REPUBLIC OF SERBIA
RATEL
REGULATORY AGENCY FOR ELECTRONIC COMMUNICATIONS AND POSTAL SERVICES

AN OVERVIEW

OF THE TELECOM AND POSTAL SERVICES MARKET IN THE REPUBLIC OF SERBIA IN 2018

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Belgrade, 2019

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00 A WORD OF INRODUCTION

We can be satisfied with the results made last year and remain optimistic wggen it comes to the years ahead. Total revenues made in electronic communications market in the Republic of Serbia in 2018 amounts to approximately 198.7 billion dinars, which is by 3.9% more compared to the previous year. The share of revenues made from electronic communications in the Serbian GDP in 2018 was 3.9%. Mobile service provision accounts for the largest share of total revenues made from electronic communications, which equals 58.2% (115.6 billion dinars).

The investments in the electronic communications sector increased by 27%, amounting to 41.7 billion dinars. Two thirds of the total investments went to the mobile (17 billion dinars) and fixed (11.1 billion dinars) networks.

Regardless of the decrease in the number of mobile users taking place in the past three years, the volume of the outgoing voice traffic is still growing in terms of minutes, with a year-on-year increase of 6.3% in 2018. During 2018, each mobile telephony user daily spent on average 5 minutes and 24 seconds on the phone. On the other hand, the number of sent text messages continues to drop, with approximately 2 messages a day per user (a 7.6% decrease).

In 2018, only 79.5% of households had a fixed phone, as a result of the decrease in the number of users, present over the past years.

Revenues form fixed broadband Internet increased by 8.3% compared with 2017. Changes in the Internet package structure involved the increase in the number of packages with higher speeds, in addition to the increase in the total number of users. The total number of subscribers of the fixed broadband Internet in 2018 amounted to 1.55 million, which is a 4.7% increase in respect to the previous year. Cell phones are still the most frequently used devices for the Internet access, resulting in the 10.7% increase in the number users of the mobile Internet service. The increase in the number of users led to the increase in the volume of the Internet traffic, which doubled in respect to the previous year, amounting to nearly 218 million GB on the annual level. The Internet was mainly used for searching the information on goods and services (76.8%), for watching the content available at sharing platforms, such as YouTube, Flickr, Picasa (76,3%), and for social networks, such as Facebook and Twiter (70.3%).

According to RATEL's 2018 market overview, the total number of media content distribution service subscribers was 1.88 million, which is a 10.6% increase in respect to 2017, as a result of the increase in the number of subscribers of the cable network media content distribution.

User right protection in the field of electronic communications and postal services remains RATEL's priority. The percentage of user complaints related to the quality of service (QoS) was by 10% less for all types of services.

The biggest share (9%) of complaints concern the quality of services of broadband access. RATEL NetTest application, enabling measurement of the Internet QoS was upgraded in 2018 and all the measurement results are transparent and publicly available to users. The advantage of this functionality is that the end user can find the information on the operators' networks at a specific location, by observing the measurement results of a large number of samples in that specific area.

Postal services in the Republic of Serbia showed a 1% increase, for the second year in a row. The number of postal deliveries per household in 2018 amounted to 131, which is 45 deliveries per inhabitant. The revenues from postal services amounted to 20 billion dinars, equalling almost 0.4% of the projected GDP. Although the universal postal service, with more than 89.1% share, is dominant in the total volume of postal services provided, the revenues made from UPS are lower than those made from commercial services (more than 55%). In particular, the revenues made from UPS grew by 3.3%, whereas the revenues made from commercial services are constantly growing, the current increase rate being over 13%.

With the adoption of the new Law on Postal Services, we expect this market to receive and additional stimulus for the development and further promotion of the existing services, as well as for the introduction of new innovative services, in particular in the area of e-commerce.

The Law on Information Security stipulates the requirement for the operators of critical ICT systems to inform the responsible authority of any incidents in the system that may significantly impact information security. There were 31 such incidents reported to the National CERT in 2018, including the incidents reported by international CERTs. The incidents which present a risk to the security of ICT systems, suspected to present a felony, have been reported according to the law or forwarded to the Special Prosecution Office for High-Tec Crime. We expect this field to be further regulated with the amendments to the Law on Information Security, which should enable raising the information security to a higher level.

The annual overview of telecommunications and postal services market in the Republic of Serbia for 2018 and the overviews for the previous years can help envisage future directions of the development of this important economic sector and we truly believe that the objective picture here shows room for growth and the opportunities for new investments and higher quality, to the satisfaction of end-users.

Director

Dr Vladica Tintor

01 BASIC FEATURES OF TELECOMMUNICATIONS MARKET IN THE REPUBLIC OF SERBIA

Figure 1.1. Republic of Serbia – Basic Facts

Basic data	
Name	Republic of Serbia
Capital	Belgrade
Area	88,499 km2
Population (without AP Kosovo and Metohija), estimated by the Statistics Office [1]	7,001,444
Country code:	+381
Internet domen:	.rs
GDP in 2018 [2]	5,059.7 billion dinars (42.78 billion euros)
Average net income in 2018 [3]	49,650 dinars (419.8 euros)

1 Statistics Office estimation for 1.1.2018.

2 Statistics Office estimation - as sum of 4 quarters. Data taken from "Statistics calendar of the Republic of Serbia 2019" published by the Statistics Office. (the average RDS/EUR exchange rate for 2018 was 118.2716), p. 38

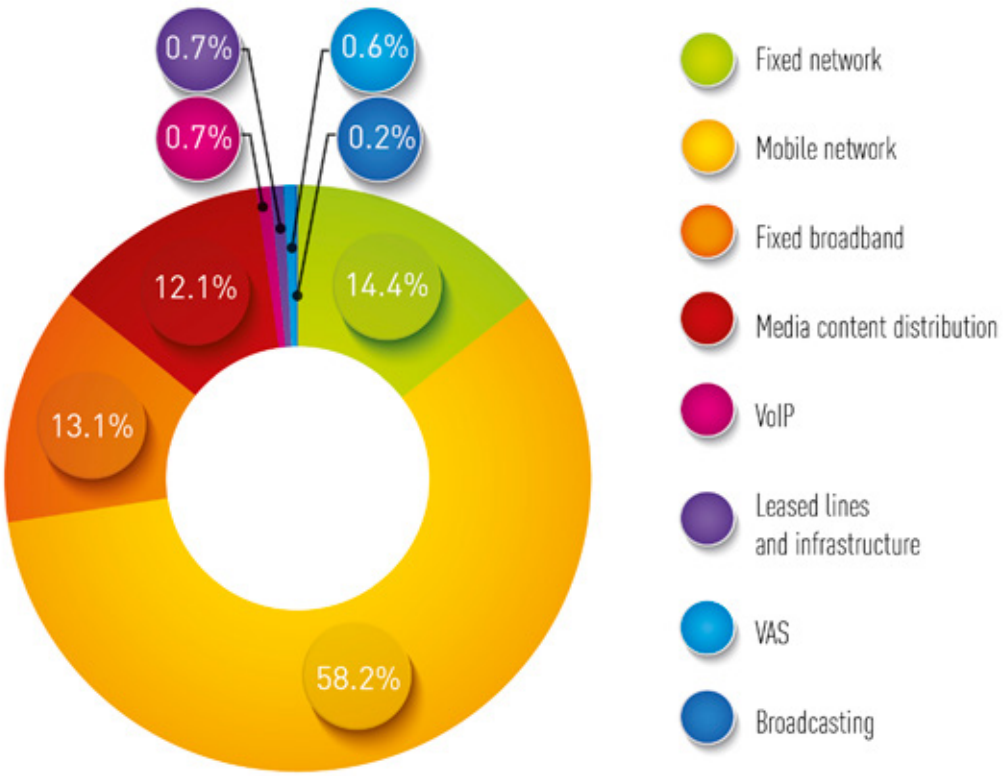
3 Ibidem p. 47

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.

The total revenues made in the electronic communications market of the Republic of Serbia in 2018 amounted to approximately 198.7 billion dinars, which is slightly by 3.9% more compared with the previous year. According to the annual average middle exchange rate the total revenues amounted to 1.68 billion euros (6.3% growth rate). The difference in the growth rate seen in dinars and euros is due to the difference in the average middle exchange rate between 2017 and 2018. The share of revenues from electronic communications in the Serbian GDP was around 3.9% in 2018.

In terms market share accounted for by different services in the Serbian electronic communication market in 2018, the same as in the previous years, the largest share went to mobile service provision, accounting for 58.2% of the total revenues.

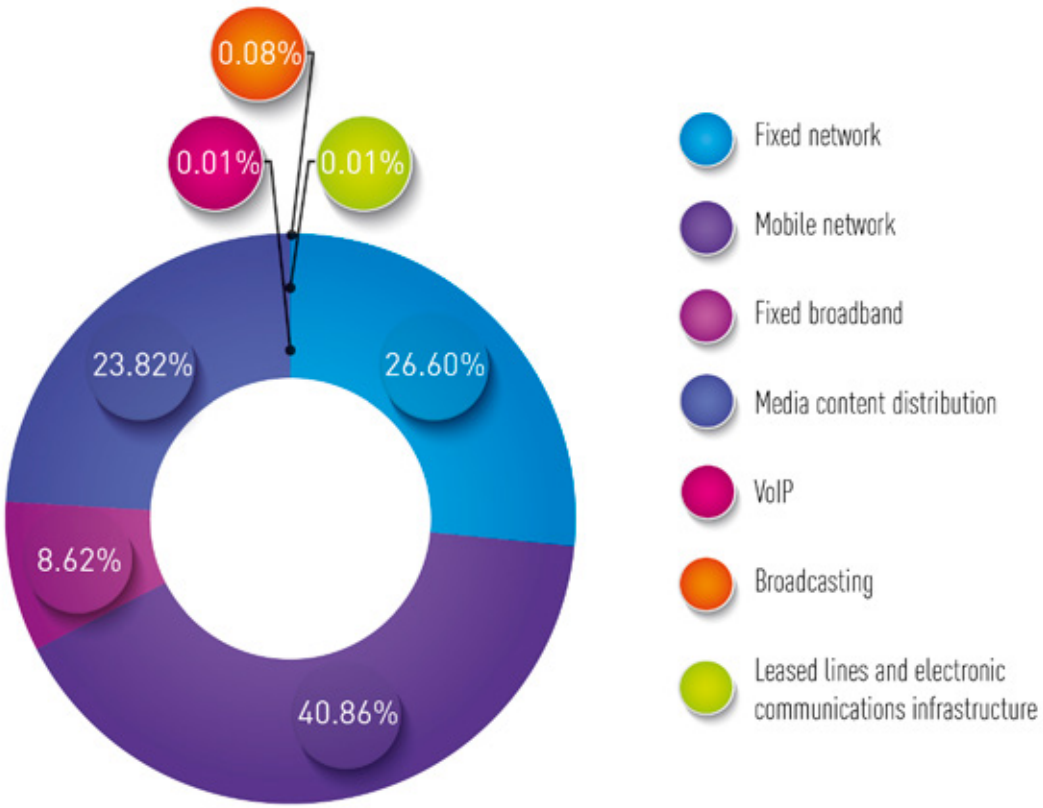
Figure 1.2. Structure of revenues by services in 2018



Source: **RATEL**

The total investments made in the electronic communications sector in 2018 amounted to 41.7 billion dinars or 352.2 million euros, which is by 27% more compared with the previous year when they amounted to 32.8 billion dinars. Considered in euros, the investments increased from 270.7 to 352.2 million euros, which is a 30.1% growth. Investments made in mobile networks individually have the largest share in the total investments, amounting to 17 billion dinars (143.9 million euros) and accounting for 40% of the total investments, while the investments made in fixed networks in the amount of 11.1 billion dinars (93.7 million euros) make up 26% of the total investments made in 2018.

Figure 1.3. Structure of investments by services in 2018



Source: **RATEL**

A comparative overview of the number of users and penetration rate of public fixed communication networks, public mobile communications networks, Internet and media content distribution systems for the period 2014-2018 are given in Table 1.1.

Table 1.1. A comparative overview of the number of users of basic electronic communications services in the Republic of Serbia (2014-2018)

	2014		2015		2016		2017		2018	
	Number (mil)	Per 100 inhabitants	Number (mil)	Per 100 inhabitants	Number (mil)	Per 100 inhabitants	Number (mil)	Per 100 inhabitants	Number (mil)	Per 100 inhabitants
Fixed telephone - subscribers	2.72	37.99	2.60	36.80	2.55	36.07	2.48	35.25	2.44	34.79
Mobile telephone - users	9.34	130.76	9.16	129.38	9.09	128.52	8.62	122.46	8.43	120.42
Fixed broadband - subscribers	1.23	17.16	1.32	18.66	1.45	20.50	1.48	21.03	1.54	22.08
Media content distribution - subscribers	1.50	20.95	1.60	22.55	1.66	23.51	1.70	24.13	1.88	26.85

Source: **RATEL**

Low usage basket of electronic communications services shows average monthly expenses of a subscriber/inhabitant for telecommunications services. Tables 1.2 and 1.3 illustrate low usage and high usage baskets, representing monthly expenditure per subscriber of electronic communication services in Serbia in 2018, compared with the data obtained in 2016, 2017 and 2018, based on weighted average. According to the collected data and the data received from the Statistics Office, in 2018, the cost of the low basket equalled 2.29% and the cost of the high usage basket equalled 10.44% of the average net annual salary.

Table 1.2. Low usage basket of electronic communications services

LOW USAGE BASKET	2016		2017		2018	
	Average bill (dinars)	% of the monthly salary	Average bill (dinars)	% of the monthly salary	Average bill (dinars)	% of the monthly salary
Fixed phone	868.68	(dinara)	764.01	1.60%	695.87	1.40%
Mobile phone (prepaid)	294.85	0.64%	321.38	0.67%	293.45	0.59%
TV (public broadcasting service tax)	150.00	0.33%	150.00	0.31%	150.00	0.30%
Total	1,313.53	2.85%	1,235.39	2.58%	1,139.32	2.29%
Average net salary (RSD)*	**46,097**		**47,893**		**49,650**	

*www.stat.gov.rs – As of 2018, average salary is calculated based on the data obtained through Withholding Tax Return Form, according to new methodology.

Source: **RATEL**

Table 1.3. High usage basket of electronic communications services

HIGH USAGE BASKET	2016		2017		2018	
	Average bill (dinars)	% of the monthly salary	Average bill (dinars)	% of the monthly salary	Average bill (dinars)	% of the monthly salary
Fixed phone	868.68	1.88%	764.01	1.60%	695.87	1.40%
Mobile phone (postpaid)	1,555.12	3.37%	1,537.60	3.21%	1,481.73	2.98%
TV (public broadcasting service tax) **	150.00	0.33%	150.00	0.31%	150.00	0.30%
Internet	1,522.32***	3.30%	1432.54***	2.99%	1,448.96	2.92%
Media content distribution	1,186.89	2.57%	1,236.24	2.58%	1,404.47	2.83%
Total	**5,283.01**	**11.46%**	**5,120.39**	**10.69%**	**5,181.03**	**10.44%**
Average net salary (RSD)*	46,097		47,893		49,650	

Notes:

*www.stat.gov.rs - As of 2018, average salary is calculated based on the data obtained through Withholding Tax Return Form, according to new methodology.

** Since January 2016, pursuant to the Law on Temporary Regulation of Public Media Service Tax Collection (Official Gazette of RS, no. 112/15), a monthly public broadcasting service tax in the amount of 150 dinars is collected.

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

Source: **RATEL**

According to available data, the total number of people in the Republic of Serbia employed in the telecommunications sector in 2018 amounted to 14 thousand.

02 EU TELECOM MARKET STATE OF PLAY

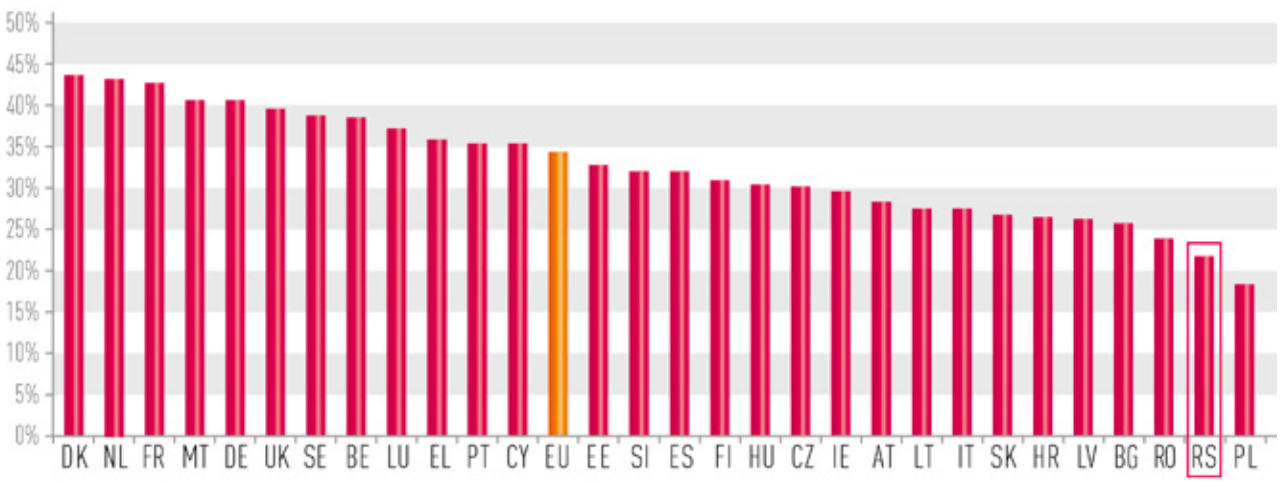
Electronic communications sector revenues

It is estimated that the operators in the European Union generated revenues of approximately 213[4] billion euros in 2018. Revenue breakdown shows a continued decrease trend in the revenues made from voice service both over fixed and mobile networks. The share in the total revenues of voice traffic over fixed and mobile networks was 43% in 2018, compared with 48% in 2015. The revenues made from data transmission on mobile network continue to grow, accounting for 28% of the total revenues in 2018.

Fixed broadband

The number of fixed broadband users in the EU is constantly growing. The total number of fixed broadband users in July 2018 grew by 3.4% with respect to July 2017, amounting to 177 million users, which is a 34.7 penetration rate. In 2018, the highest fixed broadband penetration rate was seen in Denmark, the Netherlands, France, Malta and Germany, with more than 40 subscribers per 100 inhabitants. In Serbia, at the end of 2018, there were 22 fixed broadband subscribers per 100 inhabitants.

Figure 2.1. Fixed broadband penetration rate*



*Data for the EU - July 2018, data for Serbia - December 2018

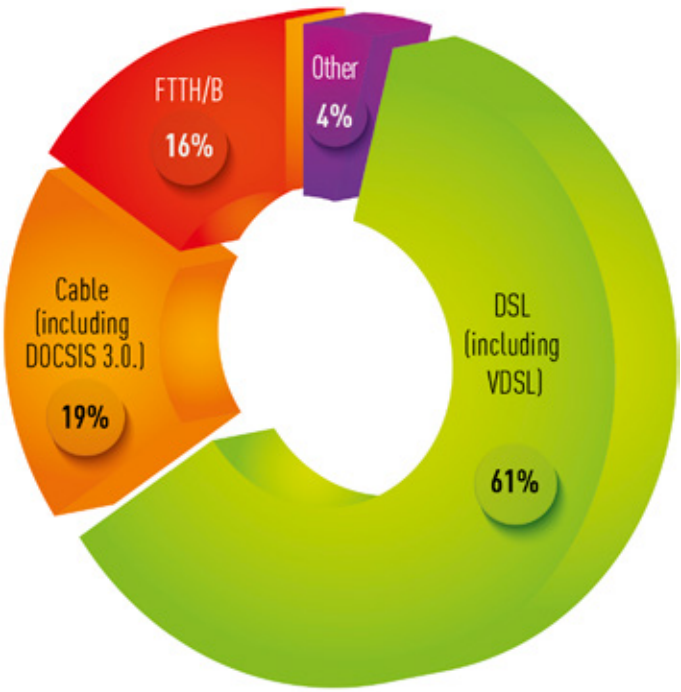
Source for the EU: EC - Communications Committee – COCOM, https://ec.europa.eu/digital-single-market/en/connectivity, as on 5. July 2019

Source for Serbia: **RATEL**

4 EC "Europe's Digital Progress Report 2018 - Connectivity"

DSL has the largest share in fixed broadband structure, with 61% of total fixed broadband subscribers in the EU. Approximately 16% of the total number of subscribers are using FTTH/B and 19% cable access. Cable access is by far more present in the Serbian market, with 44.2% of the total fixed broadband subscribers at the end of 2018.

Figure 2.2. Fixed broadband user distribution in terms of technologies in the EU*



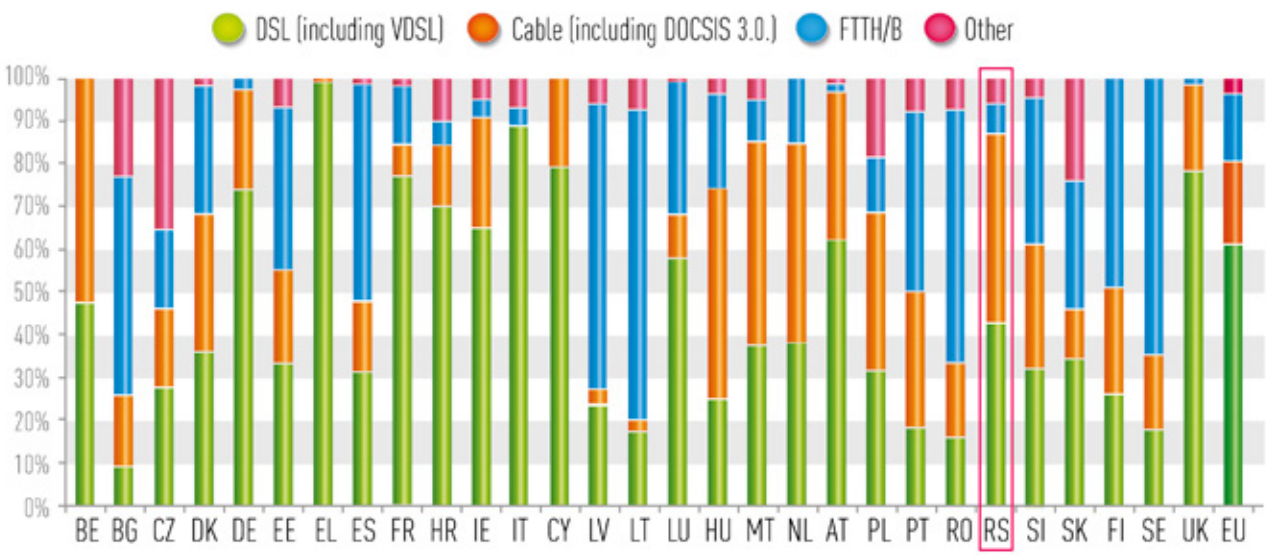
* Data for the EU - July 2018

Source: EC - Communications Committee – COCOM, https://ec.europa.eu/digital-single-market/en/connectivity, as on 5 July 2019

Figure 2.3 shows the usage of different broadband technologies in the EU-countries and the Republic of Serbia.

FTTH/B has the largest share in Lithuania, Latvia, Sweden and Romania, whereas cable access is the most used technology in Belgium, Hungary, Malta and the Netherlands. In Serbia in 2018, cable access was dominantly used, outnumbering for the first time the users of DSL technology, whereas FTTH/B was used by 7% of the total fixed broadband subscribers.

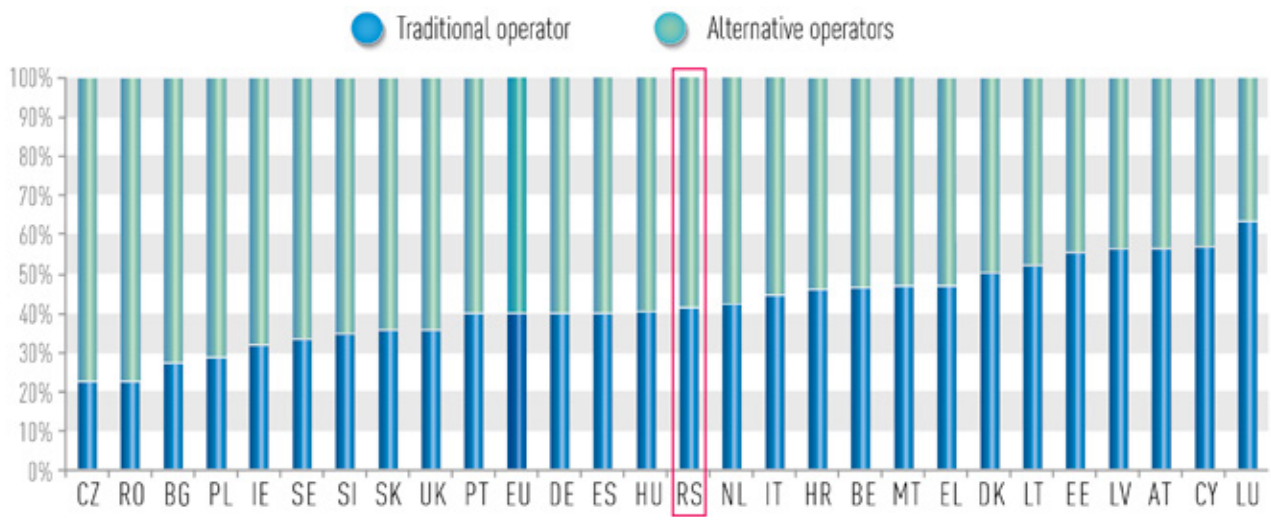
Figure 2.3. Fixed broadband user distribution in terms of technologies *



* Data for the EU - July 2018, data for Serbia - December 2018
Source for the EU: EC - Communications Committee – COCOM, https://ec.europa.eu/digital-single-market/en/connectivity, as on 5 July 2019
Source for Serbia: **RATEL**

The market share of the incumbent operators in the total number of fixed broadband subscribers remains high in the EU, the average being approximately 40%. In Luxemburg, Austria, Latvia, Estonia, Lithuania, Denmark and Cyprus, the incumbent has over 50% share in the total number of fixed broadband subscribers, whereas the share of the incumbent is below 30% in the Czech Republic, Romania, Bulgaria and Poland. The share of the incumbent in the total number of fixed broadband subscribers in Serbia is slightly above the EU average, with 41.3% (Figure 2.4).

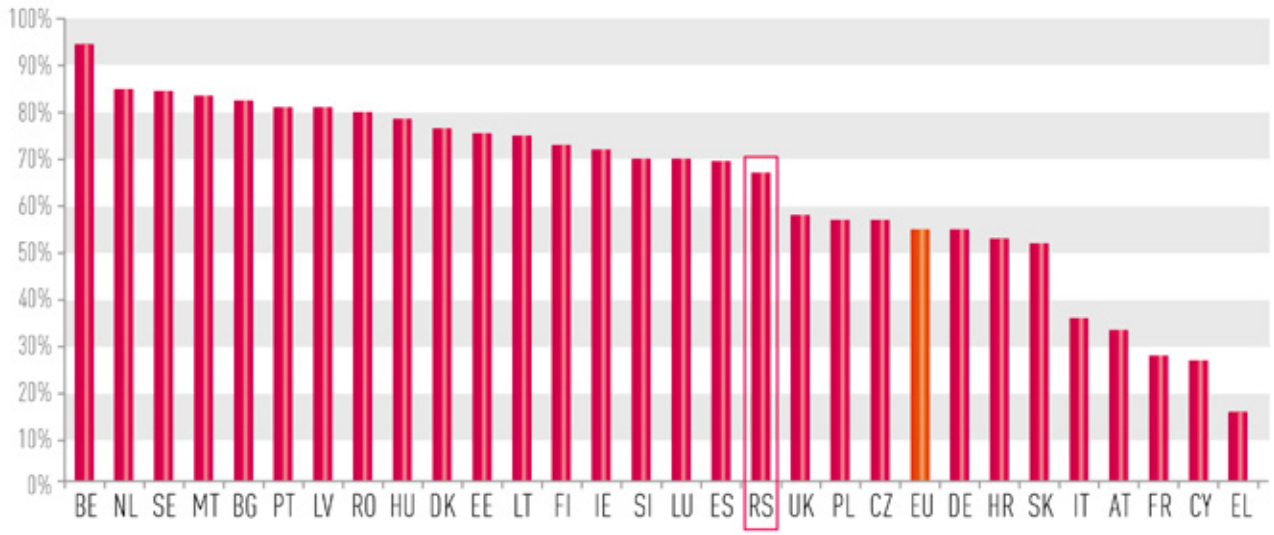
Figure 2.4. The shares of the incumbent and alternative operators in the total number of fixed broadband subscribers*



* Data for the EU - July 2018, data for Serbia - December 2018
Source for the EU: EC - Communications Committee – COCOM, https://ec.europa.eu/digital-single-market/en/connectivity, as on 5 July 2019
Source for Serbia: **RATEL**

Nearly 55% of the total number of fixed broadband subscribers in the EU are using NGA networks, comprising FTTH, FTTB, VDSL and Cable DOCSIS 3.0. Countries with the largest share of NGA are Belgium (95.1%) and the Netherlands (85.6%), whereas the lowest NGA share is seen in Cyprus and Greece, with 26% and 15%, respectively. Serbia is above the EU average with 66.9% NGA share, due to large presence of cable DOCSIS 3.0. access used by 44.2% of the total number of fixed broadband subscribers.

Figure 2.5. NGA share in the total number of fixed broadband subscribers *



* Data for the EU - July 2018, data for Serbia - December 2018

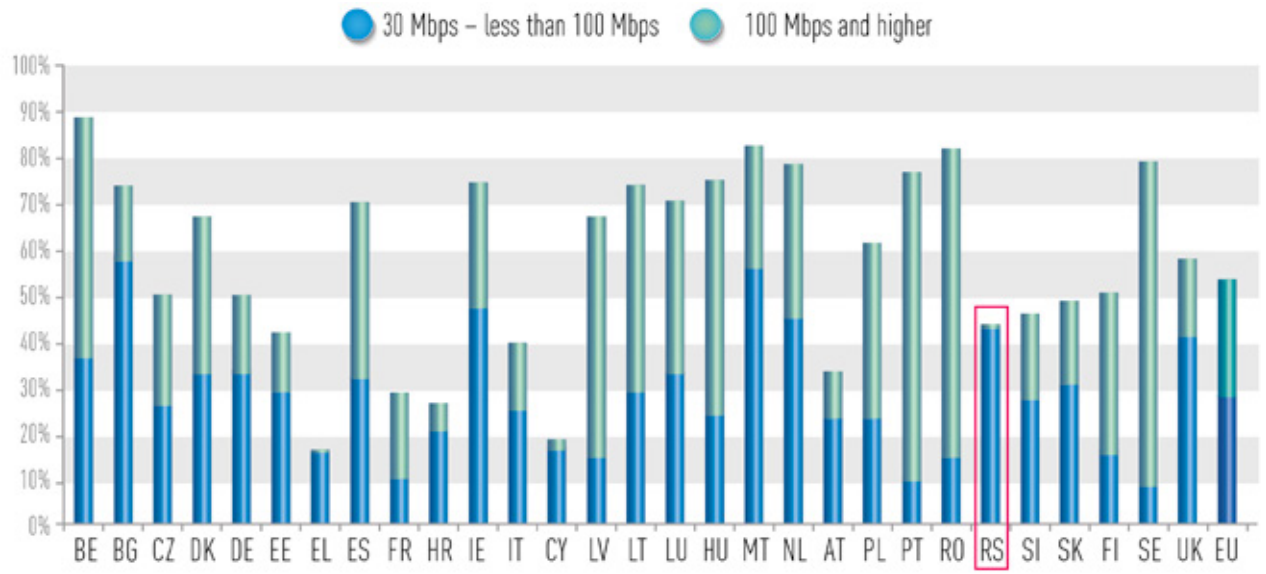
Source for the EU: EC - Communications Committee – COCOM, https://ec.europa.eu/digital-single-market/en/connectivity, as on 5 July 2019

Source for Serbia: **RATEL**

In the EU, 27% of the subscribers used 30 Mbps Internet packages or less than 100 Mbps, whereas 26% of the subscribers had access to connections of 100 Mbps and higher. The leading countries in terms of ultra high-speed Internet subscribers (100 Mb/s and higher) are Sweden, Romania and Poland, where more than 67% of users have access to this speed, whereas Croatia, Greece and Cyprus have the least users with connections at these speeds.

In Serbia, 42% of the subscribers used 30 Mbps Internet packages or less than 100 Mbps, whereas only 1.5% of the subscribers had access to connections of 100 Mbps and higher.

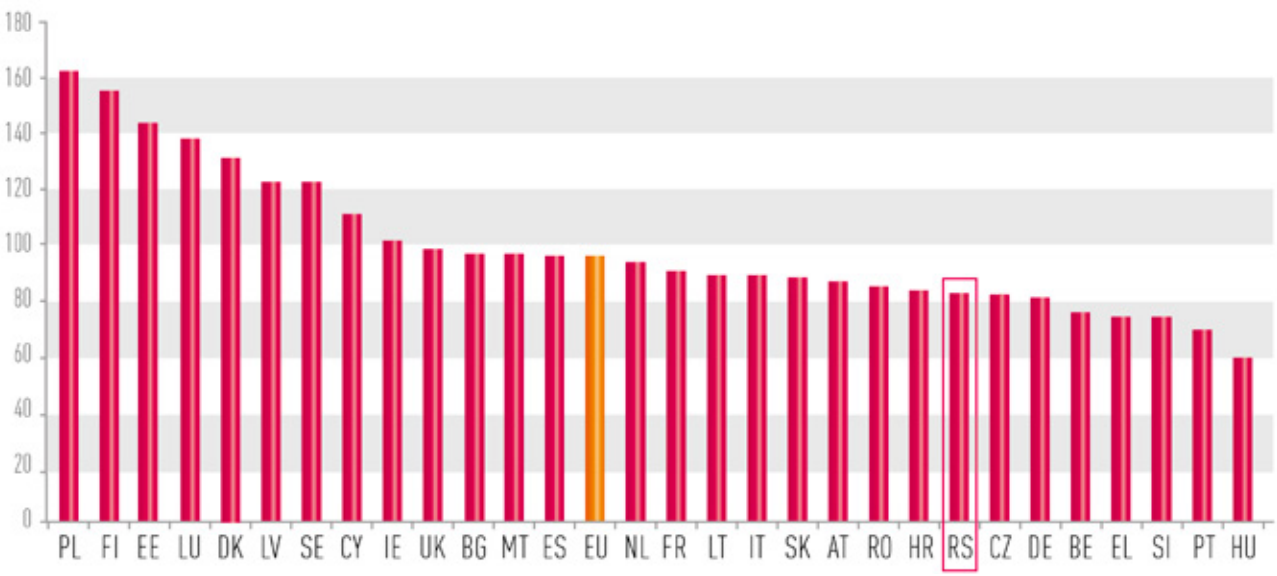
Figure 2.6. Fixed broadband users share, according to connection speed*



* Data for the EU - July 2018, data for Serbia - December 2018
Source for the EU: EC - Communications Committee – COCOM, https://ec.europa.eu/digital-single-market/en/connectivity, as on 5 July 2019
Source for Serbia: **RATEL**

In addition to fixed broadband, mobile broadband is largely used both in the EU and in the Republic of Serbia. Mobile broadband penetration rate in Poland, Finland, Estonia, Luxemburg, Denmark, Sweden, Cyprus and Ireland is over 100%, whereas Hungary has the lowest penetration rate of 59.2%. At the end of 2018, number of active mobile broadband users per 100 inhabitants was 83, which is below the EU average of 96%.

Figure 2.7. Mobile broadband penetration rate*



* Data for the EU - July 2018, data for Serbia - December 2018
Source for the EU: EC - Communications Committee – COCOM, https://ec.europa.eu/digital-single-market/en/connectivity, as on 5 July 2019
Source for Serbia**: RATEL**

03 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. DESI provides an insight in country's general performance and offers a simple way to identify areas with room for improvement. DESI consists of 5 components: Connectivity, Human capital, Use of Internet, Integration of digital technology and Digital public services (Figure 3.1).

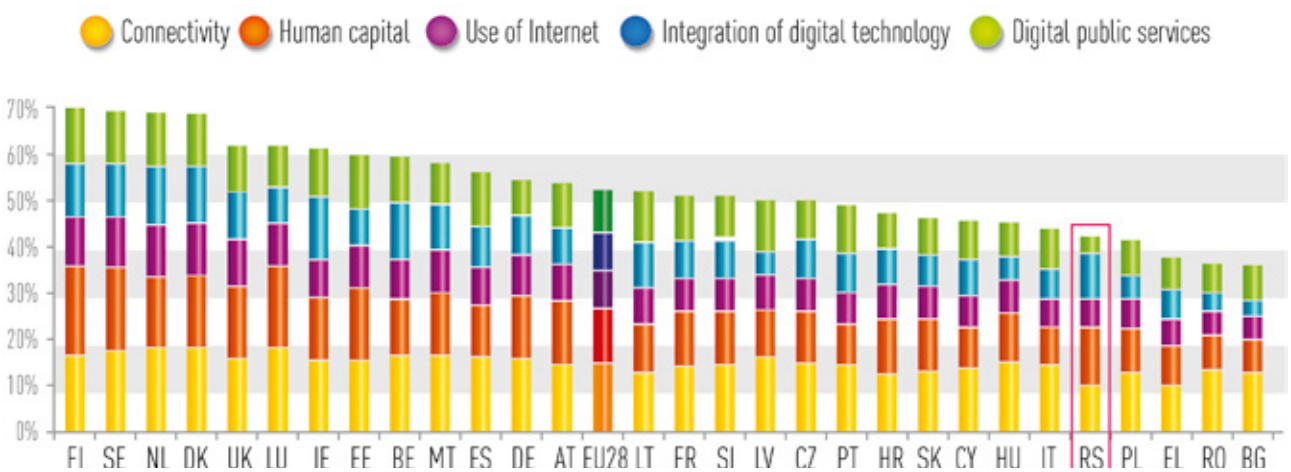
Figure 3.1. DESI components

DESI has been calculated for EU member states since 2014 and for Serbia since 2017, thus enabling Serbia to be positioned at the European digital performance map. Index for Serbia has been calculated according to the EC methodology of May 2018.

The changes in the methodology in respect to the previous year mainly concern the Connectivity component, which now includes the data on fast (over 30 Mbps) and ultra-fast (over 100 Mbps) broadband Internet, in terms of coverage and number of users. Moreover, a different calculation for price index is applied. There are also some changes in the Digital public services component, which now includes the indicator for measuring the level of development of e-Health.

DESI by dimensions for all EU countries and Serbia is given in Figure 3.2.

Figure 3.2. 2018 DESI scores of the EU countries and Serbia, by dimensions



Source for EU countries https://digital-agenda-data.eu/charts/desi-composite, as on 18.8.2019

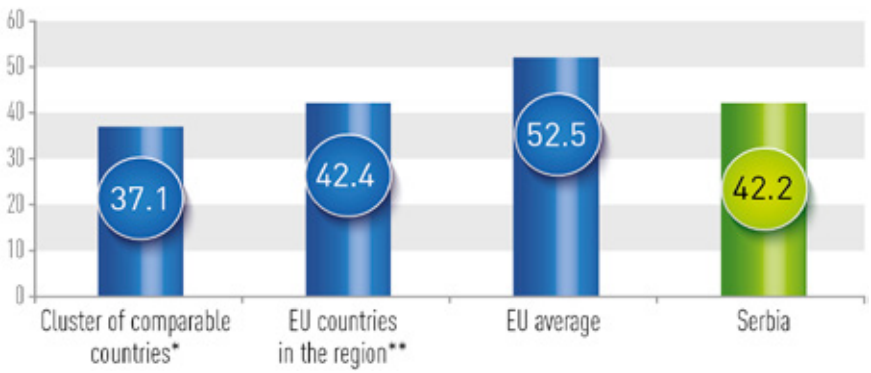
Source for Serbia**: RATEL**

* Values for Serbia and the EU countries re not fully comparable, since the overview of the EU countries is based on the new methodology published in June 2019, which includes more indicators, the additional ones mainly concerning Use of Internet and Human capital.

Finland, Sweden and the Netherlands were the most advanced digital economies in the EU in 2018, whereas Romania, Bulgaria and Greece are lagging behind.

Serbia is ranked 25th on the list of the European countries, which places it in the cluster of the countries with a relatively performances, such as: Romania, Bulgaria, Greece, Italy, Poland, Hungary, Cyprus and Slovak Republic. Serbia is close to the average of the EU countries in the region, as shown in Figure 3.3.

Figure 3.3. Comparative DESI overview

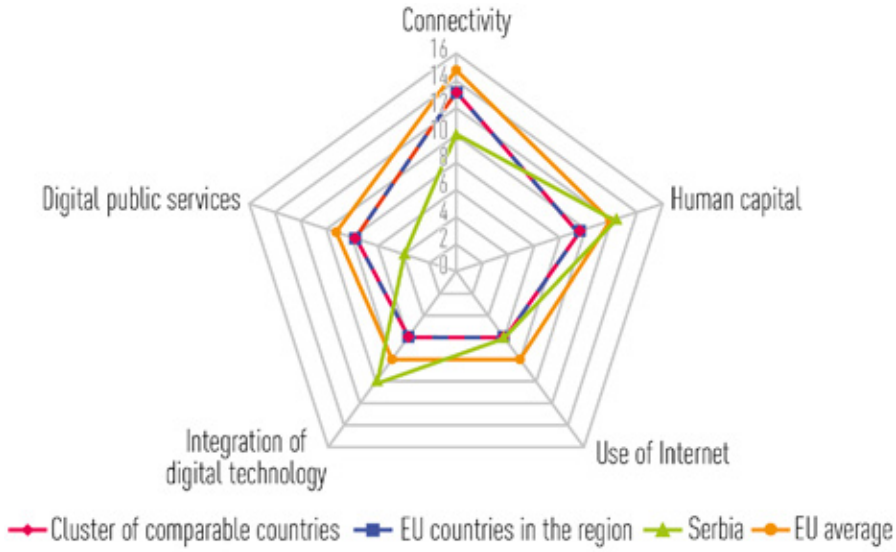


* Cluster of comparable includes countries at a similar level of digital development: Romania, Greece, Bulgaria, Italy, Poland, Hungary, Cyprus and Slovak Republic.

** EU countries in the region: Slovenia, Hungary, Romania, Bulgaria, Croatia and Greece.

Average DESI values by dimensions are given in Figure 3.4.

Figure 3.4. Average DESI values by dimensions



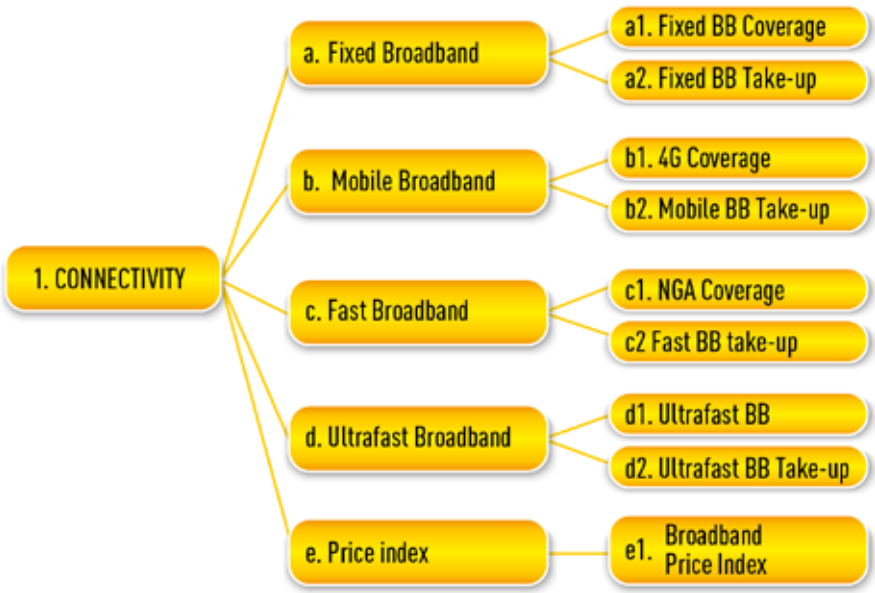
Each of the five dimensions includes several sub-dimensions and the values of their indictors are calculation components of DESI. The index is a sum weighted values for five main dimensions. Sub-dimensions also have weighted values, whereas single indicators within sub-dimensions have equal value, i.e. the same weight. Weights attributed to the DESI dimensions and sub-dimensions are given below:

DESI Dimensions / Sub-dimensions	Ponder
1 Connectivity	**25%**
1a.Fixed Broadband	20%
1b.Mobile Broadband	30%
1c. Fast Broadband	20%
1d. Ultrafast Broadband	20%
1e. Broadband price index	10%
2 Human Capital	**25%**
2a. Internet User Skills	50%
2b. Advanced Skills and Development	50%
3 Use of Internet Services	**15%**
3a. Internet use	33%
3b. Activities online	33%
3c. Transactions	33%
4 Integration of Digital Technology	**20%**
4a. Business digitisation	60%
4b. e-Commerce	40%
5 Digital Public Services	**15%**
5a. e-Government	50%
5b. e-Health	50%

Connectivity Dimension

Connectivity is a necessary infrastructure of the digital economy and society, hence this dimension provides information on the types and quality of the Internet access and availability. The sub-dimensions and their indicators are given in Figure 3.5.

Figure 3.5. Connectivity: Sub-dimensions and their indicators



The leading countries in this area are Denmark, Luxemburg and the Netherlands, whereas the countries with the lowest score in the EU are Greece, Croatia and Lithuania. The values for Connectivity dimension for the EU countries and Serbia are given in Figure 3.6, while the comparison between Serbia and the cluster of comparable countries and countries in the region is given in Figure 3.7.

Figure 3.6. 2018 Values for Connectivity dimension for the EU countries and Serbia

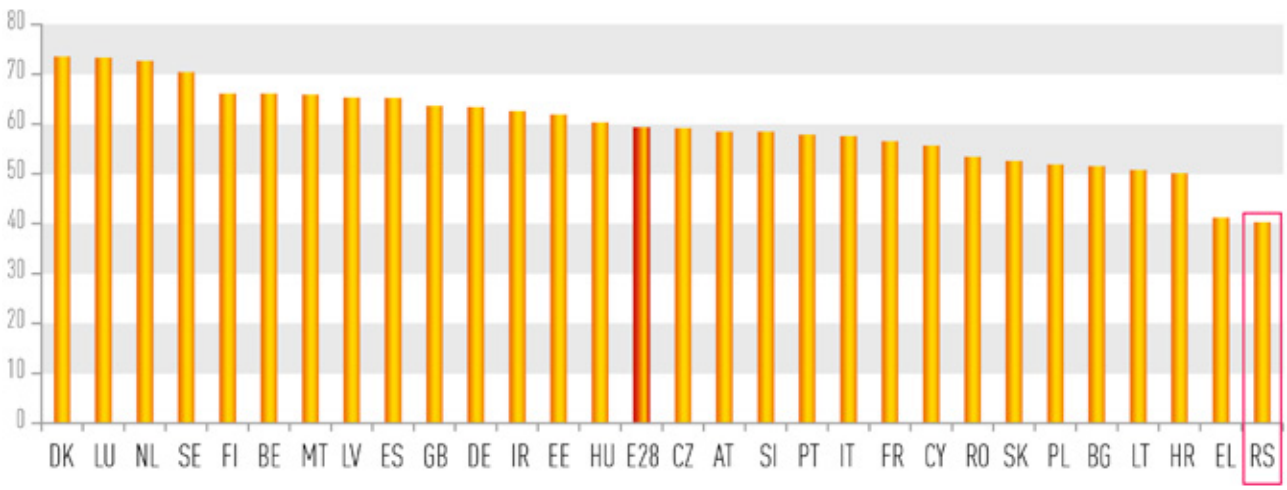
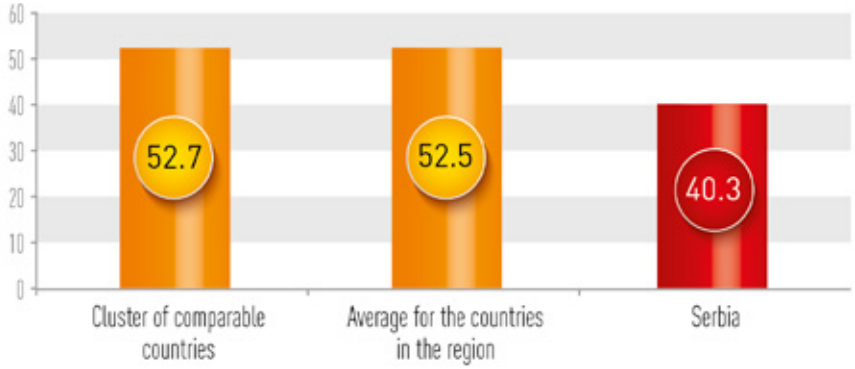


Figure 3.7. Compared overview of values for Connectivity dimension



Despite the progress made in respect to the last years score, Serbia remains at the bottom of the list of the European countries. This is mainly due to low rate of broadband coverage. The values for each indicator of the Connectivity dimension for Serbia are given below.

Indicators - Coverage	Serbia	Min*	Max*
1a1 - Fixed Broadband Coverage - household penetration rate	71.6%	80%	100%
1a2 - Fixed Broadband Take-up - household penetration rate	62.4%	50%	100%
1b1 – 4G Coverage - % of populated areas coverage by 4G	96.4%	0%	100%
1b2 – Mobile Broadband Take-up - Number of mobile data subscriptions per 100 people	83.0%	25	150
1c1 - Fast Broadband coverage - at least 30 Mbps	67.8%	0%	100%
1c2 - Fast Broadband take-up - % of households subscribing to broadband of at least 30 Mbps	27.2%	0%	100%
1d1 - Fixed Broadband Coverage - at least 100 Mbps	67.4%	0%	100%
1d2 - Fixed Broadband Take-up - % of households subscribing to broadband of at least 100 Mbps	0.9%	0%	100%
1e1 - The Fixed Broadband Price	57.0%	0%	100%

* Minimum and maximum value is predefined and used to normalize different units of indictors, converting them into values on scale from 0 to 1.

Source: **RATEL**

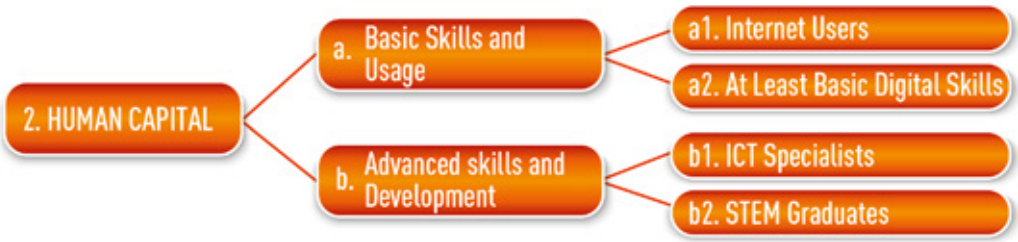
Human Capital Dimension

The Human Capital dimension measures digital skills, basic and advanced, needed to take active part in the digital society and to use digital products and services.

Hence, digital skills together with the Internet access, analysed under the previous dimension, are considered to be necessary infrastructure for the digital economy and society.

Sub-dimensions and indicators under Human Capital dimension are given in Figure 3.8.

Figure 3.8. Human Capital – sub-dimensions and indicators



The leading countries in this dimension are Finland, Sweden and Luxemburg, whereas the countries with the lowest score in the EU are Bulgaria, Romania and Italy. The values for Human Capital dimension in the EU and Serbia are given in Figure 3.9, whereas the comparison with the comparable countries cluster and countries in the region is shown in Figure 3.10. .

Figure 3.9. The values for Human Capital dimension in the EU and Serbia in 2018

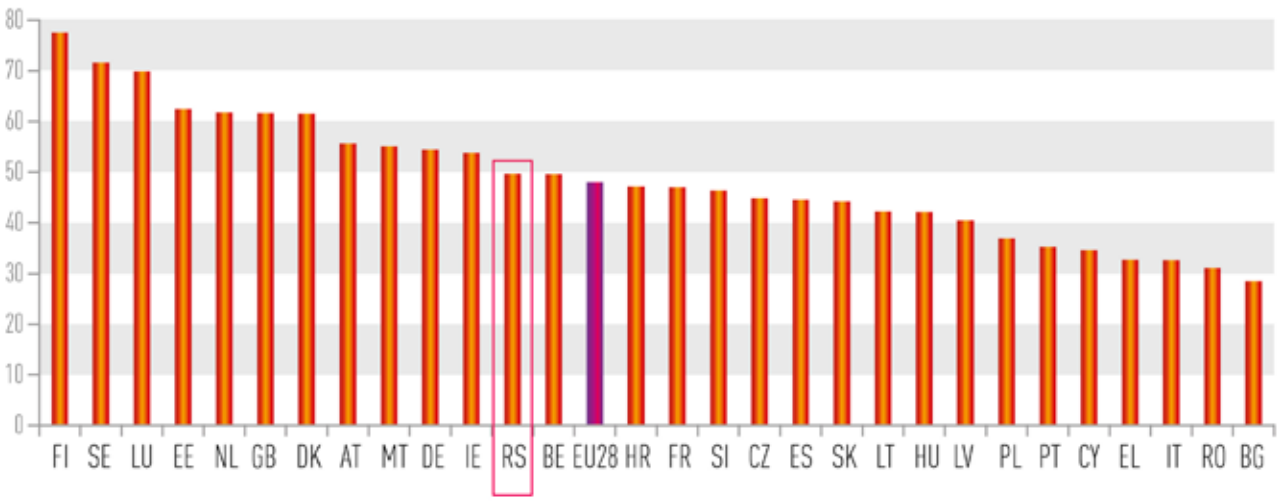
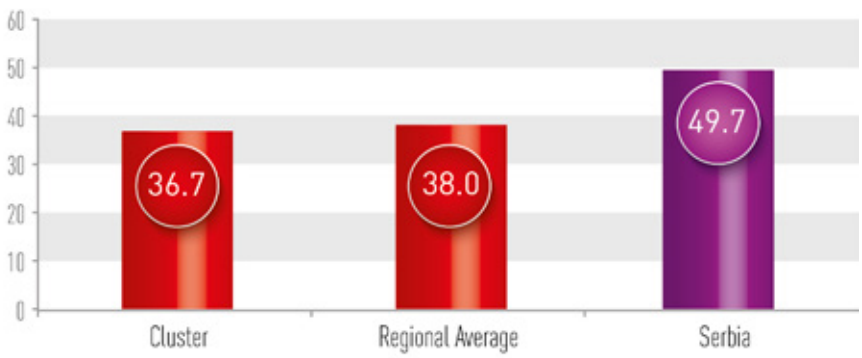


Figure 3.10. Overview of compared values for the Human Capital dimension



Serbia is ranked above the regional average and the value calculated for the cluster of comparable countries and close to the 2018 EU average. Since the results accomplished by Serbia in this dimension are slightly better in respects to the previous year, the significant jump on the scale can be explained by modifications made to the methodology in 2019 which was used to calculate the values for all countries. The values of single indicators under Human Capital dimension for Serbia are given below.

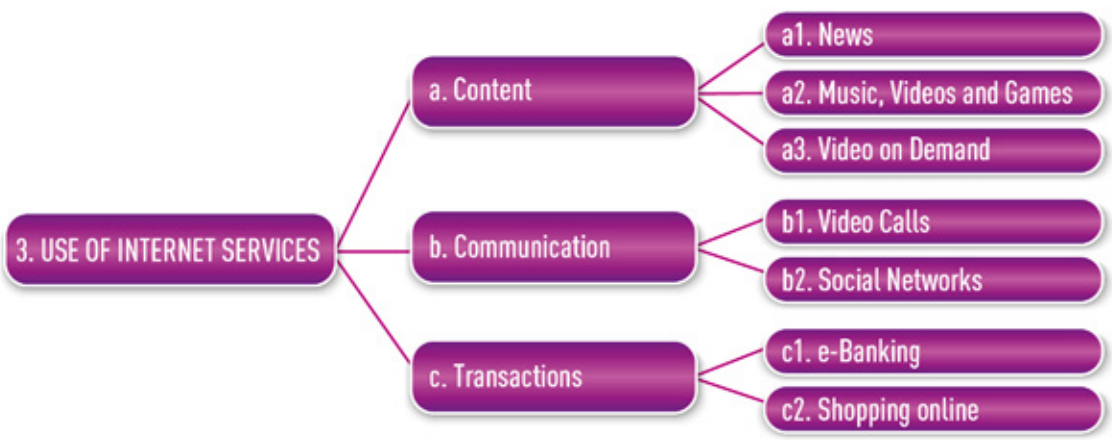
Human Capital – indicators	Serbia	Min	Max
2a1 Internet Users	72.3%	40%	100%
2a2 At Least Basic Digital Skills	66.1%	0%	100%
2b1 ICT Specialists	2.4%	0%	7%
2b2 STEM (Science, Technology, Maths) Graduates	17.8	0	40

Source: **RATEL , Statistics Office**

Use of Internet Services Dimension

This dimension measures the usage of online content (music, films, video games, social networks) modern communications (video calls) and e-commerce. These activities are key drivers of broadband networks and services development. Sub-dimensions and indicators under Use of Internet Services dimension are given in Figure 3.11.

Figure 3.11. Use of Internet Services: Sub-dimensions and indicators



The leading countries in this dimension are Denmark, the Netherlands and Sweden, whereas the countries with the lowest score in the EU are Romania, Bulgaria, and Greece. The values for Use of Internet Services dimension in the EU and Serbia are given in Figure 3.12, whereas the comparison with the comparable countries cluster and countries in the region is shown in Figure 3.13.

Figure 3.12. The values for the Use of Internet Services dimension in the EU and Serbia for 2018

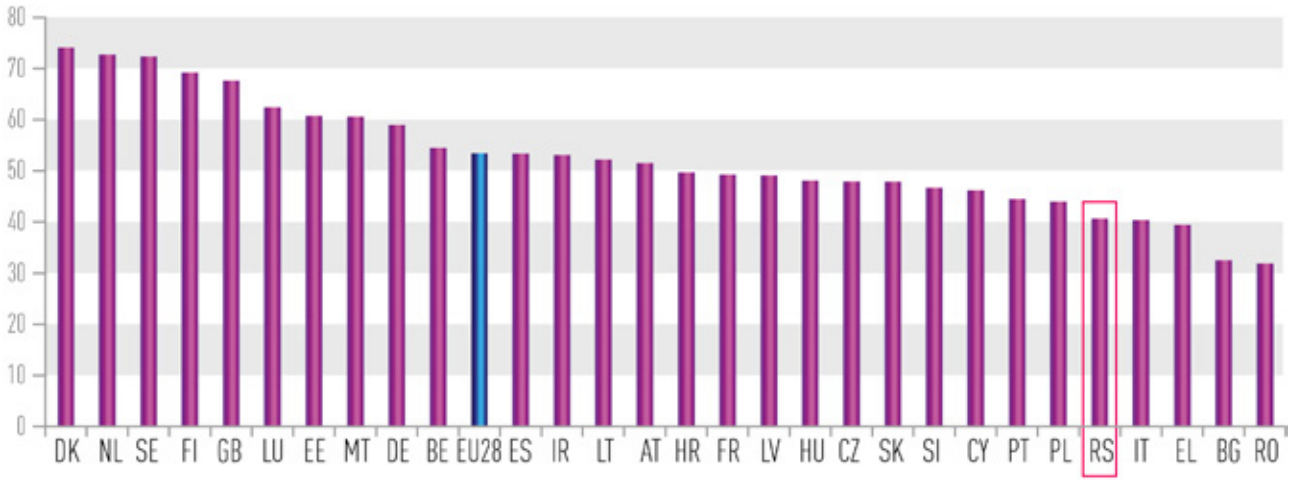
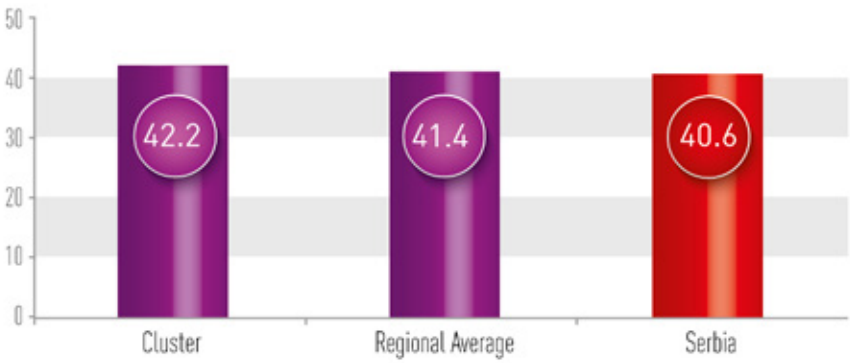


Figure 3.13. Overview of compared values for the Use of Internet Services dimension



Even though Serbia achieved better results in respect to the previous year, it remained among the lowest ranked countries in this dimension. This is mainly due to low values for online transactions indicator – e-banking and online shopping, which indicates a high level of distrust in the safety of online payments in Serbia. The values of single indicators for Serbia for 2018 are given below.

Indicators- the use of internet*	Serbia	Min	Max
3a1 reading online news sites, newspapers or news magazines	78.4%	33%	100%
3a2 playing or downloading games, images, films or music	72.7%	50%	100%
3a3 Video on Demand	22.9%	0%	60%
3b1 Video Calls (e.g. Skype)	67.4%	20%	100%
3b2 Social Networks	70.3%	40%	100%
3c1 e-Banking	20.4%	0%	100%
3c2 Shopping online	16.3%	0%	100%

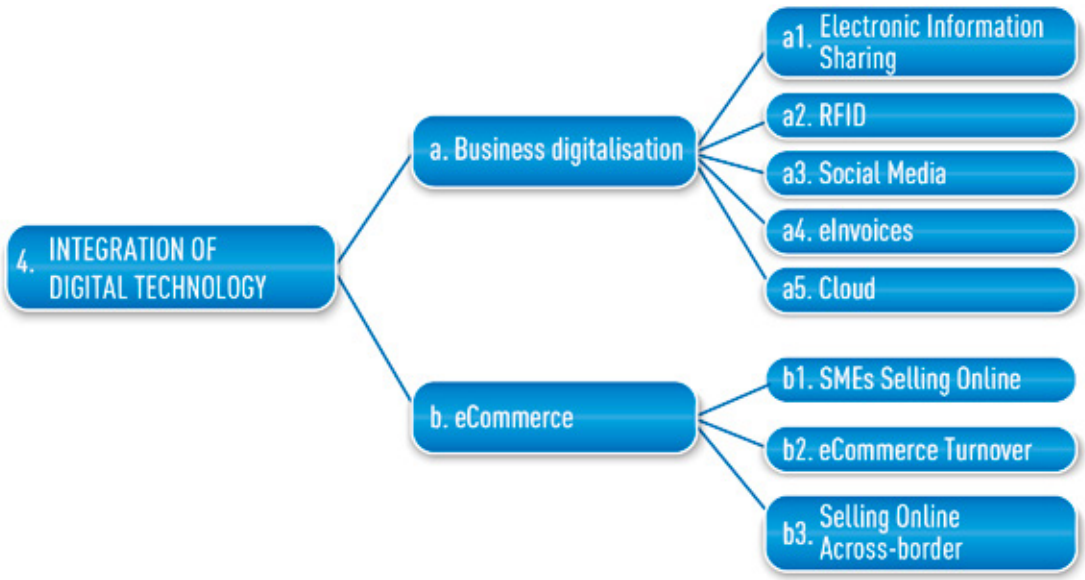
* Values of the indicator refer to the percentage of the Internet users who have used the Internet in the past three months, with the exception of shopping online indicator which refers to online purchases made in the past 12 months.

Source: **Statistics Office**

Integration of Digital Technology Dimension

The Integration of Digital Technology dimension reflects the fact that in the digitisation is one of the main drivers of economic growth. By adopting digital technologies (cloud, Big Data, IoT, etc.) businesses can enhance efficiency, reduce costs and better engage customers and business partners, therefore it is crucial for competitiveness. Sub-dimensions and indicators under the Integration of Digital Technology Dimension are given in Figure 3.14.

Figure 3.14. Integration of Digital Technology - sub-dimensions and indicators



The leading countries in this dimension are Ireland, the Netherlands and Belgium, whereas the countries with the lowest score in the EU are Bulgaria, Romania and Poland. The values for Integration of Digital Technology dimension in the EU and Serbia are given in Figure 3.15, whereas the comparison with the comparable countries cluster and countries in the region is shown in Figure 3.16.

