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Newsletter

Information Society Technologies

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New Methods of Working for Information Society Technologies Programme Promotion to Commonwealth of Independent States

WISTCIS project promotes Information Society Technologies (IST) Programme to the seven participating European CIS countries (Armenia, Azerbaijan, Belarus, Georgia, Moldova, Russia, Ukraine) by dissemination actions and teleworking, basing on new methods of team work between EU and the CIS interested parties.

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WISTCIS Outlook Conference

"Information Society Priorities: New Prospects for European CIS Countries"
Moscow, Russia (November 20-22, 2003)


Andrew OZMN

Inside this issue

SECTION 1
The EU Sixth Framework Programme and CIS

New CIS opportunities in the EU Sixth Framework Programme

A. Beriozko (EDNES Moscow branch, Russia)

At the Lisbon summit in March 2000, EU governments called for a better use of European research efforts through the creation of an internal market for science and technology - a 'European Research Area' (ERA). FP6 is the financial instrument to help make ERA a reality.

Research activities

FP6 is divided into four main groups of research themes and research activities, which are eligible for funding.

Thematic Areas

Covers those areas where the EU in the medium term intends to become the most competitive and dynamic, knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion.

- **Life sciences, genomics and biotechnology for health**

To exploit breakthroughs achieved in decoding the genomes of living organisms, for the benefit of public health and to increase the competitiveness of the European biotechnology industry. Also to bring basic knowledge through to the application stage to enable real progress at European level in medicine and improve the quality of life.

- **Information society technologies**

Intended to stimulate the development in Europe of both hardware and software technologies and applications at the heart of the creation of the information society in order to increase the competitiveness of European industry and allow European citizens the possibility of benefiting fully from the development of the knowledge-based society.

- **Nanotechnologies and nano-sciences, knowledge-based multifunctional materials and new production processes and devices**

Intended to help Europe achieve a critical mass of capacities needed to develop and exploit, especially for greater eco-efficiency and reduction of discharges of hazardous substances to the environment, leading-edge technologies for the knowledge-based products, services and manufacturing processes of the years to come.

- **Aeronautics and space**

To strengthen, by integrating its research efforts, the scientific and technological bases of the European aeronautics and space industry and encouraging it to become more competitive at international level; and to help exploit the potential of European research in this sector with a view to improving safety and environmental protection.

- **Food quality and safety**

Intended to help establish the integrated scientific and technological bases needed to develop an environmentally friendly production and distribution chain of safer and varied food. To control food-related risks, relying on biotechnology tools taking into account post-genomic research, as well as to control health risks associated with environmental changes.

- **Sustainable development, global change and ecosystems**

Intended to strengthen the scientific and technological capacities needed for Europe to be able to implement sustainable development, and integrating its environmental, economic and social objectives with particular regard to renewable energy, transport, and sustainable management of Europe's land and marine resources.

- **Citizens and governance in a knowledge-based society**

Intended to mobilise in a coherent effort, in all their wealth and diversity, European research capacities in economic, political, social sciences and humanities necessary to develop an understanding of the emergence of the knowledge-based society and new forms of relationships between its citizens, on the one hand and between its citizens and institutions, on the other.

Cross-cutting research activities

Activities under this heading will complement research within the 7 thematic areas.

- **Research for policy support**

Intended to respond to the scientific and technological needs of the policies of the Community, underpinning the formulation and implementation of Community policies, bearing in mind also the interests of future members of the Community and associated countries. They may include pre-normative research, measurement and testing.

- **New and emerging science and technology (NEST)**

Intended to respond flexibly and rapidly to major unforeseeable developments, emerging scientific and technological problems and opportunities, as well as needs appearing at the frontiers of knowledge, more specifically in multi-thematic and interdisciplinary areas.

- **Specific SME activities**

Carried out in support of European competitiveness and enterprise and innovation policy, these specific activities are intended to help European SMEs in traditional or new areas to boost their technological capacities and develop their ability to operate on a European and international scale.

- **Specific international co-operation activities**

In support of the external relations, including the development policy of the Community, specific measures aimed at encouraging international research cooperation will be undertaken. Apart from these specific measures, third country participation will be possible within the 7 thematic priorities.

- **JRC activities**

In accordance with its mission of providing scientific and technical support for Community policies, the Joint Research Centre (JRC) will provide independent, customer-driven support for the formulation and implementation of Community policies, including the monitoring of the implementation of such policies, within the areas of its specific competence.

Strengthening the foundations of ERA

To stimulate the coherent development of research and technology policy in Europe by supporting programme co-ordination and joint actions conducted at national and regional level as well as among

European organisations. Activities may be implemented in any scientific and technological area.

- **Co-ordination of research activities**

Develop synergies between existing national activities; enhance the complementarity between Community actions and those of other European scientific co-operation organisations in all fields of science (examples: health, biotechnology, environment, energy)

- **Development of research/innovation policies**

Encourage coherent development of research and innovation policies in Europe by early identification of challenges and areas of common interest and by providing policy makers with knowledge and decision-aiding tools.

Structuring the ERA

The main aim is to fight structural weaknesses of European research. By their nature and means of implementation, the activities carried out within this programme are applicable to all fields of research and technology.

- **Research and innovation**

To stimulate technological innovation, utilisation of research results, transfer of knowledge and technologies and the setting up of technology businesses in the Community and in all its regions, not least in the less developed areas. Innovation is also one of the most important elements throughout this programme.

- **Marie Curie Actions - Human resources and mobility**

To support the development of abundant world-class human resources in all regions of the EU by promoting transnational mobility for training purposes, the development of expertise or the transfer of knowledge, in particular between different sectors. To support the development of excellence and help to make Europe more attractive to third country researchers.

- **Research infrastructures**

To help establish a fabric of research infrastructures of the highest level in Europe and to promote their optimum use on a European scale.

- **Science and society**

To encourage the development of harmonious relations between science and society and the opening-up of innovation in Europe, as well as contributing to scientists' critical thinking and responsiveness to societal concerns, as a result of the establishment of new relations and an informed dialogue between researchers, industrialists, political decision-makers and citizens.

Nuclear energy

Aims at intensifying and deepening the already well established co-operation at European level in the field of nuclear research.

- **Controlled thermonuclear fusion**

Controlled thermonuclear fusion could contribute to long-term energy supply and, therefore, to the requirements of sustainable development for a reliable centralised supply of baseload electricity.

- **Management of radioactive waste**

The exploitation of nuclear fission energy for energy production requires progress to be made in the problem of waste, and more particularly the industrial implementation of technical solutions for the management of long-lived waste.

- **Radiation protection**

Vigilance is still required to ensure a continuation of the EU outstanding safety record. EU enlargement introduces new challenges. Improvement of radiation protection continues to be a priority area. Activities will be carried out in several areas including "risk and emergency management", "radio-ecology", "protection of workplace and environment", etc.

- **Other activities in the field of nuclear technologies and safety**

To respond to the scientific and technical needs of the policies of the Community in the fields of health, energy and the environment, to ensure that the European capability is maintained at a high level in relevant fields not covered by priority thematic areas, and to contribute towards the creation of the European Research Area.

Instruments

FP6 will be implemented by the means of six main instruments, each of which have their own set of aims and objectives conditions for participation.

Three "new" instruments

The new instruments introduced for FP6 are driven by the concepts of the European Research Area (ERA) and are also characterised by the structuring and integrating effects that they will have on European research.

- **Integrated Projects (IP)**

Multipartner projects to support objective-driven research, where the primary deliverable is knowledge for new products, processes, services etc. They should bring together a critical mass of resources to reach ambitious goals aimed either at increasing Europe's competitiveness or at addressing major societal needs.

- **Networks of Excellence (NoE)**

Multipartner projects aimed at strengthening excellence on a research topic by networking the critical mass of resources and expertise. This expertise will be networked around a joint programme of activities aimed primarily at creating a progressive and lasting integration of the research activities of the network partners while, at the same time advancing knowledge on the topic.

- **Article 169 (for the joint implementation of national programmes)**

This instrument requires co-operation at the level of national governments. It aims at integrating whole national or regional programmes on a particular topic by their joint implementation, e.g. through harmonised work programmes and common, joint or co-ordinated calls for proposals.

Traditional instruments

These instruments are similar to those in FP5.

- **Specific Targeted Research Projects (STREP)**

Multipartner research, demonstration or innovation projects. Their purpose is to support research, technological development and demonstration or innovation activities of a more limited scope and ambition, particularly for smaller research actors and participants from candidate countries.

- **Coordination Actions (CA)**

To promote and support the networking and coordination of research and innovation activities. They will cover the definition, organisation and management of joint or common initiatives as well organisation of conferences, meetings, the performance of studies, exchanges of personnel, the exchange and dissemination of good practices, setting up common information systems and expert groups.

- **Specific Support Actions (SSA)**

Single or multipartner activities. Intended to complement the implementation of FP6 and may be used to help in preparations for future Community research policy activities. Within the priority themes, they will support, conferences, seminars, studies and analyses, working groups and expert groups, operational support and dissemination, information and communication activities, or a combination of these.

- **Specific projects for SMEs**

Divided into Co-operative research projects (CRAFT) and Collective research projects. CRAFT are undertaken for the benefit of a number of SMEs from different countries on common specific problems. Collective research projects are carried out on behalf of industrial associations or industry groupings in sectors where SMEs are prominent.

- **Specific actions to promote research infrastructures**

To support the integrated provision of infrastructure related services to the research community at European level, inducing a long-term integrating effect on the way research infrastructures operate, evolve and interact with each other and with their users, thus contributing to develop the European Research Area.

- **Marie Curie actions on mobility, training and excellence recognition**

These actions provide a variety of possibilities for individual researchers in different stages of their career as well as for institutions acting as a host for fellows.

Budget

FP6 has a total budget of 17 500 million Euro that is distributed amongst both RTD and demonstration activities, as well as Nuclear (Euratom) activities.

Participate in FP6

Find a Call

All FP6 activities are implemented through calls for proposals.

Call for proposals:
A legal text calling interested parties to submit proposals for projects. The text defines the necessary specifications to prepare and submit a proposal, i.e., thematic priorities, instruments used, address and other technical modalities for submission, deadlines, etc. Calls are published in the Official Journal of the EU in all Community languages. They are also published on CORDIS, together with detailed guides for proposers, submission forms and an electronic proposal submission tool (EPSS).

Latest Calls information is available at *http://fp6.cordis.lu/fp6/calls.cfm*.

Information Package

In order to receive a complete Information Package for a selected call, it is necessary to obtain the following elements:

1. The call text in user preferred language;
2. The work programme in user preferred language;
3. FP6 in Brief - an overview of the basic features of this programme;
4. The Guides for Proposers relevant to the instruments used in this call, including application forms A and B.

Documents can be downloaded from the Web-page of a selected call (to be reached via the FP6 Call page *http://fp6.cordis.lu/fp6/calls.cfm*) or sent by request by email in .pdf or .doc formats.

Consortium composition

Proposals must be presented by a consortium comprising a minimum number of mutually-independent legal entities (organisations or individuals) established in different Member States of the EU or Associated States, of which a certain number must be Member States or Associated candidate countries. The default minimum numbers defined in the Rules for participation in FP6 are at least three mutually-independent legal entities established in three different EU Member States or Associated States, of which at least two must be established in EU Member States or Associated candidate countries. Any changes to these minimum numbers are set out in the Call for proposals. Exceptionally, a Specific Support Action may also be presented by a single organisation.

The EU Member states are: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Spain, Sweden, Portugal and the United Kingdom.

International organisations of European interest[1], and the European Commission's Joint Research Centre (JRC) are considered on the same footing as legal entities based in an EU Member state.

The candidate countries are: Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia and Turkey. All of these countries have signed memoranda of understanding associating them with FP6[2]. Other countries which are expected to become associated to the FP6 are: Iceland, Israel, Liechtenstein, Norway and Switzerland[3]. Potential participants should confirm the exact situation of all these countries at the FP6 International Cooperation Web-site.

Organisations from any other, e.g., the CIS, country may take part, provided the above minimum requirements have been met. Organisations from certain other countries may receive a Community financial contribution, as defined in the Rules of participation in FP6.

Co-operation with international organisations with intergovernmental agreements is welcomed. Co-operation with organisations in INCO target countries is encouraged.

Partner search

CORDIS

CORDIS has a number of services and information sources which may be useful in partner search for participation in FP6, as well as a list of organisations which have already expressed an interest in participating in the calls (call for Expression of Interest) *(http://www.cordis.lu/fp6/partners.htm)*.

National Contact Points

The IST Priority supports a network of National Contact Points (NCPs), which can be helpful to organisations from their country both in general advice (particularly on preparing proposals) and in finding partners from other countries. Organisations should contact the NCP of their own country for further information *(http://www.cordis.lu/ist/ncps.htm)*.

IDEALIST-project

The IDEALIST-project helps potential proposers and newcomers to the IST Priority to find the right partners across international boundaries.

1 International organisations, the majority of whose members are European Union Member States or Associated States, and whose principal objective is to promote European scientific and technological co-operation.

2 The association to FP6 has come into force for Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia and Slovenia. At time of writing, the remaining countries are engaged in ratifying their association to FP6.

3 The association agreements with Iceland, Liechtenstein and Norway are expected to come into force on 15 January 2003.

It comprises a network of organisations in each Member and Associated State, coordinated by the DLR Germany. IDEALIST offers:

- a partner brokerage service, targeted on particular calls and Action Lines, that pools the local knowledge of partners from 33 countries;
- international partner brokerage events;
- general support for potential proposers;
- special workshops and seminars.

The IDEALIST partners, many of whom are also official National Contact Points for the IST Priority, or who working in close cooperation with NCPs, represent all EU Member States and Associated States *(http://www.ideal-ist.net/)*.

FP6 contacts

All the information about FP6 can be found at the Web-site *(http://www.cordis.lu/fp6)*.

The European Commission maintains an Infodesk for each research activity covered by the Sixth Framework Programme for the duration of their Calls. Any questions concerning the Call may be directed to the relevant Infodesk *(http://www.cordis.lu/fp6/infodesks.htm)*.

E-Readiness research in Azerbaijan

Tofig Babayev

Director of Baku Scientific and Training Centre

Introduction

Information communication technology (ICT) is an important tool that can positively influence the development of a society. It influences State bodies and civil society institutions, economic/business and social sectors, as well as science, education, culture and people's every day lives. Many well-developed and developing countries have derived great benefits from ICT and there is no doubt that wide application of ICT in society is a way leading to the future of human civilization.

World experience clearly shows that broad usage of ICT assists a country's overall socio-economic development and can provide an effective means of reducing poverty. It is therefore crucial for countries to have a national ICT strategy in order to use country's potential for enhancing development. It is particularly important for countries such as Azerbaijan that are undergoing a socio-economic transition and wishes to fully integrate into the world community.

Transition to an information society, globalization and integration into the world community are among priorities of a number of international organizations where Azerbaijan is a member state, namely the United Nations and the Council of Europe. Creating the right environment for transition into information society is stated to go in line with the policy of the Government of Azerbaijan, and the development of a National Strategy on ICT is an important first step in this direction.

Enhancing of information flows is a complex process, which has a number of scientific, technical, technological, economic, sociological and political aspects. It is essential for the successful implementation of this process to utilize the required resources (for example, human, technical, software, financial, administrative and political) for coordination and regulation of the activities to be carried out, and to establish realistic operational targets and priorities. Therefore, it has become necessary to prepare and adopt an overall national strategy for the development and use of ICT in Azerbaijan. The strategy should include overall principles and priorities, specific operational targets with realistic timeframes, and expected results and outcomes consistent with the Government's information policy set out in the Azerbaijan Republic's Law on "Information, informatization and protection of the information". The structure and mechanism for the Government's administration of ICT infrastructural development process also needs to be resolved.

The joint project of the Government of Azerbaijan and UNDP on "National Information Communication Technology Strategy (NICTS) development and its initial implementation" has been launched. This project plays a coordinating and regulating role for all efforts directed on the development of ICT in the country.

General Statistics on Azerbaijan

Population (January 2002)	8200000
Area (sq.km2)	86,600
US$ Per Capita GDP (2002)	756.3
GDP Growth (2002/2001)	10.6%
International Reserves , US$ in million (2001)	679.6
Currency Units, Manat (September 2002)	1 US $ = 4894.2 Manat
GDP Distribution (2002)	
Agriculture	14.2%
Industry	34.9%
Services	50.9%
Merchandise Trade	
Total, US$ billion (for 11 months of 2002)	3.3
Exports (2001), US$ billion	1.8
Imports (2001), US$ billion	1.5
ICT in Merchandise Trade, US$ million (%)	162.00 (4.38%)
Penetration of ICT (2001)	
TV/100	25.9
Telephone/100	9.3
PCs/100	1.5
Mobile Cell Phone/100	7.8

Source: State Statistical Committee of Republic of Azerbaijan, USACC investment Guide to AZ 2001

The market for telecommunication equipment in 2001 amounted at US$ 58.5 million, compared to US$ 60 million in 2000, a decline of 2.5%. The market for public network infrastructure was estimated to be some US$ 36 million and private network equipment US$ 22.5 million in the year 2001. The telecommunication market was expected to grow to US$ 200 million by 2005 with public network infrastructure estimated at US$ 150 million and private network equipment for US$ 50 million. Aztelecom invested US$ 17.3 million of its own resources in 2001 for the development of telecommunication systems, and was planning to invest another US$ 22 million in 2002. By 2005 it was expected that a total of US$ 870 million would have been invested in the telecom sector. US$ 261 million of this would be from Ministry of Communications internal resources, US$ 483 million from foreign investors and US$ 126 million from foreign credits. Aztelecom, the monopoly service provider, was slated for privatization and flow of foreign investments in telecommunication. This was expected to lead to a general improvement in the telecommunication system and thereby create a market for more advanced systems.

Information Infrastructure and Internet

General Data on Telecommunications

Data on telecommunications of Azerbaijan for 2002

№	Main indicators	Data of the Regional Commonwealth of the Communication and Telecommunication Conception of Azerbaijan					Place of Azerbaijan in CIS for 2001
		Azerbaijan	According to RCC		According to the Conception		
			Ave-rages in CIS	Pages	Ave-rage data	Pages	
1	2	3	7	8	9	10	11
1.	A number of telephone sets per 100 residents of the Republic	10,84	14,53	18	12,9	42	8
2.	A number of telephone sets per 100 residents in the capitals of the Republic	23,4	28,24	23	42,8	42	7
3.	A number of telephone sets per 100 rural residents in the Republic	3,63	5,75	18	-	-	7
4.	A number of Internet users per 10000 residents	32,13	109,10	34	-	-	10
5.	Tariffs for long-distance calls for 1 minute from the capitals of CIS	9,7	4,68	78	-	-	11
6.	Specific gravity of investments at the own sources (%)	41,9	75,3	102	-	-	12
7.	Average annual number of communication employees (thousand people)	10,60	57,60	87	-	-	6
8.	Engaged in communications in % in ratio to the number of employees, engaged in economy of the country	0,43	0,78	88	-	-	12
9.	Average annual number of officials (administration) in % from the whole number of employees of electronic communications	2,40	7,18	110	-	-	11
10.	Average monthly salary of employees in telecommunications (in USD)	92.40	107,7	107	-	-	8
11.	Quality of the work of long-distance telephone communication in %	32,8	50,8	47	-	-	9
12.	Outgoing international telephone traffic (millions of minutes)	29,60	177,20	53	-	-	9

Fiber-optic lines on Azerbaijan

Within the framework of the "TransAsiaEurope" project, network of fiber-optic communication lines was built in the country that has increased application of digital technologies in infrastructure of the communication.

Also fiber-optic communication line has been constructed along the railway Baku - Tbilisi. This cable has been constructed within the TRACECA project.

Telecoms and mobile

Bakcell (GSM 2000) and Azercell (GSM 900) are two cellular services operators in Azerbaijan. Currently, there are more than 600,000 cellular service subscribers with a geographical coverage of 63%. Azercell planned to increase its subscriber base up to 700,000 and its coverage to 95%. Bakcell had 120,000 users and invested US$ 10 million in 2001 to enlarge their capacity to 200,000.

Azerbaijan: Growth of Mobile Telephone subscribers (1993-2001)

Year	Baksell	Azercell	Total	Growth
1994	2000	-	2000	-
1995	5000	-	5000	250%
1996	12000	2750	14750	295%
1997	18000	20371	38371	260%
1998	26000	55831	81831	213%
1999	30000	179640	209640	256%
2000	70000	380414	450414	215%
2001	120000	519346	639346	142%

Both operators offer international roaming, which is relatively expensive. Prepaid mobile communications services, mobile banking, Internet, SMS and other value-added services allowed operators to attract customers from other telecommunication sectors, such as paging

and trunk communication. In July 2001, Azercell in cooperation with ISP Azeronline, introduced the mobile Internet in Azerbaijan.

