

ERICSSON MOBILITY REPORT

ON THE PULSE OF THE NETWORKED SOCIETY

NOVEMBER 2015

KEY FIGURES

*Monthly data traffic volumes by year end

**Active devices

Mobile subscription essentials	2014	2015	2021 forecast	CAGR 2015–2021	Unit
Worldwide mobile subscriptions	7,100	7,400	9,100	5%	million
> Smartphone subscriptions	2,600	3,400	6,400	10%	million
> Mobile PC, tablet and mobile router subscriptions	250	250	350	5%	million
> Mobile broadband subscriptions	2,900	3,600	7,700	15%	million
> Mobile subscriptions, GSM/EDGE-only	4,000	3,600	1,300	-15%	million
> Mobile subscriptions, WCDMA/HSPA	1,900	2,200	3,200	5%	million
> Mobile subscriptions, LTE	500	1,000	4,100	25%	million
> Mobile subscriptions, 5G			150		million

Traffic essentials*	2014	2015	2021 forecast	CAGR 2015–2021	Unit
> Monthly data traffic per smartphone**	1.0	1.4	8.5	35%	GB/month
> Monthly data traffic per mobile PC**	4.0	5.8	20	25%	GB/month
> Monthly data traffic per tablet**	1.8	2.6	9.7	25%	GB/month
Total monthly mobile data traffic	3.2	5.3	51	45%	EB/month
Total monthly fixed data traffic	50	60	150	20%	EB/month

Mobile traffic growth forecast	Multiplier 2015–2021	CAGR 2015–2021
All mobile data	10	45%
> Smartphones	11	50%
> Mobile PC	3	20%
> Tablets	7	35%

Monthly data traffic per smartphone**	2015	2021	Unit
> Western Europe	2.0	18	GB/month
> Central and Eastern Europe	1.4	6.9	GB/month
> Middle East and Africa	1.1	6.3	GB/month
> Asia Pacific	1.0	6.9	GB/month
> North America	3.8	22	GB/month
> Latin America	1.2	6.0	GB/month

Traffic exploration tool

Create your own graphs, tables and data using the Ericsson Traffic Exploration Tool. The information available here can be filtered by region, subscription, technology, traffic and device type.

To find out more, visit www.ericsson.com/ericsson-mobility-report. There you will also find regional appendices for all major regions and a new Mobile Business Trends appendix.

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ERICSSON MOBILITY REPORT

Mobile data traffic continues to grow strongly, with a ten-fold increase forecast by the end of 2021

Currently, there are as many mobile subscriptions as people in the world, and every second, 20 new mobile broadband subscriptions are activated. In addition to the increase in subscribers, data consumption also continues to rise.

Consequently, mobile data traffic in Q3 2015 was 65 percent higher than in Q3 2014, largely driven by increased video consumption on mobile devices. Almost 70 percent of all mobile data traffic will be from video by 2021. Apart from mobile phones, there will also be a multitude of other connected devices communicating. Out of a total forecast of 28 billion connected devices – more than 15 billion will be Machine-to-Machine (M2M) and consumer electronic devices by 2021.

In this edition, we have three feature articles exploring various aspects of how ICT solutions contribute to a sustainable and resource-efficient society.

ICT and the low carbon economy

Our research shows that ICT solutions could help address global warming by supporting other industrial sectors to reduce greenhouse gas emissions by

up to 15 percent by 2030. This equates to more than the current carbon footprint of the EU and US combined.

Decoupling energy from traffic growth

Despite the significant growth forecast for mobile traffic, the energy performance of mobile networks is set to improve from a global average of 2 kWh per gigabyte transferred data traffic in 2015 to a projected 0.25 kWh in 2021.

5G beyond mobile broadband

Apart from improvements in mobile broadband services, 5G is about catering for a rapidly widening range of use cases related to the Internet of Things. One potential use case could be to cost-efficiently optimize the operations of a public bus service, achieving resource savings along with reduced environmental impact.

We hope you find the report engaging and valuable.

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FORECAST

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Smartphone subscriptions are expected to almost double by 2021 and grow more than 200 percent from 2015–2021 in the Middle East and Africa

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There has been a significant increase in video traffic shares on smartphones and tablets. TV and video content is increasingly being accessed via smartphones

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Around 80 percent of Android and iOS users are loyal to their operating system, choosing to stay with it when upgrading to a new model

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MOBILE SUBSCRIPTIONS Q3 2015

The total number of mobile subscriptions in Q3 2015 was around 7.3 billion, including 87 million new subscriptions

Global mobile subscriptions are growing around 5 percent year-on-year. India grew the most in terms of net additions during the quarter (+13 million), followed by China (+7 million), the US (+6 million), Myanmar (+5 million), and Nigeria (+4 million).

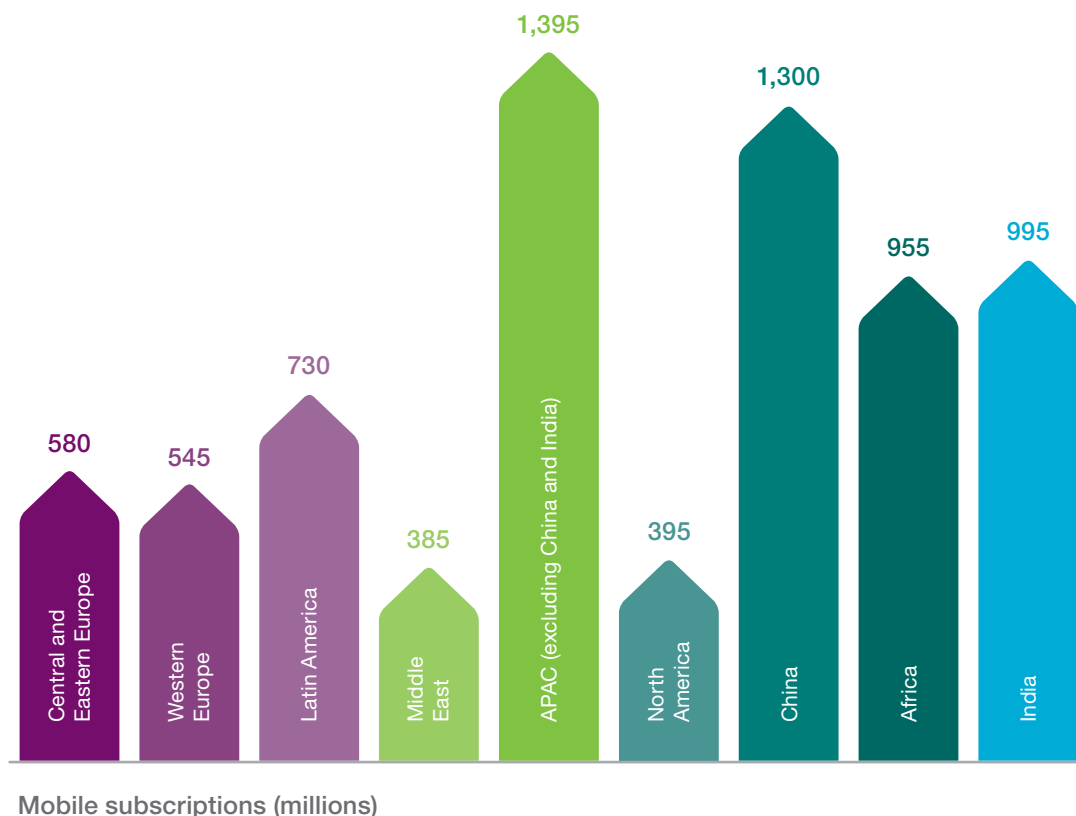
Smartphones accounted for close to 75 percent of all mobile phones sold in Q3 2015, compared to around 70 percent during Q3 2014. Today around 45 percent of all mobile phone subscriptions are associated with smartphones, compared with around 40 percent in 2014, leaving considerable room for further uptake.

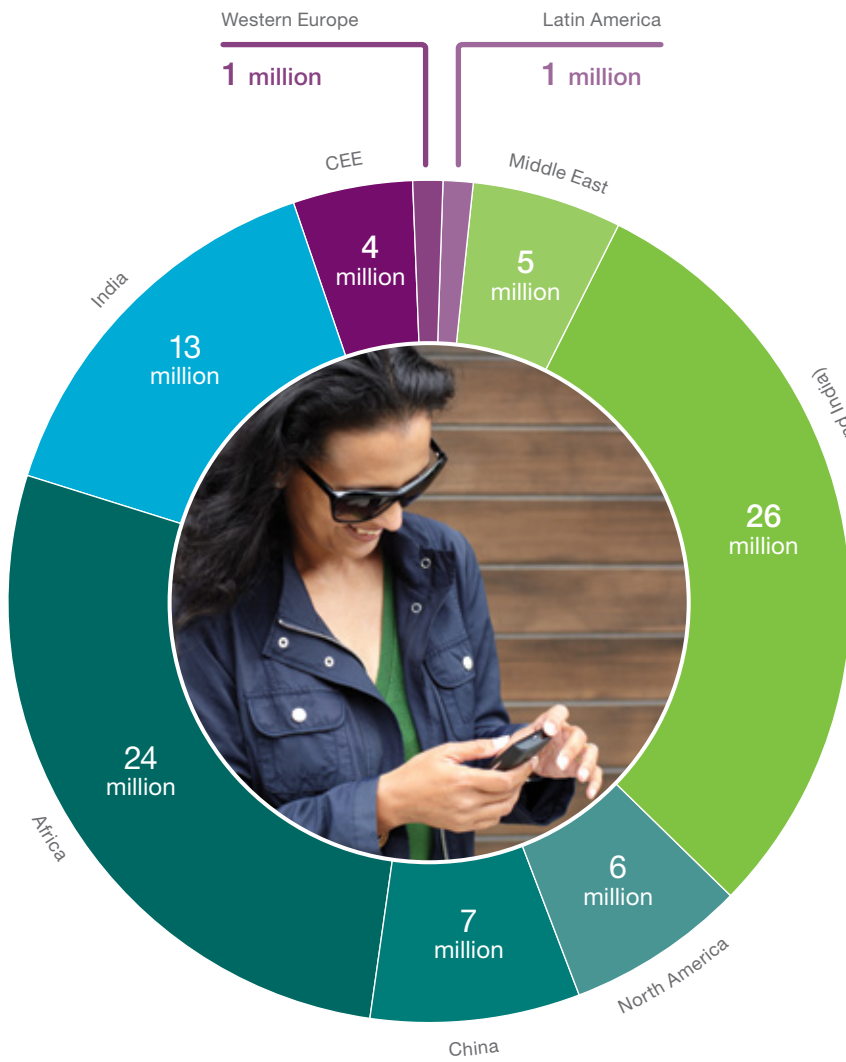
The number of mobile broadband subscriptions is growing globally by around 25 percent year-on-year, increasing by approximately 160 million in Q3 2015 alone.



3.4 billion mobile broadband subscriptions in Q3 2015

LTE subscriptions continue to grow strongly and the total figure has reached around 850 million subscriptions, with approximately 120 million additions in Q3 2015. WCDMA/HSPA added around 70 million during Q3. The majority of 3G/4G subscriptions have access to GSM/EDGE as a fallback, and GSM/EDGE-only subscriptions declined by 60 million.



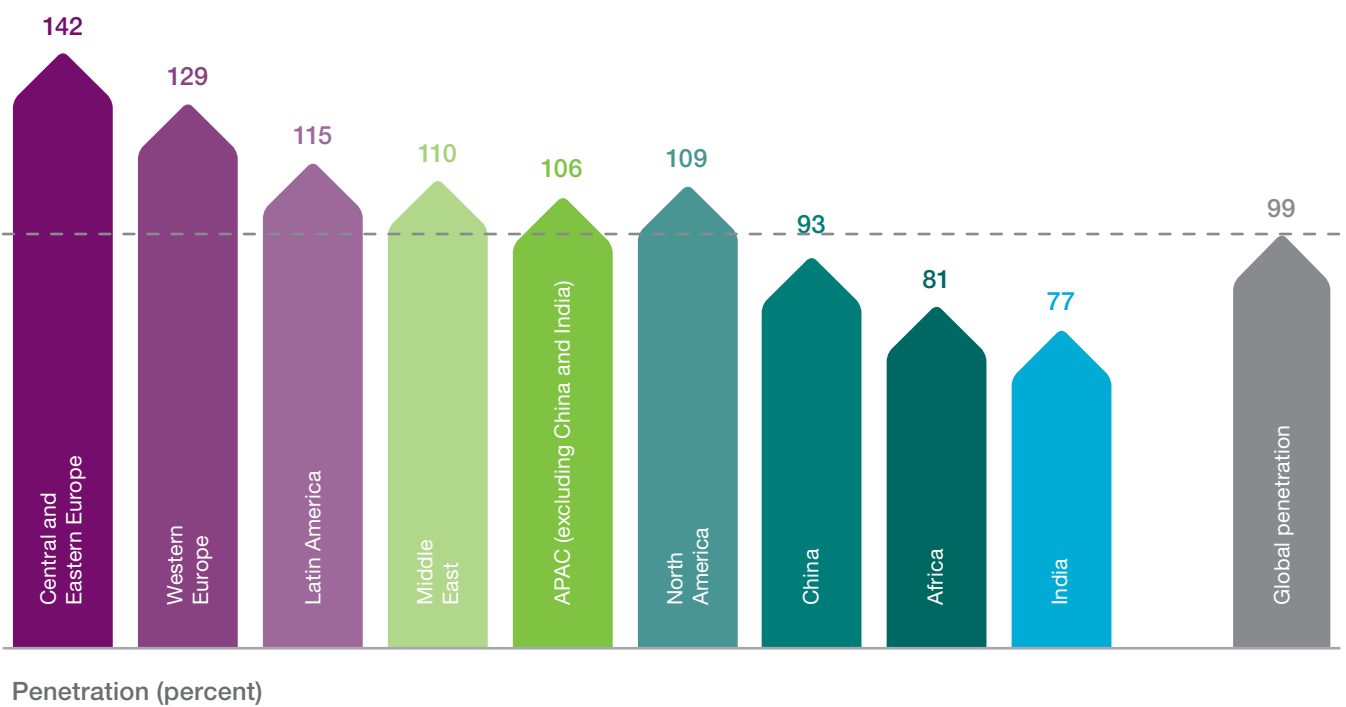


Top 5 countries by net additions Q3 2015

- 1 India +13 million
- 2 China +7 million
- 3 USA +6 million
- 4 Myanmar +5 million
- 5 Nigeria +4 million



87 million new mobile subscriptions globally in Q3 2015



MOBILE SUBSCRIPTIONS OUTLOOK

150 million 5G subscriptions by the end of 2021

The number of subscriptions exceeds the population in many countries. This is largely due to inactive subscriptions and multiple device ownership, e.g. for business and private use, or to optimize pricing by using different operators for different calls (this is common for example in parts of Africa). In developed markets, users add devices such as tablets. This means that the number of subscribers is lower than the number of subscriptions – the current figures are around 4.9 billion subscribers versus 7.3 billion subscriptions.

By 2016 the number of smartphone subscriptions will surpass those for basic phones

Smartphones make up the majority of mobile broadband devices today and subscriptions are expected to almost double by 2021. This is due

to greater affordability in developing markets such as Asia Pacific, the Middle East, and Africa.

85 percent of all subscriptions will be for mobile broadband by the end of 2021

Mobile broadband subscriptions will reach 7.7 billion globally by 2021. They account for an overwhelming share of all broadband subscriptions. Mobile broadband will complement fixed broadband in some segments, and will be the dominant mode of access in others.¹

Many PCs and tablets are used without a mobile subscription, one reason being the price difference between Wi-Fi only models and those with mobile capabilities. Despite this, the number of devices with mobile capabilities and a subscription will increase by 50 percent by 2021.

