ERICSSON

# ERICSSON MOBILITY REPORT

## ON THE PULSE OF THE NETWORKED SOCIETY

November 2013


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November 2013

The number of mobile subscriptions worldwide has grown approximately 7 percent year-on-year during Q3 2013. The number of mobile broadband subscriptions grew even faster over this period – at a rate of 40 percent year-on-year, exceeding 2 billion in 2013. The amount of data usage per subscription also continued to grow steadily and around 55 percent of all mobile phones sold in Q3 2013 were smartphones.

Together, these factors have contributed to an increase in monthly mobile data traffic over Q3 2013 that exceeded total monthly mobile data traffic in Q4 2009. In this issue we look beyond our usual update and outlook on mobile traffic with an analysis of mobile traffic distribution over different device types and operating systems.

In the last report we described app coverage – a new framework for understanding varying network performance within a given coverage area. In this edition we take this analysis a step further by using the radio characteristics of a WCDMA/HSPA network to predict coverage area and indoor penetration for popular smartphone applications such as streaming music and video, video telephony, and circuit-switched voice. Continuing on the theme of app coverage, we apply the same app type requirements on downlink speed to compare network performance in 17 cities globally. We also include consumer research results on perceived differences in voice and internet coverage at different locations in a city. Our article on gaming takes a look at the US market and discusses the correlation between playing games and watching video on smartphones in the region.

Finally, you will find our usual table of key figures at the end of this document. We hope you find this report engaging and valuable.

## ABOUT THIS REPORT

**Ericsson has performed in-depth data traffic measurements in mobile networks from the world's largest installed base of live networks. These measurements have been collected from all regions of the world since the early days of mobile broadband.**

**The aim of this report is to share analysis based on these measurements, internal forecasts and other relevant studies to provide insights into the current traffic and market trends.**

**Publisher:** Douglas Gilstrap, Senior Vice President and Head of Strategy, Ericsson

# MOBILE SUBSCRIPTIONS Q3 2013

Total mobile subscriptions up to and including Q3 2013 are at around 6.6 billion, including 113 million new subscriptions added during the third quarter. Global mobile subscriptions have continued to grow seven percent year-on-year and two percent quarter-on-quarter. The actual number of subscribers however, is lower, at around 4.5 billion. This is because many people have several subscriptions.

Throughout the world there is continued momentum for smartphone uptake. These devices accounted for around 55 percent of all mobile phones sold in Q3 2013, compared to around 40 percent for the full year in 2012. And it doesn't show any sign of slowing down. Of all mobile phone subscriptions, 25-30 percent are associated with smartphones, leaving considerable room for further uptake.

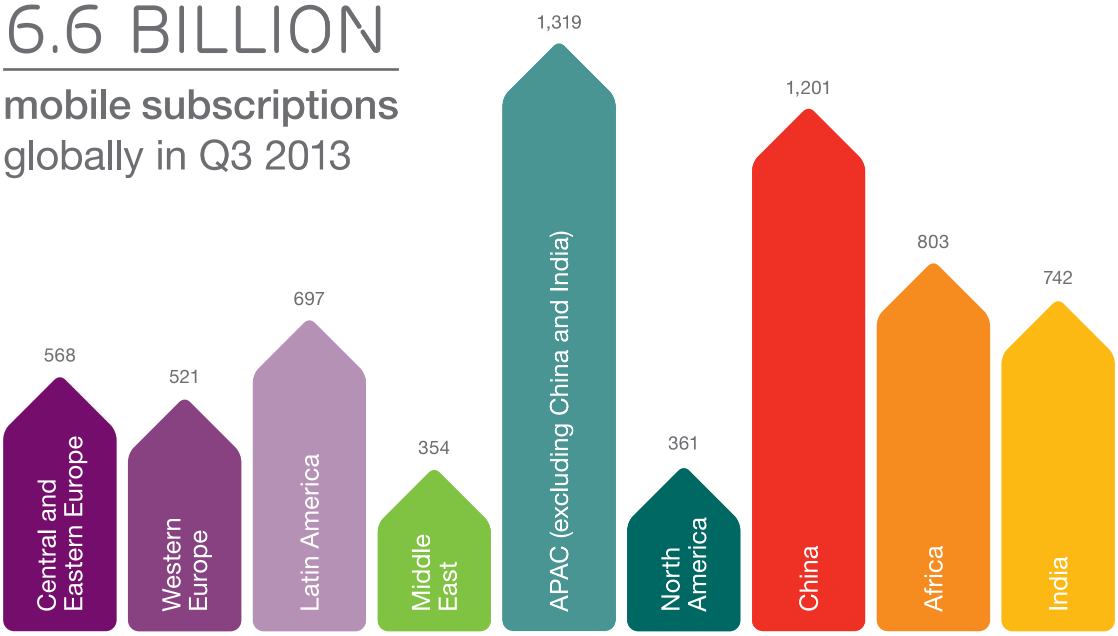
Global mobile broadband subscriptions grew by around 40 percent year-on-year, with around 150 million additions.

With around 25 million additions in Q3 2013, LTE is growing rapidly and has reached 150 million subscriptions, while WCDMA/HSPA has the highest net additions at around 80 million. Almost all of these 3G/4G subscriptions have access to GSM/EDGE as a fallback. The number of GSM/EDGE-only subscriptions did not increase.

**Global mobile broadband subscriptions** will exceed 2 billion in 2013

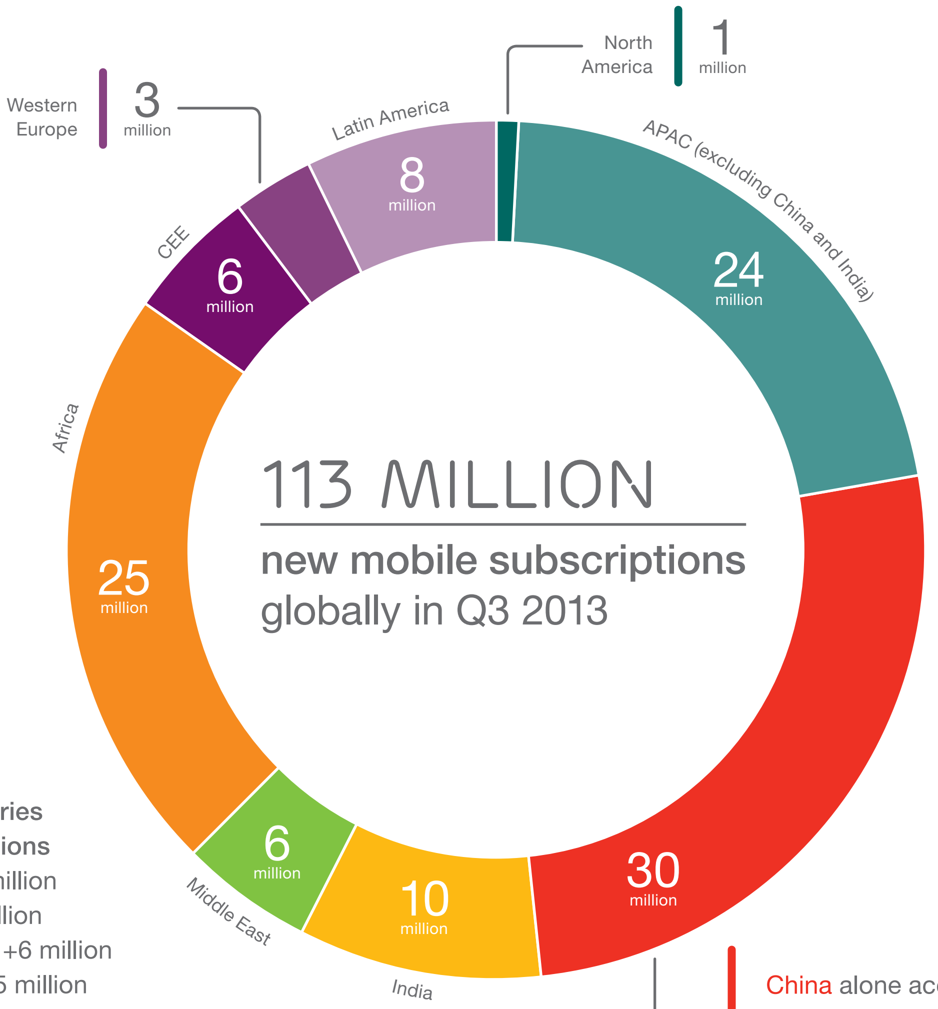
## 6.6 BILLION

**mobile subscriptions** globally in Q3 2013



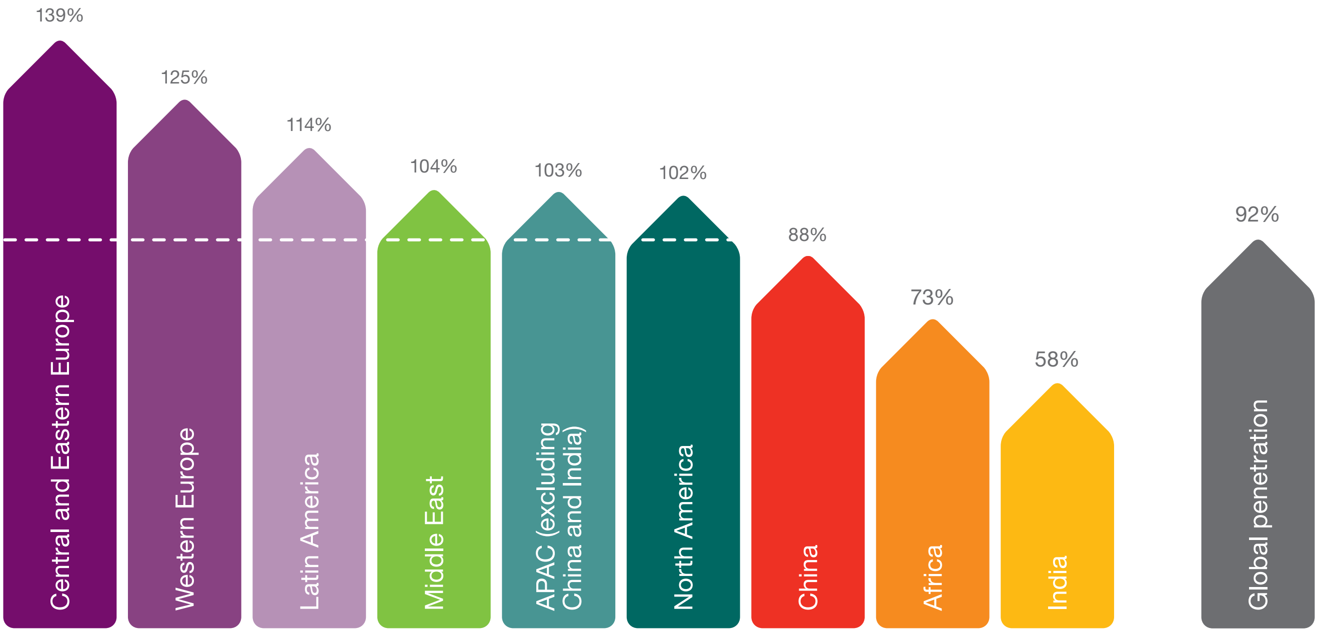

**Mobile subscriptions (million)**

Indian subscriptions include active VLR subscriptions.




**Top 5 countries by net additions**
China +30 million
India +10 million
Bangladesh +6 million
Indonesia +5 million
Egypt +4 million

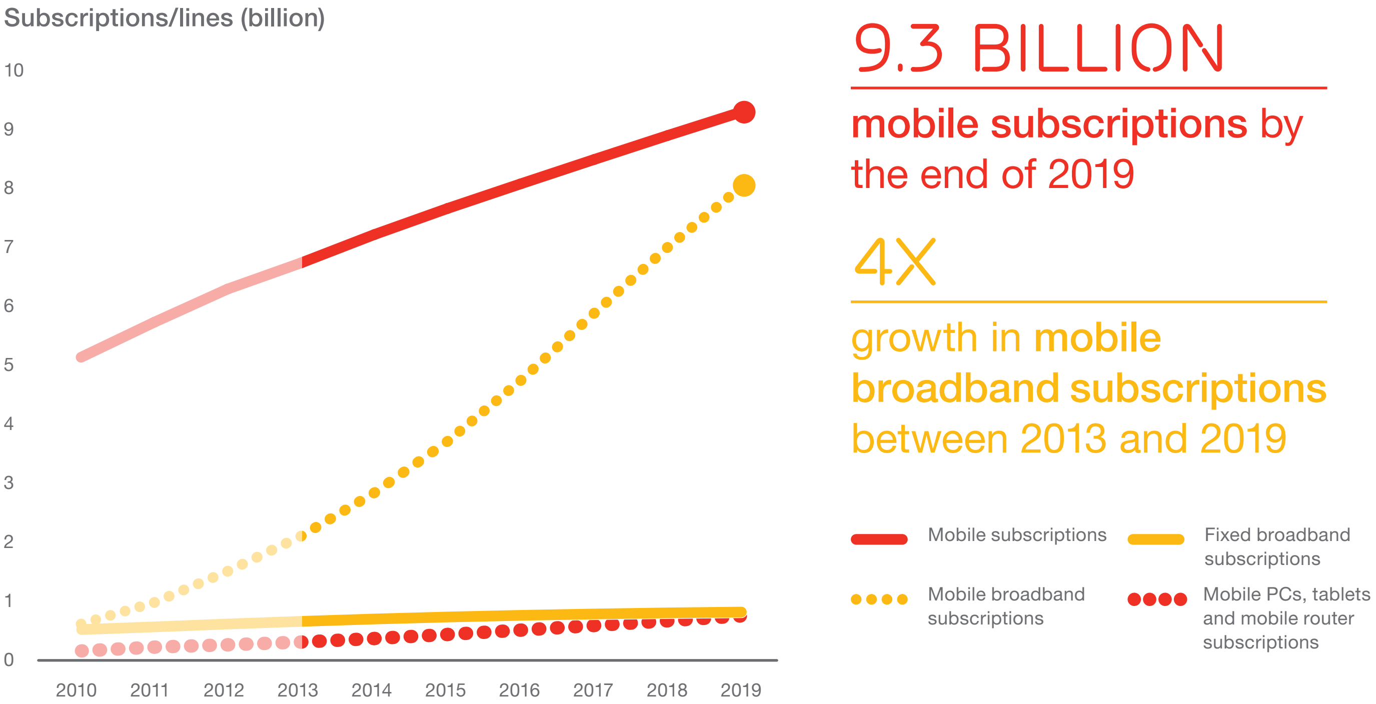
China alone accounted for around 25 percent of net additions, adding around 30 million subscriptions




## Penetration

Note that Turkey is now included as part of the Middle East region instead of Central & Eastern Europe. Because of this, comparisons of the two should not be made between this and previous editions of the Ericsson Mobility Report.

