



**The Mobile
Economy**

Russia & CIS 2018



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LTE Union

Союз операторов
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LTE Union is a nonprofit organization, with the mission to foster mobile network deployment within the Russian Federation by promoting of advanced technologies, enabling legislation and access to new spectrum bands for mobile networks.

Currently, the LTE Union includes VimpelCom PJSC, MegaFon PJSC, MTS PJSC and T2 Mobile LLC.

Executive Director of the LTE Union is Gulnara Khasyanova.

Read more at <http://lteunion.ru/>

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Executive Summary



A highly penetrated region, but limited growth ahead

The Commonwealth of Independent States (CIS) region is one of the most highly penetrated in the world, with 80% of the population subscribing to mobile services. This positions it just behind other developed market regions such as Europe (85%) and Northern America (84%) but well ahead of both Latin America and Asia Pacific (both 67%) and the global average of 66%. However, the region is diverse, with the headline numbers masking markets at different stages of development. Subscriber penetration rates range from 60% in Turkmenistan and Uzbekistan to 89% in Russia.

At the end of 2017, the region was home to 232 million unique mobile subscribers. The three largest markets – Russia, the Ukraine and Uzbekistan – together account for 80% of the region's total subscriber base. Given the relatively high level of penetration, growth over the next few years will be limited. The region will see only a 2 percentage-point increase in penetration by 2025. Only Northern America will see a smaller increase in penetration over this time. Almost half the additional subscribers will come from Uzbekistan, a country that is the third most populous but one of the least penetrated in the region. By 2025, there will be 242 million unique subscribers in the region, accounting for 82% of the population.

Note: we use the term CIS in this report to refer to the Commonwealth of Independent States, including Russia. See page 14 for a full list of countries.



4G growing rapidly; 5G launches on the horizon

Led by the move to 4G, the CIS region is continuing to see a rapid shift to mobile broadband. 4G as a proportion of the connections base tripled over a two-year period to reach 16% at the end of 2017, largely driven by Russia, which was one of the first countries in the region to launch 4G in 2012. 4G will overtake 2G as a proportion of connections in early 2020, will become the leading mobile technology in 2021, and will account for over half and then two-thirds of total connections by 2022 and 2025 respectively.

The region will be a fast follower in terms of 5G, with network launches expected in Russia from around the end of 2020. Rollout will be relatively rapid, covering more than 80% of the Russian population by 2025; by then, there will be 48 million 5G connections across the country (accounting for 19% of total connections). The initial focus in Russia is likely to be on enhanced mobile broadband (eMBB) to add capacity and higher speeds for mobile internet access. Other countries in the region expected to launch 5G services by 2025 include Azerbaijan, Belarus, Georgia and Uzbekistan.



Opportunities sought to boost muted mobile revenue outlook

Despite ongoing competitive pressures, relatively low smartphone adoption and relatively low pricing, service revenue trends have been improving in recent quarters, with revenues growing in the low single digits (largely below the level of inflation). Beyond 2019, growth in real terms is forecast to remain subdued at a rate of less than 1%. Rapid growth in smartphone adoption over the coming years (reaching around 80% of connections by 2025, up from less than 60% now) will fuel an explosion in data traffic. Any upside to existing revenue forecasts will therefore depend on mobile operators more effectively monetising this data growth and developing new revenue streams.

The Internet of Things (IoT) is an area where mobile operators can grow their business beyond traditional communications. The

number of IoT connections in the CIS region will triple over the next few years, reaching 660 million by 2025. While consumer IoT accounts for the majority of IoT connections (68% in 2017), the biggest increase is expected in industrial IoT; it will reach 48% of total IoT connections by 2025. This will be driven by increased interest in smart cities and smart utilities. IoT revenue meanwhile will reach almost \$26 billion by 2025 (up from \$5 billion in 2017), driven by applications, platforms and services – the largest source of revenue – growing from 53% of total IoT revenue in 2017 to 62% in 2025.

Other areas of opportunity for mobile operators in the CIS region include e-commerce, blockchain and investments in the startup ecosystem.



Policy: fostering development of the digital economy

The implementation of 5G networks should be considered by regulators as not just a new technical advancement for the telecoms industry, but as a condition for delivering the digital economy and to drive the transformation of industries. With such a mindset, the regulation of the mobile industry should shift from controlling and supervising the industry to fostering its development.

In the CIS region, there are four key areas where policy and regulation could be used to spur 5G rollout: the timely availability of harmonised spectrum at a suitable price; new approaches to supervise network development; updates to network architecture regulation; and the introduction of legislation covering network neutrality and data collection.



Mobile Economy Russia & CIS

Unique mobile subscribers

2017

232m

80%

PENETRATION RATE
(% of population)

82%

CAGR 2017-25

0.5%

242m

2025



SIM connections

Excluding licensed cellular IoT

422m

2017

437m

2025

146%

PENETRATION RATE
(% of population)

149%

0.4%

CAGR
2017-25



Excludes licensed cellular IoT



Smartphone connections
will increase from 57% of
total connections in 2017 to

81%

by 2025

4G

4G connections
accounted for

16%

of total connections
in 2017

5G

5G connections will
account for

12%

of total connections
by 2025

660 million IoT connections by 2025

Operator total revenues

\$16.1bn

2017

→ 2025

\$17.6bn

Operator capex of **\$15.3 billion** for the period 2018-2020



01

Industry overview

1.1

CIS: a highly penetrated region

At the end of 2017, there were 232 million unique mobile subscribers¹ in the Commonwealth of Independent States (CIS), equating to a penetration rate of 80% of the population.

The CIS region is one of the most highly penetrated regions in the world, trailing slightly behind other developed regions such as Europe and Northern

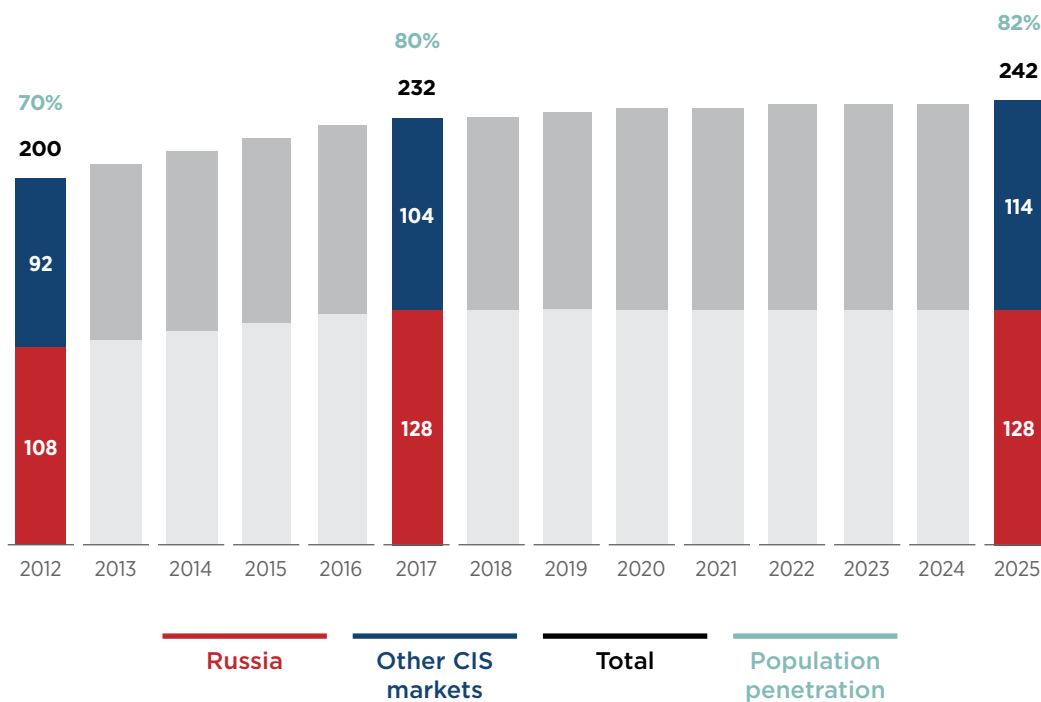
America but significantly ahead of both Latin America and Asia Pacific. The gap will close between CIS and the latter though, as the region will see only a 2 percentage-point increase in penetration by 2025. Only Northern America will see a smaller increase in penetration over this time.