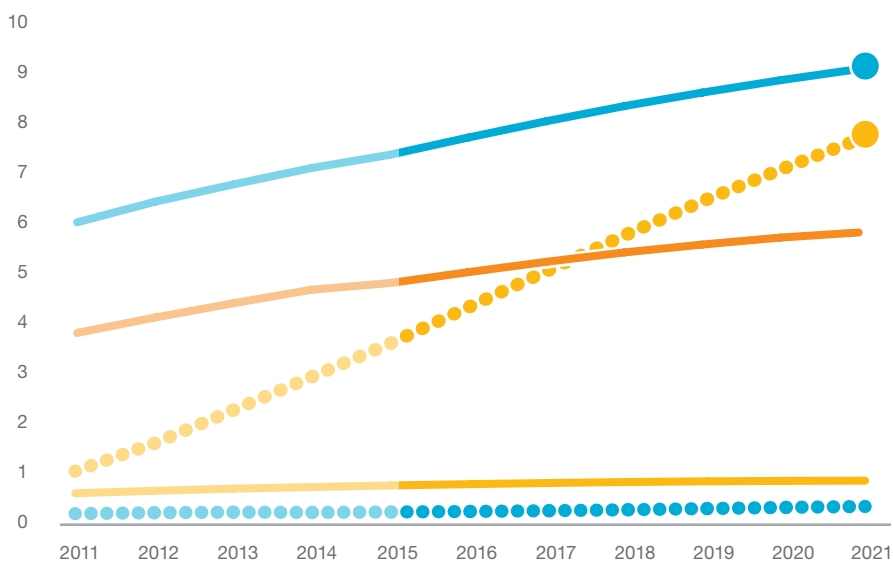
5G subscription uptake expected to be faster than for 4G

5G consists of a new radio access (NX), an evolved LTE access and an enhanced core network. It offers a wider range of services and will open up new industries and verticals.

5G networks, based on standards that will meet ITU IMT-2020 requirements, are expected to be deployed commercially in 2020. Pre-standard, pre-commercial networks are expected to be launched earlier in selected markets. 5G subscriptions will provide enhancements in mobile broadband services, as well as enable a wider range of use cases, e.g. for the Internet of Things (IoT).

In 2021, South Korea, Japan, China and the US are expected to have the fastest uptake of 5G subscriptions.

Subscriptions/lines, subscribers (billion)



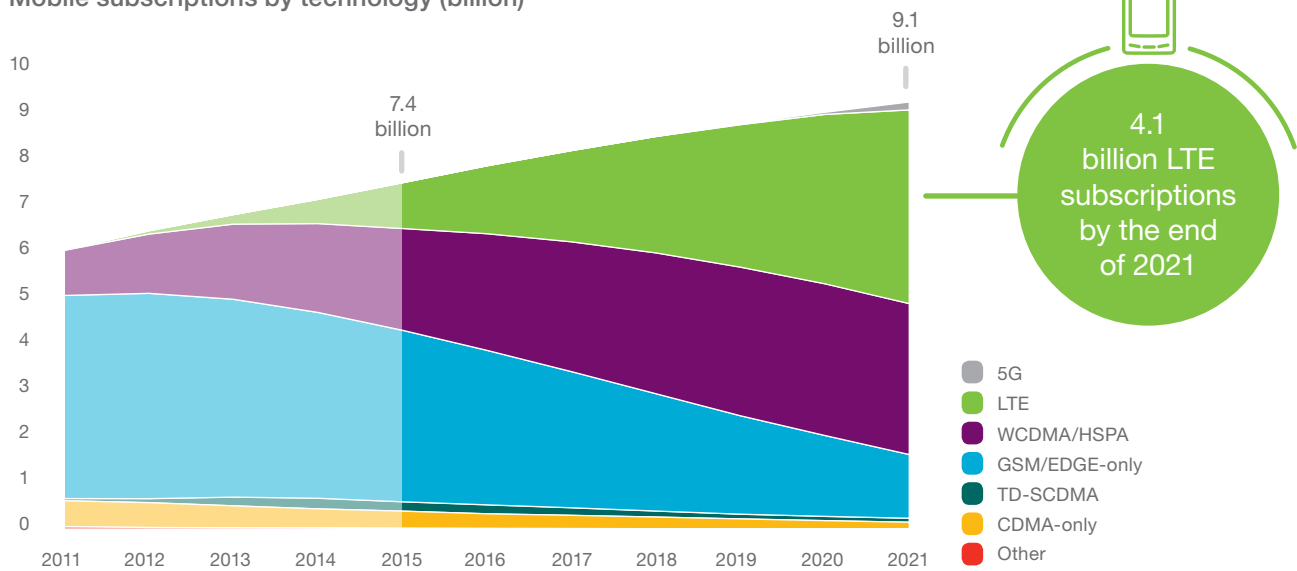
What is a 5G subscription?

A 5G subscription requires a device capable of supporting LTE Evolved or NX, connected to a 5G-enabled network, supporting new use cases.

- Mobile subscriptions
- Mobile broadband subscriptions
- Mobile subscribers
- Fixed broadband subscriptions
- Mobile PCs, tablets and mobile router subscriptions

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 by technology (billion)



There will be a shift from a world dominated by GSM/EDGE-only subscriptions in 2015 to a world dominated by LTE and WCDMA/HSPA-subscriptions in 2021

GSM/EDGE-only subscriptions presently represent the largest share of mobile subscriptions, but WCDMA/HSPA-subscription numbers will be more than double GSM/EDGE-only subscriptions in 2021. In developed markets, there has already been a substantial migration to more advanced technologies, and on a global level

this has resulted in a slight decline in GSM/EDGE-only subscriptions. However, in developing markets it remains a viable option as less affluent users are likely to choose a low-cost mobile phone and subscription. The majority of 3G/4G subscriptions in all regions will still have access to GSM/EDGE as a fallback.

LTE subscriptions reached around 850 million in Q3, and may reach the first billion during 2015. They will make up the largest share of all subscriptions by 2021, totaling 4.1 billion.

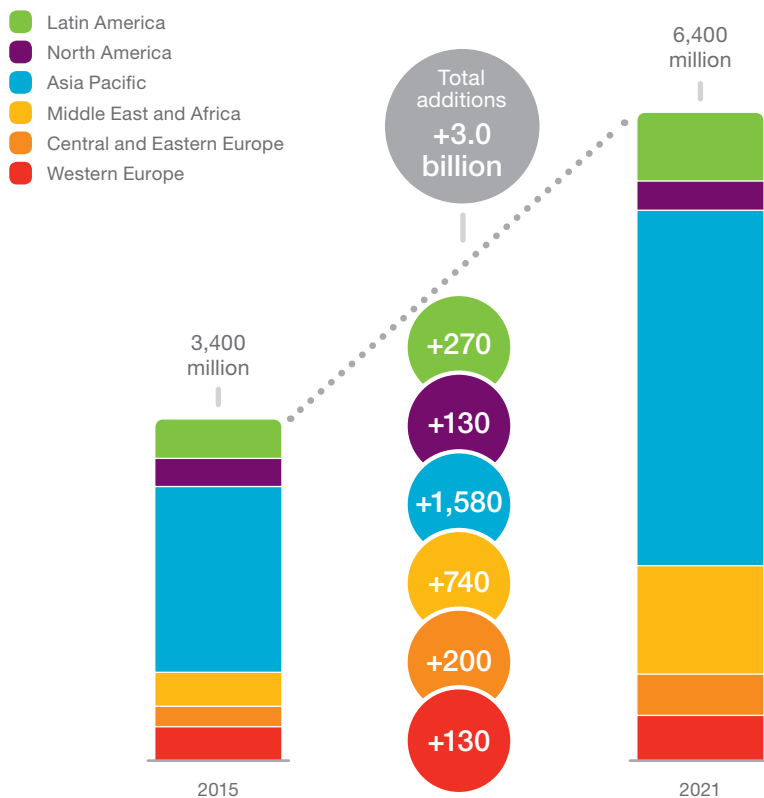
Smartphone subscriptions set to almost double by 2021

Most mobile broadband devices are, and will continue to be, smartphones. Many consumers in developing markets first experience the internet on a smartphone, usually due to limited access to fixed broadband. It took over five years to reach the first billion smartphone subscriptions, a milestone that was passed in 2012, and less than two years to reach the second billion. The four billion mark is expected to be reached by 2016.



Smartphone subscriptions in the Middle East and Africa region will grow more than 200% between 2015-2021

Smartphone subscriptions per region 2015–2021



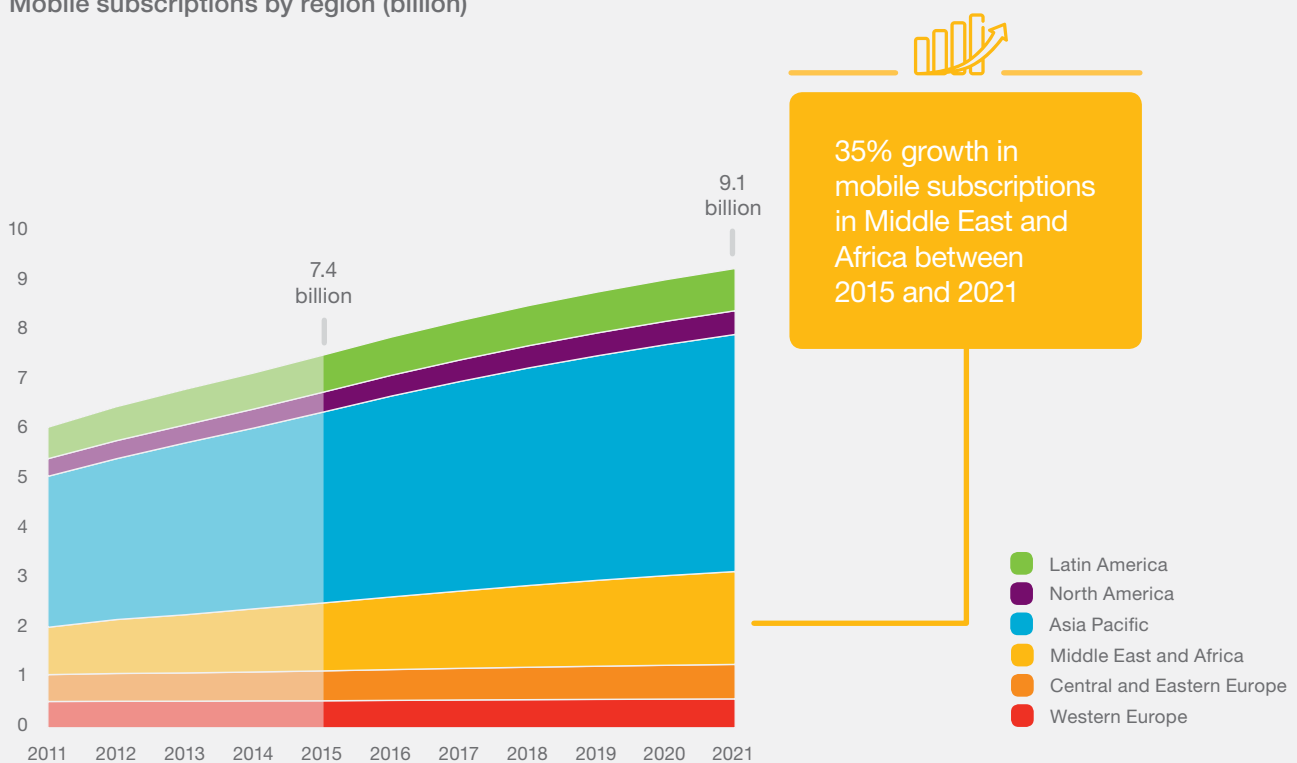
REGIONAL SUBSCRIPTIONS OUTLOOK

There is an increase in mobile subscriptions across all regions, but the underlying factors driving this increase are markedly different

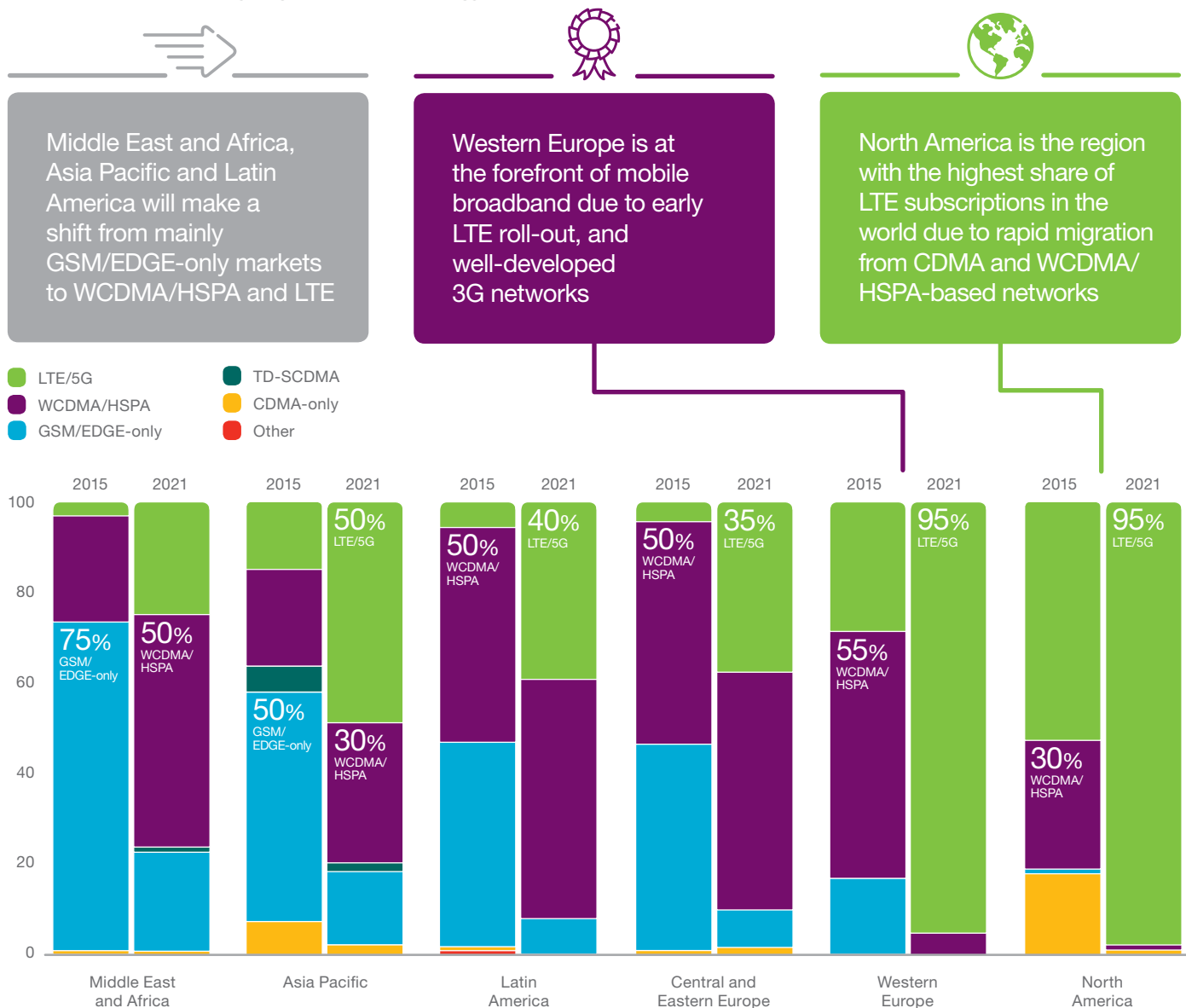
The number of mobile subscriptions is continuing to grow across regions. Greater device affordability is encouraging new subscribers in developing regions, whereas growth in mature markets is largely due to individuals adding more devices. Local economic conditions also have a significant impact on the uptake of subscriptions in different regions. The growth is expected to be particularly strong in the Middle East and Africa due to a young and growing population and rising GDP. Also, subscriber penetration in this region is low compared to the rest of the world. Several countries in the Asia Pacific region will experience a strong subscription uptake over the next five years, while more mature regions like North America and Europe will have more moderate growth.



Mobile subscriptions by region (billion)



Mobile subscriptions by region and technology (percent)



Mobile subscriptions in Middle East and Africa and Asia Pacific are mainly GSM/EDGE-only, while in Western Europe and North America the majority are WCDMA/HSPA and LTE

Middle East and Africa is a region experiencing economic growth and improved living standards in several countries. Combined with increasing availability of low cost smartphones and demand for mobile broadband services, there will be a shift from a voice centric GSM/EDGE-only majority of subscriptions in 2015 to a majority of WCDMA/HSPA and LTE-subscriptions by 2021. However, GSM/EDGE-only subscriptions will still have a significant share in the region by 2021. In Sub-Saharan Africa, WCDMA/HSPA will become predominant towards 2021, due to the high number of lower income consumers using 3G-enabled handsets.