# MOBILE SUBSCRIPTIONS OUTLOOK




## 9.3 BILLION

**mobile subscriptions** by the end of 2019

## 4X

growth in **mobile broadband subscriptions** between 2013 and 2019

By Q3 2013, total mobile subscriptions were around 6.6 billion. By the end of 2019, they are expected to reach around 9.3 billion. Global mobile broadband subscriptions passed 2 billion in 2013, and are predicted to grow 4 times by 2019, reaching 8 billion. Mobile broadband will gain a larger share of total broadband subscriptions in many markets, complementing fixed broadband, and in certain segments replacing it. As coverage is built out it is increasingly common for users to replace fixed broadband with mobile broadband. The majority of mobile broadband devices are, and will continue to be, smartphones.[1]

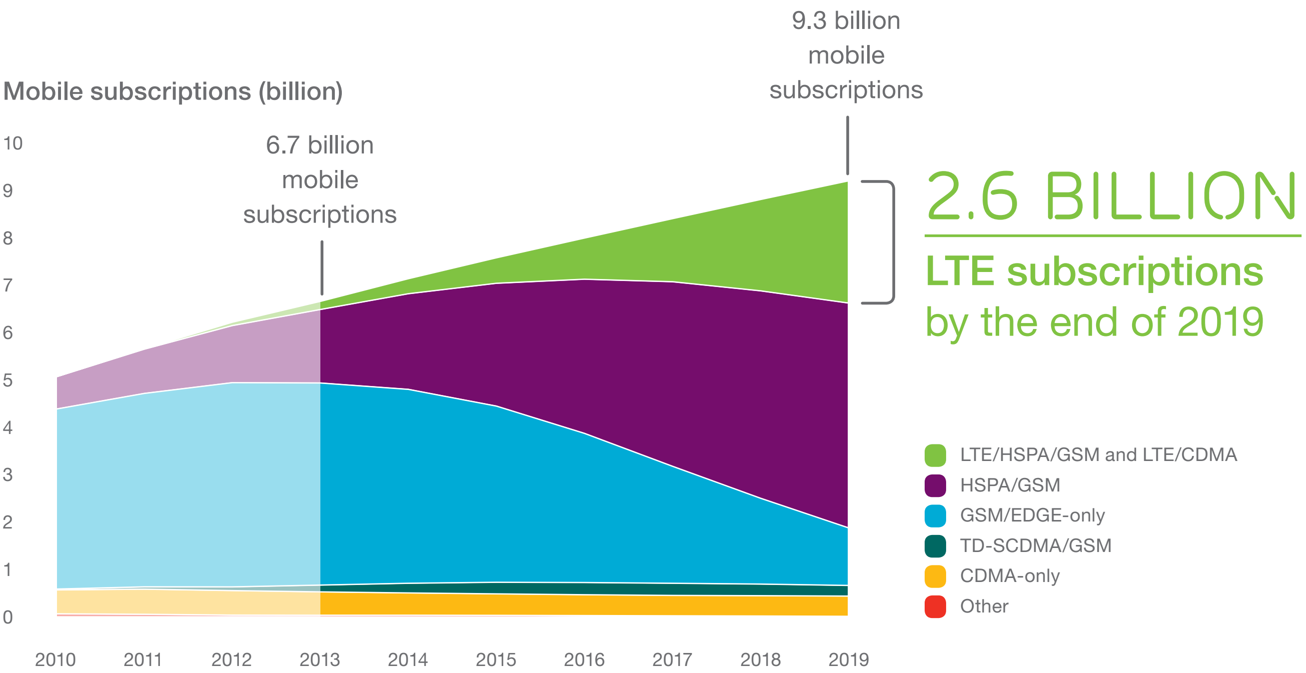
**Mobile technology**

GSM/EDGE-only represents the largest share of mobile subscriptions today. In developed markets there has been rapid migration to more advanced technologies, resulting in a decline in GSM/EDGE-only subscriptions. Despite this, GSM/EDGE will continue to represent a large share of total mobile subscriptions. This is because new, less affluent users entering networks in growing markets will likely choose a low cost mobile phone and subscription. In addition, it takes time for the installed base of phones to be upgraded. GSM/EDGE networks will also continue to be important in complementing WCDMA/HSPA and LTE coverage. LTE is being deployed and built-out in all regions, and will reach around 2.6 billion subscriptions in 2019. These subscriptions will represent the high-end share of the total subscriber base by 2019.

Mobile Broadband is defined as HSPA, LTE, CDMA2000 EV-DO, TD-SCDMA and Mobile WiMax.

[1]The number of fixed broadband users is at least three times the number of fixed broadband connections, due to multiple usage in households, enterprises and public access spots. This is the opposite of the mobile phone situation, where subscription numbers exceed user numbers.

Mobile subscriptions (billion)



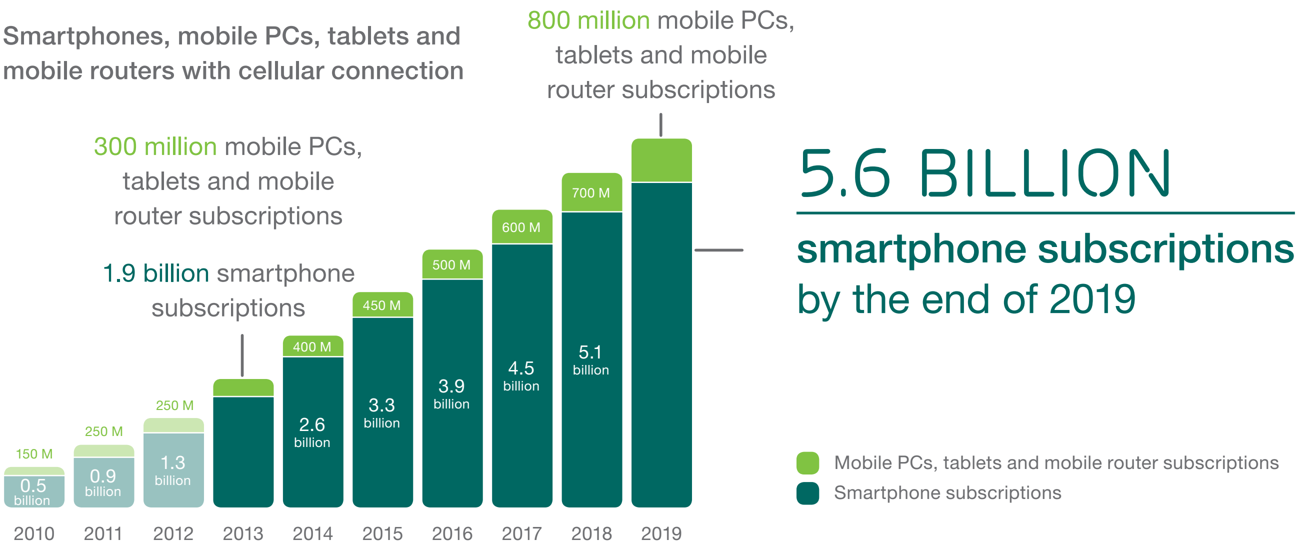

**Mobile devices**

Today, the majority of mobile subscriptions are for basic phones. It is estimated that subscriptions for these devices peaked in 2012. However, they will remain high, slowly declining from around 4.5 billion today, to around 3 billion in 2019. This is because a large part of the growth in subscriber numbers will come from the low-end phone segment.

Total smartphone subscriptions will reach 1.9 billion at the end of 2013 and are expected to grow to 5.6 billion in 2019. One of the main reasons for this is a notable increase in Asia Pacific and Middle East and Africa subscriptions, as people will be likely to exchange their basic phones for smartphones. This is due in part to the availability of smartphones in lower price ranges. In 2016 there will be more smartphone subscriptions globally than those for basic phones.

Regional differences will be large. In 2019, almost all handsets in Western Europe and North America will be smartphones, compared to 50 percent of handset subscriptions in the Middle East and Africa. The number of mobile subscriptions for mobile PCs, tablets and mobile routers is expected to grow from 300 million in 2013 to around 800 million in 2019. There is a large number of PCs and tablets without a mobile subscription. Many tablets do not have a subscription because of the current price difference between models that are Wi-Fi-only and those with mobile capabilities. Another reason is that some tablets that do have mobile capabilities do not have a subscription – their owners choose to connect using Wi-Fi instead. However, mobile-capable models are expected to represent an increasing share of tablet sales. The forecast for mobile PCs has been reduced since the last report, partly due to the increasing use of tethering via smartphones.

Smartphones, mobile PCs, tablets and mobile routers with cellular connection



# REGIONAL SUBSCRIPTIONS OUTLOOK

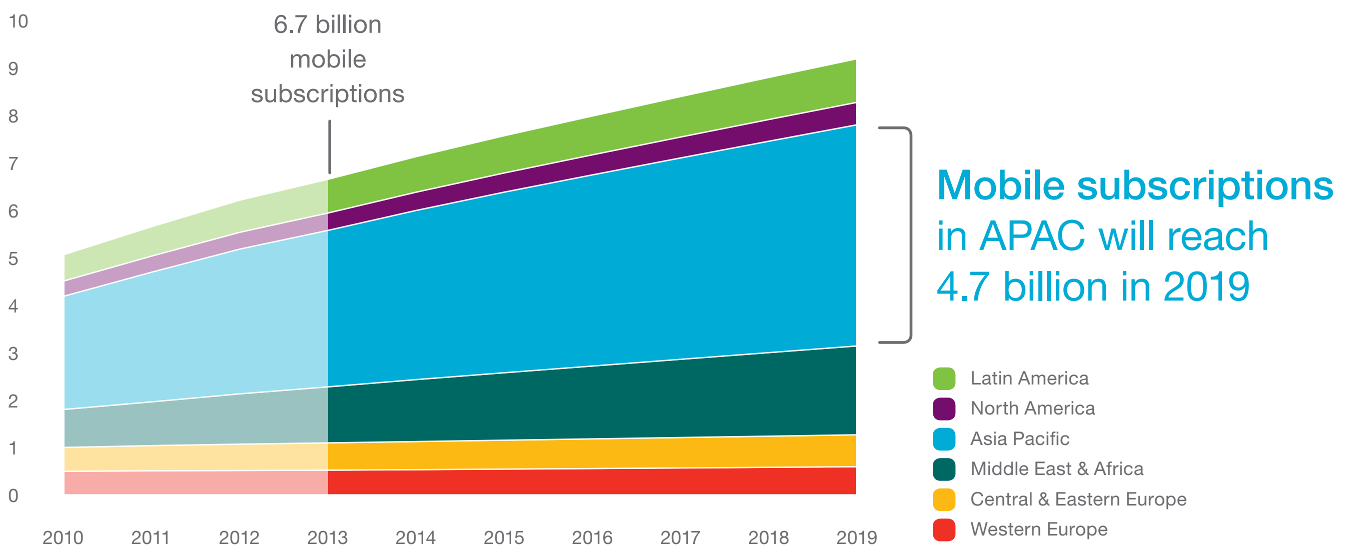
All regions show growth in mobile subscriptions. In Asia Pacific this is driven by new subscribers. In more mature markets, such as North America and Western Europe, the growth is limited and comes from the increasing number of subscriptions per individual – for example, adding a tablet.

Each region's maturity level is reflected in its radio technology mix. Developing regions are dominated by 2G technologies, like GSM/EDGE, while developed ones are dominated by WCDMA/HSPA. LTE is rapidly being embraced by both operators and subscribers, particularly in North America. In all regions, 2G networks (GSM/EDGE, CDMA 1X) remain as fallback networks for 3G and 4G subscriptions where coverage is missing.

In North America, LTE will represent the majority of subscriptions in the region in 2016, growing to around 85 percent in 2019. GSM/EDGE-only subscriptions will progressively decline. This fast growth in LTE subscriptions is driven by strong competition and consumer demand, following CDMA operators' early decisions to migrate to LTE.

Latin America has a large GSM/EDGE subscriber base. The strong growth in subscriptions in this region will be driven by economic development and consumer demand. In 2019, WCDMA/HSPA will be the dominant technology, however GSM/EDGE-only subscriptions will still be significant.

Mobile subscriptions (billion)



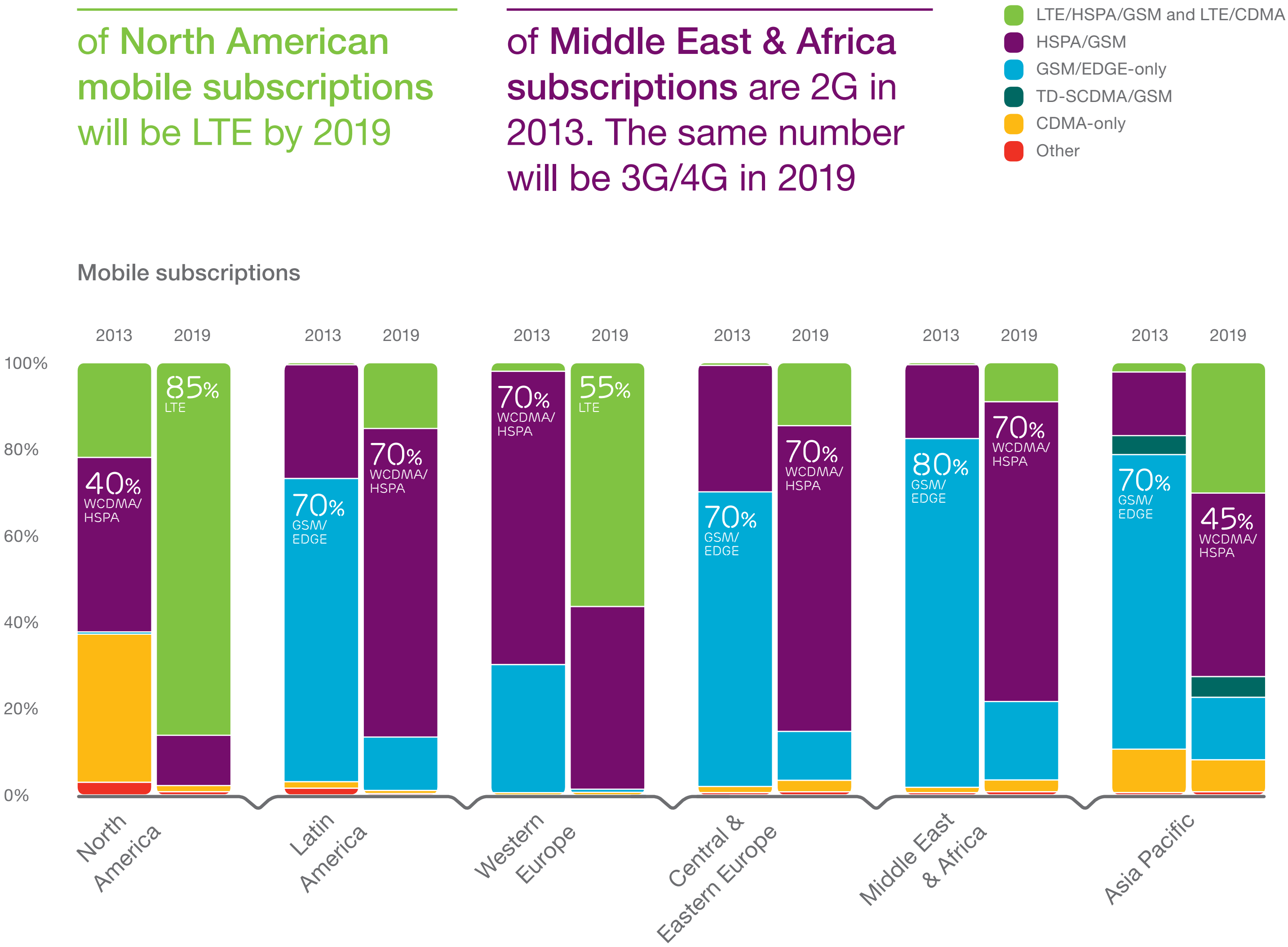
85%

of North American mobile subscriptions will be LTE by 2019

80%

of **Middle East & Africa subscriptions** are 2G in 2013. The same number will be 3G/4G in 2019

Mobile subscriptions




In Western Europe WCDMA/HSPA is the dominant technology today. By the end of the forecast period, LTE will make up around 55 percent of the subscriptions base in Western Europe. Data services were rolled out early in this region, initially accessed via dongle or mobile PC. Western Europe is at the forefront of mobile broadband uptake, but the drive for LTE has not yet been as strong in the region as North America. This is due to factors such as having many well-developed 3G networks in the region as well as the type of tariff plans that are available for LTE.