Figure 1

Source: GSMA Intelligence

Unique subscribers in CIS

Millions



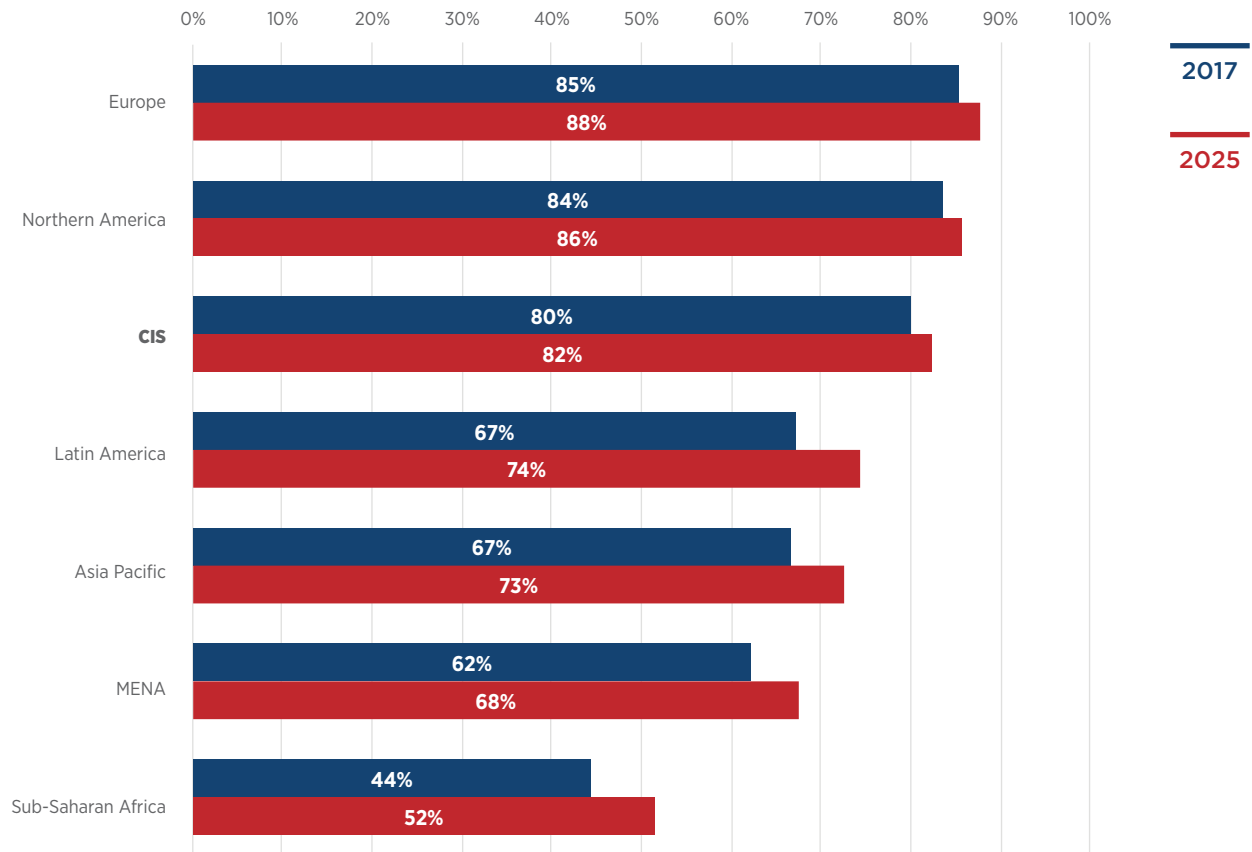
1. A unique mobile subscriber is defined as an individual person that can account for multiple mobile connections (SIM cards)

Figure 2

Source: GSMA Intelligence

CIS is one of the most penetrated regions

Subscriber penetration (of population)



The CIS region is relatively diverse, with the headline numbers masking markets at different stages of development. Russia dominates the region; not only is it the largest country but it is also the one with the most developed mobile market. The three largest markets, Russia, the Ukraine and Uzbekistan, together account for 80% of the region's total

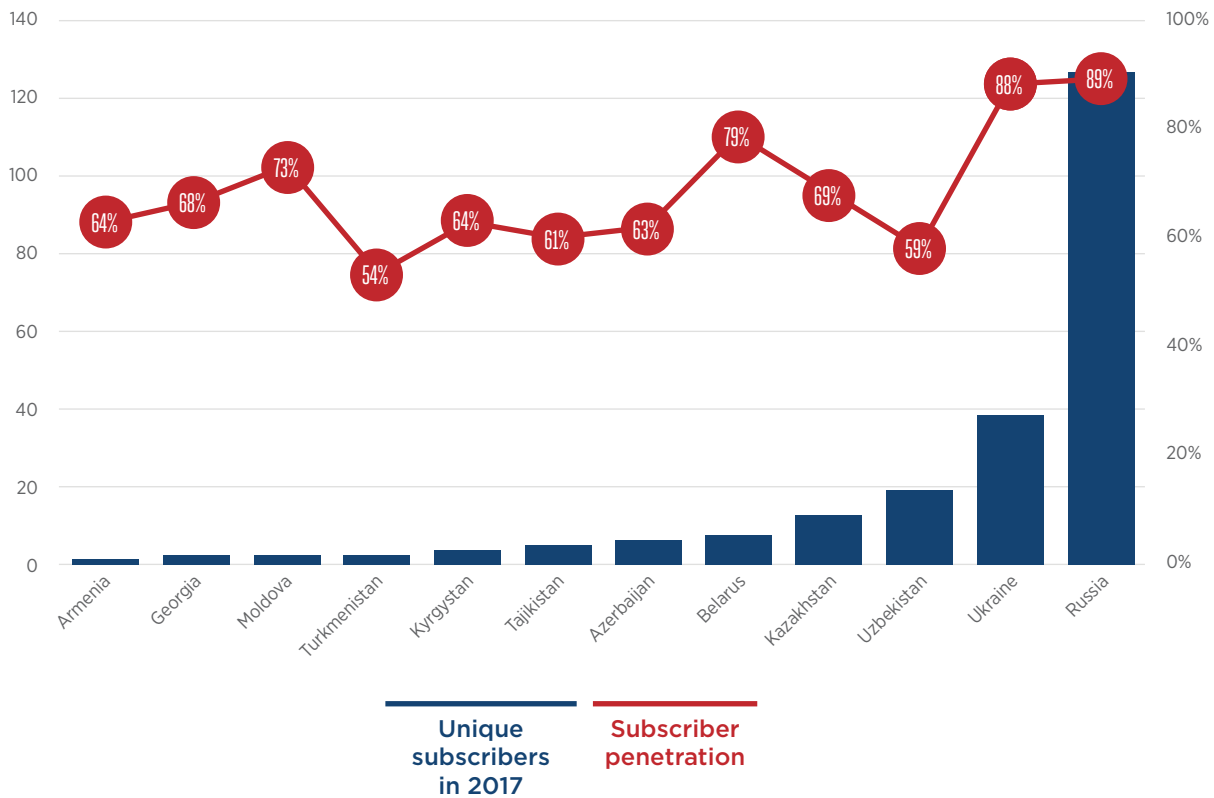
subscriber base. Subscriber penetration rates range from 60% in Turkmenistan and Uzbekistan to 89% in Russia. Of the limited subscriber growth to 2025, almost half will come from Uzbekistan, a country that is the third most populous but one of the least penetrated in the region.

Figure 3

Source: GSMA Intelligence

Russia dominates the region

Million, % population



There were around 422 million SIM connections in the region at the end of 2017 (excluding cellular M2M, which represented a further 21 million connections). This figure will grow modestly to just under 437 million by 2025, boosting connections penetration in the region from 146% in 2017 to 149% by 2025. Levels of multi-SIM ownership are high in the region, well above the global average of just over 100% penetration. This reflects high levels of competition in a largely prepaid market, where handsets are primarily sourced from independent outlets, with dual SIM phones a particular feature of the Russian market.

The unique subscriber and mobile connection figures detailed in this report are based on the results of a large-scale consumer survey conducted by GSMA Intelligence across 50 countries (which represent 79% of the global population) in developed and developing markets between June and August 2017, and incorporate the results of our previous surveys during 2012–2016.

1.2 4G adoption surging across the region

Operators across the region have been investing heavily in 4G networks and coverage over recent years, which has seen population coverage increase from 30% at the end of 2013 to around two thirds of the population by the end of 2017. The region is now seeing a rapid shift to mobile broadband (3G and

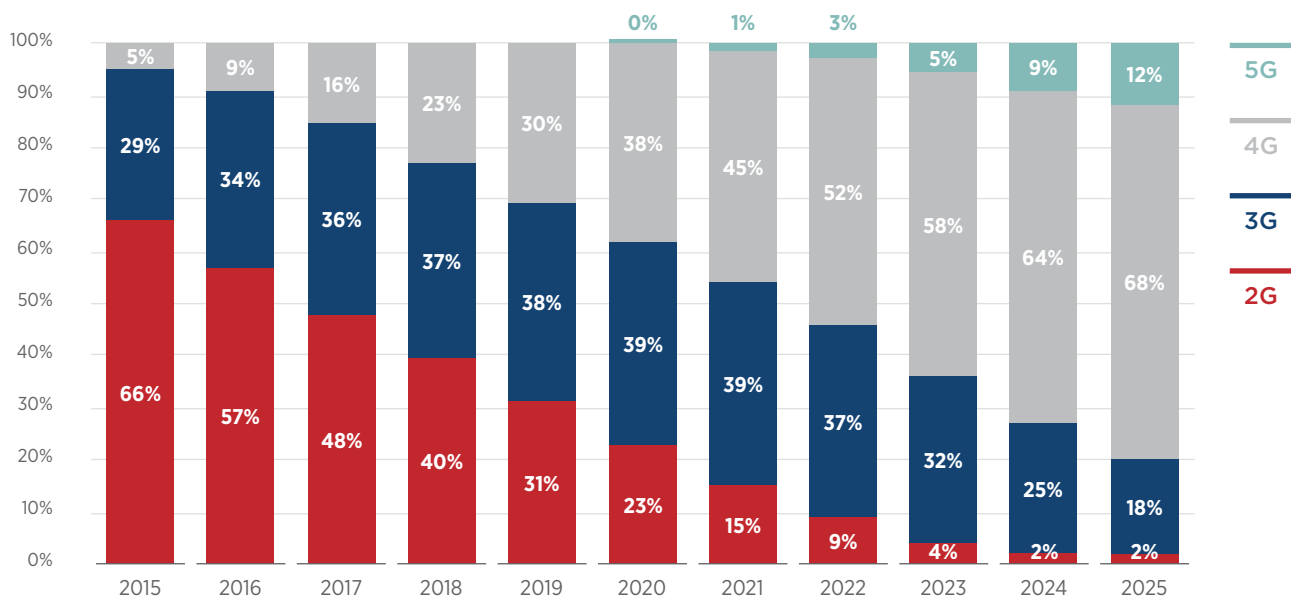
4G devices), increasingly led by the move to 4G. 4G as a proportion of the connections base tripled over a two-year period to reach 16% at the end of 2017, a figure that will grow to more than two-thirds of the connections base by 2025.

