoring a growing focus on 5G SA-enabled devices. Although wearables cannot compare in sales volume to smartphones, they may have an important role in the future device ecosystem. Device manufacturers selecting 5G SA with RedCap for devices requiring long battery life confirms that the 5G SA era is here, with the rest of the ecosystem expected to follow.

Smart glasses in the 5G era

Lightweight smart glasses typically connect to the cellular network through a companion device, such as a smartphone, but integrated connectivity is expected in the next two to three years. RedCap can play an important role here, providing the size and power efficiency required for this form factor. Companion devices will continue to be important for offloading compute from the glasses, but edge computing is expected to be the way forward. Early adopters of AI/AR glasses report benefits such as the simplicity of hands-free phone calls and use of the simple screen for incoming messages.

The question of whether smart glasses will ultimately replace smartphones remains: Currently, sales volumes are less than 1% of smartphones.

Growth of 5G SA-only devices

In China, there is a growing trend toward 5G SA-only devices to reduce cost and increase simplicity. This trend is expected to drive demand for SA roaming, as most service providers today rely on non-standalone (NSA) when subscribers roam. Without SA roaming, these devices will need to fall back to LTE when abroad.

Boosting uplink performance

The smartphone industry is increasingly focusing on uplink performance. Some commercial smartphones now include support for uplink carrier aggregation (CA), combining frequency division duplex (FDD) and time division duplex (TDD) frequency bands to boost capacity and performance. Certain models also support uplink Multiple-Input Multiple-Output (MIMO), enabling the simultaneous transmission of data over several antennas, increasing uplink speed and reliability.

A few devices implement Release 16 uplink transmit (TX) switching, a feature that lets the smartphone intelligently switch between uplink antennas depending on signal conditions, providing improved connection stability and energy efficiency. However, adding more uplink capabilities to the smartphone can introduce size, complexity, cost and battery performance challenges. For Fixed Wireless Access (FWA), there is a concurrent trend to increase output power to strengthen the uplink signal. Overall, the intensified focus on uplink aligns with today’s demanding user behavior, where people upload content more than ever before.

EVs and drones driving 5G innovation

Smartphone vendors and established chipset vendors are now investing in the electric vehicle (EV) sector. As cars offload more computational tasks, their data consumption increases. Self-driving taxis, for example, rely on reliable connectivity that can be further enhanced using network slicing. The low-altitude digital airspace ecosystem, particularly the drone segment, is becoming an important market for 5G connectivity, with 5G SA enabling digital services that enhance cost-efficiency and support weight requirements of drones.

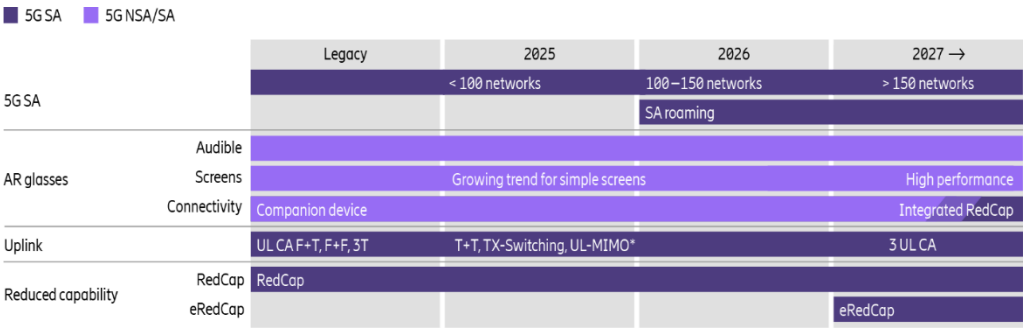

Figure 7. 5G technology area readiness on device
Note: Readiness means more than one infrastructure and device vendor is ready. Key terms: carrier aggregation (CA), F+T (FDD and TDD), F+F (FDD and FDD), T+T (TDD and TDD), TX-switching (antenna switching), UL-MIMO (2TX antennas in uplink), 3 UL CA (3 uplink carrier aggregation). *Limited market use ahead of timeline

Mobile network data traffic continues to grow. Global mobile data traffic, excluding Fixed Wireless Access (FWA), is projected to increase by a factor of around 2.2 to reach 310 EB per month in 2031.

The share of mobile data carried over 5G is forecast to rise from 34% at the end of 2024 to 43% by the end of 2025, reaching 83% in 2031. In 2031, a 14% year-on-year growth rate is expected, with a CAGR of 16% over the full forecast period. Total global mobile data traffic generated by 6G subscriptions is expected to be limited in 2031, due to the relatively low number of such subscriptions compared to 5G at that time.

Mobile data traffic growth can be highly volatile and vary significantly between years, regions, markets and service providers, depending on local market dynamics.

