

## 1. Network Access

### 1.1. Information Infrastructure

9 major Internet Providers (IPs) have filled in the questionnaires, developed according to the approved methodology [1], in order to gain information, related to **Information Infrastructure index** variables (sub-indexes). The aforesaid IPs - IP TelCom ([www.iptel.by](http://www.iptel.by)), Atlant Telecom ([telecom.by](http://telecom.by)), Basnet ([inform.bas-net.by](http://inform.bas-net.by)), Beltelecom ([www.beltelecom.by](http://www.beltelecom.by)), Global-OneBel ([www.global-one.by](http://www.global-one.by)), Business Network ([www.bn.by](http://www.bn.by)), Forenet (BelSoft CJSC, [forenet.by](http://forenet.by)), Unibel ([www.unibel.by](http://www.unibel.by)) BSUnet ([www.cit.bsu.by](http://www.cit.bsu.by)) represent different niches of the Internet Provision market in the Republic of Belarus.

The experts assessed the level of Information Infrastructure Readiness (or advancement) of the country, which can range from the 1st (least-advanced) to the 4th (most-advanced) stage, for each micro-index independently, and average data assessment for Information Infrastructure index and generalized data assessment for **Network Access** component index were evaluated on their basis.

Readiness (or advancement) estimation breakdown (in percentage) and average estimation of the Information Infrastructure index are presented below in Table 1.1.

Table 1.1

#### Average Estimation of the Information Infrastructure index

Stage No	Belarus, %	Minsk, %	Regions, %
1	10	7.5	17.5
2	42.5	17.5	45
3	45	52.5	35
4	2.5	22.5	2.5
<b>Average Index Estimation</b>	<b>2.4</b>	<b>2.9</b>	<b>2.225</b>

The following Tables 1.1 through 1.5. present the total estimation breakdown (given as share of the total amount of the answers received), assessing the whole republic, the city of Minsk and administrative regions in the context of the four micro-indexes.

Table 1.2

#### 1.1.1. Access to Telecommunications Infrastructure

№	Variable (only 1 option out of 4 was possible for each region)	Belarus, %	Minsk, %	Regions, %
1	There are very few shared facilities for telecommunications access	0	0	0
2	A small minority in the community has good access to the telecommunications network, but most of community does not	30	10	50
3	A sizeable portion of the community has good access to telephone services	70	60	50
4	There is widespread access to telecommunications and network services	0	30	0

Table 1.3

**1.1.2. Telephone Density**

№	Variable (only 1 option out of 4 was possible for each region)	Belarus, %	Minsk, %	Regions, %
1	Very low, with a teledensity of less than 2 mainlines per 100 people	0	0	0
2	Telephone penetration between 2 and 8 mainlines per 100 people	0	0	0
3	Teledensity between 8 and 40 mainlines per 100 people	90	40	90
4	There is high teledensity of 40 mainlines or more per 100 people	10	60	10

Table 1.4

**1.1.3. Mobile Wireless Penetration**

№	Variable (only 1 option out of 4 was possible for each region)	Belarus, %	Minsk, %	Regions, %
1	Mobile wireless penetration is below 0,5% of the population	10	0	20
2	Mobile wireless penetration is from 0,5 to 3%	70	10	80
3	Mobile wireless penetration is between 3 and 14%	20	90	0
4	Penetration of mobile wireless telephone is higher than 14% of the population and keeps on growing	0	0	0

Table 1.5

**1.1.4. Cable Penetration**

№	Variable (only 1 option out of 4 was possible for each region)	Belarus, %	Minsk, %	Regions, %
1	No cable services are available	30	30	50
2	Cable penetration is below 5% of households	70	50	50
3	Between 5 and 10% of households in the community are subscribed to cable services	0	20	0
4	Cable penetration is high, reaching 10% of households or higher	0	0	0

Beltelecom, the republican state-owned association (RSA), is the national telecommunications operator in the Republic of Belarus, which is assigned to provide for functioning and development of the information and telecommunication infrastructure in the Republic of Belarus [4,5].

Beltelecom RSA operates in compliance with the state programs and respective industry schemes of the telecommunication infrastructure development. The Ministry of Communications has elaborated and the Council of Ministers of the Republic of Belarus has approved An Action Program for Communication Facilities Development for the Years 2001-2005. This program is of primary importance for Beltelecom RSA as it is the national telecommunication operator in the Republic of Belarus. The program aims to establish a powerful technical foundation for informatization of the Belarusian community. It stipulates for the development of a modern communication network on the territory of

Belarus, which would be integrated with the world telecommunication systems.

Beltelecom RSA extensively cooperates with the International Telecommunications Union, The Regional Commonwealth In The Field Of Communications, EUROTELSAT, The European Satellite Telecommunications Organization, INTERSPUTNIK, The International Satellite Telecommunications Organization and INTELSAT. In 2000 Beltelecom RSA became a member of the European conference for Web planning/budgeting, as a result the information on capabilities of the Belarusian digital network became accessible for all operators of European countries - member-states of the above-mentioned conference.

Beltelecom participates in numerous international projects (TEL/TET, TAE and ITUR) for the transnational fiber optic cable (FOC) systems creation. Beltelecom has built up international lines, which bound Belarus with Poland, Ukraine, Latvia and Lithuania and became the segments of the international projects such as TEL/TET, TAE, an Asian - European FOC system, and provided for a connection with ITUR. Several telecommunication cross - border connections to the merging countries and a trunk FOC baseline network has been completed in the recent years. The information and telecommunication infrastructure, which is being built by Beltelecom RSA, should ensure a steady integration of Belarus into the European and Global information structure.

**A Primary Network of the Republic of Belarus (Fig. 1.1).** An intensive upgrading of communications networks, re-equipment with digital means and introduction and promotion of some new telecommunication services take place within the republic.

An Action Program for communication facilities development draws much attention to enhancement and creation of long-distance and international telephone lines.

Nowadays the Republic possesses a powerful high-speed modern trunk network, which uses SDH-hardware of STM-1, 4 and 16 versions. About 90% of the area telephone exchanges (ATEs) have digital intraband lines of binding, 44 % of ATEs are connected by FOC line.

There are about 4 thousand kilometers of FOC line in Belarus, which link all regional centers together and also ensure high quality connection with other countries.

The Action Program for communication facilities development presumes 10 thousand kilometers of a 4-fibre optic cable to be laid on by the year 2005.

The further optimization of a primary network and reconfiguration of a trunk network are currently under way. The installation work to run STM-4 rings linking Minsk – Gomel – Brest - Minsk was completed in March 2002. The stand-by lines for toll circuit traffic between Minsk - Brest - Gomel and international traffic to Poland and Ukraine was provided. The switchovers were made in order to ensure the operation of Minsk - Brest - Gomel - Minsk linking rings by November 30, 2002.

A Belarusian-Polish FOC line, which would connect Byalostok (Poland) and Grodno (Belarus), is planned to be built within the framework of the building schedule for a second communication crossing by FOC line to Poland.

**Secondary network of the Republic of Belarus.** The installed capacitance of the secondary network of an automatic telephone exchange totals 3 million 41 thousand mainlines as of October 1, 2002. Taking into account that the population is about 10 million, this implies 3 citizens per 1 automatic telephone exchange. The Action Program for communication facilities development presumes the growth of teledensity up to 420 thousand mainlines by 2005.

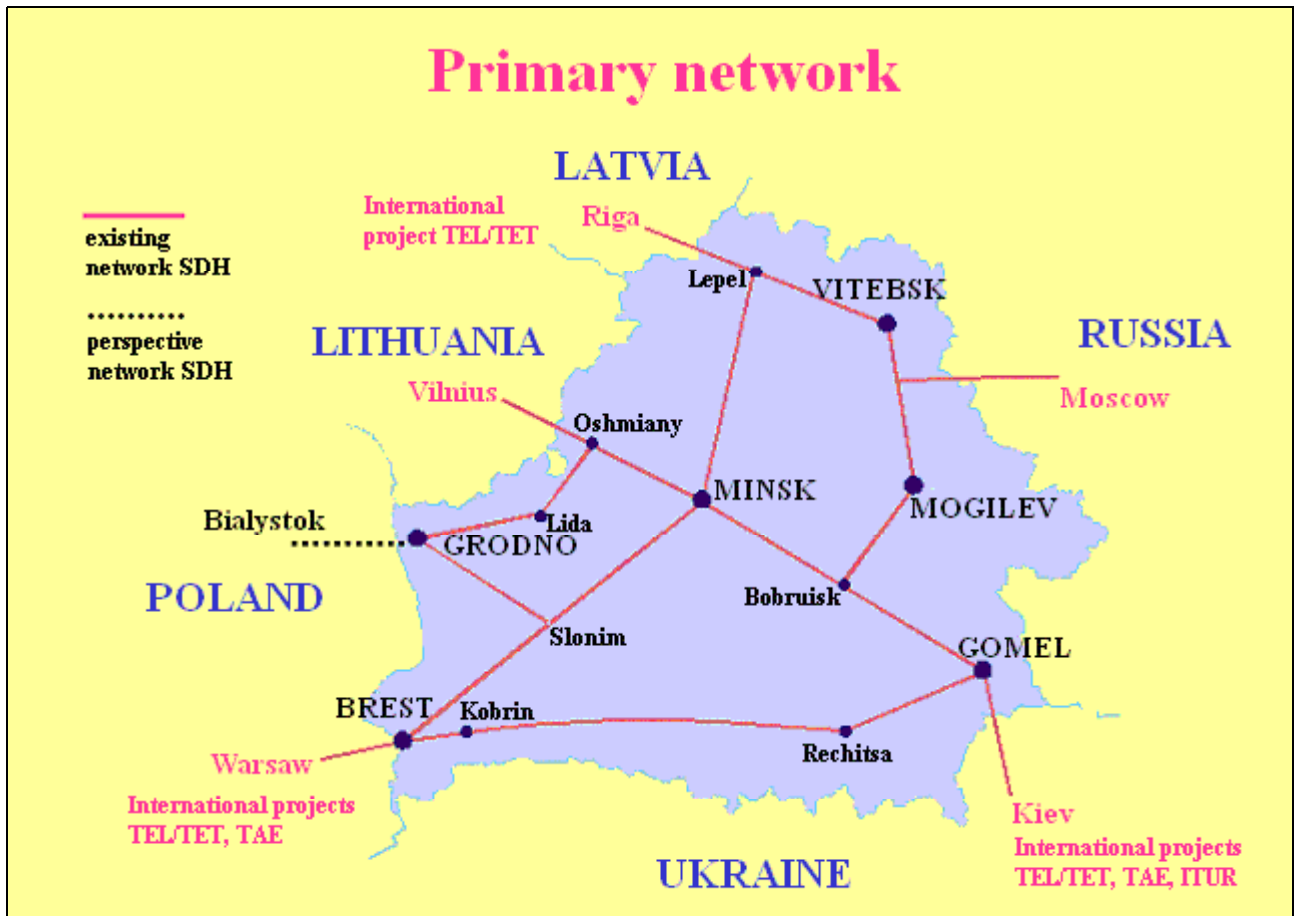


Fig. 1.1

As of 01.01.2001 the teledensity throughout the republic averaged 76,0 mainlines per 100 households (*in view of that the average family consists of the several members calling from one subscriber's number*), at that urban (city) telenetwork (CTN) averaged 88,0 and rural (village) telenetwork (VTN) averaged 47,0, respectively (Fig. 1.2). As for the regions and Minsk (Minsk CTN) breakdown, the telephone density per 100 households is presented below in Table 1.6.

Table 1.6

### Telephone Density per 100 households in Belarus

	CTN	VTN	Average
Brest Region	93,0	57,7	79,4
Vitebsk Region	91,2	39,6	73,9
Gomel Region	86,6	47,6	74,6
Grodno Region	92,5	42,0	73,3
Minsk Region	84,3	43,5	65,9
Mogulev Region	82,2	41,6	69,6
Minsk CTN	104,6	-	104,6

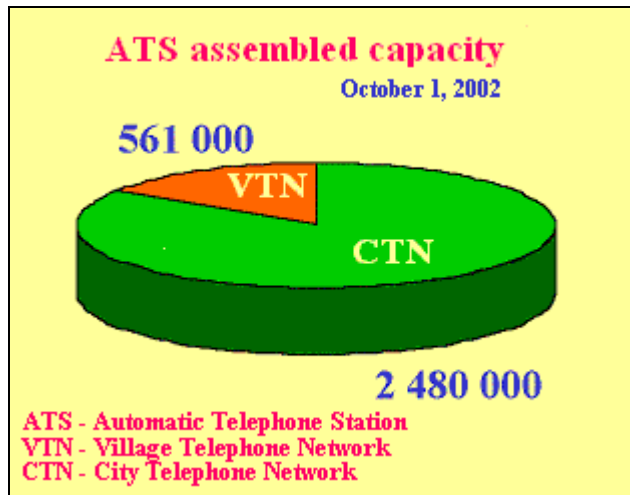


Fig. 1.2

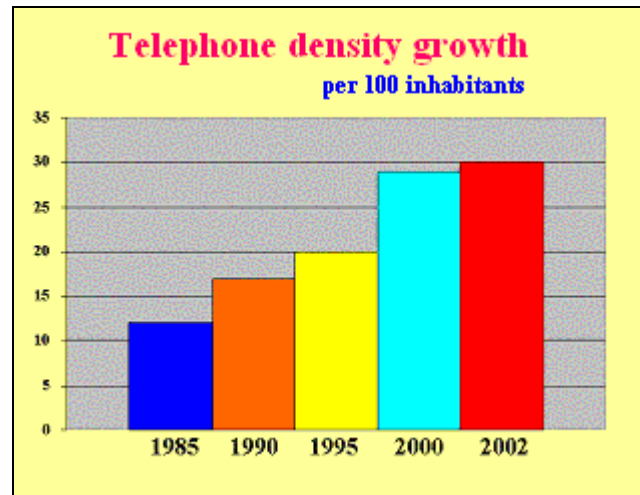


Fig. 1.3

The three-millionth subscriber (*one from members of household*) was connected to a republican telenetwork in April, 2002 (Fig. 1.3). The teledensity is to reach 32.1 % by 2005. As for teledensity per 100 people, the Republic of Belarus has been in the lead among CIS countries since 1995. The following growth rate (with regard to the quantity of telephone sets per 100 people) is noted thereupon (Table 1.7).

Table 1.7

**Telephone Density Growth Rate per 100 people**

	1985	1990	1995	2000	2002
Belarus	12	17	20	29	30,44
Russia	10	14	17	22	no data
Ukraine	11	15	16	21	no data

All the newly commissioned automatic telephone exchanges (station, ATS) are electronic. The Action Program for communication facilities development stipulates for replacement of 376 000 telephone numbers of the level and coordinate hardware with the digital ones by 2005. It will provide for higher communication quality and render a more extended range of services, the Internet access services inclusive.