According to research conducted by World Bank, Azerbaijan holds first place among the CIS countries in terms of its penetration rate of cellular-phone-using subscribers.

Telecommunications in Azerbaijan. Out of 420,000 telephone lines existing in Baku, the national operator **PO BGTS** is managing for 375,000 lines (an 89% share of the market), **Ultel** - 9,000 lines, **Catel** - 10,000 lines, **Azeurtel** - 20,000 lines.

Telecommunications in Azerbaijan (2001)

Total PSTN Telephone Lines	873,900		
PSTN Swithes:	Nakhchivan Autonomous Republic	Baku-city	Total in Azerbaijan
Step by step		10.7%	6.8%
Cross-bar		49.8%	57.7%
Digital	100%	39.5%	35.9%
Telephone Lines per 100 Families:		**97.41%**	**53.66%**

Siemens System 12, Marconi's System X, Nortel and Alcatel's switching systems were installed in Baku. Catel (Caspian American Telephone Company), Joint Venture between Ministry of Communication and Metro media International Communication (USA) utilized wireless and CDMA technology for provision of telephone communication services. Azeurotel utilized Marconi System X for developing of their network.

Investments to the communication sector in 1991-2001 years (Mln,USD)

Years	Budget Investment	Investments from Ministry of Communication		Foreign investments to joint ventures		Total
		Invest-ment	Credit	Invest-ment	Credit	
1991	3,7	-	-	-	-	3,7
1992	4,7	-	10,9	-	-	15,6
1993	15,1	-	-	2,3	-	17,4
1994	0,6	-	-	2,0	-	2,6
1995	3,1	-	-	3,4	-	6.5
1996	6,7	-	-	14,3	-	21,0
1997	-	8,2	-	6,5	-	14,7
1998	-	13,1	12,6	50,0	14,5	90,2
1999	-	20,0		26,4	25,7	72,1
2000	-	13,0	10,7	35,0	20,0	78,0
2001	-	18,2	8,3	2,4	15,0	43,9
Total	**33,9**	**71,8**	**42,5**	**142,3**	**75,2**	**365,7**

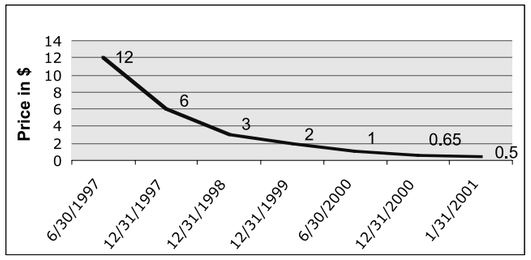
Density and coverage of the cellular communication services in Azerbaijan vary considerably from region to region. This offers good market growth opportunities for the telecom manufacturers as well as for the software developers. A third mobile operator was expected to appear shortly in the Azerbaijan market.

Internet Service Providers. Internet and broadband

Currently, there were 13 Internet Service Providers. The market for Internet service providers in Azerbaijan was growing rapidly. In 1996 and 1997 a number of ISPs were established that started to offer basic services. In the beginning, the services offered were expensive and of poor quality, but constant growth of the ISPs in the country has resulted in the formation of a highly competitive ISP industry in the Caucasus region.

Internet market growth is slowed by monopoly of Aztelecom. As a result, large ISPs were switching to satellite channels in order to provide affordable services.

Discussions have been held with a number of ISPs in Azerbaijan. From these, it was learnt that the Ministry of Communications planned to reduce the prices of calls and to charge users on a per second basis rather than per minute. The Ministry has imposed a fixed monthly telephone charge of US$ 4.32 for Internet access (2002). The average price of an Internet connection varied between $0.70 and $0.50 per hour in 2001. Some ISPs provide unlimited access to the Internet for $50-30 per month, compared to $150 in 2000. Overall, Internet access prices in Azerbaijan were falling as can be seen in below figure.



Source: Azerbaijan Development Gateway: e-Readiness Assessment Report 2001

The decline of Internet access price was one of the main reasons for the growth of number of Internet subscribers in Azerbaijan. Today, it is more convenient for individuals and organizations to get unlimited access that could be purchased about $30.00 -$50.00 depending on provider.

ICT Learning

ICT in Schools: Computerization Phase

There is no statistic information on levels of computerization in Azerbaijan educations system. However the number of projects had been implemented within the educational institutions of Azerbaijan.

In 2002 within the framework of the first tranche of the **World Bank** (5 million USD) 20 schools in the 5 biggest cities of Azerbaijan have been provided with modern PC classes. It is expected that the second tranche for this actions from the World Bank will be amounting at 14 million USD till 2010.

International NGO **Project Harmony** implements a school connectivity project, a pilot program to connect 10 Azeri schools and conduct trainings for teachers. The project aims to create an online network of teachers and develop partnership with schools in the USA and other countries.

Junior Achievement (US) cooperates with the Ministry of Education in Applied Economics in 20 high schools in Baku. Each school under the framework of the program received 1 computer.

Open Society Institute-Azerbaijan has largely worked with high schools, and is going to expand its activities on ICT in education to the primary level. OSI runs "I*Earn" project *http://www.iearn.org* in Azerbaijan. The program provided 9 schools in Baku and 2 in Sumgait with computers (1 computer per school).

ICT and High Education

Majority of students use computers in universities. The computers are mostly used for typing. There is also a group of students who use computers at a proficient level.

Exxon Company in cooperation with *OSI-Azerbaijan* and the *US State Department* assisted the State Oil Academy to develop one of its computer labs and offered computers to equip this lab.

Baku State University (more than 300 computers per 14000 students), with the support of *OSI-Azerbaijan and IREX/IATP,* has created a resource center to enhance ICT development in education. University and high school teachers receive basic computer and Internet skills at this center and then train others to transfer computer skills further.

Azerbaijan International University has 400 more computers per 6000 students.

Open Society Institute-Azerbaijan in partnership with *IREX/IATP* and *Exxon* created 5 Internet resource centers for higher learning institutions in Baku: Baku State University, Medical University, Khazar University, Western University and the Technical University. They have continued this work with the universities in 4 other regions: Nachichevan, Mingechevir, Ganja.

In 2001 for the first time the faculty of "Improving qualification and re-training" by use of distance learning tools had been established at the Azerbaijan State Economic University. At the present time 50 students study at this faculty.

Khazar University in cooperation with *Western University* and *IREX* initiates a distance-learning course on International Negotiations (started in Fall 2001).

Application of ICT in education was increasing gradually and was steadily growing. Higher learning institutions use IT not only for educational but also for marketing purposes. Private universities were more advanced in ICT development as they could afford the expenses being the self-funded entities.

University web-sites featured information on academic programs and courses offered, academic departments and centres, facilities, news and events bulletin, contact information, faculty and staff and online application forms. Some private universities, for example Khazar University, used their web-sites for online admission.

Kavkaz University works to foster development of wireless communication among 11 high schools. The teachers involved in the project within which several distance learning courses in Kuba, Alibairamli, and Nakhchivan are being currently developed.

In 2000 *Khazar University* introduced the first ever course on E-commerce delivered by professor from California State University, US. Some 50 students registered to this course experienced an extensive use of Internet in education through WebCT.

Training Centres

Baku Scientific and Training Centre (BSTC), one of the leading training centres in ICT field in Azerbaijan, was established in 1987 y. In 1996 as the result of implementation of UNESCO and UNDP project "Strengthening of Computer Technology and Training Center for Azerbaijan" computer centre on the base of BSTC was established. Computer equipment was purchased and two LANs were installed, staff were trained, BSTC was connected to the Internet.

Further projects implemented by BSTC with the help of UNESCO and UNDP:

- Establishment of Sumgait Computer Centre for Training and Information and Telecommunication Services,
- Establishment of Nakhchyvan Computer Centre for Training and Business Information Services.
- Regional Academy for Online Network Governance and System Administration.

Under the last project the first Regional Networking Academy in the South Caucasus on the base of BSTC was established.

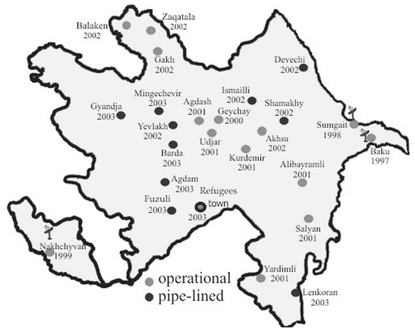
Regional Academy, which includes

- CISCO Regional Academy
- Prometric Testing Center
- MOS (Microsoft Office Specialist) Authorized Testing Centre
- Microsoft CTEC (Certified Technical Education Centre)
- Training Centre of Azerbaijan Project Management Association
- European Computer Driving License Centre,

  is a strategic and operational networking academy in Azerbaijan to train government officials in online network governance and produce systems administrators with a view to promoting the improved introduction of information networking technologies into growing local needs in New Independent Countries (NIC) for advanced network governance and systems management.

BSTC is also planning to establish Microsoft CTEC (Certification Technical Education Center) and ECDL (European Computer Driving License).

Baku Scientific and Training Centre established 14 information centres in regions of Azerbaijan and organized IT trainings in these centers:



More information about Baku Scientific and Training Centre is available on Website *www.bstc.azeri.com*

ICT projects in Azerbaijan

ICT and the Central Election Commission

By Order of the President of the Azerbaijan Republic, signed on the 3rd September 2000, an "Information Center" was established within the Central Election Commission (CEC) of the Azerbaijan Republic. The Center's most important function was to improve the overall election system through the ability to provide a range of information in an open and transparent manner.

The Government sought the assistance of UNDP to provide capacity building, training and equipment to ensure the success of introducing ICT

for a State automated information system for elections in Azerbaijan. The November 2000 parliamentary elections, involving some 100 electorates, were the first opportunity to "trial" the new ICT system for elections.

The introduction of ICT with regard to elections has two main areas of operation, namely to establish an electronic electoral roll to be regularly updated and to automate the transmission of information and the polling process from each polling station to the CEC during elections. The first electoral roll had over four million entries to be inserted, verified and transmitted to the relevant districts.

The Information Center was provided with the necessary computer technology, telecommunication devices and indicator boards to be able to receive information from 32 districts and polling stations at the same time. On election day the incoming information is saved on the server and transmitted to the three indicator boards set up in the observer's hall. The information about the voting process from constituency commissions is reflected on the first indicator board and for the Republic it is reflected on the second. The schedules reflecting the dynamics of the voting process and elector's activity is displayed on the third indicator board.

One of the main features of the ICT system is to provide communication between the Information Center and the regions, as well as individual polling stations. In order to transmit information to the world community the CEC has established a special page on its Internet website.

Through this system information on the polling process and election results from the Constituency Commissions are transmitted to the Center and through the tele-transmitters international observers, mass media and the community receive the information. In addition, information on the elections is available in five languages on the CEC's website accessible via the Internet *(www.infocenter.gov.az)*.

ICT and the State Customs Committee (SCC)

The project "Capacity Building and Data Transmission Network Implementation for the State Customs Committee of Azerbaijan Republic" is aimed to enhance the technical potential and operational effectiveness of the SCC.

The electronic transmission of the data from customs checkpoints to the SCC began in 1995, using a standard dial-up telephone. However, the system was inadequate as it did not provide a sustainable connection nor did it reach all border checkpoints. The line quality was poor or nonexistent and the entire operation was single server dependent. During the first phase of the project a sustainable connection for all Customs Checkpoints was installed that upgraded the data transmission network and expanded the network coverage so that the on-line mode of the data transmission network operates between the SCC, the Baku Chief Customs Department, and the customs checkpoints in Khachmaz, Tovuz, Astara, Ganja, Evlakh, Ali-Bayramly, Bilasuvar, Khudaferin, Samur, Yalama, Boyuk Kesik, Sinig Korpu, Massaly, and Lenkoran. The system was thoroughly tested and the results were the subject of a technical conference attended by over 150 representatives from the State and private sector scientific and telecommunication community.

The second phase of the project includes the establishment of a computerized database that will register violations of Customs Law. The goal is to establish a database of violators, while identifying criminal trends that focus Customs' inspection activities. Checkpoints will receive reports, based on analysis of the data. The documentation will provide easier tracking of the movement and routes of illegal substances and thus facilitate the combating of smuggling and other violations of the customs law.

One of the main activities of the customs checkpoints is the registration of goods and transportation used to cross the border. The integral part of this process is monitoring and controlling the information contained in the Cargo Customs Declarations (CCD). The second phase of the project envisages utilizing information technology to improve the overall effectiveness and efficiency of the process. In addition, a computerized CCD registration and data control system should make interaction between clients and customs officials easier, more accountable, and transparent.

Computerization of CCD will allow customs brokers to advise their clients, assist in the completion of documentation and serve as intermediaries. Declarations will be made on diskette or on-line at checkpoints. This will greatly reduce processing time at checkpoints, reduce input errors and ensure that customs payments are uniform. It will also enable customs officials to follow-up the non-payments of dues more effectively.

More information on SCC activity is available on Web site *www.scc-undp.org*

ICT and State Students Admission Commission

The State Students Admission Commission (SSAC) organizes the admission of students to all higher schools of the Republic of Azerbaijan and it is the first institution which applies computer technology to mass processes.

In according to regulations admission of students in Azerbaijan Universities performed by testing the applicants in centralized form. Selection of personnel for ruling the examinations, grouping of applicants in the rooms for examination, selection of test exercises in the data bank, processing of results are completely automated and computerized.

All entrants, including inhabitants of remote regions of Azerbaijan can get information about exam rules, schedule and exam results from Web-page of SSAC *(www.tqdk.gov.az)*.

E-Readiness for Information Society in Belarus

V. Anishschenko, V. Dravitsa, M. Makhaniok

The current data are based on the results of the projects performed in the Republic of Belarus under ICT Infrastructure and E-Readiness Assessments Grant # ICT 015 (Effective Data 20.08.2002) between the International Bank for Reconstruction and Development (IBRD) for the Information for Development Program (infoDev) and Belarusian Fund of Informatization as well as under the UNECE initiative ECE/TRADE/311/6 of monitoring and analyzing the development of knowledge-based economy.

Preface

At present, Belarus possesses advanced information and communication technologies, it has high R&D capability and it has recognized intellectual capacity. The country has the ambition to build an information society and integrate itself fully into the global information community.

The immediate goal is to build an integrated national informational space as the basis of socio-economical, political and cultural development and national security. Several state laws provide a comprehensive policy framework in the field of informatization. These include laws on: "Informatization"; "State Secrets"; "The Basics of State Research and Development Policy"; "Standardization"; and "Certification".

The State plays a number of key roles that include:

- building and utilization of information resources;
- facilitation of informatization processes;
- stimulation of new technologies, systems and networks;
- provisions for communication system development;
- specification of the powers of governmental bodies on the issues of informatization;
- regulation of relations in the informatization sphere through investment, tax and fiscal policy.

State informatization policy started to form in the early 1990s. Its main goal was to provide scientific, technological and economic conditions for the creation and development of ICT, information infrastructure and to encourage the development of national information resources.

Informatization in three spheres, namely the social, industrial and administrative, were recognized as a priority by the "Programme of Informatization of the Republic of Belarus for the Period of 2003-2005 and in perspective up to the Year of 2010 "E-Belarus"" (Decree of the Council of Ministries of the Republic of Belarus dated 27 December 2002, №1918). During the course of this Programme, information systems in statistics, science, education, medicine, social protection industrial management, and state administration, planned to be developed and implemented. Additionally, the telecommunications means to support a national information system and for the provision of Internet access were developed intensively.

In the "Programme of Communication Development for the Period of 2001-2005" priority is given to development of the information infrastructure for a communications network, based on advanced technologies and including: establishment of collective Internet access sites; development of distance learning; electronic trade; and telemedicine.

From 1994, Belarus began to experience depopulation resulting from mortality rates exceeding birth rates. These demographic change stemmed from a deterioration in peoples' health due to a sharp decrease in living standards, ecological problems, and a decrease in quality and accessibility of medical services.

As of 1 January 2001, 9,990,400 people lived in Belarus of which 1,992,000 thousand people were under 16 years, 5,872,400 were at a working age, and 2,126,000 were over the working age. The total number of employees was 4,441,000 thousand. 57.2% of this number worked in the state sector and 42.8% worked in the private sector. The share of employed in the nonmanufacturing sphere amounted to 29.9%, and the total number of unemployed amounted to 95,800 people.

As many as 41.2% of employees graduated from higher educational establishments and colleges. This significant percentage of employees with higher educational qualifications has resulted in a misbalance between those professionals coming into the job market and the availability of suitable positions. The job market is subject to significant inertia and is uncompetitive. This results in under-utilization of qualified members of the labor force.

Heightened scientific capacity is required if the innovation path adopted by Belarus is to flourish. The negative trends of recent years, in which there was a sharp decrease in the total number of workers in the scientific sphere, has now reversed. In 2002, the total number of workers in research institutions amounted to 32,900 people and the total number of scientists working in the educational sphere came to 20,000. Of the total scientific population of Belarus, there are about 3,800 doctors of sciences. The intensive development of ICT requires a highly-qualified human resource pool to support the process of informatization. More than 1,082,000 pupils (70 per cent of the total number) learn the basics of computer literacy and programming. There are 2,500 teachers serving the country's computer science needs.

Qualified ICT personnel are graduates of educational establishments which, amongst others, include: the Belarusian State University of Radio Electronics and Informatics; the Belarusian State University; the Belarusian National Technical University; and the Minsk Radio Technological College.

Graduates are employed in 93 scientific-industrial centers, as well as research and design institutes of the radio and electronic industries. Organizations include: the Research Institute of Electronic Computers (development of computer systems and networks); the Minsk Industrial Amalgamation of Electronic Computers (production of personal computers, servers, communication means); and the Scientific Industrial Amalgamation "INTEGRAL" (producing about 60% of world demand in integrated circuits for timepieces). More than 100,000 qualified specialists are estimated to be working in the informatization sphere although there is no confirmed statistical data available.

1. Network Access

1.1. Information Infrastructure

The ICT Infrastructure and E-Readiness (or advancement) assessment in the Republic of Belarus from 1st (least-advanced) to 4th (most-advanced) stage was carried out by the experts for each micro-index independently, and average data assessment for each index and generalized data assessment for each component index were evaluated on their basis.

Readiness (or advancement) estimation breakdown (in percentage) and average estimation by Information Infrastructure index are shown below in Table 1.1.

Table 1.1

Average Estimation by 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
Index Average Estimation	**2.4**	**2.9**	**2.225**

The total estimation breakdown (given as percentage based on collected data) covering the whole republic, the city of Minsk and administrative regions and assessed by four micro-indexes are further shown in Tables 1.1 to 1.5.

Table 1.2

1.1.1. Access to Telecommunications Infrastructure

№	Variable (1 determined from 4 for each region)	Belarus, %	Minsk, %	Regions, %
1	There are very few shared facilities for telecommunications access	0	0	0
2	A small minority of the people 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 (1 determined from 4 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 is between 2 and 8 mainlines per 100 people	0	0	0
3	Teledensity is 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 (1 determined from 4 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 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 high and growing, with at least 14% of the population subscribing	0	0	0

Table 1.5

1.1.4. Cable Penetration

№	Variable (1 determined from 4 for each region)	Belarus, %	Minsk, %	Regions, %
1	No cable services are available	30	30	50
2	Cable penetration is below 5% of per household in the community	70	50	50
3	Between 5 and 10% of households in the community subscribe to cable services	0	20	0
4	Cable penetration is high, at 10% of households or higher	0	0	0

A Primary Network of the Republic of Belarus (Fig. 1.1). An intensive upgrading of communications networks is being made, re-equipping with digital means is being carried out and some new telecommunication services are being introduced and promoted within the republic.

An Action Program for communication facilities development draws much attention to designing and building up long-distance and international telephone lines.

A powerful high-speed modern trunk network has been established now in Belarus which is using SDH-hardware of STM-1, 4 and 16 versions. About 90% of area telephone exchanges (ATEs) have digital intraband lines of binding, 44 % of ATEs are connected by FOC line .

About 4 thousand kilometers of FOC line linking all the regional centers and also ensuring high quality connection with other countries have worked their way in the republic.