Factors that could impact traffic growth include:

• The uptake rate of new devices, such as those built for AR, and scalable, multimodal generative AI (GenAI) applications. The current predicted traffic growth up to 2031 includes an assumption that an initial uptake of extended reality (XR) services, including AR, VR and mixed reality (MR), will happen in the latter part of the forecast period. However, if adoption is accelerated, data traffic could significantly surpass current traffic outlook at the end of the forecast period.

• Tariff plans and available services.

• C ntinued improvements in the performance of deployed networks.

• The pace of subscriber migration to later mobile technology generations in populous markets like India, Latin America, South East Asia and Africa.

• Changes to the split between FWA and mobile data traffic when FWA connections grow.

With continued strong FWA uptake in parts of the world where fixed broadband connections have been limited, it is likely that household-based traffic will move from smartphones to FWA – especially for streaming services.

The growth in mobile data traffic per smartphone can be attributed to several drivers: improved device capabilities, affordable service plans, increased time spent consuming services, an increase in data-intensive content, and growth in data consumption due to continued improvements in deployed network performance.

During 2025, these factors affected mobile data traffic differently across several countries:

• In Brazil, mobile data prices rose by around 20%, driving data traffic growth rate down.

• In China, intensified competition among service providers supported growth in mobile data traffic.

• In South Korea, mobile data traffic reached double-digit year-on-year, driven by a larger share of data-intensive content.

• In India, traffic growth increased year-on-year, supported by improved device capabilities.

Traffic growth is not universal across locations within a service provider's network. For example, in dense urban locations, traffic demands can be up to 1,000 times larger relative to rural areas.

Average mobile data traffic per active smartphone is 21 GB globally in 2025.

• Smartp one shipment volumes in different regions.

Total 5G coverage outside mainland China is expected to increase from 45 to 50% during 2025, while mid-band coverage is projected to grow from 40 to 45% over the same period.

There are currently 841 4G networks deployed worldwide, with 347 upgraded to LTE-Advanced and 448 LTE devices supporting Cat-16.1 By the end of 2025, 4G population coverage outside mainland China is set to reach 90% globally and is projected to exceed 95% in 2031.

The build-out of 5G continues, with around 360 networks launched worldwide. Outside mainland China, it is projected to increase from 50% in 2025 to about 85% in 2031.

5G mid-band, either delivered through time division duplex (TDD) or frequency division duplex (FDD), combines high capacity with good coverage. It is available in most markets, making it an ideal choice for delivering the full 5G experience. Combined with a low-band FDD 5G carrier, mid-band can provide full coverage and mobility. Good mid-band coverage is also essential for enabling differentiated connectivity and unlocking new revenue opportunities across consumer and enterprise use cases.

Large regional variations in 5G coverage By the end of 2025, 5G mid-band population coverage outside mainland China is projected to reach about 45%, but coverage levels vary significantly by region. Africa is expected to have the lowest total and mid-band 5G coverage, reaching about 10% by the end of 2025. The Middle East shows somewhat higher levels, with a total coverage of around 25% and mid-band coverage of about 20% expected.

Latin America, with 30% total and 25% mid-band 5G coverage, and Asia-Pacific (outside India and mainland China), with around 35% total and mid-band coverage, both remain below the global average for 5G population coverage. Extensive total and mid-band 5G coverage has been established across North America, mainland China and India, now covering 90-95% of the population in these regions.

Despite these coverage advancements, only around 35% of sites globally outside of mainland China have been upgraded to 5G mid-band.