Additionally, the realization of a global project, associated with the extension and up-grading of long-distance and international telephone exchanges as well as the overlapped digital network exchange has been launched by now. At the time of construction these exchanges were not designed for such a swift progress made even by the local networks. Currently, they have to withstand an additional burden, caused by the mobile service subscribers and the Internet users. Therefore, it's time to upgrade them. The software upgrading will allow to increase operational capabilities of telephone exchanges in processing the growing long-distance and international traffic substantially and to expand a range of services. The upgrading of the long-distance telephone exchanges in administrative regions/areas is scheduled for 2003.

Mobile wireless density in the country totaled to 4.5 % as of 30.12.2002 (Table 1.8).

**BelCell Joint Venture Company** ([www.belcel.by](http://www.belcel.by)) was established by the Belarusian communication companies and Cable and Wireless Plc., a British company. The commercial operation of the BelCell network started on May 7, 1993. Within several months the cellular communication reached Brest and Gomel and kept on developing, covering all regional centers. As for today, the BelCell network

encompasses more than 60 % of the country's territory and continues to expand, the sales and services branch offices have been opened in Minsk, Brest, Gomel, Vitebsk and Grodno.

Table 1.8

**Mobile Wireless Telephone Density in Belarus**

<b>Operator</b>	<b>Standard and the year of establishment</b>	<b>Number of users at the end of 2002</b>	<b>Wireless Internet Access</b>
BelCell joint venture company	NMT: 1993; cdma2000: since February 2003	20 000	via tele-adapter
Mobile Digital Communication joint venture company	GSM 900: 1999	403 000	WAP
Mobile TeleSystems joint share limited company	GSM 900/1800: 2002	30 000	not available

At present the company is building up a new network in cdma2000 digital standard. More over, the BelCell Company has begun to render Internet access services since 2002.

The first six months of 1993 brought merely 320 subscribers, but their quantity increased more than five fold by the end of 1994, equaling to 1725 subscribers. In the first half-year of 1995 each month brought more than 200 new clients, and by the end of the year with the growth rate increased to 400-500 new subscribers per month. In 1998 BelCell joint venture company handled already about 10 000 subscribers, and their quantity have come close to 20 thousand by the end of 2002.

The Mobile Internet service offered by BelCell Joint Venture Company is based on the NMT-450i standard cellular telephone. A fee is 60 BYR (about 3 US cents) per minute, with the Internet connection being free of charge. In order to gain Internet access, one should connect a cellular telephone with a modem via a teleadapter, and a modem should be connected to a PC. A fee for using the Mobile Internet service is included in the cellular service rate.

**Mobile Digital Communication (MDC) joint venture company** ([www.velcom.by](http://www.velcom.by)), with **Velcom**® and **Privet**® being its trademarks, is the first operator of a mobile digital standard in the Republic of Belarus. The company began its commercial operations on April 16, 1999. At present (as of 30 Dec 2002) the company handles 403 thousand subscribers. The number of Velcom subscribers has grown more than 3.35 fold since December 30, 2001.

As of December 30, 2002, Velcom network embraces over 260 base telephone sets, more than hundred of them provide for communication in Minsk. The service area of Velcom network is permanently expanding; today it covers the area of inhabitation of more than 87% of the urban population of the republic. Velcom cellular communication network is accessible in more than 95 Belarusian cities and settlements, at Minsk 2 international airport, on the major highways such as Brest - Minsk - Orsha, Brest - Gomel. The company carries on operations in order to provide for cellular transmission at Minsk - Grodno, Minsk - Oshmayny, Minsk - Gomel highways, and at customs and border points with Poland, Lithuania, Russia and Ukraine. Velcom network will soon be available at all Minsk underground stations.

In 2002 the company created a republican network of the sales and service corporate centers. Today nine Velcom service centers operate in Minsk, Brest, Gomel, Vitebsk, Grodno and Moguilev. Eleven more centers are to be open throughout the republic in 2003. The dealers' network of the company extended to 134 stores within 2002 and comprised 203 dealers' points in 40 towns and settlements. In

early 2002 the list of Velcom roaming partners extended by 29 cellular operators in 12 new countries. Currently the roaming agreements with 166 operators enable Velcom subscribers to use an automatic international roaming in 76 countries round the world.

WAP service by Mobile Digital Communication Joint Venture Company. WAP (Wireless Application Protocol) service enables subscribers to obtain access to Internet resources by means of a mobile telephone. Thus, the subscriber will not need any other auxiliaries, such as a computer or a modem. WAP is a protocol, or an engineering standard, which transmits the information from Internet to a small display of a mobile telephone. The WAP-site of Velcom presents information about the company itself, currency exchange rates, weather forecasts, TV programs, details of concerts/shows bills, playbills and club bills. Subscribers can participate in WAP-chat, and also learn political, cultural, sports news, etc.

**Mobile TeleSystems, a joint share limited company, (MTS JSLC, [www.mts.by](http://www.mts.by)),** has been rendering cellular transmission services in GSM 900/1800 standards in the Republic of Belarus since June 27, 2002. The shareholders of MTS JSLC are The Intercity Communications, a republican unitary company (Belarus), which possesses 51% and MTS ("MTS" in Russian stands for "International Telephone Networks"), an open joint stock company (OJSC, Russia), which possesses 49% of the authorized capital. As of today, the direct investments of MTS OJSC in Belarus have already totaled 5,3 million US Dollars, the investments of MTS JSLC in the telecommunication infrastructure equaled to 32,1 million US Dollars. MTS OJSC paid in 10 million US Dollars to the Belarusian budget as its charge for the license, and MTS JSLC was charged 5 million US Dollars. 6 million US Dollars are still to be paid for the license by the end of 2007. The company intends to invest 60 million US Dollars in the Belarusian economy in 2003.

MTS provides roaming to the Belarusian subscribers on the territory of over 40 Russian regions and offers reduced rates for the international calls to Russia. The total number of the roaming partners amounted to 25 operators in 17 countries of the world after the first 5 months of MTS JSLC operation in the Belarusian market.

By the beginning of 2003 there must be 150 base telephone exchanges working in the Belarusian segment of MTS network, and this number is to double by the end of 2003.

MTS JSLC has managed to cover the whole territory of the capital in less than first half – year of the commercial operation of the first phase of a network and is currently expanding the network towards the regions of the republic. Brest was the first regional centers of Belarus where MTS network started to operate on December 20, 2002. 11 base telephone exchanges were launched in Brest, which should ensure the coverage of the whole city and nearest frontier crossing points.

Over 30 thousand subscribers have been using the services of MTS JSLC by the end of 2002.

Subscription to leased cable services is rather low for two reasons. At first, people have little free money to spend it on entertainment. A monthly fee for 26 channels is around 30 USD, which is 1/3 of an average salary. Besides, typically 5-10 channels are available at charge per regular TV cables. Regions suffer the most but average income there is significantly lower than the costs of cabling. Hence, there are very few companies in this business. Cosmos TV is the largest, still it operates only in the capital and proposes TV cable Internet access from March, 2003.

**Summary.** Despite the fact that the considerable proportion of the population has good access to mainlines (telecommunication and information networks) - the teledensity amounts to 30.44 main lines per 100 people, the mobile wireless penetration amounts only to 4.3 %, and the subscription to leased cable services for a household (apartment) access to information is not widespread at all. Therefore according to the index of information infrastructure development Belarus should be put on 2nd stage of development.

## 1.2. Internet Availability

9 major Internet Providers (IPs) have filled in the questionnaires, developed according to the approved methodology [1], in order to gain information, related to **Internet Availability index** variables (sub-indexes). The aforesaid IPs - IP TelCom ([www.iptel.by](http://www.iptel.by)), Atlant Telecom ([telecom.by](http://telecom.by)), Basnet ([inform.bas-net.by](http://inform.bas-net.by)), Beltelecom ([www.beltelecom.by](http://www.beltelecom.by)), Global-OneBel ([www.global-one.by](http://www.global-one.by)), Business Network ([www.bn.by](http://www.bn.by)), Forenet (BelSoft CJSC, [forenet.by](http://forenet.by)), Unibel ([www.unibel.by](http://www.unibel.by)) BSUnet ([www.cit.bsu.by](http://www.cit.bsu.by)) represent different niches of the Internet Providing market in the Republic of Belarus.

The experts assessed the level of Internet Availability Readiness (or advancement) of the country, which can range from the 1st (least-advanced) to the 4th (most-advanced) stage, for each micro-index independently, and average data assessment for Internet Availability index and generalized data assessment for **Network Access** component index were evaluated on their basis.

Readiness (or advancement) estimation breakdown (in percentage) and average estimation of the **Internet Availability index** are shown below in Table 1.9.

Table 1.9

### Average Estimation of the Internet Availability Index

Stage No	Belarus, %	Minsk, %	Regions, %
1	0	0	0
2	47,5	7,5	55
3	42,5	45	37,5
4	10	47,5	7,5
<b>Average Index Estimation</b>	<b>2,625</b>	<b>3,4</b>	<b>2,525</b>

The following Tables 1.10 through 1.13. present the total estimation breakdown (given as share of the total amount of the answers received), assessing the whole republic, the city of Minsk and administrative regions in the context of the four micro-indexes.

Table 1.10

### 1.2.1. Availability of Local Internet Service Providers

№	Variable (only 1 option out of 4 was possible for each region)	Belarus, %	Minsk, %	Regions, %
1	Absence of local Internet Service Providers (ISPs)	0	0	0
2	More than 1,000,000 inhabitants per 1 local ISP. Several ISPs provide only for e-mail access	20	0	40
3	Between 500,000 and 1,000,000 inhabitants per 1 local ISP. ISPs render complete array of internet services	60	20	40
4	More than 2 local ISPs per 1,000,000 inhabitants. ISPs render complete array of internet services. High-speed solutions, digital dedicated lines and cable modem connection are available. The majority of users can subscribe for optional services, which differ in connection speed, grade of service, security, quality and price. ISPs provide for the possibility to create personal web-pages.	20	80	20

As of 1.11.2002 the Ministry of Communications issued 56 licenses for rendering data transfer

services. As a rule, it means rendering Internet network access services. There are about 30 actual providers. Their main activity is switched network access to the Internet (except for Beltelecom RSA and Business Network joint venture).

At the present time the leading Internet service providers in the Republic of Belarus, apart from BelPAK network of Beltelecom RSA, are the following [6]:

- UNIBEL Network of the Ministry of Education, comprising 206 educational institutions (as of June 1991);
- BASNET Network of the National Academy of Sciences of Belarus, comprising 260 scientific institutions (June 1991);
- Open Contact Co. Ltd. - 2435 (June 1991);
- Business Network joint venture - 1880 (June 1991);
- SOLO Company - 1310 (June 1991);
- Network Systems CJST - 468 (June 1991);
- Anitex Co. Ltd. - 244 (June 1991);
- Belinfonet Co. Ltd. - 254 (June 1991);
- Belresourismarket Co. Ltd. - 175 (June 1991);
- Golden Taller Co. Ltd. - 236 (June 1991);
- Informatika Company - 147 (June 1991).

**BelPAK Network of Beltelecom RSA [5].** The demand for Internet services in the Republic of Belarus has increased considerably since 1999. The number of the regular BelPAK users has grown more than 14 fold since the beginning of 1999 and now exceeds 100 thousand subscribers. The total throughput capacity of the international gateway-to-Internet has increased more than 34 fold and is now 79 Mbps (Mbit per sec).

As of December 1, 2002 17 698 subscribers were connected to BelPAK network of Beltelecom RSA on contractual basis. Among them there are 6045 e-mail subscribers, 55 - X.25/X.28 ones, 15 - ADSL ones, 11583 - Internet ones.

About 709 thousand subscribers used a non-password system for the Internet network access during 11 months of 2002, and there were 83307 of them in November 2002 alone (53729 in January 2000) (see Fig. 1.4).

**Note.** Non-password access is a new service provided by the state-owned ISP Beltelecom RSA that is also a state monopolist in the fixed telephone service. Any user of a usual telephone in Belarus can enjoy the unlimited Internet access by very simple customizing of his/her computer and make the modem dialing 8-600-100 special telephone number dedicated to the non-password Internet access. Beltelecom RSA is charging on per-minute basis. No contracts, no pre-payments, no monthly fee, no separate bills. Beltelecom RSA recognizes its every user by the same way as in its any other service such as far calls. Charge is included in the monthly general bill for the telephone service together with other extra services such as far calls, business or personal address search service, telegrams-by-the-phone service, etc.

**UNIBEL Network of the Ministry of Education of the Republic of Belarus.** The UNIBEL network is an independent network, which possesses its own hardware and software resources, operation center and IP addresses; it obtains access to the external networks through the hardware resources of BelPAK network. The basic purpose of UNIBEL network is to provide the educational users with the data transfer services on a non-commercial basis. UNIBEL is registered in RIPE (European registration service for IP-networks), and it is assigned its own IP-addresses. AS5498 off-line system is attributed to UNIBEL network.

The first node of UNIBEL network was opened in Minsk in 1993. In 1996-1997 Minsk Internet Project was implemented on the basis of the Computing and Analytical Center of the Ministry of

Education, it gained financial support from the Open Society Institute. The project resulted in the creation of the backbone network in Minsk, which was based on fiber optic communication lines, had a throughput capacity of 2 Mbps and a total length of about 23 km and was passed through 7 urban automatic telephone exchanges, where network hard-operational hardware was installed.

