Extracted version

Fixed Wireless Access handbook

Insights

2024

ericsson.com/
fwa-insights

Insight 4 of 6

Accelerate FWA uptake with integrated business processes

Driving FWA across business processes

Cross-functional teams to drive the FWA businesses on an end-to-end and agile manner

Beyond technology

Successful FWA deployments require coordination and shared decision-making across end-to-end processes and organizational boundaries. From the initial strategy and planning processes, having a holistic view that captures and considers FWA as an integral part of a service provider's business decisions is critical. This initial step includes key activities such as identifying the addressable market for FWA and selecting target segments and locations for FWA, which provide inputs for capex allocation and network deployment plans.

Once the FWA market opportunity has been identified, the next step is to define suitable FWA product(s), including potential value-added services (such as video and TV services), the business model, the technical solution (including CPE choices and installation options), and price positioning. The FWA offering needs to consider the local fixed broadband market dynamics. For the sales and go-to-market processes, it is important to understand that FWA equates to fixed broadband services, where geo-marketing plays a defining role. At the same time, it is critical to adapt processes for sales (including incentives) and user qualification for FWA services.

The delivery step of FWA services includes network provisioning and installation, sometimes including options for self-installation in addition to technician installation. Once the service is activated, it is time to monitor FWA performance, site utilization, and usage behavior – combining typical MBB KPIs and considering the fixed broadband paradigm.

FWA is often a new, adjacent service for service providers and initially requires new skills and tight monitoring across organizational boundaries. Some service providers implement cross-functional teams to regularly monitor progress and take corrective actions to ensure continued FWA growth and uptake.

FWA home qualification and provisioning

For tiered, speed-based broadband offerings, it is important to calculate the likely speed and capacity available to the consumer in each location. Since FWA consumers are fixed in location, it is possible to estimate the load in the network from FWA and calculate the available speed options.

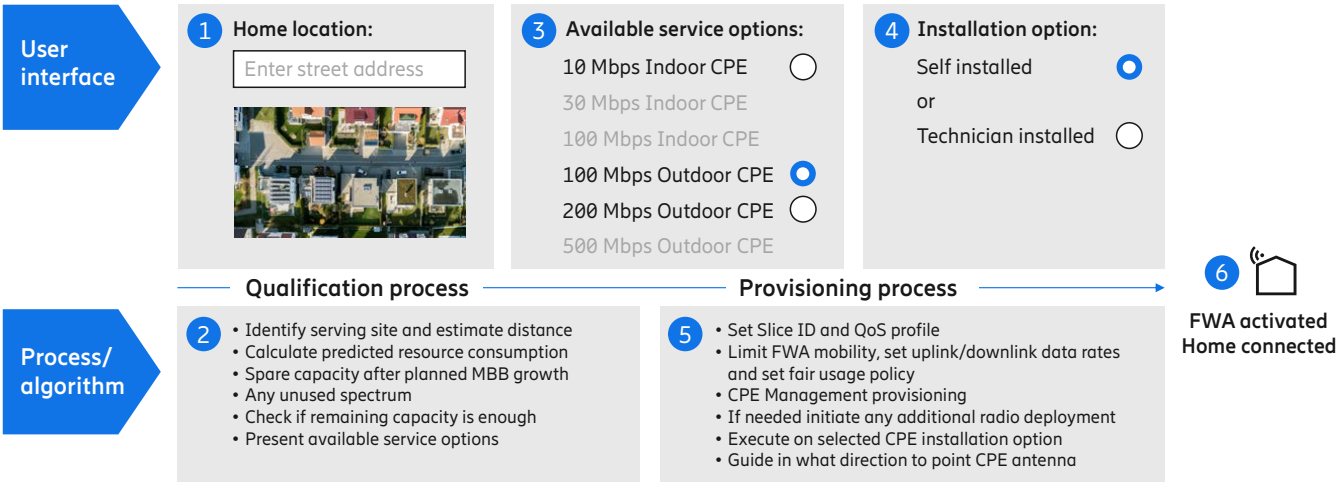
By entering a household address in the FWA home qualification process, the qualification process matches the home with the serving site, estimates the radio conditions, and determines what resource consumption is likely for this household. This is based on the spare capacity available after planned MBB growth; any unused spectrum could be activated by installing more radio equipment if needed.