Figure 4

Source: GSMA Intelligence

Rapid shift to mobile broadband

Percentage of connections



Russia has been the key driver of the shift to 4G; the country saw some of the region's first 4G network launches in 2012. In 2015, Beeline announced that it was stopping all new 3G investment in favour of further 4G expansion. 4G coverage and network quality remain key competitive factors in the

Russian market, with all four of the main operators launching LTE-Advanced networks in recent years. 4G networks will account for just over a fifth of connections at the end of 2018, a figure that will surpass half by early 2022.



1.3 5G launches in sight

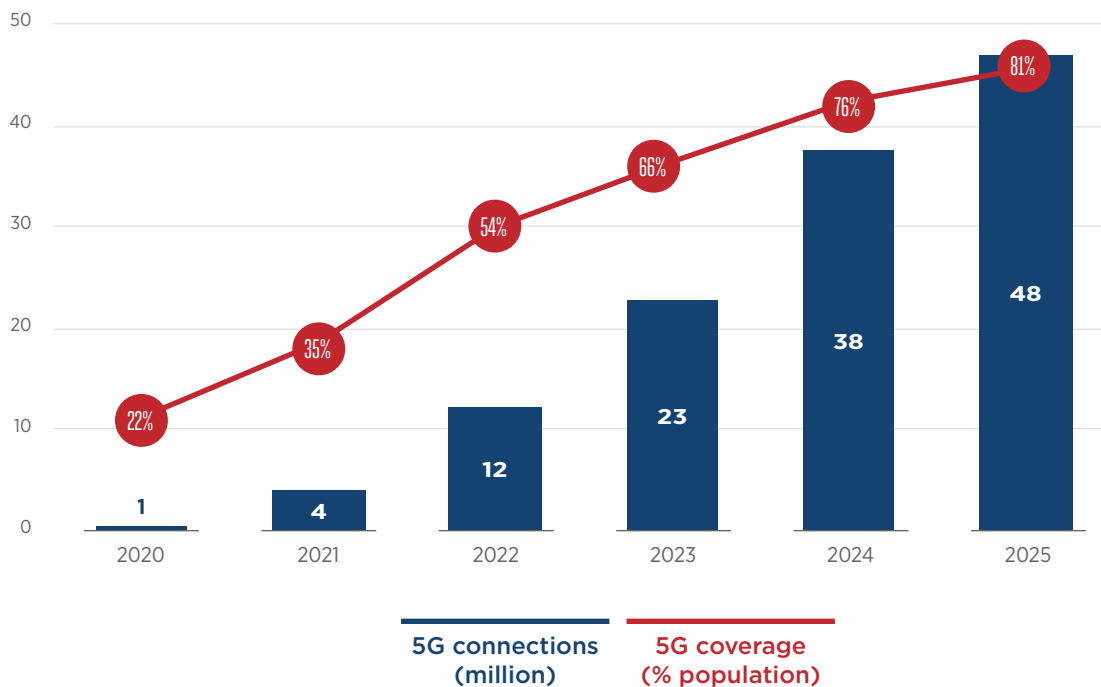
While a number of countries are vying for 5G leadership, including the likes of China, the US and South Korea, Russia is likely to be a fast follower: 5G network launches are expected in Russia from around the end of 2020, with the total number

of 5G connections set to reach 48 million by 2025 (equivalent to 19% of the connection base). Other countries in the region expected to launch 5G services by 2025 include Azerbaijan, Belarus, Georgia and Uzbekistan.

Figure 5

Source: GSMA Intelligence

Russia will lead in 5G, but critical mass some way off



The three broad use cases for 5G revolve around enhanced mobile broadband (eMBB) to add capacity and higher speeds for mobile internet access; fixed wireless access (FWA); and massive IoT deployments and emerging enterprise use cases. The initial focus in Russia is likely to be on eMBB, with fixed broadband access already a fairly

mature and competitive market in Russia, while IoT and enterprise solutions will take time to develop. In practice this means that initial 5G deployments from 2020 onwards will focus on urban areas and existing hotspots, with 5G primarily an offload solution to ease network congestion and offer higher network speeds.

5G trials and spectrum constraints

To date, only MegaFon and Rostelecom have been awarded spectrum for 5G trials by the State Commission for Radio Frequencies, specifically for sharing and compatibility tests with other services. Both MTS and Beeline had requests denied due to time constraints to perform all the required sharing and compatibility tests.

However, this has not stopped the operators conducting 5G trials, including during the recent FIFA World Cup. MTS created 5G demo zones at various sites during the event, demonstrating a series of 5G scenarios including HD video calls, ultra-low latency video games and high-definition video streaming. MegaFon also undertook trials during the tournament. This included a test of an autonomous bus that carried supporters from the fan zone to the Kazan Arena.

Rostelecom has been undertaking trials with Ericsson in St. Petersburg, while the company has also set up a 5G pilot zone in Skolkovo working with Nokia. Separately, MegaFon and Rostelcom signed an agreement in 2017 to jointly co-operate on 5G. Under the agreement, the companies will evaluate the possibility to create a joint venture to construct the 5G network. MegaFon and Rostelecom also plan to set up a working group that will propose options for rolling out 5G networks in the 3.4-3.8 GHz and 26 GHz frequency bands.

Most recently, Beeline and Huawei held a demonstration in The Museum of Moscow in October 2018 during which dialogue between speakers was conducted using a hologram and viewed through mixed reality (MR) glasses, showcasing the high bandwidth and low latency capabilities of 5G technology.

