

Concept Statements for Russian Telecom Development till 2015

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Abstract— Forecasting characteristics and network solutions for development of Russian public networks presented in the paper. These forecasting characteristics and network solutions are based on the General schemes (basic roadmap document for operator’s networks development in Russia) developed by OJSC “GIPROSVYAZ” for the different Russian companies.

One of the key direction of the Russian public telecom networks development is broadband access. Till 2015 for the Russian wired broadband access networks the rapid development of passive optical networks (PON) is assumed as a base. The forecast of wired broadband development till 2015 was made to achieve similar penetration as for leading OECD countries at the same period of time. The forecast of wireless broadband access penetration and planned technologies are also presented.

Important criteria of network development are not only broadband access penetration, but also characteristics of access speed for end users. Because of the differences in territorial conditions in Russia and big density of population dispersion these access speeds was divided to 3 categories used in General schemes. For all of these categories presented traffic growing forecasts, based on Nielsen's Law.

The critical growing of traffic and broadband subscribers amount require to make new vision to transport networks. Examples of IP/MPLS transport networks architectures for the Russian networks also presented in the paper.

Keywords— Network solution, broadband access, traffic forecast

In recent years the RF has considerably advanced in its development of wired broadband access networks (BBA). On the average, the spread of BBA in the RF has grown to encompass more than 20% of households [1], but, for example, in Sweden, this indicator is 69%, and in the Republic of Korea it is 97% [2]. If we compare the obtained level with growth rates, we can conclude that the RF is behind the advanced nations of the Organization for Economic Co-operation and Development (OECD) in terms of building BBA wired networks [3] approximately by 5-6 years (Fig. 1).

The analysis of these data shows that even today the share of broadband users in some countries accounts for the majority of the client base of telecom operators.

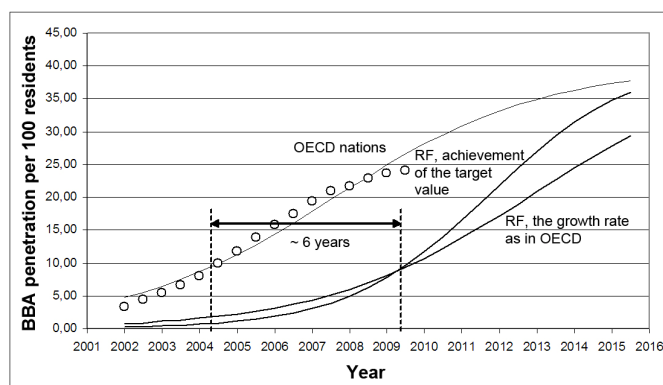


Figure 1. Prediction for the Development of Wired BBA in the RF and OECD Nations on the Planning Horizon through 2015

By 2015 this trend will very probably cover the majority of developed countries in the world, including the RF. In the RF the growth in the number of broadband users is also a strategic objective because expansion of access to data- and knowledge bases (and primarily to those owned by governments) is an important feature of the modern telecommunication development stage. Naturally, this consists of e-government, public access to library, archive, and museum holdings, etc. According to the Information Society Development Strategy [4] in the RF the share of broadband access per 100 persons of the population shall be 35 lines by 2015 (if compared to the density of main telephone stations (MTS) it accounts for over 90% of households). It means that, for example, for OJSC ROSTELECOM the total number of wired BBA users by 2015 may be about 20 million households.

The bandwidth determined by the user traffic is the main characteristic used to predict the development of communication networks. Let us use Nielsen’s law [5], which is used in practice around the world, to solve such problems.

Fig. 2 shows the pessimistic, pragmatic, and optimistic estimates of the average BBA rate on the

planning horizon through 2015 that were obtained based on this law and that were equal to 30, 75, and 128 Mbit/s, respectively. But how reliable are these predictions?

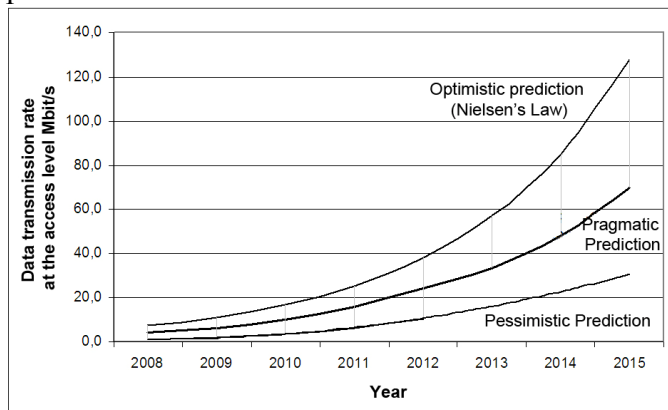


Figure 2. Prediction for Changes in Data Transfer Rate at Access Level on the Planning Horizon through 2015