Based on the radio resources available to the household, a number of different service options are presented. These include the CPE type (indoor or outdoor) and the speeds that can be achieved at the household's location. If an outdoor CPE is selected, the next step is to choose the installation option: self-installation or technician installation.

When all the input from the consumer has been received, the provisioning process starts. The new FWA user will be assigned attributes according to the service options selected. These include the slice identification and QoS profile, authorized geographical location, data rates, and fair usage policies.

This can be a quick process if there is free spectrum and a nearby tower. If radio hardware is already in place, all that is needed is to ship the CPE and schedule a site visit if the technician installation option is selected. The household should get FWA broadband service within a matter of days.

FWA enables very fast time to market (1–7 days)



Deployment and evolution options

The starting point: status of 5G deployment

The status of a service provider's 5G deployment is the starting point for the FWA network evolution. For example, the primary focus for 5G deployment for a typical US service provider has been the addition of mid-band spectrum (i.e., TDD bands above 2.3GHz). Larger service providers expect to deploy that capacity for a majority of their network, with some already reaching 90 percent of population coverage. Other markets follow similar mid-band deployment strategies, such as China, Korea, and India, while others are still lagging on midband deployment. In addition to mid-band deployments, mmWave spectrum in the US has been primarily added for venues (e.g., stadiums, airports) and high-traffic locations (e.g., Times Square in New York City). Given this 5G deployment, FWA-eligible areas are for suburban and rural areas, typically where a large share of the mid-band capacity is allocated for FWA. Eligible areas for dense urban and urban areas must be more restricted to protect MBB traffic and user experience.

Network evolution: multiple complementary options

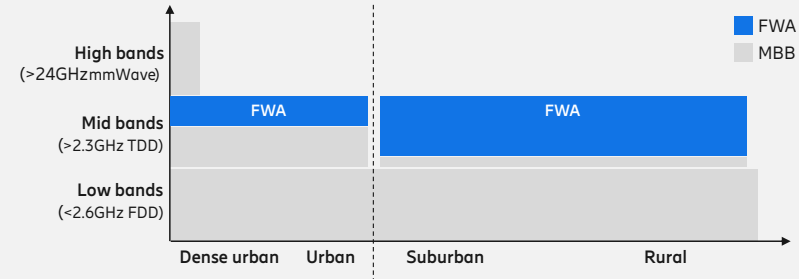
Service providers have multiple complementary network evolution options to add more capacity and performance for FWA. Starting from the customer's premises, migration from indoor CPEs to outdoor CPEs will add significant capacity because of high antenna gains and reduced attenuation losses, particularly for users in poor radio conditions.

Moving to the radio access node, new technological improvements will bring capacity and performance benefits such as 5G standalone and Carrier Aggregation. In addition, deploying high-capacity radios (e.g., MU-MIMO) and sectorization could also significantly increase the capacity. The capacity of the existing site can also be augmented with the deployment of additional spectrum bands, with mmWave spectrum being one of the most attractive given the large bandwidth available. As mmWave will offload mid-band capacity from line-of-sight (LOS) FWA users, non-LOS users will also benefit from all the allocated mid-band capacity.

Apart from that, site densification can add additional capacity, for instance, by adding small cells and macro sites. Most of the costs for new sites are related to passive infrastructure, which can be mitigated by using tower companies and government incentives in case applicable for FWA areas.

Finally, if the service provider has reached a high market share of FWA users, there could also be an option to build a fiber access network if one is financially attractive, considering household density, terrain, permits, and labor costs.