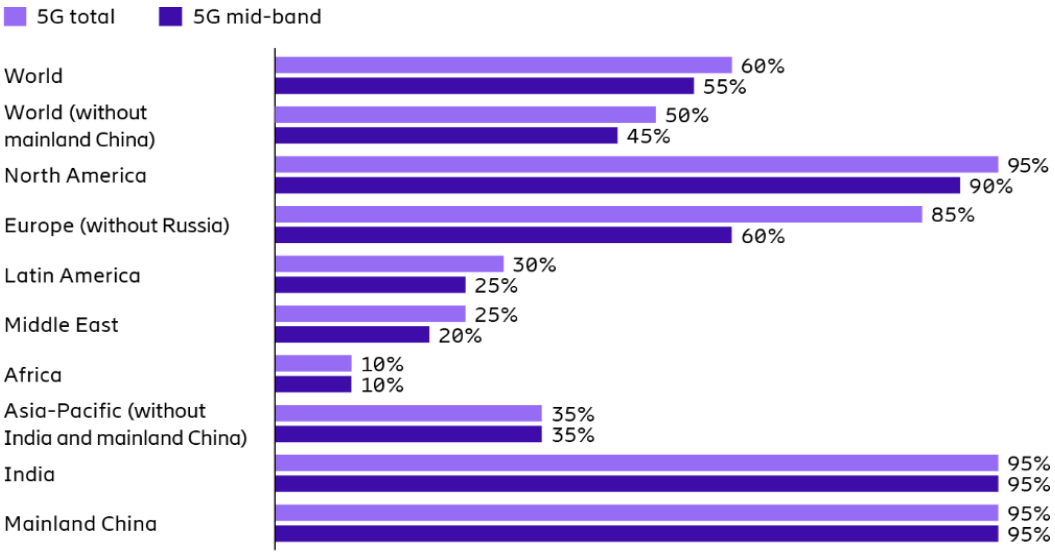

Figure 8. World population and mid-band coverage split by region (end of 2025)

5 Global momentum in commercial differentiated connectivity services

New offerings that leverage 5G standalone (SA) capabilities, such as network slicing, have progressed from limited pilots and niche experiments to fully launched commercial services. The ability for service providers to differentiate connectivity services – for example, by providing latency guarantees, priority services, security enhancements, immersive experiences, or connectivity targeting specific situations and locations or app categories – is changing with the introduction of 5G SA.

Market transitioning from proof-of-concept trials to commercial services that serve real customers in diverse contexts. This shift has been driven by advances in network capabilities and greater confidence among service providers, with an increasing willingness to explore new monetization models beyond traditional data and speed tiers. The extent of engagement is notable, with many service providers now active in several categories simultaneously.

This demonstrates scalability, market validation and confidence in the commercial viability of service offerings based on differentiated connectivity. Out of 118 such offerings, 55% are commercially available. Regional differences are notable, with unlimited offerings most prevalent in Western Europe, where about 86% of service providers include unlimited options in their plans.

There has been a constant growth in the number of service providers in recent years offering device-based plans, mainly driven by smartwatches. More service providers are deploying 5G networks that can support reduced capability (RedCap), and new categories of RedCap devices are expected to enter the market (beyond today's available broadband devices such as dongles and routers, surveillance cameras and smartwatches). Meanwhile, a range of new consumer and enterprise service offerings are expected to emerge.

Commercial broadband services using RedCap devices have been launched by one service provider in the US and by two service providers in the Asia-Pacific region.

Out of 79 service providers with commercially deployed 5G SA, there are 118 documented cases, from 56 service providers, of network slicing being used for some type of differentiated connectivity offering. Of these, 65 are commercially available either as a subscription service, an add-on package, or in the B2B and B2B2C space as a packaged, deployment-ready service. In the B2C sphere, application or situation-focused services such as video conferencing, gaming, event-specific packages and premium fixed wireless broadband subscriptions make up around 55% of all offerings.

In the B2B area, vertical markets like public safety, transport and logistics, defense and general enterprise use cases dominate.

In the parts of Europe where service providers have deployed 5G SA, they are increasingly active. The region accounts for 45% of all network slicing-related activities globally, including trials, proofs-of-concept and commercial offerings. Proportionally, there are more tests and trials in Europe than in other regions such as Asia-Pacific and North America. Out of all commercial offerings globally, 37 and 36% are in Europe and Asia-Pacific, respectively.

North America constitutes 18% of the offerings, with just one service provider accounting for three-quarters of all deployments in the region.

Learning to communicate benefits One recurring challenge identified by service providers, particularly in the consumer market, is how to explain new offers in terms that resonate with their customers. Selling "more gigabytes" or "faster speeds" is familiar territory – but telling the story of latency guarantees for gamers, uninterrupted HD streaming at live events, or priority service for emergency communications requires a more benefits-led approach. Customers respond more strongly when the offer is tied clearly to their personal experience, a specific app or situational need.

Speed, bandwidth, general performance or stability improvements are still being highlighted as user benefits in 86 of the cases based on network slicing. There are some new areas being highlighted, however, like latency (48%) or improved experiences when using a specific service or app (38%). In many cases, multiple benefits are communicated and combined to enhance the value proposition.

The number of service providers deploying 5G SA and starting to use network slicing to create differentiated connectivity offerings is increasing at pace. Meanwhile, service providers that were first to introduce differentiated connectivity, some as early as 2022, have now scaled up their deployments and started to broaden their reach. Across the 65 commercial offerings based on network slicing, half of them are offered by only six service providers. Of the network slicing use cases found, 65 are commercial offerings.

Opportunities to offer tailored experiences

Singapore is an island country, similar in size to New York City, with a population of around 6 million people. In 2022, with Singtel's network buildout, it became the first country in the world to be fully covered (95 percent) by 5G SA. In 2025, the network was further enhanced with 5G low-band (700 MHz) added to the existing coverage. This delivers reliable nationwide coverage, especially improving deep indoor penetration. Singtel's early-mover advantage has enabled it to explore and develop products and services to capitalize on the opportunities presented by 5G SA.

