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REGULATORY AGENCY FOR
ELECTRONIC COMMUNICATIONS
AND POSTAL SERVICES

AN OVERVIEW OF THE TELECOM AND POSTAL SERVICES MARKET IN THE REPUBLIC OF SERBIA **IN 2016**

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CONTENT

A WORD OF INTRODUCTION

Serbian telecom market in 2016 was principally marked by the accelerated development of 4G mobile networks. By the end of the year, all three mobile operators covered more than half of the population with LTE signal and it is expected that in 2017 more than 90% of the population will have the possibility to benefit from this technology. Naturally, the increased availability of fast mobile Internet resulted in the significant increase of the transmitted data. The increase in Gigabytes used in 2016 is by more than 50% compared with the previous year.

As for the fixed network market, there is a constant increase in the number of Internet access service users and media content distribution, and the expected drop in the number of fixed telephony subscribers.

Postal services are mainly following the global trends. Letter-post services are marked by a constant drop, while the volume of parcels and express mail is increasing at an annual rate of 10%.

This year we have introduced several new items in the Market Overview. In addition to a comprehensive overview of the Serbian market characteristics, we have also presented the situation in the European telecom market and, due to a rising offer of bundled services we have also introduced the data on this market segment.

Since 2016, RATEL is also in charge of the tasks performed by the National centre for Prevention of Safety Risks in ICT Systems (National CERT), we have provided an overview of the major challenges in the area of information security.

In addition to comprehensive market data collected and processed on an annual basis, since 2016 RATEL has begun publishing quarterly the main telecom market statistical indicators and the reports on mobile signal coverage. This data are available at www.ratel.rs.

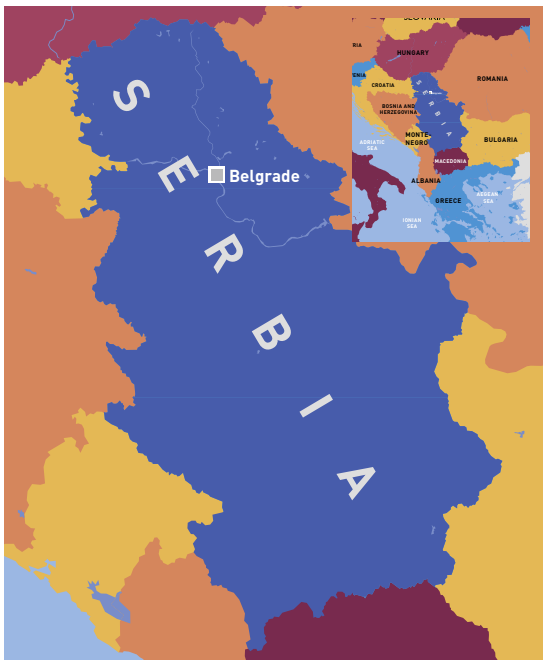
Dr Vladica Tintor,
Director

01 BASIC FEATURES OF TELECOMMUNICATIONS MARKET IN THE REPUBLIC OF SERBIA

The data used for the overview of telecom market in the Republic of Serbia have been obtained based on the questionnaires provided by the telecom market participants, and they mainly refer to the territory of the Republic of Serbia without Kosovo and Metohija since this area is under the control of the United Nations, pursuant to the Security Council Resolution 1244, temporary regulating, inter alia, the authority of the international civilian mission in the territory of AP Kosovo and Metohija.

FIGURE 1. Republic of Serbia – Basic Facts

MAP OF STATE



BASIC DATA

Name	Republic of Serbia
Capital	Belgrade
Area	88 361 km^2
Population (without AP Kosovo and Metohija), estimated by the Statistics Office[1]	7 076 372
Country code:	+381
Internet domain:	.rs
GDP in 2016[2]	4200.2 billion dinars (34.1 billion euros)
Average net income in 2016[3]	44 437 dinars (374.4 euros)

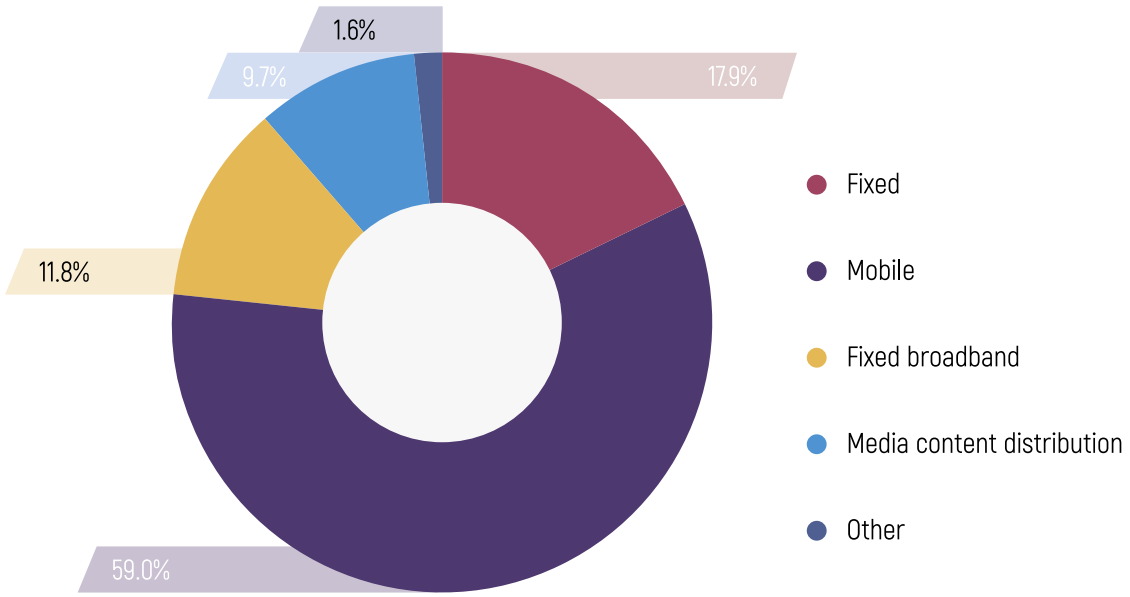
1 Statistics Office estimation for 1.1.2016.
2 Statistics Office estimation for 28.2.2017. (the average RDS/EUR exchange rate for 2016 was 123.1179).
3 Statistics Office data.

The total revenues made in the electronic communications market of the Republic of Serbia in 2016 amounted to approximately 189.4 billion dinars, which is slightly more (ca. 1%) compared with the previous year. According to the annual average middle exchange rate the total revenues amounted to 1.54 billion euros. The difference in the growth rate seen in dinars and euros is due to the difference in the average middle exchange rate between 2015 and 2016.

The share of revenues from electronic communications in the Serbian GDP was around 4.51% in 2016.

In terms of market share accounted for by different services in the Serbian electronic communication market in 2016, same as in the previous years, the revenues from the mobile services had the largest share in the total revenues, accounting for 59% of the total revenues.

FIGURE 2. Structure of revenues by services in 2016

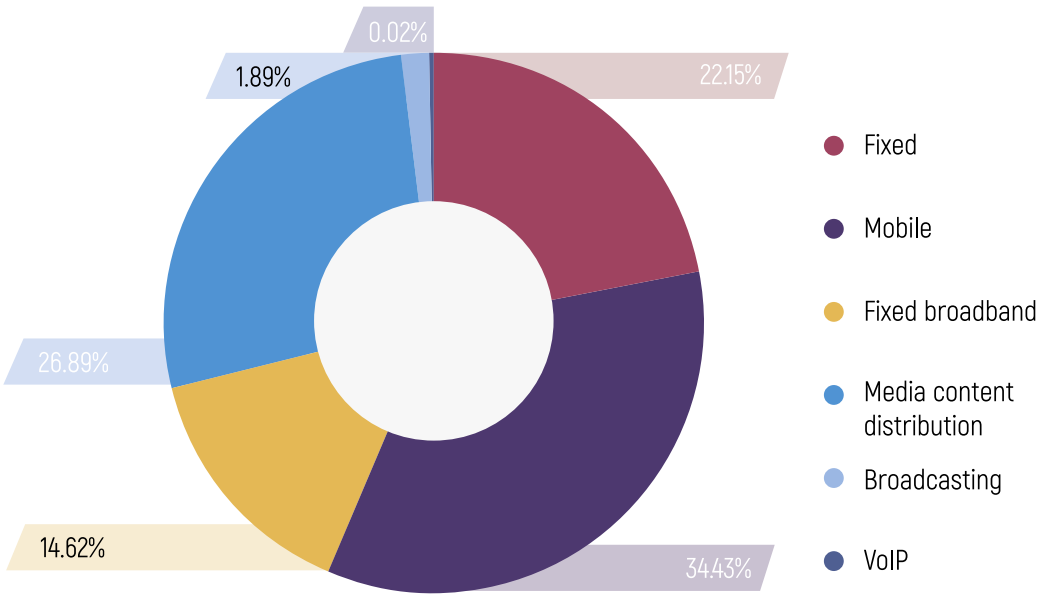


Fixed	Mobile	Fixed broadband	Media content distribution	VoIP	Leased lines	VAS	Broadcasting
17.9%	59.0%	11.8%	9.7%	0.4%	0.4%	0.5%	0.3%

Source: RATEL

The total investments made in the electronic communications sector in 2016 amounted to 32.3 billion dinars or 262.5 euros, which is by 4.9% less compared with the previous year. More than 61.3% of investments were made in mobile and media content distribution, amounting to 11.1 billion dinars (90.4 million euros) and 8.7 billion dinars (70.6 million euros), respectively.

FIGURE 3. Structure of investments by services in 2016



Source: RATEL

A comparative overview of the number of users and penetration rate for public fixed communication networks, public mobile communications networks, Internet and cable systems in 2013, 2014, 2015 and 2016 is given in Table 1.

Table 1. A comparative overview of the number of electronic communications service users in the Republic of Serbia (2013-2016)

	2013		2014		2015		2016	
	Number (mil)	Per 100 inhabitants	Number (mil)	Per 100 inhabitants	Number (mil)	Per 100 inhabitants	Number (mil)	Per 100 inhabitants
Fixed telephone - subscribers	2.79	38.85	2.72	37.99	2.60	36.80	2.55	36.07
Mobile telephone - users	9.20	128.09	9.34	130.76	9.16	129.38	9.09	128.52
Broadband - subscribers	1.46	20.36	1.51	21.19	1.56	22.09	1.72	24.29
Media content distribution - subscribers	1.55	21.62	1.50	20.95	1.60	22.55	1.66	23.51

Source: RATEL

Low usage basket of electronic communications services shows average monthly expenses of a subscriber/inhabitant for telecommunications services. Tables 2 and 3 illustrate low usage and high usage baskets, representing monthly expenditure per subscriber of electronic communication services in Serbia in 2016, compared with the data retrieved in 2013, 2014 and 2015. According to the obtained data and the data received from the Statistics Office, in 2016, the cost of the low basket equalled 2.85% of the net average annual salary and the cost of the high usage basket equalled 11.46%.

Table 2. Low usage basket of electronic communications services

	2013		2014		2015*		2016*	
LOW USAGE BASKET	Average bill (dinars)	% of the monthly salary	Average bill (dinars)	% of the monthly salary	Average bill (dinars)	% of the monthly salary	Average bill (dinars)	% of the monthly salary
Fixed phone	**837.88**	**1.91%**	**986.22**	**2.21%**	**882.77**	**1.99%**	**868.68**	**1.88%**
Mobile phone (prepaid)	**271.35**	**0.62%**	**238.8**	**0.54%**	**334.43**	**0.75%**	**294.85**	**0.64%**
TV (national TV subscription)	**500.00**	**1.14%**	/	/	/	/	**150.00**	**0.33%**
Total	**1 609.23**	**3.66%**	**1 225.02**	**2.75%**	**1 217.20**	**2.74%**	**1 313.53**	**2.85%**
Average net salary **		**43 948**		**44 525**		**44 437**		**46 097**

Notes:
*Average bill amounts for 2015 and 2016 are based on weighted average.
**www.stat.gov.rs

Source: RATEL

Table 3. High usage basket of electronic communications services

HIGH USAGE BASKET	2013.		2014.		2015.*		2016.*	
	Average bill (dinars)	% of the monthly salary	Average bill (dinars)	% of the monthly salary	Average bill (dinars)	% of the monthly salary	Average bill (dinars)	% of the monthly salary
Fixed phone	837.88	1.91%	986.22	2.21%	882.77	1.99%	868.68	1.88%
Mobile phone (post-paid)	1 666.05	3.79%	1 478.04	3.32%	1 297.01	2.92%	1 555.12	3.37%
TV (national TV subscription)***	500.00	1.14%	/	/	/	/	150.00	0.33%
Internet	1 302.59	2.96%	1 305.24	2.93%	1 380.11	3.11%	1 522.32 ****	3.30%
Media content distribution	911.40	2.07%	1 093.57	2.46%	1 054.89	2.37%	1 186.89	2.57%
Total	5 217.92	11.87%	4 863.07	10.92%	4 614.77	10.38%	5 283.01	11.46%
Average net salary **	43 948		44 525		44 437		46 097	

Notes:

*Average bill amounts for 2015 and 2016 are based on weighted average.

**www.stat.gov.rs

*** *With the entry into force of the Law on Public Media Service (Official Gazette, no. 83/14), on 13 August 2014, the Law on Broadcasting (Official Gazette, nos. 42/02, 97/04, 76/05, 79/05, 62/06, 85/06 and 41/09) ceased to be valid. As the Law on Broadcasting ceased to be valid, the monthly national TV subscription was no longer collected after August 2014. Since January 2016, pursuant to the Law on Temporary regulation of Public Media Service Tax Collection (Official Gazette, no. 112/15), a monthly tax in the amount of 150 dinars is collected.*

****Fixed broadband (excluding the mobile Internet package)

Source: RATEL

02 EU TELECOM MARKET STATE OF PLAY

The fixed and mobile networks technological convergence became a significant factor in the electronic communications market, leading to company expansion in particular areas of the sector. The expansion of the operators in the EU countries continued in 2016 through merger and acquisition.

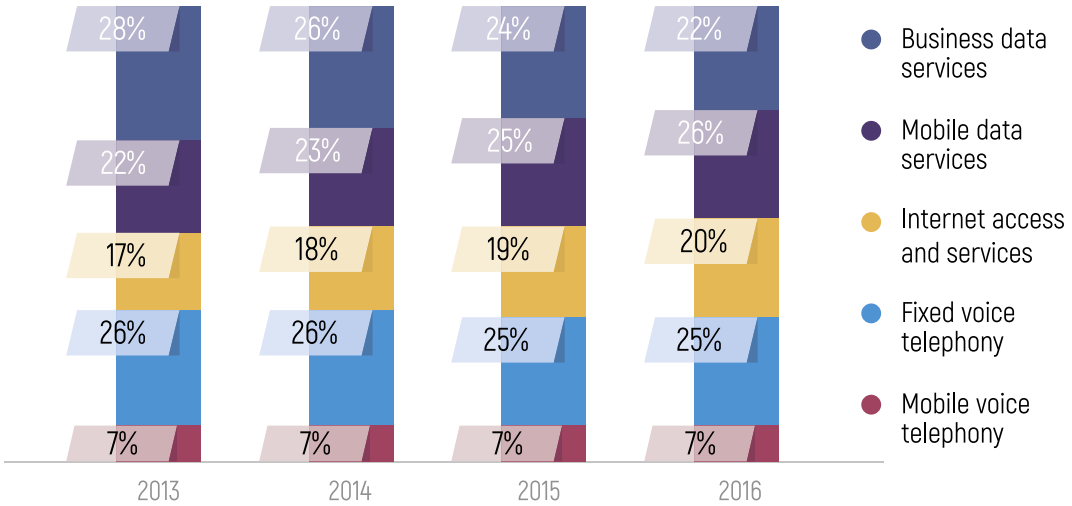
ELECTRONIC COMMUNICATIONS SECTOR REVENUES

The data on the global electronic communications market indicate that, globally, the sector generates revenues of over 1 trillion euros a year, where the share of the European operators in the total world market revenues is one quarter. Although the European Commission expected the investments in the period by 2020 to be 50 billion euros, the level of investments is by one fifth less than that. Nearly 72% of the total investments in the EU have been invested in 5 countries: Spain, Germany, France, Poland and Italy.

Revenue reports published by the European Telecommunications Network Operators' Association (ETNO) have confirmed that the operators' revenues continue to drop in the EU. The European Commission data for 2016 indicate that a drop in the telecom sector revenues was seen in 25 out of 28 EU countries.

Revenue breakdown shows a decrease in the revenues made from voice service both over fixed and mobile networks. Since 2013, voice service revenues dropped by 15.3% in fixed and by 29.9% in mobile networks. In 2016, voice service accounted for 47% of revenues, compared with 54% in 2013. The share of data transmission via mobile network in the total revenues grew by 4% in 2013, however this has not compensated for the loss in voice traffic revenues.

FIGURE 4. Electronic communications market revenue distribution in the EU



Source: European Commission

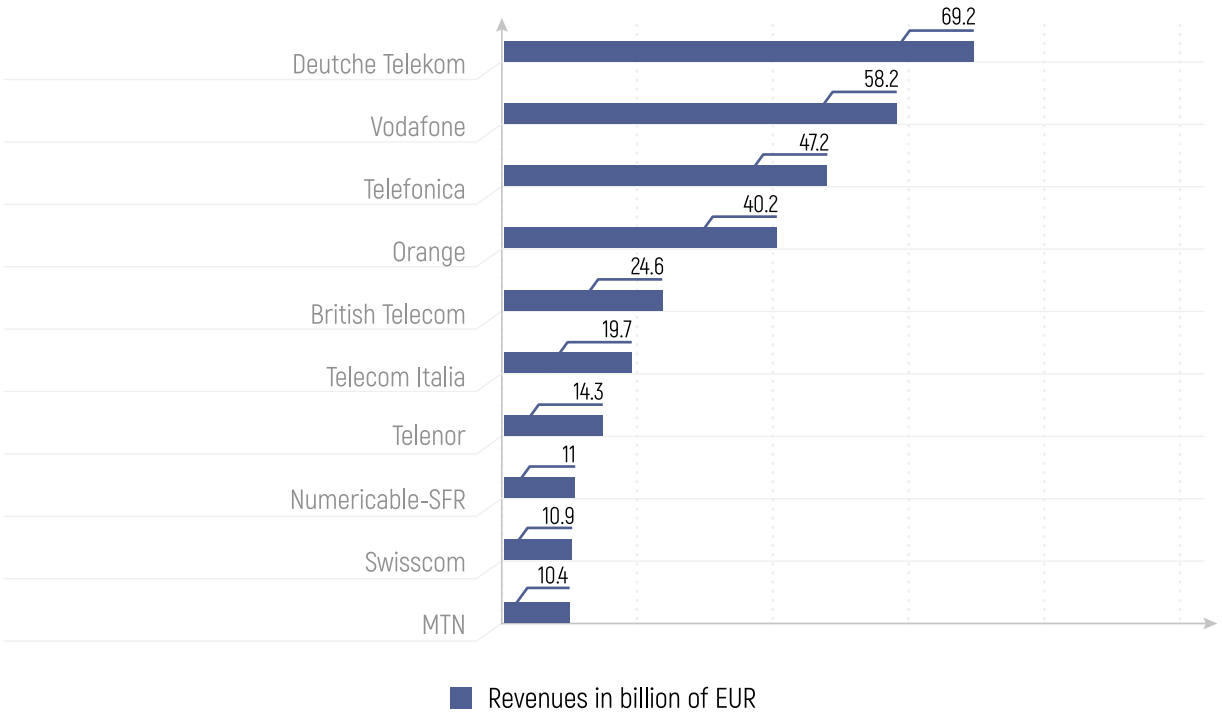
In the European telecom market report from September 2016, prepared by Analysys Mason consultant agency, the average revenue per user (ARPU) of the operators in the EU has been decreasing since 2011. The drop of ARPU indicator slowed down slightly in 2015, however the downtrend is expected to continue. The abolition of the additional roaming charges will have most impact on the countries with developed tourism industry (Greece, Portugal, Spain and Croatia).

Also, a richer offer of bundled fixed and mobile services could have a negative impact on the revenues in the short run, since subscription discounts are one of the main incentives used to attract users to switch to bundle services. However, in the long run, the discounts will be replaced by other benefits, such as the increase in the amount of data traffic offered in the package.

MARKET PLAYERS

In early 2016, there were several dominant telecom operators in the European market. Deutsche Telekom is holding tightly the leading position with annual revenues of over 69 billion euros. Next are Vodafone with 58 billion, Telefonica with 47 billion and Orange with 40 billion euros in revenue. The operators that are outside the top ten have revenues under 10 billion euros.

FIGURE 5. Top 10 European Telecoms in Terms of Revenue



Source: The Statistics Portal

Ten largest operators in the EU hold a significant share on a national level, as well. Deutsche Telekom holds 54.6% of fixed network services and 32.5% of mobile network services in Germany, with a share of over 20% in more than 5 countries. Vodafone is a direct competition to Deutsche Telekom in Germany, with a 20% share on fixed network service market and 33.1% of mobile service market. In addition, Vodafone is a significant fixed and mobile operator in more than 10 EU countries, with a share of over 20%. Telefonica is the biggest fixed operator in Spain with a 52.3% market share and it is a direct competition to Deutsche Telekom and Vodafone in Germany, with a 34.3% market share.

THE DIGITAL ECONOMY AND SOCIETY INDEX (DESI)

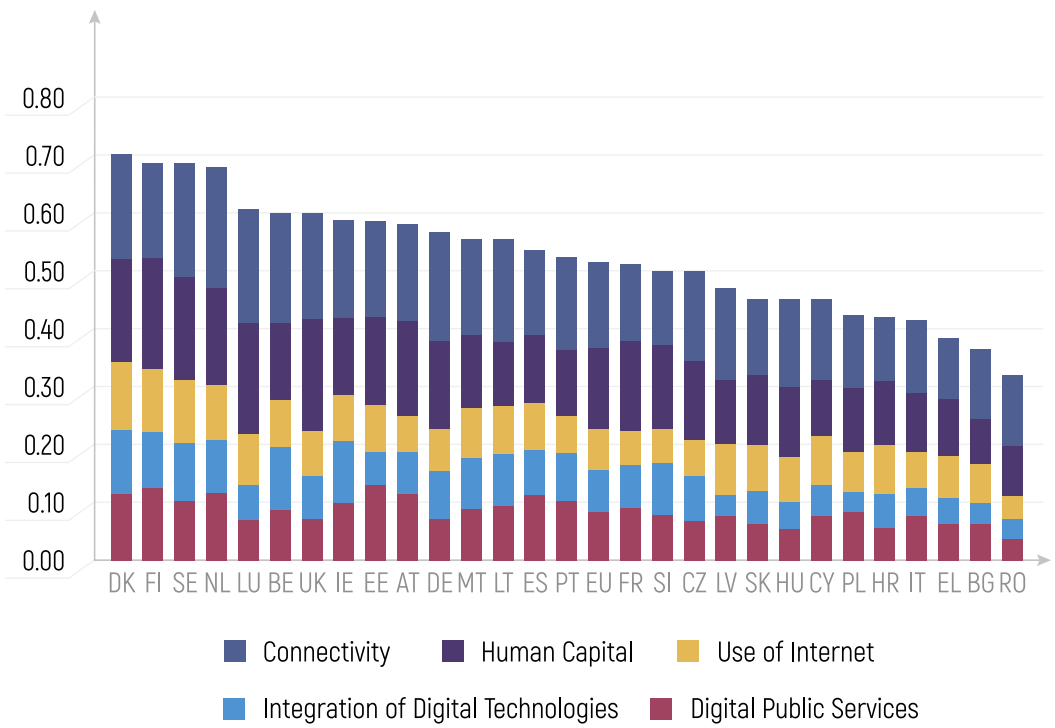
The Digital Economy and Society Index (DESI) is a composite index that summarises relevant indicators on digital performance and tracks the evolution of EU member states in digital competitiveness.

The DESI has 5 components:

1.	Connectivity	*Fixed Internet access, mobile Internet access, Internet speed and availability*
2.	Human capital/digital skills	*Basic skills and usage, advanced skills and development*
3.	Use of Internet by citizens	*Content, communications and online transactions*
4.	Integration of digital technology by businesses	*Digitisation of businesses and the online sales*
5.	Digital Public Services	*e-Government*

Denmark, Finland, Sweden and the Netherlands have the most advanced digital economies in the EU, whereas Romania, Bulgaria and Greece are lagging behind.

FIGURE 6. The DESI scores of the EU countries by dimensions



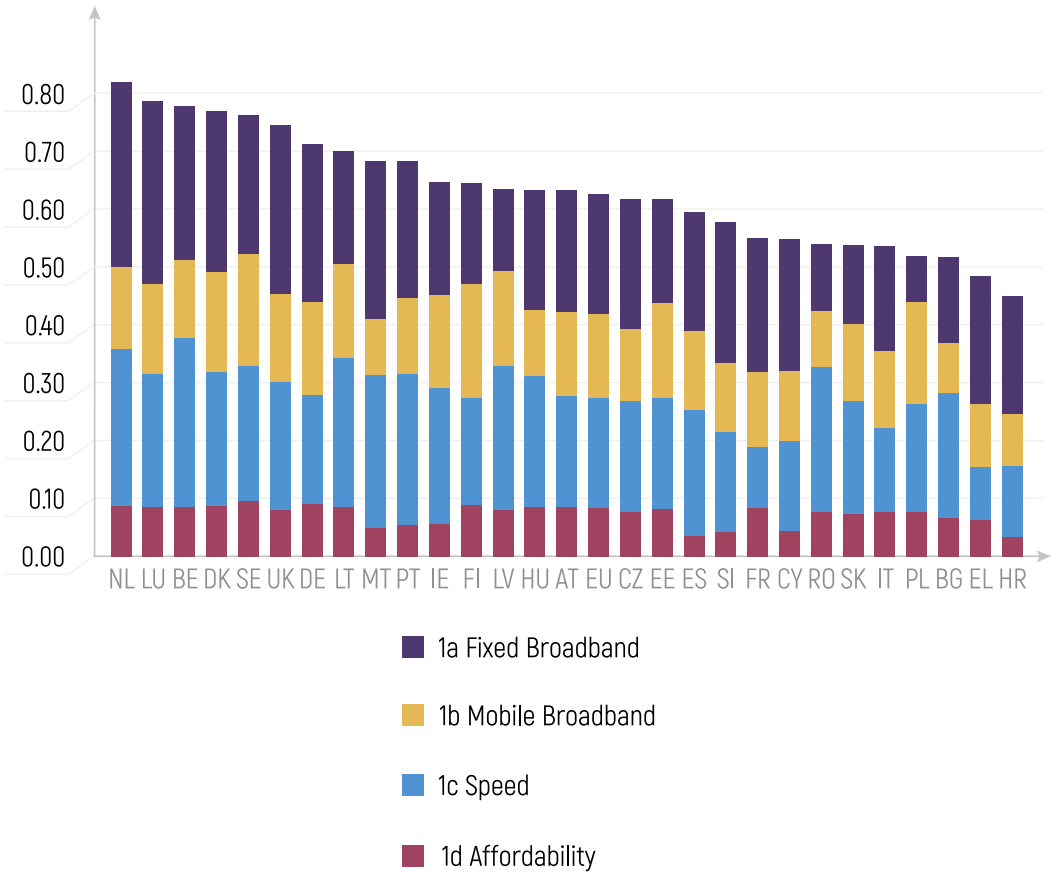
Source: European Commission

Connectivity dimension includes the data on fixed and mobile broadband supply and demand. Luxemburg and the UK scored best in fixed broadband, whereas the Nordic countries and Estonia are the leaders in the mobile broadband.

THE DESI CONNECTIVITY INDICATORS	EU AVERAGE (2016)
1a1 - Fixed Broadband Coverage % households	98 %
1a2 - Fixed Broadband Penetration Rate % households	74 %
1b1 – Mobile Broadband Penetration Rate number of users per 100 inhabitants	84
1b2 – 4G Network Coverage % households	84%
1b3 – RF Spectrum % planned RF spectrum harmonization in the EU	68 %
1c1 – NGA Network Coverage % households	76 %
1c2 – High Speed Internet Subscribers % subscribers with speeds >= 30Mb/s	37 %
1d1 – Fixed Broadband Affordability % of average gross income spent on the cheapest fixed broadband subscriptions (lower score is better)	1,2 %

According to the most important connectivity dimensions, Benelux countries are at the top of the scale, whereas Croatia and Italy are at the bottom.

FIGURE 7. The DESI Connectivity Indicators in 2016



Source: European Commission

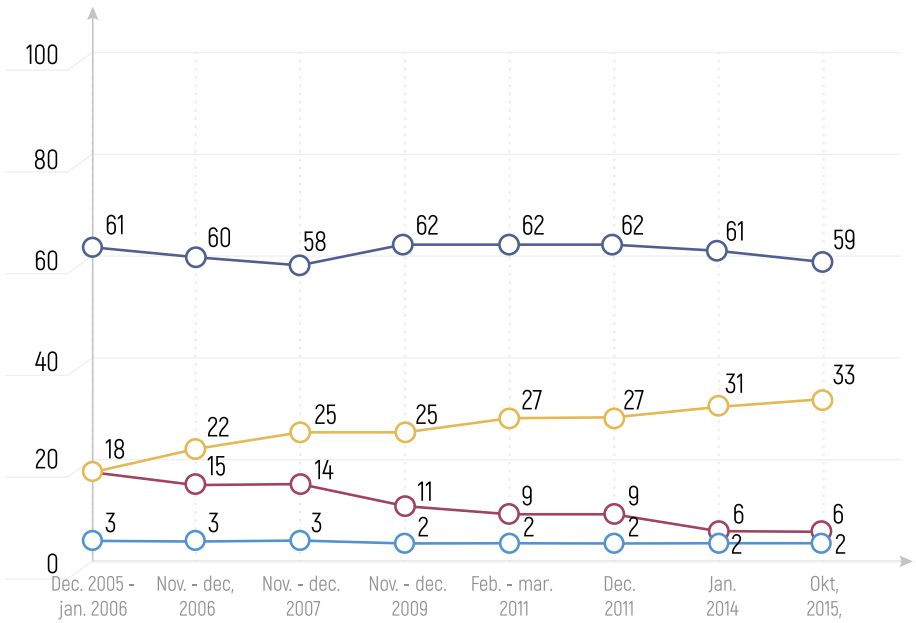
SERVICE USERS

According to Eurobarometer survey, 65% of households in the 28 EU countries have a fixed-line, however the number of subscribers varies drastically between the member countries. Malta is the only country where over 90% of households have a fixed-line (93%). Germany, Luxemburg and the Netherlands follow with 85%, whereas there are only 13% of households with fixed-line in Finland and 14% in the Check Republic. This rather significant difference can be explained by the fast development of mobile networks that are replacing fixed networks.

The number of mobile users in the EU exceeds by far the number of fixed connections, since 93% of households have a mobile phone. There is a ubiquitous mobile access in Finland and Sweden (99% of households), Denmark and Norway (98% of households). In other European countries, more than 90% of households have a mobile phone, except for Bulgaria and Greece where the rate is 88%.

Mobile Internet access rate, in terms of the number of households, is highest in Denmark (91%), The Netherlands and Sweden (90%). In all countries at least 6 out of 10 households are using mobile Internet.

FIGURE 8. Telephone service access in 2016 (% in the EU)



- Households combining a fixed and mobile telephone access
- Households having a mobile telephone access but no fixed telephone access
- Households having a fixed telephone access but no mobile telephone access
- Households not having fixed telephone access nor mobile telephone access

Source: Eurobarometer

Over the past 10 years, the way the fixed phone is used has changed significantly, hence in most EU countries less than 40% of subscribers are using fixed phone on a regular basis. The fixed phone is used the most in Greece where 69% of subscribers are making and receiving calls daily, and it is the least used in Finland where only 4% of subscribers are using it on a daily basis.

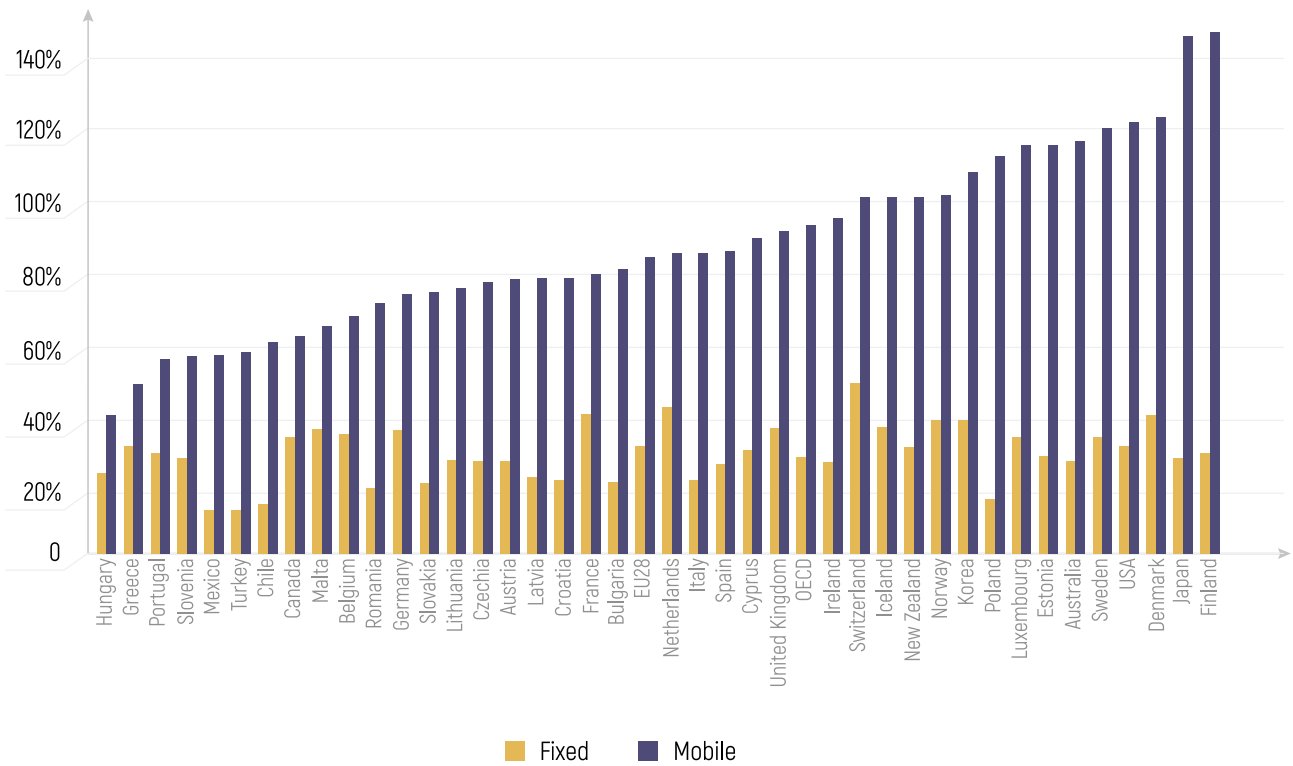
As for mobile telephony, it is noteworthy that an increasing number of users in the EU are using mobile phone for activities other than traditional electronic communication services. According to Eurobarometer survey, there are 69% of users in Sweden, 60% in Denmark and 55% in the UK using at least one of the following paid services on a regular basis: VoIP apps, music services, online video, cloud storage and digital books and newspaper access.

BROADBAND

The number of fixed broadband subscribers in the EU countries is constantly growing. The total number of connections grew by 3.7% compared with the previous year, amounting to 166.6 million in July 2016, which means there were 32.7 subscribers per 100 inhabitants. The average annual growth over the past 5 years was 5.1%. The highest broadband penetration rate is seen in The Netherlands, Denmark and France, and in Switzerland among the OECD countries. The biggest growth was seen in Portugal, Greece and Malta.

Considering the growing number of users accessing the Internet over the mobile phones, mobile broadband is the fastest growing segment in the mobile network service market. In July 2016, almost 84% of the EU population was using mobile Internet, which is by 8% more than the previous year and by 49% more than in 2012. In the EU, Poland, Estonia and Luxemburg have more than 100 users per 100 inhabitants, whereas the penetration rate in Hungary and Greece is still below 50%. The OECD average rate of approximately 95.1% is higher the EU average, owing to the high penetration rates in the USA, Japan, Australia, New Zealand and the Republic of Korea. According to the Eurostat data, the number of people connecting to the Internet over mobile phone reached 56% in 2016 in the EU countries, while at least 8 out of 10 persons in The Netherlands, UK, Sweden and Denmark are using mobile phone for the Internet access.

FIGURE 9. Broadband penetration rate (number of subscribers per 100 inhabitants) in July 2016

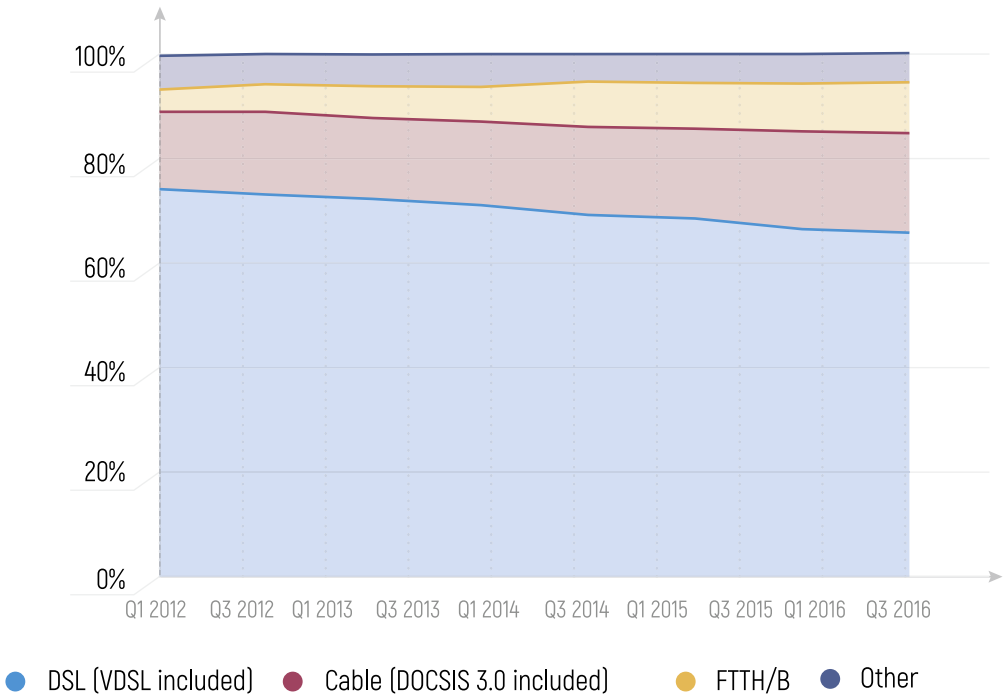


Note: Data for Switzerland and the USA are based on estimates.

Source: European Commission and OECD

There have been changes in the fixed broadband in the period from 2012 to 2016. DSL technology is still dominant in the EU, regardless of a -7.9% drop seen in the past 4 years. The users are largely switching to NGA services. The share of FTTH/B in the total number of subscribers in 2016 was 10.7%, compared to 4.65 in 2012, whereas the number of cable access subscribers increased from 17.2% in 2012 to 19.1% in 2016.

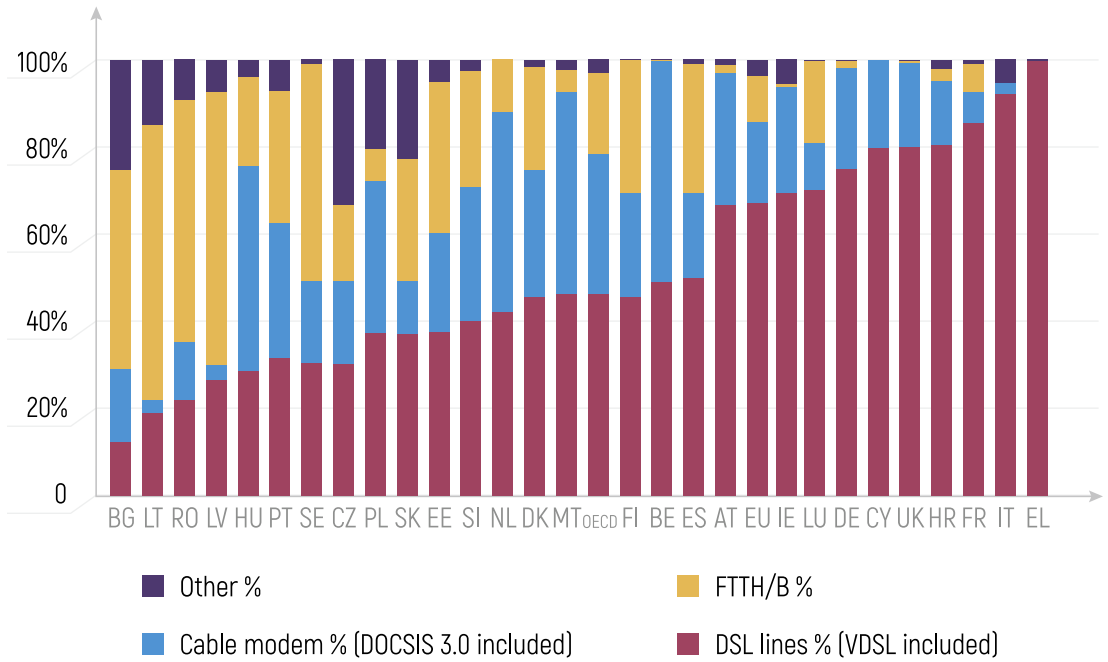
FIGURE 10. Distribution of fixed broadband subscribers in the EU by access technology



Source: European Commission

Significant differences can be seen in Figure 11 concerning the usage of different types of broadband access in Europe. FTTH/B is the main type of access in Latvia, Lithuania, Bulgaria, Sweden and Romania, whereas in Belgium, Hungary, The Netherlands and Malta, the dominant access technology are cable distribution networks. The dominant access technology in the OECD countries is DSL, although with a lower percentage compared with the EU, whereas the share of fibre-optic networks in the total number of subscribers was 19% in 2016.

FIGURE 11. Distribution of fixed broadband subscribers by the EU countries (July 2016)



Note: OECD data are from December 2015.

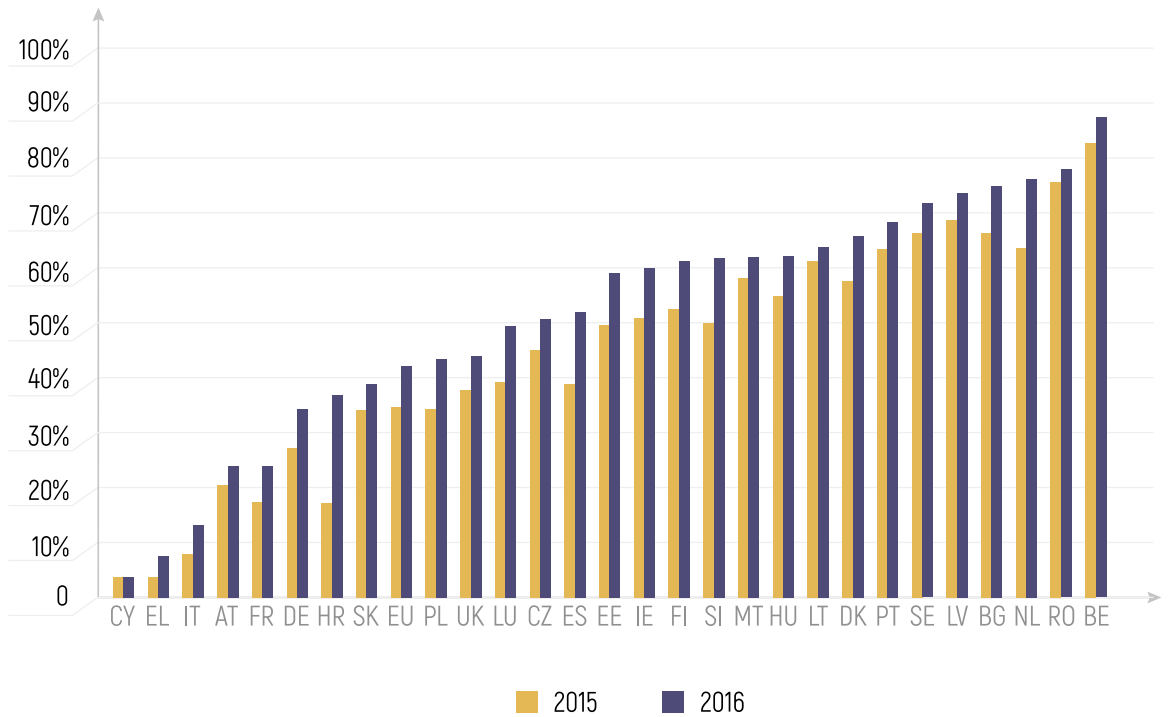
Source: European Commission and OECD

In the past 5 years there has been a particular stress on the NGA development in the EU countries. The NGA coverage has been increased from 48% in 2011 to 71% in 2015, however significant differences can be noted between countries in the level of the development, as well as in the subscriber penetration rates.

Annual growth of broadband connections was 4% in the period 2012-2016, however the demand for NGA connections is growing 10 times faster and equals 40% on an annual level. NGA penetration rate grew by 6.9% compared with the previous year, accounting for 42% of all broadband connections in the EU in 2016.

In 2016, there were 37% of subscribers with speeds of at least 30 Mb/s in the EU, and 15% with speeds of at least 100Mb/s.

FIGURE 12. NGA share in the total number of fixed broadband subscribers

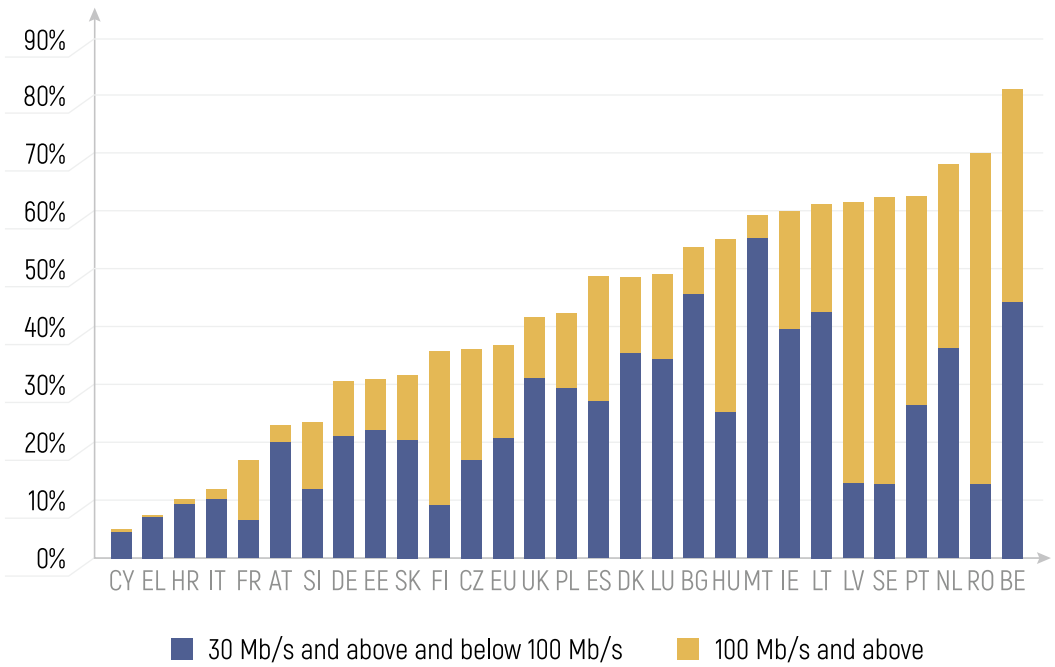


Note: NGA includes FTTH, FTTB, VDSL, Cable Docsis 3.0 and other.

Source: European Commission

In Belgium, Romania, The Netherlands, Portugal, Sweden, Latvia and Lithuania, there are more than 60% of users with the Internet access of at least 30 Mb/s, whereas less than 10% of users in Greece and Cyprus have the same speed. The leaders in turns of ultra high-speed Internet (100 Mb/s and higher) are Sweden and Romania, where more than 50% of users have access to this speed.

FIGURE 13. Percentage of high-speed internet by countries



Source: European Commission

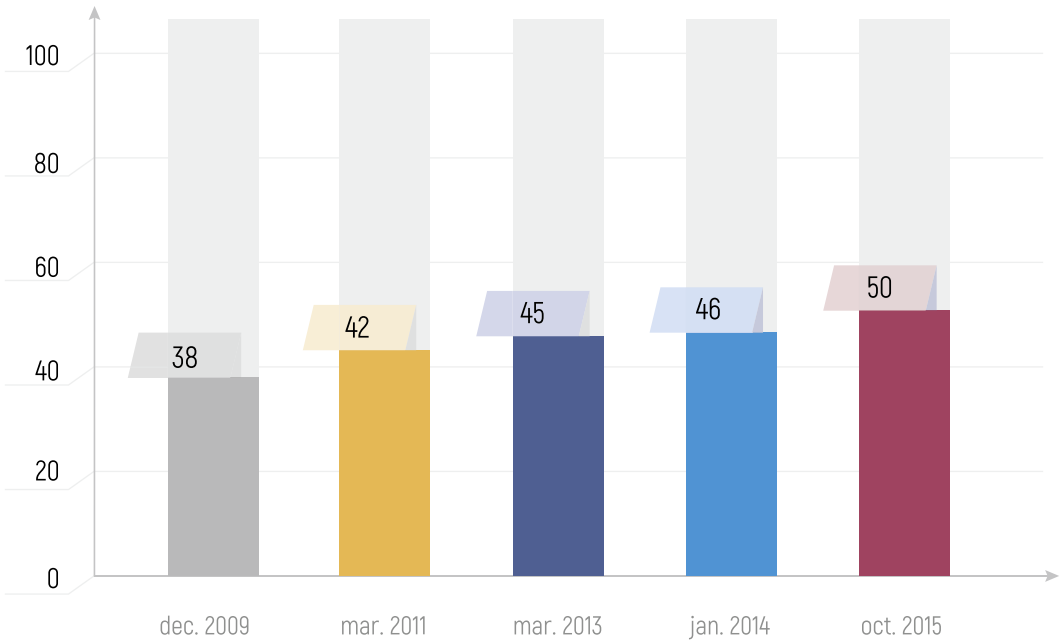
With the increasing the mobile network coverage and greater availability and affordability of mobile phones, the mobile operators have compensated for nearly all advantages of the fixed service operators. Globally, the number of users accessing the Internet via mobile devices is more than 2.5 billion, and it is expected to reach 3.8 billion by 2020. In July 2016 almost 84% of the EU population were using mobile Internet, which is an 8% growth year-on-year, and 49% more than 4 years before.

4G is expected to become the dominant technology in Europe, making up 58% of the mobile networks by 2020. In 2015, the average European use was 1.8 GB for data transmission a month and it is expected that the monthly amount will reach 12 GB by 2020.

BUNDLED SERVICES

According to Eurobarometer data, the percentage of bundled service users in terms of number of households has grown significantly over the past few years, from 38% in 2009 to 50% in 2015.

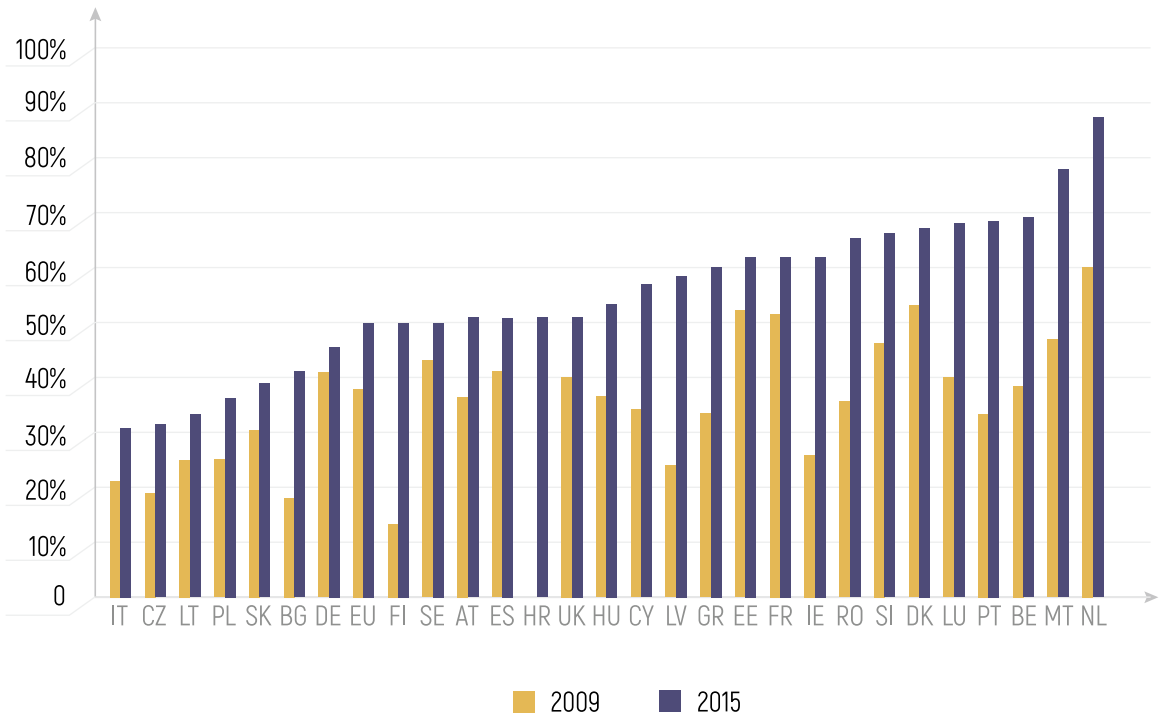
FIGURE 14. The number of bundled service users per 100 households



Source: Eurobarometer

At the end of 2015, 87% of households in the Netherlands and 78% in Malta had a bundle service subscription.

