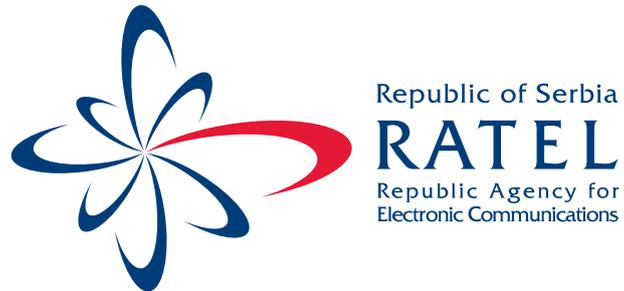


REPUBLIC OF SERBIA
REPUBLIC AGENCY FOR
ELECTRONIC COMMUNICATIONS

AN OVERVIEW

OF TELECOM MARKET
IN THE REPUBLIC OF SERBIA IN 2013



AN OVERVIEW OF TELECOM MARKET IN THE REPUBLIC OF SERBIA IN 2013

Belgrade, 2014



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of Telecom Market
in the Republic of Serbia
in 2013

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A WORD OF INTRODUCTION



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Based on the legal and strategic documents setting out the tasks and objectives of the regulatory activities of the Republic Agency for Electronic Communications, in the 2013 Action Plan, the Managing Board pointed out the Agency goals, which reflect the need to ensure optimal conditions for a further development and application of the information communication systems and new services, thereby taking advantage of all benefits offered by the modern developed information society, a knowledge-based society focusing on success and progress, in line with the Digital Agenda of the Republic of Serbia and the United Nations Declaration.

Accordingly, the Agency activities need to provide the conditions for the further development of electronic communication, enabling a uniform development of the telecommunications sector on the entire territory of the Republic of Serbia and ensuring the conditions for a level-playing field for all market players, both in technological and economic terms. Further development of the electronic communications market needs to be achieved through mechanisms that stimulate competition and, when necessary, by applying market regulation instruments. One of the priorities is an overall protection of interests of all market participants, in particular the interests of end-users who should be offered new services of higher quality at a lower price. Another priority is, indeed, optimal and rational usage of all national resources.

In line with the mentioned goals, in 2013 the Agency primarily focused on:

- **Increasing broadband penetration rate, by providing necessary level of data transmission rates, based on fixed and wireless access infrastructure, according to the relevant strategic documents.**
- **Increasing the investments in fixed-line infrastructure, by stimulating competition and by applying the general authorization regime to electronic communication activities on fixed networks.**



- **Increasing investments in wireless infrastructure, by initiating tender procedures for frequency assignment in order to introduce new operators in the frequency bands available in 2013 and to create conditions necessary for continuing the process the next year.**
- **Ensuring level-playing field for all market players, both in terms of technological-neutrality and business conditions.**

Each year, the Agency publishes *An Overview of Telecom Market in the Republic of Serbia*, presenting the data for the previous year. This year's *Overview* analyzes each segment of the telecom market. The analysis includes comparative overview of the key market parameters in the past years. Last year showed a moderate growth trend in revenues in all market segments. Electronic communications networks and services market remained mainly unchanged when it comes to fixed and mobile networks, both in terms of the number of users and the revenues made. Growth was seen in the Internet services and broadband access markets, as well as in the number of users of the media content distribution services. The broadcasting sector was, however, affected by the economic crisis. The important development in the broadcasting sector was the beginning of operation of the initial digital TV network of the *Broadcasting Equipment and Communications (ETV)*, Public Enterprise.

The relevant indicators show that, regardless of economic crisis which marked the previous year, telecom sector business remained stable enabling further market development. The development of the broadband access market and Internet usage is particularly significant. The technological development and ICT usage or information society development level is measured by the ICT Development Index (IDI). Last year, according to this index, Serbia was among the top 50 countries, based on the ITU data.

The work of the Agency during the past years provided for the creation of open and fair market in all its segments. Indeed, the Agency will continue to fulfill its duties stipulated under the Law, in line with the new technological development trends and the EU regulations affecting telecom market regulation, in order to perform the entrusted tasks.

A dynamic development of ICTs, in particular of the services, asks for a constant introduction of new regulations. In May 2012 RATEL has been granted observer status in the Body of European Regulators for Electronic Communications (BEREC) and since September 2012 it has been a member of the Independent Regulators Group (IRG), which is a recognition of the successful regulation of the Serbian telecom market. The membership also involves new responsibilities and requires attending the meetings organized by BEREC and IRG, as well as active participation in the work of all work groups. RATEL is also actively involved as a regulator in the work of the International Telecommunication Union (ITU), European Conference of Postal and Telecommunications Administrations (CEPT) and European Telecommunications Standards Institute (ETSI). The participation in the work of these international organizations requires intensive and direct cooperation with the regulatory authorities and other institutions of the neighbouring countries and the EU, which involves bilateral and multilateral meetings with the NRAs from the EU and the region, in addition to the joint work in the international institutions.

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Chair of the Managing Board



Professor Dr Jovan Radunović



1. RATEL'S ACTIVITIES IN 2013

The Republic Agency for Electronic Communications (RATEL) is a national, independent regulatory authority for electronic communication, whose position in the legal system of the Republic of Serbia is defined under the provision of Article 137 paragraph 3 of the Constitution. RATEL is functionally and financially independent from the state authorities, organizations and persons performing the activity of electronic communications. RATEL's work is not financed from the budgetary assets and the manner of financing as stipulated by the law regulating electronic communication is a mechanism ensuring RATEL's financial independence and RATEL's revenues stipulated by the law are not budgetary assets by their legal nature.

RATEL was established pursuant to the Law on Electronic Communications (*Official Gazette of RS*, nos. 44/10 and 60/13-CC Dec., hereinafter: Law), as an autonomous organization independent of state authorities, separate from the existing state administration structure, precisely in order to ensure a higher level of autonomy and independence in performing the entrusted public competencies. The purpose was to ensure a greater level of efficiency and the necessary distance from any political influence.

RATEL has been performing the regulatory function since August 2005. Pursuant to the main principles laid down under the Law, strategic documents and relevant regulations, in 2013 RATEL kept the focus of the regulatory activity on providing conditions for: a balanced and stable development of the electronic communications in the territory of the Republic of Serbia, business predictability and equal treatment of the operators, as well as the maximum benefit for the users of electronic communications services, in terms of choice, price and quality of the services offered. The objective of the regulatory activity is a liberalized and open electronic communications market, mainly through creation of a stable and predictable regulatory environment, in order to stimulate the sector development, investments, innovative services, new market entrants, promotion of competition and protection of users' interests.

RATEL's activities accomplished in the period from 1 January to 31 December 2013, which were the result of activities and tasks defined under the regulations pertinent to the telecom or electronic communications sector and under the 2013 Framework Business Plan, are presented below.

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REGULATORY ACTIVITY

In performing its regulatory activity, in 2013 RATEL passed the following bylaws:

- Rules on the manner of radio frequency usage under general authorization regime (*Official Gazette of RS, no. 28/13*)
- Rules on fee calculation for the provision of services within the competence of the Republic Agency for Electronic Communications (*Official Gazette of RS, no. 34/13*)
- Rules amending the Rules on the manner of monitoring the radio frequency spectrum usage, technical inspection procedure and protection from harmful interference (*Official Gazette of RS, no. 35/13*)
- Amendments to the Numbering Plan (*Official Gazette of RS, no. 64/13*).

Following the public consultations on the Draft rules on number portability for the services provided via public mobile communications networks, completed on 26 November 2013, the Rules were submitted to the responsible ministry in order to receive the opinion on the compliance with the Constitution and laws.

Pursuant to the Law, in 2013 RATEL also drafted the proposals of bylaws to be adopted by the responsible ministry, as follows:

- Rulebook stipulating Frequency/Location/Area Allotment Plan for Terrestrial Digital TV Broadcasting Stations in UHF Band for the Territory of the Republic of Serbia (*Official Gazette of RS, no. 73/13*),

- **Rulebook Amending the Rulebook Stipulating the Frequency/Location Allotment Plan for Terrestrial Analogue FM and TV Broadcasting Stations for the Territory of the Republic of Serbia (Official Gazette of RS, no. 93/13),**
- **Rulebook Stipulating the Radio Frequency Allotment Plan for Providing Public Communication Service – Broadband Wireless Access (BWA), Mobile/Fixed Communications Network (MFCN) in the Frequency Bands 3400-3600 MHz and 3600-3800 MHz (Official Gazette of RS, no. 10/14) and**
- **Rulebook Amending the Rulebook Stipulating the Frequency/Location Allotment Plan for Terrestrial Analogue FM and TV Broadcasting Stations for the Territory of the Republic of Serbia (Official Gazette of RS, no. 10/14).**

Public consultations on the Draft rules amending the Rules on radio and telecommunications terminal equipment were concluded on 31 May 2013, the opinions received in a timely manner were published at RATEL's website and the Draft rules were submitted to the responsible ministry.

Also, Public consultations on the Draft rules Stipulating RF Allotment Plan for Fixed Wireless Access in the bands 10150-10300 MHz and 10500-10530 MHz were concluded on 27 September 2013, the opinions received in a timely manner were published at RATEL's website and the Draft rules were submitted to the responsible ministry.

Draft rules amending Rules on application forms for the issuance of individual licence for the use of radio-frequencies, Draft rules amending the Rules on quality parameters for publicly available electronic communication services and monitoring of electronic communication activity and Draft rules amending the Rules on general terms and conditions for performing electronic communication activities under general authorization regime had been prepared in the last two quarters of 2013 and were published in the Official Gazette of the Republic of Serbia in early 2014, following the opinion of the responsible ministry on the compliance with the Constitution and laws.

In late 2013 RATEL began preparing Draft Allotment RF Plan for Working in the Frequency Bands 791-821/832-862 MHz. A number of separate enactments has also been adopted within RATEL's competence under the Law, as part of the electronic communications market regulation.

ELECTRONIC COMMUNICATIONS NETWORKS AND SERVICES

During 2013, RATEL continued with the activities aimed at creation of a free and open market, ensuring equal treatment for all participants. In keeping with the adopted regulations and procedures for the introduction of new technologies and services, which were finalized in the previous period, RATEL undertook a series of activities concerning the sector regulation, in order to stimulate competition in the Serbian telecom market.

A comparative overview of the number of users, public fixed communication network penetration rate, public mobile communication network penetration rate, Internet and cable systems for 2011, 2012 and 2013 is given in Table 1.

Table 1. A comparative overview of the number of users of the basic electronic communication services in the last 3 years
Source: RATEL

	2011		2012		2013	
	Number (thousands)	Penetration (%)	Number (thousands)	Penetration (%)	Number (thousands)	Penetration (%)
Fixed - lines	3,030.4	42.56	2,990.1	41.29	2,938	40.91
Mobile - users	10,182	142.99	9,137.9	126.19	9,198.7	128.09
Internet - subscribers	3,828.7	53	5,038.9	69.26	5,691.6	79.25
Cable - subscribers	1,331.3	18.7	1,442.2	19.92	1,552.5	21.62

In 2013, RATEL continued monitoring the operators' compliance with the conditions under the issued licences, as well as the situation in the markets and the fulfilment of the decisions passed, pursuant to the competencies related to the market analysis, as stipulated under the Law.

The EU Roaming Regulation on roaming on public mobile telecom networks entered into force in June 2001, setting a cap for both wholesale and retail roaming charges in the EU member countries and the countries of the European Economic Area – EEA. An initiative was made by the countries with observer status in BEREC to extend roaming charges limit to these countries. The European Commission suggested that the EU candidate countries could regulate roaming charges between member and candidate countries through integration procedure, in particular as part of the Stabilization and Association Agreement - SAA. Since the formal procedure requires a bilateral communication made by a member country government to the European Commission, requesting that the EU Roaming regulation be included in the SAA, in November 2012 RATEL made the initiative for the Roaming Regulation to be included in the negotiations on Serbia's accession to the EU. Upon the initiative of the BEREC observer states to limit the roaming prices by applying the EU Roaming Regulation, Macedonia, Montenegro and Serbia have prepared the draft White Book on Extending the Application of the Roaming Regulation in Macedonia, Montenegro and Serbia. RATEL has provided the responsible ministry with the relevant information regarding the legal and institutional framework in the Republic of Serbia and the data on retail roaming prices, data volume and revenues from the roaming services. The European Commission has rejected the initiative.

Since the Law stipulates the obligation of RATEL to keep appropriate registers of the operators, in February 2011, the Managing Board passed the decision on the manner in which the registers, records, data bases and other information within the competence of the Republic Agency for Electronic Communications are to be kept and published on the Agency website. In addition to updating the existing registers and creating new ones, in 2013 there were 108 changes made in the register of operators performing electronic communications activity (85 new entries and 23 erasures) as follows:

- 15 new entries and 5 erasures for media content distribution service operators
- 3 new entries and 1 erasure for VoIP operators
- 17 new entries and 10 erasures for broadband network access
- 1 new entry for MVNO operator
- 3 new entries for data transmission

- 1 new entry for leased lines
- 1 new entry for capacity leasing
- 1 new entry for infrastructure leasing
- 1 new entry for dark fiber, leasing
- 4 new entries for public telephone service
- 2 new entries for VAS voice transmission
- 2 new entries for VAS SMS and MMS transmission
- 7 new entries and 2 erasures for passive infrastructure
- 8 new entries for optical networks
- 9 new entries and 5 erasures for other wire networks (hybrid, coaxial)
- 1 new entry for microwave network operator.

During 2013, 9 authorizations for international interconnection with the telecommunications network operators in the neighbouring countries were issued. Pursuant to the Law, 52 decisions on permits to use numbering resources were issued upon operators' requests, as well as 10 decisions on the withdrawal of permits.

Number portability on public mobile networks, available since July 2011, was successfully operated during 2013 in line with RATEL's bylaw regulating number portability. By the end of 2013 the total of 190 000 numbers had been ported.

During 2013 RATEL took action so that a phased implementation of the number portability service on fixed network be carried out and the entire procedure, including the inter-operator testing, be completed by 31 March 2014. RATEL and the operators providing electronic communication services via public fixed telephone networks signed a Protocol of implementation of the Rules on number portability on public telephone networks at a fixed location (Official Gazette of RS, no. 52/11) in order to standardize the procedures related to administrative issues that may rise in the number porting procedure. Number portability service on public telephone networks at a fixed location has been available since 1 April 2014.

Since 1 April 2013 the access to universal service has been available in 712 localities of the Republic of Serbia, satisfying the needs of specific social groups, including the disabled and socially disadvantaged users. Four operators have been designated universal service operators. The localities where universal service had not been available due to lack of infrastructure have been divided between the operators by agreement, based on the respective market share. So far only Telekom Srbija Joint Stock Co. has universal service users, whereas the other operators have not yet received any universal service provision request, although they are ready in both technical and organizational terms. Also, in March 2013, RATEL set the prices (subscription fee, local and trunk call rates, rates for calls made to national mobile networks and termination rates) for the universal service operators providing US by using CLL technology.

In 2013, pursuant to the Rules on radio equipment and telecommunications terminal equipment (R&TT) (*Official Gazette of RS*, no. 11/12, in force as of 1 June 2012), RATEL, as the body in charge of R&TT equipment conformity assessment, issued:

- 1543 certificates of conformity and
- 670 excerpts from the register of issued certificates,
- 75 requests were forwarded to the responsible ministry,
- 35 requests were rejected, while there were 122 cases of withdrawn requests.

Also, the Instructions on fulfilling technical and other requirements when building an electronic communication network and associated facilities in residential or business premises were drafted and adopted.

In 2013 RATEL continued with spectrum monitoring, control of quality parameters for publicly available electronic communication services and networks and control of electronic communication business performance.

RADIOCOMMUNICATIONS

The activities related to the joint work of the Ministry of Culture, Media and Information Society, the Republic Broadcasting Agency (RRA) and RATEL on the creation of conditions

necessary for analogue to digital switchover in radio and television programme broadcasting, continued in 2012.

In addition, during 2013, the following activities related to RF spectrum management took place:

- as part of the broadcasting activities, the data from 24 BRIFICs (*BR International Frequency Information Circular*) of the International Telecommunication Union, of relevance for the broadcasting service of the Republic of Serbia, were analyzed. Answers were prepared for all cases where the new frequency assignments were affecting our broadcasting service, and they were delivered to the Radiocommunication Bureau in timely manner. Also, special sections added to ITU BRIFIC were analyzed, namely 389 requests in 10 special sections of GE84 were analyzed for the broadcasting service and the answers were sent to the ITU Radiocommunications Bureau;
- a large number of compatibility analyses were carried out related to requests for new frequency assignments, using the appropriate software;
- a large number of coordination requests for new frequency assignments or modification of the existing, made by the neighbouring or other administrations, were solved.

Implementing CEPT ECC/DEC/(01)03 and ECC Report 180, RATEL prepared the appropriate file (xml file format) for the ECO Frequency Information System (EFIS), applied in accordance with the Commission Decision 2007/344/EC on harmonized availability of information regarding spectrum use within the Community. The access to the data provided by RATEL has been available in EFIS database as of 12 February 2014.

The following proposals of general bylaws to be adopted by the responsible ministry were prepared by RATEL in 2013:

- **Rulebook Stipulating the Frequency/Location Allotment Plan for Terrestrial Digital TV Broadcasting Stations in UHF band for the Territory of the Republic of Serbia**

- Rulebook amending the Rulebook Stipulating the Frequency/Location Allotment Plan for Terrestrial Analogue FM and TV Broadcasting Stations for the Territory of the Republic of Serbia
- The Rulebook Stipulating the Radio Frequency Allotment Plan for Providing Public Communication Service – Broadband Wireless Access (BWA), Mobile/Fixed Communications Network (MFCN) in the Frequency Bands 3400-3600 MHz and 3600-3800 MHz
- Rulebook Amending the Rulebook Stipulating the Frequency/Location Allotment Plan for Terrestrial Analogue FM and TV Broadcasting Stations for the Territory of the Republic of Serbia, and
- Rulebook stipulating the Allotment Radio Frequency Plan for Fixed Wireless Access in the Frequency Bands 10150-10300 MHz 10500-10530 MHz, the opinions received in public consultation were published on RATEL's website and the proposal of the Rulebook was submitted to the responsible ministry to act within their competence.

In addition, RF spectrum management also included the following activities related to the issuance of radio station licences, radio frequency coordination and notification and RF spectrum monitoring:

- 6084 individual permits for radio frequency usage were issued at operators' requests according to provision of Art. 86 of the Law: 46 individual permits for radio-stations on aircrafts, 34 of individual permits for radio-frequency usage for radio-stations on board of ships or other vessels, 182 individual permits for radio-frequency usage to diplomatic-consular offices and foreign legal entities in accordance with the provisions of Arts. 87 and 88 of the Law, as well as 41 amateur radio-station permits were also issued.
- 311 decisions on revoking the assigned radio-frequencies were adopted, according to Art. 95 of the Law,
- 55 individual permits for radio frequency usage were issued upon a repeated technical inspection.

Continual spectrum monitoring was performed during 2013.

USER PROTECTION

Just like in the previous years, RATEL continued with the user support services and resolving the complaints concerning the work of some operators, which involved the analysis of the number of user complaints according to the type of services, preparation of specific enactments and daily communication with the users by e-mail and telephone. In 2013, 819 user complaints were received, of which 235 complaints were resolved with the positive outcome for the users. The majority of complaints in 2013 concerned the correctness of the bill for mobile telephony services, even though RATEL had published a comparative overview of mobile operators' prices for roaming services and the instructions on data transmission and the Internet access in roaming.

During 2013, following the analysis of the general terms and conditions for the subscriber contract for five operators - Telekom Srbija a.d., Telenor d.o.o., Vip mobile d.o.o., Orion telekom d.o.o. and SBB d.o.o, RATEL sent recommendations to the operators on how to align general terms and conditions with the regulations in force.

MONITORING AND ANALYSIS OF THE MARKETS SUSCEPTIBLE TO EX-ANTE REGULATION

Pursuant to the Law, RATEL has the task to carry out market analysis, collect and publish statistical data and to provide the National Parliament of the Republic of Serbia with the data on the situation in the Serbian electronic communication market in the form of annual report on the activities. In order to make available the data concerning the situation in the Serbian electronic communication market, RATEL publishes every year the *An Overview of the Telecom Market in the Republic of Serbia*, providing the necessary information on operators, relevant public authorities, scientific institutions, investors, users and NRAs in the region and in the EU. Furthermore, information was collected and submitted to the International Telecommunication Union (ITU) in form of the questionnaire with indicators, reports on the annual analysis of the telecommunication traffic were prepared and quarterly data were submitted to the Statistical Office of the Republic of Serbia, and also information on telecommunications

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market, service prices and regulatory measures was provided to the Cullen International for the purpose of the annual report.

Regarding the control of regulated prices of the SMP operators Rules on the application of the cost-accounting principle, separate accounts and reporting of an operator with significant market power in the electronic communications sector (*Official Gazette of RS*, no. 52/11) were fully applied. The regulatory reports of the following SMP operators were analyzed: Communications Company „Telekom Srbija“ Joint Stock Co. (Telekom Srbija Joint Stock Co.) and Serbia Broadband – Srpske kablovske mreže Ltd. (SBB Ltd.), as well as the service packages provided by the two operators.

As part of the implementation of the decision designating SMP operators in the mobile call termination market (ref. no. 1-02-3491-568/11-40 of 29.11.2011.), on 20.08.2013 RATEL adopted the decision ref. no. 1-02-3491-818/11-22 on reduction in rates for call termination on mobile networks applied as of 01.01.2014. In view of this decision and in line with the wholesale markets obligation to publish information in the form of reference offer, Telekom Srbija, Joint Stock Co., Telenor Ltd. and Vip mobile Ltd. modified the existing reference offers for call termination on mobile networks and submitted the offers to RATEL, according to the set procedure.

In nine relevant markets susceptible to ex ante regulation, where five operators had been identified as SMP operators, during 2013 RATEL monitored the implementation of regulatory measures, mainly reference offers and pricing methods for regulated prices. Reference offers are mandatory as regulatory measures for four operators with significant market power in six wholesale markets (Telekom Srbija Joint Stock Co., Orion telekom Ltd., Telenor Ltd. and Vip mobile Ltd.). In this way predictable and non-discriminatory business conditions have been created for operators in the wholesale markets susceptible to ex ante regulation. RATEL carried on with the continual analysis of the termination, collocation, leased lines and broadband rates, along with updating the information on cable service price modifications, overview of the roaming prices of the national mobile operators in 50 selected countries, etc.

RATEL'S ORGANIZATION AND DEVELOPMENT

In 2013 the Managing Board (five-year term) worked with the same members as in the previous years: Chairperson Prof. Dr Jovan Radunović, Deputy Chairperson Dr Zdravko Stanimirović and the members of the Managing Board Prof. Dr Miroslav Dukić, Prof. Dr Vlade Milićević and Vuk Vujović, MBA.

The following organization units were formed for performing the work within RATEL's competence:

- **Regulation Department** (with the following departments: Bylaws Division for Legal Affairs in Electronic Communications Sector, Technical Regulations Division and Radio-communications Division),
- **Economic Affairs and Market Analysis Department** (with the following divisions: Market Analysis and Cost-Accounting Division, Accounting and Finance Division and Procurement Section),
- **Logistics Department** with the following departments: General Affairs Division, e-RATEL Division and Monitoring Division).

The financial assets are provided by RATEL's revenues from the numbering fees, radio-frequency fees, fees for performing electronic communication activities, and revenues from the provision of services within RATEL's competence. RATEL's annual financial report is approved by the Managing Board and revised by an independent chartered auditor. The difference between the revenues and expenditures laid down in RATEL's annual financial report is paid into public revenues account of the Treasury of the Republic of Serbia and used by the responsible ministry for the promotion and development of electronic communications and information society. A part of these revenues, proportional to the revenues made by the electronic communication network and services operators in the territory of the Autonomous Province of Vojvodina, is paid into the account of the Province Treasury and used by the province authority in charge of electronic communication for the promotion and development of electronic com-

munication and information society in the territory of AP Vojvodina. It should be noted that the National Parliament of the Republic of Serbia approved the 2012 Work Report of the Republic Agency for Electronic Communications, submitted thereto in timely manner through the Board for Space Planning, Traffic, Infrastructure and Telecommunications.

During 2013, RATEL's total revenues amounted to approximately 1 486 million dinars, with the total expenditures of 617 million dinars. Pursuant to Article 27, paragraph 6 of the Law, once the financial reports had been audited, the surplus of 869 million dinars was paid into the Treasury of the Republic of Serbia and the Autonomous Province of Vojvodina, in the amount of 715 million dinars and 10 million dinars, respectively. Furthermore, the Republic Agency for Electronic Communications paid 143 million dinars into a special account of the Serbian Film Centre intended for the promotion of the national cinematography, pursuant to provisions of Arts. 19 and 20 of the Law on Cinematography (*Official Gazette of RS*, nos. 99/11, 2/12-corr.) in force as of 3 July 2012. The impact exercised by the Law amending the Law on Budgetary System (*Official Gazette of RS*, no. 93/12) and the Law Setting a Salary Cap in the Public Sector (*Official Gazette of RS*, no. 93/12) in force as of 29 September 2012 on the functional and financial independence of the Agency needs to be underlined.

In late 2011 the Law on Cinematography was passed (*Official Gazette of RS*, nos. 99/11 and 2/12-corr.) , and came into force as of 3 July 2012, under the provisions of which, Art. 19 point 4) and Art. 20, the institutes in the telecommunications sector, i.e. electronic communications, are regulated in a different way than they are regulated by the systemic law, whereby they are exceeding the limits of the cultural sector regulation. Namely, it is laid down by these provisions of the Law on Cinematography that the assets for the promotion of the national cinematography shall be raised, inter alia from: 10% of the revenue made from the fees paid by the public telecommunications operators to the Agency for the right to build, possess or exploit a public telecommunications network, and/or the right to provide public telecommunications services, revenue made from the fees radio frequency usage and assignment, revenue made from the certificate issuance, and revenue made from the costs of technical inspection and other costs of permit issuance, paid no later than 30 June of the current year for the revenue made in the previous year. The assets are paid into a separate account of the Film Centre Serbia. 115.4 million dinars were paid into the account of the Film Centre Serbia, on

these grounds, in 2012, whereas the expected payment for 2013 amounts to 143.6 million dinars. In March 2012, the Agency submitted the initiative to the Constitutional Court of the Republic of Serbia for the review of the constitutionality of this law, for the reason that the provisions of the 19 point 4) and Art. 20 of this law are contrary to the Art. 4, paragraph 1, Art. 84, paragraph 3 and Art. 194 of the Constitution of the Republic of Serbia. In December 2013 the Constitutional Court passed the decision on initiating the procedure for determining unconstitutionality of the provisions of the 19 point 4) and Art. 20 of the Law on Cinematography. On 3 April 2014 the Constitutional Court passed the Decision no. IUz – 128/2012, whereby it was found that the provisions of the 19 point 4) and Art. 20 of this law are contrary to the Constitution and the aforesaid provisions were repealed as of 29 April 2014.

It should further be noted that the Law Amending the Law on Budgetary System (Official Gazette of RS, no. 93/12) and the Law Setting a Salary Cap in the Public Sector (Official Gazette of RS, no. 93/12) were passed and entered into force in 2012. The Law Setting a Salary Cap in the Public Sector (Official Gazette of RS, no. 93/12) also involves the salaries of the Agency employees, setting the amount of the maximum salary, and also the minimum salary (for the assistant and technical positions), in the public sector. The implementation of this law since its entry into force has resulted in the reductions in the salaries of the Agency employees, in particular of the employees with a university degree. Seven employees left the Agency in one month. It should be noted that a number of listed regulatory authorities have been exempted from this law.

The mentioned laws impact RATEL's functional and financial independence, as has been reported in the Serbia 2013 Progress Report of the European Commission in the section concerning Chapter 10: Information Society and Media. It was reported that the amendments made to the budget law and the law on public sector salaries in September 2012 had had great impact on the Agency's operational independence and its ability to recruit and retain competent staff. Furthermore, it was concluded that the issue of the telecom regulator's budgetary and operational independence raises concerns. Also, in November 2012 the Body of European Regulators for Electronic Communications (BEREC) issued a communication expressing its concern at the impact of some national legislative initiatives on the efficiency of the electronic communications regulatory authority for in performing its regulatory tasks and, in turn, its independence.

1. RATEL'S ACTIVITIES IN 2013

This trend continues in 2013 with the adoption of the Law on Reducing Net Salaries of the Persons in Public Sector (Official Gazette of RS, no. 108/13) whereby the salaries of the Agency employees were once again progressively reduced, and also with the adoption of the Law Amending the Law on Budgetary System (Official Gazette of RS, no. 108/13) stipulating, inter alia, proscription for the beneficiaries of the public assets to hire new employees in order to fill job vacancies, either existing or created by an employment termination until 31 December 2015, where the Agency and the Republic Agency for Postal Services are the only regulatory authorities that are not exempted from this proscription by the provisions of the Art. 6 of the latter law.

In consequence of the mentioned laws, a number of highly qualified employees had left the Agency, while the problem of filling the vacancies after the retirement of a number of employees in 2014 and 2015 also emerged. On 31 January 2014 the total number of employees was 111, 80% of which have a university degree (6 PhD and 14 MSc) and 20% with secondary education.

RATEL is located in rented business premises in Višnjićeva 8 in Belgrade. The spectrum monitoring centres are located in Dobanovci and Nis. Further upgrade of the existing ICT systems within RATEL continued in 2013.

During 2013, a great number of sessions of the Managing Board were held where a number of general bylaws (rules, draft rules, instructions), the Financial Plan and the Procurement Plan for 2014 were passed. Furthermore, a large number of memoranda were addressed to the Government of Republic of Serbia, the responsible ministries, operators and many other institutions and organizations, both in the country and abroad.

The same as in the previous years, RATEL published on its website the Report on the Work of the Republic Agency for Electronic Communications for 2013, pursuant to the provision of the Art. 39 of the Law on Free Access to Information of Public Importance ("Official Gazette RS" Nos. 120/04, 54/07, 104/09 and 36/10) and the Instructions for preparing and publishing the report on the work of a state authority issued by the Commissioner for Information of Public Importance and Personal Data Protection. Observing the principles of transparency in the work and provision of information to all participants of the telecom market, a regular

press conference, the Presentation of the annual publication - Overview of the Telecom Market in the Republic of Serbia 2011, was held in RATEL's premises on 17 April 2013.

In 2013 RATEL continued publishing the professional-scientific magazine *Telekomunikacije*. Also, RATEL's representatives participated in the following roundtables and conferences:

- 10th Annual SEE Telecoms Forum, 24.01.2013, Belgrade;
- TELSIS 2013 International Conference, roundtable: *Digitalization - Rational Usage of the RF Spectrum*, 16.10.2013, Faculty of Electronic Engineering, University of Nis;
- Board for Space Planning, Traffic, Infrastructure and Telecommunications: Public Hearing *Digitalization - Rational Usage of the RF Spectrum*, 12.11.2013, the National Assembly, Belgrade;
- TELFOR 2013, International Conference, roundtable: *System for Continual Automatic RF Spectrum Monitoring in the Territory of the Republic of Serbia*, 27.11.2013., "Sava" Centre, Belgrade;
- PostTel 2013 Symposium, opening address: *The Regulatory Challenges for Building a Single Market for Electronic Communication in the European Union*, 03.12.2013, Faculty of Transport and Traffic Engineering, Belgrade.

With the purpose of providing transparency in RATEL's work and offering an opportunity to the public to take part in the process of decision-making in the telecommunications sector, in 2013, pursuant to the provision Arts. 34-36 of the Law and the Instructions on the Public Consultations Procedure, RATEL organized a number of public consultations prior to the adoption of all general bylaws by the Managing Board.

COOPERATION WITH OTHER ORGANIZATIONS AND INSTITUTIONS

In performing its main role under the Law to create the necessary conditions for an unhindered development of the electronic communication market in the Republic of Serbia, RATEL



has established close cooperation with the responsible ministry, relevant state authorities, organizations and other entities.