Asia Pacific is a diverse region and the regional share of LTE subscriptions will be around 50 percent in 2021. This

is despite an already ongoing massive deployment of LTE in China which will result in 1.2 billion LTE subscriptions in the country by the end of 2021 – around one quarter of the global total. Also, countries like South Korea and Japan were among the first countries to adopt LTE, and penetration has reached 80 percent and 60 percent, respectively. These two countries currently account for 14 percent of global LTE subscriptions.

In Central and Eastern Europe, the share of WCDMA/HSPA subscriptions is increasing and LTE networks will be present in almost all countries in 2015.

5G initial deployments

5G subscriptions will provide enhancements in mobile broadband services, as well as enabling a widening range of use cases for the IoT. The US, Japan, China and South Korea are expected to be the first countries where 5G subscriptions will be available.

ENABLING THE INTERNET OF THINGS

The number of connected devices is increasing, driven by a growing range of applications and business models, and supported by falling modem costs

Coverage for cellular machine-type communication (MTC) will be extended due to new cellular network functionality, supporting IoT applications in more remote locations, as well as further into buildings and underground locations.

Historically, mobile phones have been the largest category of connected devices. M2M is expected to grow at an annual growth rate of 25 percent up to 2021, driven by new use cases. In total, around 28 billion connected devices are expected by 2021, of which more than 15 billion will be connected M2M and consumer electronics devices.

Connected devices

In our forecast a connected device is a physical object that has an IP stack, enabling two-way communication over a network interface.¹

1.5 billion M2M and consumer electronics devices with cellular subscriptions by 2021

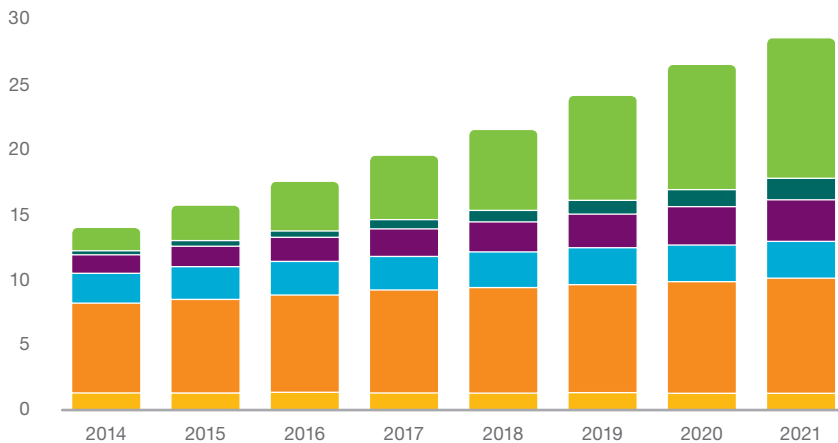
There will be around 400 million M2M and consumer electronics devices with cellular subscriptions at the end of 2015. Anticipating the effects of increased industry focus, 3GPP standardization of LTE-based Narrowband-IoT technology and other enhancements – e.g. in provisioning, device management and service enablement – the number of cellular connected devices is expected to grow substantially, reaching 1.5 billion in 2021. The increase will be driven by new use cases for cellular M2M. Moreover, many things will be connected through capillary networks. This will leverage the ubiquity, security and management of cellular networks. Today, around 70 percent of cellular M2M modules are GSM-only. Network mechanisms are being implemented, resulting in many-folded extended network coverage for low-rate applications. Additional functionality

will allow existing networks to support different device categories, and enable prioritization of devices accessing the network. M2M communication does not yet generate large traffic volumes. In cellular networks its share of total data traffic in terms of bytes is well below one percent in most networks.

LTE devices will be increasingly viable

Today, LTE's share of cellular M2M device penetration is around five percent. Cost reductions will make LTE-connected devices increasingly viable, enabling new, very low latency applications. This will be achieved by reducing complexity and limiting modems to IoT application capabilities. Network systems improvements will support battery lifetimes beyond 10 years for remote cellular devices. Evolved functionality in existing networks as well as 5G capabilities are expected to extend the range of addressable applications for massive MTC deployments.

Connected devices (billions)



	15 billion	28 billion
M2M: non-cellular	2.6	10.7
M2M and consumer electronics; cellular	0.4	1.5
Consumer electronics; non-cellular	1.6	3.1
PC/laptop/tablet	2.4	2.8
Mobile phones	7.1	8.7
Fixed phones	1.3	1.4
	2015	2021

¹ Traditional landline phones are included for legacy reasons

Examples of M2M: connected cars, machines and utility meters, remote metering.

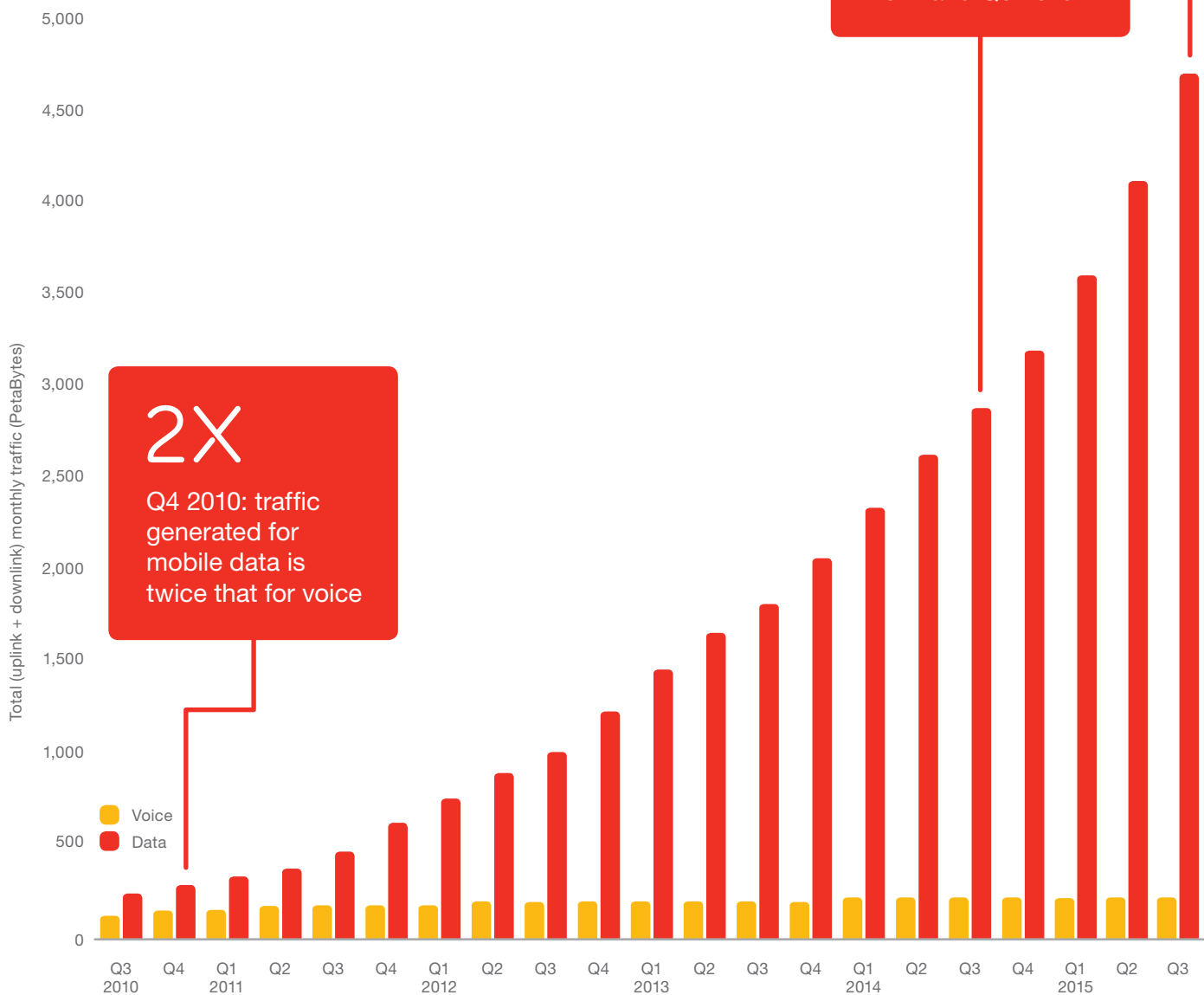
Note: A connected car is herein counted as one "thing" though it may have hundreds of sensors.

Examples of consumer electronics devices include: smart TVs, digital media boxes, Blu-Ray players, gaming consoles, audio/video (AV) receivers, etc.

MOBILE TRAFFIC Q3 2015

Mobile data traffic continues to grow, and the graph below shows total global monthly data and voice traffic from Q3 2010 to Q3 2015.¹ It depicts a continued strong increase in data traffic, and voice traffic growth in the mid-single digits per year. The growth in data traffic is being driven both by increased smartphone subscriptions and a continued increase in average data volume per subscription, fueled primarily by more viewing of video content.

Data traffic grew around 14 percent quarter-on-quarter and 65 percent year-on-year. It should be noted that there are large differences in traffic levels between markets, regions and operators.

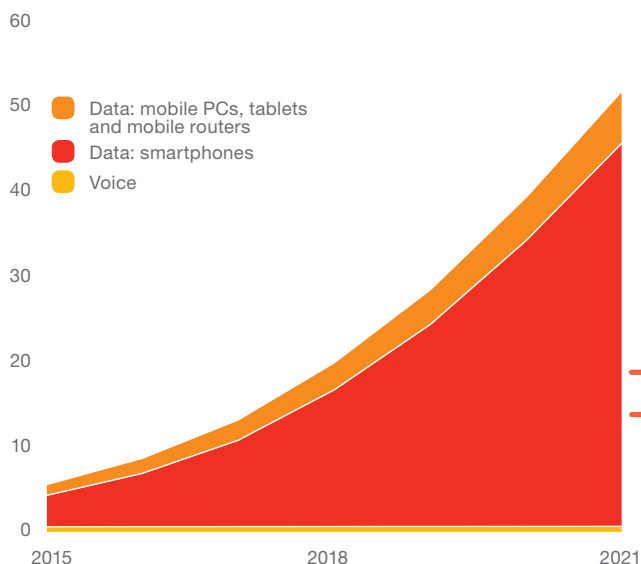


Source: Ericsson traffic measurements (Q3 2015)

¹ Traffic does not include DVB-H, Wi-Fi, or Mobile WiMAX. VoIP is included in data traffic

MOBILE TRAFFIC OUTLOOK

Global mobile traffic (monthly ExaBytes)



11X

11X growth in smartphone traffic between 2015 and 2021

Total mobile data traffic is expected to rise at a compound annual growth rate (CAGR) of around 45 percent

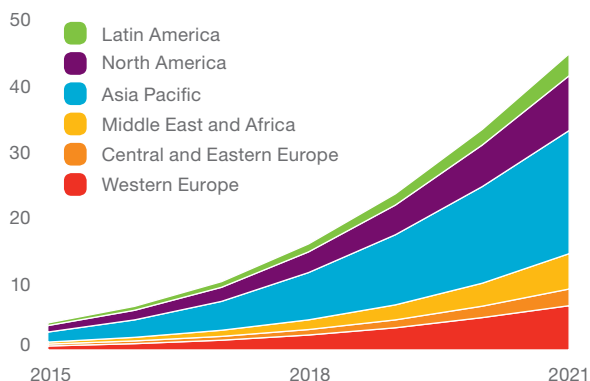
Based on recent network measurements, a stronger than anticipated growth of average data traffic consumption per user resulted in a significant upward adjustment of our forecast. The growth in mobile data traffic is due to both the rising number of smartphone subscriptions, in particular for LTE smartphones, and increasing data consumption per subscriber. This is forecast to result in a ten-fold increase in total traffic for all devices by the end of 2021.

There are large differences in subscribers' data consumption patterns between networks, markets and subscriber segments. Factors such as data plans, user device capabilities and network performance all impact data consumption per subscriber. Even switching to a new version of the same device could typically increase data consumption by 25–40 percent.



Around 90% of mobile data traffic will be from smartphones by the end of 2021

Smartphone data traffic per region (monthly ExaBytes)



Asia Pacific will generate 40 percent of total smartphone traffic by the end of 2021

In the next 5 years, monthly smartphone data consumption per active subscription in North America (22 GB) will be 1.2 times that of Western Europe (18 GB) and 3 times that of Asia Pacific (7 GB). However, the Asia Pacific region will have the largest share of total smartphone traffic in 2021, due to growth in the number of subscriptions.

Asia Pacific will have the largest share of mobile data traffic in 2021, due to it being the most populous region and a rapid growth in subscriptions. China alone will add 260 million mobile subscriptions by 2021

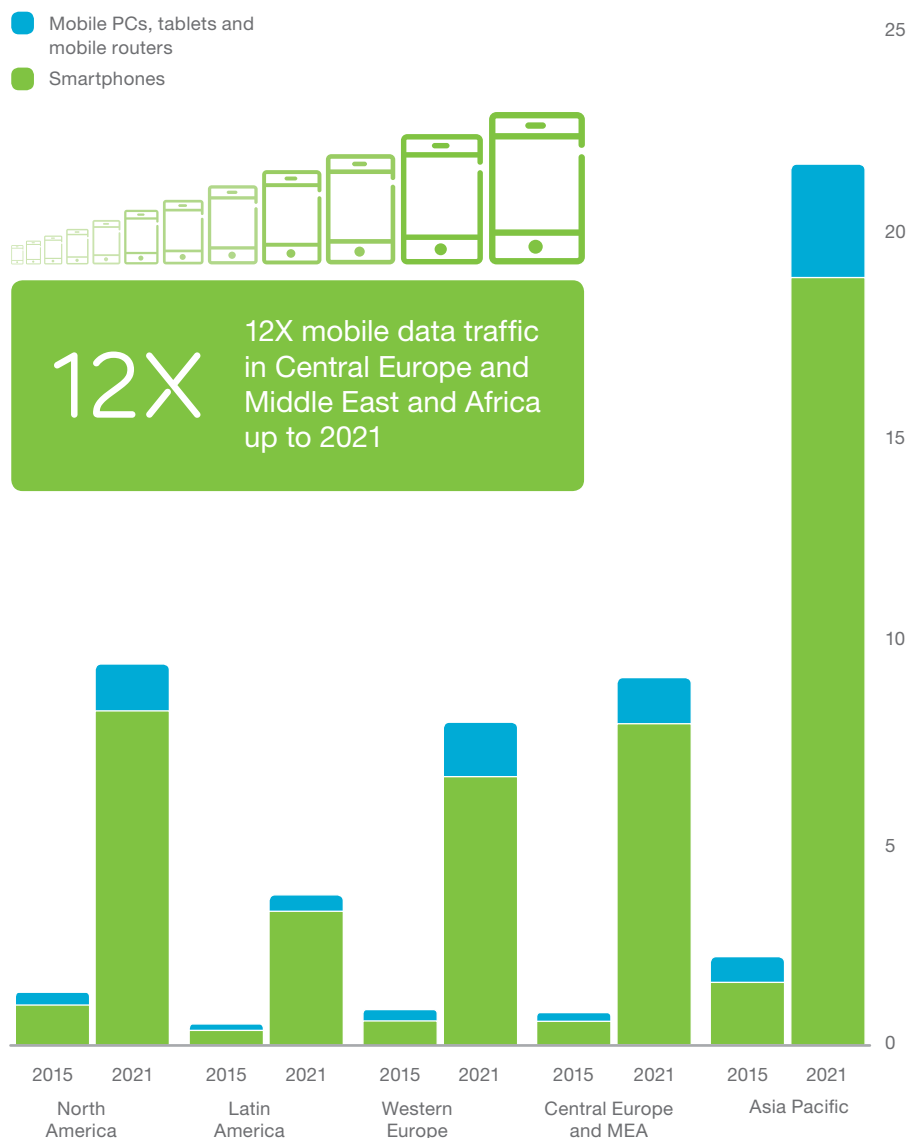
With varying levels of maturity, diversity is a key feature of the mobile broadband market in Asia Pacific. For example, South Korea and Japan deployed LTE early, and with fast penetration take-up, markets such as Singapore and Hong Kong are highly advanced. GSM is still the dominant technology in the less developed countries, and insufficient network quality and the cost of data subscriptions remain barriers to higher mobile data consumption.

Central Europe and Middle East and Africa will experience a twelve-fold increase up to 2021, driven by a strong growth in smartphone subscriptions and demand for data-intensive applications like video.