FIGURE 15. Percentage of households with a bundle service subscription (2009 and 2015)

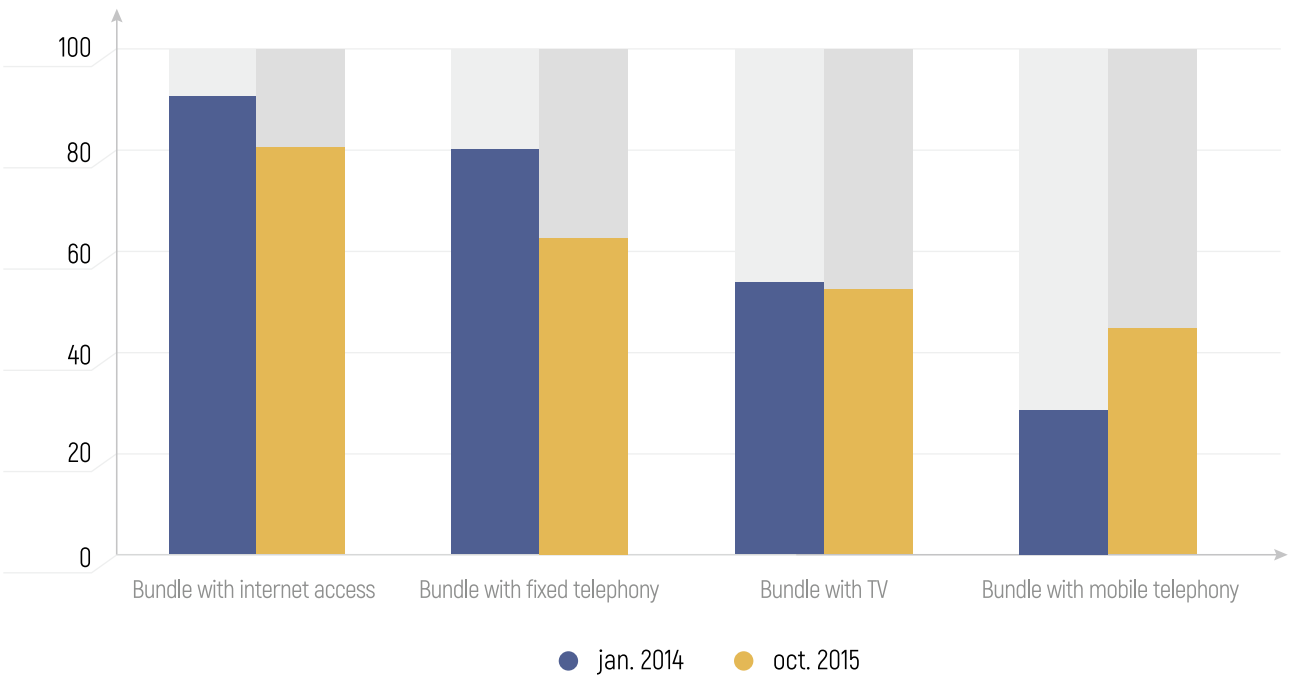


Source: Eurobarometer

The sales of electronic communication services within packages offering 2, 3 or 4 services is growing in the European countries, both due to larger convergence of fixed and mobile networks and due to benefits offered with the subscription. In 2009, most popular were the bundles of two services, whereas in 2015 the average number of services in a bundle was 2.5 and the 5 best sellers were triple-play and quad-play packages.

80% of packages included Internet access (via fixed or mobile network), 75% of them included fixed telephony and TV was a part of 53% of packages. The percentage of packages that also included mobile telephony increased from 29% in January 2014 to 45% in October 2015. This is one of the best indicators of a gradual market convergence of mobile telephony and services provided over the fixed networks.

FIGURE 16. The percentage of packages with a particular type of service



Source: Eurobarometer

The offer of electronic communication services is directed toward greater integration with other contents, therefore, telecom service packages often include entertaining content (e.g. music streaming, online games), communication services (messaging apps, social networks), different software (e.g. antivirus) or cloud storage.

According to a study conducted by Global Industry Analysts, the revenues from additional content are expected to exceed 600 billion euros by 2018, mainly due to increased usage of smartphones, and also due to the development of mobile networks and the changes in user habits. Since telecom operators are facing a further decrease in the revenues made from voice traffic, more additional content is expected to be included in the packages, in order to increase competition, attract new users ad keep the old ones. A survey made by Ovum consulting company showed that additional content is usually offered together with the mobile phone services (70%). An increased offer of additional content can be expected along with mixed fixed/mobile service packages, since the possibility of using additional services promotes a greater demand for accessing the services over different devices.

03 ICT DEVELOPMENT INDEX

With the aim of measuring and monitoring the development of information society and determining the digital divide among UN Member States, the International Telecommunication Union (ITU) publishes the indicators of ICT development on a regular basis. The indicators are obtained on the basis of a representative sample of the households and population. The list of core indicators for households and individuals in the Republic of Serbia for 2016 are given in Table 4 below. The indicators are presented according to the ITU Manual for Measuring ICT Access and Use by Households and Individuals, published in 2014, which defines the key parameters and the methodology for data collection and analysis. In 2016, ITU included three additional indicators (HH17, HH18 i HH19) to those given in the mentioned Manual, which are an integral part of the table below.

Table 4. ICT development indicators

	INDICATOR	DEFINITION	2016
HH1	Proportion of households with a radio	*This is the proportion of households that have a radio.* A radio is defined as a device capable of receiving broadcast radio signals, using common frequencies, such as FM, AM, LW and SW. A radio may be a stand-alone device, or it may be integrated with another device, such as an alarm clock, an audio player, a mobile telephone or a computer.	**75.7%**
HH2	Proportion of households with a TV	*This is the proportion of households that have a television (TV).* A television (TV) is a device capable of receiving broadcast television signals, using popular access means such as over-the-air, cable and satellite. A television set is typically a standalone device, but it may also be integrated with another device, such as a computer or a mobile telephone.	**97.8%**

	INDICATOR	DEFINITION	2016.
HH3	Proportion of households with telephone	*This is the proportion of households that have a telephone.*	
	Proportion of households with fixed telephone	A fixed telephone line refers to a telephone line connecting a customer's terminal equipment (e.g. telephone set, facsimile machine) to the public switched telephone network (PSTN) and which has a dedicated port on a telephone exchange. This term is synonymous with the terms main station or Direct Exchange Line (DEL) that are commonly used in telecommunication documents. It may not be the same as an access line or a subscription.	81.2%
	Proportion of households with mobile cellular telephone	A mobile (cellular) telephone refers to a portable telephone subscribing to a public mobile telephone service using cellular technology, which provides access to the PSTN. This includes analogue and digital cellular systems and technologies such as IMT-2000 (3G) and IMT-Advanced. Users of both postpaid subscriptions and prepaid accounts are included.	n/a
HH4	Proportion of households with a computer	*The proportion of households with a computer* A computer refers to a desktop computer, a laptop (portable) computer or a tablet (or similar handheld computer). It does not include equipment with some embedded computing abilities, such as smart TV sets, and devices with telephony as their primary function, such as smartphones.	65.8%
HH5	Proportion of individuals using a computer	*This is the proportion of individuals who used a computer from any location in the last three months.* A computer refers to a desktop computer, a laptop (portable) computer or a tablet (or similar handheld computer). It does not include equipment with some embedded computing abilities, such as smart TV sets, and devices with telephony as their primary function, such as smartphones.	67.2%
HH6	Proportion of households with Internet	*This is the proportion of households with Internet access at home.* The Internet is a worldwide public computer network. It provides access to a number of communication services including the World Wide Web and carries e-mail, news, entertainment and data files, irrespective of the device used (not assumed to be only via a computer – it may also be by mobile telephone, tablet, PDA, games machine, digital TV etc.). Access can be via a fixed or mobile network.	64,7%

	INDICATOR	DEFINITION	2016.
HH7	Proportion of individuals using the Internet	*The proportion of individuals who used the Internet* is calculated by dividing the total number of in-scope individuals who used the Internet (from any location) in the last 12 months by the total number of in-scope individuals. The *Internet* is a world-wide public computer network. It provides access to a number of communication services including the World Wide Web and carries e-mail, news, entertainment and data files, irrespective of the device used (not assumed to be only via a computer – it may also be by mobile phone, PDA, games machine, digital TV etc.). Access can be via a fixed or mobile network.	67,1%
HH8	Proportion of individuals using the Internet, by location	*This is the proportion of individuals who used the Internet from specified locations in the last three months.*	
	Home		97.5%
	Work	Where a person's workplace is located at his/her home, then he/she would answer yes to the home category only.	34.3%
	Place of education	Applies only to students – teachers and others who work at a place of education would report 'work' as the place of Internet use; where a place of education is also made available as a location for general community Internet use, such use should be reported in the Community Internet access facility category.	14,6%
	Another person's home	The home of a friend, relative or neighbour.	29.8%
	Community Internet access facility (typically free of charge)	Internet use at community facilities such as public libraries, publicly provided Internet kiosks, non-commercial telecentres, digital community centres, post offices, other government agencies; access is typically free and available to the general public.	7.6%
	Commercial Internet access facility (typically not free of charge)	Internet use at publicly available commercial facilities such as Internet or cybercafés, hotels, airports etc., where access is typically paid for.	24.1%
HH9	Proportion of individuals using the Internet, by type of activity	This is the proportion of individuals who undertook one or more activities using the Internet for private (defined as non-work) purposes from any location in the last three months.	
	Getting information about goods or services		71.3%
	Seeking health information (on injury, disease, nutrition etc.).	Includes information on injury, disease, nutrition and improving health generally.	71.7%

	INDICATOR	DEFINITION	2016.
	Making an appointment with a health practitioner via a website		7.9%
	Getting information from general government organizations	*General government organizations* should be consistent with the SNA93 (2008 revision) concept of general government. According to the SNA "... the principal functions of government are to assume responsibility for the provision of goods and services to the community or to individual households and to finance their provision out of taxation or other incomes; to redistribute income and wealth by means of transfers; and to engage in non-market production." (General) government organizations include central, state and local government units.	34,8%
	Interacting with general government organizations	Includes downloading/requesting forms, completing/lodging forms on line, making online payments and purchasing from government organizations, etc.	42.2%
	Sending or receiving e-mail		58.2%
HH9	Telephoning over the Internet/VoIP	Using Skype, iTalk, etc.; includes video calls via webcam.	60.2%
	Participating in social networks	Creating user profile, posting messages or other contributions to Facebook, Twitter etc.).	68.7%
	Access to chat sites, blogs, newsgroups or online discussions		27.7%
	Purchasing or ordering goods or services	Purchase orders placed via the Internet whether or not payment was made online; excludes orders that were cancelled or not completed; includes purchasing of products such as music, travel and accommodation via the Internet).	26.3%
	Selling goods or services		27.4%
	Using services related to travel or travel-related accommodation		37%

	INDICATOR	DEFINITION	2016.
	Internet banking	Includes electronic transactions with a bank for payment, transfers, etc. or for looking up account information. Excludes electronic transactions via the Internet for other types of financial services such as share purchases, financial services and insurance.	12.9%
	Doing a formal online course (in any subject)		10.0%
	Searching information for learning purposes	Consulting wikis (Wikipedia etc.), online encyclopaedias or other websites for formal learning purposes	67.0%
	Listening to web radio	Listening to web radio (either paid or free of charge)	71.1%
	Watching web television	Watching web TV (either paid or free of charge)	29.5%
HH9	Playing or downloading video games or computer games	Includes file sharing games and playing games on line, either paid or free of charge.	44.6%
	Reading or downloading on-line newspapers or magazines, electronic books	Includes accessing news websites, either paid or free of charge. Includes subscriptions to online news services.	77.4%
	Uploading self/user-created content to a website to be shared	Text, images, photos, videos, music, software, etc.	43.5%
	Blogging	Maintaining or adding contents to a blog	7.5%
	Using storage space on the Internet	Using storage space on the Internet to save documents, pictures, music, video or other files (e.g. Google Drive, Dropbox, Windows Skydrive, iCloud, Amazon Cloud Drive)	19.4%
	Other		24.2%
HH10	Proportion of individuals using a mobile cellular telephone	This is the proportion of individuals who used a mobile telephone in the last three months. A *mobile cellular telephone* refers to a portable telephone subscribing to a public mobile telephone service using cellular technology, which provides access to the PSTN. This includes analogue and digital cellular systems, as well as IMT-2000 (3G). Users of both postpaid subscriptions and prepaid accounts are included.	91.8%

	INDICATOR	DEFINITION	2016.
	Proportion of households with Internet, by type of service		
HH11	*Narrowband*	*Narrowband includes analogue modem (dial-up via standard phone line), ISDN (Integrated Services Digital Network), DSL at speeds below 256 kbit/s, and mobile phone and other forms of access with an advertised download speed of less than 256 kbit/s.* Note that narrowband mobile phone access services include CDMA 1x (Release 0), GPRS, WAP and *i-mode*.	**<1%**
	Fixed broadband	*Fixed broadband refers to technologies at speeds of at least 256 kbit/s, in one or both directions, such as DSL (Digital Subscriber Line), cable modem, high-speed leased lines, fibre-to-the-home, powerline, satellite, fixed wireless, Wireless Local Area Network and WiMAX.*	**90.8%**
	Mobile broadband	*Mobile broadband refers to technologies at speeds of at least 256 kbit/s in one or both directions, such us Wideband CDMA (W-CDMA), known as Universal Mobile Telecommunications System (UMTS) in Europe; Highspeed Downlink Packet Access (HSDPA), complemented by High-Speed Uplink Packet Access (HSUPA); CDMA2000 1xEV-DO and CDMA 2000 1xEV-DV. Access can be via any device (handheld computer, laptop or mobile cellular telephone etc.).*	**46.6%**
HH12	Proportion of individuals using the Internet, by frequency	This is the frequency of Internet use by individuals who used the Internet from any location in the last three months.	
	At least once a day	Once a working day for respondents who only (or most frequently) use the Internet from work or from school.	**85.9 %**
	At least once a week but not every day		**11.4 %**
	Less than once a week		**2.7 %**
HH13	Proportion of households with multichannel television, by type	*This is the proportion of households with multichannel television (TV) and by type of multichannel service.*	
	Cable TV (CATV)		**5.1%**
	Direct-to-home (DTH) satellite services		**57.3%**
	Digital terrestrial TV (DTT)		**37.5%**
HH14	Barriers to household Internet access		**n/a**

	INDICATOR	DEFINITION	2016.
	Individuals with ICT skills, by type of skills		
	Copying or moving a file or folder		92.0%
	Using Word text processing software		69.9%
	Using a spreadsheet program		50.3%
	Installing and configuring software		68.0%
HH15	Creating electronic presentations with presentation software (including text, images, sound, video or charts)		42.9%
	Transferring files between a computer and other devices		86.3%
	Writing a computer program using a specialized programming language		9.4%
HH16	Household expenditure on ICT	This measures the percentage of total household expenditure that is expended on ICT (telephone and telefax equipment, telephone and telefax services, equipment for the reception, recording and reproduction of sound and picture, information processing equipment, Repair of audio-visual, photo-graphic and information processing equipment, etc.)	n/a
	Proportion of individuals using the Internet, by type of portable device and network used to access the Internet[4]	The Internet is a worldwide public computer network. It provides access to a number of communication services including the World Wide Web and carries e-mail, news, entertainment and data files, irrespective of the device used (not assumed to be only via a computer – it may also be by mobile telephone, tablet, PDA, games machine, digital TV etc.). Access can be via a fixed or mobile network. A portable device can be a mobile phone, tablet or a portable computer (such as laptop, notebook, netbook). The network used to access the Internet can be either via mobile cellular network or via other wireless networks (e.g. WiFi).	
HH17	Mobile phone (smartphone)		71.2%
	Mobile phone via WiFi		55.8%
	Mobile phone via GPRS or 3G network		51.0%
	Portable computer (laptop, notebook, netbook)		23.5%
	Laptop or tablet via WiFi		20.8%
	Laptop or tablet via USB modems or SIM card		6.1%
	Other devices		0.6%

4 Mobile device categories have been modified in respect to the ITU Manual.

	INDICATOR	DEFINITION	2016.
HH18	Proportion of individuals who own a mobile phone	An individual owns a mobile cellular phone if he/she has a mobile cellular phone device with at least one active SIM card for personal use. It includes mobile cellular phones supplied by employers that can be used for personal reasons (to make personal calls, access the Internet, etc.) and those who have a mobile phone for personal use that is not registered under his/her name. It excludes individuals who have only active SIM card(s) and not a mobile phone device.	91.8%
HH19	Proportion of individuals not using the Internet, by type of reason	*This measures the barriers to Internet use by individuals.*	
		Do not need the Internet (not useful, not interesting)	17.8%
		Do not know how to use it	8.8%
		Cost of Internet use is too high (service charges, etc.)	8.3%
		Privacy or security concerns	0.5%
		Internet service is not available in the area	1.7%
		Cultural reasons (e.g. exposure to harmful content)	1.3%
		Don't know what Internet is	2.4%
		Not allowed to use the Internet	0.5%[5]
		Lack of local content	3.0%[5]
		Other reasons	0.7%

Source: The Statistical Office of Serbia, RATEL

The ICT Development Index (IDI), which has been published annually since 2009 by the International Telecommunication Union (ITU), for the purposes of measuring the development of information society, is used to monitor the developments in information and communication technology. The main objectives of the IDI are to measure:

- the level and evolution over time of ICT market;
- progress in ICT development in both developed and developing countries;
- the digital divide, i.e. differences between countries in terms of their levels of ICT development; and
- the development potential of ICTs.

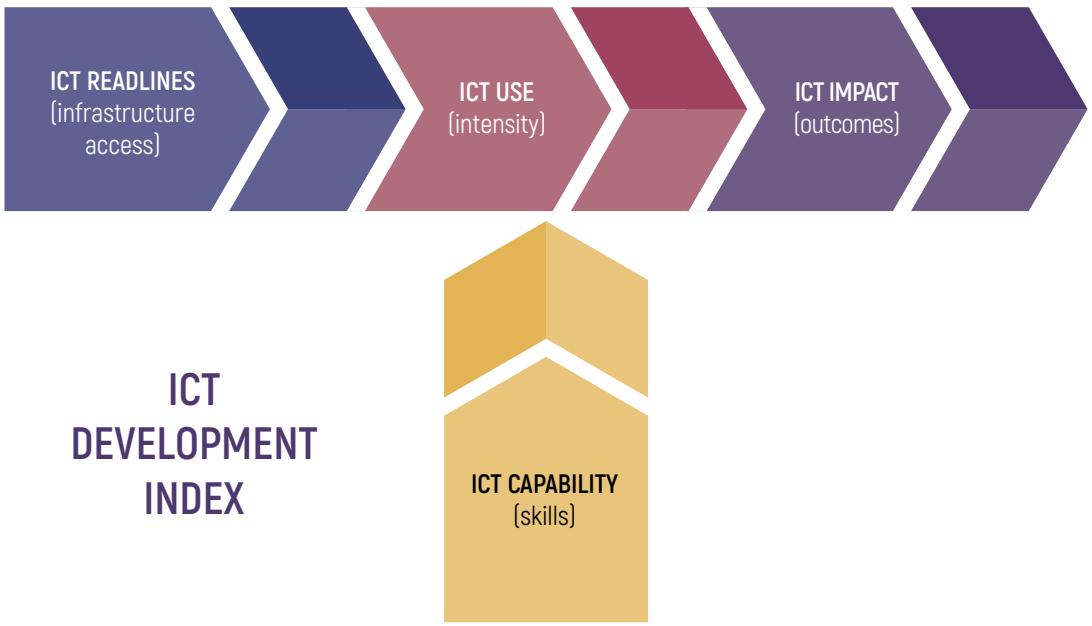
IDI includes 11 indicators divided into the following 3 sub-indices:

1. ICT infrastructure and access
2. ICT use
3. ICT impact (outcomes of an efficient ICT use).

5 Last available data.

Given the fact that these three sub-groups of ICT development cannot be monitored by means of a single index, there is a necessity for the establishment of a single composite index for monitoring the development of information society in each country. Infrastructure, developed to meet the needs of end-users as well as an appropriate level of education, act as prerequisites for the use of ICTs and evolution towards an information society (Figure 17).

FIGURE 17. IDI Index Structure



Source: Measuring the Information Society - The ICT Development Index, ITU

According to ITU survey, the best ranked country in 2016 is the Republic Korea with IDI value of 8.84 (in theory the range is 0 to 10). It is followed by Island and Denmark, whereas Nigeria is at the bottom of the list with 1.07. The average IDI value calculated for all 175 countries in the world was 4.94.

The list of 11 indicators is given in Table 5 below, along with reference (normalized) values prescribed by the ITU, sub-indices value and IDI Index value for the Republic of Serbia in 2016. The values of the sub-indices were calculated by normalizing the 11 indicators by means of reference values. The final value of IDI Index is calculated as a sum of sub-indices multiplied by weight coefficients. The ICT Access and ICT use sub-indices are given 40% weight each, whereas the skill sub-index is given 20% weight.

Table 5. 2016 IDI for the Republic of Serbia

	INDICATOR	ITU IDEAL VALUE	VALUE FOR SERBIA IN 2016
ICT Access			
a	Fixed telephone lines per 100 inhabitants	*60*	39.07
b	Mobile cellular telephone subscriptions per 100 inhabitants	*120*	128.52
c	International Internet bandwidth per Internet user	962 216	193.202
d	Proportion of households with a computer	100	65.80
e	Proportion of households with Internet access at home	100	64.70
ICT Use			
f	Internet users per 100 inhabitants	*100*	67.10
g	Fixed broadband Internet subscriptions per 100 inhabitants	*60*	23.94
h	Mobile broadband subscriptions per 100 inhabitants	100	71.85
ICT Skills			
i	Adult literacy rate	*100*	10.82*
j	Secondary gross enrolment ratio	*100*	88.20
k	Tertiary gross enrolment ratio	100	48.40

	INDICATOR	ITU IDEAL VALUE	VALUE FOR SERBIA IN 2016
ICT Access – Normalized values		**Formula**	
z1	Fixed telephone lines per 100 inhabitants	*a/60*	0.65
z2	Mobile cellular telephone subscriptions per 100 inhabitants	*b/120*	1.07
z3	International Internet bandwidth per Internet user	log(c)/5.98	0.88
z4	Proportion of households with a computer	d/100	0.66
z5	Proportion of households with Internet access at home	e/100	0.65
ICT Use – Normalized values		**Formula**	
z6	Internet users per 100 inhabitants	*f/100*	0.67
z7	Fixed broadband Internet subscriptions per 100 inhabitants	*g/60*	0.40
z8	Mobile broadband subscriptions per 100 inhabitants	h/100	0.72
ICT Skills – Normalized values		**Formula**	
z9	Adult literacy rate	*i/100*	0.72
z10	Secondary gross enrolment ratio	*j/100*	0.88
z11	Tertiary gross enrolment ratio	k/100	0.48
L	**ICT Access – Sub-index**	y1+y2+y3+y4+y5	0.78
y1	Fixed telephone lines per 100 inhabitants	*z1*0.2*	0.13
y2	Mobile cellular telephone subscriptions per 100 inhabitants	*z2*0.2*	0.21
y3	International Internet bandwidth per Internet user	z3*0.2	0.18
y4	Proportion of households with a computer	z4*0.2	0.13
y5	Proportion of households with Internet access at home	z5*0.2	0.13

	INDICATOR	ITU IDEAL VALUE	VALUE FOR SERBIA IN 2016
M	**ICT Use – Sub-index**	**y6+y7+y8**	**0.59**
y6	Internet users per 100 inhabitants	*z6*0.33*	0.22
y7	Fixed broadband Internet subscriptions per 100 inhabitants	*z7*0.33*	0.13
y8	Mobile broadband subscriptions per 100 inhabitants	z8*0.33	0.24
N	**ICT Skills – Sub-index**	**y9+y10+y11**	**0.69**
y9	Average years of schooling	*z9*0.33*	0.24
y10	Secondary gross enrolment ratio	*z10*0.33*	0.29
y11	Tertiary gross enrolment ratio	z11*0.33	0.16
IDI	**ICT DEVELOPMENT INDEX**	**((L*0.4)+(M*0.4)+(N*0.2))*10**	**6.87**

*Due to changes in the methodology for IDI calculation, adult literacy rate indicator that had been previously used was replaced by average years of schooling. Therefore, ICT index can not be copmared with the values for the previous years. The table provides the last known value published by the UNESCO Institute for Statistics in 2013.

The value of IDI Index for the Republic of Serbia in 2016 is 6.87, which shows a growth trend compared with the previous year. The trend of IDI in the last 5 years is shown in Figure 18.

FIGURE 18. The trend of IDI for Serbia in the last 5 years

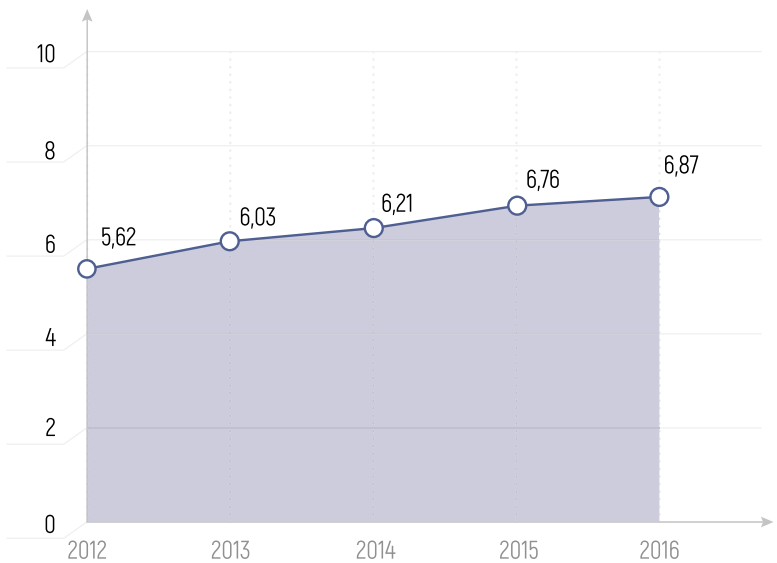
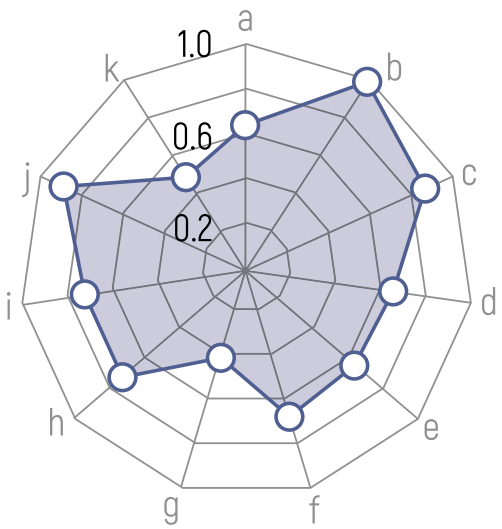


Figure 19 illustrates normalized values of 11 indicators with values ranging from 0 to 1, whereby 1 represents the maximum value of an indicator. The fact that ICT access indicators (a to e) have significantly higher values than ICT use indicators (f to h) is quite apparent and serves as an illustration of the disparity between the existing telecommunications infrastructure capacity and the use of such capacity in terms of telecommunications services transmitted by such infrastructure in Serbia, as is the case with the use of broadband Internet services. The value of ICT skills indicators (i to k) is satisfactory.

FIGURE 19. Graphical representation of 11 Indicators (normalized values)



Source: RATEL

04 PUBLIC FIXED TELECOMMUNICATIONS NETWORKS AND SERVICES

At the end of 2006, there were 30 operators registered for the public telephone service provision over fixed-line network.

The following operators are holders of the licence for public fixed telecommunications network and services:

- *Telecommunications Company "Telekom Srbija" Joint Stock. Co. holds a licence to build, own and operate a public fixed telecommunications network and provide public fixed telecommunications network services, issued in 2007, and a licence for public fixed wireless access (FWA) network in 411.875-418.125/ 421.875-428.125 MHz frequency bands and voice services, data transmission services and simultaneous voice and data transmission, issued on 17 June 2009;*
- *Orion telekom, Ltd., Belgrade, (previously Media Works, Ltd.), who was issued a licence for public fixed wireless access (FWA) network in 411.875-418.125/ 421.875-428.125 MHz frequency bands and voice services, data transmission services and simultaneous voice and data transmission, in 2009;*
- *Telenor, Ltd., Belgrade, holds a licence for public fixed telecommunications network and services, issued in 2010.*

Pursuant to Art. 149 of the Law on Electronic Communications, since 1 January 2012 the provision of public fixed telecommunications network and services has been under the general authorization regime. Hence, in addition to the above licence holders, in 2016 public voice service via fixed network was also provided by another 15 operators, whereas other operators who mainly registered in 2016 have not started with the service provision by the end of the year.

Telekom Srbija is still the largest active operator of the fixed telecommunications network, hence its business activities had the biggest impact of the fixed telephony market in 2016, both in financial and technical terms. In addition to the Serbian market, Telekom Srbija is also present in Republic of Srpska and Montenegro.

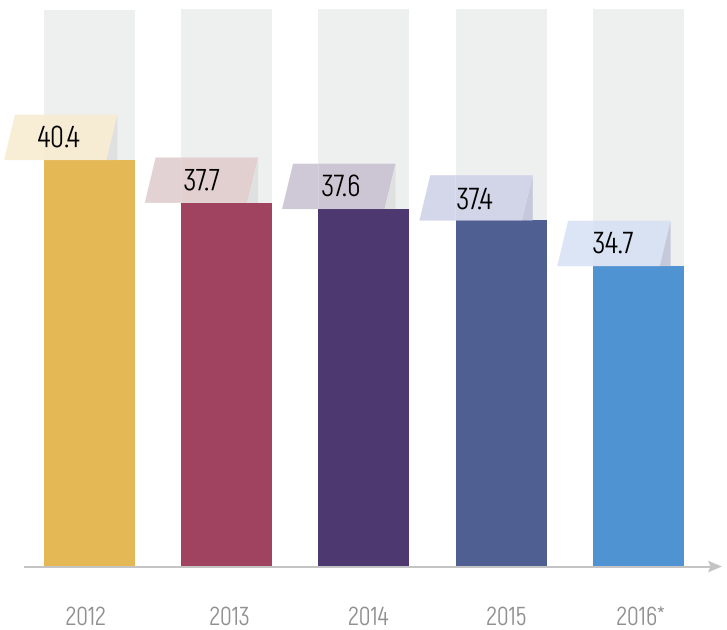
Following the public consultation procedure on the Report on the analysis of the wholesale market for call termination on the public telephone network, in December 2014 RATEL adopted the Decision designating SMP operators on the wholesale market for call termination on the public telephone network and imposing relevant obligations on the SMP operators. 13 operators registered for the provision of public voice service at the time were designated SMP operators in the relevant market.

Following the analysis of the retail market for public telephone network access on a fixed location, RATEL adopted the Decision designating Telekom Srbija a.d. as SMP operator in this market and imposing, *inter alia*, the obligation of price regulation for retail access service. Also in 2016, in the procedure of the analysis of the retail market for publically available telephone service from a fixed location RATEL applied the "3 criteria test" which showed a tendency for the competition to be developed in this market. Therefore, following the public consultation procedure, Decision amending the Decision on designating relevant markets was adopted, whereby the retail market for publically available telephone service from a fixed location is no longer susceptible to *ex-ante* regulation and, consequently, Telekom Srbija a.d. is no longer considered to be an SMP operator in this market.

Telekom Srbija provided services over public fixed telecommunications network and public fixed wireless (FWA) telecommunications network and the operator Orion telekom provided the services over FWA network. In 2016, in the operators' register kept by RATEL the number of public fixed wireless network stations of 294 remained the same (99 Orion telekom and 195 Telekom Srbija). In 2016 SBB increased the number of users of the public telephone service provided over its own public fixed telecommunications network. Also, there was a significant increase in the number of users of Sat-Trakt and I.KOM.

The total revenues from fixed telephone services provided by all operators in the territory of the Republic of Serbia in 2016 were by 7% lower compared to the previous year, amounting to 34.7 billion dinars, including the revenues made from VoIP services in the amount of 848 million dinars. The investments made in the fixed telephony services in 2016 amounted to approximatly 7.2 billion dinars, which is by 14% less compared with the previous year.

FIGURE 20. Revenues from fixed telecom network services (billion dinars)



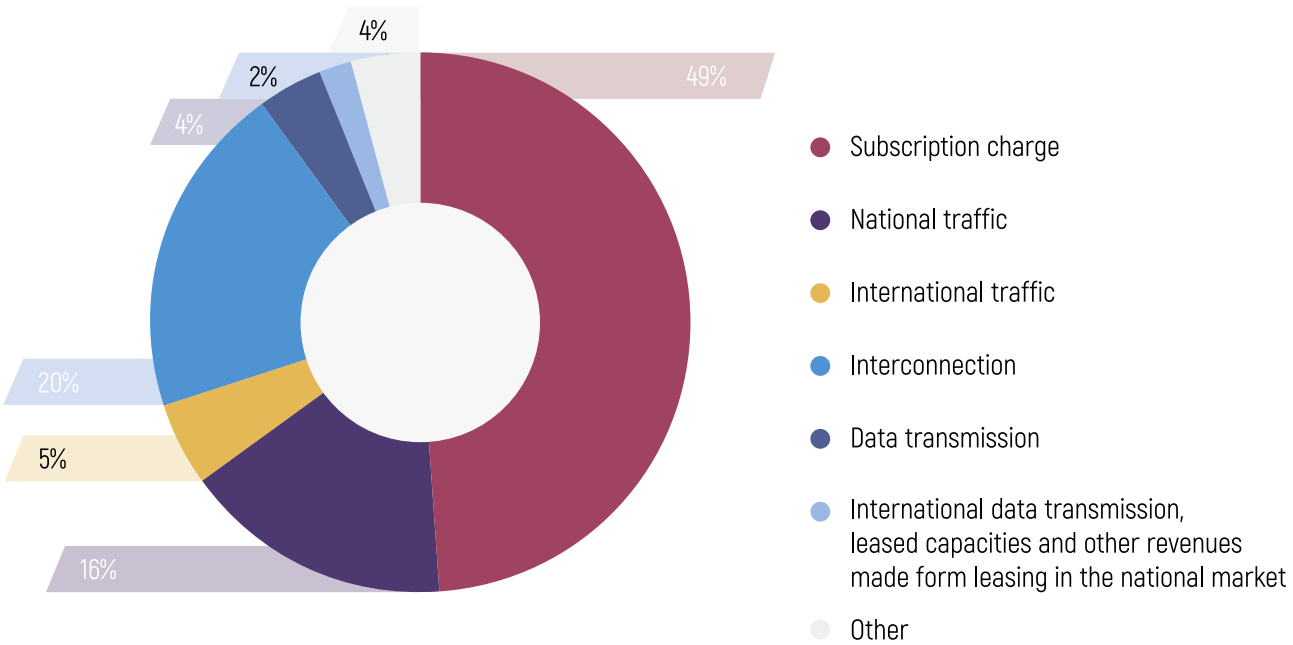
* In 2016, the revenues from fixed telecom network services do not include the revenues from leased lines.

Source: RATEL

Figure 21 provides an overview of the structure of revenues made from fixed telecom network. The largest share in the total revenues goes to the subscription charges in the amount of 16.6 billion dinars, accounting for almost one half of total fixed network service revenues in 2016. The revenues from the national and international traffic both dropped compared with the previous year, however their share in the total revenues remains roughly the same. Along with the decrease in the revenues from the national and international traffic, there was also a decrease in the number of subscribers and the number of minutes of the traffic made.

The revenues from interconnection in 2016 include the revenues from interconnection in the national and international traffic and account for 20% of the total revenues. The revenues from other services include the revenues made from connection, leased cable ducts, collocation, public payphones and other revenues made from public voice services.

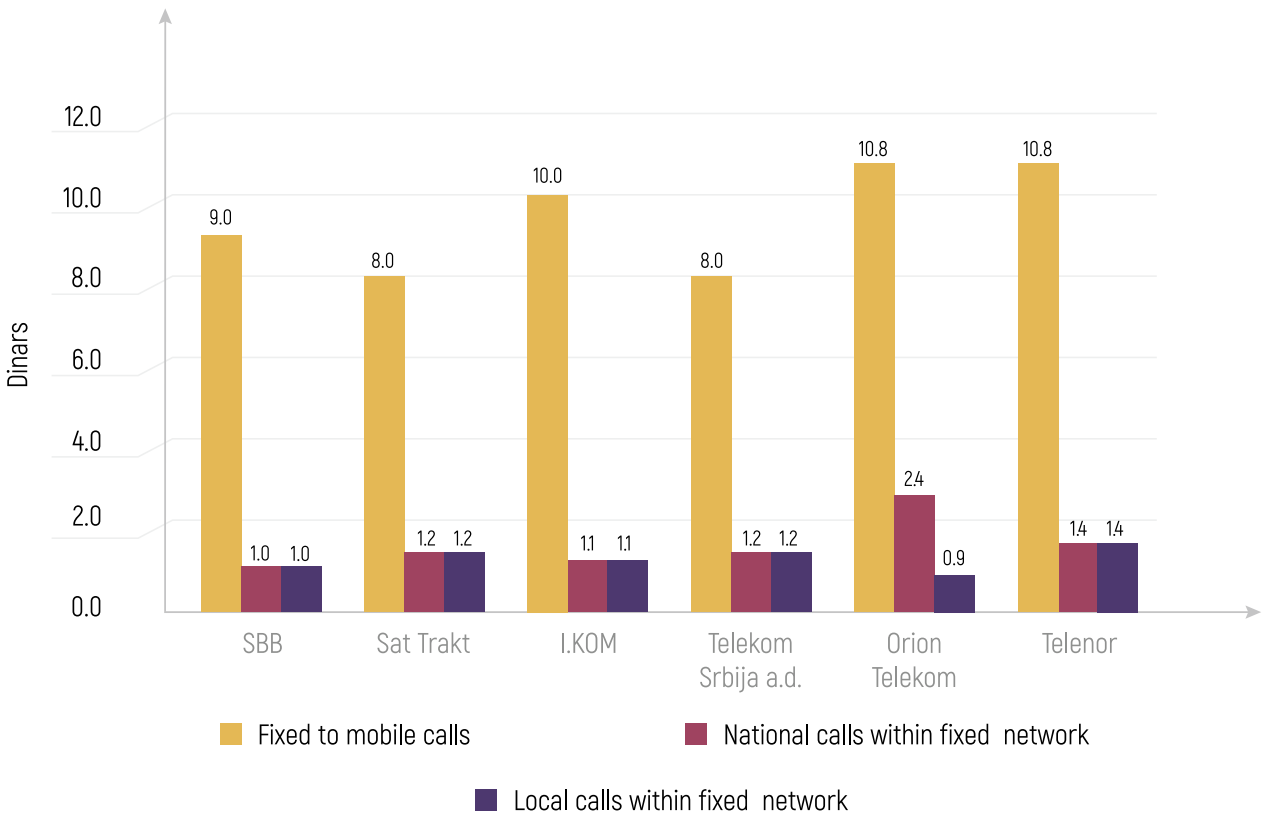
FIGURE 21. Structure of revenues from fixed telecom network in 2016



Source: RATEL

Per-minute rates for the local and national calls and for calls to mobile networks of the operators with the biggest number of subscribers are given in Figure 22. The rates ranged between 1 and 2.4 dinars per minute for the local and national calls, and between 8 and 10.8 dinars per minute for the calls made to mobile networks.

FIGURE 22. Local, national and fixed-to-mobile telephone service rates in 2016, VAT included (RSD/min)



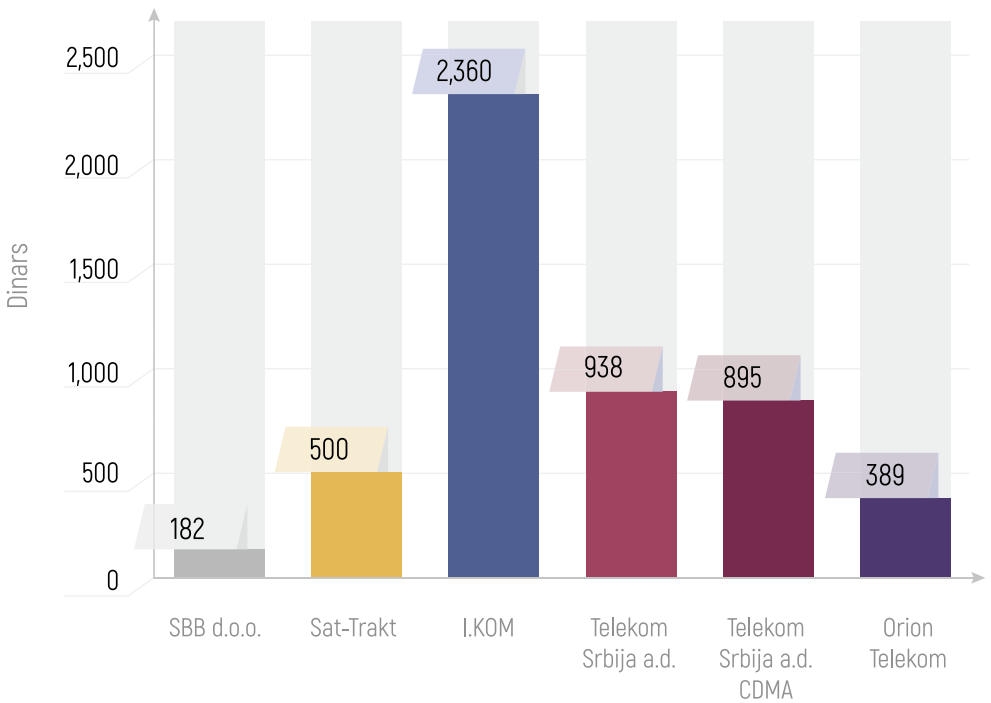
Source: RATEL

The rates for the international calls have not been significantly modified compared with the previous year. The information on the rates is available on the official websites of the operators.

The number of Telekom Srbija's residential users with monthly bills for fixed-line services ranging between 500 and 1,000 dinars continued to increase, amounting to 67% in 2015. On the other hand, the number of residential users paying less than 500 dinars in 2015 dropped to 3% of the total number of subscribers. The number of Telekom Srbija's users with bills ranging between 500 and 1,000 dinars continued to rise reaching around 67% in 2015. On the other hand, the number of residential users with bills under 500 dinars decreased, accounting for 3% of all residential users in 2015. There were 25% of residential users with monthly bills ranging between 1,000 and 2,000 dinars and 5% (same as previous year) with bills over 2000 dinars. SBB had a slightly different distribution: most subscribers (41%) paid for subscription and bills under 500 dinars, whereas 38% paid for bills ranging between 500 and 1,000 dinars. As for Orion Telekom, the majority of residential users (78%) paid between 500 and 1,000 per month. The distribution of residential users according to the monthly bill, for all three operators, is given in figure 24 below.

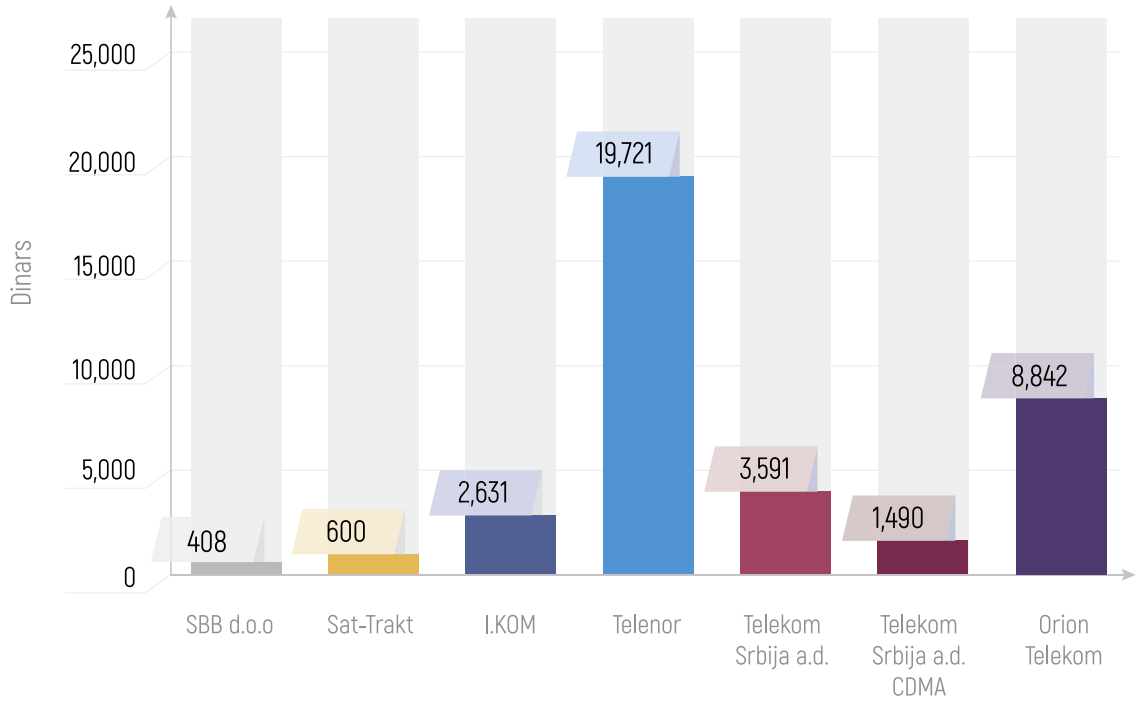
Average monthly bills charges by the operators with most users ranged between 182 and 2360 dinars for residential users and between 408 and 19721 dinars for business users. The average monthly bills charged to residential and business users are given in Figure 23 and 24.

FIGURE 23. The average monthly bills charged to residential users (in dinars)



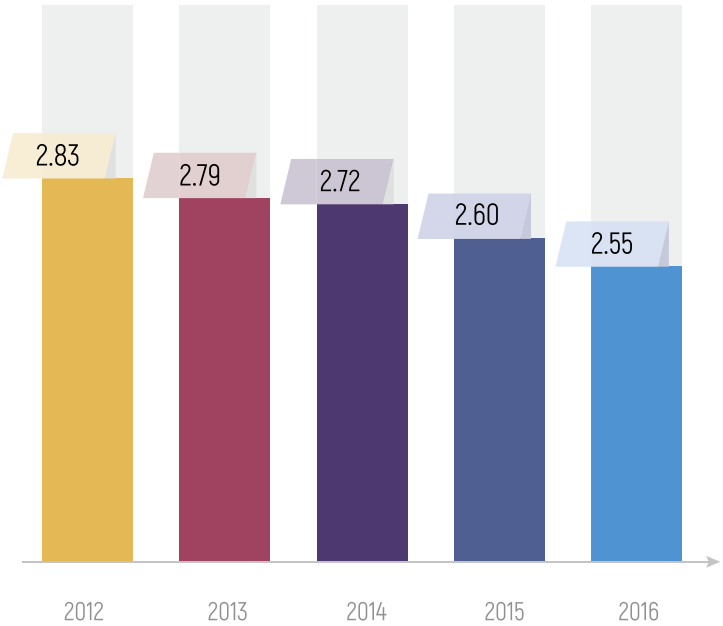
Source: RATEL

FIGURE 24. The average monthly bills charged to business users (in dinars)



Source: RATEL

FIGURE 25. Number of fixed line subscribers (million)



The number of users continued to decrease, amounting to 2.55 million at the end of 2016. Residential users are still dominant with 87% share in the total number of users. In 2016, the digitalization rate rose to 99.94% in Telekom Serbia's network, whereas all other operators have a 100% digitalization rate. The number of public payphones continued to decrease, amounting to 2,707 in 2016.

Source: RATEL

FIGURE 26. Share of residential and business users in the revenues made from subscription charge and traffic made

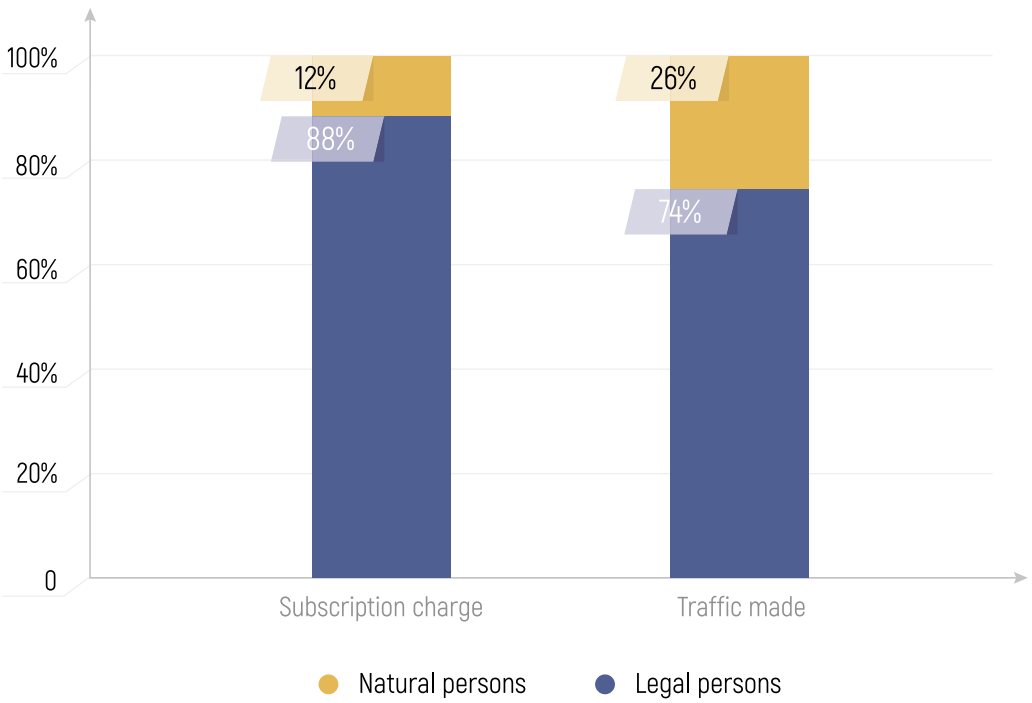
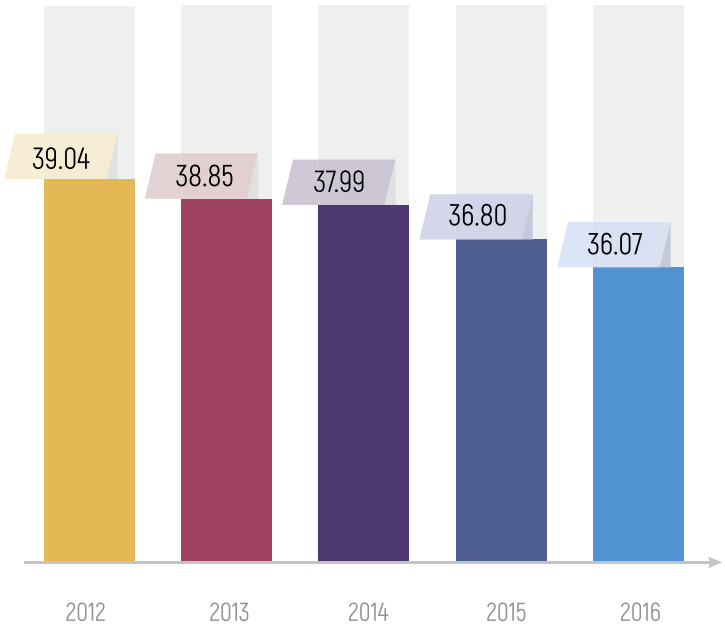


Figure 26 shows the share of natural and legal entities in the revenues from subscription charge and traffic made.