With the aim of ensuring an efficient radio frequency spectrum management and the protection of operation of priority radio services, RATEL has established the cooperation with the responsible ministry, Ministry of Culture and Media, the Republic Broadcasting Agency, the Ministry of Defence, Serbian Armed Forces, the Ministry of Interior and the Serbia and Montenegro Air Traffic Service Agency. Also, a good cooperation has been established with the Commission for the Protection of Competition in the area of market analysis.

During 2013, RATEL participated in the activities related to the National Programme for the Adoption of *Acquis* (NPAA), in particular Chapter 10 (Information Society and Media), Chapter 8 (Competition) and Chapter 1 (Free Movement of Goods). The cooperation with the EU Integration Office involved, in particular, drafting monthly and quarterly reports on the activities related to the European integrations, update of the NPI electronic base of legal documents, participation in the activities related to the NPAA, drafting materials for the Enhanced Permanent Dialogue (EPD) with the EC representatives and providing information concerning electronic communication sector for the annual EC Progress Report. RATEL participated in the EPD for the Information Society Media and Audiovisual Policy held on 18 June 2013 in Brussels, Belgium.

The dynamic development of ICTs, i.e. services and equipment, requires continuous monitoring and introduction of new regulations. This requires intensive and direct international cooperation with the national regulatory authorities (NRAs) and other international institutions in the region and in the EU. For the purposes of the harmonization of regulations, technical provisions, and standards, in 2012 RATEL's experts took an active part in the meetings organized by ITU, BEREC, Cullen International, CEPT, ETSI, in particular:

- ITU-T work groups (SG2, SG3, SG9, SG12, SG13, SG15 i SG17) and ITU-R work groups (SG1, SG4, SG5 i SG6);
- CEPT Work Group Spectrum Engineering (WGSE), Work Group Frequency Management

- WGFM) and Work Group Numbering and Networks (WGNaN),
- COMMITTEE RAINWAT (Regional Arrangement on the Radiocommunication Service for Inland Waterways) meetings
- European Communications Office (ECO) WGRA meetings.

Since it had been granted the observer status in the **Body of European regulators for Electronic Communications – BEREC** as of 1 March 2012, RATEL representatives have participated in the Board of Regulators – BoR and Contact Network – CN meetings, and since 2013 in Expert Working Group – EWG meetings, as well. Also, in September 2012 RATEL became a member of **Independent Regulators Group – IRG**, which is a network of independent European telecom regulators. IRG was established in 1997 as a group of European National Telecommunications Regulatory Authorities (NRAs) to share experiences and points of views among its members on important issues relating to the regulation and development of the European telecommunications market.

International cooperation in the radiocommunications involved RF coordination with the neighbouring countries in the border areas, according to the previously signed coordination agreements, as well as the RF coordination based on the commitments arising from the ITU-R Radio Regulations.

Constant contacts with all participants in the market were maintained through the official institutional participation of RATEL in the meetings and roundtables and through presentation in the national and international conferences and papers in the national and international magazines. In 2013, there were two international meetings:

- **WG NaN Project Team Number Portability meeting, 4-5 June 2013;**
- **Workshop on the Polish experience in the telecom infrastructure mapping, 27 November 2013.**

RATEL representatives attended the “Follow-up Workshop on the Implementation of the Law on Electronic Communications in Administrative Court Proceedings” organized by TAIEX in cooperation with the Judicial Academy and the Ministry of External and Internal Trade and Tele-

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communications, in the period 28-29 January 2013. RATEL's representatives also attended the *Competition and Telecommunications* seminar organized by the Ministry of External and Internal Trade and Telecommunications as part of the 2011 IPA Project, held on 18 December 2013.

RATEL cooperates with the other NRAs in Europe, in particular with those in the region. In 2013 RATEL signed the memoranda of understanding with the NRAs of Turkey, Bosnia and Herzegovina and Poland. The cooperation defined by the memoranda provides for a regular exchange of information concerning the electronic communications policy and strategy making and expert meetings with the purpose of studying and comparing technical, legal, economic and other aspects of the regulatory activities in this sector.

In its work, RATEL continues the cooperation with all participants in the telecom market: operators, providers, distributors, industry, research and educational institutions as well as with consumer associations.

Director



Dr Milan Janković



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2. ELECTRONIC COMMUNICATIONS MARKET ANALYSIS

2.1. BASIC CHARACTERISTICS OF THE TELECOM MARKET IN THE REPUBLIC OF SERBIA

Figure 1. Republic of Serbia – Basic Facts



Basic data	Source: Statistical Office of the Republic of Serbia
Name	Republic of Serbia
Capital	Belgrade
Area	88,361 km ²
Population (without AP Kosovo and Metohija), estimate by the Statistics Office	7,181,505
Country code:	+381
Internet domain:	.rs
GDP for 2013	3,618.17
Average net income in December 2013	RSD50 820.00 (€449)
Fixed penetration:	40.91
Mobile penetration:	128.09
ISPs:	221
Network digitalization rate:	99.69%

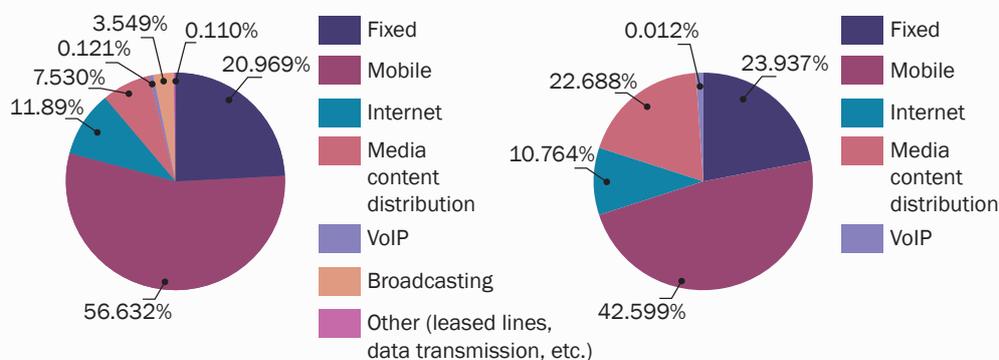
The revenues from telecom services in 2013 in the Republic of Serbia amounted to 1.55 billion euros, which is approximately the same as in the previous year. The share of telecom sector revenues in GDP was around 4.85%, whereas the total investments in the telecom sector in 2013 amounted to 262 million euros, which is 12% more compared to the previous year.

The data utilized for the telecom market analysis in the Republic of Serbia were retrieved from the reports submitted by the telecom market participants and refer to the territory of the Republic of Serbia without the Autonomous Province of Kosovo and Metohija which is under UN administration pursuant to 1244 Security Council Resolution temporarily regulating, *inter alia*, the competencies of the international civil mission in this territory.

In terms of market share accounted for by different services in the Serbian electronic communication market in 2013, same as before, the revenues from the mobile services accounted for the largest share in the total revenues, with almost 57%, amounting to 878 million euros. A similar trend may be seen in the total investments made in 2013, since the investments in the mobile telephony accounted for over a half of the total investments in the electronic communications market in the Republic of Serbia, with EUR111 million (43%). The structure of the revenues and investments in the telecommunications sector is given below (Figure 2).

Figure 2. Structure and investments by services in 2013

Source: RATEL



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Low usage basket shows average monthly expenses of a subscriber/inhabitant for telecommunications services. Tables 3 and 4 illustrate telecom service baskets representing monthly expenditure per subscriber of telecom services in Serbia in 2013 compared with the data retrieved in 2010, 2011 and 2012. According to the obtained data and the data received from the Statistics Office, in 2012, the cost of the basic package equalled 3.17% of the net average monthly salary in December and for the expenses of the high usage basket equalled 10.27%.

Table 2. Low usage basket (RSD) Source: RATEL

LOW USAGE BASKET	2010		2011		2012		2013	
	Average bill	% of teh monthly salary	Average bill	% of teh monthly salary	Average bill	% of teh monthly salary	Average bill	% of teh monthly salary
Fixed	1,004.30	2.60%	988.99	2.25%	880.86	1.88%	837.88	1.65%
Mobile (prepaid)	331.30	0.90%	249.24	0.57%	261.95	0.56%	271.35	0.53%
TV (national TV subscription)	500.00	1.30%	500.00	1.14%	500.00	1.07%	500.00	0.98%
Total	1,835.60	4.80%	1,738.23	3.96%	1,642.81	3.50%	1,609.23	3.17%
<i>Average net salary (in December)</i>		39,580.00		43,887.00		46,923.00		50,820.00

Table 3. High usage basket (RSD) Source: RATEL

OSNOVNA KORPA	2010		2011		2012		2013	
	Average bill	% of the monthly salary	Average bill	% of the monthly salary	Average bill	% of the monthly salary	Average bill	% of the monthly salary
Fixed	1,004.30	2.60%	988.99	2.25%	880.86	1.88%	837.88	1.65%
Mobile (postpaid)	1,948.70	5.00%	1,715.07	3.91%	1,817.72	3.87%	1,666.05	3.28%
TV (national TV subscription)	500.00	1.30%	500.00	1.14%	500.00	1.07%	500.00	0.98%
Internet	1,165.00	3.00%	1,289.84	2.94%	1,224.69	2.61%	1,302.59	2.56%
Media content distribution	559.00	1.40%	593.06	1.35%	727.34	1.55%	911.40	1.79%
Total	5,177.00	13.40%	5,086.96	11.59%	5,150.61	10.98%	5,217.92	10.27%
<i>Average net salary (in December)</i>		39,580.00		43,887.00		46,923.00		50,820.00

2.2. COMPARATIVE ANALYSIS WITH THE SEE COUNTRIES

Same as the previous years, a comparative analysis of South East Europe countries was carried out in 2013. SEE countries include one EU country – Croatia member since 1 July 2013, four EU candidate countries Serbia, Turkey, Montenegro and Macedonia, and also two Stabilization and Accession Agreement (SAA) signatory countries – Bosnia and Herzegovina and Albania.

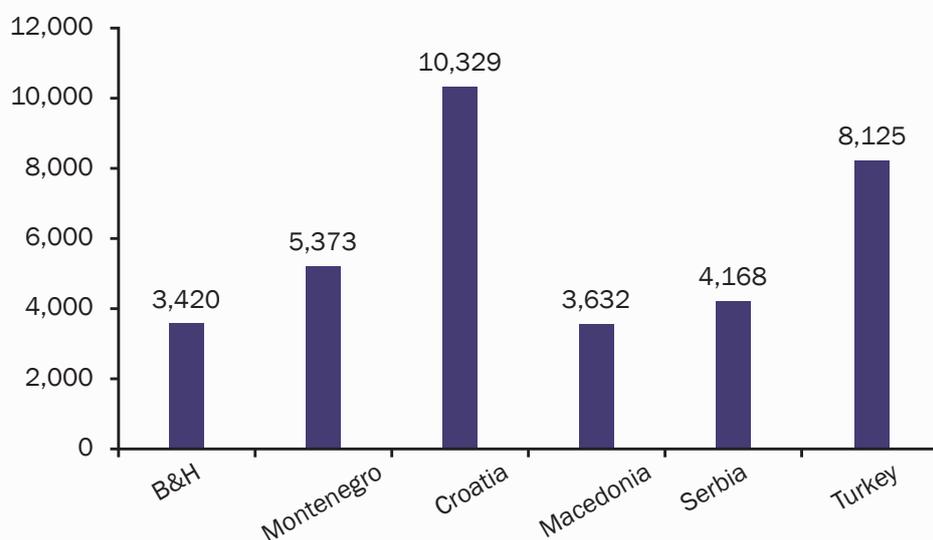
Compared to 2012, the value of VAT has changed only in Montenegro from 17% to 19%. In other counties it remained unchanged: 17% in Bosnia and Herzegovina, 18% in Turkey and Macedonia, 20% in Serbia and Albania and 25% in Croatia.

Table 4 below shows the population and GDP in each country. According to the MMF data, real decrease in GDP was seen in all the countries: Bosnia and Herzegovina (1.2%), Croatia (1.9%), Macedonia (0.4%), Montenegro (2.5%), Serbia (1.5%) and Turkey (2.2%).

Country	Population (mn)	GDP (€ bn)
Albania	n/a	n/a
Bosnia & Herzegovina	3.836	13.117
Montenegro	0.623	3.346
Croatia	4.260	44.000
Macedonia	2.062	7.490
Serbia	7.182	29.932
Turkey	75.627	614.459

Figure 3. GDP per capita in current prices (in euro, 2012 data)

Source: Based on the Statistical Office of the Republic of Serbia and Eurostat data



GDP per capita in current prices, as a valuable indicator which also reflects the population size is shown in Figure 3. In 2012 the biggest GDP per capita was seen in Croatia (€10,329), followed by Turkey (€8,125), Montenegro (€5.373) and Serbia (€4.168).

The total telecommunications market value in these countries is estimated to nearly 16.67 billion euros, as shown in Table 5, which is an increase of 4.3% compared with 2011. This means that the growth trend continued in 2012, unlike 2010 when a minor decrease had been perceived. Even though the growth trend went on, the share of services in 2012 was different. The biggest increase was seen in the data transmission (38.8%), mainly due to the revenues from this service in Turkey (66.3%). There was an increase in the revenues from the Internet in all observed countries, which led to the total increase in the revenues from this service of 19.6%. The growth of the revenues made from CATV (8.5%) and mobile telephony (7.2%) were rather modest compared to the Internet, whereas the revenues made from the fixed telephony continue to drop (14.3%).

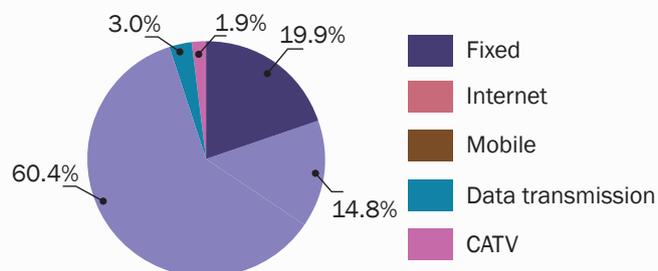
Table 5. SEE electronic communication market
Source: Enlargement countries monitoring report 4 - Annex - February 2014 (Cullen International)

Service	2009	2010	2011	2012	Sector growth 2011-2012
Fixed-line telephony	4,183,524,600	4,076,763,763	3,880,011,968	3,324,770,755	-14.31%
Internet services	1,531,031,400	1,639,126,245	2,062,128,441	2,467,071,493	19.64%
Mobile telephony	9,126,823,000	9,142,852,083	9,384,038,670	10,061,813,763	7.22%
Data transmission	448,902,100	409,233,079	362,524,704	503,199,211	38.80%
Cable (cable Internet services excluded)	181,364,900	225,346,894	289,687,575	314,357,326	8.52%
Total	15,471,646,000	15,493,322,063	15,978,391,538	16,671,212,548	4.34%

* CATV services excluded

As shown in Figure 4, the largest share in terms of investments in the telecom market in SEE went once again to mobile telephony with 60.4%. The share of the fixed telephony in total investments was 19.9% (cf. 24.3% in 2012). The share of the Internet showed considerable growth from 12.9% to 14,8%. The share of cable television was stable with 1.9%, whereas the share of data transmission grew from 2.3% to 3%.

Figure 4. Market share of electronic communication services in 2012
Source: Enlargement countries monitoring report 4 - Annex - February 2014 (Cullen International)



The total investments in the electronic communication sector of the SEE countries in 2012 amounted to approximately 3.16 billion euros, which is a 27.8% growth compared with 2011. In terms of investments, Turkey is leading the way with 2.36 billion euros. The total investments amounted to 252.48 billion euros in Serbia, which is a slight growth, and 299.44 billion euros in Croatia. In other countries the investments were significantly lower, with a growth tendency in Montenegro and a decrease in Bosnia and Herzegovina, Macedonia and Albania compared with 2011. Figure 5 shows investments as percentage of revenue in electronic communications sector for each country.

Figure 5. Investments as percentage of revenue in electronic communications sector (2012 data)
Source: Enlargement countries monitoring report 4 –February 2014 (Cullen International)

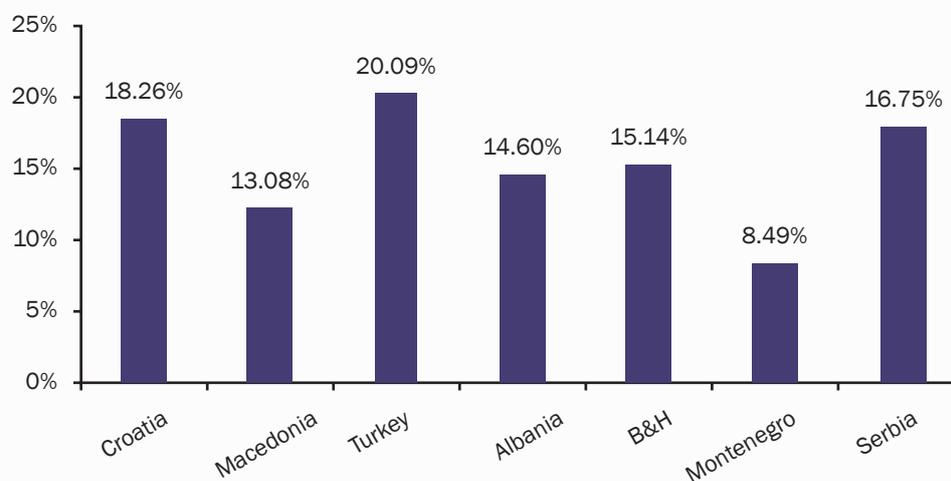
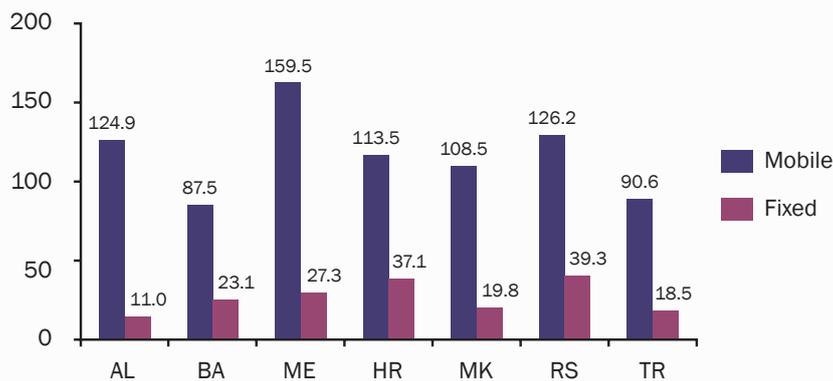


Figure 6 compares the mobile and fixed-line penetration rates of the SEE countries. Compared to the previous year, the indicators showed a slight growth in the mobile penetration rate only in Turkey (2.26%) and Bosnia and Herzegovina (6.06%), the rates remained virtually unchanged in Macedonia, whereas a drop was seen in Serbia (9.79%), Montenegro

(14.98%) and Croatia (2.07%), a sharper one, in Albania (32.45%). Fixed-line penetration rate, which had been characterised by a downtrend for years, had the biggest drop in Turkey (10.19%), Albania (8.33%) and Croatia (7.02%), followed by Macedonia (3.41%), Bosnia and Herzegovina (2.94%), Montenegro (1.09%) and Serbia (0.76%).

Figure 6. Mobile and fixed penetration rate in Dec. 2012
Source: Enlargement countries monitoring report 4 - Annex - February 2013 (Cullen International)



The prices of specific fixed network services provided by the operators in the region, as well as the leased line services are given in Figures 7, 8 9 and 10. The lowest monthly subscription charge is in Albania and the highest in Croatia (Figure 7) whereas the lowest local and national call tariff is in the Republic of Serbia and the highest in Turkey (Figure 8). The highest annual charges for 2km of 2Mb/s leased lines were observed in Croatia (€7 140) and the lowest in Albania (1 597€), whereas charges for 2km of 34Mb/s leased lines are the highest in Serbia (€53 452) and the lowest in Macedonia (€7 462).

The growing trend in the number of Internet users went on in 2013 when, amounting to 5,691,645 together with 3G subscribers, which is a 12.95% increase compared with

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Figure 7. Standard monthly subscription for residential users (€) (VAT included)
Source: Enlargement countries monitoring report 4 - Annex - February 2014 (Cullen International)

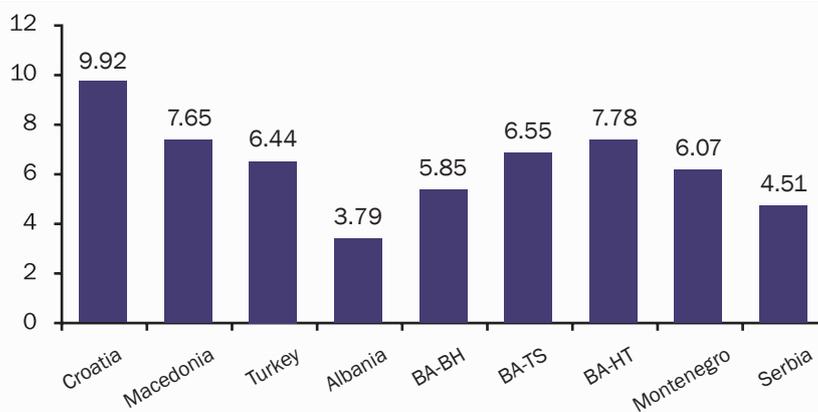


Figure 8. Price of a 10-minute local and national call (€) (VAT included)
Source: Enlargement countries monitoring report 4 - Annex - February 2014 (Cullen International)

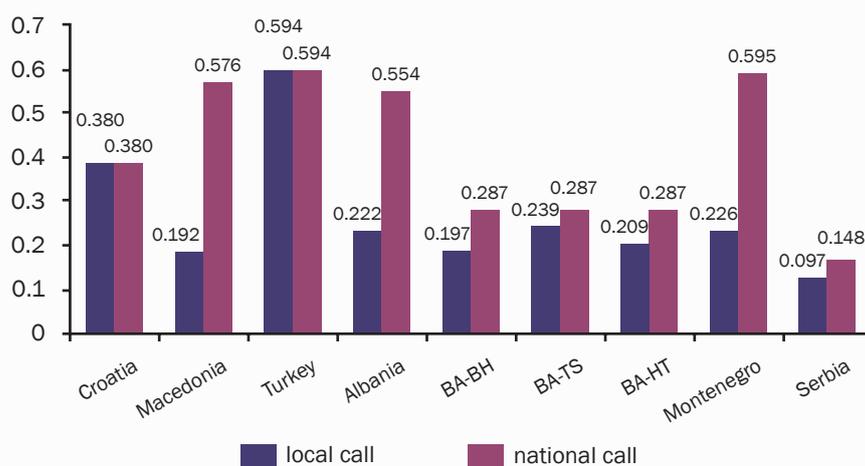


Figure 9. Annual charges for 2 Mbit/s 2 km national leased lines (€)
Source: Enlargement countries monitoring report 4 - Annex - February 2014 (Cullen International)

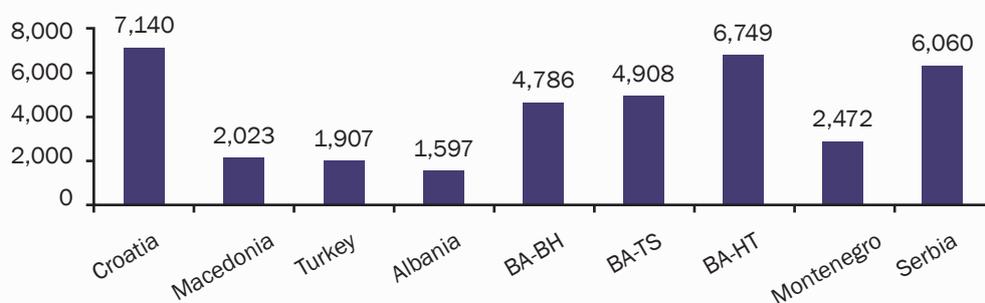
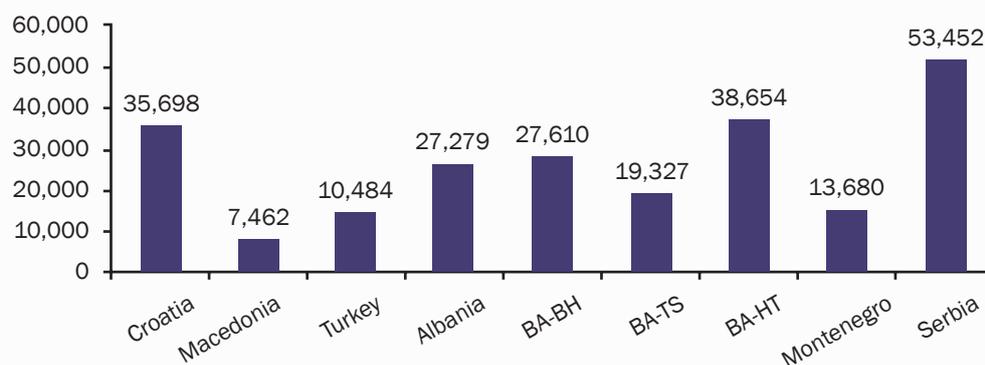


Figure 10. Annual Charges for 34 Mbit/s 2 km National Leased Lines (€)
Source: Enlargement countries monitoring report 4 - Annex - February 2014 (Cullen International)



5,038,924 users in 2012. Due to the ongoing development of the broadband Internet access, the number of broadband users continued to grow, whereas the number of dial-up users continued to drop (47.95%), which is a trend recorded in both the EU countries and countries in the region.

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Figure 11. Fixed broadband penetration rate
Source: Enlargement countries monitoring report 4 - Annex - February 2014 (Cullen International)

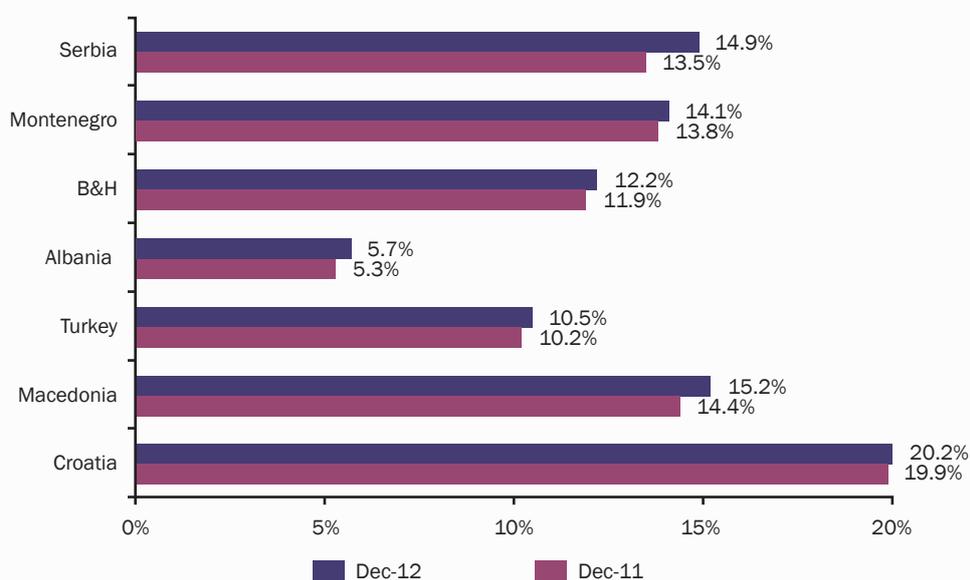
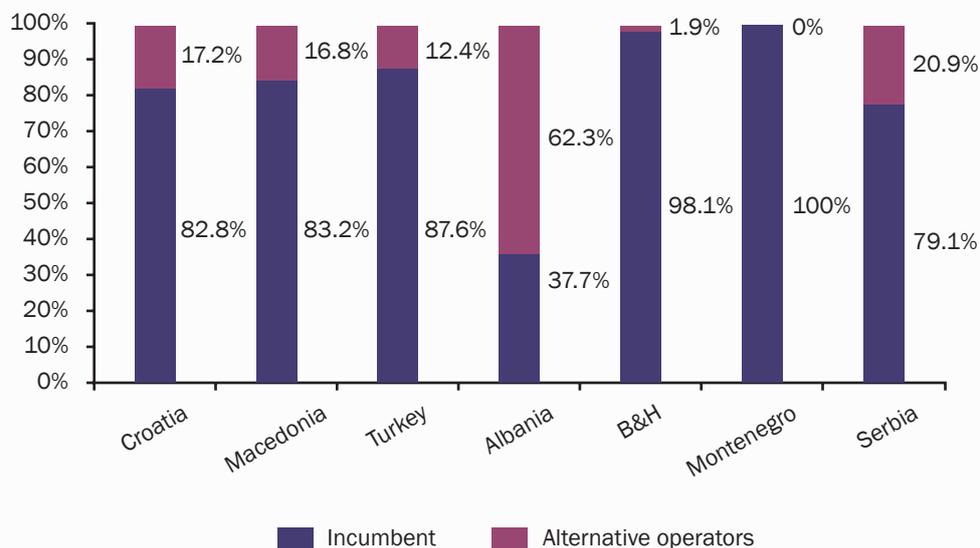


Figure 12 illustrates competition on the retail ADSL market between incumbent operators and other (alternative) operators. As clearly shown, the incumbent operator had absolute ADSL access market share (100%) only in Montenegro, followed by the incumbent operators in Bosnia and Herzegovina with 98.1% and Turkey with 87.6% of shares. The incumbent operator had the least share in Albania (37.7%).

Figure 12. Retail ADSL Copmetition

Source: Enlargement countries monitoring report 3 - Annex - April 2013 (Cullen International)



2.3 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. In comparison with the previous methodology, when data was usually obtained from the undertakings present in the ICT industry, recent approaches of data collection focus on obtaining relevant indicators on the basis of a representative sample of the telecommunications services users. The following indicators are presented according to the ITU Manual for Measuring ICT Access and Use by Households and Individuals, published in 2011, which provides a description of the core indicators and methodology for data collection and analysis. The list of the core indicators on the use of ICTs by households and individuals is given below in Table 6. The list comprises 11 out of 12 core indicators with relevant values

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for the Republic of Serbia in 2013, and an additional, reference indicator HHR1, which is a general indicator. RATEL obtained the results given in Table 6, in cooperation with the Statistical Office of the Republic of Serbia.