According to statistical data and predictions made by J'son & Partners the increment of IPTV traffic in the RF came to 70% in 2009. Around the world, on the average, large-scale IPTV operators provided approx. 164 channels by the end of 2009. In the USA, this indicator was 330 channels on the average, and in Europe it was 92 channels on the average [6]. The Russian IPTV providers (the NORTHWEST and SIBIR macroregional branches of OJSC ROSTELECOM, for example, provide 78 channels each. Today, the RF has approx. 350 television channels: 16 All-Russian channels, 117 cable and satellite channels, 7 TV channels broadcasting outside Russia, approx. 180 regional channels, and approx. 30 channels belonging to townships and villages [7]. Assuming that the growth dynamics for the total number of channels is close to the growth dynamics of the number of available channels, we can expect that the number of IPTV channels by 2015 may exceed 400, and the majority of such channels will be broadcast in HDTV and Blu-ray formats, and some – in 3D Blu-ray format. Assuming that during peak hours household users may watch 2 IPTV channels at the same time and actively surf the Web, including watching video materials, the predictive estimates for the average BBA rate are quite well-grounded.

Based on these traffic estimates, we can make an important conclusion that only FTTx (xPON, Optical Ethernet) optic technologies may be

dominating development technologies for wired BBA on the planning horizon. The example of OJSC ROSTELECOM where even today we can see a sharp drop in the xDSL construction rate and considerable FTTx construction growth we can expect that by 2015 the share of BBA FTTx technologies will reach 80% (or 16 million households).

It is comforting that the main growth in the number of BBA users in the RF is now due mainly to the regions, and the Russian Internet has crossed the threshold where now most young people are on the network, and it is time for older generations to explore the Internet. But, if we compare predictive indicators with the existing rates, it becomes clear that in order to commission over 3 million BBA FTTx connections every year, the scope of BBA designing, construction, and commissioning work should almost be tripled. It is not a secret that the opportunity to use the existing copper customer-access infrastructure was the most important factor of successful BBA xDSL deployment. The analysis of the pricing and labor content structure for mass construction of BBA FTTH networks based on GPON shows that over 60% of the pricing and labor content is accounted for by construction of inside-apartment and house distribution networks (Fig. 3).

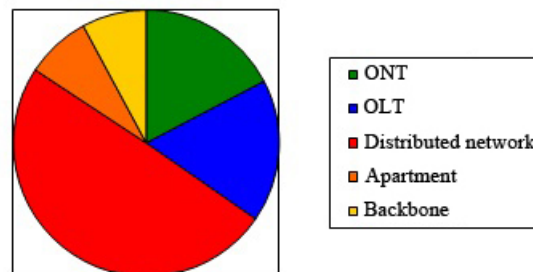


Figure 3. Pricing and Labor Content Structure for GPON Construction

On the one hand, it means that in the next years the considerable resources of design and construction and assembly organizations will concentrate on BBA FTTx, and on the other hand it sets us thinking about the need to find new technologies for designing and constructing BBA FTTx that allow for achieving new horizons not through extensive but intensive (possibly innovative) methods.

It should be noted that the search for new network-structure solutions for really mass integration of BBA FTTx may become one of the high-priority objectives for operators because the ways to reduce CAPEX related to reducing the price of the active equipment (OLT – Optic Line Terminal, ONT – Optic Network Terminal, STB – Set Top Box) will more probably bring about a sharp decrease in reliability and QoS at the access site, and it will not achieve considerable savings in terms of investments. In terms of reducing OPEX, the above-mentioned processes stimulate operators to develop service platforms (SDP – Service Delivery Platform), self-service portals, and components of OSS/BSS systems, and automated configuration systems based on the TR-069 protocol.

Let us compare the predictions for the BBA subscriber base growth with the predictions of traffic growth for FTTx solutions. With the help of the estimates simplified to the accuracy level sufficient for practical purposes, the BBA traffic can be divided into multicast downstream (IPTV) and bidirectional unicast flow (VoD, Web surfing, FTP, VoIP, Skype, etc.) Based on the estimates related to the development of IPTV, on the planning horizon it is easy to calculate that for 300-400 HDTV and Blu-ray channels the aggregate multicast flow will be approx. 15-20 Gbit/s. We all know that in order to accelerate channel switching in the majority of GPON FTTH implementations, the whole multicast IPTV flow must be taken to the OLT level, and given an average density of 2 thousand GPON users, this flow will exceed the unicast traffic from all connected OLT subscribers. It means that the issue of distributing multicast IPTV flows and efficient aggregation of unicast flows related to the “heavy” contents of VoD and file-exchange applications will require the implementation and engineering of a new system and network solutions at the access aggregation level. The nearest market peak will be related to subscriber access aggregation and IP/MPLS core systems based on Metro WDM technologies and MPLS-TP protocols (MPLS Transport Profile).