North America and Western Europe currently have a larger share of total traffic volume than their subscription numbers imply. This is due to high penetration of high-end user devices and well built-out WCDMA and LTE networks with affordable packages of large data volumes. This leads to higher data usage per subscription.

Mobile data traffic growth by region	2015 (EB/month)	Multiplier 2015–2021
Asia Pacific	2.1	10
Central Europe and Middle East and Africa	0.8	12
Western Europe	0.8	10
North America	1.3	7
Latin America	0.5	8

Global mobile data traffic (monthly ExaBytes)



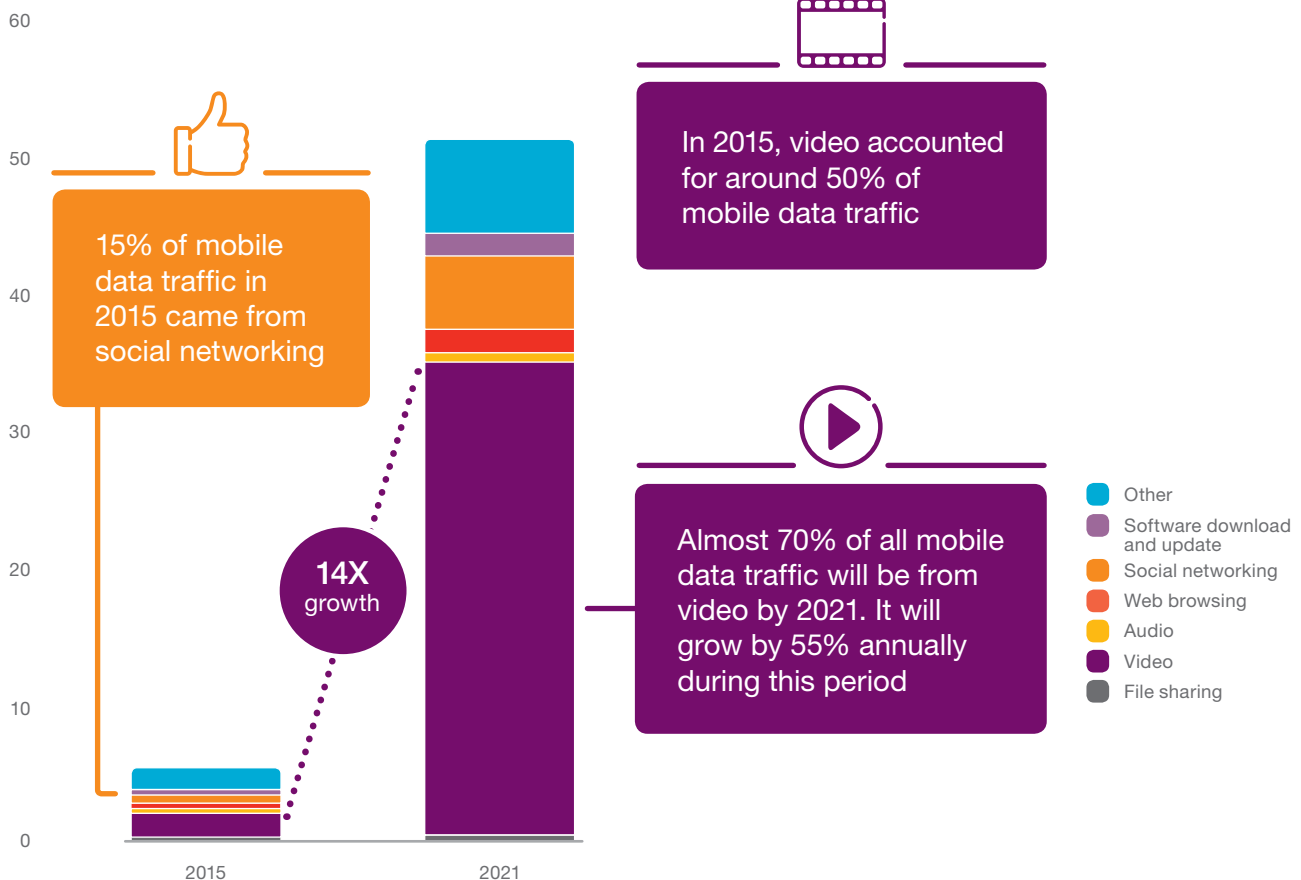
MOBILE APPLICATION TRAFFIC OUTLOOK

Mobile video traffic is becoming increasingly dominant

In many mobile networks today, 50–70 percent of video traffic¹ is from YouTube. Mobile video in general is forecast to grow by around 55 percent annually through 2021, when it will account for around 70 percent of all mobile data traffic.² Music streaming is gaining popularity, but functions such as content caching and offline playlists reduce the impact on traffic growth. The relative share of traffic generated by social networking will have declined from 15 percent in 2015 to 10 percent by 2021, mainly as a result of stronger growth in the video category. Consumer preferences are shifting towards more video and app-based mobile use relative to web browsing.

The emergence of new applications can shift the relative volumes of different types of traffic, but the proliferation of different sized smart devices will also affect the traffic mix – for example, phablets and tablets are associated with a higher share of online video traffic than smartphones. Typically, tablets and smartphones are used equally for watching short video content, but tablets are preferred for watching longer video content.³

Mobile data traffic by application type (monthly ExaBytes)

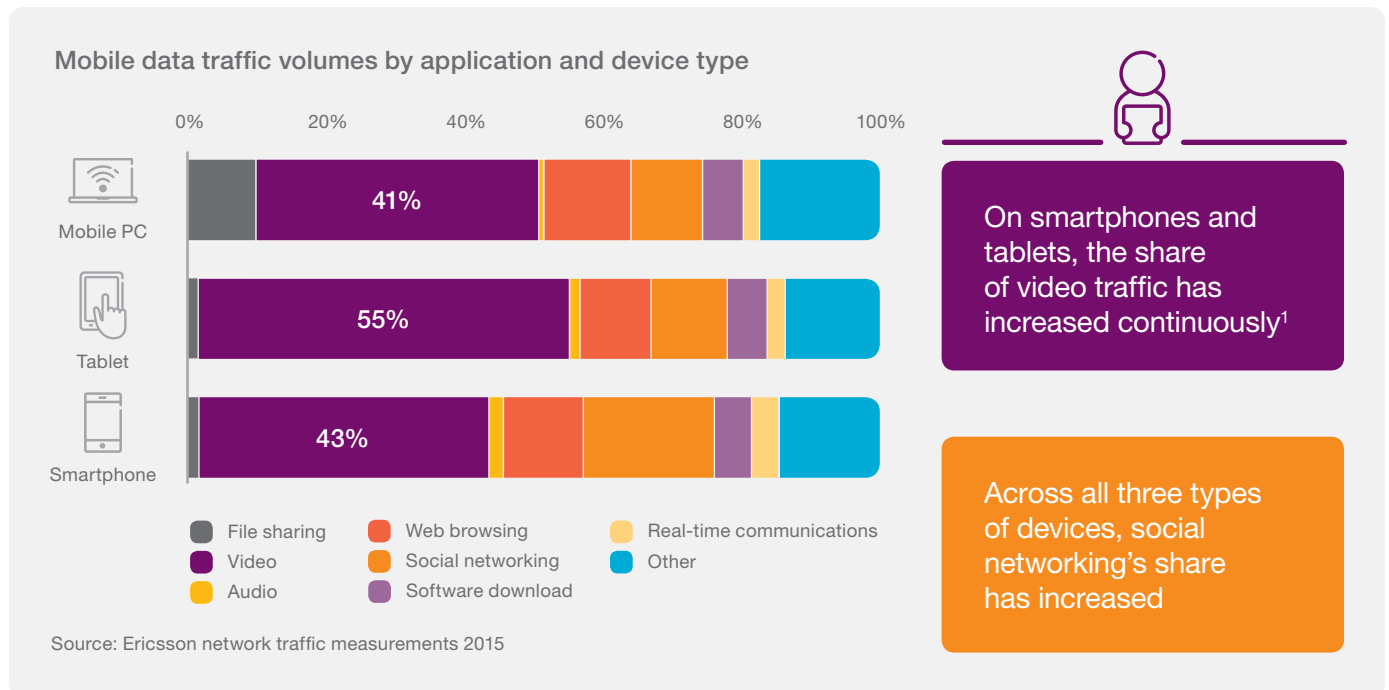


¹ This is based on Ericsson measurements in a selected number of commercial networks in Asia, Europe and the Americas

² Video is also likely to form a major part of file sharing traffic in addition to the identified application type "video"

³ Ericsson ConsumerLab, TV and Media (2015)

MOBILE TRAFFIC MIX PER DEVICE TYPE



Significant increase of video traffic shares on smartphones and tablets

Average values from measurements² 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 (40–55 percent). However, actual values in individual networks can vary a lot.

YouTube still dominates video traffic in most mobile networks and accounts for between 50–70 percent of total video traffic for almost all measured networks, regardless of terminal type. In markets where Netflix, an international provider of on-demand streamed TV series, programs and movies, has launched services, its share of video traffic can reach 10–20 percent of total mobile video traffic. These findings are supported by research from Ericsson ConsumerLab, which has found that smartphone viewing continues to be driven by short video content, with around 30 percent watching user generated content. However, streaming Video-on-Demand (VoD) services is also increasing, with 20 percent of viewers now watching longer on-demand content, such as TV series and movies, on a smartphone.³

For smartphones, social networking is the second largest traffic volume contributor, with an average share of 20 percent in measured networks. There has been a steady increase in the share of social networking traffic on smartphones, as well as an increased share of video traffic on smartphones and tablets in recent years.

Ericsson ConsumerLab research also shows that TV and video content is increasingly being accessed via smartphones. In fact, since 2012 there has been a 70 percent increase in the number of consumers who watch video on a smartphone. When taking tablets and laptops into consideration as well, almost two thirds of the time spent watching TV and video among teenagers is on these devices.⁴

File sharing is more prominent on mobile PCs than on other devices, constituting around 10 percent of traffic. The very small part of file sharing that is associated with smartphones and tablets comes predominantly from tethering traffic. The share of traditional web browsing traffic shows a decreasing trend on all three types of devices.

¹ Compared to similar traffic measurements in 2012

² Does not take into account Wi-Fi offload traffic. "Other" includes applications that it was not possible to identify or that don't qualify as one of the listed applications

³ Ericsson ConsumerLab, TV and Media (2015)

⁴ Ericsson ConsumerLab, TV and Media (2015)

STATE OF THE NETWORKS

Today's subscribers expect a high quality user experience and continual service improvement. Evolving mobile network capabilities is key to ensuring such a user experience

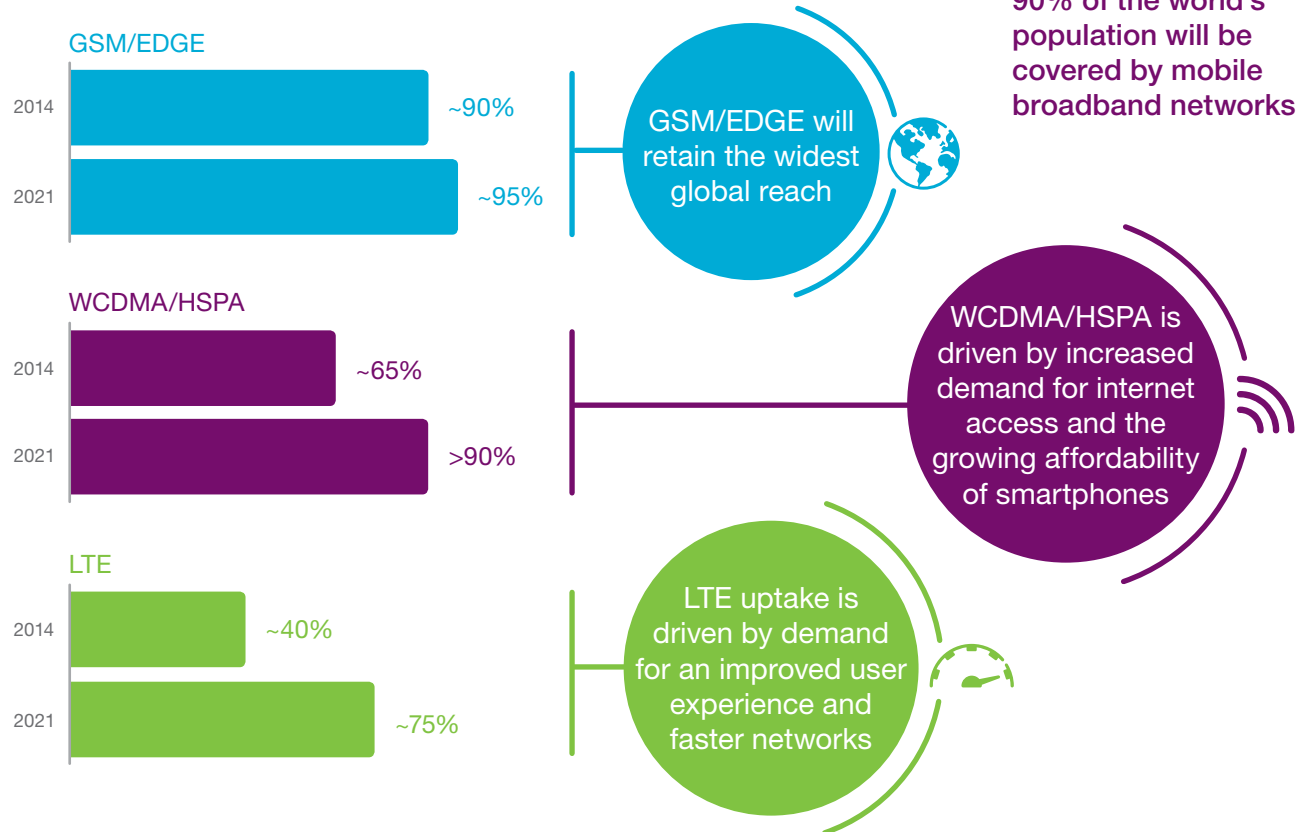
New mobile network functionalities and service capabilities are being implemented for both data and voice. These include improvements to both downlink and uplink speeds in WCDMA/HSPA and LTE networks. Improved voice quality and new, richer communications services like mobile HD voice, VoLTE, video communication and enriched messaging are enabled by IP-based networks. Furthermore, with native Wi-Fi calling functionality now available on more types of devices, users can be offered operator voice and communication services in more locations and on more devices. To ensure good mobile network performance, microwave backhaul technology plays an important role. Future radio networks' capacity needs will be supported by microwave backhaul evolution through 2020 and beyond.

WCDMA/HSPA enables mass market mobile broadband

In recent years, network performance improvements during high traffic load have been implemented. This is expected to continue with enhancements for both the downlink and uplink. Today, around 60 percent of WCDMA/HSPA operators support 5.8 Mbps or higher speeds on the uplink. 22 operators have implemented uplink speeds of up to 12 Mbps.