Table 6. ICT development indicators		Izvor: Republički zavod za statistiku Srbije	
Indicator	Definitions and notes	2013	
HH1	Proportion of households with a radio	The proportion of households with a radio is calculated by dividing the number of in-scope households with a radio by the total number of in-scope households.	
		A radio is a device capable of receiving broadcast radio signals, using popular frequencies, such as FM, AM, LW and SW. It includes a radio set integrated in a car or an alarm clock but excludes radios integrated with a mobile phone, a digital audio player (MP3 player) or in a computer.	71 %
HH2	Proportion of households with a TV	The proportion of households with a TV is calculated by dividing the number of in-scope households with a TV by the total number of in-scope households.	
		A TV (television) is a stand-alone device capable of receiving broadcast television signals, using popular access means such as over-the-air, cable and satellite. It excludes TV functionality integrated with another device, such as a computer or a mobile phone.	98.2 %
HH3	Proportion of households with telephone	The proportion of households with telephone (fixed or mobile) is calculated by dividing the number of in-scope households with a telephone (fixed or mobile) by the total number of in-scope households	
	Proportion of households with fixed telephone	The proportion of households with fixed telephone only is calculated by dividing the number of in-scope households with a fixed telephone only by the total number of in-scope households.	
		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 subscriber.	84 %

	Proportion of households with mobile cellular telephone	<p>The proportion of households with mobile cellular telephone only is calculated by dividing the number of in-scope households with a mobile cellular telephone only by the total number of in-scope households.</p> <p>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 post-paid subscriptions and pre-paid accounts are included.</p>	86.9 %
	Proportion of households with both fixed and mobile cellular telephone		
HH4	Proportion of households with a computer	<p>The <i>proportion of households with a computer</i> is calculated by dividing the number of in-scope households with a computer by the total number of in-scope households.</p> <p>A <i>computer</i> refers to a desktop or a laptop computer. It does not include equipment with some embedded computing abilities such as mobile cellular phones, personal digital assistants (PDAs) or TV sets.</p>	59.9 %
HH5	Proportion of individuals who used a computer (from any location) in the last 12 months	<p>The <i>proportion of individuals who used a computer</i> is calculated by dividing the total number of in-scope individuals who used a computer from any location in the last 12 months by the total number of in-scope individuals.</p> <p>A <i>computer</i> refers to a desktop or a laptop computer. It does not include equipment with some embedded computing abilities such as mobile cellular phones, personal digital assistants or TV sets.</p>	59.1 %
HH6	Proportion of households with Internet access at home	<p>The <i>proportion of households with Internet access</i> at home is calculated by dividing the number of in-scope households with Internet access by the total number of in-scope households.</p> <p>The <i>Internet</i> 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.</p>	55.8 %

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HH7	Proportion of individuals who used the Internet (from any location) in the last 12 months	<p>The <i>proportion of individuals who used the Internet</i> 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.</p> <p>The <i>Internet</i> 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</p>	56.2 %
HH8	Location of individual use of the Internet in the last 12 months	<p>The proportion of individuals who used the Internet at each location can be calculated as either: the proportion of in-scope individuals or the proportion of Internet users, using the Internet at each location.</p> <p>Access to the Internet is not assumed to be only via a computer – it may also be by mobile phone, PDA, games machine, digital TV etc.</p> <p>Individuals should be asked about all locations of Internet use (that is, the survey question used by countries should specify multiple responses). Note that, except for mobile access, the locations are associated with the equipment used e.g. a PC installed at work or at an Internet café.</p>	
	Home		92.5 %
	Work	Where a person's workplace is located at his/her home, then he/she would answer yes to the home category only.	31.9 %
	Place of education	For students. Teachers (and others who work at a place of education) would report 'work' as the place of Internet use.	8.4 %
	Another person's home	The home of a friend, relative or neighbour.	27.5 %
	Community Internet access facility	Internet use at community facilities such as public libraries, publicly provided Internet kiosks, non-commercial telecentres, digital community centres, post offices and other government agencies; access is typically free and is available to the general public.	11.5 %
	Commercial Internet access facility	Internet use at publicly available commercial facilities such as Internet or cyber cafés, hotels, airports etc, where access is typically paid (i.e. not free of charge).	10.9 %
	Any place via a mobile cellular telephone	Use of the Internet at any location via a mobile cellular telephone (including handheld devices with mobile phone functionality).	Not covered by the survey

	Any place via other mobile/wireless access devices	Use of the Internet at any location via other mobile access devices, e.g. a laptop computer or handheld device that uses wireless access (at a WiFi 'hotspot') or a laptop computer connected to a mobile telecommunications network.	Not covered by the survey
HH9	Internet activities undertaken by individuals in the last 12 months	The proportion of individuals who undertook each activity can be calculated as either: the proportion of in-scope individuals or the proportion of Internet users who undertook each activity.	
	Getting information about goods or services		60.8 %
	Getting information related to health or health services	Includes information on injury, disease, nutrition and improving health generally.	62.4 %
	Getting information from general government organizations	<i>General government organizations</i> 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.	92.6 %
	Interacting with general government organizations	Includes downloading/requesting forms, completing/lodging forms on line, making on-line payments and purchasing from government organizations. It excludes getting information from government organizations. <i>General government organizations</i> 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.	57.7 %
	Sending or receiving e-mail		70.4 %
	Telephoning over the Internet/VoIP	The use of Skype, iTalk, etc. Includes video calls (via webcam).	53.2 %
	Posting information or instant messaging	Posting messages or other information to chat sites, blogs, newsgroups, on-line discussion forums and similar; use of instant messaging.	68 %

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	Purchasing or ordering goods or services	Refers to purchase orders placed via the Internet whether or not payment was made on line. Orders that were cancelled or not completed are excluded. Includes purchasing of products such as music, travel and accommodation via the Internet.	Not covered by the survey
	Internet banking	Includes electronic transactions with a bank for payment, transfers, etc. or for looking up account information. Excludes electronic transactions via the Internet for other types of financial services such as share purchases, financial services and insurance.	9.3 %
	Education or learning activities	Refers to formal learning activities such as study associated with school or tertiary education courses as well as distance education involving on-line activities. (A more narrow interpretation is likely to be less meaningful as it could include a range of activities such as using the Internet to search for information.)	66.5 %
	Playing or downloading video games of computer games	Includes file sharing games and playing games on line, either paid or free of charge.	Not covered by the survey
	Downloading movies, images, music, watching TV or video, or listening to radio or music	Includes file sharing and using web radio or web television, either paid or free of charge.	Not covered by the survey
	Downloading software	Includes the downloading of patches and upgrades, either paid or free of charge.	27.9%
	Reading or downloading on-line newspapers or magazines, electronic books	Includes accessing news websites, either paid or free of charge. Includes subscriptions to on-line news services.	69.5 %
HH10	Proportion of individuals who use a mobile cellular telephone	<p>The <i>proportion of individuals with use of a mobile cellular telephone</i> is calculated by dividing the total number of in-scope individuals with use of a mobile cellular telephone by the total number of in scope individuals.</p> <p>A <i>mobile cellular telephone</i> 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 post-paid subscriptions and pre-paid accounts are included.</p> <p><i>Use of a mobile cellular telephone</i> does not mean that the telephone is owned or paid for by the person but should be reasonably available through work, a friend or family member, etc. It excludes occasional use, for instance, borrowing a mobile phone to make a call.</p>	87 %

HH11	Proportion of households with access to the Internet by type of access (narrowband, broadband (fixed, mobile))	<p>This indicator should be calculated as the proportion of in-scope households with Internet access that use each type of access service, for instance, the proportion of households with Internet access that use a broadband service as their means of access.</p> <p>It is expected that countries will collect data at a finer level than shown here.</p> <p>The categories chosen by countries should allow aggregation to total narrowband and total broadband, as well as to fixed and mobile broadband, as defined below.</p> <p>As households can use more than one type of access service, multiple responses are possible.</p>	
	<i>Narrowband</i>	<p><i>Narrowband includes analogue modem (dial-up via standard phone line), ISDN (Integrated Services Digital Network), DSL at speeds below 256 kbit/s, and mobile phone and other forms of access with an advertised download speed of less than 256 kbit/s.</i></p> <p>Note that narrowband mobile phone access services include CDMA 1x (Release 0), GPRS, WAP and i-mode.</p>	1 %
	<i>Fixed broadband</i>	<p><i>Fixed broadband refers to technologies at speeds of at least 256 kbit/s, in one or both directions, such as DSL (Digital Subscriber Line), cable modem, high-speed leased lines, fibre-to-the-home, powerline, satellite, fixed wireless, Wireless Local Area Network and WiMAX.</i></p>	83.2 %
	<i>Mobile broadband</i>	<p><i>Mobile broadband refers to technologies at speeds of at least 256 kbit/s in one or both directions, such as Wideband CDMA (W-CDMA), known as Universal Mobile Telecommunications System (UMTS) in Europe; Highspeed Downlink Packet Access (HSDPA), complemented by High-Speed Uplink Packet Access (HSUPA); CDMA2000 1xEV-DO and CDMA 2000 1xEV-DV. Access can be via any device (handheld computer, laptop or mobile cellular telephone etc.).</i></p>	n/a
HH12	Frequency of individual use of the Internet in the last 12 months (from any location)	<p>The frequency of individual use of the Internet can be calculated as either: the proportion of in-scope individuals or the proportion of Internet users, using the Internet with each frequency.</p> <p>It is recommended that countries collect this information in respect of a typical period; therefore, respondents should ignore weekends (if they only use the Internet at work) and breaks from their usual routine, such as holidays.</p> <p>Access to the Internet is not assumed to be only via a computer – it may also be by mobile phone, PDA, games machine, digital TV etc.</p>	

<i>At least once a day</i>	Once a working day for respondents who only (or most frequently) use the Internet from work	82 %
<i>At least once a week but not every day</i>		11.8 %
<i>Less than once a week</i>		6.2 %

Reference indicator

HHR1	Proportion of households with electricity	Electricity is not an ICT commodity, but is an important prerequisite for using many ICTs. It is therefore included in the core list as a reference indicator.	
		Electricity access may be enabled by a grid/mains connection, or by power generated locally (including at the dwelling). Local power includes electricity generated by a fuel-powered generator, or from renewable resources such as wind, water or solar. It excludes sole use of energy storage devices, such as batteries (though these may be used to store electricity from other sources).	99.9 %

In 2007, the International Telecommunication Union (ITU) initiated the process of creating a single Index which can be utilized in measuring the development of information society, the so-called ICT Development Index (IDI), which serves as a substitute for the previous two, namely the Digital Opportunity Index (DOI) and the ICT Opportunity Index (ICT-OI). This single IDI Index serves as a benchmarking tool for measuring:

- the development of the ICT market in UN Member States
- digital divide between the developed and developing countries
- developmental potential of the ICT market

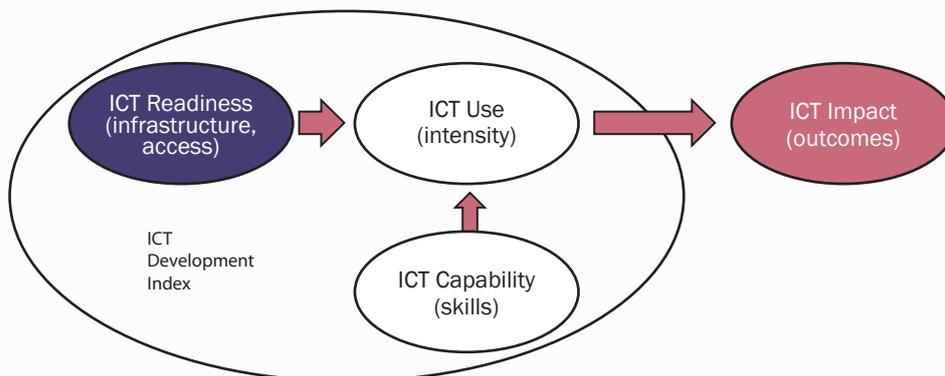
This Index combines 11 indicators divided into three sub-groups:

- 1 ICT Readiness (infrastructure and access)
- 2 ICT use (primarily by individuals, but also households and undertakings) and the intensity of use
- 3 ICT Capability (skills necessary for the effective use of ICTs)

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 13).

Figure 13. IDI structure

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



The list of 11 indicators is given in Table 7, along with reference (normalized) values prescribed by the ITU, sub-indices value and IDI Index value for the Republic of Serbia in 2013. 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 per cent weight each, whereas the skill sub-index is given 20 per cent weight.

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Table 7. 2013 IDI for the Republic of Serbia		Source:RATEL	
Indicator		ITU ideal value	Value for Serbia in 2013
ICT Access			
a	Fixed telephone lines per 100 inhabitants	60	42.21*
b	Mobile cellular telephone subscriptions per 100 inhabitants	170	128.09
c	International Internet bandwidth per Internet user	280,377	134.192
d	Proportion of households with a computer	100	59.90
e	Proportion of households with Internet access at home	100	55.8
ICT Use			
f	Internet users per 100 inhabitants	100	44.83
g	Fixed broadband Internet subscriptions per 100 inhabitants	60	15.23
h	Mobile broadband subscriptions per 100 inhabitants	100	59.78
ICT Skills			
i	Adult literacy rate	100	98
j	Secondary gross enrolment ratio	100	85.5
k	Tertiary gross enrolment ratio	100	45.9
ICT Access – Normalized values		Formula	
z1	Fixed telephone lines per 100 inhabitants	$a/60$	0.70
z2	Mobile cellular telephone subscriptions per 100 inhabitants	$b/170$	0.75
z3	International Internet bandwidth per Internet user	$\log(c)/5.45$	0.89
z4	Proportion of households with a computer	$d/100$	0.60
z5	Proportion of households with Internet access at home	$e/100$	0.56

* the number includes VoIP subscribers, pursuant to ITU methodology

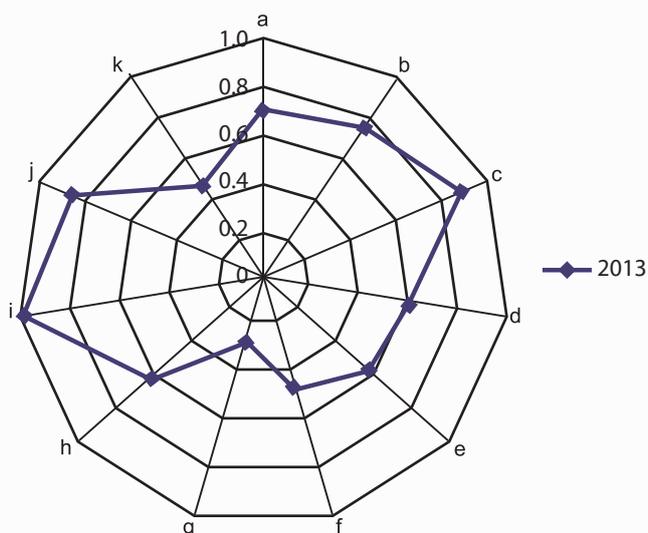
ICT Use – Normalized values		Formula	
z6	Internet users per 100 inhabitants	$f/100$	0.45
z7	Fixed broadband Internet subscriptions per 100 inhabitants	$g/60$	0.25
z8	Mobile broadband subscriptions per 100 inhabitants	$h/100$	0.60
ICT Skills – Normalized values		Formula	
z9	Adult literacy rate	$i/100$	0.98
z10	Secondary gross enrolment ratio	$j/100$	0.855
z11	Tertiary gross enrolment ratio	$k/100$	0.459
L	ICT Access – Sub-index	$y1+y2+y3+y4+y5$	0.700
y1	Fixed telephone lines per 100 inhabitants	$z1*0.2$	0.14
y2	Mobile cellular telephone subscriptions per 100 inhabitants	$z2*0.2$	0.15
y3	International Internet bandwidth per Internet user	$z3*0.2$	0.18
y4	Proportion of households with a computer	$z4*0.2$	0.12
y5	Proportion of households with Internet access at home	$z5*0.2$	0.11
M	ICT Use – Sub-index	$y6+y7+y8$	0.429
y6	Internet users per 100 inhabitants	$z6*0.33$	0.15
y7	Fixed broadband Internet subscriptions per 100 inhabitants	$z7*0.33$	0.08
y8	Mobile broadband subscriptions per 100 inhabitants	$z8*0.33$	0.20
N	ICT Skills – Sub-index	$y9+y10+y11$	0.757
y9	Adult literacy rate	$z9*0.33$	0.32
y10	Secondary gross enrolment ratio	$z10*0.33$	0.28
y11	Tertiary gross enrolment ratio	$z11*0.33$	0.15
IDI	ICT DEVELOPMENT INDEX	$((L*0.4)+(M*0.4)+(N*0.2))*10$	6.03

2. ELECTRONIC COMMUNICATIONS MARKET ANALYSIS

The value of IDI Index for the Republic of Serbia in 2013 amounted to 6.03, which is a significant growth compared with 4.23 in 2008 and 4.80 in 2009, 5.10 in 2010, 5.47 in 2011 and 5.62, in 2012. Considering the ITU data for the previous years, it may be anticipated that Serbia will secure a place among the first 50 countries on the list based on the IDI Index value.

Figure 14 illustrates normalized values of 11 indicators with values ranging from 0 to 1, whereby 1 represents the maximum value of an indicator. The fact that ICT access indicators (a to e) have significantly higher values than ICT use indicators (f to h) is quite apparent and serves as an illustration of the disparity between the existing telecommunications infrastructure capacity and the use of such capacity in terms of telecommunications services transmitted by such infrastructure in Serbia, as is the case with the use of broadband Internet services. The value of ICT skills indicators (i to k) is satisfactory.

Figure 14. Graphical Representation of 11 Indicators (normalized values) Source: RATEL



3. PUBLIC FIXED TELECOMMUNICATIONS NETWORKS AND SERVICES

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In 2013 the following operators were holders of the licence for public fixed telecommunications network and services:

- Telecommunications Company "Telekom Srbija" Joint Stock. Co. (Telekom Srbija) – licence to build, own and operate a public fixed telecommunications network and provide public fixed telecommunications network services provision – licence replaced in 2006;
- Telecommunications Company "Telekom Srbija" Joint Stock. Co. – 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 – Licence issued in 2009;
- Media Works, Ltd. which changed the name in Orion telekom, Ltd. - 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 – licence issued in 2009;
- Telenor, Ltd. – licence for public fixed telecommunications network and services. The operator was awarded the licence in January 2010.

Pursuant to Art. 149 of the Law, as of 1 January 2012, the provision of public fixed telecommunications network and services is under the general authorization regime.

In 2013, the following operators of public telephone service via fixed network were registered with RATEL:

- Serbia Broadband - Srpske kablovske mreže d.o.o. (SBB Ltd.) – registered under number 12,

- **Interaktivne kablovske objedinjene mreže - I.Kom Ltd. – registered under number 34,**
- **DOO Knight Development Support – registered under number 80,**
- **Invest-Inženjering Ltd. – registered under number 88,**
- **Beogrid Ltd. – registered under number 162 and**
- **JET TV Ltd. – registered under number 209.**

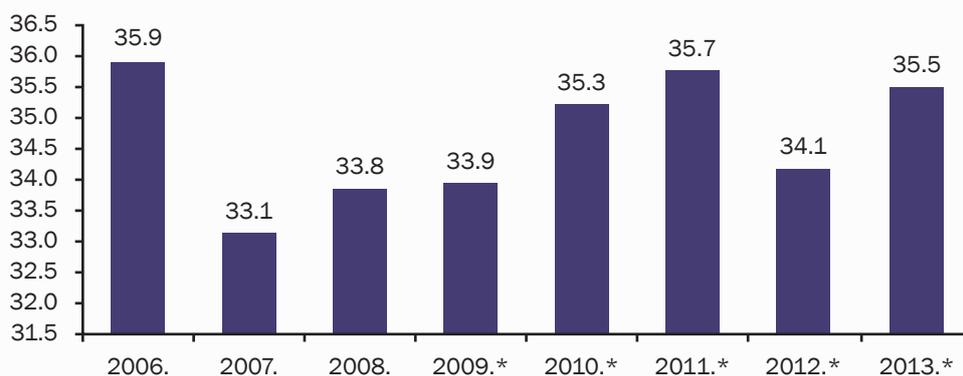
The introduction of the number portability on the fixed networks was a final step in the full market liberalization in the Republic of Serbia. The preparatory activities had been carried out during 2013 and the number portability on fixed networks has been available since 1 April 2014. In 2013, Telekom Srbija was the biggest active operator of the fixed telecommunications network, its business activities being the most important segment of the fixed telephony market, both in financial and technical terms. In addition to the Serbian market, Telekom Srbija is also present in Republic of Srpska and Montenegro. Since Telekom Serbia remained an SMP operator in 2013, the decisions stipulating the conditions for service provisions adopted in late 2011 remained in force. Telekom Srbija provided services over public fixed telecommunications network and public fixed wireless (FWA) telecommunications network and the operator Orion telekom provided the services over FWA network. At the end of 2013, in the operators' register kept by RATEL the number of public fixed wireless network stations was the same as in the previous year: 283 (99 Orion telekom and 184 Telekom Srbija). Telenor provided the services over its own public fixed telecommunications network. SBB had begun with the public telephone service provision in 2012 and in 2013 it increased the number of users of the public telephone service provided over its own public fixed telecommunications network. Operators DOO Knight Development Support and JET TV d.o.o. began with service provision, however, considering the small number of users, the data provided by these operators do not have a significant impact on the market of fixed network and services in 2013 and will not be further analysed in this Overview. It is expected that other operators registered for public telephone service provision will begin with service provision in 2014.

The total revenue from fixed telephone services provided by all operators (Telekom Srbija, Orion telekom, Telenor and SBB) in the territory of the Republic of Serbia in 2013 amounted to 35.5 billion dinars. The revenues from the international traffic in 2013 amounted to 2.2 billion

dinars, making the total revenue 37.7 billion dinars, which is 2.7 billion or 6.6% less compared with the previous year. A downtrend in the revenues from international traffic continued.

The investments made in the fixed telephony in 2013 amounted to 7.1 billion dinars, which is a 20% increase compared with the previous year.

Figure 15. Growth tendency of revenues from fixed telephone services (in billions of RSD)
Source: RATEL



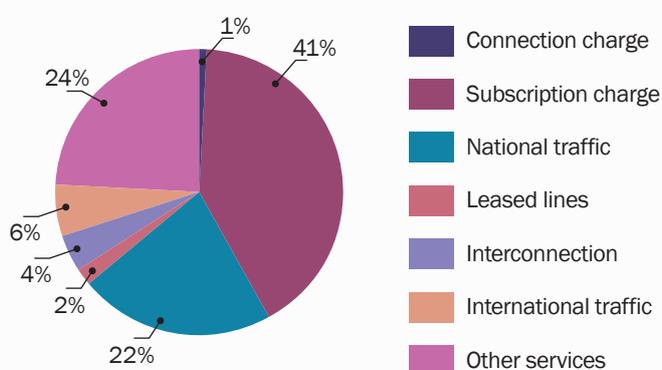
* Revenues from wholesale Internet services are illustrated within the chapter titled Internet Services and are therefore excluded from revenues from fixed telephone services

The largest share in the total revenues goes to the subscription charges, amounting to around 15.5 billion dinars and accounting for 41% of total revenues from the fixed telephone services, a share that is higher compared to the 39% in 2012. The share of the national traffic decreased to 22%, whereas the revenues from the international traffic experienced the biggest drop, from 16% to 6%.

The revenues from the subscription charges remained virtually unchanged, however their share in the total revenue increased to 2% due to an overall reduction in the revenues. The revenues from the connection charges and interconnection in the national traffic also remained unchanged. There was a significant decrease in the revenues from the leased lines from 7% to 2%. Also, the

Figure 16. Distribution of revenues from fixed telephone services in 2013

Source: RATEL

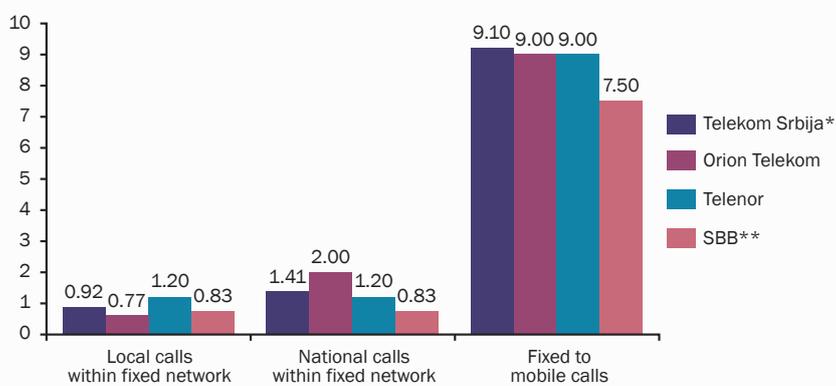


revenues from the national traffic dropped by 36%, whereas its share in the total revenues decreased from 33% to 22%. There was a significant drop in the revenues made from the international traffic, partly because the revenues from termination and transit are shown under other services.

Per-minute rates (VAT excluded) of each operator for local and national calls, and for calls to mobile networks, are given in Figure 17. Telekom Srbija's per minute call tariffs remained unchanged: local 0.92 and, national 1.41 dinars. The above rates apply to peak traffic, whereas off-peak traffic rates are 50% lower. The charges for calls made to mobile network. The prices of international calls remained unchanged for peak traffic (RSD9.1), whereas for off-peak traffic they are 33% lower. Per-minute local call charge was again among the lowest in Europe. Orion telekom's call charges remained unchanged, for local, national and calls made to mobile networks. Telenor raised the per-minute charges for calls to fixed network from 0.9 to 1.2 dinars, whereas there is a single rate for calls to all mobile networks now, since the per-minute rates for calls made to other mobile networks were raised from 6 to 9 dinars and the rates for calls made to Telenor's mobile network from 5 to 9 dinars. SBB offered calls within the same network free of charge, whereas the calls made to other fixed networks are charged 0.83 dinars per minute, and calls made to mobile networks 7.5 dinars per minute.

Figure 17. Prices of local, national and fixed-to-mobile telephone services, VAT excluded (RSD/min) in 2013

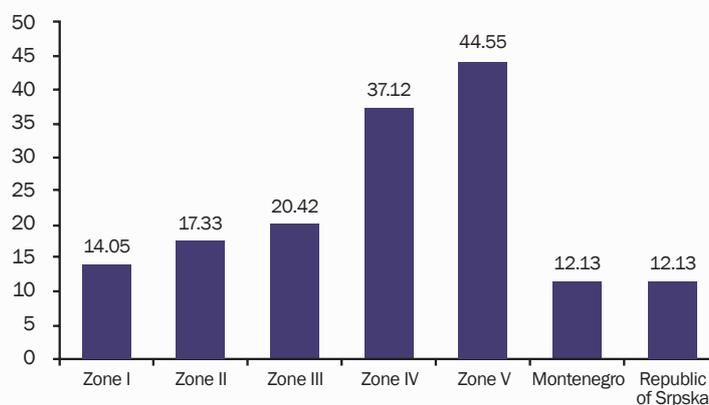
Figure 17. Prices of local, national and fixed-to-mobile telephone services, VAT excluded (RSD/min) in 2013
Source: RATEL



* Telekom Srbija's rates apply to peak traffic, whereas off-peak traffic rates are 50% lower within fixed network and 33.33% lower for calls made to mobile networks.
** Local calls within home network are not charged.

Telekom Srbija's international call charges remained unchanged and are shown in Figure 18.

Figure 18. Prices of international telephone services in 2013*, VAT Excluded (RSD/min)
Source: RATEL

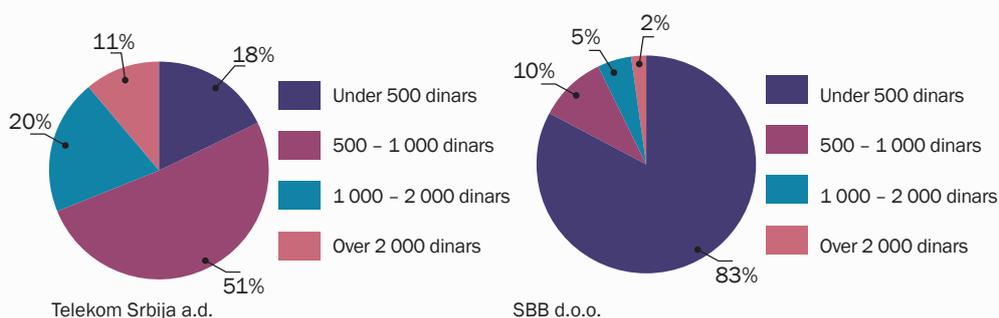


* Prices of international telephone services of other operators are available on their official websites: www.sbb.co.rs, www.telenor.rs i www.oriontelekom.rs

Telekom Srbija's connection charge remained unchanged, in the amount of 5 000 dinars for residential and 10 000 dinars for business users, excluding VAT and the CDMA connection charge was 12 000 dinars. As for Orion telekom, the connection charge range was between 416.67 and 4,165.83 for residential users and remained 8,333.33 dinars for business users, excluding VAT. In 2011 Telenor reported the charge for residential users of 50 847 dinars, without VAT, whereas in 2012 there was no connection charge. SBB had a single price for both legal and natural entities and the connection charge was 3 325 dinars, excluding VAT, the same as in the previous year.

The highest number of Telekom Srbija's residential users (around 51%) had monthly bills for fixed-line services ranging between 500 and 1,000 dinars, whereas the number of residential users paying less than 500 dinars makes 18% of the total number of subscribers. This means that the number of users with 500-1,000 dinars bill range increased significantly, whereas the number of users with bills under 500 dinars decreased. There were 20% of residential users with monthly bills ranging between 1000 and 2000 dinars and 11% (cfr. 6% in 2012) with bills over 2000 dinars (Figure 19).

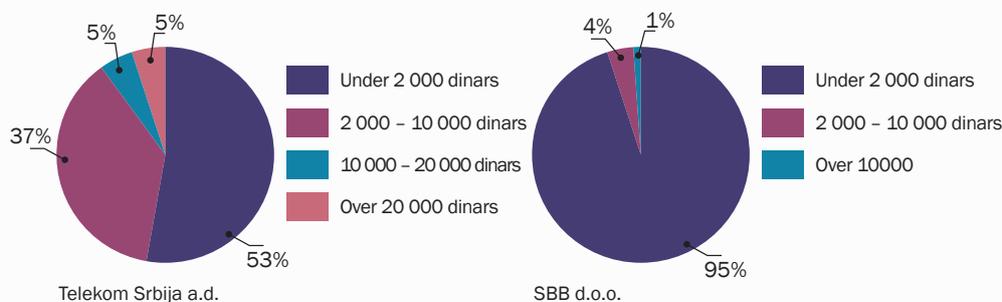
Figure 19. Distribution of residential subscribers according to monthly bills in 2013 Source: RATEL



SBB too had the highest number of users (83%) with bills under 500 dinars, around 10% had bills ranging from 500 to 1000 dinars, 5% had bills from 1000 to 2000 dinars and 2% had monthly bills of over 2.000 dinars. Such distribution of subscribers is probably a result of the operator's tariff policy, however an increased number of users will provide a real picture of the SBB users structure, in terms of monthly bills.

Business user of Telekom Srbija with monthly bills under 2 000 dinars for fixed-line services decreased significantly to 53%. The other business users with bills in the 2000-10000 dinars range increased accounting for 37%, while the percentage of users with bills between 10000 and 20000 dinars was 5%, the same as the share of those with bills of over 20000 dinars (Figure 20). SBB has a significantly smaller number of users and 95% of them have bills below 2000 dinars. The number of users of other operators does not affect the distribution of business subscribers.

Figure 20. Distribution of business subscribers according to monthly bills in 2013 Source: RATEL

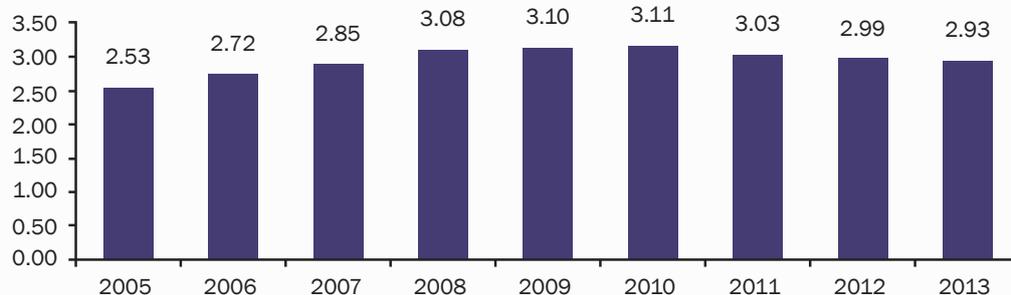


The average monthly bill of Telekom Srbija's residential users in 2013 was 698 dinars, whereas business users were paying 3789 dinars on average. Average bills of Telekom Srbija's CDMA network users were 607 dinars (excl. VAT) for residential users and 1185 dinars (excl. VAT) for business users. The average monthly bill of SBB's residential users was 732 dinars and of business users 1831 dinars. The average Telenor's bill for business users was 34296 dinars (excl VAT).

3. PUBLIC FIXED TELECOMMUNICATIONS NETWORKS AND SERVICES

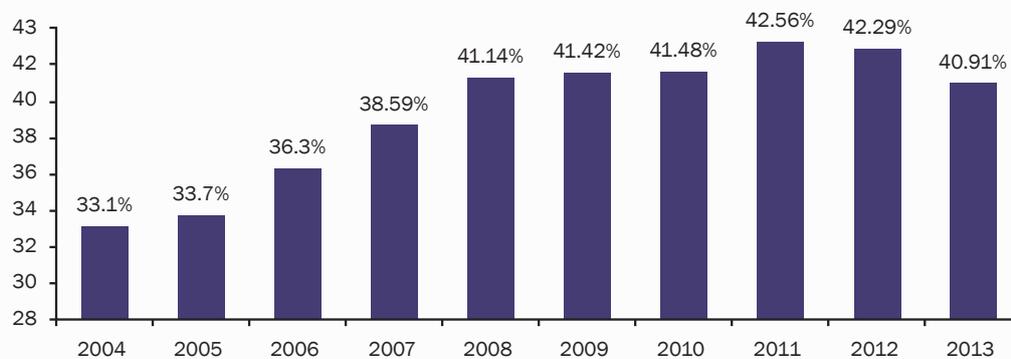


Figure 21. Number of main lines in fixed network (millions) Source: RATEL



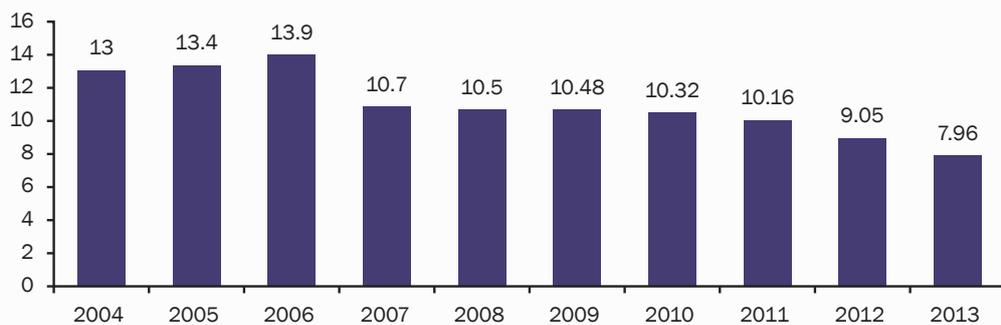
Fixed-line penetration rate was 40.91%.