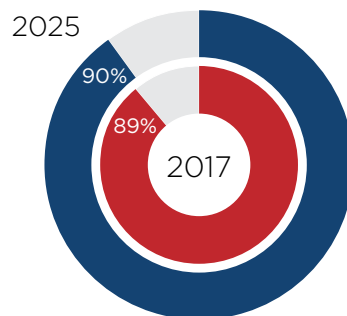


CIS region: subscriber and technology trends for key markets

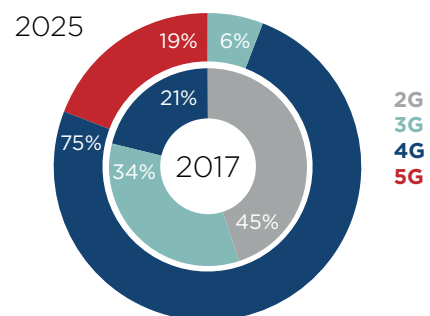


Russia

SUBSCRIBER PENETRATION



TECHNOLOGY MIX



SMARTPHONE ADOPTION

2017

62%

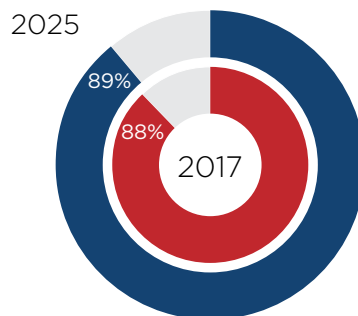
2025

85%

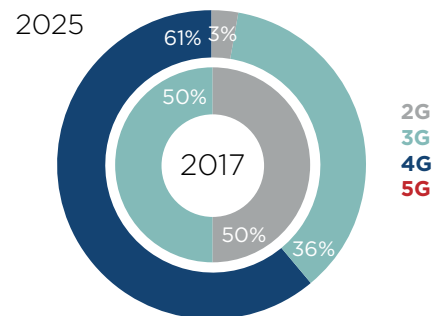
Ukraine



SUBSCRIBER PENETRATION



TECHNOLOGY MIX



SMARTPHONE ADOPTION

2017

50%

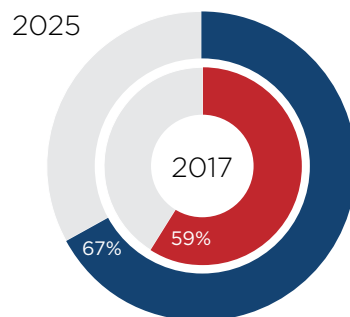
2025

76%

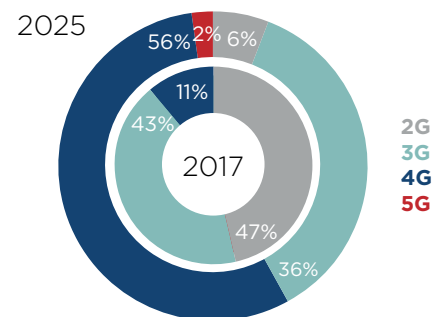
Uzbekistan



SUBSCRIBER PENETRATION



TECHNOLOGY MIX



SMARTPHONE ADOPTION

2017

51%

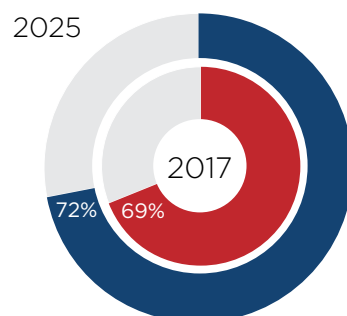
2025

84%

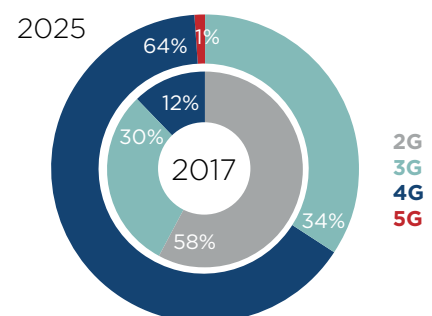
Kazakhstan



SUBSCRIBER PENETRATION



TECHNOLOGY MIX



SMARTPHONE ADOPTION

2017

53%

2025

72%

1.4

Smartphones driving data traffic growth

Despite strong growth in mobile broadband connections (3G and 4G capable) in the CIS region, smartphone adoption continues to trail the levels seen in other developed regions. At the end of 2017, smartphones accounted for 57% of connections, compared to 72% in Europe and 82% in Northern America. This largely reflects issues around affordability (exacerbated by currency weakness in recent years) but also the fact that Russia (and other major markets in the region) is largely a prepaid market with few handset subsidies and in some cases limited handset financing offers. Compared to more developed regions, the Russian market has seen the adoption of more low-end Android devices, with lower adoption of more expensive iOS handsets.

However, smartphone adoption will grow strongly over the coming years, reaching almost 82% of connections by 2025, equivalent to 342 million smartphone devices. There are already signs that consumer demand for smartphones is increasing despite a subdued outlook for consumer spending, helped by a growing share of more affordable devices from manufacturers such as Xiaomi and Huawei.

Strong growth in smartphones is fuelling an explosion in data traffic growth in the region and especially Russia, particularly in terms of video and other digital media. Forecasts from Ericsson suggest that for the broader Central and Eastern Europe region (which includes Russia and the Ukraine), mobile data traffic will grow at a CAGR of 40% for the period 2017–2023. Total mobile data traffic will grow from 1.1 Exabytes per month in 2017 to 8.4 Exabytes by 2023, an almost eight-fold increase over the period.²

The region's leading operators have been investing heavily in digital platforms to help drive both data traffic growth and new revenue streams. Video is the largest single driver of traffic growth in the region, in line with global trends. However, while many other regions see video and social media app usage dominated by familiar names such as YouTube and Facebook, in Russia VK is the most popular social media platform. VK is a Russian-based online social media and social networking site that is also popular for sharing video content.

Operators have largely moved away from unlimited data plans in recent years, and are now promoting bundled data tariffs,³ which is helping drive strong data volumes and some uplift to revenues. Operators continue to report strong data revenue growth in the first quarter of 2018, including 11% year-on-year at MegaFon and 8.9% at Beeline. However, in a highly competitive market, data pricing in Russia is extremely low compared to many other major markets around the world.

2. Ericsson Mobility Report June 2018

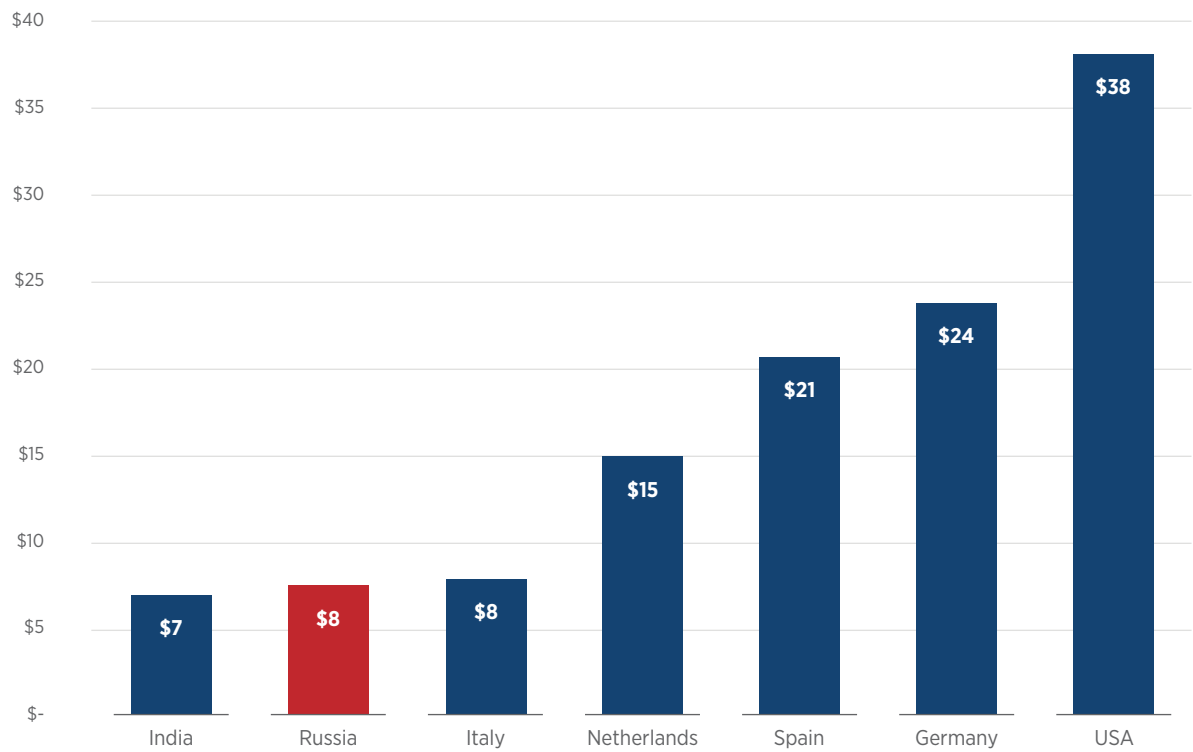
3. Beeline and MTS have relaunched unlimited tariffs in the last few months, albeit with certain limitations (such as extra costs to use a phone as a mobile hotspot, or speed restrictions when watching online videos)

Figure 6

Source: Tarifica, GSMA Intelligence

Russia data prices low by global standards

Cost of 5GB high end basket (\$ per month)



1.5

Financials: revenue outlook stabilising

Here we focus on the financial outlook for mobile operations in Russia, given its status as the largest market in the region and one that accounts for around 70% of the region's mobile revenues.

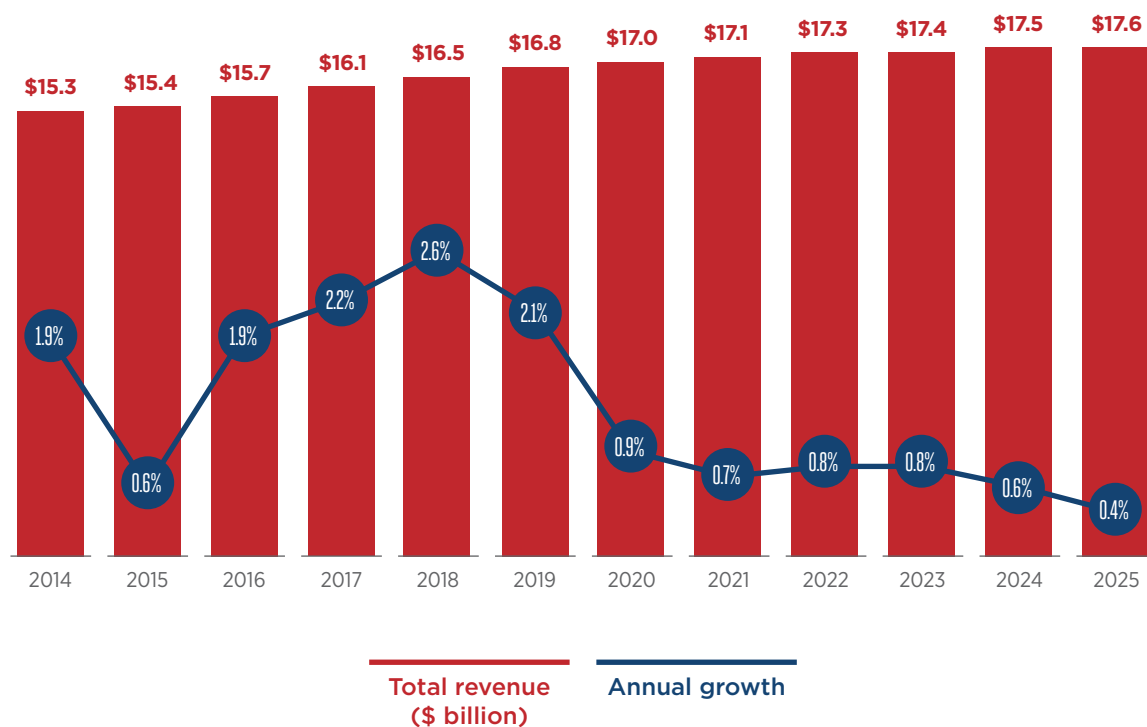
Despite ongoing competitive pressures and relatively low pricing, service revenue trends have been improving in recent quarters, with revenues

growing in the low single digits. However, with inflation rates in Russia in the range of 2–4% (well below the mid-teens level recorded in 2016), this still implies that revenues are broadly flat in real terms. Beyond 2019, growth in real terms is forecast to remain subdued at a rate of less than 1%. This growth outlook is reflected across a number of developed markets across the world.