The Asia Pacific market continues to see a significant increase in mobile subscriptions with 1.4 billion net additions up until the end of 2019. It represents approximately 50 percent of added mobile subscriptions globally. Markets such as Japan and South Korea will take up LTE subscriptions early compared to less developed countries. Today LTE penetration is already over 20 percent in Japan and over 50 percent in South Korea. China will add substantial LTE subscriptions during the forecast period, reaching over 700 million by the end of 2019. Asia Pacific is progressing towards 3G and 4G. In 2013, around 75 percent of mobile subscriptions were 2G, while around 85 percent will be 3G/4G in 2019.

Central and Eastern Europe shows a strong increase in HSPA subscriptions. LTE will initially grow in the most developed parts of the region, and will be present in almost all countries by 2015.

In 2013, the Middle East and Africa is dominated by GSM/EDGE, which represents around 80 percent of mobile subscriptions in the region. Dramatic changes will take place in the coming years and in 2019 WCDMA/HSPA and LTE will represent the same share of subscriptions as GSM/EDGE does today.

# MOBILE TRAFFIC Q3 2013

**Global traffic in mobile networks**
The graph below shows total global monthly data and voice traffic. It depicts a stable trend of data traffic growth with some seasonal variations and flat voice traffic development. The number of mobile data subscriptions is increasing rapidly, and driving growth in data traffic along with a continuous increase in the average data volume per subscription. Data traffic grew around 10 percent between Q2 and Q3 2013.

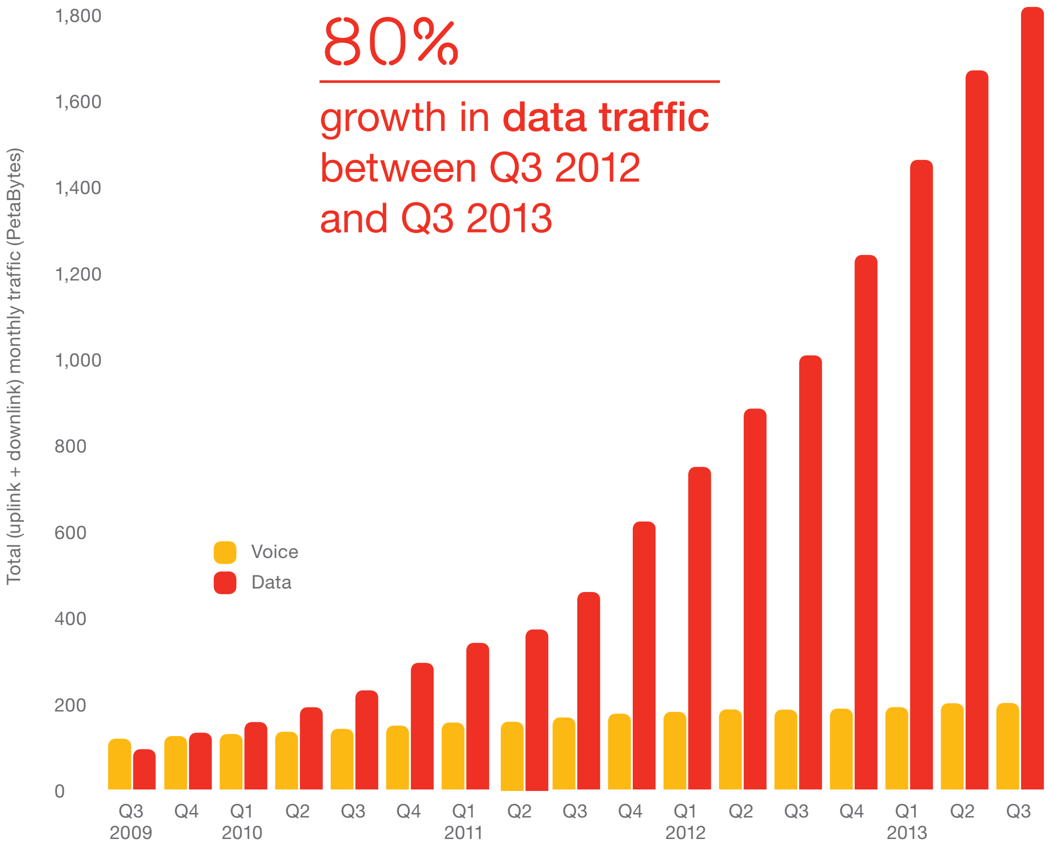
It should be noted that there are large differences in traffic levels between markets, regions and operators.

These measurements have been performed by Ericsson over several years using a large base of commercial networks that together cover all regions of the world. They form a representative base for calculating total world traffic in mobile networks.[1]

The increase of monthly **mobile data traffic** in Q3 2013 exceeded total monthly mobile data traffic in Q4 2009

80%

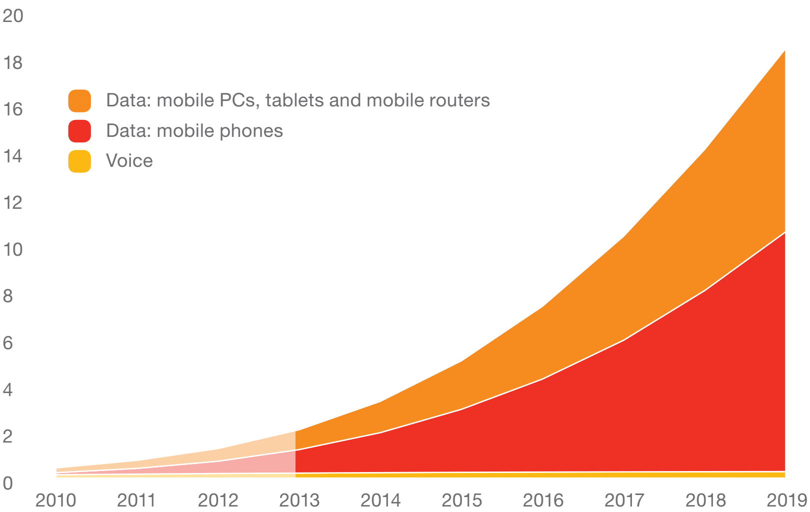
growth in **data traffic** between Q3 2012 and Q3 2013




[1]Traffic does not include DVB-H, Wi-Fi, or Mobile WiMax. Voice does not include VoIP.

# MOBILE TRAFFIC OUTLOOK

Global mobile traffic (monthly ExaBytes)




10X

growth in **mobile data traffic** between 2013 and 2019

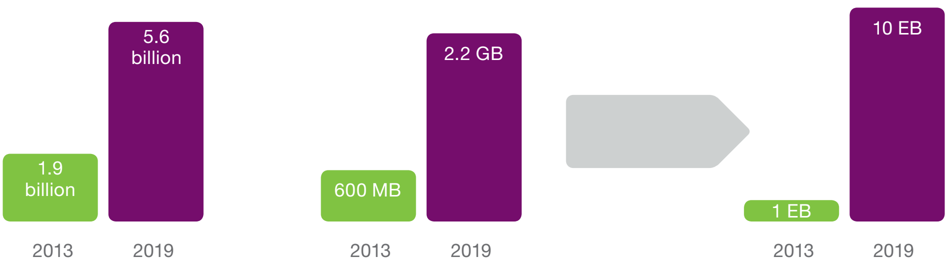
In 2013, **mobile traffic generated by mobile phones** will exceed that generated by mobile PCs, tablets and routers

Mobile data traffic is expected to grow at a CAGR of around 45 percent (2013-2019). This will result in an increase of around 10 times by the end of 2019. The rising number of smartphone subscriptions is the main driver for mobile data traffic growth. Users consuming more data per subscription – mainly driven by video – is adding to this, resulting in the increase.

In 2013, total mobile traffic generated by mobile phones exceeded that from mobile PCs, tablets and mobile routers for the first time. Traffic in the mobile phone segment is primarily generated by smartphones. By 2019, smartphone subscriptions are expected to triple, resulting in rapid traffic growth. Total monthly smartphone traffic over mobile networks will increase around 10 times between 2013 and 2019.

Mobile data traffic will grow considerably faster than fixed data traffic over the forecast period – the fixed data traffic CAGR will be around 25 percent between 2013 and 2019. However, in absolute volume, fixed data traffic will remain dominant. Mobile data traffic represents 5 percent of total mobile and fixed traffic in 2013, and 12 percent in 2019.

Note that there are large differences in user patterns between different networks, markets and user types. A large part of data traffic is generated by a limited number of users. Factors such as operator data volume caps, tariff plans, and the screen size and resolution of the user's device all impact data traffic volumes per subscriber.




10X

growth in **smartphone traffic** between 2013 and 2019

Active subscriptions here refer to the number of used devices, i.e. not including multiple-sims or inactive devices.

# REGIONAL MOBILE TRAFFIC

Asia Pacific will have a high share of the total mobile traffic both in 2013 and 2019. The main reason for this is the rapid growth in subscriptions. China alone will add over 500 million mobile subscriptions. There are large differences in usage volumes and patterns within Asia Pacific, with countries such as South Korea and Japan deploying LTE early, whereas other countries are still dominated by GSM networks.

In 2013, North America and Western Europe have a significantly larger share of total traffic volume than their subscription numbers alone would imply. This is due to a high proportion of data-rich devices in WCDMA/HSPA and LTE networks.

In Western Europe, operators made early efforts to use mobile broadband as a substitute for fixed broadband by offering competitive tariffs for dongles.

North America will have a smaller share of global traffic in 2019 than in 2013. This is because the smartphone share of total phone subscriptions – expected to be 90 percent in 2015 – will be saturated before the other regions. In 2019, Western Europe will be the only region with a higher share of traffic from mobile PCs, tablets and mobile routers than from mobile phones. This is due to a high penetration of these devices, in particular mobile routers that are associated with high traffic volumes from fixed broadband substitution in some countries.