It should also be noted that at the beginning of this year ICANN (Internet Corporation for Assigned Names and Numbers) set aside the last

IPv4 address blocks from the central pool. It means that the success of the above-mentioned strategy will depend on the transfer to IPv6 not only at the IP/MPLS core level, but also at the level of each CPE (Customer Premises Equipment). The high level of utilization of IPv4 address space in the RF (according to some estimates it is close to 100% [8]) conditions for the mass application of the technologies with which fixed and mobile communication operators convert NAT (Network Address Translation) network addresses. If the efficiency of using the available address space is increased only by implementing NAT, it will not allow for solving the IP address shortage problem even short-term. Integration of IPv6 (Fig. 4) is viewed as the strategic solution for this problem in the longer term.

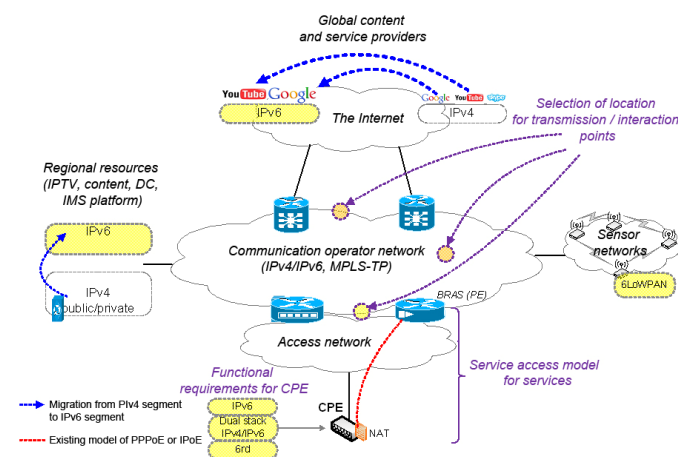


Figure 4. Integration of IPv6 on Public Communication Networks

Fig. 4: DC – the data center; Dual Stack IPv4/IPv6 – the interface providing functionality for both networks IPv4 and IPv6; IMS (IP Multimedia Subsystem) – the multimedia message subsystem; 6LoWPAN – IPv6 protocol for sensor networks. The intensive process- and infrastructure-related development of BBA together with the growth of the subscriber base, and active assimilation of the Internet segment based on IPv6 and stage-by-stage transfer of resources to the new address segment by global service and content providers (Google, YouTube), in its turn, stimulate integration of IPv6 by communication operators. The transfer of all communication operators network infrastructure to the IPv6 protocol will not occur at once. During the transitional period, the segments of IPv4 and IPv6

networks will co-exist, and operators will have to support both protocol versions at the same time, and integrate the technology in order to provide a proper interface between address segments. Integration of IPv6 will influence virtually all the levels of the network infrastructure of communication operators – from the subscriber equipment level to the level of services, billing systems, and OSS/BSS. In particular, the transfer to IPv6 will have an effect on BBA infrastructure at least in terms of the need to support dual stack IPv4/v6 or 6rd technologies [9] in CPE and determine the levels at which points of interface (transmission) are located between address segments – at the level of CPE, BRAS (Broadband Remote Access Server) or service routers.

Ultimately, even today the issue of developing an interconnected NGN transformation strategy is one of the high-priority objectives for OJSC ROSTELECOM. In fact, if the share of wired BBA in 2015 approaches 90% of the existing subscriber base, the issue of whether it is expedient to continue to operate the whole existing TDM infrastructure and replace it with IP/MPLS will arise.

Before the IMS concept emerged, the markets for wired and wireless broadband access were considered competitive. But today, due to the comparable planned penetration of wired and wireless broadband access, these technologies may be considered as mutually complementary, especially in terms of the developing convergent FMC services for multi-functional terminals. Table 1 provides the data on penetration of mobile broadband access on the planning horizon by 2015 according to the predictions of J'son & Partners for the RF. Such close penetration values for broadband users for wired and wireless access suggest a wide spread of FMC services on the planning horizon by 2015.

TABLE 1. PENETRATION OF BBA MOBILE USERS PER 100 PERSONS.

Year	2011	2012	2013	2014	2015
Share of users	For highly developed regions				
	12	18	30	35	42
	For poorly developed regions				
	5	10	20	30	38

This is why the conversion of the client base into the broadband one, entailing the primary transfer of voice traffic via VoIP, predictions for IPTV traffic and the mutual integration of wired and wireless broadband access development as the basis for integrating FMC services will create conditions for uniting fixed and mobile communication networks based on IMS technology.