FWA deployment (example)



FWA dense urban – urban

- Target: challenge fiber monopolies, older building without wiring, SMEs
- Advantage: mid-band spare capacity until MBB traffic picks up
- Service providers: mobile-only

FWA suburban – rural

- Target: DSL replacement, FWA first before fiber, cable/fiber monopolies
- Advantage: FWA to fund mid-band deployment. Enhance MBB experience
- Service providers: mobile-only and converged operators (FWA-only service provider for rural areas)

Capacity evolution options

Spectrum
More spectrum on existing site (mmWave)

Migration
Migrate to fiber if financially attractive

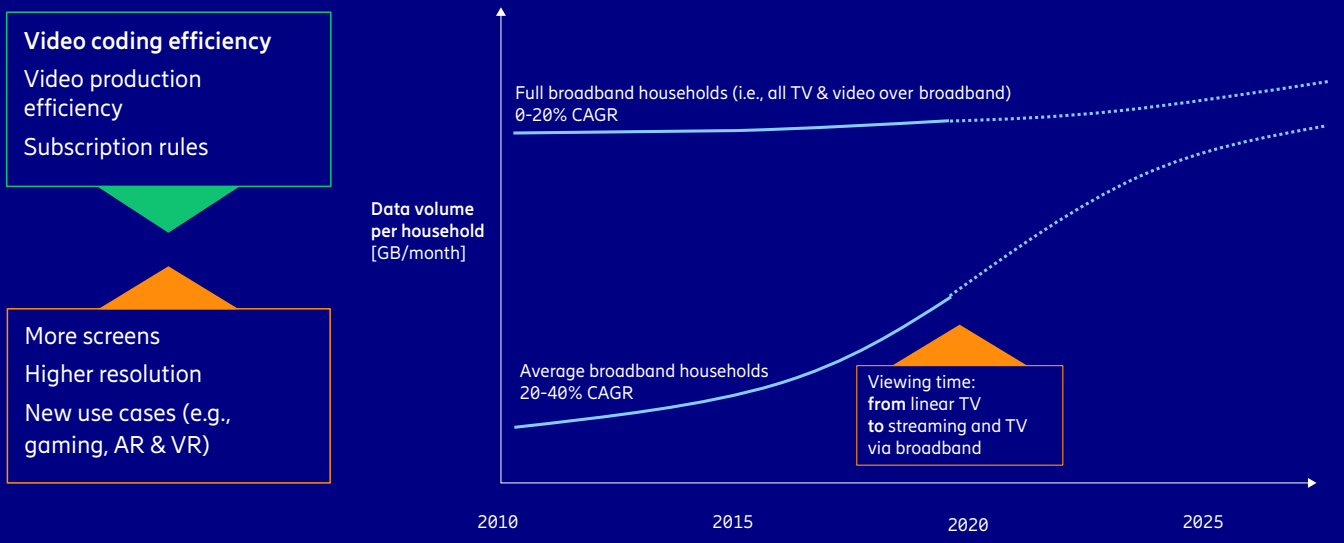
CPE
Migrate heavy/cell edge users to outdoor CPEs

RAN
Deploy latest technology and features (e.g., 5G SA)

Densification
Build additional sites (e.g., macro and small cells)

Large volume and lower growth traffic profile for average and full broadband households

Household broadband generates much more traffic per subscriber than mobile broadband, leading to lower revenue per bit, even though ARPU for a household broadband connection is often higher.



Principal illustration based on European & Asian data

Household broadband generates much more traffic per subscriber than mobile broadband, leading to lower revenue per bit, even though ARPU for a household broadband connection is often higher.

Given this circumstance, it is not surprising that some service providers fear that data-hungry FWA would quickly flood the network with low-ARPU bits, invading mobile spectrum and forcing the service provider into large investments for limited return. Some are especially wary of offering FWA with 'unlimited' data to mimic and compete with fixed broadband. How can this fear of FWA 'unlimited' traffic flooding the network be handled?

Important insights for FWA

First, it is worth remembering that any communication system is dimensioned for the busy hour: how many busy hours there are, or how much data is consumed in off-peak hours, is of little interest. This means the typical focus on monthly consumption value is overstressed – it does not directly impact investment needs. We must focus on what happens in households during busy hours, such as Sunday evenings (MMS, 2017).