Figure 3.15. The values for the Integration of Digital Technology dimension in the EU and Serbia for 2018

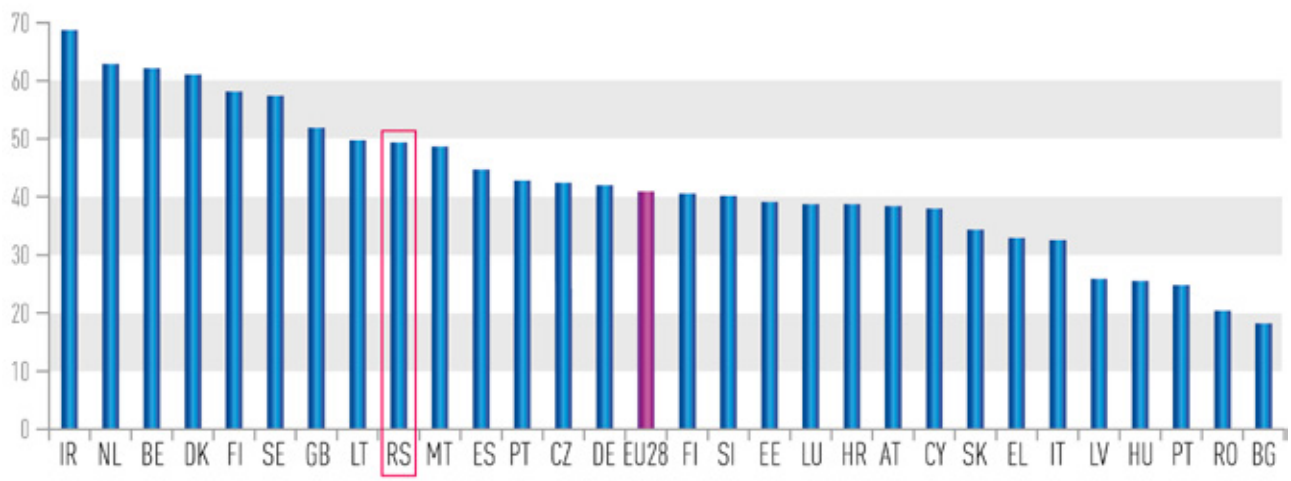
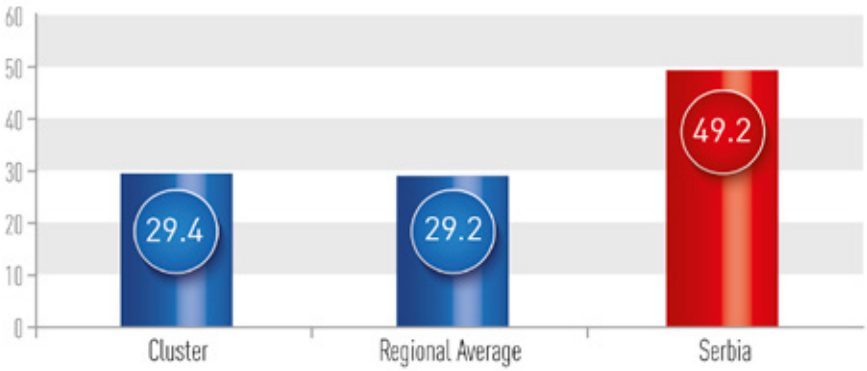


Figure 3.16. Overview of compared values for the Integration of Digital Technology dimension



Serbia's score in Integration of Digital Technology dimension is above average, partly due to better performance in 2018 and partly as a consequence of the latest methodology applied for the EU countries which now also includes Big data indicator. The values of single indicators under Digital Technology dimension for Serbia are given below.

Digital Technology dimension – indicators	Serbia	Min	Max
4a1 Electronic Information Sharing (businesses with ERP software)	36.0%	0%	60%
4a2 Using RFID for after sales identification or as part of the production and service delivery	8.5%	0%	15%
4a3 Using social media	18.5%	0%	50%
4a4 Sending e-Invoices which allow automatic processing	18.4%	0%	50%
4a5 Cloud	15.5%	0%	50%
4b1 SMEs selling online (at least 1% of turnover)	25.9%	0%	33%
4b2 e-Commerce turnover	19.9%	0%	33%
4b3 SMEs selling online cross-border	8.2%	0%	25%

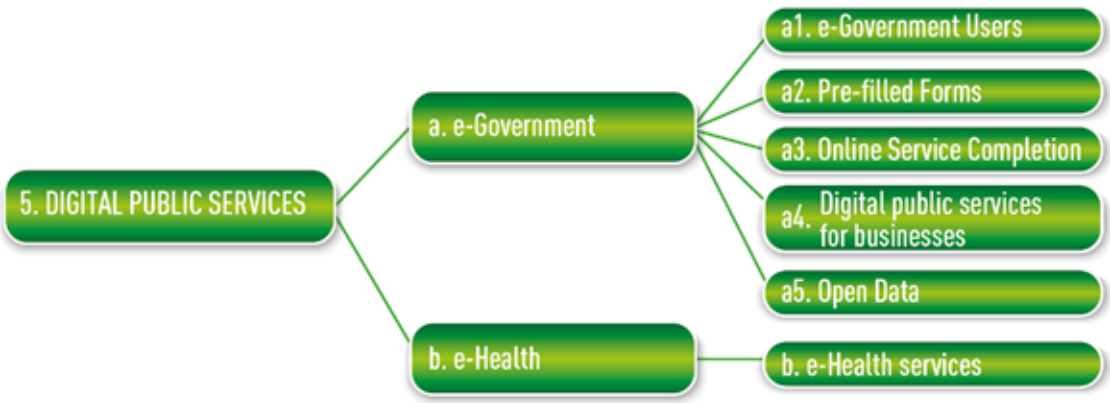
* Individual indicators refer to the percentage of businesses applying different forms of business digitisation (Business digitisation sub-dimension) or the percentage of SMEs selling online (e-Commerce sub-dimension).

Source: **Statistics Office**

Digital Public Services Dimension

Digital Public Services dimension measures digital technologies which serve to enhance the interaction of citizens and businesses with public administration, focusing on e-Government, as shown in Figure 3.17. Pre-filled forms, online service completion and open data are composite indicators, consisting of several sub-indicators.

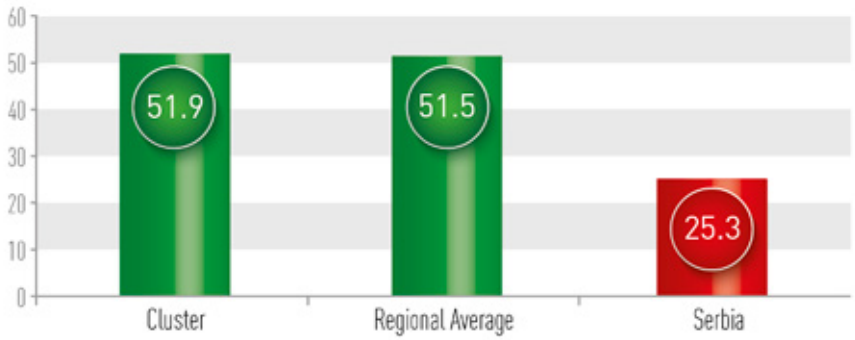
Figure 3.17. Digital Public Services dimension



The leading countries in this dimension are Finland, Estonia and the Netherlands, whereas the countries with the lowest score in the EU are Romania, Greece and Hungary. The values for Digital Public Services dimension in the EU and Serbia are given in Figure 3.18, whereas the comparison with the comparable countries cluster and countries in the region is shown in Figure 3.19.

Figure 3.18. The values for the Digital Public Services dimension in the EU and Serbia for 2018

Figure 3.19. Overview of compared values for the Digital Public Services dimension



Compared with the EU countries, Serbia is the least successful country in this dimension. This is due to low values of e-Government-related indicators, indicating the level of sophistication of public administration services available online.

Serbia is below EU average for all indicators in this dimension, except for the Open Data indicator where is scored at the level of EU average. Open Data indicator is a composite indicator, indicating the degree to which a country applies open data policy, and also political, social and economic impact of open data, along with the characteristics of the national data portals (functionality, availability and usage). The value of this indicator varies significantly from one EU country to another and Serbia is getting closer to the EU average. The values of single indicators under Digital Public Services dimension for Serbia are given below.

Digital Public Services dimension – indicators	Serbia	Min	Max
5a1 e-Government Users	15.9%	0%	80%
5a2 Pre-filled Forms	31.6	0	100
5a3 Online Service Completion	63.3	40	100
5a4 Digital public services for businesses	64.1	20	100
5a5 Open Data	66.6%	0%	100%
5b1 e-Health services	8.9%	0%	100%

Source: **RATEL, Statistics Office**

04 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 2018 are given in Table 4.1 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. ITU periodically includes additional indicators in the existing list, which are an integral part of the table below.

Table 4.1. ICT development indicators

	Indicator	Definition	2018
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.	74.3%
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 stand-alone device, but it may also be integrated with another device, such as a computer or a mobile telephone.	98.7%
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. It may not be the same as an access line or a subscription.	79.5%
	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.	93.0%
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.	72.1%

	Indicator	Definition	2018
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.	75.8%
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.	72.9%
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.	73.4%
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.*	n/a
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		76.8%
	Seeking health information (on injury, disease, nutrition etc.).	Includes information on injury, disease, nutrition and improving health generally.	55.0%
	Getting information from general government	*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.*	35.5%
	Interacting with general government organizations	Includes downloading/requesting forms, completing/lodging forms on line, making online payments and purchasing from government organizations, etc. Does not include receiving information from government organizations.	21.7%
	Sending or receiving e-mail		53.3%
	Telephoning over the Internet/VoIP	Using Skype, iTalk, etc.; includes video calls via webcam.	67.4%
	Participating in social networks	Creating user profile, posting messages or other contributions to Facebook, Twitter etc.).	70.3%

	Indicator	Definition	2018
	Access to chat sites, blogs, newsgroups or online discussions		30.9%
	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).	22.2%
HH9	Internet banking	UIncludes 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.	20.48%
	Doing a formal online course (in any subject)		12.0%
	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)	21.3%
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.	92.6%
	Proportion of households with Internet, by type of service		
	Fixed (wired) narrowband network	*Fixed (wired)* narrowband network includes analogue modem (dial-up via standard telephone line), ISDN (Integrated Services Digital Network), DSL (Digital Subscriber Line) at advertised download speeds below 256 kbit/s, and other forms of access with an advertised download speed of less than 256 kbit/s.	0.4%
HH11	*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, FTTH/FTTB and other broadband technologies.	67.9%
	Mobile broadband via a handset	Mobile broadband network (at least 3G, e.g. UMTS) via a handset.	67.5%
	Mobile broadband via a card or USB modem	Mobile broadband network (at least 3G, e.g. UMTS) via a card (e.g. integrated SIM card in a computer) or USB modem.	8.1%
	Proportion of households with multichannel television, by type	*This is the proportion of households with multichannel television (TV) and by type of multichannel service.*	
HH12	*At least once a day*	Once a working day for respondents who only (or most frequently) use the Internet from work or from school	92.2 %
	At least once a week but not every day		6.3 %
	Less than once a week		1.5 %

	Indicator	Definition	2018
	Proportion of households with multichannel television, by type	*This is the proportion of households with multichannel television (TV) and by type of multichannel service.*	
HH13	Cable TV (CATV)		52.4%
	Direct-to-home (DTH) satellite services		6.0%
	IPTV		20.3%
	Digital terrestrial TV (DTT)		29.2%
HH14	Barriers to household Internet access are:		
	Do not need the Internet (not useful, not interesting, lack of local content)		20.7%
	Have access to the Internet elsewhere		2.6%
	Lack of confidence, knowledge or skills to use the Internet		5.6%
	Cost of the equipment is too high		5.0 %
	Cost of the service is too high		4.3%
	Privacy or security concerns		0.1%
	Internet service is not available in the area		1.0%
HH15	Individuals with ICT skills, by type of skills		
	Copying or moving a file or folder		74.9%
	Using Word text processing software		54.8%
	Installing software applications		41.7%
	Installing and configuring software		37.4%
	Spreadsheet programme usage		33.3%
	Creating electronic presentations with presentation software (including text, images, sound, video or charts)		34.5%
	Transferring files between a computer and other devices		53.6%
	Writing a computer program using a specialized programming language		5,7%

	Indicator	Definition	2018
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, photographic and information processing equipment, etc.)	5.6%
HH17	Proportion of individuals using the Internet, by type of portable device and network used to access the Internet		
	Mobile phone via cellular network		47.3%
	Mobile phone via other wireless networks (e.g. WiFi)		52.8%
	Tablet – via cellular network, USB key/dongle or integrated SIM card		3.7%
	Tablet – via other wireless networks		14.2%
	Portable computer (laptop, notebook, netbook) via mobile cellular network, using USB key/dongle or integrated data SIM card or mobile cellular telephone as modem		7.7%
	Portable computer (laptop, notebook, netbook) via other wireless networks (e.g. WiFi)		30.6%
	Other portable devices (e.g. portable games consoles, watches, ebook readers etc.)		2.1%
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.	92.6%
HH19	*Proportion of individuals not using the Internet, by type of reason*	*Reasons for not using the Internet.*	
		Do not need the Internet (not useful, not interesting)	18.3%
		Do not know how to use it	5.5%
		Cost of Internet use is too high (service charges, etc.)	5.1%
		Privacy or security concerns	0.1%
		Internet service is not available in the area	1.4%
		Cultural reasons (e.g. exposure to harmful content)	0.1%
		Don't know what Internet is	0.1%
		Not allowed to use the Internet	0.1%
		Lack of local content	0.2%
		Other reasons	0.1%

	Indicator	Definition	2018
HH20	Proportion of individuals who purchased goods or services online, by type of good/service		
	Books/magazines/newspapers		12.2%
	Cloths, sports equipment		55.5%
	Electronic equipment (including cameras)		18.3%
	Games and upgrades		4.6%
	Food		4.4%
	Household goods (furniture, toys...)		22.6%
	Pharmaceutical products		8.0%
	Films, music		3.2%
	Telecom services		2.6%
	Cultural events tickets		5.3%
	Holiday accommodation (hotel...)		6.4%
	Other travel arrangements (travel tickets, rent-a-car...)		6.1%

Source: **The Statistics 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. It is used to monitor the developments in information and communication technology. The main objectives of the IDI are to measure:

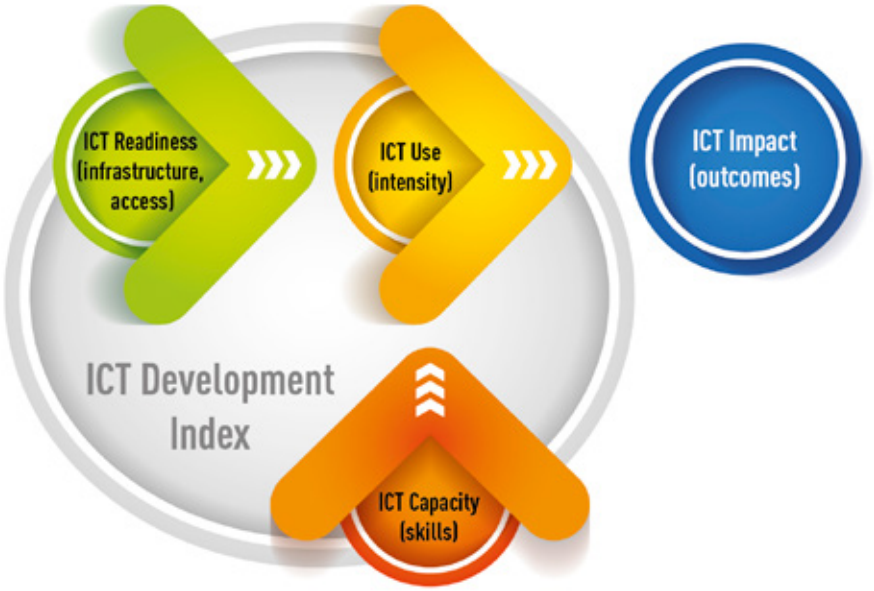
- the level and evolution over time of ICT market;
- progress in ICT development in both developed and developing countries;
- the digital divide, i.e. differences between countries in terms of their levels of ICT development; and
- the development potential of ICTs

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).

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 4.1).

Figure 4.1. IDI structure



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

The list of 11 indicators is given in the table below, along with reference (normalized) values prescribed by the ITU, sub-indices value and IDI Index value for the Republic of Serbia in 2018. 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 4.2. 2018 IDI for the Republic of Serbia

	Indicator	ITU ideal value	Value for Serbia in 2018
ICT Access			
a	Fixed telephone lines per 100 inhabitants	60	36.77
b	Mobile cellular telephone subscriptions per 100 inhabitants	120	120.42
c	International Internet bandwidth per Internet user	2.158.212*	155.524
d	Proportion of households with a computer	100	72.1
e	Proportion of households with Internet access at home	100	72.9
ICT Use			
f	Internet users per 100 inhabitants	100	73.4
g	Fixed broadband Internet subscriptions per 100 inhabitants	60	22.08
h	Mobile broadband subscriptions per 100 inhabitants	100	83.00

	Indicator	ITU ideal value	Value for Serbia in 2018
ICT Skills			
i	ICT Skills	15	14.70*
j	Procenat osoba upisanih u sekundarni nivo obrazovanja	100	89.30*
k	Procenat osoba upisanih u tercijarni nivo obrazovanja	100	54.2*
ICT Access – Normalized values		**Formula**	
z1	Fixed telephone lines per 100 inhabitants	a/60	0.61
z2	Mobile cellular telephone subscriptions per 100 inhabitants	b/120	1.00
z3	International Internet bandwidth per Internet user	log(c)/6.33	0.82
z4	Proportion of households with a computer	d/100	0.72
z5	Proportion of households with Internet access at home	e/100	0.73
ICT Use – Normalized values		**Formula**	
z6	Internet users per 100 inhabitants	f/100	0.73
z7	Fixed broadband Internet subscriptions per 100 inhabitants	g/60	0.37
z8	Mobile broadband subscriptions per 100 inhabitants	h/100	83
ICT Skills – Normalized values		**Formula**	
z9	Adult literacy rate	i/100	0.98
z10	Secondary gross enrolment ratio	j/100	0.89
z11	Tertiary gross enrolment ratio	k/100	0.54
L	**ICT Access – Sub-index**	**y1+y2+y3+y4+y5**	**0.78**
y1	Fixed telephone lines per 100 inhabitants	z1*0.2	0.12
y2	Mobile cellular telephone subscriptions per 100 inhabitants	z2*0.2	0.20
y3	International Internet bandwidth per Internet user	z3*0.2	0.16
y4	Proportion of households with a computer	z4*0.2	0.14
y5	Proportion of households with Internet access at home	z5*0.2	0.15
M	**ICT Use – Sub-index**	**y6+y7+y8**	**0.64**
y6	Internet users per 100 inhabitants	z6*0.33	0.24
y7	Fixed broadband Internet subscriptions per 100 inhabitants	z7*0.33	0.12
y8	Mobile broadband subscriptions per 100 inhabitants	z8*0.33	0.27
N	**ICT Skills – Sub-index**	**y9+y10+y11**	**0.80**
y9	Average years of schooling	z9*0.33	0.32
y10	Secondary gross enrolment ratio	z10*0.33	0.29
y11	Tertiary gross enrolment ratio	z11*0.33	0.18
IDI	**ICT DEVELOPMENT INDEX**	**((L*0.4)+(M*0.4)+(N*0.2))*10**	**7.25**

* the latest available data (2017)

Source: **The Statistics Office of Serbia, RATEL (value for individual indicators); Calculations: RATEL**

The value of IDI Index for the Republic of Serbia in 2018 is 7.25, which shows a slight growth compared with the previous year. The trend of IDI in the last 5 years is shown in Figure 4.3.

Figure 4.2. The trend of IDI for Serbia in the last 5 years

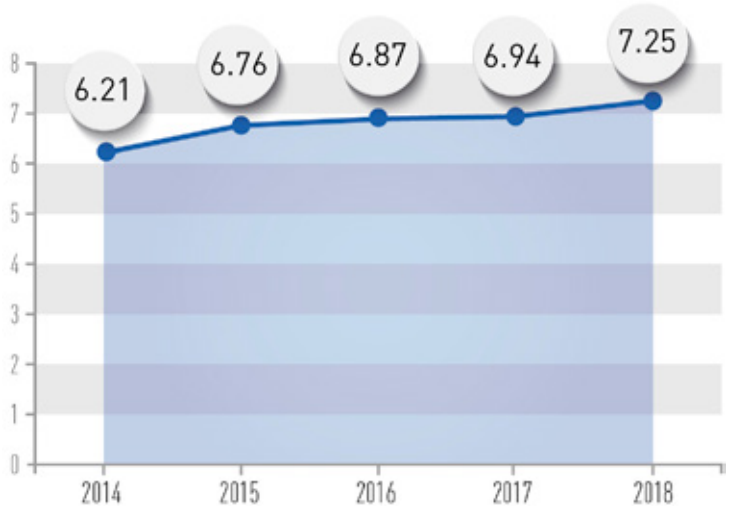
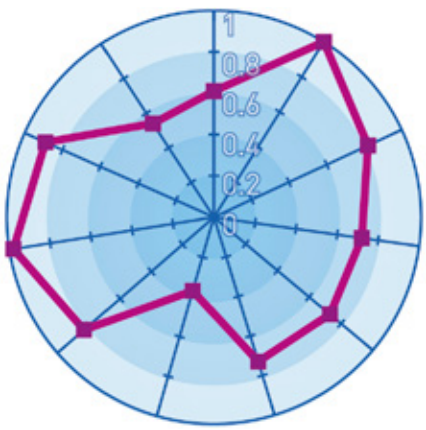


Figure 4.4 illustrates normalized values of 11 indicators with values ranging from 0 to 1. The value of ICT skills indicators (i to k) is satisfactory.

Figure 4.3. Graphical representation of 11 Indicators (normalized values)



Source: **RATEL**

Development index has been revised by modifying or replacing some of the indicators in 2018. According to the modified methodology, this index will include 14 in stead of 11 indicators in the future, and the calculation for Serbia will be made once the reference values are available.

05 PUBLIC FIXED TELECOMMUNICATIONS NETWORKS AND SERVICES

At the end of 2018, there were 38 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 provision, 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 on17 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.

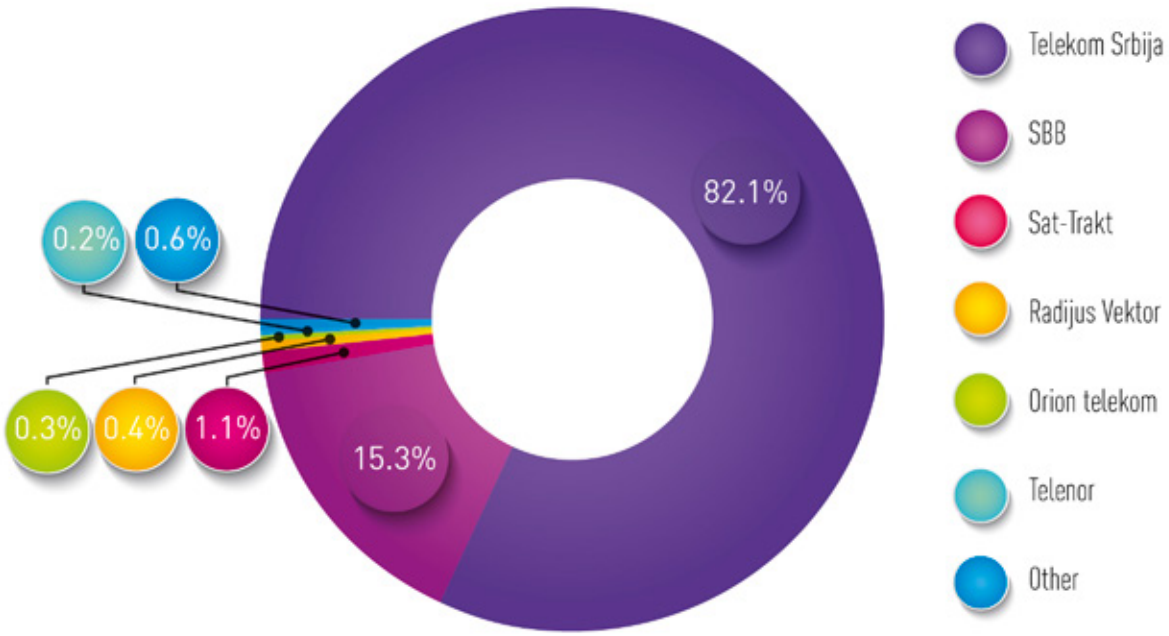
Pursuant to Art. 149 of the Law on Electronic Communications, since 1 January 2012 the provision of public fixed telecommunications network and services has been under the general authorization regime. Hence, in addition to the above licence holders, in 2018 public voice service via fixed network was also provided by another 30 operators, whereas other registered operators did not provide services in 2018.

In 2018, Telekom Srbija had approximately 7% of subscribers less than in the previous year, but it remained the biggest public fixed telecoms operator and its business activities had the largest impact on the fixed telephony market in 2018. In 2018 Telekom Srbija acquired 100% share in the capital of the companies Kopernikus technology and Avcom, whose data are analysed independently of the data for Telekom Srbija in this Overview. In the region, Telekom Srbija is present in the markets of Republika Srpska and Montenegro. The operator SBB is the second largest fixed operator according to the number of subscribers, with an increase of 24% in respsct to the previous year.

In 2018, in the register of operator kept by RATEL, the number of public fixed wireless network stations was 306 (111 Orion telekom and 195 Telekom Srbija).

Market shares of pubic fixed telecom service operators via fixed network measured in terms of the number of telephone lines is given in figure 5.1.

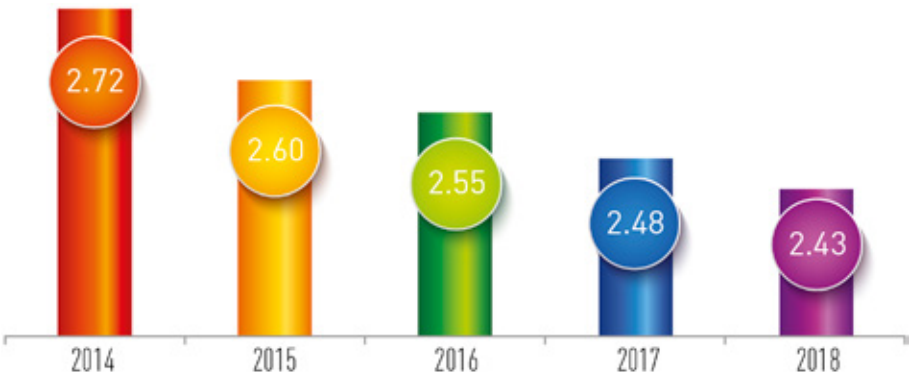
Figure 5.1. Market shares of pubic fixed telecom service operators via fixed network



Source: **RATEL**

The number of fixed line subscribers continued to decrease, amounting to 2.43 million at the end of 2018. The number of subscribers includes of users of electronic communications services provided at a fixed location via public mobile networks (Cellular Local Loop - CLL) by Telekom Srbija and Vip mobile, which take up 0.2% of the total number of subscribers in 2018. Residential users are still dominant, with 88% share in the total number of users. In 2018, the digitalization rate was 99.95% in Telekom Serbia's network, whereas all other operators have a 100% digitalization rate. The number of f payphones continued to decrease, amounting to 2,171 in 2018.

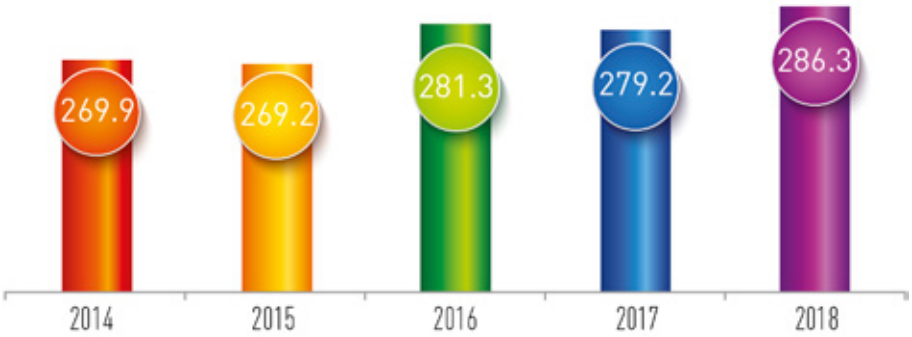
Figure 5.2. Number of fixed network subscribers (million)



Source: **RATEL**

The share of business subscribers in 2018 was approximately 12%. The trend over the past years is shown in Figure 5.3.

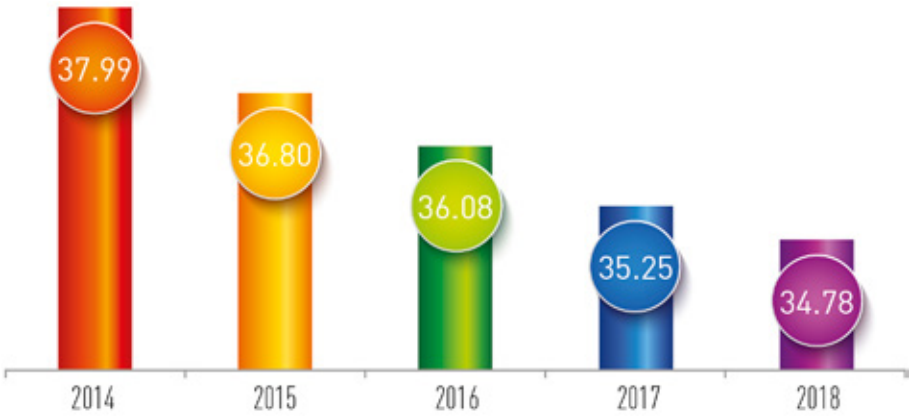
Figure 5.3. Number of business subscribers (in thousands)



Fixed telephony penetration rate in 2018 was 34.78%.

Source: **RATEL**

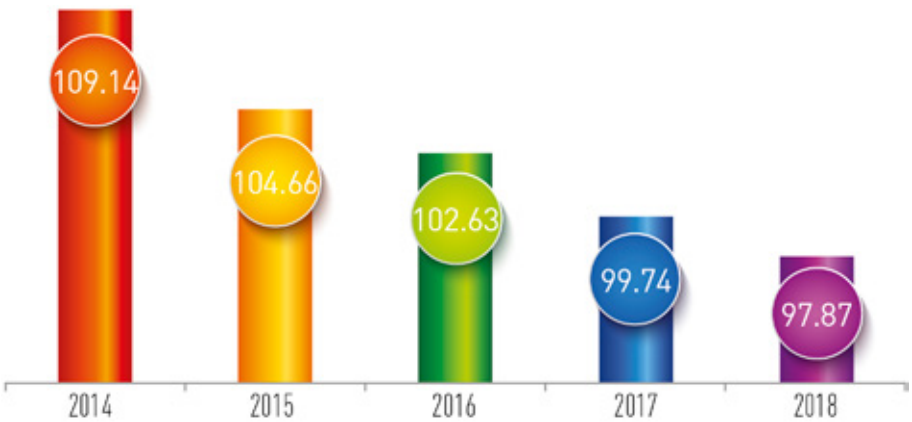
Figure 5.4. Fixed line penetration rate – population



Source: **RATEL**

In 2018, fixed line penetration rate in terms of households was almost 98%.

Figure 5.5 . Fixed line penetration rate - households

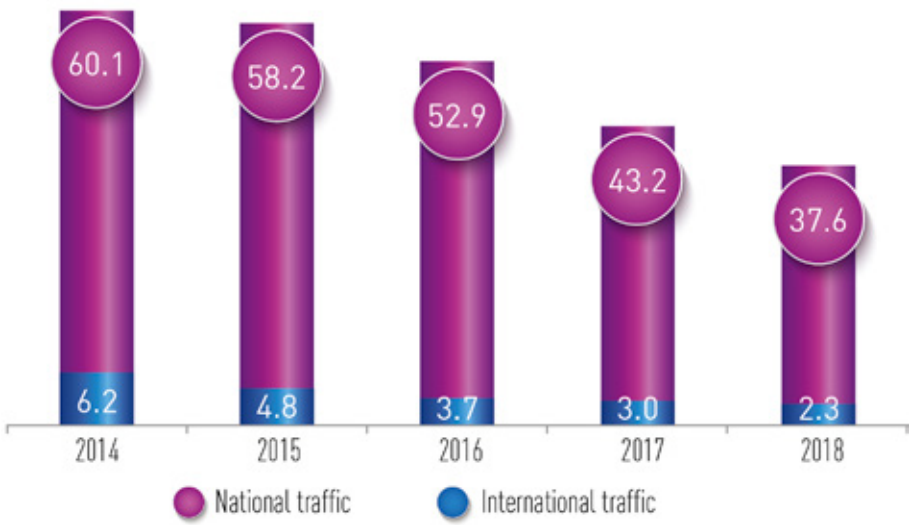


Source: **RATEL**

The number of ISDN subscribers in 2018 was approximately 27 thousand, which is by 23% less year on year. 6% of ISDN subscribers have primary rate access, whereas other users have a basic rate access. As expected, ISDN connections are following a downtrend, due to technological migration of users to advanced IP-based technologies.

The total traffic over fixed network in 2018 decreased by approximately 12% year on year, the national traffic being estimated to 3.8 billion of minutes and the international traffic to 240 million of minutes. As shown in Figure 5.6, the downward trend continued, mainly due to other types of services available, such as mobile telephony or VoIP applications. The biggest fall was seen in traffic made within the home network, by almost 17%. International traffic, with 20% of minutes less than in the previous year, continues to drop due to the increasing trend of using VoIP applications.

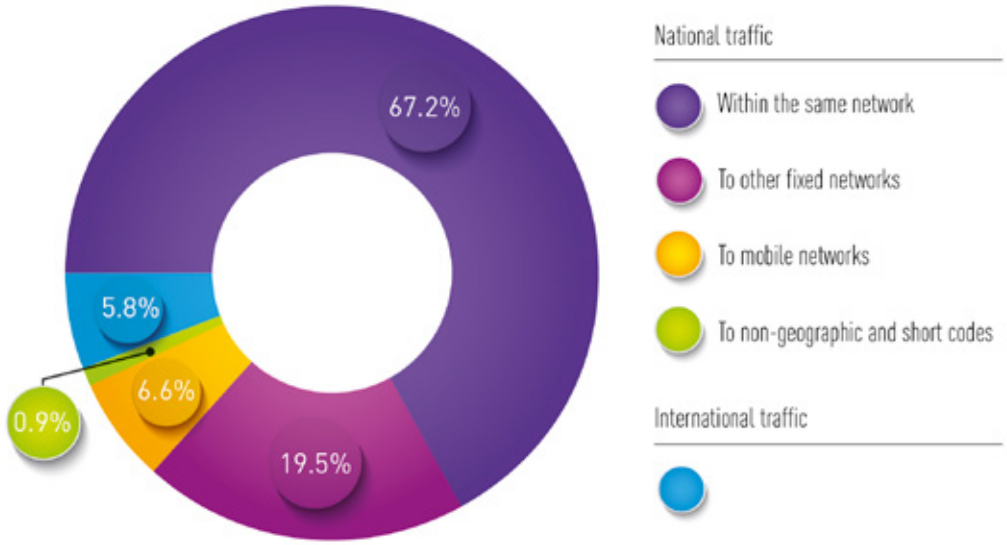
Figure 5.6. Total traffic (in hundreds million minutes)



Source: **RATEL**

Despite a slight decrease over the years, the biggest share in the total traffic still goes to the traffic made within the same network (67.2%), whereas the smallest share goes to the traffic made to non-geographic numbers and short codes (under 1%). Fixed network traffic distribution in 2018 is given in figure 5.7. The traffic made to non-geographic numbers and short codes includes both minutes made within the same network and to other networks, whereas international traffic includes outgoing international traffic from fixed network to other fixed and mobile networks and incoming international traffic made to fixed network.

Figure 5.7. Fixed network traffic distribution in 2018



Source: **RATEL**

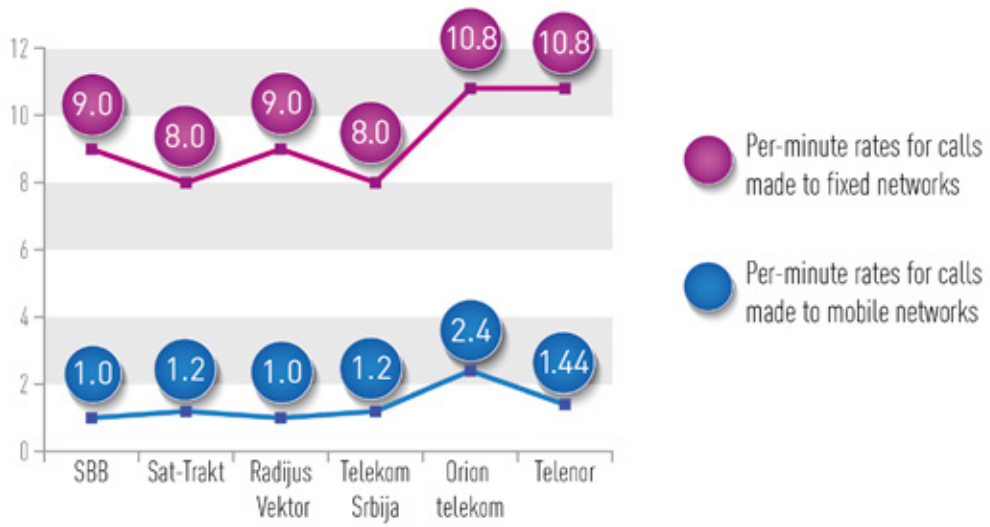
The average duration was 3.80 minutes for a call made within the same network, 1.61 minutes for a call made to mobile network and 4.38 minutes for an international call.

The total number of VoIP operators at the end of 2018 was approximately 37.3 thousand, which is a 10% decrease year on year. There were 5.8 million of minutes of traffic and there were 116 million minutes of international transit.

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 5.8. 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 5.8. Local, national and fixed-to-mobile telephone service rates in 2018, VAT included (RSD/min)

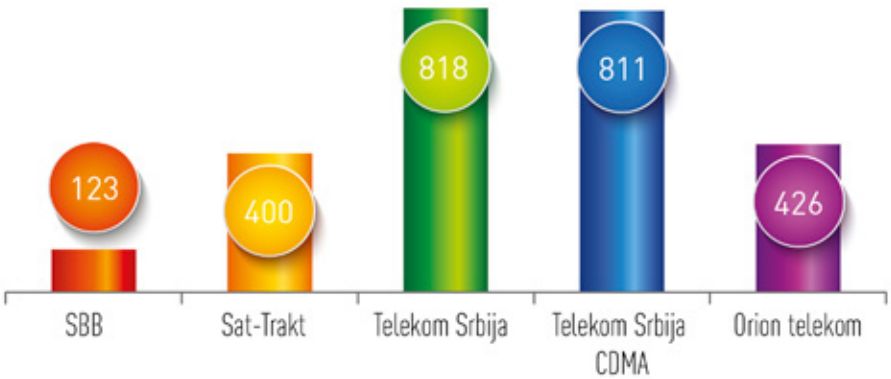


Source: **RATEL**

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.

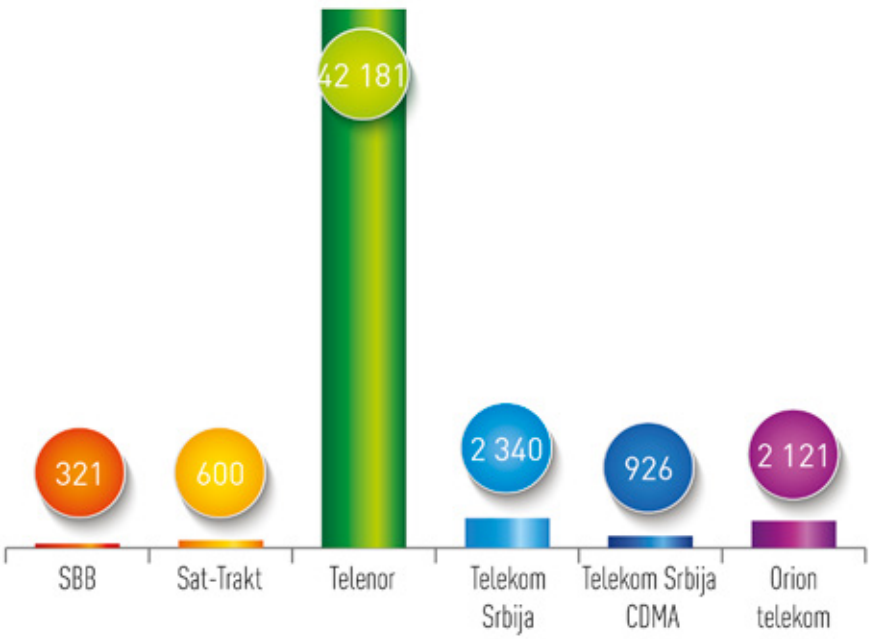
Average monthly bills charges by the operators with most users ranged between 123 and 818 dinars for residential users and between 321 and 42,181 dinars for business users. Average monthly bills charged to residential and business users are given in Figure 5.9 and 5.10.

Figure 5.9. Average monthly bills charged to residential users in 2018 (in dinars)



Source: **RATEL**

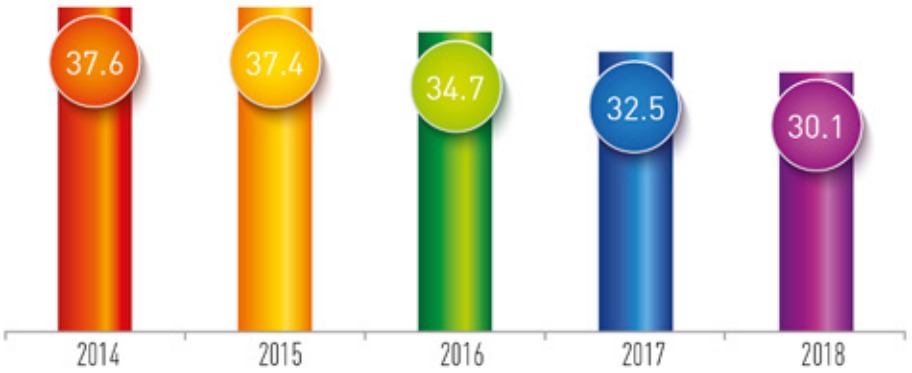
Figure 5.10. Average monthly bills charged to business users in 2018 (in dinars)



Source: **RATEL**

The total revenues from fixed telephone services provided by all operators in the territory of the Republic of Serbia in 2018 were by 7% lower compared to the previous year, amounting to 30.1 billion dinars, including the revenues made from VoIP services in the amount of 1.4 billion dinars. The investments made in the fixed telephony services in 2018 amounted to approximately 11 billion dinars, which is by 38% more compared with the previous year.

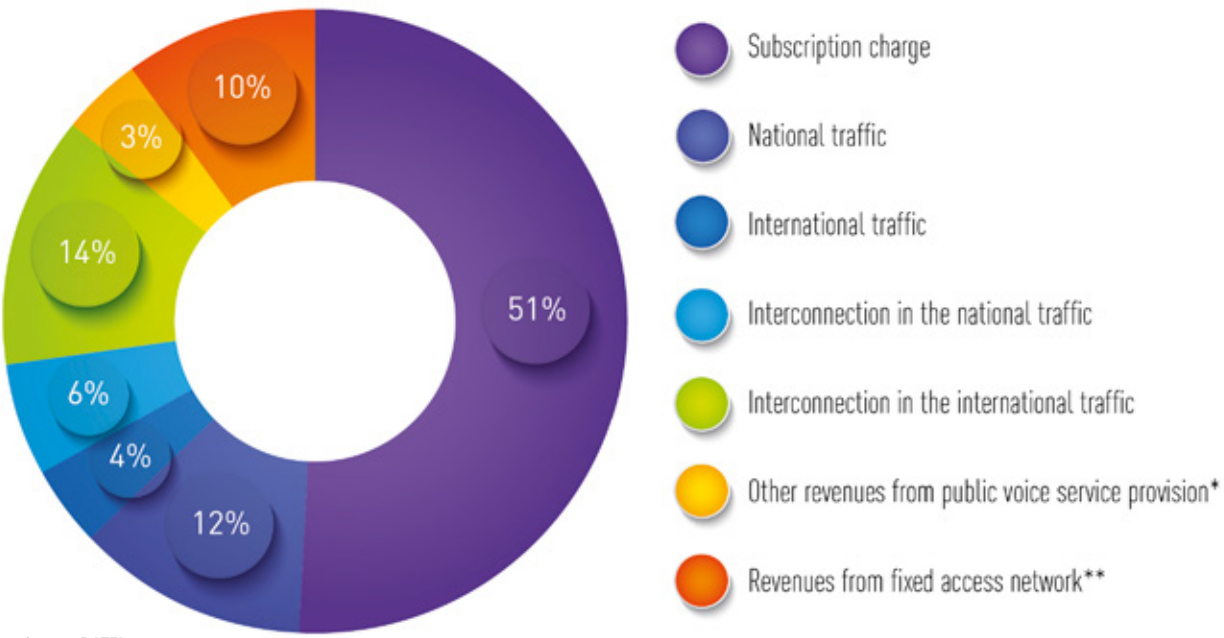
Figure 5.11. Revenues from fixed telecom network services (billion dinars)



Source: **RATEL**

Despite being lower that in the previous year, the subscription charges, in the amount of 14.6 billion dinars, still have largest share in the total revenues, accounting for almost one half of total fixed network service revenues in 2018. The revenues made from the national traffic, in the amount of 3.4 billion, and the international traffic, in the amount of 1.2 billion, both dropped, however their share in the total revenues remains roughly the same. Reduced revenues from the national and international traffic are a result of the drop in the number of subscribers and minutes of traffic made. The revenues from interconnection in the national and international traffic also dropped slightly.

Figure 5.12. Structure of revenues from fixed telecom network in 2018



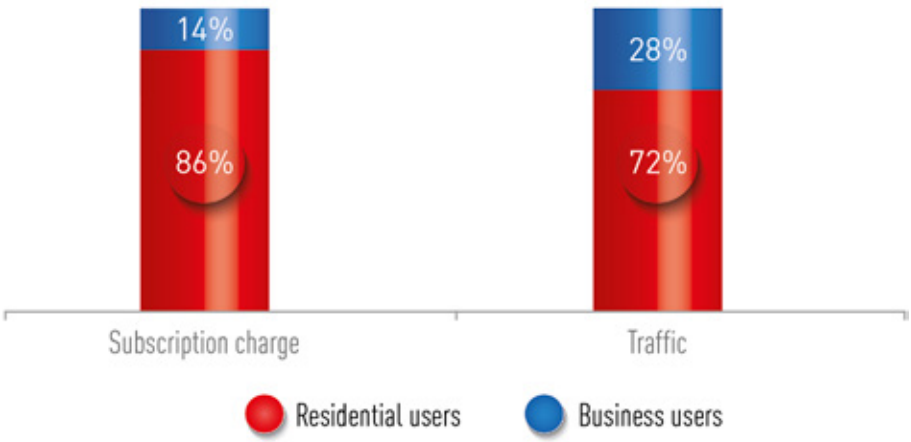
Source: **RATEL**

Other revenues from public voice service provision include revenues from special services on fixed network (call identification, call on hold, call diverting, etc), revenues from connection fees, VAS, public payphones, etc. Revenues from

fixed access network include revenues from data transmission, leased capacities on national market, international data transmission and leased capacities, LLU (full or shared), co-location, leased cable ducts, etc.

The share of residential and business users in the revenues from subscription charge and traffic made has not significantlly chaneged, as shown in Figure 5.13.

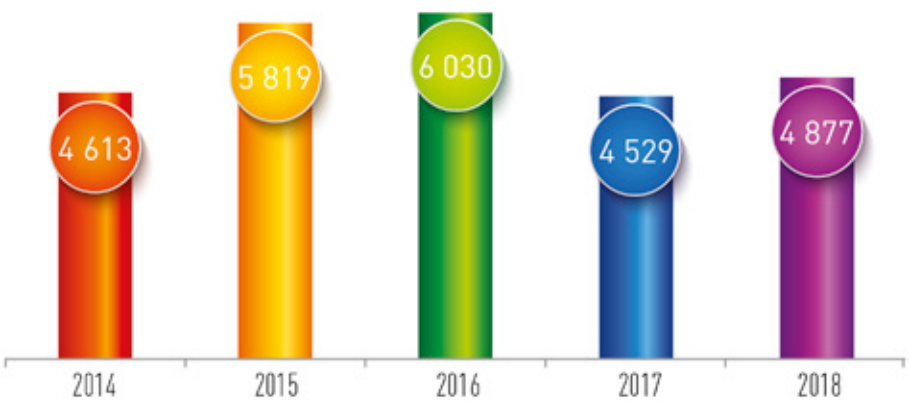
Figure 5.13. Share of residential and business users in the revenues made from subscription charge and traffic made



Source: **RATEL**

The interest in the number portability service on public telephone networks, available since 1 April 2014, showed a slight increase. In the fifth year of number portability being available on fixed networks, the monthly average of ported numbers was 4877.

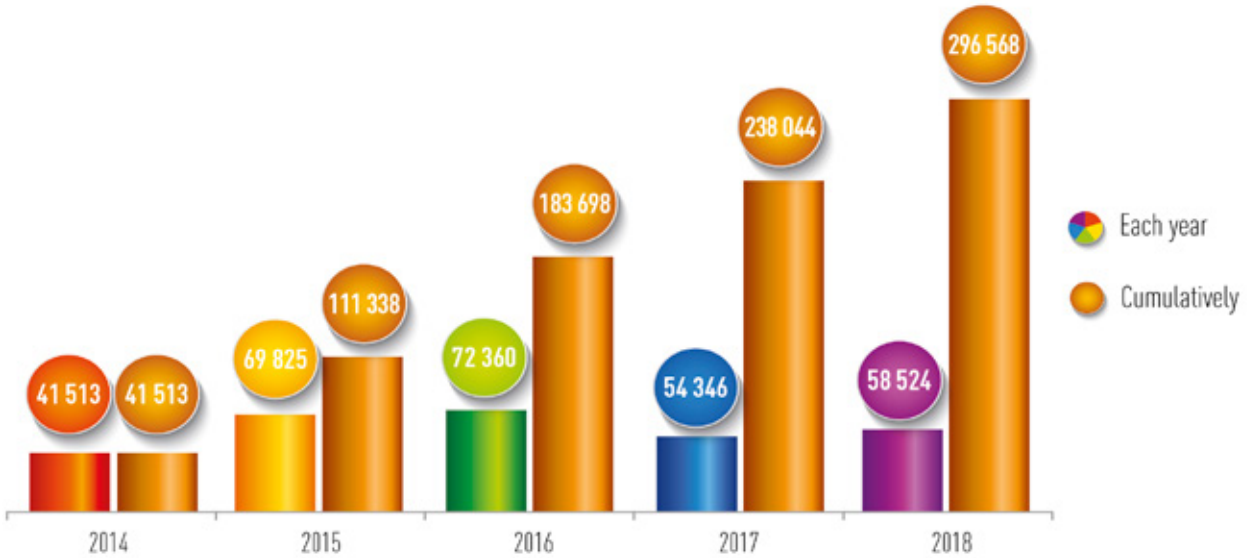
Figure 5.14. Monthly average of ported numbers each year



Source: **RATEL**

During 2018 there were 58,524 fixed line subscribers who changed the operator while keeping the same number, so that the total of ported numbers amounted 296,568 at the end of 2018 (Figure 5.15).

Figure 5.15. Portings made each year and in total



Source: **RATEL**

Leased Lines

Leased lines is a service which involves high-quality access provided at a fixed location to business users and operator-users. Leased lines enable the user to have a stable connection of guaranteed speed rate between two network termination points (NTP) on a single or different electronic communication networks, via appropriate interfaces, assigned solely to a specific user and enabling symmetrical transmission i.e. equal download/upload speeds. The service satisfies user needs for a reliable high-quality transmission capacity with symmetrical and stable guaranteed speed rates and it is often offered, especially to business users, together with services such as VPN, direct high-speed, Internet access, VoIP, connections with data centres and customer support centres, etc.

According to available data, leased lines service was provided by 15 operators in Serbia in 2018 and the total number of national and international leased lines was 3986, while national lines accounted for 98% of the total in 2018.

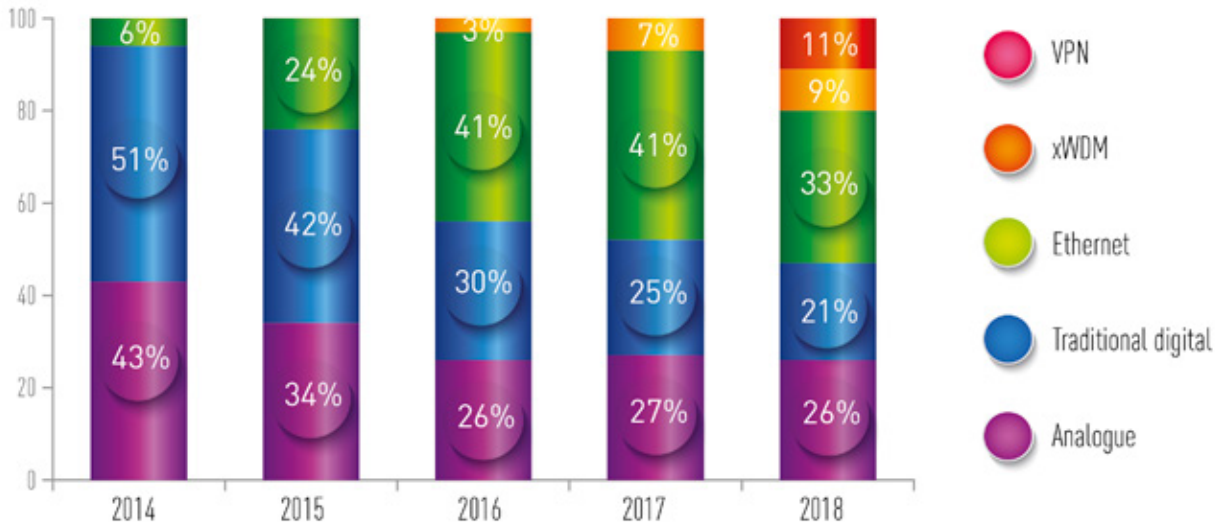
Slika 5.16. Total number of leased lines over years

Source: **RATEL**

As for technologies, most national leased lines are Ethernet based (33%). The share of traditional digital lines is decreasing and the number of xWDM based lines enabling symmetrical high-speed data transmission rates (up to 40 Gbps) is increasing. Since 2018, data on VPN end-user service are being collected which present, in terms of high-quality access provision, an equivalent to the traditional leased lines service, with an 11% share in the total number of lines.

Analogue leased lines account for one quarter of leased national lines, although their number is decreasing over the analysed period at an average 4% annual rate. This service is no longer available to new users and its presence is a result of valid contracts on lease closed for a period of 5 to 10 years. Therefor, a continued drop may be expected as the contracts come to expire. Traditional digital lines were the most common form of international connections in 2018.

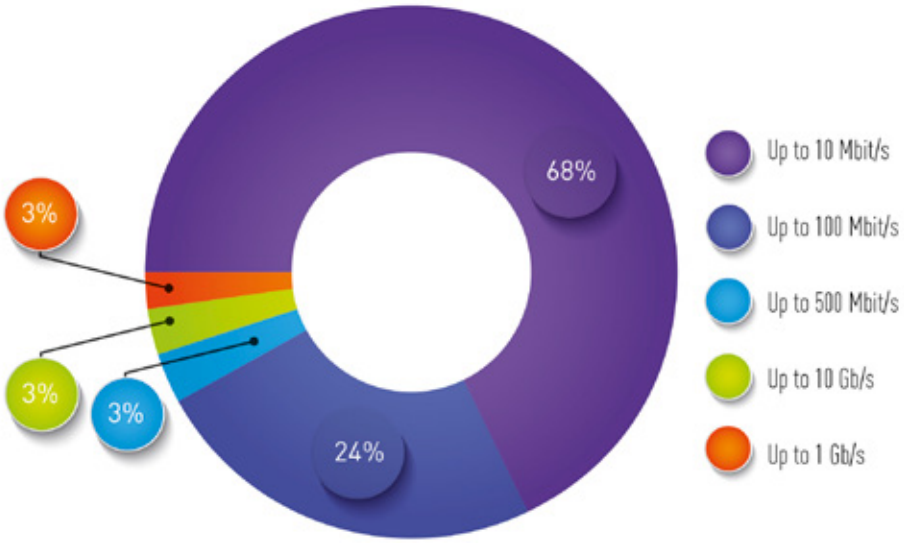
Figure 5.17. Distribution of national leased lines according to access type



Source: **RATEL**

In terms of speed, the most common national line transmission technologies in 2018 are Ethernet 10 Mbit/s lines with 68% share, followed by Ethernet 100 Mbit/s lines with 24% share and Ethernet 500 Mbit/s to 1 Gb/s lines with 3% share.

Figure 5.18. Distribution of Ethernet national leased lines according to speed in 2018



Source: **RATEL**

Leased lines is a service designed for business users (companies, organizations, institutions and public institutions) that need to connect several units at different locations, in order to ensure an uninterrupted data transmission. In addition the service is intended for operator users, to build and connect their own network, to connect it to networks of other operators and to provide retail service own end users. In the analysed period, over 70% of national lines were leased by business users (73%) and the most commonly leased type of lines, by both categories of users, were Ethernet lines of up to10 Mbit/s.

The total revenues made from national and international leased lines in 2018 were somewhat over 1 billion dinars, the share of revenues made from international lines being 12%.

Figure 5.19. Revenues made from leased lines in 2018 (million dinars)

Source: **RATEL**

06 PUBLIC MOBILE TELECOMMUNICATIONS NETWORKS AND SERVICES

Mobile telephony services in the Republic of Serbia were provided by the following three operators in 2018:

• **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;

• **Telenor Ltd., Belgrade**, 100% owned by PPF TMT Bidco 1 B.V., the Netherlands;

• **Vip mobile Ltd.**, 100% in the ownership of Mobilkom CEE Beteiligungsverwaltung GmbH, Austria.

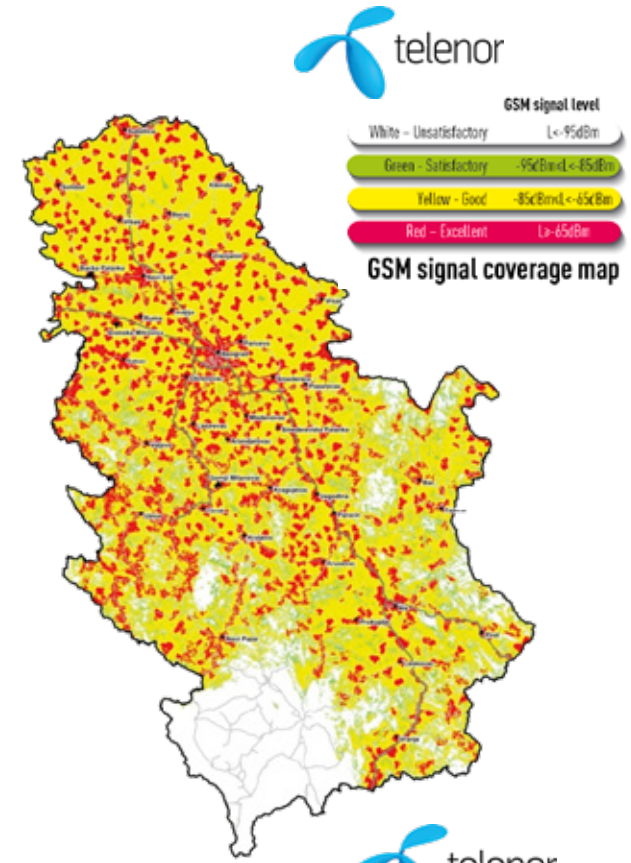
All three operators were granted licences for public mobile telecommunications networks and public mobile telecommunications network services in accordance with GSM/GSM1800 and UMTS/IMT-2000 standards, issued by RATEL. The licences were issued for the territory of the Republic of Serbia, for a period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

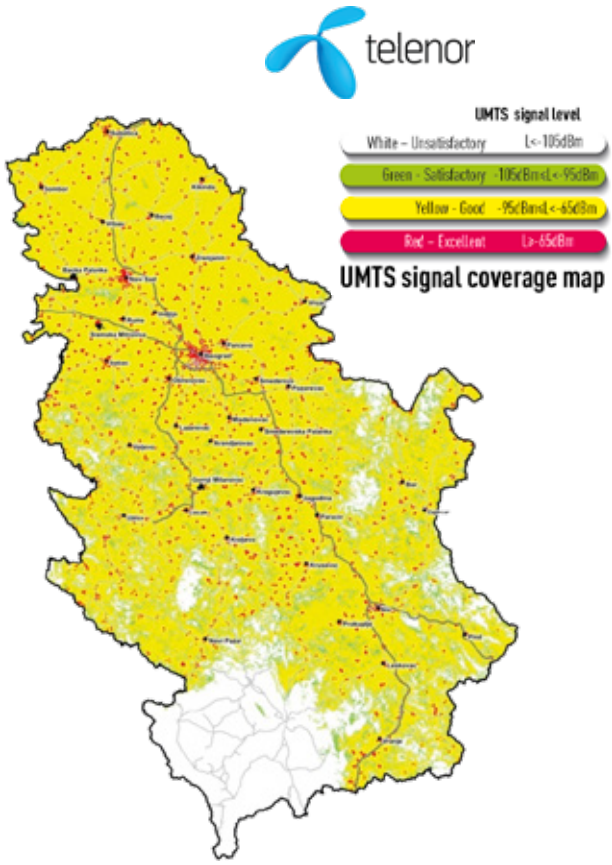
In addition to network operators, in 2016 two virtual mobile operators were also registered, **Mundio Mobile d.o.o.** and **Globaltel d.o.o.** During 2018, only Globaltel provided services.

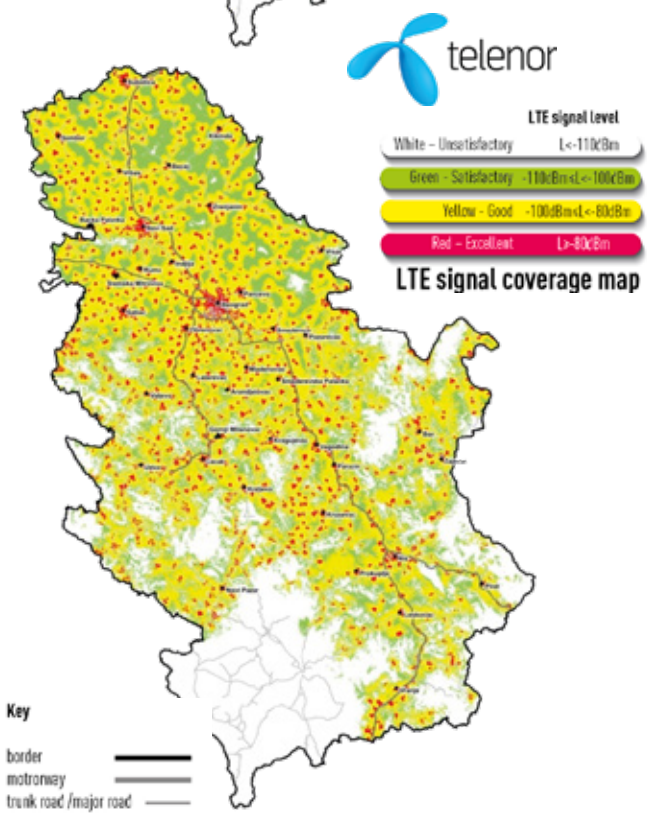
4G network was launched in 2015 in the Republic of Serbia. In the beginning of 2015, the public bidding procedure for the issuance of individual licences for the usage of radio frequencies in the 1710-1785/1805-1880 MHz frequency bands, in which all three mobile operators had participated, was completed. 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.

Telenor has been in the Serbian telecoms market since 2006, when it purchased the company Mobi63 (ex Mobitel) established in 1994. In 2018 the ownership structured changed, since Telenor Group sold its business in Central and Eastern Europe, consisting of subsidiaries in Bulgaria, Hungary, Serbia and Montenegro and Telenor Common Operation Serbia, to PPF Group. As part of the regional transaction, PPF Group purchased 100% of shares in Telenor Ltd. The coverage maps for Telenor, as on 31 December 2018, are given in Figure 6.1.