Source: RATEL

FIGURE 27. Fixed line penetration rate (%) - users



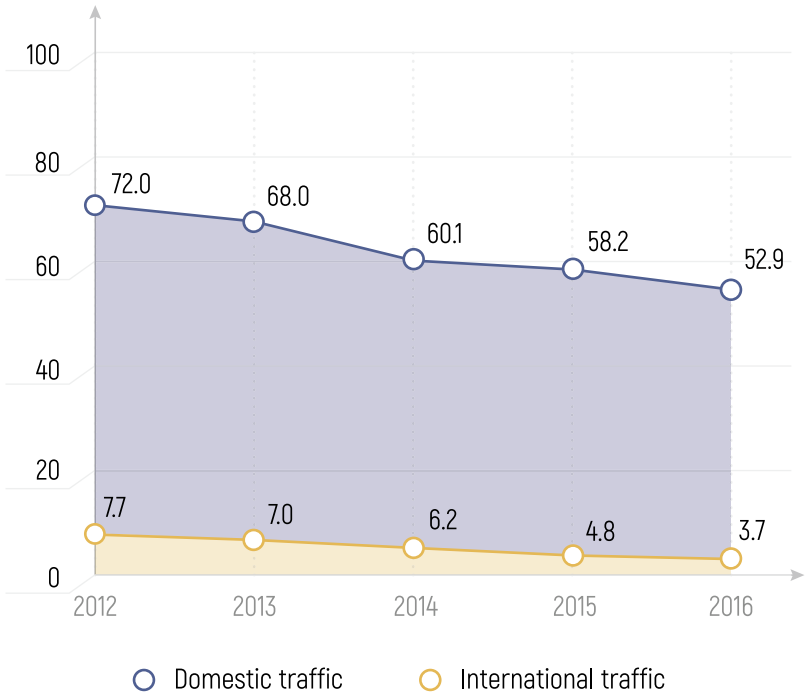
Fixed line penetration rate by the number of subscribers amounted to **36.07%** in 2016.

Source: RATEL

The number of ISDN subscribers in 2016 was 41 thousand, which is by 19% less year on year. 5% of ISDN subscribers have primary rate access, whereas other users have a basic rate access. As expected, ISDN connections are following a down-trend, due to technological migration of users to advanced IP-based technologies.

The total traffic over fixed network in 2016 decreased by approximatly 10% year on year, the national traffic being estimated to 5.3 billion of minutes and the international traffic to 374 million of minutes. As shown in Figure 13, the downward trend continued, mainly due to other types of services available. The biggest fall was seen in the international traffic, with 23% of minutes less than in the previous year, due to the increasing trend of using VoIP applications. The traffic made to other fixed networks was increased by 9% due to user fluctuation and migration to other networks.

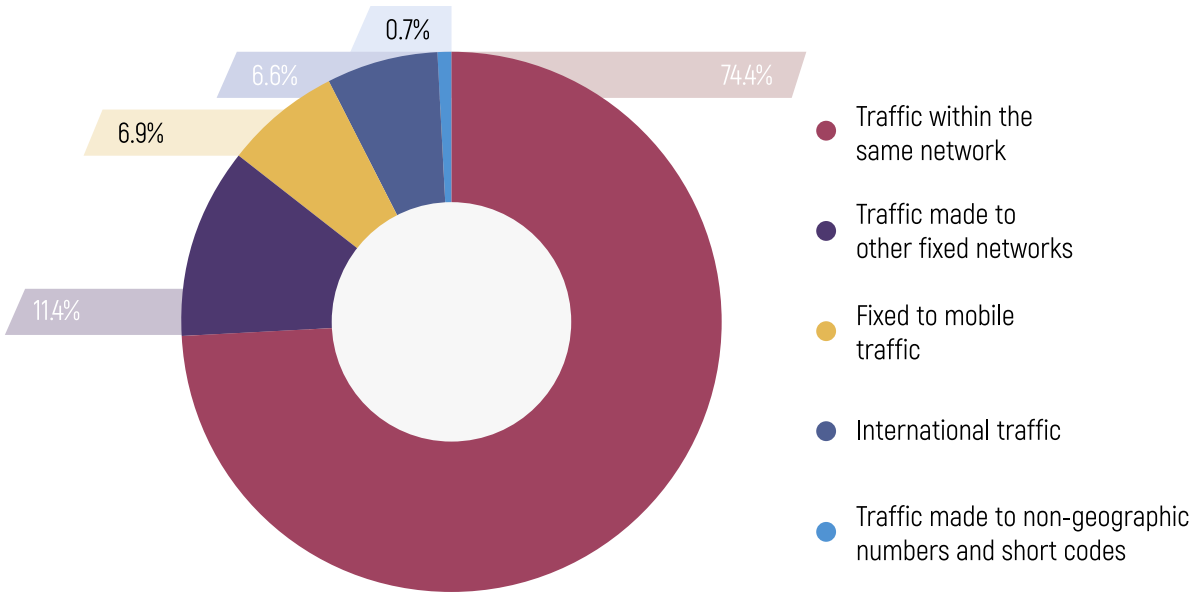
FIGURE 28. Total traffic (hundreds of million of minutes)



Source: RATEL

The biggest share in the total traffic in 2016 went to the traffic made within the same network (74.4%), whereas the least traffic was made to nongeographic numbers and short codes. The distribution of the fixed network traffic is given in Figure 29.

FIGURE 29. Distribution of fixed line traffic in 2016

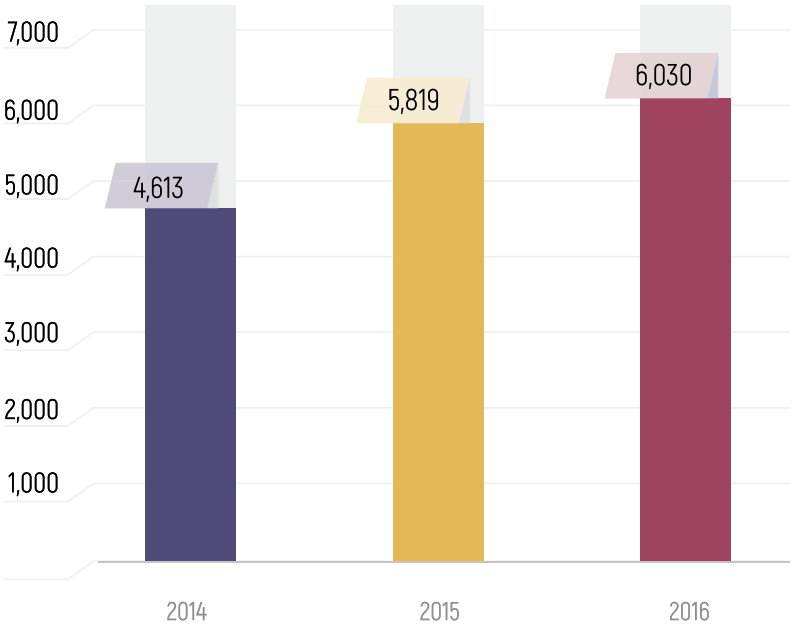


Source: RATEL

The average duration was 3.35 minutes for a call made within the same network, 1.56 for a call made to mobile network and 4.05 for an international call.

The total number of VoIP operators at the end of 2016 was approximately 56 thousand, which is an 18% decrease year on year. There were 14.4 million of minutes of traffic and there were 48 million minutes of international transit.

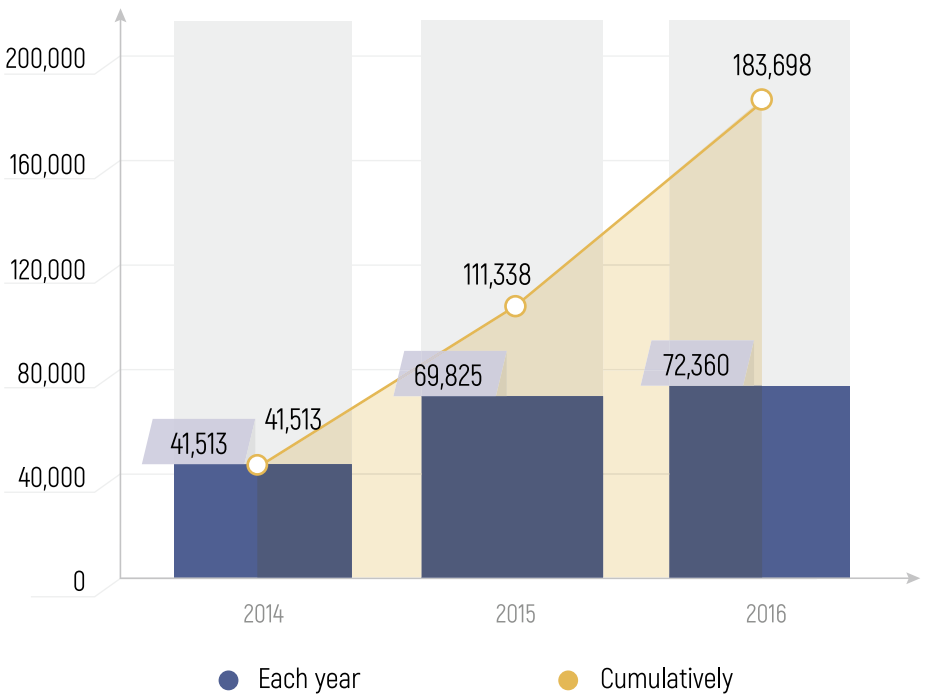
FIGURE 30. Average number of portings per month



The interest in the number portability service on public telephone networks, available since 1 April 2014, showed a slight increase. The monthly average of ported numbers was 6030.

Source: RATEL

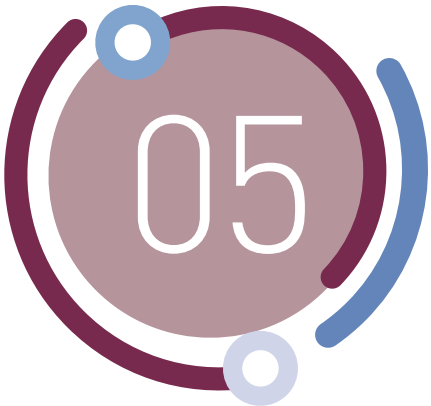
FIGURE 31. Portings made each year and total



During 2016 there were 72 360 fixed line subscribers who changed the operator while keeping the same number, so that the total of ported numbers amounted to 183 698 at the end of 2016 (Figure 31).

The fact that the requests for number portability on fixed networks continue to grow, shows that this is a rather important mechanism for enhancing competition, enabling the users to change the operator and to opt for better conditions.

Source: RATEL



05 PUBLIC MOBILE TELECOMMUNICATIONS NETWORKS AND SERVICES

Mobile telephony services in the Republic of Serbia were provided by the following three operators in 2016:

- ***Telecommunications Company Telekom Srbija Joint Stock Co. - Mobilna telefonija Srbije MTS**, 58.11% owned by the Republic of Serbia – the Government of the Republic of Serbia, 20% owned by Telekom Srbija, 14.95% owned by the citizens of the Republic of Serbia and 6.94% owned by the current and former employees of Telekom Srbija and its predecessor[6] (licence valid as of 15. 08. 2006);*
- ***Telenor Ltd., Belgrade,** 100% owned by Telenor A/S, Denmark, (licence issued on 31. 08. 2006)*
- ***Vip mobile Ltd.**, 100% in the ownership of Mobilkom CEE Beteiligungsverwaltung GmbH, Austria (licence issued on 01. 12. 2006)*

All three operators were granted licences for public mobile telecommunications networks and public mobile telecommunications network services in accordance with GSM/GSM1800 and UMTS/IMT-2000 standards, issued by RATEL. The licences were issued for the territory of the Republic of Serbia, for a period of 10 years, and in 2016 they were extended for another 10 years.

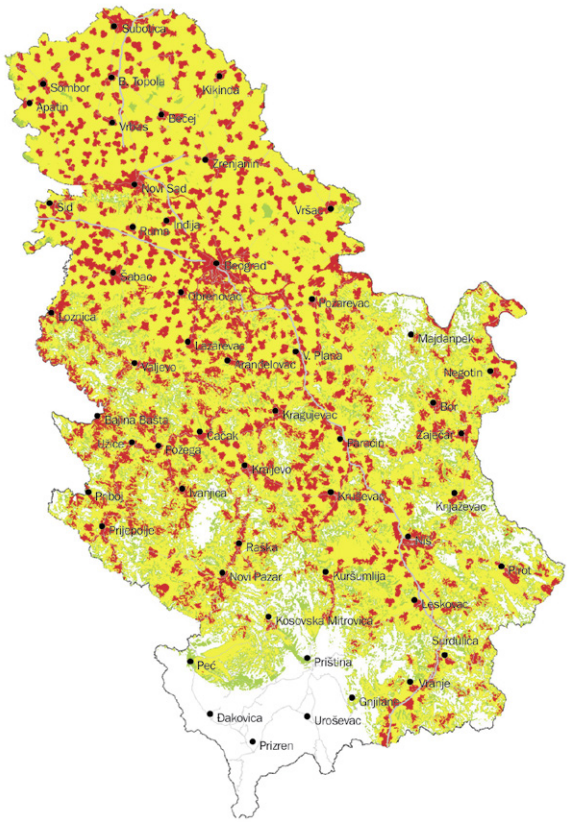
In 2016 two virtual mobile operators were also registered Mundio Mobile d.o.o. and Globaltel.

4G network was launched in 2015 in the Republic of Serbia. In the beginning of 2015, the public bidding procedure for the issuance of individual licences for the usage of radio frequencies in the 1710-1785/1805-1880 MHz frequency bands, in which all three mobile operators had participated, was completed. In March 2015, individual decisions were awarded to all three operators, granting the usage of two 5 MHz-radio frequency blocks, each. The requirements were thus met for the 4G mobile technology to be launched, enabling better coverage and faster Internet on the territory of the Republic of Serbia. In the second half of 2015, public bidding procedure for the issuance of individual licences for the usage of radio frequencies in the 791-821/832-862 MHz frequency bands in the territory of the Republic of Serbia, in which all three mobile operators had participated, was successfully carried out. Upon the completed procedure, in January 2016 individual decisions were awarded to all three operators, granting the usage of two 10 MHz-radio frequency blocks, each, in the 791-821/832-862 MHz frequency bands.

6 Source: www.mts.rs

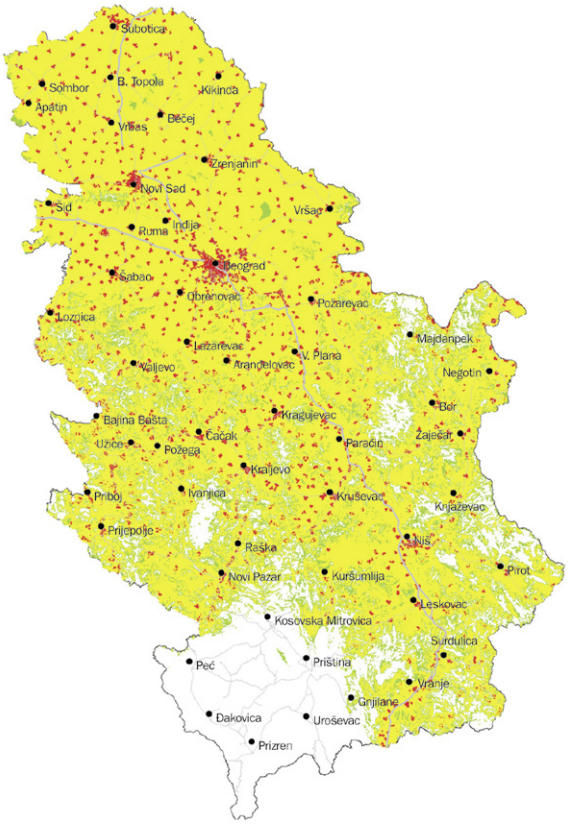
Telenor has been in the Serbian telecoms market since 2006, when it purchased the company Mobi63 (ex Mobitel) established in 1994. Telenor is a part of Telenor Group, present in 13 countries across Europe and Asia and another 14 countries through ownership in VimpelCom. The mobile operators from Telenor Group present in the neighbouring countries are Telenor Hungary (ex Panon), Telenor Montenegro (ex Promonte) and Telenor Bulgaria (ex Globul). The coverage maps for Telenor are given in Figure 32.

FIGURE 32. Mobile operator – Telenor



GSM signal coverage map

RATEL does not assume any liability for the accuracy and authenticity of maps, territory coverage and population percentages, these information being taken as quoted by the operator.



UMTS signal coverage map

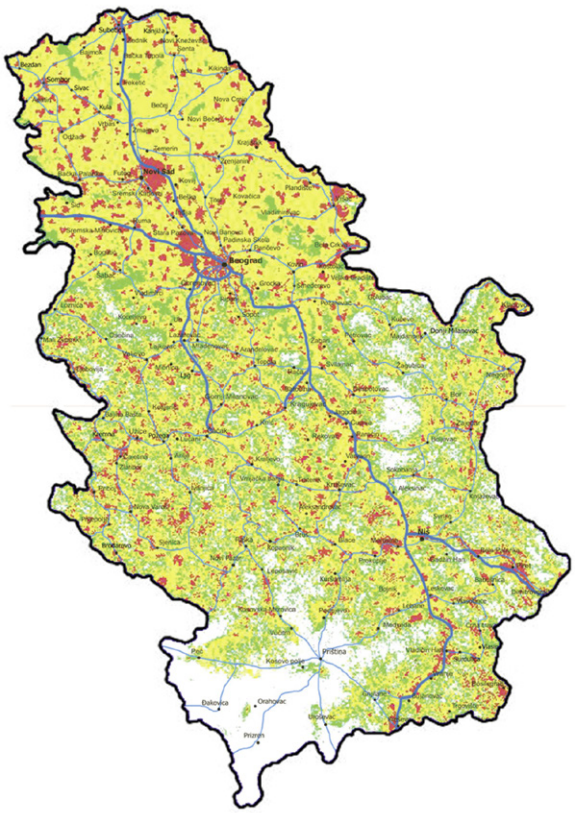
LTE signal coverage map

OFFICIAL DATA	
Name	Telenor Ltd.
Head office	Belgrade
Ownership	100% Telenor A/S, Denmark
Percentage of territory covered by GSM network signal	91.90%
Percentage of population covered by GSM network signal	99.42%
Percentage of territory covered by UMTS network signal	91.02%
Percentage of population covered by UMTS network signal	98.51%
Percentage of territory covered by LTE network signal	9.95%
Percentage of population covered by LTE network signal	53.78%

Source: Telenor

Telecommunications Company Telekom Srbija Joint Stock Co. has been providing mobile telephony services since 1998. In addition to Serbian market, Telekom Srbija is also present as a mobile operator in the region, in Republic of Srpska and Montenegro. The coverage maps for Telekom Srbija are given in Figure 33.

FIGURE 33. Mobile operator – Telekom Srbija



GSM signal coverage map

UMTS signal coverage map

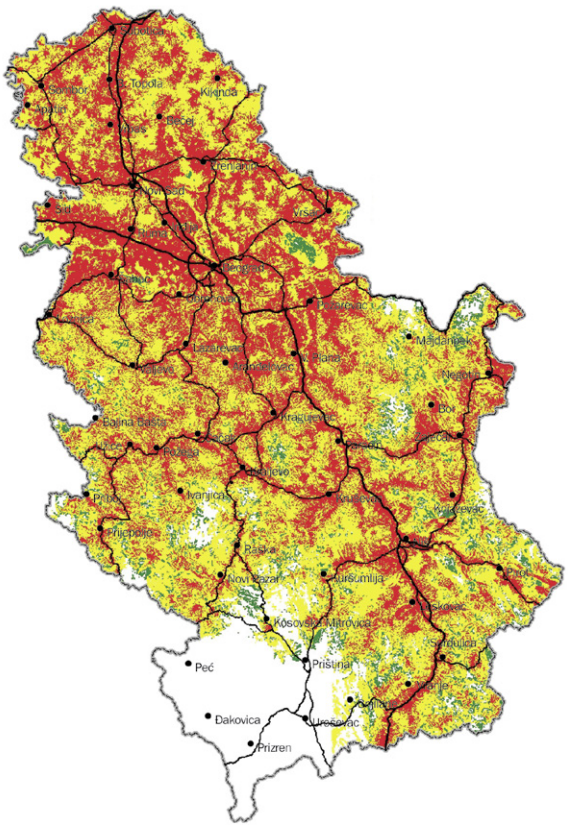
LTE signal coverage map

OFFICIAL DATA	
Name	Telecommunications company "Telekom Srbija" Joint Stock Co.
Head office	Belgrade
Ownership	58.11% the Republic of Serbia, 20% Telekom Srbija, 14.95% the citizens of the Republic of Serbia and 6.94% current and former employees of Telekom Srbija and its predecessor.
Percentage of territory covered by GSM network signal	90.62%
Percentage of population covered by GSM network signal	99.76%
Percentage of territory covered by UMTS network signal	85.59%
Percentage of population covered by UMTS network signal	97.30%
Percentage of territory covered by LTE network signal	15.64%
Percentage of population covered by LTE network signal	60.95%

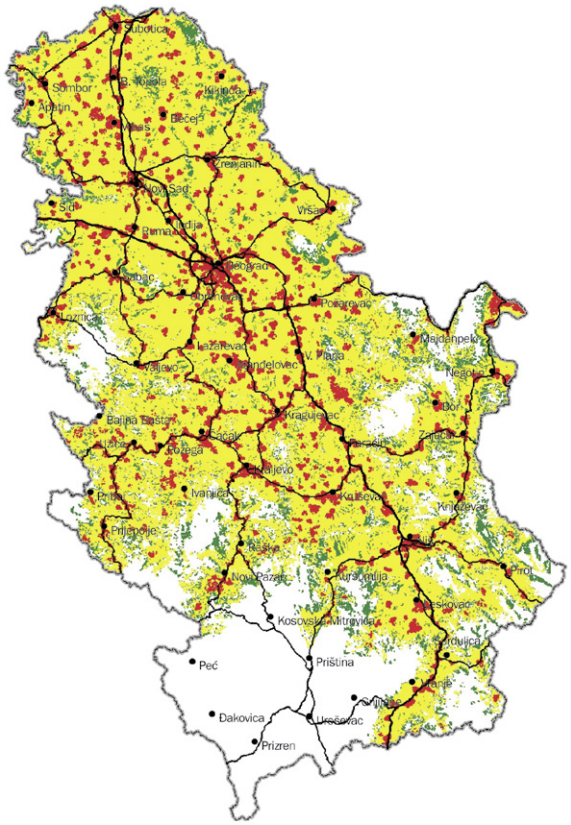
Source: Telekom Srbija

Vip mobile Ltd. is a member of the Telekom Austria Group, present in 7 European countries, including the following countries in the region: Croatia, Bulgaria and Macedonia. Vip mobile has been present in the Serbian market since 2006. The coverage maps for Telekom Srbija are given in Figure 34.

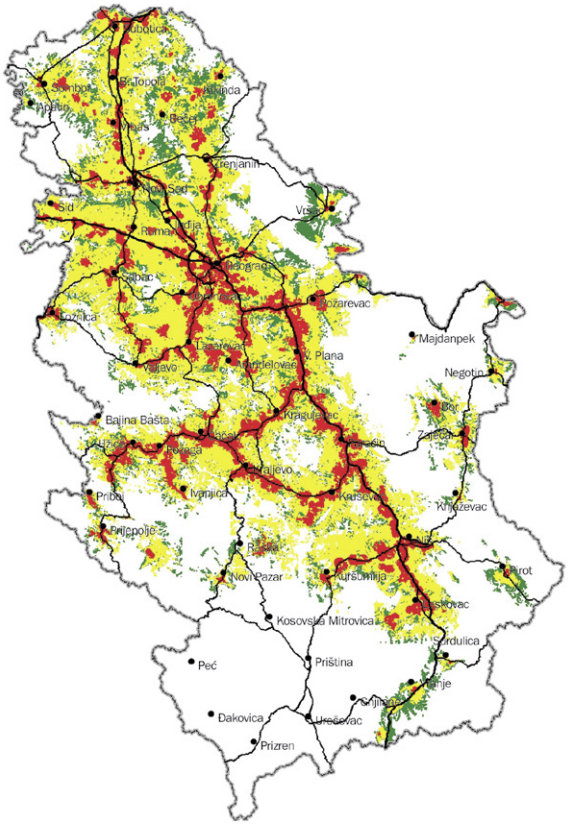
FIGURE 34. Mobile operator – Vip mobile



GSM signal coverage map



UMTS signal coverage map



LTE signal coverage map

OFFICIAL DATA	
Name	Vip mobile Ltd.
Head office	Belgrade
Ownership	100% Mobilkom CEE Beteiligungsverwaltungs GmbH, Austria
Percentage of territory covered by GSM network signal	88.7%
Percentage of population covered by GSM network signal	99.1%
Percentage of territory covered by UMTS network signal	67.2%
Percentage of population covered by UMTS network signal	95.3%
Percentage of territory covered by LTE network signal	34.4%
Percentage of population covered by LTE network signal	78.2%

Source: Vip mobile

Table 6. An overview of wireless access network on 31.03.2017 for all three operators

I		TELEKOM SRBIJA	TELENOR	VIP MOBILE
1.	Total number of sites with base stations	2391	2009	1755
2.	Raw land sites (RL)	1487	1179	1046
3.	Rooftop sites (RT)	863	813	693
4.	Indoor sites	30	30	11
5.	RL +RT sites	11	13	5
II				
6.	ADAS indoor	2	0	1
7.	DAS indoor	35	17	14
8.	ADAS + DAS indoor	4	0	1
III				
9.	GSM base station sites (all frequency ranges)	1885	1959	1744
10.	GSM1800 network base stations	27	48	852
11.	GSM900 network base stations	1583	1364	354
12.	GSM900+GSM1800	275	547	538
IV				
13.	UMTS network base stations	2243	1986	1596
14.	UMTS2100 network base stations	2238	77	1588
15.	UMTS900 network base stations	5	282	2
16.	UMTS900 + UMTS2100 network base stations	0	1627	6

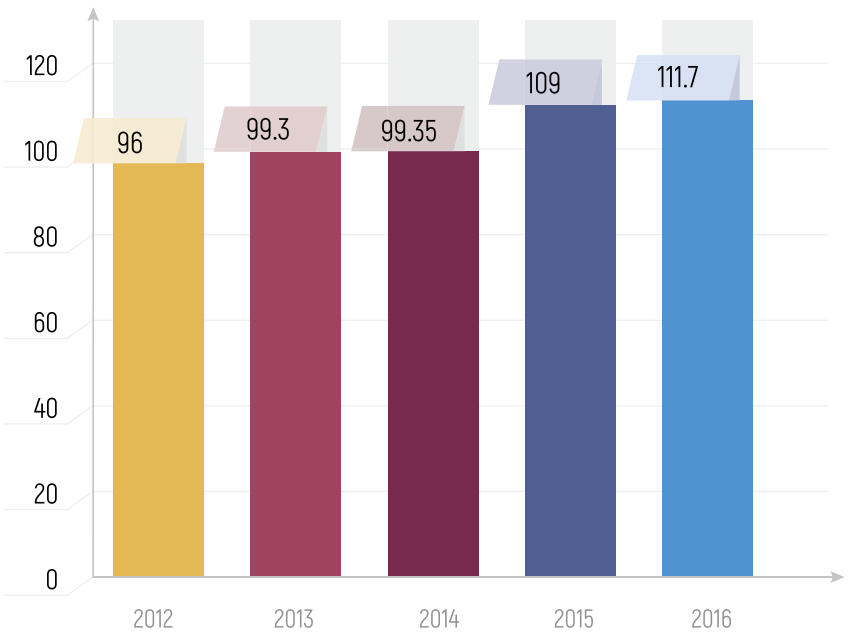
V		TELEKOM SRBIJA	TELENOR	VIP MOBILE
17.	LTE network base stations	558	838	1076
18.	LTE800 network base stations	46	520	257
19.	LTE1800 network base stations	503	214	810
20.	LTE800 + LTE1800 network base stations	9	104	9
VI				
21.	Indoor repeater sites	366	199	123
22.	Indoor GSM repeater sites	72	13	30
23.	Indoor UMTS repeater sites	184	23	26
24.	Indoor dual repeater sites (GSM + UMTS)	110	155	1
25.	Indoor LTE repeater sites tehnologije	0	0	
26.	Indoor dual/triple repeater sites (LTE+GSM/UMTS)	0	8	66
VII				
27.	Outdoor repeater sites (only remote if different from donor)	23	12	
VIII				
28.	WiFi sites	628	16	0
29.	Indoor" WiFi sites	331	0	0
30.	Outdoor WiFi sites	153	16	0
31.	Indoor + outdoor WiFi sites	144	0	

XI		TELEKOM SRBIJA	TELENOR	VIP MOBILE
32.	GSM900 base radio stations	1858	1932	892
33.	GSM1800 base radio stations	302	609	1390
34.	UMTS900 base radio stations	5	1932	8
35.	UMTS2100 base radio stations	2238	1741	1594
36.	LTE800 base radio stations	55	624	266
37.	LTE1800 base radio stations	512	325	819
38.	WiFi AP	1178	16	0
39.	Indoor WiFi AP	701	0	0
40.	Outdoor WiFi AP	477	16	0
41.	Indoor repeaters	366	224	0
42.	Outdoor repeaters	23	12	0

The revenues from mobile networks in 2016 amounted to around 111.7 billion dinars or 907.5 million Euros. Observed in the national currency (RSD), the revenues increased by 2.7% year on year, when the total revenues from mobile telephony service amounted to 109 billion dinars, whereas the revenues observed in Euros showed a less than 1% rise. The difference in the revenues in the two currencies is a consequence of the increase in the average exchange rates for euro in 2016, compared with the previous year.

The total investments made in the mobile market decreased by 14% in respect to the previous year, amounting to 11.1 billion dinars.

FIGURE 35. The total revenues from the mobile telephony (RSD billion)



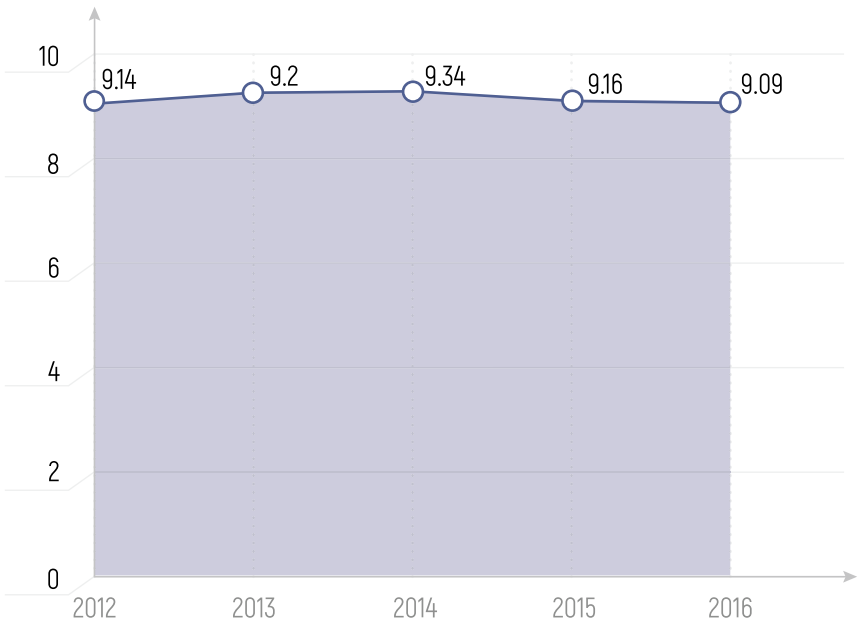
*includes revenues from mobile data traffic ammounting to 3.7 million dinars in 2016.

Source: RATEL

The total number of mobile users dropped by 0.7% year on year, amounting to 9 094 447 in the end of 2016. The total number of users has been decreasing in the past two years, due to a decrease in the number of prepaid users. However, the penetration rate is nevertheless high and outgoing traffic is growing in terms of minutes.

Figure 36 shows changes in the total number of users in the previous period.

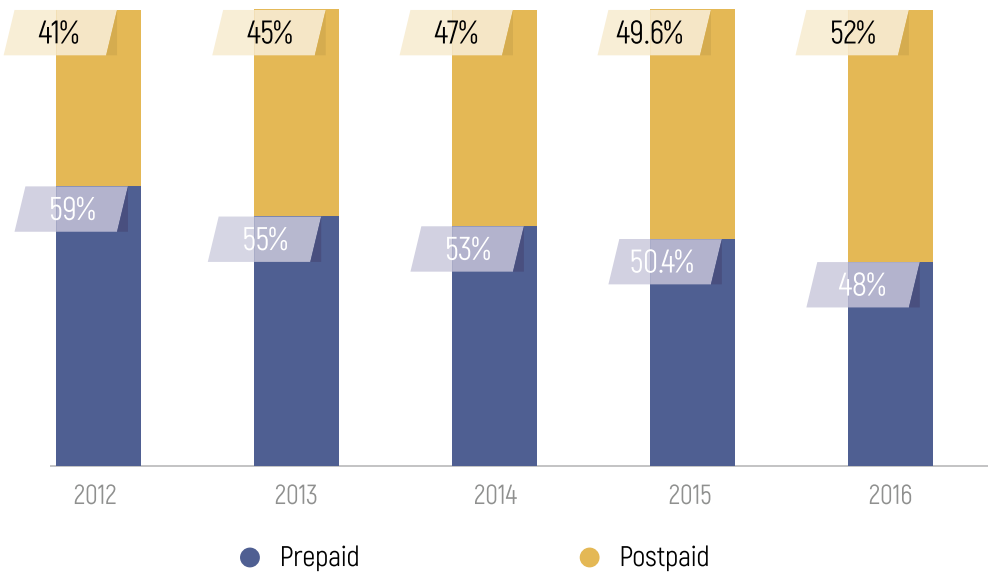
FIGURE 36. Total number of active mobile telephony users (million)



Source: RATEL

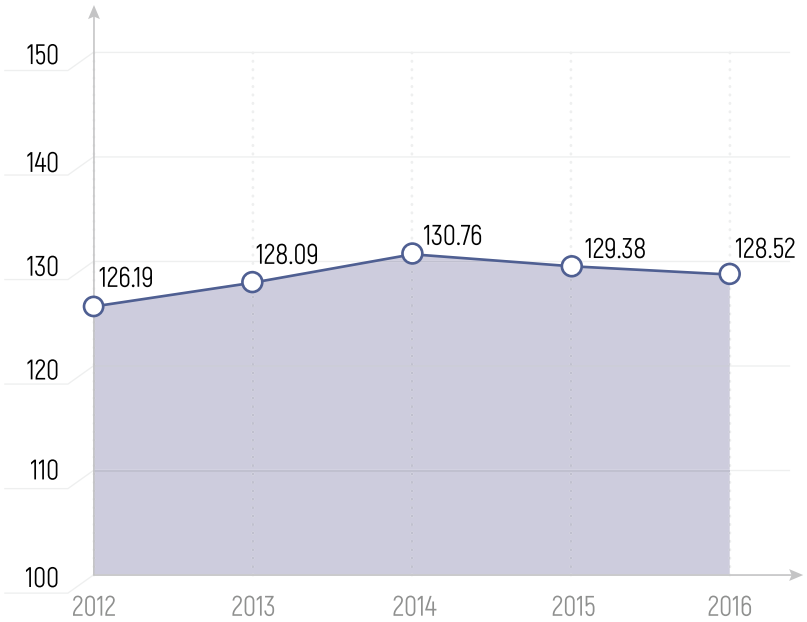
The total number of users consists of postpaid and prepaid users active in the last three months of the observed year. The share of the prepaid and postpaid users is given in Figure 37. So far, the number of prepaid users has been higher than the number of postpaid users, however in 2016 the number postpaid users exceeded the number of postpaid users for the first time with a share of 52% .

FIGURE 37. Prepaid/postpaid users ratio



Source: RATEL

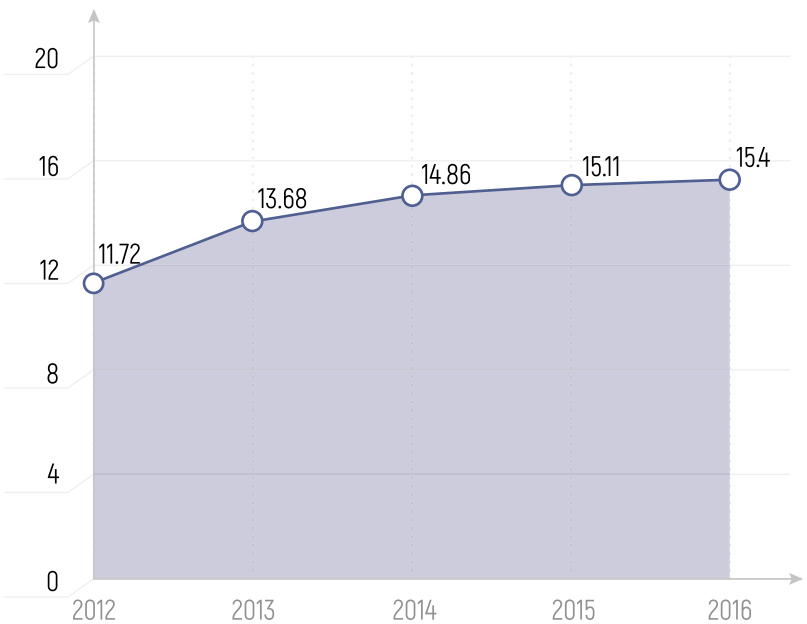
FIGURE 38. Mobile penetration rate



The number of mobile network users is again higher than the number of inhabitants in 2016, the mobile penetration rate being 128.52%. This indicates that some people are using more than one mobile number.

Source: RATEL

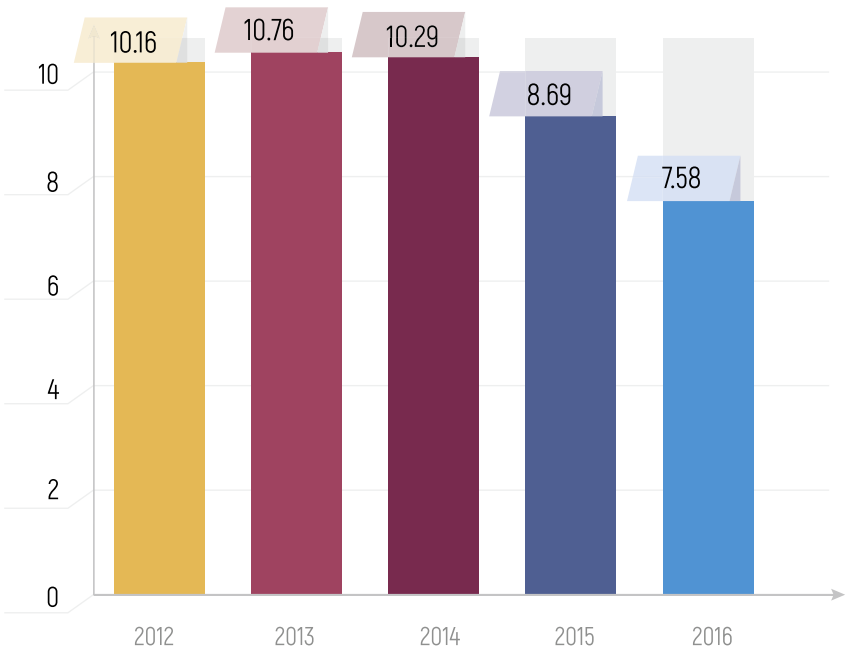
FIGURE 39. Total outgoing traffic (billion minutes)



The minutes of calls made from mobile networks are constantly increasing year after year. In 2016, the total outgoing traffic on the mobile network amounted to 15.4 billion minutes, which is an increase of 1.9% compared with the previous year (cf. 15.4 in 2015). The annual average of traffic per user in 2016 was 1 693 minutes or approximately 4 minutes and 38 seconds a day.

Source: RATEL

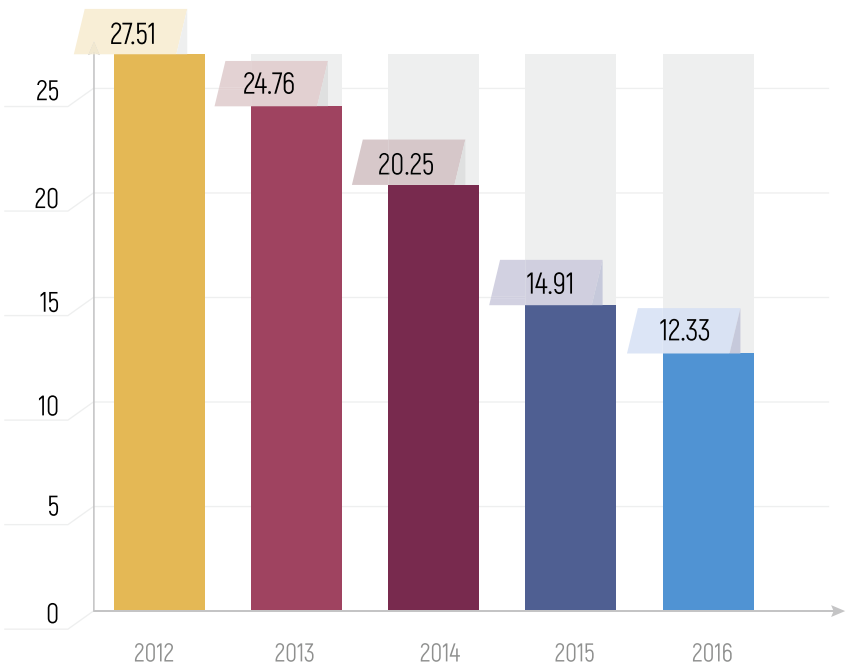
FIGURE 40. Number of sent text (SMS) messages (billion)



The number of sent text messages continued to decrease. In 2016, the total of 7.58 billion SMS messages were sent, which is a decrease by 12.8% compared with 2015 when 8.69 billion SMS messages were sent. The average number of text messages sent in 2016 per user was 833, or 2.3 SMS messages a day.

Source: RATEL

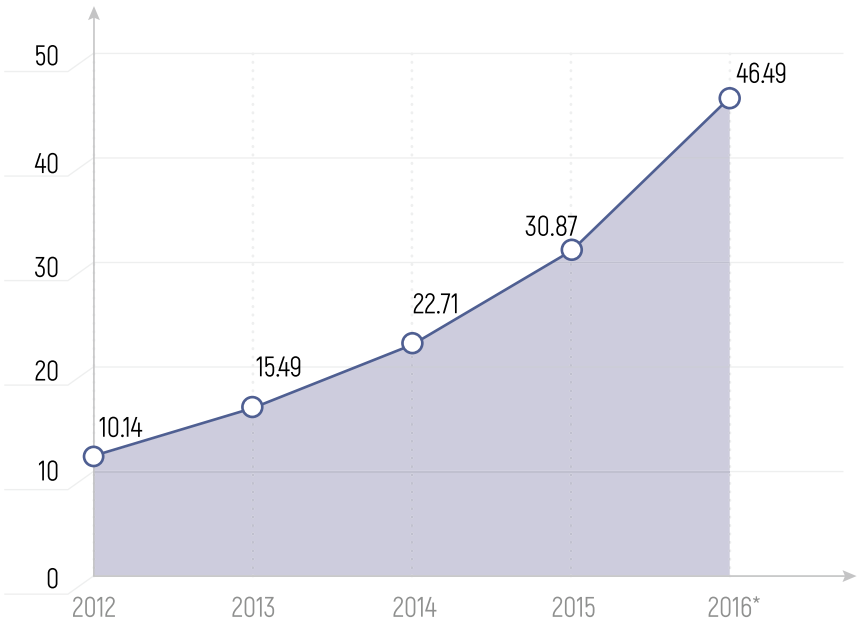
FIGURE 41. Number of SMS messages sent (million)



The number of MMS messages also continued to drop. In 2016, 12.33 million MMS messages were sent, which is a decrease of 17.3% in respect to 2015.

Source: RATEL

FIGURE 42. Data traffic in millions of GB (GPRS+UMTS+LTE)

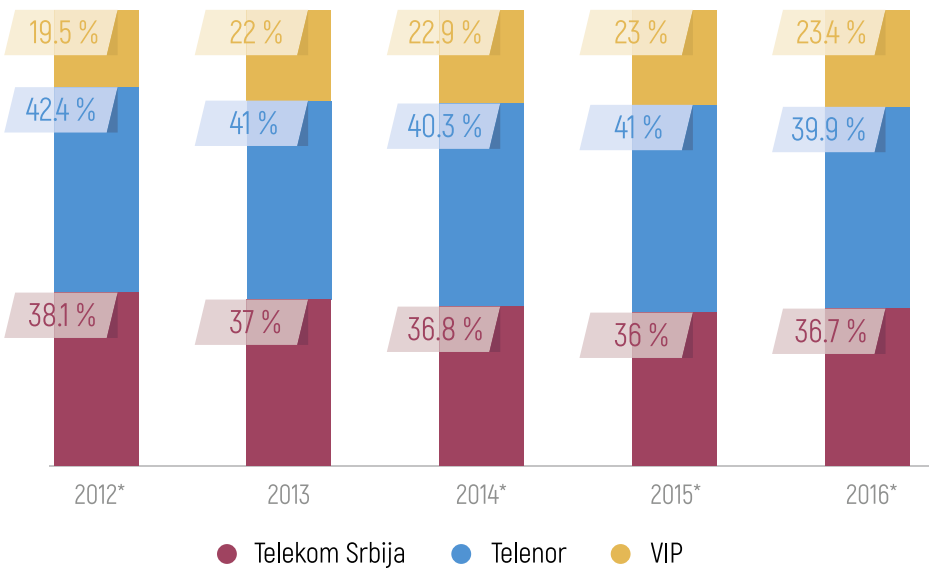


The data traffic has been constantly growing during the observed period (Figure 42). During the five-year period, the average annual growth rate of the transmitted data was 46%.

Source: RATEL

*As of 2016 data traffic over LTE network is also included.

FIGURE 43. Share in the total revenues made from mobile services (%)

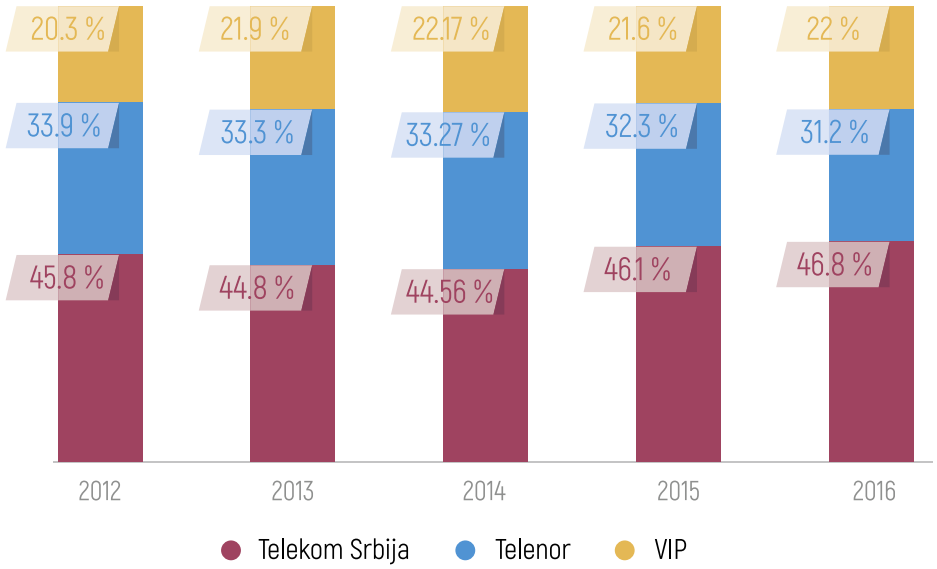


Based on the available data, Figures 43 - 48 show the share of the mobile operators in terms of revenues, number of users, outgoing traffic, number of text and multimedia messages (SMS and MMS) sent and the data traffic made, based on the available data.

Source: RATEL

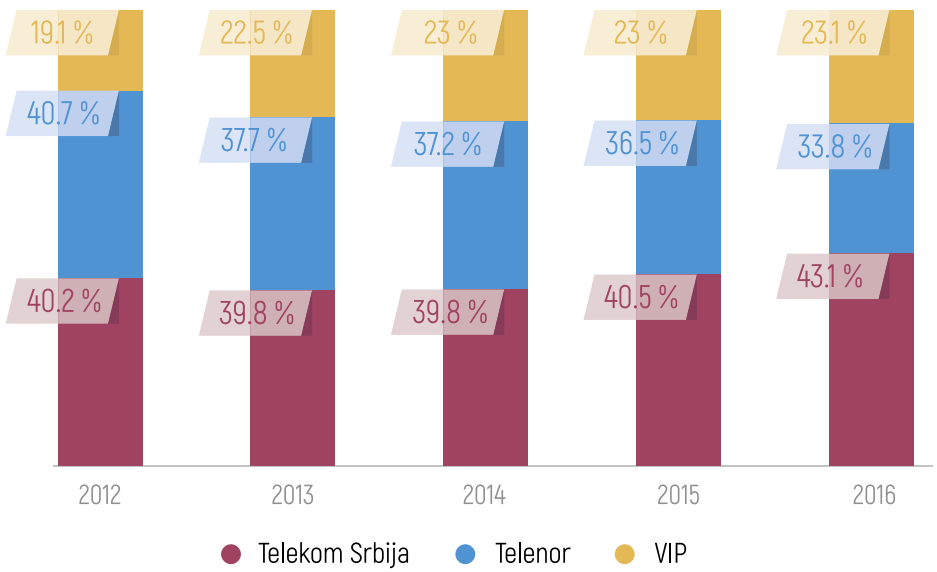
* If the internal accounting between business segments were included, the share of Telekom Srbija in the total mobile market revenues would be 39.4% in 2012, 37.6% in 2014, 36.6% in 2015 and 37.1% in 2016.