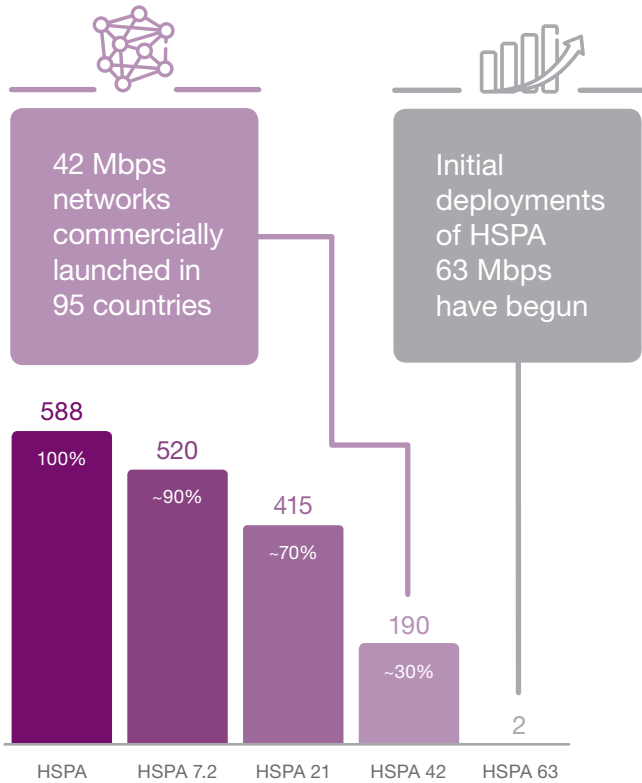
Low band networks can complement higher frequency deployments and enhance the user experience. Today, WCDMA/HSPA 900 MHz deployments are considered mainstream, with 100 commercial networks in 64 countries.²

World population coverage by technology¹



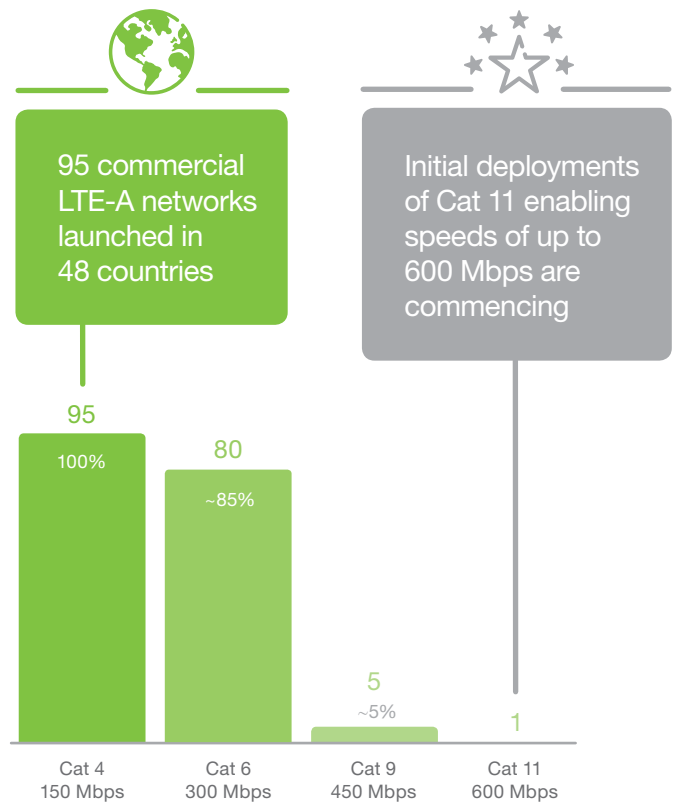
¹ The figures refer to population coverage of each technology. The ability to utilize the technology is subject to factors such as access to devices and subscriptions
² GSA (October 2015)

Percentage and number of WCDMA networks upgraded to HSPA and to HSPA 7.2, 21, 42 and 63 Mbps



Source: Ericsson and GSA (October 2015)

Percentage and number of LTE-Advanced networks upgraded to Cat 4, Cat 6, Cat 9 and Cat 11



Source: Ericsson and GSA (October 2015)

LTE is continuously expanding and evolving

LTE uptake is driven by the demand for an enhanced user experience and higher network speeds. The uptake is being fueled by an attractive LTE device ecosystem, and around 3,700 LTE user devices have been launched.³

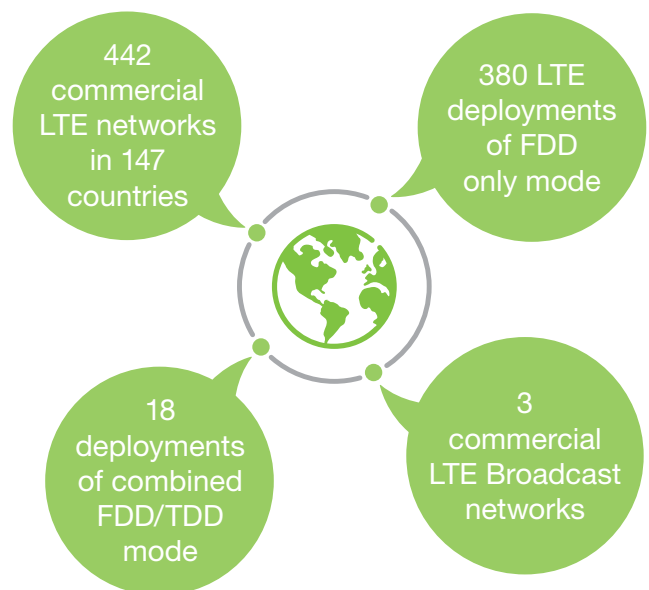
To meet the demand for enhanced app coverage, the number of LTE-Advanced (LTE-A) carrier aggregation commercial launches is continuously increasing. Operators are evolving their LTE-A networks with Category (Cat) 4, 6, 9 and 11 implementations, combining lower and higher frequency spectrum (both for FDD and TDD modes) to achieve a wider coverage area, increased network capacity and higher user data throughput. This means people can enjoy their apps, music streaming, video content, etc. with less performance degradation, even during peak times or in crowded places.

95 operators have commercially launched LTE-A networks. 85 percent are Cat 6 networks which enable network speeds up to 300 Mbps.

Some operators have aggregated 60 MHz of FDD spectrum, enabling peak downlink data speeds up to 450 Mbps (Cat 9).

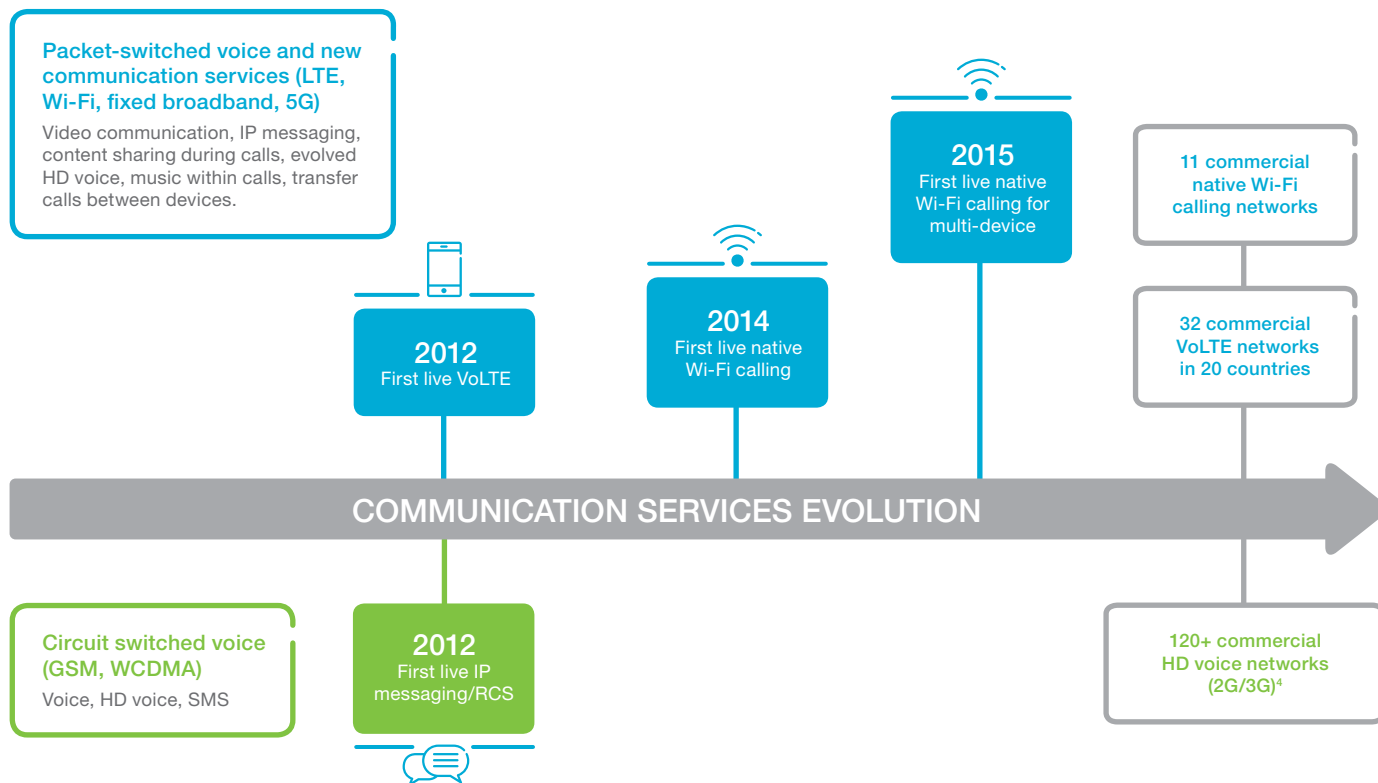
The next LTE-A capability that operators are beginning to deploy is a higher order of modulation – 256 Quadrature Amplitude Modulation (QAM) – which can increase downlink data speeds by 33 percent. Aggregating 60 MHz of FDD spectrum with 256 QAM will enable peak downlink speeds of up to 600 Mbps (Cat 11).

These higher speeds will enhance the user experience both indoors and outdoors. Note that network speeds mentioned here are a theoretical maximum: typical user speeds will be lower and depend on factors such as device type, user location and network conditions.



Source: Ericsson and GSA (October 2015)

³ GSA (November 2015)



Operators can stay competitive by launching attractive data and communication services bundles

The relative share of voice and messaging revenue reported by operators is declining, driven by growing data usage, but demand for communication services is still strong. Many operators offer combined voice and data plans, often with unlimited voice and messaging. This has increased operator-provided voice and SMS usage in many markets.

Communication services based on VoLTE enable operators to offer bundled data and high-quality communication services packages, such as telecom-grade HD voice, video calling, IP-based messaging and other new, richer communication services, while enabling simultaneous high speed LTE data services on smartphones.

Mobile HD voice services improve sound quality

By providing improved intelligibility and voice clarity, HD voice services offer a more natural sound than conventional mobile voice services. Enabling HD voice requires device support, as well as new network functionality on 2G, 3G and LTE networks. An evolved HD voice service further improves the user experience by delivering even higher quality voice and music within LTE calls. The first evolved HD voice-enabled network is expected to be commercially launched in early 2016.

Wi-Fi calling for multi-device

Several major device vendors have integrated native Wi-Fi calling on smartphones, and 10 commercial launches took place during 2015. Consumers can be offered operator

provided SIM-based voice services in their homes over their own Wi-Fi access points, using any Internet Service Provider (ISP). This benefits users with limited circuit-switched voice or VoLTE indoor coverage. According to an Ericsson ConsumerLab study⁵, around 60 percent of Wi-Fi calling users surveyed claim they now make more frequent and longer voice calls, while around half say they have replaced some over-the-top (OTT) app communication.

Recent developments also enable operator voice services to be offered over Wi-Fi on devices without a SIM card, such as tablets and personal computers. This means the user's personal devices can be located at different Wi-Fi access points across the world, and the smartphone can be on cellular or Wi-Fi access. The user can select to pick-up and make calls on any of the devices and transfer calls between (personal) devices. Users can also make calls over Wi-Fi when roaming abroad. This provides operators with a new tool to offer their voice service on Wi-Fi only devices and thus provide more attractive service packages to consumers and enterprise users.

The service is run via the operator's upgraded Evolved Packet Core (EPC) and IP Multimedia Subsystem (IMS) network. This is an extension of VoLTE-based services to Wi-Fi access, and seamless voice and video calling handover between LTE and Wi-Fi can also be supported.

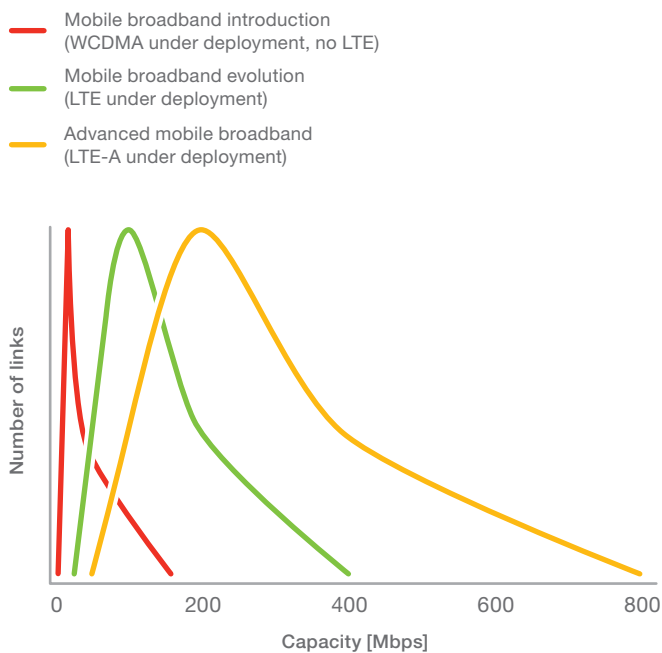
The IMS and core network enables all these packet-switched communication services, which can be run over LTE, Wi-Fi and fixed broadband on any device.⁶ With Network Function Virtualization (NFV) starting to be deployed in core networks, operators will be able to more quickly and cost-effectively launch and run new innovative services.

⁴ GSA (April 2015)

⁵ Ericsson ConsumerLab, Wi-Fi calling finds its voice (2015)

⁶ As the device ecosystem evolves

Distribution of deployed microwave link capacities (2015)⁷



Source: Ericsson (2015)

Microwave backhaul technology plays an important role in providing high quality mobile network performance and is the dominant backhaul media today

In 2020, 65 percent of all cell sites will be connected with microwave solutions (excluding North East Asia). Choosing what backhaul media to deploy will not be about capacity, rather it will be about existing fiber presence and Total Cost of Ownership (TCO).

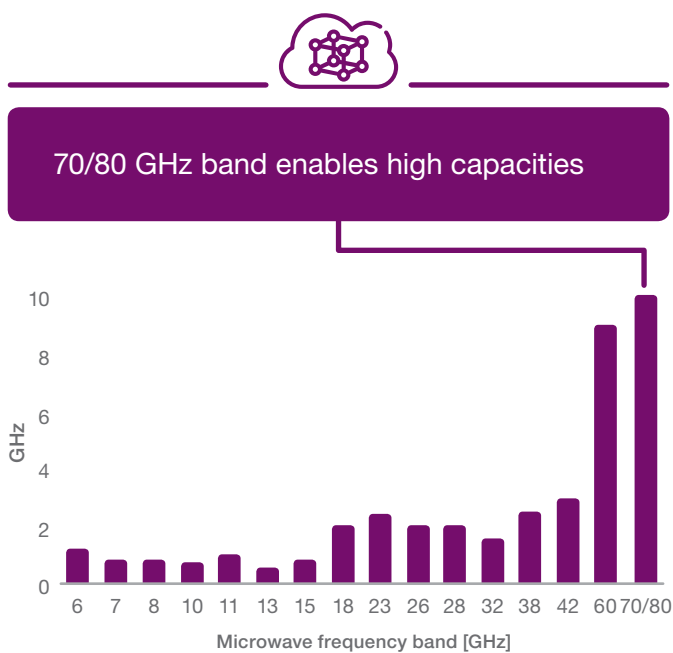
The backhaul capacity needed per base station differs substantially, depending on targeted network data speeds and population density. Mobile broadband maturity also differs globally and thus the corresponding distribution of deployed microwave link capacities.

Spectrum in different frequency ranges is used to support backhaul in all locations, from very sparse rural areas to ultra-dense urban environments. It is estimated that up to 10 million radios are in operation worldwide, in over 4 million microwave radio hops. There are large regional and national variations in the relative use of different frequency bands. The variance is due to local parameters such as climate, inter-site distances, performance requirements, national spectrum regulations and fiber penetration.

Along with spectrum, microwave technology has rapidly evolved over the last few decades to support the increasing performance requirements from new services. Features such as extreme-order modulation, super high performance antennas, increased output power levels and wider frequency channels have enabled microwave to evolve.