### BelPAK Internet Users Growth Rate within last 5 years

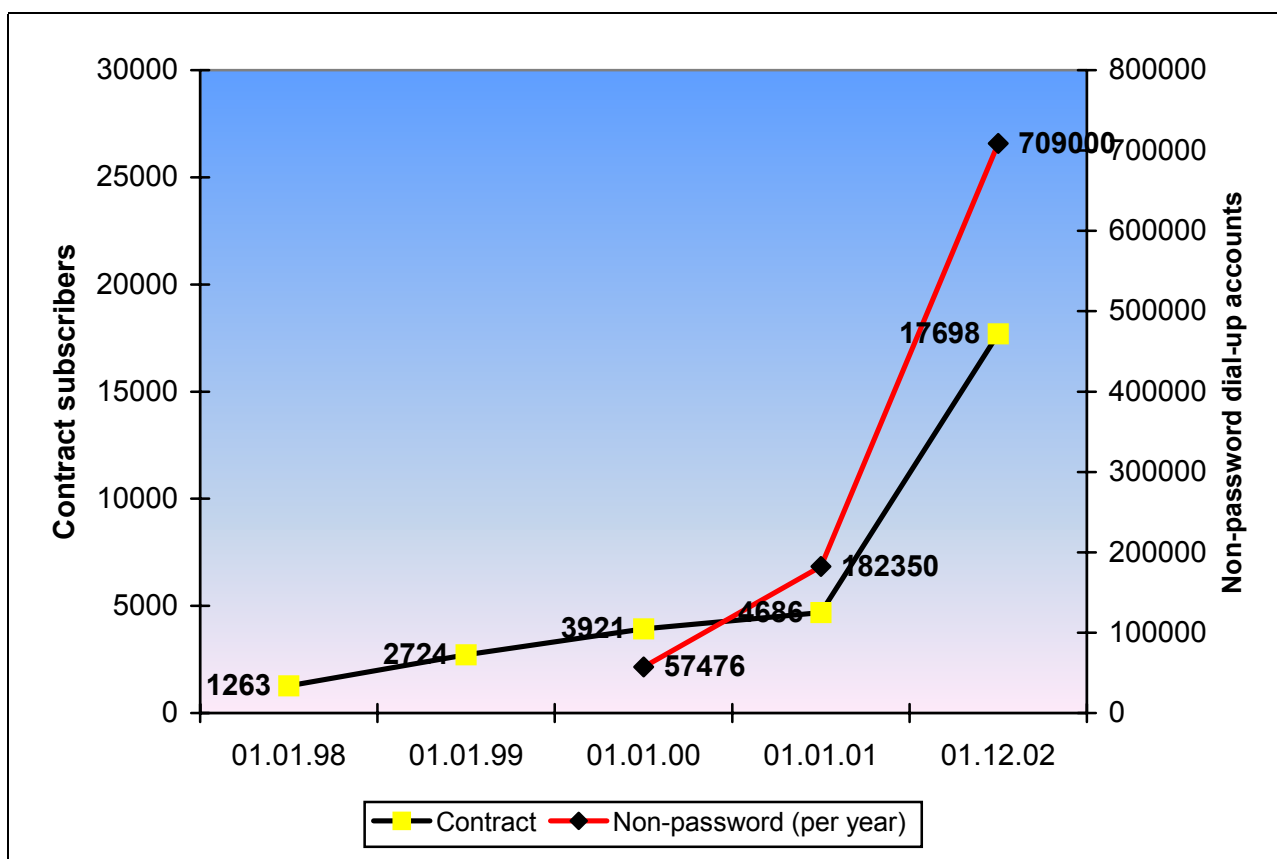


Fig. 1.4

With the financial support of the Euro-Asian Fund 6 Internet gateway nodes were established in the regions of Belarus (in the cities of Grodno, Vitebsk, Polotsk, Moguilev, Gomel and Brest), in the course of implementing this project. The cities were connected with UNIBEL backbone network with digital channels of 64 Kbps capacity.

Starting 1997, the further development of UNIBEL network was supported by the UN Development Program “Internet” project (project BYE/96/003 «Strengthening of the national information and communication infrastructure for the purposes of fostering democratic reforms, improving state management and market economy development»). The main objective of the Internet project was the development of information and communication infrastructure in the governmental institutions and bodies, as well as in various scientific and cultural establishments, mass media institutions, and public organizations. The project made for the hardware/software upgrading of Minsk backbone network and regional nodes.

In 1999 the project was re-titled «Assistance in sustainable development and open society

formation in the Republic of Belarus on the basis of new information technologies». A new stage of the project presumed further elaboration and development of the UNIBEL network infrastructure. However, its major task now is to ensure informational fullness of the network, increase efficiency of Internet usage in routine operations of the state management bodies, scientific and social institutions, and also to improve the quality of access by means of new ICT application.

Currently UNIBEL network serves more than 200 subscribers, including leading republican universities, specialized secondary educational establishment, schools, public organizations and other social institutions.

**BASNET Network of the National Academy of Sciences of Belarus (NASB).** BASNET, the computer network of NAS (Fig. 1.5) is one of the first networks established in the republic for data exchange between various R&D organizations and scientific teams.

BASNET along with the networks of Belarusian State University and of the Ministry of Education is a part of a United Computer Network for Science and Information (titled NIKS) of the Republic of Belarus. BASNET computer network consolidates more than 50 scientific organizations. Around 40 institutes of the NASB, as well as the Committee for Science and Technologies, BelVak Supreme certification committee, Basic Research Fund, Fund of Informatization, R&D Institute for Computers, Ministry of Emergencies, Ministry of Industry, BelCMT, Minsk production amalgamation for Computing hardware, National Library, Central scientific library of the NASB and others are connected to it. BASNET is stationed on seven baseline network nodes, five of which are interconnected with high-speed fiber optic channels providing for data transfer via network with the speed of 10 - 100 Mbit/sec (Mbps). Two nodes are connected to central node with radio relay communication lines, which permits to transfer data via network with the speed of 2 Mbps (Fig. 1.5). Modern local networks bound over 1000 computers in the institutes, connected to BASNET. BASNET possesses a license for an independent satellite gateway to Internet global computer net and another license for rendering services to BASNET and NIKS users. In 2001 a satellite communication ground station with the asymmetric traffic to access Internet with the total throughput capacity of up to 8 Mbit/sec (Mbps) was commissioned.

BASNET architecture is designed and implemented in compliance with the international standards, but no more than 10% of its throughput capacity is used today. At the same time a conceived spare capability of the throughput capacity was designed to solve future tasks of the information support automation of scientific research work (these tasks include construction of information servers and databases, library activity automation, scientific research automation, etc.) and will be demanded within coming 3-5 years.

Thus, BASNET possesses its own system of high-speed telecommunications in Minsk targeted mainly at the needs of academic institutes, and ensures connection of individual regional scientific centers through Beltelecom RSA lines. The network has an operation center equipped with modern telecommunication and computer hardware, where own information resources have been created.

**BSUnet corporate network of the Belarusian State University (BSU).** The set up of data transfer networks in BSU has started in 1991. In 1996 the information technologies center of BSU designed a BSU information network project, which was largely implemented on the basis of fiber optic communications by 2001. This project has made for a set-up of a high-speed integrated data network, which combined computer and telephone circuits of the scattered department buildings of the university, located in various areas, into a single multi servicing Internet / Intranet.

At present all the training departments and faculties of the university have their local computer networks combining class-rooms, chairs, research and development labs.

# BASNET Network Structural Diagram

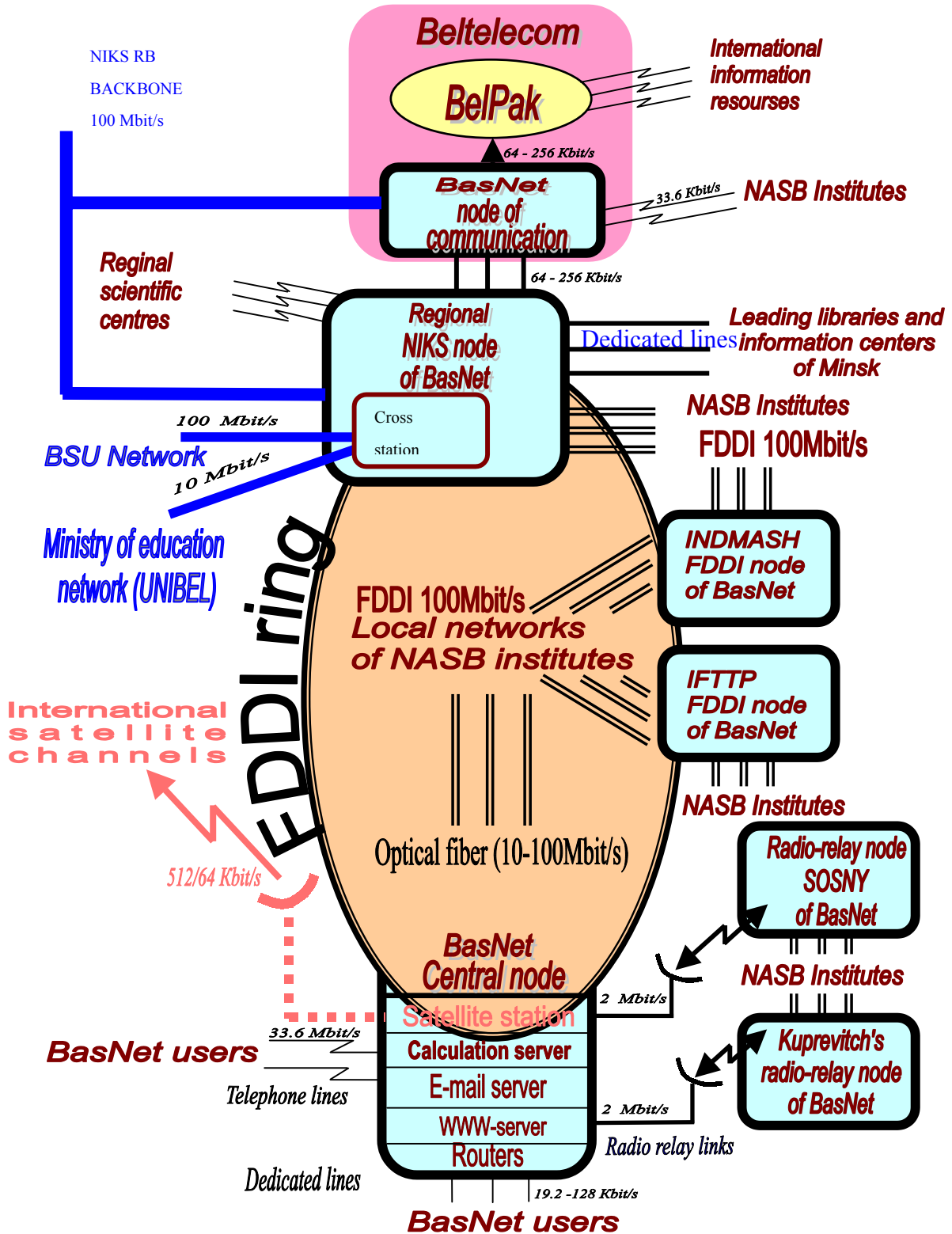


Fig. 1.5



No1677 of 18.12.1997) a network of a higher level - United Science and Information Computer Network (NIKS) was constructed on the basis of the three above mentioned networks (Fig. 1.7).

### NIKS Structural Diagram

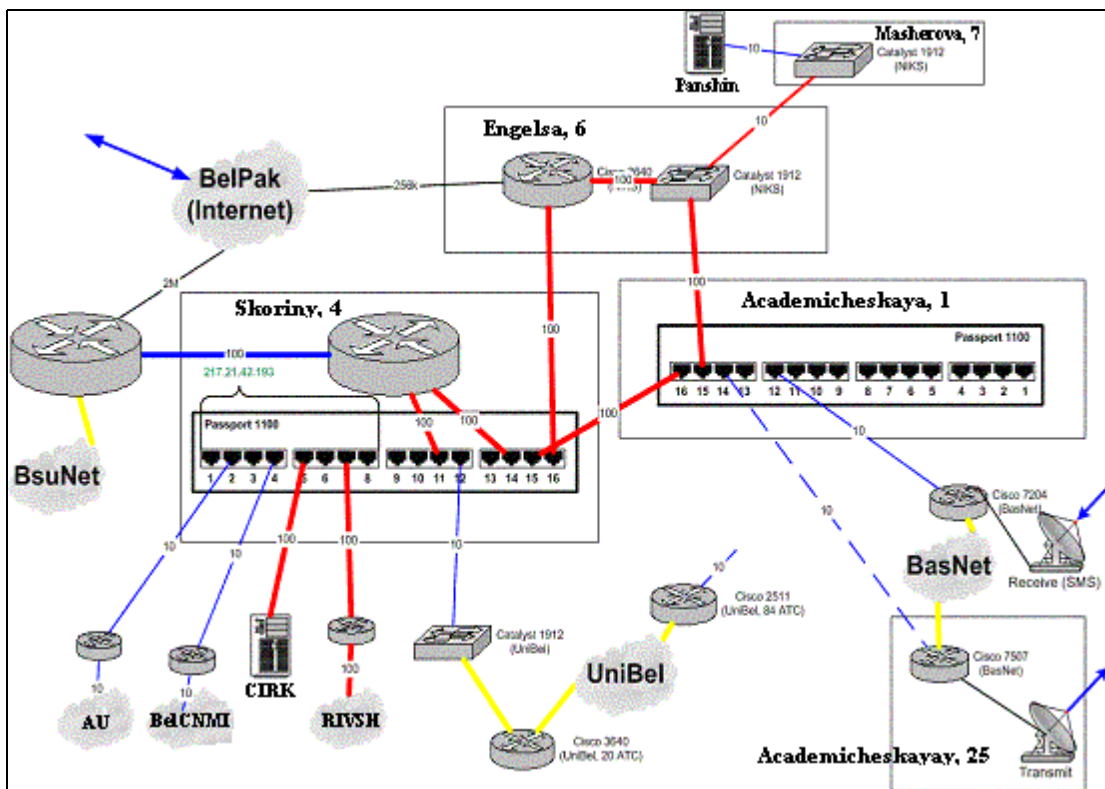


Fig. 1.7

In compliance with the licenses issued by the Ministry of Communications, the providers for rendering data transfer services using the networks based on NIKS infrastructure, are

- The Main information and analytical center of the Ministry of Education,
- Information Technologies scientific and research enterprise of the NASB,
- The Center of information resources and communications, as a representative of the Belarusian State University.

The latter, in its turn, is to administer the NIKS as a whole, according to the Resolution adopted by the Interdepartmental Commission for informatization in the Republic of Belarus under the Council of Ministers of the of Republic of Belarus (Minutes No 05/185 of 1.07.1999).

**BELNET computer network of the educational system of the Republic of Belarus.** The set up of BELNET computer network of the educational system of the Republic of Belarus in compliance with the resolution of the Council of Ministers of Republic of Belarus will obviously promote and increase the Internet usage. The design work for this network is currently under way.

The design of BELNET does not duplicate the work carried out for the development of UNIBEL and NIKS networks. *The strategic objective for the construction of UNIBEL* was to set up a communication infrastructure in order to provide a gateway to the external networks of educational institutions located in Minsk and other regional centers. *The main purpose for setting up NIKS* was the integration of existing scientific and educational networks, in order to supply scientific organizations and

training institutions with high-speed channels, giving access to international nets and to set up information resources for educational and scientific systems. As for *BELNET*, the aim of setting it up is to provide equal opportunities for the pupils and specialists from various training institutions (first of all, for those from the rural general schools) to gain knowledge and other essential educational information meeting up-to-date requirements, the national and European standards.

BELNET is supposed to be set up on the grounds of the operational telecommunication infrastructure of UNIBEL and NIKS networks, regional telecommunications of Beltelecom RSA using NIKS access channels to Russian and other international networks. Thus, the major part of information resources provided by NIKS and BELNET will be available for the users of both networks not only in Minsk and regional centers, but also in other localities of the republic. The operational connectivity diagram of the scientific and educational networks of the Republic of Belarus is shown in Fig. 1.8.