Figure 6.1. Mobile operator – Telenor





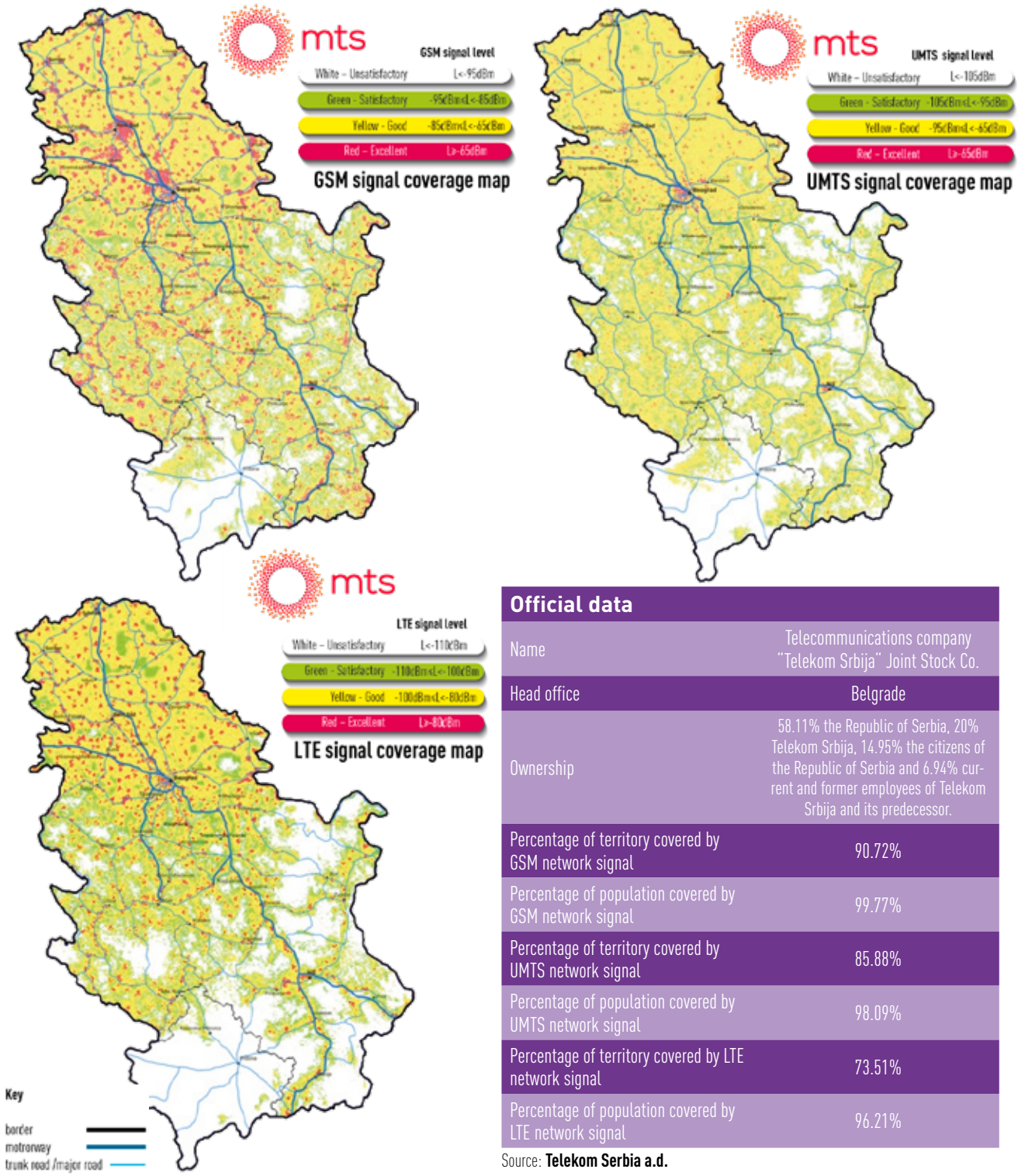


Official data	
Name	Telenor Ltd.
Head office	Belgrade
Ownership	100% owned by PPF TMT Bidco 1 B.V., the Netherlands
Percentage of territory covered by GSM network signal	91.90%
Percentage of population covered by GSM network signal	99.42%
Percentage of territory covered by UMTS network signal	91.02%
Percentage of population covered by UMTS network signal	98.67%
Percentage of territory covered by LTE network signal	78.04%
Percentage of population covered by LTE network signal	96.31%

Source: **Telenor d.o.o.**

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 Bosnia and Herzegovina and Montenegro. The coverage maps for Telekom Srbija are given in Figure 6.2.

Figure 6.2. Mobile operator – Telekom Srbija

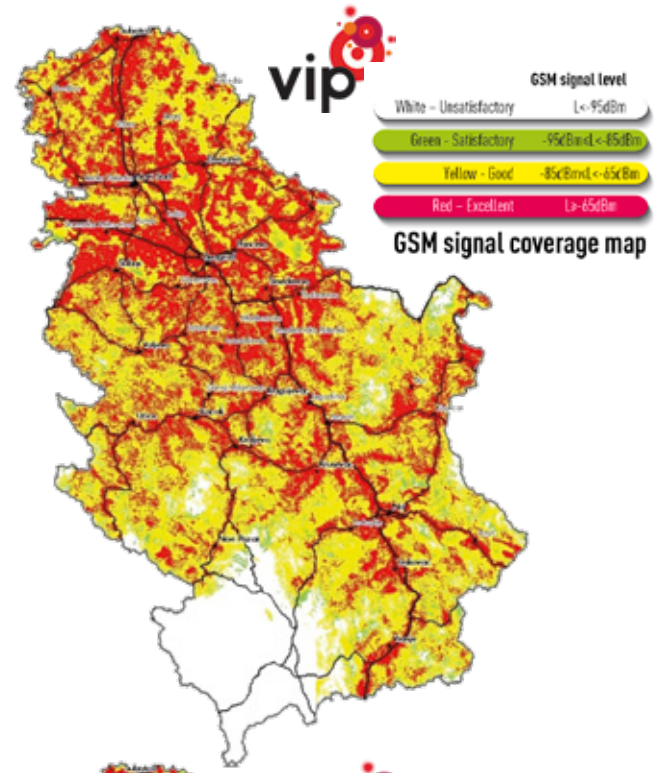


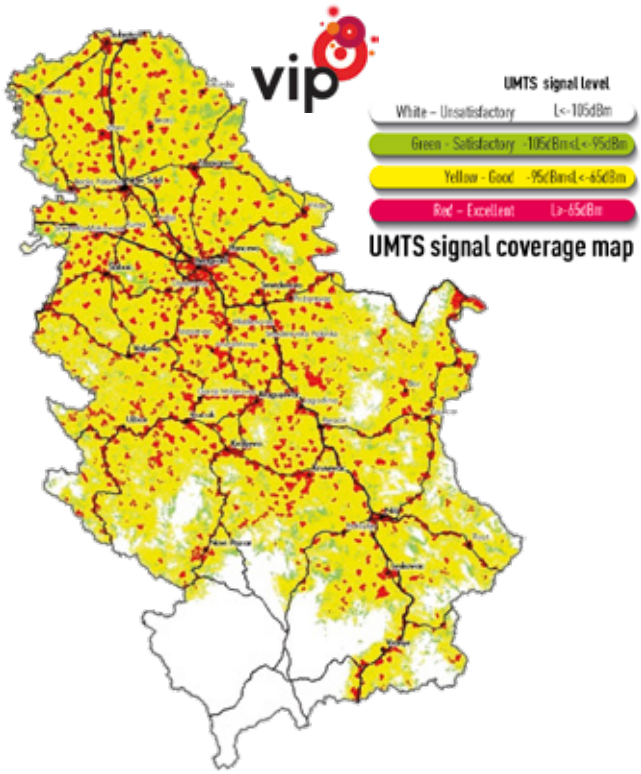
Official data	
Name	Telecommunications company "Telekom Srbija" Joint Stock Co.
Head office	Belgrade
Ownership	58.11% the Republic of Serbia, 20% Telekom Srbija, 14.95% the citizens of the Republic of Serbia and 6.94% current and former employees of Telekom Srbija and its predecessor.
Percentage of territory covered by GSM network signal	90.72%
Percentage of population covered by GSM network signal	99.77%
Percentage of territory covered by UMTS network signal	85.88%
Percentage of population covered by UMTS network signal	98.09%
Percentage of territory covered by LTE network signal	73.51%
Percentage of population covered by LTE network signal	96.21%

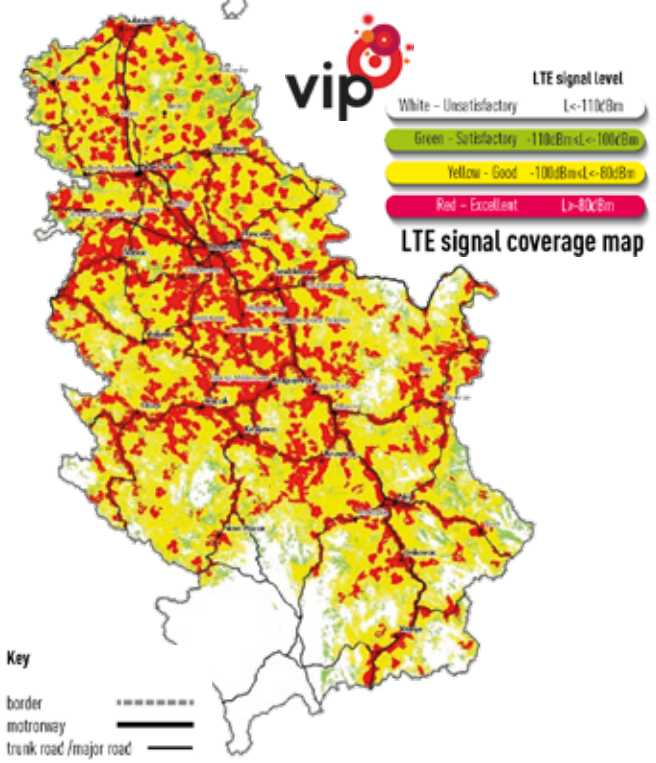
Source: **Telekom Serbia a.d.**

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 6.3.

Figure 6.3. Mobile operator – Vip mobile







Official data	
Name	Vip mobile Ltd.
Head office	Belgrade
Ownership	100% Mobilkom CEE Beteiligungsverwaltungs GmbH, Austria
Percentage of territory covered by GSM network signal	82.2%
Percentage of population covered by GSM network signal	99.2%
Percentage of territory covered by UMTS network signal	74.4%
Percentage of population covered by UMTS network signal	97.4%
Percentage of territory covered by LTE network signal	72.3%
Percentage of population covered by LTE network signal	96.7%

Source: **Vip mobile**

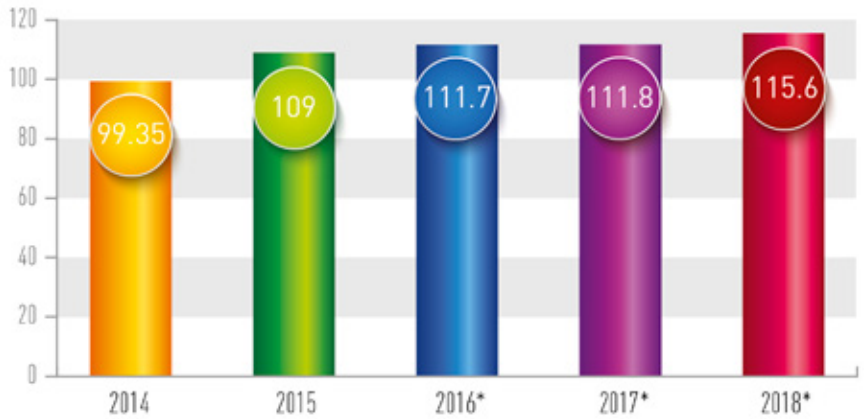
Table 6.1. An overview of wireless access network on 31.12.2018 for all three operators

I		TELEKOM Serbia	TELENOR	VIP MOBILE
1.	Total number of sites with base stations	2573	2104	1975
2.	Raw land sites (RL)	1533	1207	1180
3.	Rooftop sites (RT)	991	850	768
4.	Indoor sites	40	26	21
5.	RL +RT sites	9	21	6
II				
6.	ADAS indoor	3		2
7.	DAS indoor	42	46	24
8.	ADAS + DAS indoor	4	1	1
III				
9.	GSM base station sites (all frequency ranges)	2001	2052	1966
10.	GSM1800 network base stations	2	8	877
11.	GSM900 network base stations	1828	1818	455
12.	GSM900+GSM1800	171	226	634
IV				
13.	UMTS network base stations	2479	2093	1946
14.	UMTS2100 network base stations	2468	57	1940
15.	UMTS900 network base stations	6	299	2
16.	UMTS900 + UMTS2100 network base stations	5	1737	4
V				
17.	LTE network base stations	1999	1940	1887
18.	LTE800 network base stations	1066	1314	762
19.	LTE1800 network base stations	706	50	614
20.	LTE800 + LTE1800 network base stations	227	576	511

VI		TELEKOM Serbia	TELENOR	VIP MOBILE
21.	Indoor repeater sites	521	239	215
22.	Indoor GSM repeater sites	86	8	25
23.	Indoor UMTS repeater sites	277	26	87
24.	Indoor dual repeater sites (GSM + UMTS)	158	189	6
25.	Indoor LTE repeater sites	0		
26.	Indoor dual/triple repeater sites (LTE+GSM/UMTS)	0	16	97
VII				
27.	Outdoor repeater sites (only remote if different from donor)	20	15	0
VIII				
28.	WiFi sites	1120	15	0
29.	Indoor" WiFi sites	360	0	
30.	Outdoor WiFi sites	521	14	
31.	Indoor + outdoor WiFi sites	239	1	
IX				
32.	GSM900 base radio stations	1999	2064	1089
33.	GSM1800 base radio stations	173	236	1511
34.	UMTS900 base radio stations	11	2046	6
35.	UMTS2100 base radio stations	2473	1830	1944
36.	LTE800 base radio stations	1293	1894	1273
37.	LTE1800 base radio stations	933	647	1125
38.	WiFi AP	2559	15	0
39.	Indoor WiFi AP	1645	1	
40.	Outdoor WiFi AP	914	14	
41.	Indoor repeaters	679	267	
42.	Outdoor repeaters	20	15	

The revenues from mobile networks in 2018 amounted to around 115.6 billion dinars or 977.3 million euros. Observed in the national currency (RSD) the revenues increased by 3.4% year on year, whereas the revenues observed in euros increased by 6%. The difference in the revenues in the two currencies is a consequence of the increase in the average exchange rates for euro in 2018, compared with the previous year.

Figure 6.4. The total revenues from the mobile telephony (RSD billion)



* includes revenues from mobile data traffic, amounting to 5.12 million dinars in 2018.

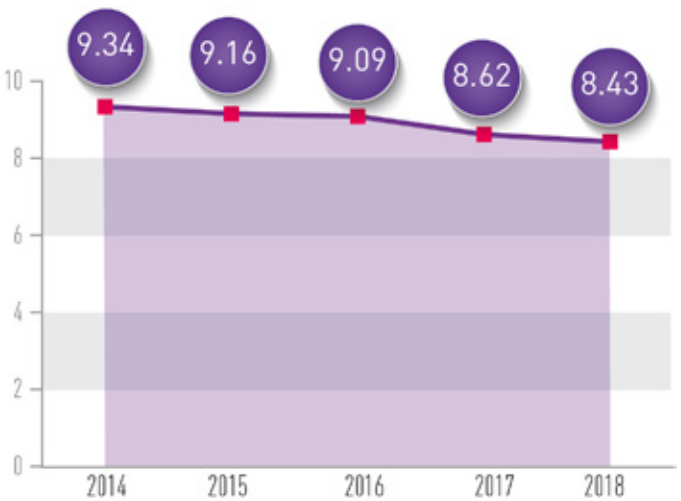
Source: **RATEL**

Investments in this market segment increased by 26% compared with the previous year, amounting to 17 billion dinars.

The total number of mobile users dropped by 2.2% year on year, amounting to 8,431,365 at the end of 2018. The total number of users has been decreasing in the past three years, due to a decrease in the number of prepaid users. Nonetheless, the volume of outgoing voice traffic in minutes is increasing.

Figure 6.5 shows changes in the total number of users in the previous period.

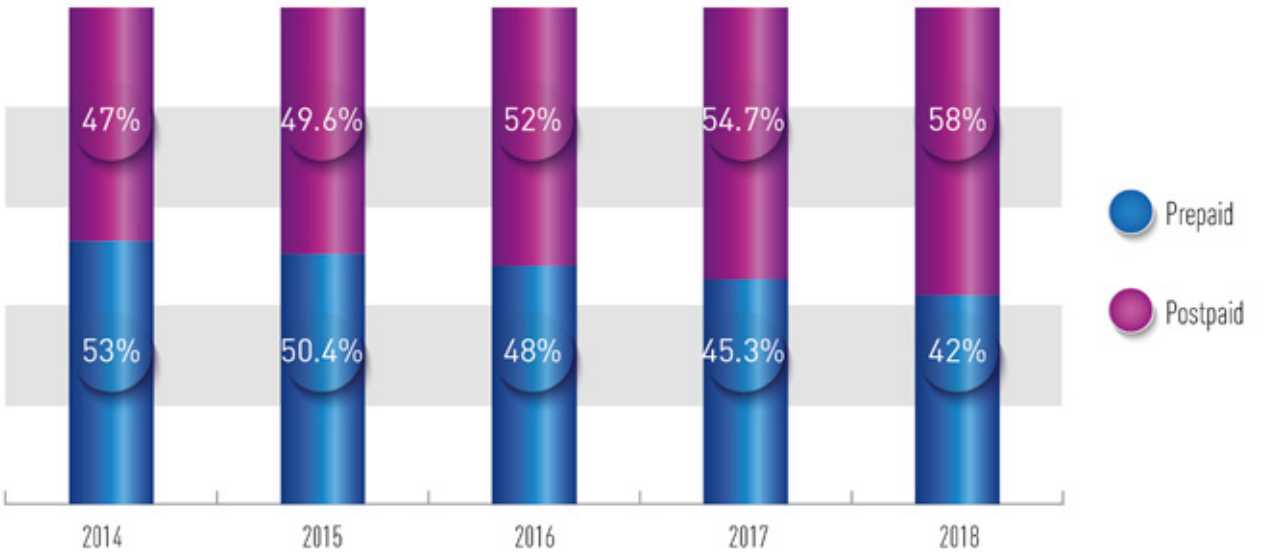
Figure 6.5. Total number of active mobile telephony users (million)



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 6.6. In 2016 the number postpaid users exceeded the number of postpaid users for the first time and this trend continued in 2017 and 2018, with a share of 58%.

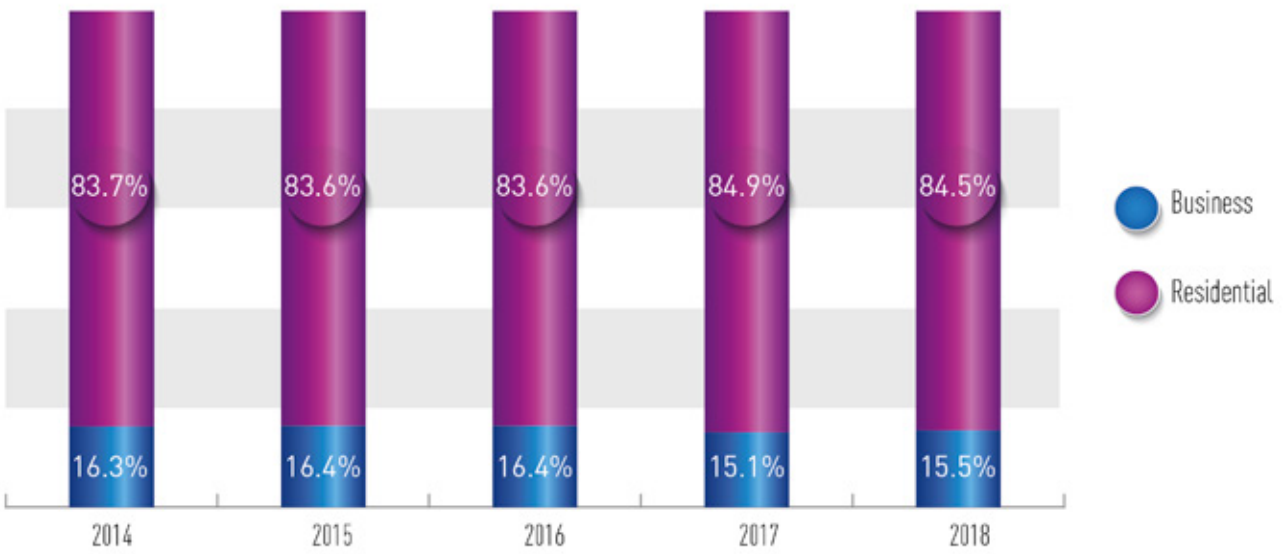
Figure 6.6. Prepaid/postpaid users ratio



Source: **RATEL**

Residential and business users ratio is given in Figure 6.7. Residential users are dominant in user structure over years and in 2018 the share of residential users in the total number of users was 84.5%.

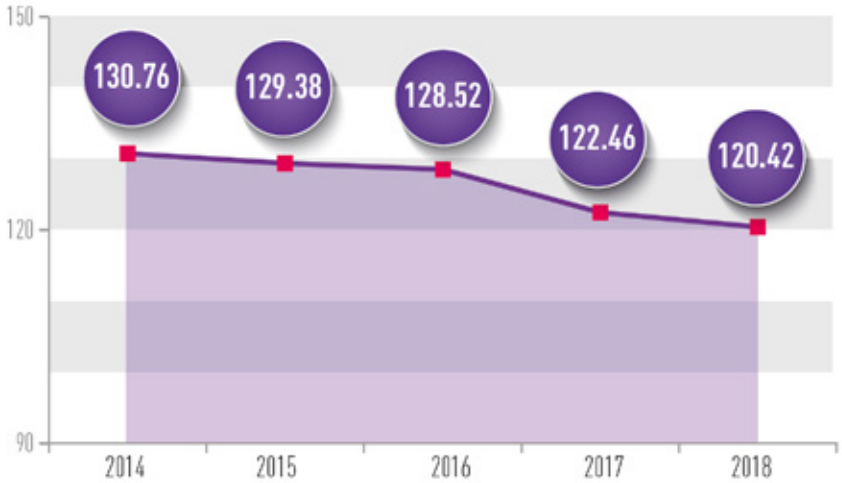
Figure 6.7. Residential/business users ratio



Source: **RATEL**

The number of mobile network users is again higher than the number of inhabitants in 2018, the mobile penetration rate being 120.42%. This indicates that some people are using more than one mobile number.

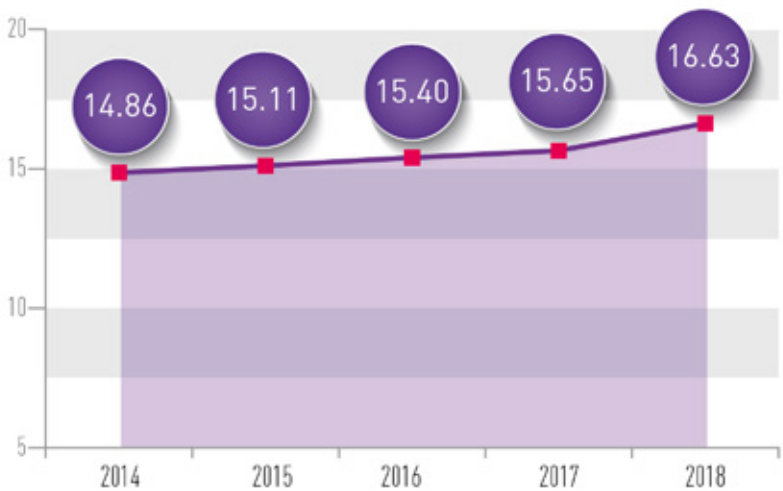
Figure 6.8. Mobile penetration rate



Source: **RATEL**

The minutes of calls made from mobile networks are constantly increasing year after year. In 2018, the total outgoing traffic on the mobile network amounted to 16.63 billion minutes, which is an increase of 6.3% compared with the previous year when it amounted to 15.65 billion minutes. The annual average of traffic per user in 2018 was 1,972 minutes or approximately 5 minutes and 24 seconds a day.

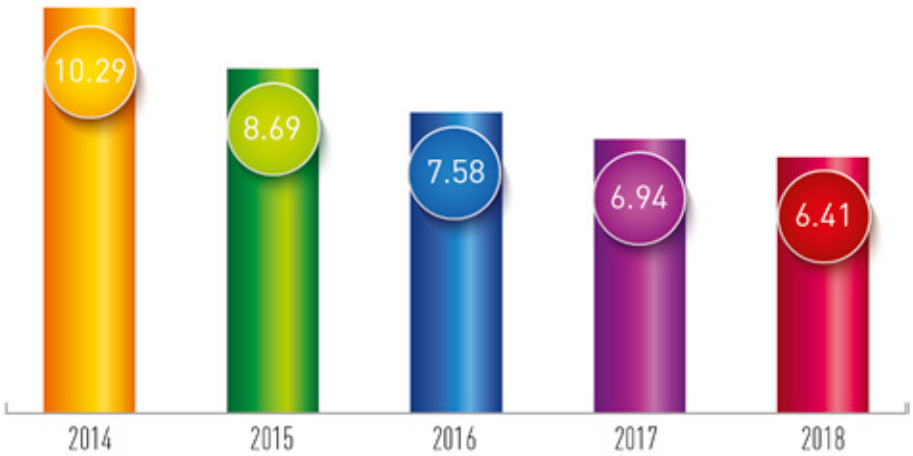
Figure 6.9. Total outgoing traffic (billion minutes)



Source: **RATEL**

The number of sent text messages continued to decrease. In 2018, the total of 6.41 billion SMS messages were sent, which is a decrease by 7.6% compared with 2017 when 6.94 billion SMS messages were sent. The average number of text messages sent in 2018 per user was 761, or 2 SMS messages a day. In 2018, residential users accounted for 89% of SMS messages.

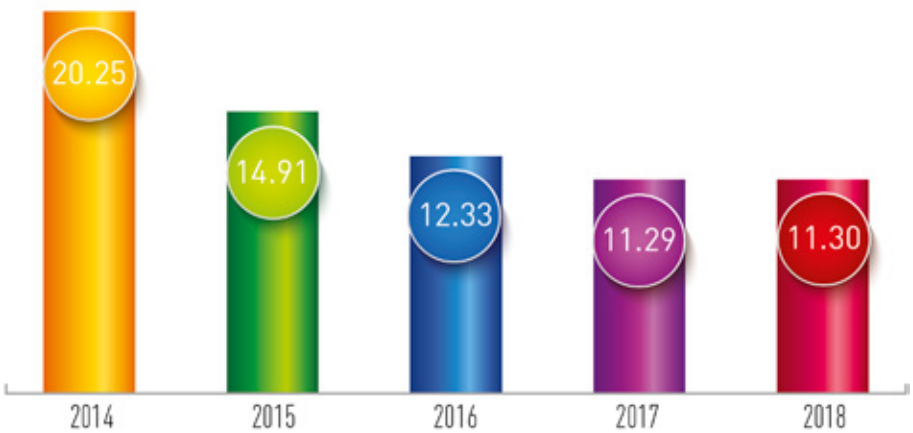
Figure 6.10. Number of sent text (SMS) messages (billion)



Source: **RATEL**

The number of MMS messages also continued to drop. In 2018, 11.30 million MMS messages were sent, which is a slight increase in respect to 2017. In 2018, residential users accounted for 86% of MMS messages.

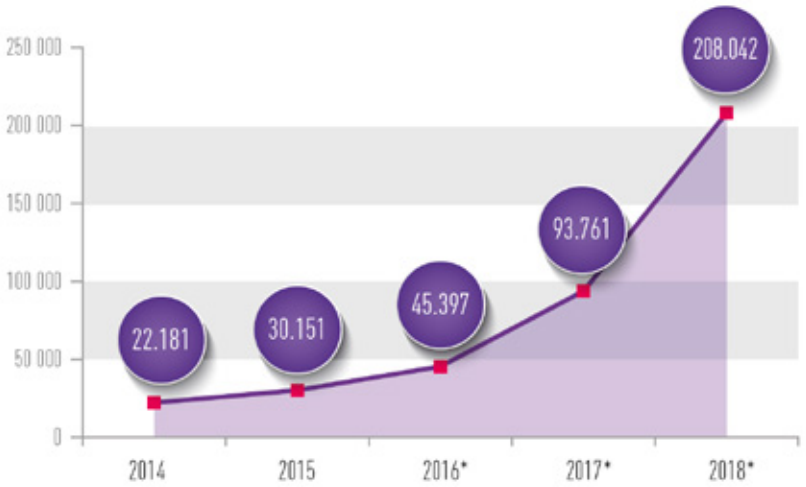
Figure 6.11. Number of MMS messages sent (million)



Source: **RATEL**

Data traffic has been constantly growing during the observed period (Figure 6.12). During the analysed five-year period, the average annual growth rate of the transmitted data was around 75%.

Figure 6.12. Data traffic in TB (GPRS+UMTS+LTE)

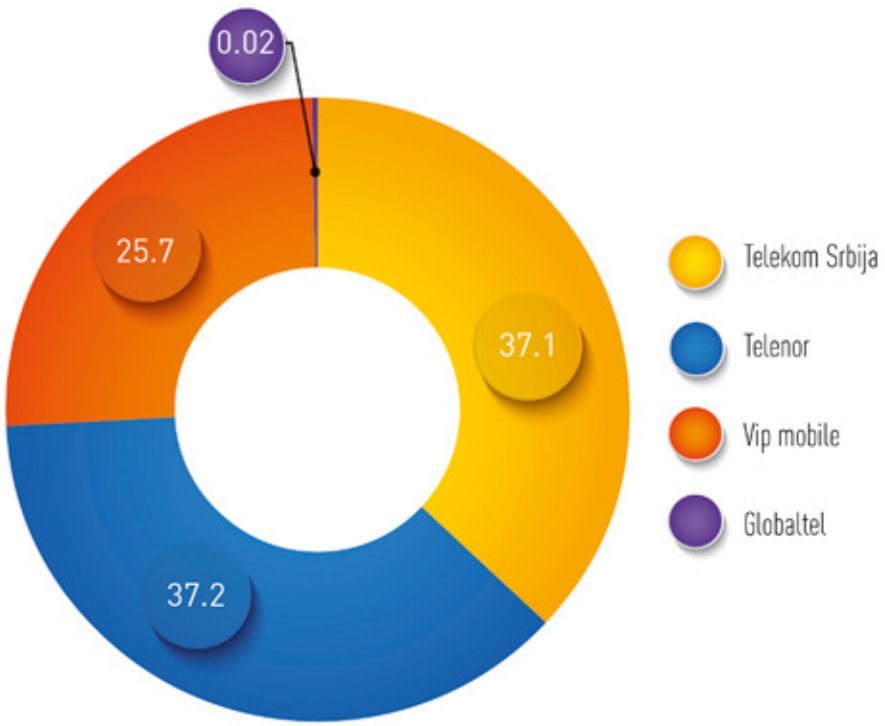


* As of 2016 data traffic over LTE network is also included.

Source: **RATEL**

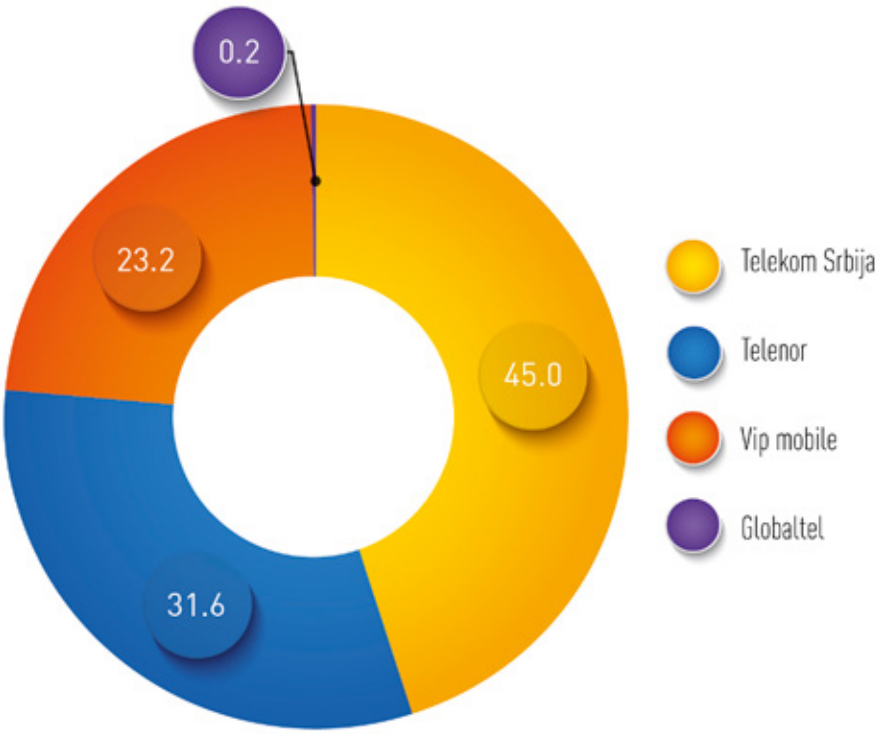
Figures 6.13 – 6.18 show the share of the mobile operators in terms of revenues, number of users, outgoing traffic, number of text and multimedia messages (SMS and MMS) sent and the data traffic made, based on the available data.

Figure 6.13. Share in the total revenues made from mobile services (%)



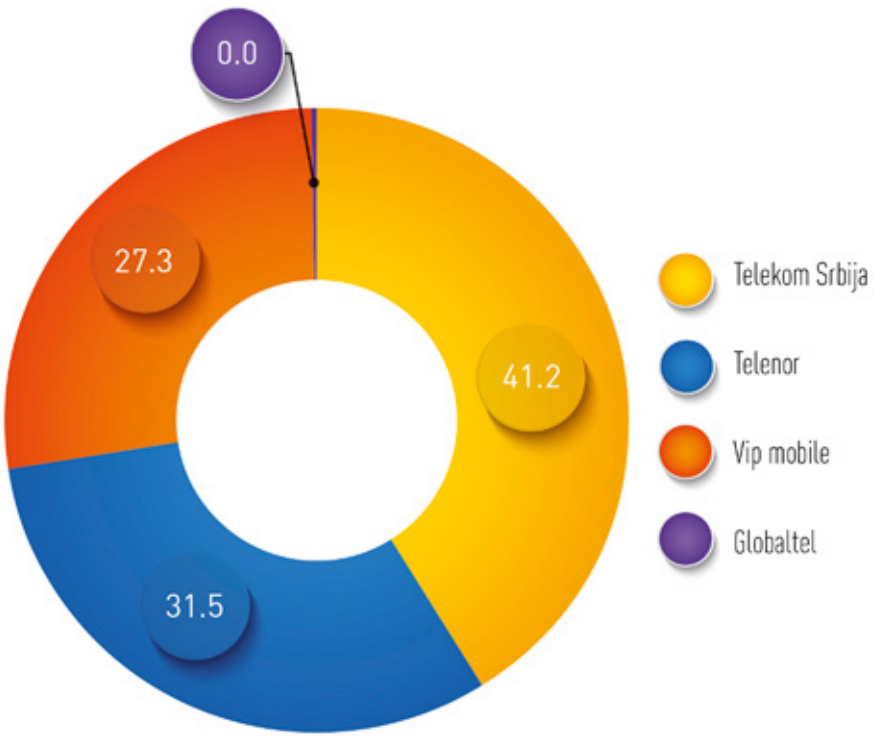
Source: **RATEL**

Figure 6.14. Market share in terms of the number of users (%)



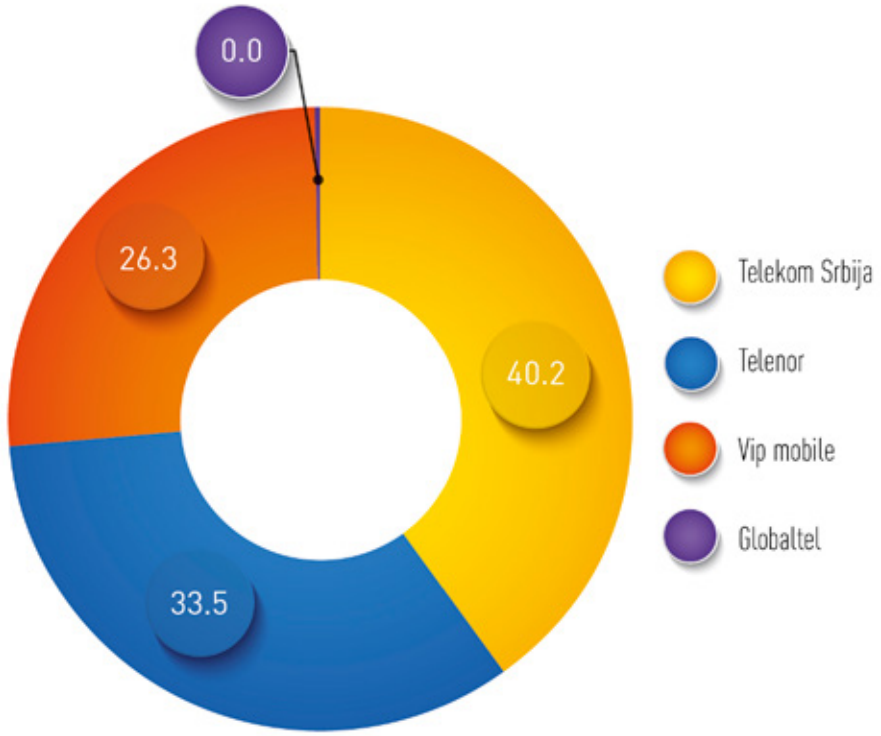
Source: **RATEL**

Figure 6.15. Share in the total outgoing voice traffic (%)



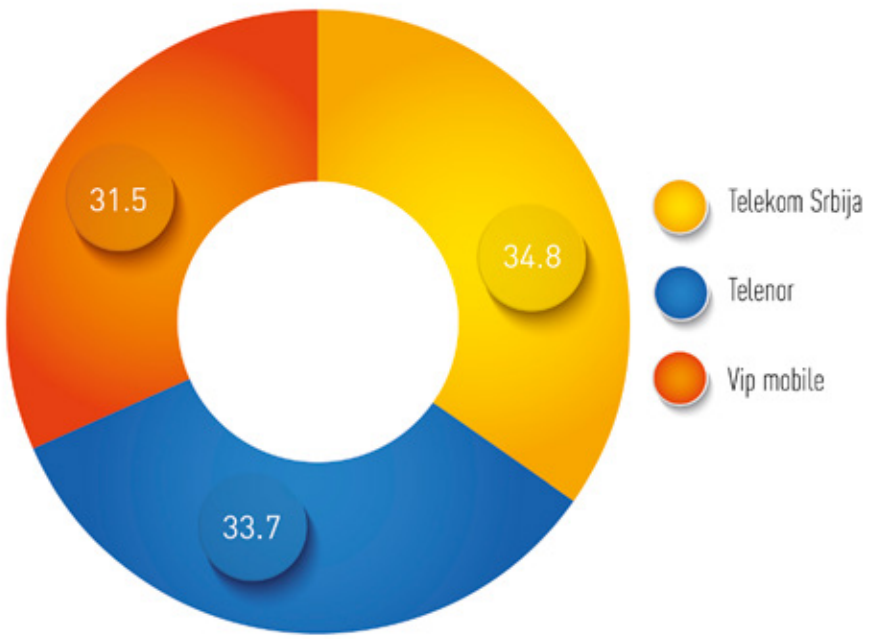
Source: **RATEL**

Figure 6.16. Share in the total number of sent SMS messages (%)



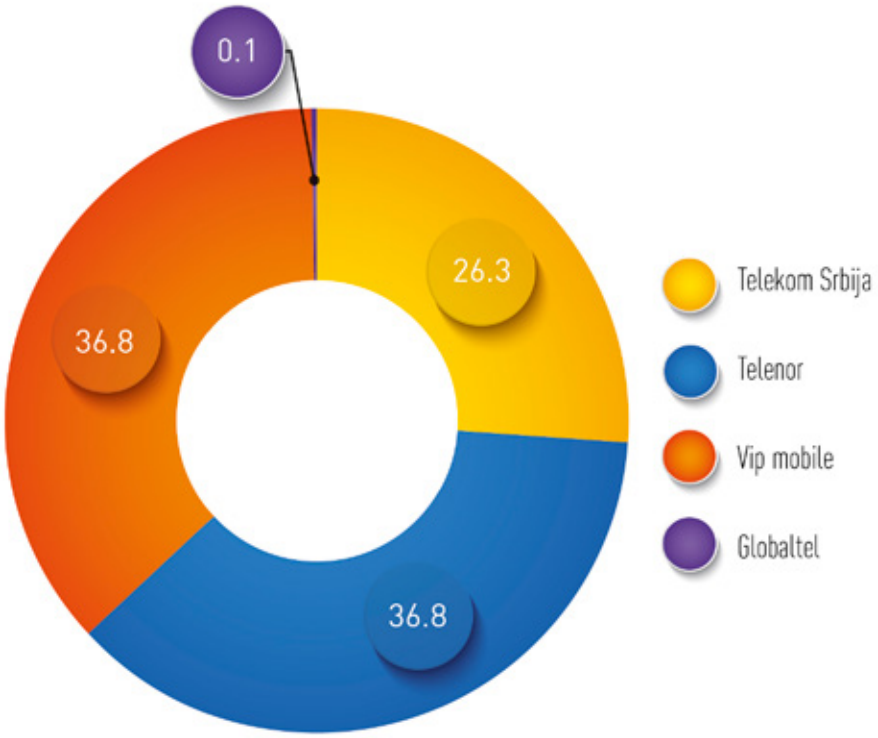
Source: **RATEL**

Figure 6.17. Share in the total number of sent MMS messages (%)



Source: **RATEL**

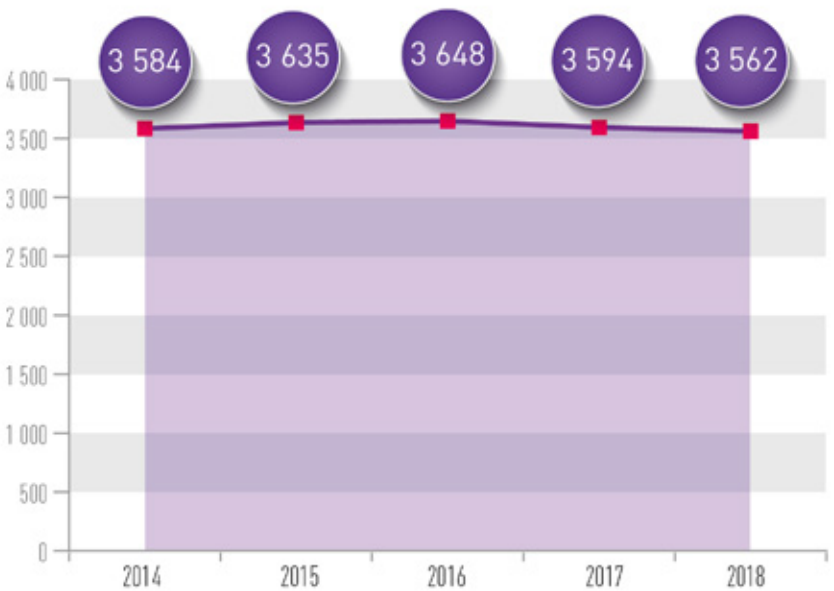
Figure 6.18. Share in data traffic (GPRS+UMTS+LTE) (%)



Source: **RATEL**

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.

Figure 6.19. HHI values

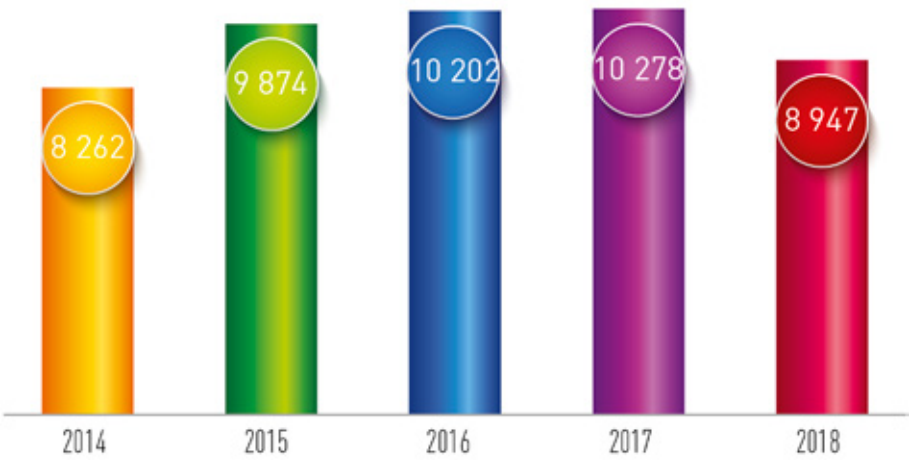


Source: **RATEL**

The value of HHI for 2018 was the lowest in the last five years, indicating a lower market concentration and increase in the level competition.

The average number of mobile number portings decreased by 12.9% in respect to the previous year, with an average number of portings of 8947 per month.

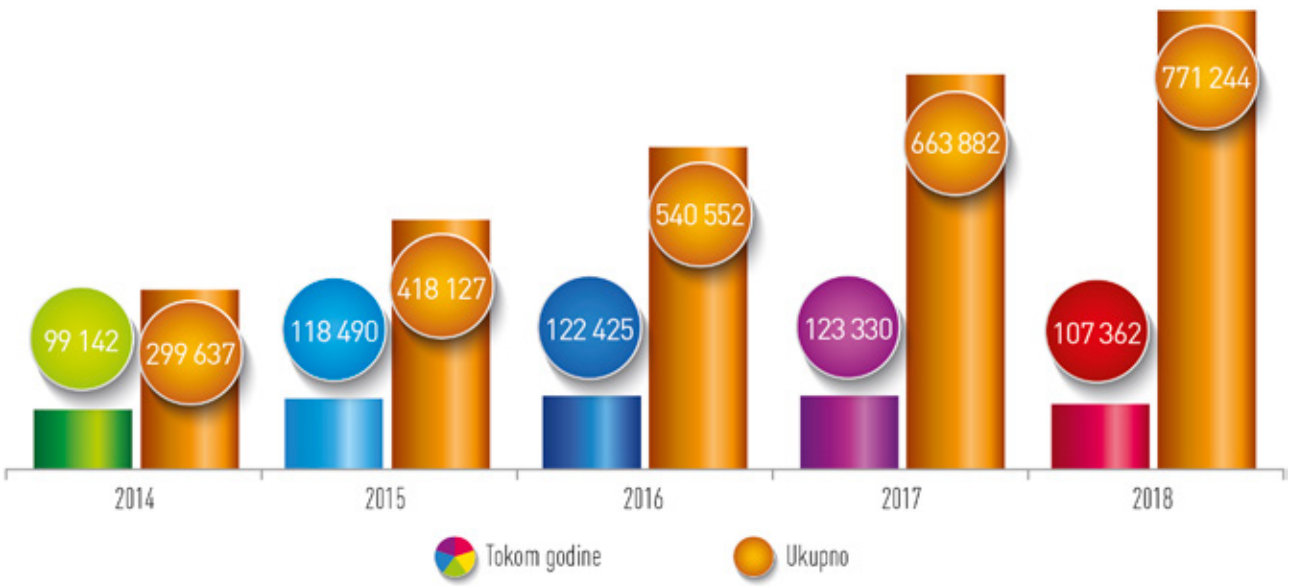
Slika 6.20. Average number of portings on mobile network a month for each year



Source: **RATEL**

In 2018 there were around 107,362 number portings on mobile networks, thus reaching the total of 771,244 portings made since the beginning of number portability service.

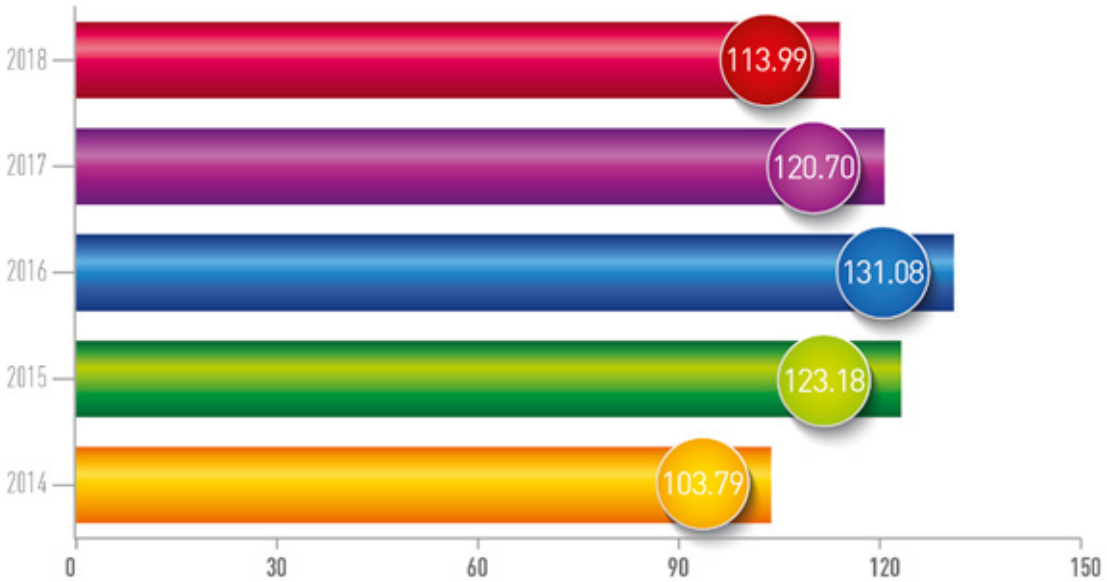
Figure 6.21. Number of portings on mobile network each year and in total



Source: **RATEL**

In addition to national traffic, the users also use roaming traffic abroad. Voice traffic abroad has been growing until 2016, in the past two years there was a drop. mainly due to usage of VoIP applications.

Figure 6.22. Number of roaming minutes (million)

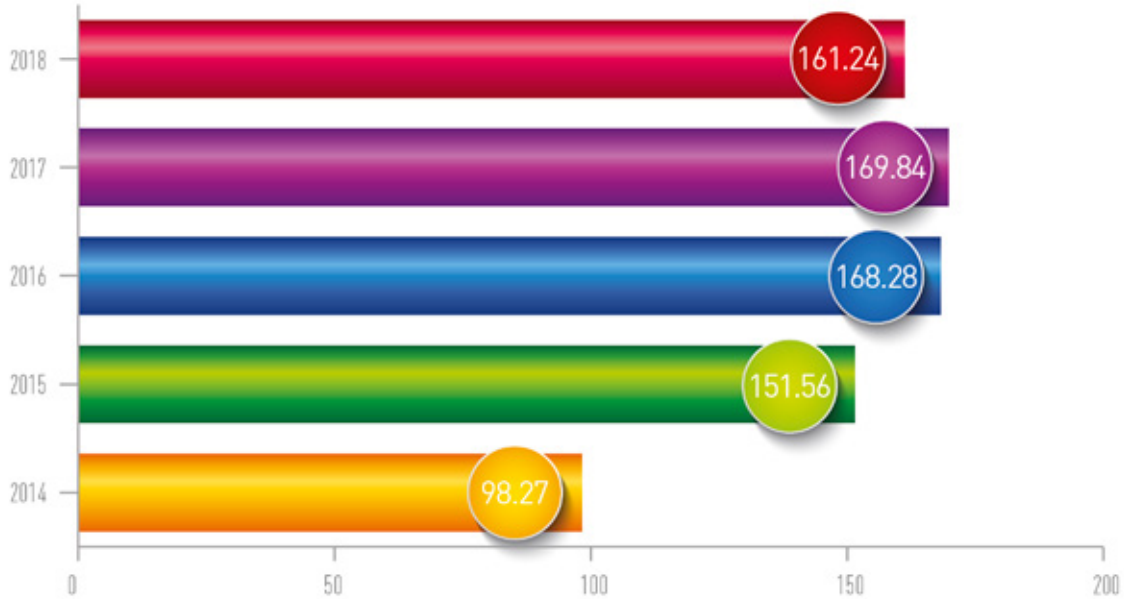


Source: **RATEL**

In addition to voice traffic, the users also use mobile internet abroad and according to the available data for 2018, there were 1942 TB of roaming mobile broadband internet traffic made. In addition, 45.3 million text (SMS) messages were sent.

Beside the users of the national networks, the traffic in the territory of Serbia is also generated by foreign network subscribers, with increase in voice service usage in the previous year, which showed a slight drop in 2018.

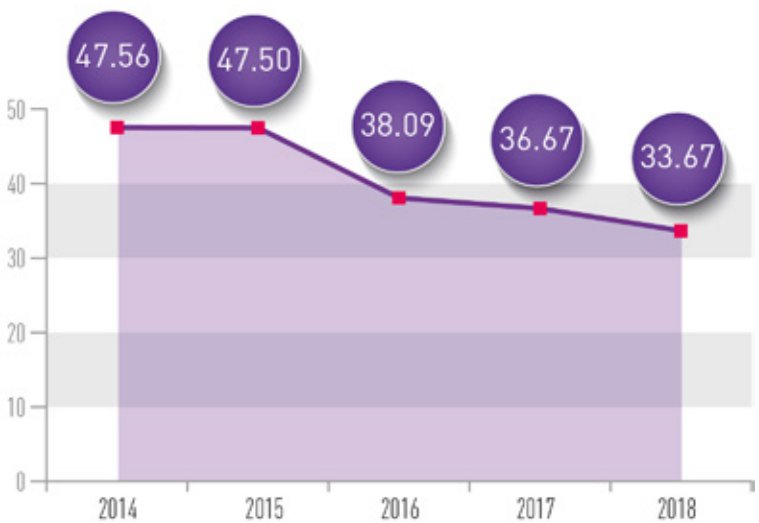
Figure 6.23. Number of roaming minutes made by foreign subscribers (million)



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 6.24. Roaming revenues (mil. EUR)



Source: **RATEL**

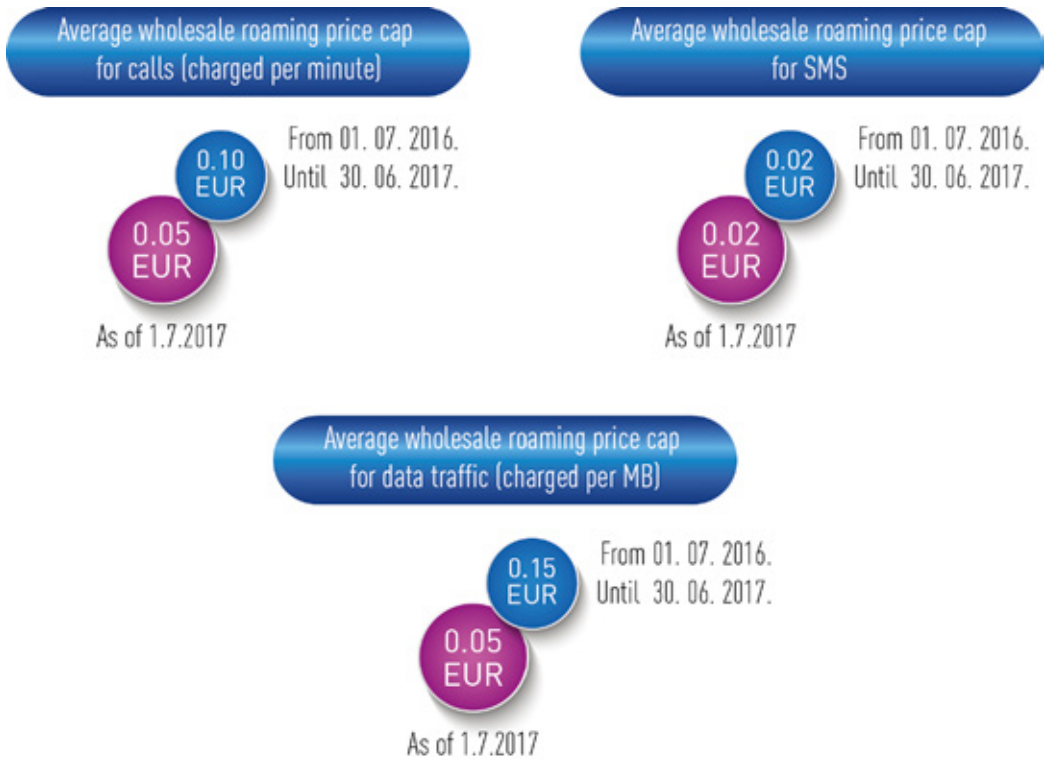
07 REGIONAL ROAMING

Based on the Agreement on the Reduction in Roaming Fees on Public Mobile Communication Networks, signed between Bosnia and Herzegovina, Montenegro, Macedonia and 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 retail and wholesale price caps applied during the second and third implementation phase of the Agreement are given in Figures 7.1 and 7.2.

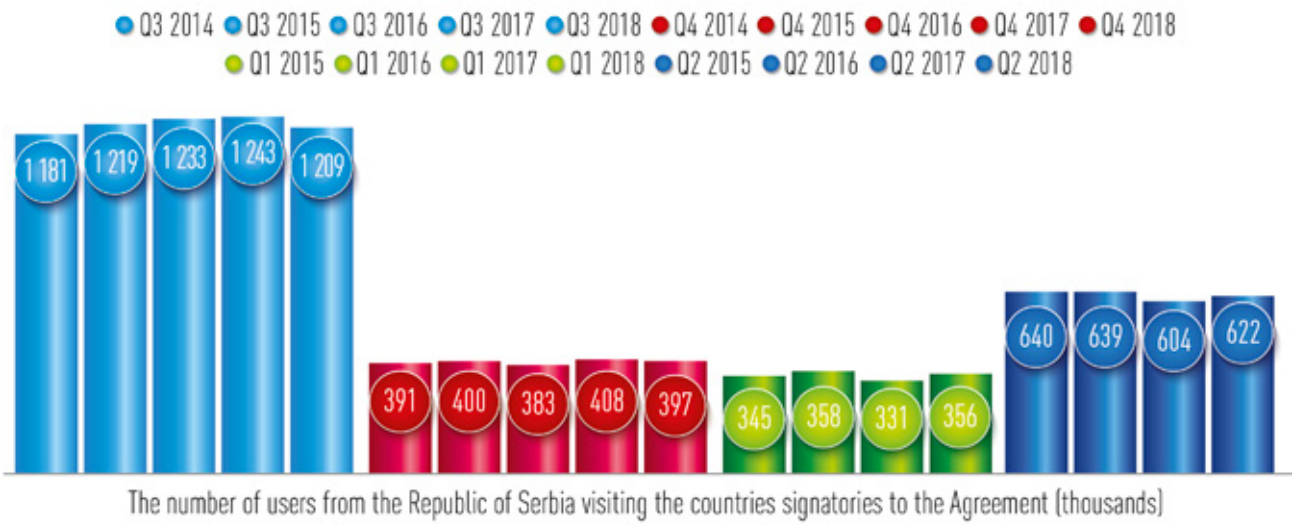
Figure 7.1. Retail roaming price caps (EUR, excluding VAT) applied in the following periods, in the countries that signed the Agreement: 01.07.2016-30.06.2017 and as of 1.07.2017

Figure 7.2. 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



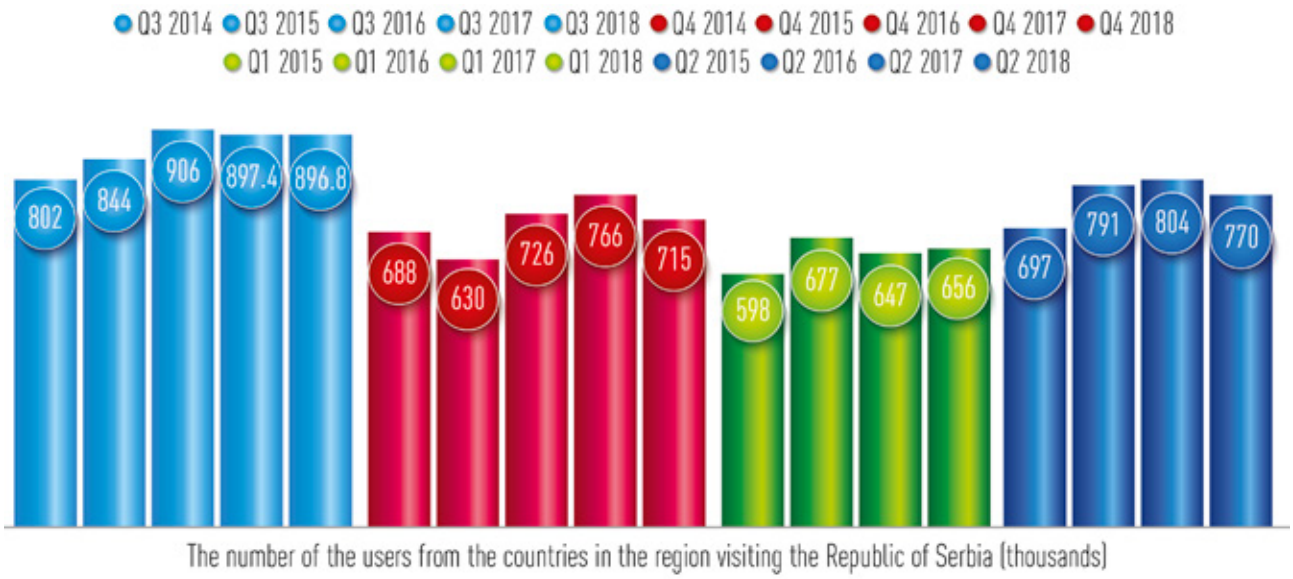
The data on the number of users show that in the third quarter, during the holiday season, there are more people from the Republic of Serbia travelling to the countries signatories to the Agreement compared to the users from the signatory countries visiting Serbia, contrary to the situation in other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

Figure 7.3. The number of users from the Republic of Serbia visiting the countries signatories to the Agreement



Source: **RATEL**

Figure 7.4. The number of users from the Republic of Serbia visiting the countries in the region (thousands)



Source: **RATEL**

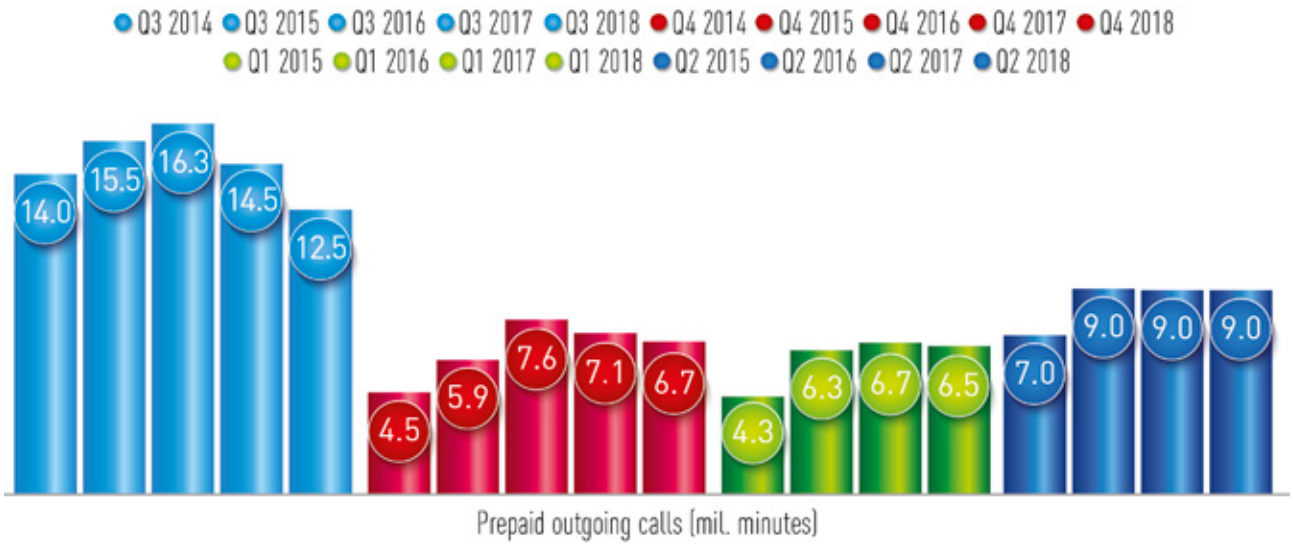
Comparative data for the third and the fourth quarter of 2014 and for the third and the fourth quarter of 2015, 2016, 2017 and 2018 are given below, in order to show the effects of the application of the regulated roaming tariffs.

The overview shows the trend followed by the traffic 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.