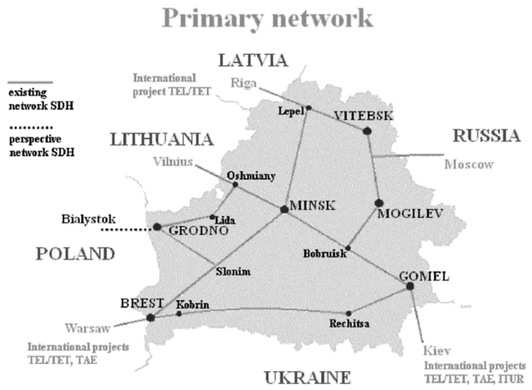


Fig. 1.1. A Primary Network of the Republic of Belarus

10 thousand kilometers of a 4-fibre optic cable are envisaged to be laid on more by the Action Program for communication facilities development by the year of 2005. The work is in progress to furtherly optimize a primary network and reconfigure a trunk network are prolonged. The installation work to run STM-4 rings linking Minsk - Gomel-Brest-Minsk were 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 to ensure the operation of Minsk - Brest - Gomel - Minsk linking rings by November 30, 2002. A Belarusian-Polish FOC line to 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 according to a secondary network of an automatic telephone exchange has totaled 3 million 41 thousand mainlines as of October 1, 2002. Pursuant to indicators of the Action Program for communication facilities development the growth of teledensity is to amount to 420 thousand mainlines by 2005.

As of 01.01.2001 the teledensity throughout the republic has averaged 76,0 mainlines per 100 families, including those of urban (city) telenetwork (CTN) averaging 88,0 and those of rural (village) telenetwork (VTN) being 47,0, respectively (Fig. 1.2). As for the regions and Minsk (Minsk UTN) breakdown, the telephone density per 100 families is shown below in Table 1.6.

Table 1.6

Telephone Density per 100 households in Belarus

	CTN	VTN	Average
Brest Region 79,4		93,0	57,7
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
Moguilev Region	82,2	41,6	69,6
Minsk CTN	104,6	-	104,6

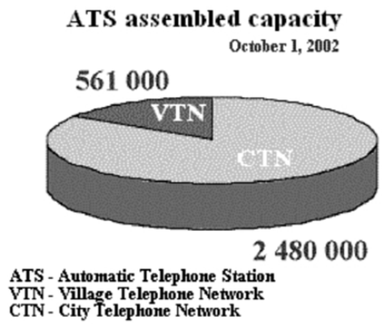


Fig. 1.2

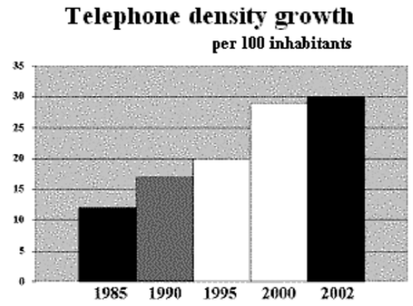


Fig. 1.3

Thus, each third inhabitant of the republic enjoys an opportunity to use a home telephone line.

The three-millionth subscriber 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 a quantity of telephone sets per 100 people) is noted therewith (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 to replace 376 thousand telephone numbers of the level and coordinate hardware means with digital ones by 2005. Additionally, the realization of a global project, pertaining to the extension and up-grading of long-distance and international telephone exchanges as well as the overlapped digital network exchange has been launched now. At the time of build-up these exchanges were not designed for such a swift progress made even by the local networks. Currently, they have to endure an additional burden also on the part of the mobile service subscribers and the Internet users. The right time, therefore, for their upgrading has come. The software upgrading will permit to substantially increase operational capabilities of telephone exchanges while processing a growing long-distance and international traffic and to expand a range of services. Upgrading of the long-distance telephone exchanges in administrative regions/areas is on the schedule for 2003.

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

Table 1.8

Mobile Wireless Telephone Density in Belarus

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

Summary 1.1. In spite of 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, but the mobile wireless penetration amounts only to 4.3 %, and the subscription on leased cable services for a family (apartment) access to information is not advanced at all, therefore Belarus should be referred to 2nd stage by index of information infrastructure development.

1.2. Internet Availability

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

Table 1.9

Average Estimation by 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
Index Average Estimation	**2,625**	**3,4**	**2,525**

The total estimation breakdown (given as percentage based on collected data) covering the whole republic, the city of Minsk and administrative regions and assessed by four micro-indexes are furtherly shown in Table 1.10 - 1.13.

Table 1.10

1.2.1. Availability of local Internet Service Providers (ISP)

№	Variable (1 determined from 4 for each region)	Belarus, %	Minsk, %	Regions, %
1	There are no local Internet Service Providers (ISPs)	0	0	0
2	There are more than 500,000 inhabitants per local ISP	20	0	40
3	There are between 500,000 and 1,000,000 inhabitants per local ISP	60	20	40
4	There are more than two local ISPs per 1,000,000 inhabitants	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 services to access the Internet network. There are about 30 providers actually working. 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);

Belresoursmarket Co. Ltd. - 175 (June 1991);

Golden Taller Co. Ltd. - 236 (June 1991);

Informatika Company - 147 (June 1991).

Traffic aggregation. All the Belarusian providers, according to the established laws and rules, lease communication channels linking the 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 may be considered crucial in the matter when it has to be decided, what provider is the major (or most-equipped) one.

There are some hierarchical strata of the Internet providers in the Belarusian market: a primary one, i.e. Beltelecom, the national communication operator, constitute the upper stratum; 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, specialized in individual servicing (ASP, apartment houses connection, etc.), form the remaining third stratum. A tentative amount of investments required, as estimated by the experts, for keeping 5-6 major providers of the country with the group, is 1.5 million US dollars for the first 6 months of a year.

Judging from the tariffs/rates for services to obtain network access to the Internet national service providers the Internet and legal entities posted on a site of Beltelecom RSA *(http://www.beltelecom.by/tarif.phtml)*, it follows that from 15.10.2002 quote "a 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 (merge and extension) of the service providing market serves the interests of the major providers and will lead inevitably to reduction of rates, that is favorable to the end users.

Table 1.11

1.2.2. Public Internet Access

№	Variable (1 determined from 4 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 (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

Public shared posts and Internet-cafes (Cybercafes). To public Internet access category are referred 130 public shared posts (PSPs) of Beltelecom RSA and 47 Internets - 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 to access Internet throughout the republic as a whole [8].

Due to swift development of telecommunications and information technologies PSPs have ceased to fulfil a function of rendering primary necessity services. At present time PSPs of Beltelecom RSA are not only the offices where it is possible to ring up to any point round the world, to send the cable, to pay a toll and telephone service bill or print out a long-distance call destination list. At present public timeshared posts give more full spectrum of services, including those of Internet access (26.8 BYR 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), telephone plastic cards sale, xerography, scanning, laminating, computer-aided text typing, primary training for clients to learn basic skills how to browse/use Internet, printing out the information from the computer, etc. The information with the PSP list, indicating a range of services to be rendered, open - close hours and contact telephone numbers is maintained on the server of Beltelecom RSA *(http://www.beltelecom.by)*.

There are more than 280 Beltelecom PSPs throughout the territory of the Republic of Belarus at present, and 130 of them are granted to attend to clients' needs for Internet access. Most intensively the Internet access service at PSP was developing during 2001-2002 (just these 2 years alone saw Internet workplaces having appeared in 50 PSPs). The number of the Internet workplaces al over the republic has amounted to 364 by the end of 3rd quarter of 2002. New PSP are scheduled to be opened and additional Internet access workplaces are to be set up by Beltelecom RSA pursuant to Program of communication facilities development pending 2005. Following this program, a planned task to set up 170 new Internet workplaces was set before the facilities of Beltelecom RSA early in 2002. The plan was fulfilled by 94 % by the end of 3rd quarter of 2002. Vitebsk region was leading to develop such kind of service, with its share being over 25% (115 workplaces) of all operational Internet access workplaces at PSPs. The number of the customers willing to get Internet access service at PSPs increased almost three fold within 2 years.

Beltelecom RSA is to arrange shortly for setting up at least one Internet access workplace each area center of the republic. There is another issue also under consideration to reduce a number of call boxes in PSP premises and substitute them with the Internet workplaces.

Fig. 1.4 shows the generalized results of analysis by Internet-cafe Affordability index, by one from eighteen sub-indexes. 1759 visitors of tut.by site have been respondents: 492 ICT specialists; 104 representatives of education and science fields; 446 students and school-children; 277 managing staff officers and 440 people of other fields were among them.

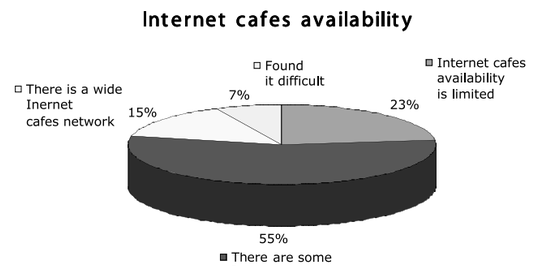


Fig. 1.4

Table 1.12

1.2.3. Available connection opportunities and services

№	Variables (1 determined from 4 for each micro-index)	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

Switched (dial-up) access. Other providers (except for Beltelecom RSA) were not furnished all over the areas (but Minsk). The "peak hour" notion in many respects is determined by a tariff policy carried out by the providers and limited resources of their switched access pools. The telenetwork of the republic as a whole has a sufficient resource to put a switched network access traffic through to Internet. Fig. 1.5 shows the generalized results of a public opinion poll at tut.by site by Quality of Establishing a Dial-Up Connection with the Local IP index.

Table 1.13

1.2.4. Availability of Leased Lines for Business

№	Variables (1 determined from 4 for each micro-index)	Belarus, %	Minsk, %	Regions, %
1	Businesses are unable to lease dedicated lines from the local telephone operator, or there is a multi-year wait to do so	0	0	0
2	There is no competition in commercial leased line provision. Businesses may only lease lines from a single telephone operator	60	20	70
3	One or two private providers leased lines to businesses	30	30	30
4	Multiple private providers leased lines to businesses	10	50	0

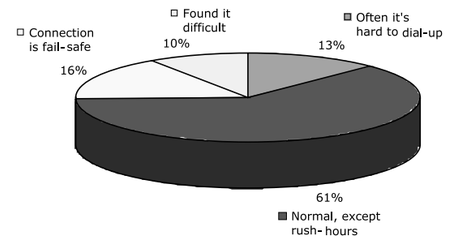


Fig. 1.5

Beltelecom RSA and its facilities is practically a single dominant employer of a cable infrastructure. The Internet providers never fail to get permission when placing order for a connecting line to provide a network coupling to Internet. Currently, any provider having the applicable hardware installed at his node is able practically to render service of a dedicated line connection the Internet network upon an application to Minsk UTN state unitary company or any other similar regional facilities of Beltelecom RSA .

There is an exception among providers, namely Business Network Joint Venture Co. Ltd., which is being granted the services of the Internet access due to its own data transfer network available and set up by 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 (round-the-clock) access to Internet from any user's computer (the com-

puters of a local area network). The users can always take advantage of services of Internet access, when required, or may have their own information servers also, 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, as synchronous digital channels are used at the transfer speed selected by the user, said speed being from 32 Kbps to 2048 Kbps;

Fixed subscriber's rate, which is independent of traffic content/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 content/size does not affect repayment. Monthly subscriber's accounts (for port, modem and IP address availability) are issued only;

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/ location;

High operational characteristics of a web, as the overall performance is ensured by the topology of Business Network data transfer network and by regular monitoring with a 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, related to addressing, routing, web hardware, channels and communication lines.

1.3. Internet Affordability

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

Table 1.14
Average Estimation by 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
Index Average Estimation	**2,3**	**2,8**	**2,27**

The total estimation breakdown (given as percentage based on collected data) covering the whole republic, the city of Minsk and administrative regions and assessed by three micro-indexes are further shown in Tables 1.15, 1.16, 1.23.

The effective telephone rate are referred to a category of the social - significant rates and do not reach a level of their self-repayment in the Republic of Belarus. They are affordable for all population of the republic by virtue of this fact. Flat rate pricing alone for local phone calls may be allowed to be applied only in case a time-metered system for local calls is 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 (1 determined from 4 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 most who can afford 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 of Regional commonwealth of communication, with one of the members of which being also Belarusian Administration of communication, testify to a share of the incomes from publicly shared services of mail, local, long-distance and international telephone calls being reduced versus a simultaneous growth of documentary and cellular transmission/ communication. The decrease, for example, of the local telephone service share takes place due to a comparable rate growth for this service is not available (as against the worldwide tendency). The inland phone call rates within the republic are the lowest in Belarus among CIS countries (Fig. 1.6).

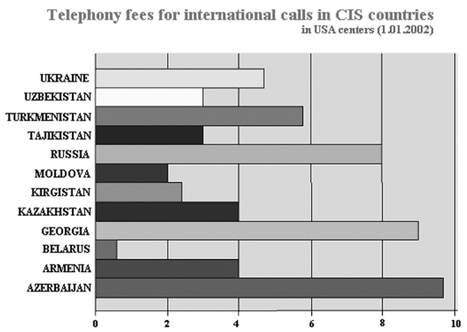


Fig. 1.6

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 1.16
1.3.2. ISP Service Fees

№	Variables (1 determined from 4 for each micro-index)	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 most who can afford 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

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 of Velcom 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 obtained at site of Beltelecom RSA and concern only private subscribers (service for the population). A conversion rate of the Belaruisan National Bank as set on 29.12.2002 was applied: 1920 BYR per 1 USD. The rates on local and international telephone service were changed on April 20 last time, on communication services for the NMT mobile network subscribers - on July 11, GSM mobile networks ones- on October 1, on Internet access - on October 15, 2002 (in the latter case, Christmas discounts are not counted).

Tables 1.17 - 1.21 show the price basis. They are followed by a number of clauses (disclaimers). To list some basic of them there are as follows:

Local communication. The pricing of phone calls is made per each full or incomplete minute of connect time. 5 % of the charged amount are levied as extra charge for each phone call from room or office telephones. A rate rising coefficient of 1,5 applied to effective rates is used while rendering international phone calls in case of a destination automated dial-

ing in custom system servicing. 60 minutes connect free of charge is granted per month. The flat pricing is set in the range of 975 to 1560 BYR per month.

International telecommunications. The rate calculation per each full or incomplete minute of connect time is indicated. For international calls from room and office telephones, a 50% extra rate charge per 1 minute of each rated call is levied.

Communication with wireless mobile subscribers. The rate calculation per each full or incomplete minute of connect time is indicated. Local calls charges are levied extra.

Dial-up access. The charge is levied per each full or incomplete minute of connect. 5 % extra rate charge is levied per each connect. The time of connects from the moment devices/ modems have been sensed up to 20 seconds long inclusively is not subject to tariffication.

Analysis. There is an obvious hyper spread of rates. It is 1 US Dollar cost to talk for about 7 hours with a local subscriber, for approximately 10 minutes with a mobile telephone holder and just a couple of minutes with a subscriber abroad. There is a 281fold difference gap as great as abyss between the rate of 4.79 BYR (local call) and that of 1346 BYR (Belarus - USA call).

The Internet access rates are sequentially being reduced. For example, one hour access at highest rate cost a user 1.68 USD in autumn of 2000, nowadays it costs about 1 USD. It has been reduced by 70 %. In spite of that, independent ISPs tender the private people even more favorable terms (refer, for example, Table 1.22, *www.bn.by*).

Table 1.22
Dial-up Internet Access Rates via Business Network Facilities

Connection Time	General Access		Service Pack		Card	
	BYR/ Time	USD/ Time	BYR/ Time	USD/ Time	BYR/ Time	USD/ Time
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

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

The rates for the ISPs, which are actually the wholesale buyers of Beltelecom RSA channel capacity, are a few times higher, than those ones for organizations, which employ Beltelecom RSA services at retail. In other words, the latter have a definite channel capacity in their disposal, but do not sell the services of access to third parties. However, in ordinary case, the wholesale prices are always lower than the retail ones.

The new rates offered by Beltelecom RSA to the legal entities and individual businessmen who are not having the license of Belarusian Ministry of Communications to render data transfer services are shown in Table 1.25.

Table 1.23
1.3.3. Leased Lines Pricing

№	Variables (1 determined from 4 for each micro-index)	Belarus, %	Minsk, %	Regions, %
1	There is no competition in commercial leased line provision	20	10	20
2	The lack of competition in the provision of commercial leased lines is reflected in prohibitively or very high leasing fees	70	30	60
3	Competition in leased line provision for businesses has been introduced, and prices are falling but are still high	10	30	20
4	Pricing for leased business lines is set in a competitive environment featuring multiple vendors.	0	30	0

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 organisations	
	effective before 15.10.2002	set on 15.10.2002	effective before 15.10.2002	set on 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

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 mass media information, Beltelecom RSA paid 1 million USD for a year employment of 34 Mbps channel in 2001. It is not hard to calculate that a 1 Mbps capacity line cost 2451 USD per one month to Beltelecom RSA, and a 64 Kbps capacity line cost 153 dollars only. Nevertheless, Beltelecom sells the same, even after the rates have been reduced since October 15, 2002 by 15-20 %, to its ISPs for 10273 and 967 USD per one month, respectively, that is 4.2 and 6.3 times higher per a line, accordingly.

Thus, the rates for the lease of channels for ISPs, though had been curtailed, still remained considerably higher as compared to 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 in this matter is a requirement to subsidize unprofitable lines of development, for instance, deploying PSPs in regions, huge investments in re-equipment of communication lines. As for Internet service rendering, Beltelecom RSA shows 30 % profitability in its work, though the rates are held up.

Referring to the official booklet of Beltelecom RSA the income from the main line of activity of the Amalgamation has amounted to 231 bln BYR in 2001 *(http://www.beltelecom.by/beltelecom/bt2001.pdf)*. The inflation does not permit to give an equivalent, but if to take a conversion rate of 1500 BYR per USD the amount equals 154 million USD. The profit has amounted to 12,3 bln BYR (8 million USD) in 2001. The share of the item headed Data Transfer and Telematic Services in the revenue structure of Beltelecom RSA for 2001 is 4.24 % (6.5 million USD). The incomes 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 profitability was equal to 5.56 % in 2001, whereas in 2000 it was 18.40 %.

In opinion of ISP's representatives, the international channels available for Internet access at present time (as of October, 2002) are loaded less than by 70 %. It may reflect both a lack of demand and a price being not affordable. However, it is worth noting that it is unreasonable to load channels by 100 %, as "jams" may occur there at once The traffic ratio still remains negative: 20 % goes abroad, 80 % comes from abroad. Though it should be noted, that there was 90 % of the external traffic in May, 2001. The expenditures of the Belarusian side are raised in such situation as Beltelecom RSA considers. A way out from the situation is to develop local networked information resources, located right on the territory of Belarus.

Fig. 1.7 shows the generalized results of a public opinion poll at tut.by site by Internet Access Fees for The People of your Region index.

1.4. Network Speed and Quality

To gain information, related to Network Speed and Quality index variables (sub-indexes), the data has been collected from 9 major Internet Providers: IP TelCom *(www.iptel.by)*, Atlant Telecom *(telecom.by)*, Basnet *(inform.bas-net.by)*, Beltelecom *(www.beltelecom.by)*, GlobalOneBel *(www.global-one.by)*, BusinessNet *(www.bn.by)*, Forenet *(BelSoft CJSC, forenet.by)*, Unibel *(www.unibel.by)*, BSUnet *(www.cit.bsu.by)*, the said IPs being the representatives of different niches of the Internet Providing market in the Republic of Belarus.

The ICT Infrastructure and E-Readiness (or advancement) assessment in the country from 1st (least-advanced) to 4th (most-advanced) stage was carried out by the experts for each micro-index independently, and average data assessment for each index and colligated/generalized data assessment for each component index were evaluated on their basis.

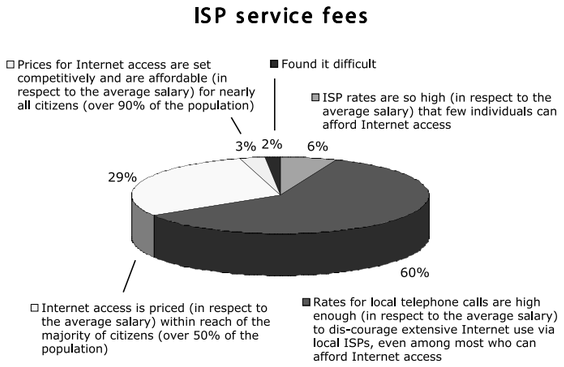


Fig. 1.7

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

Table 1.26
Average Estimation by 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
Average index estimation	**3,08**	**3,49**	**2,77**

The total estimation breakdown (given as percentage based on collected data) covering the whole republic, the city of Minsk and administrative regions and assessed by four micro-indexes are further shown in Tables 1.27 - 1.29, 1.31.