### Operational Connectivity Diagram of the Belarusian Scientific and Educational Networks

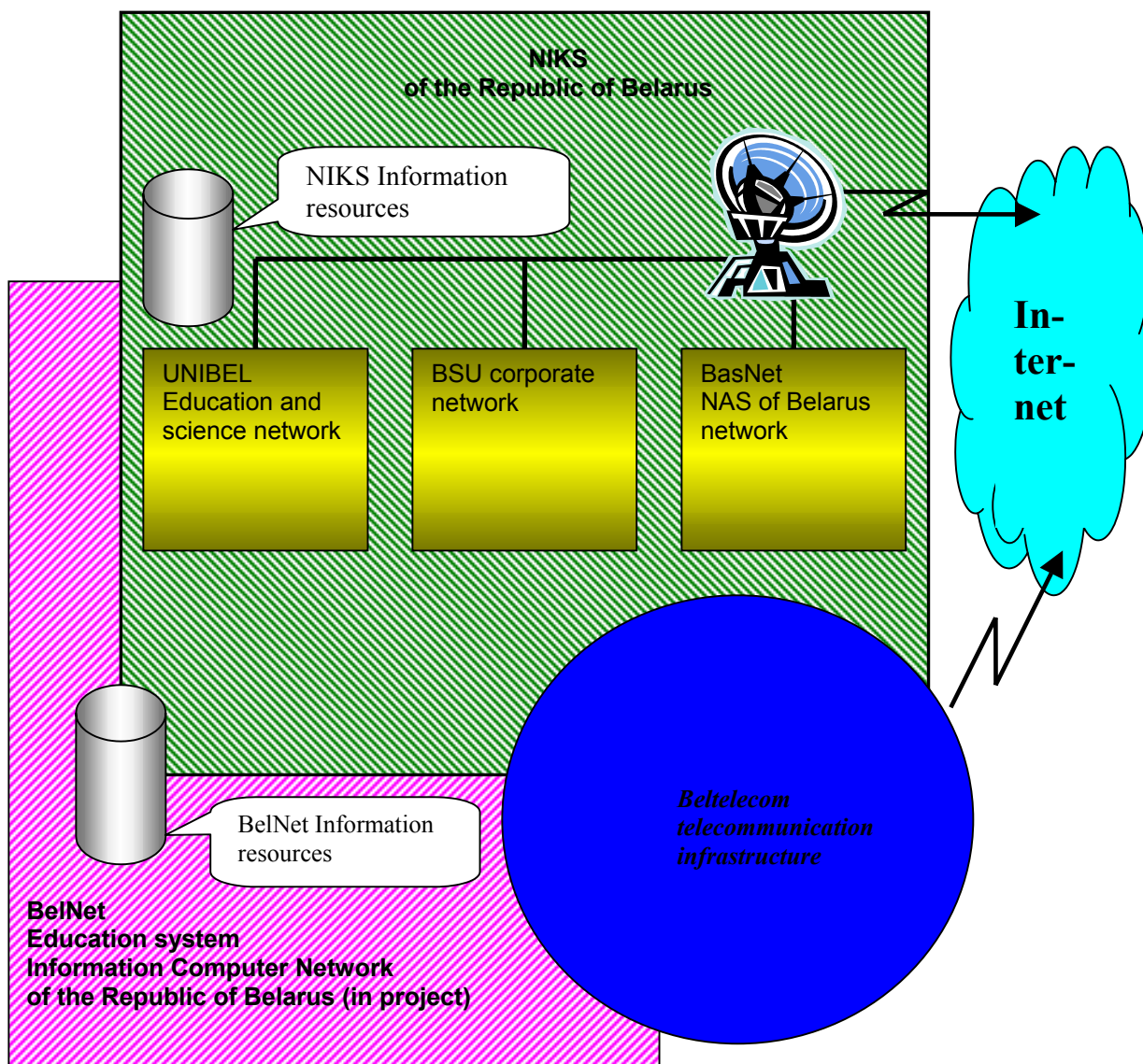


Fig. 1.8

**Traffic aggregation** [<http://www.belarusmedia.com>]. All the Belarusian providers, according to the established laws and rules, must lease communication channels, which link Belarusian Internet with the international web, from Beltelecom RSA. The capacitance of a leased channel provides for a definite traffic rate (or speed). This variable indicator is crucial for determining which provider is more important (powerful).

There are some hierarchical strata of the Internet providers in the Belarusian market: Beltelecom, the national communication operator, constitutes the upper stratum, i.e. the primary one; secondary ones - 5-6 major Internet providers - make up a medium stratum; and, finally, a wide range of the networked tertiary providers of any form of subordination, specializing in individual services (ASP, residential constructions connection, etc.), form the remaining third stratum. Experts estimate an approximate amount of investments for keeping 5-6 major providers of the country with the group at the level of 1.5 million US dollars for the first 6 months [<http://www.belarusmedia.com/?p=article798>].

In the Fall of 2001 one of the providers - the Business Network joint venture company - increased the external communication channel up to 1.5 Mbps, while other two independent providers, namely Open Contact and SOLO, acquired 768 Kbps channels approximately at the same time. Half-year later the competition continued: Business Network managed to reach 2 Mbps, Open Contact and SOLO achieved 1 Mbps. Business Network went for another improvement and increased the channel capacity connected with an international web segment of Internet up to 6 Mbps in November 2002. The remaining part of Belarusian independent providers fails to keep up a pace [<http://www.belarusmedia.com/?p=article869>].

On April 25, 2002, one of the top managers of Beltelecom RSA admitted the actual presence of tight partnership between the national providers [7]. A pilot operation of the traffic aggregation system of the abovementioned providers, i.e. Business Network, SOLO and Open Contact had started in the end of 2001. It allowed to more than double a shared operation of the traffic, which is finally profitable for everybody, including the end users. It is obvious, that transition to new operational principles should be thoughtful and mutually beneficial. The traffic aggregation is technically and economically appropriate in the case of a large scale consumption (at least 512 Kbps) [<http://www.belarusmedia.com/?p=article963>].

More over, "the traffic aggregation" means a joined financing for the shared external communication channel, which must be leased from Beltelecom RSA. The Business Network provider received an official permission to lease (actually to resell) the external channel to Internet, already leased from Beltelecom RSA, to other providers [<http://www.belarusmedia.com/?p=topic1414>].

National service providers and legal entities' tariffs/rates for the Internet access, posted on the Beltelecom RSA site (<http://www.beltelecom.by/tarif.phtml>), imply that since 15.10.2002 "the payment rate for an access point has been reduced: from 40118 to 32282 USD per month (less VAT) for 6-Mbps channel; from 18272 to 15547 USD for 2-Mbps one; from 12064 to 10273 USD for a megabit.

The consolidation (enlargement) of the service providing market serves the interests of the major providers and will inevitably lead to the rates reduction, which is profitable for the end users [<http://www.belarusmedia.com/?p=article963>].

**Public shared posts and Internet-cafes (Cybercafes).** Public Internet access category refers to 130 public shared point (PSPs) of Beltelecom RSA and 47 Internet - cafes (i.e. clubs, centers, rooms in libraries, etc.), set up by other organizations of any form of subordination. As of November, 2002 Beltelecom RSA had more than 380 workplaces for Internet access throughout the whole republic [8].

PSPs of Beltelecom RSA were initially built in the districts of the low telephony coverage as the socially significant establishments. The emphasis was made on the development of the automatic long-distance call and wire communication offices/stations network.

Due to rapid development of telecommunications and information technologies PSPs have lost their initial function of rendering primary necessity services. At present PSPs of Beltelecom RSA are not only the offices to call any place in the world, to send a telegram, to pay a toll and telephone service bill or to print out a long-distance call listing. Nowadays PSPs give a full array of services, including Internet access (26.8 BYR or 1.3 US cents per minute), e-mail, facsimile transmission, videotelephone

communication, «066» service (advertisement and greeting billboard for posting/ publishing them in mass-media, or transmitting message/cable by telegraph), pre-paid telephone plastic cards sale, photocopying, scanning, laminating, computer-aided text typing, basic skills for Internet browsing/usage, printing out the information from the computer, etc. The information with the PSP list, indicating a range of rendered services, working hours and contact telephone numbers is available on the Beltelecom RSA web-page (<http://www.beltelecom.by>).

Table 1.11

### 1.2.2. Public Internet Access

№	Variable (only 1 option out of 4 was possible for each region)	Belarus, %	Minsk, %	Regions, %
1	There is no public Internet access	0	0	0
2	There are limited opportunities for public Internet access (only one from the following: telecenters, libraries, post offices, Internet cafes, computer clubs)	70	10	80
3	There are some opportunities for public Internet access (a few from the following: telecenters, libraries, post offices, Internet cafes, computer clubs)	30	60	20
4	There are adequate opportunities for public Internet access for those without access at home, school or work	0	30	0

There are more than 280 Beltelecom PSPs throughout in the Republic, and 130 render Internet access service. This PSP service was developing most intensively in 2001-2002 (just during these 2 years alone 50 PSPs developed Internet - connected workplaces). The number of the Internet - connected workplaces all over the republic has reached 364 by the end of 3rd quarter of 2002. According to the Communication Facilities Development Program Till 2005, Beltelecom RSA plans to open new PSPs and arrange additional Internet - connected workplaces. Following this program, Beltelecom RSA set up 170 new Internet workplaces by the beginning in 2002. By the end of 3rd quarter of 2002 94 % of the plan was fulfilled. Vitebsk region became the leader of the development of this service as over 25% (115 workplaces) of all operational Internet access workplaces at PSPs are situated there. The number of the customers willing to access Internet at PSPs increased almost three fold within last 2 years.

Marketing research revealed that the age of PSP customers varied mostly between 20 and 30 years, whereas 30 and 50-aged clients use PSP services less often. One visitor usually uses PSP services several times per month. A great portion of visitors (52 %) uses trunk call services, 21 % employ Internet and e-mail services, the remaining portion come to pay toll and telephone service accounts, to make a photocopy, etc. The share of PSPs with Internet access service, as compared to IPs' Internet-clubs in Minsk totals 48 %, i.e. 36 cafes and clubs and 29 PSPs providing Internet access of Beltelecom in Minsk. The major Internet - clubs of Beltelecom RSA are: Kupalovsky (PSP No 820, 39 Marx str.), *Site* (PSP No 812, 100 Yesenin str.), *Poisk /Search/* (PSP No 818, 9 Logojsky track) and *Sputnik /Satellite/* (PSP No 805, 1 Chkalov str.). There is little competition between Internet - clubs in the administrative regions. Apart from Beltelecom RSA, there are 5 providers that render their services there.

The immediate task for Beltelecom RSA is to arrange at least one Internet access workplace in each area center of the republic. Another issue to be considered is the replacement of call boxes in PSP with Internet workplaces.

Fig. 1.9 contains the generalized results of the Internet-cafe Affordability index analysis. This is one out of eighteen sub-indexes, presented in the survey list at tut.by web site according to [1]. 1759 tut.by site visitors responded, including 492 ICT specialists; 104 representatives of education and science fields;

446 students and school-children; 277 managers and 440 people representing other fields. Please see Annex 1 with a background (domicile, occupation, employment, age) of participants of the poll. Here and later on text “Found it difficult” means “none of the options suits” or “no definite answer available”.

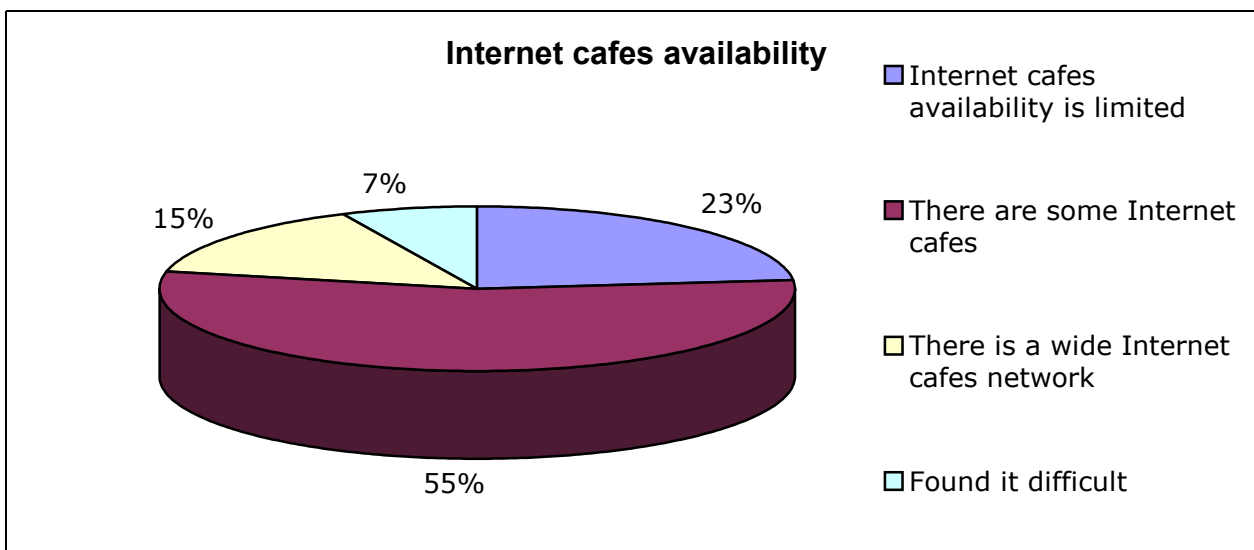


Fig. 1.9

**Switched (dial-up) access.** Other providers (except for Beltelecom RSA) were not presented for all areas (except for Minsk). The providers’ tariff policy and limited resources of their switched access pools primarily determine the «peak hour» notion. The telenetwork of the republic as a whole has a sufficient resource to put switched network access traffic through to Internet. Fig. 1.10 shows the generalized results of a public opinion poll at tut.by site for the Establishment Quality of a Dial-Up Connection with the Local IP index.