A business and technology journey Singtel's early move into 5G SA clearly signals its strategic priorities. Service providers predominantly compete to offer data packages at the lowest price, meaning increasing the size of data buckets is no longer a differentiator in the hyper-competitive landscape.

Therefore, the top priority was to shift the conversation from data quantity to data differentiation, and to make enhanced experiences the new currency, where experience become the main measure of value. This was both a technical and marketing challenge, requiring a company-wide approach. Singtel's strong belief that 5G SA is a strategic asset to achieve this goal has been a driving force behind its successful business transformation, embedding new ways of working to both maximize and commercialize the capabilities of 5G.

From a technology perspective, a robust and flexible network is required to support varying performance levels across consumer, enterprise and industry verticals. Key enablers such as network slicing, advanced traffic management and end-to-end quality assurance mechanisms mean Singtel can deliver consistent, predictable performance. Through the various capabilities unlocked in the network, they have been able to integrate with device and application ecosystems to ensure a seamless user experience.

Co-creation with partners, clear consumer monetization models and business outcome-driven offerings for enterprises are essential for success. Singtel was able to bring the technical and business aspects together through building a common language across the organization as a foundation, removing barriers between the technological and commercial sides of the organization. From here, a unifying goal of launching offerings that provided tailored experiences was built, based on the combined technical capabilities and value proposition of differentiated connectivity.

In 2022, Singtel had already achieved 95 percent nationwide 5G SA coverage.

	5G+	5G+ Enhanced	5G+ Priority
Connectivity	**Network PLUS** – 700 MHz **Coverage PLUS** – deep inside	**Network PLUS** – 700 MHz **Coverage PLUS** – deep inside **Enhanced network** – 2x faster speed **Enhanced roaming** – trusted partners	**Network PLUS** – 700 MHz **Coverage PLUS** – deep inside **Priority lane** – 4x faster speed **Priority roaming** – first choice partners
Services		**Enhanced security** – security protection software **Enhanced care** – 24/7 hotline	**Priority security** – Mobile Protect **Priority care** – dedicated in-store service and 24/7 hotline
Extras		**Enhanced deals** – latest phones	**Priority deals** – 15 percent off accessories

Figure 16. Singtel 5G+ commercial offerings structure

6 Modernizing enterprise IT with 5G

As digital transformation accelerates in the enterprise sector, service providers are well positioned to modernize enterprise IT, shifting from traditional site-bound perimeter models to secure, zero-trust endpoint-centric models that improve user experience while enabling agile, resilient operations.

For decades, enterprise IT has largely revolved around centralized, site-based infrastructure. Data centers, on-premises servers and wired networks formed the backbone of corporate computing and communications. However, the rise of remote work, high-performing mobile networks and 5G laptops, and cloud services is disrupting this model. Enterprises now require greater agility, scalability and mobility to support distributed operations and real-time data processing.

The enterprise IT market encompasses a wide range of technologies and solutions designed to support complex business processes, enhance productivity, ensure security and enable digital transformation at scale. These technologies are typically implemented, managed and maintained by the enterprise's IT department. The trends of cloudification, hybrid working and AI are raising significant challenges for enterprises to cost-effectively and securely manage, maintain and develop existing IT infrastructure to meet future demands:

• Cloudification: The current software trends strongly lean toward cloud services driven by their flexibility, scalability, cost-effectiveness and ease of maintenance. As enterprise applications migrate to the cloud, IT infrastructure becomes lighter but also more distributed – requiring consistent management and security across locations and devices.

• Hybrid working has become the new normal for many organizations. Enterprises are now managing users and devices across office, home and mobile environments, requiring seamless and secure connectivity. This shift increases reliance on mobile networks and makes location-based security models less effective.

• AI: Enterprises are increasingly integrating AI tools into a wide range of business functions, and even moving beyond pilot initiatives to embed AI in their core operations, such as automating tasks and enabling real-time decision making. These applications depend on continuous, secure connectivity to access data and computing resources distributed between the cloud and edge. In this context, 5G's low-latency and always-on characteristics provide the foundation for secure and responsive AI-driven workflows, while also reinforcing the need for zero-trust security principles.

Enterprises face significant IT management challenges in: device selection, procurement and lifecycle management; network design and operations for both on-site and remote locations; and IT asset governance [10, 11].

The shift to hybrid work broadens the scope of these tasks. In environments that mix on-premises and cloud systems, secure operations based on zero-trust principles are increasingly essential. From a management perspective, the ongoing costs of maintaining legacy systems are a persistent concern.