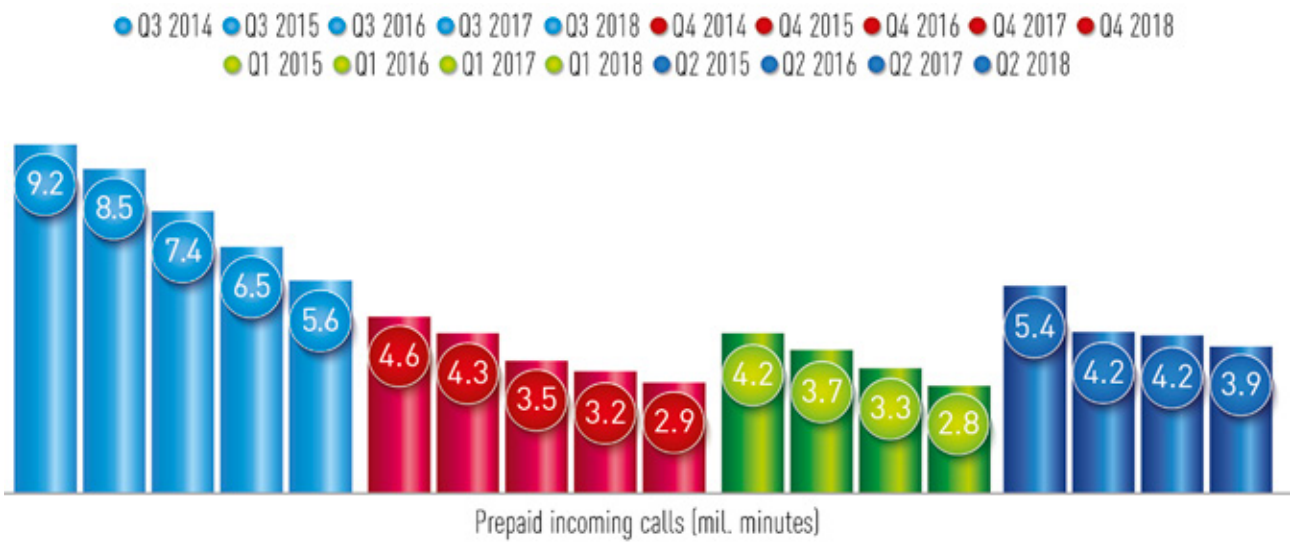
The quarterly comparative data show a growth in the traffic for most roaming voice services. The data which refer to the prepaid users, show a growth in the outgoing calls until 2017, when the drop in the number of prepaid users resulted in the drop in traffic and decrease in the number of minutes, with the exception of 2017 Q1. In 2018 outgoing minutes continued to drop, with the exception of Q2 2018 when a slight growth was seen as compared to Q2 2017. Comparable quarters show that the number of incoming call minutes has been decreasing over the entire observed period.

Figure 7.5. Roaming outgoing calls made by prepaid users in the countries signatories to the Agreement (million minutes)



Source: **RATEL**

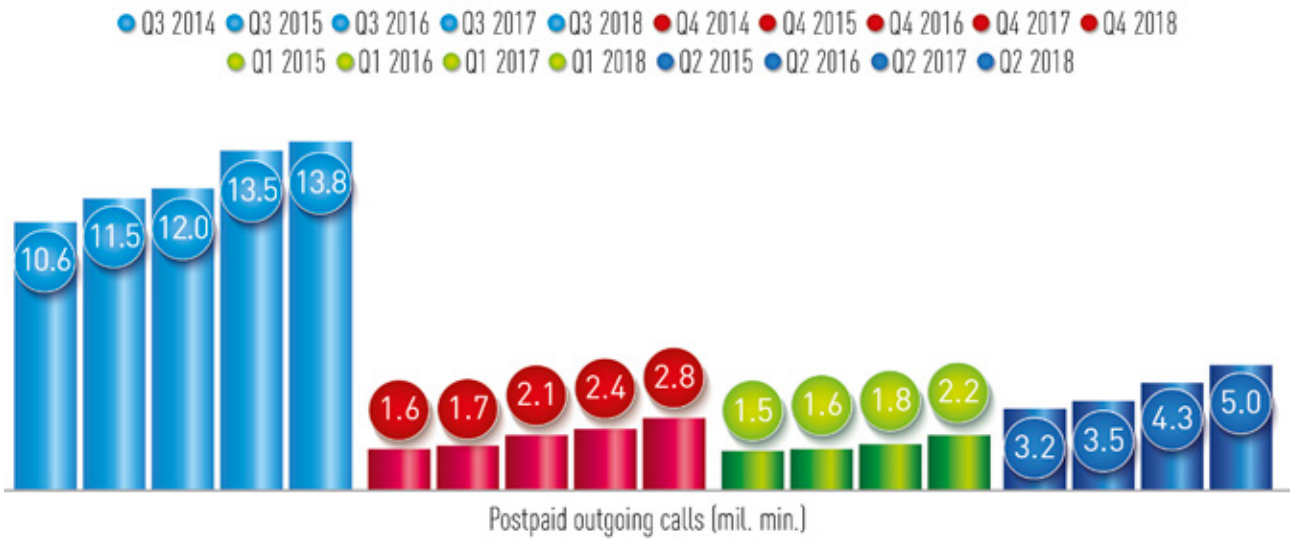
Figure 7.6. Roaming outgoing and incoming calls made by prepaid users in the countries signatories to the Agreement (million minutes)



Source: **RATEL**

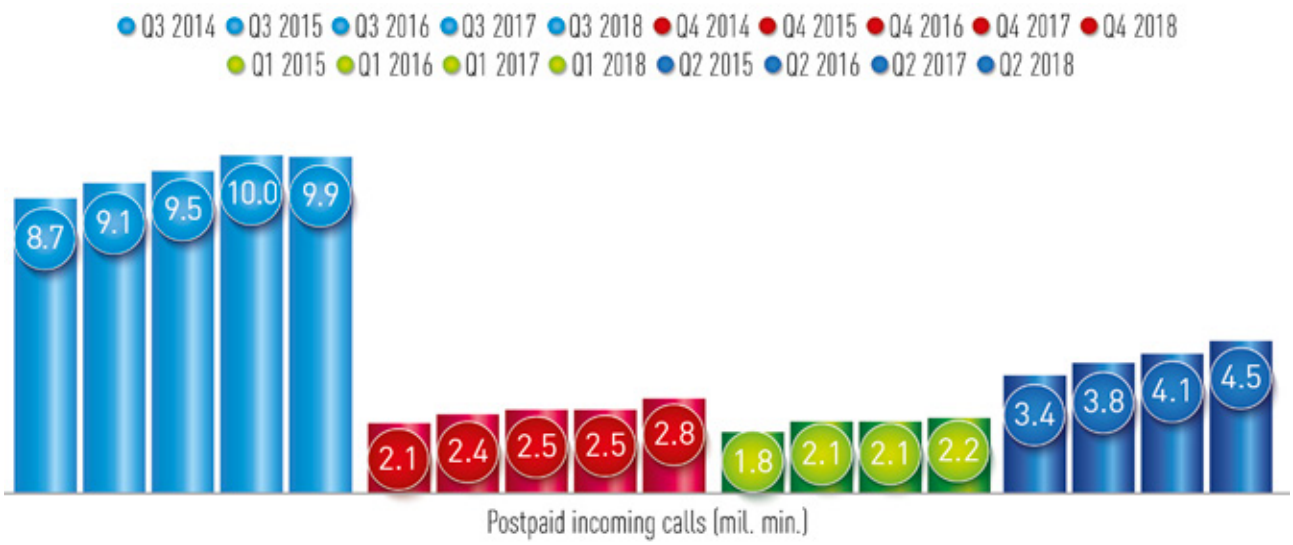
Comparable quarterly data show a growth in both outgoing and incoming calls with postpaid users, with the exception of 2017 Q1 and Q3 2018, when a drop was seen in respect to comparable quarter of the previous year (Figure 7.7 and 7.8).

Figure 7.7. Roaming outgoing calls made by postpaid users in the countries signatories to the Agreement (million minutes)



Source: **RATEL**

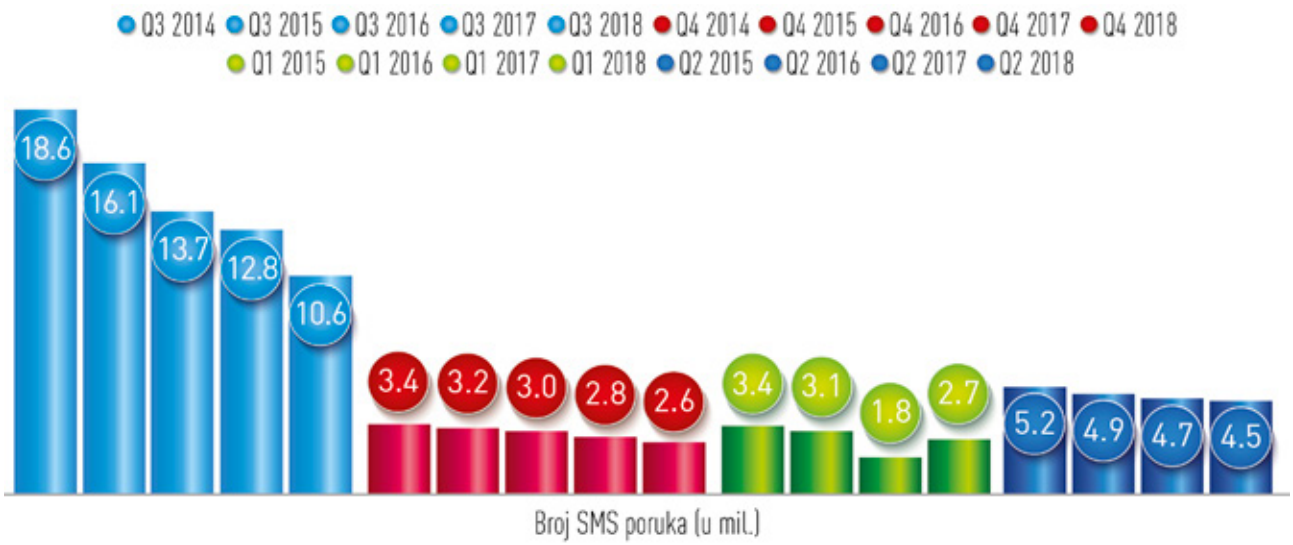
Figure 7.8. Roaming incoming calls made by postpaid users in the countries signatories to the Agreement (million minutes)



Source: **RATEL**

The same as in the national market, there was a drop in roaming SMS messages as well, with the exception of Q1 2018 when an increase was seen compared to Q1 2017 (Figure 7.9).

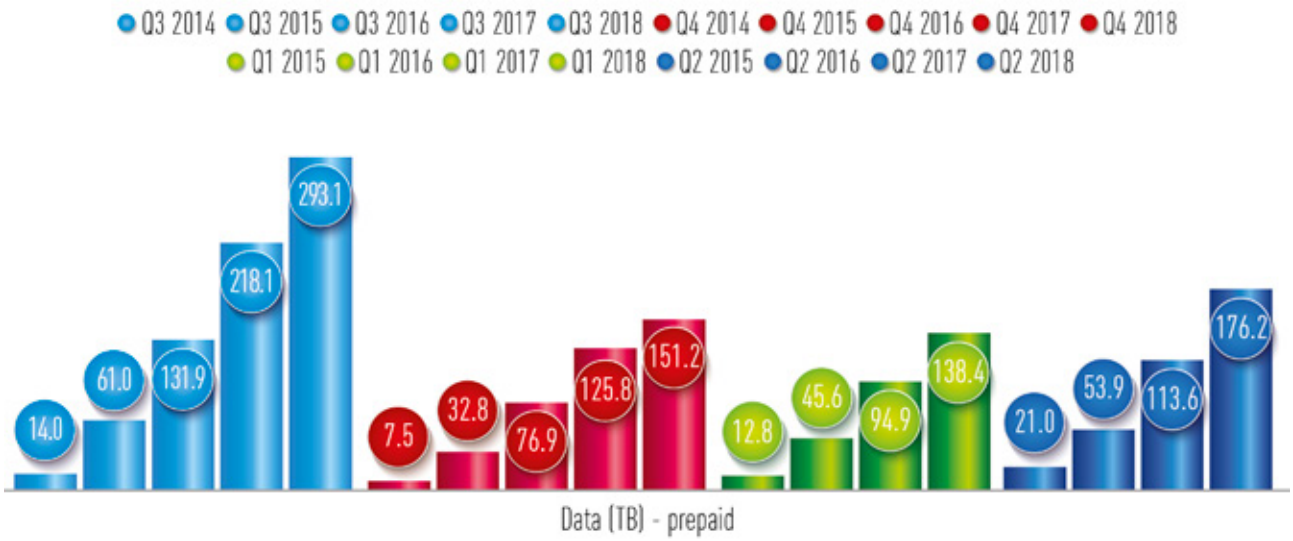
Figure 7.9. Number of roaming SMS messages sent in the countries signatories to the Agreement (million)



Source: **RATEL**

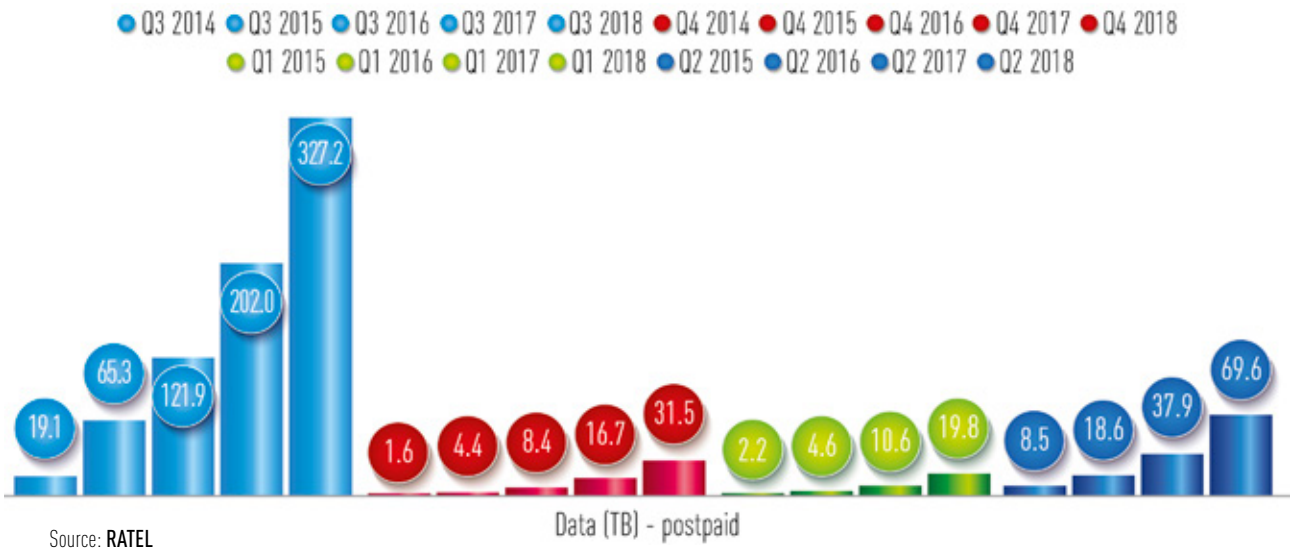
Roaming data transmission is the service with the biggest and a rather significant rise, with both types of users, based on the comparable quarterly data (Figure 7.10 and 7.11).

Figure 7.10. Roaming data traffic made in the countries signatories to the Agreement - prepaid (TB)



Source: **RATEL**

Figure 7.11. Roaming data traffic made in the countries signatories to the Agreement - postpaid (TB)



Source: **RATEL**

The absolute vales 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. The only exception is Q1 2018, when a slight increase in the revenues made from outgoing calls was seen (Figures 7.12 and 7.13).

Figure 7.12. Revenues made from outgoing call service provided to prepaid users in the countries signatories to the Agreement (EUR thousands)

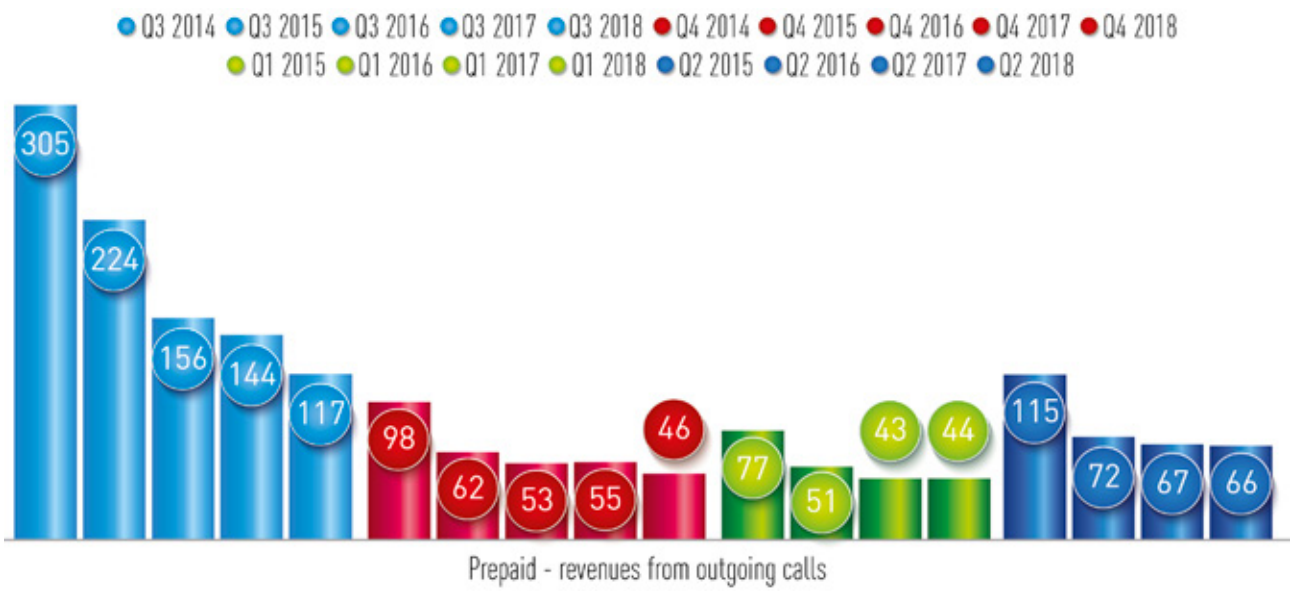
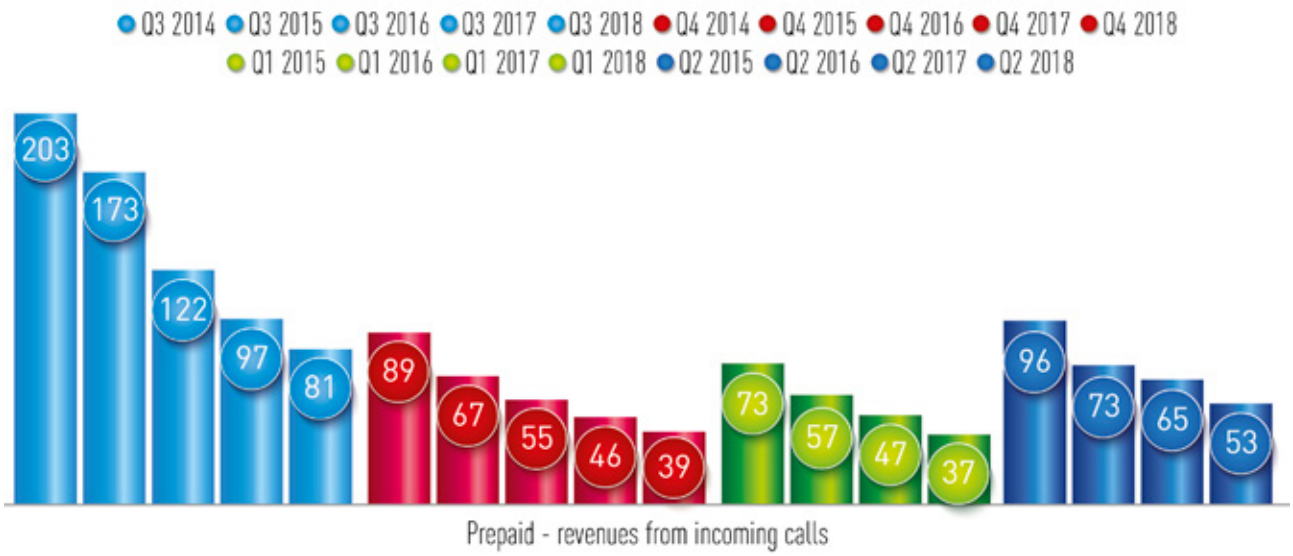


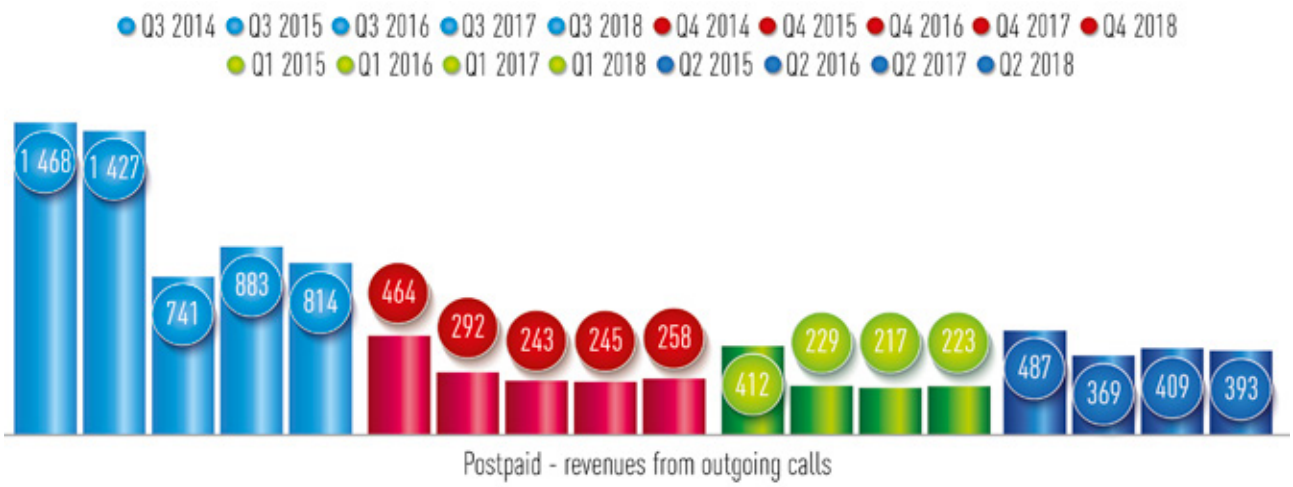
Figure 7.13. Revenues made from incoming call service provided to prepaid users in the countries signatories to the Agreement (EUR thousands)



Source: **RATEL**

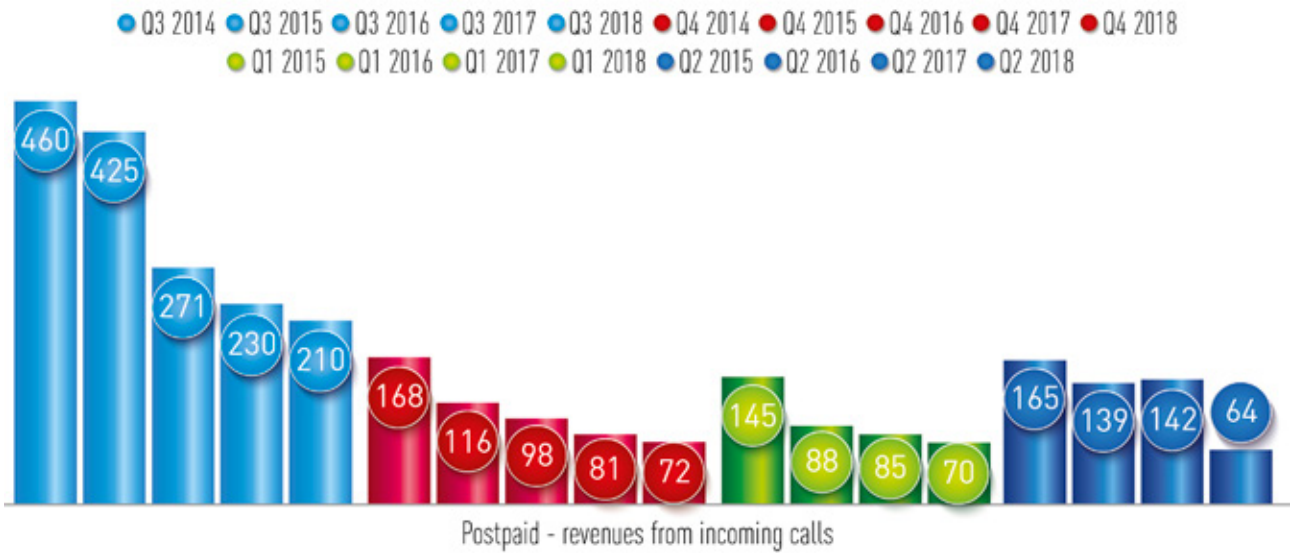
The revenues made from incoming and outgoing calls provided to postpaid users have shown a decrease in all comparable quarters, year after year, with the exception of 2018 Q1 and Q4, when a slight increase in the revenues from outgoing calls was made. (Figure 7.14 and 7.15).

Figure 7.14. Revenues made outgoing call service provided to postpaid users in the countries signatories to the Agreement (EUR thousands)



Source: **RATEL**

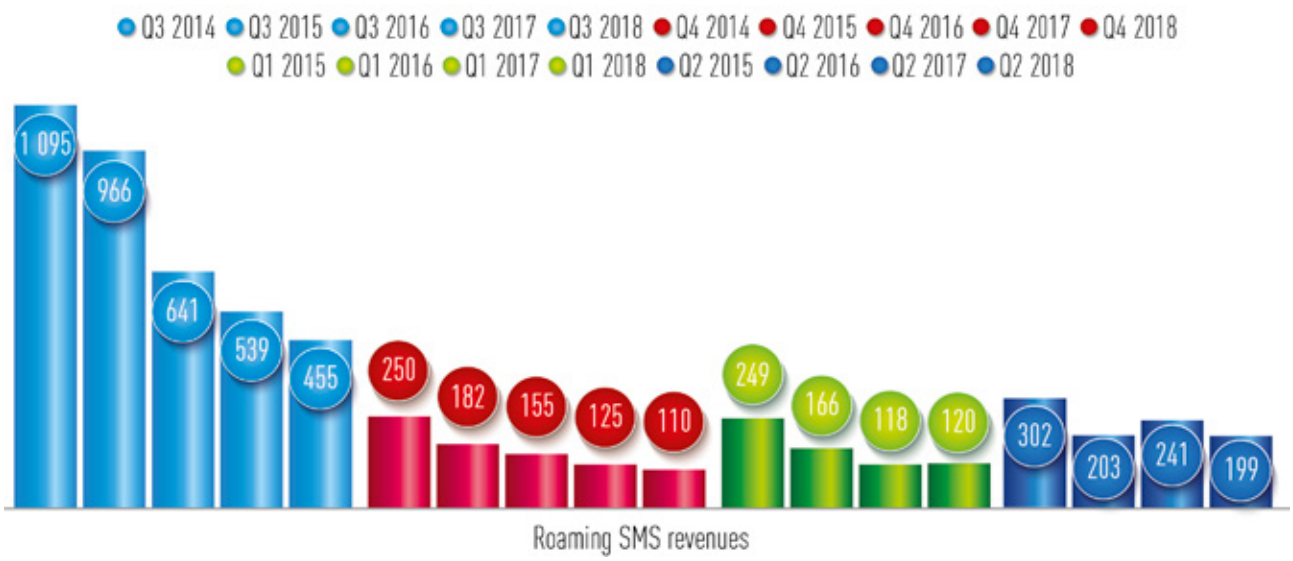
Figure 7.15. Revenues made incoming call service provided to postpaid users in the countries signatories to the Agreement (EUR thousands)



Source: **RATEL**

Revenues made from roaming SMS messages have also been dropping in the observed comparable quarters, with the exception of Q2 2017 and Q1 2018 when a slight increase in the revenues has been seen (Figure 7.16).

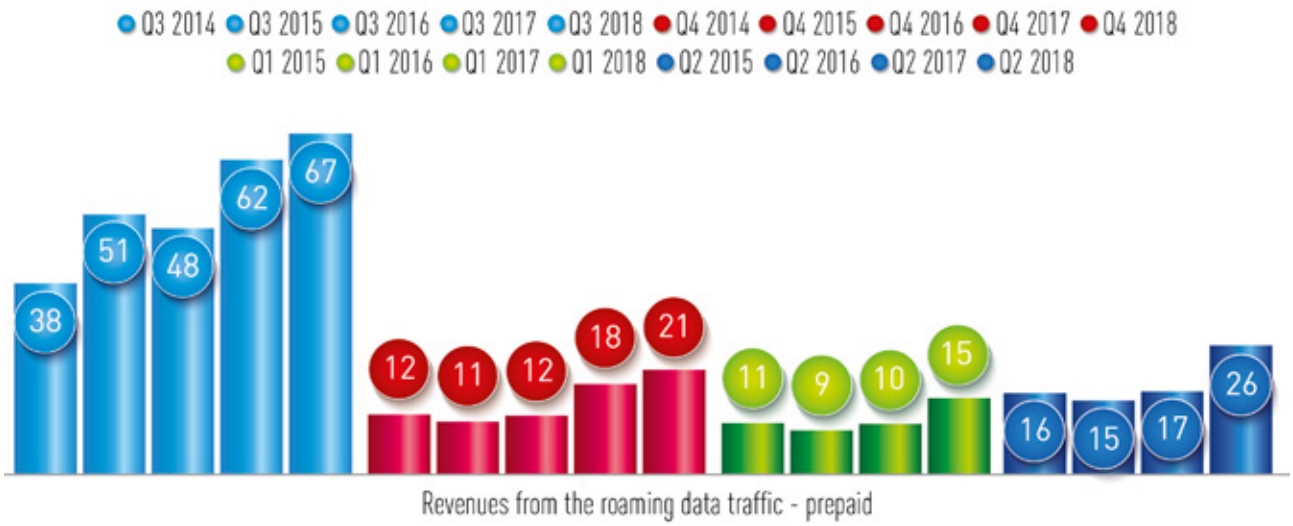
Figure 7.16. Revenues made from roaming SMS messages in the countries signatories to the Agreement (EUR thousands)



Source: **RATEL**

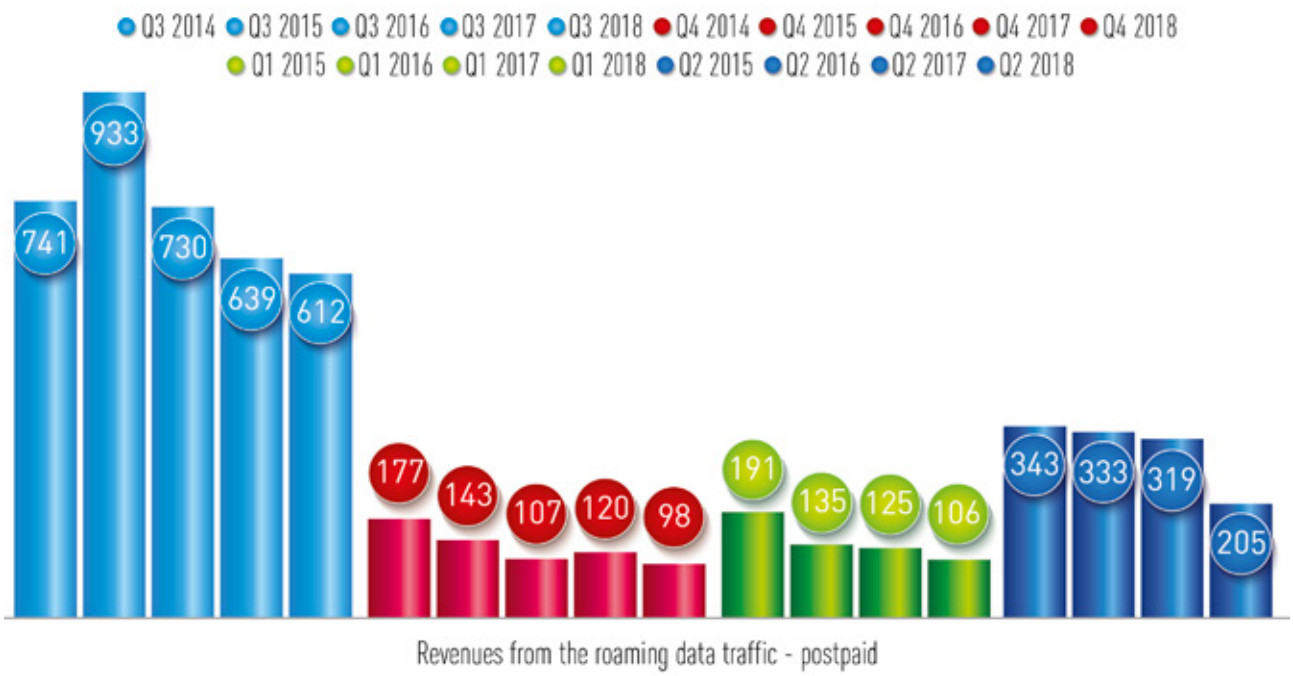
The revenues made from the roaming data traffic made by prepaid users increased in all four quarters of 2018, compared with the comparable quarters the year before. As for postpaid users, the revenues decreased in all four quarters of 2018, compared with the comparable quarters the year before (Figures 7.17 and 7.18).

Figure 7.17. Revenues made from the roaming data traffic in the countries signatories to the Agreement – prepaid (thousands of EUR)



Source: **RATEL**

Figure 7.18. Revenues made from the roaming data traffic in the countries signatories to the Agreement – postpaid (thousands of 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.

08 BROADBAND INTERNET SERVICE

The Internet market in Serbia has been experiencing a significant growth for years, which continued to a somewhat smaller extent in 2018. 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 high-rate packages. Since OTT and video streaming services are on the rise and the number of connected devices at home is increasing, the users show a greater demand for higher rates in order to upgrade their experience with digital service usage. The increasing demand for broadband access produces the need for faster and more reliable networks, which results in the changes in infrastructure used to provide services to the users, so that optical infrastructure is increasingly used to provide broadband access to users.

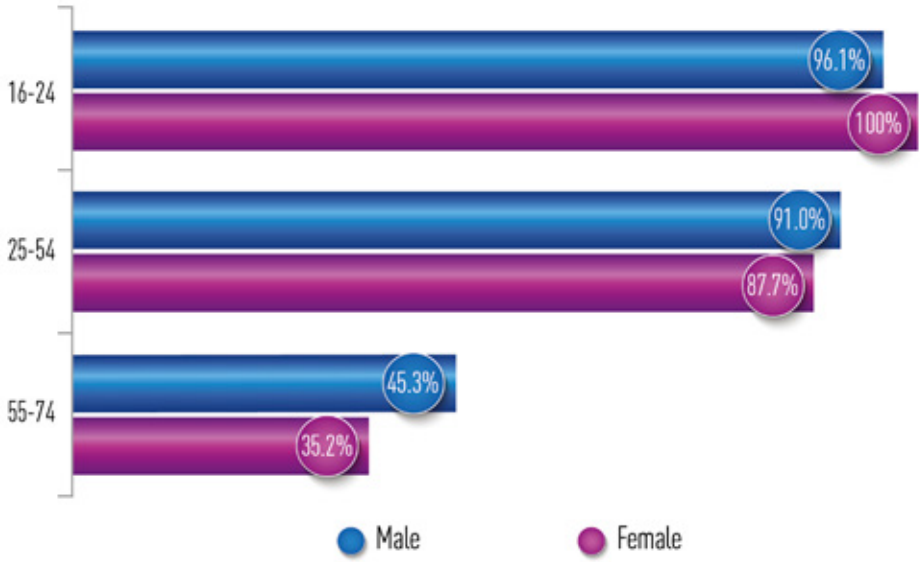
According to the survey on ICT usage by individuals, households and business, carried out in 2018 by the national Statistical Office on the sample of 2800 households and 2800 individuals, the number of Internet users increased slightly compared to the previous year, by 1.4%, and in Q1 2018, **seven out of ten persons in Serbia used the Internet.**[6]

The Internet was used most by the youngest population (16 – 24 years). 100% of female respondents in this user reported to have used the Internet in the last three months. Compared with 2017, the share of respondents who have an account on the social networks such as Facebook and Twitter slightly increased, from 90.6% to 96.4%.

The survey showed that the older age group (25-54 years) used the Internet less than the youngest population. The smallest share of Internet users is in the oldest group, comprising individuals between the age of 55 and 74 years (Figure 8.1). This group also displays the greatest discrepancy between genders regarding the usage of Internet.

6 Data taken from the publication "Usage of information and communication technologies in the Republic of Serbia, 2018", Statistical Office of the Republic of Serbia, based on research from March 2018.

Figure 8.1. Internet users by gender and age

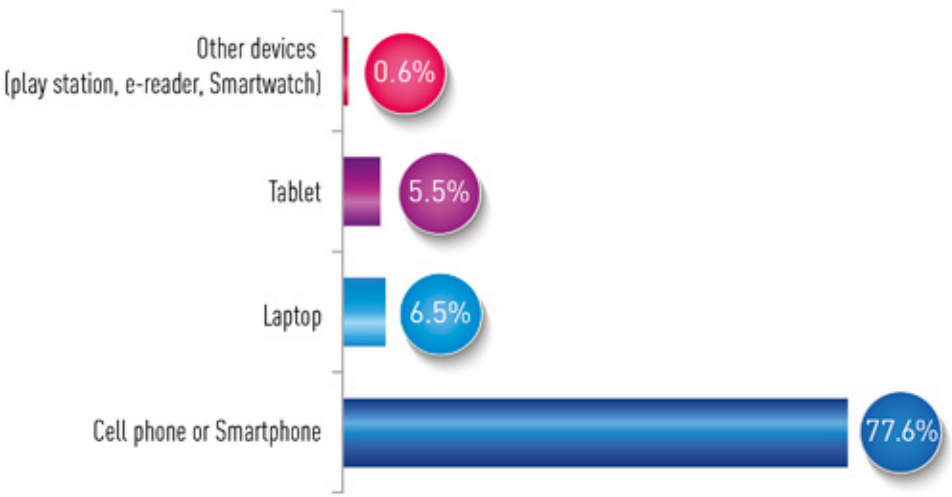


Source: **Statistical Office of the Republic of** Serbia

It would be hard to imagine life without telecom systems and the Internet and it seems that this is just the beginning of the technological advantages of modern digital era. 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.

77.6% of the respondents use a Smartphone for the Internet access outside home or work, which is particularly characteristic for the youngest population (16-24 years old) since more than 89.1% of them are using Smartphone for the Internet access (Figure 8.2).

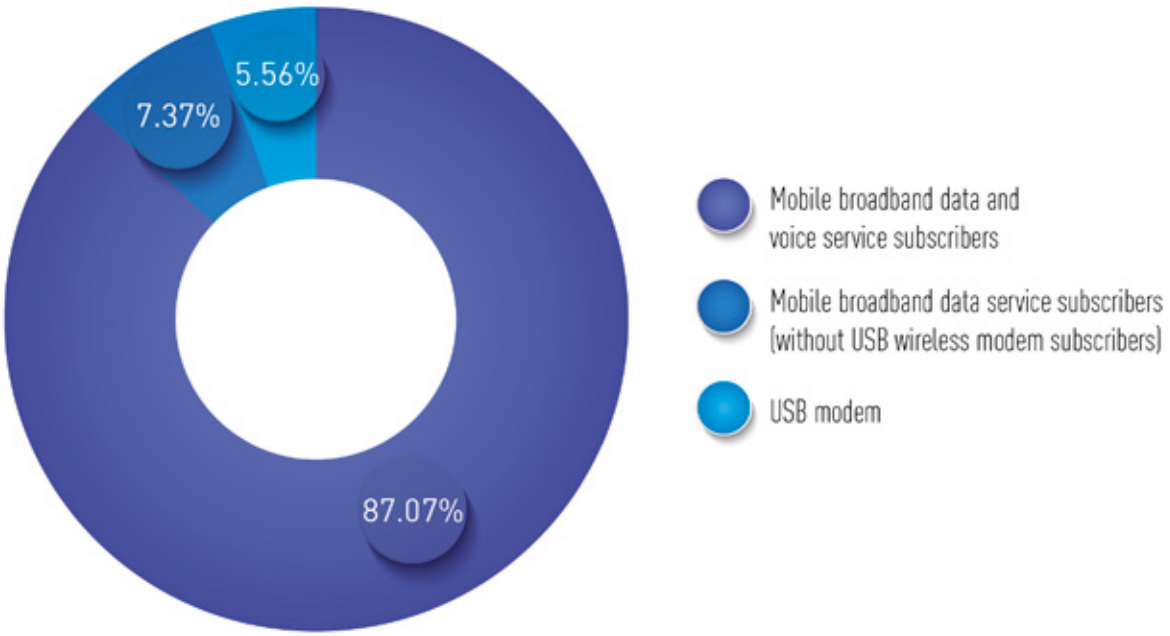
Figure 8.2. Devices used for the Internet access outside home/work



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 in 2018 by three mobile operators: Telekom Srbija, Telenor and Vip mobile and one virtual mobile operator - Globaltel.

Figure 8.3. Mobile broadband users structure

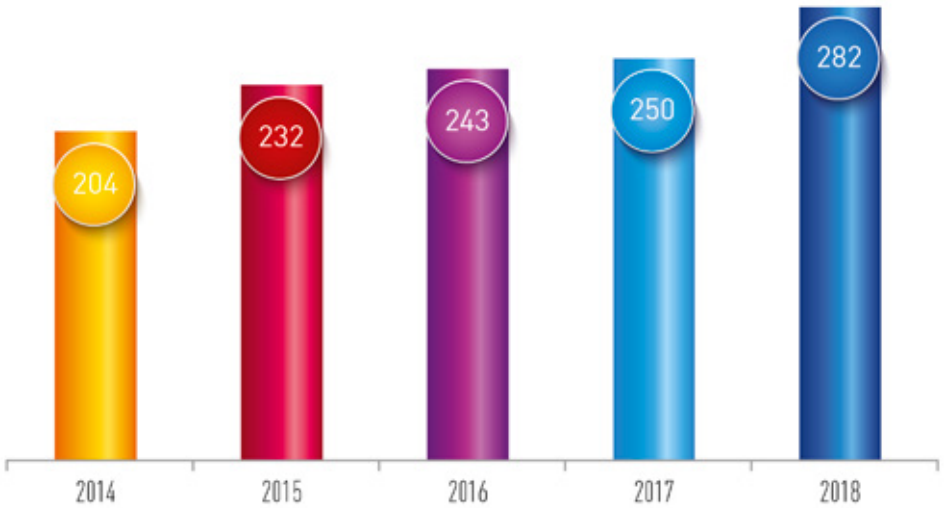


Source: **RATEL**

The total number of active mobile broadband users in 2018 was 6.2 million, including the subscribers of mobile broadband data and voice service, data service only and subscribers using USB wireless modem for the Internet access, which is a significant increase compared to 2017. This is a 10.7% increase compared to 2017 when the number of users was around 5.6 million. Data show that the number of subscribers who purchased mobile broadband Internet services independently of voice services increased compared to the previous year.

The number of M2M subscriptions increased as well, amounting to 282 thousand in 2018, which is by 12.8% more than the previous year.

Figure 8.4. Number of M2M subscriptions (thousand)

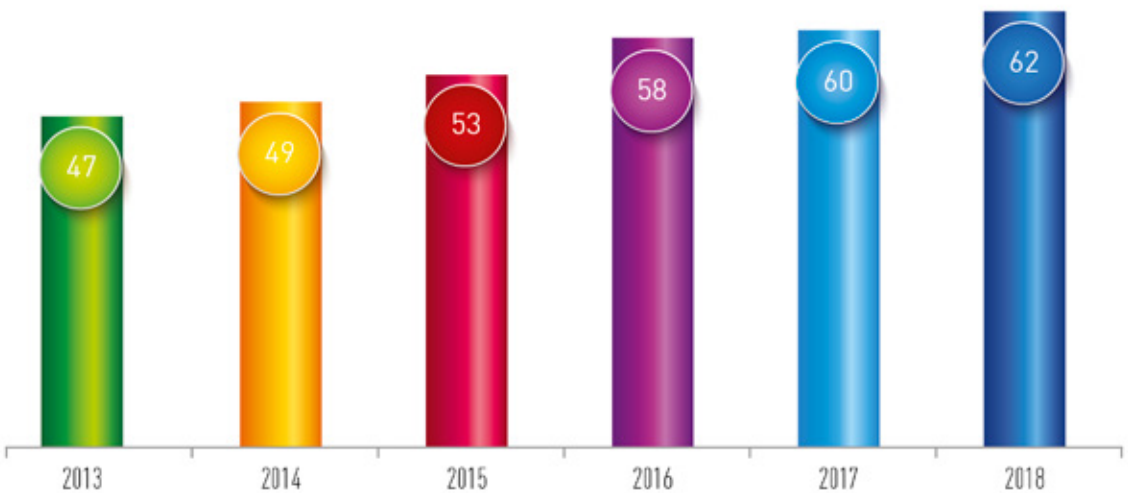


Source: **RATEL**

The increase in the number of users resulted in the increase in the traffic volume, which doubled compared with the previous year, amounting to almost 218 million GM on an annual level in 2018 for entire UMTS and LTE traffic (the traffic includes mobile Internet users, via cell phones and modems), where, as expected, LTE traffic increased the most, as much as four times.

The best sold mobile Internet package for private postpaid users offered 30 GB of data transmission at the price of 1599 dinars.

Figure 8.5. The number of fixed broadband internet subscribers per 100 households



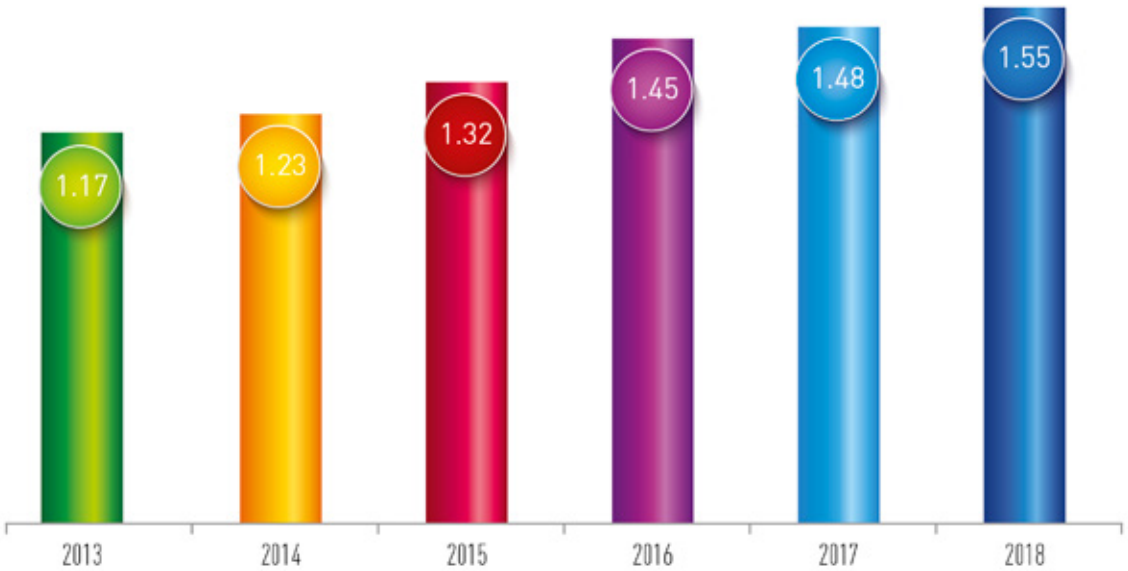
Source: **RATEL**

In 2018, sixty-two out of one hundred households (62.39%) had fixed broadband.

There were 194 registered ISPs for broadband service in 2018 in Serbia.

The total number of fixed broadband subscribers in 2018 was 1.55 million, which is a 4.7% increase compared with the previous year (Figure 8.6).

Figure 8.6. The total number of subscribers of fixed broadband Internet access (million)



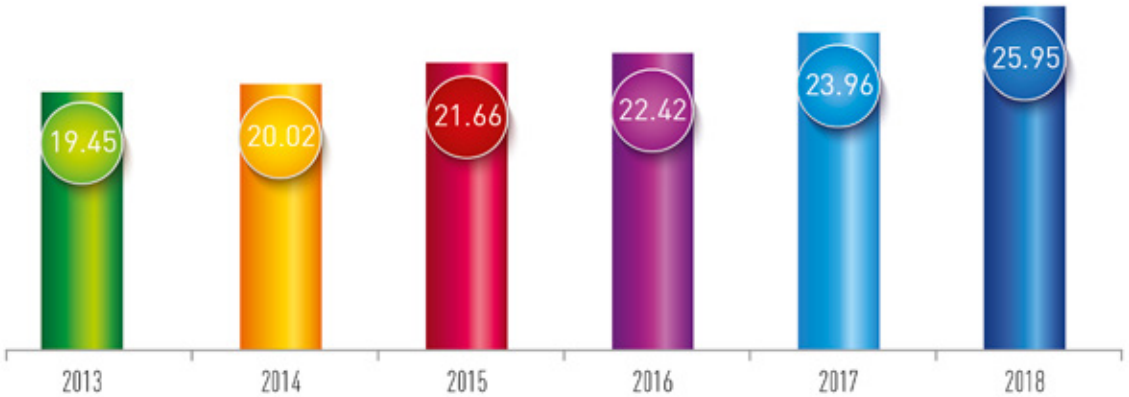
Source: **RATEL**

In terms of technology used, based on the available data, the biggest percentage increase of 45% was seen in the number of users with FTTH or FTTB Internet access, however this number is still relatively low, corresponding to 7% of the total number of broadband users. The number of users with coaxial cable infrastructure grew by 13%, whereas the number of users with fixed wireless access dropped by 8%. The number of users of xDSL decreased by 5% for two years in a row. However, xDSL subscriber structure changed significantly with a significant increase of the number of users of VDSL technology that account for 42% of the total number of xDSL users, due to greater demand for packages with bigger throughput.

As for household coverage by NGN (VDSL, coaxial DOCSIS 3.0 and FTTB/H), as much as 67,79% of households have a possibility to use networks of over 30 Mbps.

The increase in the number of users is reflected in the increase in the revenues form fixed broadband Internet, which rose by 8.3% (Figure 8.7.)

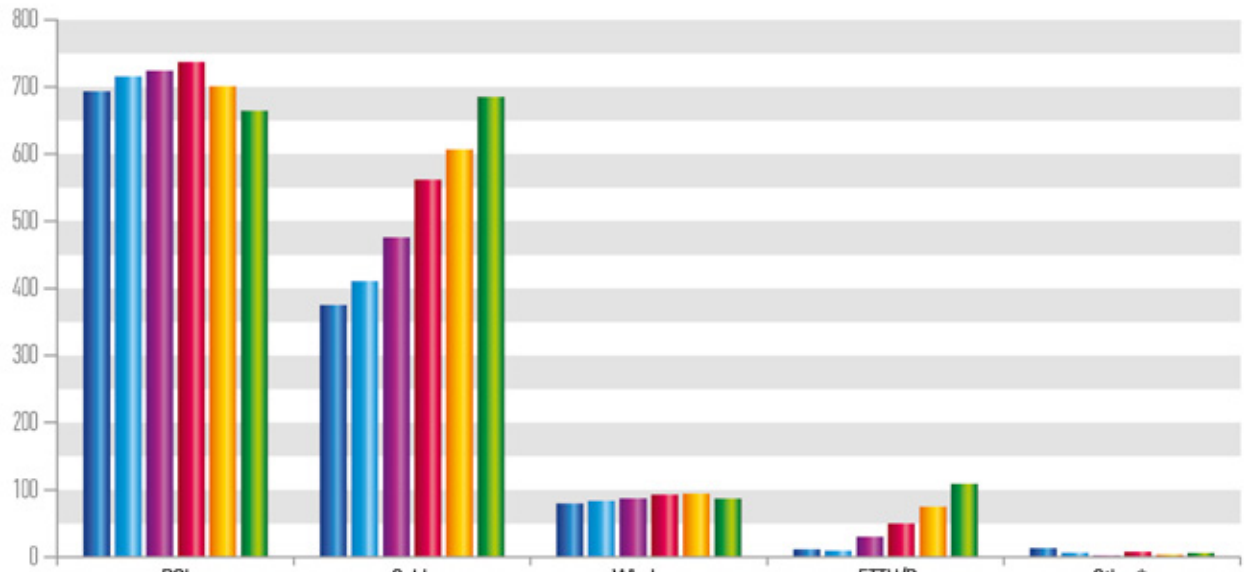
Figure 8.7. Revenues from fixed broadband (billion)



Source: **RATEL**

Coaxial cable infrastructure is for the first time in the five-year period the most widely used access technology with 44% of the total number users, followed by xDSL infrastructure with 43% of users (Figure 8.8).

Figure 8.8. The share of the broadband subscribers by access technology (thousand)



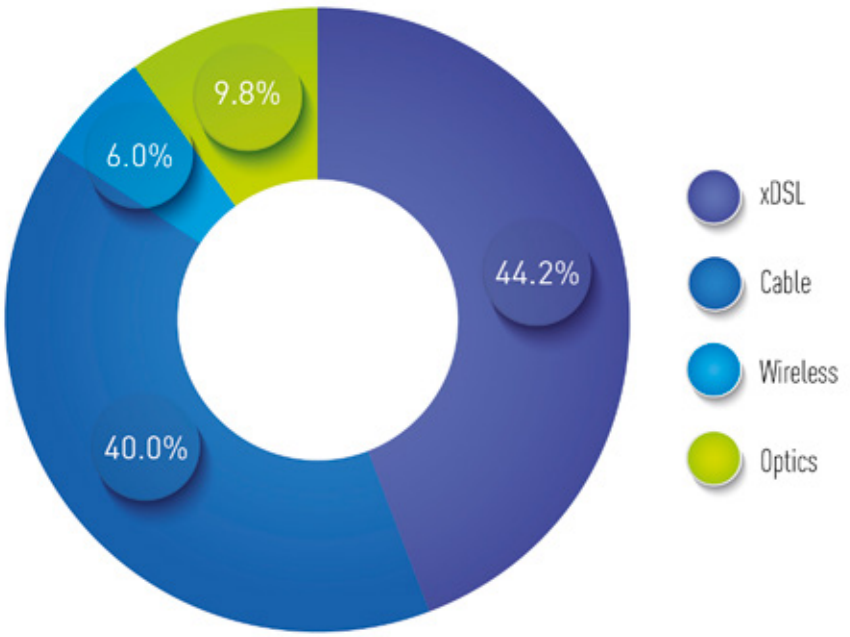
	xDSL	Cable	Wireless	FTTH/B	Other*
2013	693.65	375.33	79.88	11.52	13.53
2014	715.84	410.82	83.64	9.52	6.49
2015	724.16	475.97	87.57	30.53	2.29
2016	737.25	561.94	93.14	50.16	7.99
2017	701.00	606.62	94.49	75.15	3.50
2018	664.61	685.48	87.20	109.04	5.83

* 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 44,2% and 40%, respectively, whereas the share of wireless access was 6% (Figure 8.9).

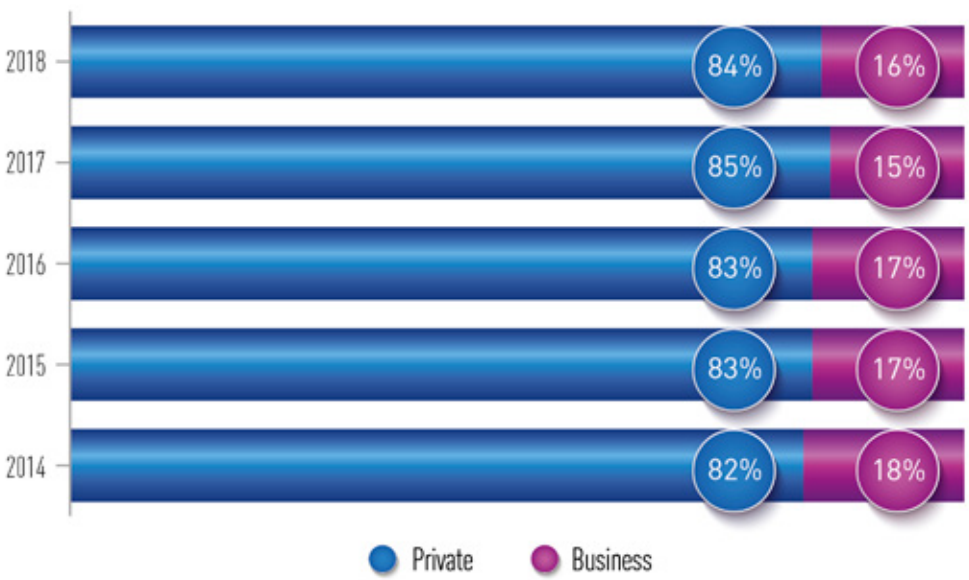
Figure 8.9. The structure of revenues made from fxed broadband, by access technologies



Source: **RATEL**

The revenues from fixed broadband access provision to business users had a similar distribution as in the previous years, corresponding to 16% in 2018. The share of private and business users in the total revenues made in the past five years is illustrated in Figure 8.10.

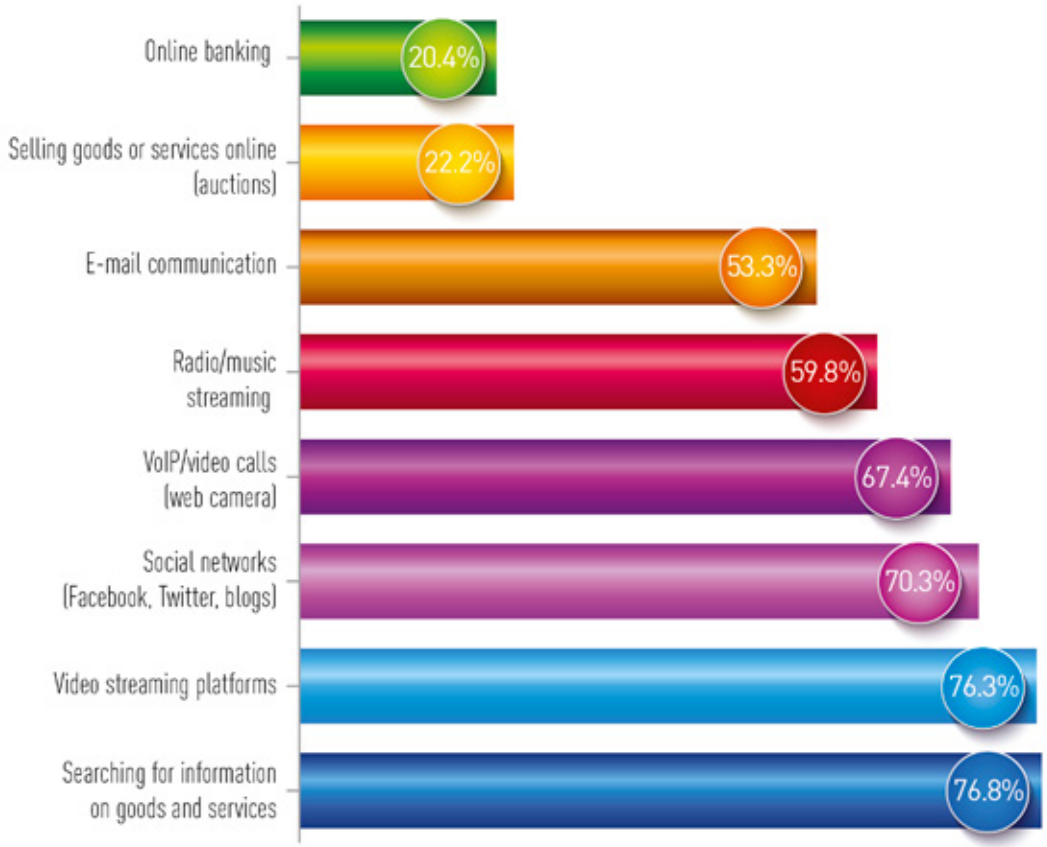
Figure 8.10. Share of private and business users in the total revenues made from fixed broadband Internet service



Source: **RATEL**

The Internet was most used for searching for information on goods and services (76.8%), video streaming platforms (YouTube, Flickr, Picasa) (76.3%) and social networks such as Facebook and Twitter (70.3%).

Figure 8.11. Types of Internet usage for private purposes

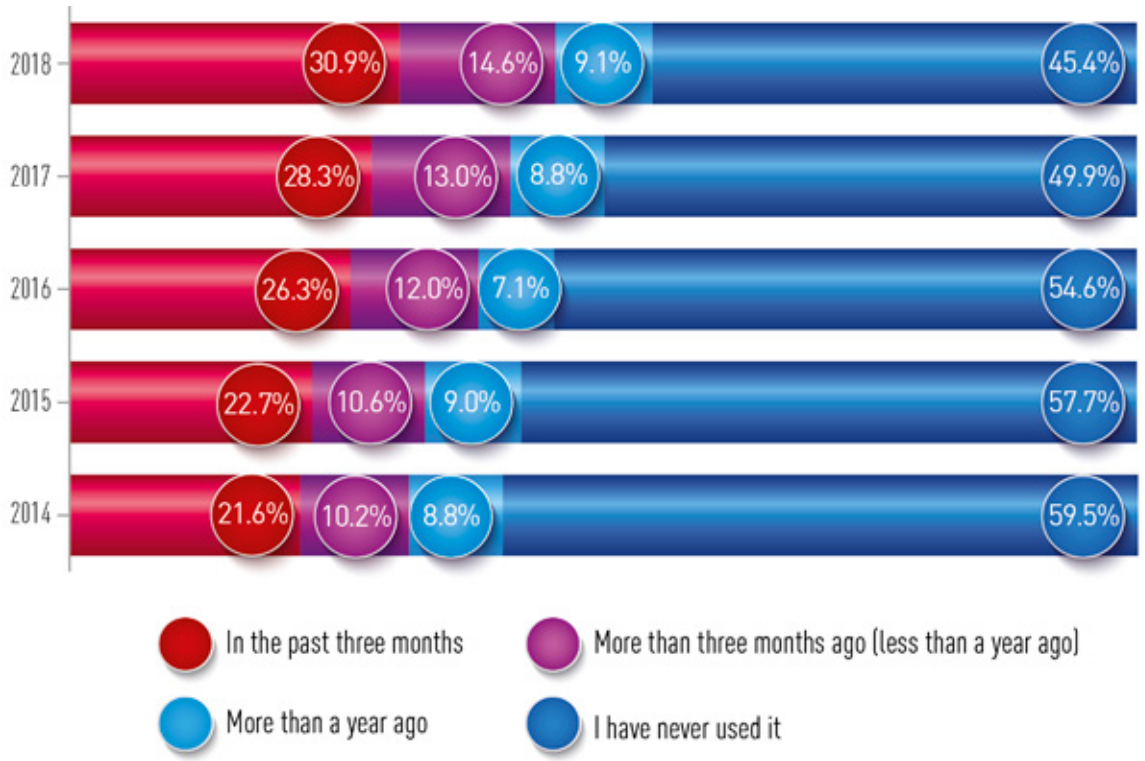


Source: **Statistical Office of the Republic of** Serbia

In 2018, more than 1.8 million people purchased or ordered goods and/or services online.

Online purchase of goods and/or services is growing and the number of persons that made an online purchase was increased by over 170,000 in respect to the previous year. 30.9% of the respondents have ordered goods or services online in the last three months, whereas 45.4% of the respondents 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 8.12.