Figure 22. Fixed-line penetration rate Source: RATEL



In 2013 the number of public pay-phones dropped by 1089, amounting to 7962.

Figure 23. Number of public payphones (thousands) Source: RATEL



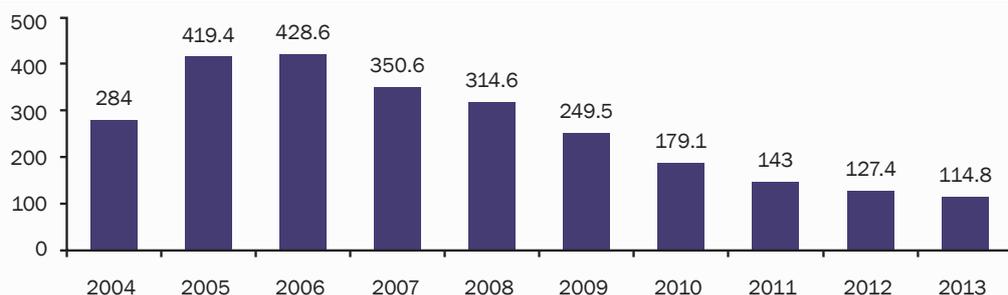
The number of main lines decreased compared with 2012, amounting to 2.93 million. Residential users still prevail with a 90% share in the total number of users, whereas the number of party-lines was reduced by 19%. The digitalization rate rose to 99.69% in 2013.

The number of ISDN subscribers in 2013 was 71 thousand. Around 95% of ISDN subscribers have a basic rate access, whereas other users have primary rate access. ISDN connections are following a downtrend, as is reflected by the drop in the number of ISDN users.

In 2013, the number of unmet requests for new fixed-line connections was 114 thousand, this being a 10% decrease compared with 2012. The number of malfunctions per 100 lines in 2013 was 13, compared with 15 recorded in 2012. The percentage of malfunctions repaired within 24 hours was 58%, which is a decrease in respect to 60% in the previous year. Since other operators have a considerably smaller number of users, their data is incomparable with the data received from Telekom Srbija. The number of unmet requests for new connections is expected to keep on reducing, due to the Telekom Srbija's network development, new operators in the market and smaller interest for fixed-line network in general.

Figure 24. Number of requests for new fixed-line connections (thousands)

Source: RATEL

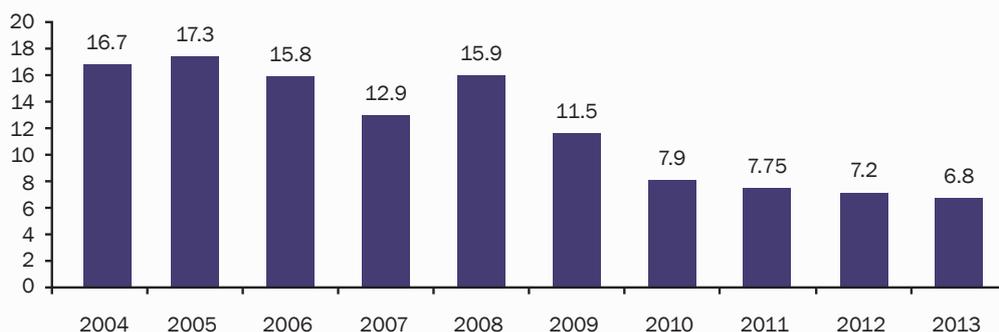




The total fixed network traffic in 2013 was estimated to 6.8 billion minutes of national traffic and 700 million minutes of international traffic, which is an overall decrease of 7% compared with 2012. As shown in Figure 25, the traffic volume varied considerably in the observed period, following a downtrend, primarily due to other types of services being offered, such as mobile network, electronic messaging or VoIP, etc.

Figure 25. Total fixed network traffic (in billions of minutes)

Source: RATEL



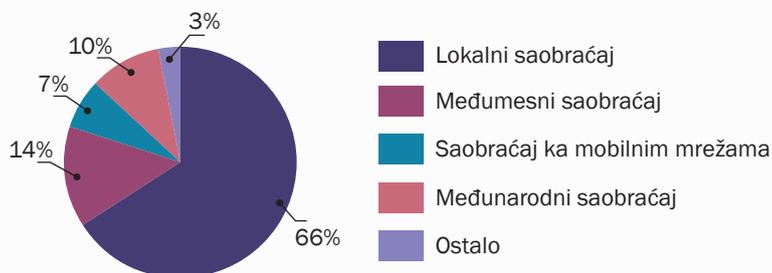
The average call duration of 3.014 minutes.

The total number of minutes of fixed network traffic is estimated on the basis of data from the exchanges where it is possible to register the consumed call-units or minutes. Such data are extrapolated according to the total number of users in the network. Out of the total fixed network traffic, 73% was local traffic, which is almost identical to the data from the previous years.

Compared with the previous year, the share of local traffic remained 66% and the share of long-distance traffic 14%. The share of fixed-to-mobile traffic was reduced from 10% to 7% and the share of the international traffic in the total traffic was once more 10%.

Figure 26. Distribution of fixed network traffic in 2013

Source: RATEL



The total number of VoIP operators at the end of 2013 was approximately 94000 which is a 42% increase compared to the previous year. There were 23.5 million of minutes of traffic, which is 10.5 million more compared with the previous year or an 80% increase. There were 6.6 million minutes of the international transit which is a 20% increase.

4. PUBLIC MOBILE TELECOMMUNICATIONS NETWORKS AND SERVICES

There were three mobile operators in 2013 in the mobile market in the Republic of Serbia:

- **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 predecessor¹ (licence replaced, valid as of 15. 08. 2006)
- **Telenor Ltd., Belgrade**, 100% owned by Telenor A/S, Denmark, (licence issued on 31. 08. 2006)
- **Vip mobile Ltd.**, 100% in the ownership of Mobilkom CEE Beteiligungsverwaltung GmbH, Austria (licence issued on 01. 12. 2006)

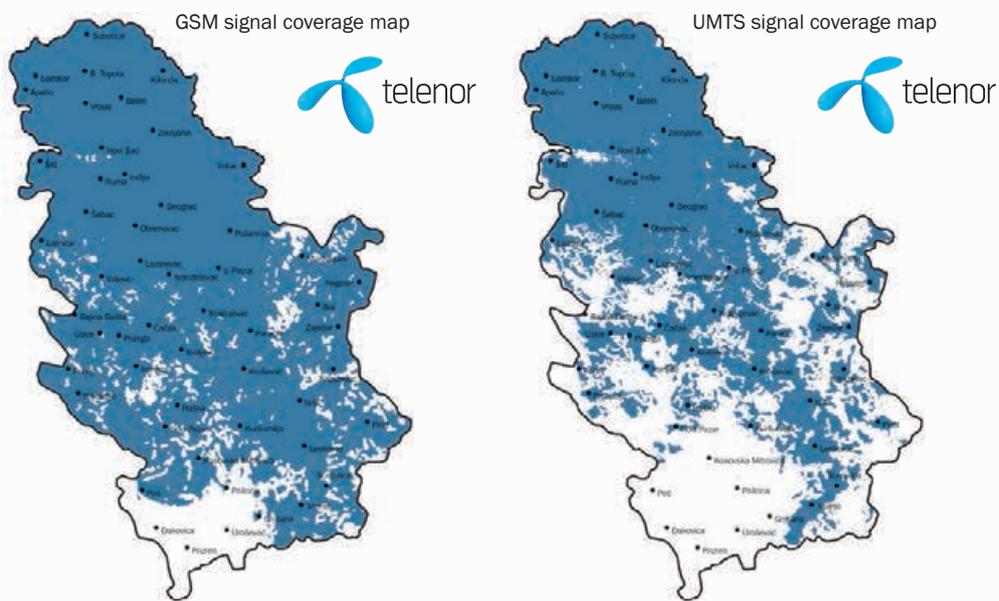
All three operators were granted licences for public mobile telecommunications networks and public mobile telecommunications network services in accordance with GSM/GSM1800 and UMTS/IMT-2000 standards, issued by RATEL. The licences were issued for the territory of the Republic of Serbia, for a period of 10 years, which, upon expiration, may be extended for another 10 years without a special request from the operator, provided the requirements under the licence are fulfilled.

The Norwegian company Telenor has been present in the Serbian telecom market since 31 July 2006, when they bought the company Mobi63, through a bidding procedure. Telenor Ltd. is a part of Telenor Group, present in 13 countries across Europe and Asia and another 17 countries through ownership in VimpelCom. The mobile operators from Telenor Group present in the neighbouring countries are Telenor Hungary (ex Panon), Telenor Montenegro (ex Promonte) and Globul Bulgaria.

¹ Source: www.telekom.rs

Figure 27. Mobile operator – Telenor

Source: Telenor d.o.o.



Official data

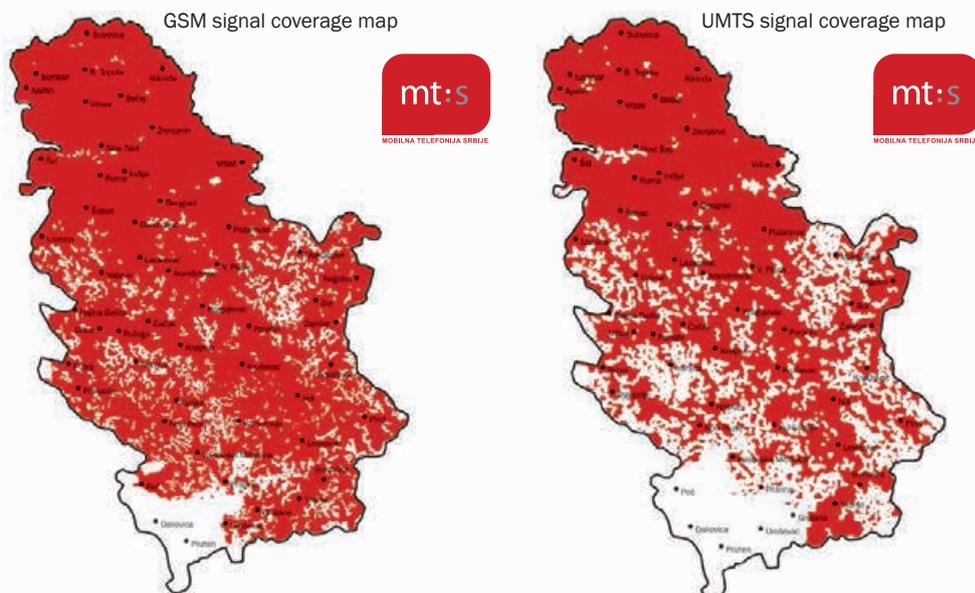
Name	Telenor Ltd.
Head office	Belgrade
Ownership	100% Telenor A/S, Denmark
Percentage of territory covered by GSM network signal	90.73%
Percentage of population covered by GSM network signal	99.15%
Percentage of territory covered by UMTS network signal	62.24%
Percentage of population covered by UMTS network signal	82.45%
Number of base stations	3,048

4. PUBLIC MOBILE TELECOMMUNICATIONS NETWORKS AND SERVICES



In 2007 Telenor began with the commercial use of the UMTS network, enabling video calls and additional services based on high-speed data transmission. In 2013, Telenor built 372 new base stations.

Figure 28. Mobile operator – Telekom Srbija, Joint Stock Co. Source: Telekom Srbija



Official Data

Name	Telecommunications company “Telekom Srbija“ Joint Stock Co.
Head office	Belgrade
Ownership	58.11% the Republic of Serbia – the Government of 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	89.7%
Percentage of population covered by GSM network signal	99.71%
Percentage of territory covered by UMTS network signal	81.09%
Percentage of population covered by UMTS network signal	95.85%
Number of base stations	3,787

MTS - Mobilna telefonija Srbije, as a branch of the Telecommunications Company Telekom Srbija Joint Stock Co., was founded in June 1997 and it began to operate through a GSM standard based network in August 1998. In addition to Serbian market, Telekom Srbija is also present as a mobile operator through daughter companies in Republic of Srpska and Montenegro.

In December 2006, MTS began with the commercial operation of a 3G network with the latest HSDPA technology. During 2008, the operation of the 3G network was intensified.

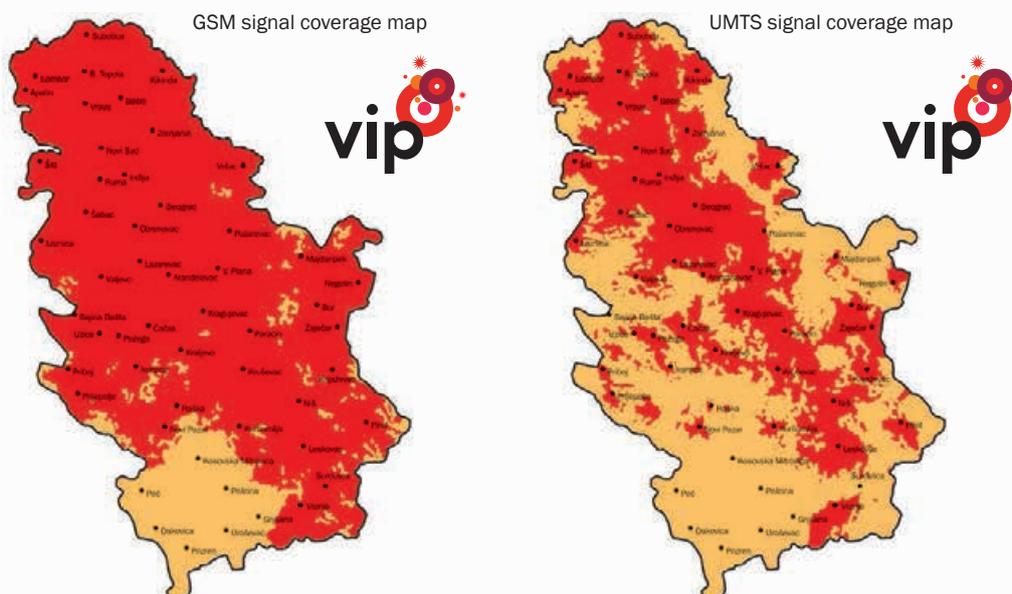
In 2013, Telekom Srbija built 373 new base stations.

Vip mobile Ltd., the holder of the third mobile network licence, is a member of the Mobilkom Austria Group/Telekom Austria Group, present in eight European countries, including the following countries in the region: Croatia, Bulgaria and Macedonia.

In addition to 320 million and 1 euros paid for the licence, Mobilkom Austria made considerable investments in the development of infrastructure and hired a great number of professionals. In 2013, Vip mobile Ltd. built 227 new base stations.

Figure 29. Mobile operator – Vip mobile

Source: Vip mobile

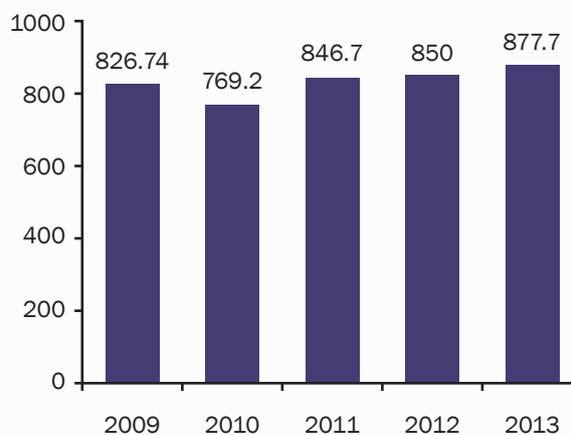


Official data	
Name	Vip mobile Ltd.
Head office	Belgrade
Ownership	100% Mobilkom CEE Beteiligungsverwaltungs GmbH Austria
Percentage of territory covered by GSM network signal	83.8%
Percentage of population covered by GSM network signal	98.5%
Percentage of territory covered by UMTS network signal	33%
Percentage of population covered by UMTS network signal	72.5%
Number of base stations	2,539

The revenues from mobile networks in 2013 were 99.3 billion dinars or 877.7 million euros. In the national currency (RSD), the revenues were increased by 3.44% in respect to the previous year when the total revenues from mobile telephony service amounted to 96 billion dinars, whereas the revenues observed in euros showed a 3.26% growth. The difference in the revenues in the two currencies is a consequence of the decrease in the average exchange rates for euro in 2013, compared with the previous year. The total investments in the mobile market were slightly lower in respect to the previous year amounting to 12.63 billion dinars.

Figure 30. Total revenues from mobile telephony (million euros)

Source: RATEL



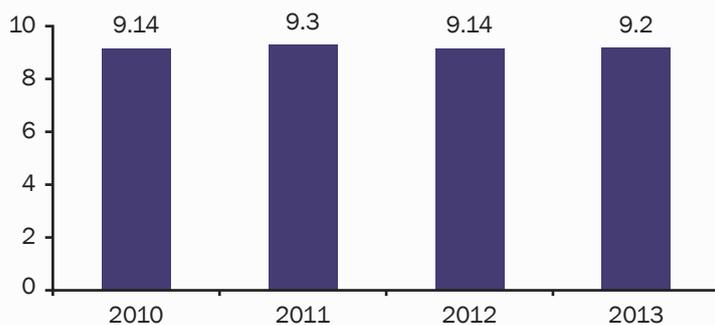
The total number of mobile users increased, amounting to 9,198,717, at the end of 2013. The number of users includes postpaid and prepaid users active in the last 3 months in 2013 (pursuant to the ITU definitions).

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**9.2
million
users**

Figure 31. Total number of active mobile users (millions)

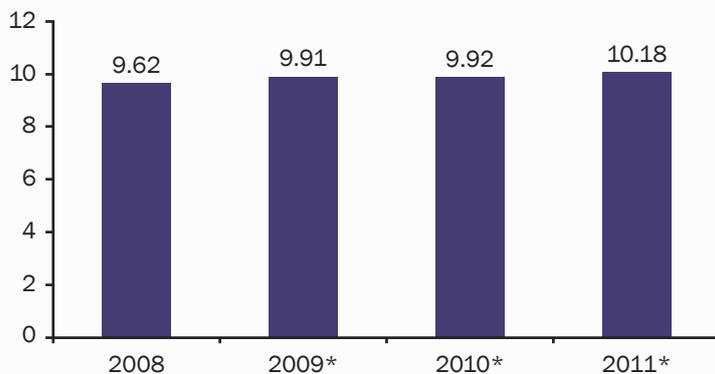


* total number of prepaid and postpaid users active in the last 3 months of 2013

Total number of mobile users is given in Figure 32.

Figure 32. Total number of mobile users (millions)

Source: RATEL



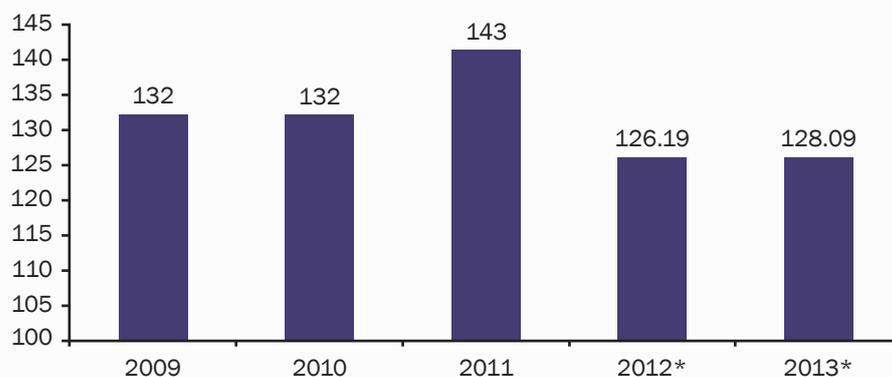
* total number of prepaid users is indicated for Telekom Srbija



The number of mobile users was again higher than the number of inhabitants with 128.09% penetration rate.

Figure 33. Mobile penetration rate

Source: RATEL

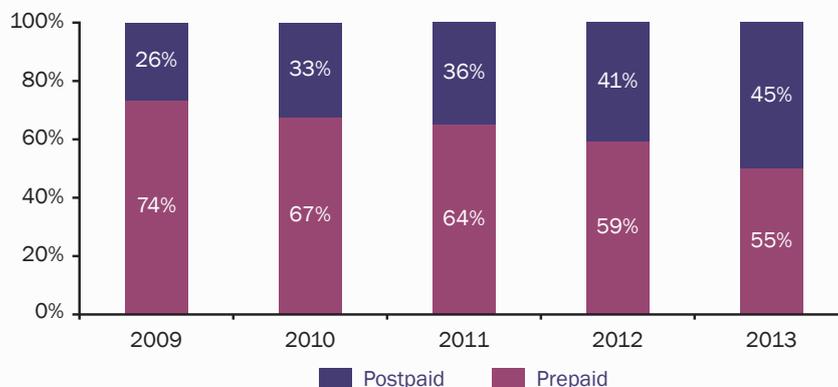


* prepaid and postpaid users active in the last 3 months of 2013 for all three operators

If we observe the prepaid/postpaid users ratio, the advantage goes to the prepaid users, yet the share of the postpaid users is growing year after year, amounting to 45% in 2013 (Figure 34). Since 2010, the calculation includes only those prepaid users active in the last 90 days, pursuant to the revised ITU indicators definitions.

Figure 34. Prepaid/postpaid ratio

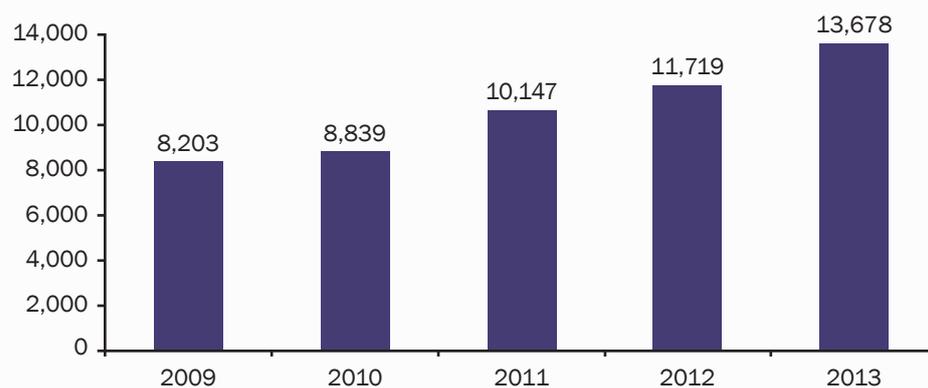
Source: RATEL



The minutes of calls are increasing year after year. In 2013 the total outgoing traffic on the mobile network amounted to 13.68 billion minutes of calls, which is an increase of approximately 16.7% compared with the previous year. The annual average of traffic per user in 2013 was 1 487 minutes or approximately 4 minutes and 4 seconds daily.

Figure 35. Total outgoing traffic (millions of minutes)

Source: RATEL



The total of 10.76 billion SMS messages were sent in 2013, which is a 6% growth compared with 2012 when 10.16 billion SMS messages were sent. The average per user in 2013 was 1 170 SMS messages a year or 3 SMS messages a day. In 2013, there were 24.76 million MMS messages sent, which is a decrease of 10% in respect to 2012.

Figure 36. Number of SMS messages sent (millions)

Source: RATEL

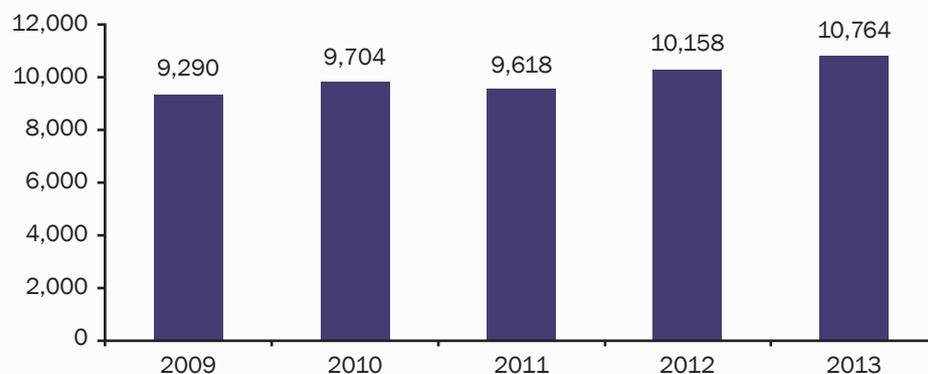
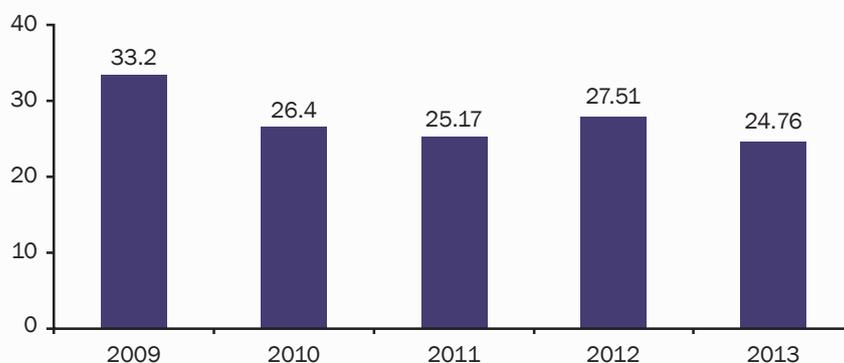




Figure 37. The number of MMS messages sent (millions)

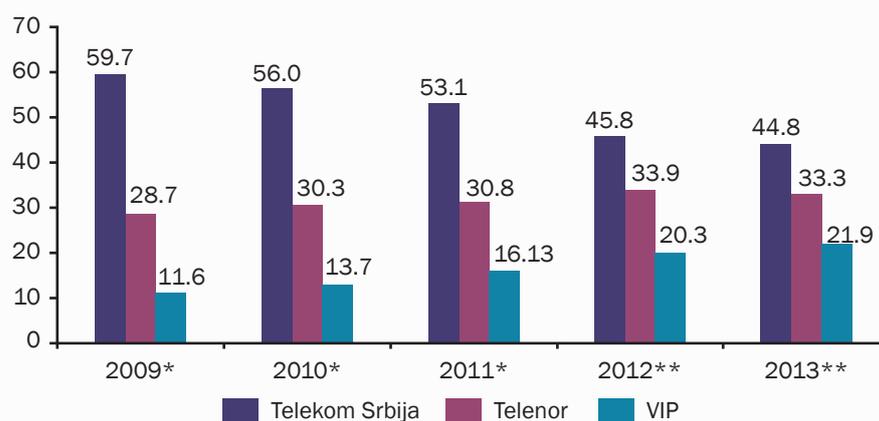
Source: RATEL



Figures 38. to 42. show the market share of mobile operators in terms of the number of users, share of each operator in the total mobile telephony revenues and share in the total outgoing traffic and the number of sent messages - SMS and MMS.

Figure 38. Market share in terms of the number of users (%)

Source: RATEL

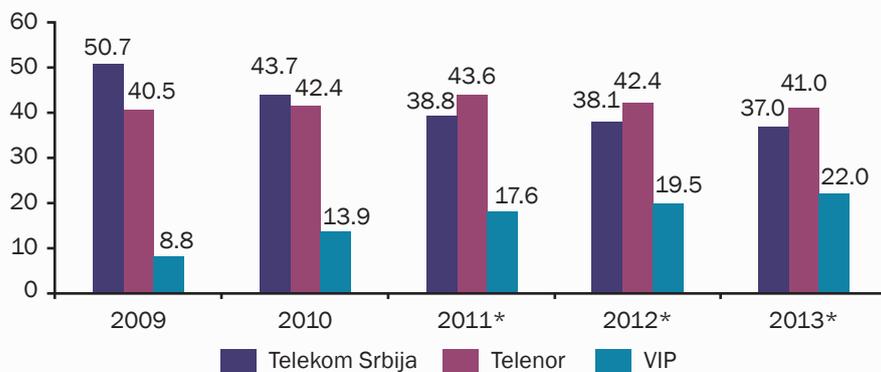


* The data for Telekom Srbija comprises the total number of prepaid users

** Market share for all three operators shows concerns prepaid and postpaid users active in the last 3 months of 2013

Figure 39. Share in the total revenue from mobile services (%)

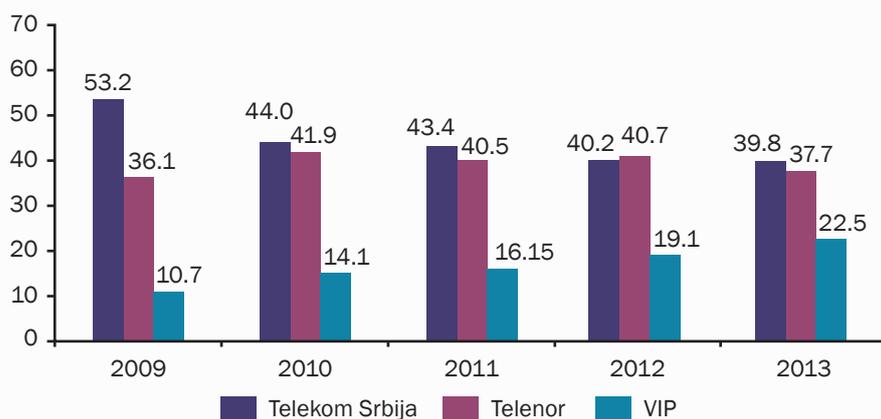
Source: RATEL



* If the internal calculation between business segments of Telekom Srbija were taken into account, their share in the total revenues from mobile telephony would amount to 41.35% in 2011 or 39.4% in 2012.