Table 1.12

**1.2.3. Available Connection Opportunities and Services**

№	Variable (only 1 option out of 4 was possible for each region)	Belarus, %	Minsk, %	Regions, %
1	There are no local connection opportunities	0	0	0
2	There is an opportunity for limited, bad quality dial-up connection to a local ISP. Some providers offer only e-mail services. No competition in commercial leased line provision	40	0	30
3	ISPs provide dial-up connection and full Internet access with some options between various Internet service packages. There are one or two private providers of leased lines	50	70	60
4	Higher bandwidth solutions such as DSL and cable modem access are available in addition to reliable dial-up connection. Wireless solutions are available. Most customers can tailor services to meet different demands for speed, service, security, quality and cost	10	30	10

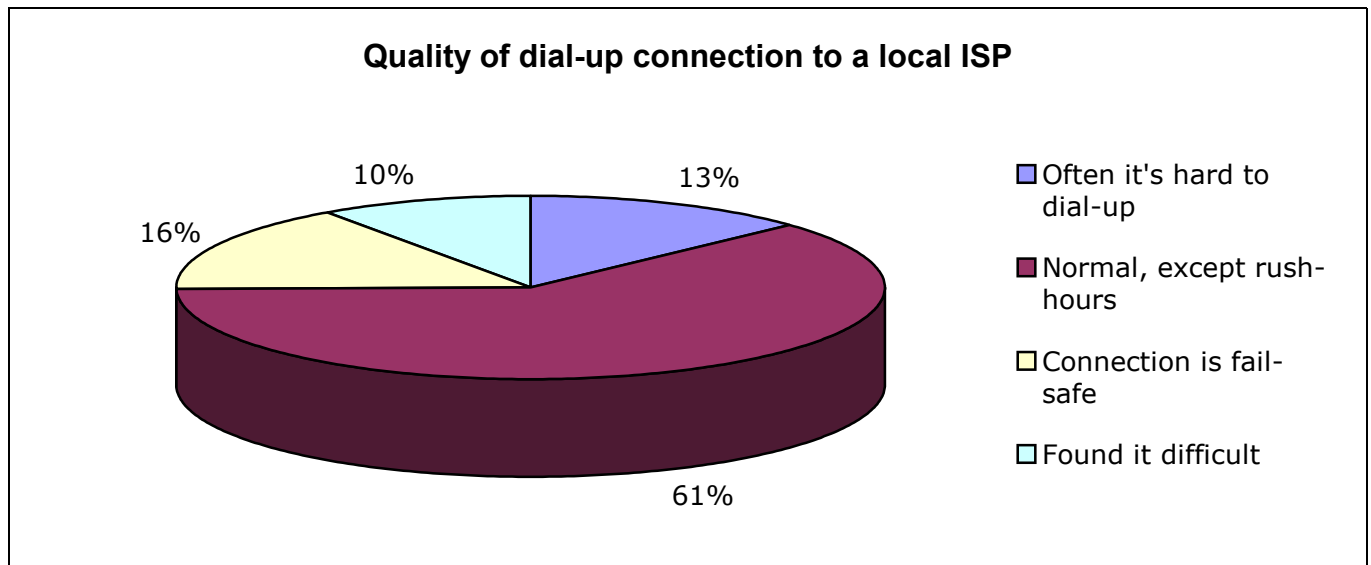


Fig. 1.10

Table 1.13

#### 1.2.4. Availability of Leased Lines for Business

№	Variable (only 1 option out of 4 was possible for each region)	Belarus, %	Minsk, %	Regions, %
1	Businesses are unable to lease dedicated lines from the local telephone operator, or there is a multi-year line	0	0	0
2	There is no competition in commercial line leasing. Businesses can only lease lines from a single telephone operator	60	20	70
3	One or two private providers lease lines to businesses	30	30	30
4	Multiple private providers lease lines to businesses	10	50	0

The only actual owner of cable infrastructure is Beltelecom RSA. The Internet providers are never refused when asking for a connecting line to provide a network coupling to Internet. Currently, any provider having the applicable hardware installed at its node is practically able to render service of a dedicated line connection to the Internet network upon an application to Minsk UTN state unitary company (SUC) or any other similar regional facilities of Beltelecom RSA.

Business Network Joint Venture Co. Ltd. is the only exception among providers, as it renders the Internet access services on the basis of its own data transfer network using FOC links. Business Network has the gateway server with BelPAK of Beltelecom RSA, a national data network.

The main features of Internet access service rendered by Business Network Joint Venture Co. Ltd. are described below.

- Permanent dedicated line connection, which ensures permanent (24-7) access to Internet from any user's computer (the computers of a local area network). The users can take advantage of Internet access, whenever required, as well as arrange their own information servers, which will be 24 hours accessible to all users of the Internet;
- Non-occurrence of line overstrains and engagements, as it happens with a switched public shared telenetwork;
- High access speeds (from 32 Kbps to 2048 Kbps), as synchronous digital channels are used at the

transfer speed selected by the user;

- Fixed subscriber's rate, which is independent of traffic size, as the fixed payments remove usage limitations. The traffic is not limited and is bounded only to speed of Business Network data transfer connection line. The traffic size does not affect repayment. Only monthly subscriber's fees (for port, modem and IP address availability) are to be paid;
- No necessity to apply to Minsk UTN SUC, Business Network joint venture company ensures a network access and leads up a dedicated digital channel to the user's a site;
- High operational characteristics of a web, as the overall performance is ensured by the topology of Business Network data transfer network and is regularly monitored by the centralized monitoring and network control system;
- Full scale maintenance (the qualified specialists of Business Network Joint Venture Co. Ltd. ensure an optimum mode of network operation); there is a single contact point for a user to a solve problems, concerning addressing, routing, web hardware, channels and communication lines.

The founders of Business Network, Belarusian-British Joint Venture Co. Ltd. are: Beltelecom RSA; Beltechexport, CJSC; Kenwood Corporation Ltd.; Solidex PI Joint venture company.

The #1 business priority of Network Joint Venture Co. Ltd. is to render services on the basis of its own data transfer network.

### 1.3. Internet Affordability

9 major Internet Providers (IPs) have filled in the questionnaires, developed according to the approved methodology [1], in order to gain information, related to **Internet Affordability index** variables (sub-indexes). The aforesaid IPs - IP TelCom ([www.iptel.by](http://www.iptel.by)), Atlant Telecom ([telecom.by](http://telecom.by)), Basnet ([inform.bas-net.by](http://inform.bas-net.by)), Beltelecom ([www.beltelecom.by](http://www.beltelecom.by)), Global-OneBel ([www.global-one.by](http://www.global-one.by)), Business Network ([www.bn.by](http://www.bn.by)), Forenet (BelSoft CJSC, [forenet.by](http://forenet.by)), Unibel ([www.unibel.by](http://www.unibel.by)) BSUnet ([www.cit.bsu.by](http://www.cit.bsu.by)) represent different niches of the Internet Providing market in the Republic of Belarus.

The experts assessed the level of Internet Affordability Readiness (or advancement) of the country, which ranges from the 1st (least-advanced) to the 4th (most-advanced) stage, for each micro-index independently, and average data assessment for Internet Affordability index and generalized data assessment for **Network Access** component index were evaluated on their basis.

Readiness (or advancement) estimation breakdown (in percentage) and average estimation for Internet Affordability index are shown below in Table 1.14.

Table 1.14

**Average Estimation of the Internet Affordability index**

Stage No	Belarus, %	Minsk, %	Regions, %
1	10	3,33	13,33
2	53,33	30	50
3	33,33	50	33,33
4	3,33	16,67	3,33
<b>Average Index Estimation</b>	<b>2,3</b>	<b>2,8</b>	<b>2,27</b>

The following Tables 1.15, 1.16 and 1.23 present the total estimation breakdown (given as share of the total amount of the answers received), assessing the whole republic, the city of Minsk and administrative regions in the context of the four micro-indexes.

In the Republic of Belarus telephone rates are considered to be of a great social significance thus

they are not allowed to reach their self-repayment level. Therefore they are affordable for all citizens of the republic. Flat rate pricing for local phone calls may be applied only in case if time records for local calls are not available. Besides, if there is a time-metered pricing established, each subscriber is granted one rate-free hour for local calls per month.

Table 1.15

**1.3.1. Telephony Fees**

№	Variable (only 1 option out of 4 was possible for each region)	Belarus, %	Minsk, %	Regions, %
1	Users are charged long distance or international rates for dial-up access	10	0	20
2	Rates for local telephone calls are high enough (in respect to the average salary) to discourage extensive Internet use via local ISPs, even among those who have Internet access	30	20	20
3	Reduction of telephone charges for Internet access reflects emerging competition in the telecom market, yet they are high enough (in respect to the average salary) to discourage extensive use by some users	50	70	50
4	Prices for telephone usage are set competitively and are affordable (in respect to the average salary) for nearly all citizens	10	10	10

The recently obtained data from the Regional commonwealth of communication (Belarus is one of its members) reveals a decline in the revenues, obtained from publicly shared services of mail, local, long-distance and international telephone calls and a simultaneous growth of documentary and cellular communication. The decrease, for example, in the local telephone service share is caused by the absence of a comparable rate growth for this service (as against the worldwide tendency). On the average, domestic long distance rates in Belarus are the lowest among CIS countries (Fig. 1.11).

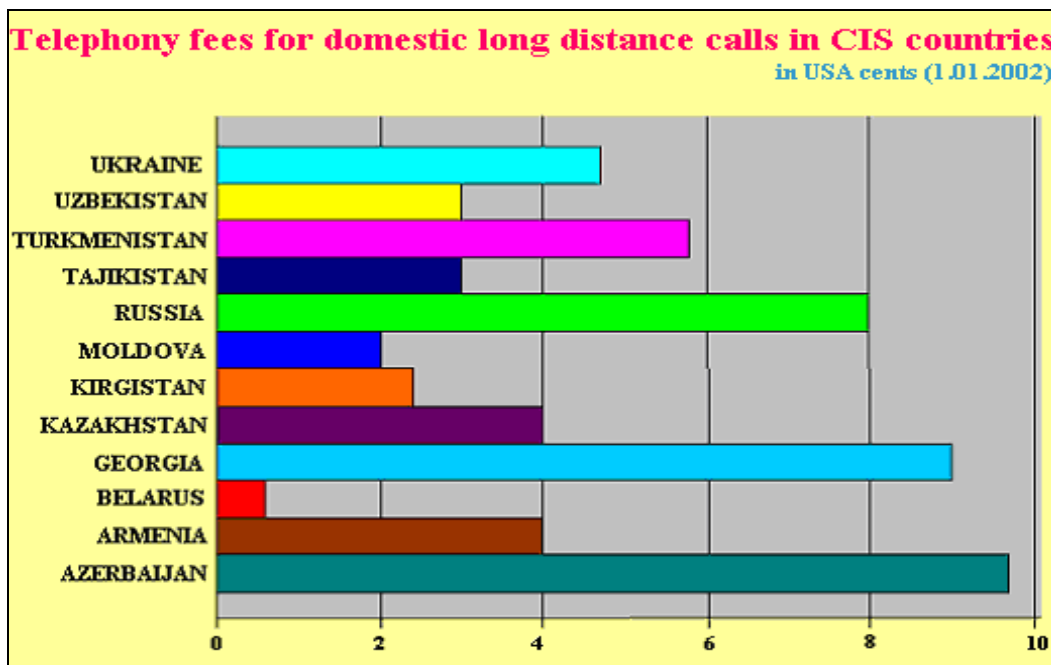


Fig. 1.11

Table 1.16

## 1.3.2. ISP Service Fees

№	Variable (only 1 option out of 4 was possible for each region)	Belarus, %	Minsk, %	Regions, %
1	ISP rates are so high (in respect to the average salary) that few individuals can afford Internet access	0	0	0
2	Rates for local telephone calls are high enough (in respect to the average salary) to discourage extensive Internet use via local ISPs, even among those who have Internet access	60	40	70
3	Internet access is priced (in respect to the average salary) within reach of the majority of citizens (over 50% of the population)	40	50	30
4	Prices for Internet access are set competitively and are affordable (in respect to the average salary) for nearly all citizens (over 90% of the population). Flat rate pricing may be available. Free ISP services may be available, particularly in communities with time-metered pricing of local phone calls. Higher bandwidth solutions such as DSL services and cable modem access are priced competitively, which may include tiered pricing based on speed of access or usage-based pricing based on total volume. "Always-on" connections are available without time-metered pricing	0	10	0

**Comparative statistics of Beltelecom RSA communication service rates.** The rates for local (Table 1.17), international (Table 1.18), mobile communication (Table 1.19 and 1.20), as well as dial-up Internet access (Table 1.21) services, effective from 15.10.2002, offered by Beltelecom RSA are given below [<http://www.beltelecom.by/tarif.phtml>].

Table 1.17

## Long Distance Telephony Rates

Destination	Roubles per min	USD per min	Minutes for 1 USD
Local calls (i.e., within a city)	4,79	0,0025	400
Within a region	12,80	0,0067	149
Within the republic	25,40	0,013	77

Table 1.18

**International Telephony Rates**

Country	Roubles per min		USD per min		Minutes for 1 USD	
	Working days, 9:00 – 21:00	Working days, 21:00 – 09:00; weekends and holidays	Working days, 9:00 – 21:00	Working days, 21:00 – 09:00; weekends and holidays	Working days, 9:00 – 21:00	Working days, 21:00 – 09:00; weekends and holidays
Russia	375	250	0,20	0,13	5,0	7,7
Ukraine	309	206	0,16	0,11	6,25	9,1
Germany	435	290	0,27	0,18	3,7	5,6
UK	534	356	0,33	0,22	3,0	4,5
USA	1346	673	0,82	0,41	1,2	2,4

Table 1.19

**Telephone Connection with GSM Users (MDC and MTS)**

Connection Time	Roubles per min	USD per min	Minutes for 1 USD
Working days, 06:00 – 23:00	258	0,13	7,5
Working days, 23:00 – 06:00; weekends and holidays	129	0,07	14,9

Table 1.20

**Telephone Connection with BelCel Users**

Connection Time	Rubbles/min	USD/min	Minutes for 1 USD
Working days, 06:00 – 23:00	147	0,077	13,0
Working days, 23:00 – 06:00; weekends and holidays	108	0,056	17,9

Table 1.21

**Dial-up Access to the Internet via Public Line for Individuals**

Connection Time	Roubles per min	USD per min	Minutes for 1 USD
Working days, 8:00 – 20:00	32,3	0,017	59
Working days, 20:00 – 02:00	15,1	0,008	125
Working days, 02:00 – 08:00	10,2	0,0053	189
Weekends and holidays, 09:00 – 02:00	10,5	0,0055	182
Weekends and holidays, 02:00 – 09:00	5,2	0,0027	370

**Extra charges to rates.** These data are available at the Beltelecom RSA web-page and concern only private subscribers (B2C). An exchange rate of the Belaruisan National Bank as of 29 Dec 2002 was: 1920 BYR per 1 USD. The last change in local and international telephone service rates was on April 20, in communication services rates for the NMT mobile network subscribers - on July 11, in GSM mobile networks services rates - on October 1, in Internet access rates - on October 15, 2002 (in the latter case, Christmas discounts are not included).

Basic prices are presented in tables 1.17 through 1.21. There are several reservations to be made, the main among them are:

- *Local communication.* The phone calls are charged for each full or incomplete minute of connection time. In addition, 5 % of the charged amount is levied on every phone call, either from home or business telephones. A rate rising coefficient of 1,5 applies to effective rates whenever international phone calls are rendered with destination automated dialing and order-based servicing system. A free connection time of 60 minutes per month is available. The flat pricing rate ranges between 975 and 1560 BYR per month.
- *International telecommunications.* The rate is charged for each full or incomplete minute of connection time. An extra charge of 50% of 1-minute rate is levied on each international call, either from home or business telephone.
- *Communication with wireless mobile subscribers.* The rate is charged for each full or incomplete minute of connection time. Local calls charges are levied separately.
- *Dial-up access.* . The rate is charged for each full or incomplete minute of connection time. In addition, 5 % of the charged amount is levied on every connection. If the connection time is less than 20 seconds starting with the moment the devices/ modems were identified no fee is charged.