Table 1.27
1.4.1. Telephone Connection Quality

№	Variables (1 determined from 4 for each micro-index)	Belarus, %	Minsk, %	Regions, %
1	Fewer than half of all domestic telephone calls are successful	0	0	0
2	50-70% of domestic telephone calls are successful. Dropped connections 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. Connections are dropped with noticeable frequency and are somewhat disruptive	83	29	75
4	Dropped connections are fairly infrequent and not a major disruption. Over 90% of domestic telephone calls placed are successful	17	71	25

Table 1.28

1.4.2. Number of Faults Registering Annually per Each 100 Mainlines

№	Variables (1 determined from 4 for each micro-index)	Belarus, %	Minsk, %	Regions, %
1	More than 100 faults are reported per year for each 100 telephone mainlines	0	0	25
2	Between 50 and 100 faults are reported per year for each 100 mainlines	25	25	25
3	Fewer than 50 faults are reported per year for each 100 mainlines	50	25	50
4	Fewer than 10 faults are reported per year for each 100 mainlines	25	50	0

Table 1.29

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

№	Variables (1 determined from 4 for each micro-index)	Belarus, %	Minsk, %	Regions, %
1	No services beyond limited electronic mail capabilities are supported by the local telecommunications infrastructure	0	0	0
2	The telecommunications infrastructure in most areas of the community supports dial-up modem transfer speeds of 9.6 Kbps or less. Some areas may 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 widespread access to dial-up modem transfer speeds up to 56 Kbps, with some access to high speed solutions such as DSL, cable modems and wireless media	43	89	43

Within the framework of an Internet development strategy in the Republic of Belarus, Beltelecom RSA elaborates on raising the capacity and improving the structure of BelPAK network. The Belarusian Ministry of Communications adopted a regular Five Year Program for Developing Communication Facilities, which set, for the first time, planned indicators to increase port capacity for the Internet network access in 2001. According to target, quoted in the Program, the hardware capacity quantity to arrange for Internet access should be increased almost 5 fold in the republic by the end of 2005 [4].

By October, 2002 the access switched nodes were set up at all regional centers. More over, 160 ADSL-access ports located in Minsk and in all the regions were commissioned. 3 nodes in Minsk and one node in each region were developed. The Internet ADSL access service was introduced by Beltelecom RSA in July of 2002. It is designed to have 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, what provides qualitative traffic exchange between subscribers' telephone exchange facilities and the international gateway server of the Internet web [5].

The program for developing communication facilities for 2005 stipulates to add 15000 ports to the total port capacity of the Internet network access. According to said development program the port capacity growth was 1200 ports commissioned in 2001. The port capacity totaled 3145 ports, with 1290 ports of them belonging to dial-up switched access system. Over 2400 ports were installed and launched into operation (total 1620 ports commissioned, out of them in Minsk - 720, in Brest - 240, in Vitebsk - 120, in Gomel - 210, in Grodno - 210, in Moguilev - 120) under the project for 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	1 200
2002	2 300
2003	3 700
2004	3 900
2005	3 900

The priority is given to developing of switched access as it was in 2001. The reorganization of regional nodes has been made by installing the switched access servers right in the regional nodes premises. The capacity of switched access set for each of area was 240 ports, and it was 480 ports for Brest and Vitebsk regions. The installation of Cisco 7206 backbone routers was made, the capacity of the channels linking Minsk with regions was increased, bringing it up to 8 Mbps (about 2 - 3 fold), to provide for bandwidth capability required for load skip and set up a basis for further developing of the network in the regional nodes. A separate operational node for processing the regional traffic was set up in Minsk.

A topology of the network access in Minsk was considerably changed. A backbone ring/loop 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 optimally the capabilities of the city telephone network. 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, that enables to make connection of the subscribers at a greater scale and with less expense. The capacity of switched access servers round Minsk was almost doubled and totals 1680 ports.

A new hardware and software platform was put into operation for hosting services by Beltelecom RSA equipment. Capacity of the system is 36GB. An individual domain *(www.belhost.by)* was registered for hosting platform operation. The modernization/ upgrading of the national traffic exchange node was completed by installing a leased switch board to maintain high-speed bandwidth hardware connection to provide for speeds of 10 Mbps and higher.

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

Table 1.31

1.4.4. Country backbone facilities

№	Variable (1 determined from 4 for each region)	Belarus, %	Minsk, %	Regions, %
1	Large businesses, which want access, 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 support user 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 during infrequent periods of high demand. Packet loss by the network is below 10%	14	11	14

The attention will be focused on developing the network topology of the regional nodes in 2003. First of all it concerns to solve the task of traffic sharing: a traditional voice one and the Internet traffic being generated by the users.

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

Here follow the generalized results of a public opinion poll as answers to a question: quote **Are you pleased with a speed of your connection to Internet?** unquote. The question was put at Computer News On-Line site *(http://www.kv.by/vote/voteview.cgi)* and the vote results were the following: total polee s - 489 visitors, "yes" - 25,8 % , "no" - 74,2 %.

1.5. Hardware and Software

To gain information, related to Hardware and Software index variables (sub-indexes), according to the assigned methodology [1], the data has been collected from 9 major Internet Providers: IP TelCom *(www.iptel.by)*, Atlant Telecom *(telecom.by)*, Basnet *(inform.bas-net.by)*, Beltelecom *(www.beltelecom.by)*, Global-OneBel *(www.global-one.by)*, Business Net *(www.bn.by)*, Forenet (BelSoft CJSC, *forenet.by*), Unibel *(www.unibel.by)*, BSUnet *(www.cit.bsu.by)*, the said IPs being the representatives of different niches of the Internet Providing market in the Republic of Belarus.

The ICT Infrastructure and E-Readiness (or advancement) assessment in the country from 1st (least-advanced) to 4th (most-advanced) stage was carried out by the experts for each micro-index independently, and average data assessment for each index and generalized data assessment for each component index were evaluated on their basis.

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

Table 1.32

Average Estimation by 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
Average index estimation	**2,25**	**2,83**	**2,09**

The total estimation breakdown (given as percentage based on collected data) covering the whole republic, the city of Minsk and administrative regions and assessed by four micro-indexes are shown in Table 1.33 and 1.34.

Table 1.33h

1.5.1. Hardware Market Development for ICT Solutions

№	Variables (1 determined from 4 for each micro-index)	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	33	17	33
3	Most ICT products are sourced from abroad, but there is a strong and growing localization industry to adapt products to local needs.	50	50	50
4	A vibrant marketplace exists for hardware with a competitive retail and wholesale market for these products	0	33	0

Table 1.33s

1.5.2. Software Market Development for ICT Solutions

№	Variables (1 determined from 4 for each micro-index)	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 are sourced 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 market for these products	0	33	0

Belarusian ICT market. CIS experts consider, that the ICT market in Belarus, Russia and Ukraine develops under identical scenarios, emphasizing thereby some key stages which have been passed through by them from the moment of generation till today. The years 1990 to 1992 was the stage when the common assignment mainframe computers were given up and Unix servers and PCs taken over; terminal mode fell to oblivion and a transition to distributed use of server nodes and software took place. Middle '90s were the years of appreciation of what Client-server relationship means. 1996 year was the beginning of development of the present distributed systems on the basis of servers and IBM PC servers [9-11].

According to our estimations, there are about 600 companies, firms and organizations working in the ICT market of Belarus (in such fields as PC and telecommunication hardware manufacture, assembly and sales; software development and delivery, telecommunications and Internet services), with less than 50 out of them hardly counting to challenge a brand name, their share equaling 25 to 28 % .

A Business Directory which has been posted on Computer News Online site and is considered to be one of the oldest and most frequently-visited Belarusian Internet sites for ICT experts *(http://www.kv.by/sprav/sprav.cgi)*, published the information reading that 494 firms/corporations were registered by the end of 2002, with their quantity breakdown area-wise as given below:

Minsk	- 373;
Brest and adjacent areas	- 28;
Vitebsk and adjacent areas	- 25;
Gomel and adjacent areas	- 23;
Grodno and areas	- 24;
Minsk adjacent areas	- 8;
Moguilev and adjacent areas	- 13.

Among them are: Internet - providers - 56; Software developers - 70; ICT application consulting companies- 60; PC and telecommunication hardware manufacture, assembly and delivery, service support and maintenance - 250.

These are, as a rule, non-government organizations/companies, therefore there are as minimum as 600 companies, if to take into account the above companies and the government organizations and R&D Institutes of such Ministries as Ministry of Industries, Communications, Education, the NASB and other Ministries and departments/ offices, involved in ICT fields of the Republic of Belarus.

Computers and peripherals. According to marketing services of the leading local computer manufacturers in the Belarusian market, about 55 to 75 thousand computers are sold for industrial sector and up to 50 thousand ones - in the retail consumer market annually, and it is less than in Russia almost 20 fold. The ICT industry turnover is approximately likewise less (whereas the Russian turnover of ICT industry as a whole, as estimated by various sources, totals 2-3 billion US Dollars a year). The market of network hardware, despite of definite difficulties, is expanding [9-11].

1.6. Service and support

Readiness (or advancement) estimation breakdown (in percentage) and average estimation by Service and Support index are shown in Table 1.35.

Table 1.34pr

1.5.3. ICT-related Hardware and Software Pricing

№	Variable (1 determined 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 to most small and medium-sized businesses, as well as many individuals	33	50	17
4	Hardware and software appropriate to local needs and languages are widely available and affordable	0	0	0

Table 1.34pe

1.5.4. PCs penetration

№	Variable (1 determined 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. 1.8 shows the generalized results of a public opinion poll at tut.by site assessed by PCs and Software Pricing index.

Hardware and software pricing affordability with regard to ICT

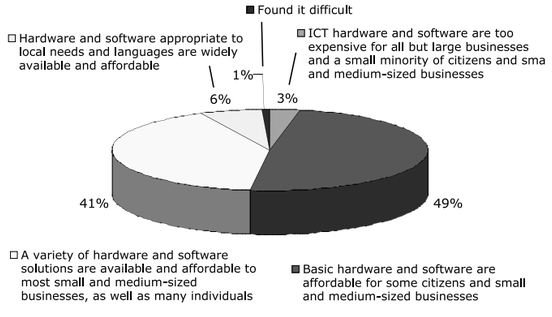


Fig. 1.8

Table 1.35

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
Index Average Estimation	**2.11**	**2.72**	**2.05**

The total estimation breakdown covering the whole republic, the city of Minsk and administrative regions and assessed by two micro-indexes are shown in 1.36 - 1.38.

Table 1.36

1.6.1. Telephone Line Installation Waiting Period

№	Variable (1 determined from 4 for each region)	Belarus, %	Minsk, %	Regions, %
1	Telephone mainlines take at least four years to be installed from the time their orders are placed	50	0	50
2	Mainlines take at least six months for installation	50	100	50
3	Mainlines take at least one month to be installed	0	0	0
4	Mainline installation is usually completed within a few days	0	0	0

Table 1.37

1.6.2. Time Necessary to Fix Mainlines Problems

№	Variable (1 determined from 4 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 most. 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

Table 1.38

1.6.3. Qualified Personnel Availability

№	Variable (1 determined from 4 for each region)	Belarus, %	Minsk, %	Regions, %
1	Very few or no software developers, programmers or computer technicians are present in the community	0	0	17
2	A small community of software developers, web designers, network administrators and other technical personnel exists	67	0	50
3	A nascent software industry is present in the community, and there is a growing number of hardware technicians, web designers and network administrators	33	83	33
4	A competitive and sophisticated web design market exists, 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 was carried out with the purpose to study a general situation in the market regarding hosting service and probable perspectives of its) development.

The survey voter were offered to give answers to 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 of developing this segment of the market,

6) Recommendations to customers while choosing commercial hosting provider.

There were 16 organizations in total known to render commercial hosting service for the time the survey was carried out. 9 of them gave votes 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 Connecticum, Network Systems CJSC - or about 56 %, that amounts to more than half of hosting-providers, which are the most efficient players in this market today.

Total turnover of the hosting providing market - within the limits of 10 to 17 thousand USD per a month or 120 to 200 thousand USD per a year was more precisely defined.

As a conclusion the voters of the survey have noted, 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. It requires additional investments and expenditures to provide proper servicing, that, naturally, brings more profits and permits to reduce the service rates to customers. Hosting companies are integrating, and this tendency means raising reliability of hosters, allows them to extend the range of services and, again, to tender more attractive rates at the expense of cutting costs per each customer. There is any considerable change in hosting provision market as forecasted in Belarus, a steady progressive growth is expected as sequel of Internet extensive use in the country. A

moderate marketing business activity of hosters was also noted that was due to low market penetration and minor incomes.

Conclusion

A defined total assessment of the readiness stage by Network Access component index (Table 1.39) shows, that the capital of the country (20 % of the population) has actually reached 3rd stage of development according to ICT indexes taken into account, whereas the regions and other areas are found to be at 2nd stage.

Table 1.39
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
Total Estimation by Component Index		**2.46**	**3.02**	**2.32**

2. Networked Learning

2.1. Access by schools to ICTs

- Are there computers in schools? How many students per computer? On which level (university/secondary/primary)?

41 students per computer (on average)

Number of schools	*– 4,574*
Number of computers in schools	*– More than 30,000*
Number of schools with computer labs	*– 3,385*
Number of computers per school	*– Average of 10*
Number of students	*– 1,276,000*
Students per computer	*– 41*
% of schools with computer labs	*– 74%*

- Who has access to computers (technical staff/faculty/students)?

Students/teachers.

- What is the quality of hardware (386/486/Pentium...)?

386/486/Pentium – 50%
Original models – 50%.

- Are there LANs in schools? Regional WANs? National school networks?

Belarussian school networks: UNIBEL/NIKC.

- Do schools have connection to the Internet? Is it dial-up or through a leased line, wireless?

4% schools have connection. 1% is through dial-up and 3% through leased line (local).

2.2. Enhancing education with ICTs

- What is the percentage of students and teachers who use computers? (Universities/primary schools/secondary schools)

Primary teachers – 71%; Secondary teachers – 60%.

- What are the computers used for? What is the level of computer literacy/skills?

Tutors of school subjects. Programmes used - Word, Excel, Search information on the Internet, on CD ROM.

- What is the level of information and communication technologies integration in the curriculum?

MS Windows, MS Office, Internet Explorer etc.

2.3. Developing the ICT workforce

- Are there training opportunities for programming, maintenance, and support?

N/A.

- Who is offering them (public/private centers)?

Public centres.

- Are they affordable for majority/minority of the population?

Majority.

- Is on-line training available?

Limited (too expensive).

- Do employers offer training?

Promote.

3. Networked Society

3.1. People and organizations online

- What percentage of the population:
  - is aware of the existence of the Internet?

50%

- has used the Internet recently?

10%

- uses the Internet regularly?

3%

- What is the structure of users by gender, age, social and educational status?

Mainly males, 15-35 years, secondary and higher education

- What is the number of locally registered domain names (per 1000 people)?

0.2

- Is there advertising for online companies, and how common is it?

Widespread

3.2. Locally relevant content

- Are there (and how many: no, few, some, many) websites:

About 2,000

  - Providing local topics?

Yes

  - In local languages?

Yes

- How often are they updated and is content static or dynamic?

Several times/week. Content is generally static

- Are the above websites created in the community?

Business-companies.

- Are bulletin board systems, Usenet groups, newsletters, and/or listservs in use?

Yes

- Are there opportunities for Web-related training?

Limited (too expensive)

3.3. ICT in everyday life

- Does the population include information and communication technologies (phones, faxes, pagers, computers) in everyday life?

To a limited degree

- Are there phones, wireless phones, digital assistants, pagers, PCs and are they being used regularly? Are they used for household commerce (banking, online shopping, investing) and social and commercial interaction (bartering, online chat and etc.)

All of these facilities are present and are used. They are not yet used for household commerce and social and commercial interaction

- Are there PCs with e-mail capability available (cyber caf_s, telecenters) and are they being widely used?

About 75 public points for accessing Internet – used to a limited degree

3.4. ICTs in the workplace

- Do employees have:
  - (Un)limited access to phones?

Limited access to phones

  - Personal e-mail accounts?

Limited use of email accounts

  - Internet access from personal workstations?

Limited Internet access

  - E-mail and web addresses on business cards?

Mainly for organisations

- What percentage of businesses and government offices have computers, how many of them, how many employees use them?

More than 50% have computers which a few employees use

- Are they networked?

In governmental offices and those of big organisations, yes

- Is business mostly conducted in person or by e-mail, or is there data-sharing, enterprise, reporting, transaction, and research applications? How intensively are they used?

Mostly in person with use of telephone and/or fax

- Are there efficiency gains resulting from the use of ICT systems?

Minor

4. Networked Economy

4.1. ICT employment opportunities

- Are there opportunities for technically skilled workers within the country?

Many opportunities

- Are companies from outside of the country investing in IT related projects?

To a restricted degree. UN, OSI, Euroasia Foundation, MTC (Russian) etc..

- What is the proportion of knowledge-workers and information-related businesses in the economy? (Percentage of labour force, percentage of GDP)?

4-5%

- Are businesses considering IT in their strategies?

Yes

4.2. B2C electronic commerce

- Do local businesses have websites and how many? Is content current or static?

About 4,000 (2,000 local). Mainly static.

- Are there online B2C transactions, or are transactions mainly oral and/or paperbased, phone or fix-based?

Mainly oral and/or paper-based with use of phone and/or fax

- Is online retail a noticeable component of overall commercial activity?

No

4.3. B2B electronic commerce

- What are the sources of market information and are they sufficient for providing transparency?

Traditional, teletext, websites, etc

- Are there online B2B transactions, or are transactions mainly oral, paper-based, phone or fax-based?

Mainly oral, paper-based with use of phone and/or fax

- Can transactions be conducted online without paper documents? Is the process automated? Does it allow online tracking, monitoring?

No

- What portion of B2B activity is conducted on line? Is there gain in efficiency?

No

4.4. E-Government

- Number of government resources online? Do they include information, hours of operation, any services? Is information current and relevant?

55 websites

- Is there online interaction between government and citizens, or is interaction mainly oral, paper-based, phone or fax-based?

Mainly oral and/or paper-based with use of phone and fax

- Is there online interaction between government and suppliers and contractors, or is the interaction mainly oral, paper-based, phone or fax-based?

Mainly oral and/or paper-based with use of phone and fax

- Is it possible to download applications from the websites?

No

- Can citizens apply for permits, licenses, and taxes on line?

No

5. Network Policy

5.1. Telecommunications regulation

- Is liberalisation of the telecommunications sector planned or implemented?

Planned

- Is there competition between telecommunications service providers?

Very limited (regulation by state)

- Is broadband Internet access offered?

Only by state

- Is regulation set and enforced by an independent body?

By state

5.2. ICT trade policy

- Do tariffs or other restrictions (technical standards, domestic regulation, etc.) exist?

Tariffs

- Are there restrictions in the service (including information services) sector?

Tariffs

- Are there disproportional taxes on electronically delivered services?

No

- Is Foreign Direct Investment in IT sector existent, and is it encouraged, discouraged, restricted?

Restricted

6. Media

6.1. Radio, TV and newspapers

- Number of radio and TV stations, newspapers

172/120/610

- The size of audience/circulation.

7-8 million

6.2. Employment in the media

- Number of employees in the media

NA

- Trend: is the number increasing/decreasing?

N/A

7. Intellectual Capital

7.1. Patents

- What is the number issued per annum?

903

- What are the trends?

Rising

7.2. Copyrights

- What is the number issued per annum?

3,200

- What are the trends?

Rising

7.3. Licenses

- What is the number issued per annum?

208

- What are the trends?

Rising

7.4. Trademarks

- What is the number issued per annum?

5,155

- What are the trends?

Rising

7.5. Scientific and/or technical associations

105

8. Education

8.1. Higher education

- Total number of higher education establishments (public/private).

57 (42/14)

- Total number of students (total average per annum, in both the private and public sectors)

281.7 (36.6/245.1)

- Prevailing specializations. (distribution of students among the fields)

Prevailing specializations - total 245,100, of which:

- *industry and construction 70,700*
- *transport and communications 7,300*
- *agriculture 21,900*
- *economy 31,700*
- *public health, physical training and sports 12,600*
- *education 90,300*
- *arts and cinematography 1,800*
- *others 8,800*

- Cumulative number of population with higher education degrees (total in the fields of both science and technology)

761,200

8.2. Distance learning

- Distant learning facilities

N/A

- Number of students trained per center

N/A

9. Labour Force

9.1. Employment in science and technical fields

- Number of employees and trends in the fields

42,200, falling trend

- Compensation rates in the fields (average salaries)

74,000 BRB/month

9.2. Employment in the electronics industry

- Number of employees and trends in the fields

40,000 (preliminary assessment0.

- Compensation rates and trends in the fields

71,100 BRB/month

9.3. Employment in telecom industry

- Number of employees and trends in the fields

62,500, rising trend

- Compensation rates and trends in the fields

68,000 BRB/month.