Figure 40. Share in the total outgoing traffic (%)

Source: RATEL



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Figure 41. Share in the total number of sent SMS messages (%)

Source: RATEL

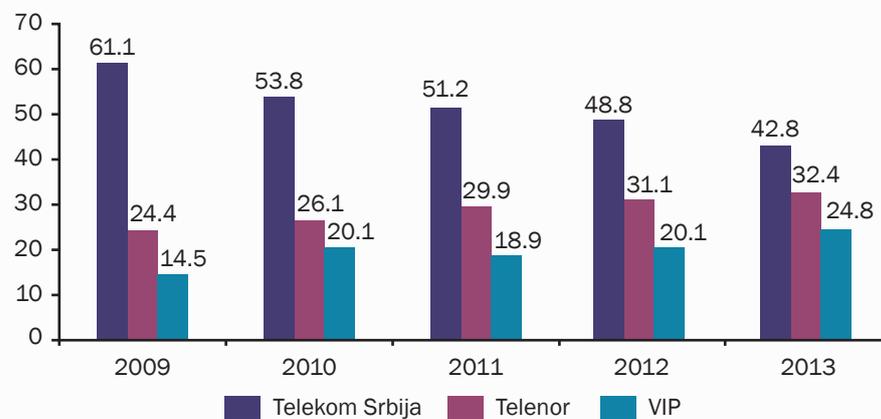
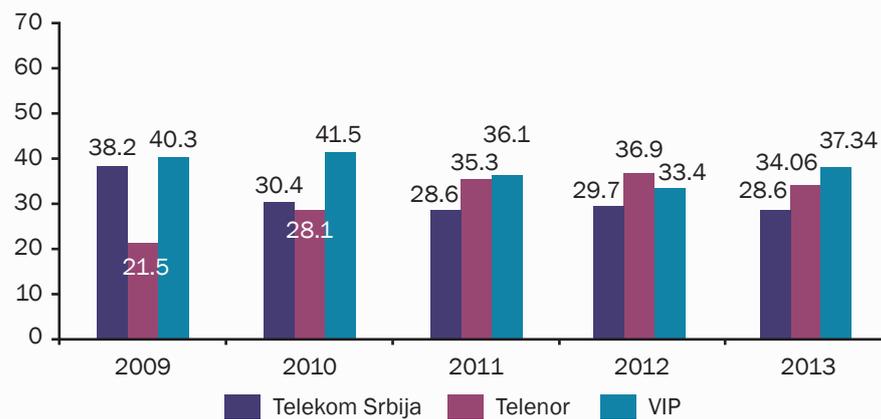


Figure 42. Share in the total number of sent MMS messages (%)

Source: RATEL

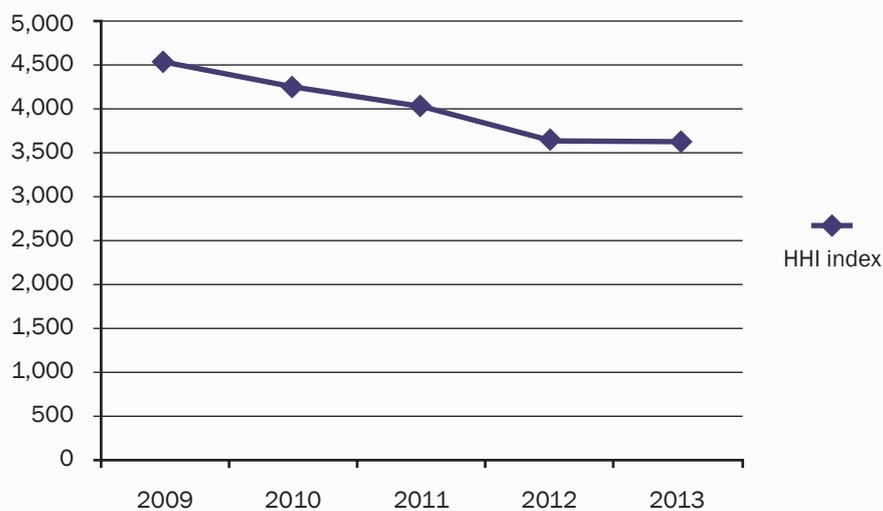


HHI (Herfindahl Hirschman Index) is an indicator used for determining the degree of concentration of a given market and it is defined as the sum of the squares of the market shares of each individual market share. The market share was identified by the number of users.

Table 8. HHI values in the period 2008– 2013

	2009	2010	2011	2012	2013
HHI indeks	4520	4239	4025	3656	3596

Figure 43. HHI values in the period 2009-2013



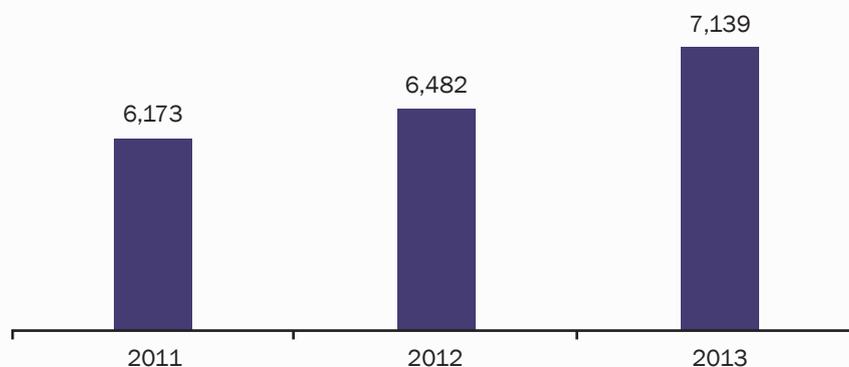
The value of HHI has been decreasing year after year, indicating a decrease in the market concentration and the increase in the competition between the operators.

In the third year since it had been available, the number portability showed a slight increase once again. In 2013 the number of ported numbers on mobile networks varied between 10 305 in April and 4 932 in May, with a monthly average of 7 139 of ported numbers.



Figure 44. Average monthly ported numbers by year

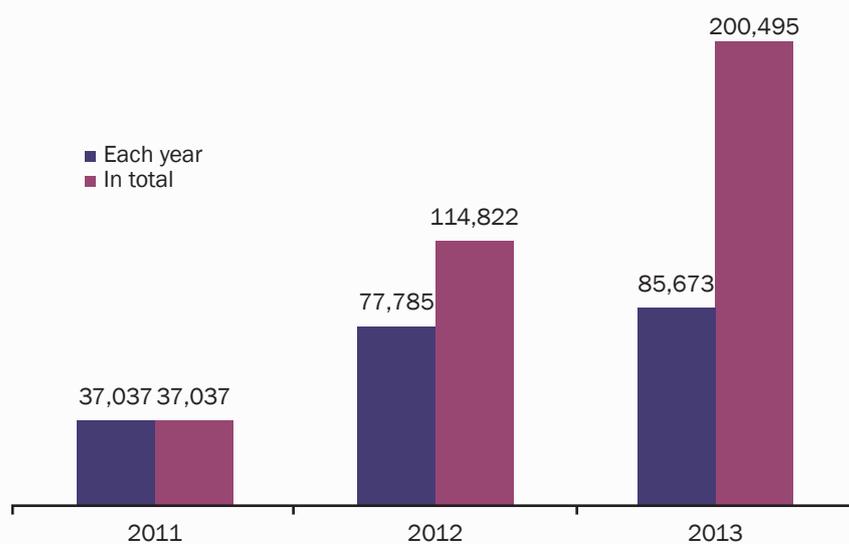
Source: RATEL



At the end of 2013, there were 200 000 users who had changed the operator keeping the same telephone number, which is 2% of the total number of users. The trend of returning to the previous operator was rather noticeable in 2013.

Figure 45. Total number of ported numbers each year and in total

Source: RATEL



5. INTERNET SERVICES

The Internet market in the Republic of Serbia has been experiencing expansion for years. This refers in particular to the number and structure of the Internet connections and the total revenues from the Internet service provision. The structure of the Internet connections was as expected concerning the growing quantity of data exchanged via Internet and the growing demands by the end-users in terms of speed and easy Internet access.

The Internet market in 2013 maintained a positive growth trend from the previous years, with the total number of broadband connections in the Republic of Serbia in 2013 amounting to nearly 1.4 million (without accounting for 3G network subscribers), which equals 99% of all Internet connections (without accounting for 3G network subscribers).

ADSL access represented the dominant Internet connection in 2013 with around 690 thousand connections, accounting for 47% of all broadband connections (without 3G network subscribers). In addition to the ADSL, other means available for the Internet access were cable modem, which is another service provided by the CATV operators, directly, via Ethernet, via optical cable, by means of wireless access in the 2.4 GHz and 5.8 GHz unlicensed frequency bands, less often using the 3.4-3.6 GHz frequency band, as well as via mobile operators' network (either via cell phone, or by means of special modems).

In December 2013, there were 221 Internet service providers (ISPs) registered in Serbia. Table 8 indicates that the number of ISPs according to the Internet access provided to end-users.

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Table 9. Number of ISPs according to Type of Access

Source: RATEL

	2009	2010	2011	2012	2013
Dial-up	36	42	29	18	12
Cable modem	20	22	21	22	23
Optical cable	3	11	11	12	12
Ethernet	24	25	14	10	12
Wireless	78	115	109	95	71
ADSL	27	23	21	13	16

Table 10. Total Number of ISPs

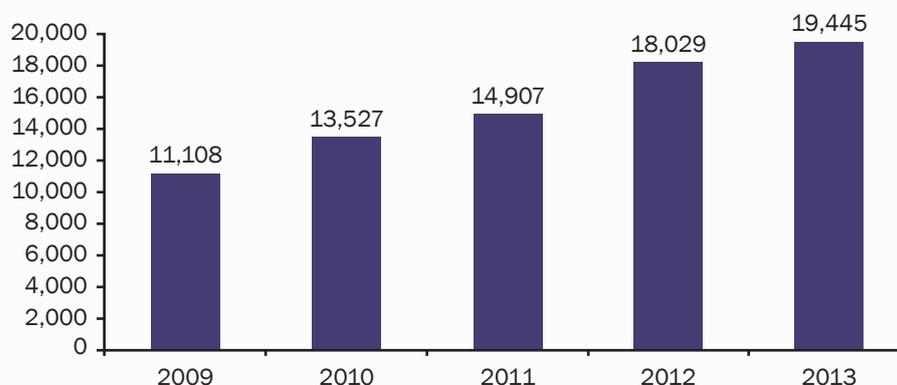
Source: RATEL

	2009	2010	2011	2012	2013
ISPs	199	192	232	222	221

The continued expansion of the Internet market is reflected, not only by the increase in the number of users (Internet connections), but also by the constant increase in the total revenues from the Internet service provision in the past years. The total revenues in 2013 grew by 20% in respect to 2012, amounting to approximately 19 billion dinars². If the total revenues from the Internet service provision in 2013 are compared with the

Figure 46. Internet service revenues (millions of RSD)

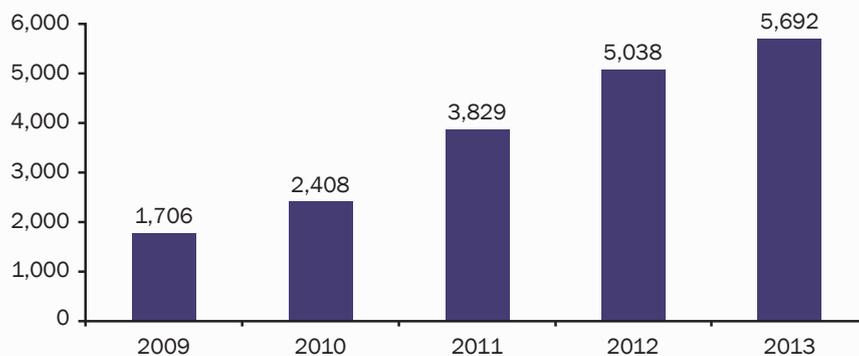
Source: RATEL



² The total revenues include the revenues from the Internet wholesale

total revenues in the previous years, a continuous growth trend of the Internet market in Serbia is evident.

Figure 47. Number of potential Internet users in thousands* Source: RATEL



*3G network subscribers included.

The total number of Internet subscribers in 2013 amounted to approximately 1.4 million. However, if we consider the availability of Internet access using 3G mobile network (via cell phone), the total number of potential subscribers in 2013 amounted to over 5 million.

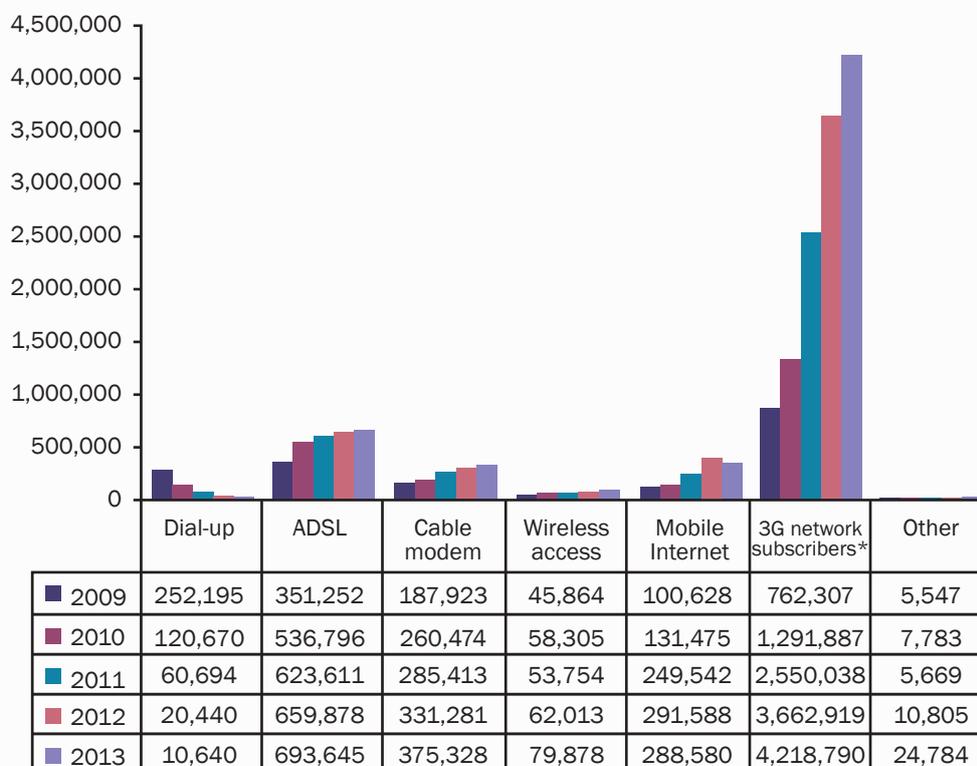
The total number of broadband connections in Serbia in 2013 was 1.46 million (3G mobile network users excluded), which is approximately 8% more than in 2012 (the year-on-year growth in 2012 was by 10%). There was a 5.1% increase in the number of subscribers who accessed the Internet using ADSL modem, which is slightly lower than the 5.8% increase in 2012. The increase in the number of subscribers accessing the Internet via cable modem by 13.3% is moderate compared with 2012 when the year-on-year increase was 16%.

The number of broadband users of mobile 3G modem was stable compared with the previous year. In 2013 there were 288 thousand users of mobile 3G modem, with the share in the total number of broadband users of 21% (excluding 3G network subscribers).

5. INTERNET SERVICES

Figure 48. Internet users according to the access technology

Source: RATEL

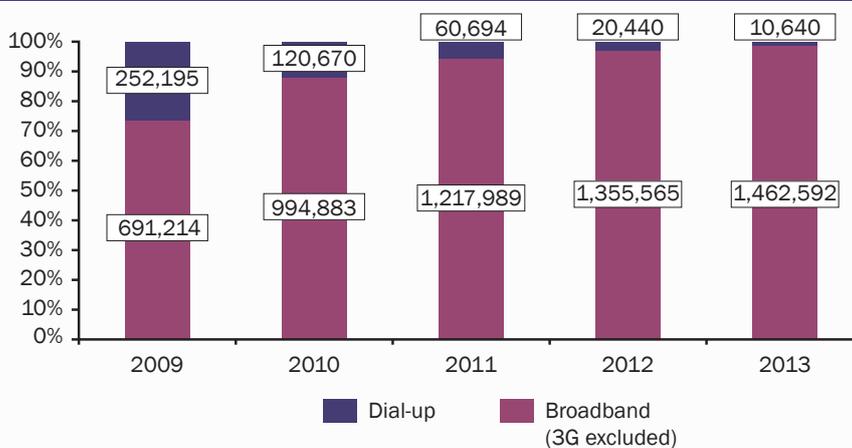


*3G network subscribers without mobile Internet

In view of the growing demand for high bit-rate data transmission, the number of dial-up connections has been dropping significantly year after year. In 2006 the total number of dial-up subscribers amounted to 882 thousand accounting for 88% of the total number of Internet subscribers, whereas in 2013 the number dropped to 10 thousand, with a minor share in the total number of Internet connections.

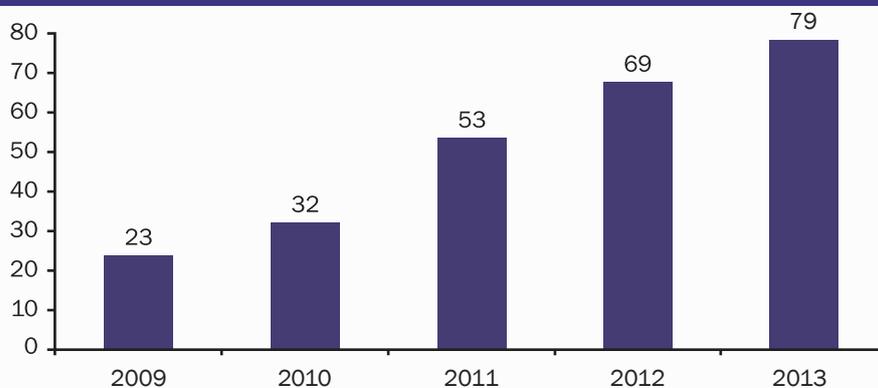
In 2013, the number of Internet connections per 100 inhabitants was approximately 75, which roughly corresponds to the number of broadband Internet connections per 100 i

Figure 49. Share of the Internet connections (3g mobile network subscribers excluded) Source: RATEL



nhabitants, in view of the rather low share of narrowband connections. However, if the 3G mobile network subscribers are excluded from the total number of broadband subscribers, broadband penetration amounts to nearly 20%. Fixed broadband penetration was over 16%, which is a satisfying percentage compared with the countries in the region, but still below the EU average (according to the available data, the average for the EU candidate and potential candidate countries was 11% and the EU average was 28.2%)³.

Figure 50. Internet Penetration Rate * Source: RATEL



* 3G mobile network subscribers included

³ Source: Monitoring regulatory and market developments for electronic communications and information society services in Enlargement Countries, Fourth Report February 2014, Cullen International.

5. INTERNET SERVICES

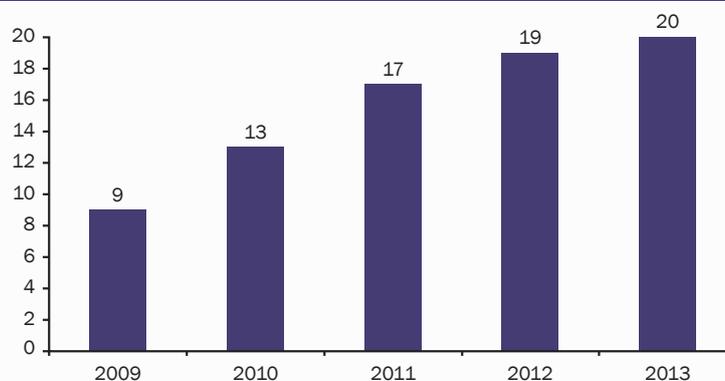


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Figure 51. Broadband penetration rate

Source: RATEL



The above data are showing a continuous growth of the Internet sector in Serbia, however it is slowing down compared to the previous period as a consequence of a saturated market and general economic trends. A progress was seen both in terms of total revenues and the number of broadband users. The choice of access technology reveals a step-up towards broadband services usage, reflected in the constant increase of ADSL, cable and mobile Internet access users, whereas the number of mobile Internet users is stagnating. Also, there is a continuous decrease in the number of dial-up users.

The increased competition in the broadband market and the growing user demands led to an improved quality of Internet service provision, reflected in the constant growth of high bitrate connections. Table 11 illustrates the tariffs of some packages available in the market.

Table 11. Monthly subscription fees for permanent internet connection in 2009, 2010, 2011 and 2012

2009		
Access bitrate	Access Technology	Amount of monthly subscription fee for permanent Internet access (VAT included) in RSD
1024/128 Kbps	ADSL	1,425.44
1536/128 Kbps	Cable	1,390.00
1024/256 Kbps	Wireless (2.4 GHz)	1,299.00
5 GB free of charge, and RSD3.84 for every additional MB	Mobile Network	1,480.00

2010		
Access bitrate	Access Technology	Amount of monthly subscription fee for permanent Internet access (VAT included) in RSD
1536/256Kbps	ADSL	1.532.82
4096/256 Kbps	Cable	1.390.00
1536/256Kbps	Wireless (2.4 GHz)	1.186.00
5 GB free of charge, and RSD3.00 for every additional MB	Mobile Network	1.050.00 –1.364.00
2011		
Access bitrate	Access Technology	Amount of monthly subscription fee for permanent Internet access (VAT included) in RSD
1536/256Kbps	ADSL	1,532.82
6144/512Kbps	Cable	1,540
2048/256 Kbps	Wireless (2.4 GHz)	1,000
6 GB free of charge, and RSD1.00 for every additional MB	Mobile Network	1,050.00
2012		
Access bitrate	Access Technology	Amount of monthly subscription fee for permanent Internet access (VAT included) in RSD
5120/1024Kbps	ADSL	1,549
10240/1024Kbps	Cable	1,566
3072/512 Kbps	Wireless (2.4 GHz)	1,599
3 GB with full access bitrate included in the price	Mobile Network	690
2013		
Access bitrate	Access Technology	Amount of monthly subscription fee for permanent Internet access (VAT included) in RSD
5120/1024Kbps	ADSL	1,549
15360/1536Kbps	Cable	1,590
3072/2048 Kbps	wireless (2.4 GHz)	1,279
3 GB with full access rate included in the price	Mobile network	690

Note: the price lists were taken from the websites of the undertakings and apply to residential users; each package has additional costs and technical requirements pertinent to the closing of subscription contracts and establishment of connection; some of the packages require subscription contracts that entail specific obligations over a specified period of time.



6. USAGE OF ICTs IN SERBIA

In the modern society ICT has the main role in both economy and manufacturing, as well as in all segments of the social life of an individual and of the society as a whole.

Surveys on the use of information-communication technologies by individuals, households and companies in Serbia are regularly conducted by the Statistical Office of the Republic of Serbia. The survey was carried out according to the Eurostat methodology in the territory of the Republic of Serbia. However, the data do not include the data for AP Kosovo and Metohija.

In 2013, the survey was conducted on the sample of 2,400 individuals, 2,400 households and 1,200 companies. The sample was allocated to the areas of Central Serbia (without Belgrade), AP Vojvodina and the City of Belgrade, according to the respective number of households.

The growth trend of households with a computer continued in 2013. There were 59.9% of the households that owned a computer, which is an increase of 4.7% in respect to 2012. Most of the households, 75.7%, have one computer, whereas 18.8% of the households have two computers. The incidence of computers in households varies depending on different territorial areas: Belgrade 67.1%, Vojvodina 64.0% and Central Serbia 55.1%.

The incidence of computers in households also varies between urban areas (66.3%) and rural areas (50.9%) in Serbia. The gap was slightly smaller compared to the previous year, since the number of households with computer in urban areas grew by 3.3%, while in rural areas the increase was 7%.

In 2013, there were 55.8% of households in the Republic of Serbia with the Internet connection, this being an increase of 8.3% in respect to 2012, or a 14.6% increase in respect to 2011. Once again, significant discrepancies may be observed if we compare

Figure 52. Percentage of households with a computer

Source: Statistical Office of the Republic of Serbia

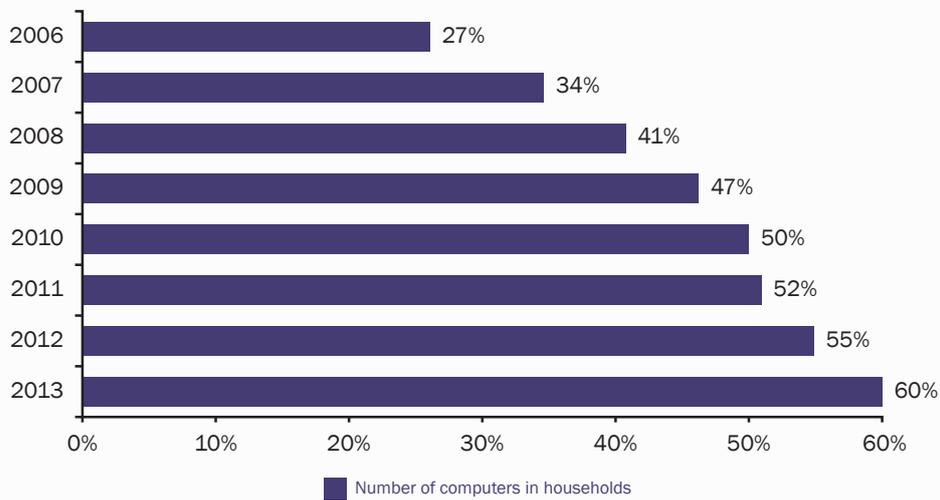
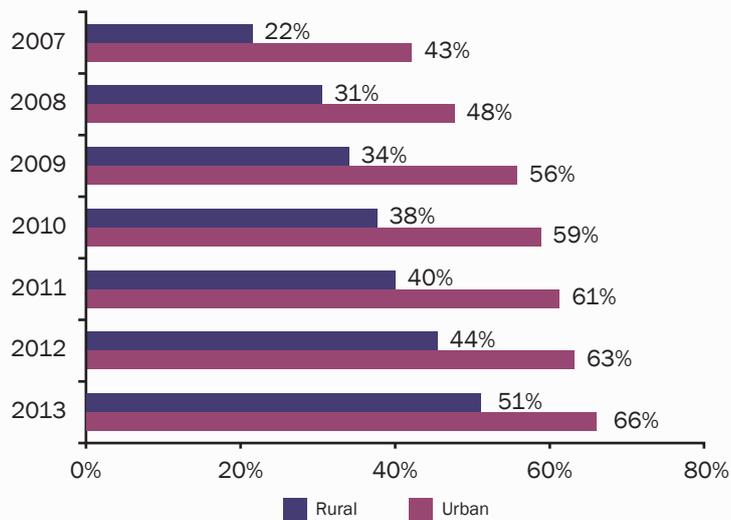


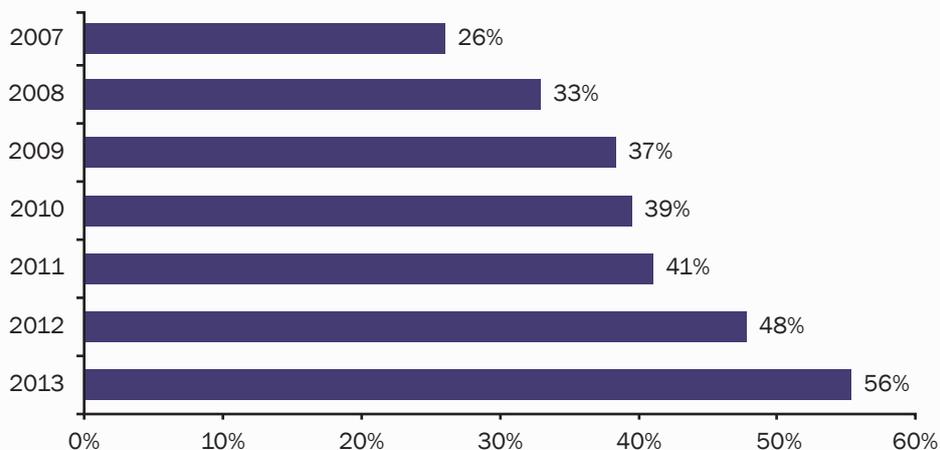
Figure 53. Percentage of Households with a Computer according to the Type of Area (Rural or Urban)

Source: Statistical Office of the Republic of Serbia



the number of households with Internet connection in urban and rural areas in Serbia. While in urban areas of the Republic of Serbia the number of households with Internet connection amounted to 63.8% (cf. 57.5% in 2012), in rural areas there were 42.5% (cf. 33.2% in 2012) of households with Internet connection. It should be noted that the growth rate of Internet connections in respect to 2012 was seen in both urban (6.3%) and rural (9.3%) areas.

Figure 54. Households with Internet connection
Source: Statistical Office of the Republic of Serbia



It should be noted that the gap is also related to the household income, as Internet connection was mainly used by the households with the monthly income of over 600 euros (89.8%), while the share of households with the income of 300 euros was only 39.5%.

One of the main indicators of ICT development in the EU is the percentage of households with broadband Internet. With the broadband diffusion, the downtrend of modem connection was continued. In 2013, 50.6% of households with Internet had DSL (ADSL), 32.6% cable and 19.7% were using wireless Internet.

Figure 55. Household Internet use according to the type of connection
 Source: Statistical Office of the Republic of Serbia

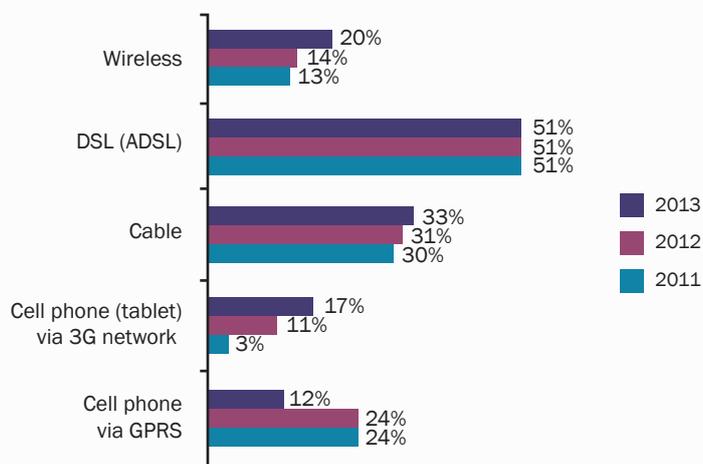
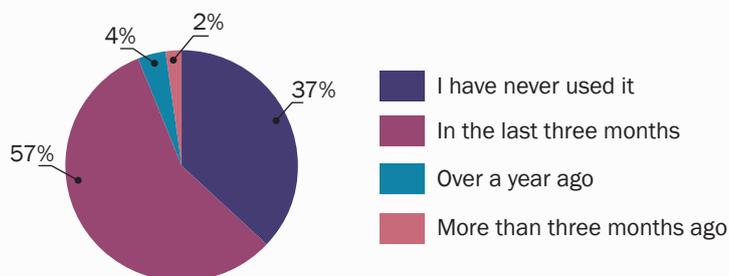


Figure 56 shows the usage of computers by individuals. The survey revealed that 56.9% of the respondents had used the computer in the past 3 months (cf. 55% in 2012), 2.2% participants had used the computer more than 3 months earlier, 4.3% more than a year earlier and 36.6% respondents had never used the computer.

The number of computer users in the past 3 months increased by over 20 000 in respect to 2010.

Figure 56. Computer usage by individuals
 Source: Statistical Office of the Republic of Serbia

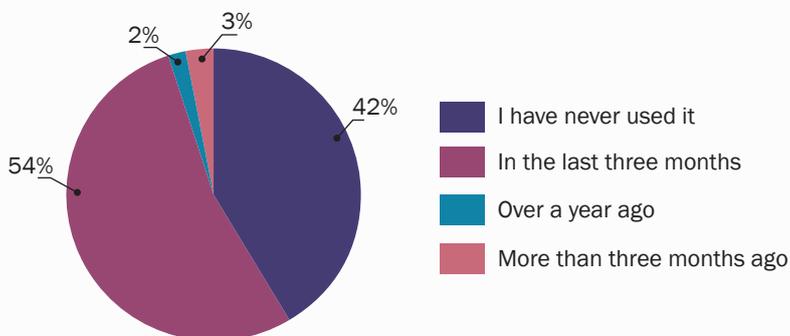




In the Republic of Serbia 53.5% (cf. 48.4% in 2012) of people used the Internet in the last three months, 2.7% of the respondents used the Internet more than three months ago and 2.3% of them over a year ago. The percentage of the respondents who said that they had never used the Internet is 40.5% (cf. 48.4% in 2012), which is slightly lower compared with the previous years.

The number of Internet users in 2013 increased by 6.9% in respect to 2012 or by 11.5% in respect to 2011 and 12.6% in respect to 2010. The survey showed that the number of persons who had used the Internet in the past three months increased by over 200 000 compared with 2012.

Figure 57. Internet usage by individuals Source: Statistical Office of the Republic of Serbia



The survey showed that 26.1% of respondents among the Internet users, had used public administration services instead of personal contact.

Over 806,000 individuals used the electronic services of the public administration.

82% of the respondents reported that they had been using the Internet every day or almost every day in the past three months.

Over 2 400 000 persons used the Internet (almost) every day, which is an increase of over 300 000 compared with 2011.