**Analysis** [<http://www.belarusmedia.com/?p=article1136>]. A great dispersion in prices is obvious. 1 US Dollar corresponds to cost to 7 hours of local calls, approximately 10 minutes of calls to mobile telephones and just a couple of minutes of international calls. There is a 281 fold gap between the rate of 4.79 BYR (local call) and that of 1346 BYR (Belarus - USA call).

The Internet access rates decline steadily. For example, in the Fall 2000 the highest possible rate was 1.68 USD, and nowadays it is about 1 USD. It has been reduced by 70 %. Moreover, independent ISPs lay down even better conditions for natural persons (See, for example, Table 1.22, [www.bn.by](http://www.bn.by)).

Table 1.22

**Dial-up Internet Access Rates via Business Network Facilities**

Connection Time	General Access		Service Pack		Card	
	BYR/min	USD/min	BYR/min	USD/min	BYR/min	USD/min
Working days, 8:00 – 22:00	20,8	0,011	21,6 (24h access)	0,01125	17,3	0,009
Working days, 22:00 – 08:00	12,5	0,0065				
Weekends and holidays, 00:00 – 24:00	12,5	0,0065	5 (students access)	0,0026	6,4	0,0033

Table 1.23

**1.3.3. Leased Lines Pricing**

№	Variable (only 1 option out of 4 was possible for each region)	Belarus, %	Minsk, %	Regions, %
1	There is no competition in commercial line leasing	20	10	20
2	The lack of competition in the commercial lines leasing is reflected in prohibitively high leasing fees	70	30	60
3	Competition in line leasing for businesses has been introduced, prices are falling but still remain high	10	30	20
4	Pricing for leased business lines is set in a competitive environment featuring multiple vendors.	0	30	0

A comparison of Beltelecom old and new rates for the Internet Service Providers is shown in Table 1.24.

Table 1.24

**Secure Bandwidth Internet Access Rates (for ISPs and legal entities)**

Transfer Speed	Channel Access Rates per Month, USD (less VAT)			
	For ISPs and legal entities		For educational and scientific establishments	
	Effective before 15.10.2002	Starting with 15.10.2002.	Effective before 15.10.2002.	Starting with 15.10.2002
1	2	3	4	5
64 Kbps	1207	967	1207	967
128 Kbps	2292	1836	2292	1836
192 Kbps	3378	2705	3378	2705
256 Kbps	4404	3526	4404	3526
384 Kbps	6032	4830	6032	4830
512 Kbps	7962	6376	7962	6376
768 Kbps	9892	8423	9892	8423
1 Mbps	12064	10273	12064	10273
1.5 Mbps	18095	15407	18095	12077
2 Mbps	18272	15547	16508	13993
3 Mbps	25535	20414	23022	18357
4 Mbps	31029	24928	27938	22293
5 Mbps	36475	29317	32811	26386
6 Mbps	40118	32282	37419	30016
7 Mbps	43810	35120	41986	33523
8 Mbps	47397	38079	44799	35964

The rates for the ISPs, which are actually the wholesale buyers of Beltelecom RSA channel capacity, are a few times higher, than those for educational and scientific establishments, which purchase Beltelecom RSA services at retail. In other words, the latter have a definite channel capacity at their disposal, but do not resell the access services to third parties. However, the wholesale prices are typically lower than the retail ones.

The new rates offered by Beltelecom RSA to the legal entities and individual entrepreneurs without the license for rendering data transfer services from the Belarusian Ministry of Communications

of the Republic of Belarus are shown in Table 1.25.

Table 1.25

**User's Fees per Month for Internet Access via Leased Lines to the Synchronous Router Port**

Transfer Speed	Fees in USD (less VAT) effective from 15.10.2002r.
Up to 64.000 bps	332
Up to 128.000 bps	664

According to the mass media, Beltelecom RSA paid an annual fee of 1 million USD for using the external 34 Mbps channel in 2001. It is easy to calculate that a 1 Mbps capacity line cost Beltelecom RSA only 2451 USD per month, and a 64 Kbps capacity line - 153 dollars. Nevertheless, even after the rates reduction of 15-20 % on October 15, 2002 Beltelecom sells its capacity lines to its ISPs for 10273 and 967 USD per month respectively, which is 4.2 and 6.3 times higher, accordingly.

Thus, although the channels leasing rates for ISPs were reduced, they still remained considerably higher than the rates for non-providers (ref: Table 1.25, User's Fees per Month for Internet Access via Leased Lines to the Synchronous Router Port). The main argument of Beltelecom RSA in favor of its tariff policy is a necessity to subsidize unprofitable lines development, for instance, in the regions, and huge investments in re-equipment of communication lines. Internet services render 30 % profitability rate for Beltelecom RSA, which doesn't consider them to be overpriced.

In its official report, Beltelecom RSA claims its principal activity to bring 231 bln BYR revenues in 2001 [<http://www.beltelecom.by/beltelecom/bt2001.pdf>]. The inflation impedes conversion, but an exchange rate of 1500 BYR per 1 USD would show 154 million USD revenues. The profit amounted to 12,3 billion BYR (8 million USD) in 2001 [<http://www.belarusmedia.com/?p=article1313>].

The share of Data Transfer and Telematic Services in the Beltelecom RSA revenue structure was 4.24 % (6.5 million USD) in 2001. The revenues from data transfer network break down as follows:

- 89.4 % - Internet network;
- 3.7 % - electronic mail;
- 2.96 % - newspaper bars transfer;
- 2.51 % - data transfer network with packet switching;
- 1.43 % - facsimile transmission.

The rate of profitability was 5.56 % in 2001, whereas in 2000 it was 18.40 %.

In opinion of ISP's representatives, the international channels currently available for Internet access (as of October, 2002) are loaded by less than 70 %. It can reflect both a lack of demand or an overpricing. However, it is unreasonable to load channels by 100 %, as "jams" are likely to occur. The traffic ratio still remains negative: 20 % goes abroad, 80 % comes from abroad. Though it is noteworthy that 90 % of the external traffic was recorded in May 2001. Such situation boosts expenditures of the Belarusian side, in Beltelecom RSA opinion. The solution might be in the development local networked information resources, located right on the territory of Belarus.

Fig. 1.12 shows the generalized results of a public opinion poll (at tut.by site) for "Internet Access Fees for The People of your Region" index.

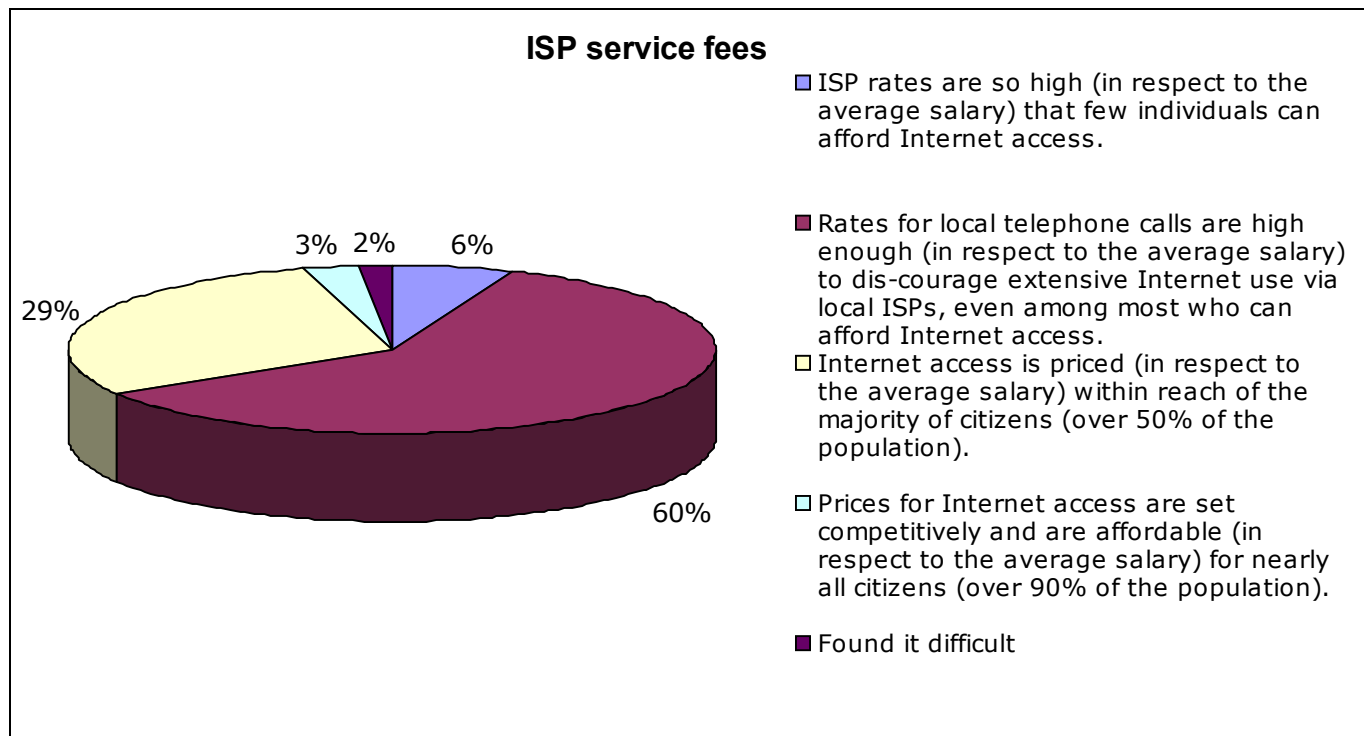


Fig. 1.12

#### 1.4. Network Speed and Quality

9 major Internet Providers (IPs) have filled in the questionnaires, developed according to the approved methodology [1], in order to gain information, related to **Network Speed and Quality index** variables (sub-indexes). The aforesaid IPs - IP TelCom ([www.iptel.by](http://www.iptel.by)), Atlant Telecom ([telecom.by](http://telecom.by)), Basnet ([inform.bas-net.by](http://inform.bas-net.by)), Beltelecom ([www.beltelecom.by](http://www.beltelecom.by)), Global-OneBel ([www.global-one.by](http://www.global-one.by)), Business Network ([www.bn.by](http://www.bn.by)), Forenet (BelSoft CJSC, [forenet.by](http://forenet.by)), Unibel ([www.unibel.by](http://www.unibel.by)) BSUnet ([www.cit.bsu.by](http://www.cit.bsu.by)) represent different niches of the Internet Providing market in the Republic of Belarus.

The experts assessed the level of Network Speed and Quality Readiness (or advancement) of the country, which ranges from the 1st (least-advanced) to the 4th (most-advanced) stage, for each micro-index independently, and average data assessment for Network Speed and Quality index and generalized data assessment for **Network Access** component index were evaluated on their basis.

Readiness (or advancement) estimation breakdown (in percentage) and average estimation of the Network Speed and Quality index are shown below in Table 1.26.

Table 1.26

#### Average Estimation of the Network Speed and Quality Index

Stage	Belarus, %	Minsk, %	Regions, %
1	0	0	6,25
2	17	6,25	31,25
3	58,25	38,5	42
4	24,75	55,25	20,5
<b>Average Index Estimation</b>	<b>3,08</b>	<b>3,49</b>	<b>2,77</b>

The following Tables 1.27 through 1.29 and 1.31 present the total estimation breakdown (given as share of the total amount of the answers received), assessing the whole republic, the city of Minsk and

administrative regions in the context of the four micro-indexes.

Table 1.27

#### 1.4.1. Telephone Connection Quality

№	Variable (only 1 option out of 4 was possible for each region)	Belarus, %	Minsk, %	Regions, %
1	Less than half of all domestic telephone calls are successful. Quality of connection is often unacceptable	0	0	0
2	50-70% of domestic telephone calls are successful. Connection breaks are frequent and extremely disruptive. For voice telephony, sound quality is acceptable for regular conversation	0	0	0
3	70-90% of domestic telephone calls are successful. Connection breaks are noticeably frequent and are somewhat disruptive	83	29	75
4	Broken connections are fairly rare and not very disruptive. Over 90% of local telephone calls are successful	17	71	25

Table 1.28

#### 1.4.2. Number of Faults Registering Annually per Each 100 Mainlines

№	Variable (only 1 option out of 4 was possible for each region)	Belarus, %	Minsk, %	Regions, %
1	More than 100 faults per 100 telephone mainlines are reported annually	0	0	25
2	Between 50 and 100 faults per 100 telephone mainlines are reported annually	25	25	25
3	Less than 50 faults per 100 telephone mainlines are reported annually	50	25	50
4	Less than 10 faults per 100 telephone mainlines are reported annually	25	50	0

Table 1.29

#### 1.4.3. Local connection infrastructure/ modem dial-up access speed

№	Variable (only 1 option out of 4 was possible for each region)	Belarus, %	Minsk, %	Regions, %
1	Local telecommunications infrastructure supports merely electronic mail	0	0	0
2	Telecommunications infrastructure in most areas supports dial-up modem transfer speeds of 9.6 Kbps or less. Some areas can support speeds of 14.4 Kbps	0	0	43
3	Users have access to dial-up modem transfer speeds of up to 28.8 Kbps	57	11	14
4	There is a widespread access to dial-up modem transfer speeds of up to 56 Kbps, with some access to high speed solutions such as DSL, cable modems and wireless media	43	89	43

In the framework of the Internet development strategy in the Republic of Belarus, Beltelecom RSA continues to expand its capacity and improve the BelPAK network structure. The Belarusian Ministry of

Communications adopted a regular Five Year Program for Communication Facilities Development, which was the first to set benchmarks for the increase of port capacity for the Internet network access in 2001. According to target of the Program, the hardware Internet access capacity should be increased by a factor of five by the end of 2005 [4].

By October, 2002 the access switched nodes were set up at all regional centers. Moreover, 160 ADSL-access ports were commissioned in Minsk and in other regions. 3 nodes were developed in Minsk and one node in each region. Beltelecom RSA introduced the Internet ADSL access service in July 2002. It provides for a regular network access at speeds of some Mbps, while maintaining an active capacity of the ordinary phone line. ADSL Nodes in Minsk are connected directly to backbone ring hardware, which ensures qualitative traffic exchange between subscribers' telephone exchange facilities and the international gateway server of the Internet web [5].

The program for communication facilities development for 2005 stipulates to add 15000 ports to the total port capacity of the Internet network access. According to the development program the port capacity growth was 1200 newly commissioned ports in 2001. The port capacity totaled 3145 ports, including 1290 ports of the dial-up switched access system. According to the initial project, over 2400 ports were installed and launched into operation (total 1620 ports commissioned, including 720 in Minsk, 240 in Brest, 120 in Vitebsk, 210 in Gomel, 210 in Grodno, 120 in Moguilev) in 2002.