Figure 8.12. Ordering/purchasing goods or services online



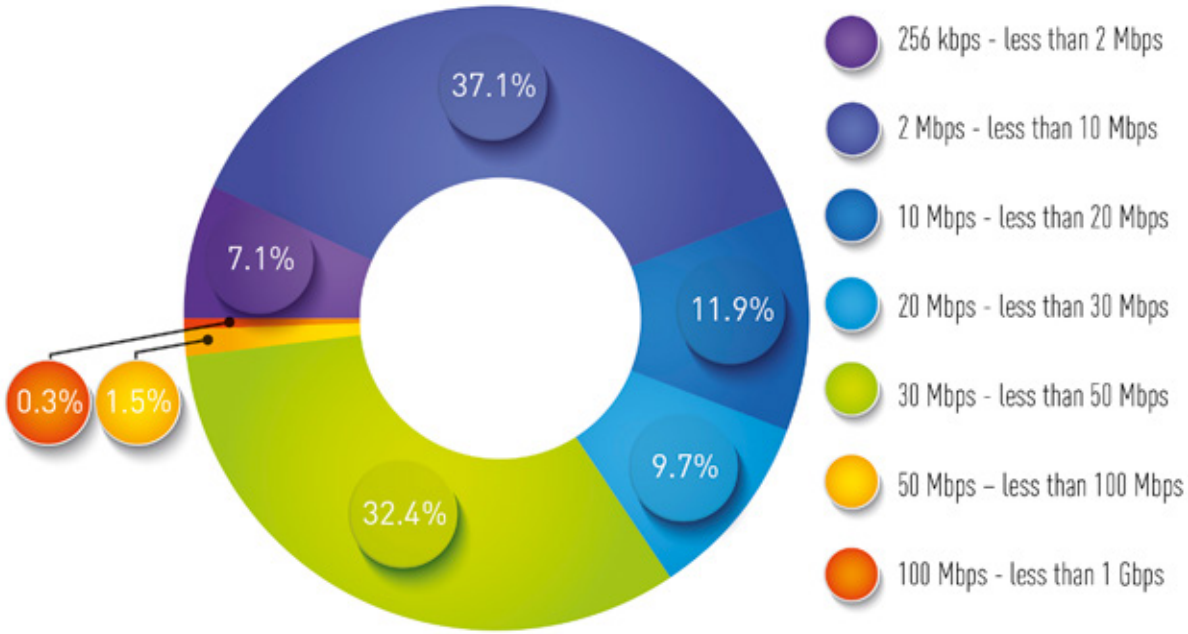
Source: **Statistical Office of the Republic of** Serbia

Changes in user habits, increased number of users accessing video streaming services, along with the increase in the number of device used to access the Internet at the same time have resulted in the change of the package structure and the increase in the traffic volume.

As for fixed broadband access, the same as the previous year, Internet packages offering 10 Mbps were the most sold, at the price ranging between 790 and 2160 dinars.

According to the available data, in 2018 over 37% of fixed broadband users used the packages of at least 10 Mbps but less than 20 Mbps and more than 32% of users used the packages of at least 50 Mbps but less than 100 Mbps.

Figure 8.13. Share of the fixed broadband subscribers, according to access rate

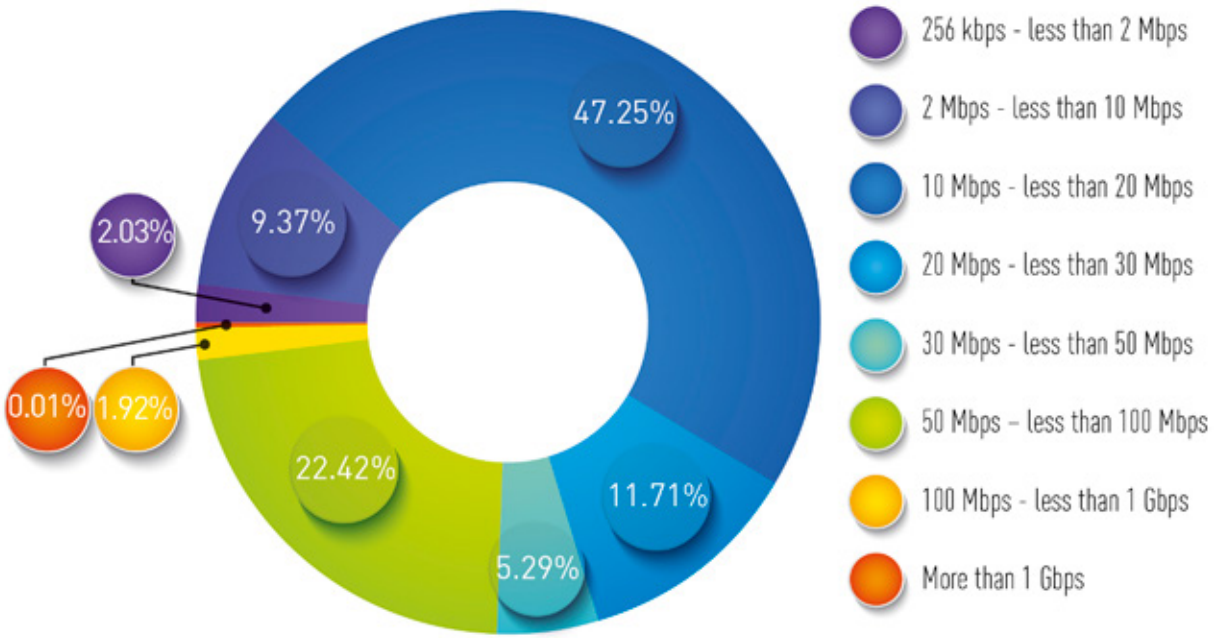


Source: **RATEL**

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 1449 dinars for private users and 4837 dinars for business users in 2018.

Internet connection speed defined under the contract closed between a company and an ISP is given in Figure 8.14.

Figure 8.14. Share of business fixed broadband subscribers, according to access rate



Source: **RATEL**

Out of the total number of companies with Internet connection, 82.6% have their own website, mainly with the purpose of giving the possibility to view contents in customized mode (86%), providing the description of goods or services and price lists (82.6%) and the possibility for consumers to get acquainted with the products (67.6%).

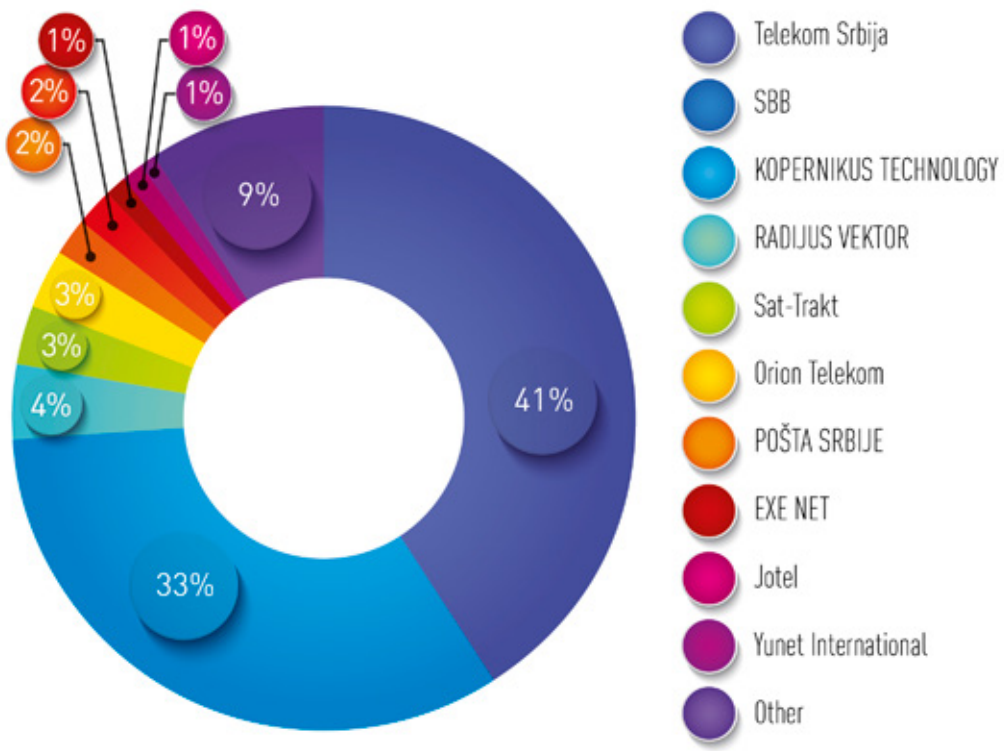
Social networks are becoming increasingly important for the businesses. During 2018, nearly 40% of the companies used social networks, such as Facebook, LinkedIn, Xing or Yammer, for business purposes. Multimedia websites for information sharing, such as Youtube, Flickr, Picassa (20%) and company blogs such as Twitter (10%) were also widely used.

The number of companies paying for cloud service, accessed via Internet for the purpose of software usage, data storage etc. remained 15.5%, the same as 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 within the same household, resulted in the increased traffic volume. Based on the available data, the assessed total traffic made by fixed broadband in 2018 was around 1.26 billion GB (1.17 EB). The assessed international link capacity was approximately 625 thousand Mb/s and the leased international link capacity (*lit/equipped*) was around 2.24 million Mb/s.

Telecommunications Company "Telekom Srbija" remains to be the largest operator of fixed broadband in the Republic of Serbia in 2018, with a market share of 41% in terms of the number of subscribers, showing a decreasing trend in the past two years. Other leading ISPs in the market are: SBB with 33% market share, followed by Kopernikus technology, Radijus vektor, Sat-Trakt, Orion telekom, PE "Pošta Srbije", EXE NET and Yunet International, , each of them holding a significantly smaller share compared to Telekom Srbija and SBB. Together these 10 operators hold 91% of the Serbian ISP market in terms of the number of subscribers.

Figure 8.15. Market share of the leading ISPs in 2018



Source: **RATEL**

The number of broadband subscribers in 2018 amounted to 1.44 million users , based on submitted data.

In 2018, there were 210 active operators providing the Internet access and 111 of them provided the requested data. Information on the number of users and penetration rate for the Internet access by districts and the data for 10 municipalities with the highest penetration rates is based on the submitted questionnaires.

Data on penetration rates for Kosovo and Metohija and for Presevo have not been presented in the table due to unavailability of information on the number of households. The number of users in Kosovo and Metohija reported by the operators registered with the Agency was 1632 and the number of users in Presevo municipality was 2150.

Table 8.1 shows data on broadband penetration rate for households, by districts, based on the analysis of the submitted and processed data for 111 ISPs.

Table 8.1. Internet users by districts

District	Number of households	Total number of broadband subscribers	Household penetration rate (%)
Belgrade	606,433	478,376	78.88
South Bačka	223,653	156,795	70.11
North Bačka	71,416	40,150	56.22
South Banat	101,503	55,070	54.25
Šumadija	97,096	51,740	53.29
Central Banat	68,866	36,582	53.12
West Bačka	68,888	35,553	51.61
Raška	90,515	45,871	50.68
Nišava	128,303	64,477	50.25
Srem	10,5031	50,886	48.45
Podunavlje	64,155	30,760	47.95
Kolubara	58,973	28,106	47.66
Morava	72,867	34,634	47.53
Zlatibor	94,434	41,641	44.10
Mačva	100,136	43,300	43.24
Braničevo	59,776	25,326	42.37
Rasina	77,270	32,383	41.91
Bor	45,970	17,545	38.17
Zaječar	42,445	15,953	37.59
Pirot	34,036	12,236	35.95
Pomoravlje	71,478	25,596	35.81
North Banat	56,800	19,245	33.88
Toplica	31,184	10,355	33.21
Jablanica	66,740	19,862	29.76
Pčinja	49,918	14,081	28.21

Figure 8.16. Internet penetration by districts

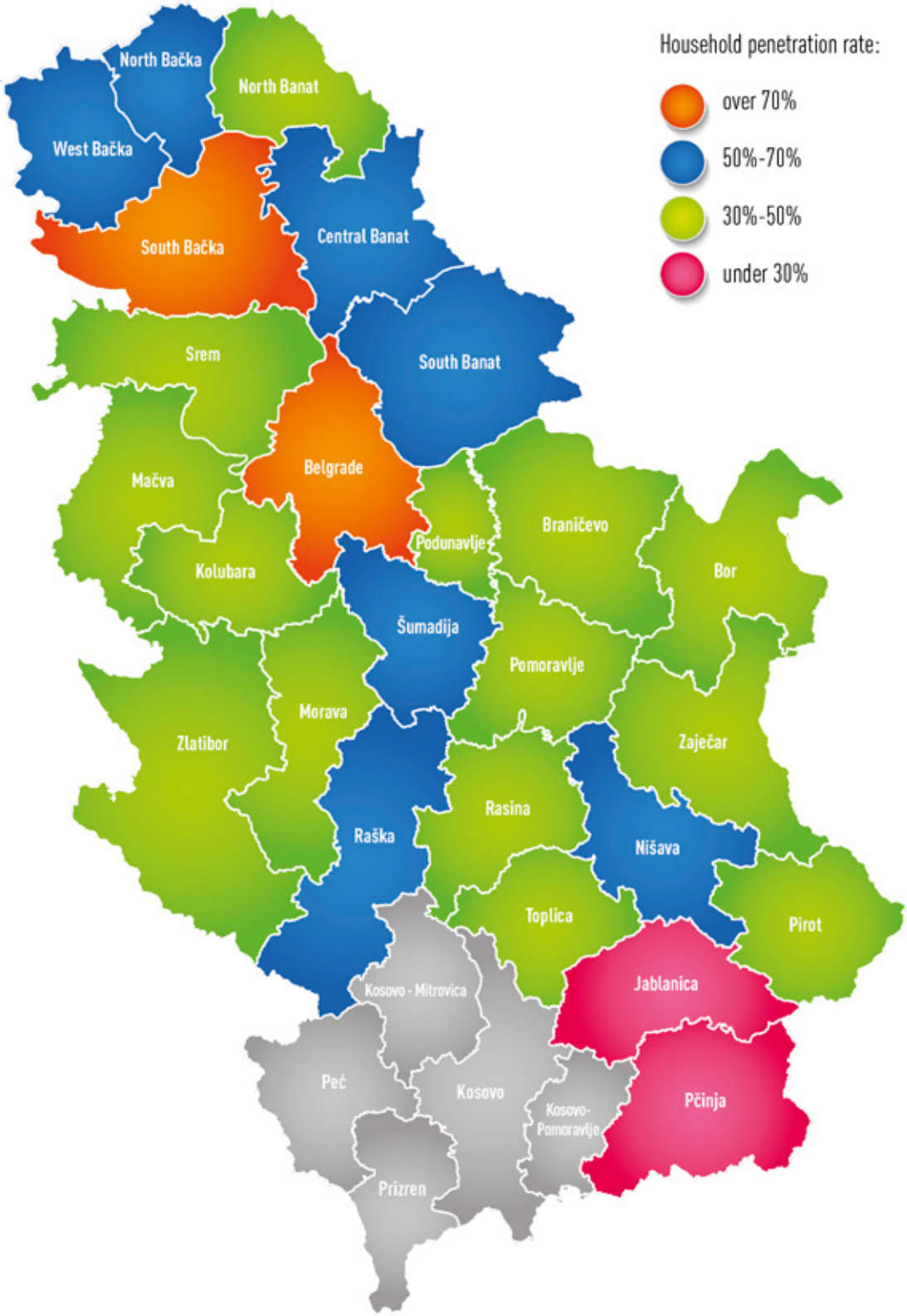


Table 8.2. Internet penetration by districts

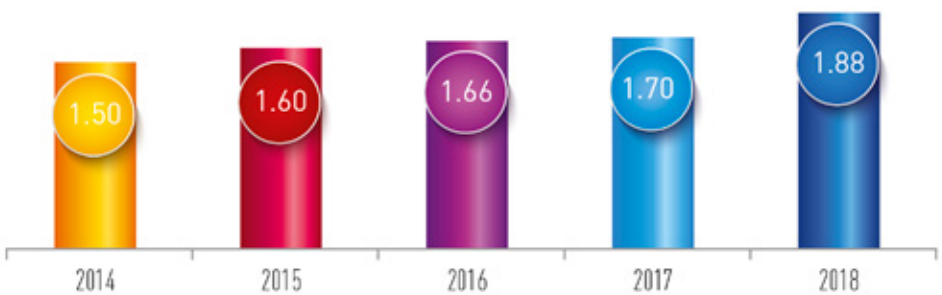
City/municipality	Number of households	Number of users	Penetration (%)
Novi Sad	128,876	113,929	88.40
Belgrade	606,433	478,376	78.88
Vršac	17,769	11,596	65.26
Sjenica	6,618	4,200	63.46
Niš	89,903	54,620	60.75
Novi Pazar	24,090	14,499	60.19
Kragujevac	59,991	35,906	59.85
Novi Bečej	8,757	5,160	58.92
Subotica	54,070	31,653	58.54
Zrenjanin	44,470	25,957	58.37

09 MEDIA CONTENT DISTRIBUTION

In 2018, there were 81 registered media content distribution operators providing the service via cable distribution network (coaxial, hybrid and optical), xDSL technologies, satellite distribution network and wireless network. As of 2016, a new media content distribution service is available – 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. For the provision of this service on the market of the Republic of Serbia a company "Antena TV" LLC has been registered since 2016.

The total number of subscribers of the media content distribution service in 2018 was 1.88 million (Figure 9.1), which represents an increase by 10.6% compared to the previous year, mostly due to the increase of CDS service subscribers. Approximately 1.07 million 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.

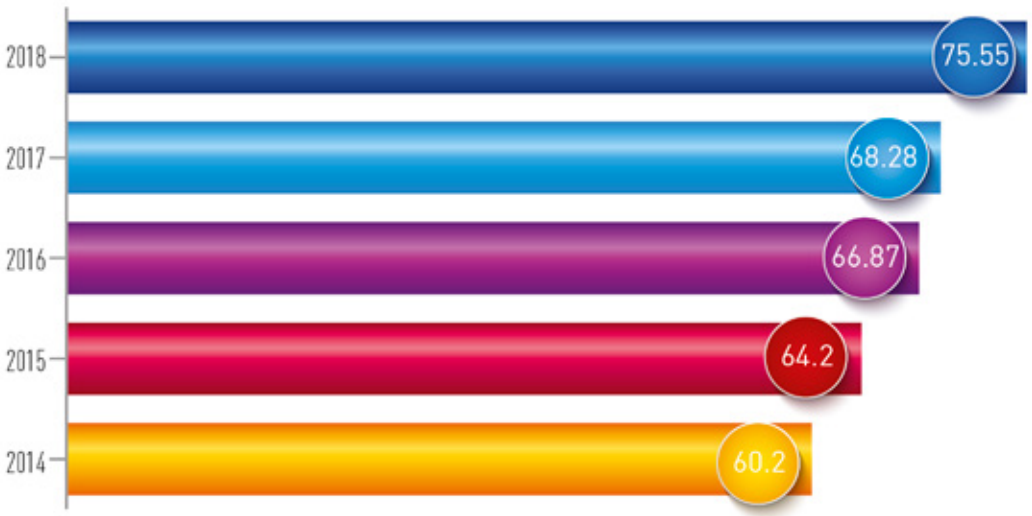
Figure 9.1. Total number of subscribers (in million)



Source: **RATEL**

Household penetration is 75.55% (Figure 9.2).

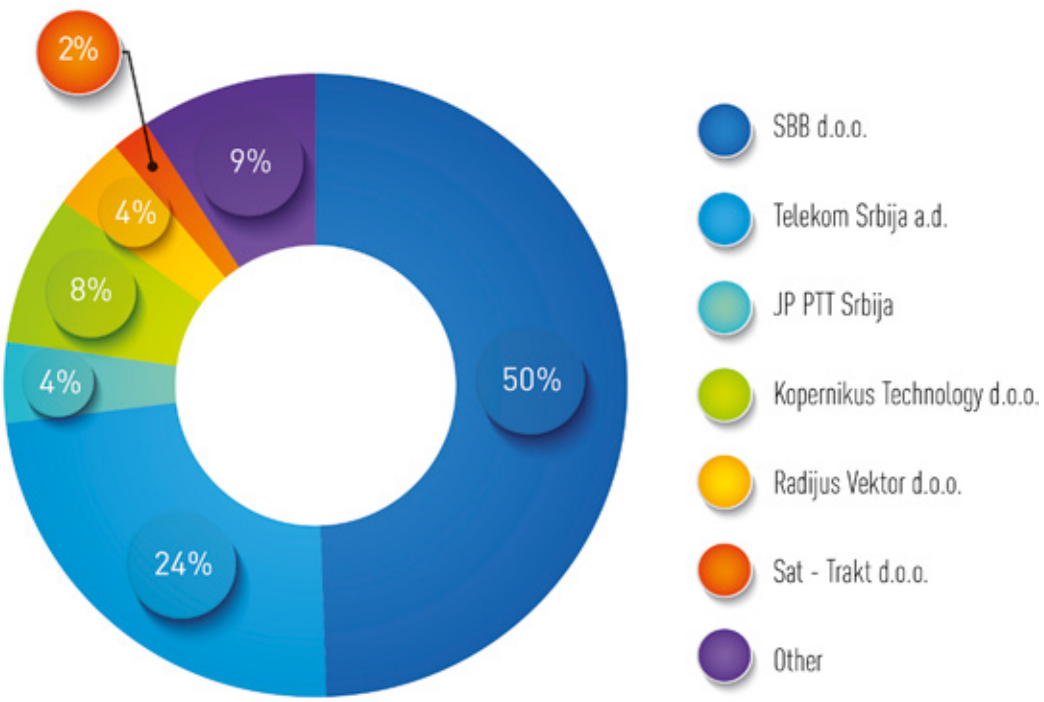
Figure 9.2. Household penetration (in %)



Source: **RATEL**

The largest media content distribution operator in the Republic of Serbia during 2018 is still Serbia Broadband – Srpske kablovske mreže Ltd. (SBB Ltd.), with a market share of 50%, in terms of the number of subscribers. Telekom Srbija JSC has accounted for around 24% of the market share in 2018, whereas the Public Enterprise "Pošta Srbije", Kopernikus Tehnology Ltd, Radijus Vektor Ltd. and Sat-Trakt Ltd, in terms of number of subscribers, have accounted for a joint market share of 91% pertaining to media content distribution.

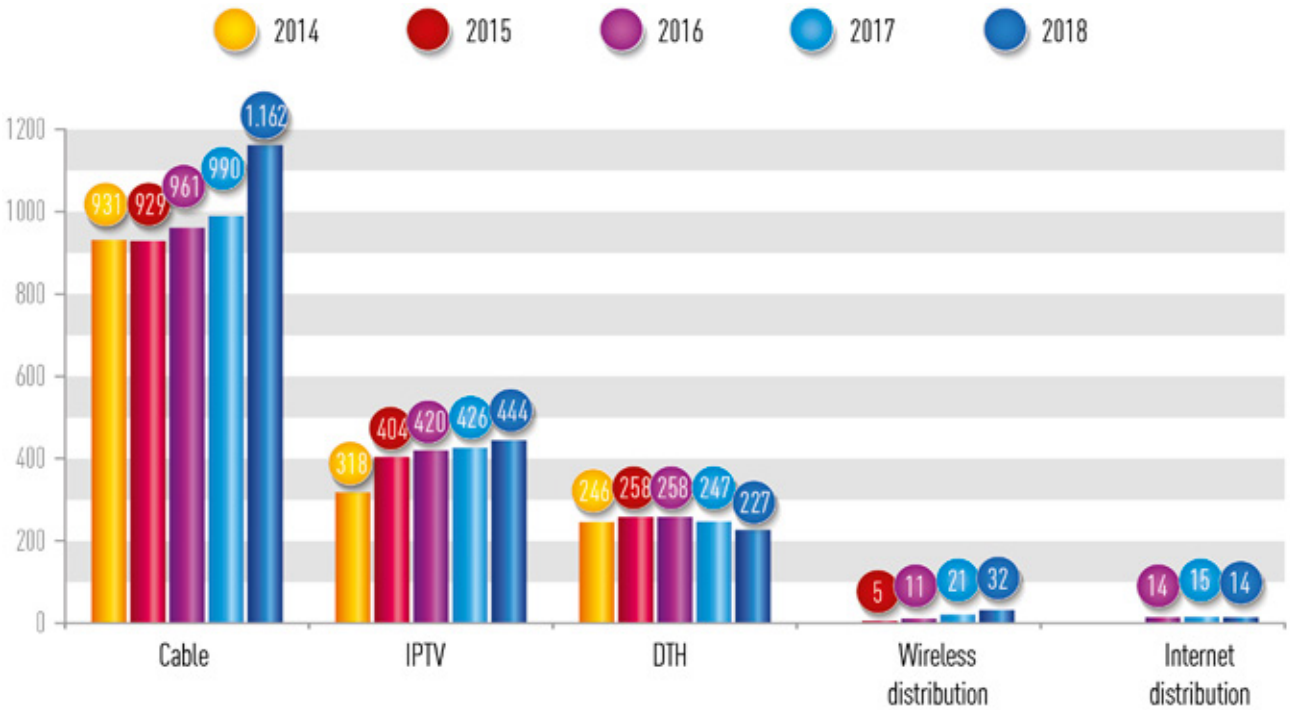
Figure 9.3. Market share of leading operators in 2018



Source: **RATEL**

Media content distribution via cable distribution systems (CDS) is still dominant in 2018, with around 1.16 million subscribers, which is an increase by 17.4% compared to the previous year. The number of IPTV subscribers via xDSL technlologies has increased as well, by approximately 4.4% compared to the previous year, whereas the number of DTH subscribers vianetwork has dropped by approximately 8%. The number of media content distribution subscribers via wireless network has equally continued to grow in 2018, amounting to approximately 32 thousand, whereas the number of media content distribution subscribers via Internet has amounted to approximately 14 thousand.

Figure 9.4. Number of subscribers/users of media content distribution service (in thousand)

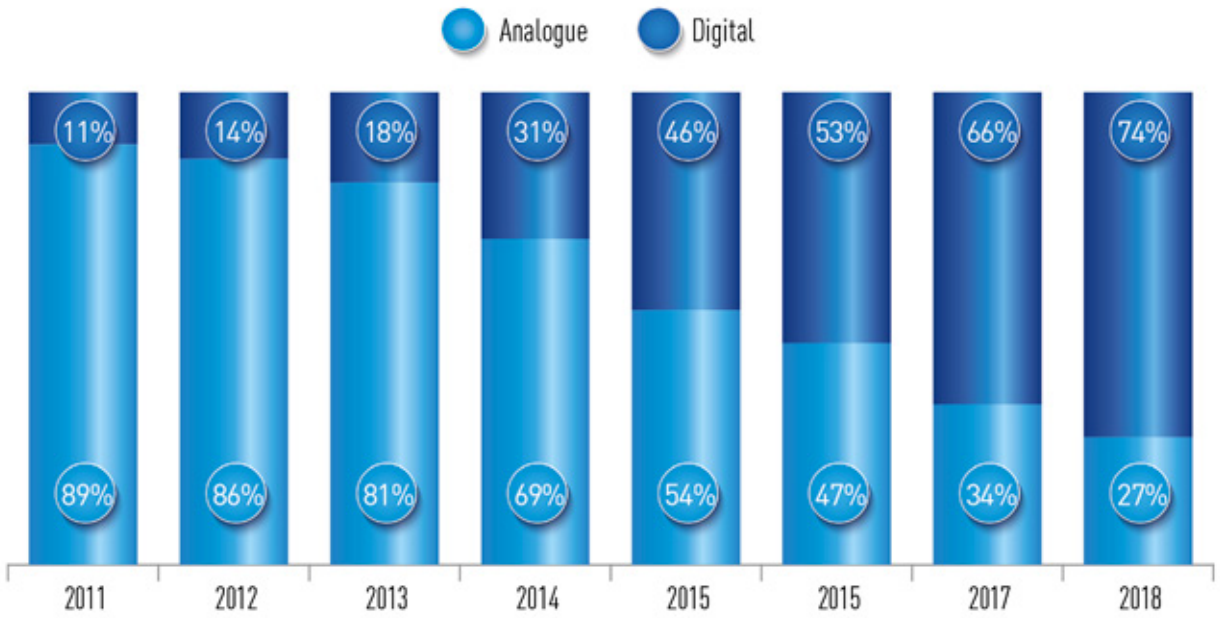


Source: **RATEL**

Compared to the previous year, subscribers of other types of distribution slightly increased their share, from 2% to 2.5%. More precisely, these are the subscribers using wireless distribution, whose number grew from 1.3% to 1.7%, including the subscribers of paid terrestrial TV, with almost 23 thousand subscribers and a doubled growth rate compared to 2017.

In 2018, as much as 74% of the total number of CDS subscribers has followed media content in digital format, which means that the users' preferences have changed and that the digitalization of cable networks is in its full development. 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.

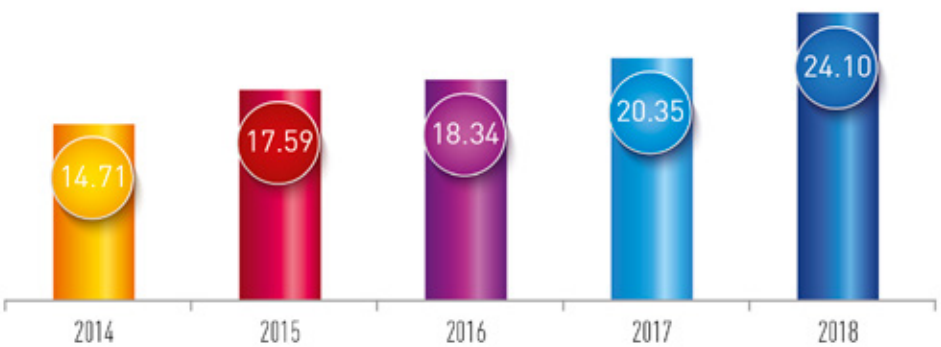
Figure 9.5. Distribution of CDS subscribers



Source: **RATEL**

The total income of media content distribution operators in 2018 reached 24.10 billion dinars, which is by almost 18% higher compared to the previous year.

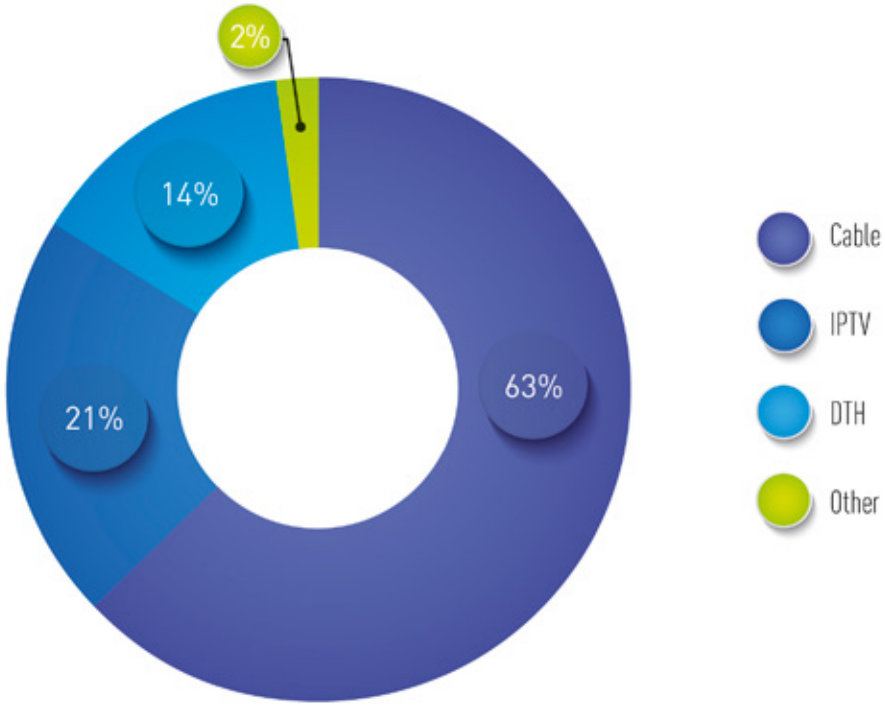
Figure 9.6. Revenue trends on media content distribution market (in billion dinars)



Source: **RATEL**

The share of revenues by the type of distribution has not changed in 2018 compared to the previous year. CDS accounts for the biggest share in the revenues from the media content distribution (63%), marking an increase by 7% compared to the previous year, whereas IPTV (21%) and DTH (14%) have been on a slight decrease compared to the same period. Other revenues in the observed market (revenues from distribution via Internet and from distribution via wireless network including revenues from paid terrestrial television) participate with approximately 2%.

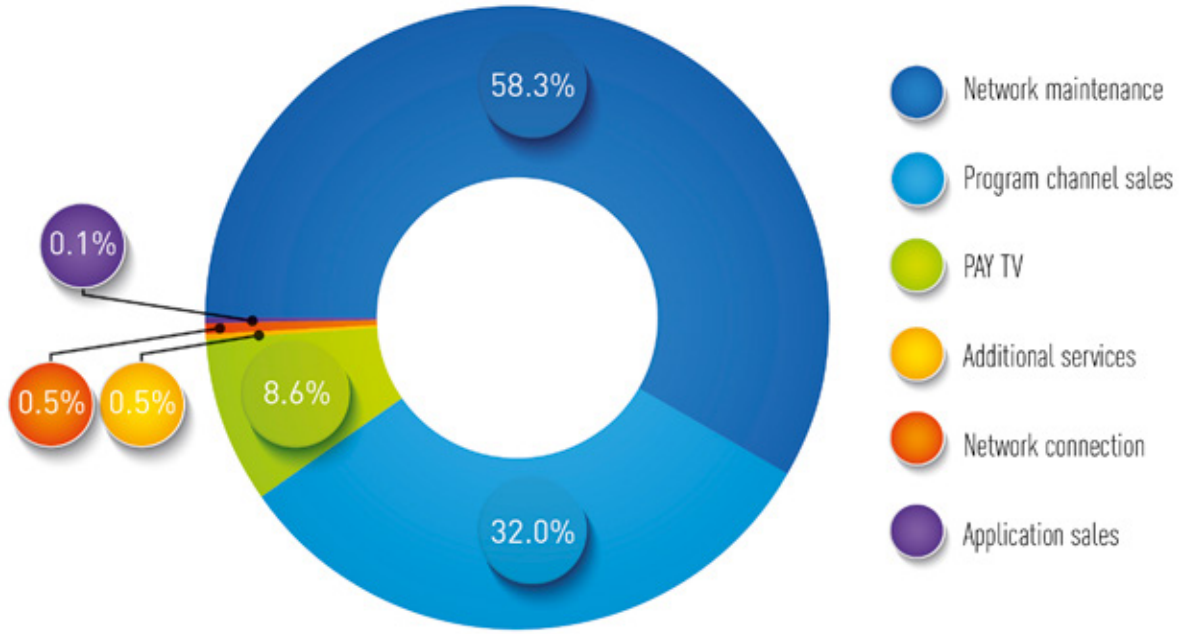
Figure 9.7. Structure of revenues from media content distribution in 2018



Source: **RATEL**

The revenues from network maintenance and sale of program channels, representing an income from the sale of own program channels to other operators, account for 90% of the total income, as shown in Figure 9.8. Revenues from additional paid program packages, i.e. PAY TV service, account for almost 9% of the total revenues. Network connection charges account for approximately 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 for a 12-month/24-month user contract. Additional service income includes revenues from services such as video on demand, rewind service, program recording etc, which altogether account for 0.45% of the total revenues in 2018. Revenues pertaining to the sale of TV watching application refer to the application that is sold independently of the distribution service, and for which there is no user's agreement, account for 0.07%, a rather negligible portion of the total income.

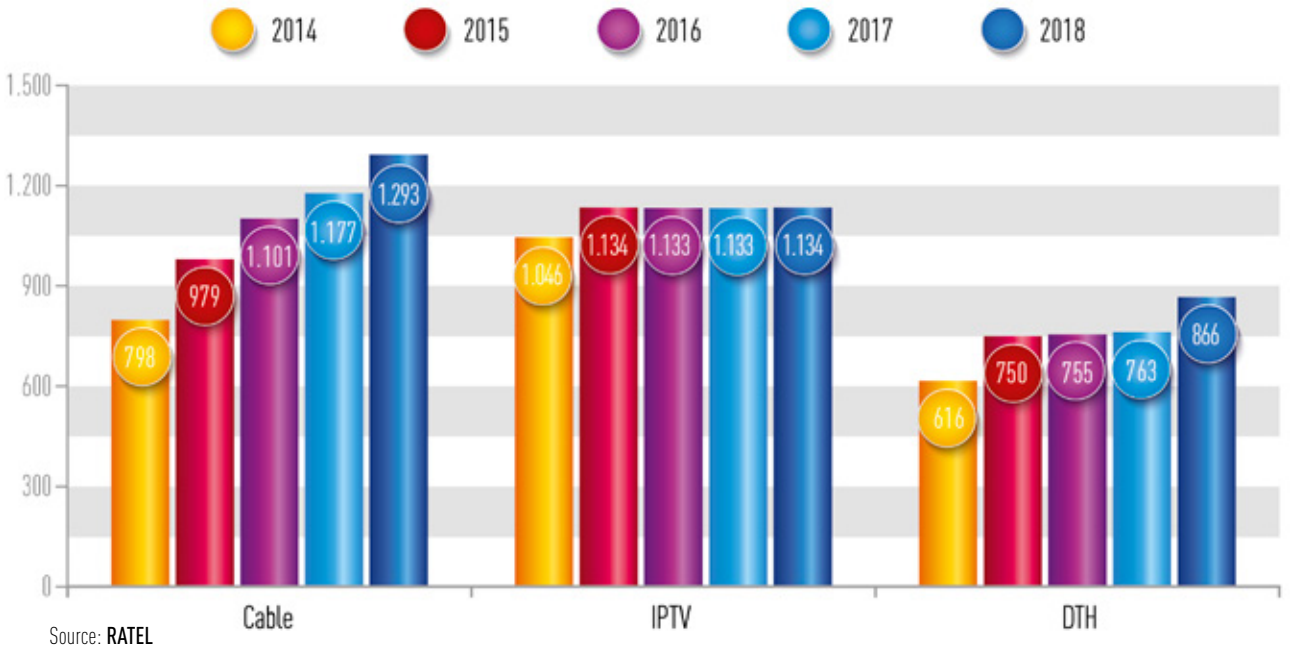
Figure 9.8. Share of revenues from media content distribution in 2018



Source: **RATEL**

In 2018, the average monthly subscription for basic analogue CDS package was 1147 dinars, against 1340 dinars for digital CDS. The average subscription for basic IPTV package has remained on the approximately same level compared to the previous year, amounting to 1134 dinars, whereas the average monthly subscription for DTH has slightly augmented to 866 dinars.

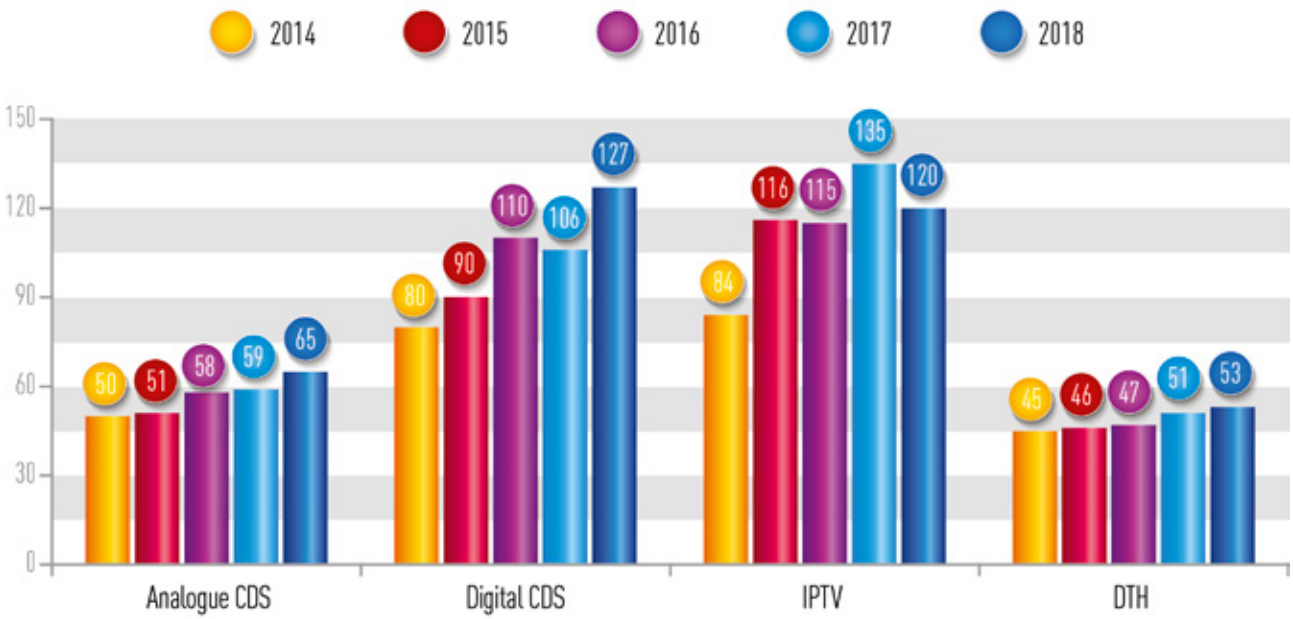
Figure 9.9. Average monthly subscription for basic package of the most popular types of distribution (in RSD)



Source: **RATEL**

The average number of TV programs in the basic package in 2018, for different types of distribution, has ranged from 65 in case of analogue CDS, to 127 in case of digital CDS. There is still a big disproportion between the number of basic package programs of analogue and those of digital CDS, which is one of the means operators use to encourage subscribers to switch to digital distribution of media content.

Figure 9.10. Average number of TV programs in basic package of the most popular types of distribution



Source: **RATEL**

In addition to 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 2018, these programs were followed by more than 427 thousand subscribers.

Beside additional channels, additional services available to the subscribers of digital CDS and IPTV include VoD (video on demand), rewind service, recording of the content, interactive TV guide, parental control, watching content on mobile devices and other. According to the available data, in 2018, out of the total number of subscribers, 1.1 million used additional services and realized over 289 requests for an additional service (around 254 requests annually per subscriber), out of which more than 10 million requests for the VoD service, i.e. 9 requests per subscriber annually.

For the distribution service subscribers to be able to watch media content in digital format (whatever the network they might be connected to – cable, telephony, wireless) on various TV devices, for each one of those they need an additional receiver (set-top box), which is paid additionally. During 2018, more than 400 thousand subscribers were renting the additional receiver.

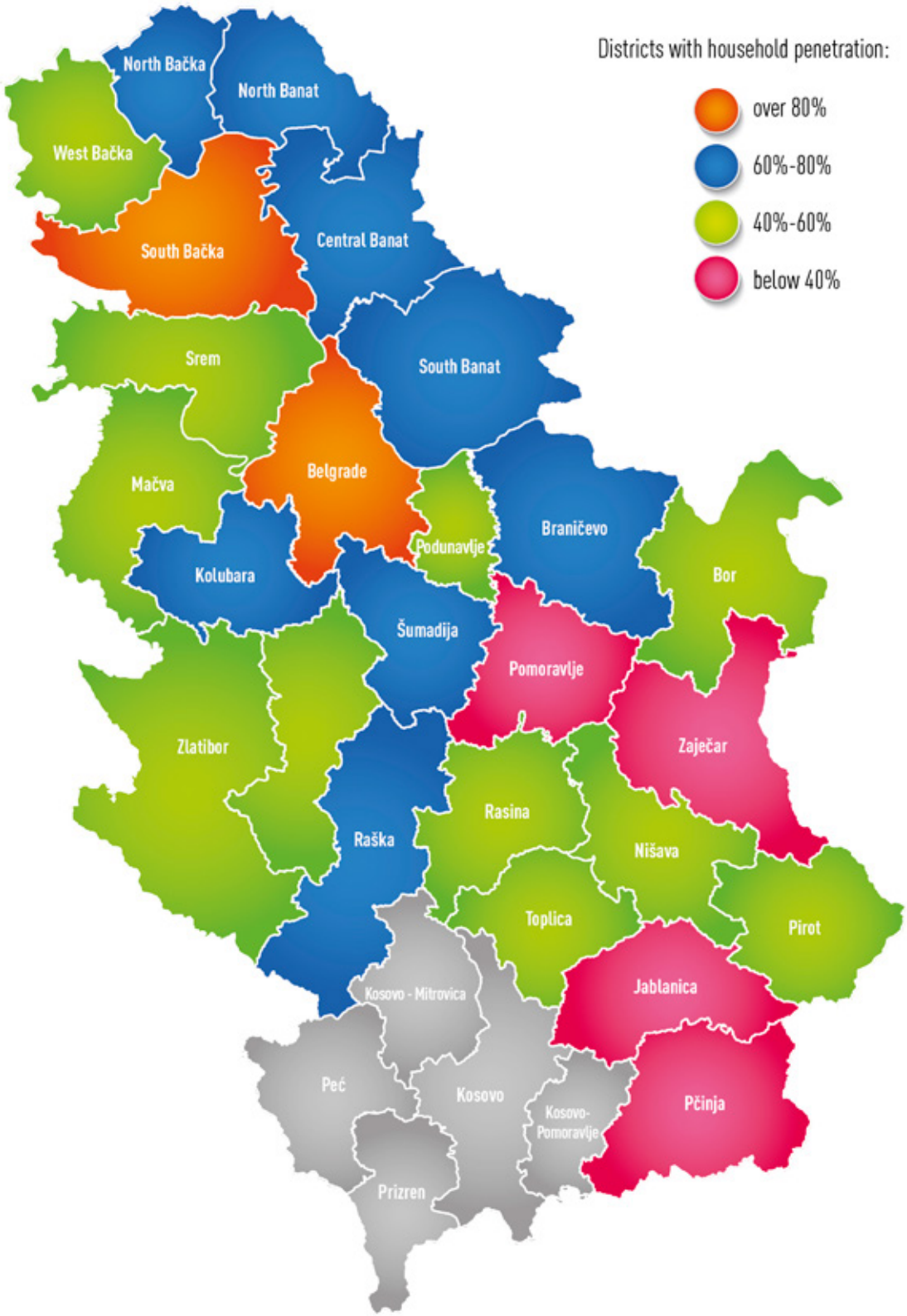
In addition to the distribution service, it is also possible to follow certain TV content on mobile devices, using different applications, without connecting oneself to the distribution network and without entering into subscriber agreement with the operator. The application user is not obliged to pay 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.

Table 9.1 provides data on the penetration of subscribers of media content distribution per household, on a district level.

Table 9.1. Subscribers of media content distribution service by districts

District	Number of households	Total number of subscribers	Penetration per household (%)
City of Belgrade	606,433	578,566	95.40
South Bačka	223,653	195,243	87.30
Šumadija	68,866	50,366	73.14
Central Banat	71,416	48,962	68.56
North Bačka	97,096	65,903	67.87
Braničevo	59,776	39,182	65.55
South Banat	58,973	38,125	64.65
Kolubara	90,515	58,404	64.52
Raška	101,503	63,801	62.86
North Banat	72,867	44,915	61.64
Mačva	94,434	55,491	58.76
Srem	68,888	39,486	57.32
West Bačka	77,270	44,031	56.98
Podunavlje	128,303	72,538	56.54
Rasina	100,136	56,503	56.43
Morava	64,155	34,814	54.27
Zlatibor	105,031	56,338	53.64
Pirot	56,900	30,432	53.48
Nišava	34,036	17,035	50.05
Bor	45,970	19,619	42.68
Toplica	42,445	17,924	42.23
Pomoravlje	71,478	26,154	36.59
Jablanica	66,710	23,257	34.86
Zaječar	31,184	10,663	34.19
Pčinj	49,918	13,103	26.25

Figure 9.11. Media content distribution by districts in the Republic of Serbia



10 BUNDLED SERVICES

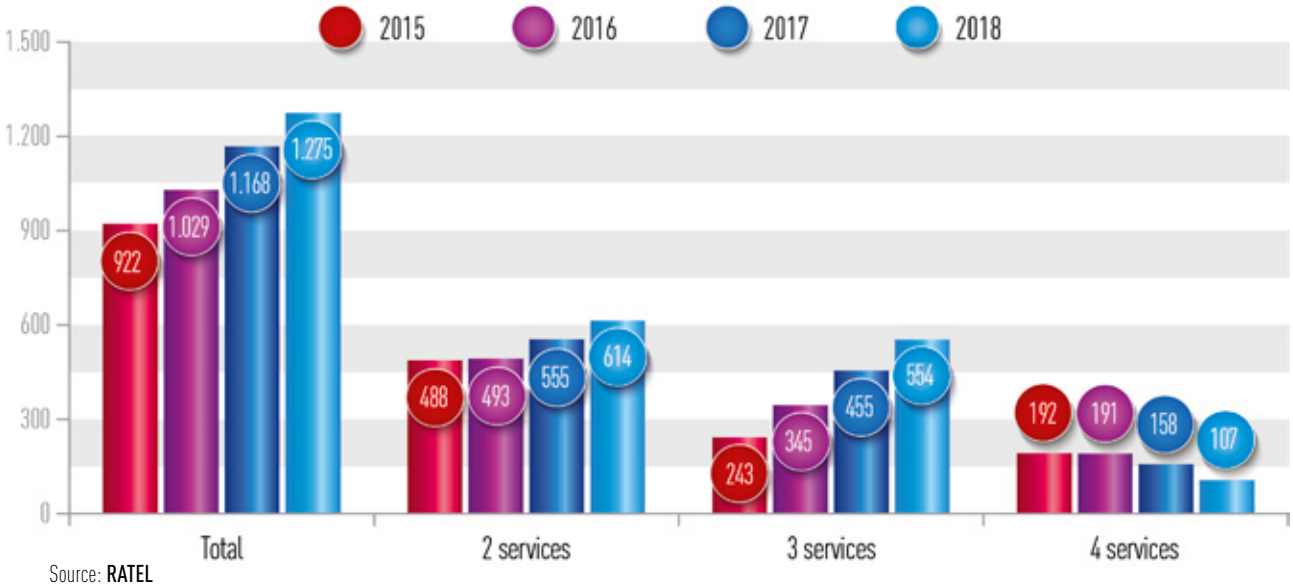
Bundled services are commercial offers of two or more services at a flat rate, which is lower than the sum of individual prices for each of the services. On the electronic communications market, service packages (bundled services) are the result of the horizontal integration, enabling operators to use the same network and thus provide more different services on the retail market (horizontally integrated operators), such as fixed telephony, fixed broadband Internet access, media content distribution, mobile telephony and mobile broadband Internet access. In that way, the 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 has marked constant growth, due to the benefits they provide to 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 (double-play) 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 (quadruple-play) packages that include mobile telephony service as well, while on the EU level there are 5-service packages 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 18 offer 3-service packages, whereas 4-service packages are offered by one operator. The total number of bundled service subscribers in 2018 was over 1.27 million, marking a growth by 9% compared to the previous year. The highest growth (22%) relates to the number of triple-play package subscribers, while the number of double-play service packages grew by 11% compared to 2017. The number of 4-service subscribers has continued to drop in 2018 as well.

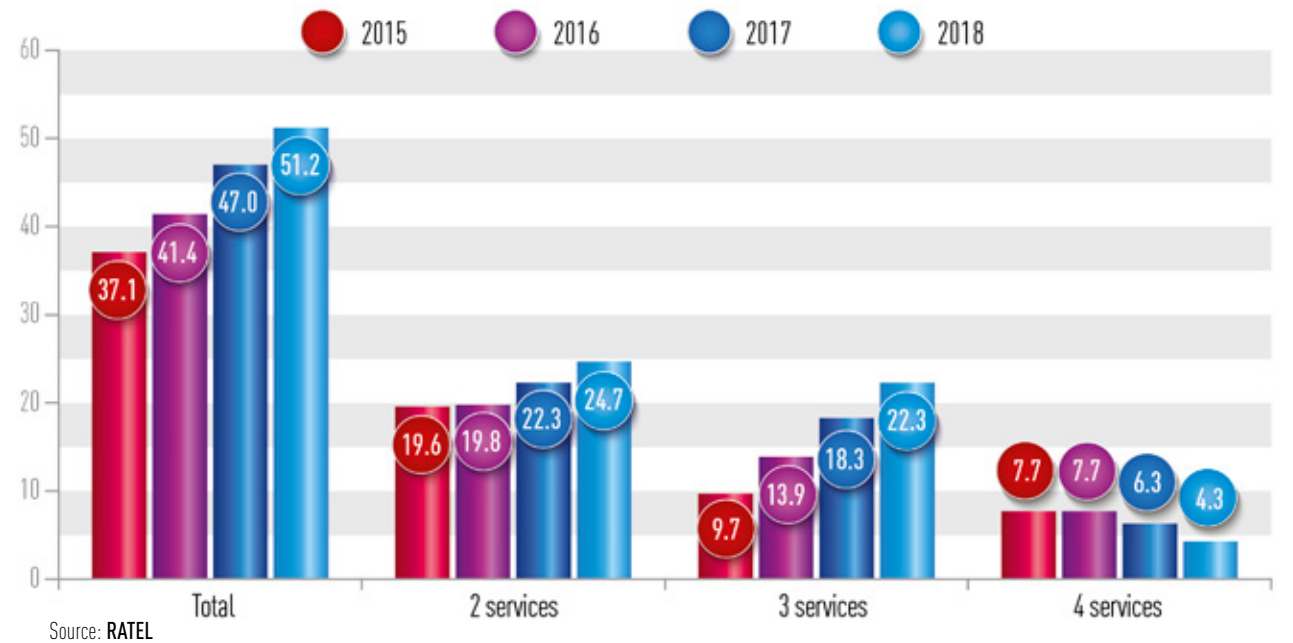
Figure 10.1. Number of bundled service subscribers (in thousand)



Source: **RATEL**

In 2018, the penetration of bundled services by the number of households was around 51%.

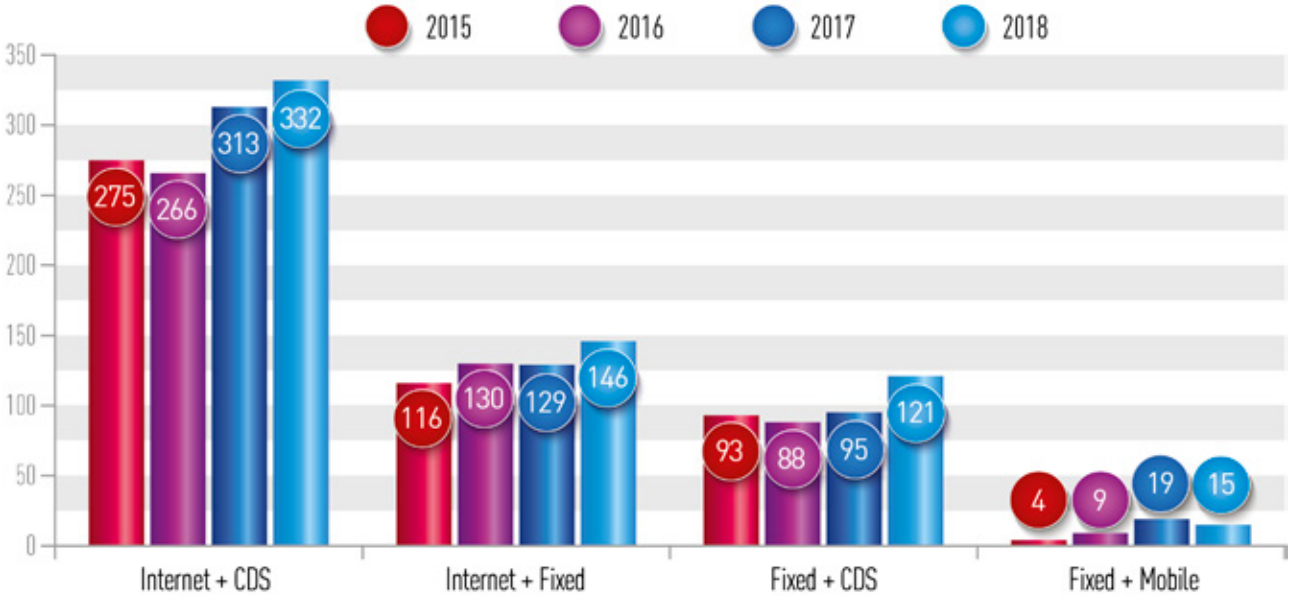
Figure 10.2. Bundled service penetration by the number of households (%)



Source: **RATEL**

The majority of 2-service package subscribers used bundled service offering broadband Internet access and media content distribution. Figure 10.3, showing the number of double-play service subscribers by types of included services, indicates that in 2018 the number of subscribers of broadband Internet access and media content distribution has increased (by 6%), as well as the number of subscribers of packages including fixed telephony and media content distribution, whereas the number of subscribers of packages with mobile telephony remained low. Compared to the previous year, a rise in the number of subscribers of packages with broadband Internet access and fixed telephony (by 13%) has been observed.

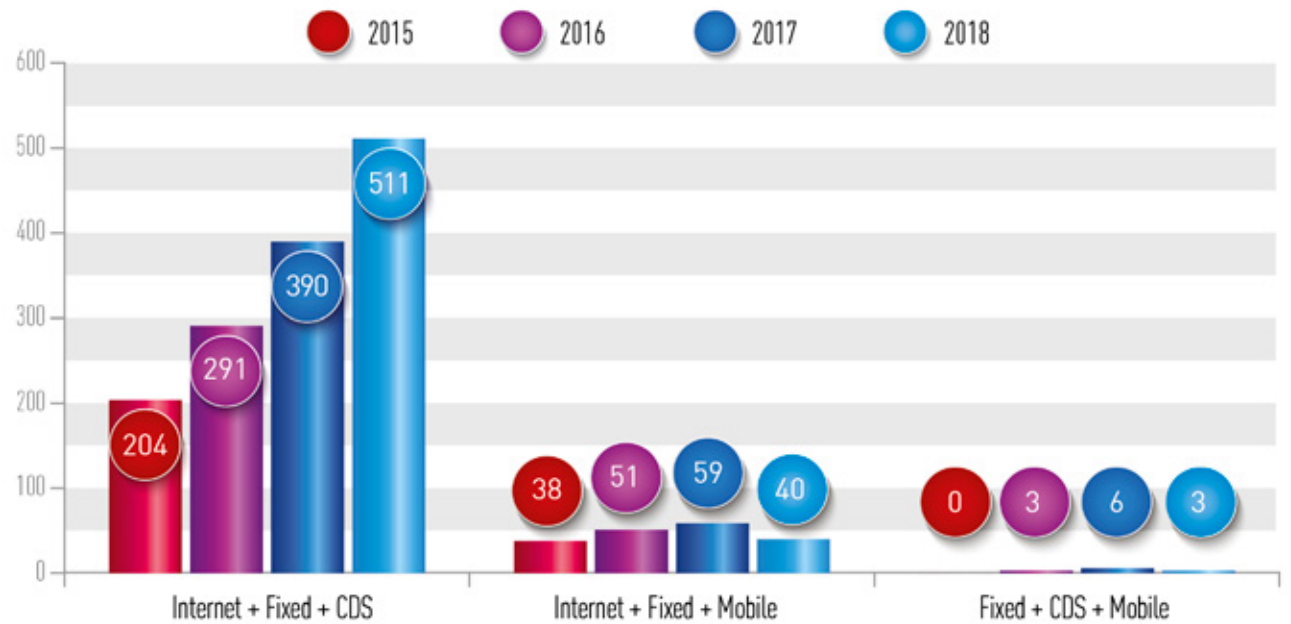
Figure 10.3. Number of 2-service package subscribers (in thousand)



Source: **RATEL**

The best selling 3-service package is bundled service including broadband Internet access, fixed telephony and media content distribution. This package has seen an increase of subscribers by 31%. As of 2016, triple-play packages offering fixed telephony, media content distribution and mobile telephony are present on the market, but their number has continued to drop in 2018 as well, amounting to approximately 3 thousand subscribers..

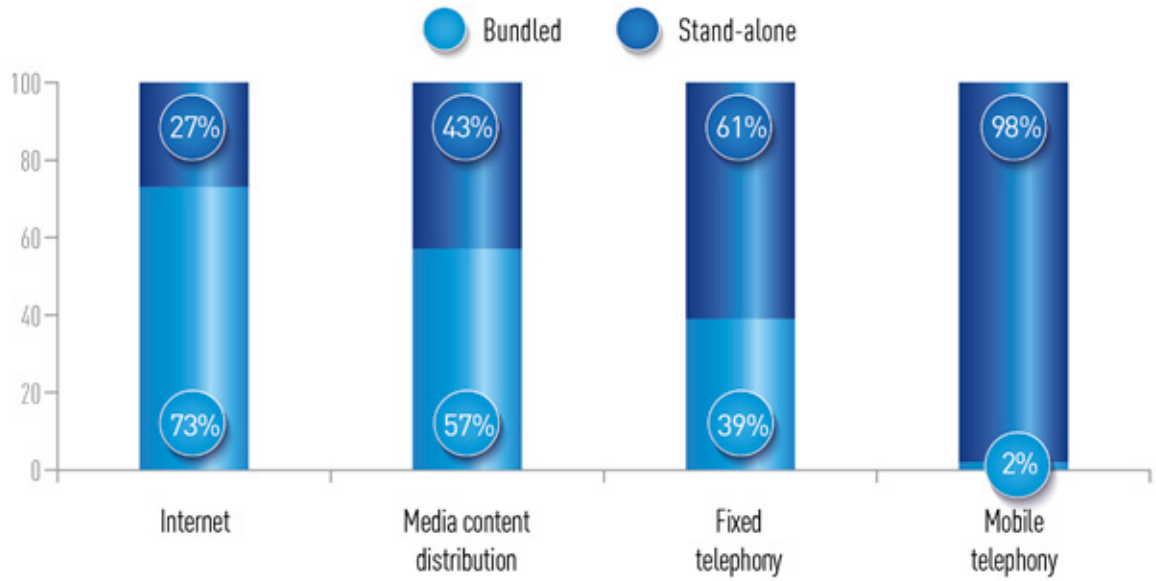
Figure 10.4. Number of 3-service package subscribers (in thousand)



Source: **RATEL**

Compared to the previous year, the number of subscribers purchasing broadband Internet access, media content distribution and fixed telephony as bundled service, has marked significant increase, while the situation regarding the mobile telephony service has remained unchanged. The best selling service within the package is still the service of broadband Internet access, used in bundled mode by over a million subscribers in 2017. It is followed by the service of media content distribution, used in package by half of its subscribers (around 1.1 million), while the least popular service is that of mobile telephony.

Figure 10.5. Share of Stand-alone and bundled services purchased by subscribers in 2018



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, since thus the subscribers have the opportunity to pay less and have simpler procedures regarding registering and bill payment (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).

Within best selling 2-service and 3-service packages in 2018 containing broadband Internet access service, as much as 48% of the subscribers opted for an Internet rate from 30 Mbps to less than 100 Mbps. Within package containing broadband Internet access and media content distribution services, 72% of the subscribers opted for the above rate, whereas almost 80% of the subscribers using package containing broadband Internet access and fixed telephony services opted for a slower Internet rate (from 2 Mbps to less than 30 Mbps). As for the triple-play packages containing broadband Internet access, media content distribution and fixed telephony services, half of the subscribers also use the slower Internet rate (from 2 Mbps to less than 30 Mbps).

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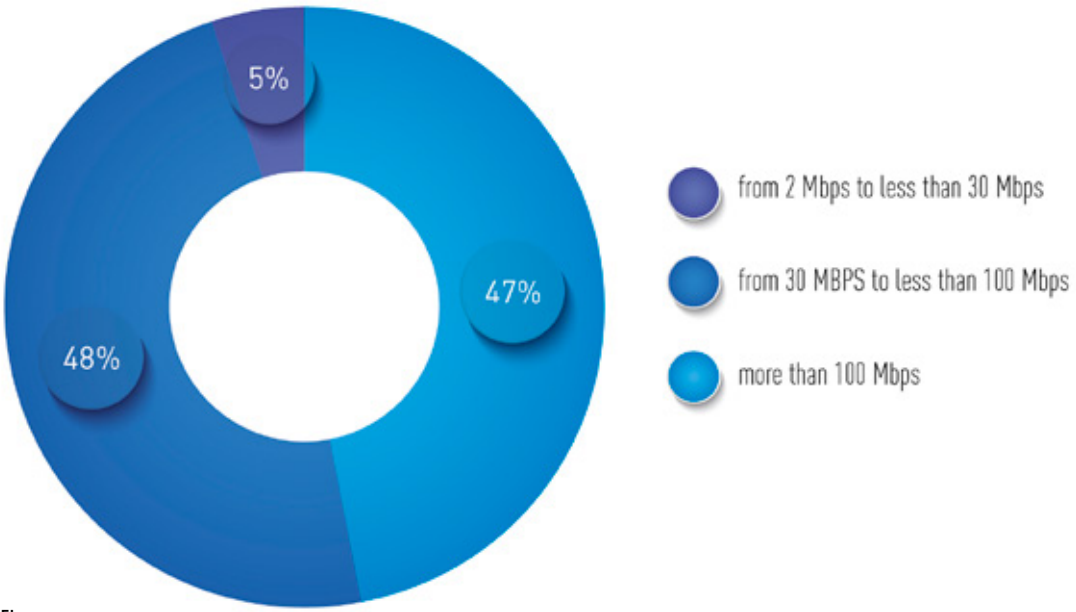
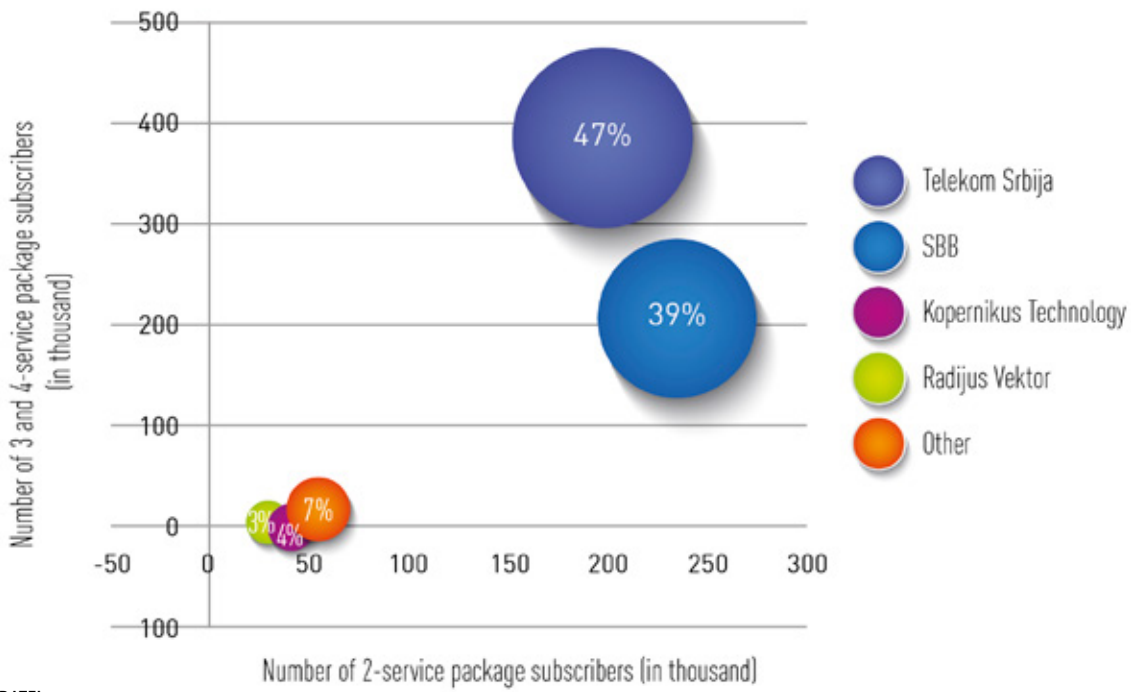
Figure 10.6. Subscribers of the most popular service packages using different Internet rates in 2018



Source: **RATEL**

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 of the Republic of Serbia, designed to offer services otherwise absent from regular operators' offers, but those include 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 10.7.