Second, FWA is dominated by video and, as such, has a limited needed data rate. At peak times, the maximum household data rate needed is governed by the number of simultaneously active household screens and their resolution. As explained previously, these needs are typically only small fractions of the sold data rates in the offering. In other words, although an 'unlimited' data offering with a high sold data rate could, in theory, induce constant busy-hour consumption at that rate, this will never happen in practice. The amount of video consumption is also largely governed by the viewing habits of households, where the split between scheduled TV (linear and time-shifted) versus video-on-demand is key. Naturally, there are large regional variations, implying that as long as households' linear TV needs are catered for by satellite or terrestrial broadcasting, data consumption over the broadband connection is rather limited.

Only when the FWA solution is also aimed at full broadband households is consumption substantially higher, requiring special consideration. In these households, however, the viewing time is already spent on services over FWA, so viewing time is rather constant, and growth is limited to 0–20 percent. An increased number of higher-resolution parallel screens drives data consumption upward, while advancements in coding and production techniques drive a reduction, as shown in the illustration (Strategy Analytics, May 2021).

As for the average broadband household, an ongoing transfer of viewing time from linear TV to streaming and TV over broadband explains much of the 20–40 percent growth across markets today (for example, Cisco VNI, 2019). As viewing time is spent increasingly on streaming and TV over broadband, consumption will likely approach full broadband households' level and limited growth rate. (Strategy Analytics May 2021)

The traffic levels in the illustration are based on data from Europe and Asia. Traffic patterns in North America show similar trends, but levels tend to be around three times higher, stemming from a different viewing behavior.

A final important insight for FWA is that, unlike mobile broadband, the traffic location is very well known. The CPE is stationary, dramatically reducing statistical uncertainties in network performance observability and predictability. Mobile broadband planning, at best, employs statistical busy-hour traffic averages per sector, while for FWA, the exact location of traffic consumption is known. This also enables a more straightforward planning process for network expansion – there is no need to provide data capacity in a general area in a statistical 'just in case' sense. The geographically stationary nature of data consumption facilitates build-outs with almost surgical precision – which is, of course, less investment-heavy than a general expansion over large, statistically overloaded areas.

Actions to handle FWA data consumption

There are several ways to control FWA data consumption in the network, even with an 'unlimited' data offering, with varying degrees of sophistication, including:

- Outdoor CPE can be used to squeeze 2–3 times higher performance out of the network. There is also the option of trading CPE performance with CPE cost, for example, to offer a more capable (outdoor) CPE to households in a particular location that puts an extra load on the network.
- Limiting the number of signed-up households in a sector. The service provider can observe spare resources in a location and predict whether a new household at a specific street address would fit into the existing capacity headroom or which expansions would be needed.
- More sophisticated methods include stimulating video end-points to transmit at a lower resolution, such as SDTV, and to pre-load likely desired video-on-demand content to household devices during off-peak hours.
- As with fixed broadband, even 'unlimited' offerings often include a contract clause about over-consumption and fair usage, enabling a de facto limit on consumption.
- Existing network functionality such as QoS differentiation or RAN slicing should be used to separate mobile broadband from FWA traffic using the same spectrum so as not to jeopardize mobile broadband quality as FWA traffic grows.

Home broadband usage remains video and downlink-centric

Household broadband is dominated by video and entertainment usage. The main applications are video streaming, music streaming, gaming, social media, and internet browsing and downloads. Since the start of the COVID-19 pandemic, there has been an increase in work and study from home, which includes voice, screen sharing, cloud storage, and video conferencing. Overall household data consumption depends on the number of people per home. The illustration shows examples of required data rates for different applications (source Cartesian 2021 and Ericsson Technology Review, 2021).

Data rate

The data rate requirement depends on the quality of the video, which in turn depends on the resolution, frame rate, and encoding quality. Modern video servers have content coded in multiple qualities, and end-to-end protocols switch between these, depending on the data rate experienced by the receiving client.