FIGURE 44. Market share in terms of the number of users (%)



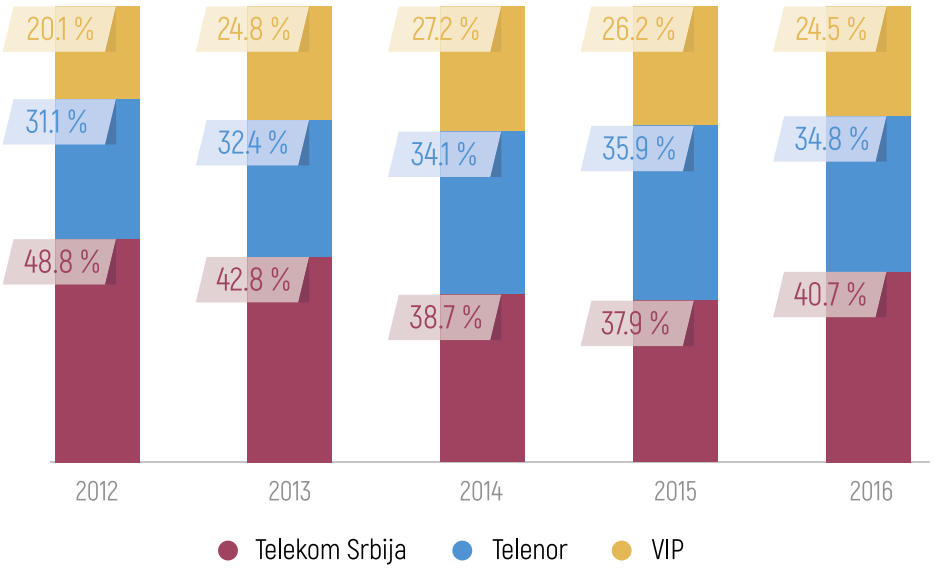
Source: RATEL

FIGURE 45. Share in the total outgoing traffic (%)



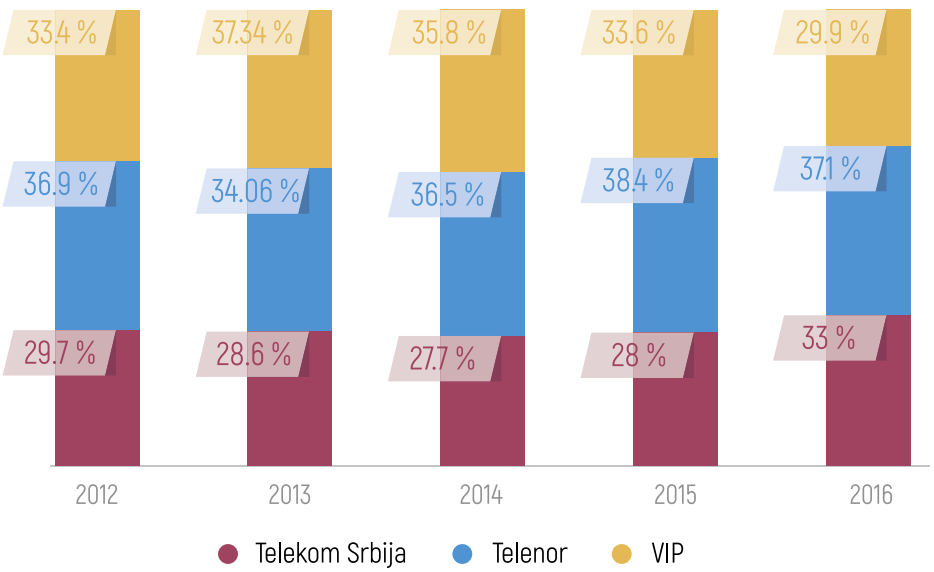
Source: RATEL

FIGURE 46. Share in the total number of sent SMS messages (%)



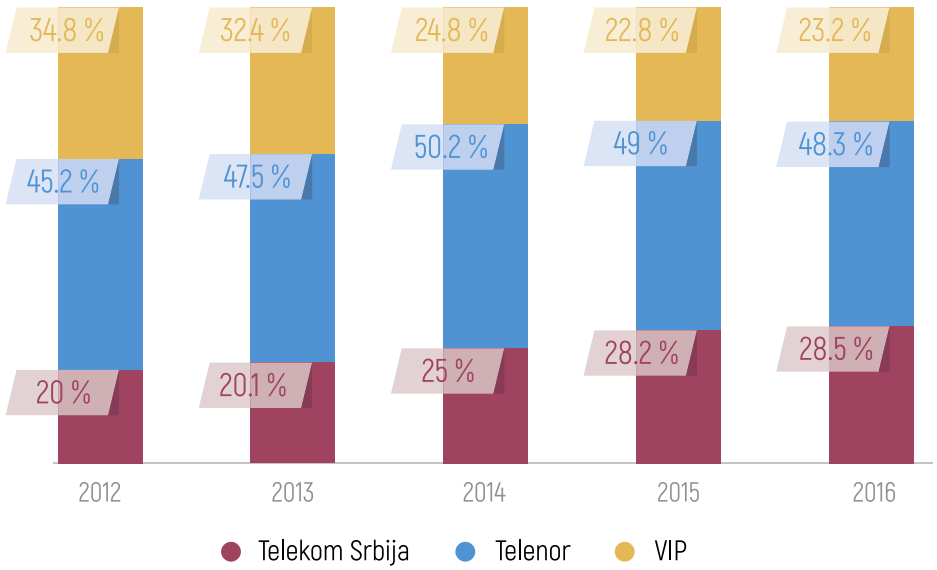
Source: RATEL

FIGURE 47. Share in the total number of sent MMS messages (%)



Source: RATEL

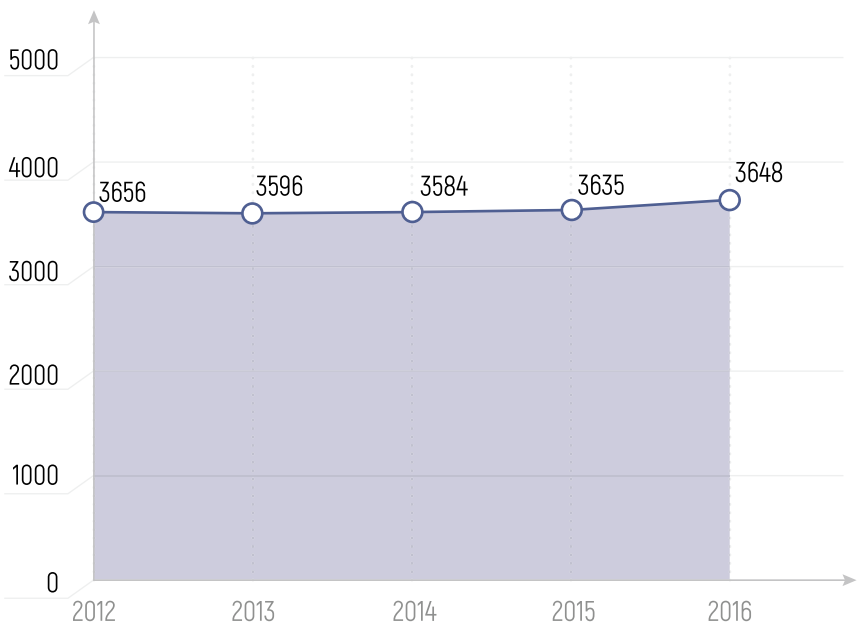
FIGURE 48. Share in data traffic (GPRS+UMTS+LTE) (%)



*As of 2016 data traffic over LTE network is also included.

Source: RATEL

FIGURE 49. HHI values in the period 2012–2016



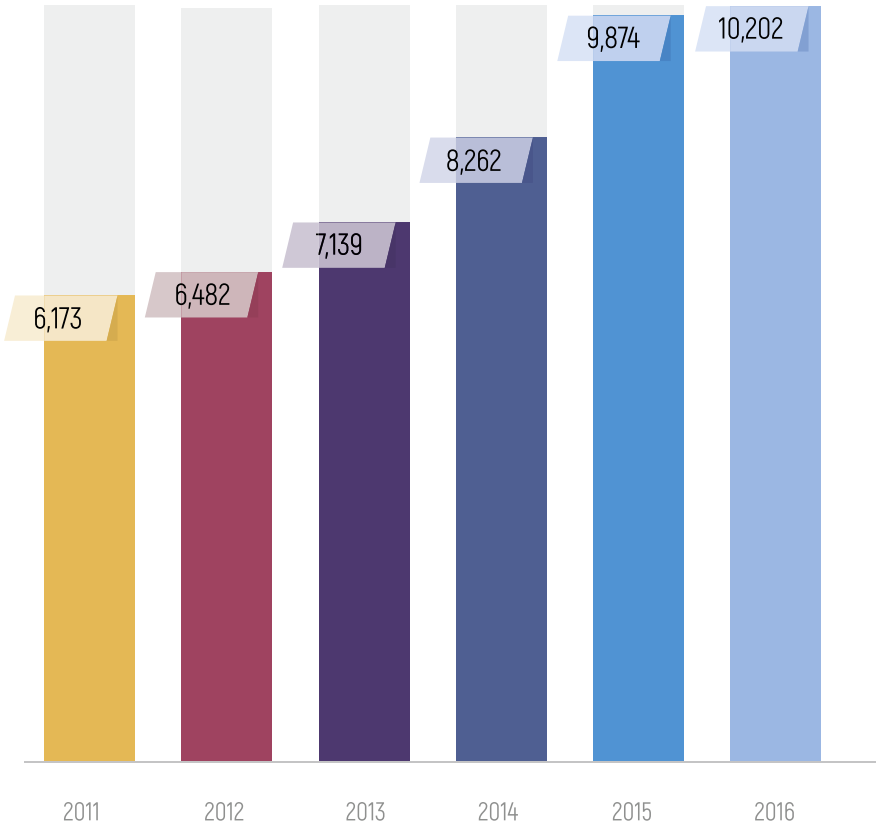
The competition in the mobile market can be estimated using the Herfindahl Hirschman Index (HHI). HHI is an indicator used for determining the degree of concentration of a given market and it is defined as the sum of the squares of the market shares of each individual market share. The market share was identified by the number of users.

Source: RATEL

The value of HHI for 2016 was slightly higher compared with the previous year, indicating a higher market concentration and decrease in the level competition, reflected in the decreased market share of one operator and increased market shares of the other two operators.

The average number of mobile number portings continued to grow, with an average number of portings a month being 10 202 in 2016.

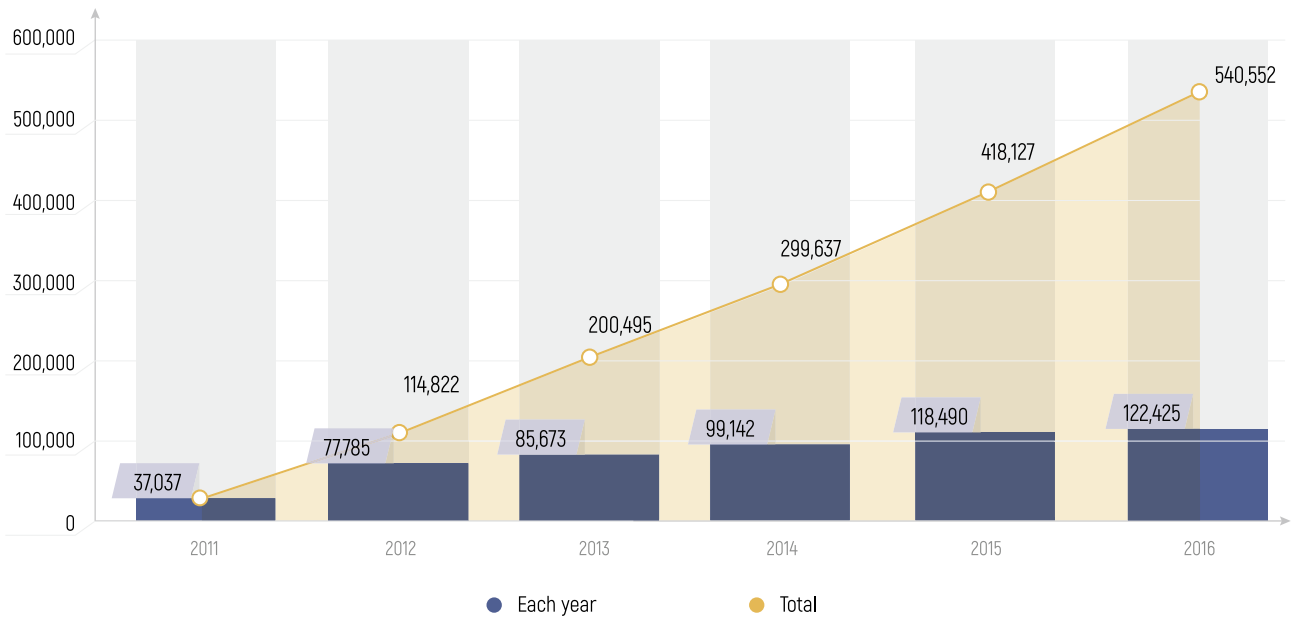
FIGURE 50. Average number of portings on mobile network a month for each year



Source: RATEL

In 2016 there were around 122 425 number portings on mobile networks, thus reaching the total of 540 552 portings made since the beginning of number portability service.

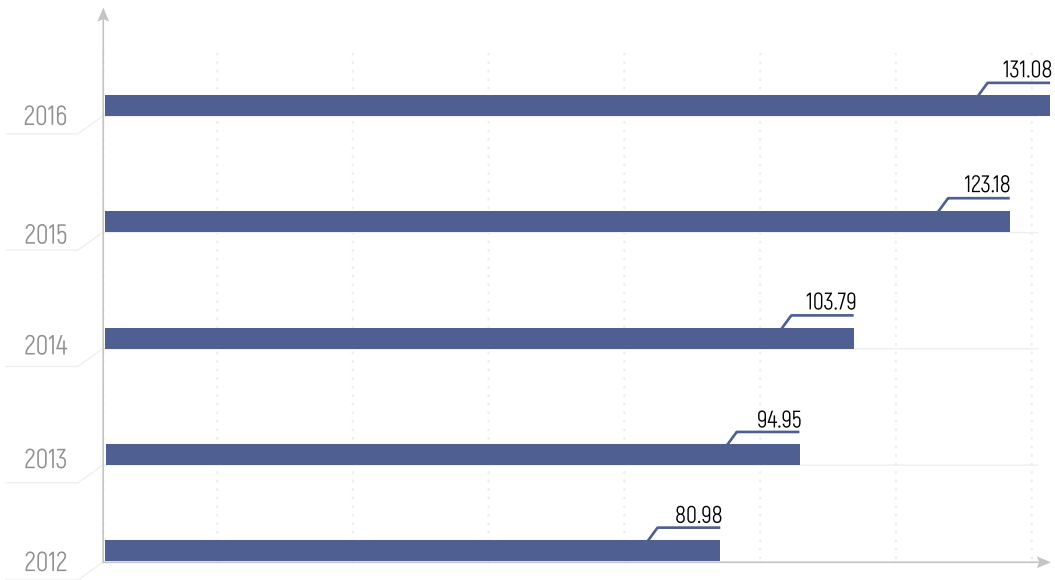
FIGURE 51. Number of portings on mobile network each year and in total



Source: RATEL

In addition to national traffic, the users also use roaming traffic abroad. Voice traffic abroad has been growing in the past years.

FIGURE 52. Number of roaming minutes (million)

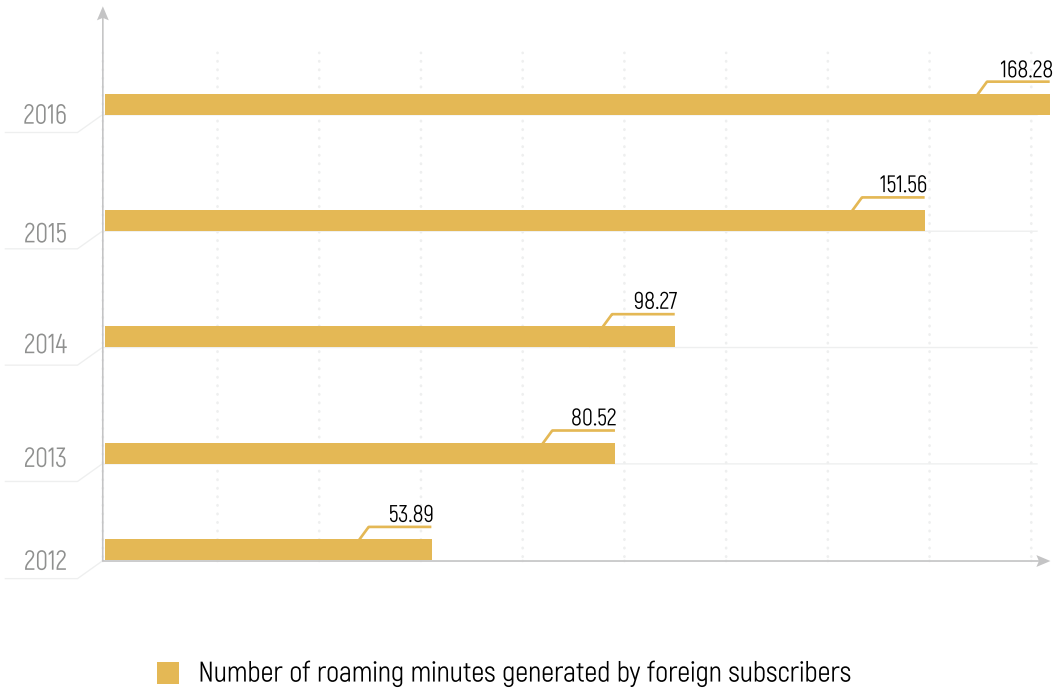


Source: RATEL

In addition to voice traffic, the users also use mobile internet abroad and according to the available data for 2016, there were 925 TB of roaming mobile broadband internet traffic made.

Beside the users of the national networks, the traffic in the territory of Serbia is also generated by foreign network subscribers, who have also increased voice service usage in the observed period.

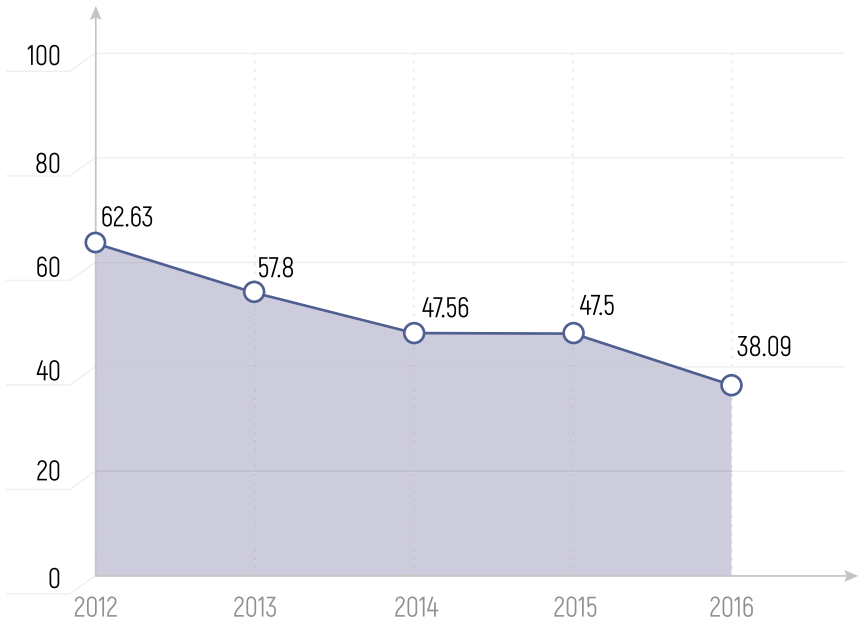
FIGURE 53. Number of roaming minutes made by foreign subscribers (million)



Source: RATEL

The revenues made from roaming, which include revenues made from outbound roaming and revenues made from inbound roaming, have been dropping in the past years.

FIGURE 54. Roaming revenues (mil. EUR)



Source: RATEL

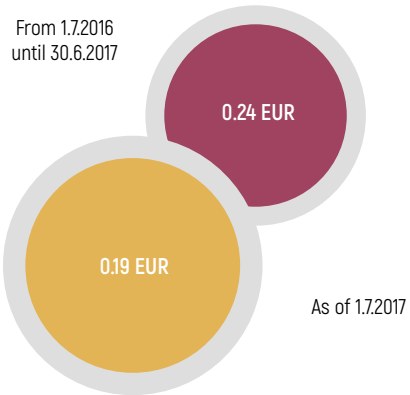
06 REGIONAL ROAMING

Based on the Agreement on the Reduction in Roaming Fees on Public Mobile Communication Networks, signed between Bosnia and Herzegovina, Montenegro, Former Yugoslav Republic of Macedonia and Republic of Serbia, the regulated roaming fees began to be applied in the region as of 30 June 2015. The Agreement stipulates a price cap for roaming services in the signatory countries aligned with the prices laid down under Regulation (EU) No 531/2012 of the European Parliament and of the Council of 13 June 2012 on roaming on public mobile communications networks within the Union.

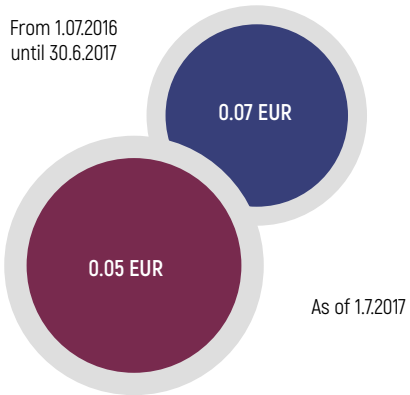
In order to implement the Agreement, RATEL passed a decision on gradual reduction in roaming fees (No. 1-03-021-146/14 of 25.12.2014) defining the dates and periods of application of price caps for wholesale and retail fees charged for calls, SMS, data traffic and MMS, in line with the fees under the Roaming Regulation. The price caps applied during the first two years since the implementation of the Agreement are given in Figures 55 and 56.

FIGURE 55. **Retail roaming price caps (EUR, excluding VAT) applied in the following periods, in the countries that signed the Agreement: 01.07.2016-30.06.2017 and as of 1.07.2017**

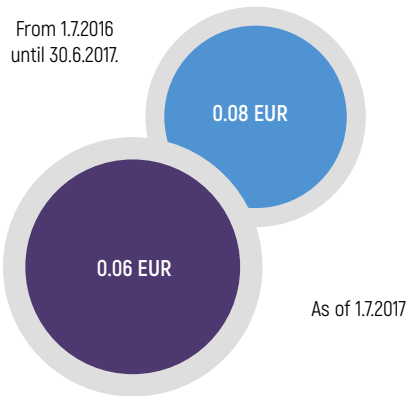
RETAIL ROAMING PRICE CAP FOR OUTGOING CALLS (CHARGED PER MINUTE)



RETAIL ROAMING PRICE CAP FOR INCOMING CALLS (CHARGED PER MINUTE)



RETAIL ROAMING PRICE CAP CHARGED FOR SMS



RETAIL ROAMING PRICE CAP CHARGED FOR DATA TRAFFIC AND MMS (PER MB/MESSAGE)

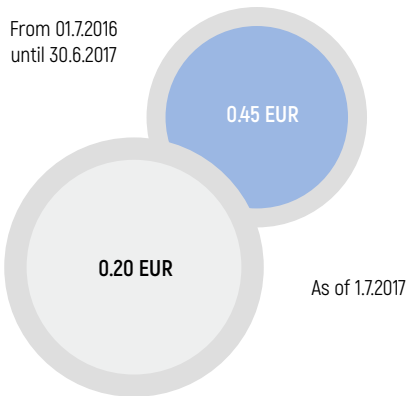
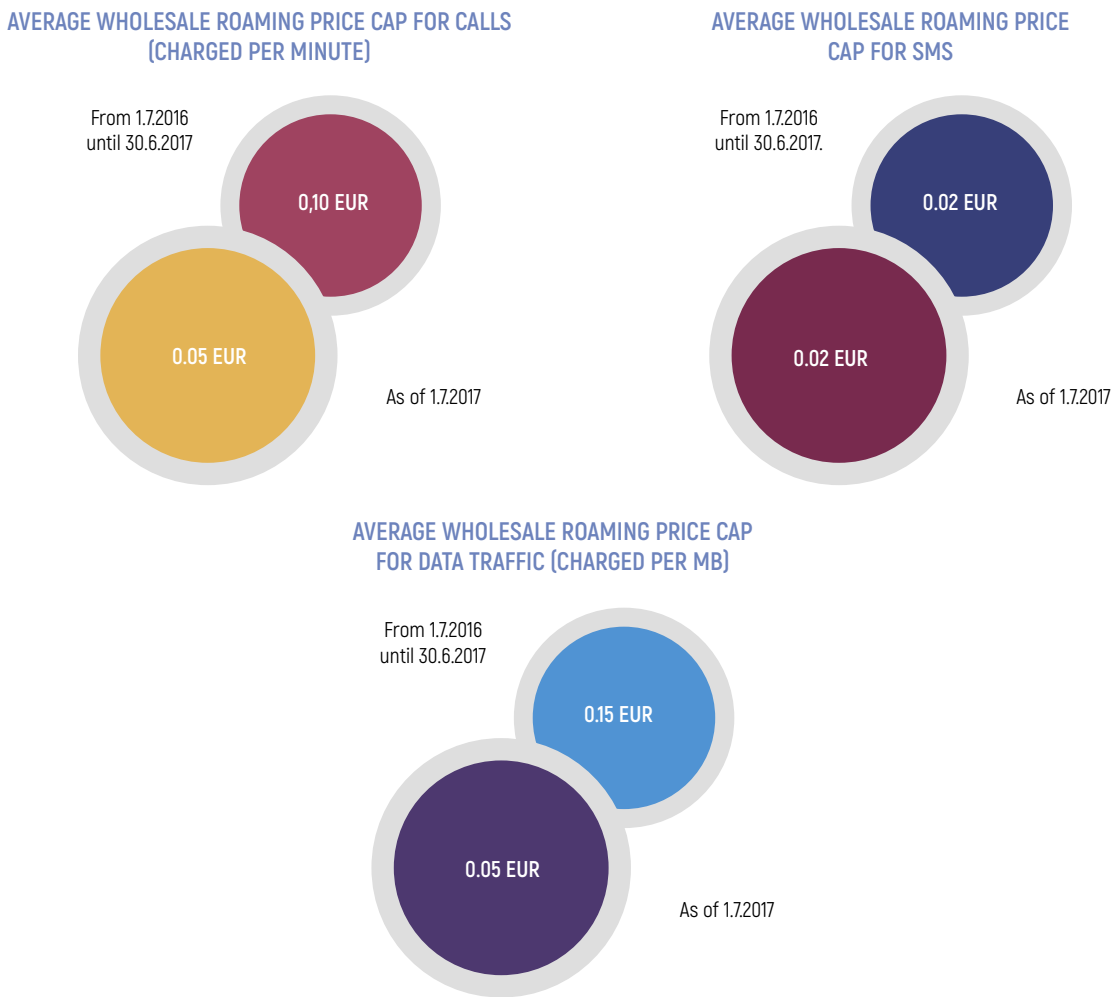


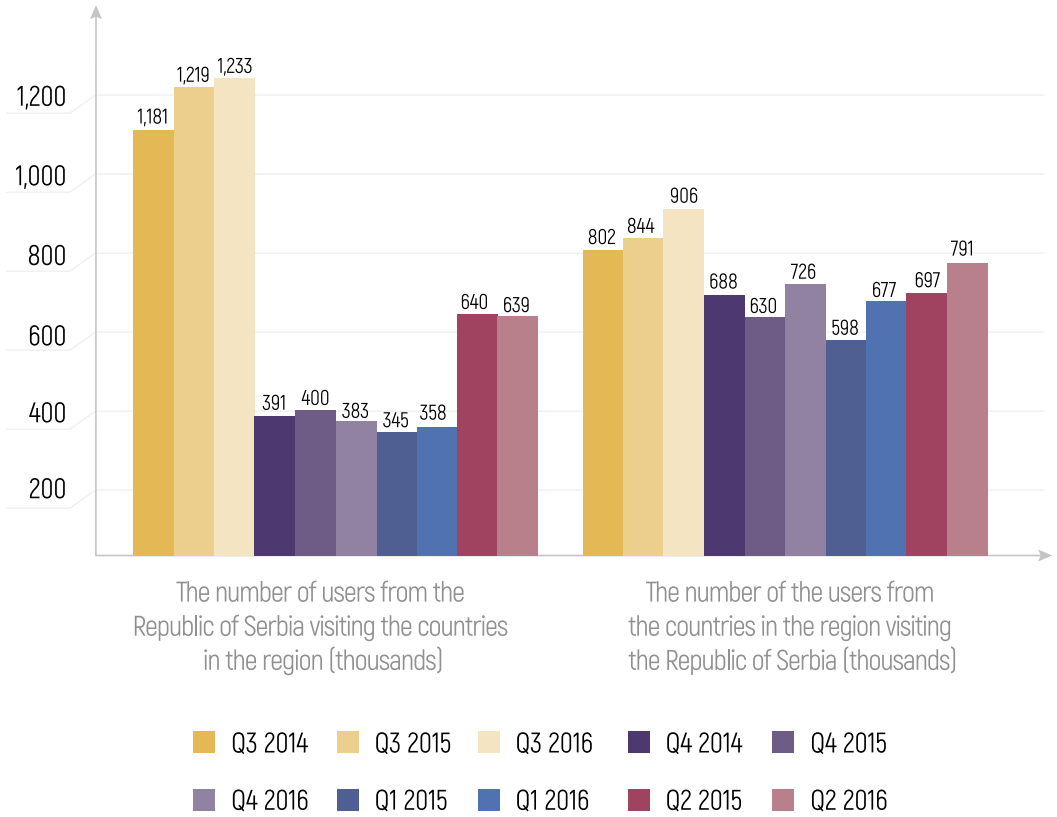
FIGURE 56. Wholesale roaming price caps (EUR, excluding VAT) applied in the following periods, in the countries that signed the Agreement: 1.7.2016-30.6.2017 and as of 1.7.2017



Comparative data for the third and the fourth quarter of 2014 and for the third and the fourth quarter of 2015 are given below, in order to show the first effects of the application of the regulated roaming tariffs.

The data on the number of users show that in the third quarter, during the holiday season, there are more people from the Republic of Serbia travelling to the countries signatories to the Agreement compared to the users from the signatory countries visiting Serbia, contrary to the situation in other quarters.

FIGURE 57. The number of users from the Republic of Serbia visiting the countries in the region and the number of the users from the countries in the region visiting the Republic of Serbia



*Countries in the region means countries signatory to the Agreement

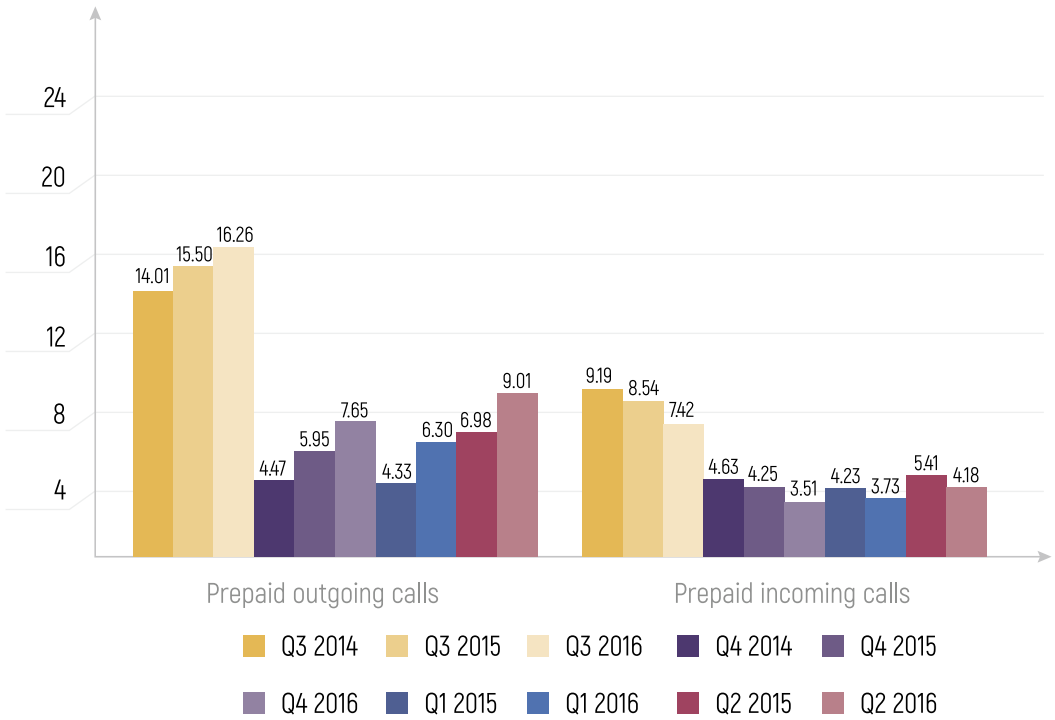
Source: RATEL

The overview shows the trend followed by the traffic and the revenues made from the regulated retail roaming services provided to the subscribers of the Serbian operators during their stay in other countries signatories to the Agreement.

The data include the entire traffic, i.e. the total of the traffic made without any tariff add-ons and the traffic made using tariff add-ons which are available to the end users.

The comparative data show a growth in the traffic for most roaming voice services. The data given in Figure 58, which refer to the prepaid users, show a growth in the outgoing calls, i.e. in the number of minutes along with the drop in the incoming calls in the comparable quarters.

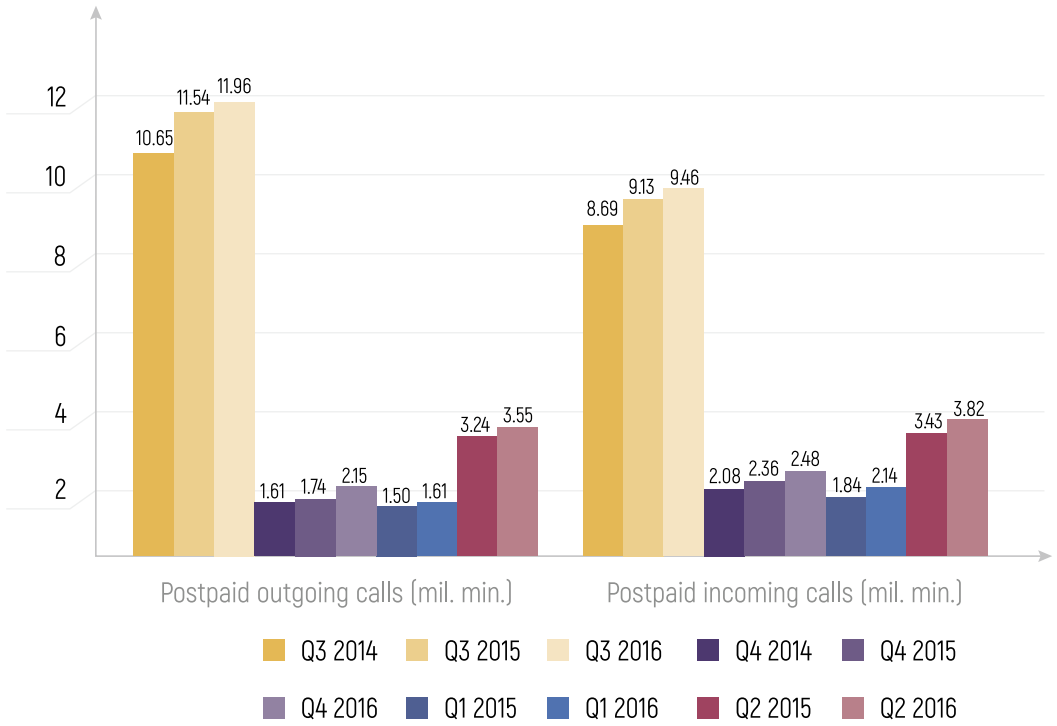
FIGURE 58. Roaming outgoing and incoming calls made by prepaid users in the countries signatories to the Agreement (million minutes)



Source: RATEL

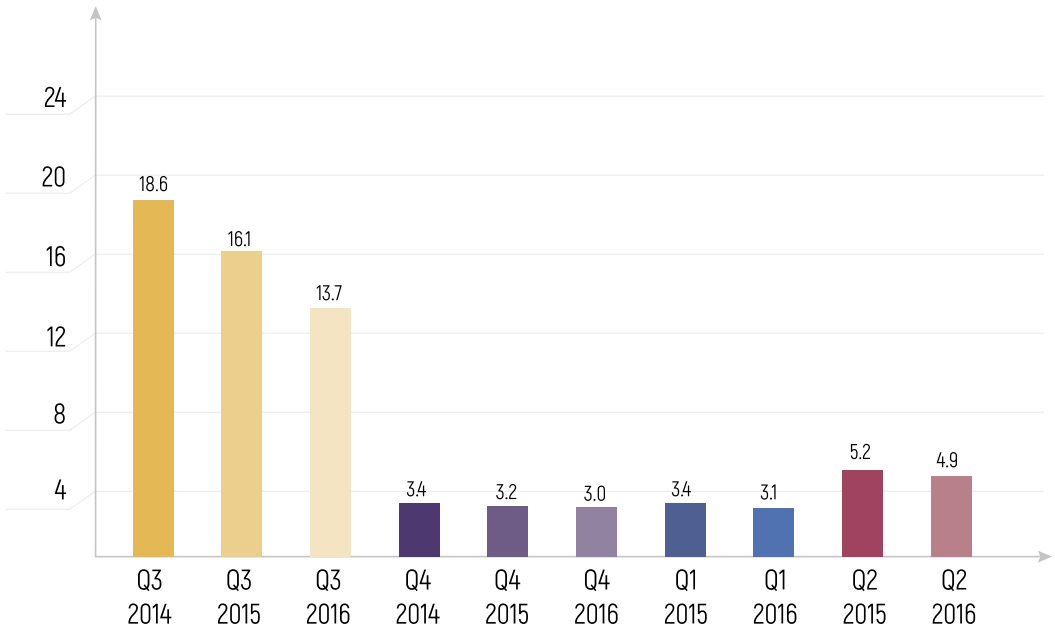
Comparable quarterly data show a growth in both outgoing and incoming calls with postpaid users. (Figure 59).

FIGURE 59. Roaming outgoing and incoming calls made by postpaid users in the countries signatories to the Agreement (million minutes)



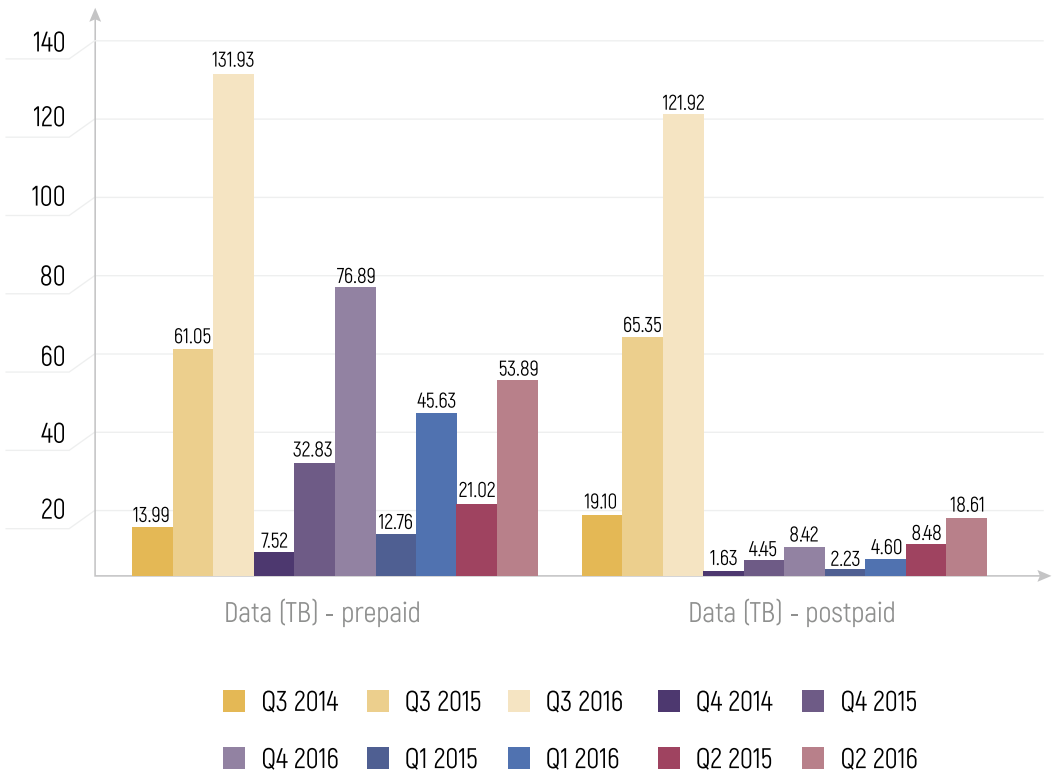
The same as in the national market, there was a drop in the SMS messages in roaming (Figure 60).

FIGURE 60. Number of roaming SMS messages sent in the countries signatories to the Agreement (million)



Roaming data transmission is the service with the biggest and significant rise with both groups of users, based on the comparable quarterly data (Figure 61).

FIGURE 61. Roaming data traffic made in the countries signatories to the Agreement (TB)

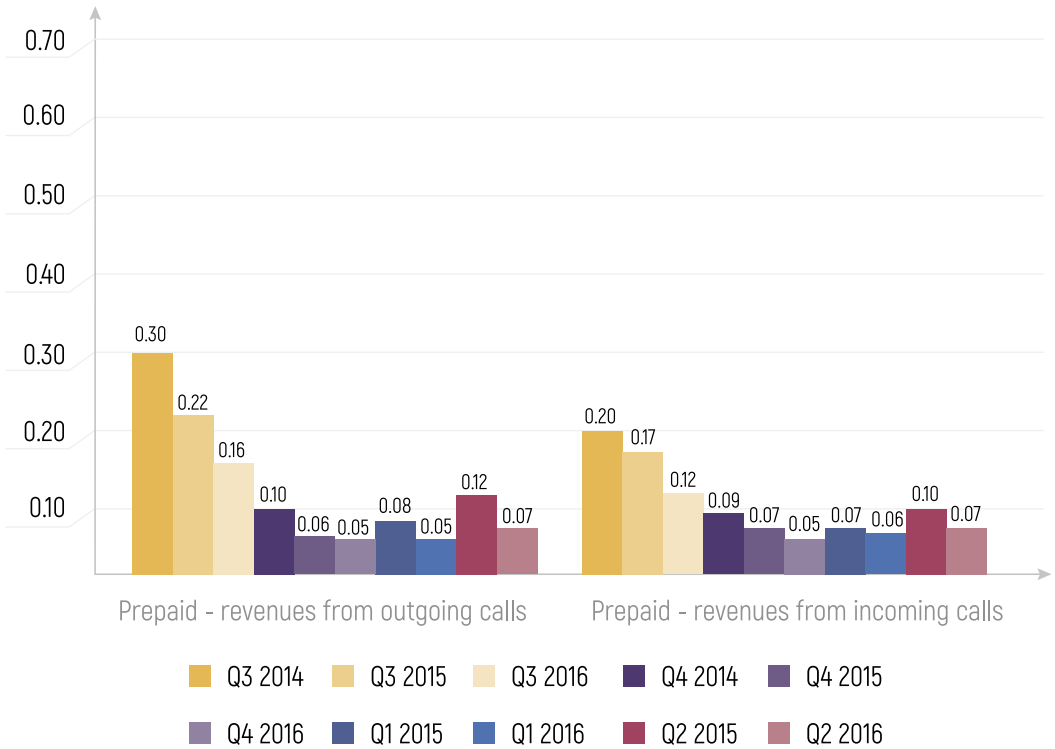


The absolute values concerning the observed retail service traffic show that there is the biggest traffic in the third quarter during the summer holiday season, when people travel more frequently to the countries signatory to the Agreement.

The data illustrating the trend followed by the revenues made from roaming without the revenues made from tariff add-ons are given below.

The revenues made from incoming and outgoing calls provided to prepaid users have been showing a decrease in all comparable quarters, year after year (Figure 62).

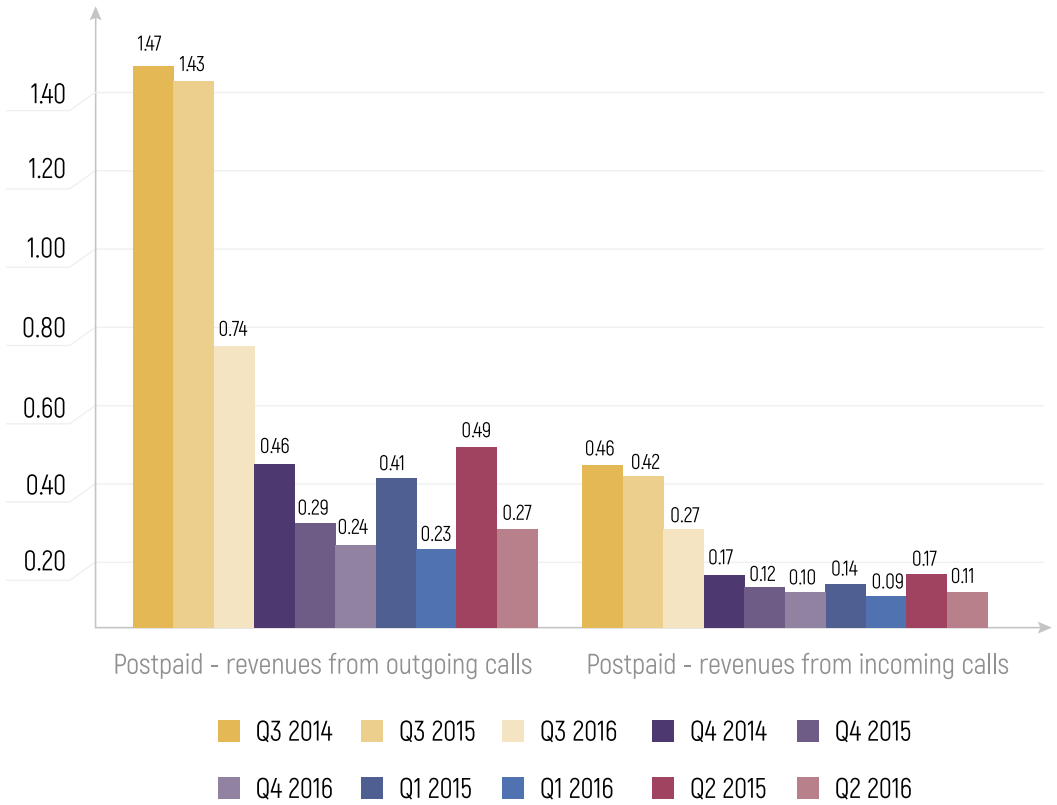
FIGURE 62. Revenues made from outgoing and incoming call service provided to postpaid and prepaid users in the countries signatories to the Agreement (million EUR)



Source: RATEL

The revenues made from incoming and outgoing calls provided to postpaid users have been showing a decrease in all comparable quarters, year after year (Figure 63).

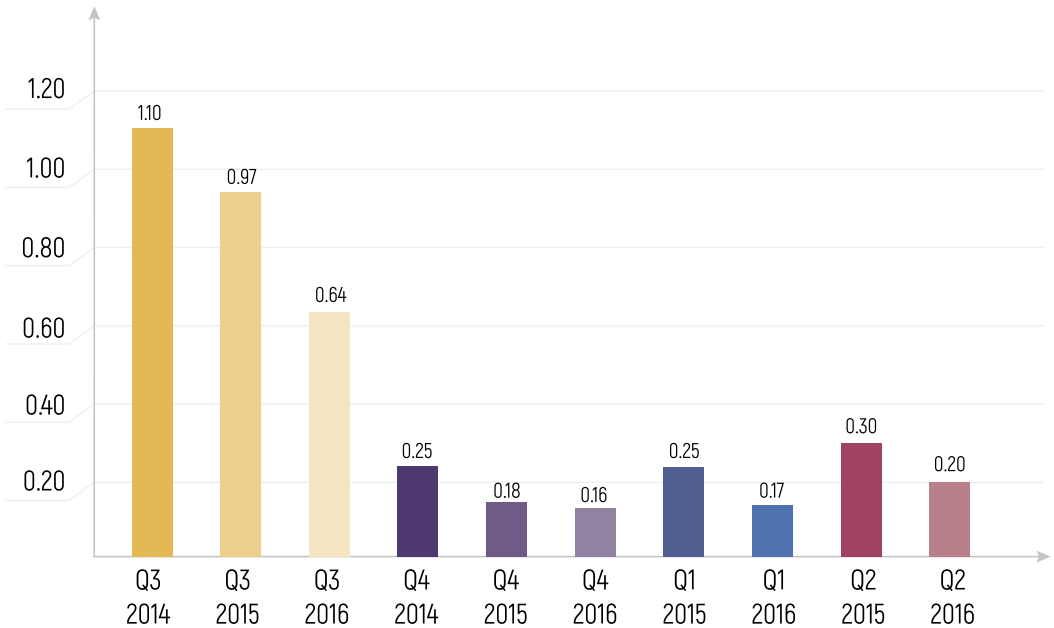
FIGURE 63. Revenues made from roaming SMS messages in the countries signatories to the Agreement (million EUR)



Source: RATEL

Revenues made from roaming SMS messages have also shown a drop in the observed comparable quarters (Figure 64).

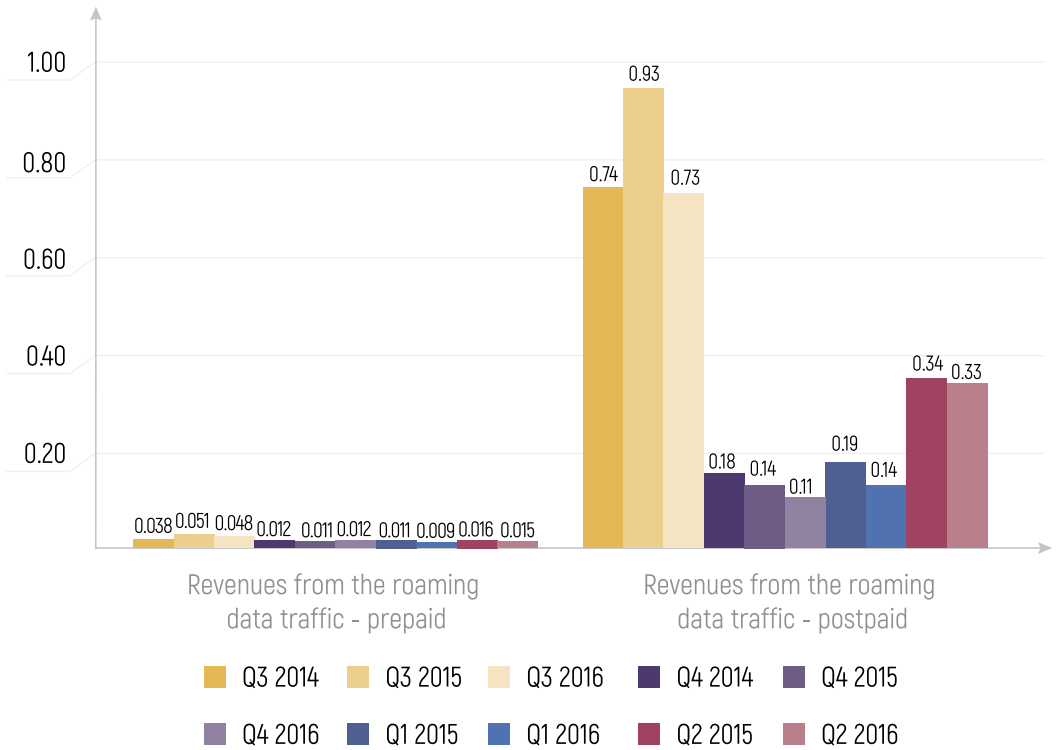
FIGURE 64. Revenues made from roaming SMS messages in the countries signatories to the Agreement (million EUR)



Source: RATEL

The revenues made from the roaming data traffic increased in the Q3 2015, compared with the same period a year before, both in case of prepaid and postpaid users. Also, there was a growth in case of prepaid users in Q4 2016 compared with the same quarter of the previous year. In other observed quarters the revenues showed a drop (Figure 65).

FIGURE 65. Revenues made from the roaming data traffic in the countries signatories to the Agreement – prepaid and postpaid (mil. EUR)



Source: RATEL

The absolute values concerning the revenues made from the observed retail services show that the biggest revenue was made in the third quarter, during the summer holiday season, when people travel more frequently to the countries signatory to the Agreement.

07 INTERNET SERVICES

The Internet market in Serbia has been experiencing a significant growth for years, which continued to a somewhat smaller extent in 2016. In addition to the rise in the total number of users, a change occurred in the structure of the service packages offered, in terms of increase of the number of packages with high rate and changes in terms of used fixed broadband infrastructure, with the increase in the number of users of the optical access technologies.

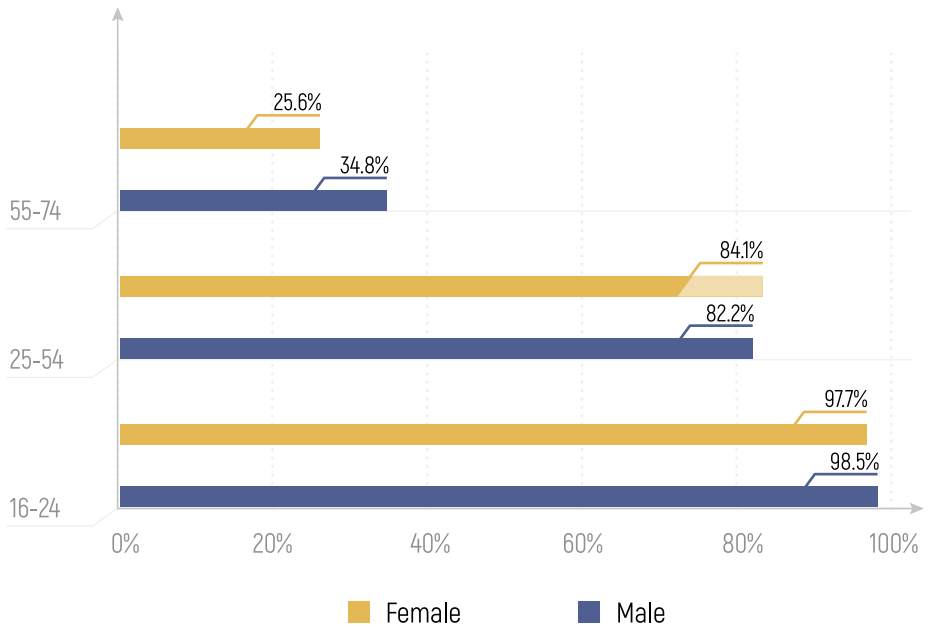
According to the survey on ICT usage by individuals, households and business, carried out in 2016 by the national Statistical Office on the sample of 2400 households and 2400 individuals, **seven out of ten persons in Serbia have used the Internet in the past three months**[6].

The Internet was used most by the youngest population (16 – 24 years). In this user group there is no difference between genders as far as Internet usage is concerned. Compared with 2015, the share of respondents who have an account on the social networks such as Facebook and Twitter decreased from 97.4% to 90.3%. The survey showed that the older age group (25-54 years) used the Internet less.