Mobile data traffic increase between 2013 and 2019 by region

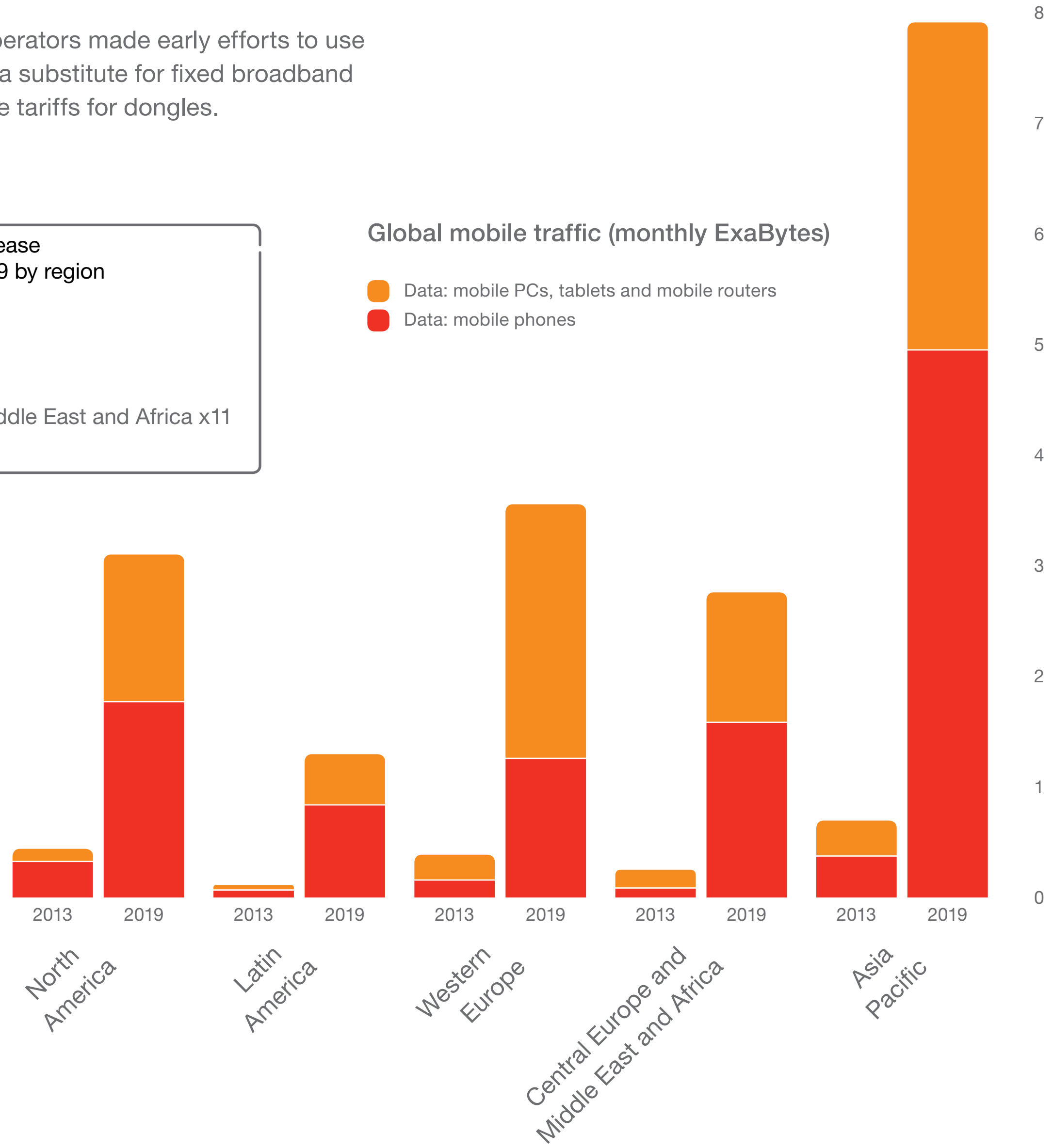
North America x7

Latin America x11

Western Europe x9

Central Europe and Middle East and Africa x11

Asia Pacific x11



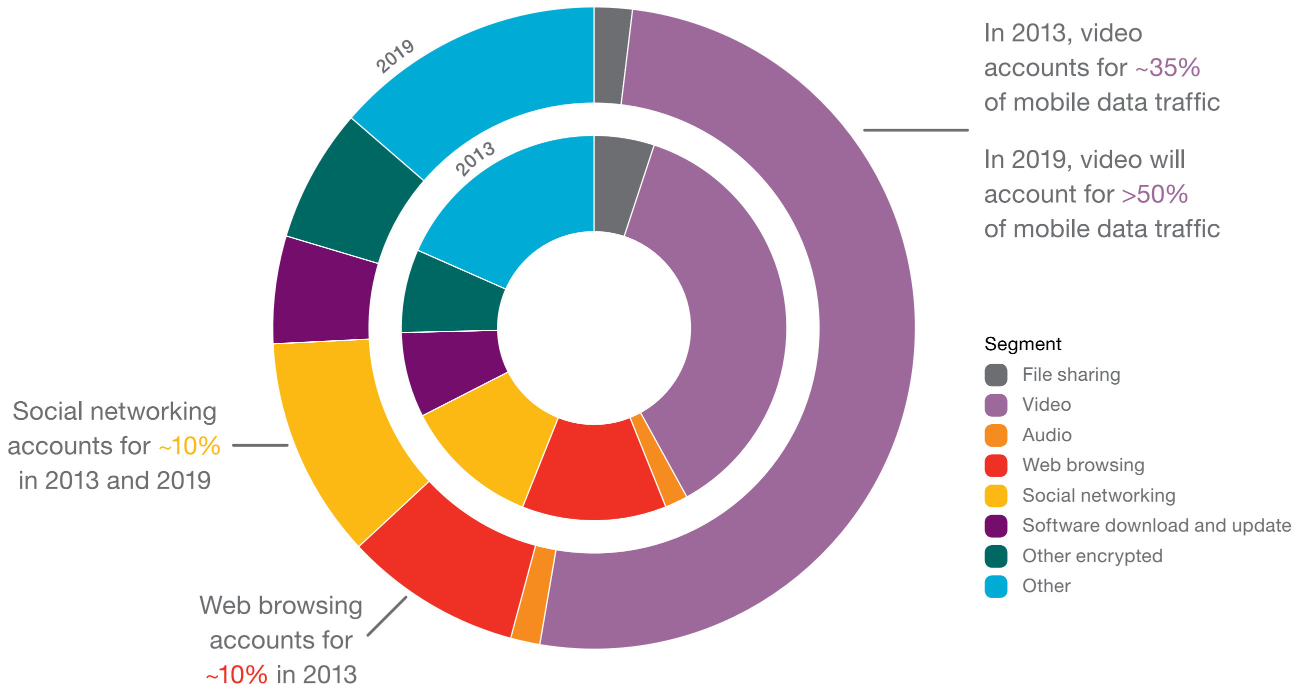
# MOBILE APPLICATION TRAFFIC OUTLOOK

The largest and fastest growing mobile data traffic segment is video. It is expected to increase by around 55 percent annually up until the end of 2019, by which point it is forecasted to account for more than 50 percent of global mobile traffic.

Streaming on-demand and time-shifted content, including YouTube, is growing. It is no longer just early adopters that use these services. As many as 41 percent of people aged between 65 and 69 stream video content over mobile and fixed networks on at least a weekly basis. People watch video on all types of devices. This is increasingly the case when they are out and about.[1] Video streaming services, such as Netflix, HBO and Vimeo, have shown very strong uptake in some markets. In addition, operators are increasingly making their own TV services available as streaming services on mobile networks. This is facilitated by the better network speeds that come with HSPA and LTE development. It is increasingly common to watch video over mobile networks and mobile devices make up an increasing share of TV and video viewing. This has contributed to the growth in mobile data traffic.

Music streaming is gaining popularity, but functions such as caching of content and offline playlists limit the impact on traffic growth. Audio traffic is still expected to increase at an annual rate of around 40 percent, which is in line with the total mobile traffic growth.

Today, web browsing and social networking each constitute around 10 percent of total mobile data traffic. The share will remain at the same level in 2019, even though a typical web page will increase in data volume and social networking increasingly will include data-rich content.




Video is also likely to form a major part of file sharing traffic and a sizeable part of encrypted traffic, in addition to the identified application type 'video' By encrypted traffic we mean encryption on the network layer (e.g. VPNs) or transport layer (e.g. TLS/SSL). Application layer encryption such as DRM for video content is not included.

[1]Ericsson Consumer Lab TV & Media study (2013).

The arrival of new devices or content can rapidly change people's behavior and hence traffic patterns, and add new traffic types. Furthermore, there will be broad variations between networks with different device profiles – for example, some will be PC dominated while others will mainly facilitate smartphone users. Traffic will also vary between markets due to differences in content availability and content rights issues.

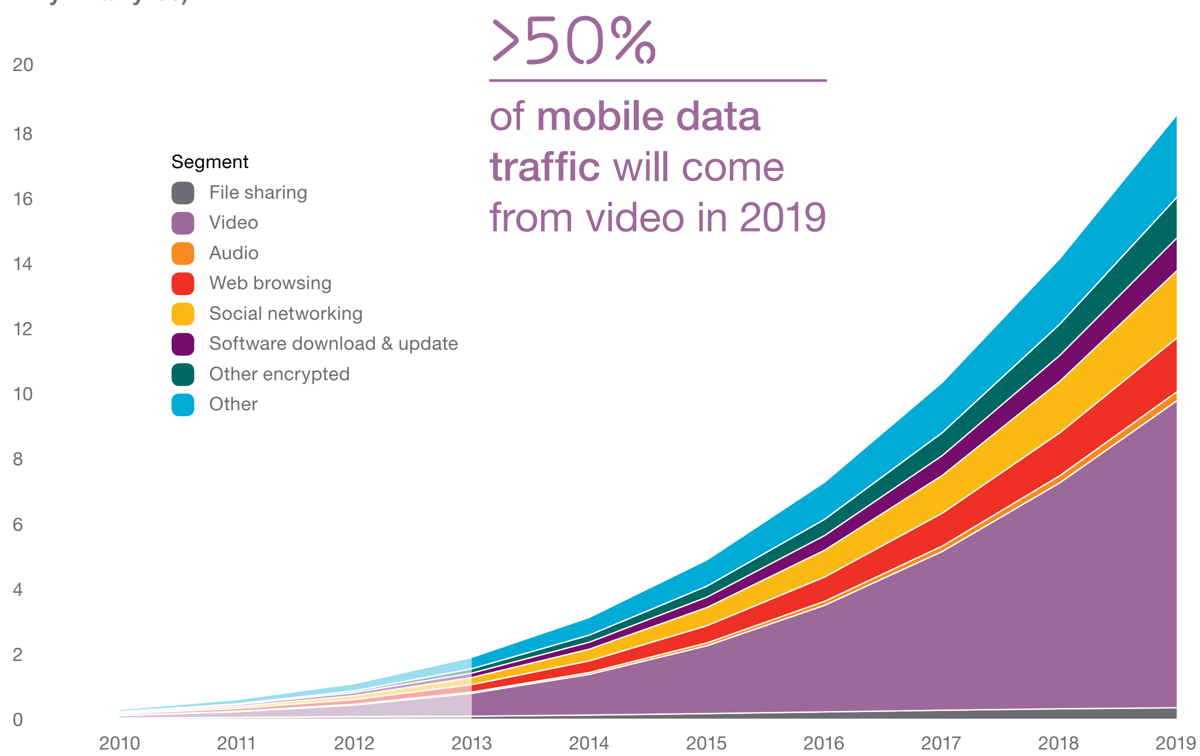
### User behavior and drivers

When a user changes devices from a basic phone to a smartphone, voice and text messaging continue to be used. They tend to develop their app usage behavior over time as they discover new apps and services that capture their interest. Recommendations from friends, family, media and online stores for new apps play an important role in this development. Such new communication behaviors drive data traffic in mobile networks. A good example of this is sharing video via MMS or instant messaging. User-generated content has also shifted from just sharing text on sites such as Facebook. Today people increasingly share photos and videos.

Over time, users tend to discover more advanced services that put greater demands on device capabilities. Smartphone users who subscribe to both music and video streaming services can easily have a significantly higher consumption than that of an average smartphone user. Those with the greatest usage on the highest data plan will often consume 10 times the average monthly volume. In many markets, legal streaming services for both music and video are gaining popularity. Given sufficient content, ease of use and the right price level, these services will exhibit strong adoption rates.

The outlook for every category of mobile data shows significant growth through to 2019. The highest growth is expected from video traffic, which is estimated to constitute more than half of all mobile data traffic by the end of the forecast period.

Mobile data traffic by application type (monthly ExaBytes)



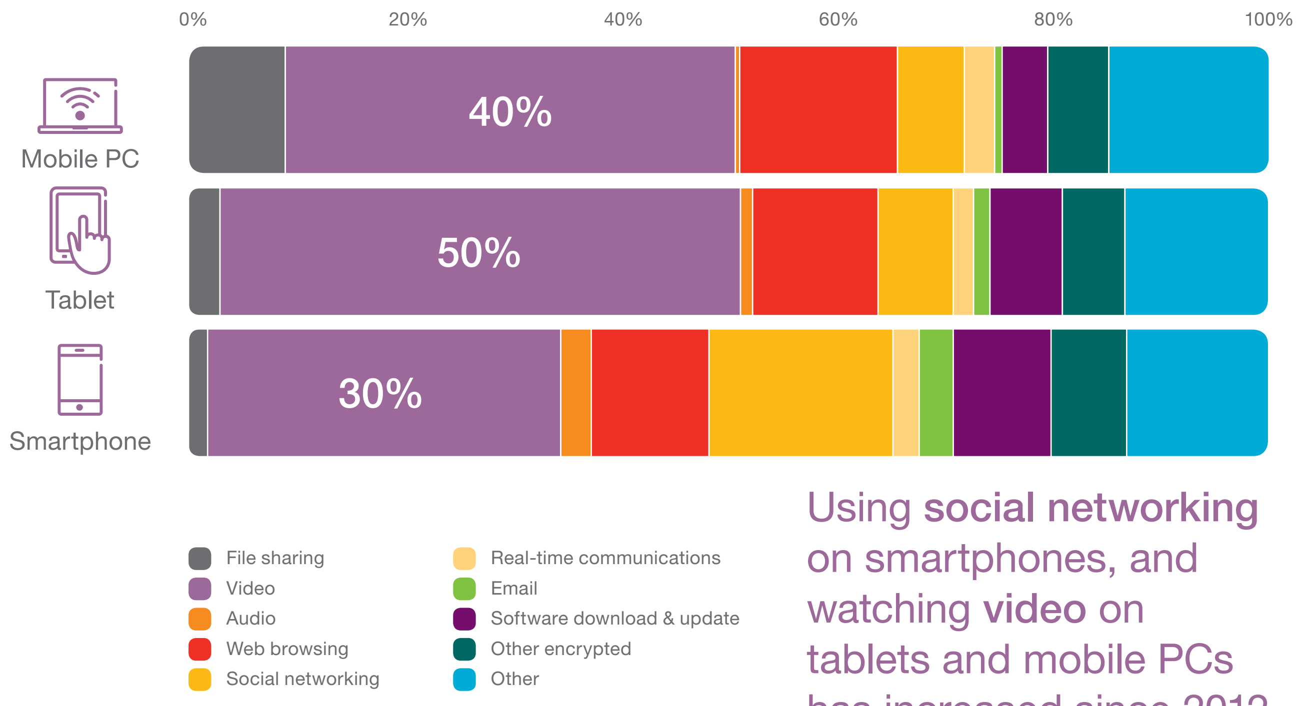
# MOBILE TRAFFIC MIX – APPLICATIONS & DEVICES

Average values from measurements[1] in a selected number of commercial HSPA and LTE networks in Asia, Europe and the Americas show that regardless of device type, video is the largest contributor to traffic volumes (30-50 percent). Actual values in individual networks can vary a lot. This article discusses how the most widely used online applications contribute to overall mobile data traffic volumes, and how these contributions vary by the type of connected device. YouTube still dominates video traffic in most mobile networks and accounts for an average of around 45 percent of total video traffic volume. In fixed networks where it has been launched, Netflix often dominates traffic. This is not the case in mobile networks, where Netflix only represents a small share of mobile PC and tablet traffic.

For smartphones, social networking is already the second largest traffic volume contributor with an average share of over 15 percent in these networks. During the past year, we have seen an increase in the percentage of both social networking traffic on smartphones and video traffic on tablets and mobile PCs.

Traffic drawn from mobile PCs is notable for having higher file sharing activity than other devices. Online audio and email are important contributors to data traffic on tablets and smartphone devices. The part of file sharing that is associated with smartphones and tablets comes predominantly from tethering traffic.

Application mobile data traffic volumes by device type




Using **social networking** on smartphones, and watching **video** on tablets and mobile PCs has increased since 2012

[1]Does not take into account Wi-Fi offload traffic. Smartphones include Android and iPhone models only. "Other" includes applications that it was not possible to identify or that don't qualify as one of the listed applications.

# POPULATION COVERAGE

Population coverage of the world's mobile networks is constantly increasing as more base stations are deployed. This article deals with the trends and outlook concerning the area in which a user has sufficient signal to connect to a mobile network – better known as population coverage. GSM/EDGE technology has by far the widest reach and today covers more than 85 percent of the world's population. The areas that remain to be covered by GSM/EDGE in the countries that use the technology are sparsely populated.

By the end of 2012, WCDMA/HSPA covered 55 percent of the world's population. Further build-out of WCDMA/HSPA will be driven by a number of factors: increased user demand for internet access, the growing affordability of smartphones, and regulatory requirements to connect the unconnected. By the end of 2019, around 90 percent of the world's population will have the opportunity to access the internet using WCDMA/HSPA networks.[1]

Even in the early days of roll-out, at the end of 2012, it has been estimated that LTE covered 10 percent of the world's population. Looking ahead 6 years, it is predicted that this will increase to over 65 percent.

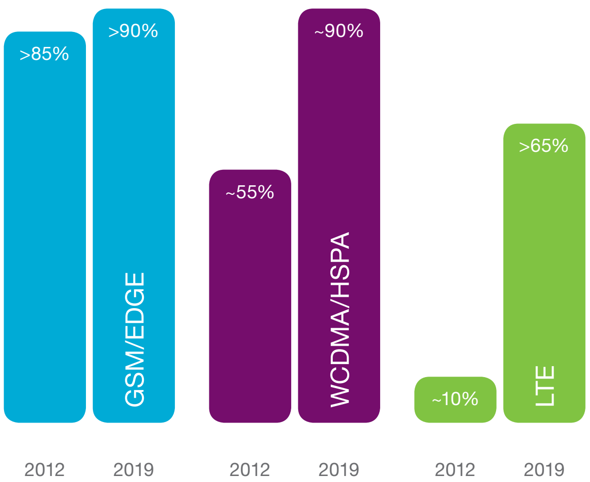
**North America population coverage**

Despite the fact that the world's first publically available LTE network was launched in Europe, North America is the earliest adopter of LTE. The region's fast adoption rate of the entire LTE ecosystem is also reflected in its population coverage figures. By end of 2012 it was estimated that LTE covered around 80 percent of the North American population. This is by far the highest population coverage figure of all the major regions in the world. It is forecast that LTE's population coverage will increase to around 95 percent by 2019. This is also substantially higher than the world's global average for LTE. During the period between the end of 2012 and end of 2019, the number of LTE subscriptions is expected to grow from about 40 million to over 400 million.