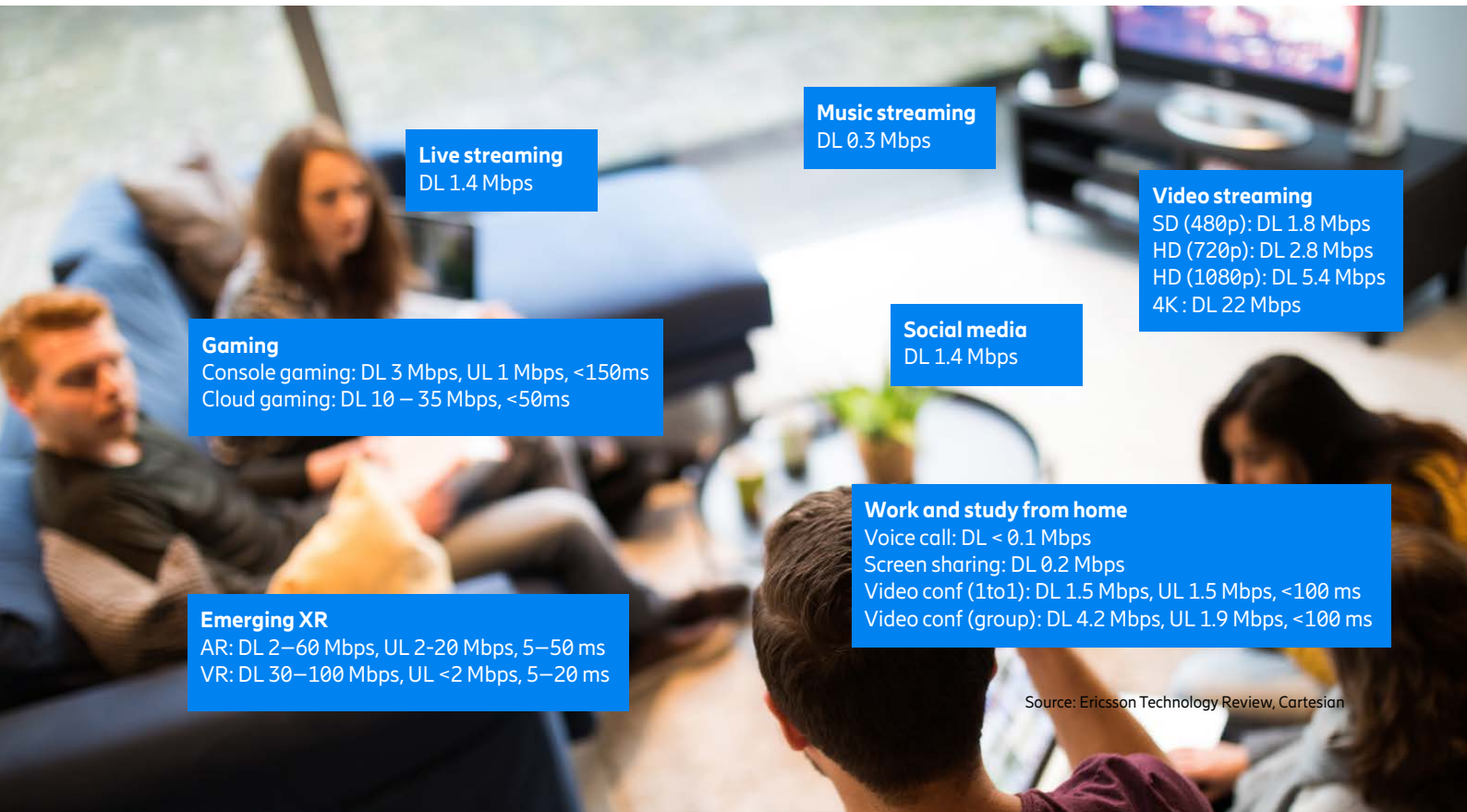
Video providers work with big device buffers to avoid quality degradation when network conditions vary. For example, Netflix typically strives to build up a 90-second buffer. With YouTube leading the way, video providers can rather accurately predict how each consumer will continue watching the shows once started, which means that significant buffers (up to one hour) of 'good' data could be built up using free capacity. This relieves the dimensioning requirements since a longer time interval than the actual peak can be considered.

Delay

The absolute delay of starting the play out is flexible: one or a few seconds is acceptable. However, a pretty low delay is still desirable to quickly get up to speed (say 10 Mbps) with TCP after possible link interruptions.