Although there is untapped potential in all frequency bands, there are local hotspots where heavily used bands are congested and wider channels are not achievable. Introducing new frequency bands is important to further support the evolution to higher microwave capacities, wider network

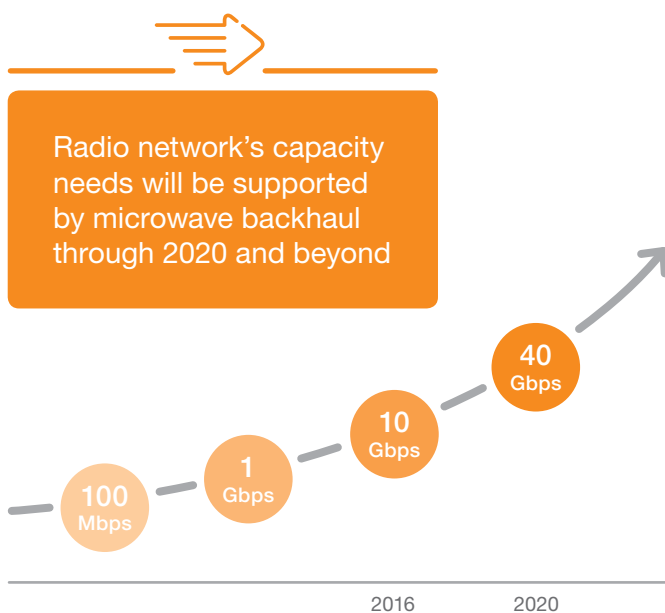
Spectrum per microwave frequency band



coverage and denser networks. The new 70/80 GHz band is now rapidly increasing in use due to its very wide spectrum and channels. This will enable 10 gigabit capacities in urban areas and support the evolution towards 5G.

Microwave performance will continue to evolve with, for example, the use of multi-band configurations to extend the reach of multi-gigabit capacities. New, very wide frequency bands beyond 100 GHz are also being investigated to enable capacities in the 40 gigabit range. Through technology evolution and more efficient use of the microwave spectrum, future radio networks' capacity needs will be supported with microwave backhaul through 2020 and beyond.

Microwave backhaul capacity evolution



⁷ Typical distribution, based on collected data from a large number of networks

ICT AND THE LOW CARBON ECONOMY

The Information and Communications Technology (ICT) industry is unique in that it has the potential to enable all other industrial sectors to reduce their environmental impact. Ericsson research shows that ICT solutions could help to reduce greenhouse gas (GHG) emissions by up to 15 percent by 2030, which amounts to around 10 gigatonnes of carbon dioxide equivalents (CO₂e), more than the current carbon footprint of the EU and US combined

Global warming, a result of rising GHG emissions levels, is a major challenge to society that needs to be addressed. According to the United Nations Intergovernmental Panel on Climate Change (IPCC), GHG emissions need to be reduced to 40-70 percent below 2010 levels by 2050 in order to limit global warming to below two degrees Celsius.¹

As part of the 70th session of the UN General Assembly held in September 2015, 193 world leaders committed to 17 Global Goals for Sustainable Development (SDGs) over the next 15 years. SDG 13 is aimed at combating climate change, and will require existing as well as new and innovative technological solutions to succeed.

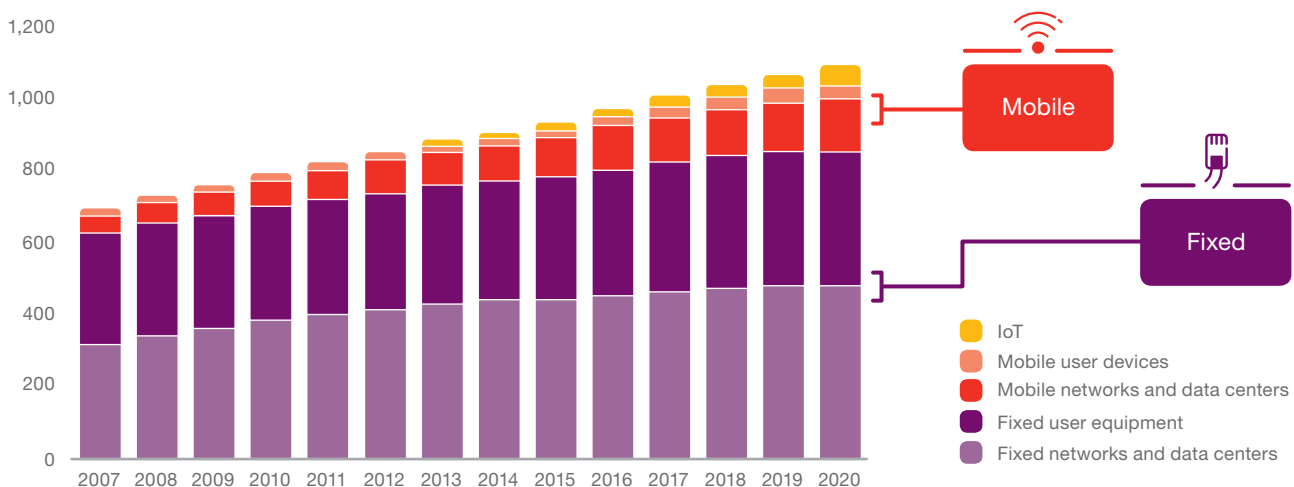
The energy and carbon footprint of ICT

The environmental impact of ICT's end-to-end energy consumption, from devices through to access, core, transport networks and data centers, can be expressed as GHG emissions measured in CO₂e.

Ericsson has long assessed the energy and carbon footprint of ICT from a life cycle perspective and made projections out to 2020. Life cycle assessment² (LCA) studies show that operations typically represent about two thirds of the carbon footprint of ICT. The remaining third is related to the manufacturing and transport of equipment and devices.

Energy consumption from fixed networks and user equipment represents more than 85 percent of the total ICT energy consumption in 2015. Mobile ICT represents a smaller share because user devices are powered by small batteries with limited capacity, and therefore are designed to use energy more efficiently. While fixed ICT uses a large amount of energy, new screen technologies, the switch from desktop PCs to laptop PCs, improvements in data centers and energy efficiency gains in various components have led to improvements in this area.

Global energy consumption for network infrastructure and user equipment during operational phase (TWh)³

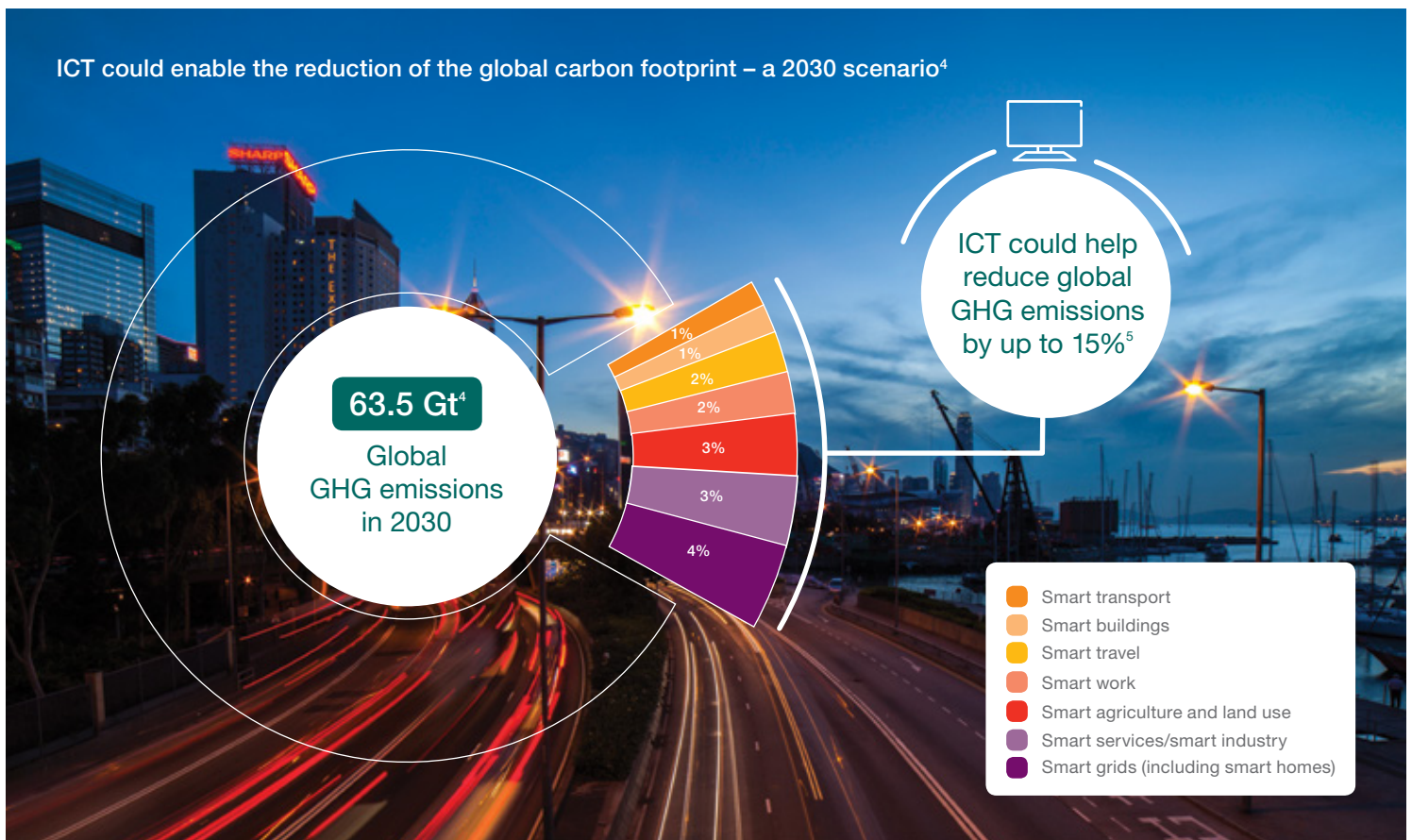


¹ Parties to the United Nations Framework Convention on Climate Change (UNFCCC) have agreed that deep cuts in GHG emissions are required, and that future global warming should be limited to below 2.0 °C (3.6 °F) relative to the pre-industrial levels

² Life cycle assessment (LCA) is a methodology to assess environmental impacts associated with a product's life from raw material extraction, processing, manufacture, distribution and use, to disposal or recycling

³ Malmodin, J. et al (2013), The future carbon footprint of the ICT and E&M sectors, proceedings for ICT for Sustainability Conference

ICT could enable the reduction of the global carbon footprint – a 2030 scenario⁴



Recent studies show that in Organisation for Economic Cooperation and Development (OECD) countries with high ICT use, the total energy footprint (and consequently the carbon footprint) has started to decrease. Another new and important change is that as mobile device usage grows, the use of larger, less energy-efficient fixed devices declines, further reducing the energy and carbon footprint of ICT overall. However, as ICT becomes more prominent in many developing countries, its overall energy and carbon footprint continues to grow worldwide. Today, its share of global GHG emissions is around 1.6 percent and it is estimated to account for around 2 percent by 2020. This share is expected to have increased only marginally by 2030. Of this, about three quarters is expected to be related to fixed ICT and one quarter to mobile ICT.

The transformative potential of ICT

While ICT's contribution to the overall carbon footprint is projected to increase marginally in the coming years, the transformative potential of ICT to enable savings in energy consumption, and subsequently GHG emissions, across all other industrial sectors is high. Research indicates a total GHG emission reduction potential of up to 10 gigatonnes of CO₂e (including direct and indirect reductions), representing about 15 percent of the global GHG emissions in 2030.⁴

All of the industrial sectors studied show potential for ICT-enabled reductions of GHG emissions. Examples include:

Electricity distribution – Smart metering for homes as well as building energy management and smart grid solutions help households and building managers reduce their energy

consumption. They also allow for the use of more small-scale local renewable energy sources (e.g. solar panels) and help utility companies to better plan and optimize the grid to reduce losses.

Services and industry – Smart service solutions include services for the healthcare, education and governmental sectors and can provide these services at a lower cost. This enables socioeconomic development in parts of the world where it's needed the most. Smart services also include services with a dematerialization effect, of which digital media and the internet itself is a good example. Other smart services shift the focus from owning and using products sparsely to using services that provide the same function when needed, increasing the efficiency of products and ultimately natural resources, e.g. car pools.

Transport – Smart travel and transport solutions enable better route and traffic optimization, improved vehicle and fleet management and can also support the shift to low emission alternatives like public transport.

Reducing the part that industry and society play in global warming is essential to support the UN's SDG 13. ICT is in a unique position to create efficiencies that help other industrial sectors to reduce their GHG emissions. The projected leverage of such solutions is high, with a marginal increase of global emissions from ICT solutions enabling a potential 15 percent decrease in emissions from all other sectors by 2030. A common denominator to these solutions is the maturity of mobile broadband and the emerging wide-ranging application of the Internet of Things (IoT).

⁴ Malmodin, J. and Bergmark, P. (2015), Exploring the effect of ICT solutions on GHG emissions in 2030, Proceedings for ICT for Sustainability Conference

⁵ In a high reduction scenario based on the broad application of ICT in other sectors to drive efficiency and transformation. The sum of the individual sectors is around 16 percent, whilst double counting effects have been removed for the aggregated total of around 15 percent

DECOUPLING ENERGY FROM TRAFFIC GROWTH

While traffic in mobile networks has grown tremendously over the last few years, networks have become increasingly energy efficient. A study estimating the energy consumed by mobile networks in Sweden shows that over the past 6 years, data traffic increased over 13 times while energy consumption grew by around 40 percent. Globally, mobile data traffic is projected to increase over 10 times by 2021, while the energy required to serve that traffic is projected to go up by only around 20 percent

Mobile traffic growth has little impact on networks' energy consumption

The growth in app and smart device usage over the past several years has driven a rapid increase in data traffic, and this trend is expected to continue. Mobile data traffic in 2015 will total around 50 ExaBytes (EB), and will reach 540 EB in 2021 – a more than ten-fold increase. Given the magnitude of traffic usage today and taking into account the sizeable growth expected in the coming years, the energy required to manage this usage has become an increasingly important consideration.

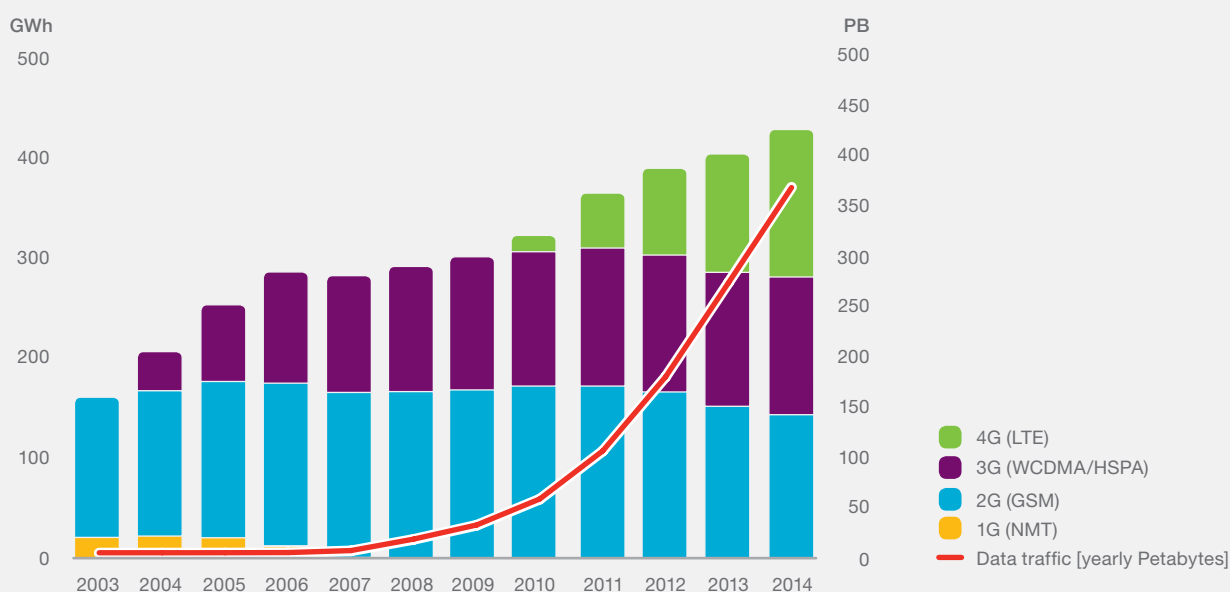
To illustrate the growing energy consumption in mobile networks, electricity usage in live networks in Sweden has been measured over the past decade to estimate

energy consumption by radio technology deployment. The energy consumption in gigawatt hours (GWh) was then plotted against data traffic in Petabytes.

Analysis of energy consumption by radio technology deployment shows that the energy consumed by 2G (GSM) was relatively constant, as GSM coverage was, to a large extent, already built out at the start of the period. The slight increase can be attributed to capacity additions.