## >65%

### of the world's population will be covered by LTE in 2019

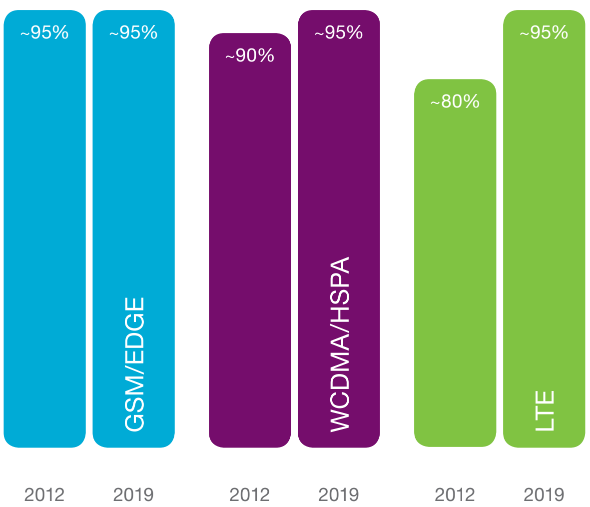
**Population coverage by technology, 2012 and 2019**




## 95%

### of the North American population will be covered by LTE in 2019

**North American population coverage by technology, 2012 and 2019**




[1] The figures refer to the population coverage of each technology. The ability to utilize the technology is subject to other factors as well, such as access to devices and subscriptions.

The GSM population coverage in North America is around 95 percent and it is estimated that it will remain so. By the end of 2012, WCDMA/HSPA covered approximately 90 percent of the region's population. Looking ahead, WCDMA/HSPA will continue to be built out and reach the same population coverage as GSM/EDGE.

Even though the LTE and WCDMA/HSPA population coverage is expected to grow from now until the end of 2019, the majority of the network roll-out efforts and investments will be targeted towards enhancing user experience and app coverage in already covered areas. In particular, indoor environments will be one of the major focus areas. Efforts to improve and densify existing mobile broadband infrastructure using heterogeneous networks, together with added small cells, will be important ingredients in improving network efficiency and user experience in these challenging areas.

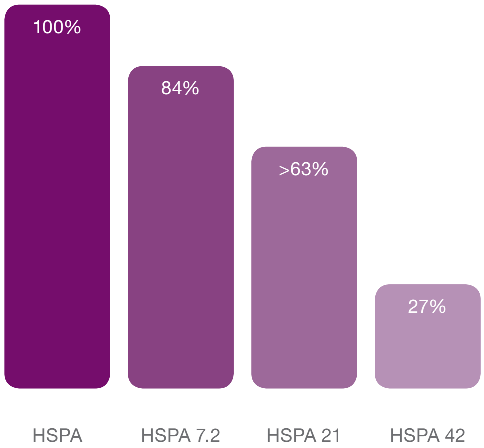
### WCDMA/HSPA networks

There are 532 WCDMA/HSPA networks that currently provide coverage to around 60 percent of the world's population. All WCDMA networks deployed worldwide have been upgraded with HSPA. It is calculated that 447 of the HSPA networks have been upgraded to a peak downlink speed of 7.2 Mbps or above and 338 of these networks have been upgraded to 21 Mbps or higher.

Around 27 percent of the HSPA networks now have speeds of up to 42 Mbps in whole or parts of the network following a wave of upgrades. We are already seeing evolutionary steps towards speeds of over 100 Mbps.

Low band networks can complement 2,100 MHz deployments to improve coverage and quality of service and enhance the user experience. In particular, WCDMA/HSPA 900 MHz provides better indoor coverage than is possible using 2,100 MHz. Today, there is a well-established ecosystem for terminals and the technology is considered mainstream with 72 commercial WCDMA/HSPA 900 MHz networks in 49 countries.[2]

**Percentage of WCDMA networks upgraded to HSPA 7.2, 21 or 42 Mbps**




Source: Ericsson and GSA (October 2013)

**145**

**HSPA 42 Mbps networks are commercially launched in 75 countries**

### LTE network-rollout

There are 222 commercial LTE networks in operation in 83 countries, and the number of commercially deployed networks continues to grow every quarter.[3] At the end of Q3 2013, it was estimated that there were 150 million LTE subscriptions globally. 1,064 LTE user devices have been announced by 111 manufacturers.[2] Of these devices, 360 are smartphones.

### LTE-ADVANCED (LTE-A) CARRIER AGGREGATION

LTE Advanced, the next major milestone in the evolution of LTE, recently reached commercial status. This was marked by the launch of Carrier Aggregation (CA) in Korea and the completion of the world's first call on aggregated 1,800 MHz and 900 MHz bands on a commercial network in Australia. The technology enables higher data speeds by aggregating multiple carriers across different bands. It has an evolution path that allows the support of 1 Gbps on mobile devices in the future. Carrier aggregation is beneficial for delivering higher download speeds across LTE networks enabling good app coverage, which in turn ensures subscribers have a higher probability of downloading their desired apps wherever, and whenever needed. In addition, CA not only delivers impressive peak data rates in good radio conditions, but in general, it significantly improves the user experience on the cell edge. This is important for maintaining a good user experience in performance-challenged areas. Because of the success achieved to-date with CA, many additional commercial launches are soon expected. LTE small cell deployments and trials are also generating interest and offer opportunities to further improve users' mobile broadband experience.

[2]GSA, October 2013. [3]GSA and Ericsson, October 2013.

# APP COVERAGE APPLIED

The use of smartphones and tablets has caused a surge in mobile data around the world. Today, users want reliable access for their apps, wherever they go in the network. To deliver the best possible experience to mobile broadband subscribers, operators need new ways to assess performance that will enable them to build and manage their networks in the most efficient way.

In response to this challenge, a new approach to network performance – app coverage – has been proposed. From a user's perspective, app coverage is the probability that the network will deliver sufficient performance to run a particular app at an acceptable quality level. From the operator's perspective, it deals with cell-edge performance.

### Apps and network performance

There are around one million apps available to download from the major app stores and marketplaces, and this number is growing constantly. It is not possible to deliver network performance sufficient for each and every app everywhere, all the time – or even know what they all require. A successful approach involves understanding the requirements of the most popular app types, and setting performance targets that will cater for them. Attaining these targets would ensure a high probability that the most widely used apps will perform well throughout the network coverage area.

Contributing factors to data service quality – uplink and downlink throughput, latency and capacity – are sensitive to the radio conditions in the network. They are affected by obstructions as well as fading and interference. A cell that can serve many megabits per second in downlink data rate near the radio base station might only have a few hundred kilobits per second at the edges of its coverage area.

The network performance experienced by the user is also influenced by the number of other active users in the cell and the demands their apps place on the network at any given time.

The wide variance in radio performance means that KPIs for managing user experience cannot be limited to peak or even median downlink throughput speeds. To allow a high probability (e.g. 95 percent) of receiving a targeted network performance level, radio networks need to be deployed with site-to-site distances that can enable an acceptable service out to the cell edge.

### Predicting cell-edge throughput

In order to illustrate app coverage in a realistic environment, digital mapping data from a dense urban area was used to generate a series of coverage plots. A traffic profile of 500 MB per subscriber per month was applied which included usage of particular app types (streaming music, streaming video, and video telephony) as well as circuit-switched voice. Using the radio characteristics of a WCDMA/HSPA access network (5 MHz bandwidth in the 2.1 GHz band), coverage area and indoor penetration was predicted for each of the application types. Three scenarios were explored focusing on a 4 $km^2$ area dominated by high-rise buildings.

The requirements of the various app types are the result of measurements made on popular apps. They were tested on iOS and Android devices over a WCDMA channel set up to emulate cell-edge performance.

**The effect of different radio network designs on coverage in a 4 $km^2$ area**

| | | Base case | | Tuning and optimization | | Macro densification | |
|---|---|---|---|---|---|---|---|
| | Threshold | Total coverage | Indoor penetration | Total coverage | Indoor penetration | Total coverage | Indoor penetration |
| Voice | 12.5 Kbps UL/DL | 94% | 85% | 95% | 88% | 97% | 93% |
| Music streaming | 160 Kbps DL | 88% | 70% | 89% | 71% | 93% | 82% |
| Video telephony | 320 Kbps UL/DL | 70% | 24% | 76% | 38% | 83% | 55% |
| Video streaming | 720 Kbps DL | 48% | 17% | 68% | 40% | 73% | 47% |

A set of app throughput requirements was generalized from these tests and used in predicting the coverage for each type of app. The results can be seen in the table on the previous page.

The plots on this page show a magnified area of approximately 1 km$^2$ out of the 4 km$^2$ area. It shows the varying coverage areas for each app, as well as penetration improvements in the buildings. The plots (on the left, top to bottom) include a map of the city center area, the coverage prediction for each app and an overlaid composite showing all the apps in the base case. In the middle and on the right below are composites for scenarios two and three, respectively. White spots show areas with no coverage.

Each improvement is accompanied by more traffic served, as the increased network resources are allocated between coverage and capacity.

**Base case** (scenario one – 11 three-sector macro sites): The initial cluster of 33 cells results in total coverage ranging from 94 percent for voice to just under half the area for video streaming at an acceptable quality level.

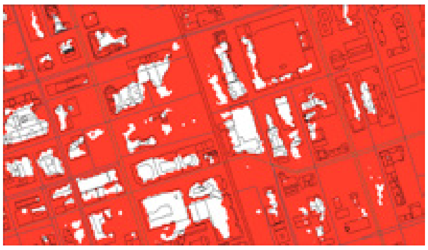
**Tuning and optimization** (scenario two – site count unchanged): Tuning antennas and optimizing parameter settings resulted in improvements in coverage and in-building penetration for all apps, with greater improvements for those apps requiring higher speeds.

**Macro densification** (scenario three – add 10 macro sites for a total of 21 three-sector sites): Nearly doubling the number of sites in a city center is an extreme scenario and not a practical alternative. It is used here to illustrate limits to densification, especially in dense urban areas. It is difficult to provide large buildings with the bit rates necessary to meet demand from apps using outdoor base stations. Other approaches could include the deployment of a second carrier on the macro sites (given spectrum availability), and adding integrated small cells utilizing the same frequency band as the initial deployment.

### Base case

City plan view without mapped coverage

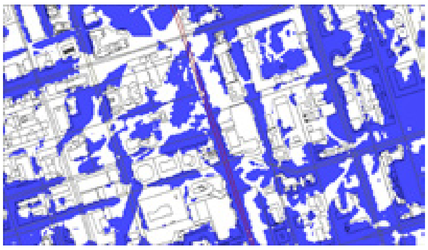
Voice coverage (red)



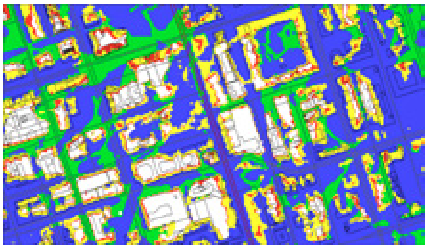
Music coverage (yellow)

Video telephony coverage (green)

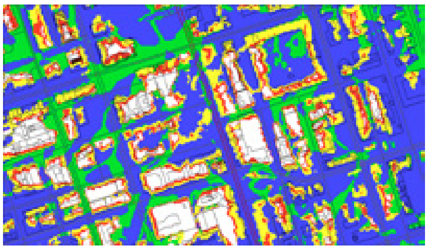
Video streaming coverage (blue)



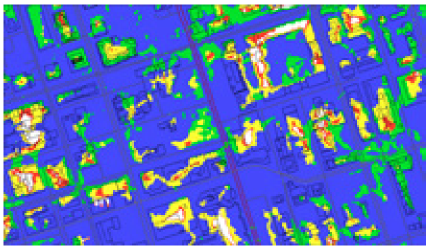
All apps



### Tuning and optimization



### Macro densification



### Applying app coverage

The goal for mobile broadband operators today is to enable the best experience for as many users as possible, given the apps and devices available. In addition to monitoring network performance, operators must increasingly be aware of the usage of both devices and apps in their networks. They then need to gauge how fast the demands on the network are increasing, and finally build this knowledge into their network investment plans. Operators will need to adapt as mobile devices, apps and network capabilities all develop in parallel.

Today's radio mobile broadband network technologies are capable of delivering very high throughput and low latency. The challenge is to build out enough bandwidth at site-to-site distances to enable a high probability of getting sufficient performance throughout each cell.

The first step in achieving this is to measure and estimate app coverage for popular apps within given coverage areas in order to understand what improvements are needed. Through ongoing monitoring of cell-edge performance, operators will be able to see which areas need attention, and target investments to ensure they are delivering the best user experience.

An effective approach to enhancing network performance is to optimize the existing radio infrastructure and then to move progressively from macro to micro using efficiency measures to determine investment priorities.

### In-building coverage challenges

In any mobile broadband radio access network, buildings present a significant challenge. It is estimated that the majority of traffic served over mobile networks originates and/or is consumed indoors. Radio signals attenuate rapidly as they go through buildings. This means that the most cost-effective solution for building mobile coverage in dense urban terrain – the roof-top macro site – has limits on how far its radio signals can reach into large city buildings.

It is possible to deploy micro base stations outside buildings which lack coverage at the targeted performance levels. In areas with high-rise structures however, deploying small cells outside the buildings may result in acceptable data throughput and capacity only for those users on floors nearest the small cells, while network performance drops off for those that are further away.

Beyond height and size, materials used in building construction also have a large effect on radio signal propagation.

For a user, being inside a structure built from materials such as metalized glass can result in significantly slower data throughput speeds and dropped calls, when compared to one made from standard glass and concrete. In many buildings the outdoor (macro cell or micro cell) base stations can provide indoor app coverage for most applications. However, in buildings with very thick walls or those built using metalized glass, indoor base stations are needed to serve users inside the building.

In dense urban areas with high buildings, achieving a high probability of cell-edge performance good enough for the apps and devices in use today may require smaller "outdoor-in" base stations and indoor solutions in the radio network that complement the macro base stations.