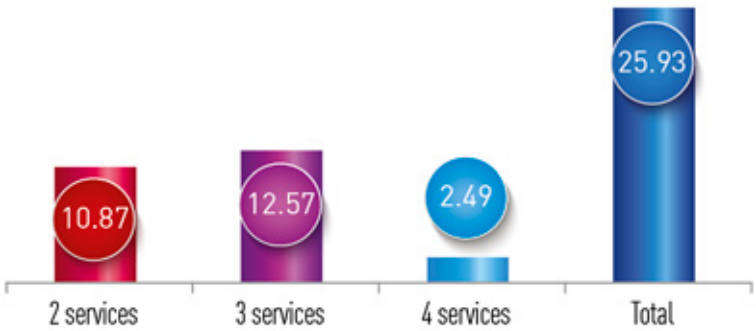
Figure 10.7. Share of operators by number of bundled service subscribers in 2018



Source: **RATEL**

From the sale of bundled services in 2018, the operators earned an income of almost 26 billion dinars, the most of which (around 12.6 billion dinars) is due to the sale of triple-play bundles, while the sale of quad-play packages accounted for the smallest income share (around 2.5 billion dinars).

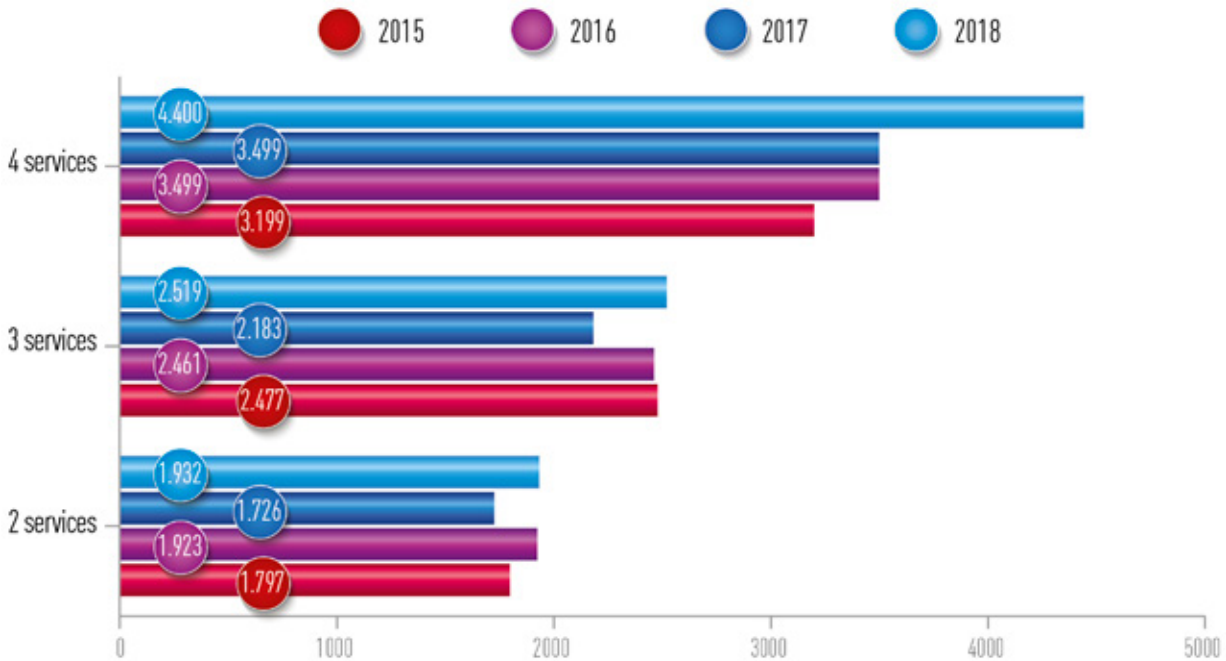
Figure10.8. Earned income from bundled service sales in 2017 (in billion RSD)



Source: **RATEL**

Monthly subscriptions for the best selling packages in 2018 ranged between 750 dinars for the cheapest package and 5399 dinars for the most expensive one, depending on the operator and the package content. These amounts are similar to those of the previous year, except in case of 4-service bundles, whose price augmented. Operators often offer bundled services at promotional prices (considerably lower than the regular ones) during certain time spans and with 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 Figure10.9.

Figure 10.9. Average amounts of monthly subscription for the best selling bundled services (in RSD)



Source: **RATEL**

11 VALUE ADDED AND MESSAGING SERVICES

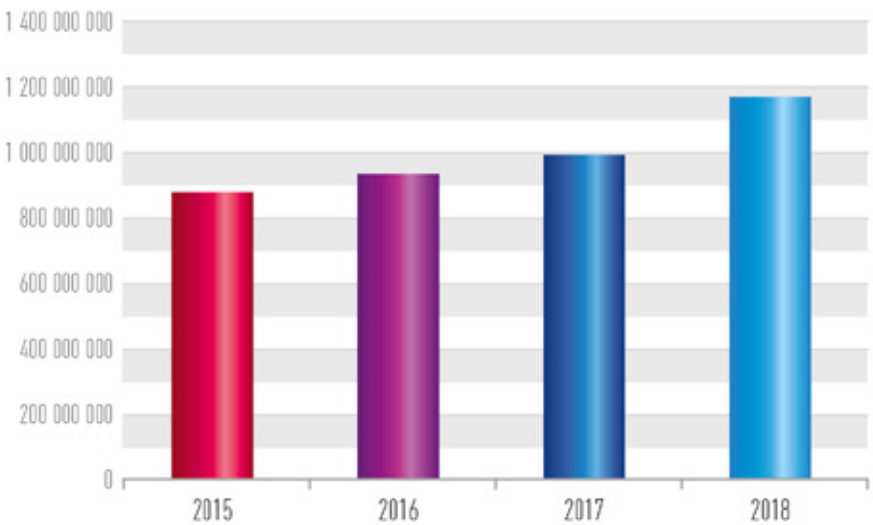
The Law on Electronic Communications and Rulebook on general terms and conditions for electronic communication activity ("Official Gazette of RS", no. 38/11) have created administrative possibility for messaging and value added service (VAS) providers to be registered in the register of operators managed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

In 2018, there were 50 operators in the register of public communication networks and services registered for value added service provision, most of them simultaneously being registered for message transmission service. These operators provide services through fixed and mobile network operators, the users of these networks being able to access value added services by means of public numbering (090Xabcdef and 0780abcdef) for value added voice transmission and internal numbering of mobile operators for value added messaging (SMS, MMS).

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

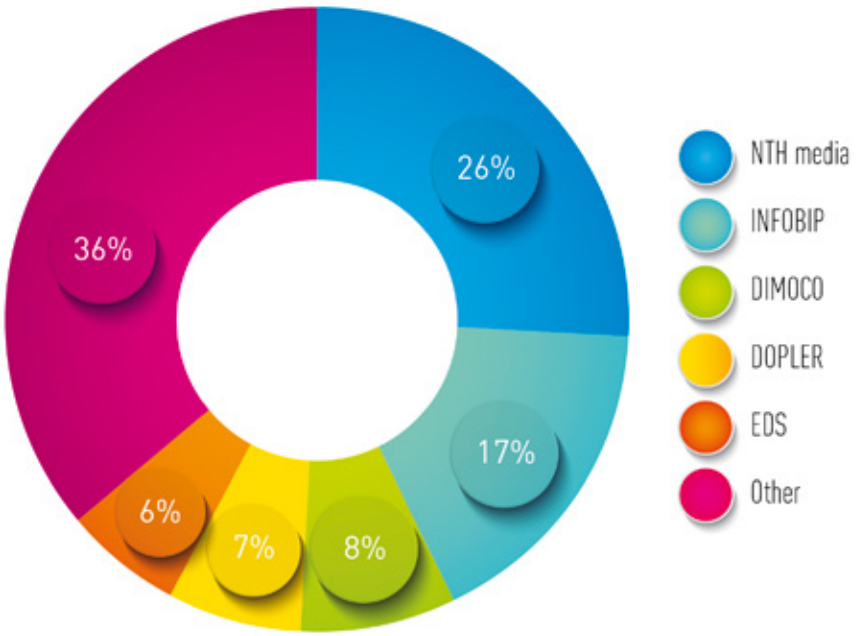
Annual revenues for the period 2015-2018 pertaining to the above services are given in Figure 11.1. Service provision accounts for the total income of 850 to 990 million dinars annually. In 2018, the revenues in this market, according to the data collected by RATEL, amounted to approximately 1,174 million dinars, which means the operators' income increased by more than 19% 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 11.1. Annual revenues 2015 – 2018



According to the available data provided to RATEL by the operators, three operators with the largest revenues from messaging and value added service provision in 2018, were: NTH Media LLC, INFOBIP and DIMOCO, with the total share of 51% of the value added service market.

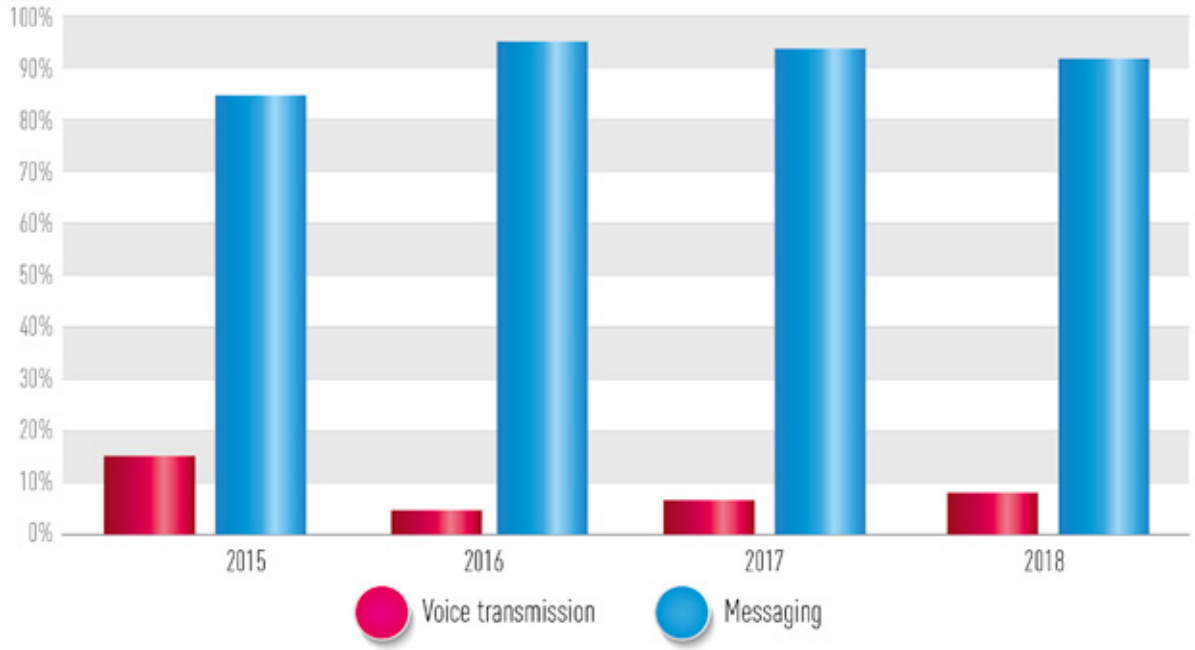
Figure 11.2. Market share of messaging and value added service operators by revenues made from these services



Value added service market is fully competitive. Figure 11.2 shows market 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 92% of the total revenues made by the operators in 2018 are revenues from messaging service (SMS, MMS) and VAS messaging, and the rest of the revenues comes 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 and to a simultaneous drop in the revenues from VAS voice transmission services, with the income share steadily set in during the recent years. In addition, the large-scale usage of smart phone devices has decreased the users' interest for VAS realized by voice transmission or SMS messaging, which particularly affects voice VAS.

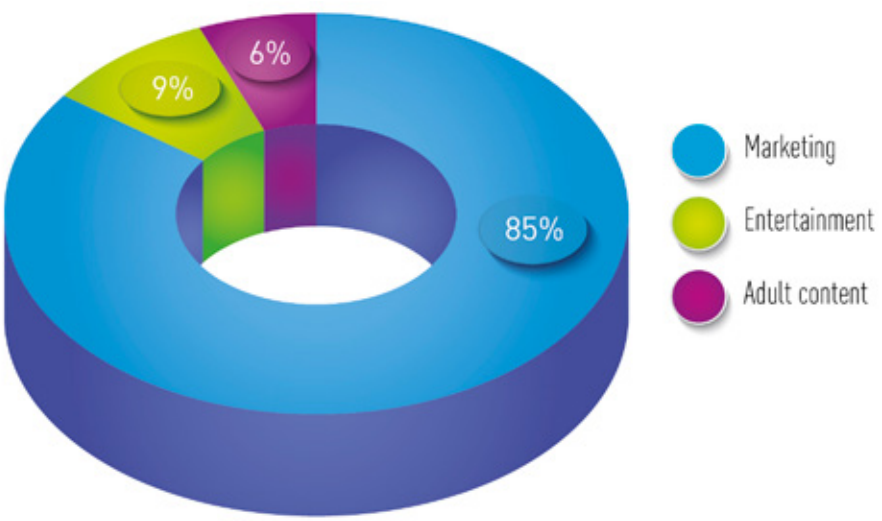
Figure 11.3. Market share by type of VAS, by revenues made in 2015, 2016, 2017 and 2018



For the purpose of VAS voice transmission, the operators were assigned 540 numbers, the same as the previous year.

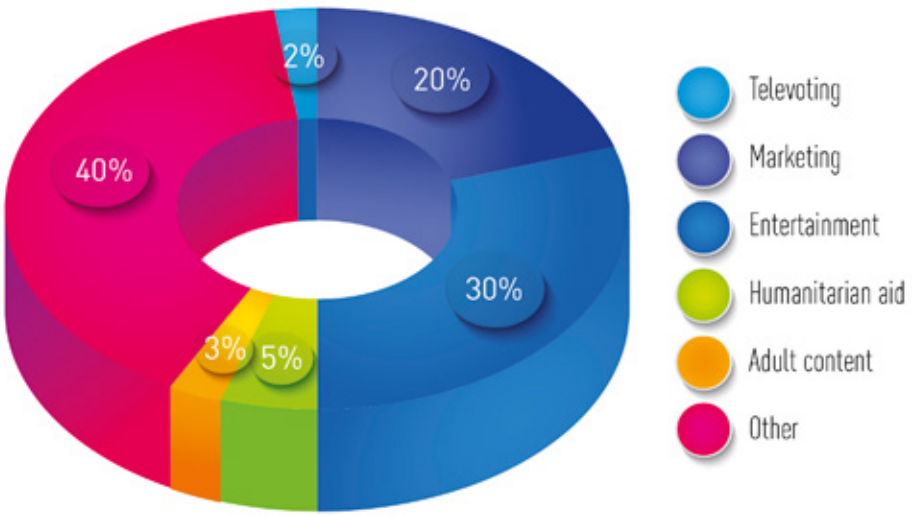
In 2018, voice value added service provision accounted for approximately 2 million minutes of traffic, and the share by type of voice VAS is given in Figure 11.4.

Figure 11.4. Share of minutes by type of voice VAS in 2018



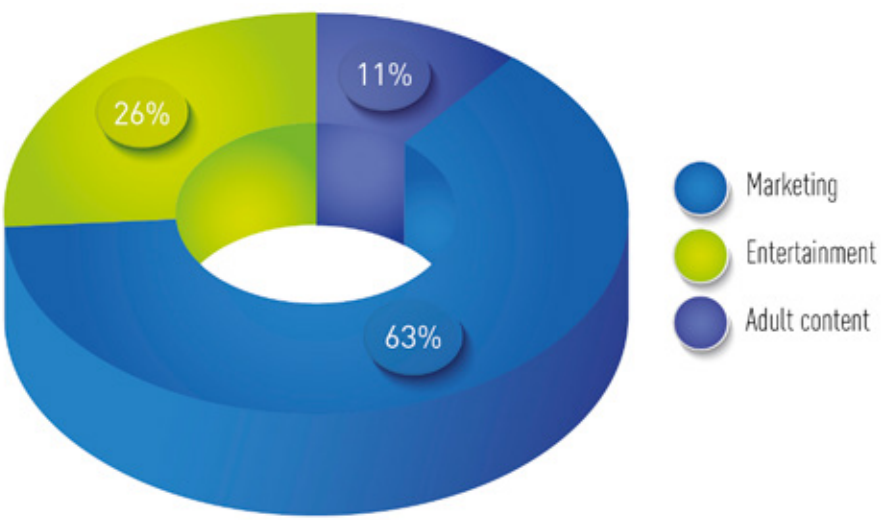
Messaging value added services accounted for 52 million messages and the share by type of VAS is given in Figure 11.5. Messages labelled as "other" make up 40%, since they do not fall into a standard set of VAS, but concern different information or notifications, taxi orders or queries (on exchange rates etc.) and payment of goods and services.

Figure 11.5. Share of realized VAS messages by purpose in 2018



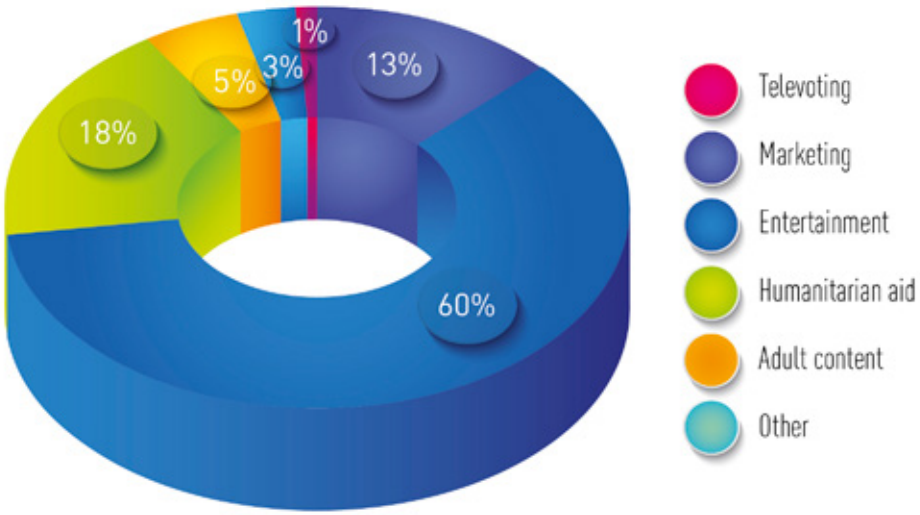
Revenues from voice VAS amount to around 100 million dinars and the share by purpose is given in Figure 11.6.

Figure 11.6. Share of voice VAS revenues by purpose in 2018



Revenues from messaging VAS amount to over 910 million dinars and the share by purpose is given in Figure 11.7.

Figure 11.7. Share of messaging VAS revenues, by purpose in 2018



12 MONITORING OF ELECTRONIC COMMUNICATIONS NETWORK AND SERVICE QUALITY PARAMETERS

Monitoring 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).

The electronic communication operators are required to provide, at least once a year, 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 performs monitoring of quality parameters for services and networks, compliance with technical and other requirements and performance of the electronic communication activity, in accordance with 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, 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 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 electronic communication QoS.

The reports on the values of quality parameters for electronic communication services and networks for the previous year were submitted to RATEL by the operators within the prescribed delay, till March 15, 2019.

Average values of quality paramenters for electronic communications services and networks for the period 2016–2018

Table 12.1 shows the number of the operators of electronic communications networks and services that submitted their network and service parameters in a report.

Table 12.1. Number of operators that provided reports

	2016	2017	2018
Operators providing voice service on the public telephone network at a fixed location	18	18	18
Operator providing voice service provided via Internet (VoIP)	23	22	20
Operators providing services on the public mobile communication network	3	4	4
Operators providing broadband access	128	114	107
Operators providing voice service on the public telephone network at a fixed location	62	57	60

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 less than 6 days. The average supply time has been maintained compared to the previous years.

Table 12.2. Average supply time for service

	Prescribed value	2016	2017	2018
Voice service on the public telephone network at a fixed location	10 days for 50% new connections a year	5.6	4.4	4.7
Voice service provided via Internet (VoIP)	8 days for more than 95% requests	2.5	2.5	3
Broadband access service	8 days for more than 95% requests	3.5	3.1	6
Media content distribution service	8 days for more than 95% requests	3.2	2.6	3.2

Customer complaints about quality of electronic communications services

During 2018, the percentage og users' complaints about quality of electronic communications services was in average less than 10% for all types of services. The highest percentage of complaints (9%) was about the broadband access quality.

The time needed for the resolution of users' complaints (applicable for 80% of the complaints) was less than one day for all electronic communications services. For all electronic communications services, the percentage of users' complaints about the correctness of bills was less than 1%..

Table 12.3. Users' complaints and complaint resolution

		Prescribed value	2016	2017	2018
Voice service on the public telephone network at a fixed location	Percentage of user complaints about quality of service	0.5%	2.4%	2.4%	2.9%
	Resolution time for user complaints for 80% of the complaints (days)	10.0	1.6	1.1	1
	Percentage of user complaints about bill correctness	⩽1%	0.3%	0.9%	1%
Voice service provided via Internet (VoIP)	Percentage of user complaints about quality of service	-	3.0%	2.7%	2%
	Resolution time for user complaints for 80% of the complaints (days)	1.0	0.8	0.72	1
	Percentage of user complaints about bill correctness	⩽1%	0.3%	0.1%	0.1%
Services on the public mobile communications network	Percentage of user complaints about quality of service	-	1.5%	1.9%	2%
	Percentage of user complaints about bill correctness	⩽1%	0.1%	0.1%	0.1%
Broadband access service	Percentage of user complaints about quality of service	-	5.2%	6.1%	9%
	Resolution time for user complaints for 80% of the complaints (days)	1.0	1.1	1	1
	Percentage of user complaints about bill correctness	⩽1%	0.7%	0.4%	0.6%
Media content distribution service	Percentage of user complaints about quality of service	-	6.3%	4.5%	6%
	Percentage of user complaints about bill correctness	⩽1%	0.7%	0.7%	0.7%

Parameters of 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 46 seconds.

Response time in contact centers during 2018 remained at the approximately same level as in 2017, namely in contact services of the operators providing voice service on the public telephone network at a fixed location. Notably shorter was the operator's response time in the broadband access and media content distribution support service, compared to the previous years.

Table 12.4. Response time for operator's contact services (Call Center) (seconds)

	2016	2017	2018
Voice service on the public telephone network at a fixed location	22	27	30
Voice service provided via Internet (VoIP)	46	68	40
Services on the public mobile communications network	28	29	46
Broadband access service	94	40	32
Media content distribution service	31	30	22

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

The ratio of all unsuccessful calls, including the percentage of unsuccessful calls in fixed network within and outside 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 0.83% in 2018, i.e. slightly higher compared to two previous years.

Table 12.5. Quality parameters for voice service on the public telephone network at a fixed location

	Parameter definition	Prescribed value	2016	2017	2018
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%	0.76%	0.53%	0.83%
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	3.2	3.3	3.4

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 and
- Globaltel

whereby, during 2016, Globaltel was registered as a virtual mobile operator.

Measurement of quality parameters for services on the public mobile telecommunications network, which are supposed to correspond to average values measured for the peak traffic hour in a 7-day week, was carried out in the 50th week of 2018, between the 10th and 16th of December 2018.

Table 12.6. Quality parameters for public mobile services

	Parameter definition	Prescribed value	2016	2017	2018
Call Setup Success Rate for GSM mobile network (Call Setup Success Rate)	CSSR=(successful call attempts/all call attempts)*100	> 98% at GSM network level	99.40%	99.42%	99.5%
Call Setup Success Rate for UMTS mobile network (Call Setup Success Rate)	CSSR=(successful call attempts/all call attempts)*100	> 98% at UMTS network level	99.46%	99.53%	99.88%

	Parameter definition	Prescribed value	2016	2017	2018
Telephony Setup Time for GSM network	Time for connection setup from the moment user activates sending function.	-	6.51s	6s	4.6s
Telephony Setup Time for UMTS network	Time for connection setup from the moment user activates sending function.	-	5.72s	5s	3.3s
DL Throughout for Packet Interactive in GSM and UMTS mobile networks	Average throughput towards user (DL) for packet interactive.	> 128 Kb/s	4.9 Mb/s	5.6Mb/s	5.3Mb/s
DL Throughout for Packet Interactive in LTE mobile network	Average throughput towards user (DL) for packet interactive.	-	-	35.7Mb/s	29.5Mb/s

It can be observed that call setup time in 2G and 3G mobile communications networks has become shorter.

Network load for GMS and UMTS network voice traffic

Measurement of quality parameters for mobile communications networks, which should correspond to average values measured for the peak traffic hour in a 7-day week, was carried out in the 50th week of 2018, between the 10th and 16th of December 2018.

Table 12.7. Network load for GMS and UMTS network voice traffic

		2016	2017	2018
GSM voice traffic	mean value of network load for GSM network voice trafic, Erlang/TRX	1.7	1.53	1.52
UMTS voice traffic	mean value of network load for UMTS network voice trafic, Erlang/TRX	1.6	1.76	2.1

Values of quality parameters for public fixed wireless telecommunications networks (CDMA)

The report on the CDMA network quality consists of the coverage overview in 5 districts in Srbija: Pčinja District, Jablanica District, Raška District, Pirot District and Zlatibor District.

The reports on the CDMA network coverage by district have been provided by:

- Telekom Srbija,
- Orion telekom.

The lowest prescribed CDMA network coverage of the populated localities in districts needs to be 40% for the transmission signal power above -94 dBm. Operator Telekom Srbija fulfilled the criteria for the network coverage set under the licence for public fixed wireless telecommunications network and voice service, package data transmission and simultaneous voice and data transmission in all the districts concerned. Over the years, the CDMA coverage has not increased, since the demand for this service is dropping, causing the operators to stop developing services in the above CDMA networks.

Benchmarking of mobile communications networks

RATEL's strategy aims to encourage additional investments and further development of telecommunications market by fostering competition, cost-effectiveness and efficiency of mobile communications, and to inform users in a reliable and neutral way on the quality of mobile networks in Serbia. For that very reason, RATEL has been undertaking comprehensive benchmarking of mobile communications networks belonging to the following operators: Telekom Srbija, Telenor and Vip mobile, for two consecutive years now.

The purpose of mobile network benchmarking is an objective parallel testing of QoS in mobile networks, from users' point of view, by measuring KPI quality parameters (Key Performance Indicators). Benchmarking measurements were realized during September and October 2018 and represent an integral part of RATEL's regular activities.

Benchmarking measurements of 2018 were carried out in 47 cities and along 10,000 km of roads in the Republic of Serbia. During the campaign, more than 6,000 calls and 100,000 data transfer sessions were performed, on all mobile networks and all available technologies (2G, 3G, 4G). The measurement included:

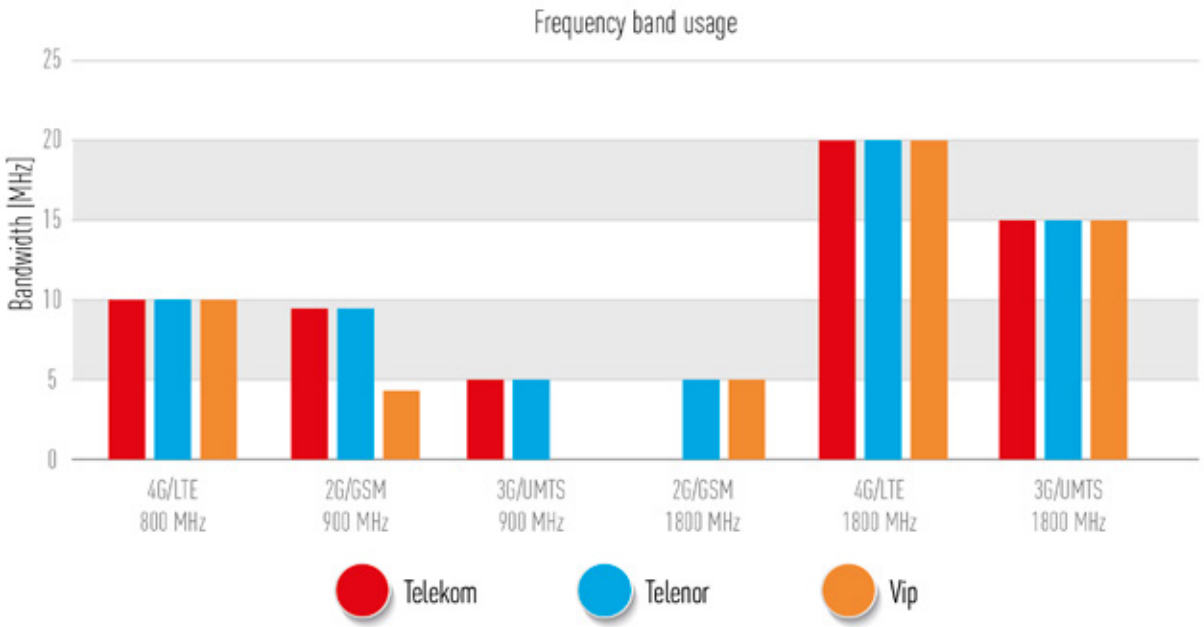
- radio parameter measurements for 2G/3G/4G technologies,
- measurement of KPIs for voice service and data transfer service.

Since benchmarking of mobile networks was carried out in September and October 2018, the measured and calculated values of quality parameters, including final results, refer only to that period.

Radio parameters for 2G/3G/4G technologies

Radio frequency bands used by operators during benchmarking:

Figure 12.1. Radio frequency bands used by operators during benchmarking campaign



2G/GSM: All three operators used radio frequency band 900MHz. Radio frequency band 1800MHz was used by Telenor and Vip mobile.

3G/UMTS: All three operators used radio frequency band 2100MHz. Radio frequency band 900MHz was mostly used by Telenor and to a lesser extent by Telekom Srbija.

4G/LTE: Radio frequency bands 800MHz and 1800MHz were used by all three operators. Telekom Srbija and Vip mobile used both frequency bands in all categories, while Telenor mostly used 800MHz band for towns and roads. Telekom Srbija and Vip mobile predominantly used 20 MHz bandwidth channel for data transfer tests, in all categories, while Telenor mostly used 10 MHz bandwidth channel for the same purpose.

The use of Carrier Aggregation (or CA – combination of multiple carriers with aim to achieve higher data transfer rate) depends on network configuration and on the quantity of sent data during the test. In big cities, Telenor used LTE carrier aggregation for 30% of data transfer tests, Vip mobile for 23% and Telekom Srbija for 18%. In smaller cities, carrier aggregation was used by Telenor for 20% of data transfer tests, by Vip mobile for 16% and by Telekom Srbija 6%. Along the roads, this figure was smaller in case of Telekom Srbija and Telenor (around 1%), whereas in case of Vip mobile it was used for 16% of tests.

KPI benchmarking for voice and data transmission services in 2017 and 2018

Within the performed benchmarking measurements, Telenor showed the best total result, primarily due to its voice service improvements. Telekom Srbija made the biggest progress compared to the results of 2017, thanks to the significant quality enhancements in data transmission service. Vip mobile scored slightly lesser total result compared to 2017, due to a weaker performance along the roads.

All three mobile operators improved their voice transmission service quality, compared to 2017. Telenor scored the best results in almost all categories, while Telekom Srbija made the biggest progress in all categories.

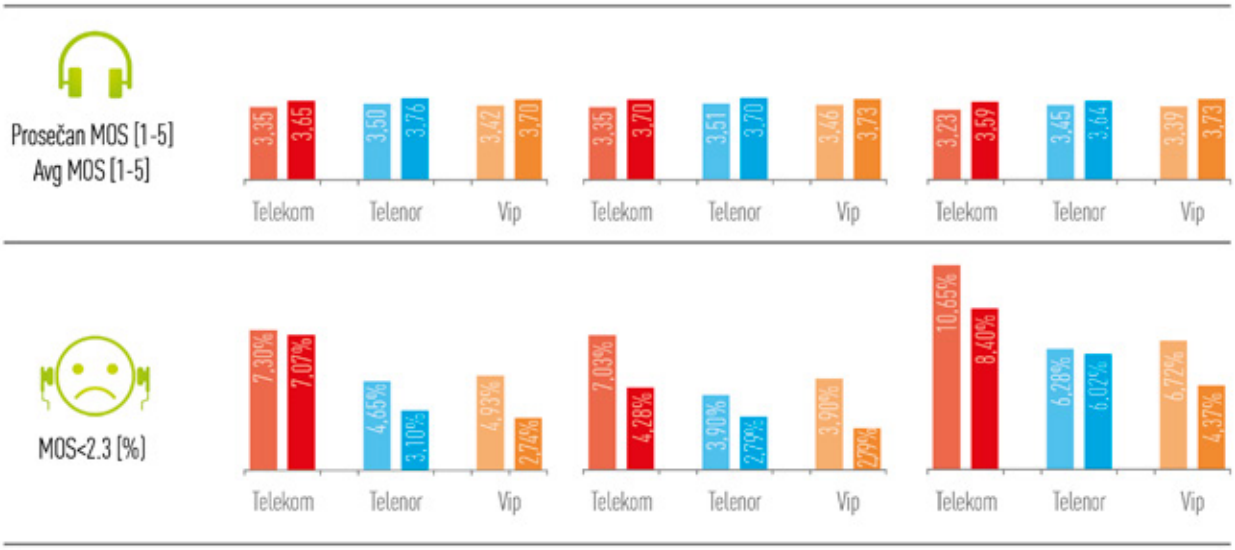
All KPI values for voice service tests were on the expected levels:

- Call Success Rate – CSR was above 97% for all operators in big and small cities,
- Call Setup Time was less than 5 seconds in big and small cities,
- Average value of MOS parameter regarding voice signal quality was mostly around 3.7,
- High percentage of samples with unsatisfactory MOS parameter values (MOS<2.3; voice signal quality considered unacceptable by users) was identified only in Telekom Srbija's network.

Telekom Srbija and Telenor increased the percentage of successfully realized calls in cities by approximately 3%, followed by Vip mobile, that achieved the similar result as in 2017. As for the shortest average set up time, the most striking result discrepancy compared to 2017 is found in Telekom Srbija, that considerably improved this parameter.

The complete analysis and comparison of KPI parameters for voice service is shown in Figure 12.2:

Figure 12.2. Voice service testing results – KPI

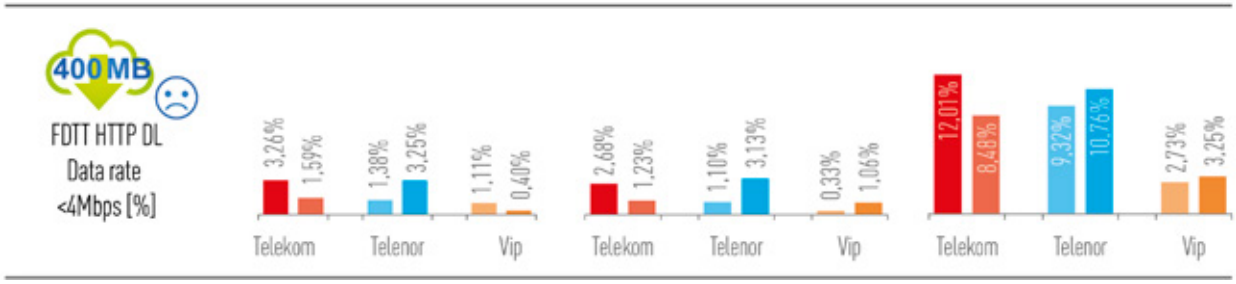


Note: Different colour shades are used to make distinction between benchmarking campaign results in 2017 and 2018. Lighter shades represent benchmarking campaign results of 2017, whereas darker ones refer to benchmarking campaign results of 2018.

As for the data transmission service parameters, operators mainly achieved better results, compared to the measurements carried out in 2017.

Comparative overview of the FDTTHTTP data transmission results is given in Figure 12.3:

Figure 12.3. FDTTHTTP data transmission service testing results (DL 400MB)



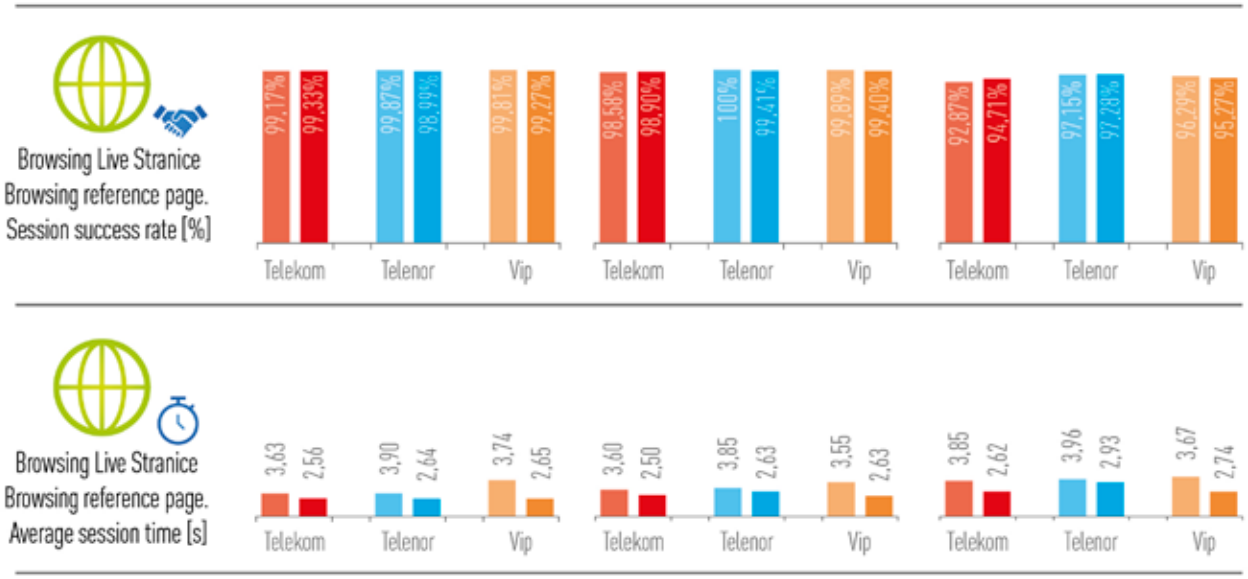
The session success rate reflects the level of reliability of the Internet connection provided by the mobile operator to users. During the benchmarking campaign of 2017, all three operators achieved excellent results (>99%), both in big and small cities. During the benchmarking campaign of 2018, the quality of service in big and small cities was maintained at the same level, whereas the QoS along the roads was slightly improved.

The average data transmission rate was improved for all three operators, compared to 2017, namely by 5-6 Mb/s in big cities, and by 7-10 Mb/s in small cities. Telekom Srbija improved its result along the roads by 3 Mb/s, and Vip mobile by 6 Mb/s. Telenor' rate was by 2Mb/s slower, compared to the previous year. The results achieved in 2018 enable the subscribers to comfortably use some of the most demanding services, such as video streaming.

The percentage of samples with an average data transmission rate below 4Mb/s is a metrics quantifying the rate of measurement samples not fulfilling the minimum criteria of customer satisfaction. If the average data transmission rate is below 4 Mb/s, subscribers may encounter problems when using more demanding services, such as video streaming or when downloading greater amounts of data. Compared to 2017, Telekom Srbija made progress in all categories. Vip mobile improved its results in big cities, while its results in small cities and along the roads were better in 2017. Telenor scored weaker results in all categories, in comparison to 2017.

The comparative overview of the browsing service testing results can be seen in Figure 12.4:

Table 12.4. Response time for operator's contact services *(Call Center)* (seconds)



The rate of successfully realized browsing live page sessions reflects most precisely web browsing service subscribers' quality perception. During 2018 benchmarking campaign, all operators had almost identical performance in big and small cities, with differences unnoticeable for a user. The best results along the roads achieved Telenor, followed by Vip mobile and Telekom Srbija. Despite negligible differences, users still can notice QoS fluctuations along the roads. Differences between the 2018 and 2017 results are due to the operators' network performance, but also to the changes in live pages' content and structure.

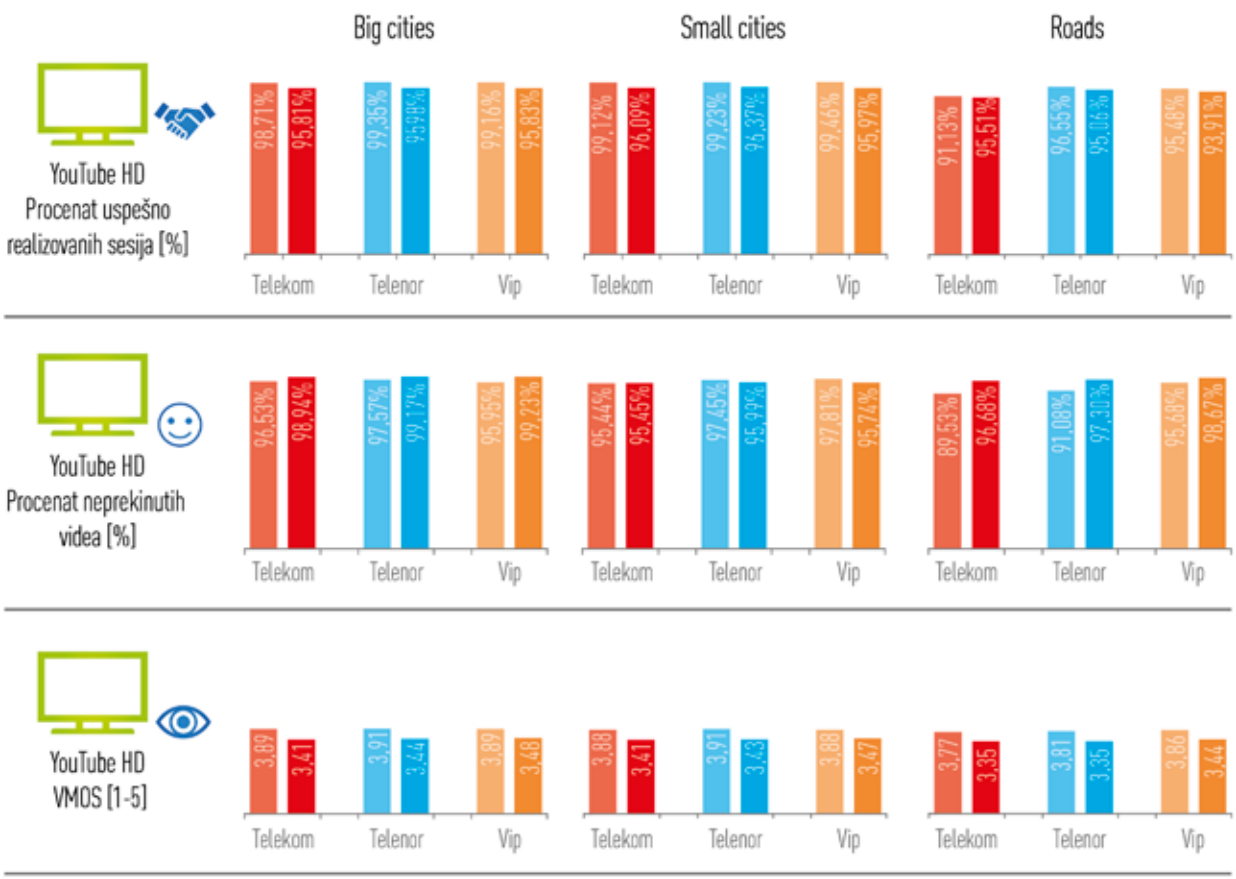
The average session time differs in the 2018 and 2017 campaigns, due to the network improvements and changes in live pages' content and structure. All three operators' performance was on a similar level, with Telekom Srbija achieving the best results in all categories.

The rate of successfully realized browsing reference page sessions in this year's benchmarking campaign was improved in Telekom Srbija's network and degraded in Telenor's and Vip mobile's networks. From the users' point of view, discrepancies tend to be undetectable in big and small cities, while along the roads, Telekom Srbija' s and Vip mobile's network users could perceive somewhat lower QoS levels, in comparison to Telenor's subscribers.

The average reference page browsing session time has been improved for all operators, the biggest improvement being made in Vip mobile network (1.2 s for big cities, 0.64 s for small cities and 0.68 s along the roads). For this type of service, the discrepancies remain indiscernible by users, however they tend to be significant along the roads, so the Telenor network's QoS shows degradation compared to its competition.

Parameters referring to YouTube and comparative results overview in 2018 are shown in Figure 12.5.

Figure 12.5. YouTube video service testing results



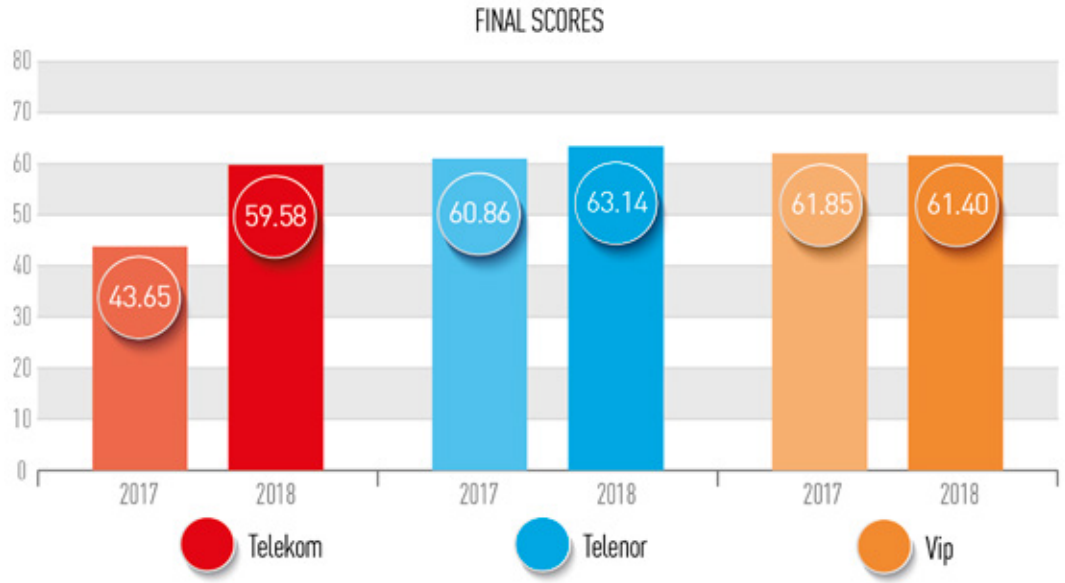
The rate of successfully realized sessions has decreased by approximately 3% for all operators. Differences between the operators are indiscernible by users. Along the roads, the results have remained virtually the same, with Telenor scoring the best results. Along the roads, subscribers notice discrepancies in the mobile network performance when using YouTube.

The uninterrupted video playout rate has been improved for all operators during this year's benchmarking campaign. In big cities, Vip mobile progressed by 3.28%, reaching the top of the list, right before Telenor. In small cities, Telekom Srbija has remained on the same level, whereas Telenor and Vip mobile slightly degraded in their performance, resulting in almost identical results achieved by all three operators. Along the roads, Telekom Srbija made the biggest progress (7.15%), followed by Telenor (6%) and Vip mobile (3%). Nonetheless, Vip mobile retained the first position, slightly ahead of the competition.

YouTube VMOS is a complex metrics reflecting all aspects of video signal quality (resolution, interruption, blurriness, blockage etc.). Comparing the results between 2017 and 2018, a degradation of 0.4 VMOS points for all operators can be observed. This is caused by usage of a different YouTube player. Measurements in 2017 were performed with YouTube App v11.49.55, which starts playout from 1080p resolution. With a new version of application, YouTube modified the application behaviour. During the 2018 benchmark, YouTube App v13.10.55 was used. This app starts playout with low resolution and upgrades gradually over time to 1080p. Comparing the results between operators, Vip mobile scored consistently higher 0.04 – 0.09 VMOS points, depending on the category. Such small difference is unlikely to be recognized by the end user.

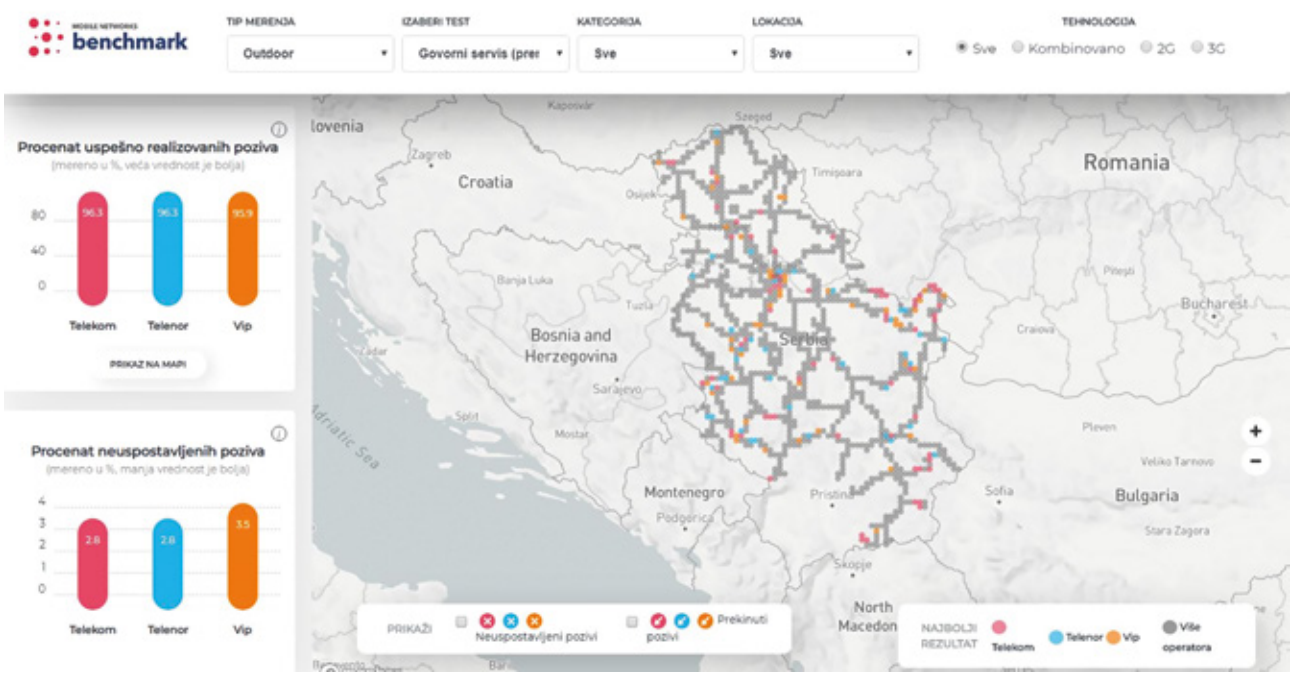
The analysis of the above and scoring of all parameters according to the scoring matrix have resulted in the final measurement scores performed in 2018, as shown in Figure 12.6:

Figure 12.6. Comparison of final scores



Upon the completion of the benchmarking, followed by data processing and analysis of the measurement results regarding mobile operators' network quality in the Republic of Serbia, an update was added to the interactive portal for comparative mobile network quality. The portal was published at the end of November 2018 on the official RATEL's Internet page and has been available since to end users in Serbian and English, at: http://benchmark.ratel.rs.

Figure 12.7. Benchmarking interactive portal



RATEL NetTest: testing of Internet connection quality

As of May 2016, RATEL enabled the users of Internet access services in public fixed and public mobile communications networks to measure QoS of broadband Internet access, by means of RATEL's application *NetTest*. Since then, the app has been upgraded with several new functions.

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

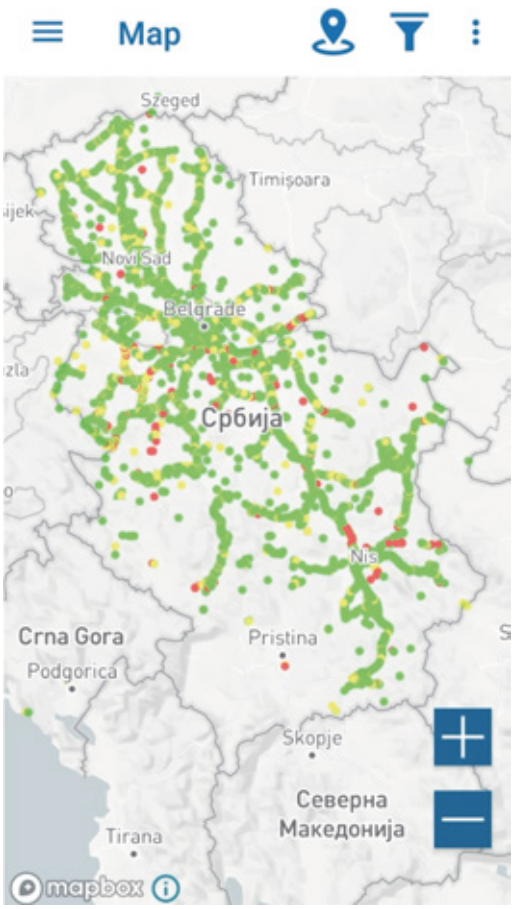
Testing of Internet connection in public mobile communications networks can be done by using the application for Android and iOS mobile devices downloaded free of charge from *Google PlayStore* and *Apple App Store*.

Figure 12.8. Net test application logo

The purpose of RATEL NetTest application is to provide transparent and comprehensive information regarding the users' Internet connection quality. It measures connection from the 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 without favoring any of the connections.

Figure 12.9. Mobile application home page

Figure 12.10. Map view of performed 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 enables comparative analysis of Internet service providers, 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.

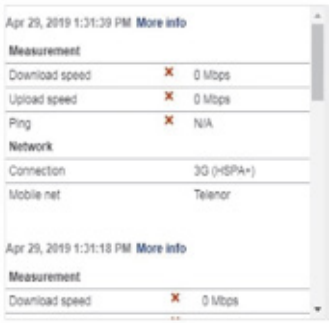
By means of RATEL NetTest application, the following quality parameters of Internet connection can be tested:

- 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,
- zero measurements – measurements in locations with no signal coverage, suggesting that service is not available, therefore tested parameters equal zero value. These spots on the map are marked in black.

Figure 12.11. Testing of Internet connection

Figure 12.12. Testing results

Figure 12.13. Zero measurements



In 2018, RATEL NetTest application was improved, so that all measurement results have become open and publicly available to end users. The benefit of this functionality is that, by having at their disposal a number of measurement results in the selected area, end users can get information about the operator's network QoS locally.

13500 users measured their Internet connection quality using RATEL NetTest application in 2018. 76% of subscribers used web application, 21% mobile phone, and 3% measured the above parameters by means of a tablet. The majority of measurements were performed for Telekom Srbija's telecommunications network.

By the end of December 2018, RATEL NetTest application was downloaded 2599 times from the Google Play Store and 4016 times from the Apple App Store.

RATEL is following the EU regulations in electronic communications and takes an active part in the work of BEREC (Body of European Regulators for Electronic Communications) and its expert WGs, among other in expert WG dealing with net neutrality and QoS. At the moment, BEREC is in the process of testing the tools for measurement of Internet access and Internet service quality, that will be made available to users by European regulatory bodies for electronic communications. As a next step, RATEL will adapt and conform its own tools for measurement of Internet access and Internet service quality, RATEL NetTest, to BEREC's tools technical specification that will be used for the same purpose, in order to be in line with other European regulatory bodies and be able to perform quality result analysis and comparison to those obtained in Europe.

13 ELECTRONIC COMMUNICATIONS INFRASTRUCTURE INTENDED FOR SHARED USE

The Agency maintains an updated database on type, availability and geographic location of capacities that may be subject to demand for common use and access. Operators of public electronic communications networks are entitled to require shared usage of another operator's or third person's electronic communications infrastructure, when needed for the purpose of a competitive, cost-effective and efficient performance of electronic communications activities

The shared use of infrastructure in the Republic of Serbia is defined in the Law on Electronic Communications („Official Gazette of RS", nos. 44/10, 60/13 – CC and 62/14, hereinafter: the Law) and 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, hereinafter: the Rulebook).

Pursuant to Article 52 of the Law, the Agency keeps an updated database on the type, availability and geographic location of capacities which may be subject to shared use and access (hereinafter: the Capacity database). The Agency adopted the Rulebook in July 2015. It prescribes creation of the records of the electronic communications network capacities which may be subject to shared use, in the form of an aggregated database.

Pursuant to Article 5 of the Rulebook, the Agency is responsible for creation, maintenance and funding of the Capacity database, including definition of the manner of data provision (access, interfaces and protocols).

The Capacity database was created in June 2016. Coordination with operators was established and data input into the database was enabled, by web access or through automatic data exchange systems.

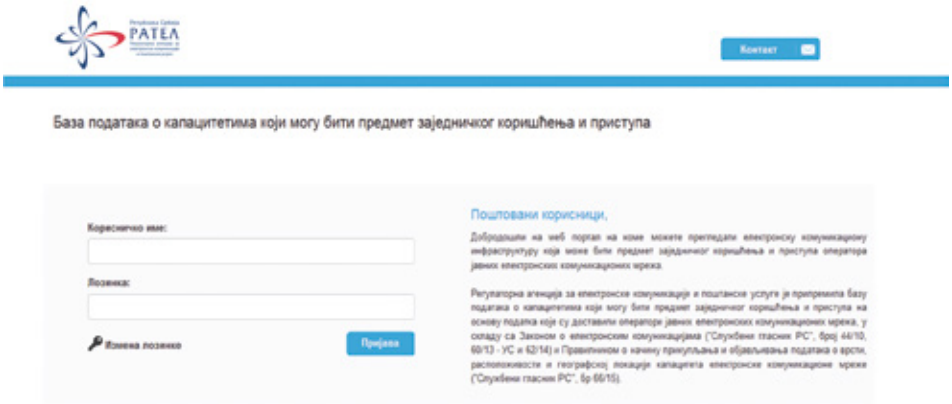
In case of the building of a new infrastructure subject to *shared use and access*, the operators are obliged to subimt all required data within 15 days from the beginning of the use of infrastructure and to update their data at least once in 3 months, should any changes in infrastructure occur.

The data on electronic communications network refer to electronic communications network cable ducts and antenna masts.

On December 31, 2018, this Database contained information on 1500 antenna masts, 1500 optic cables and approximately 200,000 cable duct elements. A web – GIS application for end users (operators of electronic communications networks) has been made available on RATEL's website. There have been more than 6900 logins to this database during 2018.

There is a choice between read access and read/record access. The read access is available to all registered electronic communications operators, whereas the read/record access is reserved only to electronic communications operators with recorded infrastructure lease service. The users can access the application by means of a user name/password combination, Figure 13.1.

Figure 13.1. Access to Capacity database web – GIS application



The Web – GIS application includes standard tools for map operation, such as (Figures 13.2 and 13.3):

- 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 large number of data through free ArcGIS online service (satellite footages, topographic maps, street networks etc.)

Figure 13.2. Use of standard tools – measurement of surface by hand

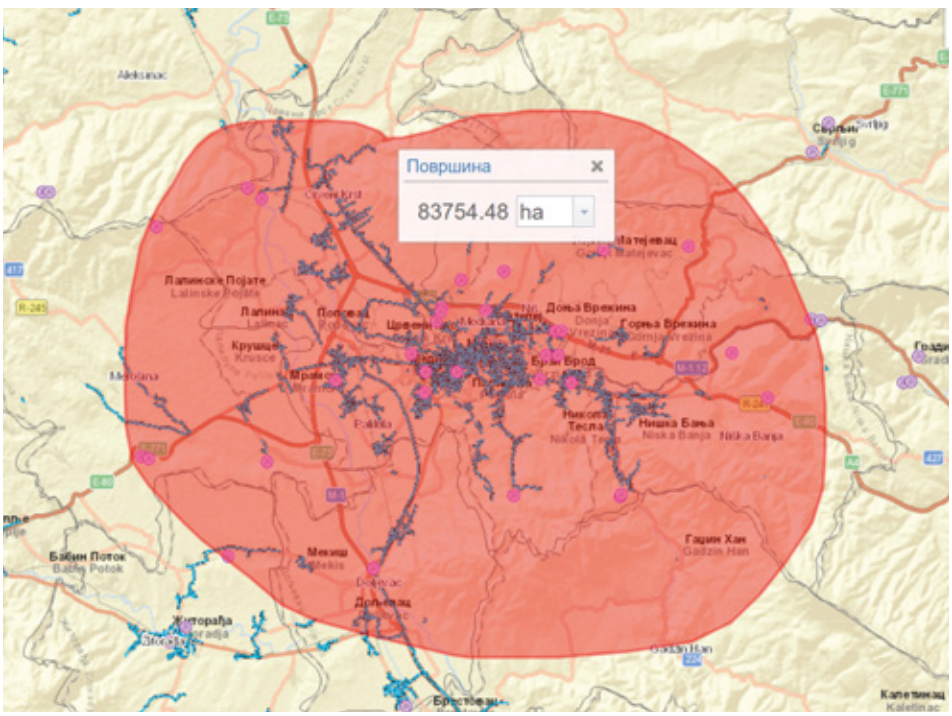


Figure 13.3. Use of standard tools – measurement of distance

Cable ducts of electronic communications networks subject to lease

Based on Annex 1, EKMI1 Form of the Rulebook, data on cable ducts to be collected are the following (Figures 13.4 and 13.5):

- Name of operator (owner)/ locations/ routes;
- WGS84 coordinates of important positions (start/ end, node);
- Route length/ geodetic footage;
- Cable type;
- Information on cable ducts (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 13.4. Cable details

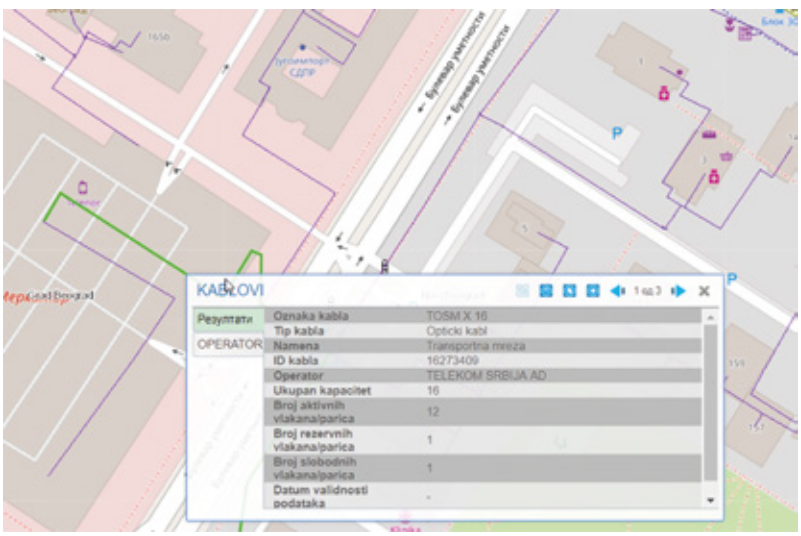


Figure 13.5. Cable ducts segment details

Antenna masts and equipment

Based on Annex 2, EKMI2 Form of the Rulebook, data on antenna masts and equipment to be collected are the following (Figures 13.6 and 13.7):

- Name of operator (owner);
- Location of antenna mast;
- Mast construction;
- Shape of mast base/ dimensions of mast base (m);
- Mast height (m);
- Facility height in meters (if 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 to lease.