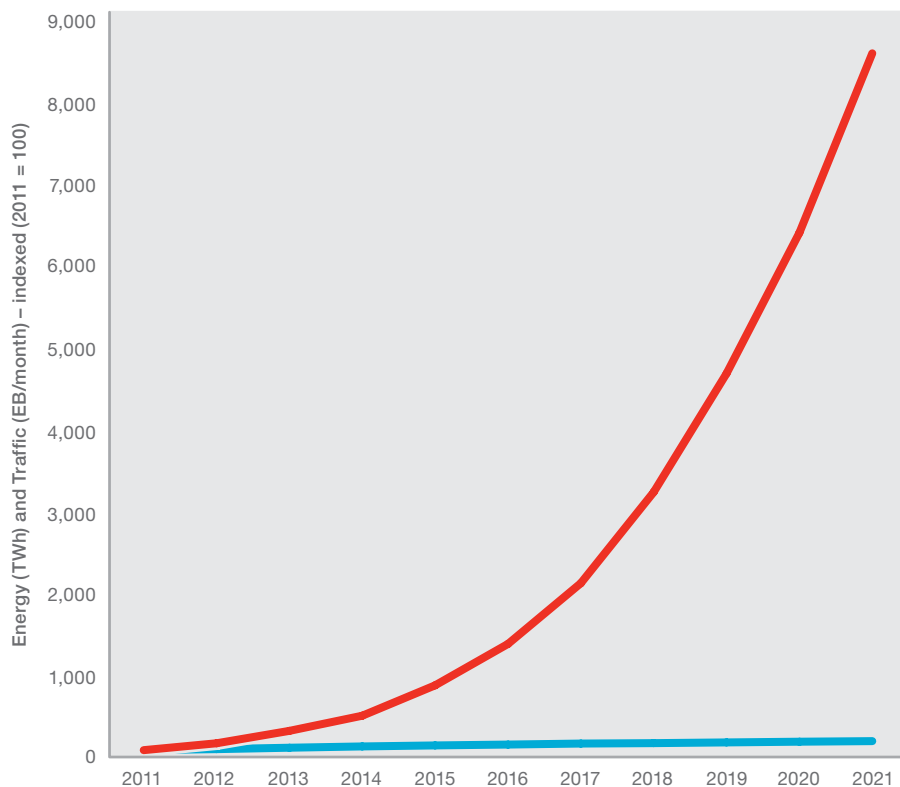
From 2004 to 2006, a rapid growth in energy consumption coincided with the deployment of 3G (WCDMA). From 2007, energy consumption flattened out as 3G deployment matured and coverage build-out slowed – even as data traffic began to grow rapidly.

Energy consumption and data traffic in mobile networks in Sweden,¹ 2003–2014



¹ Total energy consumption of all mobile networks in Sweden between 2003 and 2014, including radio access, core and transport. The data traffic plotted is measured in PetaBytes per year

Global energy consumption and data traffic growth in mobile networks, 2011–2021



Mobile networks' energy performance will improve from 2 kWh per gigabyte transferred data traffic in 2015 to 0.25 kWh in 2021

— Mobile data traffic (EB/month)
— Energy Consumption (TWh)

In 2010, the deployment of 4G (LTE) began. At the same time, 2G and 3G energy consumption, on the site level, started to decline as a result of network modernization of existing radio sites. From 2012, these reductions made an impact on the network level.

The increase in mobile networks' energy consumption is shown to be closely correlated with building out geographical coverage for new radio technologies. Despite rapid traffic growth, energy consumption is relatively stable after infrastructure build-out as long as subsequent increased capacity demands can mainly be met with software improvements. These efficiency gains drive a clear decoupling between data traffic growth and energy consumption.

An eight-fold increase in energy performance of mobile networks

Based on observations over the past decade, global energy consumption in mobile networks is expected to increase by around 20 percent from around 108 TWh in 2015 to 132 TWh in 2021.² With traffic calculated to grow 10 times over the same period, the energy performance of mobile networks is set to improve significantly, from a global average of 2 kWh per gigabyte transferred data traffic in 2015 to a projected 0.25 kWh in 2021 – an eight-fold improvement. The projected gains in the mobile network are rooted in improvements to both radio site hardware and network application software.

Optimizing mobile networks to reduce energy consumption

As apps and devices continuously evolve new features and functions, so do the networks in which they operate. Continual network software improvements will account for a majority of the expected energy performance gains. These will include adapting network functionality to evolving traffic behavior, as well as anticipated improvements in spectral efficiency, e.g. enabling the transmission of more bits per hertz of radio spectrum due to advances in modulation and antenna diversity schemes.

Historically, while building out radio access networks, the main focus was to improve network capacity in high traffic load situations. But in a typical radio network, 50 percent of the radio sites serve only 15 percent of the traffic, while 5 percent of the sites serve 20 percent of the traffic. Network measurements reveal that the low-load sites are often over-dimensioned, i.e. operating at sub-optimal capacity utilization levels. This leads to higher energy consumption per transferred byte. Precise dimensioning with the right radio site hardware for each traffic segment can reduce energy consumption by up to 40 percent while maintaining network performance.

High network energy performance is an important factor for network operators to reduce TCO. It also enables operators to provide wireless access in a sustainable and more resource-efficient way. One example of this is the potential for off-grid network deployments, enabling wireless connectivity in the most remote geographical areas.

² Based on current practice of building mobile networks and pace of modernization. Alternative dimensioning of the radio access hardware, different modernization speed etc. might affect future projected figures

IMPROVING PUBLIC TRANSPORT WITH 5G

Ericsson has built a prototype testbed for applying 5G networking functions and data analytics to public transport. One use case under study is to optimize the operations of a public bus service to save resources and reduce its environmental impact.¹ Using simulated traffic and passenger data, results indicate changing to dynamic bus scheduling is possible while maintaining service levels and reducing the number of buses on a route by an average of 15 percent. Additional gains are expected as the research progresses stepwise to include dynamic bus stops, flexible routing and vehicle platooning

In the future, where mobile broadband will co-exist with critical network services such as those used to optimize public transport, a service isolation approach will be essential to guarantee QoS. Depending on their criticality, services may have different network requirements. For example, emergency response or traffic flow services require priority over infotainment. The primary aim of the research is to test the viability of 5G network functionality to enable the automation of service creation, allowing the economic deployment of thousands of mobile services with diverse Quality of Service (QoS) attributes. The ability to secure prioritized network resources even in high network traffic scenarios allows the 5G system to be used as a foundation on which to build urban transport optimization solutions.

5G beyond mobile broadband services

5G mobile networks will offer significantly higher throughput, lower latency, and more data capacity compared to previous generations of mobile networks. Beyond improvements in mobile broadband services, 5G is about catering for a rapidly widening range of use cases related to the Internet of Things (IoT). 5G is envisioned to deal with complexity in the network as services beyond voice and mobile broadband are integrated. Operators will be able to provide virtual network slices, each with their own set of performance characteristics to offer optimal support for different types of services for different types of customer segments.

Growing urban traffic challenges

The urbanization of the world's population is forecast to continue during the next few decades. There will be many challenges for cities in the future, including dealing with increased traffic congestion, and decreased quality of life due to longer commute times. Dense urban mobile coverage can provide ubiquitous connectivity, opening up opportunities to improve public transportation, resulting in reduced congestion and increased availability. Vehicles that interact with each other and with roadside infrastructure may improve traffic flow and increase safety for both vehicle occupants and pedestrians.

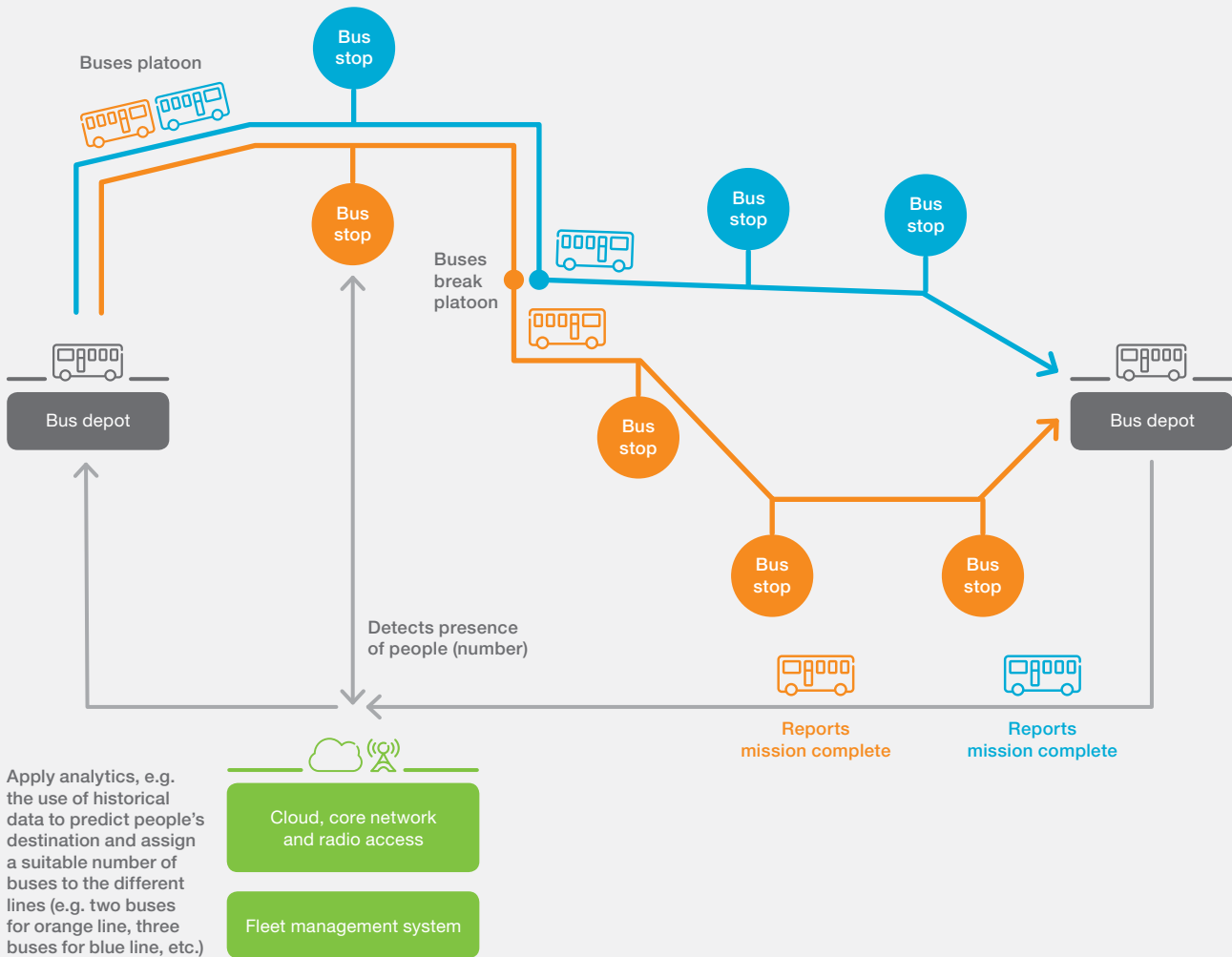
The optimization of urban traffic flows will be enabled by reliable connectivity combined with data analytics. Vast amounts of data and information from a large number of heterogeneous devices will need to be exchanged, analyzed, combined and actioned upon in a secure way, creating a complexity that goes far beyond the capabilities of human management.

As mobile technology evolves toward 5G, network services with mission-critical data traffic, such as instructions sent from a cloud service to a driver or to an automated vehicle, will coexist with other types of network services (e.g. web browsing and media streaming). The 5G network enabling the connectivity will guarantee QoS for the critical data traffic by prioritizing it over non-critical data traffic.

Ericsson has joined forces with Scania, one of the world's leading manufacturers of trucks and buses for heavy transport applications, and Sweden's Royal Institute of Technology in their Integrated Transport Research Lab (ITRL) to explore future transport solutions

¹ "5G for Improving Urban Transport", Leonid Mokrushin, Rafia Inam, Elena Fersman, Hongxin Liang, Keven Wang, Athanasios Karapantelakis, www.ericsson.com/research-blog/5g/5g-for-improving-urban-transport

Automated vehicle fleet management



Smarter public transport is possible through data analytics and connectivity

Public transport is efficient and sustainable, but also relatively inflexible today. Cities around the world are now exploring intelligent transport systems (ITS) to improve commuting by using demand prediction, dynamic trip planning and integrated payment solutions. ITS continually analyzes commuting patterns and takes into account upcoming sports events, concerts or road maintenance projects. Adaptive ITS provides real-time recommendations to drivers and passengers, thus offering a more compelling service at a lower operational cost and reduced environmental impact.

Traffic authorities can also benefit from using data provided by ITS (such as location, speed and intended route) to improve urban traffic flow by optimizing traffic signals. Various strategies such as traffic signal preemption can be applied to prioritize public transport and emergency vehicles.

Vehicle platooning optimized by 5G networks

Vehicle platooning creates a convoy in which vehicles travel in line very close to each other, coordinating braking and acceleration. This increases road capacity, and, in the case of urban transportation, can help address commuting demands at peak hours while reducing marginal cost. Dynamically adding driverless buses into a route to meet additional passenger demand is an attractive situation for fleet operators, as the cost of a driver is typically the largest operational cost.

5G mobile networks can enhance this by enabling platoons of multi-vendor vehicles, and connecting platoons to roadside infrastructure, such as traffic signals. Using a common interface for dynamic forming and decommissioning of a platoon, supported by a 5G network, vehicles could join and leave the platoon at any time. Platooning is an example of a service class that would benefit from automated service lifecycle management.



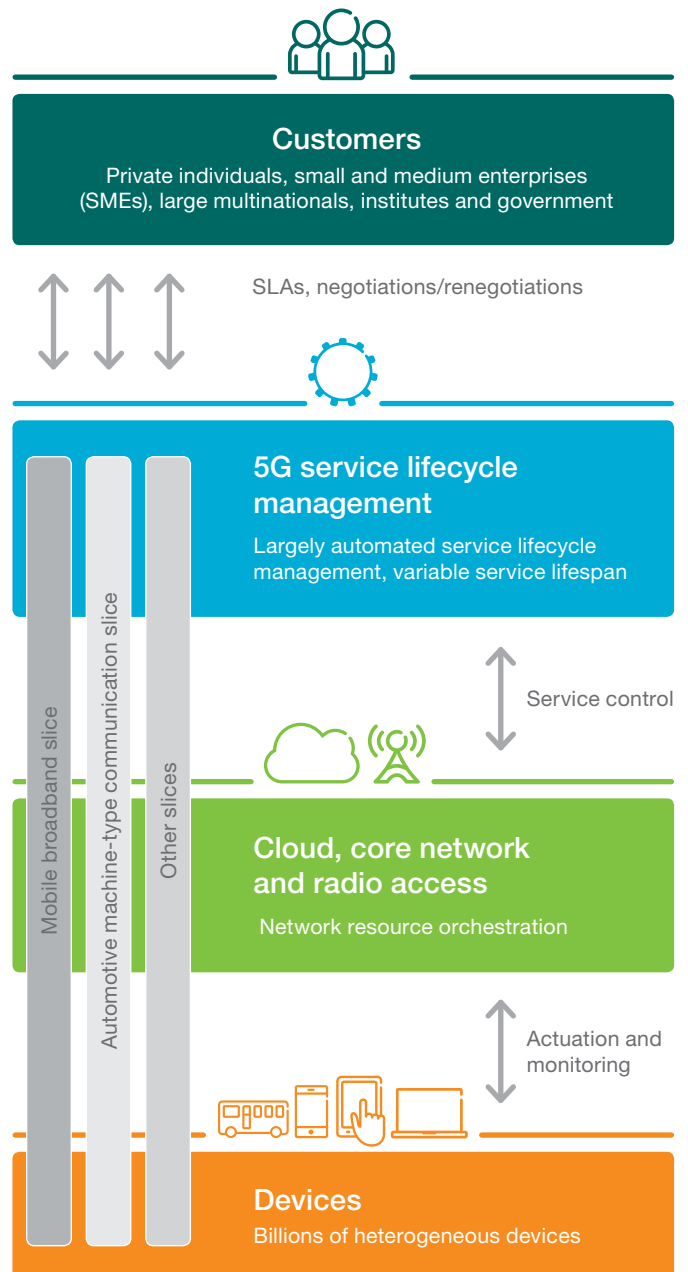
Automated service lifecycle management – a key 5G functionality

The current generation of mobile networks was designed to support a limited set of long-duration telecom network services (e.g. voice, messaging and mobile broadband). As a result, service lifecycle management is often handled manually. In addition to well-defined, long-standing traditional telecom services, 5G opens up the possibility of having many services that vary in terms of duration and QoS requirements. The management of a large number of network services with different QoS requirements will increase complexity enormously. Therefore, 5G networks will have an automated service lifecycle management function. Automation of the network service lifecycle management function, from negotiation of a Service Level Agreement (SLA), to network service deployment and operation and eventually decommissioning, is a key requirement in the design of 5G systems.