10. Research and development

10.1. Research institutions

- Number of research institutions

307

10.2. Investments in research and development

- The total amount

$67,000,000

- Government and private business breakdown of total investment in research and development

6,100,000 million - private.

State of the art of telecommunications sector in Georgia

O. Shatberashvili

The Article describes the current situation and development trends in the sphere of telecommunications in Georgia.

Telecommunications

From the moment the country gained its independence, no other sector in Georgia has witnessed development on such a rapid scale as that of telecommunications. Moreover, the development has taken place against the background of the decline of other sectors. This phenomenon can be ascribed to the following factors:

- the gaining of independence and the transition to a market economy have lifted artificial restrictions inherent in the USSR that were impeding the sector's development, especially of international communications;
- the said period coincided with a boom in the use of cellular mobile phones, the Internet and IP telephony and the telecommunication sector as a whole throughout the world, which could not help but affect Georgia also;
- the above-mentioned boom has served as a stimulus for attracting foreign investments in the country's telecommunications sector, rendering it of priority significance compared to other sectors.

Market economy has substantially settled in the telecommunications sector of the country after carrying out of reforms. The sector became fragmented after demonopolization and liberalization and private enterprises started operation on the market together with state ones. The process is illustrated on the Fig. 1. Foreign investments and credits played a significant role (Fig. 2).

The overall growth of the sector could be characterized by the income of US$180 million in 2001 compared to US$40 million in 1996.

Table 1
Density of Communications

Type of communications	Telephone	Mobile phone	Internet-linked computers
Density (number per 1000 inhabitants), %	12	6.5	0.6

Local telephone communications (PSTN)

Six operator companies function in Georgia, with the largest being Georgian Elkavshiri (state-owned, 600 thou users) and Akhali Kselebi (private, 100 thou users). Tbilisi has a capacity of 26 telephones/100 inhabitants. A relatively high level exists in the towns of Kutaisi, Batumi and Poti, in comparison to rural areas where such level is extremely low.

The development of telephone networks in rural areas needs investments five times exceeding those in urban areas. The most active company working on the issue is Infotell introducing Swedish Ericsson technology.

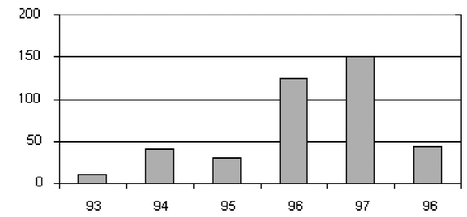


Fig.1 Number of new telecommunication firms obtaining an operating license from the Ministry of Communications

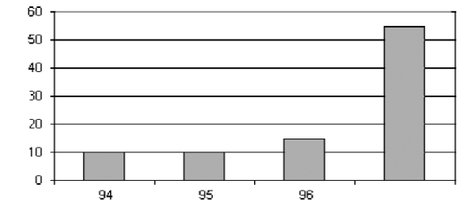


Fig.2 Foreign investments and credits (US$ million)

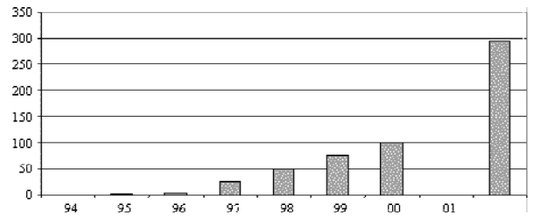


Fig.3 Cellular communications growth (number of subscribers, thou)

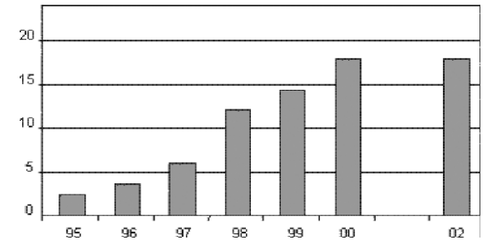


Fig.4 Number of Internet service providers (ISPs)

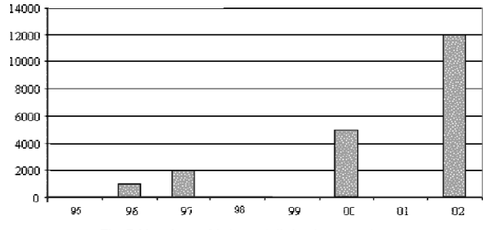


Fig.5 Number of Internet-linked computers

The present situation has been achieved as a result of the installation of electronic exchange stations carried out by Turkish, Israeli, Korean and other foreign companies. At present both electronic (70% of total capacity) and old-type crossbar (30%) exchanges are in operation. Some companies provide free local calls charging only subscriber fees (US$1.5-2 per month), while others offer 300 free minutes per month, at a rate of US$0.01 per minute for extra call-time (plus the subscriber fee – US$1).

According to the density of registered telephones (12%) Georgia is considered among the medium developed countries.

International and trunk telephone communications

Fifteen international operators function in Georgia, with the largest being Georgian Telecom, 51% of whose shares are still held by the State. Other operators are private. Tariff with different operators is US$0.25 per minute when communicating with the US, between US$0.30-0.35 per minute when communicating with Europe, and US$0.25-0.35 per minute when communicating with the CIS countries. Sprint, AT & T, MCI, SCOTTCO and Deutsche Telecom are the main partners of the international communication operators. About 800 digital satellite lines connect Georgian operators to the networks of these companies. In addition, international communications are provided by a further four companies, making use of IP telephony for calls to the US and Europe. Their prices fluctuate within US$0.90 per minute to US$0.40 per minute. Since 1998 international calls have been carried out by means of electronic cards (priced at between 5 to 50 GEL) purchased in advance.

Fiber-optic lines started to play growing role in the trunk communications. Total length of them is 446 km (10% of all trunk lines). This is mainly Georgian segment of TransAsia-Europe fiber-optic line. New fiber-optic lines are under construction: Poti-Rize (Turkey) and Poti-Varna (Bulgaria) segments of the above-mentioned line and also the line passing along Armenia-Azerbaijan-Georgia Railways. Foptnet, Wanex and Georgian Railroad companies are operators of these lines.

Mobile (cellular) telephony The first local operator started operations in 1994. At present, three companies are in operation. This is one of the fastest-growing sectors of the national economy. The total number of mobile phones is 295 thou. The growth rate can be seen in Fig. 3. The largest company - MAGTI (210 thou users) covers 95% of Georgian territory. Geocell has 80 thou users and covers 80% of the territory. Megacom with 5 thou users occupies the rest of the market. Two operators use GSM 900/1800 technology and one uses AMPS 800.

The Internet

The first Internet service provider (ISP) started operations in 1993. At present, 11 commercial and four non-commercial providers are in operation. The number of users is estimated at approximately 40 thou. The number of Internet-linked computers amounts to 12 thou in 2002 (5 thou in 2000). Despite this the Internet users' growth rate per 1000 inhabitants falls behind a similar index for the world. Information resources on the Georgian Internet sector include more than 2000 sites, according to the directory Georgia in Internet *(Georgia in Internet, Techinformi, 2003)*.

The tariff for Internet access fluctuates between the different providers, at between US$0.30 per hour to US$0.60 per hour, dial-up mode for the speed 33 Kbit/sec.

Radio and television Independent television and FM radio stations have significantly increased in number of late. Where only four local TV companies and two local channels were in operation before 1989, now tens of the companies are involved in the preparation and distribution of television broadcasts and 14 local TV channels are functioning.

Only one radio company broadcasting on three frequencies used to operate in Georgia. At present, 15 FM radio stations operate in the country, and three of them are capable to cover the whole territory of Georgia.

The most advanced TV and radio companies operate through use of satellite communication and the Internet.

Also in operation are three subscriber television networks (two of them cable) with encrypted signals.

Technological development

In addition to the gradual transition of telephone communication to electronic exchanges and to satellite systems for international communications and the introduction of IP telephony, the most significant of the latest technological advances are the fiber-optic ring connecting Tbilisi exchanges, the fiber-optic backbone linking eastern and western Georgia, the relay line also linking eastern and western Georgia, and the announcement made by Georgian Telecom concerning its mastering and introduction of the Ericsson's ISDN technology. E-commerce is making initial steps in a number of Georgian companies.

Regulatory environment and future prospects

State policy in the telecommunications sector is being elaborated and pursued by the Ministry of Transport and Communications. Other procedures for fixing and regulating tariffs, also registering and licensing of operators, are carried out by the independent Regulatory Commission. Specific matters within the telecommunications sector (e.g. Internet content, etc.) are also dealt by the State Department of Informatization Mention must also be made of the Coordinating Council for the Development of Information and Communication Technologies, which is presided over by the Georgian President. The Council's function, jointly with all the above-listed bodies, the academic community, other concerned agencies and organizations, is to elaborate national policy in the information sector, including telecommunications as an integral part.

At present the following Acts governing activities of the telecommunications sector have been adopted by the Georgian Parliament:

- The Law on Communications and Post, dated 23 June, 1999;
- The Law on the Press and other Mass Information Media, dated 10 August 1991;
- Georgian Law No. 686, dated 13 December 2000, "concerning amendments and supplements to certain legal acts of Georgia" (including licensing in the field of communication).

Another body playing a significant part in the telecommunication sector development is the Ministry of State Property Management. This Ministry is entrusted to manage the blocks of state owned shares in telecommunication companies and thus plays a decisive role in the privatization of these companies. Its purpose is to hold tenders for making the said companies private. In the near future it plans to sell the state-owned shares in the two largest companies of Georgian Telecom (65% of the international communications sector) and Georgian Elkavshiri (60% of local telephone communications).

Of utmost importance is the issue of attracting foreign investments in the areas of the sector where the level of development remains low: telephony in rural areas, the Internet, the ISDN technology expansion and further introduction of fiber-optic lines.

Taking into account that the telephone installing level is less than half that of developed countries, that Internet development is ten-times less than the world average, that telephone communication development in rural areas is just in embryo, it can be concluded that the sector has rather good prospects for growth.

E-Readiness for Information Society and for telework in Moldovan society

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Chisinau, Moldova

The following article addresses the ability and readiness of the Moldovan Society to benefit from Information Communication Technologies in their development toward Information Society.

This article is based on the research, which was recently performed in Moldova. Based on the results of the research, the level of Moldova's e-readiness to the digitally driven world community has been assessed by stages from 1 to 4 (stage "one" being the least advanced and stage "four" the most advanced).

The assessment has been accomplished in accordance with the methodology suggested by the Center for International Development at Harvard University by the following categories: Network Access, Networked Learning, Networked Society and Networked Economy. The current article describes the results of the research in these categories and their subcategories. These categories are directly related to the telework conditions and opportunities, and the results of the research show the picture telework readiness in Moldovan society.

Network Access

Information Infrastructure

"Moldtelecom" State Company was established in 1993 as a result of restructuring of the telecommunications sector of economy. On the 5th January 1999 "Moldtelecom" State Company was reorganized into a Joint-Stock Company. The Founder and sole shareholder is the State.

JSC "Moldtelecom" S.A. manages the fixed telephony network comprising 676.6 thousand of lines through its 39 branch offices situated throughout the Republic. JSC "Moldtelecom" S.A. is a fixed telephony, data transmission and Internet Operator; it offers Internet access to other Internet Service Providers.

Moldtelecom Internet Point of Presence has direct access to the Global Network via three fiber optic cables with a total capacity of 48 Mbps, connected to the Frankfurt (Germany) Sprint — internationally recognized operator.

Moldtelecom offers Internet services both to other ISP and direct Internet subscribers via its own public telephone networks or via the leased lines. Today the following Internet Operators are connected to the Moldtelecom Internet Point of Presence:

- MoldData
- MoldInfoNet
- Moldpac
- MoldSat
- Relsoft
- Riscom
- UNDP
- Arax-Impex
- DNT
- InterDnestrCom
- MedNet
- MegaDat
- MNC
- Meganet

Some of those ISP's also have satellite Internet access channels to Sky-Vision (UK) and Satellite Media Services (UK).

In 2003, Moldovan information infrastructure is, in general, at stage 3 of e-readiness assessment in accordance with the methodology suggested by the Center for International Development at Harvard University[1].

A sizeable portion of the community has good access to telephone services. Growth in mobile wireless telephony is accelerating. (Roughly: Teledensity is between 8 and 40 mainlines per 100 people. Mobile wireless penetration is between 3% and 14%. Between 5 and 10% of households in the community subscribe to cable services.)

Internet Availability

There are more than 12 Internet Service Providers (ISPs) and sub-providers in Moldova, more than 4 ISPs per 1,000,000 inhabitants. Local ISPs offer dial–up and radio-modem, ISDN and satellite access.

Most Internet users utilize dial-up connection. However, some work has been already carried out to create the fiber-optic network on International level, and in 1-2 years DSL system will be widely available.

ISPs provide full Internet access and the subscribers have options between various existing Internet service packages. Most ISPs, especially major ones, provide e-mail, web hosting, hosting of customer-specific servers, etc. to their subscribers.

Dial-up connection to some small scale ISPs is easily possible to establish round the clock. In Chisinau the quality is better than in other cities of Moldova.

Public Internet access is limited because of some factors. The first is high Internet rates, high costs for the services and the existence of few free Public Internet accesses.

Rates in the Internet cafes are MD 7 (equal to US$ 0.5) per hour, which is affordable for the majority of the community, but the quality of service is not good enough. The demand for the free Internet use is very high. However, the number of users is growing. Banks, research and development institutions, universities are the main corporate users of Internet services in Moldova. Medium sized businesses, particularly banking companies, can afford to have the leased lines as well as instant and high speed access to their corresponding accounts abroad.

Conclusion:

Internet Availability in Moldova in terms of the number of ISPs and leased lines provisions is at stage 4. In the case of public Internet access, it is mainly at stage 3. In general, Internet Availability in Moldova is considered to be at stage 4.

There are more than two local ISPs per 1,000,000 inhabitants. Higher bandwidth solutions such as DSL(digital subscriber line) and cable modem access are available. Most customers can tailor services to meet different demands for speed, service, security, quality and cost. ISPs provide web hosting services to their subscribers. There are adequate opportunities for public Internet access for those without access at home, school or work. Users are able to establish a dial-up connection to a local ISP on a reliable basis. Multiple private providers leased lines to businesses.

Internet affordability

In 2001-2002, the number of local ISP's has doubled prompting the competition in the telecommunications market and diminishing the prices, but the rates are still high enough for extensive Internet use.

1 Since all conclusions are made based on the mentioned methodology, this fact will not be mentioned hereinafter.

In Moldova, the telephone charges for Internet access are higher than the international. Internet rates vary between $12-$60 per month. However, there is an emerging competition between ISPs. Flat rate pricing is available. The diversification of service prices offered by local ISPs is very high and this creates the opportunities for the customer to have many options between various Internet service packages.

There is a competition in leased line provision for businesses, but it has not been introduced on high level, the prices decrease very slowly and are still high. The lease fees for dedicated lines are presented in the following table:

Table 3
Lease Fees for Dedicated Lines in Moldova, 2003

Speed (Kb/s)	Monthly Fee
64 Kbps	$448
128 Kbps	$807
256 Kbps	$1470
512 Kbps	$2813
2048 Kbps	$6470
4096 Kbps	$12275

Conclusion:

Although in some cases the Internet affordability is considered to be at stage 2, the analytical and statistical approaches generally estimate it in Moldova by stage 3.

Network Speed and Quality

Users have access to dial-up modem transfer speeds for digital connections up to 40-56 Kbps, although this access is not widespread all over the country. Leased lines with transfer speeds up to 2 Mbps are widely available for businesses and ISPs.

There is no national backbone network in Moldova.

Conclusion:

Network Speed and Quality in Moldova is in some cases at stage 2 and, in general, it is considered AT 3 STAGE.

Networked Learning

Schools Access to ICTs

Computers can be found at the university level as well as in primary and secondary schools.

According to recent research from 10 to 20 computers can be found in computer laboratories at some schools for classroom group work, or about 2-3 students/per computer. However, it is true concerning city schools only. The number of PCs in Moldovan schools totals about 5000 and the number of pupils - about 650,000; that equals approximately to 0.75 PC per 100 pupils.

About 60 schools in 2002 had Internet access. Dial-up as well as radio-modem connections through dedicated lines are available in these schools.

Most state universities are equipped with computers. However, there are still very few PCs available for students. Faculty and staff are the most common users of computers, though integration of ICTs into the education process is mainly limited to engineering schools. Students, especially in state-owned universities, which are traditionally considered better choices for study, have access to computer labs installed for their usage. As a rule, a lab consists of 10-15 computers, connected to the Internet.

Teachers' computer literacy is at the beginner's level. Most of them have only elementary computer literacy. Computer literacy of students can be estimated as from none to basic at secondary school level; mainly basic for university level, with the exception of science students.

In general, in the curriculum, there is a subject, "Information Science", but it is mainly technical and does not teach browsing and PC skills. There are schools teaching this subject without computers.

Special training opportunities for the teachers are available in the context of the ICT initiatives. Many specialists are integrated to carry out training courses with teachers to promote their computer literacy. The demand for computer training courses in schools is very high.

Networked Society

People and Organizations Online

According to some sources, such as the Ministry of Transport and Communications, approximately 50% of the population is aware of the Internet.

There are about 80,000-120,000 recent computer users (2-3% of population). However, there is a growing tendency in the number of the Internet users.

In 2002 there were more than 900 web servers and 7000 hosts in Moldova and their number is increasing.

Advertising in traditional media for the online companies or resources is very infrequent, although advertised companies, which have web sites, have a growth trend in traditional media.

Conclusion:

People and Organizations Online, with some reservations, is considered to be at stage 3. Registered domains and web servers are in some cases at stage 2, but are generally considered to be at stage 3 of e-readiness assessment in accordance with the methodology suggested by the Center for International Development at Harvard University[2].

Locally Relevant Content

The number of Internet hosts in Moldova was 7000 in 2002.

There exist many web sites covering local topics. Most of them are created and hosted inside the community. These include government resources, online newspapers and news agencies

About 40% of government resources have web pages and approximately 50% use e-mail service.

There are many web sites in Moldova available in Romanian. In general, all state-related web sites are available in the Romanian language. A large number of web sites with local content are in English, some of them are in Russian and a number of others use two or three languages.

Approximately one third of the major Moldovan news agencies and newspapers (10-15) are online. In general, they provide information on local topics. Most of them are available in Romanian, others in English or in Russian.

Conclusion:

Locally Relevant Content is generally considered to be at stage 3.

Networked Economy

B2C Electronic Commerce

E-commerce, by generally recognized definition, is almost non-existent in Moldova. For now, the Internet mostly is used for news dissemination and communications rather than commerce.

2 Since all conclusions are made based on the mentioned methodology, this fact will not be mentioned hereinafter.

Laws on e-commerce are under development.

Many businesses post the description of their activities on their web sites. The basic information they provide is static and infrequently updated.

There is little awareness of online business, and all dealings between businesses and consumers consist of verbal and/or paper-based transactions. Some businesses accept orders placed by telephone or fax. The others distribute hard-copy catalogs for remote browsing of goods and services.

Many businesses post key information on websites. Information is often not kept current and relevant. Websites provide information on goods and services for sale. Purchases take place primarily in person, by fax or by telephone, though electronic mail may expedite the process. Some businesses may have introduced online ordering.

There are e-shops transactions in Moldova, but only few of them in Romanian, having small audience, and lacks real time credit card processing.

There are possibilities to make payments by credit card, they keep gaining larger scale of use in Moldova. Most of the cards used by the population are debit ones. Purchases take place primarily in person by fax or telephone.

However, some online currency transactions are implemented in Moldova.

Thus, the absence of appropriate Moldova laws on e-commerce, taxation, customs language and terminology problems for e-commerce result in the above mentioned situation in Moldova.

Conclusion:

B2C Electronic Commerce is generally considered to be at stage 3.

B2B Electronic Commerce

As it was already mentioned in the description of B2C conditions in Moldova, there is no legal framework and developed infrastructure in Moldova that would regulate and promote online transactions, so virtually all B2B transactions take place off-line, using traditional communication tools (paper, phone fax). There is little awareness of online business, and all dealings between businesses and consumers consist of oral and/or paper-based transactions. Some businesses accept orders placed by telephone or fax.

Sources of market information are limited to ministries, databases of International organizations, consulting companies and businesses. They are not sufficient to provide transparency and the efficiency of most B2B interactions is hampered by this lack of transparency.

There is a some noticeable interest amongst large Moldovan companies that are using the Internet to conduct business online.

In general, e-commerce has the possibility to develop in Moldova. The main problem we are face is the insufficient awareness of our Government and Parliament in the field of new technologies (IT sector, e-commerce).

Conclusion:

B2B Electronic Commerce is generally considered to be at stage 2.