Five-year port capacity development schedule is shown in Table 1.30 [4].

Table 1.30

**Port Capacity Development Schedule by Beltelecom**

Year	Capacity (number of ports)
2001	<b>1 200</b>
2002	<b>2 300</b>
2003	<b>3 700</b>
2004	<b>3 900</b>
2005	<b>3 900</b>

As before, the priority is given to the development of switched access. Regional nodes were reorganized and switched access servers were installed right in the regional nodes premises. The capacity of switched access set for each region amounted to 240 ports, with the exception of Brest and Vitebsk regions with 480 ports in each. The Cisco 7206 backbone routers were installed, which increased the capacity of the channels linking Minsk with regions and brought it up to 8 Mbps (about 2 - 3 fold). It provided for bandwidth capability required for load skip and set up a basis for the further network development in the regional nodes. A separate operational node for the regional traffic procession was set up in Minsk.

A topology of the network access in Minsk has changed considerably. A backbone ring round the city was built up and the switched access servers were connected straight to the city automatic telephone exchanges. It will permit to use the capabilities of the city telephone network in the most efficient way. There are nine nodes round Minsk, a set backbone protocol is Ethernet, a gigabit one (nodes located at ATE Nos. 262, 234, 251, 271, 224, 226, 221, 247, Minsk Switching Center /MSC/). The backbone network nodes have means to provide for connection of the subscribers via dedicated lines, which enables to connect more subscribers at less cost. The capacity of switched access servers round Minsk has almost doubled and totals 1680 ports.

A new hardware and software platform was put into operation for hosting services using

Beltelecom RSA equipment. Capacity of the system is 36 GB. For the operation of the hosting platform an individual domain (www.belhost.by) was registered.

The upgrading of the national traffic exchange node was completed with the installation of a leased switch board, which is to maintain high-speed bandwidth hardware connection at the speeds of 10 Mbps and higher.

A high capacity hardware, put into operation by Beltelecom RSA, permitted to serve, on the average, up to 200 thousand subscribers, to the maximum of 300 thousand subscribers per month in 2002. It makes up about 10 % of a telephone capacity. The total switched access capacity is to amount to 15000 ports, when a planned hardware is installed and commissioned in 2005. It will be possible then to serve as much as 450 thousand subscribers per month.

In 2003 the emphasis will be laid on the development of the regional nodes network topology. First of all the task of traffic sharing is to be solved: traditional voice traffic and the Internet one, which is generated by the users.

All Beltelecom RSA modem pools maintain 56 Kbps speed. Due to regular adjustment work carried out in the public shared telephone networks in order to switch them over to electronic ATEs, percentage of connections at 56 Kbps speed is growing steadily. The connection time at 56 Kbps speed is in the range of 40 to 50 % for an UTN infrastructure, but there is no precise information available about the RTN one.

Here follow the generalized results of a public opinion poll for the question: “**Are you pleased with a speed of your connection to Internet?**”. The question was put at Computer News On-Line site (<http://www.kv.by/vote/voteview.cgi>) and the results are as follows: total number of interviewees - 489 visitors, "yes" - 25,8 % , "no" - 74,2 %.

Table 1.31

#### 1.4.4. Country backbone facilities

№	Variable (determined 1 from 4 for each region)	Belarus, %	Minsk, %	Regions, %
1	In order to gain access, large businesses must link their networks directly to infrastructure backbone outside their country	0	0	0
2	Large businesses and ISPs can link their networks to a local infrastructure backbone, but backbone capacity is frequently inadequate to satisfy users' demands. Packet loss is significant and regularly disruptive for any online activities	43	0	57
3	Leased lines with transfer speeds of up to 64 Kbps are widely available for businesses and ISPs. Limited higher-speed lines are available in some areas. Backbone facilities serving the country are usually sufficient, although regular peak demand periods result in slower network response times. Packet loss by the network may occur but is not generally disruptive	43	89	29
4	High-speed services of 1.5 Mbps are common, with higher speeds available in some areas. Adequate backbone capacity exists to support country needs without significant transmission delays except for rare periods of high demand. Packet loss by the network is below 10%	14	11	14

GlobalOneBel, a closed joint stock company ([www.global-one.by](http://www.global-one.by)) provides financial organizations with the following range of services:

- access to Reuters dealing systems;
- access to Moscow Interbank Stock Exchange;
- access to the international electronic payment and monetary fund transfer systems;
- access to S.W.I.F.T. system;
- connection between bank hardware and credit cards processing centers;
- communication systems for interbank payment transactions and clearing settlements;
- access to Dow Jones informational resources.

One of the services, rendered on the basis of the data transfer network, operated by Business Network Joint Venture Co. Ltd., is the access to global information and communication resources and standard Internet applications, available in the web from the user's computer or from computers of the local area network.

Business Network Joint Venture Co. Ltd. as an ISP offers permanent synchronous connection via a leased line using FR protocol (frame relay, FR) at transfer rate ranging from 32 Kbps to 2048 Kbps (including asymmetric traffic). This method provides for a full-scale operation in the Internet and is perfect when connecting to the user's local area networks. It gives the user a full access to all resources of the Internet with no time constraints. Business Network Joint Venture Co. Ltd. covers with its services the following cities and towns: Minsk, Brest, Vitebsk, Gomel, Grodno, Moguilev, Baranovichi, Zhlobin, Novopolotsk, Mozyr.

Business Network Joint Venture Co. Ltd. render the Internet network access services on the basis of its own data transfer network built up on FOC lines. Business Network has a gateway server linked to BelPAK national data network of Beltelecom RSA. Business Network Joint Venture Co. Ltd. is constantly improving its channel bandwidth capacity for the Internet access, which allows to maintain high quality access capabilities as the number of users is growing.

Business Network Joint Venture Co. Ltd. provides for Internet access connection points via leased lines in all business districts of Minsk. For instance, a Business Network user can obtain access to Internet by connecting to the closest telecommunication node of the Business Network data transfer network. The Business Network Joint Venture Co. Ltd. specialists do the whole job package associated with the Internet connection.

## 1.5. Hardware and Software

9 major Internet Providers (IPs) have filled in the questionnaires, developed according to the approved methodology [1], in order to gain information, related to **Hardware and Software index** variables (sub-indexes). The aforesaid IPs - IP TelCom ([www.iptel.by](http://www.iptel.by)), Atlant Telecom ([telecom.by](http://telecom.by)), Basnet ([inform.bas-net.by](http://inform.bas-net.by)), Beltelecom ([www.beltelecom.by](http://www.beltelecom.by)), Global-OneBel ([www.global-one.by](http://www.global-one.by)), Business Network ([www.bn.by](http://www.bn.by)), Forenet (BelSoft CJSC, [forenet.by](http://forenet.by)), Unibel ([www.unibel.by](http://www.unibel.by)) BSUnet ([www.cit.bsu.by](http://www.cit.bsu.by)) represent different niches of the Internet Providing market in the Republic of Belarus.

The experts assessed the level of Hardware and Software Readiness (or advancement) of the country, which ranges from the 1st (least-advanced) to the 4th (most-advanced) stage, for each micro-index independently, and average data assessment for Hardware and Software index and generalized data assessment for **Network Access** component index were evaluated on their basis.

Readiness (or advancement) estimation breakdown (in percentage) and average estimation of the Hardware and Software index are shown in Table 1.32.

Table 1.32

**Average Estimation of the Hardware and Software Index**

Stage	Belarus, %	Minsk, %	Regions, %
1	17	0	25
2	41,5	33,5	41,5
3	41,5	50	33,5
4	0	16,5	0
<b>Average Index Estimation</b>	<b>2,25</b>	<b>2,83</b>	<b>2,09</b>

The following Tables 1.33 through 1.36. present the total estimation breakdown (given as share of the total amount of the answers received), assessing the whole republic, the city of Minsk and administrative regions in the context of the four micro-indexes.

Table 1.33

**1.5.1. Hardware Market Development for ICT Solutions**

№	Variable (determined 1 from 4 for each region)	Belarus, %	Minsk, %	Regions, %
1	There are no distribution/sales points for ICT hardware within the country	17	0	17
2	Some off-the-shelf hardware is available locally, but almost no hand-books are available in the native language	33	17	33
3	Most ICT products stem from abroad, but there is a strong and growing localization industry, which adapts products to local needs.	50	50	50
4	A vibrant marketplace exists for hardware with a competitive retail and wholesale markets for these products	0	33	0

Table 1.34

**1.5.2. Software Market Development for ICT Solutions**

№	Variable (determined 1 from 4 for each region)	Belarus, %	Minsk, %	Regions, %
1	There are no distribution/sales points for ICT software within the country	17	0	17
2	Some off-the-shelf software solutions are available locally, but there are none or very few in the native language	33	17	33
3	Most ICT products stem from abroad, but there is a strong and growing localization industry to adapt products to local needs. Some software appropriate to local needs and languages is available	50	50	50
4	A vibrant marketplace exists for software with a competitive retail and wholesale markets for these products	0	33	0

Belarusian ICT market. CIS experts, who consider the ICT markets in Belarus, Russia and Ukraine develop under identical scenarios, distinguish several key stages on the way from the very conception till

the present. The years 1990 to 1992 were the time to abandon common assignment mainframe computers and to turn towards Unix servers and PCs; terminal mode fell to oblivion and a transition to distributed use of server nodes and software took place. Mid'90s were the years to perceive the Client-server relationship. 1996 year was the beginning of the present distributed systems development on the basis of servers and IBM PC workstations [9-11].

The competition among Belarusian computer companies becomes more rigorous. In the recent years, they created information technologies and significant infrastructure, which even excel current demands of local businesses.

The majority of Belarusian firms are making their first steps towards full-scale application of information technologies in the fields of management, production, marketing and sales. There is an obvious contradiction: on the one hand, there is a strong flow of informatization offers to firms and organizations, on the other hand, the quantity of firms which are able to perceive information (networked) novelties, is definitely limited.

Computers and peripherals. According to marketing departments' assessments, carried out by the leading Belarusian computer manufacturers, about 55 - 75 thousand computers are sold annually to industrial sector and up to 50 thousand - in the end consumers, and it is almost 20 times less than in Russia. The ICT industry turnover is less accordingly (whereas the Russian turnover of the whole ICT industry, as estimated by different sources, totals 2-3 billion US Dollars a year). The market of network hardware, despite of definite difficulties, is expanding [9-11].

Many Western companies work successfully with Ukraine and Belarus for a long time, to tell the truth though, the turnover in these countries is not that great for the present. According to Mr. Serguey Tarasov, the head of the Russian office of Sun Microsystems, the Moscow market still remains the most attractive for Sun, as its share in the last year was about 80 % of its business in CIS countries [12].

On the other hand, a number of representatives of western corporations operating in the CIS consider the market development to differ drastically between countries. Many of them concur that Belarusian ICT market is considerably less advanced, than Ukrainian one. As Mr. Serguey Tarasov put it, " Practically, there is no private property in the republic. Almost all businesses are government-owned. It determines the peculiarities of planning and budgeting. Internet is rather underdeveloped. As for the Ukrainian market, it is on the intermediate stage of development - between Russian and Belarusian markets" [12]. The markets features in the both republics, according to the head of Sun office, influence the business rules in these areas.

Mr. Yury Rimejko, the representative of Sony ITE for the PC monitors sales promotion in CIS and Baltic countries, agrees with a rather reserved assessment of the Belarusian market. "The market is especially small in Belarus, profitability is extremely low (although, apparently it can't be lower — Slav - brothers manage to turn it down)," — he stated. "It is more correct, in general, to speak about cases of sales in Belarus rather than about turnover of sales. Roughly speaking, Belarus is 10 % of Ukraine, and Ukraine is 10 % of Russia." It can explain why Sony does not rush to open up the markets of the former soviet republics. For example, what concerns the monitors sales, there is only one office, located in Brussels, which is responsible for Russian, Belarusian, and Ukrainian sales taken together[11].

There are also other quantitative assessments of the markets of Ukraine and Belarus; however, they are close to the above-mentioned proportions. "All markets differ, first of all, by turnover. For example, the whole Belarusian computer market is much less than 10 % of Russian market, but the Ukrainian one makes up a bit more of this estimate. This implies all the remaining consequences and effects, namely large-scale corruption, severe rivalry, etc.", Mr. Grigor Karchikyan, the general director of the Moscow brunch office of MAS Elektronik AG considers. The main feature of the Belarusian market is a huge number of papers required for any transaction, any payment is possible only under a contract. Even more bureaucratic approach to operation of any company in any business is disclosed by a separate licensing of

all kinds of the business activities. At first, MAS company opened its office in St. Petersburg, then in Moscow, later on in Minsk and Kiev [12].

In Mr. Grigor Karchikyan's opinion, there is a considerable bureaucratic influence in Belarus, as well as in Ukraine. As a matter of fact, a free commercial market here is at its earliest stage of formation and its main feature is that yet no developed market institutions have been established. Marketing, in its traditional understanding, is underestimated, the markets have not been examined, and many experts look skeptically at their development.

According to Ms. Lidiya Grechina, the Oracle marketing manager in CIS countries, the Ukrainian market is more advanced as compared to the Belarusian one. It refers to the industrial sector, and to the private investments both. "It is basically possible to speak about a market in Ukraine, since market institutions are established and operate (at least restrictedly), which is not the case of Belarus. In Belarus, there is practically one customer only, namely the government; and no private property or foreign investments. Therefore market is limited, and the sales turnover is some times less than in Ukraine", Ms. L. Grechina asserts [11].

In spite of the fact that the majority of representatives of the western ICT companies admit, that the Ukrainian and Belarusian markets are quite promising and develop dynamically, not all the companies consider it necessary to establish representation offices in these countries at the current stage. Moreover, the operation via the business partners turns to be effective enough. Dell Company, for example, adheres to this policy. In Russia it operates through Dell Systems Corporation, by the way, Dell's only business partner, which was granted the right to use "Dell" trademark. Ulysses corporation plays the same role for Ukraine, and Belsoft CJSC deals in Minsk, but only difference is, that Dell Systems has exclusive rights in Russia and non-exclusive ones in other regions, whereas other Dell partners work, as for now, in the «native» markets only [12].

IBM has chosen a little bit different strategy, but in this case too, business partners are the core of their activities. According to Mr. Serguey Komyagin, IBM works through the business - partners in Ukraine and in Belarus, which are, in their turn, working with CIS department of the Moscow office. It is well known that each CIS country had its own distinguished operation model: it could be business partners only, IBM service organizations, IBM independent regional employees or agencies. "At present, the representation through business partners strategy is considered to be the most successful one. In «major» countries, small groups of IBM employees are assigned to support local workers, the latter in their turn are subordinate to IBM CIS department. Nowadays such business practice has been successfully adopted in Belarus (by IBA company [12]).