6 Data taken from the publication "Usage of information and communication technologies in the Republic of Serbia, 2016", Statistical Office of the Republic of Serbia, 2016.

The smallest share of Internet users is in the oldest group, including individuals between the age of 55 and 74 years. This group also displays the greatest discrepancy between genders regarding the usage of Internet, however it decreased from 17% in 2015 to 9.2% in 2016 (Figure 66).

FIGURE 66. Internet users by gender and age



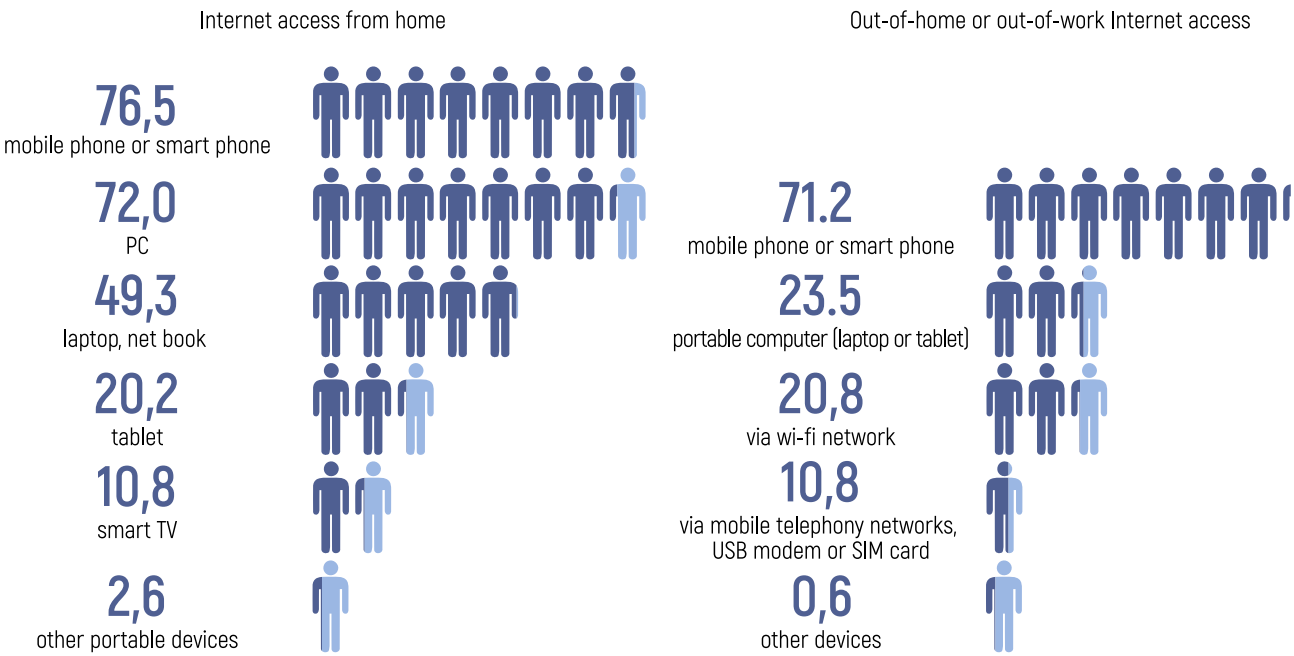
Source: Statistical Office of the Republic of Serbia

Internet access has become a constant in our everyday life, and its importance the development of economy and society in general is immense. Ubiquitous connectivity is necessary either for work or for social networking. This is reflected both in the user habits and in the devices used for this purpose.

The most used device for the Internet access in 2016 was Smartphone or cell phone.

As many as 76.5% of the respondents are using a mobile device for the Internet access from home, whereas 71.2% of the respondents use a Smartphone for the Internet access outside home or work, which is particularly characteristic for the younger population (92%) (Figure 67).

FIGURE 67. Devices used for the Internet access

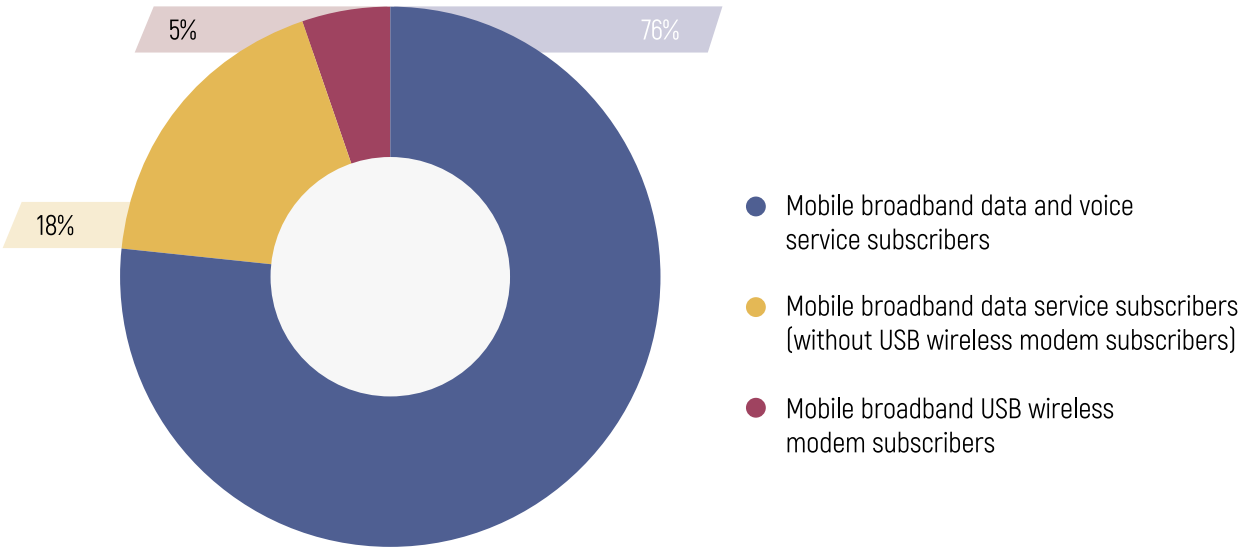


Source: Statistical Office of the Republic of Serbia

The rising usage of mobile phones for the Internet access is reflected in the constant rise of the users of the mobile Internet service provided by thre operators in 2016: Telekom Srbija, Telenor and Vip mobile.

The total number of active mobile broadband users in 2016 was 5.1 million, including subscribers of mobile broadband data and voice service, data service only and subscribers using USB wireless modem for the Internet access.

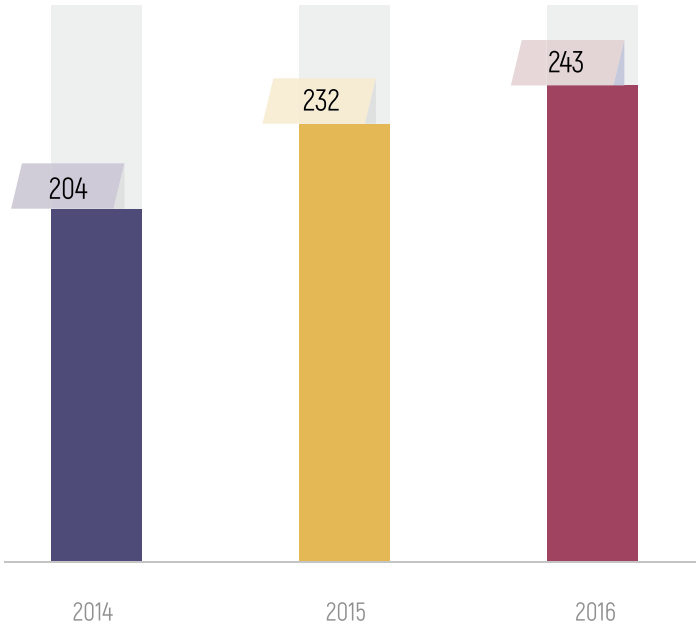
FIGURE 68. Mobile broadband Internet users distribution



Source: RATEL

The number of M2M subscriptions increased as well, amounting to 243 thousand in 2016 which is 5% more than the previous year.

FIGURE 69. Number of M2M subscriptions (thousand)



Source: RATEL

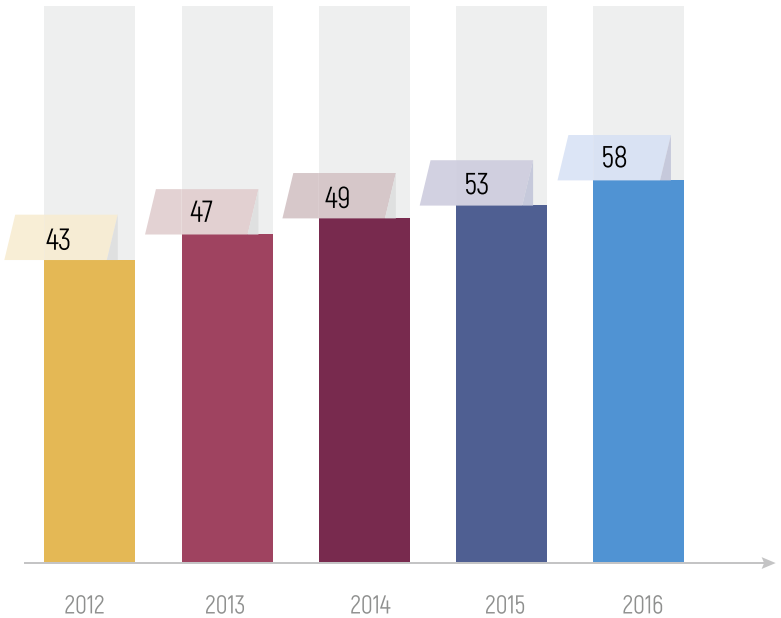
The increase in the number of users resulted in the increase in the traffic volume, which amounted to approximately 45 million GB on an annual level in 2016, for entire UMTS and LTE traffic (the traffic includes mobile Internet users, via cell phones and modems), where UMTS volume increased by 35% compared with 2015.

The best sold mobile Internet package for private postpaid users offered 5 GB of data transmission at the price that ranged between 549 and 699 dinars.

The total revenues from data transmission over mobile network in 2016 were approximately 3.7 billion dinars.

As for the Internet access, the most used devices after cell phones are PCs and laptops, which usually have fixed broadband access, which was present in six out of ten households (58.3%) in 2016, this being an increase of almost 10% in respect to the previous year.

FIGURE 70. The number of fixed broadband Internet access per 100 households



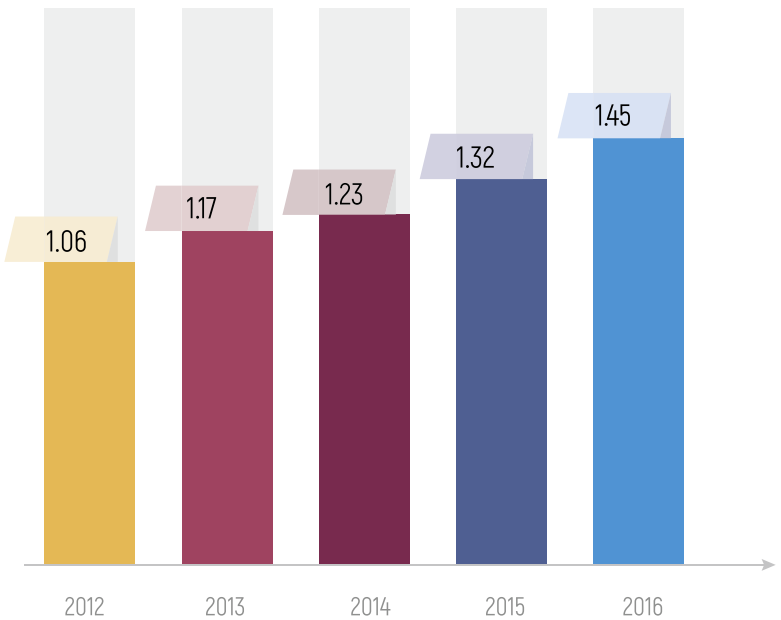
Source: RATEL

There were 214 registered ISPs in 2016 in Serbia.

The total number of fixed broadband subscribers in 2016 was 1.45 million, which is a 10% increase compared with the previous year (Figure 71).

In terms of technology used, based on the available data, the biggest percentage increase of 65% was seen in the number of users with FTTH or FTTB Internet access. The number of users with cable modem grew by 18%, whereas there was stagnation in the number of users with fixed wireless access. The number of users of xDSL increased by 2%, however, the subscriber structure changed significantly in respect to 2015, with a significant increase of the number of users of VDSL technology that account for 28% of the total number of xDSL users, due to greater demand for packages with bigger throughput.

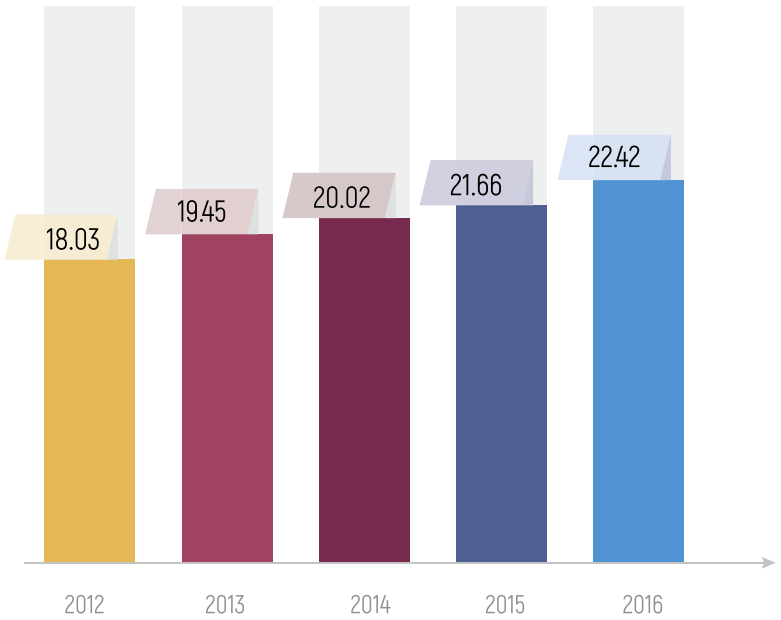
FIGURE 71. The total number of subscribers of fixed broadband Internet access (million)



Source: RATEL

The increase in the number of subscribers is also reflected in the increase in the revenues from fixed broadband Internet access of 3.5% in respect to 2015. (Figure 72).

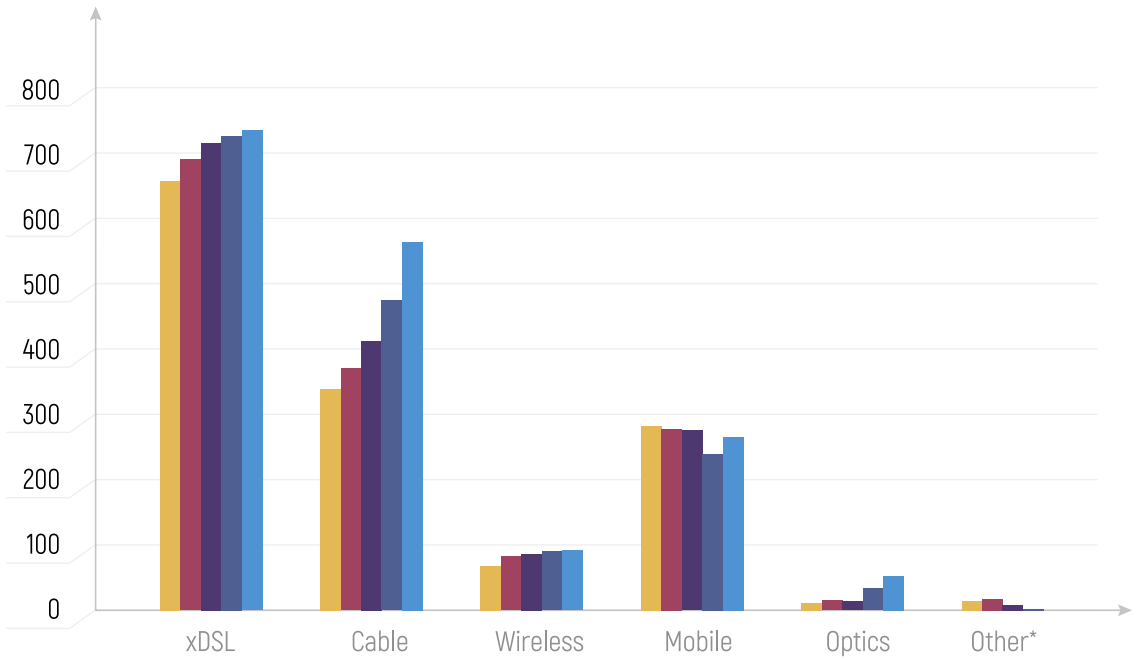
FIGURE 72. Revenues from fixed broadband Internet access (billion)



Source: RATEL

xDSL is the most common access, used by 51% of the total number of users, followed by cable modem with 39% of users (Figure 73).

FIGURE 73. The share of the broadband subscribers by access technology (thousand)



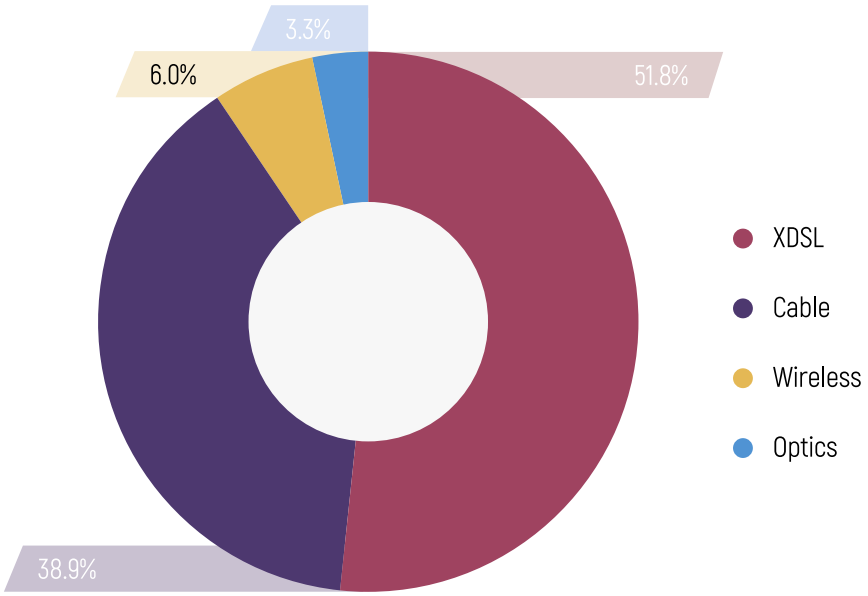
	xDSL	Cable	Wireless	Optics	Other*
2012	659.88	331.28	62.01	8.10	11.90
2013	693.65	375.33	79.88	11.52	13.53
2014	715.84	410.82	83.64	9.52	6.49
2015	724.16	475.97	87.57	30.53	2.29
2016	737.25	561.94	93.14	50.16	7.99

*) Eternet. LAN.,,,

Source: RATEL

The structure of revenues made from fixed broadband access follows the subscriber structure, with a slightly bigger share of xDSL and cable, with 51,8% and 38,9%, respectively, whereas the share of wireless access was 6% (Figure 74).

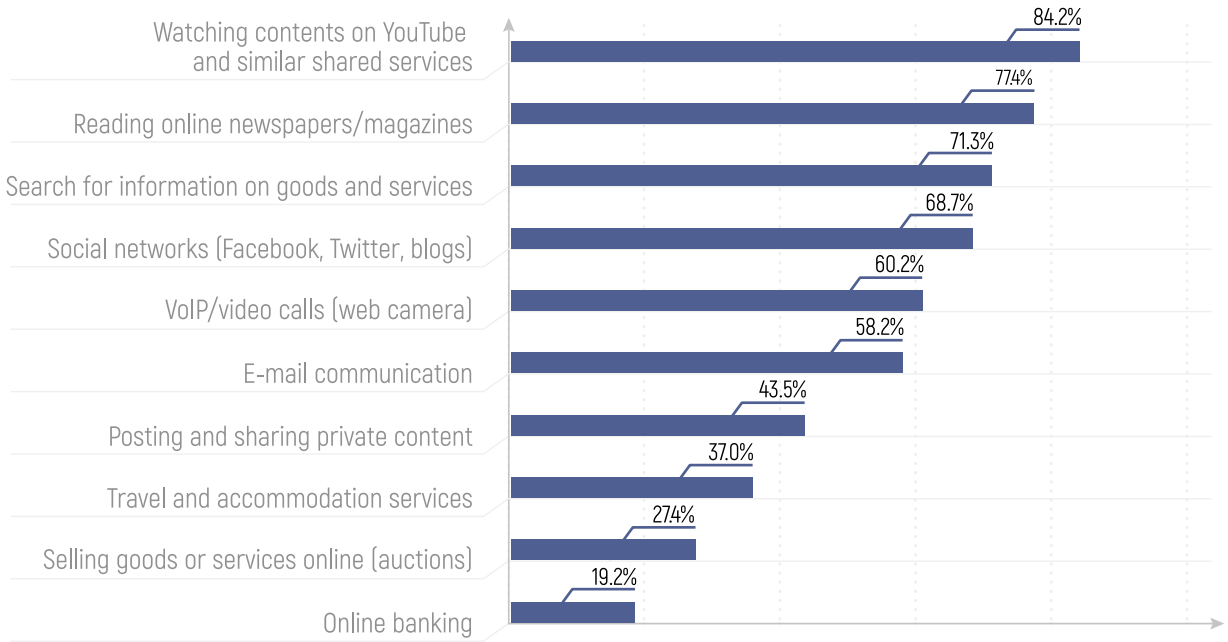
FIGURE 74. The structure of revenues made from fixed broadband, by access technologies



Source: RATEL

The Internet was used most of all for watching the contents on YouTube and similar shared applications (84.2%), online newspaper and magazine reading (77.4%), looking up the information on goods and services (71.3%), and social networks such as Facebook and Twitter (68.7%).

FIGURE 75. Types of Internet usage for private purposes

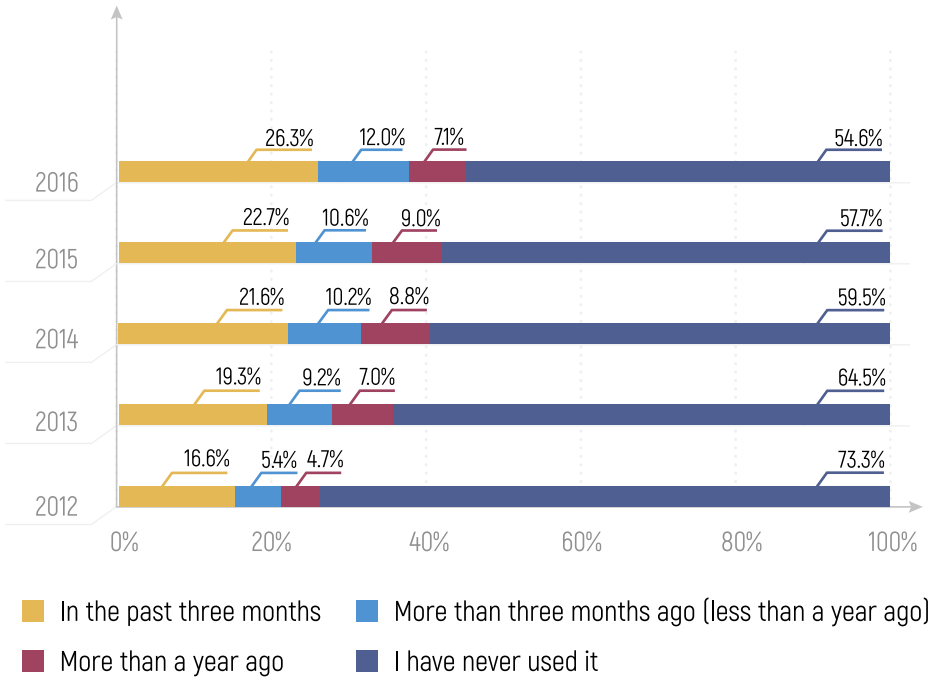


Source: Statistical Office of the Republic of Serbia

Reduced number of social network accounts among the 16/24 age group resulted in participation on social networks falling from the first to the fourth place on the list of most common usage.

Selling goods or services online is rising and the number of persons that made an online purchase was increased by 230 000 in respect to the previous year. Only 26.3% of the respondents have ordered goods or services online in the last three months, whereas 54.6% persons have never used the Internet for these purposes. The change in habits of the individuals regarding the online purchase in the last 5 years can be seen in Figure 76.

FIGURE 76. Ordering/purchasing goods or services online



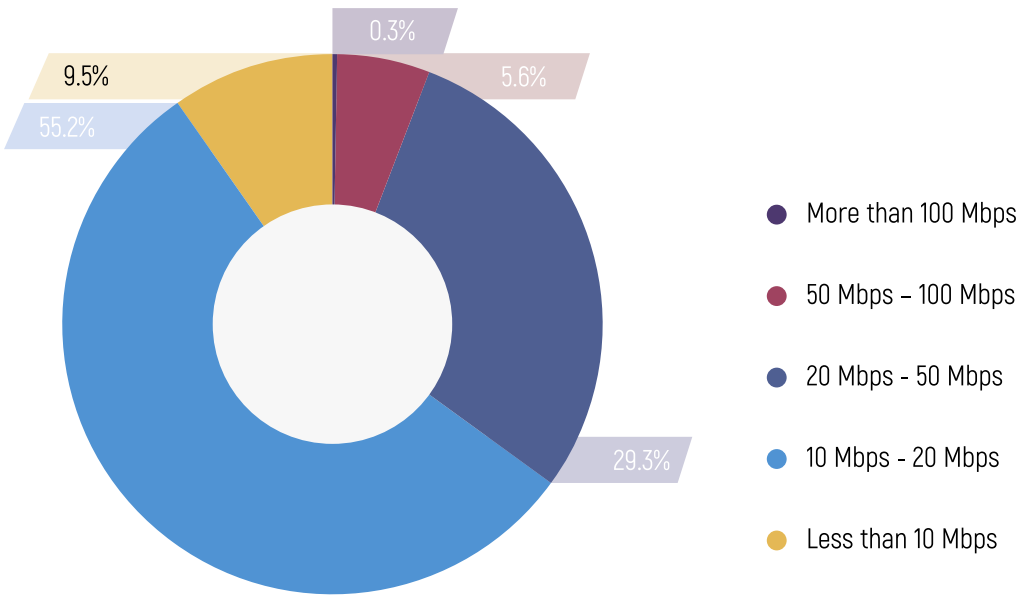
Source: Statistical Office of the Republic of Serbia

Changes in user habits, increased number of users accessing services such as YouTube, along with the increase in the number of device used to access the Internet have all resulted in the change of the package structure and the increase in the traffic volume.

As for the broadband access, the same as the previous year, Internet packages offering 10 Mbps are the most sold, at the price ranging between 1000 and 2015 dinars.

According to the available data, in 2016 over 55% of fixed broadband users used the packages of at least 10 Mbps but less than 20 Mbps, almost 30% used the packages of at least 20 Mbps but less than 50 Mbps and almost 6% of users used the packages of at least 50 Mbps but less than 100 Mbps.

FIGURE 77. Share of the fixed broadband subscribers, according to access rate

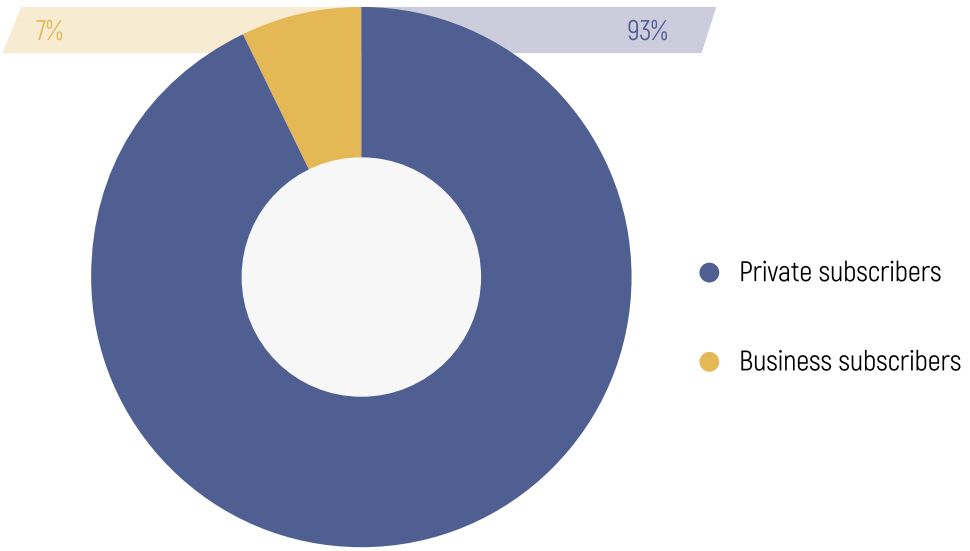


Source: RATEL

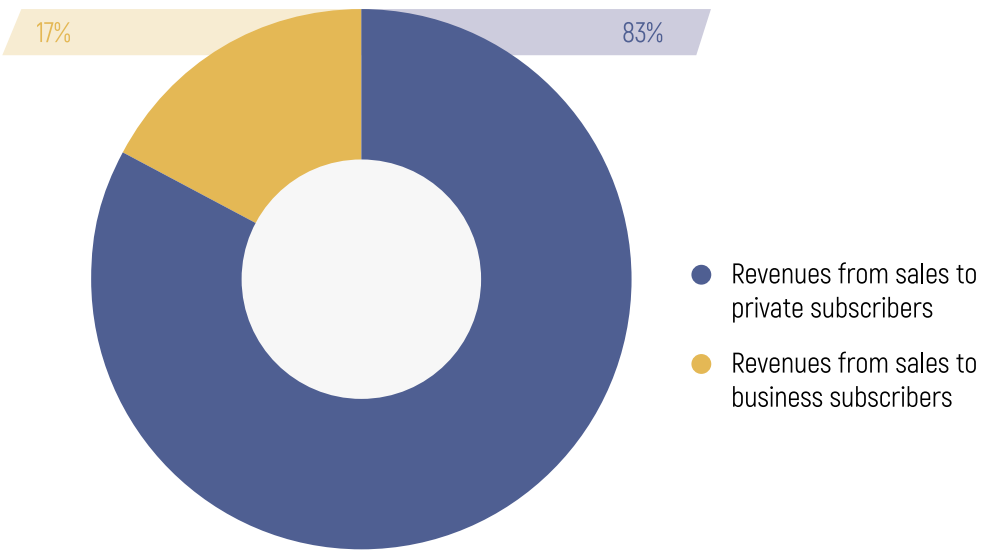
The share of the fixed broadband subscribers according to access rate influenced the amount of the average bill for fixed broadband Internet, which amounted to 1437 dinars for private users and 3499 dinars for business users in 2016. A considerably bigger percentage of users are private users (Figure 52a), consequently, having a larger share in the revenues (Figure 78b).

FIGURE 78. Private/business fixed broadband subscribers ratio and revenue share

a)



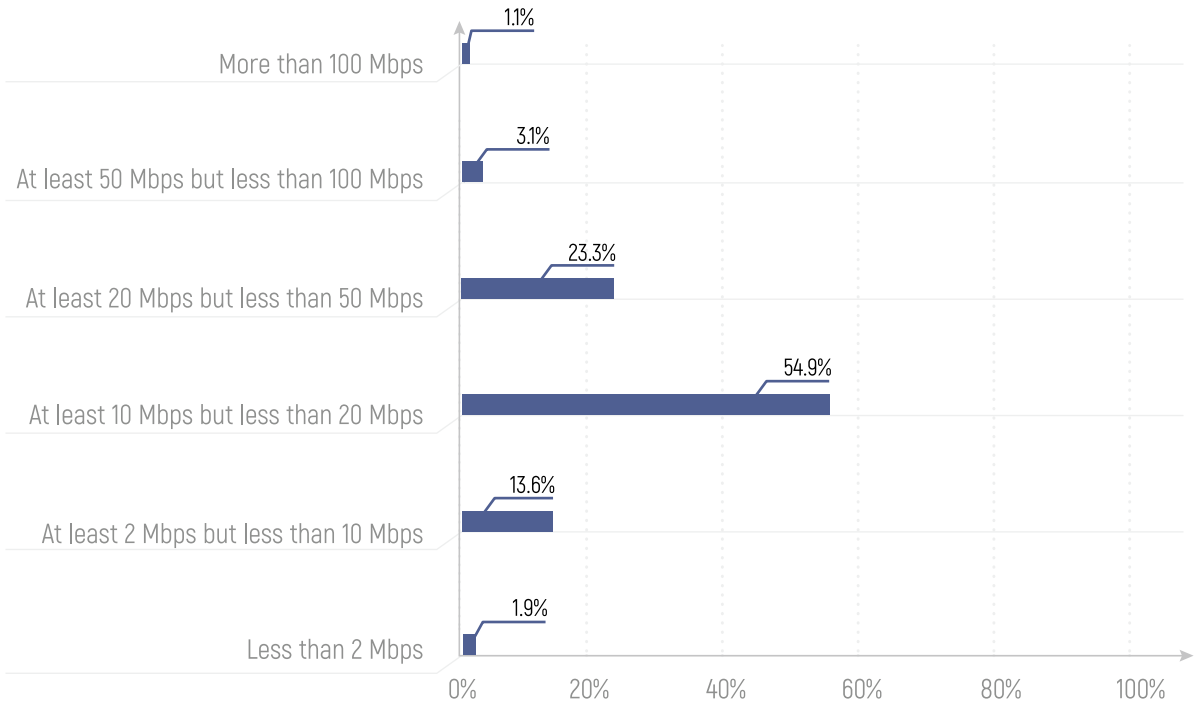
b)



Source: RATEL

The Internet connection rate defined under the contract with the Internet service provider used by business is given in Figure 79.

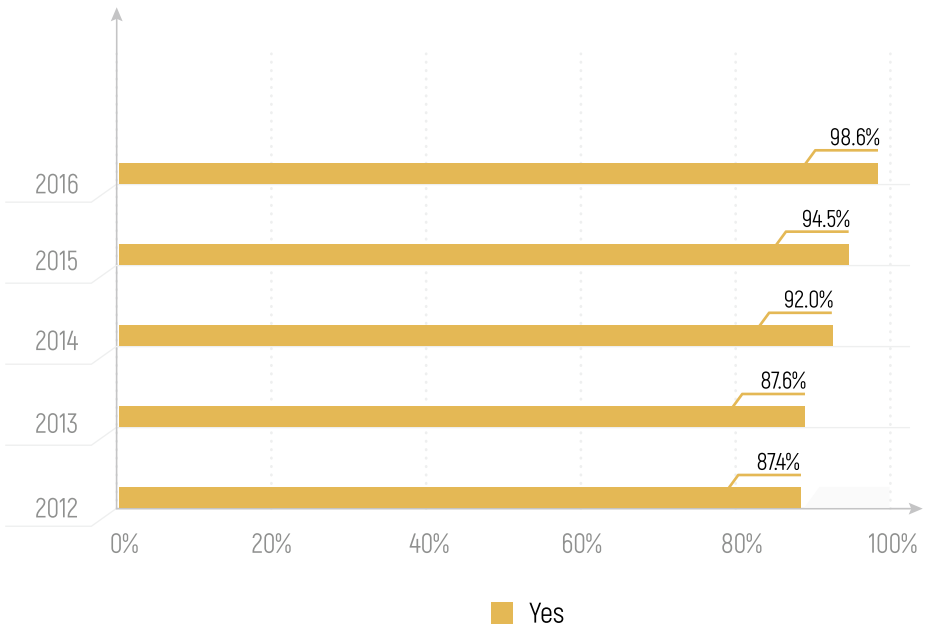
FIGURE 79. Internet connection rate used by businesses



Source: RATEL

Companies on the territory of the Republic of Serbia increasingly use public administration electronic services, predominantly for the purpose of obtaining information, downloading the forms or uploading the filled out documents. In 2016, these services were used by 98.6% of companies. The usage of the public administration electronic services in the last five years is shown in Figure 80. One of the reasons of the increased number of users in the last three years is a rapid development of the e-government services in the Republic of Serbia.

FIGURE 80. Usage of online public administration services by companies



Source: Statistical Office of the Republic of Serbia

Out of the total number of companies with Internet connection, 80.8% have their own website, the purpose of which is mainly description of goods or services and price lists (86.9%), the possibility to view contents in customized mode (84.4%) and the possibility for consumers to get acquainted with the products or to customize them (70%).

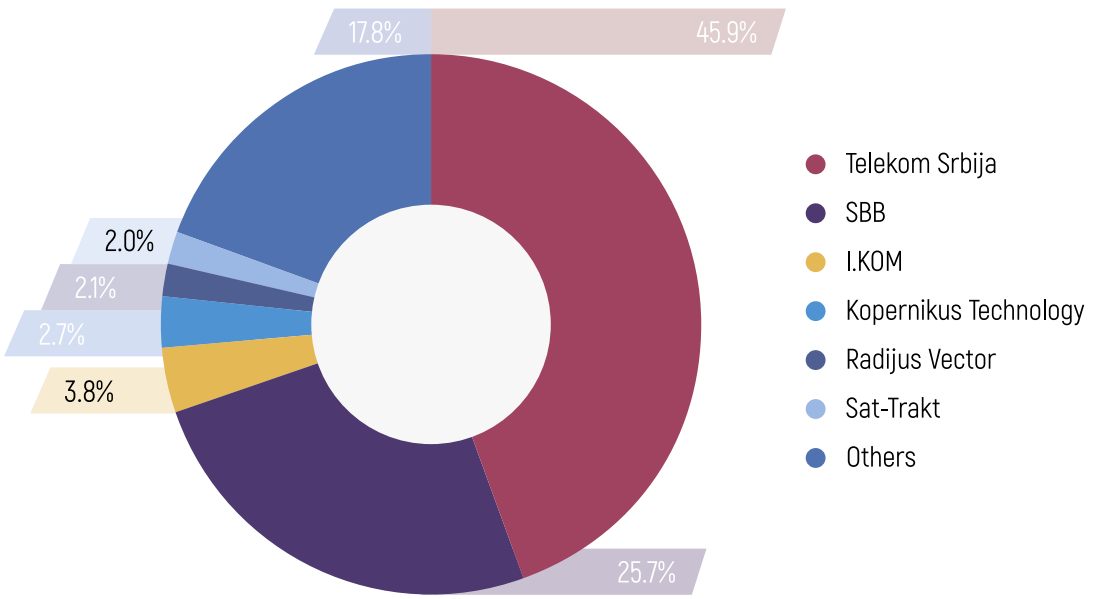
Social networks are becoming increasingly important for the company business. For their business operations during 2016, nearly 36.1% of the companies used one of the social networks, such as Facebook, LinkedIn, Xing or Yammer.

The number of companies paying for cloud service, accessed via Internet for the purpose of software usage, data storage etc. during 2014, reached 9.3% which is a slight increase compared to 9.2% the previous year.

The change in the package structure in favour of higher access rates and the increased number of devices used for the Internet access in the household resulted in the increased traffic volume. Based on the available data, the assessed total traffic made by fixed broadband in 2016 was around 765 million GB. The assessed international link capacity was approximately 263Mb/s and the leased international link capacity (*lit/equipped*) was around 887Mb/s.

Telecommunications Company "Telekom Srbija" remains to be the largest operator of fixed broadband in the Republic of Serbia in 2016, with a market share of 46% in terms of the number of subscribers. Other ISPs that should be mentioned are: SBB, Telenor, I.KOM, Kopernikus technology, Radijus vektor, Sat-Trakt, PE "Pošta Srbije", Orion telekom, Yunet International, Orion telekom tim and Beotelnet ISP. Together these operators hold 90% of the Serbian ISP market in terms of the number of subscribers.

FIGURE 81. Market share of the leading ISPs in 2016



TELEKOM SRBIJA	SBB	I.KOM	KOPERNIKUS TECHNOLOGY	RADIJUS VEKTOR	SAT-TRAKT	POŠTA SRBIJE	ORION TELEKOM	YUNET INTERNATIONAL	ORION TELEKOM TIM	BEOTELNET-ISP	Other operators
45,9%	25,7%	3,8%	2,7%	2,1%	2,0%	1,9%	1,8%	1,6%	1,6%	1,5%	9,3%

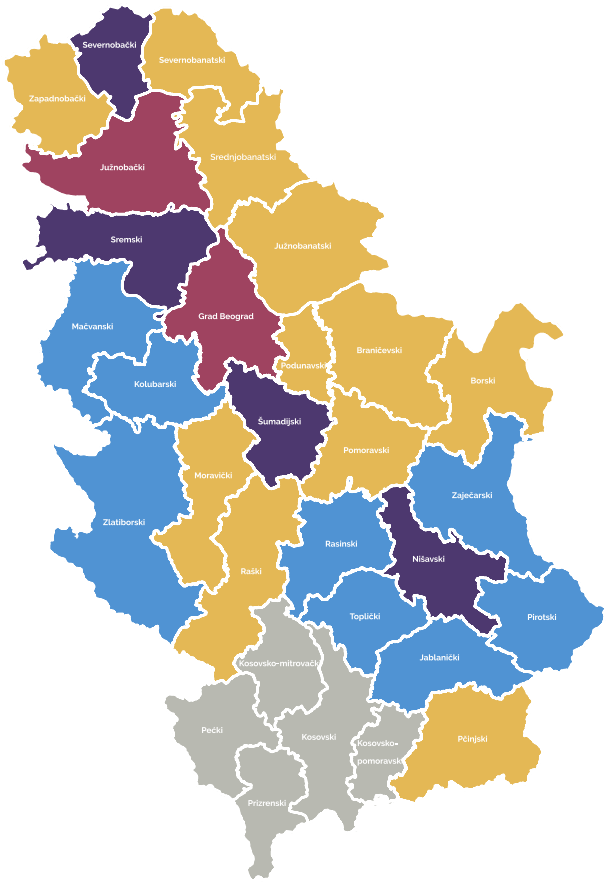
Source: RATEL

Table 7 shows the data on the Internet household penetration by districts.

Table 7. Penetration by districts

DISTRICT	NUMBER OF HOUSEHOLDS	TOTAL NUMBER OF SUBSCRIBERS	HOUSEHOLD PENETRATION (%)
Belgrade	606433	598706	98.73
South Bačka	223653	184542	82.51
North Bačka	71416	47898	67.07
Nišava	128303	80824	62.99
Šumadija	97096	59838	61.63
Srem	105031	62491	59.50
South Banat	101503	58330	57.47
Podunavlje	64155	36661	57.14
Central Banat	68866	39344	57.13
West Bačka	68888	39249	56.98
Morava	72867	41431	56.86
Pomoravlje	71478	40590	56.79
Raška	90515	49381	54.56
Bor	45970	25019	54.42
Braničevo	59776	32243	53.94
Pčinja	49918	26465	53.02
North Banat	56800	29791	52.45
Kolubara	58973	28830	48.89
Mačva	100136	48904	48.84
Zlatibor	94434	45192	47.86
Rasina	77270	36028	46.63
Pirot	34036	15602	45.84
Zaječar	42445	18886	44.50
Topla	31184	12612	40.44
Jablanica	66740	25926	38.85

FIGURE 82. Internet access penetration by districts of the Republic of Serbia



- Districts with household penetration over 80%
- Districts with household penetration 58%-80%
- Districts with household penetration 50%-58%
- Districts with household penetration below 50%

Note: Average household penetration in the Republic of Serbia is 58%

Source: RATEL

Table 8 shows a list of 10 municipalities/ cities with the highest Internet access subscriber penetration, compared to the number of households.

Table 8. List of 10 municipalities/ cities with the highest Internet access subscriber penetration compared to the number of households

MUNICIPALITY/ CITY	NUMBER OF SUBSCRIBERS PER 100 HOUSEHOLDS
Novi Sad	**99,95**
Beograd	**98,73**
Temerin	**76,82**
Niš	**75,98**
Vršac	**72,50**
Požarevac	**71,87**
Subotica	**70,87**
Veliko Gradište	**67,97**
Kragujevac	**67,30**
Požarevac	**64,41**

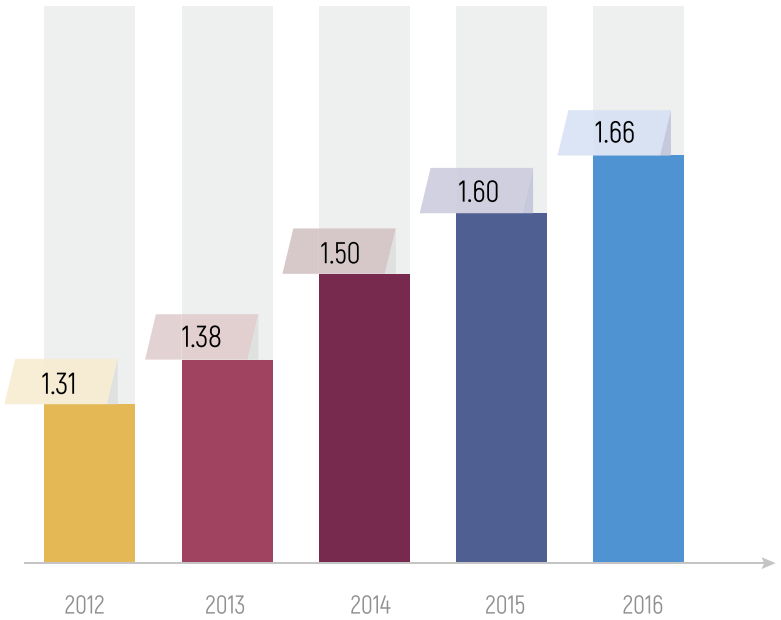
MEDIA CONTENT DISTRIBUTION

In 2016, the number of media content distribution operators remained on the last year's level, which is 90 registered operators providing the service via cable distribution network (coaxial, hybrid and optical) – CATV, public fixed telephone network – IPTV, satellite distribution network – DTH (Direct to Home) and wireless network. During the observed year, a new distribution service has emerged – paid terrestrial television, broadcasted via the network of terrestrial transmitters in the DVB-T2 standard. For the usage of this service, an indoor antenna and a set-top box are required. Since 2016, a company "Antena TV" LLC has registered to provide this type of service on the market of the Republic of Serbia.

Total number of subscribers of the media content distribution service in 2016 was 1.66, which represents an increase by 4% compared to the previous year, mostly due to the increase of IPTV and CATV service subscribers.

Approximately 839 thousand subscribers used the service of media content distribution within service package (bundled service), most often coupled with the service of broadband Internet access and/or fixed telephony.

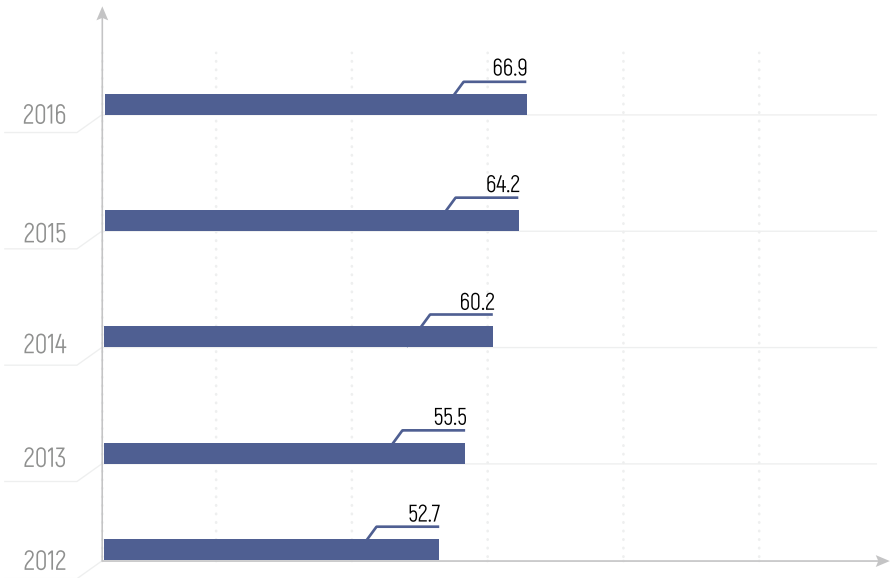
FIGURE 83. Total number of subscribers (in million)



Source: RATEL

Penetration is 23,51% in terms of population and 66,87% in terms of households.

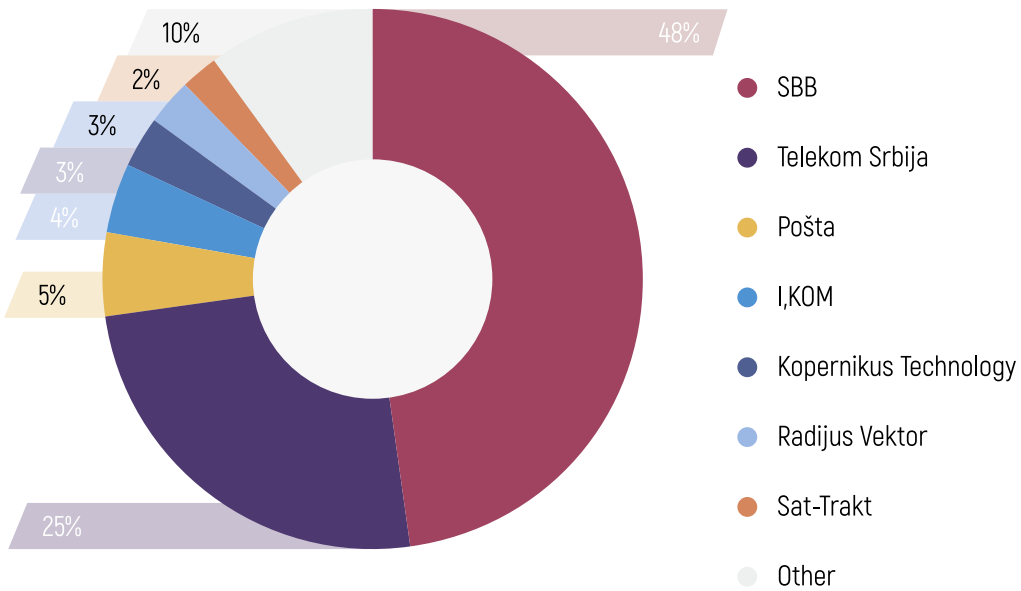
FIGURE 84. Subscribers per 100 households



Source: RATEL

The largest media content distribution operator in the Republic of Serbia during 2016 remained Serbia Broadband – Srpske kablovske mreže Ltd. (SBB), with a market share of 48%, in terms of the number of subscribers. Other leading operators are Telekom Srbija JSC, Public Enterprise "Pošta Srbije", I.KOM Ltd, Kopernikus tehnology Ltd, Radijus vektor Ltd. and Sat-Trakt Ltd. In terms of the number of subscribers, the joint market share of these operators in the media content distribution market amounts to 90%.

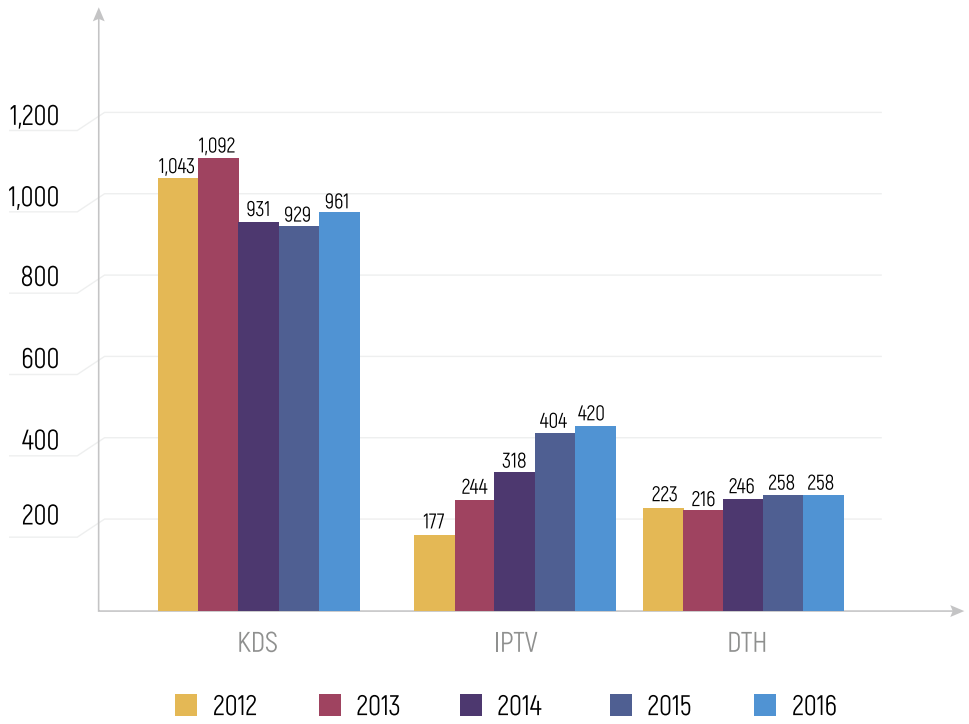
FIGURE 85. Market share of the leading operators in 2016



Source: RATEL

Media content distribution via CATV continued to be dominant in 2016, with around 961 thousand subscribers, which is an increase by 3% compared to the previous year. The number of IPTV subscribers is on the increase as well, by approximately 4% compared to the previous year, whereas the number of DTH subscribers remains unchanged.