Direction

The FWA household traffic is highly downlink-centric, as video streaming is the dominant service. Even future emerging XR applications for augmented-, virtual- and mixed-reality for gaming and volumetric video are likely to remain downlink-centric, with requirements not exceeding 100 Mbps and with many efforts to optimize and lower data rates. The uplink must still support the application signaling to get the video started, a relatively high rate of TCP acknowledgments, and reasonable experience for uploads and uplink webcam-type streaming. Later in the chapter we discuss usage patterns for a typical full broadband home.



Source: Ericsson Technology Review, Cartesian

Home broadband usage trends stabilize

Home broadband usage behavior and traffic profile are starting to stabilize after the effects of the COVID-19 pandemic and the increased working-from-home behavior. Analysis of recent traffic data from the UK and Italy provides insights into the continuing influences and trends arising in the past four to five years.

Daily traffic variation, but evening busy-hour remains

An analysis of average weekday traffic profiles from Ofcom, the UK's national telecoms regulatory agency, clearly shows four main phases of home broadband usage:

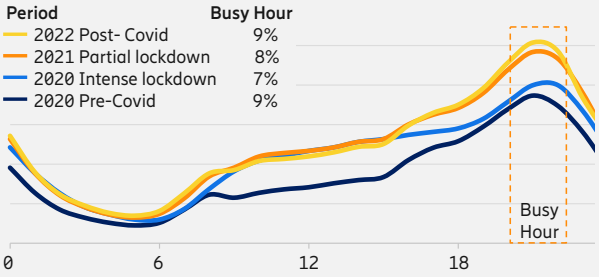
1. 2020 pre-Covid (Jan 27–Mar 23): normal traffic behavior before the rapid increase in working from home
2. 2020 intense lockdown (Mar 22–Jul 31): large increase in daily home broadband traffic as people worked and studied from home
3. 2021 partial lockdown (Feb 1–Jul 31): daily work-from-home traffic remains stable, while traffic increases after 4 pm as children return home from school
4. 2022 Post-Covid (Feb 1–Jul 31): daily work-from-home traffic declined slightly as people returned to the office, while busy-hour traffic in the evenings continued to increase

Total home broadband traffic volumes have gone down single-digit in 2021 to 2022, much lower than in 2020. For 2022, the total home broadband traffic growth was similar to 2021 at 6 percent, while busy-hour traffic was slightly higher at 7 percent.

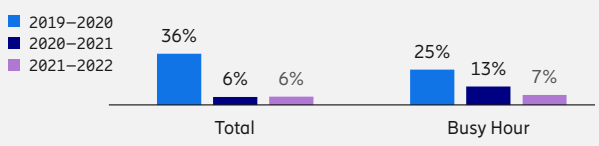
Return to the office may impact home traffic volumes

A report from AGCOM, Italy's national telecoms regulatory agency, also illustrates the distinct home broadband usage profiles before, during, and after the Covid-19 pandemic. Looking at the home broadband traffic data for the first six months from 2019 to 2023, we can infer the monthly traffic growth has stabilized in the past two years to just over 10 percent per year. Aggregate traffic data also show that most home broadband traffic remains downlink-oriented, and the uplink/downlink ratio has remained stable throughout the five-year period.

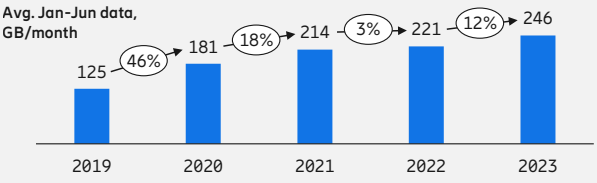
Average weekday daily traffic profile (2020–2021, UK)



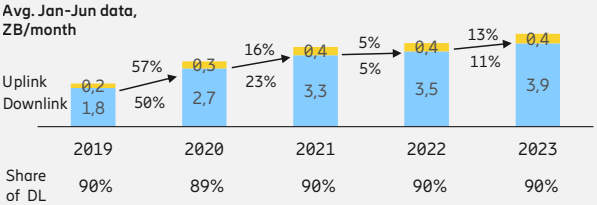
Year-over-year total traffic growth (UK)



Average fixed broadband traffic per connection (Italy)



Fixed broadband network traffic (Italy)



Source: AGCOM, 2023, Ericsson analysis.