Figure 7

Source: GSMA Intelligence

Russia mobile revenue outlook



Upside to current forecasts will depend on operators succeeding in more effectively monetising the ongoing strong growth in data traffic and developing new revenue streams. All the main operators have been active in building new digital platforms and developing a range of new services. However, to date these have had less impact on top line trends than has been the case in markets such as Turkey that have seen similar developments.

There has also been a significant shift in the mobile distribution market in Russia: MegaFon and Beeline agreed to end their Euroset retail outlet joint venture, with MegaFon becoming the sole owner of the chain. Euroset operated a large number of multi-brand outlets, which are now due to be merged with another multi-brand handset chain, Svyaznoy. The management of Svyaznoy have announced plans to move the enlarged chain away from SIM and handset sales towards more premium electronics. Vimpelcom is retaining around 1,800 stores from the Euroset JV, which it will integrate into its existing network of 4,000 Beeline branded stores. This will see the closure of overlapping stores as well as some repositioning to broaden the range of goods sold.

The net result of these changes should be a shift towards more directly operator controlled distribution channels in Russia, as well as a significant reduction in the total number of mobile distribution outlets. These changes should herald a shift to a more pragmatic and rational retail market, with the major operators increasingly focused on churn reduction and ARPU maximisation rather than headline connections growth. Churn rates have been historically extremely high in Russia compared to other markets, running at close to 50% in recent years.

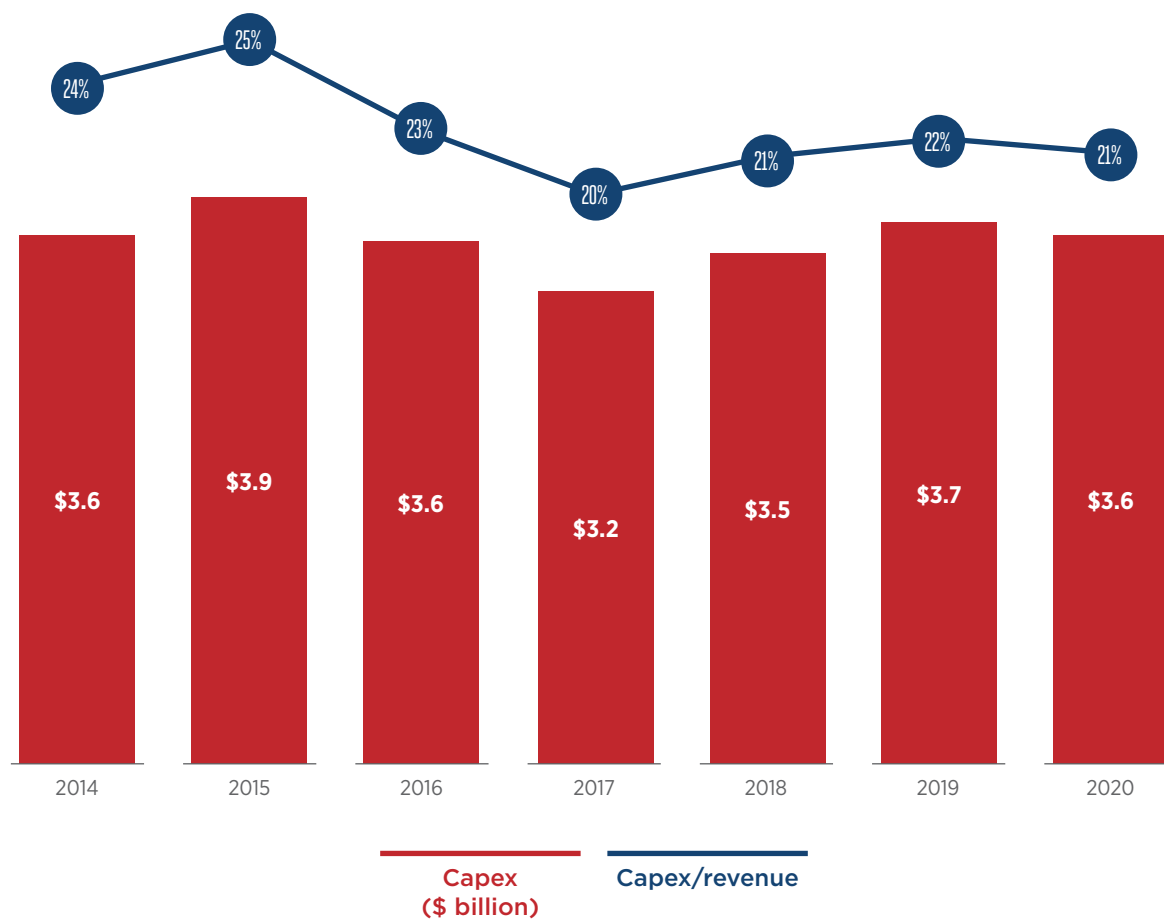
A more rational retail market with fewer competitive pressures and lower churn should in turn feed through to an improving margin outlook for the Russian operators. The ongoing adoption of IFRS 16, which deals with the accounting treatment of leases and has to be implemented in full by January 2019, will also boost reported EBITDA margins while making historic comparisons less transparent.

Capex levels in Russia have been falling in recent years as operators have completed initial investments in 4G network build-outs and extending fibre infrastructure across the country. Slowing subscriber growth and ongoing efforts at improving investment and network efficiencies have also helped reduce investment levels for all the major operators. Initial 5G deployments are unlikely before late 2020 at the earliest and will not significantly affect capex levels in the current forecast period to 2020. However, launches post-2020 are likely to drive an upturn in aggregate capex levels after that date.

Figure 8

Source: GSMA Intelligence

Mobile operator capex in Russia



The Yarovaya law will also affect cashflows over the coming years for Russian operators – a factor that is not reflected in our forecasts. This law came into force in July 2018 and obliges operators to store voice, SMS and data records for a period of time,

which means operators are now beginning to invest significant sums in storage capacity (company estimates range from \$600 million to \$900 million over a five-year period).

02

Mobile driving growth and innovation in CIS

Mobile operators in the CIS region, as in most of the developed world, increasingly need to innovate and evolve to future-proof themselves against the challenges facing traditional mobile communication

services. Below we explore the key opportunities and areas of investment for mobile operators across the region in the near to medium term.

2.1 Scaling IoT

The number of Internet of Things (IoT) connections⁴ in the CIS region will triple over the next few years, reaching 660 million by 2025.⁵ Consumer IoT accounts for the majority of connections – 68% in 2017 – mainly due to smart home deployments and demand for consumer electronics (such as smart TVs). However, industrial IoT is where the biggest increase is forecast, growing from 71 million

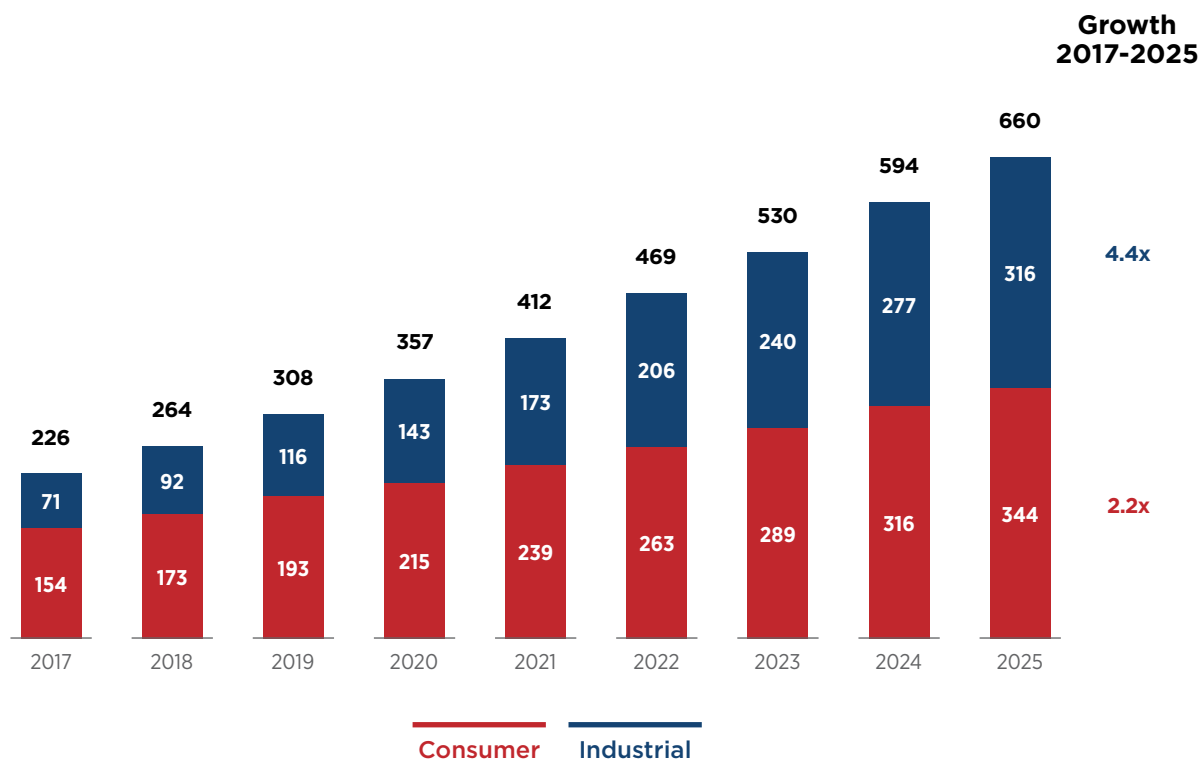
connections in 2017 to 316 million by 2025 – driven by smart cities and smart utilities. By this time, industrial IoT will account for 48% of total IoT connections, up from 32% currently. Some mobile operators are already preparing for this increase; for example, MTS launched its industrial IoT platform in December 2017.