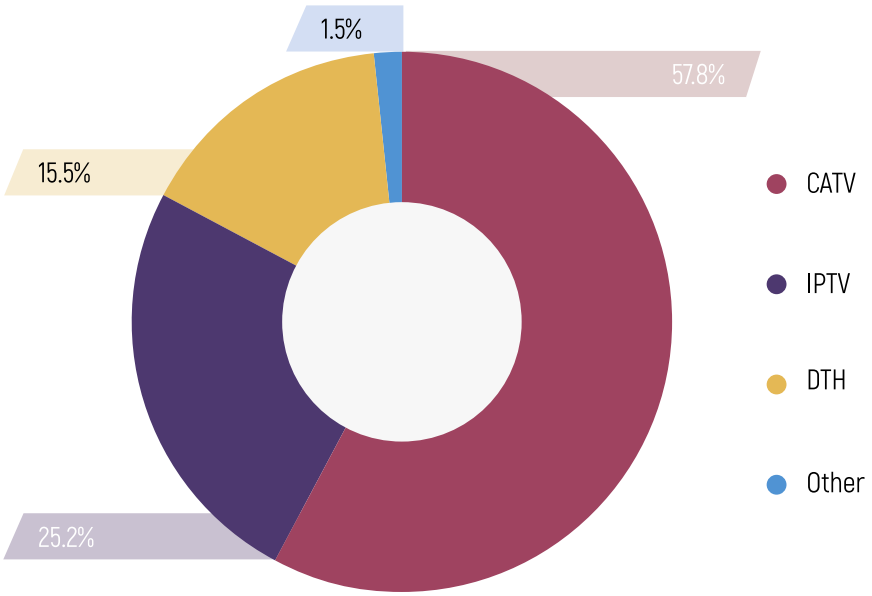
FIGURE 86. Number of subscribers of the most popular types of media content distribution (in thousands)



Source: RATEL

The percentage share of the subscribers by the type of distribution, during 2016, did not change substantially regarding the most popular types of distribution, while the subscribers of other types of distibution slightly increased their share from 0.3% to 1.5% compared to the previous year. More precisely, those are subscribers of the distribution via Internet and subscribers of the wireless network distribution, including subscribers of the paid terrestrial television, which emerged on the observed market as a new distribution service, with around 2800 subscribers in 2016.

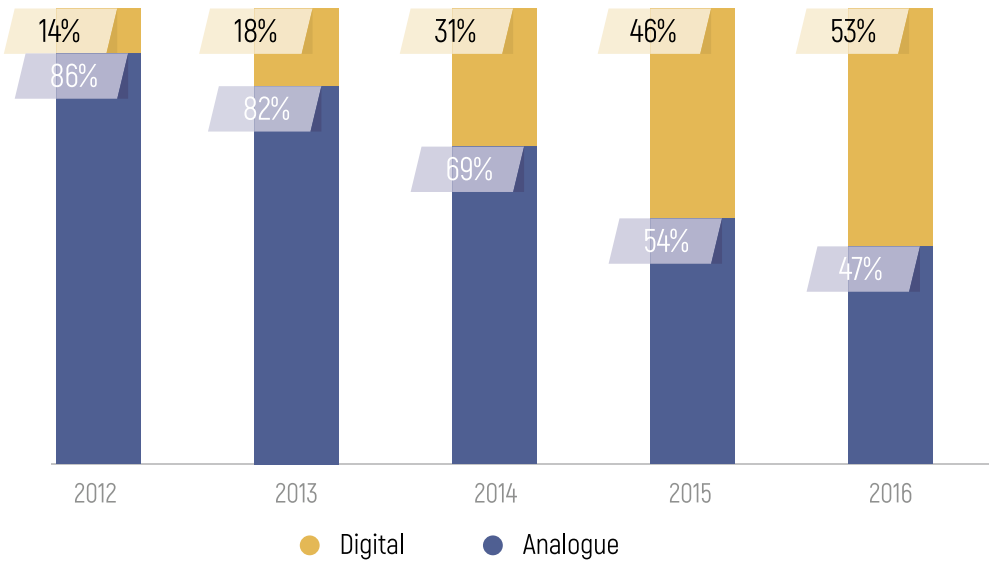
FIGURE 87. Share of subscribers by the type of distribution in 2016



Source: RATEL

If we compare the ratio between the analogue and digital CATV, since 2016, the subscribers following the media content in digital format have for the first time outnumbered the subscribers of the analogue TV, which means that the users' preferences change and that the digitalization of cable networks has only but started to expand. Digital cable distribution enables users to watch content in high resolution (HD), as well as to have numerous additional services, while simultaneously the analogue to digital distribution switchover is being encouraged by the operators' diverse promotional activities.

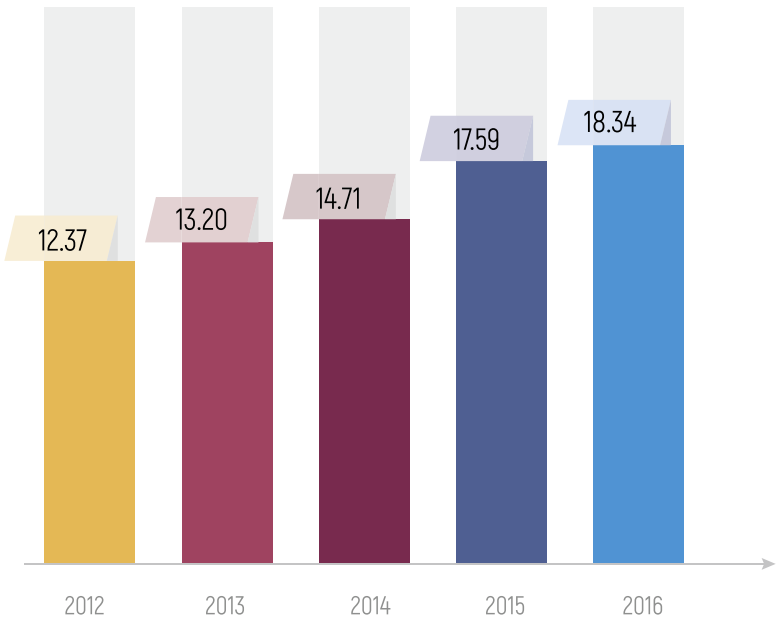
FIGURE 88. CATV subscribers



Source: RATEL

The total operators' revenues from media content distribution in 2016 was 18.34 billion dinars, which is a 4% increase compared to the previous year.

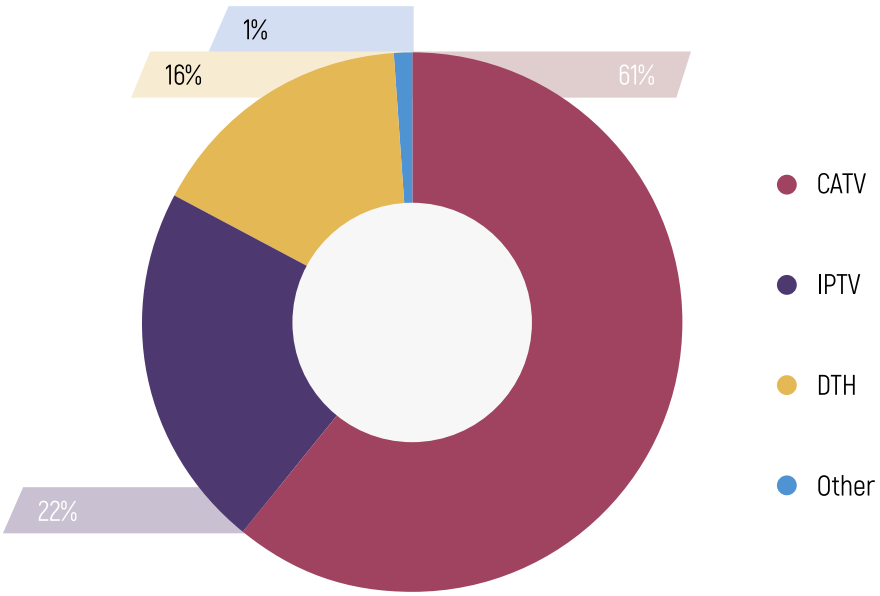
FIGURE 89. Revenue trends on the media content distribution market (in billion dinars)



Source: RATEL

The share of revenues by the type of distribution did not change in 2016 compared to the previous year. CATV accounts for the biggest share in the revenues from the media content distribution (61%), followed by IPTV (22%) and DTH (16%). Other revenues on the observed market (revenues from the sale of the application for watching the TV channels, revenues from the distribution via Internet and revenues from renting the multiplex RTV signal) participate with approximately 1%.

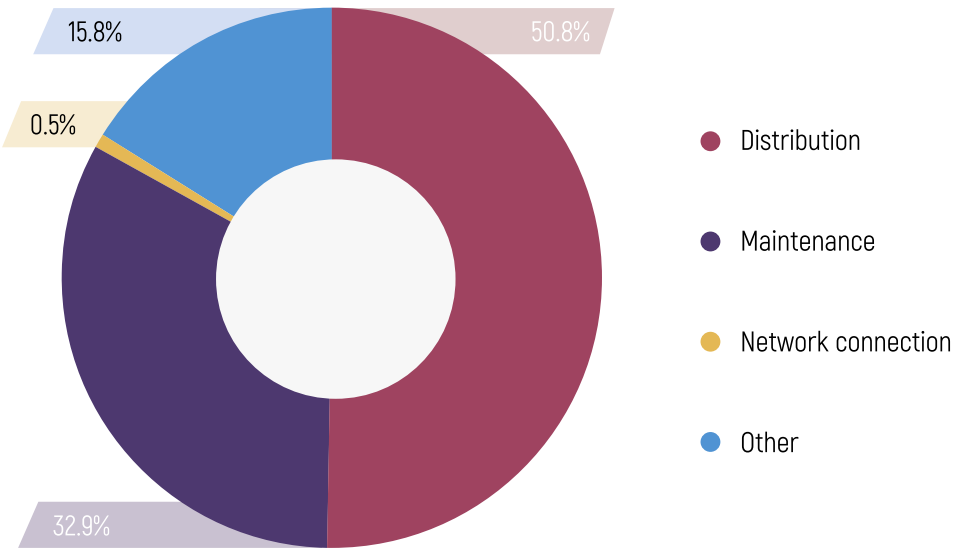
FIGURE 90. Structure of the revenues from media content distribution in 2016



Source: RATEL

The revenues from the network maintenance and content distribution account for 84% of the total income, as shown in Figure 91. Network connection charges account for 1% of the total revenues. The reason for such a low share is the fact that the majority of operators do not charge for this service during promotional offers or if entering in a 12-month/24-month user contract. Revenues from other services include income from additional program packages, video on demand, equipment for digital TV usage on an additional device etc. These revenues were increased and account for around 16% of the total revenues in 2016, mostly due to an increased interest of users for program packages with additional subscription charges.

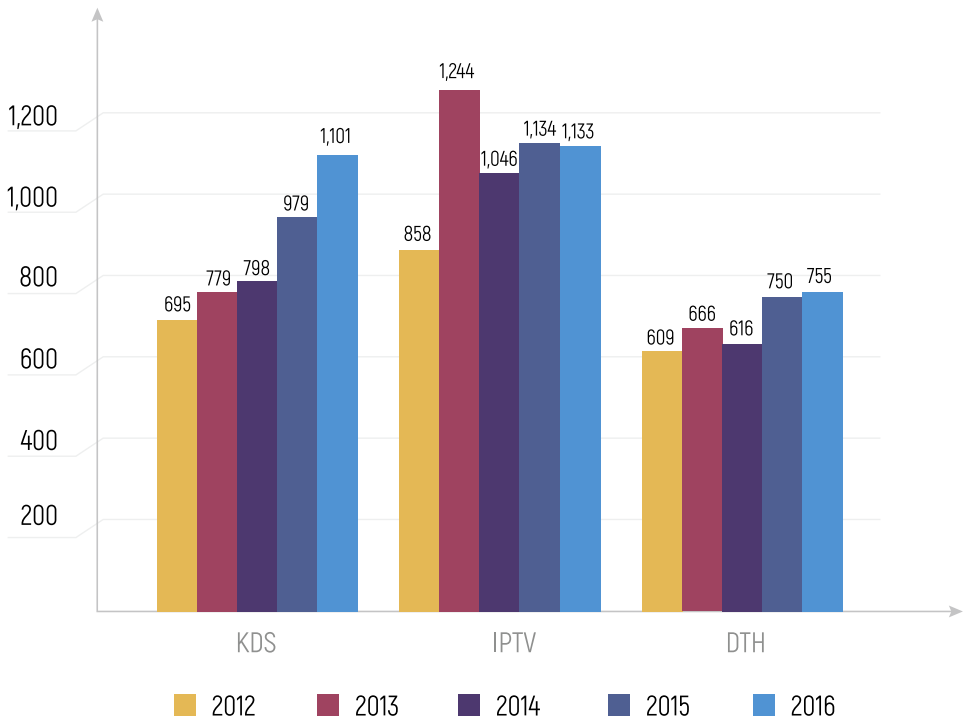
FIGURE 91. Share of the revenues from media content distribution in 2016



Source: RATEL

In 2016, the average monthly subscription for basic analogue CATV package was 936 dinars, whereas for digital CATV it was 1245 dinars. Average subscriptions for basic IPTV package, as well as DTH, remained on the approximately same level, compared to the previous year and amounted to 1333 dinars, i.e. 755 dinars on a monthly basis.

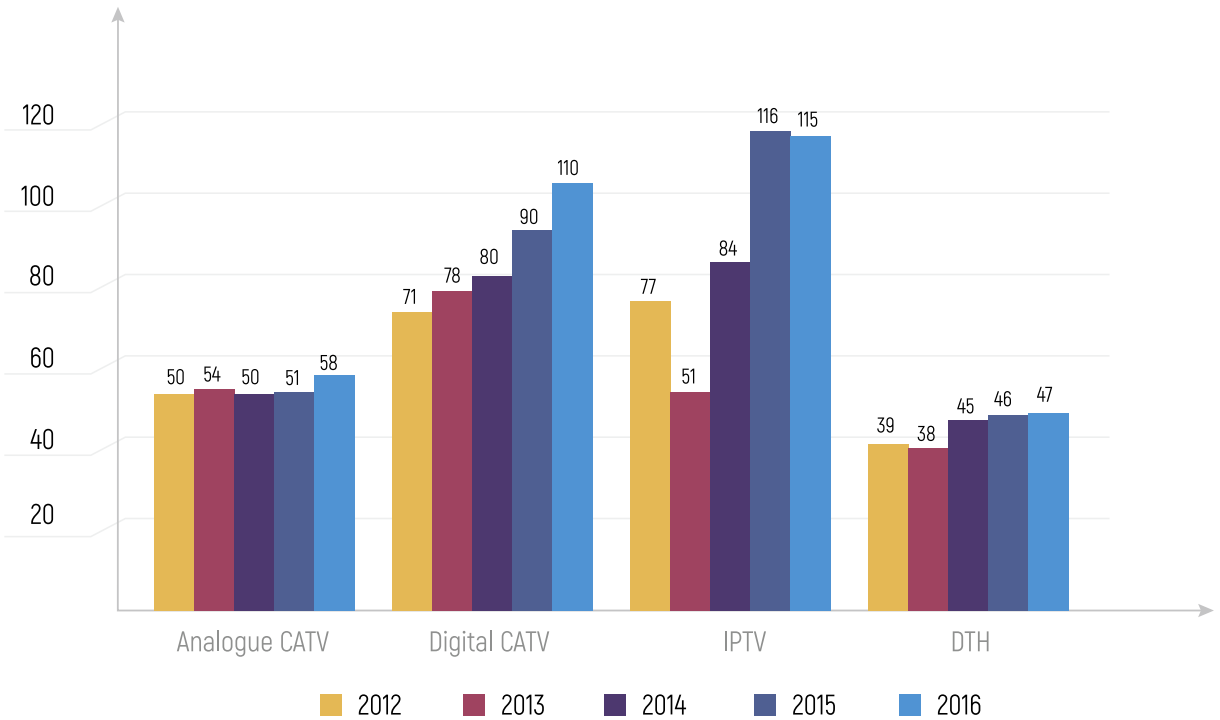
FIGURE 92. Average monthly subscription for the basic package of the most popular types of distribution (in RSD)



Source: RATEL

The average number of TV programs in the basic package in 2016, for different types of distribution, ranges from 58 in case of analogue CATV, to 115 in the case of IPTV. There is still a big disproportion between the number of basic package programs of analogue and those of digital CATV, which is one of the means operators use to stimulate subscribers to switch to digital distribution of media content.

FIGURE 93. Average number of TV channels in the basic package of the most popular types of distribution



Source: RATEL

In addition to the basic package programs included in monthly subscriptions, users can opt for additional, usually thematic channels with additional subscription. These program packages, beside programs from their regular offer already included in the subscription, also contain additional educational, sport-related, film or entertainment and other additional HD programs. According to the available data, in 2016, these programs were followed by more than 334 thousand subscribers.

Additional services available to the subscribers of digital CATV and IPTV include VoD (video on demand), rewind feature, recording of the content, interactive TV guide, parental control, watching content on mobile devices and other. According to the available data, in 2016, operators realized over 287 million requests for an additional service (345 requests annually per subscriber), out of which over 68 million requests for the VoD service, i.e. 82 requests per subscriber annually.

For distribution service subscribers to be able to watch media content in digital format (irrelevantly from the network they are connected to – cable, telephony, wireless) on various TV devices, for each one of those they need an additional receiver (set-top box), which is also paid additionally. During 2016, more than 150 thousand subscribers were renting the additional receiver, but in the following period, this number is expected to decine, whereas the number of users of applications for watching TV content on mobile devices is expected to rise. These applications, often provided by the o-

perators to their users free of charge, are included in the chosen distribution package.

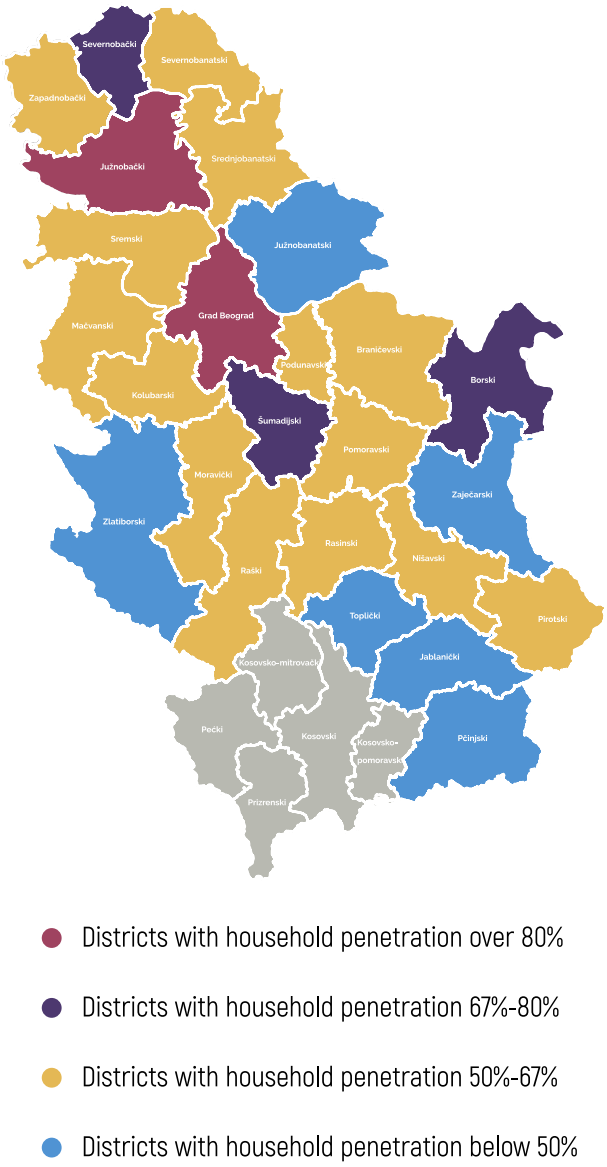
In addition to the distribution service, it is also possible to follow certain TV content on mobile devices, by means of different applications, without connecting oneself to the distribution network and without entering into an agreement with the operator. The application user is not obliged to pay monthly subscription, while the application itself is usually activated by means of an SMS, charged at a previously set rate. This rate actually represents the fee for the usage of the application during a certain, usually shorter period of time. According to the available data, during 2016, the number of users of the application for watching TV content without subscriber agreement amounted to over 14 thousand persons, whereas 3 operators had this application in their business offer.

Table 9 provides data on the penetration of subscribers of media content distribution per household, on a district level, whereas Figure 94 shows its graphical overview on the map of Serbia.

Table 9. Subscribers of the media content distribution service by districts

DISTRICT	PENETRATION PER HOUSEHOLD (%)
City of Belgrade	83.97
South Bačka	83.84
Bor	71.02
North Bačka	70.25
Šumadija	67.60
Central Banat	66.50
Raška	63.85
Braničevo	63.74
North Banat	58.95
Kolubara	57.65
Rasina	57.05
West Bačka	55.84
Podunavlje	53.82
Mačva	53.81
Pirot	53.52
Morava	53.15
Srem	52.70
Pomoravlje	51.24
Nišava	51.10
South Banat	48.25
Zlatibor	46.91
Jablanica	42.26
Zaječar	42.02
Pčinja	35.20
Toplica	34.66

FIGURE 94. Penetration of the media content distribution



Note: Average household penetration in the Republic of Serbia is 67%

Source: RATEL

Table 10 shows a list of 10 municipalities/cities with the highest subscriber penetration regarding media content distribution, compared to the number of households.

Table 10. List of 10 municipalities/cities with the highest subscriber penetration regarding media content distribution, compared to the number of households

MUNICIPALITY/CITY	NUMBER OF SUBSCRIBERS PER 100 HOUSEHOLDS
Novi Sad	**96.66**
Belgrade	**83.97**
Veliko Gradište	**77.66**
Vršac	**77.61**
Sremski Karlovci	**74.34**
Subotica	**73.81**
Šabac	**73.76**
Zrenjanin	**72.02**
Dimitrovgrad	**71.76**
Beočin	**71.39**

09 BUNDLED SERVICES

Bundled services are commercial offers of two or more services at a flat rate, which is lower than the sum of individual prices for each of the services sold individually. On the electronic communications market, service packages (bundled services) are the result of the horizontal integration, enabling operators to use the same network and thus provide more different services on the retail market (horizontally integrated operators), such as fixed telephony, fixed broadband Internet, media content distribution, mobile telephony and mobile broadband Internet. In that way, operators are able to reduce some costs and attract new subscribers, regardless of if they use their own or another operator's network for the provision of retail services. Bundling services into packages also makes it possible for the operators as independent market players to offer their services together, in a unique package containing services otherwise non-existent individually in their standard offer.

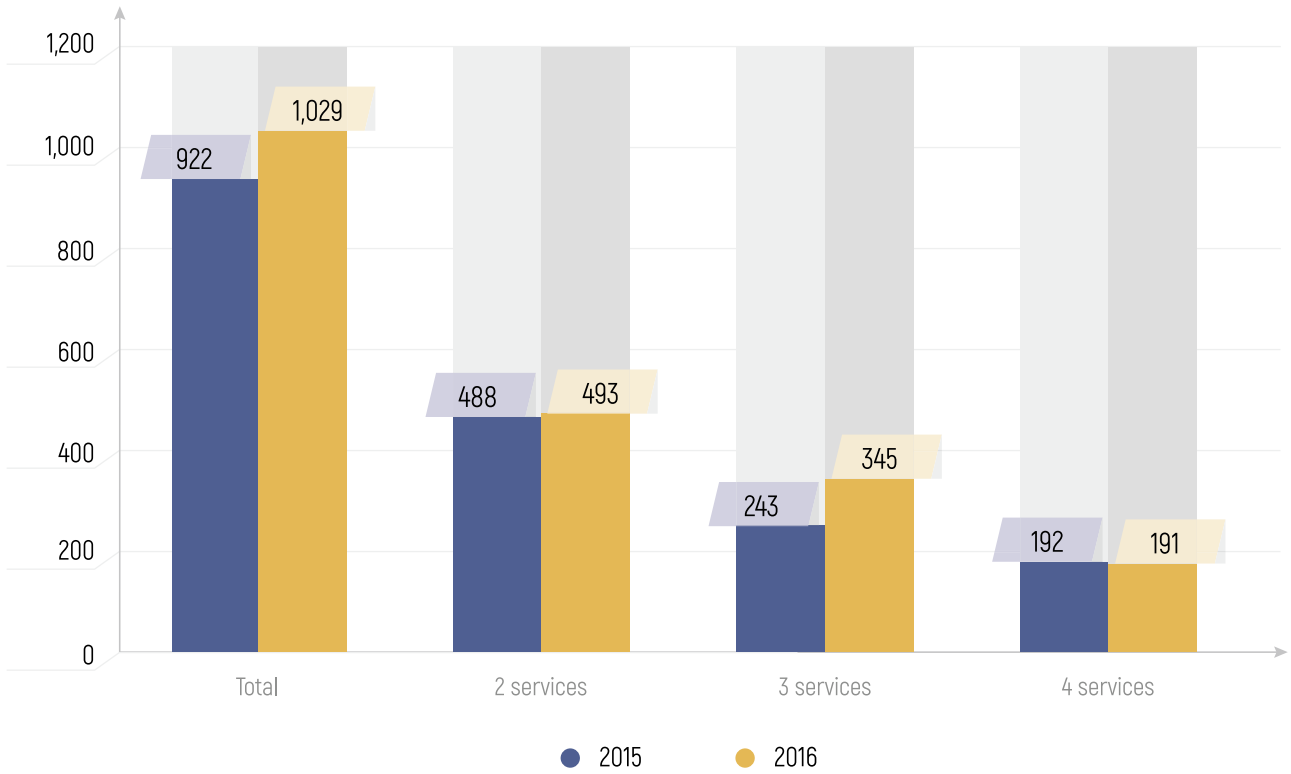
During last several years, the sale of bundled electronic communications services marks constant growth, due to the benefits they provide to the end-users, such as lower prices and simpler purchase and payment procedures for a whole set of services, through one single registration and one single account.

In the Republic of Serbia, beside 2-service or 3-service (triple-play) packages made up of different combinations of fixed telephony services, broadband Internet and media content distribution, there are also 4-service (quad-play) packages that include mobile telephony service, while on the EU level an initiative has been launched for the introduction of a 5-service package including mobile broadband Internet, normally offered separately from the voice service via mobile network.

Based on the available data, on the market of the Republic of Serbia, bundled services are offered by around 40 operators, out of which 10 offer 3-service packages and only one operator offers 4-service package. The number of bundled service subscribers in 2016 was over one million, marking a growth by 12 % compared to the previous year. The highest growth (42%) relates to the number of triple-play package subscrib-

ers, while the number of quad-play package subscribers has virtually remained the same. The most popular bundled services on the market are 2-service packages, whereas the least used ones are 4-service packages including mobile telephony service.

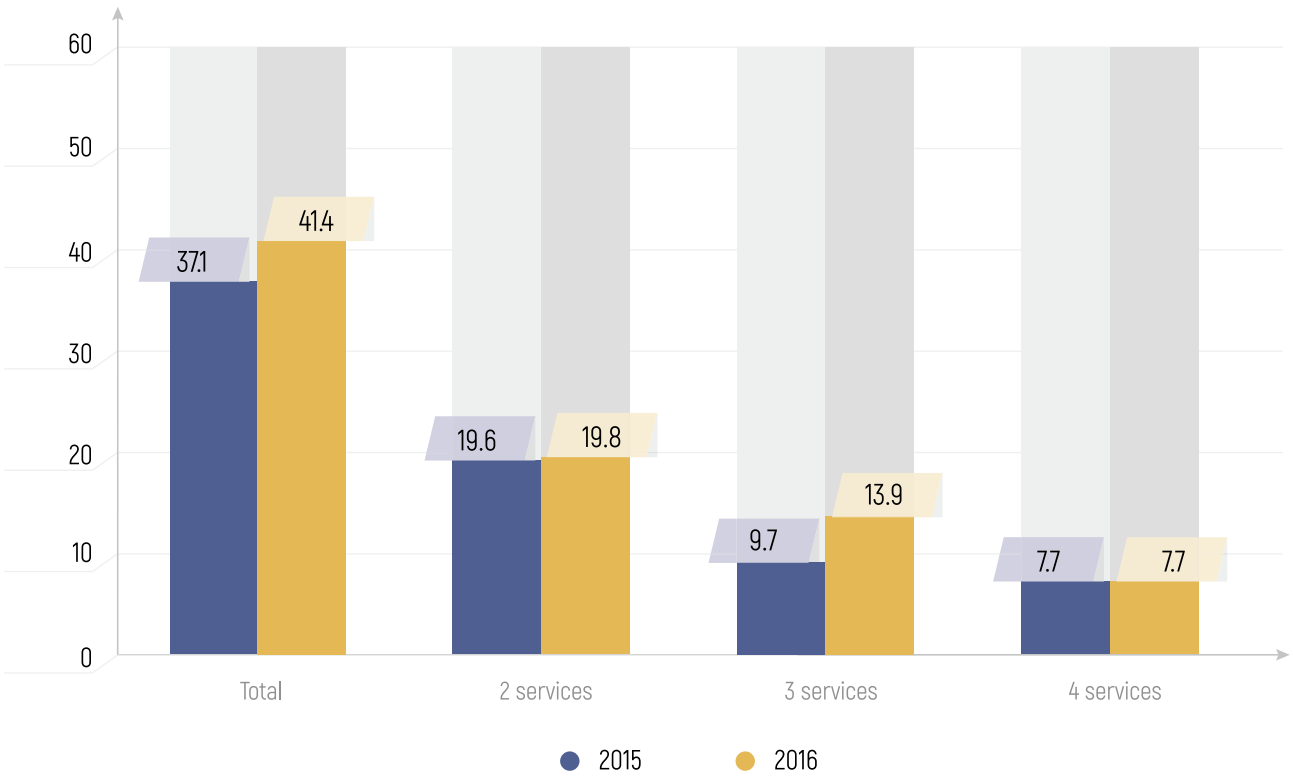
FIGURE 95. The number of bundled service subscribers (thousands)



Source: RATEL

In 2016, the pentration of bundled services by the number of households was around 41%.

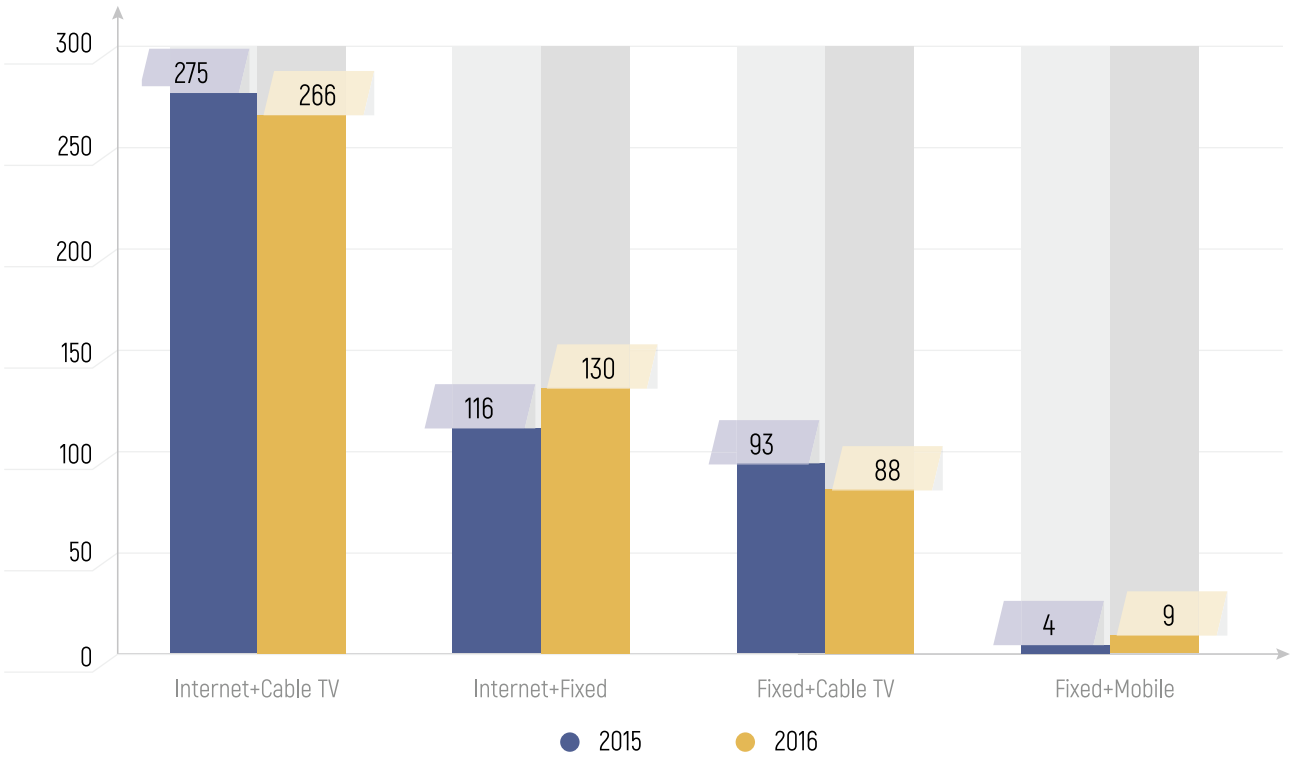
FIGURE 96. Bundled service penetration by the number of households (%)



Source: RATEL

The majority of 2-service package subscribers used the bundled service offering broadband Internet and media content distribution. Figure 97 showing the number of 2-service package subscribers by type of service included, indicates that in 2016, the number of subscribers of bundled service including media content distribution slightly decreased, while the number of subscribers of bundled service including mobile telephony, despite certain growth, was still very low.

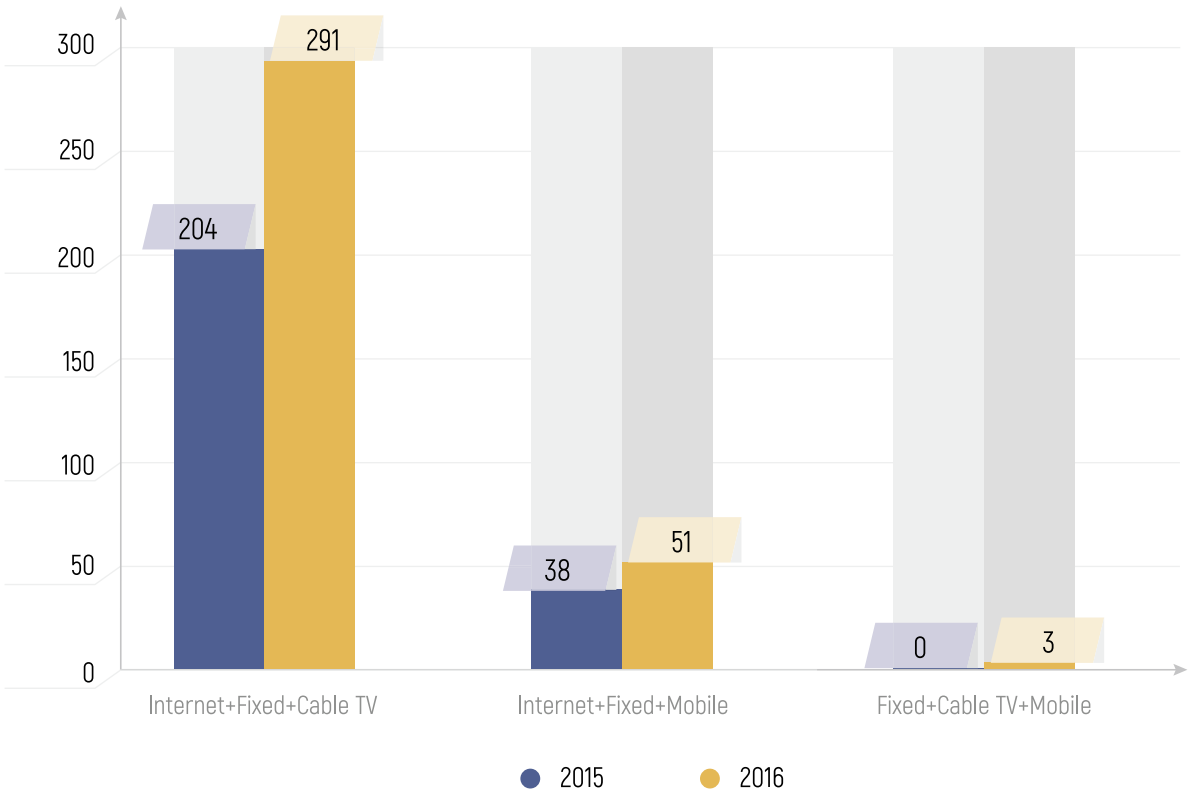
FIGURE 97. The number of 2-service package subscribers (thousands)



Source: RATEL

The best selling 3-service package is bundled service including broadband Internet, fixed telephony and media content distribution. This package saw an increase of subscribers by 43%. In addition, as of 2016, emerged the subscribers of triple-play packages including fixed telephony, media content distribution and mobile telephony.

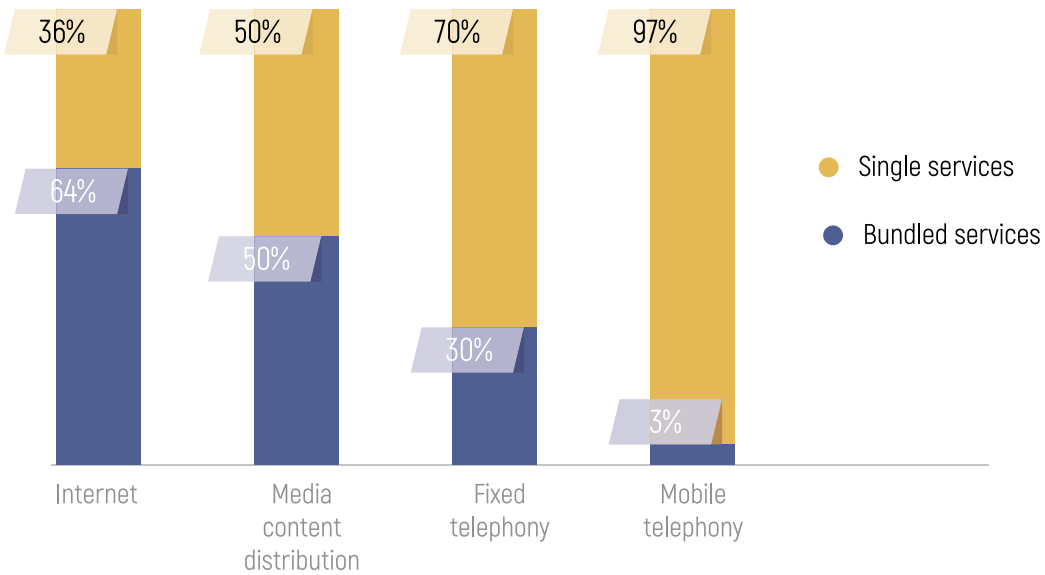
FIGURE 98. The number of 3-service package subscribers (thousands)



Source: RATEL

Compared to the previous year, the number of subscribers purchasing the Internet service, media content distribution and fixed telephony as bundled service, marked slight increase, while the situation regarding the mobile telephony service remained unchanged. The best selling service within the package is still the service of broadband Internet access, used in bundled mode by over 920 thousand subscribers in 2016. The next on the list is the service of media content distribution, used in package by half of its subscribers (around 830 thousand), while the least popular service is that of mobile telephony, presently offered in a bundle with other services by one single horizontally integrated operator on the territory of the Republic of Serbia.

FIGURE 99. The share of single and bundled services purchased by subscribers in 2016

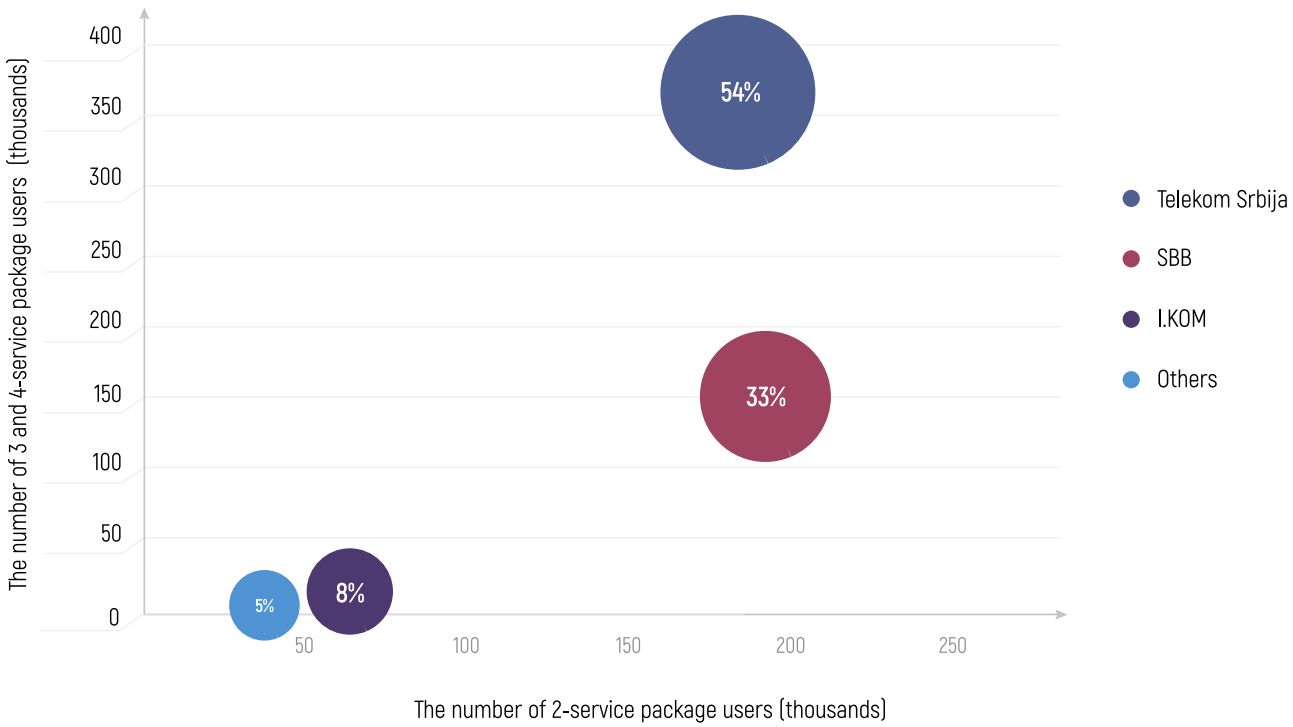


Source: RATEL

In the majority of cases, subscribers purchase the service of broadband Internet access from the same operator whose service of media content distribution or service of fixed telephony they are already using. For that reason, the service of broadband Internet access is most usually purchased in package, because this gives the subscribers the opportunity to pay less and have simpler procedures regarding registering and payment of bills (for example, instead of several subscriber agreements for each individual service they purchase, only one package contract is signed with the operator; instead of various separate bills for each individual service, only one package bill is received etc).

Most of the operators on the market act individually, offering in their packages the services they already provide to their subscribers. There are certain forms of joint offers on the market, including services from other operators, but these joint offers come with separate subscriber agreements and separate bills for end-users, so they cannot be considered bundles services. The share of operators measured by the number of bundled service subscribers is shown in Figure 100.

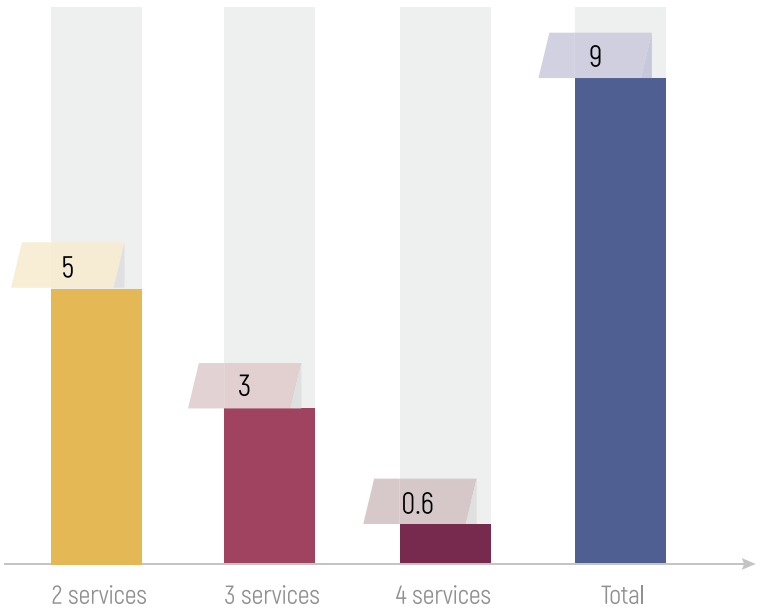
FIGURE 100. The share of operators by the number of bundled service subscribers in 2016



Source: RATEL

By selling bundled services in 2016, the operators realized an income of around 9 billion dinars, the most of which (around 5 billion dinars) was due to the sale of 2-service packages, while the sale of quad-play packages accounted for the smallest income share.

FIGURE 101. Earned income from the sale of bundled services in 2016 (billion RSD)

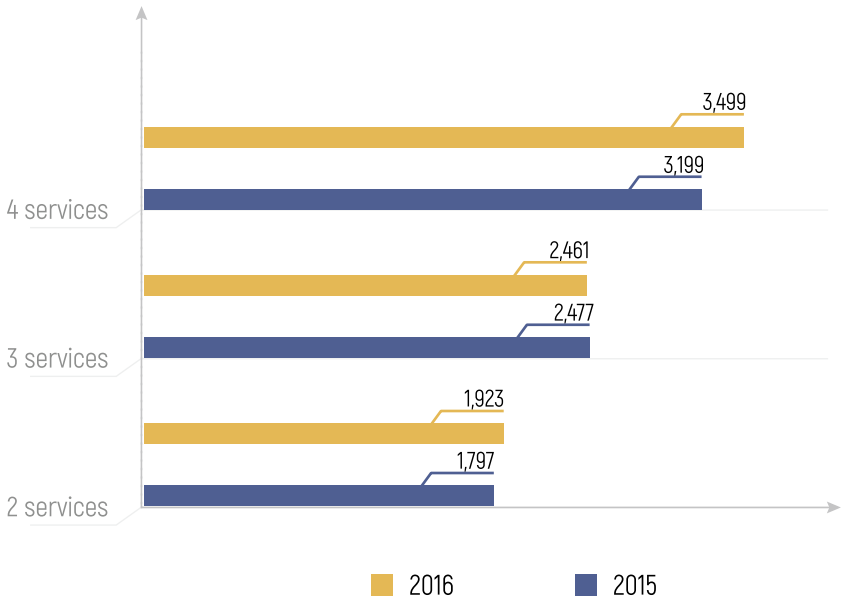


Source: RATEL

Monthly subscriptions for the best selling packages in 2016 ranged between 1500 dinars for the cheapest package and 4000 dinars for the most expensive one, depending on the operator and the package content. Operators often offer bundled services at promotional prices (considerably lower than the regular ones) during certain time spans and accompanied by a 12 or 24-month contract.

Monthly subscriptions differ depending on the program package (basic channel package, additional services, additional media content), Internet speed, free minutes in fixed telephony and mobile telephony package included in the bundled service. The average subscription amounts for the best selling bundled services in the Republic of Serbia are given in Figure 102.

FIGURE 102. Average amounts of monthly subscription for the best selling bundled services (in RSD)



Source: RATEL

10 VALUE ADDED AND MESSAGING SERVICES

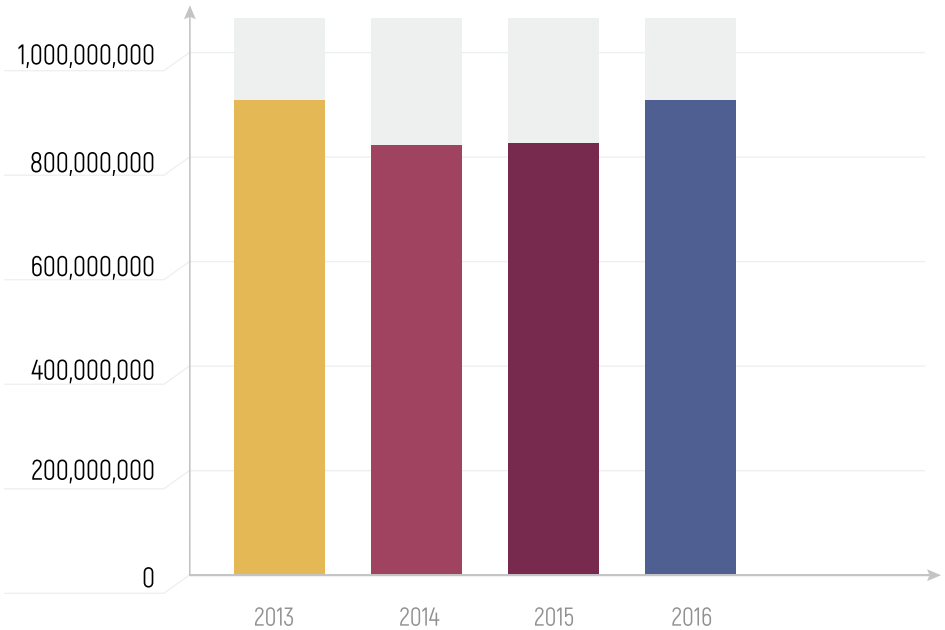
Law on Electronic Communications and Rulebook on general terms and conditions for electronic communication activity ("Official Gazette of RS", no. 38/11) have created administrative possibility for messaging and value added service (VAS) providers to be registered in the register of operators managed by RATEL, in line with its legal competences.

In 2016, there were 61 operators in the register of public communication networks and services registered for value added service provision, most of them being registered for message transmission service, as well. These operators provide services through fixed and mobile network operators, and the users of these networks can access value added services using public numbering (090Xabcdef and 0780abcdef) for value added voice transmission and internal numbering of the mobile operators for value added messaging (SMS, MMS).

Messaging and value added service provided by operators may be divided, according to purpose, into: televoting, advertising, entertainment, children entertainment, humanitarian aid, adult entertainment, lottery, SMS notification, marketing bulk messages, goods and services payment and other.

Annual revenues for the period 2013-2016 from the above services are given in Figure 1. Service provision accounts for the total revenues in the amount of around 900 million dinars. In 2016, the revenues in this market, according to data collected by RATEL, amounted to somewhat over 934 million dinars, which means the operators' incomes increased by around 6% compared to the previous year. It should be noted that part of the revenues, made from network usage, traffic billing and collecting, go to network operators, based on commercial contracts between network operators and messaging and value added service providers.

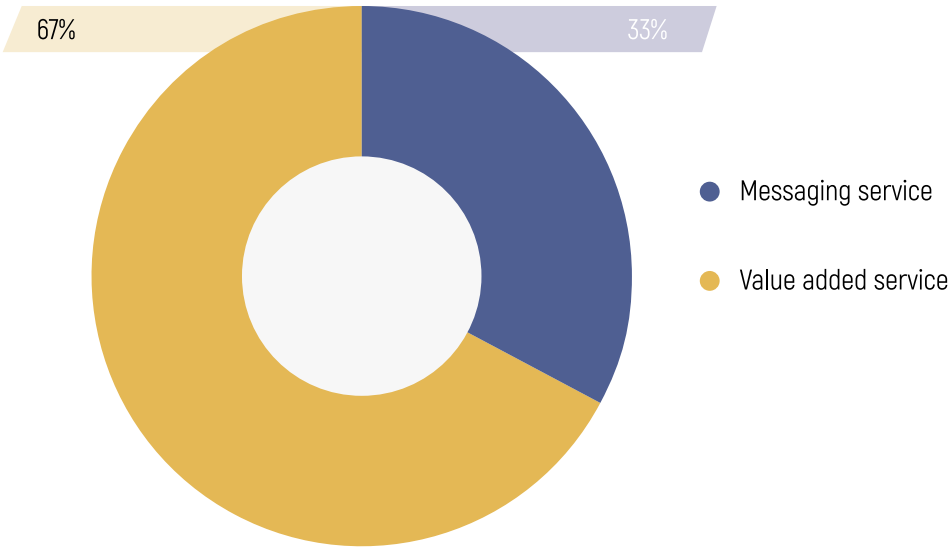
FIGURE 103. Annual revenues in the period 2013 - 2016



Source: RATEL

Figure 104 shows the share in revenues held by messaging service provision on the one hand and value added service provision on the other.