5G laptops: Anywhere is a secure office Cellular-enabled laptop adoption is expected to grow faster than the overall laptop market. By 2030, the global installed base of 5G laptops is, by some external analysts, projected to approach 100 million, corresponding to a CAGR of approximately 45 percent between 2024 and 2030. The growth of 5G laptops, combined with the migration of enterprise applications to cloud platforms, serves as a catalyst for enterprise IT transformation.

This shift indicates that traditional perimeter-based, location-dependent enterprise IT network architectures will become increasingly obsolete, making way for more flexible, cloud-centric and zero-trust networking approaches enabled by seamless 5G connectivity both inside and outside the office.

Traditional, perimeter-based architectures rely on securing fixed physical sites and treating remote access as an exception – typically employing device certificates and virtual private networks (VPNs) to mimic a trusted internal environment. This approach is becoming less cost effective as modern workforces demand secure, seamless connectivity from anywhere, and as new operational models emerge that leverage 5G networks to meet evolving user demands and offer enhanced experiences.

A mobility-first, zero-trust network protects enterprise information assets by continuously validating both the user and the device, rather than basing security on physical location. Access rights are determined by identity and the device's security posture. By leveraging persistent device authentication based on non-removable eSIM and SIM credentials managed through the mobile network, and integrating these with enterprise-managed identity systems and device management platforms, organizations achieve a unified, high-assurance security framework that works seamlessly across office, home and mobile environments. With the traditional notion of a "secure location" disappearing, there is no longer a need to centralize assets at specific sites. This new model allows enterprises to provision, manage and secure devices anywhere – creating the foundation for more flexible operational practices.

Service providers play a key role in enabling this transformation, as mobile networks provide the trusted, always-on connectivity required to verify users and devices continuously.

In a zero-trust environment built on persistent device identity, even traditionally IT-controlled tasks such as device provisioning can now be performed securely by end users. User-driven onboarding – supported by cloud-based Unified Endpoint Management (UEM) tools and integrated mobile authentication – enables employees to set up corporate devices directly, wherever they are, without compromising security. This approach reduces operational overhead and enhances flexibility in enterprise IT operations.

Cellular laptops maintain continuous connectivity via the mobile network. This ensures remote management functions and security actions can be immediately executed at any time and at any location, such as remote wiping or the removal of connection profiles if a device is lost or stolen. Always-on, network-native connectivity also gives IT administrators increased confidence in managing and responding to incidents by enabling consistent policy enforcement across all working environments within a zero-trust framework. While this consistent policy enforcement is a core benefit, another important advantage of cellular-first connectivity is the reduced dependence on extensive Wi-Fi infrastructure, enhancing both security and operational simplicity.

In collaboration with partners, SoftBank has been exploring new ways for enterprises to build secure and flexible connectivity for remote and hybrid workforces. High-performing 5G networks enable employees to securely access cloud-based services using 5G-connected laptops – whether in the office, at home or on the move. These initiatives illustrate how 5G connectivity can simplify enterprise IT architecture while supporting zero-trust and AI-enabled workflows that enhance both security and productivity.

In Japan, enterprises are increasingly looking for ways to improve both security and productivity through mobile-first IT environments. With cellular PCs providing continuous, secure connectivity within a zero-trust framework, this step was eliminated. Based on internal trials, this improvement translated into measurable productivity gains across the sales organization – the cumulative reduction is estimated to be up to one full working day per month, per employee. This demonstrates how cellular-enabled PCs can enhance both security and employee experience by enabling truly seamless, always-on access to enterprise resources.

As enterprises transition their office environments to support hybrid work and accelerate cloud migration, traditional LAN and WAN infrastructures often become underutilized yet still costly to maintain. According to Ericsson internal analysis, replacing parts of these conventional network environments with 5G-based architectures leveraging network virtualization could reduce overall IT infrastructure costs by up to 50%, depending on deployment conditions and enterprise size.

Ericsson Japan has also been implementing this approach within its own offices, gradually replacing local Wi-Fi environments with private 5G networks. Early internal results show reduced operational complexity and improved network reliability, providing a practical demonstration of how 5G can streamline enterprise IT and connectivity management. While the actual savings will vary, such 5G-enabled architectures offer opportunities to simplify network operations, improve agility and future-proof enterprise connectivity.

As enterprises accelerate cloud adoption and hybrid work, a fundamental shift from perimeter-based security to zero-trust models is becoming essential. A mobility-first, zero-trust architecture – powered by cellular-connected secure endpoints – enables service providers to deliver this transformation with capabilities unique to 5G mobile networks. This evolution not only strengthens enterprise security across all workspaces during hybrid working, but also streamlines operations and paves the way for more agile, flexible business practices by making 5G programmable networks available for enterprise IT.