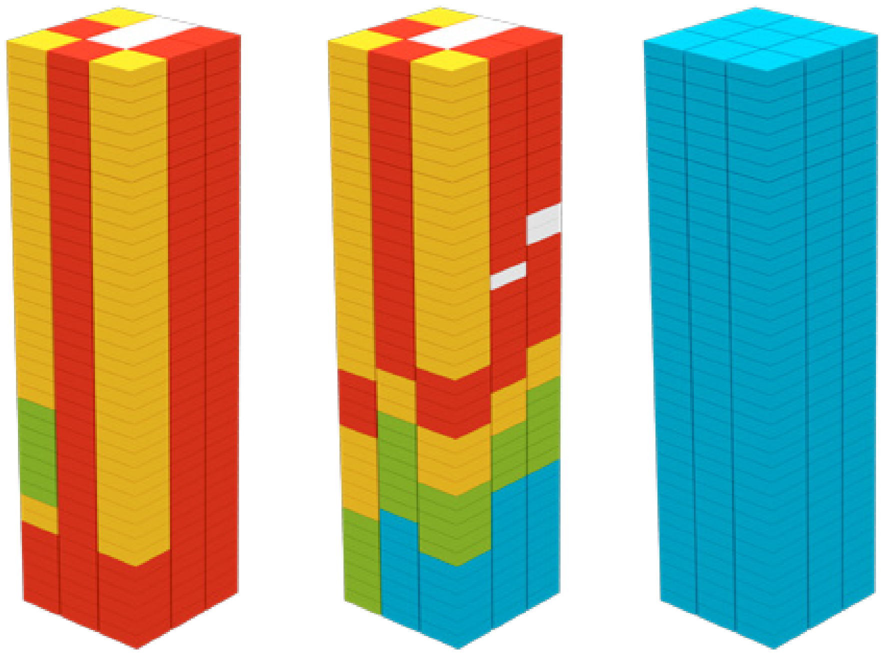
Ericsson has conducted three software simulations to illustrate alternative approaches to delivering coverage in high-rise buildings with metal-coated glass walls. The simulated scenarios were:

> **Macro-only:** WCDMA/HSPA network with a high load, exhibiting poor app coverage in high-rise buildings

> **Add outdoor micro:** deployment of a small micro base station outside the building (in addition to the macro network)

> **Add indoor picos:** deployment of indoor pico base stations (in addition to the macro network)

Proportion of indoor coverage in a metalized glass building



| Macro only | Add outdoor micro | Add indoor picos |
|---|---|---|
| 86% | 91% | 100% |
| 26% | 61% | 100% |
| 2% | 41% | 100% |
| 0% | 21% | 100% |

- No coverage
- Voice (12.5 Kbps UL/DL)
- Music streaming (160 Kbps DL)
- Video telephony (320 Kbps UL/DL)
- Video streaming (720 Kbps DL)

In each of the three cases, the simulation software predicts the extent of app coverage using the same application types and network requirement thresholds as the outdoor cases above. The graph above illustrates the extent of cell-edge performance for each of the three scenarios on a high-building with metal-coated glass walls.[1]

The first simulation case is a macro-only network with very high load (2GB per subscriber per month), and results in poor cell edge-performance. The second deployment includes a small micro base station outside the buildings. This improves app coverage in the areas of the building that the micro can reach. In step three, indoor base stations are deployed to improve app coverage throughout the building. Quite a large number of base stations are required due to the interior wall and floor losses. However, when these areas are covered the capacity is also very high and the app coverage is excellent, due to the large number of cells, and hence small number of users per cell.

In summary, even as traffic grows, app coverage can be maintained or improved in many ways, including improvement of existing sites, the addition of small cells outside challenging buildings or deployment of a wide range of indoor solutions that are suited for different scenarios.

App coverage integrates all aspects of network performance – including radio network throughput and latency, capacity, as well as the performance of the backhaul, packet core and content delivery networks. Ultimately, managing performance demands a true end-to-end approach to designing, building and running mobile networks.

[1]High building with 30-50 dB radio signal attenuation due to glass coatings employed to increase the energy efficiency of the air conditioning.

# APP COVERAGE IN CITIES

Having good mobile coverage is an important aspect of life in the city for today's consumers. However, in many cities around the world, app coverage is surprisingly limited.

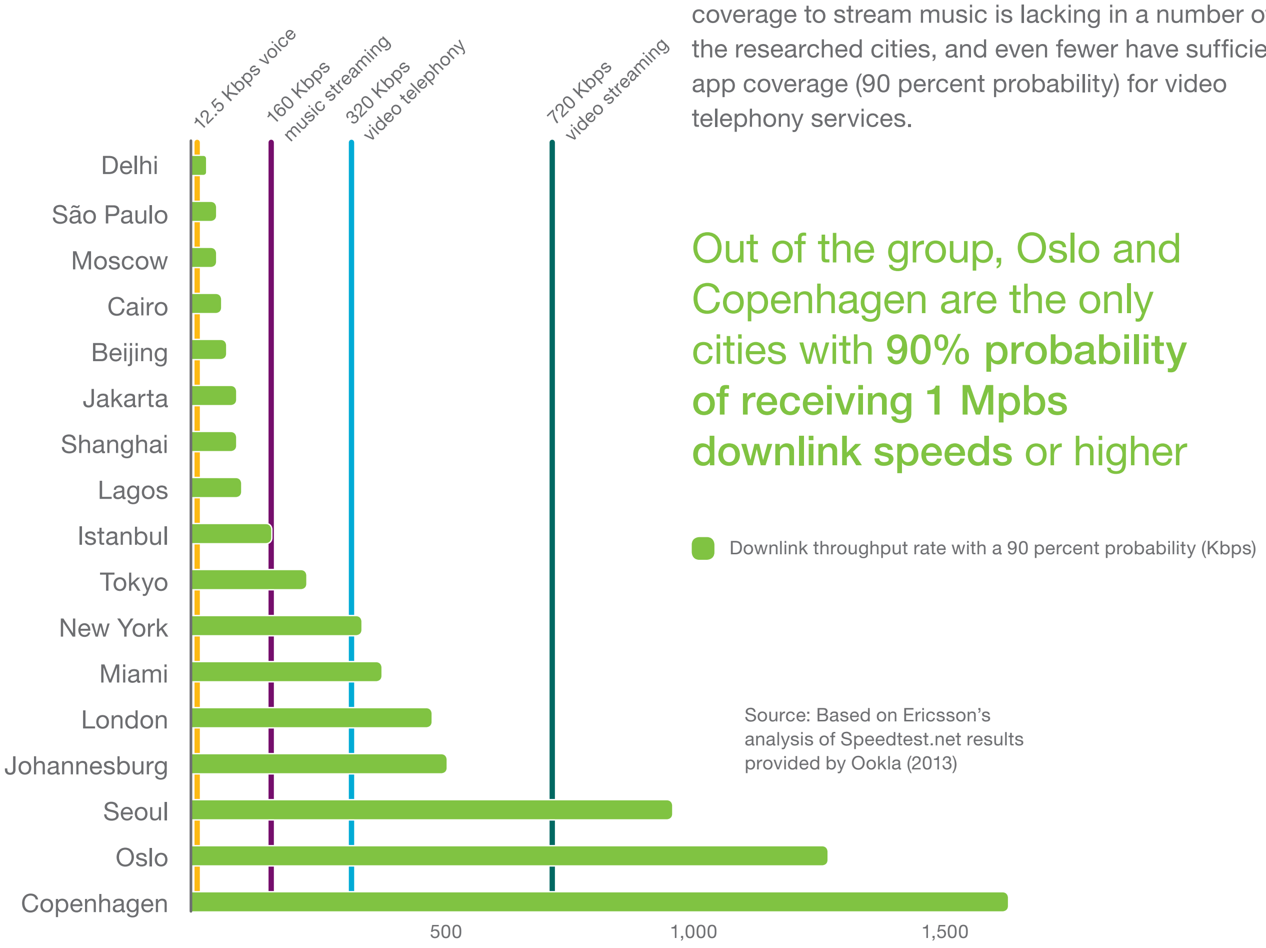
The majority of mobile traffic originates in cities, and it is in these urban environments that the challenge to provide a good connection is greatest. At the same time, urban users expect instant, reliable access to their apps, wherever they go.

App coverage is the probability that the network will deliver sufficient performance to run a particular application at an acceptable level of quality. Providing a good user experience will always involve a balancing act between networks, devices and apps.

In order to compare network performance in cities globally, we analyzed measurements from Speedtest.net. While median speeds in cities can be 10 Mbps and higher in a given cell, throughput is generally much lower at cell edge (only a few hundred kilobits per second). How much lower is determined by many factors including available signal strength, network load and device capability. Our analysis allowed us to determine which downlink throughput rates can be obtained with a 90 percent probability. The graph below estimates the acceptable quality level for a number of app types in order to put the performance into context. Of the cities studied, only Copenhagen and Oslo have a 90 percent probability of getting a 1 Mbps downlink throughput or higher. In Shanghai, Jakarta, Beijing, Moscow, São Paulo, Cairo and Delhi, the corresponding speed is less than 100 Kbps.

There is a high probability of voice coverage in all cities, while video streaming only has appropriate app coverage in Copenhagen, Oslo and Seoul. Adequate coverage to stream music is lacking in a number of the researched cities, and even fewer have sufficient app coverage (90 percent probability) for video telephony services.

**Achieved downlink speed (90 percent probability), comparison of different cities.**[1]

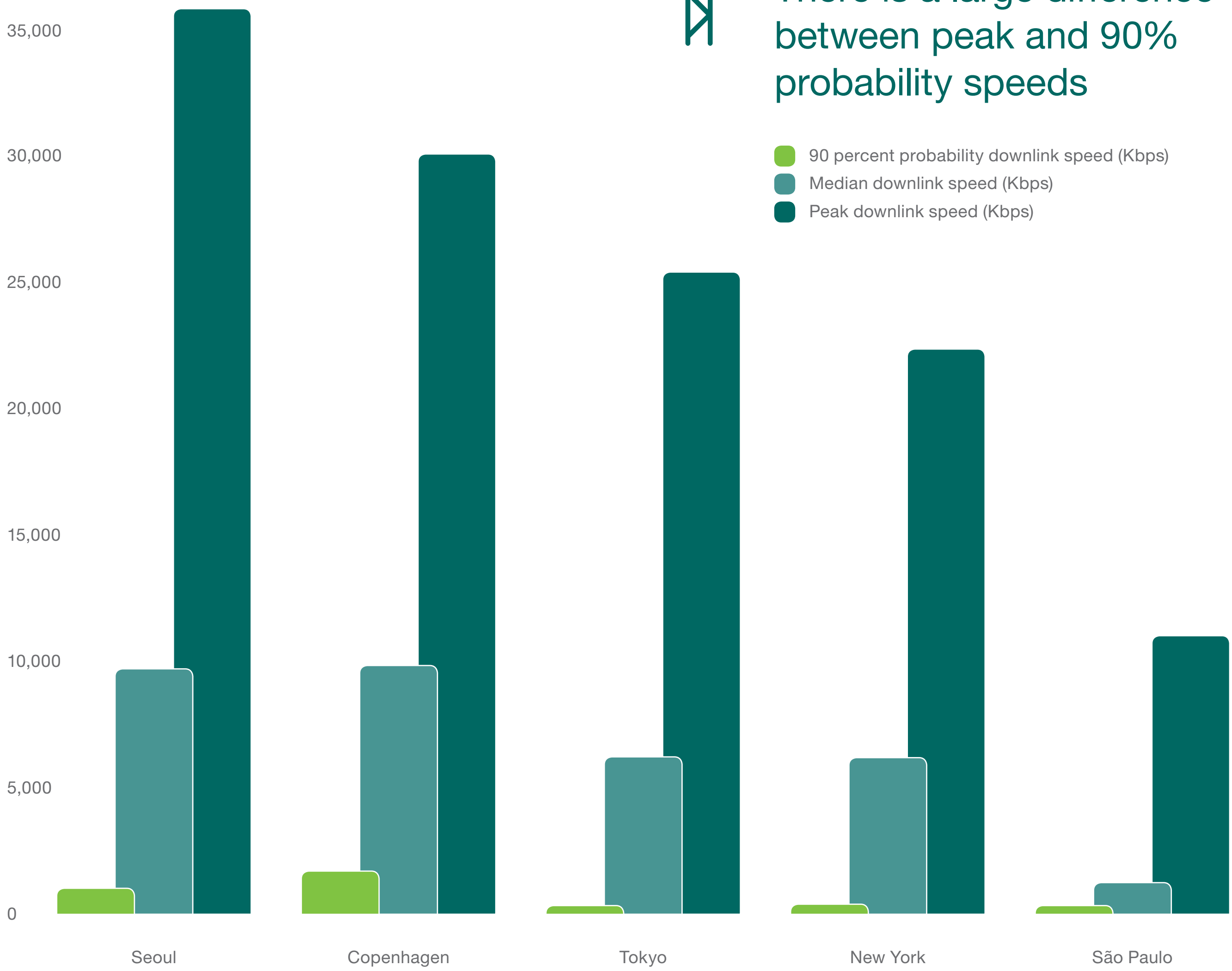



Out of the group, Oslo and Copenhagen are the only cities with **90% probability of receiving 1 Mpbs downlink speeds** or higher

Source: Based on Ericsson's analysis of Speedtest.net results provided by Ookla (2013)

[1]Compilation of Speedtest.net measurements in each city during the period July–September 2013.
Measured median speeds (50 percent probability) and top speeds (10 percent probability) are considerably higher in all cities.

Comparison of peak, median and 90 percent probability downlink speeds (kbps)




## There is a large difference between peak and 90% probability speeds

Source: Based on Ericsson's analysis of Speedtest.net results provided by Ookla (2013)

All cities are unique and provide different conditions for operators to be able to offer sufficient network performance. Usage patterns are not the only way cities differ. Other ways include population density, economic and population growth, geographical and structural conditions, and infrastructure legacy.[2]

In all of the cities studied, there is a large difference between the 10 percent (peak), 50 percent (median) and 90 percent probability downlink speeds. Apart from user device capability, data service quality also depends on the distance from the base station, local landscape, size and composition of buildings, fading and interference. If users are expecting the peak speed, but are only receiving the 90 percent probability speed, then they are likely to be dissatisfied with the service they are receiving.

[2]Ericsson's Networked Society City Index provides a deeper understanding of cities' ICT maturity position and social, economic and environmental status.

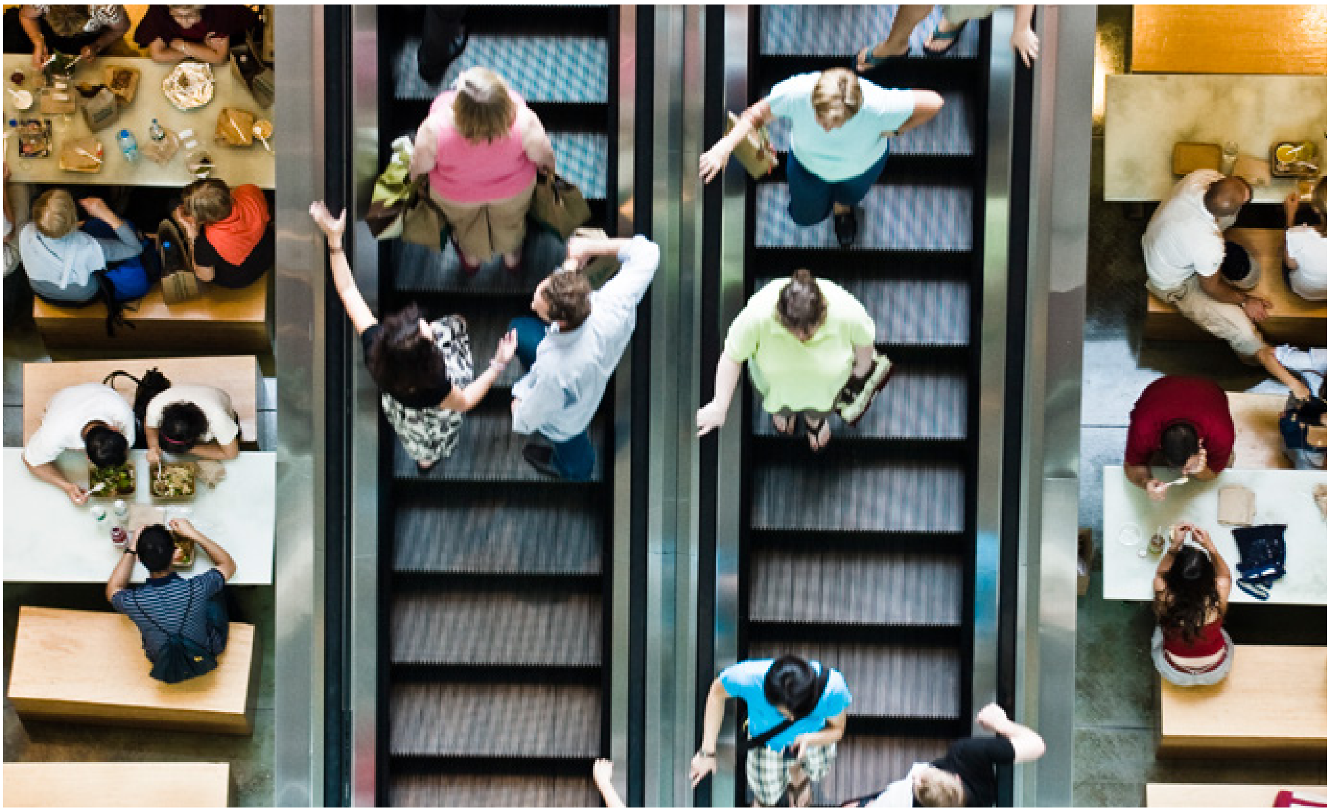
Ericsson consumer research in cities shows that citizens notice the difference in voice coverage and internet coverage, irrespective of it being mobile, fixed or Wi-Fi. In all areas of the city, except for in the home, internet satisfaction is falling behind voice satisfaction. In some cities, such as Istanbul, the difference between voice and internet satisfaction is extensive – up to 20 percentage points in some places.