Figure 9

Source: GSMA Intelligence

IoT connections in the CIS region

Millions



4. IoT connections include cellular and non-cellular connections. IoT connections are IP-enabled devices capable of two-way data transmission (excluding passive sensors and RFID tags). The definition includes connections using multiple communication methods such as cellular, short range and others. It excludes PCs, desktops, tablets, laptops, e-readers and smartphones.

5. For detailed forecasts, assumptions and methodology see the GSMA Intelligence report IoT: the next wave of connectivity and services <https://www.gsmainelligence.com/research/2018/04/iot-the-next-wave-of-connectivity-and-services/665/>

Narrowband IoT (NB-IoT) deployments will help drive industrial IoT connections, spurred by MTS's launch of the first Russia-wide network for IoT services and devices based on the technology in September 2018. Having already launched NB-IoT services in 20 Russian cities, including Moscow, St. Petersburg, Novosibirsk, Kazan, Nizhny Novgorod and Vladivostok, MTS will provide NB-IoT coverage as well as integrated services for smart devices in all large cities across Russia by the end of 2018.

Elsewhere, smart utilities connections will help drive industrial IoT growth, accounting for 27% of industrial IoT connections in the CIS region by 2025. Technical standards and federal law implemented by the Russian Federation Ministry of Energy, which rewards improvement in energy efficiency, have been an important driver behind increased adoption of smart metering in the region. In addition, the region has seen a number of collaborative projects formed between mobile operators and utilities companies to test and deploy IoT networks for smart meters. For example:

- MegaFon in Russia has partnered with Huawei to test NB-IoT connectivity in utility meters in the city of Innopolis
- Beeline Kazakhstan has collaborated with KazTransGaz to install NB-IoT connected gas meters in Kostanay
- In Belarus, Velcom (in partnership with ZTE Corporation) successfully demonstrated a connected gas metering service and deployed NB-IoT in Minsk (with plans for other regions of the country).

Additionally, there has been increased interest in smart cities in the region. Moscow's smart city strategy has included several traffic reduction solutions, already connecting over 1 million users to a car-sharing system. Moscow's smart parking system has also grown to more than 6,000 connected spaces, which has increased average traffic speed, reduced parking violations and increased parking space turnover. Connected bikes added to the transport strategy with several thousand bikes available from launch at the start of 2017. Moreover, smart cities represent another area where collaboration has been on the rise:

- Beeline in Russia has worked closely with Ericsson to provide NB-IoT connectivity to the Maryino area of Moscow, the most populated district of the city. Sensors and other monitoring devices use this connectivity to transmit data regarding road conditions, building monitoring, air pollution levels and environmental conditions.
- In May 2018, MegaFon signed agreements with Moscow and St. Petersburg authorities with the aim to develop new technologies including smart city and IoT applications.
- Kazakhtelecom and Uzbektelecom are working together to implement smart city projects in their respective countries.

IoT revenue⁶ in the CIS will increase at a CAGR of 23% between 2017 and 2025 to reach almost \$26 billion. Applications, platforms and services⁷ is, and will continue to be, the largest source of revenue, growing from 53% of total IoT revenue in 2017 to 62% in 2025. Mobile operators have been deploying different strategies and business models to capture a larger share of the IoT revenue opportunity and move beyond offering connectivity only. Several operators are focusing on smart home initiatives: for example, MegaFon launched its Life Control smart home series in 2017 and car monitoring service in 2016, while Velcom in Belarus will soon launch its smart home service, providing the devices and connectivity for a subscription fee with data uploaded to the cloud.

Other operators are targeting several use cases; for example, MTS is offering use-case specific tariffs for businesses including tariffs for online cash registers or transport sensors. A different approach in Russia has seen a trilateral agreement between MTS, Nokia and NVision to provide an IoT platform that combines existing IoT technology standards to ensure a wider offering of services to clients, with the aim to boost the Russian economy through improved business efficiencies.

6. For GSMA Intelligence, IoT revenue excludes device and module chipset revenue but includes revenue associated with provision of connectivity, applications, platforms and services, and professional services

7. Includes revenue associated with the provision of vertical-specific IoT solutions and services; connectivity and device management platforms; data analytics; cloud storage and security services

2.2 E-commerce

The Russian e-commerce market has seen a spike in growth in recent years, with an estimated value of up to \$25 billion in 2017.⁸ The impact of sanctions, low oil prices and a devaluation of the ruble, coupled with high rent costs and low consumer demand, have challenged bricks-and-mortar stores while spurring growth of digital retail. With more smartphones in the country (accounting for 62%

of total connections in 2017, up from 52% in 2016) and more people accessing the internet via their mobile devices (two thirds of the Russian population in 2017, up from just over half in 2014), mobile is playing an ever-increasing role. In 2017, two-thirds of smartphone owners in Russia used their device to order and/or purchase goods online, just under half of whom did so on a monthly basis.⁹

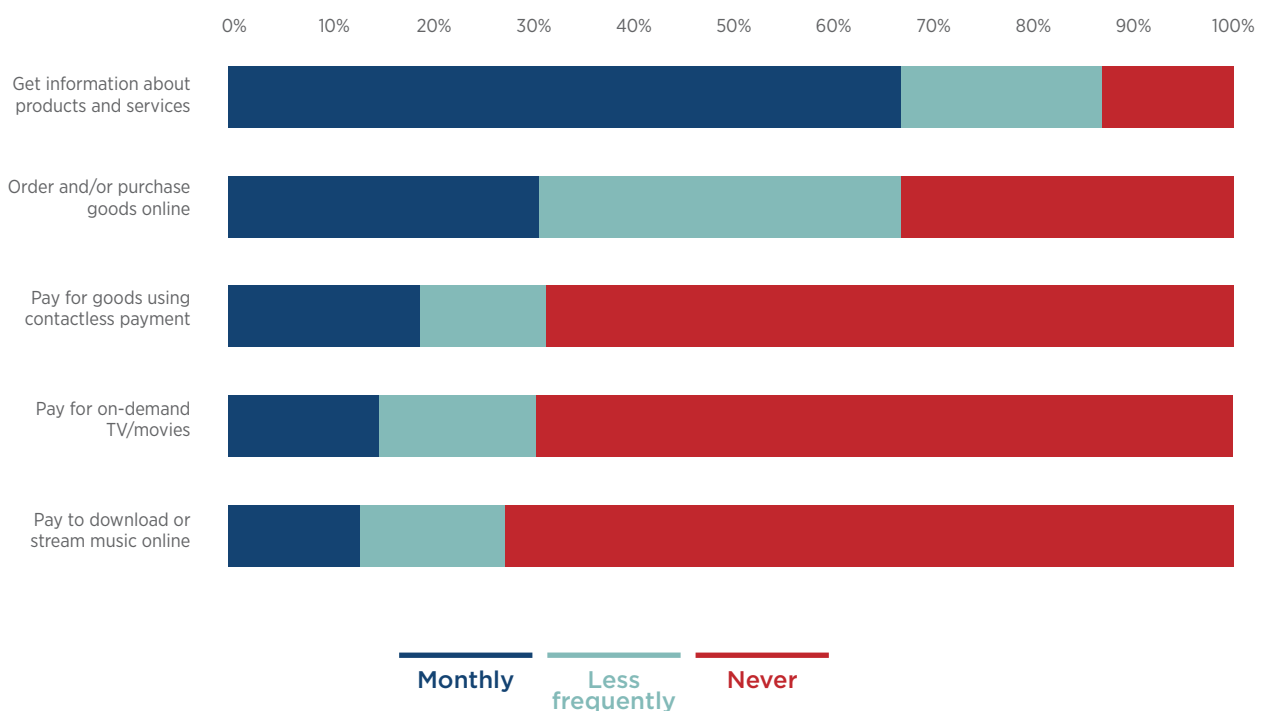
Figure 10

Source: GSMA Intelligence Consumer Survey 2017

Digital commerce in Russia

Percentage of smartphone owners

Question: How frequently do you do each of the following on a mobile phone?



8. National report on e-commerce development in Russia, UNIDO, 2017

9. GSMA Intelligence Consumer Survey 2017

The Russian e-commerce market is expected to grow by 33% in 2018, largely driven by increased cross-border trade, with more people shopping abroad for cheaper products than those available on the domestic market. According to the Association of Internet Trade Companies (AITC), China accounts for 90% of foreign goods ordered by Russian customers.¹⁰ Accordingly, the Chinese e-commerce giant Alibaba announced in September 2018 that it had signed a deal with MegaFon, the Russian Direct Investment Fund (RDIF) and Internet group mail.ru to launch AliExpress Russia – a one-stop destination for consumers to communicate, socialise, shop and play games.¹¹ This places Alibaba in direct competition with domestic e-commerce company Yandex, which itself launched a \$1 billion joint venture with state-run Sberbank in December 2017 to create an online retail platform.¹²

Other examples of mobile operators looking to seize opportunities to further participate in the Russian e-commerce value chain include the following:

- In July 2017, Beeline's parent company VEON launched its global personal internet platform in many of its key markets, including Russia, the Ukraine and Georgia. This uses data analytics and AI to provide customised information, offers and services to customers. The platform incorporates Masterpass, which stores all payment information, including card details from Mastercard and other payment networks, in one place, enabling one-click payments and purchases on the VEON platform.¹³
- In March 2018, MTS announced plans to invest as much as \$34 million over the next 12 months to increase its stake in online retailer Ozon – often referred to as “the Amazon of Russia”. This follows acquisitions of two of Russia's three biggest ticket sales sites Ticketland.ru and Ponominalu.ru for a combined RUB3.75 billion (\$55 million) in early 2018.