Service providers are uniquely positioned to lead this transformation, integrating secure connectivity, identity management and managed lifecycle services into a cohesive solution offering for enterprise customers. In doing so, they enable enterprises to boost operational efficiency, strengthen security and reduce total cost of ownership (TCO) – while enhancing user experience and laying the groundwork for AI-driven innovation.

The endpoint-centric model, powered by zero-trust, 5G and cloud technologies, is positioned to redefine enterprise IT architecture. Service providers who embrace this shift stand to gain not only new revenue streams but also deeper strategic partnerships with enterprises undergoing digital transformations.

Video dominates downlink, but not uplink traffic

Social platform video accounts for the vast majority of smartphone video viewing, while video-on-demand services deliver higher bitrates and superior quality of experience (QoE) scores. Comparing downlink and uplink traffic across four European mobile networks shows that video still dominates downlink usage, while cloud storage and communication services generate relatively more uplink traffic.

Video represents the largest portion of mobile data traffic across all four networks, accounting for around 50% of mobile traffic. Downlink traffic consistently shows a high share for video, reaching up to 60%t. The share of video in uplink traffic, however, varies between networks. This variation reflects differences in user behavior, such as content creation and live streaming activity.

Communication services (including messaging, VoIP and video calls) are more bi-directional than video streaming, and therefore they generate a higher proportion of uplink traffic compared to downlink across the four sampled networks – 73% downlink and 27% uplink. The share of uplink traffic for communication services across the sampled networks ranges from 13 to 23%, while the share of downlink traffic remains around 5% or lower. This disparity underscores the interactive and user-driven nature of these services, where frequent user-originated activities such as voice and video calls, conferencing and content uploads significantly contribute to uplink traffic.

Across the sampled networks, social networking downlink traffic varies considerably, ranging from about 2 to 13%. For uplink, social networking usually ranks as the third-largest traffic category share – after video and either communications services or cloud storage – contributing roughly 7 to 14% of uplink traffic. Cloud storage services represent a substantially larger share of uplink traffic compared to downlink, highlighting active usage of cloud-based functions such as backups and file synchronization. Conversely, gaming, audio and software downloads consistently contribute less than 2% of both downlink and uplink traffic across all networks.

Across the four sampled European networks, a more detailed analysis of video traffic was performed, where video consumption of content from the most popular global service providers was grouped into two main categories:

• social med a–generated video (YouTube, TikTok, Instagram, Facebook);

• glo al1 video on-demand streaming (Netflix, Disney+, Amazon Prime, Apple TV).

The analysis shows that across the four European service providers, video traffic on smartphones is dominated by social media, far exceeding that of streaming video-on-demand services. For three of the service providers, social media video accounts for approximately 80% of all video traffic, while the fourth records nearly 70%. These results highlight smartphone users' clear preference for short, dynamic videos on social platforms.

Across the four European mobile service providers, YouTube consistently emerges as a leading video service by user share, with the share of mobile video users ranging from about 73% to nearly 99%. Almost every mobile video user consumes YouTube content, making it the dominant platform in terms of reach. In terms of traffic volume, it takes the clear lead in two networks with a 34 and 21% share, while in one network it shares the top position with Instagram, and in the fourth network it remains a major contributor despite a slightly lower user share.

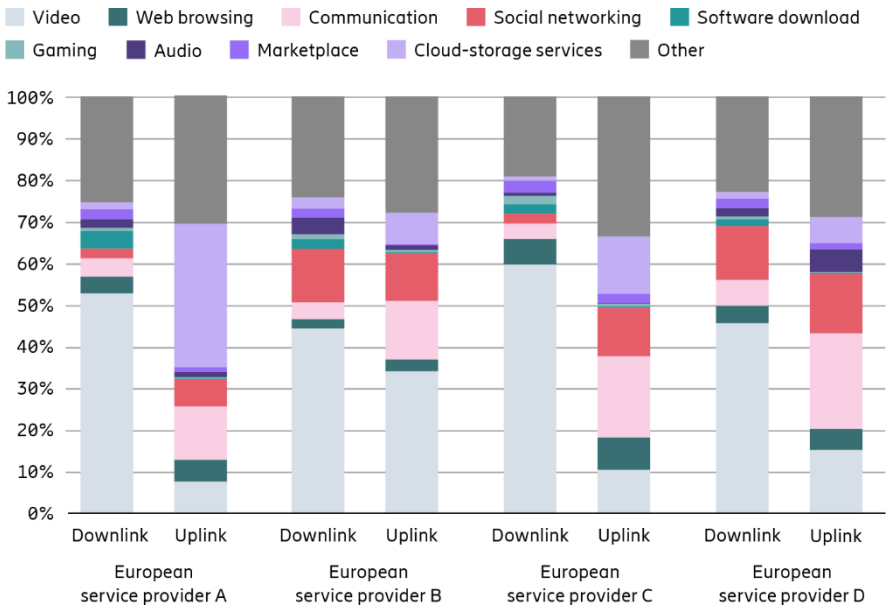

Figure 8. Share of traffic volume in downlink and uplink per application category