E-Government

Today only 40% of state organizations have their web pages. Small enthusiastic professional teams within some Governmental institutions work hard on the creation of their institutional web pages, but in most of the cases institutions are not able to maintain their institutional web sites.

Some governmental agencies post key information on websites, including directories of services, hours of operation, and downloadable forms. Information is often not kept current and relevant. Transactions take place primarily in person, by fax or by telephone, though electronic mail may expedite the process. The government manages relationships with some contractors and suppliers online or with other electronic mediation.

In general, e-Government in Moldova is less developed than even e-business. Almost all government-community interactions are paper-based. However, there is a tendency to develop e-government in Moldova, which will result in high transparency, which in its turn is part and parcel of democracy.

Conclusion:

E-Government is considered to be in, some cases, at stage 3, and, in general, at stage 2.

E-Readiness for the Networked World research in Moscow, Russia: assessment guides by CID of Harvard University and CSPP

A. Soloviev

What is the Networked World?

Ever-evolving and increasingly powerful information and communication technologies (ICTs) have fundamentally changed the nature of global relationships, sources of competitive advantage and opportunities for economic and social development. Technologies such as the Internet, personal computers and wireless telephony have turned the globe into an increasingly interconnected network of individuals, firms, schools and governments communicating and interacting with each other through a variety of channels. The explosion of this technologically mediated global network has resulted in a world in which virtually everyone, everywhere, has the potential to reap the benefits of connectivity to the network.

The Networked World is:

An artisan in a rural village using her community center's computer to sell handicrafts on the World Wide Web.

Healthcare workers accessing online databases to research recent health advisories.

Students in different countries collaborating on a science project over the World Wide Web.

Programmers creating customized software for distant clients through the Internet.

Government procurement officers using the World Wide Web for purchases and contracts.

A farmer using a wireless handheld device to research market prices.

What are the benefits of the Networked World for developing countries?

Success in the Information Age depends upon the widespread integration of information and communication technologies into society-at-large. New value propositions based upon ICTs emerge as individuals begin to accept and understand their usefulness. This change in attitude and behavior leads to creative solutions and new models that can radically reshape how businesses, hospitals, schools and governments work.

In the more developed nations, the deployment of ICTs is more widespread and is supported not only by better infrastructure, but also by more fundamentally sound societal building blocks such as healthcare and education. The developing world, on the other hand, suffers from serious deficits and profoundly uneven distributions within these areas.

Rapid increases in computing power, plunging prices for silicon chips and electronics, and advances in wireless communications have made powerful technologies accessible to many parts of the world which have historically lagged far behind in technology adoption. Suddenly, this accessibility allows developing nations to achieve significant, shared and sustained gains from joining the Networked World, particularly if broad development goals are kept in mind as communities in these nations focus on their own Readiness.

The new ICTs are a powerful yet neutral tool that can be used to address a host of issues in every community - their real power, therefore, lies in their ability to support holistic development that promotes long-term social and economic benefits. If information and communication technologies are used effectively, they can help to create a trained, educated and healthy workforce that can build a vibrant and successful economy.

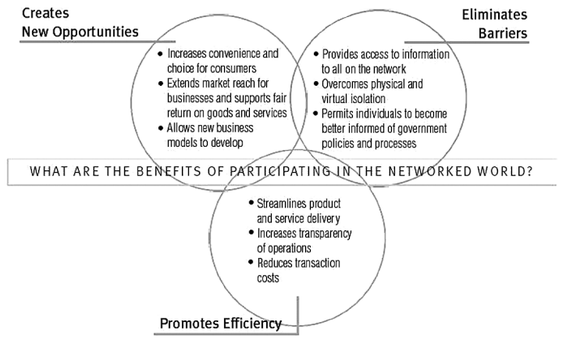
The value of a network increases as its number of users grows. By participating in the global information network, developing nations not only add value to the rest of the world, but also benefit from the ability to use the network to communicate and trade with all other users. For this reason it becomes ever more important for the developing world to get ready for the Networked World.

Getting ready for the Networked World creates new opportunities for firms and individuals in the developing world, eliminates barriers that have traditionally stifled flows of information and goods to and from developing nations, and promotes efficiency in a host of activities. Students can learn more about the world and about themselves through use of the network. Businesspeople can find new market opportunities and more efficient ways to run their firms. Governments can more effectively provide public services. Individuals can communicate with friends and family and become more informed about virtually anything that is on the network.

Participation in the Networked World can provide new ways for developing countries to improve their economic, social and political well-being. These opportunities for positive change are increasingly relevant and achievable as information and communication technologies become more powerful and less expensive.

What is Readiness?

Readiness is the degree to which a community is prepared to participate in the Networked World. It is gauged by assessing a community's relative advancement in the areas that are most critical for ICT adoption and the most important applications of ICTs. When considered together in the context of a strategic planning dialogue, an assessment based on these elements provides a robust portrayal of a community's Readiness.



The value to a community of assessing its Readiness lies in evaluating its unique opportunities and challenges. Most communities will not be uniformly Ready across all evaluation criteria. The result is not a simple "yes" or "no," but rather a complex map or detailed snapshot of a community's potential. A community may be well poised for some applications of ICTs, but unable to use others. The scope and detail of the guides' output makes it a powerful tool for identifying a community's strategic priorities for participating in the Networked World.

Who should use these guides?

The guides are targeted at communities in developing countries seeking to define a strategy to participate in the Networked World. A "community" may be any size: a country, province, city or village. The guides will naturally yield unique results for each community. For instance, the issues that are most easily addressed at a municipal level may be more challenging at a national level, and vice versa. Likewise, the value of each category will vary for each community. Available data are also of different character and quality in each community. This will be reflected in the relative precision of each assessment.

A Guide for Developing Countries

by Center of International Development of Harvard University

http://www.readinessguide.org

What is the Guide?

This Guide is an instrument that systematically organizes the assessment of numerous factors that determine the Networked Readiness of a community in the developing world. The Guide requires significant participation and interpretation on the part of its users. It examines 19 different categories of indicators, ranking each by levels of advancement in Stages One through Four. The Guide neither offers specific advice nor suggests that the only route from Stage Two to Stage Four be through Stage Three. Nor does it provide an overall score; it seeks only to offer a starting point in an ICT planning process.

The categories are linked, each driving the others, such that a community cannot concentrate solely in one area, but must pay attention to each, noting where it might be able to capitalize on synergies among the categories.

The categories fall within five groups:

Network Access: What are the availability, cost and quality of ICT networks, services and equipment?

Networked Learning: Does the educational system integrate ICTs into its processes to improve learning? Are there technical training programs in the community that can train and prepare an ICT workforce?

Networked Society: To what extent are individuals using information and communication technologies at work and in their personal lives? Are there significant opportunities available for those with ICT skills?

Networked Economy: How are businesses and governments using information and communication technologies to interact with the public and with each other?

Network Policy: To what extent does the policy environment promote or hinder the growth of ICT adoption and use?

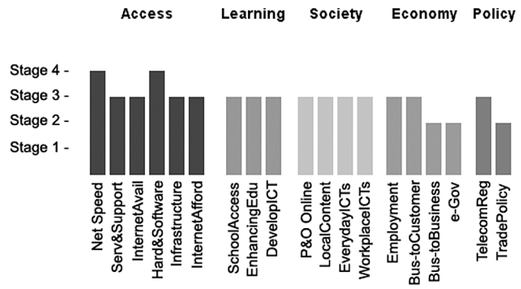
How should the Guide be used?

There is no one correct way to use the Guide; each community should determine how the Guide best addresses its own needs. Depending on the resources and goals of the community, the assessment process and results will vary in detail, depth and scope.

In general, however, users of the Guide should estimate their own community's current stage within each Readiness category. Communities may have difficulty placing themselves in a specific stage within some categories, as certain indicators within a stage may not be consistently linked. A community facing this situation should realistically determine which indicator is most relevant to its own ICT goals.

While the Guide alone does not offer prescriptions for improved Readiness, it is useful for giving communities an idea of their current state of preparedness to participate in the Networked World. In order to decide where to go, each community must first know where it is. The Guide provides a firm base upon which to build a planning dialogue and is an important step in making sound policy and investment decisions.

Assessment results



Mean level of readiness is 2.9

Note: *Each answer contains only the closest (not exact!) description of situation given in the corresponding question.*

Detailed answers

ACCESS Assessment:

• SPEED & QUALITY

Dropped connections are fairly infrequent and not a major disruption.
Over 90% of domestic telephone calls placed are successful.
Fewer than 10 faults are reported per year for each 100 mainlines.
There is widespread access to dial-up modem transfer speeds up to 56 Kbps, with some access to high speed solutions such as DSL, cable modems and wireless solutions.
High speed services of 1.5 Mbps are common, with higher speeds available in some areas.
Adequate backbone capacity exists to support community needs without significant transmission delays except during infrequent periods of high demand.
Packet loss by the network is below 10%.

• SERVICE AND SUPPORT

Mainlines take at least one month to be installed.
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 most. Some ICT maintenance and technical support services are available.
A nascent software industry is present in the community, and there is a growing number of hardware technicians, web designers and network administrators.

• INTERNET AVAILABILITY

There are between 500,000 and 1,000,000 inhabitants per local ISP.
ISPs provide full Internet access.
Subscribers may have some options between various Internet service packages.
There are some opportunities for public Internet access.
It is normally possible for users to establish a dial-up connection to a local ISP, except during peak hours.
One or two private providers leased lines to businesses.

• HARDWARE AND SOFTWARE

A vibrant marketplace exists for software and hardware with a competitive retail and wholesale market for these products.
Hardware and software appropriate to local needs and languages are widely available and affordable.

• INFORMATION INFRASTRUCTURE

A sizeable portion of the community has good access to telephone services. Growth in mobile wireless telephony is accelerating.
(Roughly: Teledensity is between 8 and 40 mainlines per 100 people. Mobile wireless penetration is between 3% and 14%. Between 5 and 10% of households in the community subscribe to cable services.)

• INTERNET AFFORDABILITY

Telephone charges for Internet access reflect emerging competition in the telecoms market, yet they are high enough to discourage extensive use by some users.
Internet access is priced within reach of the majority of citizens.
Competition in leased line provision for businesses has been introduced, and prices are falling but are still high.

LEARNING Assessment:

• SCHOOLS' ACCESS TO ICTs

Computers can be found at the university level as well as in primary and secondary schools.
Up to 10 to 15 computers can be found in laboratories for classroom group work, with about four students per computer.
Computer labs are generally only open for computer studies during the day and closed after school, or may be open to teachers for class preparation but closed to students.
Computers tend to be older generation models, such as 486 PCs or higher, and they may be networked with a file and mail server.
There may be an internal Local Area Network (LAN) in place. If there are multiple computer labs, they may be connected through the school network.
Where there are stand-alone PCs, they may have a limited CD-ROM library.
The networked lab achieves connectivity through a dial-up connection to the Internet, which supports limited World Wide Web access.

• ENHANCING EDUCATION WITH ICTs

Teachers and students use computers to support traditional work and study.
Teachers who use computers are generally proficient with word processing applications and may access information offline from CD-ROMs.
They may employ computers in some basic drill-and-practice lessons.
In some cases, teachers access and organize information from the World Wide Web in their work, share information using e-mail, and create information in electronic format to share with others both inside and outside the school.

• DEVELOPING THE ICT WORKFORCE

Technical classes and programs on ICT-related subjects are available from a variety of public and private centers.
Some limited online access to training is available.
Some employers offer training in the use of information and communication technologies to their employees.

SOCIETY Assessment:

• PEOPLE AND ORGANIZATIONS ONLINE

Most of the population has heard of the Internet, although few have used it.
Less than 10% of the population uses the Internet regularly.
The overwhelming majority of Internet users are males between the ages of 10 and 35.
The number of registered domains locally is at least 2 per 1000 people.
Advertising in traditional media for online companies or resources is infrequent.

• LOCALLY RELEVANT CONTENT

Some local websites are available, though most carry static content and are updated infrequently. Websites carry diverse types of information relevant to different groups within the community.
Many websites are available in local languages or a dominant Web language spoken locally.
There is some use of online bulletin-board systems, Usenet groups, newsletters, and/or listservs.
There are opportunities for Web-related training, although they may be expensive and accessible only in certain areas.

• ICTs IN EVERYDAY LIFE

Public telephones may be found in most parts of the community and are heavily used.
Some members of the community have Internet access at home.
Growing numbers of community members use telecenters, cybercafes and other businesses that offer computer use and online services to the public for a fee.

• ICTs IN THE WORKPLACE

Organizations achieve some efficiency gains through some degree of deployment of ICT systems in their internal workings.
Many computers in business offices are internally networked for data processing, management reporting, and other enterprise applications.
Some employees conduct research and business transactions over the Web, though most often they use a shared workstation to do so. Some employees use e-mail for internal communications.

ECONOMY Assessment:

• Employment Opportunities

Technical skills in the community are becoming a source of competitive advantage and are beginning to attract investment and employment opportunities by companies from outside the community.

• BUSINESS - TO – CONSUMER

Many businesses post key information on websites. Information is often not kept current and relevant.
Websites provide information on goods and services for sale. Purchases take place primarily in person, by fax or by telephone, though electronic mail may expedite the process. Some businesses may have introduced online ordering.

• BUSINESS - TO - BUSINESS

B2B interactions remain inefficient with little transparency.
Faxes and telephones are commonly used to facilitate orders or for remote client support, although some paper-based transaction (e.g. signature) is required.

• E-GOVERNMENT

A few governmental websites exist, providing basic information, often directed at parties outside of the community. This information is static and infrequently updated.
Some limited interaction with the government is possible by telephone or fax.
The government distributes some information about services, procedures, rights and responsibilities in hard copy.

POLICY Assessment:

• TELECOMMUNICATIONS REGULATION

Plans for the liberalization of the telecommunications sector are in place and are being implemented.
Progress is being made in achieving universal access, but there are many hurdles in implementation.
Services such as data, paging and mobile telephony are available from competing private providers.
Alternative carriers compete for private network services, leased lines and other telecommunications services for businesses.
Incumbent provider networks are being opened to competition through interconnection and/or unbundling obligations.

• ICT TRADE POLICY

Trade barriers for ICT equipment have been reduced, but are still relatively high.
There has been some opening in service sectors related to electronic commerce and ICT networks.
Foreign direct investment is allowed in network sectors under certain conditions.

What next?

The results from the Readiness assessment act as the starting point in a participatory planning dialogue. They should heighten awareness of the opportunities and challenges of joining the Networked World.
A planning process should be undertaken as a true partnership among business, government and other members of the community. The process should encourage but not require participation from the whole community. Participants should be key stakeholders that might include local carriers (incumbent and competitors), ISPs, high-tech companies, business users, appropriate government officials, educators, universities, bankers and community groups.
Just as the other components of Readiness have been assessed, the nature and progress of the planning dialogue that is currently underway within the community should also be carefully understood. This is valuable whether a plan has already been put into action or if there is not yet any planning underway.
The following concepts should be kept in mind during the planning dialogue:

- Communities at lower stages of Readiness can get ideas for improvement from the higher stage indicators. It is important to note, however, that the path from Stage One to Stage Three does not necessarily lead through Stage Two. Indeed, the absence of ICT development within a particular community may present unique opportunities for rapid ICT adoption and a "leapfrogging" of stages of Readiness. Reaching Stage Four does not mean a community is finished; there is a need for continual improvement, especially in light of the speed with which ICTs and their applications develop and change.
- Preparing people is at least as important as preparing the technology they will use.
- The importance of education in Readiness cannot be overestimated - a heavy emphasis upon incorporating ICTs in the educational system can yield tremendous long-term benefits by investing in the future Readiness of the workforce, society and economy.
- Each community must decide its own priorities and resource allocation to get Ready, but it should be careful not to sacrifice long-term gains for short-term benefit.
- A close working relationship between business and government is critical.

ICTs are constantly becoming more powerful and less expensive. Applications that may be prohibitively expensive in the present may prove to be quite affordable in the near future.

The CSPP Readiness Guide for Living in the Networked World

by Computer Systems Policy Project
http://www.cspp.org/projects/readiness/assesRediness.htm

About the Guide

This self-assessment tool is designed to help you and your community determine how prepared you are to participate in the Networked World. It facilitates the first step of understanding where you are and provides a vision of where you need to be to reap the benefits of being connected in a Networked World. Most importantly, it prepares you to take actions that will enable your community, government, businesses, schools, community groups, and citizens, to benefit from being as connected as possible.

Criteria

There are hundreds of criteria that could be used to assess readiness for the Networked World. In the enclosed matrix, five key categories were selected. They are supposed to represent in a best way the elements that need to be in place to capture the benefits of the Networked World.

1. **The Network (Infrastructure)** — the backbone technologies and infrastructure that connect you to the Network.
   There is an ever-expanding communications network infrastructure that spans the globe, connecting people and devices to all sorts of voice, video, and data services. However, there is tremendous variability in the speed, quality, affordability, and range of services that are available where people actually connect to the Network: in homes, schools, businesses, cars, trains, etc.
2. **Networked Places (Access)** — where you spend your time and need to be connected.
   Infrastructure alone does not ensure connectedness. The Network must extend to the places where people spend their time. Mobile technologies will soon make the Network available everywhere, but wired access will remain important for higher speed connections and fixed access devices.
3. **Networked Applications and Services** — how you use your connectedness to make it meaningful and purposeful.
   The Networked World is all about how we are able to use the Network to make our lives better, jobs more meaningful, time more well spent, people smarter, and communities stronger, healthier, and safer.
4. **Networked Economy** — the role of the Network in driving the economy.
   The Internet has started to change the economy-the Networked World will revolutionize it. There are three key factors that indicate an economy, whether at the macro or micro level, is well-grounded to benefit from the change: 1) are the ingredients in place to promote innovation; 2) is the workforce trained and skilled enough to adapt to an ever-changing environment; and 3) are consumers plugged into the networked economy.
5. **Networked World Enablers** — key levers to expediting the Networked World.
   The Networked World is happening all around us in fits and starts. Most of us still operate in a duplicative online and physical mode because we are not yet at a level of reliability and ubiquity to do many of the things possible on the Network alone.

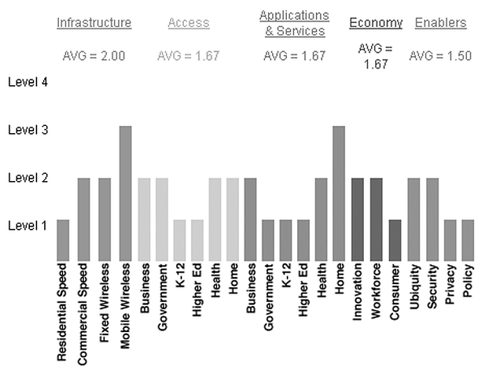
Many people are concerned that online interactions are not adequately secure and private. Policies are still maturing that will ensure that a viable legal framework is in place and that promote connectedness everywhere and for everyone. If these key issues are addressed expeditiously, communities will be better enabled to benefit from the Networked World.

What do the Stages mean?

The Stages are meant to provide a benchmark for communities to determine how far along they are in achieving and using connectedness. Communities are likely to be at a variety of stages as each criterion is assessed. For example, a community might have advanced infrastructure (Stage 4) but little actual use of the network for providing government services (Stage 2). An overall "score" for the community can be estimated by simply averaging the scores across the criteria.

Assessment results

Note: *Each answer contains only the closest (not exact!) description of situation given in the corresponding question.*



Detailed answers

Network/Infrastructure Assessment:

- Residential Speed & Availability
  56k dial–up available to 100% of homes.
  Only analog mobile wireless services offered.
- Commercial Speed & Availability
  High–speed (DSL/Cable or dedicated T1+) access available to 40% of businesses.
  Mobile digital wireless data service covers 30% of the community at 12kbps.
- Fixed Wireless Competition
  2 residential high–speed data providers servicing more than 50% of the community.
  3 high–speed data providers for the business market.
  Installation takes less than 2 weeks.
- Mobile Wireless Competition
  5 mobile voice and data wireless providers.

Network Places/Access:

- Business
  30% of employees have access to an always–on connection to the Internet.
  50% of employees have email accounts.
  50% of mobile employees use wireless devices.
- Government
  100% of government buildings have always–on connection to the Internet.
  100% of employees have email.
  50% of mobile employees use wireless devices.
- K-12 (elementary and secondary (K–12) schools)
  10% of classrooms have always–on connection to the Internet.
  25% of teachers have email accounts.
- Higher education institutions (community colleges, colleges, and universities)
  100% of offices, libraries, and labs have always–on connection to the Internet.
  25% of dorm rooms have always–on connection to the Internet.
  100% of students, faculty, and staff have email accounts.
- Health (health care provider operations)
  25% of providers have always–on connection to the Internet.
  50% of providers have email accounts for external communication.
- Home
  50% of homes have a computer/access device.
  30% of homes use the Internet.