10. “Russia's e-commerce up 22% in 2017”, TASS, September 2017

11. “Alibaba to set up online retail service in Russia”, FT, September 2018

12. “Sberbank and Yandex finalise \$1bn ecommerce joint venture”, FT, December 2017

13. “VEON plans to roll out Masterpass”, Mastercard, February 2017



2.3

Investing in grassroots innovation

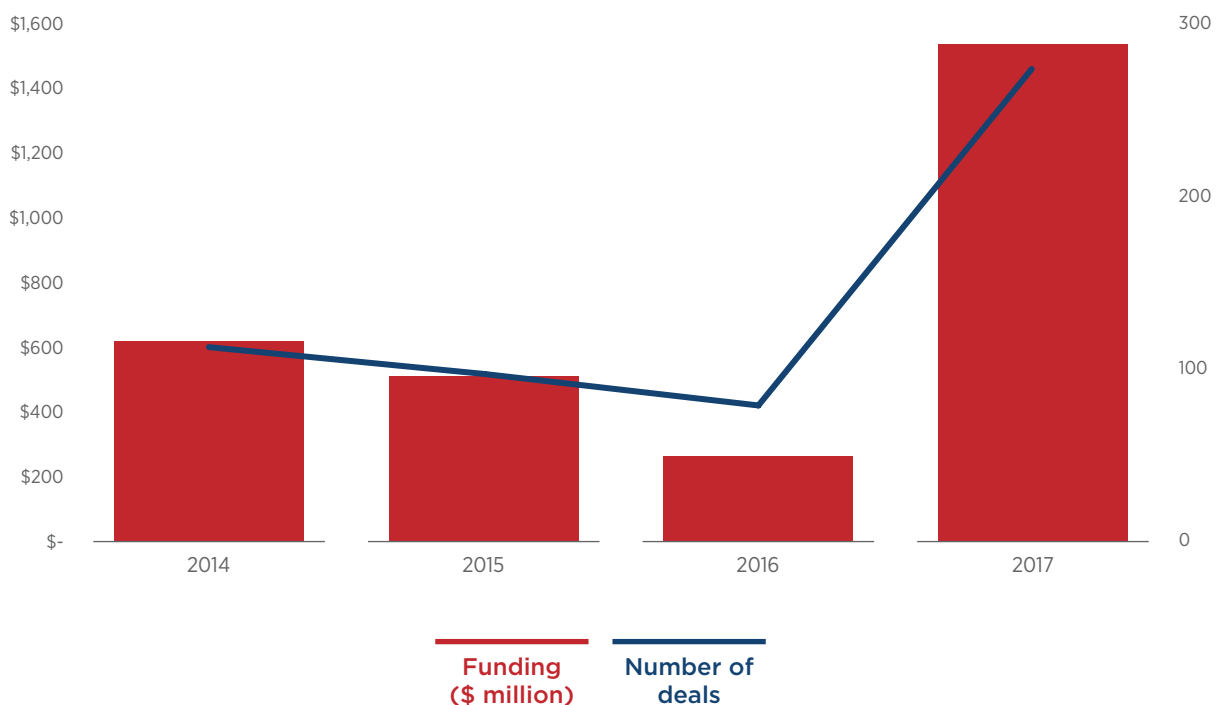
2017 marked a positive trend in the Russian venture capital (VC) market for the first time since 2013, following three years of recession. 2017 was a record year for funding in Russia, with around \$1.5 billion invested via 260 deals – more than the previous three years combined. The government has been active in supporting the Russian VC industry, reflected in a variety of grant mechanisms for early-stage startups; tax breaks and subsidies for

startups; and a large number of tech parks (such as Skolkovo, the international tech hub near Moscow). Further, a new \$100 million Russian investment fund is targeting AI startups globally, with investments including Astro Digital (a Californian startup which develops open APIs for satellite imagery) and Banuba (which develops AR-enabled mobile applications, based in Hong Kong).

Figure 11

Source: CB Insights

Russian investor financing





2018 has so far shown a much lower level of investment, potentially due to growing international tensions. A substantial part of Russian capital goes to foreign startups, or Russian founders established abroad, making access to funding more difficult to domestic entrepreneurs. However, mobile operators in Russia are themselves becoming much more active in this space:

- In January 2018, MTS acquired cyber-sports club Gambit Esports for an undisclosed amount. In an effort to developing products that lie outside the traditional telecoms sector, MTS intends to utilise the opportunities offered by Gambit Esports for branding purposes and to offer sponsorship to interested corporate partners.¹⁴
- In April 2018, MegaFon invested in City-Mobil, a Moscow-based ride-hailing company which, having begun as a conventional taxi operator, recently moved online to allow bookings through a proprietary app.¹⁵
- In June 2018, MegaFon acquired TechnoInvestProject from Technoserv group, a major Russian system integrator, in an effort to expand its integrated digital solutions portfolio for the implementation of “Safe city” projects. These are projects under the state programme to improve safety of the population, infrastructure, environment and transport.¹⁶
- In September 2018, MTS announced the investment of \$12 million for the acquisition of a 13.7% stake in the Cyprus-based company Youdo Web Technologies, the owner of the Russian online service YouDo, one of the largest Russian online service providers matching freelance labour demand and supply for everyday and business tasks.¹⁷

2.4 Blockchain

Russia aims to become a global pioneer in blockchain, with President Vladimir Putin promoting the technology as part of his new “digital economy” programme, saying that the country can’t be “late in the race” for blockchain innovation. The country is already a leading innovator: according to Forbes, as of late 2017, 20% of the top 50 blockchain startups by funds raised were Russian.¹⁸ Both public and private organisations are increasingly experimenting with the technology. Examples include the following:

- In December 2017, the Russian government announced plans to implement distributed ledger technology (DLT) in Moscow’s voting system to increase efficiency and transparency.
- In May 2018, the Bank of Russia reported intentions to transfer the country’s money transfer system – Financial Communications Transfer System – to blockchain technology in 2019 to reduce the country’s dependence on the SWIFT system.
- Sberbank, Russia’s largest commercial bank and part of the Enterprise Ethereum Alliance (EEA), conducted Russia’s first transaction powered by blockchain in November 2017, and the country’s first blockchain-based bond deal in April 2018. Sberbank has also launched a blockchain lab to carry out research and connect with fintech startups to speed up technology adoption in the financial sector.

14. “Mobile operator MTS buys Gambit Esports”, East-West Digital News, January 2018

15. “MegaFon and Mail.RU Group invest into on-line taxi market”, MegaFon, April 2018

16. “MegaFon Increases Expertise in Safe City Solutions”, MegaFon, June 2018

17. “MTS invests in online marketplace YouDo”, Telecompaper, September 2018

18. “Meet The Russians Behind Your Blockchain (And Cryptocurrency, Too)”, Forbes, April 2018

2.5

Other areas of innovation by mobile operators



In April 2018 MTS launched Smarty – an innovative intelligent customer care dialogue system that is integrated into business operations and IT infrastructure, and which has helped to increase request processing efficiency by up to 75%. It allows customers to manage their accounts, fees and services easily, which helps to reduce costs associated with maintaining the contact centre and increases customer loyalty and satisfaction. The MTS AI team plans to increase the efficiency of the system by up to 90% and deploy it to all channels available.

MTS has also launched a five-year strategic programme called Internal Digital Automation (IDA), which aims to make greater use of digitised business processes within the company to help increase productivity and drive greater efficiency. MTS estimates place the impact of IDA in the billions of rubles over the full period of the programme.



To address all customer enquiries in real time, whether in-store or through call centres, Beeline has introduced My BeeStore, an omnichannel in-aisle sales support application. Through integration with Beeline's Big Data and Artificial Intelligence platforms, the service provides real-time detailed product information, inventory stock levels, call detail records, tariff information and, most importantly, targeted recommendations on relevant services and customer propositions. An advanced recommendation engine analyses a customer's profile and enables sales personnel to deliver customised and targeted offers, as well as upsell and cross-sell relevant products and services. In order to ensure customer identity, an intuitive two-factor authentication process is deployed, which will soon be fully integrated with Mobile Connect.

The application offers a comprehensive set of tools enabling sales and customer support teams to provide various services, including product searches and feature comparisons, competitor price monitoring, product ordering/delivery and scheduling of household connections to broadband internet. In addition, the application allows seamless customer-service operations such as duplication

checks, changes to tariffs and activation/deactivation of services. The software is flexible and can be seamlessly re-purposed for the needs of almost any company; pilots are underway with a number of retailers in Russia. As the integration points and the KPI sources change, the product-specific logic is added to the service, and the platform can evolve further using machine learning.

Built-in course training and educational testing functionalities, as well as a commission module, ensure the highest quality of support provided by, and motivation of, Beeline's sales and customer care personnel.