City dwellers spend half of their time at home and one quarter at work or school. Grocery stores are visited at least weekly by 65 percent of people in large cities, while approximately 40 percent visit a shopping mall and a restaurant or cafe at least weekly.

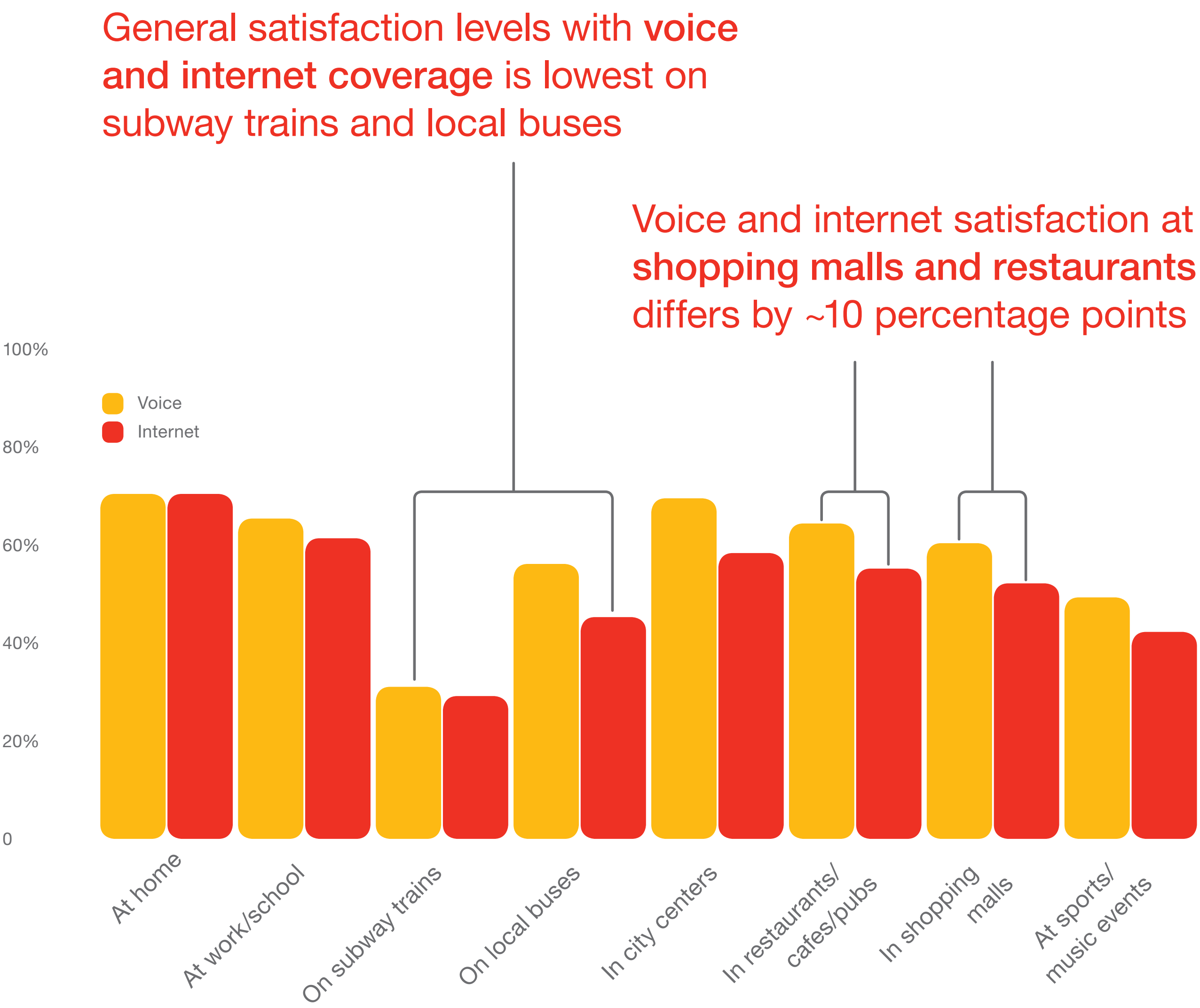
Satisfaction with internet coverage varies at these indoor locations. For shopping malls and restaurants, satisfaction with internet connections is at just over 50 percent on average. In these locations there is a difference in satisfaction levels of almost 10 percentage points for voice, compared to internet use. Satisfaction is higher at home and at work – places where one would typically have some influence over the quality of the connection through a dedicated fixed or Wi-Fi service. Public transport has the lowest satisfaction. In Tokyo, London and New York as many as 50-60 percent are dissatisfied with voice and internet on the subway.

Users are frustrated with areas where their apps do not work, while cell-edge performance is more important to how operators approach the issue. By monitoring cell-edge performance, operators are able to see which areas need attention to improve and maintain the user experience quality. This is a continuous process as devices, apps and networks all develop in parallel.

This study concludes that, outside of the home, satisfaction with internet coverage is limited in locations that are frequently visited by city dwellers. The analysis also shows that app coverage for some main application groups, such as music and video streaming, is poor in many cities today.



Satisfaction levels with voice and internet coverage in cities




Source: Ericsson ConsumerLab Analytical Platform 2013

## APP USAGE

Ericsson has studied hundreds of smartphone users in Stockholm over the course of a year to get a deeper understanding of their usage.[3] The study's results give a flavor of some people's app usage. The results show that there is a broad spectrum of how often smartphones are used. The most frequent users interact with their smartphone more than 150 times a day, or an average of every 7 minutes during the daytime. Between 8 am and 8 pm, business apps (e.g. Office Suite, Lync), communication (e.g. Gmail, WhatsApp) and music apps (e.g. Spotify) are most frequently used, while educational apps (e.g. vocabulary and educational games) are in demand during the rush hours at 8 am and 5 pm. During the night, the tendency is to use entertainment (e.g. YouTube, IMDB) and personalization apps (e.g. Evernote, Dropbox).

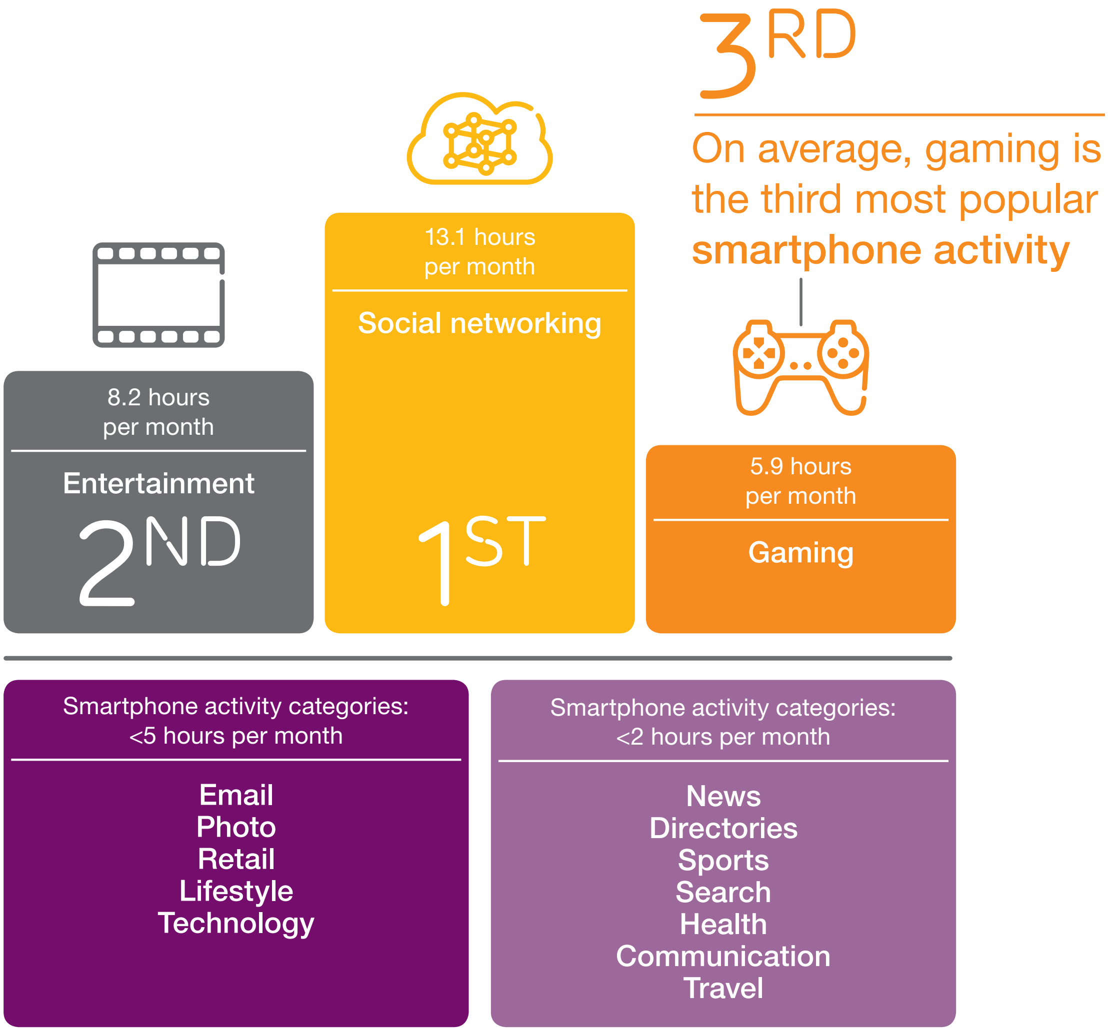
[3] Ericsson Apps is a learning engine that suggests mobile apps based on the behavior of those users that agree to share their app behavior.

# GAMING DRIVES VIDEO ON SMARTPHONES

Gaming on mobile phones has grown strongly in the US during recent years. This has been fuelled by the growth in smartphone subscriptions and the increased availability of app-based games. Social gaming and free-to-play business models are also driving the increase in the number of mobile phone gamers. This growth in gaming will also drive an increase in video traffic.

Today, many single or multi-player games generate relatively limited data traffic volumes and requirements on throughput speeds, making them manageable for mobile networks. However, as more games adopt elements such as multi-player features, high-definition content and video streaming, requirements for greater throughput speeds and improved latency on both uplink and downlink will increase.

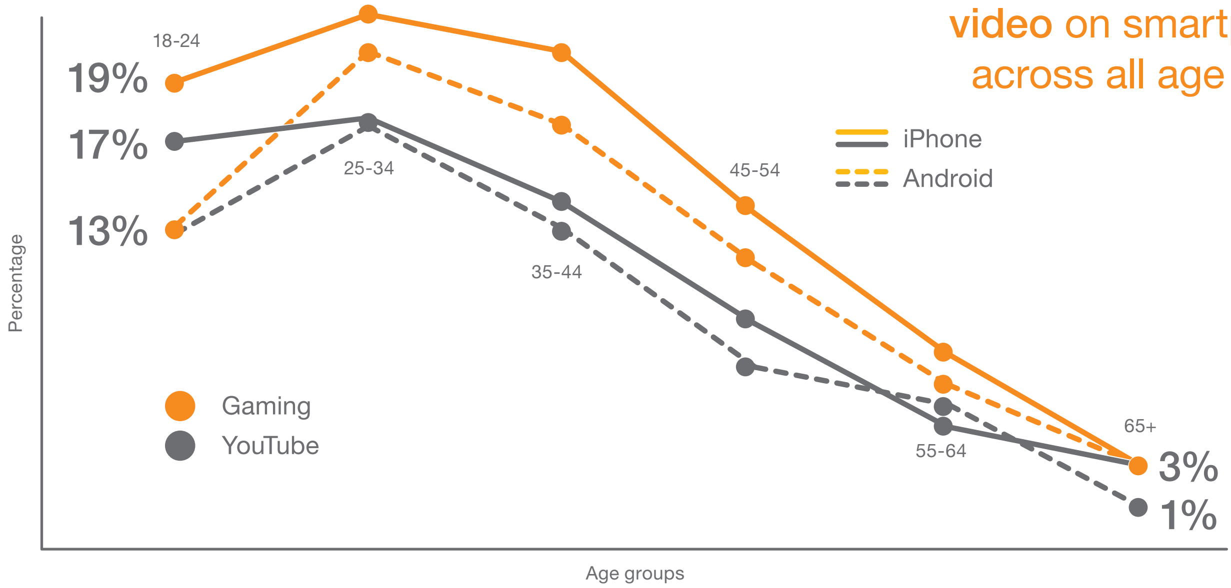
Until the introduction of app-based smartphones, digital games were part of tech savvy subcultures rather than the mainstream. But today, 25 percent of consumers in the US play digital games every day, which makes it one of the most common daily activities (in comparison, 29 percent read a newspaper and 14 percent read a magazine every day). Furthermore, 76 percent of US Android and iPhone smartphone users aged 15-69 play games on their device every month. That's a monthly average of 5.9 hours, or 9 percent of the total time smartphone users spend using apps and browsers. This is shown in the diagram below. An analysis of the average hours that smartphone users spend playing games on their device per month shows that it is one of the most engaging activities, next to social networking and entertainment.