The proposed vision for developing Russian telecommunications as compared to the plans of RF social and economic development will not be complete since the modern development of any sector is characterized both by continuing intensive development of telecommunications and their convergence with new technological achievements in allied sectors. The convergence of scientific and technical achievements in the sensor device sector, transformation of automobiles into potential communication network terminals, and medical networks provide examples of how all-penetrating telecommunications begin to integrate into our world. It is no coincidence that the Internet of Things [10] is one of the most popular and recently widely discussed communication network development concepts. Both above-mentioned telecommunication development areas require that communication operators transform their business.

On the planning horizon through 2015 we can segregate three components which will determine the way in which telecommunication operators will transform their business (Fig. 5).

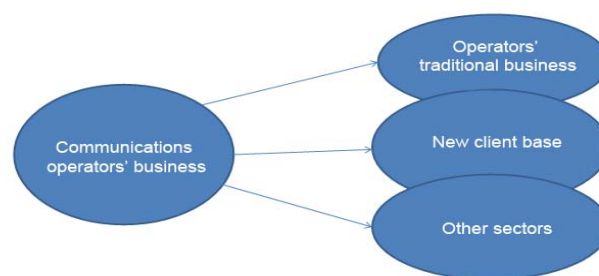


Figure 5. Transformation of Communication Operators' Business on the Planning Horizon through 2015

The first component for the transformation of communication operators' business is the new approach to such traditional telecommunications business as rendering voice, data, video, etc.

transmission services to individuals and legal entities. The main momentum for the transformation of communication operators' business in this area is the retention of the existing (traditional) client base subject to ever-escalating competition.

The provision of broadband access to users is widely recognized as the technological basis for implementing a program for preserving the traditional client base. The conversion of the traditional client base into a broadband one requires not just very large investments. As we noted above, in order to preserve the traditional client base during its transformation into a broadband one, the largest Russian operator, OJSC ROSTELECOM, will require triple intensification of design, construction, and commissioning processes. Subject to such intensive integration of the broadband access, the transfer from managing the band to managing services is an important feature. Indeed, today it is more pragmatic to provide the user with access at a rate of 100 Mbit/s and gradually fill this band with services than to change its capabilities in terms of access rate every time the user has new requirements for services.

The second component of the communication operators' business (generation of the new client base) is determined by principle changes in technological capabilities in terms of creating wireless sensor nodes and radio identifiers. According to predictions [11] their number will reach 7 trillion devices per 7 billion people by 2017-2020. This is the technological basis of the so-called Internet of Things. Such volumes of forthcoming integration not only are sure to attract the attention of communication operators, but most probably, there are no other networks (other than public communication networks) which may service the traffic potentially created by these devices.

Conceptually, today the Internet of Things is still being formed, but it is already clear that the structure of its client base will include mechanisms, structures, biomasses, etc. [12]. The International Telecommunication Union takes an active stand on this issue, and the global initiative on standardizing the Internet of Things can only be cheered [13].

Another component of the communication operators' business transformation is based on the convergence of the capabilities of telecommunications and other sectors. As examples, let us consider the convergence of the capabilities of telecommunications and means of transportation, and of telecommunications and banking payment systems.

The convergence of the capabilities of telecommunications and means of transportation suggests the creation and development of safety and comfort services for the "driver and automobile" pair. It should be noted that the number of automobiles and public telephone network users have comparable values (in the RF on the planning horizon by 2015 the number of automobiles will be about 60 million). The services for transport vehicles should be implemented subject to recommendation MSE-T Y.2281 [14]. In the RF, the ERA-GLONASS system serves as the technological base for creating such networks and is used together with mobile public communication networks to provide the user with such services as positioning, interacting with the home-area and drive-up networks, etc.

The convergence of the capabilities of telecommunications and banking payment systems will first of all allow for the use of terminals (mobile phones, radio identifiers) as payment instruments. The wide opportunities for rendering such services require a respective level of security. Here we should note the considerable contribution of RF experts. On their initiative and as the result of their development in MSE-T, a set of recommendations for mobile payment security was adopted [15], [16].

CONCLUSIONS

1. The target volume-related indicators for BBA development in the RF will require an increase in design and construction rates, and the development of new BBA methods and system & network solutions aimed at reducing CAPEX/OPEX.
2. The rate-related characteristics together with volume-related indicators will require reviewing approaches to aggregating BBA,

- constructing high-rate super highways (backbones) and distributed DCs.
3. The exhaustion of IPv4 address space and transfer to IPv6 will require a full-scale revision and modernization of the CPE installed base, as well as updating service models for access to services.
 4. The transformation of the communication operator's business is a task for the present and (if properly carried out) will enable operators to preserve and expand the traditional client base primarily due to the Internet of Things, and it will allow them to provide new services together with other sectors.

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