Sun Company applied a similar policy in Belarus, but the Ukrainian market was recognized to be large enough to justify the establishment of a local representation office. The Ukrainian office of Sun Microsystems was opened three years ago. Before that the trade with the republic was very scarce as it went through the Ukrainian partners from the Moscow. By now, about 10 companies have been accredited in Ukraine. Sun Microsystems operates in Belarus through the Moscow office. Four partner companies are registered, which are IBA, Solidex, Belsoft and Microexpress companies [12].

*Oracle* corporation is represented in CIS countries through the Oracle CIS organizational structure. This structure consolidates the Central - Asian office located in Alma-Ata, Kiev office, which is responsible for both the Ukrainian and Moldavian markets, and the Moscow office, which is directly responsible for the business development in Russia and the remaining CIS countries, including Belarus. Such a structure has been set up since the very establishment of the official Oracle representation in the CIS. There is no Oracle office in Belarus, sales and the marketing operations are carried out through the distributors, namely by CompIT Technology and Belsoft companies.

The market of system integration. The analysts and the computer companies representatives note the general trends of growth and increasing market activity in the field of ICT solutions, an expanding

number of Internet users and quantity of home PCs. The Belarusian market is expected to respond adequately, concerning the background of the forecasted growth of Internet - business. At the same time, mass media points out that the demand for the enterprise management systems has fallen noticeably during the last two years. The systems, which were designed in the West and locally adapted by domestic agencies or distribution companies, prevail in the big enterprise market sector of the country. The local integrators (such as Belsoft CJSC, BelABM joint venture, BelHard Group, etc.) achieve the highest success in the Belarusian market. It is mainly due to reasonable pricing as compared to foreign companies. A most vivid market trends are consolidation of the companies and decrease in the number of integrators as small and medium enterprises merge, which allows to increase their market power.

Government contracts play a significant role, as the majority of big enterprises are state owned. Tender bidding is obligatory even for the minor contracts.

As for constraining factors of the system integration development, the shortage of funds for networked re-equipment of enterprises and inadequate understanding of strategic importance of the networked structure development among the managers of the large-scale companies are among the main.

Piracy. The problem of piracy is the main one in the Belarusian software market. In the opinion of Mr. Alexey Badayev, business development department manager of Microsoft in the CIS, «There is a copyrights law adopted in Belarus, but at present there are no mechanisms to enforce it» [10].

The market of the legal software producers is on its stage of conception, and the software companies have to compete, first of all, with counterfeit products. Thus, even low prices for licensed software CDs, which are just about 50 to 80 % over the illegal CD price, does not encourage many retail vendors to include «white» software in their offers. And the legal manufacturers can not lower the prices any further due to the amount of royalties to be paid, which is about 30 % of the prime cost of a CD [10]. As for the general description of the CIS ICT markets, according to Dataquest information they are ranked among the top ten largest in Eastern Europe, with Ukraine's share being about 4 %, Belarus — about 2%, and Russia — 26 %.

Table 1.35

### 1.5.3. ICT-related Hardware and Software Pricing

№	Variable (determined 1 from 4 for each region)	Belarus, %	Minsk, %	Regions, %
1	ICT hardware and software are too expensive for all but large businesses and a small minority of citizens and small and medium-sized businesses	17	0	33
2	Basic hardware and software are affordable for some citizens and small and medium-sized businesses	50	50	50
3	A variety of hardware and software solutions are available and affordable for most small and medium-sized businesses, as well as for many private users	33	50	17
4	Hardware and software appropriate to local needs and languages are widely available and affordable	0	0	0

Table 1.36

### 1.5.4. PCs penetration

№	Variable (determined 1 from 4 for each region)	Belarus, %	Minsk, %	Regions, %
1	Less than 5 personal computers per 100 households	17	0	33
2	5-15 personal computers per 100 households	50	50	50
3	16-50 personal computers per 100 households	33	50	17
4	Over 50 personal computers per 100 households	0	0	0

Fig. 1.13 shows the generalized results of a public opinion poll at tut.by site, assessing PCs and Software Pricing micro-index.

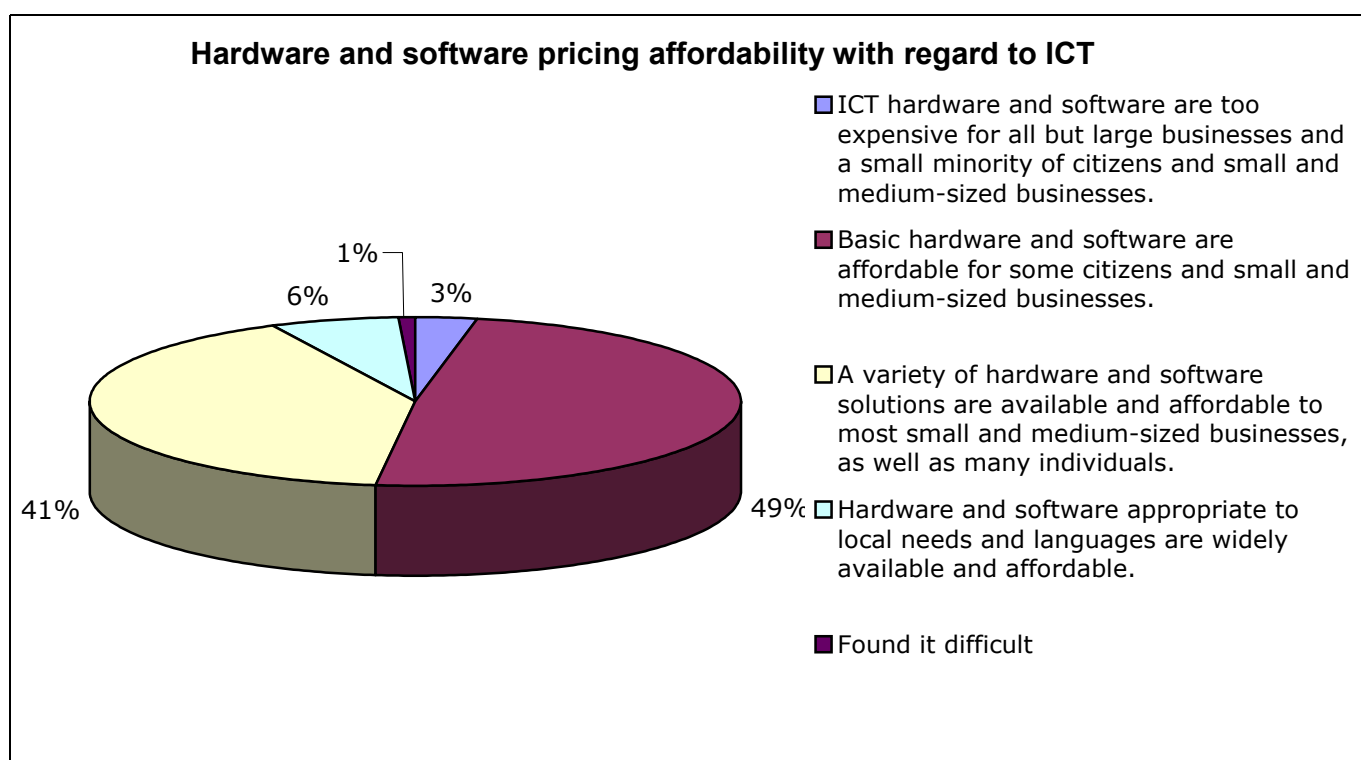


Fig. 1.13

### 1.6. Service and support

9 major Internet Providers (IPs) have filled in the questionnaires, developed according to the approved methodology [1], in order to gain information, related to **Service and Support index** variables (sub-indexes). The aforesaid Ips - IP TelCom ([www.iptel.by](http://www.iptel.by)), Atlant Telecom ([telecom.by](http://telecom.by)), Basnet ([inform.bas-net.by](http://inform.bas-net.by)), Beltelecom ([www.beltelecom.by](http://www.beltelecom.by)), Global-OneBel ([www.global-one.by](http://www.global-one.by)), Business Network ([www.bn.by](http://www.bn.by)), Forenet (BelSoft CJSC, [forenet.by](http://forenet.by)), Unibel ([www.unibel.by](http://www.unibel.by)) BSUnet ([www.cit.bsu.by](http://www.cit.bsu.by)) represent different niches of the Internet Providing market in the Republic of Belarus.

The experts assessed the level of Service and Support Readiness (or advancement) of the country, which ranges from the 1st (least-advanced) to the 4th (most-advanced) stage, for each micro-index independently, and average data assessment for Service and Support index and generalized data assessment for **Network Access** component index were evaluated on their basis.

Readiness (or advancement) estimation breakdown (in percentage) and average estimation for Service and Support index are shown in Table 1.37.

Table 1.37

**Average Estimation by Service and Support Index**

Stage No	Belarus, %	Minsk, %	Regions, %
1	22.33	0	28
2	44.67	44.4	39
3	33	33.8	33
4	0	16.8	0
<b>Average Index Estimation</b>	<b>2.11</b>	<b>2.72</b>	<b>2.05</b>

The following Tables 1.38 through 1.40. present the total estimation breakdown (given as share of the total amount of the answers received), assessing the whole republic, the city of Minsk and administrative regions in the context of the four micro-indexes.

Table 1.38

**1.6.1. Telephone Line Installation Waiting Period**

№	Variable (only 1 option out of 4 was possible for each region)	Belarus, %	Minsk, %	Regions, %
1	It takes at least four years for telephone mainlines to be installed, counting from the time orders are placed	50	0	50
2	It takes at least six months to install	50	100	50
3	It take at least one month to install	0	0	0
4	Mainline installation is usually completed within a few days	0	0	0

Table 1.39

**1.6.2. Time Necessary to Fix Mainlines Problems**

№	Variable (only 1 option out of 4 was possible for each region)	Belarus, %	Minsk, %	Regions, %
1	It takes over six months for reported mainline problems to be resolved, if ever	17	0	17
2	It takes over one month for reported mainline problems to be resolved. Providers pay no explicit attention to customer service	17	33,3	17
3	It takes over one week for reported mainline problems to be resolved. There is a growing customer service ethic among service and support providers, although it is not a priority for the majority. Some ICT maintenance and technical support services are available	66	33,3	66
4	Service providers can be contacted in a number of ways (e-mail, telephone, and mail). Reported problems are usually resolved within 48 hours. On-line help is available and may allow for immediate resolution. Customer service is considered a source of competitive advantage for the service provider. ICT maintenance and technical support are widely available	0	33,3	0

## 1.6.3. Qualified Personnel Availability

№	Variable (only 1 option out of 4 was possible for each region)	Belarus, %	Minsk, %	Regions, %
1	There are very few or no software developers, programmers or computer technicians in the community	0	0	17
2	There is a small community of software developers, web designers, network administrators and other technical personnel	67	0	50
3	There is a nascent software industry in the community, and there is a growing number of hardware technicians, web designers and network administrators	33	83	33
4	There is a competitive and sophisticated web design market, incorporating the latest development technology	0	17	0

**Hosting Providing. Computer News paper** [13] questioned a number of organizations which tender hosting service in the Belarusian market in a survey held in August - September, 2002. The survey intended to study a general situation in the market regarding hosting service and probable perspectives of its development.

The survey voters were required to answer 6 questions:

- 1) What services are provided for customers,
- 2) What are the main participants involved in this segment of the market,
- 3) Market shares of the participants,
- 4) Total hosting market turnover in Belarus,
- 5) Main trends in the development of this market segment,
- 6) Recommendations to customers when choosing commercial hosting provider.

At the time the survey was carried out there were 16 organizations known to render commercial hosting service. 9 of them participated in the survey: Webcom Design Studio, By.Com Belarus T (Office Technologies CJSC), Tut.By Electronic Business Center, Sunico studio, Currycomb company, Pixelhead studio (division of IBA joint venture), HostTrade (Federation CJSC), CNT Connecticut, Network Systems CJSC – which is about 56 %, i.e. more than half of hosting-providers, including today's most efficient market players.

As the result of the survey 4 groups of hosting providers (HPs) were distinguished:

1. Companies, which consider hosting provision to be their principal activity, namely By.Com and Tut.By;
2. Studios and Web-design companies which are involved in site designing and offer customers and third parties individual Web-design and implementation solutions, namely CNT Connecticut, Pixelhead, Webcom Design Studio and Sunico studio;
3. Internet Service Providers, the companies that are involved in hosting provision as a logical extension of their principal activity, namely Network Systems;
4. IT companies, whose principal activity promotes and encourages hosting providing - Currycomb and HostTrade (Federation CJSC).

It was also noted, that there is a multitudinous group of dumping promiscuous dealers which offer cheap American hosting provision in the Belarusian market.

The first five companies, in the opinion of professional HPs, are Beltelecom, Open Contact, By.Com, Hosteks and Tut.By. The current distribution of the market is the following: Tut.By - 15-18 %,

Hosteks - 5-7 %, By.Com Belarus - 30 %, with petty operators remaining.

The total turnover of the hosting provision market was estimated more precisely - within the limits of 10 to 17 thousand USD per month or 120 to 200 thousand USD per year. The method of calculation applied here was the following: quantity of sites was multiplied by an average hosting rate for each customer. In the voters' opinion, the total number of sites which are taken into consideration, vary between 1000 and 2000, minimum hosting rate - 2 USD per month, ceiling hosting rate - 35 USD, average one - between 10 and 15 USD.

The voters concluded, that the very first stage - the stage of a nascent hosting service market - is already over in Belarus. If earlier many HPs actually were only subproviders for major Russian or Western hosters, nowadays they use their own hardware facilities. Proper servicing requires additional investments and expenditures, which naturally brings more profits and permits to reduce the service rates for customers. Hosting companies are integrating, and this tendency means the raising reliability of hosters, allows them to extend the range of services and, again, to tender more attractive rates at the expense of cutting average costs. No considerable changes in hosting provision market are forecasted in Belarus, a steady progressive growth is expected to follow the extension of the Internet usage in the country. Marketing business activity of hosters is still sluggish, due to the low market penetration and minor incomes.

**Conclusion.** The overall score of the above assessment of the readiness stage based on the Network Access component index (Table 1.41) shows, that the capital of the country (20 % of the population) has actually reached the 3rd stage of development according to the index, whereas the regions got stuck at the 2nd stage.

Table 1.41

**Total Estimation by Network Access Component Index**

No	Sub-Index	Belarus	Minsk	Regions
1.1	Information Infrastructure	2.4	2.9	2.225
1.2	Internet Availability	2.625	3.4	2.525
1.3	Internet Affordability	2.3	2.8	2.27
1.4	Network Speed and Quality	3.08	3.49	2.77
1.5	Software and Hardware	2.25	2.83	2.09
1.6	Service and Support	2.11	2.72	2.05
<b>Total Estimation by Component Index</b>		<b>2.46</b>	<b>3.02</b>	<b>2.32</b>