Figure 58. Frequency of the individual Internet usage
Source: Statistical Office of the Republic of Serbia

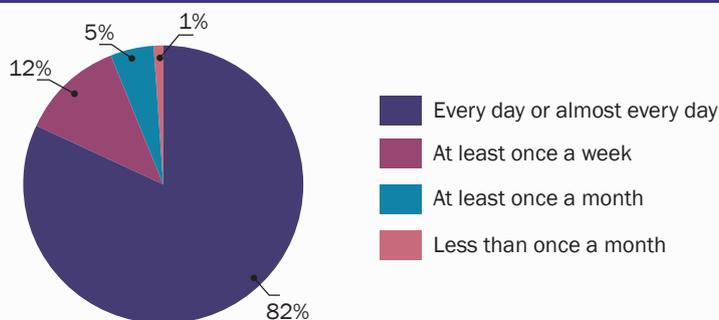
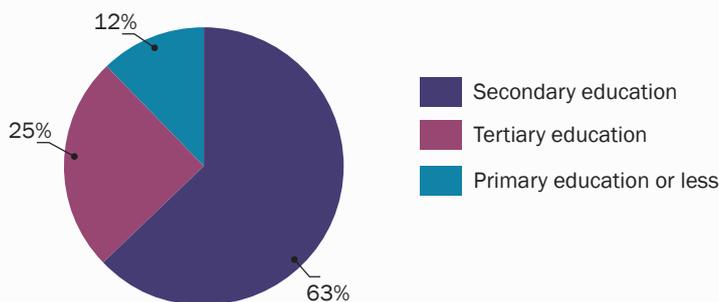


Figure 59 illustrates the structure of the Internet users by the level of education. The Internet is mainly used by the individuals with secondary education (62.7%), followed by the users with higher education or university degree (25.3%) and the users with less than secondary education (12%).

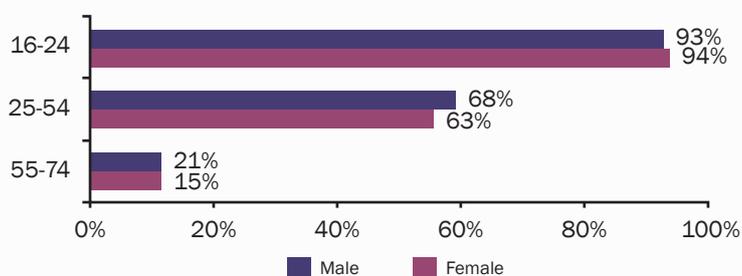
Figure 59. Internet users by level of education
Source: Statistical Office of the Republic of Serbia



In 2013 there was a greater percentage of male users in respect to female users in 25-54 and 55-74 age groups, with the biggest discrepancy in 55-74 age group, whereas in 16-24 age group there were slightly more female users. The survey showed that in the past 3 months there had been 57% of male and 50% of female users of the Internet.

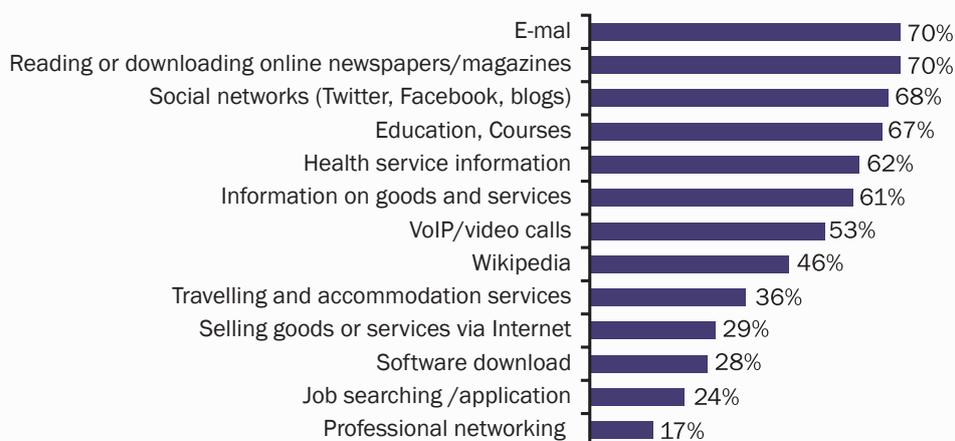


Figure 60. Internet usage in last 3 months according to gender/age
Source: Statistical Office of the Republic of Serbia



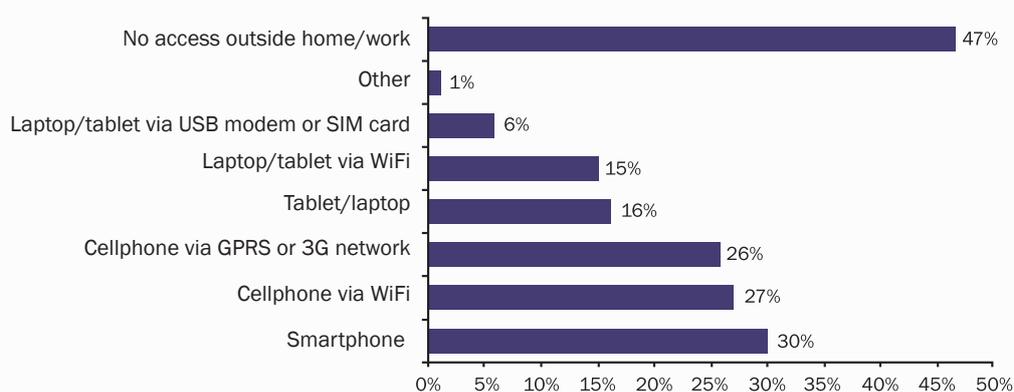
In 2012 the Internet was mostly used for e-mailing (70.4%), followed by reading or downloading online newspapers/magazines (69.5%), social networks (Twitter, Facebook, blogs) 68%, looking for education-related information and courses (66.5%). Also, the survey showed that as much as 93.4% of population in the 16-24 age group have a profile in a social network (Twitter and Facebook).

Figure 61. Internet usage for private purposes (in the last 3 months)
Source: Statistical Office of the Republic of Serbia



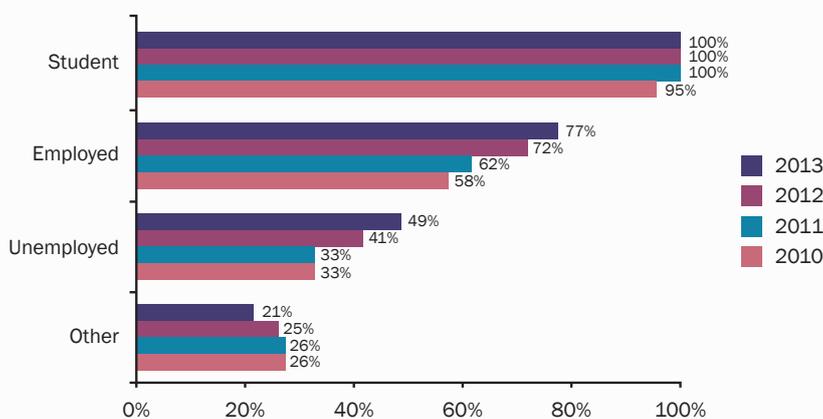
The survey showed that 30.3% of the Internet population had used a Smartphone for the Internet access outside home or work (Figure 62).

Figure 62. Usage of mobile devices for Internet access outside home/work
Source: Statistical Office of the Republic of Serbia



The share of the Internet users according to their employment status (Figure 63) shows that the Internet was mainly used by students (100%), while the number of employed users grew from 71.5% in 2012 to 76.6 in 2013. As regards the unemployed users, the number was increased from 40.6% in 2012 to 49.1% in 2013..

Figure 63. Share of Internet users according to their employment status
Source: Statistical Office of the Republic of Serbia

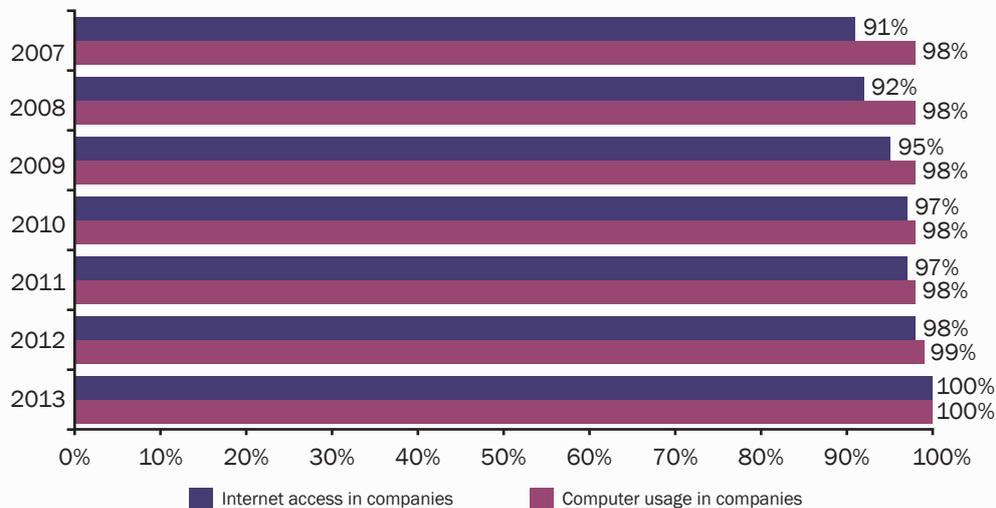


The growth in the number of enterprises using the computer for business continued to grow, since 100% of enterprises used the computer in 2013 (cf. 98.7% in 2012).

There are 99.6% of companies in the Republic of Serbia with the Internet connection. Among the companies with the Internet connection, 75.7% used DSL connection, followed by cable Internet (45.2%) with the biggest increase and mobile connections (28,6%) which showed a slight decrease (cfr. 31,2% u 2012.).

Figure 64. Internet and computer usage by companies

Source: Statistical Office of the Republic of Serbia



The survey showed that 87.6% of companies with Internet connection had used public administration electronic services, which is a slight increase compared with 2012.

Figure 66. shows the Internet connection bitrate in the companies, defined by the contract with ISPs, where the majority (63.7%) of the companies had 2-10 Mbit/s.

Figure 65. Usage of online public administration services by companies
Source: Statistical Office of the Republic of Serbia

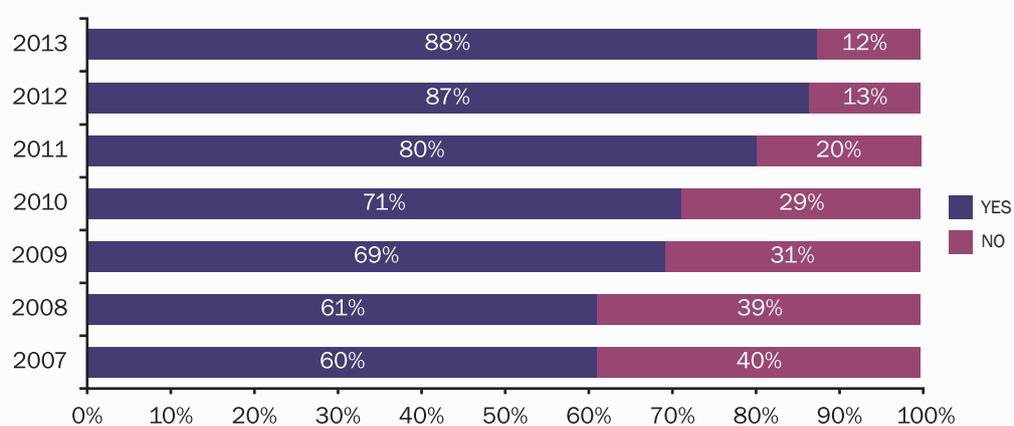
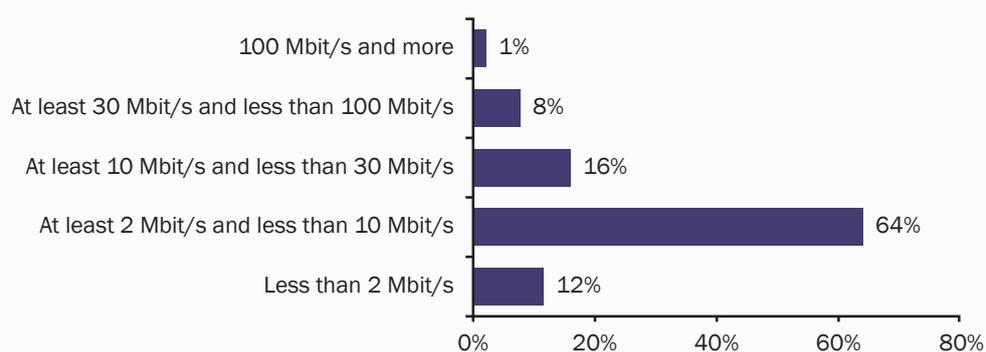


Figure 66. Internet bitrate in companies (as defined by the agreement with ISP)
Source: Statistical Office of the Republic of Serbia

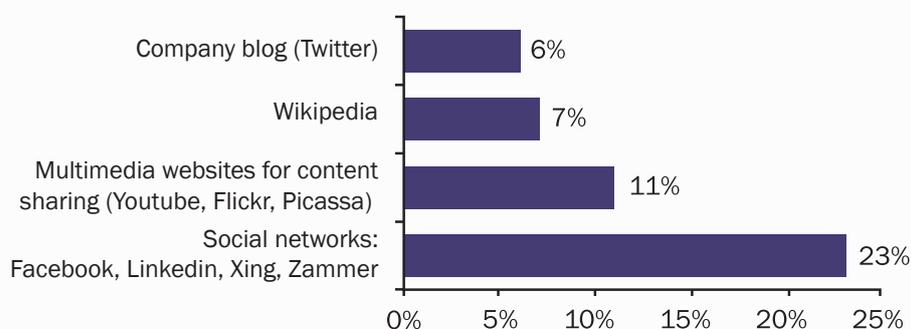


73.8% of the companies with Internet connection had their own website. Social networks are becoming more and more important for the company business, as illustrated by the results showing that as much as 23.4% of the companies used social networks for their business.



Figure 67. Usage of social networks for business purposes

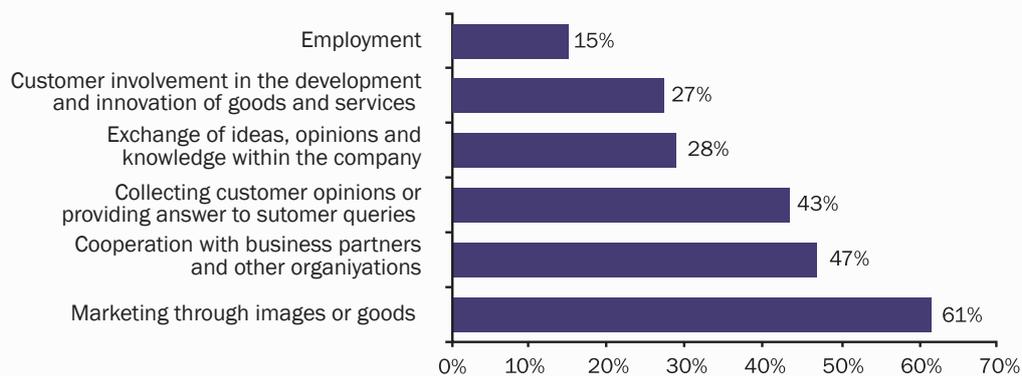
Source: Statistical Office of the Republic of Serbia



The number of companies with the website depends on the territorial area, as confirmed by the following data. In Belgrade there were 83.7% of companies with website, in Vojvodina 73.5% and in Central Serbia 61.9%.

Figure 68. Purpose of social media usage by compaies

Source: Statistical Office of the Republic of Serbia



The majority of companies used social networks for marketing (61%) and cooperation with business partners or other organizations (46,9%).

7. MEDIA CONTENT DISTRIBUTION

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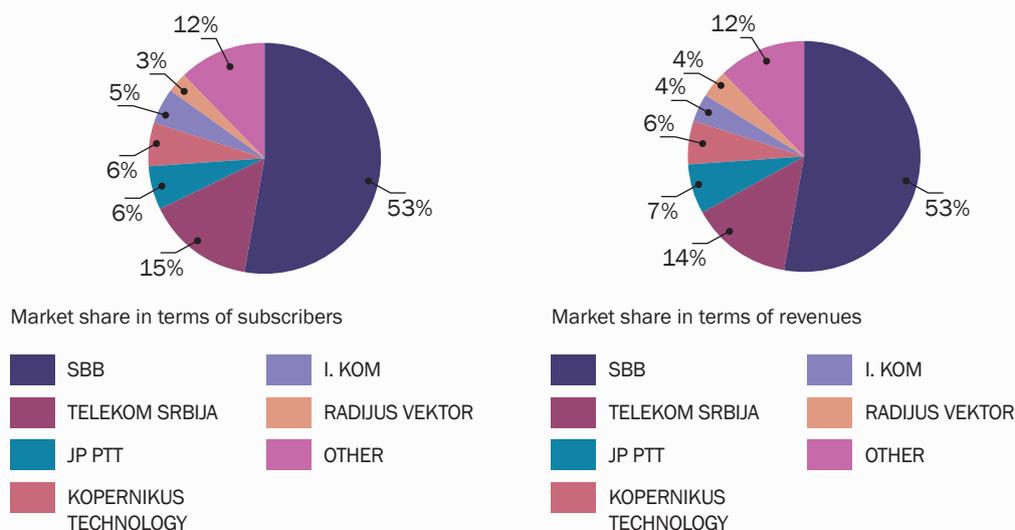
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In 2013 there were 94 operators registered for media content distribution provided via: cable distribution networks (coaxial, hybrid and optical) – CATV, public fixed telephone network– IPTV and satellite distribution network– DTH (Direct to Home).

There were 1.55 million users of the media content distribution services in 2013, which is an increase of 7.6% compared to the previous year. The penetration rate was 21.6% in terms of population, and 58% in terms of households.

The largest media content distribution operator was once again SBB with a market share of over 50%, in terms of the number of subscribers and revenues. The other leading operators are Telekom Srbija Joint Stock Co., Public Enterprise PTT, Kopernikus tehnology Ltd., I.KOM Ltd. and Radijus vektor Ltd. In terms of the number of subscribers, the joint market share of these operators was around 88%.

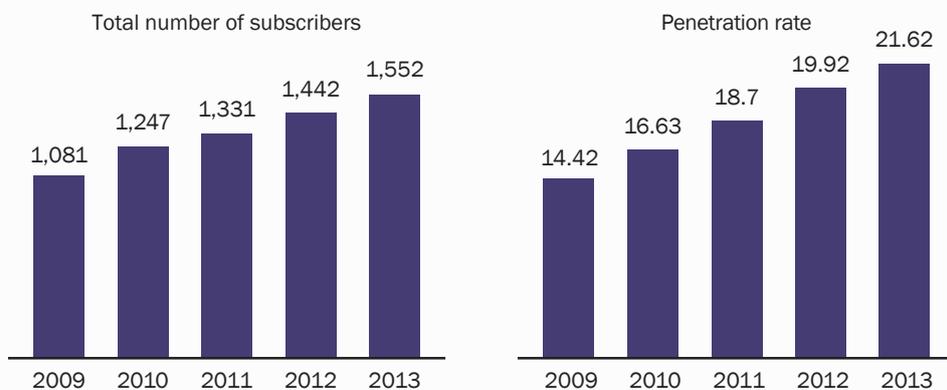
Figure 69. Market share of the leading operators in 2013 Source: RATEL



7. MEDIA CONTENT DISTRIBUTION



Figure 70. Total number of media content distribution subscribers (thousands)/Penetration rate (%)
Source: RATEL



Media content distribution via cable prevailed, with over one million subscribers in 2013.

Figure 71. Media content distribution users by technologies (thousands)
Source: RATEL

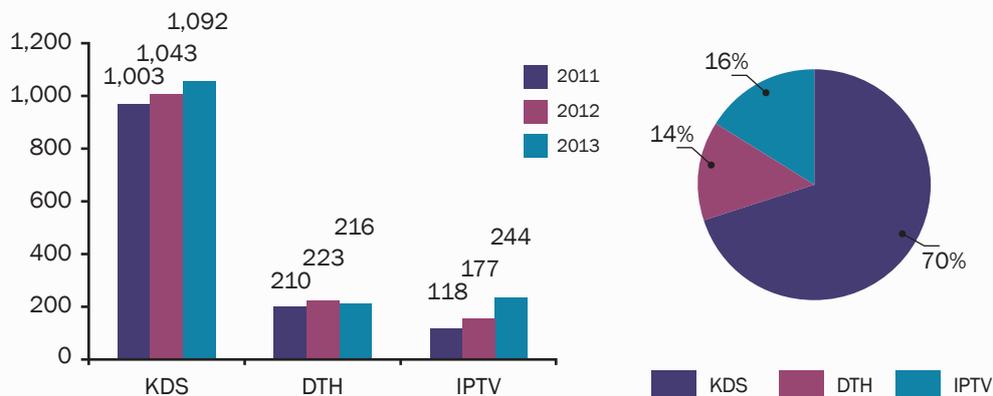
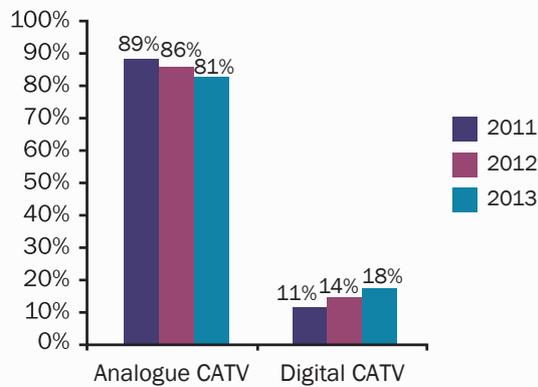


Figure 72. Cable users

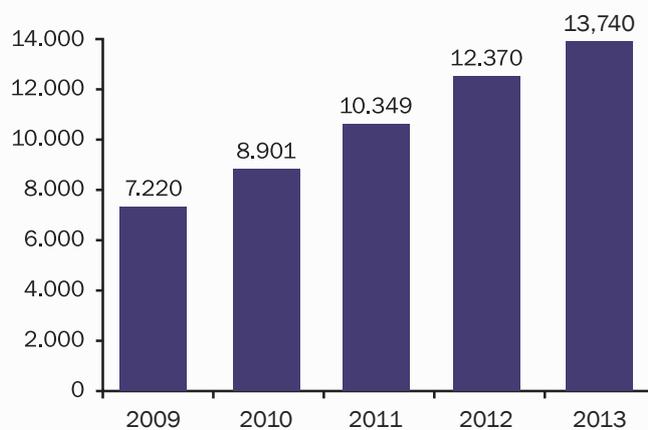
Source: RATEL



In 2013, the total revenues from media content distribution increased by 6.7% year-on-year, amounting to approximately 13.2 billion dinars. This increase was mainly the result of the increase in the number of users, higher quality, additional services, but also of the higher monthly subscription fee (figure 73).

Figure 73. Increase in the revenues from the media content distribution (RSD millions)

Source: RATEL



7. MEDIA CONTENT DISTRIBUTION

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In 2013, the biggest share of revenues from the media content distribution went to CATV (67%), followed by IPTV (19%) and DTH (14%).

Figure 74. Revenue structure in 2013

Source: RATEL

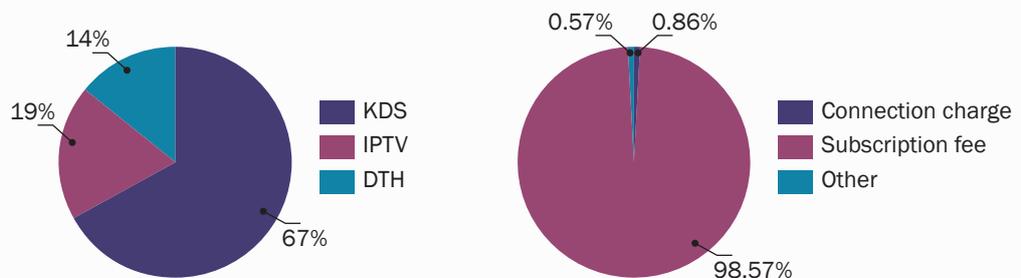
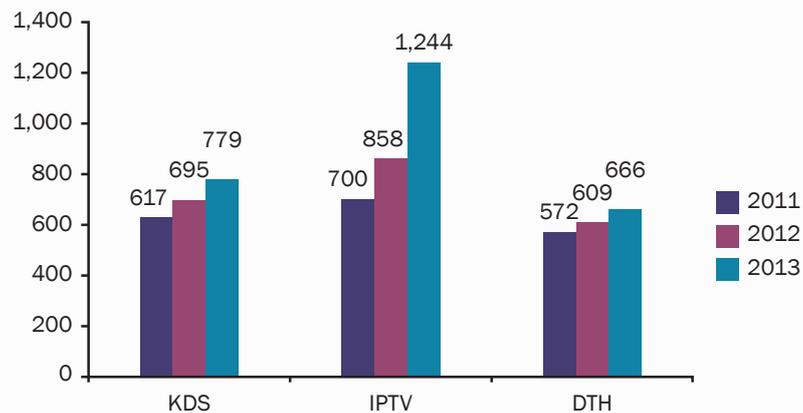


Figure 75. Average monthly subscription fee for basic package

Source: RATEL



The revenues from the monthly subscription fee accounted for 98% of the revenues, the connection charges make up 1% of the revenues and 1% were the revenues from Pay TV and other services.

As shown in Figure 76, in 2013 CATV subscribers paid on average 798.80 dinars a month, DTH service subscribers paid on average 921,54 dinars for the basic service package, while IPTV services subscribers paid on average 1209.90 dinars on a monthly basis.

Figure 76. Average bill in 2012 (RSD)

Source: RATEL

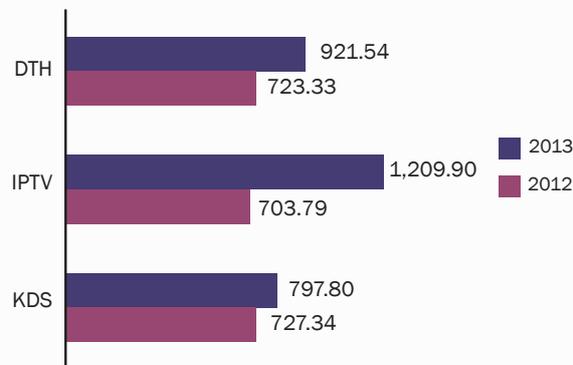
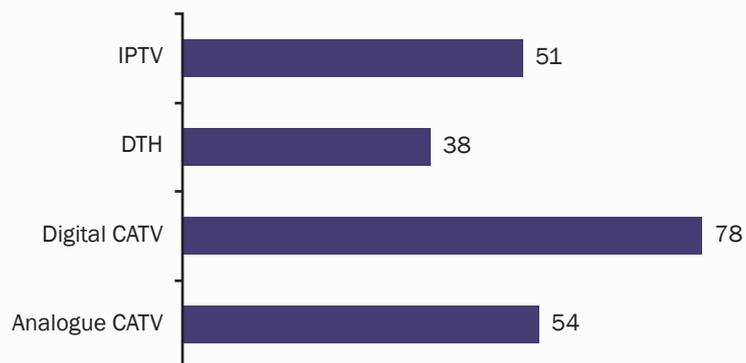


Figure 77 provides an overview of the number of TV programmes offered in the basic package in 2013, for different media content distribution technologies.

Figure 77. Average number of TV programmes in the basic package in 2012

Source: RATEL



8. BROADCASTING

Based upon users' requests, public tenders as well as decisions made by the Council of the Republic Broadcasting Agency regarding the permit issuance for television and radio programme broadcasting, RATEL issued the broadcasting station permits to the following broadcasters:

Initial network for digital TV signal broadcast testing

Ord. no.	Name and seat of the radio station owner	Number of issued broadcasting station licences	Number of issued micro-wave station licences
1.	Javno preduzeće emisiona tehnika i veze, Beograd	28	24

For TV signal coverage – commercial service – national coverage

Ord. no.	Name and seat of the radio station owner	Number of issued broadcasting station licences	Number of issued micro-wave station licences
1.	PRVA TELEVIZIJA DOO, Beograd	36	0
2.	ZEMUN, "HAPPY TV" DOO, Beograd	1	0
3.	Privredno društvo za radio i televizijske aktivnosti "HAPPY K. TELEVIZIJA" D.O.O., Beograd	1	0

For TV signal coverage – commercial service – regional coverage

Ord. no.	Name and seat of the radio station owner	Number of issued broadcasting station licences	Number of issued micro-wave station licences
1.	TELEVIZIJA TELEMAR DOO, Čačak	5	2

For radio signal coverage – commercial service – regional coverage

Ord. no.	Name and seat of the radio station owner	Number of issued broadcasting station licences	Number of issued micro-wave station licences
1.	"NS - AS" D.O.O., proizvodnja, trgovina i usluge, Novi Sad	1	0

For TV signal coverage – commercial service – local coverage			
Ord. no.	Name and seat of the radio station owner	Number of issued broadcasting station licences	Number of issued microwave station licences
1.	Radio-difuzno preduzeće "RTV DEVIĆ PLUS" D.O.O., Smederevska Palanka	1	0
2.	Društvo sa ograničenom odgovornošću "TELEVIZIJA VALJEVO PLUS", Valjevo	1	0
3.	MOTO BOEM TRANS DOO NEGOTIN, OGRANAK TV TRANS NEGOTIN, Negotin	1	0
4.	MTS-MOJA TV STANICA DOO, Beograd	1	0
5.	Javno preduzeće "Radio i televizije Trstenik" sa PO, Trstenik	1	0
6.	Ustanova "CENTAR KULTURE BOSILEGRAD" sa PO., Bosilegrad	0	1

For radio signal coverage – commercial service – local coverage			
Ord. no.	Name and seat of the radio station owner	Number of issued broadcasting station licences	Number of issued microwave station licences
1.	Akcionarsko društvo "RADIO TV PODRINJE", Loznica	1	0
2.	Radiodifuzno preduzeće "RADIO MAX FM" DOO, Jagodina	1	0
3.	Preduzeće za radio i TV difuziju "GAGA" D.O.O., Vlasotince	1	0
4.	Ekološki radio "FRUŠKA GORA" D.O.O. za nformativnu, marketinšku i zabavnu delatnost, Ruma	1	0
5.	"RADIO DŽOKER" DOO, Velika Plana	1	0
6.	Goran Radojković PR Bežične telekomunikacije marketing emitovanje i produkcija radio programa "ENIGMA-RG", Čičevac	1	0
7.	Radio difuzno društvo "BRAVO PLUS" D.O.O., Kragujevac	1	0
8.	Jasmina Simović PR Agencija za marketing "MASTER CRAFT", Požega	1	0
9.	RAZVOJNI CENTAR ROM OBRENOVAC, Obrenovac	1	0
10.	Privredno društvo "RADIO STIL" D.O.O., Kostolac	1	0
11.	Jasmina Radisavljević PR agencija za emitovanje radio programa "RADIO AMORE", Jagodina	1	0
12.	Udruženje "RTV BUM018", Niš	1	0
13.	"M-31" Društvo sa ograničenom odgovornošću, Užice	1	0

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14.	Jasmina Simović PR radio produkcija "MASTER CRAFT", Požega	1	0
15.	DOO "RADIO SAJAM", Novi Sad	0	2
16.	Javno preduzeće "INFORMATIVNI PRESS CENTAR" opštine Vladičin Han, Vladičin Han	0	2
17.	SURDULIČKA RADIO TELEVIZIJA D.O.O., Surdulica	0	2

For TV signal coverage – commercial service – Belgrade region

Ord. no.	Name and seat of the radio station owner	Number of issued broadcasting station licences	Number of issued micro-wave station licences
1.	MTS-MOJA TV STANICA DOO, Beograd	3	0

For radio signal coverage – commercial service – Belgrade region

Ord. no.	Name and seat of the radio station owner	Number of issued broadcasting station licences	Number of issued micro-wave station licences
1.	"LAGUNA ETAR" DOO, Beograd	1	0
2.	"ENERGY RADIO" DOO, Beograd	1	0

9. RF SPECTRUM USAGE AND QUALITY OF SERVICE MONITORING

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As part of the RF spectrum management, RATEL performs permanent monitoring of the RF spectrum usage, monitors technical inspection implementation and controls the quality parameters of the publicly available electronic communication services and the electronic communication business activities.

9.1 RF SPECTRUM USAGE MONITORING

RF spectrum usage monitoring in 2013 was performed from fixed monitoring centres either from suitable fixed locations or from selected locations in specific campaigns or in motion. Table 12 shows the number of monitoring records made from the fixed centres or on field.