Local variations in FWA usage

Although some major home broadband usage trends are similar across markets (driven by increases in video streaming and gaming, for example), many local market variations need to be considered for fixed wireless services.

User-driven

Three main user-driven aspects exist to the local variation in broadband usage patterns.

First, home broadband usage is driven by the number of people living in the household. For example, the average number of people per household is three times higher in Pakistan than in Germany. The number of people often correlates to the number of screens and connected devices, which drive usage, as TV viewing and gaming are increasingly individual practices.

Second, the fixed wireless opportunity is driven by the number of premises that can be connected, including primary home addresses as well as secondary or vacation homes. In some countries, it is common to have secondary homes, which can represent an extra 20 percent of homes to be connected.

Third, there are different FWA connectivity needs for the business segment, where some service providers, such as Verizon in the USA, have a strong business segment presence. By 3Q-2023, the business segment represented close to 40 percent of Verizon's FWA connections, and the number of business FWA connections is expected to grow to one million by 2025 (~25 percent of the total).

Usage-driven

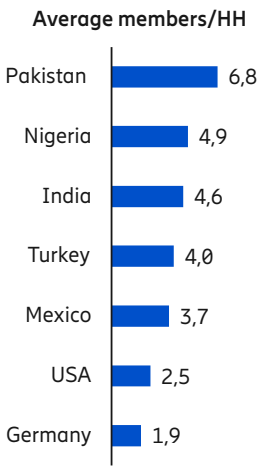
Business Internet usage is very different from consumer usage. The most obvious difference is that business usage is typically highest during working hours (9 am–5 pm). This complements home usage, which typically has busy-hour consumption during the evening (often 8–9 pm). Moreover, business usage is not video-intensive, resulting in much lower average data consumption than home connections. For instance, T-Mobile US reports that business Internet usage for SMEs is around 80–140GB/month compared with 450GB/month for home Internet (average FWA usage for Verizon is 300GB/m due to share of business users). At the same time, reliability, availability, and performance are critical differentiators for most business segments.

It is also important to consider seasonality, as weather affects how much time people spend indoors, and the programming of specific sports and entertainment events affects usage patterns, for example. Popular content (like the final episodes of popular TV shows), sports events (such as the Olympic Games), and iconic live TV events (like the Eurovision Song Contest) capture a high share of concurrent viewing.

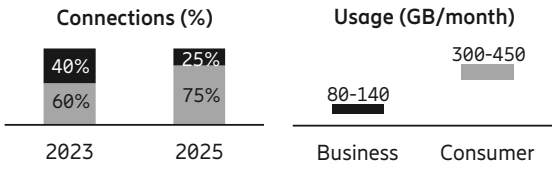
User and usage variations, combined with the availability of alternative services (including digital terrestrial TV), help to explain variations per country in fixed wireless traffic volumes and growth rates.

Market variations (examples)

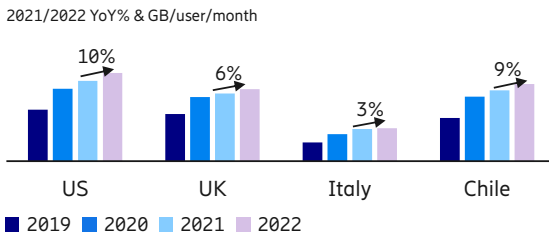
Household size



Mix: Consumer vs. business (examples)



Fixed broadband usage and growth



FWA usage market drivers

User
- Household size
- Secondary homes
- Business users

Usage
- Popular content
- Seasonality
- Large events

Source: Regulator, service provider information, OpenVault, Ericsson analysis

Learn more in six actionable insights on capturing the value of 5G FWA

ericsson.com/fwa-insights

Ericsson
SE-164 80 Stockholm, Sweden
Telephone +46 10 719 0000
www.ericsson.com

The content of this document is subject to revision without notice due to continued progress in methodology, design and manufacturing. Ericsson shall have no liability for any error or damage of any kind resulting from the use of this document.

© Ericsson 2023