Networked Applications & Services:

- Business
  25% order goods online.
  25% transact with customers online.
  25% manage HR/administrative information online.
- Government
  50% of agencies have informational websites.
  25% of agencies manage HR/administrative information online.
- K-12
  100% of schools have an informational website.
  25% of teachers trained to use the Internet for instruction.
- Higher Ed
  25% of campuses offer online registration.
  25% of faculty trained to use the Internet for instruction.
- Health
  25% of providers have an informational website.
  10% of providers store records electronically.
- Home
  75% of community–based organizations have an informational website.
  A unified community portal provides access to a broad range of community information and services.

Networked Economy:

- Innovation
  Business permits and licenses take up to 1 month to secure. 50% of existing businesses have transformed their internal and external practices due to the Internet.
- Workforce
  25% of the workforce participates in training/education programs either online or in person every 5 years.
  25% of employers post job openings on online job listing services.
  5% of the workforce telecommutes at least once a week.
- Consumer
  10% of households purchase goods or use services online.

Networked World Enablers:

- Ubiquity
  A visitor can find high–speed access to the Network within a 10–minute drive from the center of the community on a 24x7 basis.
- Security
  50% of always–on connections have firewalls.
  Sensitive business and personal e–mail sometimes encrypted.
  Virus software updated monthly.
- Privacy
  75% of public and private sector websites post privacy policies.
  10% of people feel they understand how to protect their privacy when online.
- Policy
  Policy makers and business leaders are familiar with key connectedness policy issues such as privacy, telecommunications competition, taxation, authentication, intellectual property, security, and online criminal activity.

Analysing results

Based on the responses to the CSPP Readiness Assessment, the community is between Stage 1 and Stage 2.

Benefits of Stage 2 include:

Improved access to information:

Citizens have better access to information about products, services, government, and their community, improving decision making at all levels.

More efficient businesses:

Local businesses can cut costs by using e-mail and intra-corporate networking to improve communication between employees, suppliers, distributors, and customers.

Faster and more convenient transactions:

Some personal and business transactions can be accomplished over the Internet giving citizens more control over the use of their time and cost of doing business.

More effective government:

Government can more accurately and efficiently collect and analyze data, providing higher customer service that is more responsive to citizens needs.

The readiness score is an average of responses. By carefully reviewing the graph above, it is possible to see where the community is doing well and where it faces challenges.

Reminders:

The assessment is meant to provide a snapshot of the community's readiness so that it could be better understood what is needed to be done to be as ready as possible to benefit from the Networked World. Stage 4 is the vision that communities should be targeting to achieve in the next 3-5 years, depending on their current situation. Networked World readiness requires involvement from every sector in the community. The online assessment is only a small first step - moving toward planning for Stage 4 and most importantly, taking action to increase readiness, is essential.

Suggested Next Steps:

- Convene a meeting of the public and private sector stakeholders in the community;
- Go through the exercise as a group of assessing the community's readiness;
- Develop consensus on a vision for the community in terms of its place in the Networked World;
- Conduct a more formal assessment that uses the most accurate data which could be found to measure against the criteria;
- Reconvene the stakeholders and develop a plan for reaching the vision of readiness for the community;
- Garner the resources and take the actions needed to move the community toward Stage 4.

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E-Readiness of Ukraine in the TelCo field

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The given article analyzes technical development of Ukraine in the sphere of communication technologies, namely in the sphere of telecommunication. Methodology developed by the Center of International Development of Harvard University in the category “network access” *(http://www.readinessguide.org/test.html)* was used for determination of a degree of electronic readiness in the field of telecommunications (E-readiness). According to this methodology the four-stage scale is used to estimate the degree of development, the fourth step corresponding to the highest degree of readiness, the first step — to the lowest readiness.

Introduction

The current normative documents in force in Ukraine (“On licensing specific economic activities”) imply rather rigid system of licensing and admission for work in the sphere of telecommunication. At the moment Goscomsvyazy, Gosstandart, Gostochnadzor are acting as the fundamental bodies of regulation of Ukrainian telecommunication. Normative provisions currently in force poorly meet the demands of flexibility, made by high dynamics of the development of modern information technologies. Excessive state regulation is making negative impact upon the development of free competition and leading to the market monopolization.

2002 has made Ukrainian telecommunications closer to the international and European standards. We especially want to note several events which can determine the development of the telecommunication market in Ukraine within the next few years: the development of a draft law “On telecommunication” –basic law of the field, the development of a draft state program “Electronic Ukraine” and the adoption of revisions to the law in force “On communication” by the Supreme Rada.

The draft law “On telecommunication” assumes liberalization of market by introducing mechanism of common sanctions similar to the analogical mechanism determined in the European Community by the directive 97/13/EC. This law also introduces the definitions for new technologies and services which are widely used, however had not been legislatively defined earlier (particularly, IP-telephony).

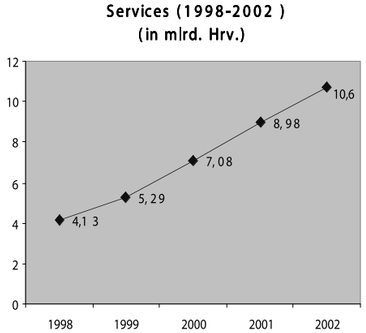
The main task of the program « Electronic Ukraine » is assistance to construction of modern competitive economy and increase cost-of-living index of the population of Ukraine by introduction of modern and perspective information-communication technologies in all spheres of live of the state and the population.

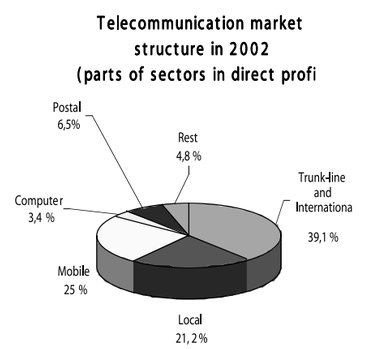
The program « Electronic Ukraine » is based on substantive theses of the program « Electronic Europe », « Electronic Europe Plus » as the overall objective and tools for its realization are equivalent to the European programs.

Broad resonance in the country was also caused by amendments to the law "On communication", prohibiting the organizations of any form of ownership to demand payment for incoming calls. The law was adopted in February 2003 after overcoming the Presidential veto. On enacting this law (the fourth quarter of 2003) the mobile communication operators will have to introduce the interaccounting system for Internet calls.

The telecommunication market characteristic

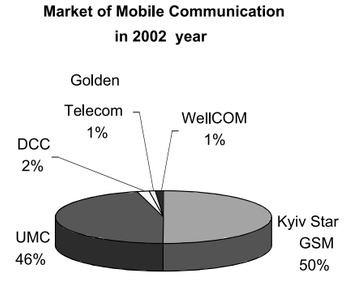
Ukrtelecom is the biggest player in the telco market. Together with Utel company (its 100 % shares belonging to Ukrtelecom) Ukrtelecom is actually in total control of providing telephone wire services in Ukraine (local and long-distance communication), as well as of international communication. According to Goskomstat of Ukraine it is these sectors which are characterized by the highest profit (6.4 billion hrv in 2002). Therefore the future privatization of Ukrtelecom is stirring great interest with foreign investors, especially with Russians. According to the decision of the Cabinet of Ministers of Ukraine the Ukrtelecom privatization has been transferred to 2003.





Source: Goskomstat

The second telco sector in profitableness is cell (mobile) communication. In 2002 the Ukrainian mobile communication market made 2,7 billion hrv. 2002 has confirmed leadership of two operators "Kievstar GSM " and UMC, these companies possess practically equal parts of the market.



Source: data of operators

In this market the essential influence of Russian capital is noticeable. In 2002 the Russian company "Mobile Telesystems " redeemed UMC control share holding (57,6 %). Russian company "Alfagroup" purchased control share holding of "Storm", which owns 16,23 % of Kievstar GSM shares. "Alfagroup" is also in control of the Russian company Golden Telecom Inc., which in 2002 became the exclusive Golden Telecom owner.

The development of Ukrainian segment of computer communication (in particular the Internet) is characterized by stable growth during the last five years. Growth of incomes in 2002 made 164 %, which even exceeded the growth of incomes of mobile communication. After cancellation of licensing in 1997 when granting the Internet services, the number of providers has grown up to 300. This number is approximate as there is no official statistics in this sphere. However, in 2002 the Cabinet of Ministers of Ukraine prepared a draft law on licensing the Internet-provider activity, which will be in the near future transferred for consideration to the Supreme Rada of Ukraine.

The biggest provider of the Internet access services is Ukrtelecom. Unfortunately, in Ukraine there aren't any non-state providers of the national repute. The majority of private providers (up to 30 %) are concentrated in Kiev; in general providers cover only a few regions of Ukraine. There are some provider associations – UNIA, InAU, AURIU, "TELAS".

Founded in November, 2002 "Ukrainian network information center" (UANIC) has united representatives of all above-mentioned Internet - communities and representatives of the state – Goscomsvyaz, Security service of Ukraine. The purpose of the new body – to coordinate activity of providers, develope Internet in Ukraine, and in the long term — to administer UA national domain.

Characteristic of general-purpose telephone network access (GPTN)

Growth of incomes in sphere of providing general-purpose telephone services is accompanied not only by growth of user's base, but by the cost change of services as well.

In 2002 the cost of calls of local and long-distance communication increased almost twice:

- cost of a minute call of local communication has made 3 kopecks (little more than 0,5 cents of USA),
- cost of telephone calls within an area has made 0,36 hrv. (7 cents of USA),
- cost of phone calls within Ukraine has made 0,60 hrv (11 cents of USA).

At the same time cost of trunk calls has decreased. However, as before, cost of outgoing trunk calls 10-50 % exceeds cost of trunk calls in the countries of the European Community. Rather high cost of trunk calls is caused by the Ukrtelecom-Utel monopoly to possession of external (international) telephone communication channels.

Utel competition on the part of operators of "cheap" IP-telephony has been leveled by introduction by the state of IP-telephony service marginal tariffs and a licensing system. As a result of these innovations the number of IP-telephony operators has been reduced from 60 to a dozen.

During 2002 cell communication tariffs were changing poorly, remaining within 20-25 cents for intranet calls and 40-45 cents for Internet calls. The future cancellation of payment for incoming calls can to some extent correct the prices for Internet calls towards their growth.

Growth of the number of mobile communication subscribers in 2002 was carried out by the intensive advertising company and so-called "actions" – systems of temporary discounts for newly connected subscribers. The two biggest mobile communication operators Kievstar and UMC in GSM 900/1800 standard were continuing to develop the covering zone. Now GSM standard is covering the majority of big and average cities, motorways and popular resorts. However, covering the rest of territories (in particular, rural territory and small settlements) is unsatisfactory.

CDMA standard in Ukraine is presented poorly – in a few biggest cities. The development of this standard is artificial limited by the state for the benefit of GSM.

Operators are also planning to gradually remove the analog standard covering (NMT, DAMPS).

Growth of user's base of stationary communication is characterized by the following statistics:

Years	ATE capacity (thousand subscribers)	Number of phones per 100 inhabitants
1995	8056	17,8
1996	8186	18,3
1997	8415	18,8
1998	9263	19,4
1999	9960	19,8
2000	10240	20,8
2001	10570	21,8
2002	10970	22,6
2005*	13670	28,6
2010*	16940	36,7

* - forecast of the Ukrainian Research Institute of Communication (URIC) analysis

Change of quantity indicators of a stationary telephone communication will be closely connected with change of quality indicators – transfer to digital telephone ATEs and introduction of additional services connected with it. At the moment 80 % of ATEs in Ukraine are the out-of-date analog stations produced in the Soviet Union.

UNICA is predicting the following parameters of the GPTN field development for the period to 2010:

Parameter	2005	2010
Mounted number capacity of a stationary telephone network, one million pieces	13,26	15,64
Mounted number capacity of a mobile telephone network, one million pieces	6,03	11,90
Intertoll (interzone) and international (MM) calls, one million calls	1000	2000
Cell radio telephony/total number capacity of all standards, one thousand numbers	5764	12012
Tranking radio telephony, one thousand numbers	75	200
Search radio call networks /total capacity of common user network of all standards, one thousand numbers	150	200
Satellite communication with mobile objects / Total number of subscribers	5	50

Characteristic of the Ukrainian Internet segment

Infrastructure of the Ukrainian Internet segment

Core of network

The biggest initial provider of Ukraine is actively developing its own infrastructure of data transfer network. Already now the Ukrtelecom network includes channels 155 Mbit/s from Kiev to six biggest cities of Ukraine: Dnepropetrovsk, Donetsk, Odessa, Lvov, Simferopol and Lugansk and channels from 2 up to 8 Mbit/s to the rest of regional centers. The core of the network constructed by the national operator uses Asynchronous Transfer Mode (ATM) technology. The network covers 250 settlements, including 315 access nodes.

External optical-fiber channels of Ukrtelecom make 250 Mbit/s.

Ukrtelecom network is the most powerful, but it is not the only one national network. So, there is the network of "Infocom" (UkrPak) joint venture covering all regional centers by channels of 2 Mbit/s and a great number of areas all over Ukraine. There is UkrSat network which provides high-speed satellite channels all over Ukraine. During the last few years the information holding Incom – operator Datacom (on-ground channels) and Datasat operator (the satellite channels) have been actively developing their access services. The integrated voice and data transfer services are provided by Golden Telecom.

The pointed operators provide their base networks for both Internet - traffic transfer and creation of corporate networks and secondary provider networks. For example, atop the UkrSat network the network of Customs service of Ukraine functions. To create corporate network of "Aval"bank the operational resources of Ukrtelecom and Infocom initial networks have been used.

In creating the core optical-fiber communication channels are actively used.

At the moment the workgroup at Goscomsvyazy with the participation of the biggest communication operators is actively studying an opportunity of creating unified national data network (backbone).

In 1998 with assistance of program Tempus-Tacis of the European Union construction of the Ukrainian Research and Academic Network (URAN) is started. Network URAN uses primary channels of a Ukrtelecom and covers more than 50 universities and scientific institutions in the majority of the regional centers of Ukraine. Throughput of internal channels of a network makes from 64кбит/с up to 2048 kbit/s, external channels up to 33 Mbit/s.

Access degree

Statistics of the majority of operators shows that up to 90 % of their clients get access to network on telephone circuits with dial-up technology. This service is accessible in overwhelming majority of regional centers of Ukraine. The connection rate is limited to 56 kbps, however, taking into account the out-of-date automatic telephone exchanges in the regions of Ukraine, rate is frequently limited to lower figures up to 33 kbps.

Dedicated line access (mainly DSL), which uses the existing copper lines (typical transmission capacity up to 2 Mbit/s) are on the second place in popularity (up to 7 %). Here channels from 64 kbps up to 256 kbps are the most popular.

Radio channel Internet Access (RadioEthernet, GSM WAP, GPRS) is presented insignificantly. Operators of Kievstar and UMC mobile communication have begun to propose high-speed Internet access services from mobile phone (till 40-50 a kbps) under the GPRS report in 2003.

Broadband Internet access on TV cable network in Kiev is presented restrictedly. The development of this type of access is constrained by an out-of-date infrastructure of cable networks.

Character of Internet access

According to different estimations in 2002 there were from one million up to two million active Internet users. About 300 thousand used Internet periodically. On the whole 3 % of the population (data of the Ukrainian marketing group) had access to network. In general youth (80 %) has access to Internet. Recently in Ukrainian Internet the number of people over 30 years old (20 %) has increased. Males-Internet users are 2.5 times more than female users.

About 30 % of organizations use Internet in their work. However, only 6 % get access to Network on dedicated lines. Only fractions per cent of private users (0.24 %) get access to network on dedicated lines.

It is no wonder, why 40 % of users are not satisfied with the quality of Internet access, in particular rate of access. However, according to forecasts growth in number of new dedicated line installations in 2003 are planned, that will be promoted by the cost reduction of dedicated line organization. An office with 3 computers and more prefers connection on dedicated lines.

Regional distribution of users shows obvious overweight of mega cities before other regions. So, in Kiev up to 46 % of Network users are situated.

The majority of providers offer various ways of payment for dial-up services: contract system, prepaid card system. In 2002 Ukrtelecom integrated Internet services into a common complex of services –any Ukrtelecom subscriber can receive Internet access according to the unified for the country / region telephone number without preliminary conditions.

Among services actual among users in Ukraine, it is possible to point out web and electronic mail. Organizations use web-design and hosting. Taking into account rise in prices of local telephone communication, popularity of "back call" service has grown among dial-up users. Additional services –Internet - banking, teleconferences, other complicated information complexes are still poorly claimed.

Cost per business hour in network through dial-up changes from region to region and makes on average $0,25-0,3 (USA) per hour. Cost of the unlimited access makes $20-35 (USA) per hour. In case when calls are to be payed for, indicated expenses increase by $0.3 (USA) per hour.

The estimated cost of dedicated channels (one-time payments and rent charge) is presented in the table (data are taken from the Ukrtelecom site).

№	Transmission capacity	Monthly payment, $ USA
1	64 Kbps, taken into account — 2,0 Gb	75
2	128 Kbps, taken into account — 4,0 Gb	150
3	256 Kbps, taken into account — 8,0 Gb	299
4	384 Kbps, taken into account — 12,0 Gb	449
5	512 Kbps, taken into account — 16,0 Gb	599
6	768 Kbps, taken into account — 24,0 Gb	898
7	1024 Kbps, taken into account — 32,0 Gb	1198
8	1536 Kbps, taken into account — 48,0 Gb	1796
9	1920 Kbps, taken into account — 62,0 Gb	2246
10	2048 Kbps, taken into account — 66,0 Gb	2395
	Value for the dedicated line establishment: from 150	

Sufficiently high cost of dedicated channels permits to keep these services on the first place in total sale volume (50-60 % of provider profit). Mass dial-up services give only 30-40 % of total income volume.

Free Network access is possible on a limited scale (universities, biggest libraries).

Conclusion

Reasoning from the above set statistics and methodology of the International Development Center of Harvard University, in the network access category it is possible to come to the following conclusions on network access development.

Speed and quality of Internet-access stands on the third level in the majority of cities and on the second level — in the countryside.

Service and maintenance and Internet-availability stand on the third - fourth levels (depending on region).

Development of hardware and software is on the third level all over the country.

Development of infrastructure is on the third level.

Availability of the Internet is on the third level.

The facts specified above show, that integrated activities on providing Network access in Ukraine stand on the third level.

SECTION 2
Project partners and events

National Centre of Information Resources and Technologies and IST Programme in Belarus

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General Information

The National Center for Information Resources and Technologies of the Republic of Belarus has been established within the structure of the National Academy of Sciences of Belarus (NASB) with the view of providing for the development of informatization and the system of scientific-technical information (STI) in the country by the Decree № 7 of the President of the Republic of Belarus of March 5, 2002.

The aim of the Center is the activity directed to the elaboration and realization of the state policy, coordination of the work in the sphere of the development of informatization and the system of STI in the Republic of Belarus.

The Center elaborates the development strategies of the Information society, state monitoring of the National information resources and it is the head organization in the country carrying out scientific-methodological supervision and coordination of the activity of juridical persons of the Republic of Belarus aiming at the development of the systems of informatization and STI.

The subject and basic aims are the following:

1. Elaboration and realization of the activities aimed at establishing and implementing the state policy in the field of the development of informatization and the system of STI in the Republic of Belarus, including the creation of automatic information systems, information technologies, information resources, computer and telecommunication networks, program and information products and services.

2. Elaboration of the development strategy of the information society, state programs in the field of informatization and STI system, the analysis of the realization process.

3. Working out the proposals concerning the normative-legal basis of the Republic of Belarus and organizing state control of law abidance in the field of STI and informatization development, analyzing the implementation of the normative legal acts and elaborating the proposals for their protection.

4. Realization of international cooperation in the field of developing informatization and STI systems, participation in international organizations, interstate programs and projects, establishing links with organizations, institutions, researchers and specialists in foreign countries.

5. Formation of the uniform information space of the country by creating a uniform National information telecommunication infrastructure, territorial access centers to the home and foreign information resources, the system of information provision of state management bodies, juridical and individual persons.

6. Elaboration of the structure and formats of information resources description including the resources of the state STI system. Working out the proposals on the formation of state policy on managing information resources, as well as state program for developing, storing and using of the National information resources and coordinating the work of its fulfillment.

7. Elaboration of the infrastructure, organizational and normative-methodological provision of the state system of regulation, certification and standardization of the complexes of program- technical means, software, computer and telecommunication networks.

8. Analysis of the state and tendencies of the development of National and international markets of information resources, technologies and services, information-methodological provision of the development processes of informatization and STI system in the country meeting international requirements and standards.