Base: US iPhone/Android smartphone users age 18-69+
Source: comScore, Mobile Metrix 2013, on-device measurement

There is a strong correlation between **gaming and watching video** on smartphones across all age groups

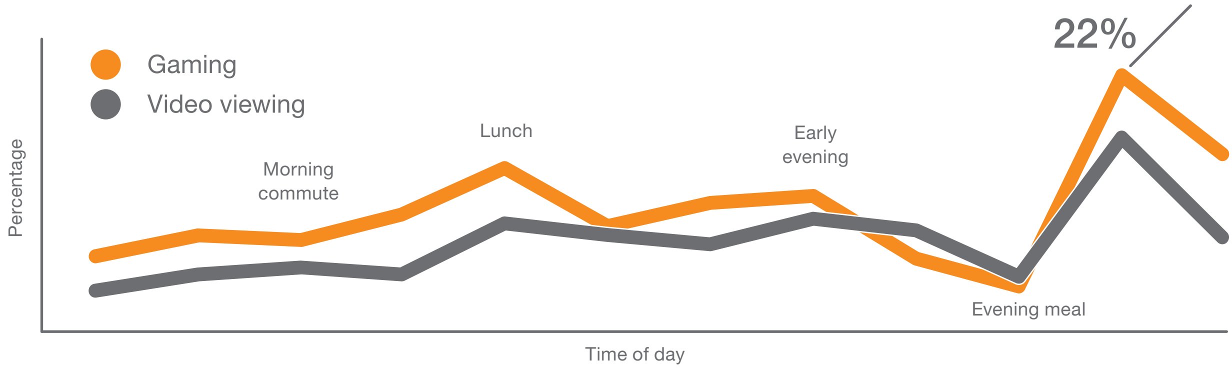
Smartphone gaming and YouTube use – correlated across age groups




Base: US iPhone/Android smartphone users age 18-69+
Source: comScore, Mobile Metrix 2013, on-device measurement

**Gaming and video** peak during the late evening

Smartphone gaming and video viewing – correlated throughout the day




Base: US smartphone users age 15-69
Source: Ericsson ConsumerLab Analytical Platform 2013, online survey

An Ericsson ConsumerLab analysis of smartphone users in the US found a strong correlation between the frequency of playing games and watching video on this device type. Only 14 percent of all smartphone users watch video on their device on a daily basis – but out of this group, 57 percent also used it to play games every day. In fact, 52 percent of those who don't watch videos on smartphones also play games less than monthly or never on their device.

Qualitative studies reveal that mobile phone gamers mix games and video in order to improve the overall experience. Many watch videos of other players to improve their skills, find solutions to in-game problems or just enjoy watching others play. Creating and uploading one's own gaming video is also gaining popularity. In addition, many free mobile games enable players to unlock bonuses by watching video ads.

The correlation between gaming and watching video on smartphones is also clear when we consider comScore's Mobile Metrix data – a set of measurements that logs use of different types of smartphone apps. This data clearly shows that the 25-34 age group contains the most active game players and YouTube users for both iPhone and Android phones.

The correlation between gaming and watching video also holds throughout the day, with a soft peak during lunch and then much sharper peaks late in the evening. Gaming and video consumption inhabit the same spaces in our everyday lives.

# MOBILE TRAFFIC DISTRIBUTION – DEVICES AND SUBSCRIPTIONS

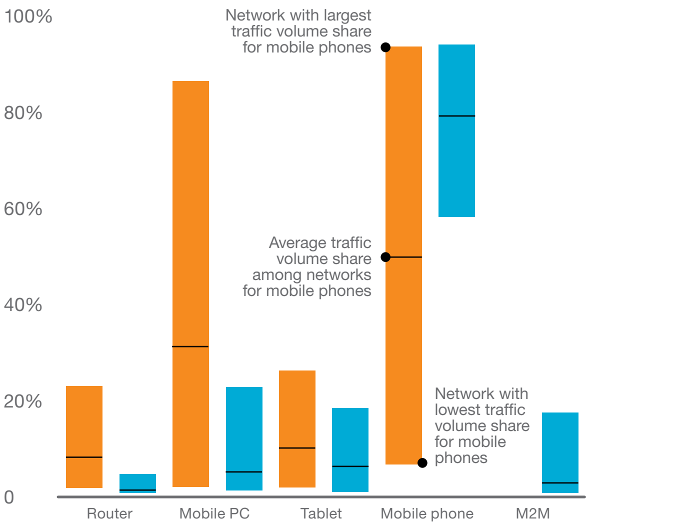
There are major differences in how much traffic various devices generate in different mobile networks. In this section, we analyze the traffic and subscription distribution of mobile data subscribers with different device types and operating systems. The analysis is based on measurements taken over the past year from different mobile broadband networks all over the world. Mobile data subscriptions with 2G, 3G or 4G capable devices are included in the analysis, however devices without mobile data subscriptions were excluded.[1]

The graph below shows the penetration and share of total traffic volume for different device types. Mobile phones account for around 50 percent of total mobile data traffic volume in the measured networks. However, there are large regional differences. In many European networks, mobile PCs represent 10-30 percent of the subscription[2] base and generate 50-80 percent of the data traffic. In contrast, North America is typically dominated by smartphone traffic, with mobile PC subscriptions only representing a small share of traffic.

One reason for this large variation is the different focuses operators have had on mobile PC and smartphone devices. Operators that launched mobile broadband early, typically successful in selling dongle subscriptions, often have a large share of mobile PC subscribers. In some markets it is still the dominant segment due to late proliferation of smartphones and a general strategy to target households with fixed broadband replacement offerings.

In some networks, router and tablet traffic volume shares can also be significant. In one extreme, network routers represented around 20 percent of the total traffic. Per subscription, traffic from home routers is usually significantly higher than from mobile routers. The reason for this is probably due to different usage patterns. Mobile routers only tend to be used for tablets and smartphones on an occasional basis. Home router traffic on the other hand, is usually dominated by mobile PCs and tablets. Most M2M devices are still 2G-only, meaning that traffic volumes are not visible in the graph below. This is despite the fact that these devices made up almost 20 percent of all subscriptions in one network.

**Penetration and share of total mobile data traffic volume (in bytes) per device**




~50%

of total mobile data traffic is generated by **mobile phones**

Categorization of devices is performed based on the IMEI TAC (International Mobile Station Equipment Identity Type Allocation Code) identifier of the device. Therefore router without a built-in HSPA/LTE modem using an external USB dongle are classified as mobile PC.

[1]Mobile traffic figures include 2G, 3G and 4G traffic from these devices but do not include traffic offloaded to Wi-Fi. Wi-Fi-only devices without 3G or 4G modems – a feature quite common in devices such as tablets – are also excluded.

[2]Among mobile data subscriptions with 2G/3G/4G devices.

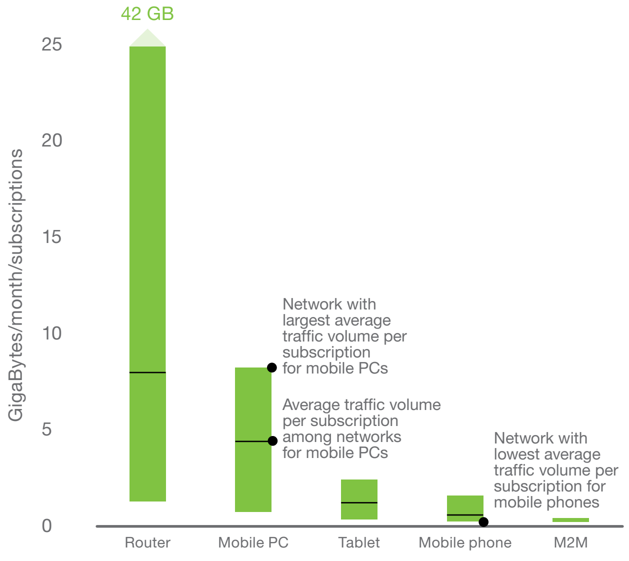
The graphs below summarize the spread of average monthly mobile data traffic volumes per subscription in the measured networks by device type and mobile phone operating system. The largest average values have been measured on router devices at 1–42 GB, followed by mobile PCs at 0.5–8 GB and tablets at 150– 2,200 MB.

Traffic volumes per subscription for mobile phones vary greatly both between operating systems and networks. The largest average traffic volumes per subscription are measured on Android smartphones that use up to an average of 2.2 GB per month, in the network with the largest usage for this device type. One reason for the wide spread is the difference in data plans offered to subscribers. In some markets a majority of the subscribers are not addressed, with data plan tariffs that start above ARPU levels or with very low data volume caps in the lowest priced plans.

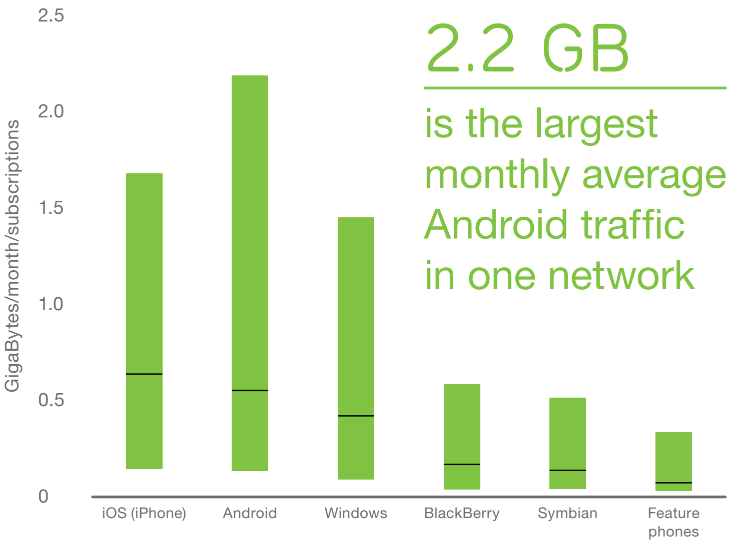
Android models have a greater variance due to a larger diversity of device models. In networks where high-end models dominate, average usage on these devices exceeds average iPhone usage. However, when operators focus on the low-end Android segment the average usage is usually lower than for iPhones. There are large differences between traffic volumes of phones with different versions of Windows OS, hence average values might increase in the future when Windows 8 devices outnumber older Windows devices.

Only measuring LTE devices will usually result in higher values. Data plans also have a strong impact on per subscription traffic volumes – only measuring devices with the highest data allowance or an unlimited plan will usually result in higher values.

### The spread of average monthly traffic volumes per subscription, per device type




### The spread of average monthly traffic volumes per subscription, per operating system



# KEY FIGURES

| Mobile subscription essentials | 2012 | 2013 | 2019 forecast | CAGR 2013–2019 | Unit |
|---|---|---|---|---|---|
| Worldwide mobile subscriptions* | 6,300 | 6,700 | 9,300 | 6% | millions |
| – Smartphone subscriptions | 1,300 | 1,900 | 5,600 | 20% | millions |
| – Mobile PC, tablet and mobile router subscriptions | 250 | 300 | 750 | 15% | millions |
| – Mobile broadband subscriptions | 1,500 | 2,100 | 8,000 | 25% | millions |
| – Mobile subscriptions, GSM/EDGE-only | 4,300 | 4,300 | 1,200 | -20% | millions |
| – Mobile subscriptions, WCDMA/HSPA | 1,200 | 1,600 | 4,800 | 20% | millions |
| – Mobile subscriptions, LTE | 70 | 175 | 2,600 | 55% | millions |

| Traffic essentials** | 2012 | 2013 | 2019 forecast | CAGR 2013–2019 | Unit |
|---|---|---|---|---|---|
| – Monthly data traffic per smartphone*** | 450 | 600 | 2,200 | 25% | MB/month |
| – Monthly data traffic per mobile PC*** | 2,500 | 3,300 | 13,000 | 25% | MB/month |
| – Monthly data traffic per tablet*** | 750 | 1,000 | 4,500 | 30% | MB/month |
| Total monthly mobile data traffic | 1.1 | 1.9 | 18 | 45% | EB/month |
| Total monthly fixed data traffic | 30 | 40 | 140 | 25% | EB/month |

| Mobile traffic growth | Multiplier 2013-2019 | CAGR 2013–2019 |
|---|---|---|
| All mobile data | 10 | 45% |
| – Smartphones | 10 | 45% |
| – Mobile PC | 4 | 25% |
| – Tablets | 20 | 65% |

*Using active VLR subscriptions for India
**Monthly data traffic volumes by year end
***Active devices

## TRAFFIC EXPLORATION TOOL

Create your own graphs, tables and data using the Ericsson Traffic Exploration Tool. This information can be filtered by region, subscription, technology, traffic and device type. You may use generated charts in your publication as long as Ericsson is stated as the source.

To find out more, scan the QR code, or visit www.ericsson.com/ericsson-mobility-report

# METHODOLOGY

### Forecast methodology

Ericsson performs forecasts on a regular basis to support internal decisions and planning as well as market communication. The subscription and traffic forecast baseline in this report uses historical data from various sources, validated with Ericsson internal data, including extensive measurements in customer networks. Future development is estimated based on macroeconomic trends, user trends (researched by Ericsson ConsumerLab), market maturity, technology development expectations and documents such as industry analyst reports, on a national or regional level, together with internal assumptions and analysis. Historical data may be revised if the underlying data changes – for example, if operators report updated subscription figures.

Mobile subscriptions include all mobile technologies. M2M subscriptions are not included. Subscriptions are defined by the most advanced technology that the mobile phone and network are capable of. Figures are rounded and hence summing up rounded data may result in slight differences from the actual total.

Traffic refers to aggregated traffic in mobile access networks and does not include DVB-H, Wi-Fi or Mobile WiMax traffic. Voice traffic does not include VoIP.

### Traffic measurements

New devices and applications affect mobile networks. Having deep and up-to-date knowledge of the traffic characteristics of different devices and applications is important when designing, testing and managing mobile networks. Ericsson regularly performs traffic measurements in over 100 live networks in all major regions of the world. Detailed measurements are made in a selected number of commercial WCDMA/HSPA and LTE networks with the purpose of discovering different traffic patterns. All subscriber data is made anonymous before it reaches Ericsson's analysts.

# GLOSSARY

2G: 2nd generation mobile networks (GSM, CDMA 1x)
3G: 3rd generation mobile networks (WCDMA/HSPA, LTE, TD-SCDMA, CDMA EV-DO, Mobile WiMax)
APAC: Asia Pacific
Basic phone: non-smartphone
CAGR: Compound Annual Growth Rate
CDMA: Code Division Multiple Access
CEE: Central and Eastern Europe
CEMA: Central and Eastern Europe, Middle East and Africa
DL: Downlink
EB: ExaByte, 10^18 bytes
EDGE: Enhanced Data Rates for Global Evolution
GB: GigaByte, 10^9 bytes
GSA: Global Supplier Association
GSM: Global System for Mobile Communications
HSPA: High Speed Packet Access
IMEI-TAC: International Mobile Equipment Identity – Type Approval Code
LA: Latin America
LTE: Long-Term Evolution
M2M: Machine-to-Machine
MB: MegaByte, 10^6 bytes
MBB: Mobile Broadband (Defined as CDMA2000 EV-DO, HSPA, LTE, Mobile WiMax and TD-SCDMA)
Mbps: Megabits per second
MEA: Middle East and Africa
MMS: Multimedia Messaging Service
Mobile PC: Defined as laptop or desktop PC devices with built-in cellular modem or external USB dongle
Mobile router: A device with a cellular network connection to the internet and Wi-Fi or ethernet connection to one or several clients (such as PCs or tablets)
NA: North America
OS: Operating System
P2P: Peer-to-Peer
PetaByte: 10^15 bytes
Smartphone: mobile phones with open OS, e.g. iPhones, Android OS phones, Windows phones but also Symbian and Blackberry OS
TD-SCDMA: Time Division-Synchronous Code Division Multiple Access
VLR: Visitor Location Register
VoIP: Voice over IP (Internet Protocol)
UL: Uplink
WCDMA: Wideband Code Division Multiple Access
WE: Western Europe

Ericsson is a world-leading provider of communications technology and services. We are enabling the Networked Society with efficient real-time solutions that allow us all to study, work and live our lives more freely, in sustainable societies around the world.

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EAB-13:063042 Uen, Revision A