Table 12. Number of monitoring records made from the fixed centres or on field in 2012

Number of monitoring records made from the fixed centres	Number of monitoring records made on field
4154	7535

Based on the study “Monitoring System Design and RF Spectrum Measurement Procedures in the Republic of Serbia, Phase 1” from 2012, prepared by the School of Electrical Engineering, University of Belgrade, during 2013 a part of remote control receiver network was built. To begin with, three receivers on the territory of the City of Belgrade were installed. The usage of these receivers speeds up RF spectrum monitoring and enables immediate locating of the monitored transmitters.

9.1.1. BANDS ALLOCATED TO SO-CALLED FUNCTIONAL COMMUNICATION SYSTEMS (4 m, 2 m, 0.7 m)

The usage of these bands has further decreased. It has been noted that many insolvent businesses failed to return the licence, although the need for their using radio networks no

longer exists. The operation of a number of radio stations without licence was also registered, mainly in 0.7 m frequency band, and the appropriate measures under the Law were taken. Illegal operation mainly concerns taxi organizations radio stations. Usually immediately upon control and identification of illegal usage of RF spectrum, the owners of taxi radio networks apply for a radio station permit. For the first time the operation of digitally modulated radio stations has been registered in the functional radio link systems, by “Elektrovojvodina”.

9.1.2 BROADCASTING (FM/TV)

Many radio stations do not comply with the requirements laid down in the permits. Typical irregularities, identified during monitoring of the RF spectrum allocated to radio and TV broadcasting, involve increased radiated power and relocation of the radio station in order to increase the service zone and achieve a greater economic effect. Also additional transmitters are installed without a permit, even by the national broadcasters, with the excuse of bad coverage in specific areas, which is usually true due to the “crowded” Allocation Plan. Another problem faced by a number of broadcasters concerns signal transmission from the studio to the broadcasting transmitters. Also, the increased deviation of the carrier signal practiced by both radio and TV broadcasters, continued. The spectators often complain to such tendency, yet the broadcasters keep on with this practice, regardless of the repeated warnings. Based on international recommendations, RATEL created software for automatic identifying of the deviation value accompanied by graphic reports.

The biggest problem of the broadcasting, however, remains the work of the stations without a permit. The number remains unchanged despite the fact that on average ten illegal stations are closed every year. The only efficient way to close down the broadcasting stations working without permit is with the support of the Ministry of Interior, based on the request issued by the Prosecutor Office for Cyber Crime.

In 2013, RATEL pressed 2 minor offence charges and 12 criminal charges against the owners of the radio stations working without permit. The overview of the broadcasting stations working without permit in late 2013 is given in Table 13.

Table 13. Overview of the broadcasting radio stations working without licence registered in late 2013

Ord no.	Identification, location	Frequency (MHz) / Channel (C)
1.	Radio Kult, Požarevac	102.7
2.	Internet Radio Ruski Krstur	96.9
3.	Radio Grom, Zrenjanin	99.8
4.	Radio Zene, Čantavir	90.9
5.	Radio Vaki, Zemun	103.7
6.	KTV, Zrenjanin	32 nd C
7.	Radio Ibis, Melenci	96.7
8.	Radio Grmeč, Novi Sad	96.9
9.	Radio Zec, Novi Sad	104.8
10.	Radio Antena, Novi Sad	104.2
11.	Radio Guess, Novi Sad	105.6
12.	Radio, Rudno, Kraljevo	88.9
13.	Radio Srpska Krajina, Novi Sad	99.1
14.	Radio bez identifikacije, F.Gora	102.9
15.	Radio Zavičaj, Beočin	102.2
16.	Radio bez identifikacije, F.Gora	103.5
17.	Radio Mladost, Apatin	101.0
18.	Radop D-65, Deronje	100.5
19.	Radio Suton, Kula	91.7
20.	Radio Padina, Padina	88.4
21.	Radio Antena, Šljivova (Krupanj)	102.0
22.	Radio Enigma, Prijepolje	104.3
23.	Radio Zavičaj Plus, Kraljevo	104.7
24.	Radio Skaj, Vranje	107.5
25.	TV Duga, Trgovište	27 th C

26.	Radio 013, Plandište	90.9
27.	Radio Jesenjin, Novi Sad	104.5
28.	TV Jerina, Smederevo	30 th C
29.	Radio Bubonja, Ljig	99.5
Radio Balkan reemituje program radija Fokus		
1.	Požarevac	91.6
2.	Vranje	105.6
3.	Kruševac	94.8
4.	Vršac	93.0
5.	Popovica	107.0
6.	Beograd	97.9
7.	Novi Pazar	96.7
8.	Cer	92.2
9.	Seličevica	104.1
10.	Zrenjanin	88.7

A number of insolvent broadcasting stations occur at all levels, from national to local. Broadcasting stations are also resold, occasionally leading to illegal media concentration.

9.1.3 MOBILE TELEPHONY

Mobile telephony operators, which are among the biggest RF spectrum users, are constantly increasing the number of base stations, resulting in two principle problems:

- **Interference to base stations caused by different illegal equipment, such as wireless video cameras, jammers, baby monitors, DECT 6.0 cordless phones intended for non-European markets, etc. In 2013 there were 122 reported cases of this type of interference and 133**

owners of such devices were identified during control, mainly of DECT 6.0 cordless phones.

- Growing complaints from individuals reporting harmful radiation caused by base stations and placing base stations on/in delicate buildings/locations such as hospitals, schools or universities.

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9.1.4 WIRELESS INTERNET

An increase in the irregularities in the 2.4/5.7 GHz frequency band was found, in particular concerning the following:

- usages detected outside the limits of the band approved for wireless Internet;
- increased transmitting parameters or misuse of the band;
- usage of unauthorized transmissions, in particular “super a”.

Also there was increasing number of users that fail to report the work to RATEL, although they are required to do so under the law.

9.1.5 FIXED WIRELESS ACCESS (CDMA)

Several years following the introduction of CDMA technology, the number of complaints concerning interference caused by these systems to the signal of other systems, mainly short range devices and TV broadcasting, began to drop. However, the number of complaints concerning the CDMA base station signal reception increased.

9.2 TECHNICAL INSPECTION

Pursuant to the Rulebook on the manner of monitoring the radio frequency spectrum usage, technical inspection procedure and protection from harmful interference, the technical inspections and results of the measured parameters are registered via web portal. In 2013

RATEL carried out 6728 technical inspections of radio stations. Table 14 shows three users with the biggest number of technical inspection performed in 2013.

Table 14. RF spectrum users with the biggest number of technical inspection performed in 2013

RF spectrum user	Number of technical inspection performed in 2012
TELENOR Ltd.	2743
TELEKOM Srbija Joint Stock Co.	1716
VIP mobile Ltd.	344

9.3 ELECTRONIC COMMUNICATION SERVICES AND NETWORKS QUALITY PARAMETERS MONITORING

Pursuant to the Law and the Rulebook on quality parameters for publicly available electronic communication services and monitoring of electronic communication activity (*Official Gazette of RS*, no. 73/11), RATEL stipulated in greater detail the electronic communication services and networks quality parameters. The process of collecting the data on quality parameter values for electronic communication services and networks, (during 2011 and 2012) showed that some parameters cannot be monitored and certain minimum values of quality parameters turned out to be too demanding for the operators in the national market. Therefore, RATEL adopted the Rulebook amending Rulebook on quality parameters for publicly available electronic communication services and monitoring of electronic communication activity (*Official Gazette of RS*, no. 3/14, of 15.1.2014), in force as of 23.1.2014.

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

- 1 public voice service on the public telephone network at a fixed location,
- 2 public voice service on the public mobile communication network,
- 3 public voice service provided via Internet,

4 broadband access,

5 media content distribution,

and for the following networks:

1 public mobile communication networks

2 public fixed wireless telecommunications networks (CDMA)

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

The parameters provided in form of a report on an annual basis may be divided in three groups:

1 Parameters that involve different records kept by the operators, such as successful call rate, records on customer complaint, service setup requests, records on faults, etc.

2 Parameters evaluated based on surveys (customer relations, professionalism of help line)

3 Help line parameters, based on the Call Manager reports.

The reports on the values of quality parameters for electronic communication services and networks were submitted to RATEL by the operators. In 2012 and in 2013 RATEL performed the verification of the received reports on the quality parameters with a number of operators. The verifications was carried out in order to check the accuracy of the provided data.

In 2012 RATEL performed the verification of the received reports on the quality parameters for publically available electronic communication services and networks for 2011 with the following operators:

- 1 JP PTT saobraćaj Srbija, Belgrade, for media content distribution service,
- 2 BEOTELNET-ISP, Belgrade, for broadband access and VoIP service,
- 3 Serbia broadband - Srpske kablovske mreže d.o.o. (SBB), Belgrade, for media content distribution service, broadband access and VoIP service,
- 4 Su Online d.o.o., Subotica, for broadband access service,
- 5 Truf d.o.o., Belgrade, for broadband access and VoIP service,
- 6 JOTEL d.o.o., Niš, for media content distribution service,
- 7 NINET Company d.o.o., Niš, for broadband access service,
- 8 Gama Elektronics d.o.o., Belgrade, for broadband access service,
- 9 Telenor d.o.o., Belgrade, for public services on public mobile communication network and for public mobile communication network,
- 10 VIP mobile d.o.o., Belgrade, for public mobile communication network services and for mobile communication network,
- 11 Telecommunications Company „Telekom Srbija“ a.d., Belgrade, for public voice services on public telephone network at a fixed location, for public mobile communication network services, for broadband access service, for media content distribution service for public communication networks and for public fixed wireless telecommunication network (CDMA).

In 2013 RATEL performed the verification of the received reports on the quality parameters for publically available electronic communication services and networks for 2012 with the following operators:

- 1 Orion telekom tim d.o.o. and Orion telekom d.o.o., for VoIP, broadband access, media content distribution and for public fixed wireless telecommunications network (CDMA);
- 2 Telenor d.o.o., for public voice services on public telephone network at a fixed location, for public mobile communication network services and for public mobile communication network;
- 3 Targo telekom, for broadband access and media content distribution service;
- 4 Verat, for VoIP and broadband access service;
- 5 VIP mobile d.o.o., for public mobile communication network services and for public mobile communication network;
- 6 I.KOM d.o.o., for VoIP, broadband access and media content distribution service;
- 7 Telekom Srbija a.d., for public voice services on public telephone network at a fixed location, for public mobile communication network services, for broadband access service, for media content distribution service, for public mobile communication networks and for public fixed wireless telecommunication network (CDMA).
- 8 Serbia broadband - Srpske kablovske mreže, SBB, for public voice services on public telephone network at a fixed location, VoIP, broadband access and media content distribution service.
- 9 DOO Knight Development Support - K.D.S. Internet branch, Novi Sad, broadband access and for media content distribution service.

RATEL maintains an up-to-date database on the quality of the public communication networks and services. Indeed, the operators are required, pursuant to Art. 106 of the Law, to make the agreement 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 QoS of the electronic communication.

RATEL is currently collecting the data on the 2013 quality parameter values. The collected data on the quality parameters for the public communication networks and services need to be analyzed and additionally verified and, therefore, the data cannot be presented yet.

Average values of the results obtained based on the received quality parameters for electronic communication services and networks for 2011 and 2012 are given in Table 15.

Table 15. Average values of the quality parameters for electronic communication services and networks for 2011 and 2012

Values of the quality parameters for public voice service provided by public telephone network at a fixed location (Only one operator provided the report for 2011 and three operators provided the report for 2012)

Parameter	Definition	Minimum value	Average value in 2011	Average value in 2012
Supply time for fixed network access	The duration from the instant of a valid service order being received by a direct service provider to the instant a working service is made available for use.	10 days for 50% of new connections a year	4 days	6.7 days
Fault report rate per fixed access lines	The number of fault reports per fixed access line refers to the total number of fault reports a year divided by the number of active lines	15% or 15 per 100 lines	30	8.75
Fault repair time for 80% of quickies repairs of access lines a year	The total duration of all faults (from the instant a fault report has been made to the instant when the service element or service has been restored to normal working order) divided by the number of faults.	36 hours	48 hours	22.5 hours
Unsuccessful call ratio	An unsuccessful call is a call attempt to a valid number, properly dialled following dial tone, 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. The measurement shall be performed on the biggest possible sample.	1%	1.03%	0.94%

Values of quality parameters for public service provided by public mobile communication network (For both 2011 and 2012 the report was provided by all three operators: Telenor, Telekom Srbija and VIP Mobile)

Parameter	Definition	Minimum value	Average value in 2011	Average value in 2012
Call/Packet Session Success Rate for GSM network	CSSR=(successfull_attempts/all_call_attempts)*100[%]	> 98% At network level	99.11%	99.32%
Call/Packet Session Success Rate Applicable for UMTS network	CSSR=(successfull_attempts/all_call_attempts)*100[%]	> 98% At network level	99.65%	99.64%
Telephony Setup Time for GSM network	Time between sending of complete address information and receipt of call setup notification	-	5 s	4.6s
Telephony Setup Time for UMTS network	Time between sending of complete address information and receipt of call setup notification	-	3.4 s	3.7 s
DL Throughput for Packet Interactive	Average throughput towards user (DL) for packet interactive	> 128 Kb/s DL	1655 Kb/s	3280Kb/s
Bill Correctness Complaints	Percentage of bills followed by user complaint (% of complaints that result in bill correction)	≤1%	0.35%	0.39%
Response time for operator services	The duration from the instant when the address information required for setting up a call is received by the network to the instant the human operator answers the calling user to handle the	20 s in 60% of cases	61.5 s	59 s

Values for quality parameters for public voice service provided over the Internet (For voice service provided via Internet, the report was submitted by 30 operators for 2012 and by 21 operators for 2011)

Service Supply Time	The duration from the instant of a valid service order being received by a direct service provider to the instant a working service is made available for use for 95% of requests	8 days for more than 95% of requests	3 days	4.5 days
Customer Complaints Resolution Time for 80% of complaints	Resolution time for 80% and 95% of complaints from the moment of complaint submission.	1 day	2 days	3 days

Values of the quality parameters for broadband services
Reports on quality parameters for broadband services were submitted by 164 operators for 2012, and by 97 operators for 2011.

Service Supply Time	Average time between sending of complete address information and receipt of service setup notification for 95% of requests	8 days for more than 95% of requests	3 days	4 days
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Quality parameters for media content transmission services
Reports on parameters for media content transmission services were submitted by 60 for 2012, and by 34 operators for 2011.

Service Supply Time	Average repair time refers to period between malfunction being reported and being repaired for 95% of requests	8 days for more than 95% of requests	5 days	4 days
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QoS Complaints	Number of complaints in proportion to total number of users (%)	-	5.5%	3.9%
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Fault Repair Time	Average repair time refers to period between malfunction being reported and being repaired	48 hours	15.5 hours	16 hours
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Values of quality parameters for public mobile communication network
Report on quality parameters for public mobile communication network both for 2011 and 2012 was submitted by three operators: Telekom Srbija a.d., Telenor d.o.o. and VIP Mobile d.o.o.

GSM coverage	GSM network signal coverage may be expressed as the percentage of the entire territory of the country covered, percentage of the population covered, or there may be specific requirements such as coverage of specific roads. GSM network should be regarded as a whole, and the coverage should be measured simultaneously in all frequency bands for RxLev > -95 dBm	-	83.55%	85%
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UMTS coverage	UMTS network signal coverage may be expressed as the percentage of the entire territory of the country covered, percentage of the population covered, or there may be specific requirements such as coverage of specific roads for CPICH RSCP > -105 dBm	-	45%	48.7%
Peak Hour Handover Success Rate Applicable to GSM network	Percentage of successful handovers in GSM network in peak hour.	≥95%	97.66%	97.52%
Network load for GSM network voice traffic	Erlang/TRX (mean value and standard deviation)	-	2.26 Erlang/TRX	2.27 Erlang/TRX
Network load for UMTS network voice traffic	Erlang/cell (mean value and standard deviation)	-	1.13 Erlang/TRX	1.82 Erlang/TRX

Values of the quality parameters for public fixed wireless telecommunication networks

(CDMA): The report on the CDMA network quality consists of the overview of the coverage 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 and Orion telekom. The operators fulfilled the criteria for the network coverage set under the licence for public fixed wireless telecommunications network (FWA) in the frequency band 411.875-418.125/421.875-428.125 MHz and voice service, data transmission, and simultaneous voice and data transmission. The lowest coverage of the localities in districts needs to be 40% for the transmission signal power above -94 dBm.

The operators generally fulfil the set minimum value, with some exceptions. The parameter-related irregularities found during control were indicated. The parameter values are reliable even though they are still below minimum values set. However, with the innovated monitoring, management and surveillance systems the values were improved compared to 2011.



There are fewer operators with a small number of users providing reports on quality parameters, compared to the operators with a large number of users. The operators with a small number of users are often unaware of the set quality parameters that they are required to provide values for to RATEL. Also, the values they provide are often unreliable. On the other hand, the operators with a large number of users have professional software for quality parameter monitoring, as described in the reports on verification of the data on quality parameters for electronic communication services and networks for 2011 and 2012.

10. TELECOMMUNICATIONS NETWORKS OF PUBLIC ENTERPRISES

10.1. ELECTRIC POWER INDUSTRY OF SERBIA, PUBLIC ENTERPRISE

The Electric Power Industry of Serbia (EPS) telecommunications system is one of the most important enablers for reliable and efficient operation of the electric power system of the Republic of Serbia. The EPS telecommunications system consists of the network of optical cables in the trunk and regional layer, transport network based on SDH technology and packet network based on IP/MPLS technology.

10.1.1. OPTICAL CABLE NETWORK

The network of optical cables can be divided into trunk, regional and local. The description of the network of optical cables relates primarily to the trunk layer.

The trunk layer optical cable network was built into the high-voltage electrical power transmission network. At the 400 kV and 220 kV power lines the cables were fully replaced by installing lines with built-in optical cables. This type of replacement was completed in a large number of power lines with a voltage level of 110 kV and several lines of 35 kV.

The new optical network was mostly built using OPGW cables with 48 fibres, of those 24 G.652 type fibres and 24 G.655 type fibres. The initial construction line from Belgrade to Bajina Bašta utilized a total of 24 fibres of the G.652 type. In some sections, where the state of power-transmission lines was such as to require extremely thin and light OPGW cables, the 24 fibre-cable, with 12 G.652 and 12 G.655 fibres was also used.

After the installation of terminal devices the fibres in use are automatically under constant control.

Due to the long optical network building period and the ever present need for utilising new telecommunications capacities, the exploitation of some optical sections started before the completion and full deployment of the network. This is especially true for the interconnection routes with neighbouring countries during the process of connecting to the UCTE (*Union for the Coordination of Transmission of Electricity*) and the routes intended for the transport network based on SDH technology.

The network connects all important sites of the electric power system of the Republic of Serbia. At the end of 2013, the network reached the total length of 6,000 km of OPGW (*Optical Ground Wire*), ADSS (*All Dielectric Self-Supporting*) and connecting underground optical cables. The optical network built thus far is shown in Figure 77.

Due to the clear needs for establishing telecommunications links at lower levels, regional and local, the network is being expanded in that direction. For example, within the electric power distribution enterprises, over 30 headquarter buildings, their branch offices and facilities are connected, primarily via ADSS and underground optical cables, and, in some rare cases, via OPGW cable.

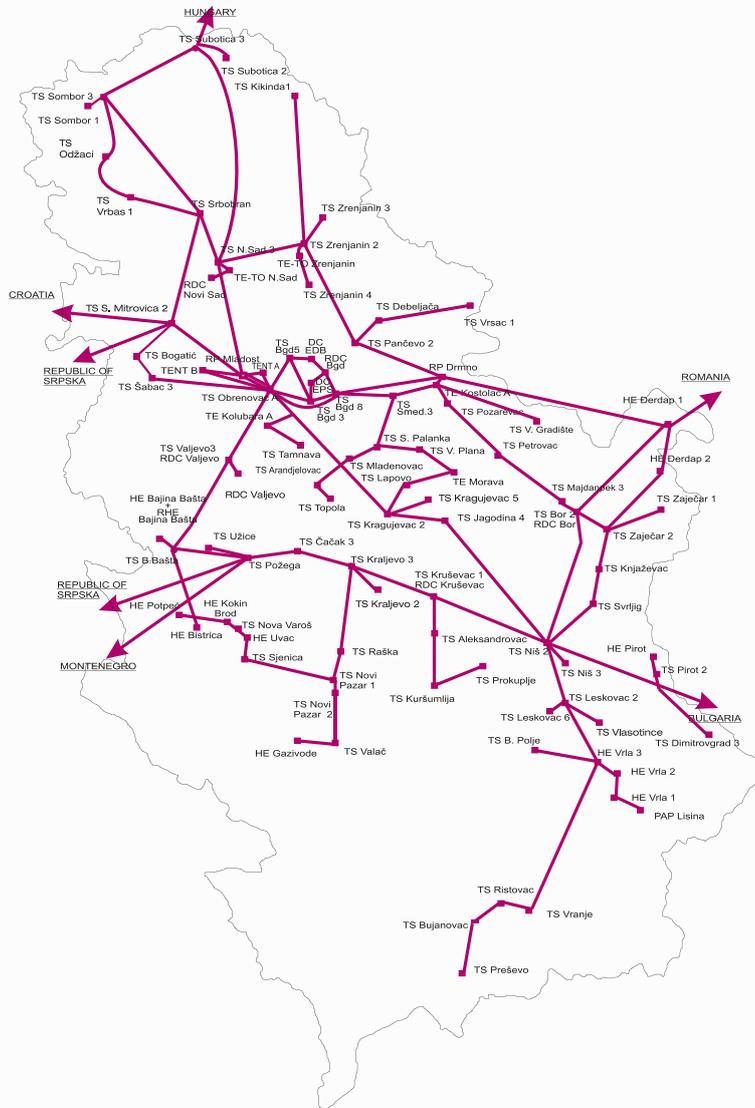
The current realization and immediate plans relate to connecting the unconnected electric power generating facilities, branch offices of the electric power distribution enterprises and certain local and regional routes important for redundant optical connecting of headquarter buildings of dependent enterprises. These further connections of major electric power sites within the country are important both for the electric power sector and telecommunications, and can be deployed for various purposes.

During the year 2014, the trunk layer optical cables built-in at 110 kV power lines will become the property of the transmission system operator, JP EMS, pursuant to the provisions of the future Energy Law.

10.1.2. TRANSMISSION NETWORK BASED ON SDH TECHNOLOGY

The transmission network based on SDH technology was built over the telecommunication optical network and the SDH terminal and multiplex equipment was installed at the network

Figure 77: Physical structure of the EPS optical network





nodes. The trunk level network contains 80 nodes. The Figure 78. shows all points – nodes with installed terminal equipment and telecommunication capacities for corresponding directions.

The SDH network nodes represent the key facilities in the power supply system of the country, i.e. all hydro and thermal power plants, all important transformer stations, as well as facilities where from electrical power connectivity with neighbouring countries is established. The system is connected to two command centres, the main centre located in the National Dispatch Centre (NDC), and the backup centre (DRC - Disaster Recovery Centre), located at separate sites in Belgrade.

SDH technology (Synchronous Digital Hierarchy) was chosen for the purpose of business, technical and voice data transmission, since it was dominant for these types of uses worldwide at the time the project was initiated. The capacities on all major routes are of the STM-16 level (2,488 Gb/s), on minor routes they are of STM-4 (622 Mb/s), while certain peripheral and antenna routes are of STM-1 level (155 Mb/s).

All those points have adequate flexible multiplexers installed, to receive various user interfaces which employ the basic 64 kbit/s channel and enable the channel transfer within the dedicated network. The network also contains the synchronization units which provide synchronization for the complete network.

All planned devices were installed, tested and deployed, and have been in successful exploitation for several years now.

Since the topology of an SDH network is of a mesh type, this required adequate security systems. Since there are no classical rings in the network, traffic security in an SDH mesh network uses SNCP (Sub Network Connection Protection) systems. They provide security for the traffic on a point-point basis, i.e. between the input and output nodes of the SDH network. The LCAS (Link Capacity Adjustment Scheme) protocol is used for transmitting business traffic and routing traffic along various routes.

The control and monitoring systems, as well as the synchronization systems, were implemented and operate successfully. The control and monitoring system is comprised of three

independent subsystems: the system for the control and monitoring of the SDH network, the system for the control and monitoring of the FMUX network and the system for the control and monitoring of the synchronisation devices. The control and monitoring system is a centralised, high availability redundant system which enables remote control of all network elements, SDH, FMUX devices and synchronisation devices.

10.1.3. EPS PACKET-SWITCHED NETWORK

The deployment of the new telecom system of the Electric Power Industry of Serbia, based on OPGW and SDH technology, provided for a modern infrastructural telecom transport network, which serves as a base for building a packet-switched network throughout the territory of the Republic of Serbia. The backbone consists of five core routers within the electric power facilities on five locations, connected into a full-mesh structure through STM-4 interfaces on SDH devices.

OSPF (Open Shortest Path First) protocol was employed as the primary routing protocol. MPLS (Multi Protocol Label Switching) technology is applied to the backbone in order to cater to specific network functions, such as VPN (Virtual Private Network), clear-cut separation of electric power services, traffic management, improved recovery time and QoS. As for access routers, the so-called lite VPN model was applied, with VRF (Virtual Routing and Forwarding) used for the needs of some services and VRF Voice created for the telephone service, and the entire traffic in this VRF is propagated through MPLS network via BGP (Border Gateway Protocol).

The centralized system of control and monitoring of all network elements (core, voice and access routers, switches, servers and IP phones) was realized, both in operational and backup, on two separate locations in Belgrade. The technical concept of the EPS telephone network established by implementing IP technology is based on centralized network calls management, with two control units (soft switches) on separate locations, in cluster architecture.

The first service launched through packet-switched network was telephone service, enabling the communication among the staff responsible for control, monitoring, exploitation and maintenance of the electric power system, as well as the administrative staff responsible

for managing the electric power system. The telephone network is the EPS private corporate network with a closed numbering system and star-loop physical structure, built in one layer, in order to provide the high, five nines (99.999) network availability using the property of the alternate traffic routing.

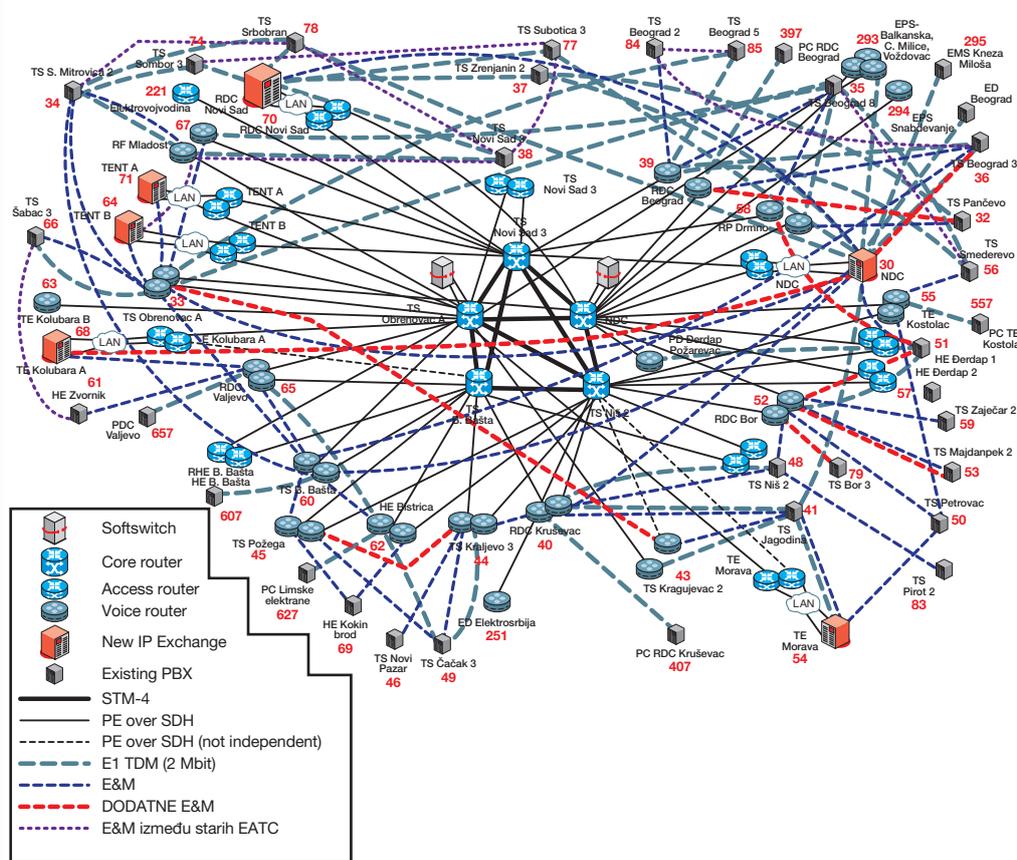
There are 30 locations connected in the access segment of the network, with 24 locations having two independent routers connected to different routers in the packet-switched network backbone, due to the high availability level required, and 6 locations having one router. Access routers on 19 out of the 30 locations have become voice gateways, i.e. IP telephone exchanges, by inserting the integrated cards for connecting to the TDM exchanges and public network.

There are another six facilities connected to the IP telephone network via access routers, mainly large production or managing/administrative centres, where new IP-TDM exchanges had been installed, and also five locations with fairly advanced TDM exchanges. Other locations with telephone exchanges that had been previously procured and installed, have been connected to a single telephone network via SDH devices, through E1 or 4-wire channels.

Another service realized through the EPS package network and over the existing infrastructure is the transmission of business data of EPS companies, i.e. connection of power distribution and production companies headquarters to the IP/MPLS network. New VRF applications will be created for electric power services provided over the packet-switched network, similar to VRF DATA for business data transmission.

The implementation of IP telephony and business data transmission in the electric power system entailed the roll out of a high-availability corporate packet-switched network and strict requirements regarding QoS, thereby creating an infrastructural network which supports of a greater number of services required by the electric power system (data transmission for controlling the electric power system, business data transmission, video signal transmission for videoconferencing, etc.), leading to a more efficient and rational usage of the telecom infrastructure. Examples of implementing new services are audio conference system and video conference system.

Figure 79. EPS IP telephone network



Audio conference system (*Webex*) is a web oriented system consisting of the central software system for managing and controlling conference sessions, which combines audio, video and web conferences into a single session. Video conference system (*Telepresence*) is a single/integrated solution over the existing IP telephone system. Telepresence solutions have been introduced into the EPS system and all EPS companies headquarters have been successfully connected with the Belgrade headquarter.

10.1.4. TELECOMMUNICATION NETWORKS OF EPS COMPANIES

The EPS telecommunication system built at trunk level is in the phase of intense activities aimed at connecting it to the telecommunication networks of its companies, built at regional and local level. Although they are not the topic of this report, it is necessary to point out that all companies engaged in electric energy production and distribution have their own complex telecommunication networks which primarily enable the internal operation of business information systems and technical control systems, business and telemetry data transmission and many other applications. These telecommunication networks are, wherever possible, based on optical infrastructure, SDH transmission technology and EPS IP telephone network. The telecommunication system of EPS group (PE EPS and its dependent companies) has thus become the most developed private telecommunication system in Serbia, regarding volume, fulfilling the most complex functions.

10.2. ELECTRIC ENERGY TRANSMISSION AND TRANSMISSION SYSTEM CONTROL (EMS), PUBLIC ENTERPRISE

Telecommunications system of the Electric Energy Transmission and Transmission System Control (EMS), Public Enterprise, represents the backbone of the closed functional system which covers the territory of the Republic of Serbia and is used for the purposes of the electrical power sector. More than 90% of traffic in the electric energy sector is transmitted for the needs of the EMS, Public Enterprise, which is in charge of maintaining, monitoring and managing its resources.