More than 2 million service operations were executed through My BeeStore application during the summer of 2018, with substantial incremental upsale of services and tariffs. A second phase currently in development integrates cash-register functionalities within the application, allowing the sale to be completed at the convenience of the customer: on the sales floor or over the phone.



Since March 2018, MegaFon's subscribers have been able to pay for their shopping directly via Apple Pay, Samsung Pay or Google Pay using their mobile phone account. To do so, they only need to create a virtual MasterCard card in one click on their personal account page on MegaFon's website or via the MegaFon.Bank app. The card is immediately available for use, and a mobile phone becomes a digital payment tool. The balance of the virtual card

is equal to that of the mobile phone. It is simple and convenient: there are no forms to fill in, as identity is confirmed by the operator. According to MegaFon, more than 20% of its subscribers use various mobile payment services offered by the operator; to date, more than 450,000 Mobile Phone Balance virtual cards have been issued.



St. Petersburg has many historical buildings that feature narrow, well-like courtyards with no mobile or Wi-Fi connectivity. It also rains on 200 days on average per year. When sheltering from the rain in these ancient courtyards, St. Petersburg residents are unable to use internet services on their mobile phones.

To overcome this problem, Tele2 introduced the Rain Wi-Fi project – the world's first rain-powered 4G router that turns restrictive weather conditions into free internet access for people who get caught in the rain. Through the creation of a "4G generator",

the solution generates electricity from rainwater with no loss of energy in the process. The system works in four steps: 1) the device is installed into a drainpipe, 2) the rain flow activates a turbine, 3) this generates electricity, 4) the 4G router delivers Wi-Fi to the immediate area.

The launch of the Rain Wi-Fi project was supported by a digital campaign, inviting city residents to visit rainwifi.ru to vote for locations where the Wi-Fi was needed most. Mobile internet users also gain access to exclusive content provided by partners including National Geographic, WWF and Psychologies.



03

Fostering development of the digital economy

The past decade in Russia and other CIS countries has seen widespread mobile broadband adoption. This started with 3G network upgrades and has continued in recent years with 4G network rollouts. Investment levels have been supported by ongoing subscriber growth and positive revenue trends.

However, with price competition and voice & data services increasingly bundled into flat-rate tariffs, operators need to become more innovative and focus on cost efficiencies to accommodate the growth in data. They are looking for new business models and innovative services to sustain the pace of development and satisfy demand for mobile data. At the same time, governments and businesses outside the telecoms and IT sectors are searching for the right approach to a digital economy and digital transformation. Considering the need for connectivity for practically everything in the digital economy to work, operators are well positioned to become a driving force in the digitisation of other industries.

5G mobile networks have been developed specifically to become the best tool to provide services for industries, in addition to serving the consumer market. In this regard, 5G is considered a necessity for the creation of a new and more competitive national economy. The implementation of 5G networks should be considered by regulators not as just a new technical advancement in telecoms, but as a condition for delivering the digital economy and driving the transformation of a range of industries. With such a mindset, the regulation of the mobile industry should shift from controlling and supervising the industry to fostering its development.

3.1 Spectrum for 5G

With mobile broadband services increasing in popularity and users consuming growing amounts of content, data traffic continues to grow. At the same time, new IoT deployments are connecting a growing range of objects. Demand for more bandwidth, improved coverage and new services can only be met by increasing the amount of spectrum assigned to mobile operators.

5G is expected to support significantly faster mobile broadband speeds and heavier data usage than previous generations, while also enabling the full potential of the Internet of Things. But to fulfil its promise, 5G needs a significant amount of new harmonised mobile spectrum.

This new spectrum needs to be right in terms of amount and type, and provided under the right conditions. It also needs to be made available in a timely manner. There are three key ranges: sub-1 GHz, 1-6 GHz and above 6 GHz.

With government users in the 800 MHz and 900 MHz bands in many CIS countries, the 700 MHz

band is the most viable for mobile services, even after taking into account cross-border coordination and re-planning of broadcasting networks. It can provide better coverage based on LTE-Advanced evolution towards 5G capabilities.

Between 1 and 6 GHz, regulators should aim to make available 80-100 MHz of contiguous spectrum per operator within the 3400-3800 MHz range. Such an amount of spectrum will significantly reduce the need for network densification and investment costs.

In a number of CIS countries, due to the historical use of this spectrum by the FSS, an alternative might be necessary. 4400-5000 MHz could be an option following progress in Japan and China.

Spectrum above 6 GHz has the potential to transform the mobile broadband experience with ultra-high speeds and low latencies. The 26 GHz and 40 GHz bands are the most promising of the WRC-19 bands for 5G network rollouts, and are already gaining traction around the globe for mobile

broadband services. The 26 GHz band is adjacent to the 28 GHz band, allowing wide harmonisation, low handset complexity, economies of scale and early equipment availability. The 28 GHz band will be used for 5G in many countries, with such implementation done outside of the WRC-19 process under an existing mobile allocation.

As well as making sufficient spectrum available, regulators are urged to reassess the spectrum pricing and annual spectrum fee approaches, specifically for new, wider bands above 3 GHz. Suitable pricing will stimulate investment in 5G infrastructure.

3.2

Deployment procedures and provisions

Rapid and efficient 5G rollout will require new approaches from regulators to supervise network development. Strict regulations and procedures historically used by many CIS countries were effective during the development of 2G and 3G, but the rapid pace of progress requires operators to roll out and repurpose networks faster using network automation. Meeting the demands of 5G services will require new investment. Building infrastructure, deploying equipment and manipulating equipment parameters on a day-to-day basis with permission-based authorisation has become too time-consuming and diverts significant resources to tasks not related to overall network quality. A move from permission-based authorisation to notification procedures will provide a necessary push for operators to speed up 5G development, providing a headstart in terms of overall competitiveness of the economy.

Notwithstanding the need to provide a safe and healthy environment for all citizens, the existing wireless radiation allowances in many CIS countries are based on studies and practices that date back decades. After several studies, many countries across the globe have adopted electro-magnetic emission limits based on international guidance (e.g. from the World Health Organization), which are significantly higher than the limits in most CIS countries. To keep up with the development of 5G networks, regulators can consider revising wireless radiation limitation standards towards the higher allowances based on international standards.

3.3

Network architecture regulation

The regulation of telecoms in CIS countries dates back to the deployment of PSTN networks, as is the case in many other countries. Such regulation was easily transferred to 2G circuit-switched cellular networks, and later 3G circuit-switched networks. A major overhaul for national regulatory provisions was introduced with the proliferation of data networks. However, all regulatory requirements and national compliance procedures are still applied to localised nodes and hardware equipment. Through the introduction of additions and clarifications, this regulatory framework was able to adapt for internet-based services. The next leap in network architecture associated with technologies such as SDN and NFV will require adjusting existing provisions once again to allow network evolution.

With the proliferation of SDN and NFV in the 5G core network, the notion of specific hardware or equipment will start to lose its meaning, as control and user plane traffic will be processed by different logical entities, which in turn will be virtualised in a cloud infrastructure in a distributed manner. In this new paradigm, the traditional node of a network will exist as software, which could be dynamically run across different data centres depending on workload or latency requirements.

The ideal solution would be to rewrite the national regulation in CIS countries to base it on a modern software-defined architecture, but this is a difficult task that may take years to implement. So as not to stall the introduction of 5G networks, it is more practical to adjust once again the existing regulation by introducing virtualised nodes and new compliance procedures at a national level based on testing software capabilities rather than hardware measurements.

In the update of regulatory provisions, particular attention should be given to lawful intercept mechanisms. The existing lawful intercept equipment is based on hardware interconnection to operator infrastructure to receive required control and user plane traffic. With the introduction of virtualised core network and technologies such as mobile edge computing, the hardware implementation of lawful intercept may be impractical for some of the services due to the establishment of redundant connections to re-route significant traffic into lawful intercept systems. For this reason, the development of lawful intercept based on virtualised functions needs to be addressed in advance so it does not hinder the introduction of new technologies and services.

Another area requiring regulatory action is the issue of dedicated versus public access networks. Historically in CIS countries, public access networks and dedicated networks (such as professional mobile radio networks) have been regulated differently, with different requirements. The introduction of network slicing in 5G, with virtual dedicated network deployed over the top of a public access network, creates uncertainty in the regulatory framework. To allow network slicing and innovative services for vertical industries, dedicated networks should be allowed to operate within public access networks.

3.4

Network neutrality and data regulation

Legislation covering personal or IoT data should be balanced to address the need to protect sensitive data but also enable new innovative services based on the use of big data. For example, the data collected by mobile networks on the movement of subscribers across a city is crucial input for city transportation system design. Strict legislation may prohibit the collection and exchange of such information even though it could benefit society. Furthermore, where such legislation is introduced, it should cover not only mobile operators but also other ICT players involved in data collection and data exchange so as not to create uneven conditions between telecoms companies and other stakeholders.

Operators also require the flexibility to manage their network traffic and create innovative service propositions, albeit mindful of the need to sustain an open internet. This is particularly important with the introduction of mission-critical services and network slicing in 5G networks. There will be an occasional need to balance best-efforts traffic (such as for video streaming) with traffic at guaranteed data rates (such as for public safety services). It is important not to limit operators in the provision of services and allow for differentiated customer propositions, to ensure a return on investment can be made on 5G networks. The existing legislation in CIS countries is already enabling such flexibility for operators. Any approaches to regulate this area without considering all the complexities of 5G networks may harm development.



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