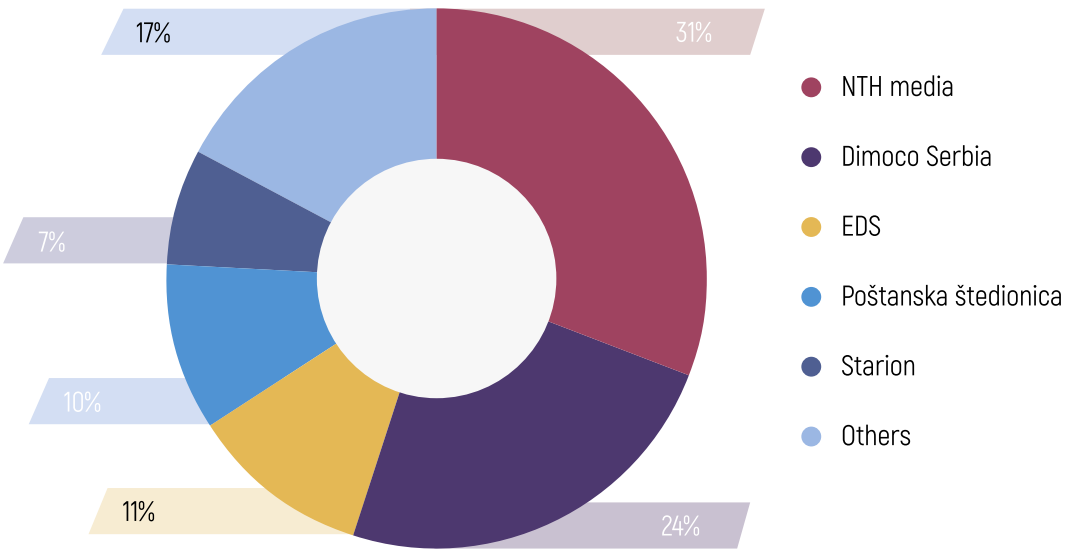
FIGURE 104. Revenue share by services in 2016



Source: RATEL

According to available data provided to RATEL by the operators, three operators with the largest revenues from messaging and value added service provision in 2016, were: NTH Media LLC, Dimoco Serbia and EDS, with the total of 65.95 % of the value added service market.

FIGURE 105. Market share of messaging and value added service operators according to revenues made from these services

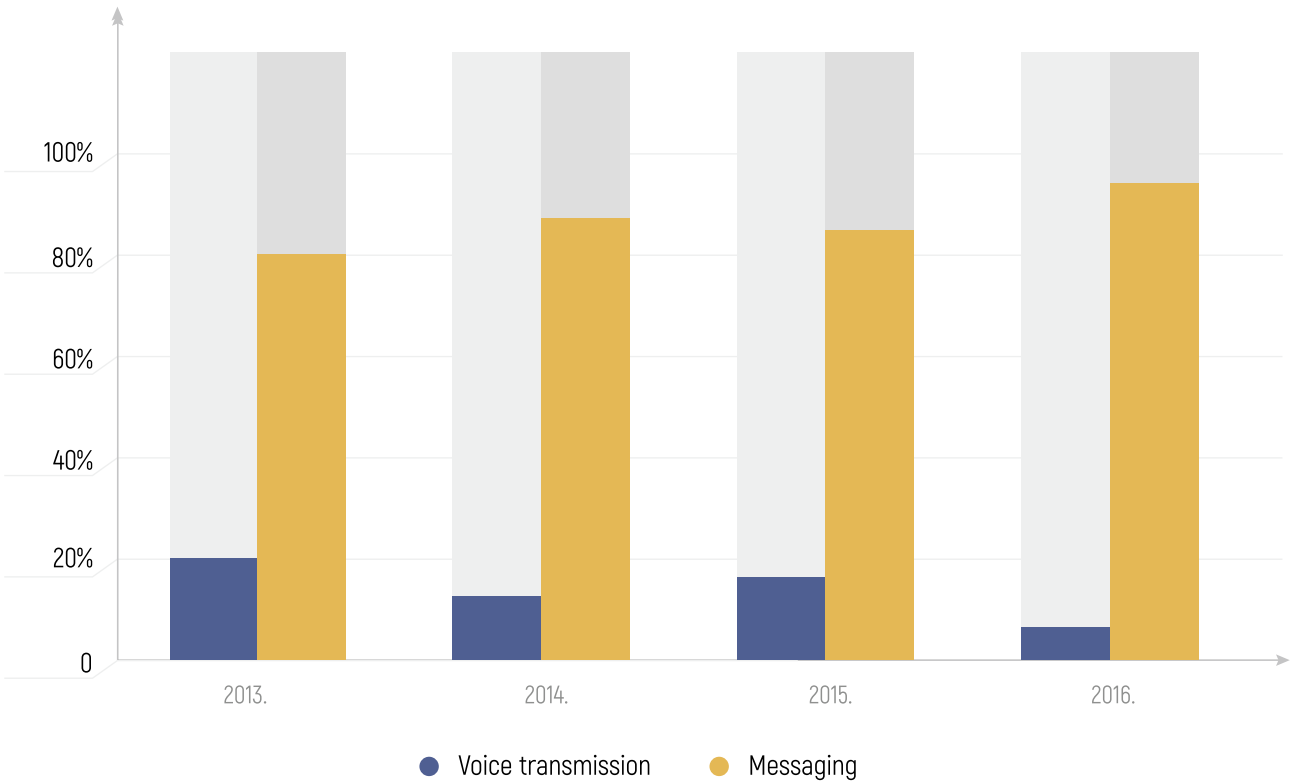


Source: RATEL

Value added service market is fully competitive. Figure 106 shows the share of VAS providers (VASPs) according to revenues made. However, it should be noted that the revenues are divided between VASPs, network operators and content creators.

Around 95% of the total revenues made by the operators in 2016 are revenues from messaging service (SMS, MMS) and VAS messaging, and the rest of revenues come from voice VAS. Technology that enables easier and better data processing for SMS and MMS and the expansion of direct electronic marketing have led to a significant increase in the revenues made from messaging and value added services, on the one hand, and a decrease in revenues from voice VAS, on the other. In addition, large-scale usage of smart phone devices lowers the users' interest for VAS realized by voice transmission or SMS messaging, which particularly affects voice VAS.

FIGURE 106. Market share by type of VAS, according to revenues made in 2013, 2014, 2015 and 2016

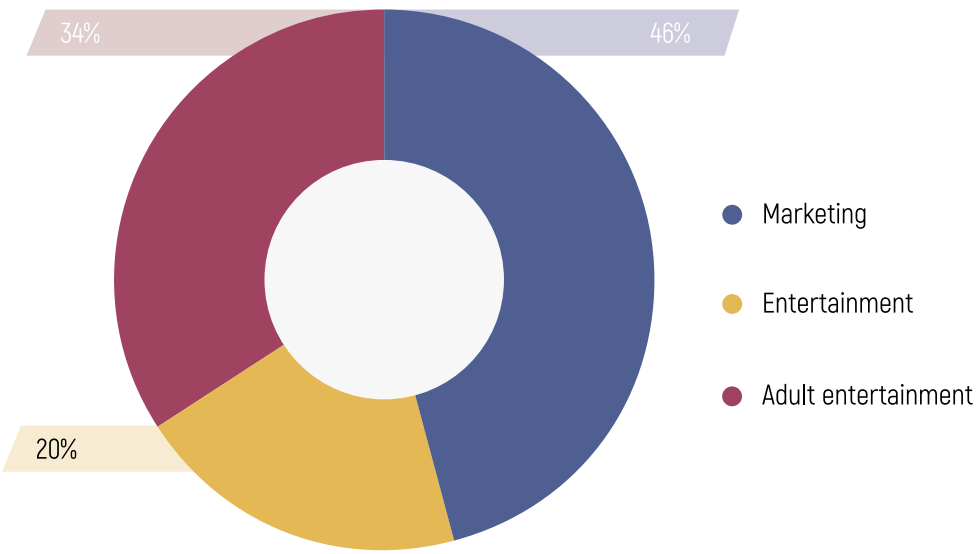


Source: RATEL

For the purpose of VAS voice transmission, the operators were assigned 560 numbers, 60 numbers less than the previous year.

In 2016, voice value added service provision accounted for over 250,000 minutes of traffic, and the share by type of voice VAS is given in Figure 107.

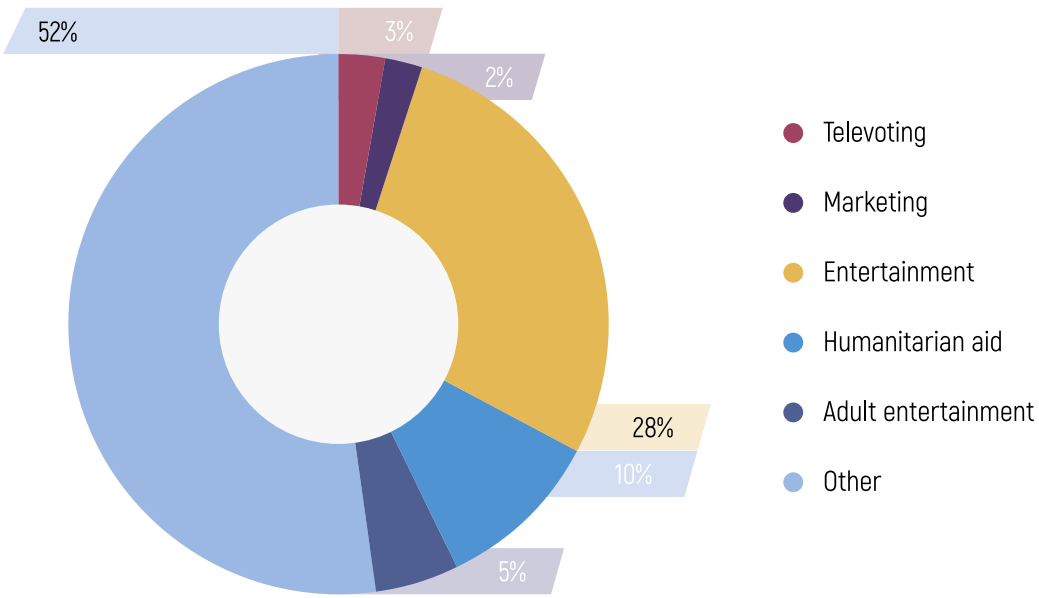
FIGURE 107. Share of minutes according to type of voice VAS in 2016



Source: RATEL

Messaging value added services accounted for over 44 million messages and the share by type of VAS is given in Figure 108. Messages labelled as "other" make up 52%, since they do not fall into a standard set of VAS, but concern different information or notifications, taxi orders or queries (on exchange rates etc.) and payment of goods and services.

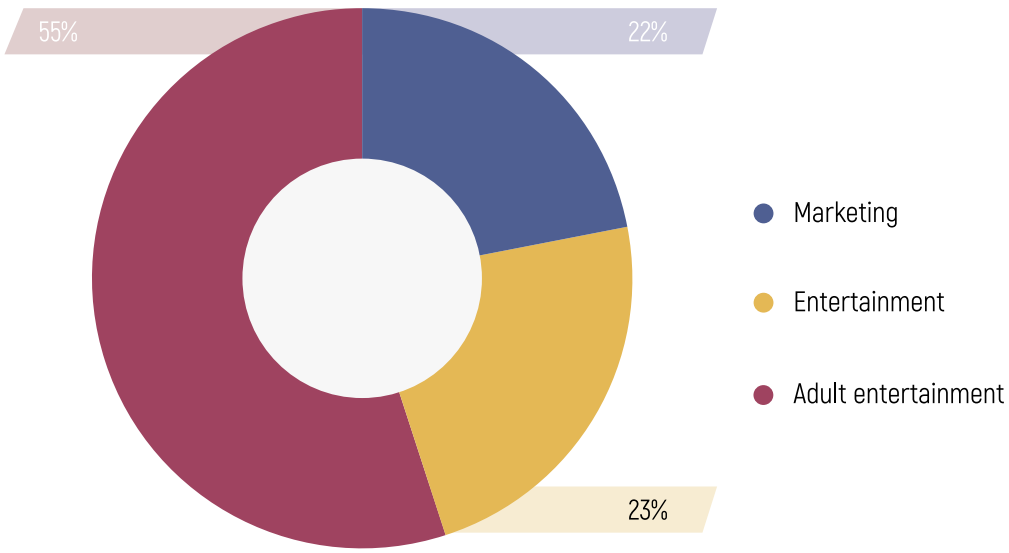
FIGURE 108. Share of realized VAS messages by type in 2016



Source: RATEL

Revenues from voice VAS amount to over 12 million dinars and the share by type is given in Figure 109.

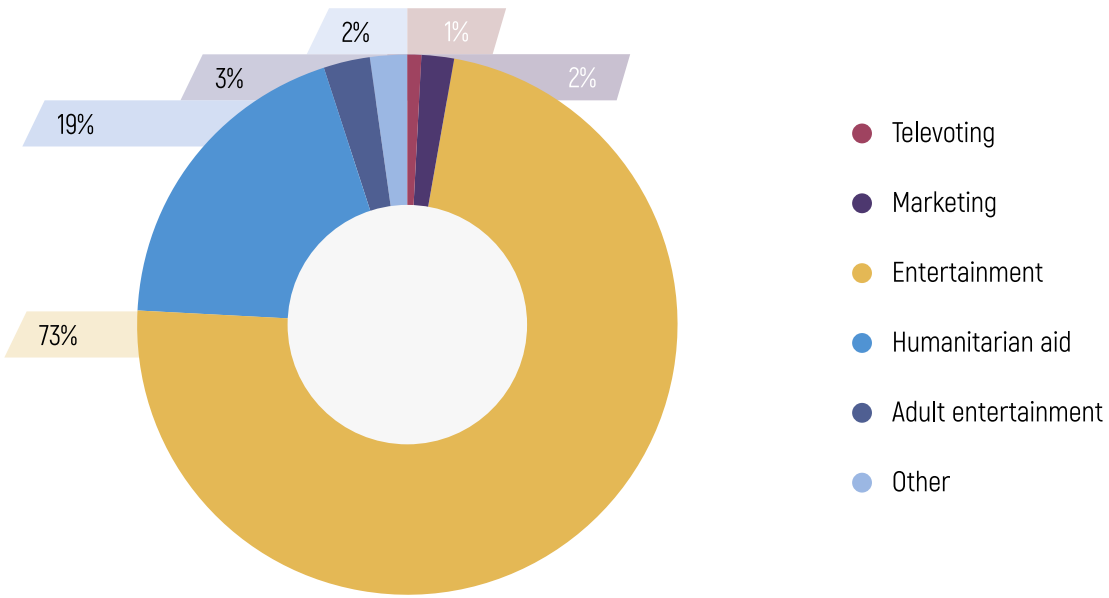
FIGURE 109. Share of voice VAS in revenue by type in 2016



Source: RATEL

Revenues from messaging VAS amount to over 515 million dinars and the share by type is given in Figure 110.

FIGURE 110. Share of messaging VAS in revenue by type in 2016



Source: RATEL

11 MONITORING OF ELECTRONIC COMMUNICATIONS NETWORKS AND SERVICES QUALITY PARAMETERS

Control of quality parameters for electronic communication services and networks is performed pursuant to the Rulebook on quality parameters for publicly available electronic communication services and monitoring of electronic communication activity ("Official Gazette" of RS, nos. 73/11 and 03/14).

The Rulebook stipulates quality parameters for the following electronic communication services:

- public voice service on the public telephone network at a fixed location,
- public voice service provided via Internet (VoIP),
- public services on the public mobile communications network,
- broadband access,
- media content distribution;

and for the following networks:

- public mobile communications networks,
- public fixed wireless telecommunications networks (CDMA).

Electronic communication operators are required to provide, on an annual basis, upon RATEL's request, a report on the values of the quality parameters for services and/or networks, on appropriate forms for each service or network. RATEL also monitors quality parameters for services and networks, compliance with the technical and other requirements and performance of the electronic communication activity, pursuant to the Law on Electronic Communications, the aforementioned Rulebook on quality parameters for publicly available electronic communication services and other bylaws and positive regulations.

RATEL maintains an up-to-date database on the quality of the public communication networks and services. In addition to that, the operators are required, pursuant to Article 106 of the Law on electronic communications, to make their terms and conditions, including the minimum quality of the service provision, publicly available in a suitable manner, so as to inform the users on the values of the quality parameters used for measuring the QoS of the electronic communication.

The reports on the values of quality parameters for electronic communication services and networks were submitted to RATEL by the operators within the prescribed delay, till March 15, 2017, for the previous year. Verification of the collected quality parameters data is planned during this year. The operators that failed to submit the required data were reported to the electronic communications inspection department of the Ministry of Trade, Tourism and Telecommunications.

AVERAGE VALUES OF THE QUALITY PARAMENTERS FOR ELECTRONIC COMMUNICATIONS SERVICES AND NETWORKS FOR THE PERIOD 2013–2016

Table 11 shows the number of the operators of electronic communications networks and services that submitted their network and service parameters in a report corresponding to each of the above years. In comparison to the previous years, the number of operators providing service on the public telephone network at a fixed location has increased.

Table 11. Number of operators that submitted reports

	2014	2015	**2016**
Operators providing voice service on the public telephone network at a fixed location	6	9	**18**
Operator providing voice service provided via Internet (VoIP)	32	16	**23**
Operators providing services on the public mobile communication network	3	3	**4**
Operators providing broadband access	151	134	**128**
Operators providing media content distribution	70	62	**57**

AVERAGE SUPPLY TIME FOR ELECTRONIC COMMUNICATIONS SERVICES

For all electronic communications services, the average time from the instant of a valid service order being received to the instant a working service is made available for use, during last year was shorter than 5 days. The shortening of the average supply time is noticeable compared to the previous years, especially for the voice service on the public telephone network at a fixed location.

Table 12. Average supply time for service

	PRESCRIBED VALUE	2014	2015	**2016**
Voice service on the public telephone network at a fixed location	**10 days for 50% new connections a year**	9.7	5.6	**4.4**
Voice service provided via Internet (VoIP)	**8 days for more than 95% requests**	5.0	2.5	**2.5**
Broadband access service	**8 days for more than 95% requests**	3.3	3.5	**3.4**
Media content distribution service	**8 days for more than 95% requests**	3.3	3.2	**2.6**

CUSTOMER COMPLAINTS ABOUT THE QUALITY OF ELECTRONIC COMMUNICATIONS SERVICES

During 2016, the percentage og users' complaints about the quality of electronic communications services was in average less than 6% for all types of services. The highest percentage of the last year's complaints (5.2%) was about the broadband access quality.

The time needed for the resolution of user complaints (applicable for 80% of the complaints) is less than 2 days for all electronic communications services, whereas the user complaints about voice service provided via Internet (VoIP) are resolved in the fastest way, for less than a day. For all electronic communications services, the percentage of users' complaints about the correctness of bills was less than 1%.

Table 13. Customer complaints and resolution of complaints

		PRESCRIBED VALUE	2014	2015	**2016**
Voice service on the public telephone network at a fixed location	Precentage of user complaints about quality of service	0.5%	7.5%	10.0%	**2.4%**
	Resolution time for user complaints for 80% of the complaints (days)	10.0	2.7	1.6	**1.6**
	Percentage of user complaints about bill correctness	≤1%	0.9%	0.5%	**0.3%**
Voice service provided via Internet (VoIP)	Precentage of user complaints about quality of service	-	4.6%	2.3%	**3.0%**
	Resolution time for user complaints for 80% of the complaints (days)	1.0	1.8	0.8	**0.8**
	Percentage of user complaints about bill correctness	≤1%	0.5%	1.4%	**0.3%**
Services on the public mobile communications network	Precentage of user complaints about quality of service	-	5.0%	4.4%	**1.5%**
	Percentage of user complaints about bill correctness	≤1%	0.2%	0.1%	**0.1%**
Broadband access service	Precentage of user complaints about quality of service	-	6.1%	6.8%	**5.2%**
	Resolution time for user complaints for 80% of the complaints (days)	1.0	1.2	1.1	**1.1**
	Percentage of user complaints about bill correctness	≤1%	0.8%	0.8%	**0.7%**

		PRESCRIBED VALUE	2014	2015	**2016**
Media content distribution service	Precentage of user complaints about quality of service	-	4.7%	6.3%	**4.5%**
	Percentage of user complaints about bill correctness	≤1%	0.8%	0.7%	**0.7%**

PARAMETERS OF THE OPERATOR'S CONTACT SERVICES

The shortest response time of an operator's contact service during last year was for the voice service on the public telephone network at a fixed location and amounted to 22 seconds.

Response time in contact centers during 2016 was considerably shorter than during the previous years, namely in contact services of the operators providing voice service on the public telephone network at a fixed location and operators providing service on the public mobile communications network.

Table 14. Response time for operator's contact services *(Call Center)*

	2014	2015	**2016**
Voice service on the public telephone network at a fixed location	79	50	**22**
Voice service provided via Internet (VoIP)	34	31	**46**
Services on the public mobile communications network	36	52	**28**
Broadband access service	64	72	**94**
Media content distribution service	31	30	**31**

PQUALITY PARAMETERS FOR VOICE SERVICE ON THE PUBLIC TELEPHONE NETWORK AT A FIXED LOCATION

During 2016, the ratio of all unsuccessful calls, including the percentage of unsuccessful calls in fixed network within and ouside of the local exchange, percentage of unsuccessful national calls from fixed network to mobile operators and other fixed operators, as well as percentage of unsuccessful international calls was 0.76% and is considerably lower than the previous years.

Table 15. Quality parameters for voice service on the public telephone network at a fixed location

	PARAMETER DEFINITION	PRESCRIBED VALUE	2014	2015	**2016**
Unsuccessful call ratio (all calls)	Percentage of call attempts to an existing user. which failed due to system failure or no capacities available. The case where the called party (B-Number) is busy or not responding is not regarded as a failed call.	≤1%	1.70%	1.00%	**0.76%**
Supply time for call (average time for national calls)	Time between selecting the two last digits of the subscriber's number and call verification signal.	< 3s	1.8	2.8	**3.2**

QUALITY PARAMETERS FOR SERVICES ON THE PUBLIC MOBILE COMMUNICATIONS NETWORK

Four operators provide reports including quality parameters for public services on the public mobile communications network:

- Telekom Srbija,
- Telenor,
- VIP Mobile,
- GLOBALTEL,

whereas, during 2016, GLOBATEL was registered as a virtual mobile operator.

Measurements of quality parameters for services on the public mobile communications network, which should be average values measured for the peak traffic hour in a 7-day week, were carried out in the 50th week of 2016, between the 12th and 18th of December 2016.

Average setup times in GSM and UMTS networks in 2016 were longer than the previous years, due to the activities of a new operator still developing its network on the telecommunications market.

Table 16. Quality parameters for public mobile services

	PARAMETER DEFINITION	PRESCRIBED VALUE	2014	2015	**2016**
Call Setup Success Rate for GSM mobile network (Call Setup Success Rate)	$CSSR = \frac{succesful\_call\_attempt}{all\_call\_attempts} * 100[\%]$	> 98% at GSM network level	98.99%	99.27%	**99.40%**
Call Setup Success Rate for UMTS mobile network (Call Setup Success Rate)	$CSSR = \frac{succesful\_call\_attempt}{all\_call\_attempts} * 100[\%]$	> 98% at UMTS network level	99.45%	99.62%	**99.46%**
Telephony Setup Time for GSM network	Time between sending of complete address information and receipt of call setup notification	-	6.13s	5.32s	**6.51s**
Telephony Setup Time for UMTS network	Time between sending of complete address information and receipt of call setup notification	-	5.19s	5.12s	**5.72s**
DL Throughout for Packet Interactive	Average throughput towards user (DL) for packet interactive	> 128 Kb/s	4980 Kb/s	4940 Kb/s	**4960 Kb/s**

RATEL NETTEST: TESTING OF INTERNET CONNECTION QUALITY

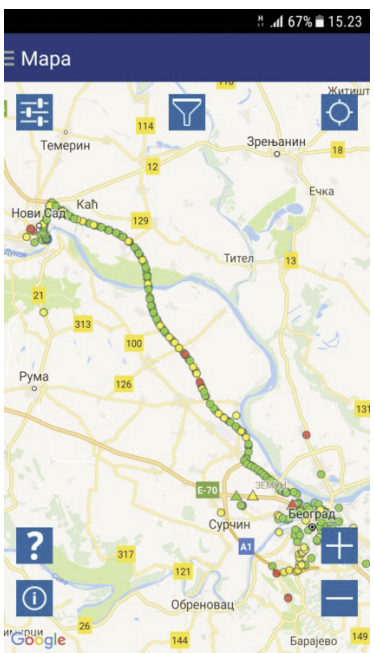
In the aim of improving the quality of electronic communications services, as of May 2016, RATEL enabled the users of Internet access services and Internet services in public fixed and public mobile communications networks, to measure the QoS of the broadband Internet access, by means of a RATEL application *NetTest*.

Testing of Internet connection in public fixed communications networks can be done by using the application available on the RATEL website: https://nettest.ratel.rs/sr/index

Testing of Internet connection in public mobile communications networks can be done by using the application downloaded free of charge from *Google Play Store* and *Apple App Store*.

The purpose of RATEL NetTest application is to provide transparent and comprehensive information. It measures connection from user's device (PC, tablet, mobile terminal) to a measuring server. Measuring server is situated in the immediate proximity of the Internet exchange point (IXP) connected to major service operators, representing an independent and optimal location which is not favoring any of the connections.

Mobile application start page

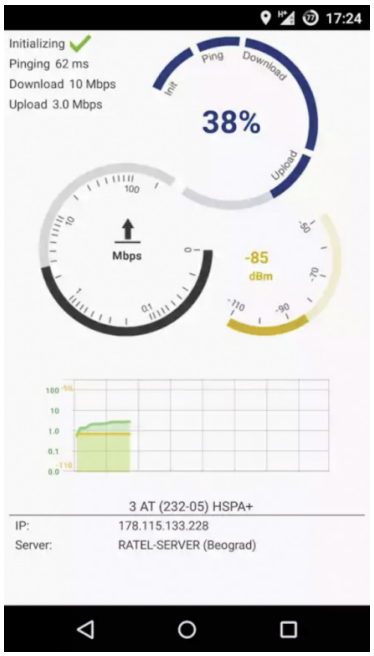


Map view of the carried out tests

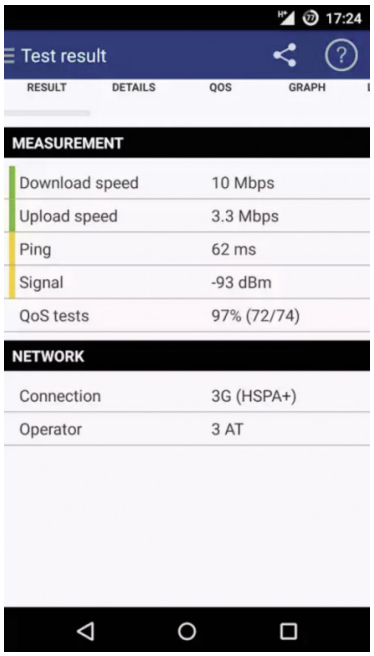
RATEL NetTest application offers to its users the possibility to test quality and speed of current Internet connection. At the same time, the results of other users who performed the testing can be compared on the map of Serbia. This feature thus makes possible a comparative analysis of Internet service operators, depending on the location or type of Internet access (fixed/ mobile). Color scale red/yellow/green serves as a visual indicator of the connection quality level for the majority of Internet services. This scale does not refer to the technology used, however extremely high speeds in mobile networks can only be achieved by means of certain technologies, such as LTE.

By means of RATEL NetTest application, the following quality parameters of Internet connection can be tested:

- data download speed: measurement from measuring server to user,
- data upload speed: measurement from user to measuring server,
- latency,
- packet loss,
- signal quality (RxQual, Ec/Io, RSRQ) and signal strength (RSSI, RSCP, RSRP), if a mobile terminal is used.



Internet connection testing



Test results

12 ELECTRONIC COMMUNICATIONS INFRASTRUCTURE INTENDED FOR COMMON USE

Operators of public electronic communications networks are entitled to require shared usage of another operator's or third person's electronic communications infrastructure, when necessary, for the purpose of a competitive, economic and efficient performance of the electronic communications activities.

The shared use of infrastructure in the Republic of Serbia is defined in the following acts and regulations:

1. Law on Electronic Communications („Official Gazette of RS", nos. 44/10, 60/13 – US and 62/14);
2. Rulebook on the manner of collection and publication of the data on type, availability and geographic location of the electronic communications network's capacities („Official Gazette of RS", no. 66/15).

Pursuant to Article 52 od the Law, the Agency shall keep an updated database on the type, availability and geographic location of capacities which may be subject of shared use (hereinafter: Database).

Based on the Law on Electronic Communications, the Rulebook on the manner of collection and publication of the data on type, availability and geographic location of the electronic communications network's capacities was adopted in July 2015. It prescribes creation of the records of the electronic communications network capacities which may be subject of shared use, in the form of an aggregated Database.

Pursuant to Article 8 of the Rulebook on the manner of collection and publication of the data on type, availability and geographic location of the electronic communications network's capacities, the Agency shall be responsible for the creation and regulation of the Database access within 12 months from the coming into force of the Rulebook. The Agency shall also be responsible for the financing, maintenance and management of the Database.

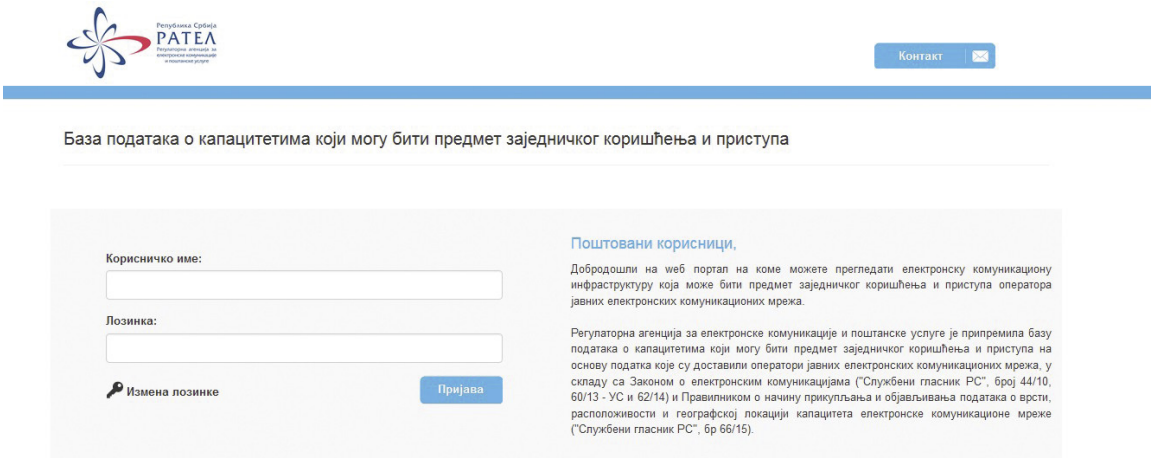
The Database was established in June 2016, in cooperation with GDI GISDATA company. Coordination with operators was established as well, and data input into the Database was enabled, by web access or through automatic data exchange systems.

Operators interested for the lease of infrastructure are obliged to submit the required data within 6 months from the creation of the Database. In case of the building of a new infrastructure subject of lease, the required data must be submitted within 15 days from the beginning of the use of infrastructure. The operators are obliged to update their data at least once in 3 months.

During 2016, the operators provided data on 703 antenna masts, while data input on cable canalization is expected in the beginning of 2017.

Following the completed coordination and transfer of the operators' data, a Web – GIS application will be made available by the Agency on its web site to end users (operators of electronic communications networks), along with the registration instructions. The users will access the application by means of a user name/password combination, Figure 111.

FIGURE 111. Access to the Capacity Databse Web – GIS application



The Web – GIS application will include standard tools for map operation, such as (Figures 112 and 113):

- Switching on/ switching off of layers;
- Zooming;
- Measurement of distance/ surface;
- Definition of coordinates in different coordinate systems;
- Selection of data using spatial inquiries/ selection of areas by hand;
- Selection of a number of data through free ArcGIS online service (satellite footages, topographic maps, street networks etc.)

FIGURE 112. Use of standard tools

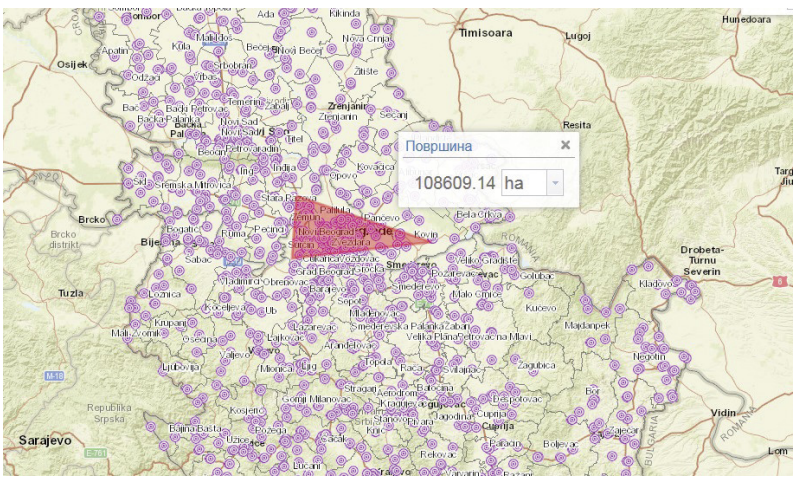
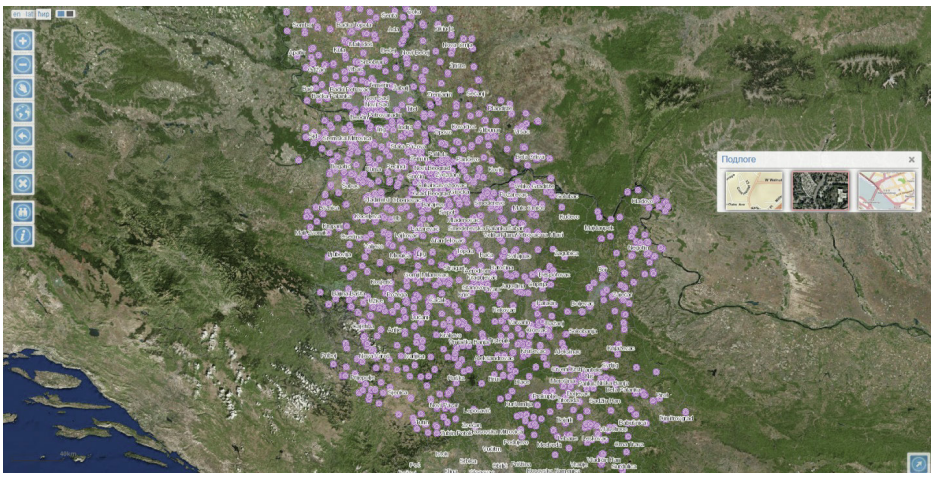


FIGURE 113. Use of different map types and overview of antenna masts



The Database contains the data on antenna masts, whereas the data on cable canalization of electronic communications networks are in the process of being collected.

CABLE CANALIZATION OF ELECTRONIC COMMUNICATIONS NETWORKS SUBJECT OF LEASE

Based on Annex 1, EKMI1 Form of the Rulebook on the manner of collection and publication of the data on type, availability and geographic location of the electronic communications network's capacities, the data on cable canalization to be collected are the following (Figure 114):

- Name of operator (owner)/ locations/ routes;
- WGS84 coordinates of important positions (start/ end, node);
- Route length/ geodetic footage;
- Cable type;
- Information on cable canalization (type of pipes/ number of pipes on the route/ type of cable shaft/ number of shafts on the route);
- Type of data transmitting equipment (optional);
- Capacity for lease/ unused capacity;
- Data on cable instalments (optional);
- Cable ending in the facility (optional).

FIGURE 114. Attributes of cable canalization and cables

ANTENNA MASTS AND EQUIPMENT

Based on Annex 2, EKMI2 Form of the Rulebook on the manner of collection and publication of the data on type, availability and geographic location of the electronic communications network's capacities, the data on antenna masts and equipment to be collected are the following (FIGURE 115.):

- Name of operator (owner);
- Location of antenna mast;
- Mast construction;
- Shape of the mast base/ dimensions of the mast base (m);
- Mast height (m);
- Facility height in meters (if the antenna mast is mounted on a facility);
- Information regarding free space on the mast (length of the free segment/ azimuth range available for mounting);
- Mounted equipment (type/ free capacity) – if subject of lease.

FIGURE 115. Attributes of antenna masts

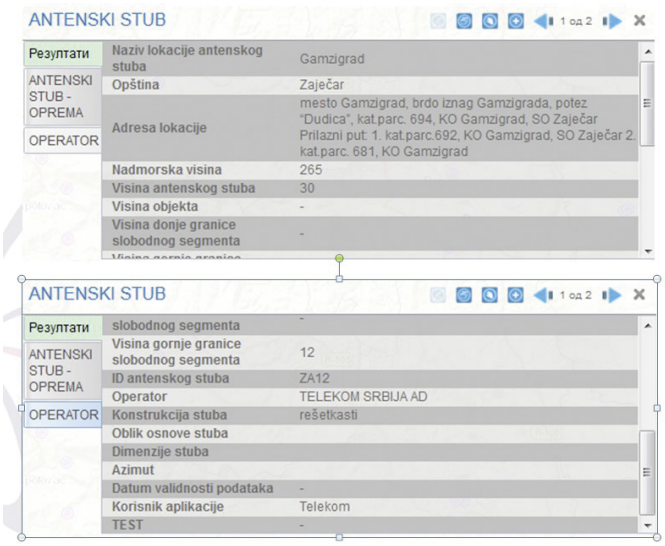
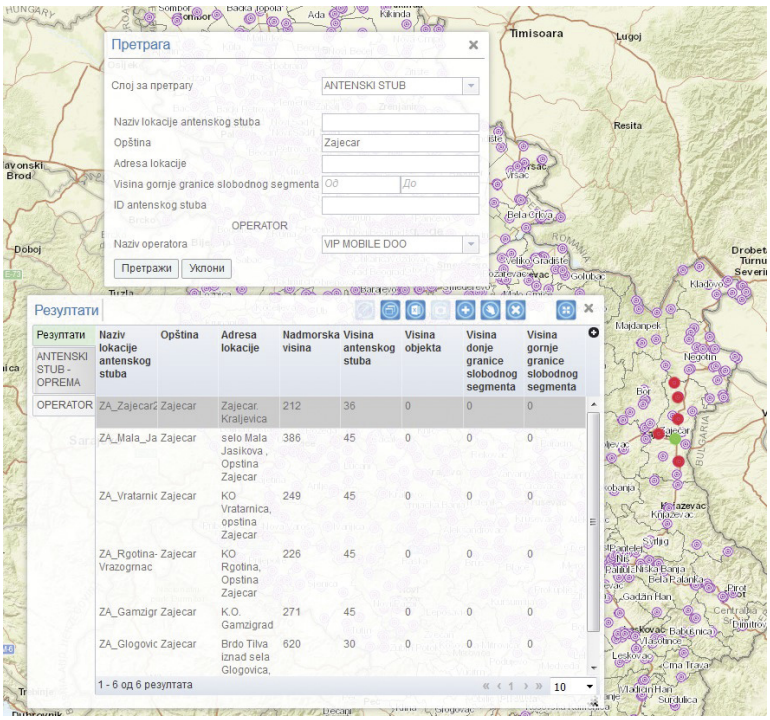


Figure 116 shows spatial query for antenna masts and their spatial selection on the map.

FIGURE 116. Search for antenna masts by means of a spatial query



13 POSTAL SERVICES MARKET

On the postal market of the Republic of Serbia, during 2016, there were 54 licensed operators providing postal services, which is by 18 operators more than in 2015. Commercial services are provided by all postal operators, while the universal postal service (UPS) is provided only by the public postal operator (PPO), PE "Pošta Srbije". In the Republic of Serbia, approximately 311 million postal services were realized, which generated an income of around 17 billion dinars, i.e. around 136 million Euros, leading approximately to the 0.4% of the projected GDP (4.200 billion dinars[7]).

This industry employs 17.964 workers, accounting for around 0.93% of the total number of employees in the Republic of Serbia (projection of 1.920.679 employees[8]).

On average 125 postal items were delivered per household annually, i.e. 43 postal items per inhabitant.

Table 17. Postal service market in 2016

TYPE OF SERVICE	VOLUME IN THOUS.	INCOME IN THOUS. DIN.	VOLUME	INCOME
Universal postal service	283,488	8,196,910	91.2	48.7
Commercial services	27,186	8,638,943	8.8	51.3
TOTAL	**310,674**	**16,835,853**	**100.0**	**100.0**

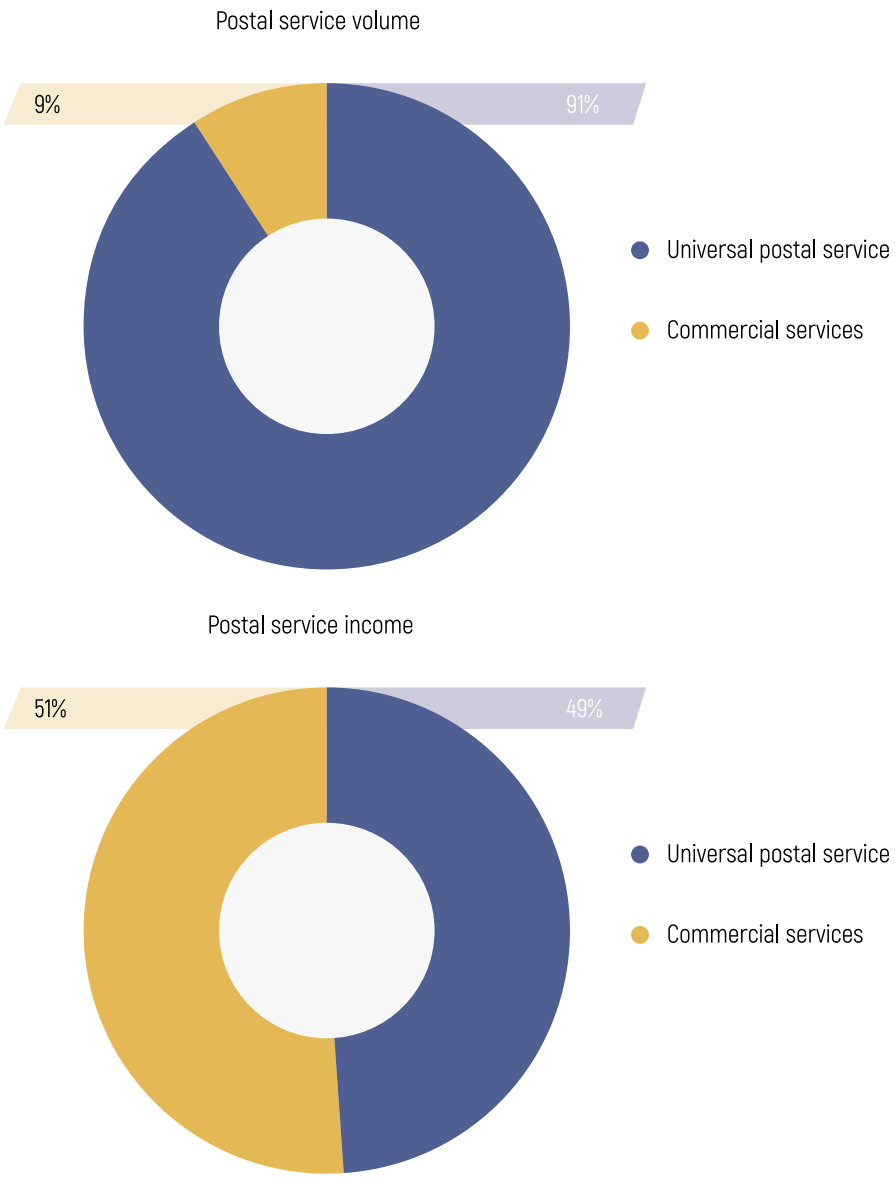
7 Statistical Office of the Republic of Serbia
8 Statistical Office of the Republic of Serbia

In 2016, the UPS volume was around 283.5 million items, while the volume of commercial services was 27.2 million, i.e. 8.8% of the total volume of services.

As of 2010, when the regulator started to analyze the postal services market, there has been a constant growth of commercial services, both in volume and income. The share of commercial services in 2010 was less then 4% in the total volume and 37% in income, whereas in 2016, commercial services accounted for 8.8% of the volume and as much as 51.3% of the total income.

In 2016, the universal postal service generated smaller income than the commercial services for the first time, despite having the most dominant share in the total volume of the postal services provided, amounting to over 91%.

FIGURE 117. Shares in volume and income of UPS and commercial services in 2016



Source: RATEL

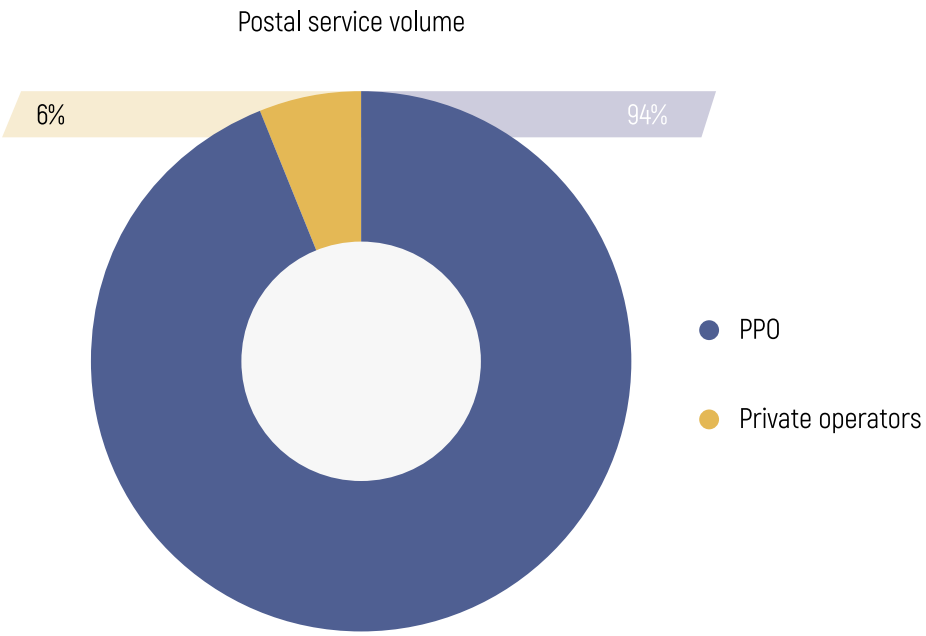
In 2016, the PPO provided almost 291.6 million services and realized an income of 10.4 billion dinars.

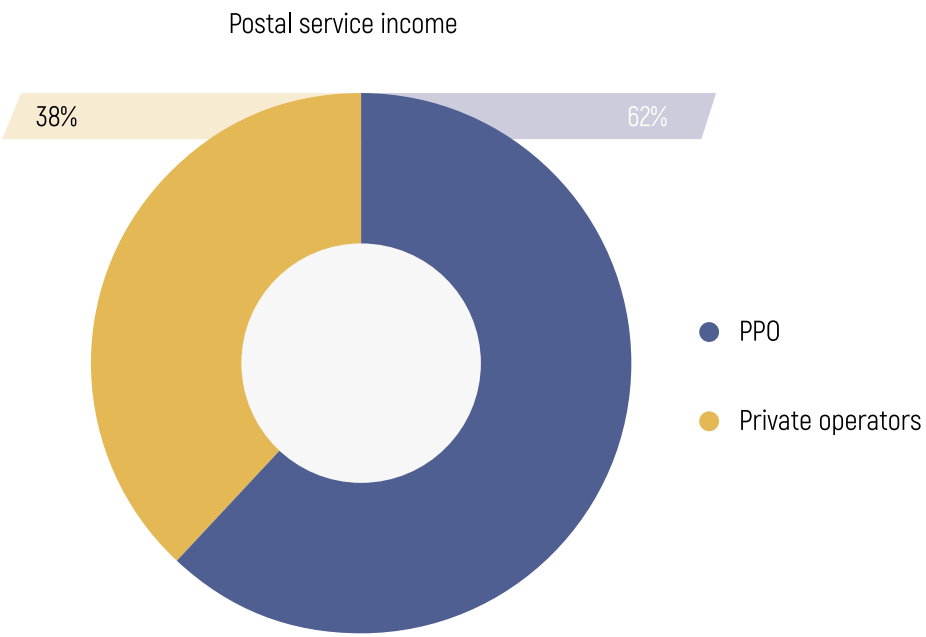
The private operators participate in the postal market exclusively as providers of commercial services, with the share of 6.1% in volume and as much as 38.4% in income.

Table 18. Postal operators' market share in 2016

OPERATORS	VOLUME IN THOUS.	INCOME IN THOUS.	VOLUME %	INCOME %
PPO	291,607	10,363,564	93.9	61.6
Private operators	19,067	6,472,289	6.1	38.4
TOTAL	**310,674**	**16,835,853**	**100.0**	**100.0**

FIGURE 118. PPO's and private operators' shares in total volume and income in 2016





Source: RATEL

In the structure of postal services provided by the PPO, the most dominant is universal postal service, the share of which declined by 1.2% in the total volume of postal services, and by over 4% in income. At the same time, the share of commercial services is on the rise.

Table 19. Percentage of the PPO's UPS and comercial services shares

TYPE OF SERVICE	VOL.	INC.	VOL.	INC.	VOL.	INC.	VOL.	INC.	VOL.	INC.
	2012.		2013.		2014.		2015.		2016.	
UPS	98.41	83.13	98.19	81.22	98.09	81.38	97.74	80.29	97.22	79.09
Post Express	1.51	13.40	1.75	15.15	1.85	14.50	2.19	15.34	2.63	17.65
Other commerc .	0.08	3.46	0.06	3.63	0.06	4.12	0.07	4.37	0.15	3.26

In the private operators' service structure, domestic express services are dominant and provided by 19 operators. These services account for 96% of all private operators' services, participating in the income with 76% and an average price of 270.6 dinars per service.

International express services, provided by 6 operators, participate by 3% in the volume and account for 23% of the income, with an average price of 2.751 dinars per service.

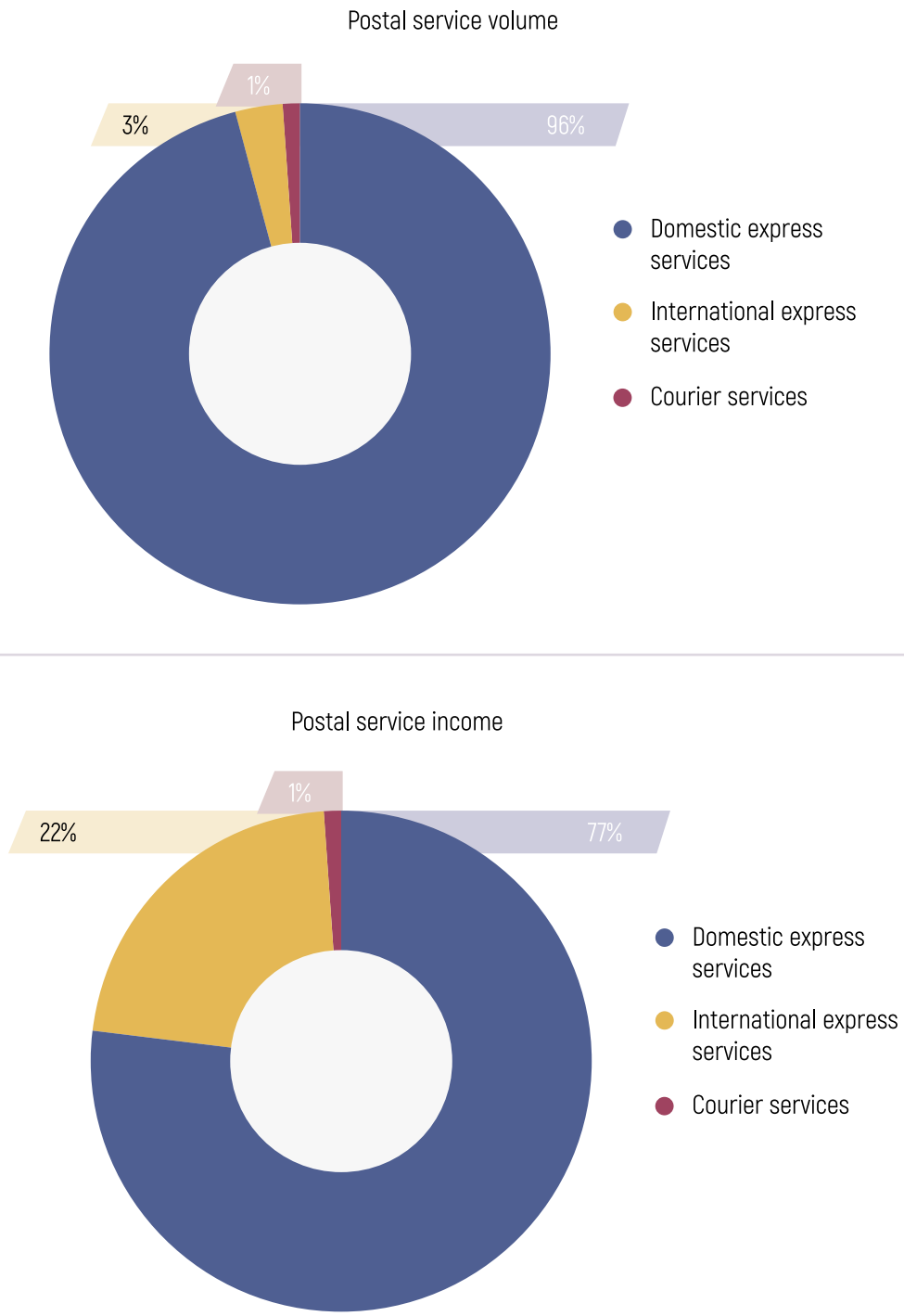
Courier services are provided by 26 operators, with an average price of 314 dinars per service, participating with approximately 1% both in the volume and income.