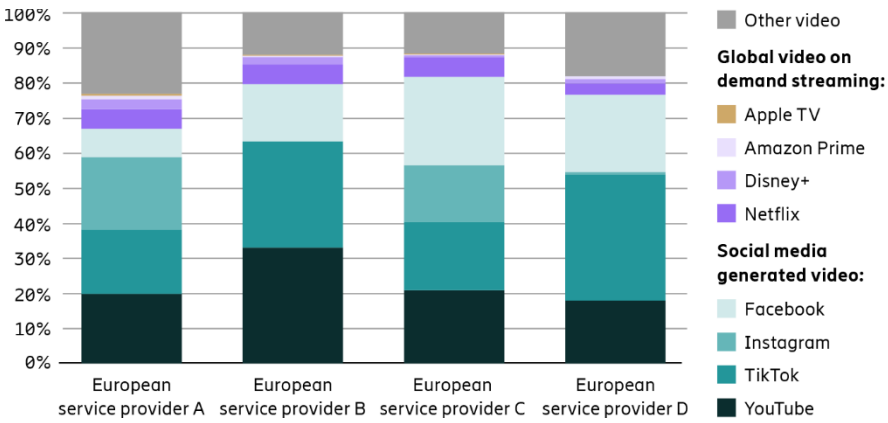

Figure 9. Share of video traffic per video service provider

TikTok is the third most popular service by reach, with user share ranging from 52-59% and generating about 20–40% of the video traffic across the four service providers.

Instagram's user base varies across the four networks: It engages around 50% of users in two networks, while its adoption remains limited in the other two. In terms of traffic share, Instagram is most dominant in one network, accounting for about 20% of the total traffic.

Facebook is especially popular in two networks, engaging more than 75 percent of video users and accounting for over 20% of total video traffic in both networks. Across the other networks, Facebook still attracts a large share of users, but it generates a smaller proportion of traffic there. This pattern suggests that consumption is driven by autoplay content and short-form formats like Reels, which increase user counts but have shorter viewing times.

Mobile video-on-demand's role limited on smartphones Streaming of global video-on-demand services accounts for less than 10% of total mobile video traffic consumed on smartphones across all sampled networks. Netflix consistently dominates this category, contributing between 3 and 6% of total video traffic on these networks. Other services like Disney+, Amazon Prime and Apple TV+ have a relatively small share, typically less than

1%. This limited usage on smartphones likely reflects users' preference to stream high-resolution content over Wi-Fi or fixed broadband connections and on larger devices such as tablets and PCs.

While traffic volumes and user behavior reveal a clear preference for short-form video content on social media platforms, the quality of the viewing experience is shaped by a range of technical factors. These include the capabilities of the smartphone itself, the encoding strategies of content providers and the performance of the underlying mobile network.

Mobile video experience on smartphones depends on several measurable factors, including intrinsic encoding quality (influenced by resolution, frame rate and codec) and dynamic quality effects such as time-to-content, rebuffering events and resolution adaptations to available channel capacity. It also depends on a specific smartphone model's capability. Calculated performance metrics across the sampled networks show that high-end flagship smartphones delivered the best streaming experience, with higher bitrates and QoE scores of above 4.2, while entry-level models showed lower bitrates and QoE scores of 3.6-4.0. Overall, flagship smartphones deliver a superior video streaming experience due to better bitrate performance and optimization.

As expected, professionally produced and optimized streaming services like Netflix and Amazon Prime deliver higher bitrates and superior QoE scores compared with social media video platforms. Notably, Instagram achieves unusually high QoE scores despite lower bitrates, suggesting particularly effective adaptation and encoding strategies that preserve perceived quality under constrained network conditions.

Across all four networks, 5G consistently delivers an improved video streaming experience compared with 4G. The enhancement is noticeable for long-form, high-quality content on video-on-demand platforms, where higher bitrates, shorter stall times and better QoE make streaming smoother. For short-form, social-media videos, 5G provides faster startup and smoother playback, minimizing interruptions as users rapidly scroll. In both cases, the upgrade to 5G results in a more responsive and reliable viewing experience.

7 Conclusion

The accelerated development and convergence of AI, cloud and mobile will fundamentally shift future traffic patterns, driving significant growth in uplink demands on mobile networks in the coming decade.