Due to the requirements of technological processes pertinent to the electrical power transmission system management, this telecommunications system enables a higher level of information transmission reliability and security, with lower transmission speed and capacity requirements as opposed to public telecommunications networks. Such a concept originates from the rules defined by the UCTE/ENTSO-E (Union for the Coordination of Transmission of Electricity /European Network of Transmission System Operators for Electricity - Operational handbook). Several types of services are supported: telephony (operational, business), the transmission of the technical control system EMS SCADA (Supervisory Control and Data Acquisition) signal, Electric Power Industry of Serbia (EPS) and EMS business data transmission, signal transmission for EMS distance power line pro-

10. TELECOMMUNICATIONS NETWORKS OF PUBLIC ENTERPRISES

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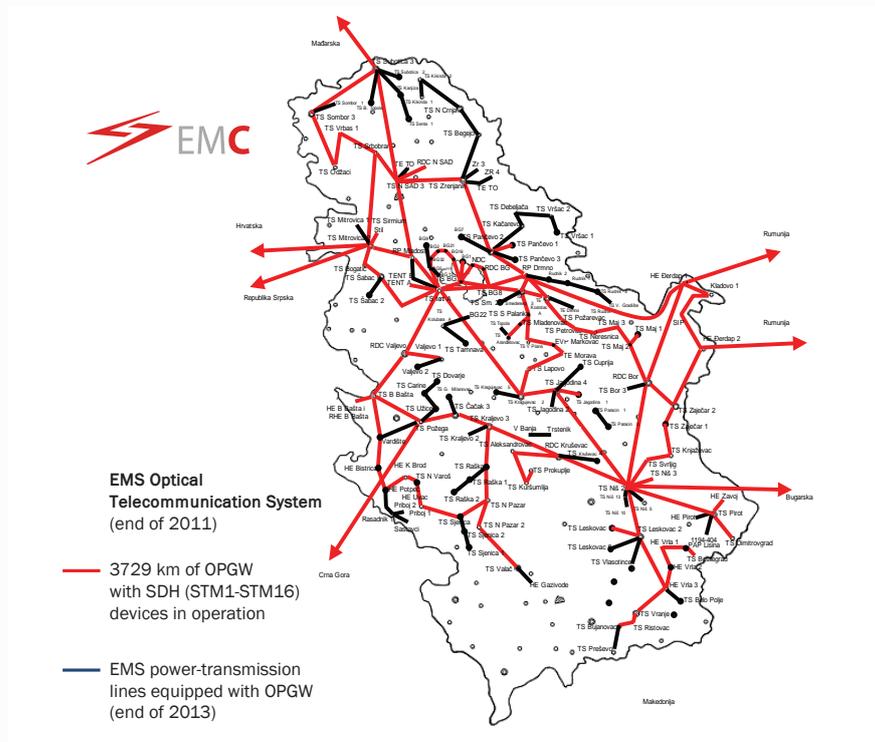
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tection as well as monitoring and managing the telecommunications system. For the purpose of information transmission, EMS uses several networks of different technologies.

The basis of the EMS telecommunications network is the optical network realized by OPGW cables and optical SDH (*Synchronous Digital Hierarchy*) terminal equipment. The OPGW network of cables is an integral part of EMS power lines, since the power line protection is the basic power function). OPGW network illustration is given by EPS.

Until the end of 2013, there were approximately 4500 kilometres of OPGW cables installed. Over 90% of OPGW cables have 48 fibres: 24 ITU-T 652 standard fibres and 24 ITU-T 655 standard

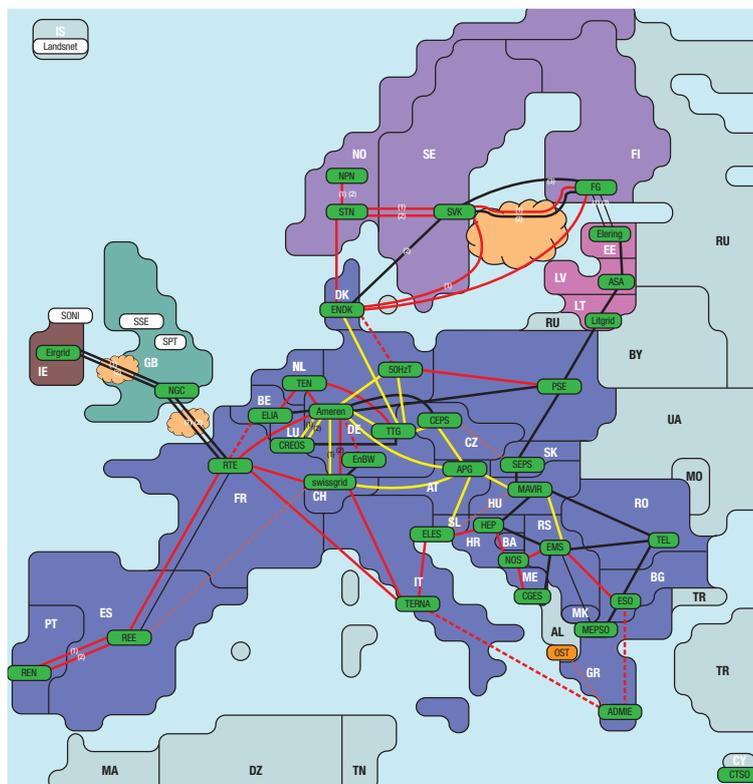
Figure 80. EMS optical TK system



fibres. EMS optical terminal devices are installed along 3730 kilometres. These devices are in function in 79 nodes. The speed levels are STM-1 (155 Mbps) and STM-2 (2.5 Gbps). Figure 80. illustrates the EMS telecommunications system (OPGW network and network of active devices).

The necessary path redundancy was achieved through 8 STM-16 and 8 STM-1 optical loops: both SDH and PDH (Plesiochronous Digital Hierarchy) links have been in operation incessantly, whereby the exceptional availability of the order of 99.99% was achieved. Monitoring, management, configuration and partial maintenance of the built-in optical equipment is conducted, in real time, from the operational room of the EMS Telecommunications Centre.

Figure 81. European Energy Telecommunications Network



With the use of optics, and in accordance with the ENTSO-E recommendations, EMS is connected with electrical power industries of Hungary, Bosnia and Herzegovina, Croatia, Romania and Bulgaria. Connections are realized by means of STM-1 links, whereas devices support links up to STM-16. In this way, EMS is linked to the European Energy Network (Electronic Highway - EH). This network is used for the exchange of data on the electrical power systems of European countries in real time, with the aim of ensuring the security of the European electrical power sector. The connection with Montenegro is secured by STM-1 link. Figure 81. illustrates the abovementioned international links. It shows that EMS has a considerably higher number of interconnections in relation to the number of links of most of the other countries.

The network of very high (VH) frequency links consists of sections realized along high-voltage lines. These sections are mainly analogue, with few channels, and, in some telecommunication centres, connected into the single network via automatic power system telephone exchanges (EATC). Voice and telemeasuring data are transmitted over VF connections. VF network, although technically obsolete, has maintained its functionality and fulfilled the basic planned technical requirements. With the development of telecommunications systems, VF links are using their role and will most likely be used for securing alternative paths.

The power system telephone exchanges are in the process of gradual replacement and migration towards the use of IP technology (out of the 32 existing exchanges, only 16 have satisfactory characteristics). Within the 15/08/PT project for the packet telephone network realization, 18 packet telephone exchanges were installed within the single EMS and EPS telephone network.

Mobile links, which include base stations, appropriate repeaters and terminal stations of various types, provide efficient operation of fieldwork teams, particularly in rural areas. These mobile links cover most of the territory of the Republic of Serbia. Further development of the mobile network is currently in stagnation. EMS uses 5 radio-relay links in the 7.8 and 23 GHz bands. Digital links with STM-1 and 34 Mbps capacity are integrated into the telecommunications system.

By upgrading and modernizing the EMS telecommunications system enabled significantly higher bitrates, availability and reliability of transmissions, which resulted in substantial sav-

ings during 2013. By transferring the traffic into its own system, EMS terminated the lease of Telecom Serbia's lines. The amount of savings has exceeded the value of the active equipment built in. By building and exploiting the modern telecommunications system, the EMS personnel gained new skills necessary for the activities of operational management, monitoring, as well as maintenance of the EMS telecommunications system. In retrospect, the usage of the optical transmission system can be regarded as one of the main characteristics of the previous period.

There are unused capacities within the active equipment, so one of the existing telecommunication systems (PE EMS, PE EPS) can be partly used by third parties. Such use must take into account the security of operational data related to the process of controlling the power system in real-time (SCADA). Surplus capacities are very pronounced in the OPGW cables. In taking this matter into consideration, one should note that EMS power lines (with OPGW cables) end in transformer stations which have highly restrictive security access. The above-mentioned transformer stations are located outside urban areas.

10.3. SERBIAN RAILWAYS, AD

10.3.1. CURRENT STATE OF THE TELECOMMUNICATION SYSTEM

Telecommunication systems along the Serbian Railways railway network comprise cable systems, transmission systems, switched systems, railway devices, radio systems and information systems.

Cable systems along the Serbian Railways electrified railways are used for transferring telecommunications and signalling data and data necessary for the stability of electrical traction facilities. STA (with no coaxial tube) and STKA (with coaxial tube) railroad signalling-telecommunications cables are used for these purposes.

Optical cables were laid down within the Belgrade railroad junctions (the business facilities at Nemanjina 6 – Belgrade Passenger – Belgrade Centre) and along the sections Belgrade

Centre – Pančevo Main, in the total length of 21 km. Optical cables were laid along Požega – Kraljevo route in the total length of 65.7 km. The abovementioned optical cables have the capacity of 8 (Pančevo most-Pančevo glavna), 10 (Požega-Čačak), 12 (Beograd Centar-Pančevo most), 24 (Beograd Nemanjina 6-Beograd Centar) and 36 (Čačak-Kraljevo) fibres.

Transmission systems types depend on the railway routes and categories. VF transmission along major routes are realized by 300 channel systems, and along side routes by 12 channel systems. All transmission systems are analogue, using electronic tubes and transistors as basic components. It serves as telephone transmission system.

Some routes of the Belgrade railroad junction transmit signals over SDH systems, with bitrate of 155 Mb/s.

Circuit-switching system, Railway Automatic Network, is a hierarchical functional structure including 55 telephone exchanges and app. 6000 active connections. Step-by-step and register-marker telephone exchanges are mostly used, and digital exchanges to a lower extent.

Railroad telephone systems enable operational management of railway traffic and transmission of the signalling-security units data for the needs of the stable electrical traction facilities (SPEV), as well as other data needed for immediate security of facilities and installations. They include railway track telephone devices which enable voice transmission within the process of running and controlling railway traffic. Type and capacity of the railway track telephone devices depends on the manner of controlling railway traffic and the railway capacity.

Major railway routes have 17 dispatch exchanges with TK desks for communications of the traffic dispatchers and electric traction dispatchers with the official points along the tracks, 196 station dispatch exchanges with TK desks for the communication of the station dispatchers with the traffic dispatchers and electric traction dispatchers, and also with the official points along the tracks equipped with over 1250 track telephones. The majority of the track telephone devices are of the radio-relay type. In the past 10 years some radio-relay units (app. 10%) were substituted by compatible elements realized in modern digital technology.

Radio link systems are a single technical and technological unit in terms of operation and usage.

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The Serbian Railways uses the following frequency bands:

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- 147.775-148.300 MHz band paired with 152.275-152.800 MHz for radio networks for communication in traffic control along non-electrified railroads (Zrenjanin-Kikinda, Subotica-Banatsko Miloševo, Crveni Krst-Zaječar, Lapovo-Kraljevo, Pančevo - Vršac, Ruma - Šabac, Novi Sad - Orlovat);
- 167.250-167.375 MHz band paired with 171.750-171.875 MHz reserved for the ZGOP radio networks (in the Serbian Railways network);
- 444.450-445.625 MHz band paired with 454.450-455.625 MHz for local radio networks in larger classification yards and sorting stations, as well as maintenance services,
- 457.450-458.300 MHz band paired with 467.450-468.300 MHz for the locomotive radio dispatch system enabling communication between dispatchers and engine drivers, in use along all major routes (Beograd-Mladenovac-Lapovo-Niš-Preševo, Beograd-Mala Krsna-Velika Plana, Batajnica-Šid, Indija-Subotica-state borderline, Resnik-Požega, Beograd node rails – cargo and passenger traffic).

A vast array of devices is in use in the radio-systems currently operating on the railroads, from the earliest generation of devices manufactured using transistor components, up to modern microprocessor-based radio devices.

10.3.2. INVESTMENT DEVELOPMENT PLAN

The investment development plan takes into consideration only main railroads. For side railroads, the continuity of the telecommunication system will be established on certain routes, according to the technical requirements of the Traffic Department and financial assets, by installing free-standing cable, radio stations at important official sites or partial calibration.

10.3.2.1. CABLES

The plans for the investment works for main routes where no copper cables have been laid down (Niš – Dimitrovgrad and Belgrade – Vršac) envisage the laying of copper STA–PV1 4x4x-1,2NF+12x4x0,9NF and optical cables, mostly with 144 optical fibres, into the ground, whereas along other main routes where railroad copper signals-telecommunications cables of the STKA and STA types are in use (Belgrade-Bar, Belgrade -Šid, Belgrade -Niš-Preševo, Indija-Subotica, Belgrade - Mala Krsna-Velika Plana) mostly 144 fibre optical cables will be laid into the ground.

The project documentation for the first phase of the optical infrastructure in the length of 461 km along the railway tracks of the Belgrade railway node and railway tracks Belgrade– Šid and Belgrade – Niš. The completion of the project documentation for other Corridor X railway tracks and the route to Bar are underway.

10.3.2.2. TRANSMISSION NETWORK

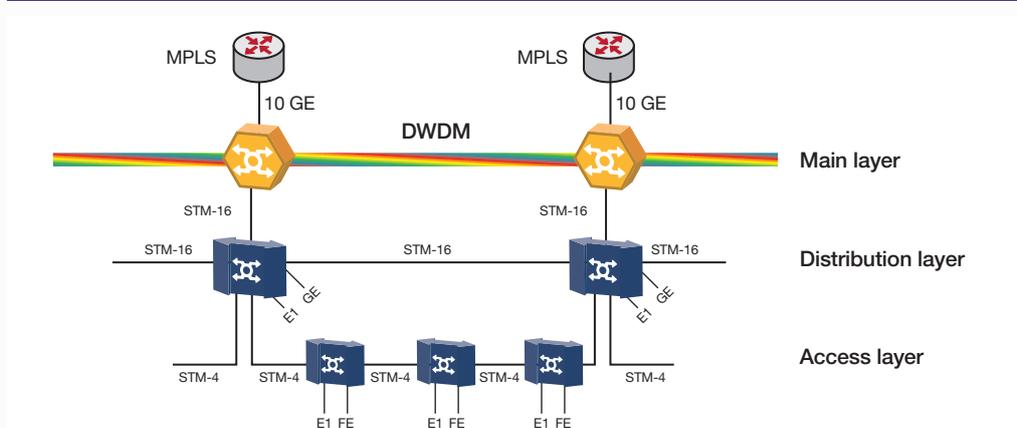
The complete transmission network architecture consists of three layers:

- Main
- Distribution
- Access

Since the principal Serbian Railways network topology element is the daisy chain, the above-mentioned transport network levels overlap physically. Redundant rings are planned (RR links, second optical cable, leasing additional capacities from other providers, etc.), since it is the only way for securing maximum traffic safety.

The transport network layer is realized in DWDM (Dense Wavelength Division Multiplex) technology, with a minimum of 8 wavelengths having 10 Gb/s bitrate per channel and 50 or 100 GHz channel separation.

Figure 82. Transport network architecture



DWDM nodes are located in regional centres, junctions and border stations. They enable aggregation of the MPLS network traffic(10 GE WAN) and the transport network distribution layer traffic (STM-16).

The distribution layer's task is to provide connection between the main and the access layer. It is realized in NG SDH technology with STM-16 capacity. Nodes of this layer are in DWDM nodes and middle stations, and they enable aggregation of the access layer traffic (STM-4), as well as the local GE and E1 interfaces traffic.

The access layer nodes are located in small stations, where they provide local E1 and FE interfaces. The access layer capacity is STM-1 or STM-4, depending on the traffic needs.

The following distribution layer capacities were planned for the main routes on the territory of Serbian Railways (STM-16-STM-4 and STM-4-STM-1, depending on the total required capacity):

- **STM-1 (Subotica-Sombor, Subotica-Horgoš, Novi Sad-Sombor, Šid-Sremska Rača, Ruma-Šabac-Zvornik, Prahovo-Zaječar);**

- STM-4 (Belgrade-Prijepolje, Niš-Dimitrovgrad, Beograd Centar-Mala Krsna-Velika Plana, Niš-Preševo, Novi Sad-Subotica, Subotica-Kikinda, Subotica-Zrenjanin, Stalać-Kraljevo-Požega, Lapovo-Kraljevo, Kraljevo-Lešak, Beograd-Pančevo-Vršac, Indija-Šid, etc.);
- STM-16 (Beograd -Niš, Beograd - Indija-Novi Sad, Beograd Centar- Beograd -Nemanjina);

10.3.2.3. CIRCUIT-SWITCHING NETWORK

The plan for the Serbian Railways network is to apply cluster technology with servers located at various geographical sites and connected by WAN links with enabled QoS functions – cluster over WAN.

According to the administrative organization and in line with the character and size of the territory it operates on, the telephone network is planned to operate as a three-tiered network:

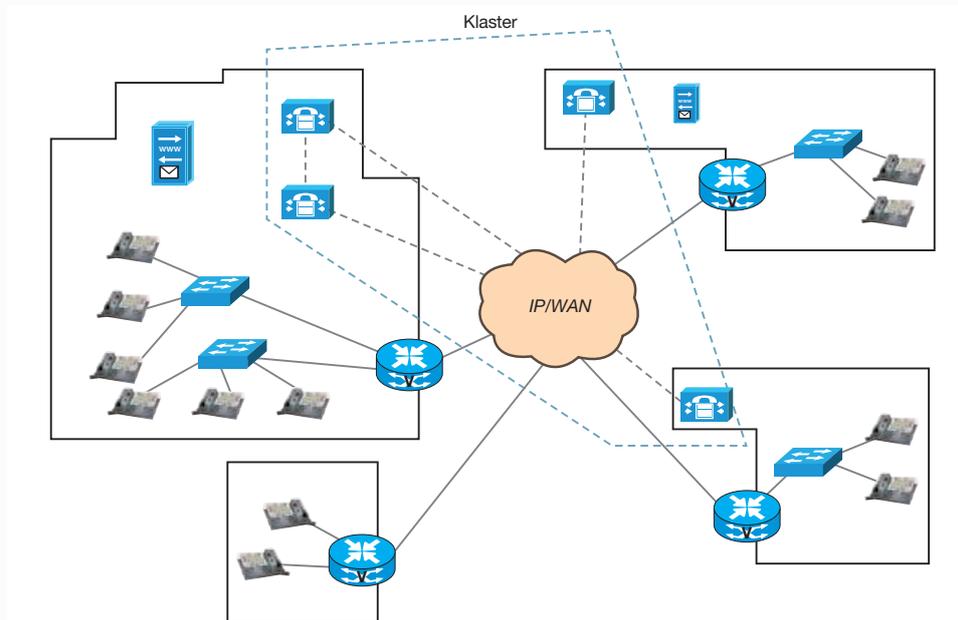
- 1 transit layer,
- 2 regional layer and
- 3 local layer.

The transit layer is a cluster in full-mesh topology. This layer contains the central database which stores the configuration data, user data, including their rights, terminal adapter addresses, numbering plan, etc. System control and monitoring are run in this layer. Standard signalling protocols, SIP and/or H.323, are planned for processing network calls. Cluster call-servers operate in the load distribution mode.

The regional layer includes locations with a significant number of users, which will be equipped with low capacity call servers or voice routers in order to provide local redundancy and uninterrupted operation of local IP telephone devices in cases of not being able to establish connection with cluster call servers.

The local layer covers all other official sites, i.e. stations with a few connections.

Figure 83. Cluster technology application in the circuit-switching network



The closed numbering system is suggested for the network. Connections with other systems, such as clock systems, railway track telephony system, GSM-R and public telephone network, is also planned.

10.3.2.4. RAILWAY DEVICES

The investment works envisage the setup of modern railroad telephony systems manufactured using digital integrated technologies.

New systems with digital communication nodes (DCN) will be used along electrified international corridor railroads. The installation of a new generation of railroad telephony systems includes changes to current rulebooks and manuals.

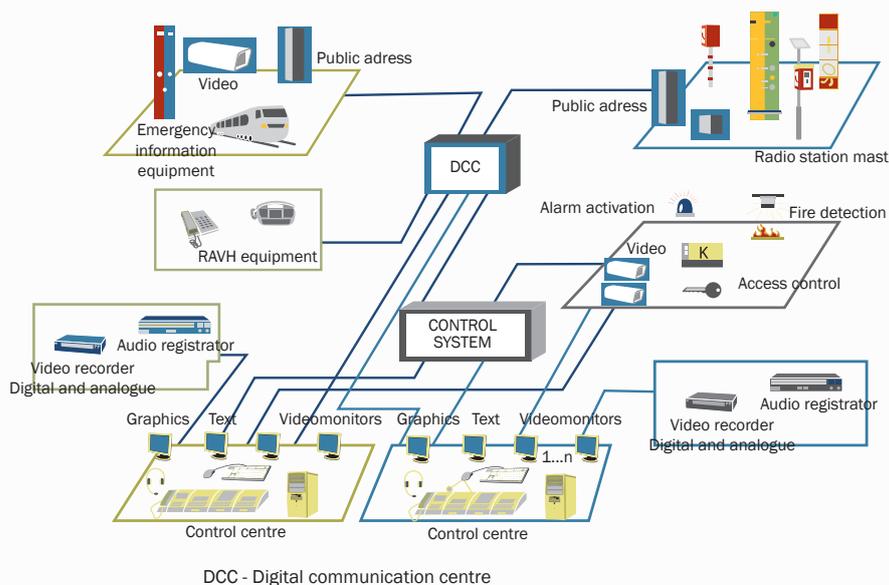
New integrated digital systems of railroad telephony will be implemented along the international Corridor X following the completion of the construction of optical infrastructure.

Figure 84. shows the systems that can be integrated within the DCN nodes and the dispatcher centres of the Dispatcher Systems of Traffic and Electrical Traction.

This solution provides for the traffic and electrical traction dispatchers to communicate with traffic and driving personnel in stations and along the railroad in order to regulate railroad traffic along a dispatcher section and provide for infrastructure maintenance. The system enables selective connections with call identification between nodes and the dispatcher centre.

The main DCN would be located in the dispatcher centre, whereas first-level digital switching nodes would be installed along the railroad in most stations. Communication between the main

Figure 84. Digital Integrated Railroad Telephony Systems



DCN in the dispatcher centre with nodes along the railroad is established through first-level DCNs. Other, smaller stations would house station and railroad connection concentrators connected to first-level DCNs by multiplexers on copper cables. The main DCN and the first-level DCNs are to be connected by optical cables, while communication will be conducted along a digital transfer system where a 2Mbit-access should be planned for at each node and for mutual communication.

The input and output signals, road crossings and railroad telephones should be fitted with intercom-style telephones.

10.3.2.5. RADIO-SYSTEMS

Further choices for integrated mobile communications are digital radio based on the GSM-R networks and bands within the designation of allocated bands were reserved to this end.

As for migration routes, the choice for the mobile segment is to equip the entire pool of vehicles with locomotive radio stations, noting that dual-mode stations shall be procured, supporting both analogue operation at 450 MHz and the GSM-R network.

A stable infrastructure migration model will depend on financial resources.

Local UHF networks will need expansion within the 450 MHz band, in order to meet the requirements of the relevant traffic volume and the complexity of technological processes of equipping larger stations.

VHF radio networks intended for traffic regulation will be built only where the telecommunication links continuity is not secured and where the railway traffic safety might be put at risk. Bearing in mind the expected cease of manufacturing analogue devices for professional systems on one side, and the feasibility of migrating from analogue to digital technology on the other side, a realistic plan is to implement analogue equipment which can be upgraded for digital operation in the future.

10.4. ACADEMIC NETWORK OF THE REPUBLIC OF SERBIA - AMRES

The network infrastructure of the Academic Network of the Republic of Serbia – AMRES connects academic, scientific-research and educational institutions of the Republic of Serbia into a single computing-communications network. AMRES infrastructure network consists of access network, backbone and external links. Access network connects the end-institutions with AMRES network access points. The access points enable physical access to AMRES network infrastructure and AMRES services to one or more member institutions.

Compared to the previous report submitted by AMRES to RATEL, there have been no changes with respect to the status of the leased optical infrastructure, whilst there have been slight changes in the status of some external and internal links, and some communication equipment has been procured. The current technical status of the network is given in further text.

The backbone of AMRES network consists of intercity and inner-city optical links, which connect the access points. External links refer to AMRES network connections with GÉANT (*Gigabit European Advanced Network Technology*), foreign academic networks, telecom service providers and other partner institutions.

In the current network topology, the capacity of the primary connection to GÉANT is 10 Gb/s, and to Internet via GÉANT access point in Budapest 3 Gb/s. The capacity of the secondary connection to GÉANT and Internet is 1 Gb/s, via Hungarian academic network HUNGARNET. AMRES network is also connected to the Academic Network of Republika Srpska SARNET, via 1 Gb/s optical link.

In the current active network topology, the access points are located in the following 20 towns: Belgrade, Novi Sad, Niš, Kragujevac, Subotica, Sombor, Zrenjanin, Šabac, Pančevo, Valjevo, Užice, Čačak, Kraljevo, Kruševac, Leskovac, Vranje, Bor, Pirot, Novi Pazar and Kosovska Mitrovica. The access technology mainly used for connecting the institutions to AMRES network is fibre-optics, and xDSL VPN and analogue links to a lesser extent.

The first two phases of the **SEELight** project (*South-East European Lambda Network Facility for Research and Education*), by signing the contract on leased optical fibres in 2010 between the Ministry of Telecommunications of the Republic of Serbia and Telekom Srbija, enabled leasing around 3800 km of optical fibres for the purposes of both backbone and access networks. Around 2000

km of optical fibres had already been in place, whereas the rest of the network was completed in 2011 through the implementation of the second phase of **SEELight** project. The completion of the second phase created preliminary conditions for connecting academic, scientific-research and educational institutions to MARES access points in 53 cities in the Republic of Serbia (Figure 85.). In Addition to the 20 cities which already have AMRES access points, procurement of the new communication equipment will enable connection of new institutions to AMRES access points in the following cities: Kikinda, Bečeј, Vrbas, Apatin, Šid, Sremska Mitrovica, Ruma, Indija, Vršac, Loznica, Mladenovac, Smederevo, Požarevac, Velika Plana, Jagodina, Paraćin, Prijepolje, Ivanjica, Gornji Milanovac, Raška, Tutin, Sjenica, Kladovo, Negotin, Zaječar, Dimitrovgrad, Prokuplje, Medveda, Bujanovac and Preševo The leased optical lines contract signed between the Ministry of Telecommunications of the Republic of Serbia and Telekom Srbija was closed for the 15 year period and is valid till November 2026.

Figure 85. AMRES Network Backbone Topology



11. LIST OF BYLAWS

11. 1. LIST OF BYLAWS WITHIN RATEL'S COMPETENCE

- Rulebook on fee calculation for the provision of services within the competence of the Republic Agency for Electronic Communications (*Official Gazette of RS*, no. 34/13)
- Rulebook on the manner of radio frequency usage under general authorization regime (*Official Gazette of RS*, no. 28/13)
- Rulebook on the terms and conditions for access to and usage of the data from a public directory (*Official Gazette of RS*, no. 84/11)
- Rulebook on obligations of value added services provider (*Official Gazette of RS*, nos. 76/11 and 91/11-corr.)
- Rulebook on quality parameters for publicly available electronic communication services and monitoring of electronic communication activity (*Official Gazette of RS*, nos. 73/11 and 3/14)
- Rulebook on the minimum content, level of detail and manner of publication of reference offers (*Official Gazette of RS*, no. 70/11)
- Rulebook on the scope and content of the minimum set of leased lines (*Official Gazette of RS*, no. 70/11)
- Rulebook on the amount of annual fee for the use of numbering (*Official Gazette of RS*, no. 67/11)
- Rulebook on the manner of radio stations usage on the national and foreign aircrafts, locomotives, ships and other vessels (*Official Gazette of RS*, nos. 60/11 and 68/11-corr.)
- Rulebook on the manner of monitoring the radio frequency spectrum usage, technical inspection procedure and protection from harmful interference (*Offi-*

cial Gazette of RS, nos. 60/11 and 35/13)

- Decision on designating relevant markets susceptible to ex-ante regulation (*Official Gazette of RS*, no. 59/11)
- Rulebook on manner of amateur radio station usage (*Official Gazette of RS*, no. 52/11)
- Rulebook on the application of the cost-accounting principle, separate accounts and reporting of an operator with significant market power in the electronic communications sector (*Official Gazette of RS*, no. 52/11)
- Rulebook on number portability on public telephone networks at a fixed location (*Official Gazette of RS*, no. 52/11)
- Rulebook on general terms and conditions for performing electronic communication activities under general authorization regime (*Official Gazette of RS*, nos. 38/11, 44/11-corr. and 13/14)
- Numbering Plan (*Official Gazette of RS*, nos. 32/11, 35/12 and 64/13)
- Rulebook on application form for the issuance of licence for the use of numbering (*Official Gazette of RS*, no. 32/11)
- Rulebook on application forms for the issuance of individual licence for the use of radio-frequencies (*Official Gazette of RS*, nos. 8/11 and 2/14)
- Rules on radio-frequency usage fees (*Official Gazette of RS*, no. 93/10)
- Rulebook on fees for the performance of electronic communications activities (*Official Gazette of RS*, no. 93/10)
- Decision on designation of operators with the universal service provision obligation (*Official Gazette of RS*, nos. 15/10)
- Rulebook on number portability on public mobile telecommunications networks (*Official Gazette of RS*, no. 5/10)
- Statutes of the Republic Agency for Electronic Communications (*Official Gazette of RS*, no. 59/10)
- Decision on keeping registers, records, data bases and other information

11. LIST OF BYLAWS

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within the competence of the Republic Agency for Electronic communications and publishing thereof on RATEL's website (adopted on 11.02.2011 by RATEL's Managing Board, available at www.ratel.rs)

- Rulebook on terms and conditions and the procedure for the issuance of authorization to a public telecommunications operator for interconnection of a national telecommunications network with a telecommunications network of another country (Official Gazette of the RS, no. 94/08)

11.2.LIST OF BYLAWS PASSED BY THE RESPONSIBLE MINISTRY AND THE GOVERNMENT OF THE REPUBLIC OF SERBIA AT RATEL'S PROPOSAL PURSUANT TO LAW ON ELECTRONIC COMMUNICATIONS

- Rulebook stipulating the Radio Frequency Allocation Plan for public electronic communication service provision – broadband wireless access (BWA) systems, mobile/fixed communication networks (MFCN) in the frequency bands 3400-3600 MHz and 3600-3800 MHz (*Official Gazette of RS*, no. 10/14)
- Rulebook stipulating the Frequency/Location/Area Allocation Plan for terrestrial digital TV broadcasting stations in UHF band for the territory of the Republic of Serbia (*Official Gazette of RS*, no. 73/13)
- Regulation stipulating the Radio Frequency Band Allocation Plan (*Official Gazette of RS*, no. 99/12)
- Rulebook on analogue to digital switchover in TV broadcasting and access to multiplex in terrestrial digital broadcasting (*Official Gazette of RS*, no. 55/12)
- Rulebook on radio equipment and telecommunications terminal equipment (*Official Gazette of RS*, no. 11/12)
- Rulebook on Universal Service (*Official Gazette of RS*, no. 24/12)
- Rulebook on requirements in terms of staff, equipment and premises of an

undertaking, company or other legal entity authorized for measuring and testing the operation of electronic communications networks and services, associated facilities, electronic communications equipment and terminal equipment (*Official Gazette of RS*, no. 13/12)

- Rulebook on stipulating Radio Frequency/Location Allotment Plan for Terrestrial Analogue FM and TV Broadcasting Stations for the Territory of the Republic of Serbia (*Official Gazette of RS*, nos. 9/12, 30/12, 93/13 and 10/14)
- Rulebook on the manner and conditions for the determination of the zone of the electronic communications infrastructure and associated facilities, protected areas and obligations of investors during the construction of buildings and premises (*Official Gazette of RS*, no. 16/12)
- Rulebook on the technical and other requirements when building associated infrastructure necessary for installing electronic communication network, associated facilities when constructing commercial and residential buildings (*Official Gazette of RS*, no. 123/12)
- Strategy for the development of electronic communication in the Republic of Serbia from 2010 until 2020 (*Official Gazette of RS*, no. 68/10)