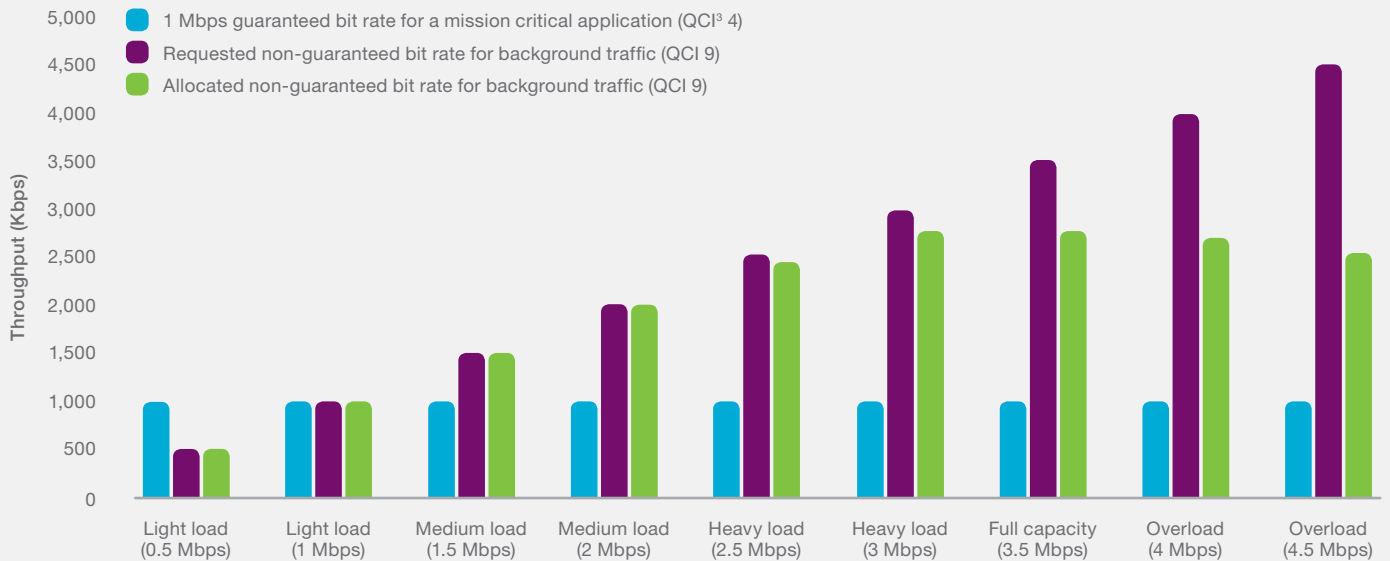
As services in the future will have different requirements on the QoS from the supporting network infrastructure, more focus will be placed on how these services are ordered from customers, i.e. the Service Level Agreement (SLA) negotiation process, as well as how the network resources are orchestrated per service. For example, a service may need a specified minimum bandwidth, along with a maximum latency to function properly. The SLA captures the QoS requirements, which are then monitored and controlled throughout the lifecycle of the service. In order to deal with the complexity and to achieve the economies of scale necessary to handle hundreds or even thousands of services, provisioning in 5G networks needs to be automated.

Resource prioritization is a technique to allocate the required network and cloud resources (e.g. radio, processing, memory, and storage) in order to provide the functionality and characteristics of a dedicated network, while actually utilizing only a portion of the available network resources. Services are isolated by allocating resources in such a way as to fulfill respective QoS requirements. This facilitates the addition, updating, or removal of services in real time, as well as the dynamic mapping of different network resources to services.

5G network slicing



Data traffic (uplink) throughput² under different network loads for different priority classes



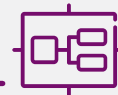
5G network test bed measurements

To explore the optimization of public transport systems, a prototype 5G system for automating network service lifecycle management has been developed. Network service deployments include both deployment of software in a private cloud as well as configuration on a core network to comply with the QoS requirements of the network service.

The system is able to deploy, monitor and decommission network services automatically on request. For measuring performance of the traffic prioritization function, a number of network load scenarios have been tested. Throughput as well as end-to-end network latency were measured under different background traffic conditions.

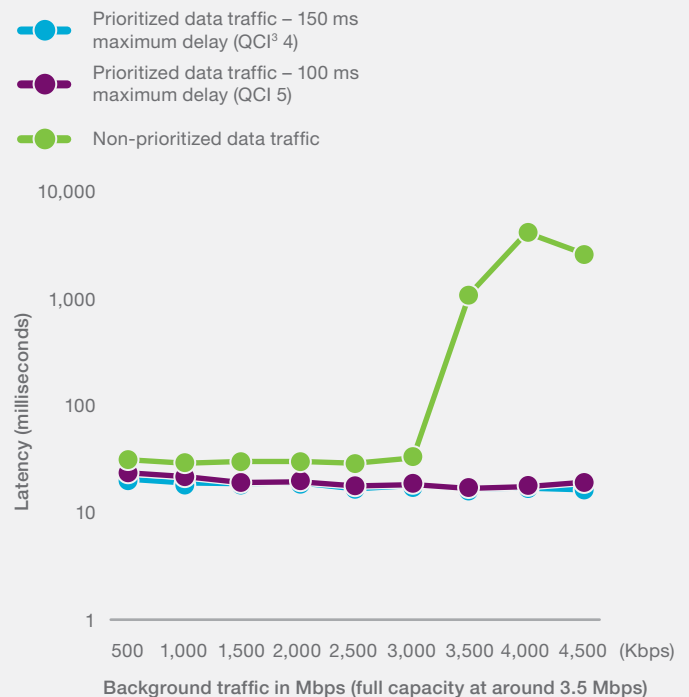
Resource prioritization test results

The first graph illustrates guaranteeing an uplink throughput of 1 Mbps to a prioritized radio bearer for a mission critical application. Background traffic is increased until the system is congested. The measurements show that even as the network becomes overloaded with traffic, the mission critical traffic is still served with no performance degradation. Furthermore, the second graph shows that when the network reaches congestion level, background traffic is delayed while latency of the mission critical traffic is still preserved.



Network resource prioritization can assure pre-defined QoS levels for mission-critical applications regardless of the level of background data traffic

Two-way latency (RTT) under different network loads for different priority classes



² Between user equipment and network test bed using different bearers

³ The QoS concept as used in LTE networks is class-based, where each bearer type is assigned one QoS Class Identifier (QCI) by the network. QCI in LTE networks enables the association of relative prioritization among interactive bearers

SMARTPHONE SWITCHING PATTERNS

Around 1.3 billion smartphones were sold during 2014, and smartphone subscriptions are expected to grow at an annual rate of 10 percent up to 2021. Around 80 percent of Android and iOS users are loyal to their operating system, choosing to stay with it when upgrading to a new model. In some mature markets, as many as 60 percent of iOS smartphone owners that switched to the newly launched model had devices that were only a year old

In mature markets, where smartphone penetration is already high, replacement purchases drive smartphone sales more than first time buyers do. Android and iOS currently dominate the smartphone market with worldwide market shares of around 80 percent and 15 percent respectively in 2015.¹

This analysis is about user switching trends from old to new devices, where users remain with the same operator. The study includes an analysis of users' mobile broadband traffic patterns before and after a switch from an older smartphone to a newly launched model.

The majority of smartphone users remain loyal their operating system

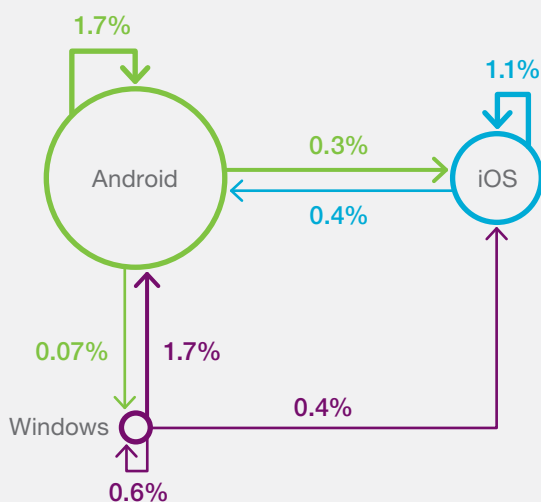
Measurements show that on average 1.7 percent of Android smartphone users upgraded to a new Android smartphone model each month, while another 0.3 percent changed to an iOS smartphone.

Similarly, 1.1 percent of iOS smartphone users switched to a new iOS smartphone model, while another 0.4 percent switched to an Android smartphone.

This indicates that the majority of Android and iOS smartphone users are loyal to their existing smartphone operating system. 82 percent of Android users and 73 percent of iOS users selected a smartphone with the same operating system when switching to a new device. This is not the case for Windows phone users – around 60 percent switched to Android smartphones and 15 percent to iOS smartphones, while only around 20 percent switched to a new Windows smartphone.

When looking into switching behaviors per device vendor and model series, loyalty varied significantly between low-end and high-end models (irrespective of operating system). Owners of high-end models were much more likely to select a new model in the same series from the same vendor than users of lower-end models.

Monthly switching rates for different smartphone operating systems **before** the launch of new iOS smartphone models



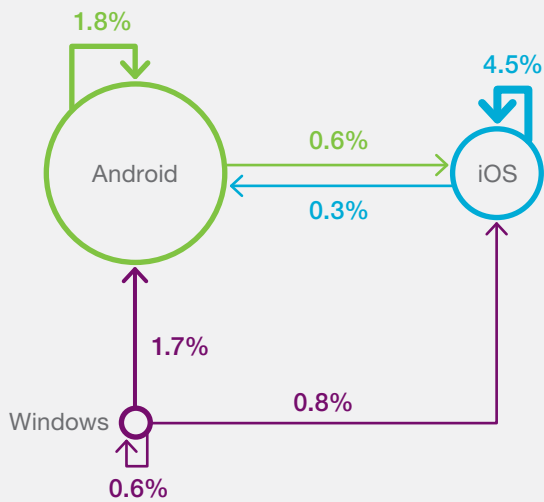
Around 80% of Android and iOS users are loyal to their operating system

Graph nodes denote existing user base (size is proportional to the number of users).
Arrows denote users switching to a new device (width is proportional to the percentage of switching users during a month).

Source: Ericsson measurements (Q3 2015)

¹ Rounded figures based on a range of external analysts' estimates

Monthly switching rates for different smartphone operating systems after the launch of new iOS smartphone models



Graph nodes denote existing user base (size is proportional to the number of users).

Arrows denote users switching to a new device (width is proportional to the percentage of switching users during a month).

Source: Ericsson measurements (October 2015)

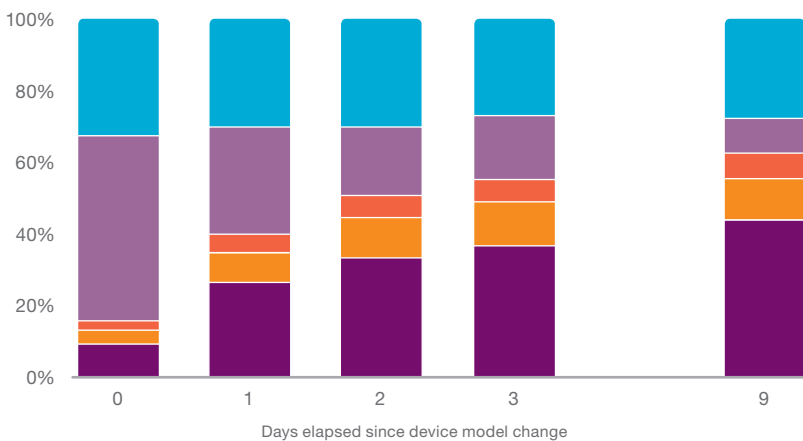
Switch patterns are significantly impacted by yearly iOS device release cycles

The regular launch of new iOS smartphones every September causes significant temporal fluctuations in device switching patterns. In the two weeks after the launch of new iOS smartphone models, switching rates of iOS users increased drastically. The iOS loyalty rate increased from 73 to 93 percent. In contrast, for the same period, Android loyalty numbers dropped from 82 to 76 percent. Twice as many Android users switched to new iOS models than before the launch of the new models.

Average data consumption increases between 20 percent and 45 percent per subscription after smartphone model upgrades

The growth in data consumption was higher in less advanced markets and in device categories with longer device lifecycles. It was lower in advanced markets with shorter device lifecycles.

Mobile data traffic consumption on days following a device model upgrade²



Analysis of mobile data traffic consumption on days following a device upgrade shows a significant surge in software download traffic share from app stores after a device switch. However, after just a few days the data consumption pattern displays the typical application mix with video-dominated traffic for average smartphone users.

This analysis is based on measurements before and after the launch of new iOS smartphone models in a selected number of mature mobile broadband networks in Europe, Asia and North America. The study encompassed iOS, Android and Windows devices. Other operating systems like Blackberry, Symbian and Firefox OS had very low penetration in all measured networks and therefore were not included.



Software download traffic share surges the first few days after a device switch. After a week, traffic consumption shows the normal average pattern with video-dominated traffic

- Other
- Software download
- Web browsing
- Social networking
- Video

² Wi-Fi traffic is not included. Traffic mix numbers can vary significantly per network depending on Wi-Fi penetration and mobile data plans

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. VoIP is included in data traffic.

Traffic measurements

New devices and applications affect mobile networks. Having a 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.

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

You may use charts generated from the Ericsson Traffic Exploration Tool in your own publication as long as Ericsson is stated as the source

There you will also be able to access regional appendices and a new Mobile Business Trends appendix



GLOSSARY



2G: 2nd generation mobile networks (GSM, CDMA 1x)
3G: 3rd generation mobile networks (WCDMA/HSPA, TD-SCDMA, CDMA EV-DO, Mobile WiMax)
4G: 4th generation mobile networks (LTE, LTE-A)
5G: 5th generation mobile networks (not yet standardized)
ARPU: Average Revenue Per User, a measure of the revenue generated per user or unit
Basic phone: Non-smartphone
CAGR: Compound Annual Growth Rate
CDMA: Code Division Multiple Access
CO₂e: Carbon dioxide equivalents
DL: Downlink
EB: ExaByte, 10¹⁸ bytes
EDGE: Enhanced Data Rates for Global Evolution
GB: GigaByte, 10⁹ bytes
GERAN: GSM EDGE Radio Access Network
GHG: Greenhouse gas
GSA: Global Supplier Association
GSM: Global System for Mobile Communications
GWh: Gigawatt hour
HSPA: High Speed Packet Access
ICT: Information and Communications Technology
IoT: Internet of Things
kWh: Kilowatt hour
LTE: Long-Term Evolution

M2M: Machine-to-Machine
MB: MegaByte, 10⁶ bytes
MBB: Mobile Broadband (defined as CDMA2000 EV-DO, HSPA, LTE, Mobile WiMax and TD-SCDMA)
Mbps: Megabits per second
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)
MTC: Machine-Type Communication
OS: Operating System
PetaByte: 10¹⁵ bytes
RTT: Round Trip Time
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
TB: TeraByte, 10¹² bytes
TWh: Terrawatt hour
VLR: Visitor Location Register
VoIP: Voice over IP (Internet Protocol)
UL: Uplink
WCDMA: Wideband Code Division Multiple Access

Ericsson is the driving force behind the Networked Society – a world leader in communications technology and services. Our long-term relationships with every major telecom operator in the world allow people, business and society to fulfill their potential and create a more sustainable future.

Our services, software and infrastructure – especially in mobility, broadband and the cloud – are enabling the telecom industry and other sectors to do better business, increase efficiency, improve the user experience and capture new opportunities.

With approximately 115,000 professionals and customers in 180 countries, we combine global scale with technology and services leadership. We support networks that connect more than 2.5 billion subscribers. Forty percent of the world's mobile traffic is carried over Ericsson networks. And our investments in research and development ensure that our solutions – and our customers – stay in front.