Figure 13.6. Antenna mast data

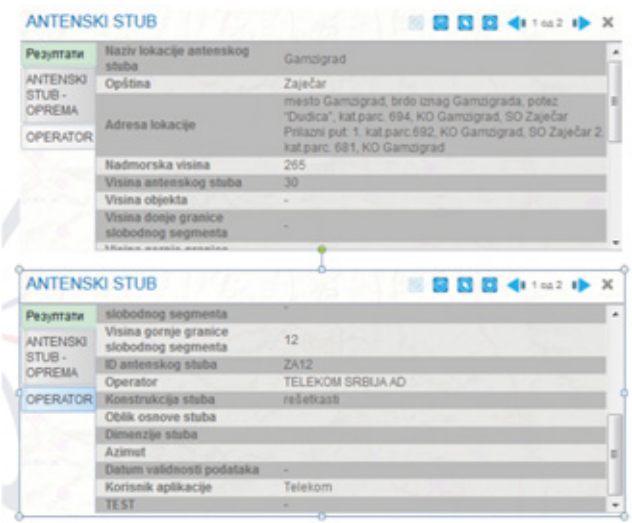
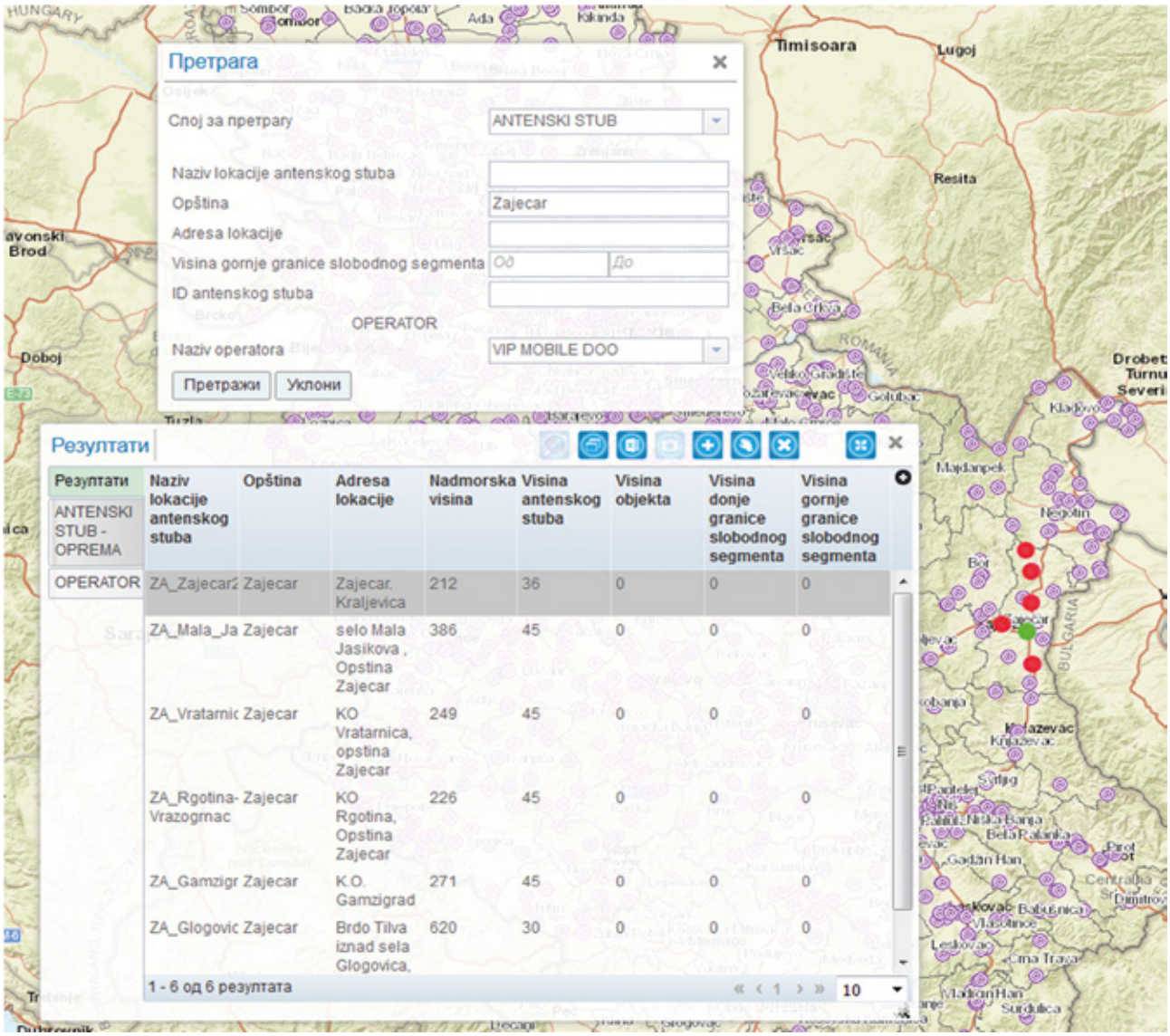


Figure 13.7. Antenna mast spatial query



14 POSTAL SERVICES MARKET

In 2018, the volume of postal services in the Republic of Serbia has increased by 1%, following a growing trend second year in a row. Even though the volume of postal services on the EU level had been collapsing for several years, in certain EU countries (Austria, Bulgaria, Cyprus, Hungary, Finland, United Kingdom) an increase in postal services volume has been observed.

During 2018, in the Republic of Serbia approximately 325 million postal services were realized, which is by 1% more than in 2017.

In 2018, there were in average 131 delivered postal items per household, i.e. 45 items per inhabitant.

Postal services in the Republic of Serbia generated during 2018 an income of approximately 20 billion dinars, i.e. over 166 million EUR, representing close to 0.4% of the projected GDP (5.060 billion dinars[7]).

On December 31, 2018, 59 commercial service operators, including the public postal operator – PPO (PE Post of Serbia), had authorization to provide postal services. The total number of authorizations remained the same in 2018, after authorization had been issued to two new postal operators (courier service), but also revoked from another two postal operators (courier service again).

Much as during the previous year, in 2018, 25 operators provided domestic express services, 2 operators provided international express services, 6 operators provided both international and domestic express services and 26 operators provided courier services. Limited number of operators, although possessing an authorization to perform commercial services (courier and express), discontinues periodically their services, making longer or shorter breaks in their activities, which is recorded in the Register of postal operators' authorizations. During 2018, within domestic postal traffic (DPT), it has been observed that some express operators cease to provide postal services for their own account, but do so on behalf and for the account of bigger postal operators instead.

The number of the postal sector jobs in the Republic of Serbia is increasing continually, reaching the growth rate of 1.5% in 2018. There are 18,883 postal employees, which represents 0.92% of the total number of employees in the Republic of Serbia (2,052,546 employees[8]), out of which 80% are employed by the PPO (Table 14.1).

The increase in the number of employees by 0.94% was recorded at the PPO, but it also includes employment on occasional and intermittent basis.

Express and courier providers marked an increase regarding the number of employees by 3.7%.

Like in previous years, the employed at auto-transport companies (drivers) such as AD „Niš ekspres" and „Autoprevoz Kikinda" were not included in the total number of employees, nor were the employees of the logistics companies (Gebrüder-Weiss, Milšped, etc.).

7 Statistics Office

8 Statistics Office

Table 14.1. Postal employees

	2014	2015	2016	2017	2018
PPO	15,015	14,965	14,868	14,980	15,121
Other postal operators	2,615	2,751	3,096	3,629	3,762
TOTAL	**17,630**	**17,716**	**17,964**	**18,609**	**18,883**

In 2018, the volume of universal postal service (UPS) was around 289.5 million, while the volume of commercial services amounted to more than 35 million, i.e. approximately 11% of the total volume of services (Table 14.2).

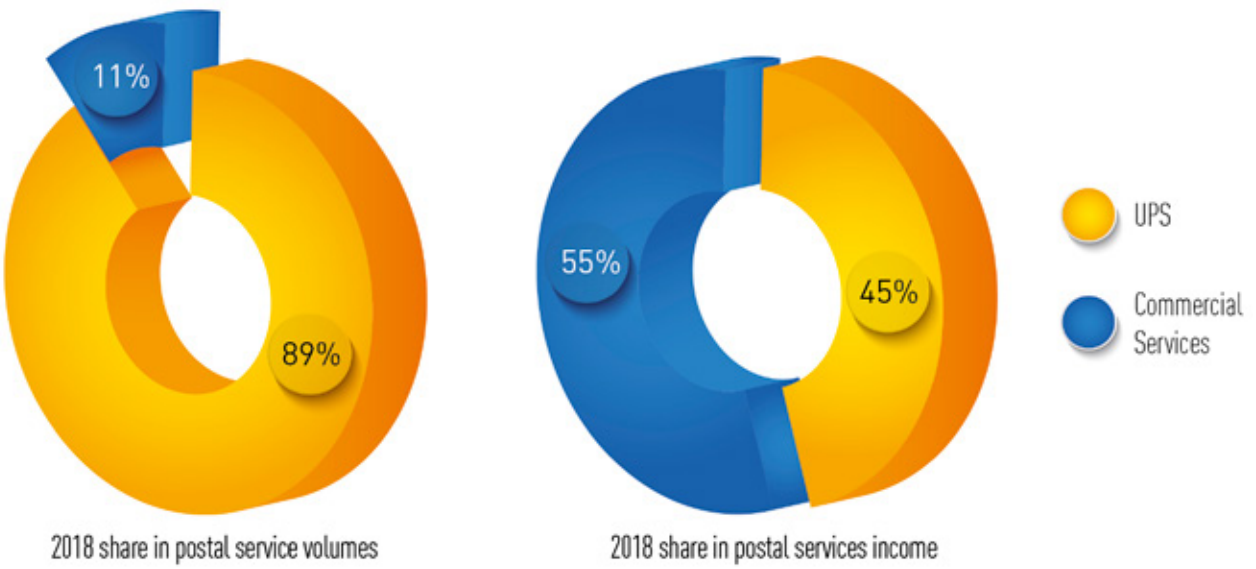
Table 14.2. Postal services market in 2018

TYPE OF SERVICE	VOLUME	INCOME	VOLUME	INCOME
	thous.	thous. din	%	%
Universal postal service	289,512	8,755,539.00	89.1	44.7
Commercial services	35,314	10,851,478.03	10.9	55.3
TOTAL	**324,826**	**19,607,017.03**	**100.0**	**100.0**

The UPS share has continued to drop, although still being dominant, participating with approximately 90% in the total volume of postal services.

The UPS share in terms of income has also continued to decrease. In 2018, more than 55% of the total income in postal industry was earned by the commercial services, as the most profitable portion of the market (Figure 14.1).

Figure 14.1. Shares in volume and income of UPS and commercial postal services in 2018



In 2018, a growth in commercial services volume by 14% was recorded. This continuous commercial service growth trend has been steadily present in all European countries.

Comparative overview of volumes and income from UPS and commercial services

Universal postal service (UPS), is provided by the PPO (PE „Post of Serbia"), the exclusive license owner, while commercial services are provided by all postal operators.

UPS is, by definition, a service of general interest consisting of several postal services provided continuously on the entire territory of the Republic of Serbia. This service must comply with the set quality, so universal service provider (USP) must meet certain quality standards. UPS is provided at affordable prices and under equal conditions for all users, without discrimination.

UPS includes collection, sorting, transport and delivery of the following items:

- letter-post items up to 2 kg, including letters in court, administrative and offence procedures,
- cecograms up to 7 kg,
- collection, transmission and payment of postal money orders,
- collection, transport and delivery of parcels up to 10 kg in domestic postal traffic,
- collection and transport of parcels up to 10 kg in international postal traffic (outbound),
- delivery of parcels up to 20 kg in international postal traffic (inbound).

Universal service is set by the Law as a service of general interest, regardless of the type of network industry and therefore, the legislator is obliged to establish the mechanisms of provision of this service category.

European and global postal sector practice has shown that UPS represents a burden to USPs, so a continuous search for new models of UPS funding and elaboration of the existing ones is constantly under way.

In the Republic of Serbia, the Law foresees funding of UPS from the scope of reserved services. Reserved services represent an exclusive right of the PPO.

Reserved service limits are set by RATEL. The determined limit is 100g in terms of weight and threefold the amount of the postal charge for a first-weight category letter and the fastest transmission level, in terms of price. This amount in 2018 was 69 RSD, as the UPS prices have remained unchanged since 2014.

Reserved postal services in domestic and international postal traffic include the following services:

- transport of all letter-post items (including recorded items) up to set limits per weight and price,
- collection and/or transmission and/or payment of money orders,
- collection and/ or sorting and/ or transport and/ or delivery of letters in court, administrative and offence procedures, regardless of the limits,
- collection, sorting, transport and delivery of addressed direct mail,
- collection, sorting, transport and delivery of notifications on day and time of voting.

The share of reserved services within UPS is constantly rising: in 2016 it was 97.6%, by 2018 it grew to 98.11%.

Letters up to 20g are dominant within the reserved area, with the UPS share of 91.84% (in 2017 the share was 91.15%).

Letters in category 20g-100g have continued to drop (6.27% in 2018, in 2017 their share was 6.91%, and in 2016 around 7.3%).

In 2018, a rise in the following categories has been observed: registered printed matter (12%), registered letters (9%), court letters (8%) and money orders (7%).

The biggest drop in services during 2018 was recorded in items with small volume within UPS: insured COD parcels (49%), insured COD letters (22%), insured letters (4%) and addressed direct mail (3%).

In the total revenue generated from the PPO's postal services, reserved services account for 72.1% (with an income share drop, out of which letter-post items make up 63.4%, and money orders 8.7%), non-reserved for 4.9% and commercial for 23% (the income share of these has increased).

In terms of the UPS income, the share of letter-post items up to 20g has continued to grow. They account for 87.24% of the total income, whereas letter-post items from 20g-100g account for 8.49%.

Reserved services continue to account for more than 95% of the UPS income.

In the UPS income, dominant growth is achieved by the registered printed matter (11.51%), registered letters (8.69%) and court letters (8.37%).

The biggest drop in income is attributed to the insured COD letters (22%), special delivery or cumbersome parcels (13.55%) and insured letters (9.48%).

Insured letters and insured COD letters have decreased in volume of items by approximately one third.

Postal items handled by the PPO under the concluded agreements with legal persons (mostly non-recorded and court letters) account for the biggest share in the UPS volume (85%) and in the UPS income (75%).

Unlike the UPS in domestic postal traffic that has marked a decline in volumes, the UPS in international traffic is growing, even though represented by a significantly smaller number.

The international inbound UPS makes up more than 80% of the total UPS international volumes. These services account for over 70% of the total international traffic revenues. On the other hand, the international outbound items make up 20% of the volumes and 30% of the income.

Commercial postal services include provision of express services, courier services and parcel services outside the UPS domain.

Express services are postal services that include collection, sorting, transport and delivery of recorded express items in the shortest delays, both in domestic and international postal traffic.

Courier services are postal services that include collection, transport and delivery of recorded postal items directly from sender to recipient, without sorting, with one same worker-courier performing collection, transport and delivery.

Commercial parcel service include parcels outside UPS, namely:

- collection, transport and delivery of parcels over 10 kg in domestic postal traffic,
- collection and transport of parcels over 10 kg in international postal traffic (outbound),
- delivery of parcels over 20 kg in international postal traffic (inbound).

In the service structure of operators providing commercial services, the largest share is that of domestic express services, which account for approximately 98% of all commercial services and participate in the income with 83% (Table 14.3). The average price of these services has continued to drop (by 4 RSD in 2018), amounting to 262 RSD approximately. These services have continuously decreased in average price since 2010.

The international express services participate in the volume of services with less than 2%, with an average price of od 2,786 dinars, accounting for more than 16% of the revenues (Table 14.3). The average price of these services has dropped by 54 RSD in 2018.

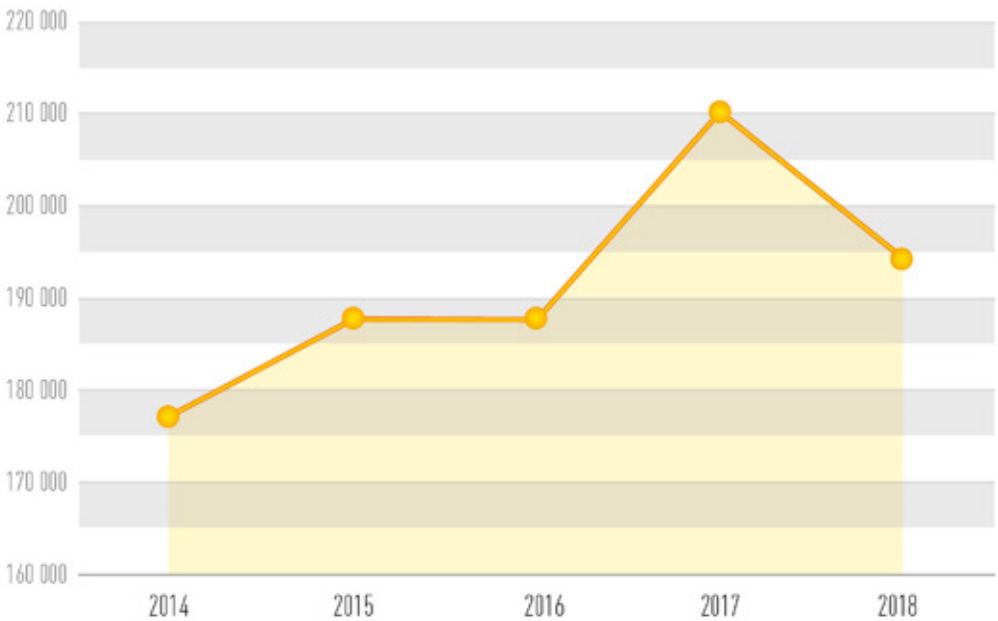
In 2018, the courier service has had a lower share in the total volume of services.

The courier services, with an average price per item of 349.32 dinars, account for 0.6% of the share both in the volume and income (Table 14.3). The prices of these services are steadily growing.

The commercial services have followed a steady trend, in place since the regulator started to analyze the market. The domestic express services have consequently seen a growth in volume by 14%. An increase in the international volume of services by approximately 5% was recorded, compared to 2017.

A decrease by 8%, on the other hand, in the volume of courier services in comparison to 2017 has been observed (Figure 14.2).

Figure 14.2. Volume trend of courier services 2014-2018



Commercial services have seen an increase in income by approximately 13%, with generated more than 10 billion dinars.

Domestic express services, as dominant, account for the largest increase in revenues by approximately 15%.

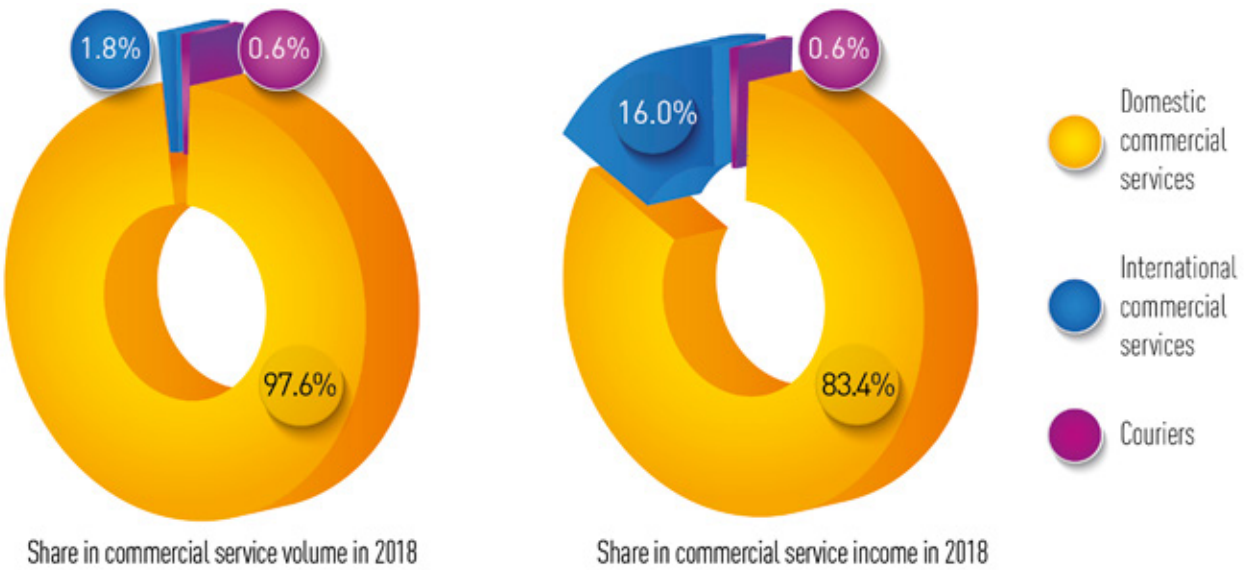
International express services have grown by over 4%, whereas courier services made an increase in income by somewhat less than 1%.

The commercial services structure is shown in Table 14.3 and Figure 14.3.

Table 14.3. Commercial services structure in 2018

Type of service	Volume	Income	Volume	Income
	thous.	thous. din.	%	%
Domestic commercial services	34,497	9,049,282	97.6	83.4
International commercial services	622	1,734,340	1.8	16.0
Courier services	194	67,855	0.6	0.6
TOTAL	**35,314**	**10,851,478**	**100.0**	**100.0**

Figure 14.3. Shares in volume and income of commercial postal services in 2018



The trend of commercial service volume and income shares in the Republic of Serbia in the last five years is given in Table 14.4.

Table 14.4. Trend of commercial service shares in %

Type of service	2014		2015		2016		2017		2018	
%	Volume	Income	Volume	Income	Volume	Income	Volume	Income	Volume	Income
Domestic commercial services	95.6	76.7	96.0	76.0	96.3	76.7	97.3	82.0	97.6	83.4
International commercial services	3.1	22.2	2.9	23.1	2.8	22.4	2.0	17.3	1.8	16.0
Courier services	1.3	1.1	1.1	0.9	0.9	0.9	0.7	0.7	0.6	0.6
TOTAL	100	100	100	100	100	100	100	100	100	100

Analysis of express services and impact of remote commerce

The data provided by the operators in 2018, as part of annual questionnaires and monthly reports, regarding volume of express items in domestic traffic, were analyzed in respect of weight, in the following manner:

- items up to 500 g,
- items 500 g - 2 kg,
- items 2 kg - 10 kg,
- items over 10 kg.

In the weight category up to 500 g items were divided according to content, to items containing documents and items containing goods, a feature harmonized with ERGP (European Regulators Group for Postal Services) recommendations.

Table 14.5 and Figure 14.4 display the structure of express items by weight in domestic postal traffic.

Table 14.5. Struktura obima ekspres usluga po masi u UPS

	Express items in domestic postal traffic (in thousand)						Total express items		Total volume
	Items up to 500 g		up to 500 g total	501 g-2 kg	2-10 kg	over 10 kg			
	Documents	Goods					Documents	Goods	
Volume	4,506	10,951	15,458	7,299	6,843	4,740	4,506	29,834	34,340
%	13.12	31.89	45.01	21.26	19.93	13.80	13.12	86.88	100.00

The items containing goods prevail in the total domestic express service volume; they are almost 7 times more frequent than items containing documents.

Items up to 500 g make up almost half of the total domestic express service volume, 60% out of which contain goods.

In 2018, over 41% of items in domestic traffic continue to be express items between 500 g and10 kg.

Figure 14.4. Structure of domestic express service volume by weight

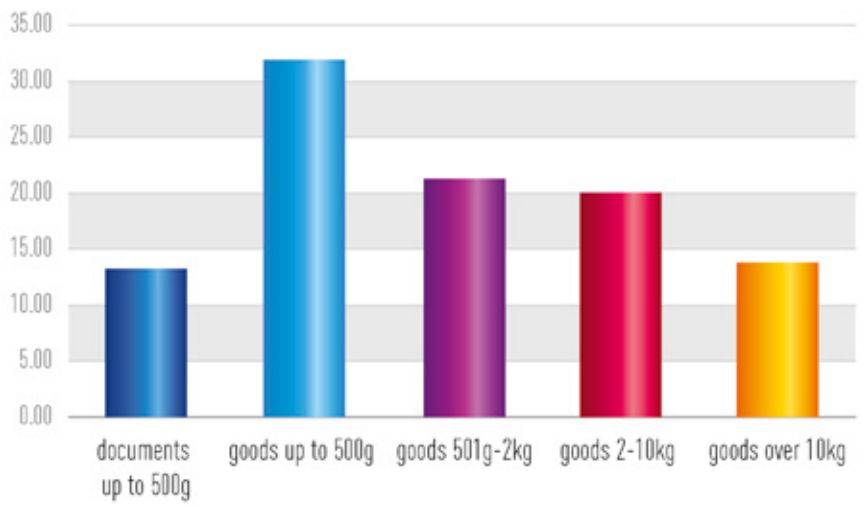


Table 14.6 and Figure 14.5 show the share of items resulting from remote sales, compared to the domestic express traffic.

Remote sales are boosting the postal volumes both in domestic and international traffic.

Remote retail commerce[9] is a sale of goods/ services offered by the seller via different communications means to the buyer who is not physically or directly present. The remote selling includes: e-commerce, catalogue sales, TV sales, commerce via postal services, printed items, advertising material with purchase order, via telephone, mobile phone text or multimedia messages and automatic machines.

Merchandise payments are effectuated electronically or COD and the delivery of goods via postal items – in domestic traffic, usually through express postal items.

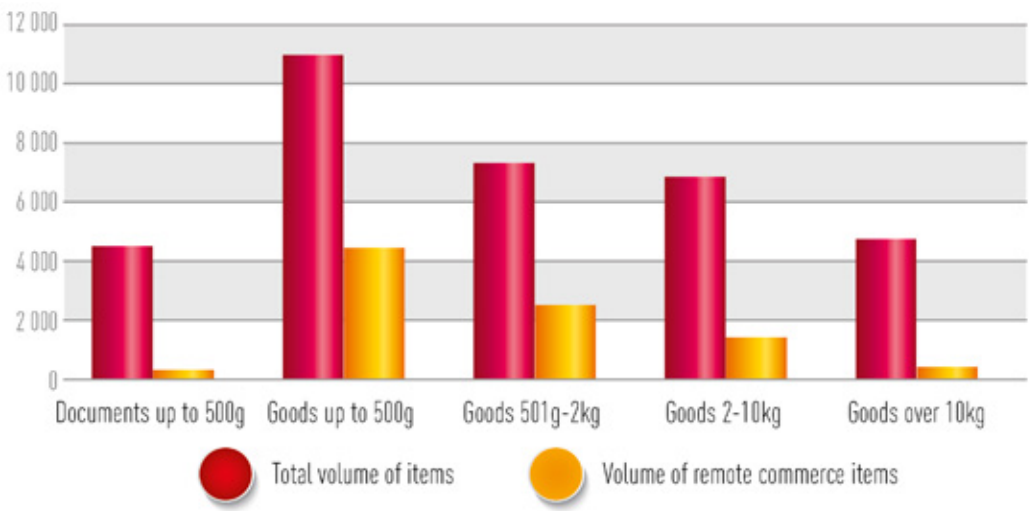
Items issuing from the remote commerce, that have already expanded on the European market, account for almost 1/3 of the total volume of express postal items in 2018 on the market of the Republic of Serbia (Table 14.6).

Table 14.6. Share of remote commerce in domestic express items (thousands)

Volume	Documents up to 500g	Goods up to 500g	Goods 501g-2kg	Goods 2-10kg	Goods over 10 kg	Total
Volume of domestic express items	4.506	10.951	7.299	6.843	4.740	34.340
Volume of remote commerce items	332	4.429	2.525	1.444	439	9.168
Remote commerce share (%)	7.4	40.4	34.6	21.1	9.3	27

Remote commerce items containing documents account for 7.4% of the volume of express items with documents up to 500g, while remote commerce items containing goods up to 500g account for more than 40%. Remote commerce items containing goods account for over 26% of the domestic express items, i.e. the items containing goods up to 2kg account for more than 20% of the total domestic express traffic.

Figure 14.5. Share of remote commerce in domestic express items



9 The Law on Trade („Official Gazette of RS", Nos. 53/2010,10/2013 i 44/2018)

Table 14.7 and Figure 14.6 show the share of express services income (in million dinars) by weight in domestic postal traffic.

Within domestic express services, items up to 500g account for the biggest income share, amounting to almost 33%. The revenues from the items containing goods up to 500g are over 2.6 times higher that those from the items containing documents.

Table 14.7. Domestic express services income share (in million din.) by weight

	Express items						Total revenues from express items		Total
	Items up to 500 g		up to 500 g total	501 g-2 kg	2-10 kg	over 10 kg			
	Documents	Goods					Documents	Goods	
Income	816	2,060	2,876	1,738	1,834	2,330	816	7,963	8,778
%	**9.29**	**23.47**	**32.76**	**19.80**	**20.89**	**26.54**	**9.29**	**90.71**	**100**

Figure 14.6. Domestic express services income share by weight

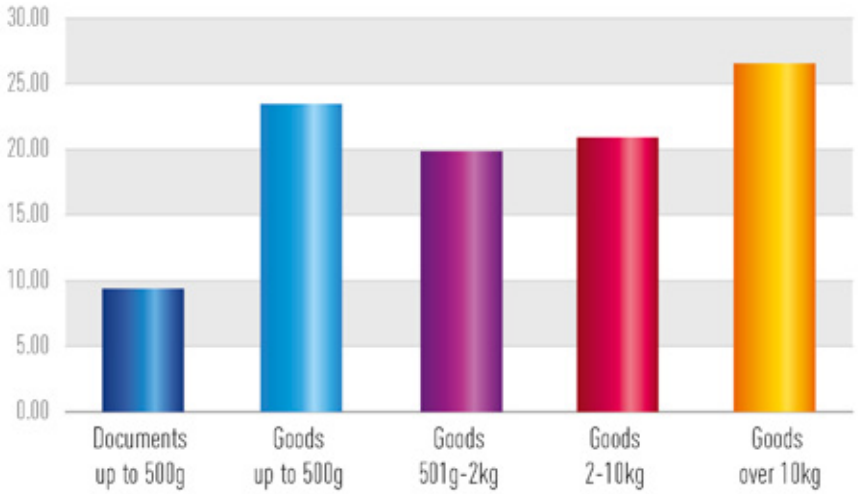


Table 14.8 and Figure 14.7 show the share of remote commerce revenues compared to the domestic express services income (in million dinars), revealing that more than 25% of the income is generated by the remote sales items. The dominant category, in terms of revenues, among the items stemming from remote commerce are the ones containing goods, up to 500g.

Table 14.8. Share of remote sales income compared to domestic express service revenues (in million din.) by weight

Income	Documents up to 500g	Goods up to 500g	Goods 501g-2kg	Goods 2-10kg	Goods over 10 kg	Total
Income from domestic express items	815.64	2,060.00	1,738.39	1,834.00	2,330.16	8,778.19
Income from remote commerce items	61.15	871.40	589.92	444.26	260.31	2,227.04
Remote commerce share (%)	7.50	42.30	33.93	24.22	11.17	25.37

Figure 14.7. Share of remote sales income (in million din.) from domestic express services

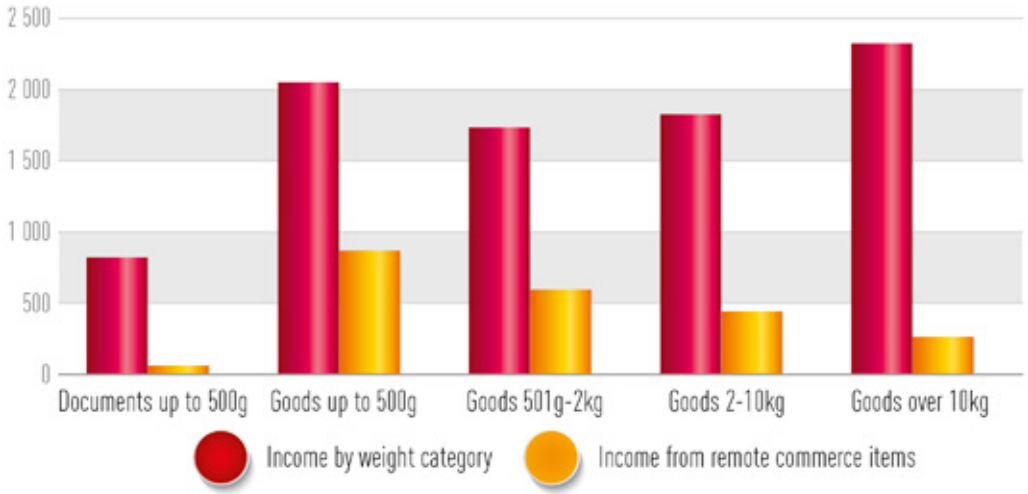


Table 14.9 shows the volume of international express items in 2018 by weight categories, 70% out of which are inbound. The majority of international express items are up to 500g, containing documents and are 5 times more frequent than the items containing documents in the same category.

Table 14.9. Share of international express volumes by weight categories

Volume of international express items 2018	0-500g		501-2kg	2-10kg	10-20kg	over 20kg	OUTBOUND	INBOUND	TOTAL
	documents	goods							
Volume	288,005	55,021	107,121	109,941	28,319	34,046	206,040	416,413	622,453
Share (%)	46.27	8.84	17.21	17.66	4.55	5.47	33.10	66.90	100.00

Postal market trends

The growing trend of commercial services compared to universal postal service has continued. Since 2010, when RATEL started to monitor postal markets in the Republic of Serbia, the share of commercial services has been on a constant rise of approximately 1%, both in volume and income.

Table 14.10 shows percentage shares in the postal service volume and income during the last five years.

Table 14.10. Postal service market in 2018

Type of service	2014		2015		2016		2017		2018	
%	Volume	Income	Volume	Income	Volume	Income	Volume	Income	Volume	Income
UPS	93.7	52.6	92.6	51.4	91.2	48.7	90.4	46.9	89.1	44.7
Commercial services	6.3	47.4	7.4	48.6	8.8	51.3	9.6	53.1	10.9	55.3
Total	100	100	100	100	100	100	100	100	100.0	100.0

Table 14.11 shows changes in the postal service volume during last five years. Figure 14.8 shows the trend of normalized UPS volume and commercial services compared to the reference year 2011.

Table 14.11. UPS and commercial service volumes

UPS and commercial service volumes 2014-2018									
Type of service	VOLUME in thous.					Growth rate/drop in volume			
	2014	2015	2016	2017	2018	15/14	16/15	17/16	18/17
UPS	301,542	291,399	283,488	291,362	289,512	-3	-3	3	-1
Comm. services	20,350	23,228	27,186	30,928	35,314	14	17	14	14
TOTAL	321,892	314,627	310,674	322,290	324,826	-2	-1	4	1

Figure 14.8. Trend of normalized UPS and commercial service volumes

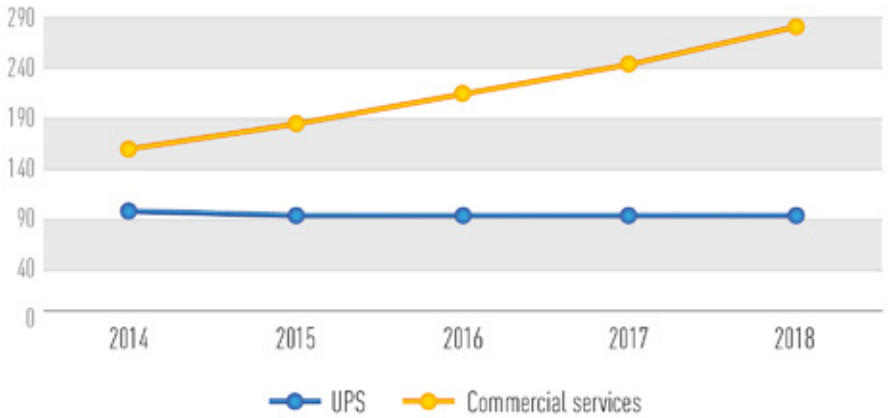


Table 14.12 shows the postal services income during the last five years, which is by 8,5% higher compared to 2017.

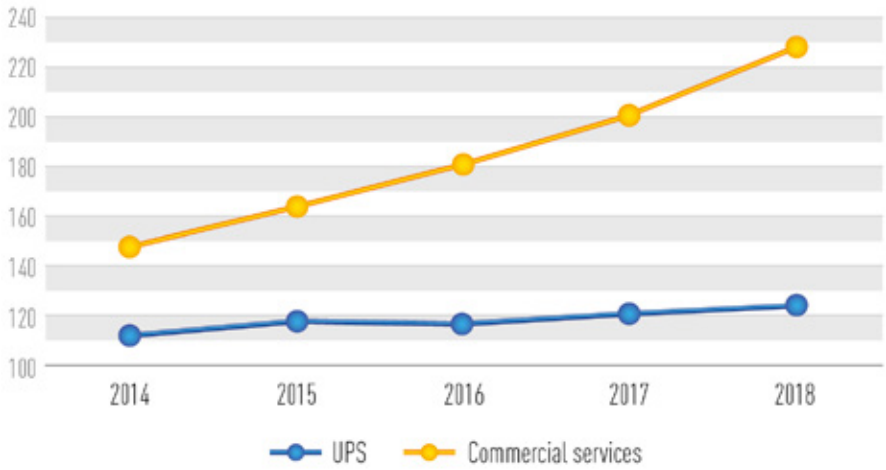
In 2018, the UPS income has increased by 3.3%. The commercial services income has been continually growing, with a more or less constant growth rate throughout the years. In 2018, the commercial services income increased by 13%.

Table 14.12. UPS and commercial services income

UPS and commercial services income 2014-2018									
Type of service	INCOME in million din.					Growth rate/drop in income			
	2014	2015	2016	2017	2018	15/14	16/15	17/16	18/17
UPS	7,871	8,264	8,197	8,473	8,756	5	-0.8	3.4	3.3
Comm. services	7,099	7,809	8,639	9,605	10,851	10	10.6	11.2	13.0
TOTAL	14,970	16,073	16,836	18,078	19,607	7	4.7	7.4	8.5

Figure 14.9 shows the trend of normalized UPS and commercial service revenues compared to the reference year 2011.

Figure 14.9. Trend of normalized UPS and commercial service revenues



Herfindahl-Hirschman index (HHI)[10]

The HHI index is the most reliable description of the market concentration. The value of HHI depends on the number of market participants and on the difference in their relative market power. With the increase in the number of market participants, the HHI values drops. The maximum theoretical HHI value is 10,000, while the minimum is close to zero. The maximum value is reached only in case of an absolute monopoly and the minimal in case of an ideal competition.

The index value is determined as the sum of single market share square values of all market participants.

In case of a separate express services market compared to UPS where there is a PPO monopoly, the HHI in the Republic of Serbia is 1.829, which means that the express services market is competitive. Seven postal operators have share of more than 1% in express services' volume, based on which the HHI is calculated.

Overview of postal market services in the Republic of Serbia

Letter-post items up to 20g (from the reserved area) are still the most dominant item category. The majority of these services are provided under the PPO agreements with legal persons, accounting for approximately 85% of the volumes and more than 75% of the UPS revenues.

In 2018, only the PPO provided parcel services, both from the UPS domain and commercial area. The volume of parcels is on a slight increase, especially in UPS area, however, the share of parcels in the total volume of services remains to be extremely low.

10 HHI – Herfindahl-Hirschman index – measurement showing the level of competition within a market.

https://www.modernanalyst.com/Careers/InterviewQuestions/tabid/128/ID/1003/What-is-the-Herfindahl-Hirschman-Index-HHI-and-why-would-you-use-it.aspx

The cause of this discrepancy with the EU trend lies in the fact that express services have very low price, which is similar to the price of parcel services. This contradicts the European practice, where express services are several times more expensive than parcels.

The number of the PPO's postal network units is on the rise, while the number of postal operators' business offices has remained on the same level as last year.

The increase of the postal items' volumes has contributed to the increase in the number of employees, especially with the private postal operators.

The commercial postal services, as high-profit services, have generated more than half of the revenues since 2016, while being almost 10 times less numerous in volume than the UPS.

This continuous express service growth trend demonstrates an increased economic activity, induced by the growth of GDP. The users opt gladly for express services, and the latter are directly connected to the impact of e-commerce and remote sales.

The domestic market only partially reflects the EU countries' postal market trends. The market of remote sales in currently growing intensively worldwide, above all in the developed countries. The projected 2019 growth rate in this market segment is 21%, thanks to Internet penetration which was 51.2% in 2018 (48.6% in 2017[11]), and an annual 2018 economic growth rate around 3.7%[12]. During the last few years, this trend has also been observed in the Republic of Serbia, where it has noticeably impacted business activities of the postal providers operating in this market segment. The majority of postal operators have recognized e-commerce as one of the key factors of economic growth. A constant growth rate in the volume of services has been observed, while some of the operators noticed an important increase in the number of postal items as a result of remote commerce activities.

Overview of postal markets in the EU based on ERGP reports[13]

ERGP (The European Regulators Group for Postal Services) analyzes and publishes reports on the European market main indicators, with an aim to identify the most important postal market development trends. Since the 2018 postal market results are published only at the end of 2019, present report will showcase only postal services of 2017. The data are collected from 33 countries, members of ERGP, for an observed period 2013-2017.

For the sake of an easier monitoring, the totality of EU markets is divided in 4 areas:

- Western countries (AT, BE, DE, DK, FI, FR, IE, LU, NL, SE, UK),
- Eastern countries (BG, CZ, EE, HR, HU, LT, LV, PL, RO, SI, SK),
- Southern countries (CY, EL, IT, MT, PT),
- non- EU countries (CH, FY, IS, NO, RS).

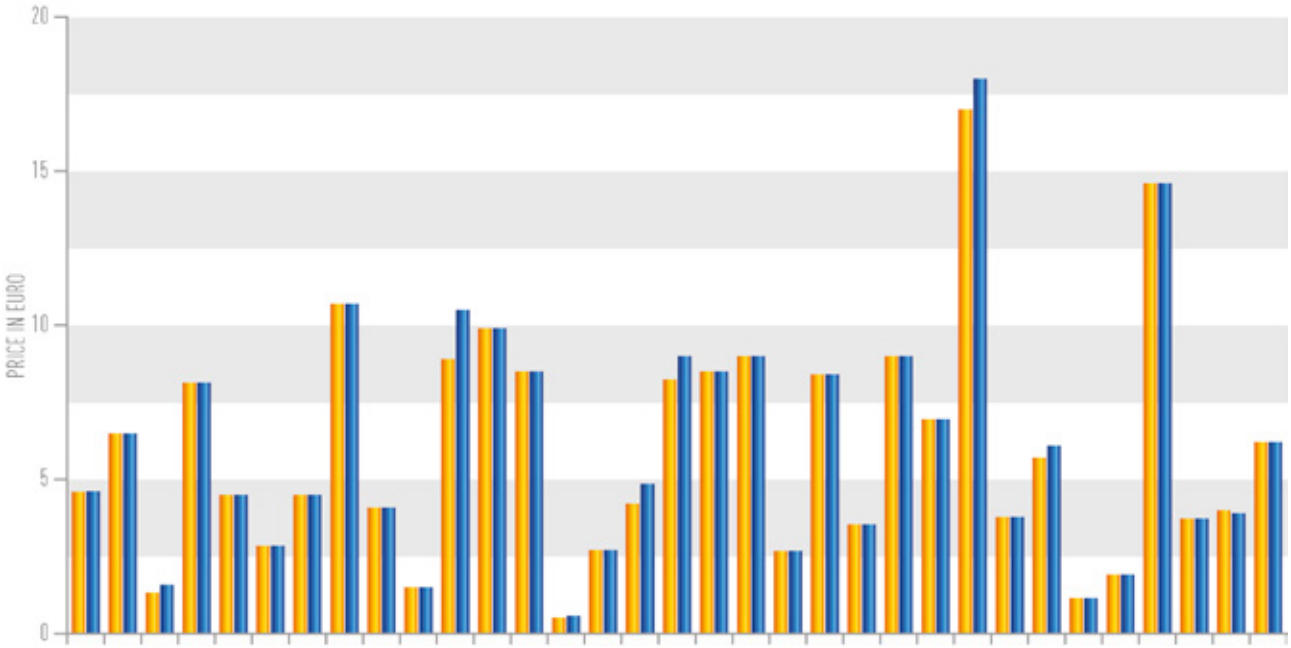
The average 2017 European domestic parcel postage fee set by the universal service provider (USP) was 6,14 EUR. It is noticeable that within Europe, there are sharp price differences regarding parcels: in Norway they cost 1809 EUR, whereas North Macedonia charges only 0.58 EUR for a parcel. Compared to 2013, the price of a priority parcel grew by approximately 3% on an annual basis. Parcel postages are shown in Figure 14.10.

11 Source ITU

12 Source IMF

13 ERGP (18)45 b – Flash of the ERGP Report on core indicators for monitoring the European postal market

Figure 14.10. Domestic priority parcel postages in 2016 and 2017



	AT	BE	BG	CH	CY	CZ	DE	DK	EE	EL	ES	FI	FR	FY	HR	HU	IE	IS	IT	LT	LU	LV	MT	NL	NO	PL	PT	RO	RS	SE	SI	SK	UK
2016	4.60	6.50	1.33	8.14	4.50	2.84	4.50	10.7	4.08	1.50	8.90	9.90	8.50	0.52	2.70	4.21	8.25	8.50	9.00	2.68	8.40	3.54	9.00	6.95	17.0	3.78	5.70	1.16	1.92	14.6	3.73	4.00	6.21
2017	4.62	6.50	1.59	8.14	4.50	2.84	4.50	10.7	4.08	1.50	10.5	9.90	8.50	0.58	2.70	4.86	9.00	8.50	9.00	2.68	8.40	3.54	9.00	6.95	18.0	3.78	6.10	1.16	1.92	14.6	3.73	3.90	6.21

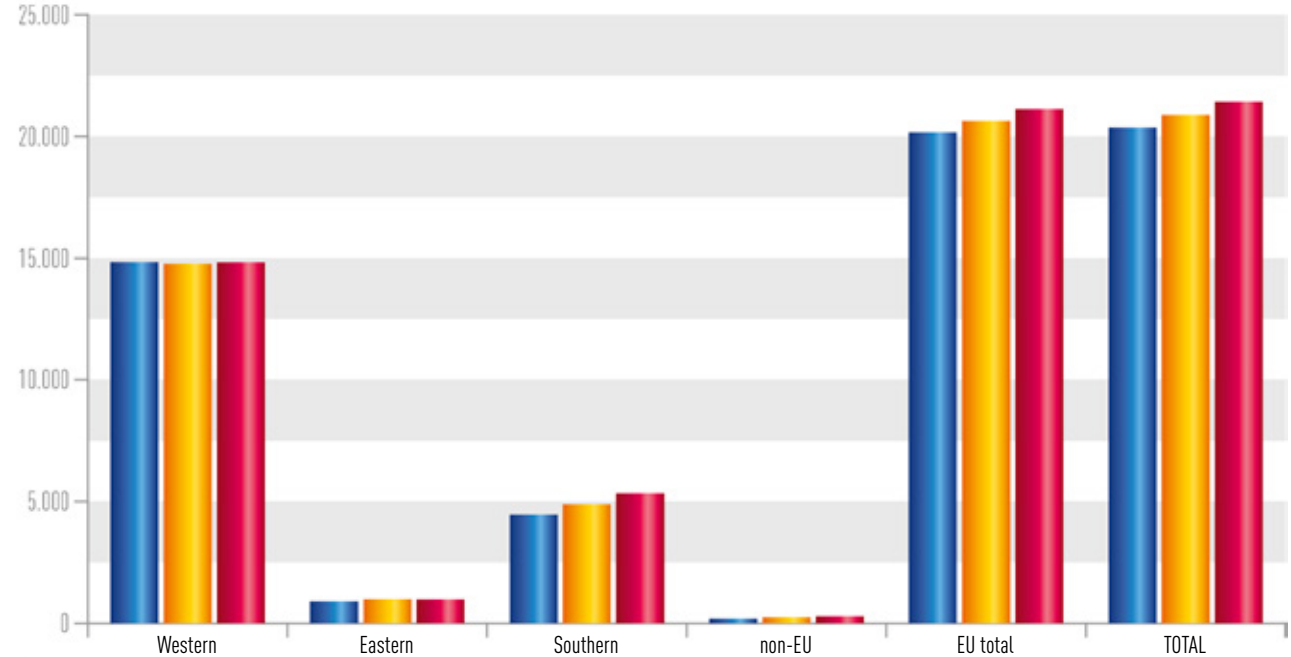
The average price for sending an international parcel up to 2 kg within European borders is 19.67 EUR. The average annual price for international parcels has a slightly lower growth rate than in the domestic traffic (by 1% each year, between 2013 and 2017). It is important to strass that the international priority parcel is on average roughly 4 times more expensive than the domestic priority parcel.

As a result of the market structure analysis, based on the HHI and number of private operators with more than 1% of the market share, it can be concluded that the European postal market is highly concentrated. The Eastern European countries have a lower level of market concentration compared to the rest of Europe.

The HHI level variation is insignificant during 2016-2017, which can be a signal of a certain postal market structure stability. During 2013-2017, the HHI was dropping on the European postal market, however a growing trend in the number of operators with more than 1% share in the market was being visible. This can be interpreted as a signal of appearance of competition in the said period.

During the period 2013-2017, there has been a growth of the number of active operators (by 5%). A substantial increase by 20% happened in Southern Europe, in comparison to 2013 (Figure 14.11).

Figure 14.11. Active postal operators 2013-2017



	Western	Eastern	Southern	non-EU	EU total	TOTAL
2013	14830	885	4451	198	20166	20364
2016	14769	970	4891	250	20630	20880
2017	14821	966	5339	297	21126	21423

Providers of universal postal service remain in the dominant position regarding the volume of letters and non-express items (in 2017 with shares of roughly 93% for letters and 82% for non-express postal items). As for the volumes of express items and parcels, these operators' shares are fairly smaller (25% for parcels and 12% for express items in 2017). A decrease trend in the UPS' share in the express and parcel markets has been present since 2013.

Table 14.13 shows the average annual changes of the EU market volumes for 2013-2017.

Table 14.13. Total volume of postal services: average annual change (2013-2017)

REVENUE	Average annual change
1. Total volume of postal services	-3.8%
1.1 Volume of letter-post items	-4.7%
1.2 Volume of parcel services	19.6%

The total volume of services dropped by 3.8% annually. A decrease in the letter-post volumes by 4.7%, caused by the electronic substitution, has not been compensated by an increase in the volume of parcels (by 19.8% annually). In this period, the volume of letters has dropped by approximately 7.45 billion items. However, the falling trend is not present in all European countries. In Austria, Bulgaria, Cyprus, Hungary, Finland, United Kingdom and Serbia, the volume of postal services is on the rise.

The total revenues have grown in average by 1.8% annually during 2013-2017. The letter-post services income dropped by 1.3% annually, but was compensated by an increase in parcel service revenues by 7.8% annually (Table 14.14).

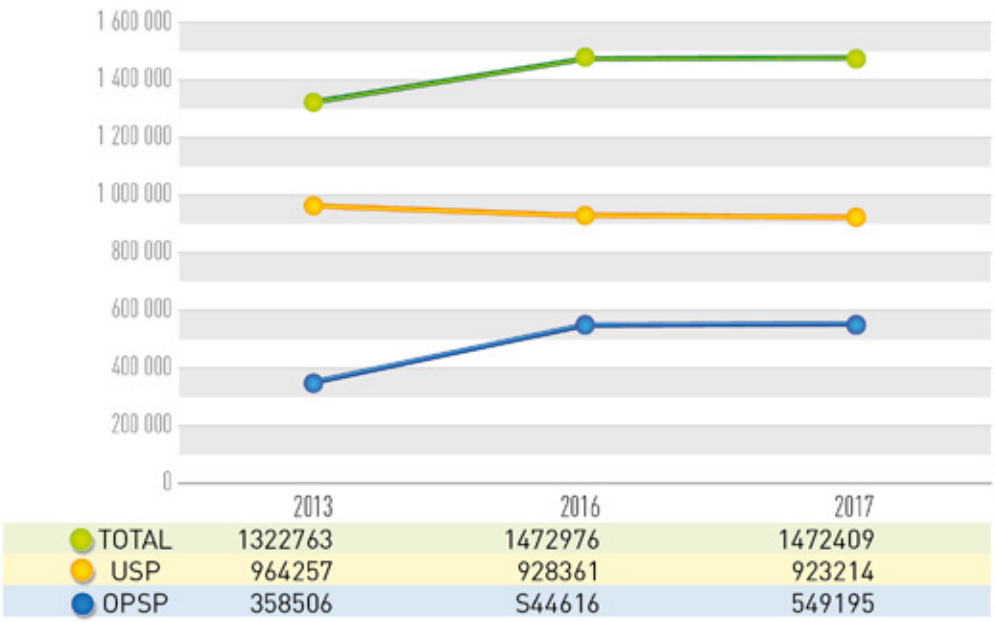
Table 14.14. Total income from postal services: average annual change (2013-2017)

REVENUE	Average annual change
1. Total postal services income	1.8%
1.1 Letter-post services income	-1.3%
1.2 Parcel services income	7.8%

In the whole of the EU, an increase in the total revenues has been recorded during this period. The income from letter-post services is in decline everywhere except in the non-EU countries. On the other hand, parcel services revenues are growing in all of the countries.

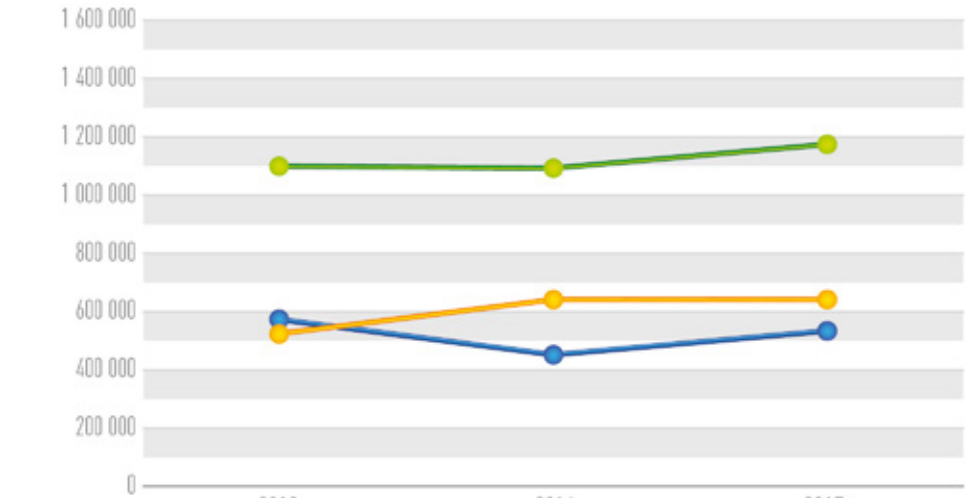
The total number of employees in the postal industry within the ERGP countries has grown by 11%, between 2013 and 2017, mainly thanks to an increase (approximately by 53%) in the number of employees at the private postal operators during that period. The number of employees at the USPs decreased by around 4%. As a result, the share of the USP employees decreased from 73% in 2013 to 63% in 2017 in the total volume of employees. Regardless of that, the USPs remain to have more employees than other postal operators in the majority of the countries (Figure 14.12).

Figure 14.12. Total number of employees at USPs and other postal operators during 2013-2017



Between 2013 and 2017, the total number of postal business offices was increased by 6.8%, due to an increase in the number of postal business offices at the USP by 21.4%, while the number of other operators' postal business offices dropped by 6.6% (Figure 14.13).

Figure 14.13. Total number of postal business units at USPs and other postal operators during 2013-2017



	2013	2016	2017
TOTAL	110446	110185	117989
USP	53017	64180	64357
OPSP	57429	46005	53632

Changes in regulatory framework

In April 2018, a EU Regulation[14] on cross-border parcel delivery services was passed, with a purpose to advance the remote commerce and more particularly cross-border parcel delivery resulting from remote selling in Europe. Numerous studies indicate that the development of parcel services stemming from the remote commerce will compensate the drop in the volume of traditional letters on the European level.

The Regulation on cross-border parcel delivery prescribes regulatory principles and rules as to how to improve regulatory monitoring, price transparency and establishment of clear guidelines for cross-border parcel delivery, ensuring a better availability for the users and an increased trust of the consumers.

The Regulation sets special rules enhancing the international parcel delivery service, namely:

1. transparency and verification regarding selected cross-border parcel delivery services, in order to identify unjustifiably inflated prices,
2. information intended for the consumers put out by the sellers, concerning the cross-border parcel delivery services.

Among other, the Regulation defines a set of data and the deadlines for their submittal, that the regulators are bound to observe during the process of data collection from the operators.

For the purpose of regulatory harmonization, RATEL has accordingly adapted its report drafting, for a better understanding of the impact of remote selling on the postal items structure (volume of postal items containing documents and goods; volume of items by weight; volume of outgoing and incoming items; number of complaints filed etc.)

The first preliminary results on the implementation of the Regulation on cross-border delivery services are expected to be published by the EC by the end of 2019.

14 Regulation (EU) 2018/644 of the European Parliament and of the Council on cross-border parcel delivery services

15 QUALITY OF UNIVERSAL POSTAL SERVICE PROVISION

Pursuant to the Rulebook on changes and amendment to the 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. 098/2017 of November 3, 2017) the regulator has set an obligation for the PPO to organize the measurement of transmission times for domestic non-recorded letters during at least two months in 2017 and 2018, by means of an independent body performing QoS measurements. The Rulebook stipulates the obligation to apply standards SRPS EN 13850:2014 and SRPS EN 14012:2014 as of January, 2019, which means that the 2019 Annual Report will include analyzed data referring to that whole year.

During 2018, the PPO, in cooperation with the Agency, made preparations for commencement of the continuous independent measurement of letter-post transmission times requiring the standard SRPS EN 13850:2014, with a trial measurement carried out in December. The standard SRPS EN 14012:2014 is also fully applied by the PPO.

The UPS quality assessment continues to be carried out pursuant to an internal PPO's document, the Methodology for QoS monitoring in postal traffic (hereinafter: the Methodology).

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

- availability of postal services,
- transmission and delivery speed and reliability,
- 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 15.1. Availability of post offices and letter boxes

Postal network capacities	Year					Trend (%)			
	2014	2015	2016	2017	2018	15/14	16/15	17/16	18/17
Number of post offices	1,478	1,491	1,516	1,530	1,534	0.88	1.68	0.92	0.26
Number of letter boxes	2,052	2,000	1,964	1,958	1,935	-2.53	-1.8	-0.31	-1.17

Since 2014 the growth of the number of post offices has continued (from 1.478 to 1.534 in 2018, which is an increase by 3.8%, with an improved accessibility as well. Compared to 2017, the number of post offices increased by 0.3%.

The average number of inhabitants per post office is 4,685, which is approximately by 4% more than the European average (around 4,500 inhabitants per post office). Due to the high population density in the city of Belgrade, there are less post offices per inhabitant (more than 7,428 inhabitants per post office) there. 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 and therefore preserves the quality of service.

The number of letter boxes has been declining for several years now. Compared to 2014, the number of letter boxes has decreased by 117, i.e by almost 6% and by 1.2% compared to the previous year. Pursuant to the prescribed Methodology for QoS monitoring in postal traffic, the PPO shall, at least once a year, carry out an analysis of the number of items inserted in letter boxes. Based on a one-month screening, a daily average volume is determined and an analysis of justifiability regarding presence of the letter box at a certain location is performed. If the number of items is found to be inferior to the projected volume, the mounting of the letter box is performed at another location or the demounting of the existing letter box at the analyzed location is carried out, provided that the minimum letter box number criterion for the concerned area is satisfied. In the observed period, the demounting of 117 letter boxed was performed, following the necessary screening.

Even though the slashing the number of letter boxes is justified by a decrease in the volume of postal items inserted in letter boxes, it remains clear that the provisions of Article 13 of the Rulebook on conditions of the commencement of the postal service activity, adopted by the line ministry („Official Gazette of RS", No. 51/10), pursuant to which the USP is required to provide at least 2000 letter boxes as a means of postal network for the collection of non-recorded postal items, are not being applied.

Working hours of post offices

One of the criteria of 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 the total of 1,534 post offices, 1,106 post offices (72.1%) are open for customers 7 hours a day, 397 post offices (25.9%) have 7 to 12 hours working time, 19 post offices (1.2%) are open more then 12 hours, and 12 post offices (0.8%) work around the clock.

Working hours of densely populated communities are longer, therefore in urban areas, with 533 post offices available to customers, there are more post offices working 7 to 12 hours daily (63%). In rural areas, where there are 1,001 post offices, 92.4% of those are open for customers 7 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 2018, the average waiting time of customers in front of the counter for the collection of letter-post items was 3.43 minutes, which is by 2.2 minutes shorter compared to the value measured last year. The PPO asserts that the criterion of counter availability is satisfactory, having in mind the limit value of less than 10 minutes defined in the internal PPO regulations is in accordance with the current regulations.

Availability of postal items delivery

The Postal Directive prescribes the delivery of postal items to all inhabitants at least 5 days a week, to be organized by the USP, with possible exceptions determined by the regulator. On the EU postal market, 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 prescribed a 5-day delivery, i.e. every working day, with possible exceptions.

Table 15.2. Volumes of inhabitants and households per delivery area

Delivery area	Number of inhabitants	Number of households	% inhabitants	% households
Local	4,893,709	1,966,658	68.09	68.75
Larger	1,550,089	587,481	21.57	20.54
Largest	742,933	306,341	10.34	10.71
Total	7,186,731	2,860,480	100.00	100.00

The analysis of the data on the population and number of households per delivery area shows that approximately 68% of inhabitants and 69% of households are covered by every-day delivery. In larger delivery areas, there are around 22% of inhabitants and 21% of households, covered by a 2-day or 3-day delivery a week. Around 10% of inhabitants and 11% of households are situated in the largest delivery area, with one delivery per week.

Speed and reliability of postal items transmission and delivery

Speed and reliability of transmission and delivery of postal items in the Republic of Serbia are measured by means of 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 RATEL and in the international postal traffic, delivery standards are prescribed by the Universal Postal Union (UPU) or by the Association of European Public Postal Operators (PostEurope).

The PPO organized a continuous measurement of domestic non-recorded letters during 2018, by means of RFID equipment, so called AMQM measurement. Another 2-month independent transmission times screening was carried out between July 9 and September 9. The results regarding D+2 and D+3 transmission times using both types of measurement were similar, presumably accurate, whereas the results for D+1 transmission time differ by more than 20%. The discrepancy between the measured results for D+1 transmission time can be explained only by different measuring systems used and particulate experience and approach to the screening procedure. Taken into account that the results from the measurement in the international traffic were obtained using RFID equipment, they will be deemed as valid in the further analysis.

As of January 1, 2019 the PPO started a continuous, three-year long, independent screening, in accordance with standard SRPS EN 13850:2014, and is expected to provide accurate results.

The screening results regarding domestic transmission times for 2018 show a slight improvement compared to the results of 2017. As for the D+2 and D+3 transmission times, the measured results reached the prescribed values set in SRPS EN 13850:2014, while the D+1 transmission time results are still way beyond the prescribed values set in the above standard

Table 15.3. Transmission times in domestic letter-post traffic

Domestic traffic							
Transmission time	Independent measurement	AMQM				Independent 2-month measurement	SRPS EN 13850:2014
		2015	2016	2017	2018	2018	
D+1	71.81%	71.05%	77.66%	67.12%	67.16%	87.57%	85%
D+2	93.63%	93.58%	95.04%	89.52%	91.42%	93.94%	90%
D+3	99.14%	97.82%	98.21%	95.56%	96.78%	97.71%	95%
D+5	100%	99.47%	99.56%	/	99.17%	99.75%	/

The international standard prescribed by the Universal Postal Union (UPU) is J+5 for 80% items, while PostEurope has set the J+3 standard for at least 85%, and the J+5 for at least 97% items.

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 prescribed. This standard defines the preparation manner of screening and analysis of the obtained data. The prerequisite for obtaining the quality data is a continuous screening of the transmission times, organized by an independent body that cannot be influenced by the PPO.