As intelligent devices increasingly rely on cloud-based processing, data is flowing in the uplink more than ever before. Yet, this shift is more complex than a simple surge in uplink demand. While AI-driven systems like AVs and AR glasses continuously send data to the cloud, advances in on-device intelligence, compression and smart data transport are reshaping how and when that data moves. The result is a more dynamic balance, where networks must support both the growing appetite for real-time cloud and the efficiencies that keep bandwidth use sustainable. Understanding this interplay is key to preparing for the next wave of connected intelligence.

The convergence of AI, cloud computing and mobile technologies represents one of the most transformative shifts in the digital era. Together, they create a powerful ecosystem where intelligence, scalability and accessibility reinforce each other: cloud platforms provide the computational infrastructure and storage capacity needed to deploy and train advanced AI models; mobile devices serve as both a data feed and the end-user interface to deliver these AI-powered cloud services, enabling personalized and context-aware experiences in real time; and networks provide ubiquitous and dependable connectivity between cloud and devices.

AI models hosted on the cloud can process massive datasets and deliver insights instantly to mobile users, whether they are powering smart assistants, enabling real-time language translation, or optimizing logistics and healthcare operations. Mobile devices therefore act not only as endpoints, but as data generators, feeding continuous streams of contextual information (such as location, behavior and sensor data) back to the cloud which, in turn, improves AI models through feedback loops.

As the convergence mentioned earlier happens, data rates increase further as a result. This will be particularly notable in the uplink. In the enterprise and industry sectors, for instance, 5G-native laptops, AI-enabled Internet of Things (IoT) devices, AVs, humanoid droids and drones will require significant uplink capacity. AVs and droids will transmit a lot of data to the cloud, as they collect a lot of training data, require data to be stored for legal reasons and sometimes require remote interventions. In the consumer

space, personalized agents will be used on smartphones and emerging devices like AI and AR glasses, or similar companion devices. Some will be activated on demand, while other agents will be on all the time.

As a result, the uplink traffic will increase significantly over the coming years and, indeed, is becoming telecom's new "currency." Short term, this will be driven by the early adoption of AI glasses; mid term, by the adoption of AI assistants over AI/AR glasses at scale; and long term, by the large-scale deployment of AVs and possibly humanoid droids.

To effectively handle such an increase in uplink traffic, advancements such as carrier aggregation (CA) and Massive Multiple-Input Multiple-Output (M-MIMO) – available in 5G SA – enable more flexible and efficient use of spectrum across both frequency division duplex (FDD) and time division duplex (TDD) bands. For example, uplink traffic can be anchored on a low-band FDD carrier to maximize coverage and enhanced with FDD M-MIMO to boost capacity. Meanwhile, downlink capacity can be boosted through aggregation between FDD and a mid-band TDD carrier, leveraging TDD M-MIMO for higher throughput and improved overall performance.

Uplink requirements of current AI glasses to date, approximately 2 million smart glasses from leading manufacturers have been sold in the US – amounting to approximately 1 percent market penetration – with ambitions to sell millions per year going forward. The success driving these sales is in connecting the user to an AI agent that delivers sentient engagements based on video and audio input from the glasses.

Going forward, some models will use AI capabilities right on the glasses and/or tethered devices; however, advanced AI capabilities will need to run in the cloud and – when inference time of the models is low – the uplink network characteristics become critical. A recently announced smart glasses model has an advertised video capture resolution of 1,440 x 1,920 pixels. Multimodal AI on-demand engagements typically require framerates in the order of 5-10 frames per second (FPS) while being used. Always-on agents, on the other hand, are likely to use lower and perhaps dynamic framerates, such as 1 frame every 5-10 seconds.

The on-demand agent can make use of video codecs with a compression ratio of about 0.1 bits per pixel (bpp). At the given resolution and a frame rate of 5 FPS, this yields about 1.4 Mbps in the uplink. It is further assumed that for users of these AI agents, about 20% are "power users" at 100 min/day, with the remaining 80% being "ordinary users" at 10 min/day. This yields an average of 28 min/day.

The always-on agent will need to use image compression, at about 0.5 bpp; at the given resolution and a frame rate of about 0.1 FPS, this yields about 0.14 Mbps. It is then assumed that the agent is on for about 8h/day.

Resulting increase in the uplink percentage with regards to today's global average baseline of about 2 GB per month. Per user, the always-on agent consumes a slightly higher uplink than the on-demand agent under these assumptions. For a given device penetration, given the value on the x-axis in Figure 24, some users may adopt an always-on agent whilst others prefer on-demand. The future demand will therefore be between these two curves. This potential growth of uplink traffic underlines the importance of network capacity planning, spectrum allocation and RAN feature developments.

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