Private operators' service structure regarding volume and income is given in Table 20 and Figure 119.

Table 20. Private operators' service structure in 2016

PRIVATE OPERATORS' SERVICES	VOL. IN THOUS.	INCOME IN THOUS. DIN.	VOL. %	INCOME %
Domestic express services	18,354	4,966,374	95.97	75.96
International express services	526	1,447,016	2.88	23.05
Courier services	188	58,899	1.14	0.99
TOTAL	**19,067**	**6,472,289**	**100.00**	**100.00**

FIGURE 119. Share of service types in volume and income of private postal operators in 2016



Source: RATEL

The total number of 17.964 employees does not include the persons employed at auto-transport companies (drivers) - AD "Niš ekspres" and "Autoprevoz Kikinda".

The PPO employs almost 83% of the total number of the postal industry workers, while in the private sector this share is 17%. Compared to 2015, the total number of postal industry employees was increased by 1.4%, whereas the number of the PPO's employees decreased by 0.6% (97 persons), and the private operators' number of employees increased by over 12.5%.

Table 21. Postal industry employees

	2012	2013	2014	2015	2016
PPO	15,068	15,115	15,015	14,965	14,868
Other postal operators	2,618	2,464	2,615	2,751	3,096
TOTAL	**17,686**	**17,579**	**17,630**	**17,716**	**17,964**

The trend of decrease of postal services has been present in the EU countries for several years and in the Republic of Serbia for almost four years in a row.

The share of the universal postal service in the total volume of services is still extremely high (almost 91%). The decrease in volume of services causes the unit cost of service provision to rise, which compromises the sustainability of the existing UPS concept.

In Europe, 135 billion postal items are transported annually, including around 72 billion letters and 4 billion parcels transiting the European territory. [11]

The income from the postal services accounts for approximately 1% of the national GDP (150 billion Euros), whereas the income of the EU postal sector was 91 billion Euros or 0.72% of the EU GDP (letter-post items participate with 44 billion Euros or 0.34% of the GDP). In the European postal industry, there are approximately 2 million employees, connecting around 800 million users daily.

The shown data point to the great importance of the postal industry and necessity for the establishment of common rules for the provision of postal services throughout Europe, which has been achieved, to the great extent, through the creation of the common EU market.

VOLUME OF POSTAL SERVICES ON THE MARKET OF THE REPUBLIC OF SERBIA

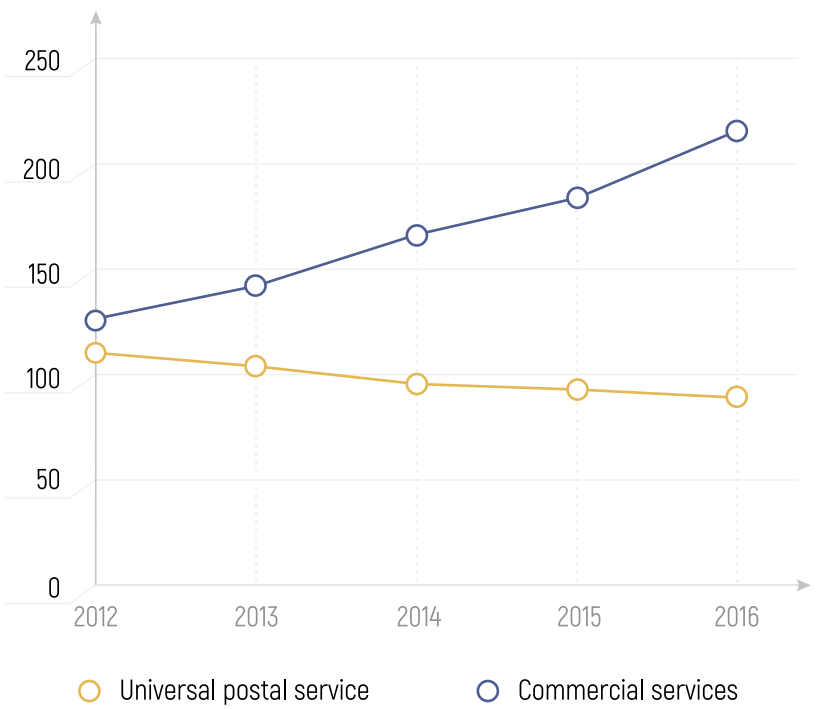
In 2016, in the Republic of Serbia, around 311 million postal services were realized, which is by 4 million (i.e. 1%) less than in 2015.

The trend of decrease of the total volume of services is the result of a mild, yet continuous drop in the UPS volume on one hand, and rise in the volume of commercial services (17% in 2016), participating in the total volume of services with 9% on the other. Similar trends are observed in all of the EU countries, as well.

Table 22. Volumes of UPS and commercial postal services

TYPE OF SERVICE	VOLUME IN THOUS. UNITS					VOLUME GROWTH/DROP IN %			
	2012	2013	2014	2015	2016	13/12	14/13	15/14	16/15
UPS	314,865	308,923	301,542	291,399	283,488	-2	-2	-3	-3
Comm. service	15,613	18,104	20,350	23,228	27,186	16	12	14	17
TOTAL	**330,478**	**327,026**	**321,892**	**314,627**	**310,674**	**-1**	**-2**	**-2**	**-1**

FIGURE 120. Trend of the volumes of UPS and commercial postal services

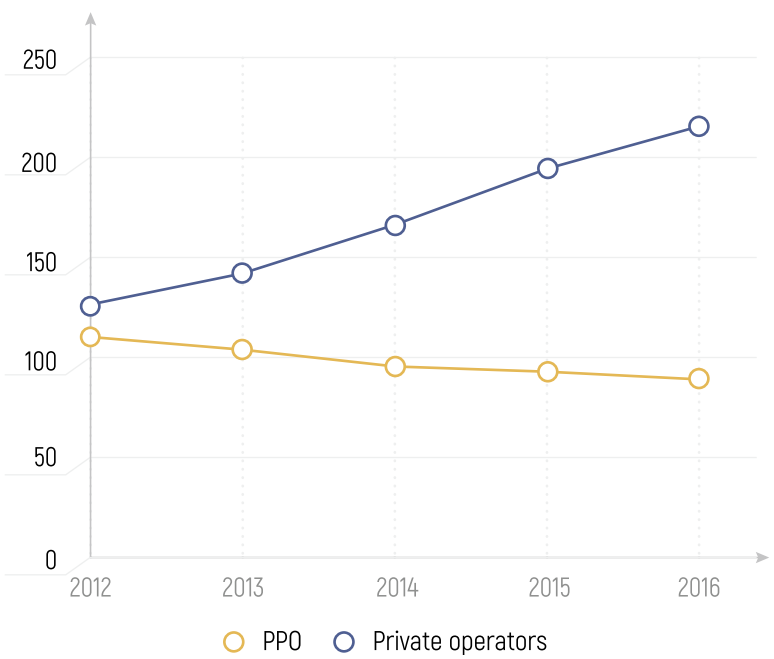


The public postal operator realized over 291 million postal services, which represents a decrease by 2% compared to 2015. Other (private) postal operators realized over 19 million services, which is by 16% more than in the previous year. The private operators' share in the total volume of services has increased by 1%, to reach 6% in 2016.

Table 23. PPO and private operators' volumes of postal services

OPERATORS	VOLUME IN THOUS. UNITS					VOLUME GROWTH/DROP IN %			
	2012	2013	2014	2015	2016	13/12	14/13	15/14	16/15
PPO	320,079	314,605	307,422	298,132	291,607	-2	-2	-3	-2
Private operators	10,399	12,421	14,470	16,495	19,067	19	16	14	16
TOTAL	**330,478**	**327,026**	**321,892**	**314,627**	**310,674**	**-1**	**-2**	**-2**	**-1**

FIGURE 121. Trend of the PPO and private operators' volume of services



The service structure has not change significantly in 2016 either, compared to the previous years. The UPS is still the most popular service, with the share of 91.2%, where the reserved services participate with 97.6%. Within the reserved services, the most dominant are the letters of 20g, with more than a 90.3% share, while the participation of items of 20-100g is 7.3%.

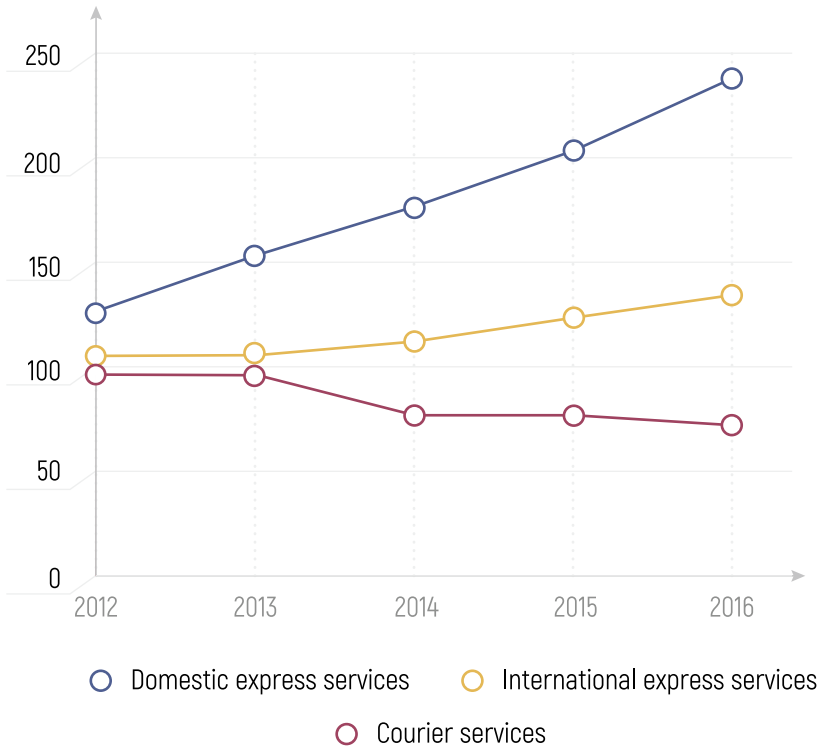
Even though the share of parcel post in the total of services is 0.2%, in 2016 a significant growth (80%) of this service was observed. The volume of express items was increased by 17.6% and the volume of postal money orders by 9%, compared to 2015.

Compared to the previous year, the private operators marked the growth in volume of services by 16%, causing the growth trend of private operators' service volume to continue. The biggest increase was, once again, realized by domestic express services (16%), followed by an increase in international services (11%). Despite another 6 operators starting to perform courier service activity in 2016, the courier service marked a drop by 1%.

Table 24. Private operators' volumes of services

OPERATORS' SERVICES	VOLUME IN THOUS.					VOLUME GROWTH/DROP IN %			
	2012	2013	2014	2015	2016	13/12	14/13	15/14	16/15
Domestic express services	9,758	11,764	13,837	15,831	18,354	21	18	14	16
International express services	404	417	440	475	526	3	6	8	11
Courier services	237	241	193	189	188	2	-20	-2	-1
Total	**10,399**	**12,421**	**14,470**	**16,495**	**19,067**	**19**	**16**	**14**	**16**

FIGURE 122. Trend of the private operators' volumes of services



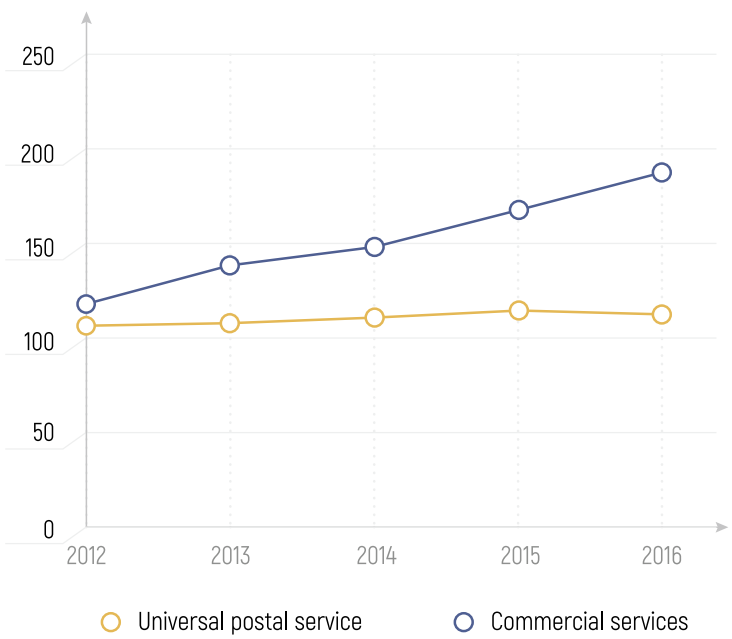
REVENUES FROM POSTAL SERVICES IN THE REPUBLIC OF SERBIA

On the postal service market, the generated income has increased by 4.7% compared to the previous year, despite the drop in the service volume (1%). In the observed period, the UPS income marked its first drop (0.8%), whereas the income from commercial services continued to rise, reaching the growth rate of almost 11% in 2016.

Table 25. Income from the UPS and commercial services

TYPE OF SERVICE	INCOME IN MILLION DIN.					INCOME GROWTH/DROP IN %			
	2012	2013	2014	2015	2016	13/12	14/13	15/14	16/15
UPS	7,119	7,245	7,871	8,264	8,197	2	9	5	-0,8
Comm. services	5,573	6,396	7,099	7,809	8,639	15	11	10	10,6
TOTAL	**12,692**	**13,641**	**14,970**	**16,073**	**16,836**	**7**	**10**	**7**	**4,7**

FIGURE 123. Trend of the UPS and commercial postal services' income



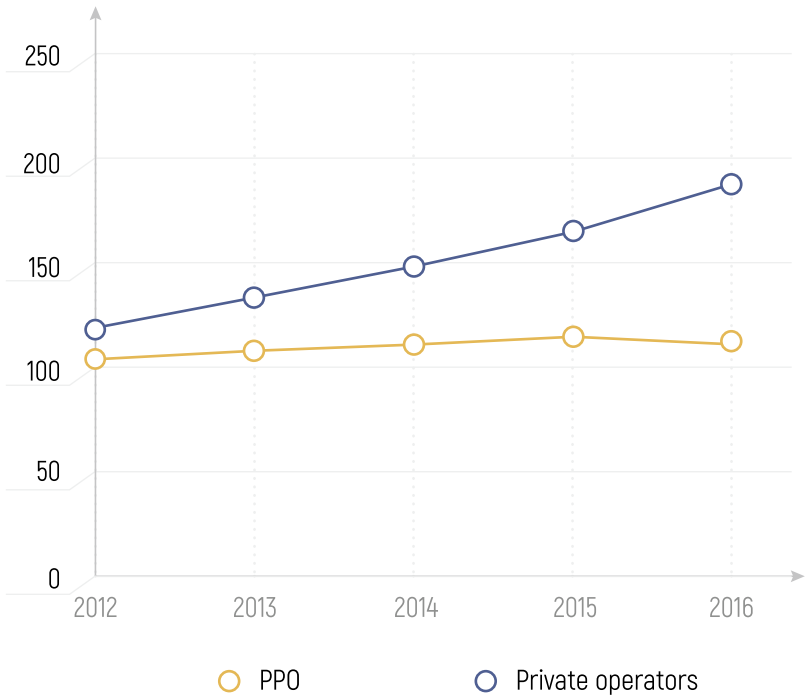
The PPO share in the total income was over 60%, while the private operators realized almost 40% of the income on the market of the Republic of Serbia. The growth rate trend in the private operators' share in the total income continued in 2016 as well, and ranged between 30% in 2011 and 40% in 2016.

The PPO income increased by 1% compared to 2015, amounting to almost 10.4 billion dinars. The income share from the reserved services in the total PPO postal service income was 73.7% (out of which letter-post items accounted for 65.8% and postal money orders for 7.9%), non-reserved service income share was 5.3% and commercial service income share was 21%.

Table 26. PPO and private operators' service income

OPERATORS	INCOME IN MILLION DIN.					INCOME GROWTH/DROP IN %			
	2012	2013	2014	2015	2016	13/12	14/13	15/14	16/15
PPO	8,563	8,920	9,671	10,293	10,364	4	8	6	1
Private operators	4,129	4,721	5,299	5,780	6,472	14	12	9	12
TOTAL	**12,692**	**13,641**	**14,970**	**16,073**	**16,836**	**7**	**10**	**7**	**5**

FIGURE 124. Trend of the PPO and private operators' service income



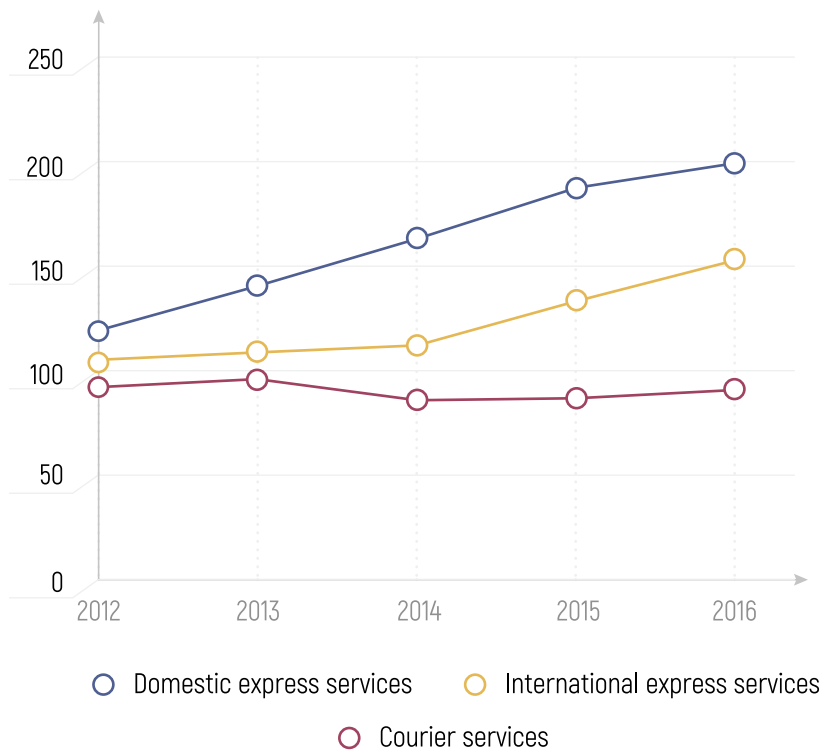
With the generated income of almost 6.5 billion dinars (domestic express services 13%, international express services almost 9% and courier services almost 3%), the private operators marked an increase of income by 12%.

Prices of services in domestic and international traffic dropped on average by 7 dinars and 50 dinars respectively, which implies a development of competition. The exception are the courier services, which marked a decrease in volume (1%), but increase in income (by almost 3%), resulting from the average price increase by 11 dinars.

Table 27. Income from private operators' postal services

PRIVATE OPERATORS' SERVICES	INCOME IN MILLION DIN.					INCOME GROWTH/DROP IN %			
	2012	2013	2014	2015	2016	13/12	14/13	15/14	16/15
Domestic express services	3,049	3,547	4,063	4,391	4,966	16	15	8	13
Int. express services	1,015	1,107	1,179	1,332	1,447	9	6	13	8,6
Courier services	65	67	57	57	59	3	-14	0	2,9
Total	**4,129**	**4,721**	**5,299**	**5,780**	**6,472**	**14**	**12**	**9**	**12**

FIGURE 125. Trend of income by private operators' type of service



Postal sector is changing rapidly. Traditional services are being replaced by digital ones, influencing at most the letter-post services, which consequently mark a decline in many countries. Continuous increase in the volume of parcels, as a result of the development of the e-commerce, emphasizes the necessity of redefining many procedures within the postal industry, in order to simplify the transport of goods purchased via Internet.

The digitalization imposes to the modern world an obligation to provide sophisticated services capable of responding to the needs of the ever demanding users. The UPS providers, regulators, lawmakers and other market players are faced with the challenges such as: UPS scope and sustainability, burdening obligation of the UPS providers, net costs or UPS financing, pertaining all to the services of common economic interest, that surpass national borders.

14 QUALITY OF THE PROVISION OF POSTAL SERVICES

In addition to the improvements of quality of the services to be provided to the users, the purpose of regulation in this area is to establish a quality measurement system which would be comparable those in the EU countries, primarily in the segment of transmission times, as well as in the improvement of the quality of complaint procedures, i.e. complaint handling/resolution system. In that sense, the Regulatory Agency for Electronic Communications and Postal Services adopted on December 30, 2014 its Rulebook on quality parameters for the provision of postal services and on the minimum quality standards for the provision of universal postal service (Official Gazette of RS, no. 146/2014), prescribing a deadline for the PPO to adapt itself to the standardized quality measurement procedures and to start measurements in 2016.

The quality was analyzed according to the data gathered as measurement results based on the PPO Methodology and data from RATEL's questionnaire, including following indicators:

- availability of postal services,
- speed and reliability of the transmission and delivery of items,
- security of items,
- efficiency of complaint handling,
- service users' satisfaction and availability of information, etc.

AVAILABILITY OF UNIVERSAL POSTAL SERVICE

The availability of postal services is assessed based on the territorial accessibility of post offices, postal letter boxes, working hours of post offices, availability of postal office counters and delivery of items.

Table 28. Availability of post offices and letter boxes

	YEAR					TREND (%)			
	2012.	2013.	2014.	2015.	2016.	13/12.	14/13.	15/14.	16/15.
Number of post offices	1499	1489	1478	1491	1516	-0.67	-0.74	0.87	1.65
Number of letter boxes	2087	2072	2052	2000	1964	-0.72	-0.97	-2.60	-1.83

Compared to 2015, the number of post offices increased in 2016 by 25 post offices (i.e. by 1.65%) and the number of letter boxes decreased by 36 (i.e. by 1.83%). The growth trend of the number of post offices started in 2015 continued and the quality of the access to post offices improved. As far as the letter boxes are concerned, their number has been declining for several years now. Compared to 2012, the number of letter boxes was decreased by 123, i.e by almost 6%. Even though the decline in the number of letter boxes may suggest the drop in the quality of service in this segment, the fact is that the number of letters that are inserted in letter boxes is decreasing on a yearly basis, so the decrease in the number of letter boxes is to the great extent justified. On the other hand, pursuant to Article 13 of the Rulebook on conditions of the commencement of the postal service activity (hereinafter: the Rulebook) adopted by the line ministry („Official Gazette of RS", No. 51/10), the UPS provider must also provide at least 2000 letter boxes as a means of postal network for the collection of non-recorded postal items. As the total number of letter boxes in 2016 was 1964, it is clear that the PPO has not fulfilled the above requirement and should remedy this deficiency. There are two possible solutions to provide the necessary number of letter boxes in accordance with the mentioned provisions of the Rulebook.

First solution would be to amend the present Rulebook and to decrease the number of letter boxes that must be provided by the UPS provider, especially in view of the permanent decrease of the number of lettres inserted in letter boxes and general drop in the volume of letter-post items, on a yearly basis. Second solution would be for the UPS provider to align the number of its letter boxes with the required number of letter boxes prescribed in the Rulebook.

The average number of inhabitants per post office is 4740, which is by approximately 5% more than European average (around 4500 inhabitants per post office). Due to the high population density in the city of Belgrade, there are less post offices per inhabitant (8000 inhabitants per post office). Post offices in Belgrade, on the other hand, have bigger service provision capacities, which, to a certain extent, eliminates the impact of more inhabitants than the Serbian average being served by one post office.

WORKING HOURS OF POST OFFICES

One of the criteria of the quality of postal service access are the working hours of post offices, showing the time (how many hours a day) during which the post offices are available to their customers.

Out of 1516 post offices, 992 (65.4%) belong to rural and 524 (34.6%) to urban areas. The analysis of these post offices' working hours has shown the following:

- out of 992 post offices in rural areas, 924 post offices (93.1%) work with customers up to 7 hours a day, 61 post offices (6.2%) work from 7 to 12 hours a day, 1 post office (0.1%) serves customers more than 12 hours a day and 6 post offices (0.6%) at border crossings work around the clock.
- out of 524 post offices in urban areas, 181 post offices (34.5%) work with customers up to 7 hours a day, 329 post offices (62.8%) work from 7 to 12 hours a day, whereas 14 post offices (2.7%) serve customers more than 12 hours a day.

AVAILABILITY OF POSTAL COUNTERS

The availability of postal counters to customers regarding the provision of universal postal service is determined by measuring the waiting time of customers in line. During 2016, the average waiting time of customers in front of the counter for the collection of letter-post items was 6 minutes and 57 seconds, which is by 2 minutes and 24 seconds longer than the value measured last year. Despite an increased waiting time in line, the criterion of availability of counters is satisfactory, having in mind the limit value of 10 minutes, prescribed in the current regulations.

AVAILABILITY OF THE DELIVERY OF POSTAL ITEMS

The Postal Directive prescribes the delivery of postal items at least 5 days a week, to be organized by the UPS provider, with possible exceptions determined by the regulator. These exceptions concern up to 10% of the population, and only in countries with specific geographic configuration. The law in the Republic of Serbia also prescribes a 5-day delivery, i.e. every working day, with possible exceptions.

The availability of the postal item delivery is not possible to be captured with accuracy, since the PPO only fulfills parts of the regulator's questionnaire on the number of inhabitants and households, but not on the volume of postal items on the local, larger and largest delivery areas. Instead of these data, the PPO keeps providing information on the percentage of postal address codes (PACs) on the local, larger and largest delivery areas: in other words, the data that are not even required, nor relevant for the analysis of this quality parameter.

Table 29. Volumes of inhabitants and households per delivery area

DELIVERY AREA	NUMBER OF INHABITANTS	NUMBER OF HOUSEHOLDS	% OF INHABITANTS	% OF HOUSEHOLDS
1	2	3	4	5
Local	4,900,481	1,923,640	68.19	68.47
Larger	1,563,827	583,987	21.76	20.79
Largest	722,506	301,843	10.05	10.74
Total	**7,186,815**	**2,809,470**	**100.00**	**100.00**

The analysis of the data on the population and number of households per delivery area shows that more than 68% inhabitants and households are covered by every-day delivery. In larger delivery areas, there are around 21% of inhabitants and households, covered by a 2-day or 3-day delivery a week. More than 10% of inhabitants and households are situated in the largest delivery areas, having one delivery per week.

Based on these data, it can be concluded that around 31% of inhabitants and households do not receive their postal items on a daily basis, i.e. are not covered by the legal provision of the every-day delivery of the UPS items. This situation points to the fact that in the Republic of Serbia far more inhabitants than in any of the EU member countires are not covered by daily delivery (the biggest percentage of inhabitants without daily delivery is prescribed in Croatia and amounts to 10%).

SPEED AND RELIABILITY OF THE TRANSMISSION AND DELIVERY OF POSTAL ITEMS

Speed and reliability of the transmission and delivery of postal items are measured by the transmission and delivery times of domestic non-recorded letter post items and international priority and air letter post items. Delivery standards for the domestic traffic are prescribed by the Regulatory Agency for Electronic Communications and Postal Services in its Rulebook on quality parameters for the provision of postal services and on the minimum quality standards for the provision of universal postal service (Official Gazette of RS, no. 146/14).

In the international postal traffic, delivery standards are prescribed by the Universal Postal Union (D+5 for 85%) or by the Association of European Public Postal Operators (PostEurop), which are D+3 for at least 85% (speed indicator) and D+5 for at least 97% (reliability indicator).

For the measurement results of the transmission times to be valid and comparable, the EN 13850 standard for Postal Services - Quality of Services - Measurement of the transit time of end-to-end services for single piece priority mail and first class mail has been presribed. This standard defines the preparation manner of screening and analysis of the received data. The prerequisite for receiving quality data is a continious screening of the transmission times, organized by an independent body that cannot be influenced by the PPO. During 2012, 2013 and 2014, the PPO annually organized independent measurements for the duration of two months, whereas in 2015 and 2016 no independent measurement of transmission times was organized, despite an existing legal obligation to do so in 2016. Therefore, the results collected from the AMQM system of measurement of transmission times were included in the final analysis. In the AMQM (Automatic Mail Quality Measurement) system, postal items are sent and received by the PPO employees, i.e. internal panellists, which can give rise to the suspicion of the poor quailty of the received results, due to the absence of an independent measurement (screening).

Table 30. Transmission times for letter-post items

	DOMESTIC TRAFFIC INDEPENDENT SCREENING			AMQM		Prescribed standards		INTERNATIONAL TRAFFIC POSTEUROP					Prescribed standard
						Up to 2015	For 2016						
	2012	2013	2014	2015	2016			2012	2013	2014	2015	2016	
D+1	79.93%	82.27%	71.81%	71.05%	77.66%	/	**80%**						
D+2	96.46%	95.86%	93.63%	93.58%	95.04%	**90%**	**85%**						
D+3	98.84%	98.74%	99.14%	97.82%	98.21%	**98.5%**	**90%**	63.70%	66.50%	67.95%	56.20%	58.45%	**85%**
D+5	99.87%	100.00%	100.00%	99.47%	99.56%	**99.5%**		90.25%	92.50%	87.50%	83.35%	87.90%	**97%**

If the transmission times are observed in continuity, regardless of the manner in which they were set (independent measurement or internal screening), the following can be concluded:

- After a two-year long period of poor results, the transmission times results in 2016 were better than those in 2015, especially as far as D+1 standard is concerned, since it improved by more than 6.5%,
- In 2016, the transmission times approached to the values of 2012 and 2013, when those were on the level of the set standard.

The provided data regarding international postal items show that, during 2016, there were improvements in the transmission times, but these results, apart from being considerably poorer than the times prescribed by the standard, are also worse than the results measured in 2012 and 2013. The shown percentage values refer to the incoming items and are significantly better than the results referring to the outgoing items (D+3 – 51.35% and D+5 – 76.16%). Based on these data, it can be concluded that, due to the fact that the quality of domestic transmission times is intrinsically connected to the international transmission times and cannot be analysed independently, the quality of transmission times is not on a satisfactory level. One of the reasons for reaching the set quality standards is the fact that a great number of inhabitants and households are not included in the daily delivery.

SECURITY OF ITEMS

An overview of the number of lost, rifled and damaged postal items during the period 2012 – 2016 is shown in Table 31.

Table 31. Lost, rifled or damaged items within UPS

TYPE OF ITEM	2012	2013	2014	2015	2016
REGISTERED LETTERS					
lost per 100000 items	10	10	8	7	8
rifled or damaged per 100000 items	0	0	0	0	0
INSURED LETTERS					
lost per 100000 items	0	0	1	0	0
rifled or damaged per 100000 items	0	0	0	0	0
PARCELS					
lost per 100000 parcels	1	1	0	0	0
rifled or damaged per 100000 parcels	3	2	1	0	0
MONEY ORDERS					
lost per 100000 items	0	0	0	0	0
SECURITY LEVEL OF ITEMS	0.009	0.009	0.007	0.006	0.007

The analysis of the data showed an increase in the number of lost registered items during 2016 (in 2015, 7 out of 100000 items were lost, against 8 items in 2016).

An overview of the paid indemnities, according to the types of recorded postal items for the period 2012 – 2016 is shown in Table 32 below.

Table 32. Paid indemnities by the types of postal items

DOMESTIC POSTAL TRAFFIC	2012		2013		2014		2015		2016	
	pcs.	dinars	pcs.	dinars	pcs.	dinars	pcs.	dinars	pcs.	dinars
Registered items	1,041	639,381.88	1,061	665,728.86	591	415,066.00	452	349,982.00	433	347,304.00
Insured items	8	10,552.52	6	9,978.00	18	31,036.00	5	10,262.00	3	5,371.00
Parcels	14	23,178.00	9	23,334.51	8	9,451.50	3	28,592.00	5	6,857.05
Money orders	0	0	1	900	0	0	3	6,140.00	0	0.00
TOTAL	1,063	673,112.40	1,077	699,941.37	617	455,553.50	463	394,976.00	441	359,532.05

Despite the deterioration of the security level of primarily registered items (Table 15), in 2016 a lower amount of paid indemnities by 9% for 5% items less was observed compared to 2015. This also resulted in a lower number of submitted requests for indemnity.

In the international postal traffic, following the decrease of the security level of items in 2016, the indemnity for 14 items was paid in the amount of 144,245.00 dinars, whereas in 2015, the indemnity for 17 items was paid in the amount of 63,852.00 dinars. The reason for the higher indemnity paid in 2016 than in 2015, for a lower number of items, is the fact that 95,999.00 dinars were paid for only 5 insured items in 2016, whereas in 2015 there were no indemnities paid for insured items. Also, more indemnity was paid for parcels (33,003.00 dinars in 2016 compared to 16,740.00 dinars in 2015), whereas less indemnity was paid for registered letters (26,243.00 dinars in 2016 compared to 47,112.00 dinars in 2015).

EFFICIENCY OF COMPLAINT HANDLING

Customers submit their complaints to the PPO in oral and written form (hard copy or e-mail). During 2016, 109 written complaints were filed, which is by 66% more than in 2015. By means of the PPO's online contact service, 10383 enquiries were made (objections, questions, complaints and similar), which is a 28% increase compared to 2015.

The majority of complaints referred to the delivery of items and the least number of complaints referred to the counter service (insufficient number of counters, long waiting in line for money transactions), so they cannot be regarded as postal service – related complaints in a strict sense.

In 2015, the customer complaints in domestic traffic usually got resolved in 3 days on average, which is by 1 day shorter than in 2015. On the other hand, a slower realization of the indemnity payment occurred, even though the payment delay was shortened, resulting in the total indemnity procedure being prolonged by 1 day only: from 13 days to 14 days (Table 33).

Table 33. Average time for complaint resolution, realization and payment of indemnities

	RESOLUTION OF COMPLAINT PROCEDURE	REALIZATION OF INDEMNITY	PAYMENT OF INDEMNITY	TOTAL FOR REALIZATION AND PAYMENT OF INDEMNITY
YEAR	(days)	(days)	(days)	(days)
	1	2	3	4=2+3
2014.	4	7	5	12
2015.	4	7	6	13
2016.	3	10	4	14

The delays for the international postal items are considerably longer, taking into account the fact that complaint procedures need to be carried out in at least two countries.

SERVICE USERS' SATISFACTION AND AVAILABILITY OF INFORMATION

In its annual report on the quality of service, the PPO regularly informs RATEL about the level of service users' satisfaction and the availability of information on products and services. The research on the level of service users' satisfaction and the availability of information is carried out by means of an internal survey on customers' opinions, whether they be natural or legal persons. The measured parameters such as: reliability, speed, assortment, price and manner of service provision are commonly highly rated.

CONCLUSION

Taking into account an overall analysis on the reached quality levels of the UPS provision, a conclusion can be drawn that in the previous period the PPO made a solid effort in making available to the users a set of tools for the submittal of complaints (electronically, via telephone, through web site, in written form, directly at the post office counters) that can be used for asking questions and filing of complaints and objections. In addition, the delays for the resolution of complaint procedures became shorter, which, along with the above steps, has resulted in the improvements of quality levels in this segment.

However, the PPO continues not to provide crucial data, such as volumes of items on the local, larger and largest delivery areas, based on which a more realistic picture could be made regarding the exceptions from the legally prescribed obligation (5-day delivery).

Having in mind the above mentioned missing data, the relevant report with its assessment of the level of quality at the PPO's would beyond any doubt provide a significantly more objective description of the quality in question.

15 CYBER SECURITY

Coming into force of the Law on Information Security ("Official Gazette of the RoS" No. 6/2016), (hereinafter "the Law") and the beginning of implementation of its provisions enabled the establishment of information systems security risk protection measures, recognition of company responsibilities in managing and using ICT systems and definition of competences of the bodies in charge of applying safety measures and coordinating protection activities and monitoring the implementation of prescribed safety measures. The Law stipulates the competence of the Regulatory Agency for Electronic Communications and Postal Services in coordinating and conducting the tasks of the National Center for Prevention of Safety Risks in ICT Systems (National CERT).

National CERT is responsible for coordinating prevention and protection from security risks in ICT system, for the complete territory of the Republic of Serbia, through detection and analysis of the most frequent types of cyber attacks aimed at jeopardizing information security of various organizations doing business or exercising competencies in Serbia. It also issues information, warnings and advice related to the ICT system security risks to the entities who manage and run ICT systems in the Republic of Serbia, as well as the general public.

Establishment of the National CERT and execution of its competencies stipulated by the Law is extremely important part of the harmonization of the national regulatory framework with the relevant competencies within the cyber security systems of EU countries. The European Union Agency for Network and Information Security (ENISA), which permanently monitors and analyzes risk prevention measures in the field of information system security and reports on their implementation, published a report titled **ENISA Threat Landscape Report 2016: 15 Top Cyber-Threats and Trends** in January 2017. The research was carried out from November 2015 till November 2016, focusing primarily on the most frequent threats and attacks on IS's in 2016. Detailed analysis of the collected data showed that the primary motives behind the threats and attacks were illegal monetary and financial benefits, on the basis of stolen data and information.

TOP CYBER THREATS

FIGURE 126. Comparison between the threat landscape in 2016 and in 2015

TOP THREATS 2015.	TREND 2015.	TOP THREATS 2016.	TREND 2016.	CHANGE IN RANKING
1. Malware	↑	1. Malware	↑	→
2. Web based attacks	↑	2. Web based attacks	↑	→
3. Web application attacks	↑	3. Web application attacks	↑	→
4. Botnets	↓	4. Denial of service	↑	↑
5. Denial of service	↑	5. Botnets	↑	↓
6. Physical damage/theft/loss	⊃	6. Phishing	⊃	↑
7. Insider threat (malicious, accidental)	↑	7. Spam	↓	↑
8. Phishing	⊃	8. Ransomware	⊃	↑
9. Spam	↓	9. Insider threat (malicious, accidental)	⊃	↓
10. Exploit kits	↑	10. Physical damage/theft/loss	↑	↓
11. Data breaches	⊃	11. Exploit kits	↑	↓
12. Identity theft	⊃	12. Data breaches	↑	↓
13. Information leakage	↑	13. Identity theft	↓	↓
14. Ransomware	↑	14. Information leakage	↑	↓
15. Cyber espionage	↑	15. Cyber espionage	↓	→

TREND: ↓ DECLINING ⊃ STABLE ↑ INCREASING

RANKING: ↑ GOING UP → SAME ↓ GOING DOWN

Source: ENISA Threat Landscape Report 2016: 15 Top Cyber-Threats and Trends

1. MALWARE

Malware outnumbered other cyber-threats last year. The number of malware threats reached 600 million per quarter. Mobile malware reached a growth of 150% in 2016. The main two malware types in 2016 were ransomware and information stealing, while the malware related to IoT (Internet of Things) is expected to be the most serious future threat.

The most often encountered types of malware were: trojans (60%), viruses (16%), worms (11%), potentially unwanted programs (PUPs) (4%) and adware/spyware (2%). Trojans were also the most efficient (66%), followed by PUPs (25%), while adware/spyware (4%), worms (3%) and viruses (2%) were much less efficient.

The top five countries regarding infection rates were China, Turkey, Taiwan, Ecuador and Guatemala, with infections rates between 50 and 40%. European countries, such as Sweden, Norway, Finland, Switzerland and Belgium were at the bottom of infection rates: (around 20%).

Both experts in the field of cyber security and other countries experience show that awareness raising and security training are the basic means of preventing this type of cyber threats.

2. WEB-BASED ATTACKS

Web-based attacks are those that use web components, i.e. parts of the web infrastructure, such as web servers and web clients, for executing attacks. The most common web based attacks are drive-by, redirection, water-holding attacks, web browser and web server exploits, browser extension attacks abusing vulnerabilities and man-in-the-browser-attacks. It is expected that web attacks will continue increasing in the future, followed by DDoS attacks.

Among the infected web pages, a big part seems to have been developed with WordPress (78%), Joomla! (14%) and Magento (5%).

3. WEB APPLICATION ATTACKS

Web application attacks are related to attacks against available web applications, including mobile and web services. The number of web application attacks increased by 15% in 2016 and they are considered as the biggest threat to organisational security.

The most vulnerable sectors per web application exposure are IT-Sector (66%), Food (60%), Manufacturing (60%), Banking (50%), Energy (47%), Insurances (44%) and Media (44%).

Comparing the number of registered web application incidents, the sector dispersion is as follows : Retail (40%), Hotel and Travel (21%), Financial Sector (11%), Media (5%) and Public Sector (5%), with a noticeable increasing trend.

4. DENIAL OF SERVICE (DOS)

The denial of service (DoS) attacks have influenced the changes in regulatory frameworks of certain countries, prescribing minimum security levels. The high occurrence rate of DDoS attacks, both the US government and the EU have announced measures regarding minimum security levels for IoT devices and devices that may be connected to the Internet.

Web browser impersonators have been DDoS bots in 45% of the cases. 36 % of them passed the existing protection, making a significant increase of 6% as compared with the previous year. Single vector attacks continue to prevail with ca. 50% of all attacks. On the other hand, multi-vector multi-vector attacks account for 35-50% of all attacks, with an increase of 10%.

The victims of this type of attacks were Gaming Industry (55%), Software & Technology (25%) and Financial Services (5%). Based on collected data, it was assessed that 73% of all organisations suffered a DDoS attack, of which 85% suffered from multiple attacks in the given period.

This type of attacks shows an increasing trend.

5. BOTNETS

Botnets are an efficient means for spam and malware distribution, DDoS campaigns and ad-fraud. Approximately 18% of DDoS attacks were executed by bots mimicking legitimate user browsers.

The number of botnet attacks increased by 7% as compared to the previous year.

6. PHISHING

The Phishing attack targets are primarily human victims, i.e. Internet users. The number of Phishing attacks increased by app. 800% in first quarter of 2016 compared to last quarter of 2015. On the average, 30% of the Phishing messages were opened by the recipients. 12% of the recipients clicked the attached malware/link. The numbers are bigger than in previous year, which indicates that the users' awareness about this type of messages and their effects is still developing. Microsoft (8%), Facebook (8%) and Yahoo (7%) are the top three brands mentioned in phishing messages. Phishing messages are most often sent to companies having up to 250 employees.

The top 5 countries hosting Phishing web sites were US, Belize, Hong Kong, Belgium, and UK. The countries with the highest number of phishing victims were China (20%), Brazil (18%), Algeria (14%), UK (13%) and Australia (12,5%). Top five attachment types of spear phishing attacks were: .doc (40%), .exe (17%), .src (14%), .xls (6%) and .bin (5%).

7. SPAM

Spam is the main means for the transport of malware and malicious URLs. This type of attacks reduces continuously since 2013, going down from 85% to 55%. In June 2015, spam rates fell under 50% for the first time since 2003. But, although reduced in numbers, spam has gained in quality and efficiency. 70-80% of spam messages were below 2KB, with the rest being between 2 and 50 KBs, and 20% of them contained trojans. Companies reported that 50% of the received messages were Spam. Top five countries that are sources of spam are US (11 %), Vietnam (10%), India (10%), China (%) and Mexico (4,5%).

8. RANSOMWARE

Of all the cyber-threats in 2016, ransomware had the most impressive growth in all categories: number of campaigns, number of victims, average ransom paid, methods used, caused damage. 60% of the victims were users, and 40% were organizations. Most of the victims were from US (28%), Canada (16%), Australia (11%), India (9%) and other (20%). Top five victim sectors were: consumers (ca. 57%), Services (ca. 38%), Manufacturing (ca. 17%), Public Administration (ca. 10%) and financial sector (10%).

9. INSIDER THREAT

Out of all registered incidents, the inadvertently caused incidents initiated by employees or end users within the organization cover between 50% and 60%. The most frequent insider incidents are: privilege abuse (60%), data mishandling (ca. 13%), use of non-approved hardware (10%), use of inappropriate software (10%) and abuse of privilege possession (ca. 10%). 70% of all insider incidents are detected after months and years.

Financial benefit is the top motive, in 50% of cases, followed by espionage with 30% confirmed cases. Data breaches were most often executed by Privileged IT users / Admins (60%), Contractors / Consultants / Temporary Workers (57%), Employees (50%), Privileged Business users (50%), Executive Managers (30%), Business Partners and Other IT Staff (20). The most vulnerable sectors are public, health and financial.

10. PHYSICAL MANIPULATION/DAMAGE/THEFT/LOSS

Physical manipulation, damage, loss and theft are not really a cyber-threat, but they have a severe impact on cyber security. These events are seriously taken in consideration while collecting and analyzing data, due to the fact that app. 70% of end devices have no or weak encryption of data.

The report on data loss and giving access to data to unauthorized users indicates that 40% of information breaches are caused by physical media loss (laptops/tablets, USB-drives, mobile phones, printed media, CDs/DVDs, microphones/WebCams and faxes).

11. EXPLOIT KITS

Exploit kits are software tools used for the installation of malware. They install malicious payloads on victim servers based on the exploits (vulnerabilities) found on those devices. The vulnerabilities found most often are related to browsers (48%), Android (24%), Microsoft Office (14%), Java (7%), Adobe Flash Player (6%) and Adobe Reader (1 %).

12. DATA BREACHES

2014 was characterized as the "year of the data breach", and the level of data breaches in 2016 was almost 45% more than that of 2014. Evidence found states that over 20% of data breaches are performed by using stolen credentials.

The type of assets targeted the most are: servers (40%), personal devices, such as mobile phones and devices connected to the Internet (35%) and users themselves, exposed to phishing tools and social engineering (25%).

The main data breach targets are healthcare (36%), government and military (36%), education (9%) and financial sector (4%).

13. IDENTITY THEFT

Identity theft is a special case of data breach and is related to compromise of identity information of users or devices. The aim of identity theft is monetization of stolen information.

Businesses lead the statistics of reported identity thefts (43%), followed by Medical/Healthcare (6%), Education (9%), Government/Military (7%) and Banking/Financial (4%). The misuse of stolen identities is related to: Tax fraud (49%), Credit card fraud (ca. 15%), Phone or utilities fraud (10%), Bank fraud (6%), Attempted identity theft (3.7%), Loan fraud (3.5%), Employment-related fraud (3.3%) and Other (19%). It is noticeable that, although data breaches have increased in 2016, the number of identity records stolen is smaller than in the previous year.

14. INFORMATION LEAKAGE

Information leakage is a category of cyber-threats abusing weaknesses of systems and components, programming mistakes and user behaviour in order to leak important information. Usually, leaked information serves as input to other threats and help in committing further cyber-crimes.

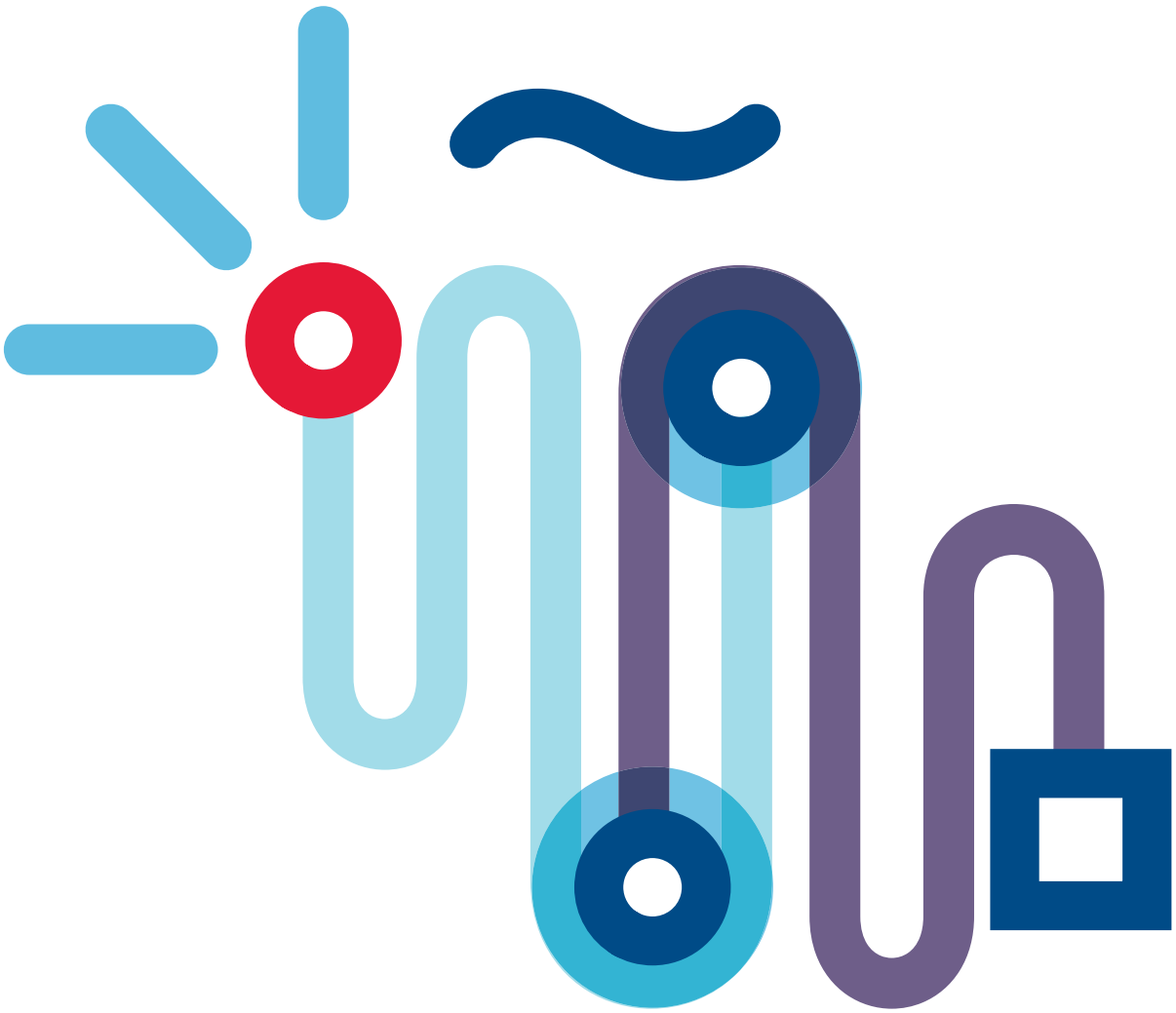
Information leakage can be achieved by malicious applications, fake offerings (such as free Wi-Fi, free storage space, etc.). Social networks are a source of "voluntarily leaked" personal information that can be misused for other cyber-threats.

15. CYBER ESPIONAGE

Cyber space has officially been recognised as a battlefield, hence cyber espionage has established itself among cyber threats. In the reporting period, cyber-espionage was the 3rd most common motive of performed attacks while cyber-warfare was the 4th most common motive in 2016.

Espionage campaigns are extremely difficult to identify, and, once identified, very challenging/costly to analyse. For these reasons, all confirmed cases of threats and attacks are just the tip of the iceberg.

Within the scope of its competences, RATEL continuously monitors and analyzes all kinds of threats and attacks against cyber security in Serbia, through exchange of experiences with other national institutions having the same or similar competencies. Information established from the results of comprehensive analyses performed in other countries are used as the basis for coordinating activities aimed at defining appropriate security measures to be executed by all institutions and organizations in Serbia, in order to protect data and information, whose misuse could harm both government institutions and companies.



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