The data regarding the international postal items show a deterioration in the delivery times during 2018, in comparison to 2017 (Table 14.4), while an obvious improvement for the outbound items was recorded: for J+3 by 11.1% and for J+5 by 10.29%. However, neither of the delivery times results reached the prescribed quality standard levels, as defined by PostEurope.

Table15.4. Transmission times in international inbound letter-post traffic

Delivery times	International traffic					Prescribed standard
	PostEurope					
	2014	2015	2016	2017	2018	
J+3	67.95%	56.20%	58.45%	48.10%	40.61%	85%
J+5	87.50%	83.35%	87.90%	82.94%	80.81%	97%

Based on the provided data, it can be concluded that the quality of transmission times is not on a satisfactory level, both domestically and internationally.

Security of items

An overview of the number of lost, rifled and damaged postal items during the period 2014 – 2018 is shown in Table 15.5.

Table 15.5. Lost, rifled or damaged items in domestic traffic

TYPE OF ITEM	2014	2015	2016	2017	2018
REGISTERED LETTERS					
- lost per 100,000 items	8	7	8	9	16
- rifled or damaged per 100,000 items	0	0	0	0	0
RECORDED DELIVERY ITEMS					
- lost per 100,000 items				4	3
- rifled or damaged per 100,000 items				0	0
COURT LETTERS					
- lost per 100,000 items				12	11
- rifled or damaged per 100,000 items				0	0
INSURED LETTERS					
- lost per 100,000 items	1	0	0	1	0
- rifled or damaged per 100,000 items	0	0	0	0	0
PARCELS					
- lost per 100,000 parcels	0	0	0	2	0
- rifled or damaged per 100,000 parcels	1	0	0	2	2
MONEY ORDERS					
- lost per 100,000 items	0	0	0	0	0
SECURITY LEVEL OF ITEMS	0.007	0.006	0.007	0.008	0.01

Unlike during the previous years when registered items also included recorded delivery items and court letters, in the 2018 report the PPO separated these categories. The data regarding the types of "registered" mail were provided for 2017 as well, for comparability purposes.

The analysis of the data by type of postal items showed that there was an increase in the security level concerning court letters and recorded delivery items, but also a significant deterioration in security levels concerning registered letter-post items. Since this type of mail is the most numerous type of recorded mail, the increase in the volume of lost registered mail had an automatic negative impact on the security levels of all postal items, i.e. from 0.008% to 0.010% (the number of lost items rose from 8 to 10 per 100,000 received items), despite an increased security regarding parcels, insured letters, court letters and recorded delivery items.

Table 15.6 gives an overview of damage compensation by type of recorded domestic postal items 2014-2018.

Table 15.6. Paid damages by type of domestic postal items

Domestic postal traffic	2014		2015		2016		2017		2018	
	VOL.	DIN.	VOL.	DIN.	VOL.	DIN.	VOL.	DIN.	VOL.	DIN.
Registered items	591	415,066.00	452	349,982.00	433	347,304.00	568	446,258.00	946	805,151.00
Insured letters	18	31,036.00	5	10,262.00	3	5,371.00	3	3,896.00	5	4,980.00
Parcels	8	9,451.50	3	28,592.00	5	6,857.05	15	38,817.15	7	23,741.00
Money orders	0	0.00	3	6,140.00	0	0.00	2	32,540.07	1	3,000.00
TOTAL	617	455,553.50	463	394,976.00	441	359,532.05	588	521,511.22	959	836,872.00

In 2018, indemnities were paid for 63.1% more items than in 2017, which accounts for a 60.5% increase in the amount of paid indemnities. The reason for such an increase is more lost registered items and subsequently paid indemnities.

In the international traffic, indemnities were paid for 22 items (in 2017 there were only 12 cases of loss). The amount of paid indemnities increased by 59%, from 58,814.00 dinars in 2017 to 93,649.21 dinars in 2018. This is due to the paid compensation for 4 insured letters and 6 registered items more than the previous year, while the number of parcel indemnity coverages remained the same as in 2017.

Efficiency of complaint handling

During 2018, 1,611 written complaints were sent to work, regional and local PPO's units, which is by 10% less than in 2017, when 1,789 complaints were filed. Out of 1,611 claims, 54% refer to delivery, 17% to at-the counter business and 29% on other complaints. 44% of the complaints were deemed justified.

In 2018, 14,784 inquiries were sent via the PPO's corporate website, against 13,083 received by the PPO during 2017. The increase is due to more inquiries regarding service information (by 17.4%), while the real number of complaints dropped by 19.7% compared to 2017. Out of the total number of inquiries 13,524, (91%) is about service information and only 1,260 inquiries are actual complaints. 855 complaints were about delivery of items (45% deemed justified), at-the counter business 59 complaints (3% justified) and 346 other complaints (20% justified).

As for the complaint handling procedures carried out in 2018, claims concerning domestic traffic were resolved in average in 4 days, same as in 2017. The resolution of damage procedures were extended by 2 days, from 13 to 15 days (Table 15.7), which complies with the prescribed deadlines.

Table 15.7. Average time for complaint resolution, realization and payment of indemnities in domestic postal traffic

Year	Resolution of damage claim	Compensation realization	Payment of indemnities	Total for resolution and indemnity payment
	(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
2017	4	9	4	13
2018	4	10	5	15

These deadlines are fairly longer in case of the international traffic claims, taking into account that the complaint handling procedures are carried out in at least two countries.

Users' satisfaction and availability of information

In its annual QoS report, the PPO has regularly informed RATEL about the level of service users' satisfaction and the availability of information on products and services. The PPO has conducted a survey on the Index of satisfaction regarding legal persons, carried out by means of personal interviews of pre-selected customers and including rating of different letter-post service parameters. The parameters such as: reliability, speed, assortment, price and manner of service provision were commonly highly rated.

The PPO made available to its users several channels for questions and complaints (e-mail, by telephone, via website, by mail, directly at post office counters). By its new internal act, the PPO is aiming to improve its communication with users via its Call Center, corporate website and Facebook page. All these measures are expected to contribute to a better availability of information, user's interface of the complaint and inquiry filing procedure and to an overall quality level in this segment of activities.

Complaints regarding commercial services

According to the data provided by nine postal operators, the structure of complaints referring to domestic commercial services is given in Table 15.8. The majority of complaints were filed on account of rifled or damaged items (around 56% of the total number of complaints filed, and 82% of the resolved claims), followed by complaints on account of loss, whereas the least complaints referred to transmission time overrun (transmission times are set under the postal operators' special terms and conditions). In comparison to 2017, the number of complaints in 2018 grew in the segment of rifled and damaged items and lost items, while the number of complaints for transmission time overrun was reduced.

Unfounded complaints account for 31.7% of the total volume of complaints filed for domestic commercial services, which represents a slight decrease compared to the previous year (33%).

Table 15.8. Structure of complaints regarding domestic commercial services

Total number of complaints filed	Unfounded	Resolved as:			Indemnity
		Loss	Rifled and damaged	Deadline expiration	Amount (in thous. dinars)
(1=2+3+4+5)	2	3	4	5	6
34.001	10.787	2.494	19.040	1.680	119.226

In 2018, 401 complaints were filed in connection to international commercial services, around 70% of which were considered unfounded by the operators. The recorded number of complaints was by 17% smaller compared to 2017.

Quality of service, user protection and complaint handling in the EU [15]

ERGP continiously monitors the liberalization effects on the postal market, using special indicators such as QoS measurements, assessment of the postal development, user protection and complaint handling procedures.

The quality-related ERGP report is based on the data of 33 member countries in 2017 and shows current national regulatory bodies' practice regarding QoS and user satisfaction on one hand, and user protection and complaint handling on the other.

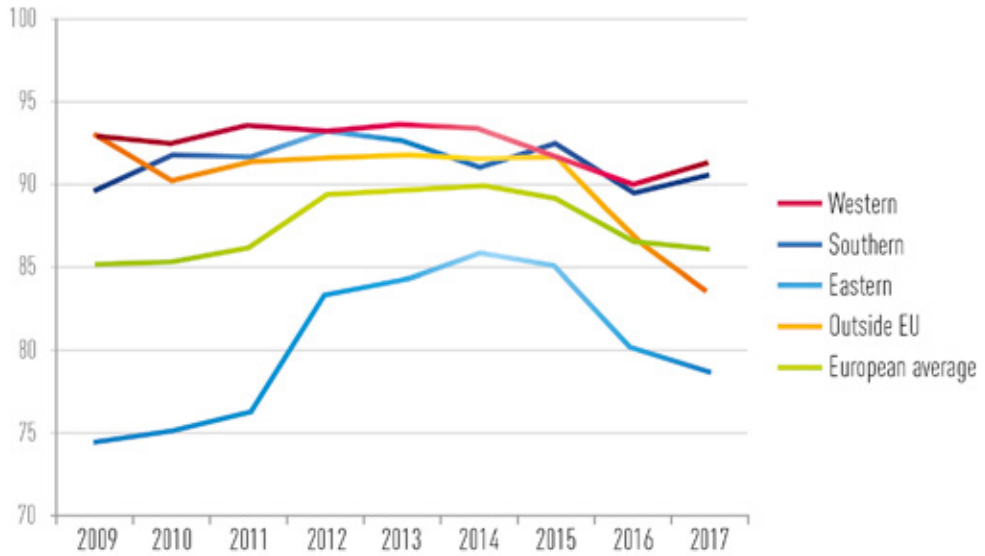
There are six key issues regarding the quality of service and user satisfaction that are being analyzed:

1. quality of service screening, taking into account transit times, accuracy and reliability of service,
2. collection and delivery,
3. access points,
4. measurement of user satisfaction,
5. research of user needs,
6. aspects of e-commerce

During 2017, 28 countries used standard EN 13850 for measurement of transit priority letter transmission times. Figure 15.1 shows that in the period 2009-2017, a higher QoS regarding priority letters (D+1) was reached between 2012 and 2014. The quality has subsequently deteriorated in all countries, until an improvement in quality occurred during 2017, in western and southern EU countries. The drop in QoS (recorded for the first time in 2015) is still present in the eastern and non-EU countries in 2017.

15 ERGP PL (18) 44 b – Flash of the ERGP Report on the quality of service, consumer protection and complaint handling

Figure 15.1. Average values of priority letter QoS (D+1) (Western: BE, DE, DK, FI, FR, IE, LU, NL, SE, UK; Southern: CY, EL, IT, MT, PT; Eastern: BG, CZ, EE, HR, HU, LT, LV, PL, RO, SI, SK; Outside EU: CH, IS, NO)



Only a few countries have defined their regulatory targets for non-priority letters in respect of QoS measurement methodology. Ten countries used European standard EN 14508, whereas 4 countries used EN 13850 for measurement of transmission quality of non-priority mail.

As for the measurement of transit transmission times for parcels, different methodologies were used. Four countries used technical report TR 1547, 7 countries used standard EN 13850, 2 countries used standard EN 14508, while 6 countries used another methodology.

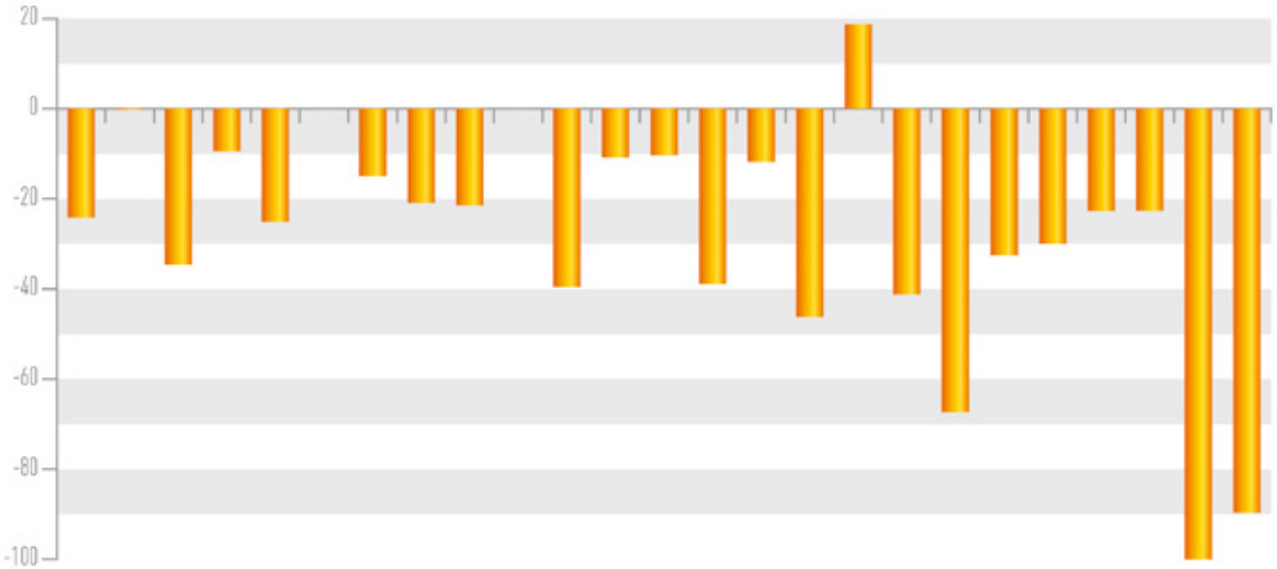
In regard to the frequency of collection and delivery performed by the USP, it was noted that the Directive was implemented in all ERG member countries that have established at least one collection/delivery 5 days a week (in some countries even 6 days a week). Table 15.9. shows the delivery frequency data.

Table 15.9. Delivery frequency in Europe during 2017

1 daily delivery/ 5 days a week	BE, HR, CY, CZ, EL, DE, ES, EE, FI, HU, IE, IS, IT, LT, LV, LU, NL, NO, PL, PT, RO, SE, SI, SK, RS, UK (Royal Mail provides 6 – day delivery for parcels)
1 daily delivery/ 6 days a week	DK, FR, MT, UK (6 days for correspondence)
Combination of 5-day and 6-day delivery	AT (6 days for newspapers), BG (6 days in Sofia) and CH (6 days for newspapers)

As for the number of letter boxes, the majority of countries are still seeing a drop. Figure 15.2 shows changes in the number of letter boxes in the period 2008-2017.

Figure 15.2. Changes with respect to number of letter boxes 2008-2017



AU	DE	DK	FR	NL	UK	CY	EE	IT	MT	PT	BG	CZ	HR	HU	LT	IE	LV	PL	SI	SK	CH	IS	NO	RS
-24.17	-0.17	-34.63	-9.37	-25.04	0	-14.90	-20.89	-21.46	0	-39.53	-10.84	-10.29	-38.96	-11.76	-46.17	18.75	-41.17	-67.36	-32.58	-30.03	-22.71	-22.61	-100	-89.65

CONCLUSION

Taking into account the overall analysis of the reached quality levels of the UPS provision, the following can be concluded:

• growth trend regarding the number of post offices and consequently regarding their accessibility to customers has continued, positively impacting quality of universal postal service provision,

• decrease trend of letter box volumes has continued, due to removing some of the letter boxes deemed by the PPO unnecessary on account of very low daily average of inserted items. It should be therefore assessed how many letter boxed should be installed as a prescribed minimum, taking into account a drop in the volume of items mailed via letter boxes,

• average waiting time of customers in front of the counter for letter-post collection has been reduced by 2 minutes compared to the previous year, suggesting an improvement of QoS in this segment,

• The results obtained during internal measurement by means of the AMQM system (Automatic Mail Quality Measurement) show that, in 2018, there was an improvement in domestic transmission times, both for D+1 items and D+2 and D+3 items. The obtained results for D+1 items are still inferior to the prescribed standard SRPS EN 13850:2014, which should be reached in 2021. The defined and set targets in the international traffic have not yet been attained.

• there was a deterioration in the segment of overall security of postal items, due to an increase of the number of lost registered letters, even though the security of other postal items (parcels, insured letters, recorded delivery letters and court letters) generally improved,

• complaint handling procedure remained on the last year's level,

• availability of information is on a satisfactory level, due to numerous access channels

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16 CYBER SECURITY OF ICT SYSTEMS

The year 2018 could be what one would call a year of crypto attacks. Even though no global attacks were recorded, like in 2017 *(WannaCry and Petya)*, a certain change in tactics, techniques and procedures regarding this attack was observed. A shift has been made from ransomware attack to "overtaking" of the victim's resources in order to mine cryptocurrencies. This type of attack was therefore named "*cryptojacking*".

Experts presume that *cryptojacking* took a lead compared to *ransomware*, since the victim does not want or is not able to pay the ransom. This makes the misuse of processor capacities a safer way to gain material resources. Illegal mining softwares do not only target computers, but smartphone as well. Cryptocurrency mining attacks can run on the device for a long time without the victim even noticing it, which can mean a more lucrative gain to the attackers.

During 2018, an increased use of encrypted C2 communication was noticed, by as much as 300%, including misuse of legitimate enrcypted channels, which makes it increasingly harder to detect these types of attacks. Such attacks involve more frequently *blockchain* technology, envisaged in the future period to be used by cyber criminals as well.

According to the research of the European Union Agency for Network and Information Security (hereinafter: ENISA), carried out in period December 2017 – December 2018, dealing with the top 15 IT threats in 2018, including the publicly available data, the National Center for Prevention of Security Risks in ICT Systems (hereinafter: the National CERT) made an overview of cyber security situation in 2018.

Cyber security worldwide

Top threats 2017	Trend 2017	Top threats 2018	Trend 2018	Change in ranking
1. Malware	→	1. Malware	→	→
2. Web Based Attacks	↑	2. Web Based Attacks	↑	→
3. Web Application Attacks	↑	3. Web Application Attacks	→	→
4. Phishing	↑	4. Phishing	↑	→
5. Spam	↑	*5. DoS*	↑	↑
6. DoS	↑	6. Spam	→	↓

Top threats 2017	Trend 2017	Top threats 2018	Trend 2018	Change in ranking
7. Ransomware	↑	7. Botnets	↑	↑
8. Botnets	↑	8. Data Breach	↑	↑
9. Insider Threats	→	9. Insider Threats	↓	→
10. Physical manipulation/ damage/ theft/loss	→	10. Physical manipulation/ damage/ theft/loss	→	→
11. Data Breach	↑	11. Information Leakage	↑	↑
12. Identity Theft	↑	12. Identity Theft	↑	→
13. Confidential data leakage	↑	*13. Cryptojacking*	↑	NEW
14. Exploit Kits	↓	*14. Ransomware*	↓	↓
15. Cyber Espionage	↑	15. Cyber Espionage	↓	↓

TREND: ↓ DECLINING, → NO CHANGE, ↑ INCREASING
RANKING: ↑ INCREASING, → NO CHANGE, ↓ DECLINING

Source: **ENISA**

1. *Malware*

Malicious software or malware is the most frequent cyber threat, accounting for 30% of all data breach related incidents.

One of the most significant events of 2018 concerning this type of threat is VPN Filter, a malware designed to attack home and small enterprise routers, including NAS devices. In 2018, 500,000 such devices were compromised worldwide.

In 2018 also appeared Triton, the first malware to recognize critical infrastructure safety systems as its targets. These systems are designed to halt industrial processes, should any unsafe working conditions be observed. The advanced attackers, with an ability and intent to perform such operations, are expected to focus on SCADA systems, so the number of these attacks is expected to rise.

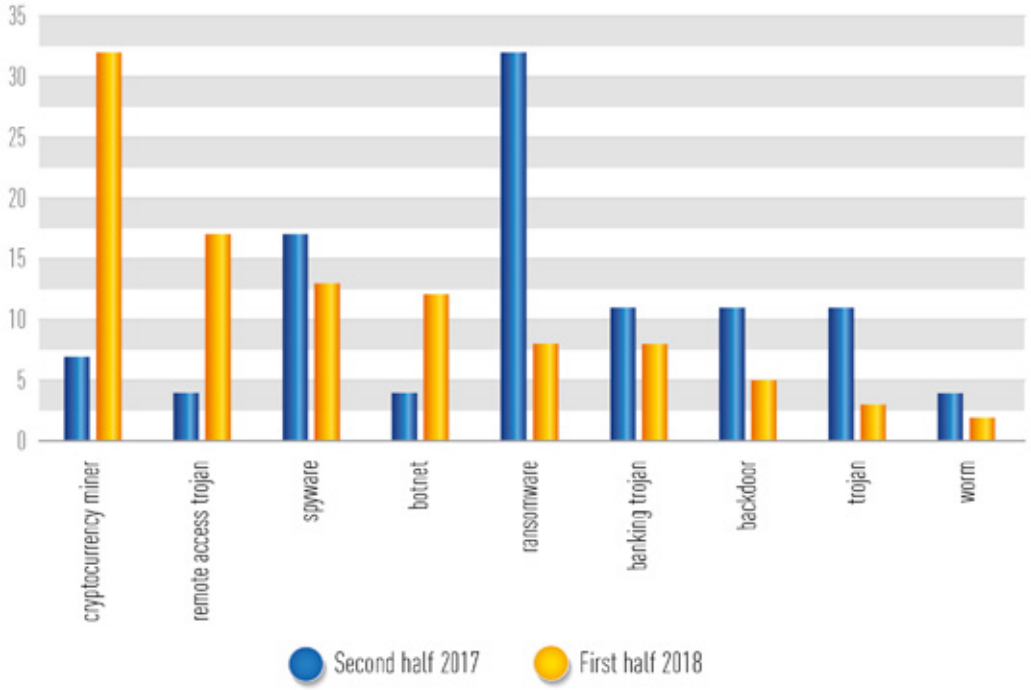
As for the mobile device malicious software, it is most frequently found in the life style related apps (27%) and audio content player apps (20%).

The share of the discovered malware formats is as follows: .js (37.2%), .vbs (20.8%), exe *Windows* databases (14.8%), MS Office (14.4%), .pdf (3.3%) other (7.0%).

Windows OS was targeted in 79% of the discovered cases, Linux in 18% and Mac in 3%.

Figure 16.1 shows a comparative analysis of malware families by type, during the period second half of 2017 and first half of 2018.

Figure 16.1. Comparative analysis by malware types



Dominant vector of attacks was e-mail (through phishing and spam) in 92.4% of the cases, followed by Internet browser 6.3%, and 1.3% of other attack vectors.

Beside e-mail and web, a growing RDP abuse for the purpose of malware diffusion was observed.

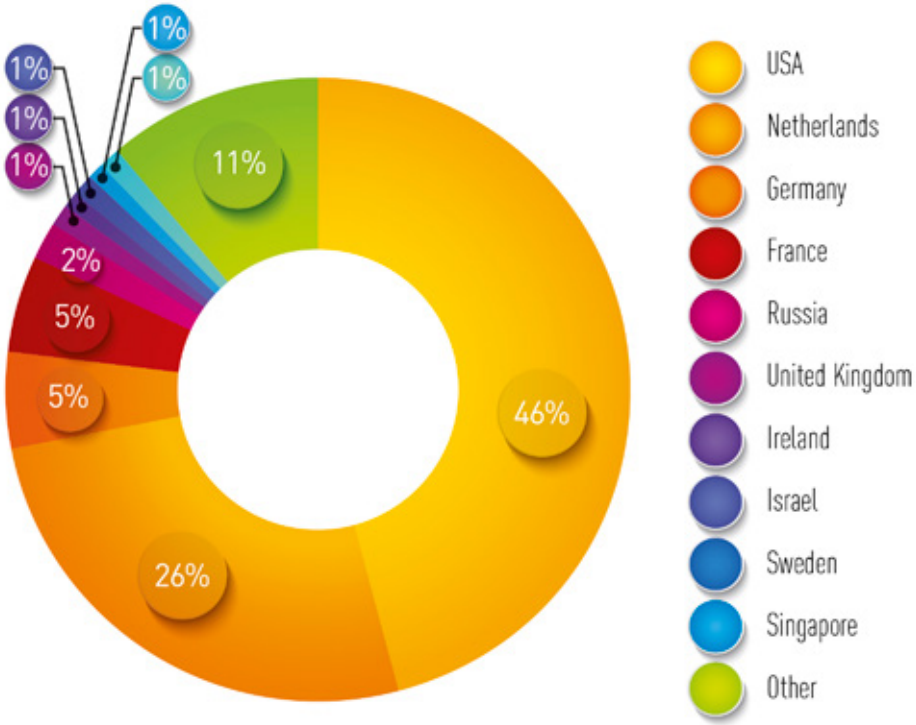
2. Web Based Attacks

This type of attack uses web-systems and services to target victims. Web based attacks most commonly include: CMS exploits, drive-by, water-hole, redirection and man-in-the-browser attacks. These attacks are considered to be one of the most important threats, due to their wide distribution.

Up to the second quarter of 2018, the total number of malicious URLs was 351,913,075 which is an increase compared to the first quarter's 282,807,433.

Top four countries by number of this type of attack were: USA (45.87%), Netherlands (25.74%), Germany (5.33%) and France (4.92%). All four countries experienced an increase in the number of attacks, compared both to Q1 2018 and the whole 2017 (Figure 16.2).

Figure 16.2. Statistical distribution of web attack sources by country, Q2 2018



The trend of this type of attack is on the rise.

3. Web Application Attacks

Web application attacks are considered as direct or indirect attempts to exploit the app's vulnerability on the web, by misusing their APIs, execution environments or services.

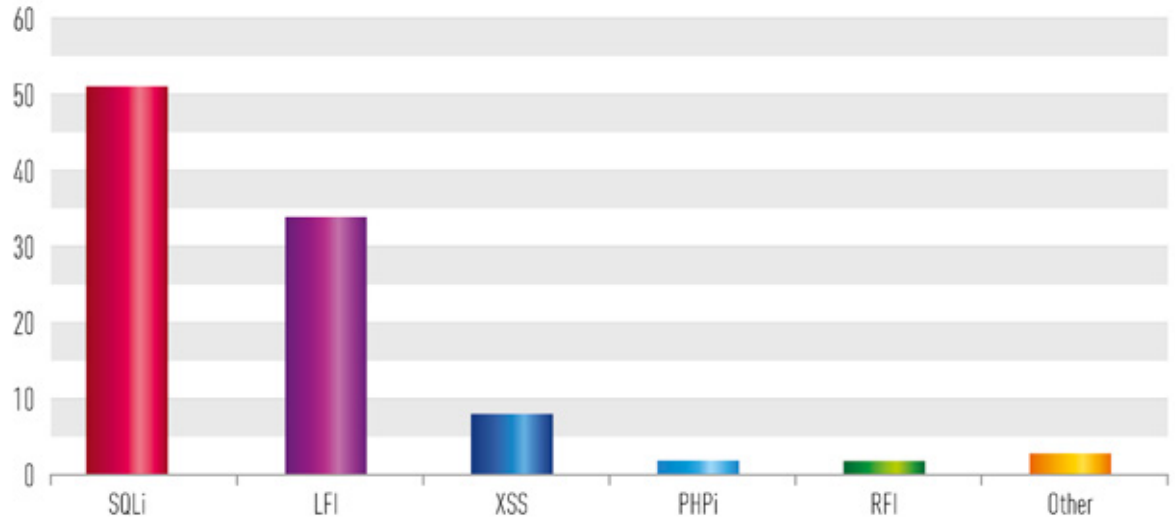
The most frequent form of this attack is *SQL Injection*, accounting for 51%. Based on the data referring to summer 2018, *Local File Inclusion* (34%) and *Cross-Site-Scripting* (8%) respectively take second and third places.

During the first half of 2018, the main source of attack was USA with 30.1%, followed by Netherlands (11.9%), China (7.1%), Brasil (6.2%) and Russia (4.4%).

Figure 16.3 shows 5 most frequent attacks in 2018. The trend of this type of attack is stable.

The trend of this type of attack during 2018 has been stable.

Figure 16.3. Web application attacks by type



4. Phishing

Phishing is a cyber attack which primarily uses social engineering to mislead its victims. The received messages contain instructions to open the attachment or unsafe URL, where then input of credentials is required.

Phishing was detected in as much as 75% EU member countries. More than 90% of malware infections and 72% of data breach attacks stem precisely from phishing.

As of 2011, this type of attacks on mobile phones has risen over the years by 85%.

Particularly challenging are the phishing messages primarily targeting employees of the financial or HR sector, with an aim to steal the money of the concerned organization. Between October 2013 and May 2018, as much as 78,000 of such attacks were reported, causing damage of 12.5 billion USD.

The most popular attachments in this type of emails are: purchase order, invoice, acquittance, bill, advice, transfer.

The most frequently used words are: payment (13.8%), urgent (9.1%), request (6.7%), attention (6.1%), important (4.8%), confidential (2.0%), urgent reply (1.9%), transfer (1.8%), important update (1.7%) and consideration (1.5%).

The trend of this type of attack is on the rise.

5. Distributed Denial of Service - DDoS

Denial of Service attacks (DoS) and especially distributed denial of service attacks (DDoS) remain a great danger to all types of businesses with online market presence. Thanks to the joint effort of legal representatives in various countries, in April 2018, during "PowerOff" operation, the largest criminal platform "webstressor.org", with over 136,000 users, was taken down. This contributed to a decrease in the number of attacks in Europe by 60%. By means of illegal services offered on this platform, around 6 million attacks were initiated.

The longest attack in Q2 2018 lasted more than 6 days, whereas 55.28% of the attackers were identified in less than 90 minutes.

The most attacked country during Q2 2018 was China (52.36%), followed by USA (17.75%) and Hong Kong (12.88%).

The trend of this type of attack is on the rise.

6. Spam

Spam is an abuse of electronic mail and technologies for the message exchange, aimed to make the recipients accidently open the unsolicited messages.

Compared to the previous year, when 96% spam messages were in English, the number in 2018 was 90%.

In 75% of the cases, spam messages concern health topics (26.6%), malware delivery (25.7%) and dating sites (21.4%).

Owing to coordinated legal enforcement activities, this type of attack is decreasing. However, on account of its low sending costs, it still represents one of the main attack vectors.

The trend of this type of attack during 2018 has been stable.

7. Botnets

During 2018, botnets were very active and employed for different malicious activities.

Approximately 97% of spam messages were sent by means of botnets.

The majority of botnet control servers are hosted in USA (36%), followed by Germany (14%) and Russia (5%).

The trend of this type of attack is on the rise.

8. Data Breaches

Data breach represents a successful malicious attempt to change the data or provoke their loss.

The most vulnerable type of data in this case are those pertaining to the healthcare system, as well as personal data on the social networks (56%). The majority of incidents were reported by the health protection sector (27%), and the biggest incident was recorded in the US, when 3.5 million healthcare files were lost.

The main type of data breach and misuse of data is identity theft (56%).

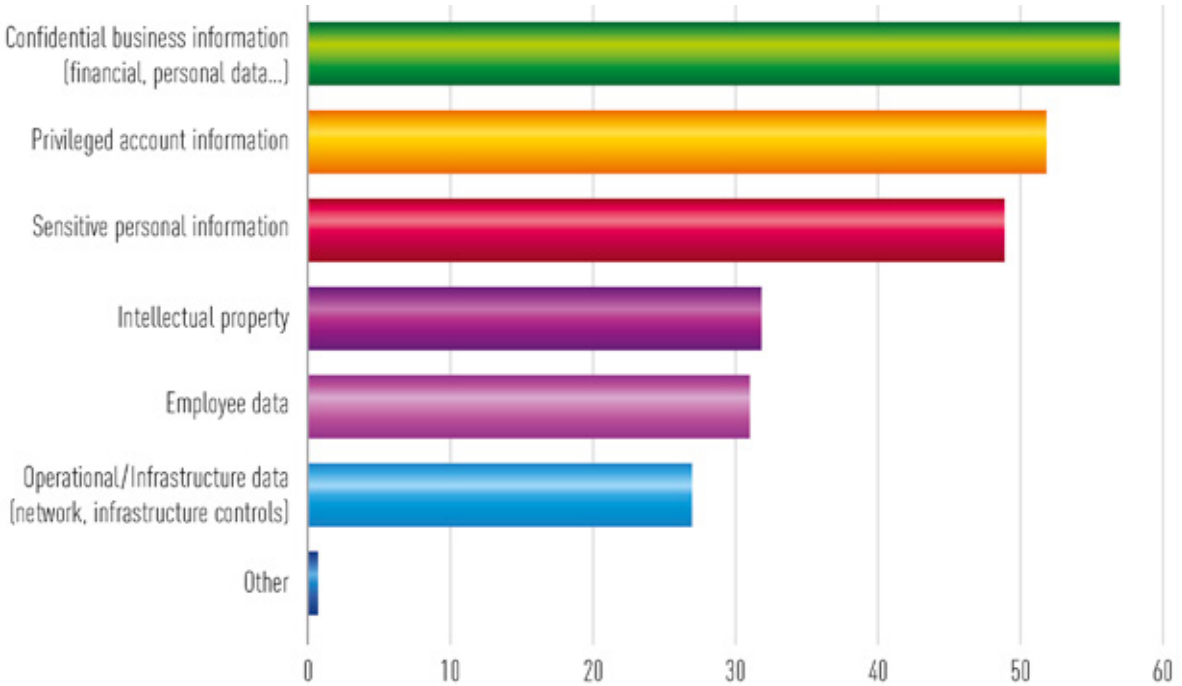
The trend of this type of attack is on the rise.

9. Insider threat

All current or former employees, business partners with access to the system can purposely or unintentionally misuse such access and become an internal cyber security threat. These actions can be malicious or unconscious and the above persons are merely a tool of the real attacker.

As much as 77% of the cases of insider threats have been caused by this type of attack. 50,6% of healthcare institutions and 47.3% of middle-sized enterprises identified this type of threat as their top safety issue. During 2018, 53% of the companies had at least one incident of this type.

Figure 16.4. Data types vulnerable to insider threats



This type of threat rarely gets published, so this might be the reason for a drop in the number of incidents in 2018.

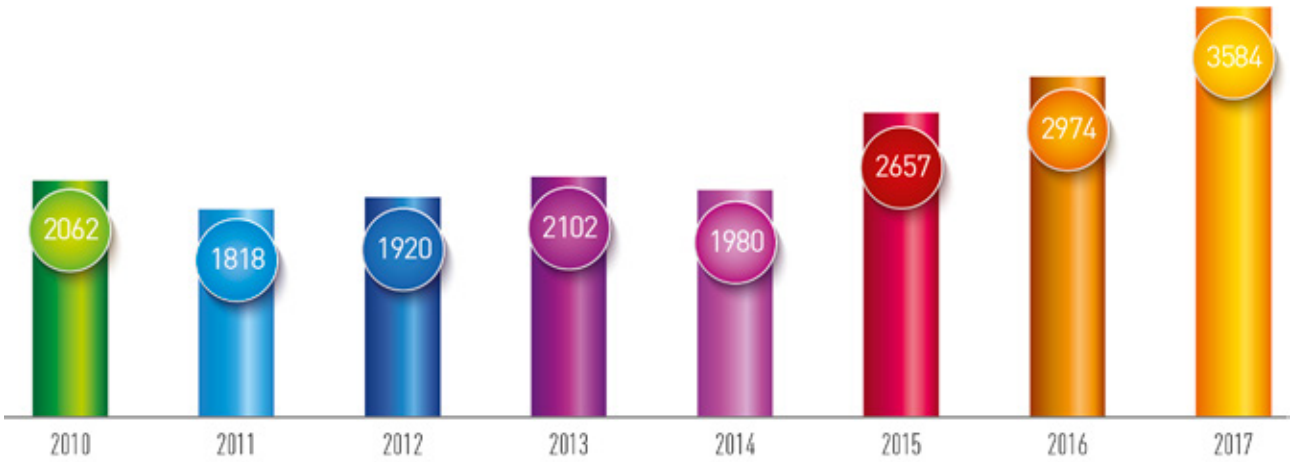
10. Physical manipulation/damage/theft/loss

Despite not directly representing a cyber threat, physical manipulation/damage/theft/loss of data are one of the biggest causes of data being compromised.

On of the most efficient methods of data protection is data encryption. Only 43% of companies regularly encrypt their data on the company level, research has shown. Nothing has changed in terms of that share compared to the previous year, suggesting that the rate of progress is very slow.

Almost one third of the companies have no adequate procedure for physical protection of laptop and mobile devices, whereas 42% have some kind of fully implemented measures for physical protection of critical information systems. As much as 57% of users are more concerned about the lost data than lost devices.

Figure 16.5. Physical attacks on ATM devices in Europe



The trend of this type of attack in 2018 has remained unchanged, i.e. stable.

11. Information Leakage

Information leakage comprises a wide range of compromised data, from personal data gathered by large Internet companies and online services, to business data stored in company databases.

Approximately 60% of the cases of information leakage in 2018 occurred in governmental and academic bodies, banks and healthcare institutions.

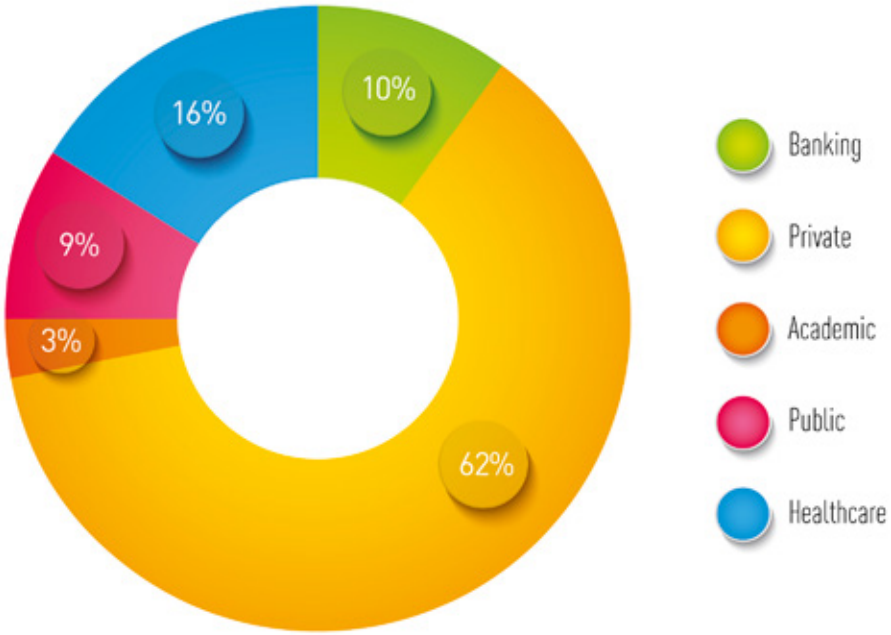
In 50% of the cases, the cause was the physical loss of device, while the reports most usually stated hacking and malware as quoted reasons.

The trend of this type of attack has been on the rise in 2018.

12. Identity Theft

Identity theft is a threat of stealing personal data stored in digital form on personal digital devices and companies' databases.

Figure 16.6. Types of compromised data by sectors



Attacks on the cloud infrastructure tend to be highly profitable and therefore very appealing to hackers. 73% of the cloud service providers have been reported to have configurations set in a way that can lead to the loss of data.

The trend of this type of attack has been on the rise in 2018.

13. Cryptojacking

Cryptojacking (known also as cryptomining) or simply „hijacking" is a new term for programs which use CPU power (70% to 80% of unused processor power) without the victim's approval, in order to "mine" cryptocurrencies for personal benefits.

There are several types of cryptojacking attacks. One of the most frequent ones is via a phishing campaign, with an aim to diffuse a malicious code, which is then run on the victim's computer after clicking on the link or downloading the email attachment. It further initiates download of the cryptocurrency mining script, which operates in the background, without the victim being aware of it.

Another type of attack is via Internet browser when the attacker uploads the mining script on different Internet pages. The victim activates the script while visiting the infected websites. The attack is hard to detect because the malicious code is not installed on the victim's computer.

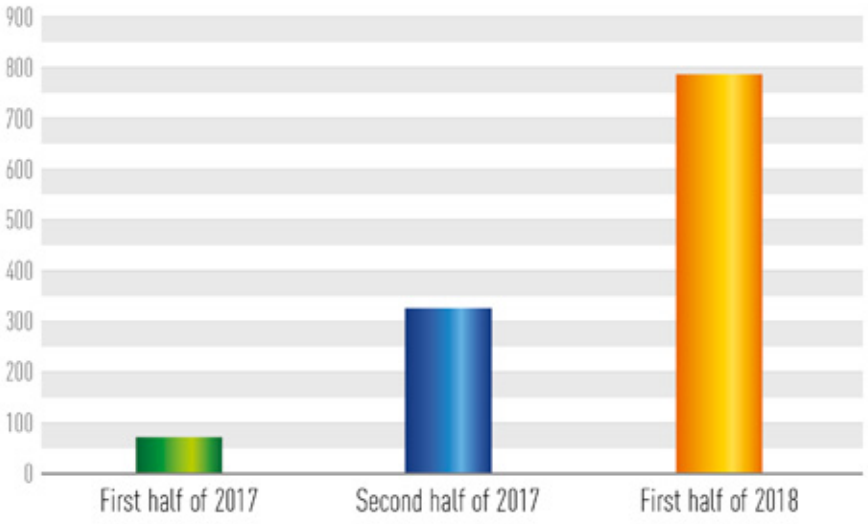
Typical indicators of such an attack include:

- high consumption of processor resources on the device,
- unusually slow response to requests and
- overheating.

During 2018, a shift from *ransomware* attacks to *cryptojacking* has been observed. The reasons for such a change are: simpler and less risky penetration in the victims cybersystem, large availability of systems as potential victims and poor legal jurisprudence sanctioning this area of illegal activity.

The growth rate of *cryptojacking* attacks is shown in Figure 16.7:

Figure 16.7. Semestrial overview of cryptocurrency mining detection



During the first half of 2018, cryptominers were assessed to have earned over 2.5 billion USD.

The trend of this type of attack is on the rise.

14. Ransomware

Ransomware is a type of attack present in cyberspace more than a decade. The malicious program locks the victim's database and demands ransom in cryptocurrency.

During 2018, 85% of the malicious software that hit the healthcare institutions were *ransomware*, 93% of phishing emails were ransomware-related and so were 70% of the incidents occurring in the academic institutions. Even though 66% of companies agreed that *ransomware* was a serious threat, only 13% were prepared to protect against this kind of attack.

In the first half of 2018, more than 20,000 *ransomware* mobile phone installation were detected. The biggest *ransomware* attack in 2018 was *GrandCrab*, which appeared as early as in January, infecting more than 50,000 systems and reappearing again in the period March – July. It was developed via *Ransomware-as-a-Service (RaaS)* and it affected also Scandinavian and anglophone countries. In 2018, the trend of this type of attack was decreasing.

15. Cyber Espionage

Cyber espionage is a threat that usually strikes governmental institutions and critical infrastructure. It is focused on the theft of state and business secrets and intellectual property rights. As much as 71% of organizations consider this threat a "black box". The most active countries in this field are China, Russia and Iran.

Efforts and time invested in the elaboration of preventive measures by cyber security specialists have decreased in 2018, from 6% (2017) to 3% (2018). Concern also dropped from 11% (2017) to 9% (2018). The trend of this type of attack has been on the decline in 2018.

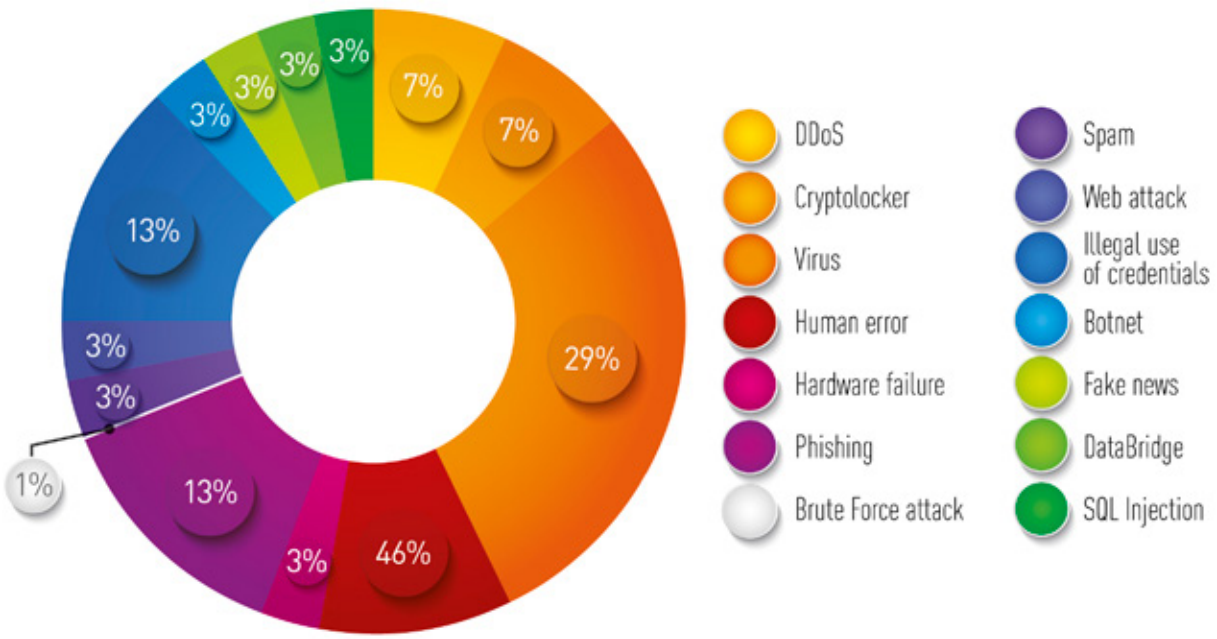
Information security in the Republic of Serbia

Pursuant to the Law on Information Security („Official Gazette RS", Nos. 6/16 and 94/17), all ICT systems operators are obligated to inform the competent authorized body on the incidents in ICT systems that could severely disrupt the information security.

During 2018, 31 such incidents, including those detected by the International CERTs, were reported to the National CERT (Figure 16.8).

Incidents that disrupted the ICT security, if found to be accompanied by reasonable doubt of a committed criminal act, were duly reported in accordance with legal and by-law provisions or forwarded to the Special Prosecutor's Office for High-Tech Crime.

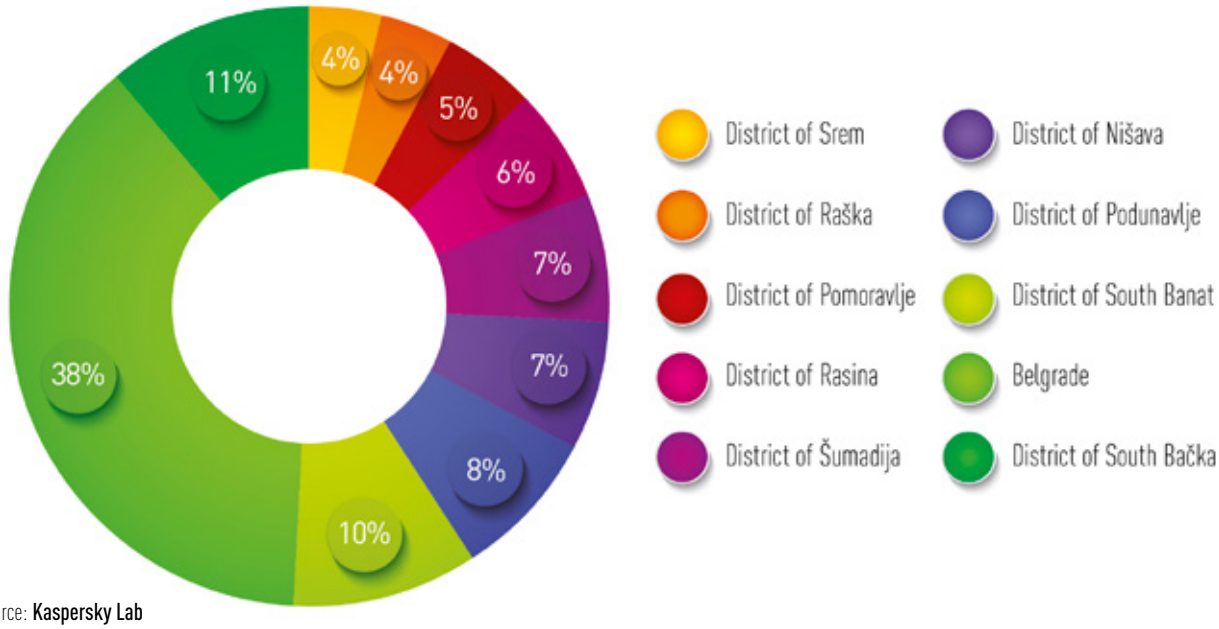
Figure 16.8. Incidents reported to National CERT



Based on the data gathered with the help of the KSN (Kaspersky Security Network) infrastructure, KasperskyLab wrote a report for 2018 on the detected threats resulting from malware, as a principal tool for the commitment of illegal acts.

Geographical distribution of cyber attacks on the Republic of Serbia is shown in Figure 16.9.

Figure 16.9. Geographical distribution of cyber attacks on Serbia

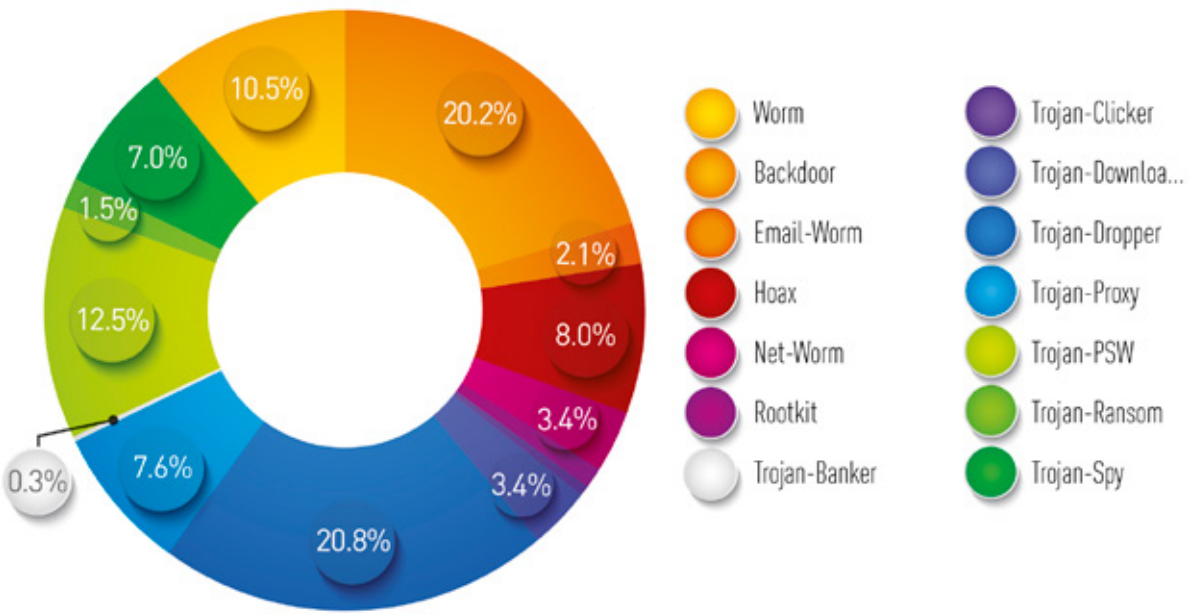


Source: **Kaspersky Lab**

In the period January – December 2018, Kaspersky products detected 6,690,660 local incidents. Malware was detected on external devices such as USB memory, CD and DVD. As much as 51.1% of users were attacked in such a way, which ranked Serbia on the 101st position in the world.

Kaspersky detected 7,013,271 different cyber threats diffused via Internet (it should be noted that this number also included several attacks on one same user). Approximately 39.7% of users in Serbia were attacked in this way, which ranks this country on the 17th position in the world, in this cyber threat category.

Figure 16.10. Distribution of cyber attacks by type of malware

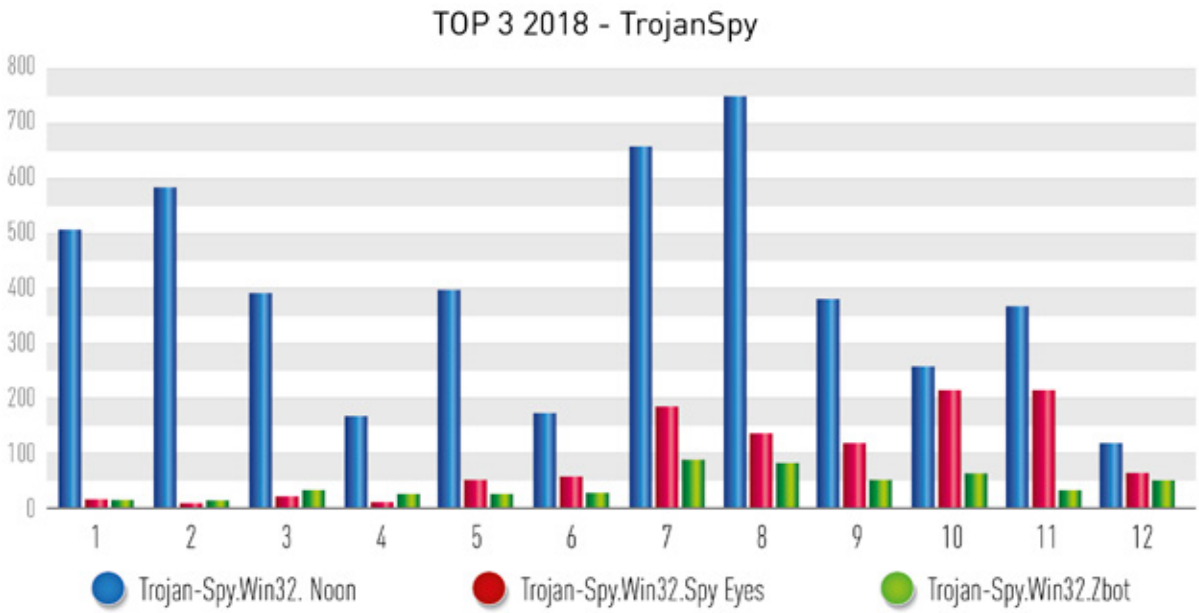


Source: **Kaspersky Lab**

By means of Trojan-Spy malware, the attacker is able to monitor and observe the user's actions and overtake his data typed in via keyboard, he can make screenshots, see the list of active applications etc.

Figure 16.11 shows three most popular Trojan-Spy malwares in 2018, in terms of Kaspersky product users.

Figure 16.11. Three most frequent Trojan-Spy malwares in 2018, in terms of Kaspersky product users

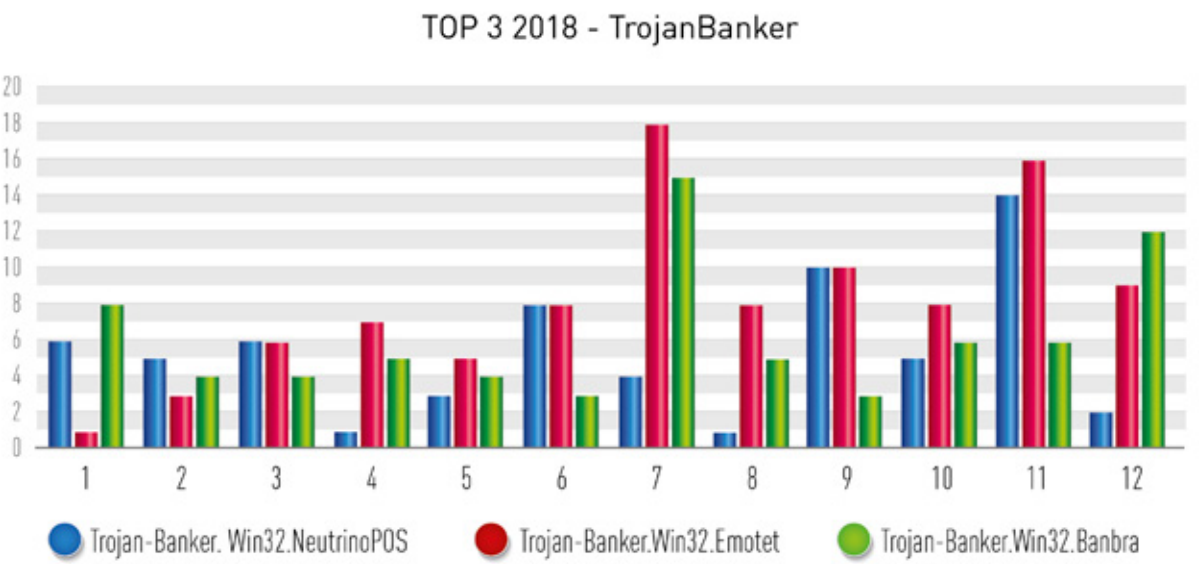


Source: **Kaspersky Lab**

Trojan-Banker was designed to overtake users' data pertaining to the electronic payment and other banking services.

The frequency of this type of malware is shown in Figure 16.12.

Figure 16.12. Three most frequent Trojan-Banker malwares in 2018, in terms of Kaspersky product users

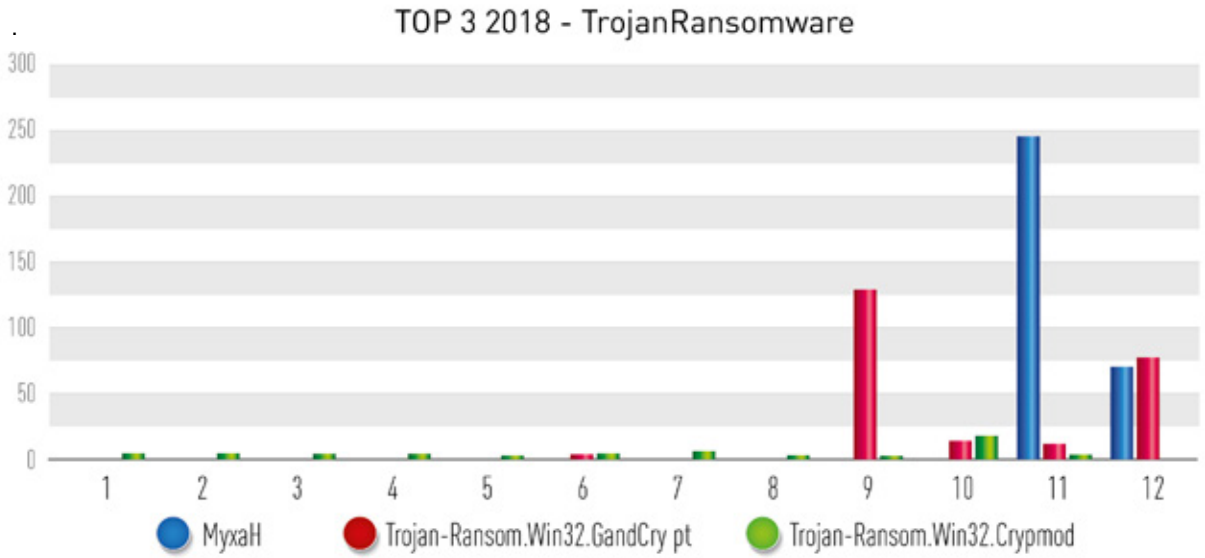


Source: **Kaspersky Lab**

Trojan-Ransomware modifies data on the victim's computer so that the legitimate user becomes unable to access them, or prevents normal functioning of the computer. After taking control over the computer, the attacker demands from the victim to pay the ransom.

Figure 16.3 shows distribution of *Trojan-Ransomware* in 2018, in terms of Kaspersky product users. A very low activity can be observed during the first few months of 2018, followed by a considerable activity in September and December. *GrandCrypt*, also known under the name *Grandcrab*, was diffused via an infected attachment in email messages and ready-to-use packages designed to compromise websites (exploitkits).

Figure 16.13. Three most frequent Trojan-Ransomwares in 2018, in terms of Kaspersky product users

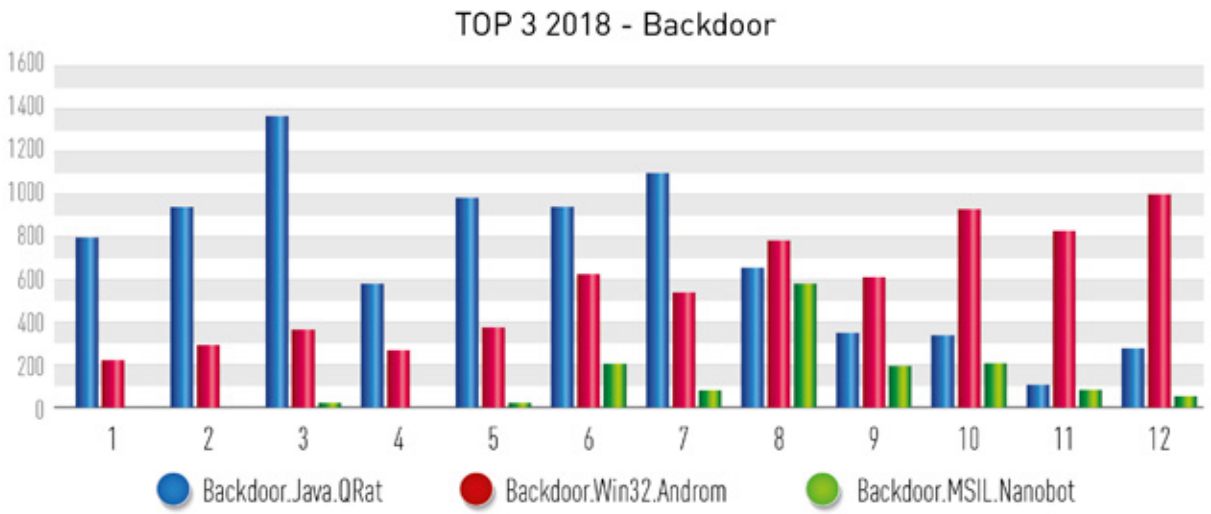


Source: **Kaspersky Lab**

Backdoor is a malicious program which gets installed, run and executed without the victims' knowledge, whereas the author of the attack gets access from a remote location.

Distribution of this type of malicious program during 2018, by the number of users identified as infected, is shown in Figure 16.14.

Figure 16.14. Three most frequent Backdoors in 2018, in terms of Kaspersky product users



Source: **Kaspersky Lab**

According to the report of the KasperskyLab, referring to the first quarter of 2018, Serbia occupies the 20th position concerning the threats originating from the Internet (malware attacks) (Table 16.2).

Table 16.2. Internet threats Q1 2018

No.	Country	% of attacked users
1	Belarus	40.90
2	Ukraine	40.32
3	Algeria	39.69
4	Albania	37.33
5	Moldavia	37.17
6	Greece	36.83
7	Armenia	36.78
8	Azerbaijan	35.13
9	Kazakhstan	34.64
10	Russia	34.56
11	Kyrgyzstan	33.77
12	Venezuela	33.10
13	Uzbekistan	31.52
14	Georgia	31.40
15	Latvia	29.85
16	Tunisia	29.77
17	Romania	29.09
18	Qatar	28.71
19	Vietnam	28.66
20	Serbia	28.55

Source: **Kaspersky Lab**

In the second quarter 2018 already, Serbia rose to the 14th position of the same ranking (Table 16.3).

Table 16.3. Internet threats Q2 2018

No.	Country	% of attacked users
1	Belarus	33.49
2	Albania	30.27
3	Algeria	30.08
4	Armenia	29.98
5	Ukraine	29.68
6	Moldova	29.49
7	Venezuela	29.12
8	Greece	29.11
9	Kyrgyzstan	27.25
10	Kazakhstan	26.97
11	Russia	26.93
12	Uzbekistan	26.30
13	Azerbaijan	26,12
14	Serbia	25.23
15	Qatar	24.51
16	Latvia	24.40
17	Vietnam	24.03
18	Georgia	23.87
19	Philippines	23.85
20	Romania	23.55

Source: **Kaspersky Lab**

The third quarter 2018 revealed an even greater Serbia's vulnerability, ranking it very highly at the 10th place in the world. (Table 16.4).

Table 16.4. Internet threats Q3 2018

No.	Country	% of attacked users
1	Venezuela	35.88
2	Albania	32.48
3	Algeria	32.41
4	Belarus	31.08
5	Armenia	29.16
6	Ukraine	28.67
7	Moldova	28.64
8	Azerbaijan	26.67
9	Kyrgyzstan	25.80
10	Serbia	25.28
11	Mauritania	24.89
12	Indonesia	24.68
13	Romania	24.56
14	Qatar	23.99
15	Kazakhstan	23.93
16	Philippines	23.84
17	Lithuania	23.70
18	Djibouti	23.70
19	Latvia	23.09
20	Honduras	22.97

Source: **Kaspersky Lab**

As for the risk from ATM trojans, Serbia was ranked among the first 10, or the 5th in the world (Table 16.5).

Table 16.5. Risks from ATM trojans

No	Country	%
1	Germany	3.0
2	North Korea	2.8
3	Greece	2.3
4	Malaysia	2.1
5	Serbia	2.0
6	United Arab Emirates	1.9
7	Portugal	1.9
8	Lithuania	1.9
9	Indonesia	1.8
10	Cambodia	1.8

Source: **Kaspersky Lab**

The above results are based on the data from users of Kaspersky antivirus on their devices.

www.ratel.rs