9. Development and application of new information and telecommunication technologies, information systems and networks, implementation of the projects in the field of the development of informatization and STI system.

10. Organization and coordination of information and publishing activities in the field of informatization and STI.

The Center realizes the following functions:

1. Prepares the proposals on the perfection of the legislation acts and other normative legal acts in the field of informatization and STI, as well as proposals on the issues of the participation of the Republic of Belarus in international agreements and international organizations in the field of informatization and STI.

2. Provides for the organization of international cooperation and fulfillment of international obligations in the field of informatization and STI.

3. Organizes the conduction of scientific-research, pilot-construction and pilot-technological works in the field of informatization and STI.

4. Organizes and holds republican and international scientific and scientific-practical symposia, conferences, workshops, seminars, exhibitions, and meetings on the issues of current directions of the development of informatization and STI system.

5. Provides for educating and advance training of specialists in the field of informatization and STI, training of the highest grade quality scientific personnel due to graduate studies, distance-learning graduate courses and doctoral research.

6. Publishes journals, proceedings and other literature on the current directions of the development of informatization and STI system.

7. Provides for methodological and legal aid in the field of informatization and STI.

8. Provides paid services in the field of informatization and STI.

9. Provides organizational-technical facilities for the activity of the interdepartmental commission dealing with the problems of informatization in the Republic of Belarus and its working groups.

1 Director General of the National Center of Information Resources and Technologies of the Republic of Belarus, Member of the Presidium of the National Academy of Sciences of Belarus

2 Deputy Director General of the National Center of Information Resources and Technologies of the Republic of Belarus

10. Fulfils other functions specified by the current legislation acts of the Republic of Belarus and ensued from the goals and aims of the Center.

The Center is authorized with the rights of the executive structure of the **State management body** in the sphere of informatization and STI system and it has the right to:

1. Submit for consideration of NASB (state management body in the sphere of informatization and STI system) proposals on the problems covered by the competence of the Center, including the projects of normative legal acts on the problems stated to be approved.

2. Apply for and receive the information needed for implementing the aims and functions of the Center from ministries and other republican bodies of state management, organizations and institutions.

3. Engage in the statutory order specialists for developing problems in the field of informatization and STI.

4. Consider in the statutory order addresses of the republican bodies of state management, local executive and legislative bodies, public organizations, mass media, deputies and people on the problems covered by the competence of the Center.

5. Approve in the statutory order tariffs and charges for providing information-telecommunication services.

The National Center is the head organization in carrying out scientific research and applied projects in the following directions:

1. Research and development in the field of natural and technical sciences including scientific, scientific-technical and innovation activities in the field of informatization, STI, information resources, information technologies, software, database and information systems, telecommunication and computer systems, telematic applications.

2. Scientific, scientific-technical and innovation activities in the elaboration, creation, development and utilization of the National information-telecommunication infrastructure of the Republic of Belarus including Uniform Research –Information Computer Network of the (URICON) Republic of Belarus and the network of the NASB (BASNET), provision for their access to the international telecommunications for the development of integrated system of fast information exchange, data processing and storage. Provision for communication services, designing, building and utilizing, networks, systems and communication structures in the statutory order.

3. Production of computers and other equipment for information processing. Installation and maintenance of computers and other equipment for information processing.

4. Development of software and consultation in this field.

5. Data processing and activities dealing with database.

The Center itself has about 100 employers united by the following 9 research Departments:

- Formation and implementation of the State scientific-technical policy, scientific-methodological supervision and legislative regulation of the processes in the field of informatization and STI system. Organizational-technical provision for the activity of interdepartmental commission on the problems of informatization in the Republic of Belarus and its working groups;
- Methodology of the development of automated information systems, information technologies and software;
- Methodology of the formation of National information resources, development of STI system;
- Parallel processing and architectures;
- Information systems;
- Administration & development of BASNET;
- Technical maintenance of equipment & communications;
- Information-computer resources;
- International cooperation and education.

The Center developed and currently is operating the Computer network of the National Academy of Sciences of Belarus - one of the first networks created in the Republic for the exchange of data between different research organizations and scientific groups. At present BASNET is the most developed scientific computer net in the Republic of Belarus. Computer network BASNET unites over 50 research institutions of the National Academy of Sciences of Belarus, as well as 6 Ministries, Committee for Science and Technology, Belarusian High Attestation Committee, National Center for Intellectual Property, Fund for Fundamental Research, Fund of Informatization, National Library, Central scientific Library, Presidential Library, Republican Scientific-Technical Library and over 60 other R&D and education institutions. BASNET is based on seven basic network nodes, five of which are connected by high-velocity fiber-optic channels transmitting data throughout the network with the velocity of 10-100 Mbps. Two nodes are switched to the central node by radio-links, which allow data transmission with the velocity of 2 Mbps. The institutes of the Academy connected with BASNET have updated local net work joining more than 3.000 computers. BASNET has a license for independent satellite link to the Global Internet and a license for servicing the users of BASNET and URICON. At present earth station of satellite communication with asymmetric traffic for the access into Internet has been put into use for servicing the users of URICON, its total bandwidth being about 8 Mbps. A uniform NOC for receiving information from Internet via satellite link with segmentation according to the demands of the users has been created. Its bandwidth can be extended up to 54 Mbps (Fig. 1).

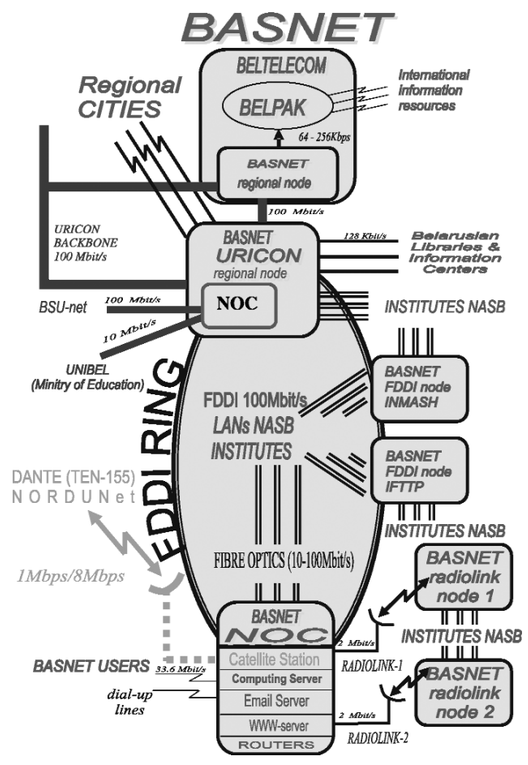


Fig. 1. Belarusian Academy of Sciences Computer Network (BASNET)

The Center is authorized to act as a customer and executor of the state programs of basic research, state scientific–technical, regional and departmental programs, as well as individual scientific-technical and innovation projects.

The structure of the Center comprises at the present time the following juridical bodies:

1) The Center (9 Research Departments listed above);
2) Fund of Informatization of the Republic of Belarus, Minsk;
State Institutions:
3) "Central Scientific Library", Minsk;
4) "Republican Scientific-Technical Library", Minsk;
5) "Belarusian Agricultural Library", Minsk;
6) Publishing House "Science & Innovation", Minsk;
Republican unitary establishments:
7) "Research and Design-Technological "Institute of Informatization" in Nonproductive Sphere", Minsk;
8) "Geo-information Systems", Minsk;
9) Publishing House "Belarusian Science", Minsk;
10) "Brest Regional Center of Information Resources and Technologies", Brest;
11) "Vitebsk Regional Center of Information Resources and Technologies", Vitebsk;
12) "Gomel Regional Center of Information Resources and Technologies", Gomel;
13) "Grodno Regional Center of Information Resources and Technologies", Grodno;
14) "Mogilev Regional Center of Information Resources and Technologies", Mogilev.

The National Center of Information Resources and Technologies consists of 14 institutions with about 400 employers. The total Annual Budget in 2002 is over **3 Mio. Euro.**

For the listed organizations comprising the structure of the Center the following basic activity directions are assigned:

Fund of Informatization of the Republic of Belarus:

1. Participation in the formation and realization of the state scientific-technical policy in the field of informatization and STI system, development of the appropriate programs and projects, coordination of scientific research and developments in the field of creating information, resources and technologies, automated information-computer systems and networks, formation of information services market.

2. Financial support on competitive basis of scientific research and development in the field of informatization and STI system having great importance for National economy and which can be realized in the framework of state, departmental and regional scientific – technical programs, other programs and projects aimed at creating new information resources and technologies, automated information-computer systems.

3. Financing of the development of material-technical basis of automated information-computer, information-analytical center, information technologies and resources.

4. Organizational and financial support of seminars, conferences, symposia, exhibitions and other activities held in the Republic and aimed at perfection and development of the works in the field of informatization and STI system.

5. Attraction of foreign investments, assistance in the organization of joint productions to create sophisticated information technologies.

6. Propagation of the idea of society informatization as the most important factor of its socio-economic development.

Regional Centers of information resources and technologies:

1. Elaboration, together with regional executive committees, of the development policy conception of informatization and STI system in the region.

2. Formation, together with regional executive committees, of the development programs of informatization and STI system.

3. Development, application and monitoring of information technologies, coordination of the work in creating information resources of the bodies of state management, judicial and physical bodies of the region.

4. Creation of information-telecommunication infrastructure of STI and informatization in the region, development of computer networks of the bodies of state management, organization of the access to external information resources for the bodies of state management, judicial and physical bodies of the region.

5. Provision of the analytical information for the bodies of state management.

6. Organization of information monitoring and transfer of technologies, information provision of scientific technical and innovation activities in the region. Analysis of the demands of the region enterprises in STI and elaboration of the proposals in their supply.

"Institute of Informatization" responsibilities:

1. Scientific-methodological provision of the development processes of informatization and STI system (elaboration of scientific-methodological recommendations for the bodies of state management, judicial bodies of the country on the applied program-technical means while developing information systems and networks, database and data banks, normative-methodological materials on the creation of information resources, technologies, systems and so on).

2. Elaboration of infrastructure, organizational and normative-methodological provision of the state system of registration, certification and standardization of the complexes of program-technical means, software, information resources, technologies and systems, computer and telecommunication networks.

3. Elaboration of the proposals on the composition and periodicity of the statistic information collection, on the state and dynamics of the development in the sphere of informatization and STI in the Republic of Belarus, analytic processing of this information.

4. Participation in working out prognosis of the economic development in the sphere of informatization and STI, preparation of the proposals on the state policy formation in this sphere, participation in the elaboration and scientific basis of the appropriate programs.

5. Analysis and monitoring of the state of departmental, departmental and territorial information resources and technologies (Belinformregister).

6. Registering finished developments and innovation projects.

7. Elaboration and coordination of technical assignments for the creation of software, complexes of program-technical means, information resources, technologies, systems, computer networks.

8. Carrying out the work, together with Goskomstandart, on the certification and standardization of software, information resources technologies, systems, computer networks (including the elaboration of the projects of Goskomstandart, their implementation and control).

9. Organization and participation in the work of interdepartmental commissions on the approval for the utilization of software, computer means, information resources, technologies and systems, computer and telecommunication networks.

“Geo-information systems” responsibilities:

1. Elaboration of the proposals on the problems of state policy in the field of geo-information provision of the republic.

2. Elaboration and scientific-organization backing of GNTP “Development of geo-informational provision of the republic for the period of 2003-2005”, including:

- Elaboration, creation and utilization of the distributed National bank of digital map graphical data, data of the distance probing of the Earth, data of the systems of satellite navigation;

- Development of the technologies, systems and complexes for the usage of geodata in the systems of automation backing of decision-taking of the highest state bodies of the Republic of Belarus (President’s Administration and Council of Ministers) in territorial management bodies (region, district, rural council, city, residential settlements) in departmental structures of management (ministry, department, enterprise).

3. Elaboration and scientific –organizational backing of the joint program “Cosmos RB” of the Union State. “Belarus-Russia” for the year 2003 and the following years on the problems of receiving and processing of the information of distance probing the Earth and satellite systems of navigation. Coordination of this work.

4. Coordination of the work and implementations of the developments on the creation of geo-information systems for the authority bodies of “Belarus-Russia Union” in the framework of the programs of the Union State.

5. Establishment of the information-analytical center for receiving, processing and distributing of the data of distance probing of the Earth for providing the institutions of NAS of Belarus (1-st round) and all the users of the republic (2-d round).

“National scientific library” is a republican universal scientific library, National deposition of scientific literature in the field of natural sciences and it has the status of a scientific-research institution.

Basic activity directions:

1. Formation and maintenance of the National Fund of scientific literature in the field of natural, technical and social sciences on the basis of receiving a full obligatory copy of the documents.

2. Organization of information-librarian provision of scientific research, meeting information demands of the whole scientific community of the Republic of Belarus.

3. Carrying out scientific research with the aim of optimizing the system of information provision of science.

4. Formation of the most fully complete collection of foreign scientific documents in the republic.

5. Formation and storage of the collection of literature about Belarus, rare books and manuscripts, archives of the outstanding Belarusian scientists, writers, state and public leaders.

6. Creation of database on the challenging directions of science development.

7. Provision for the access to national and foreign scientific electronics resources.

8. Formation of international information center with the view of informing the users about the achievements of foreign countries in the field of science technology, education, current technological developments, broadening of international cooperation of scientists and specialists.

9. Creation of corporative computer network of scientific libraries and coordination of the activities for establishing a republican scientific electronic library.

10. Reviewing of national scientific documents.

11. Creating and keeping up a republican master electronic catalogue of scientific literature.

12. Establishing a republican publishing house “Electronic Publications”.

13. Carrying out methodological supervision of scientific libraries of the network.

“Republican Scientific-Technical Library” is a National depository of the literature on technology and technical sciences, state storehouse of patent documentation of the Republic of Belarus, normative documents on standardization and industrial catalogues.

Basic activity directions:

1. Inquiry- bibliographic, information and librarian servicing of the specialists of scientific-technical, and production sphere of Belarus - ministers and departments, industrial enterprises, research and design institutions, as well as inventors, innovators, engineer-technical workers, workers of patent services, services of standardization, metrology and certification, teachers and graduates of technical high educational establishments.

2. Provision for a free access to international and National information resources on technology, production engineering, industrial economy and related branches.

3. Formation of the most fully complete fund of literature on technology, production engineering, industrial economy and related branches, fund of patented documents, normative documents on standardization and industrial catalogues, including an obligatory copy of the documents received from the National Center of Intellectual Property and the Committee on Standardization, Metrology and Certification.

4. Creation of the database on the challenging directions of the development of technology, production engineering, industrial economy and related branches.

5. Keeping an inquiry-bibliographical apparatus, creation of electronic catalogues, including a master catalogue on technical literature and documentation and provision for the remote Internet-access to them. Provision for the copies of the original documents, including electronic ones.

6. Carrying out methodological supervision of scientific-technical libraries, patent services and the services of standardization in their work with document funds.

“Belarusian Agricultural Library” is a National depository of literature on agriculture and forestry, departmental information center in the field of agrarian sciences and it provides for the creation of its information resources as well as access to the international ones, it is also a National center of the International information organization system on food stuffs and agriculture of the U.N. (FAO).

Basic activity directions:

1. Formation of the fund of national and foreign documents on agriculture.

2. Reviewing of the documents on agrarian sciences.

3. Acquisition, adaptation and application of the international and National information resources on the problems of Agricultural-Productive Complex (APC) considering the peculiarities of APC in Belarus and information situation in Belarus and the world.

4. Provision for a free access to International and National information resources on the problems of APC, delivery information, resources on the problems of APC, delivery of information from abroad.

5. Record keeping and cataloguing acquired information resources, compiling an electronic catalogue and making it available for a free public use.

6. Organization of information and librarian services for juridical and physical bodies.

7. Realization of the functions of the National information center of the International Information system FAO.

8. Integration of the National information resources into international information systems.

9. Coordination of the information resources in APC, development of a departmental system STI based on network technologies.

10. Carrying and methodological supervision of the network libraries.

“Science and Innovations” responsibilities:

1. Quality control and coordination of the activities of publishing departments of the subjects of scientific activities of the National Academy of Sciences of Belarus.

2. Issue of the popular scientific journals: “Science and Innovations”, “News of NASB”,

“Science and Education”.

3. Scientific-methodological and organizational supervision, coordination of the activities of Publishing House **“Belarusian Science”**.

WISTCIS Activities

WISTCIS Belarus Information Demonstration Center (IDC) is located at the premises of the National Center of Information Resources and Technologies.

Belarus is in the focus of international attention due to the Chernobyl technogenic disaster. The experience of Belarussian STACCIS partners in conjunction with EDNES expertise in geosciences ensured high level applications to environmental problems. In 2001 the WISTCIS Belarus IDC Web-site first was launched at < *http://www.bas-net.by/wistcis/idc.html* > (Fig. 2)

WISTCIS IDC consists of the following items: News, Background, Activity, Workshops, Partners, Questions, Contacts, Links.

1. The link to News and 4. Workshops allows obtaining full information regarding WISTCIS Newsletters and planned workshops.
2. The link to Background is describing WISTCIS project and provides information on its history.
3. The link to Activity presents information about current activities of the National Center done within the WISTCIS project.
   WISTCIS IDC in Belarus covers the following subjects
   - 3.1. IST ACTIVITY
   - 3.2. Belarussian Academy of Sciences Network (BASNET)
   - 3.3. BASNET Topology
   - 3.4. Telemedecine & Teleconsulting
   - 3.5. Distance Education and Training
   - 3.6. Scientific Computing Resources
   - 3.7. WWW Resources in Belarus
   - 3.8. Scientific & Research Organizations
   - 3.9. Library Computer Technology
   - 3.10. About Belarus

Within the WISTCIS activities the National Center of Information Resources and Technologies of the National Academy of Sciences of Belarus in cooperation with the Centre of Information Technologies of Academy of Sciences of Moldova (CIT ASM) and RENAM Public Association took part in organization of the Workshop in "Telematics and Network Support in Environmental and Natural Hazard Research and Monitoring", Kishinev, 21-22, June 2001.

The Workshop Programme has been developed that covered a number of essential topics, e.g., “Information Society Technologies Programme of the European Commission” and “WISTCIS project: background, state of the art and prospective” presented during the opening plenary session and “Decision-making” during the final plenary session.

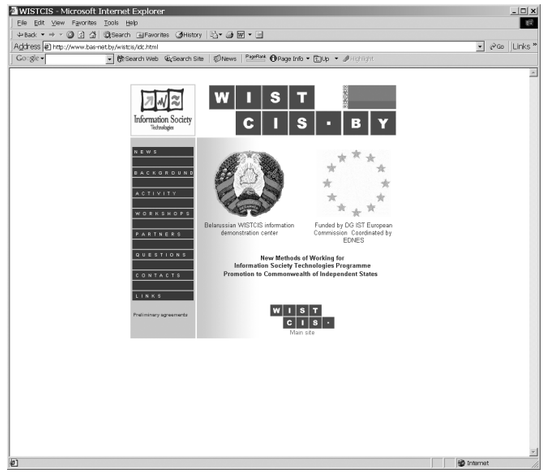


Fig. 2. WISTCIS IDC Web-site

Apart of the two plenary sessions the following Sections have been organized:

“Computer networking and telematics application in Eastern European countries”;

“IST environmental applications";

“Telematics applications in natural hazard and geophysical studies”;

"New project opportunities for CIS countries".

Under “Building the new EU-CIS projects for IST” activities the following hand-on courses were organized:

Training course on EC 5th Framework Programme (PricewaterhouseCoopers, PwC);

Training course on IST (PricewaterhouseCoopers, PwC);

Collaborative browsing (COBROW, Germany);

UNESCO/BSTC Microsoft office distant education course.

Finally a Special session with several invited presentations completed the Workshop:

This session covered such topics as "The Networking Infrastructure Program of the NATO Science Committee -Skills and Challenges", “WISTCIS manual "EU-CIS teleworking 2001", and “European Union and the Opportunities for CIS countries”.

Two representatives of the National Center (Belarus) have made two talks:

1) S. Zolotoy, E. Novikov (Belarus) “Geoinformation technologies in the system of space and land monitoring emergency situations in the Republic of Belarus”

2) M. Makhaniok (Belarus) “International connectivity and services to force telematics product development“.

Full information about the workshop is available from the “WISTCIS Workshop in Moldova” official web-site of the *http://www.idc.asm.md/wistcis/0005.html/*.

The National Center for Information Resources and Technologies of the Republic of Belarus as the leading organization in Belarus in development of informatization and the system of scientific-technical information represents Belarus in a number of international organizations, for example:

NATO Scientific Committee;

Coordination Council of the Commonwealth of Independent States on Informatization under the Regional Commonwealth in the Field of Communications;

International Coordination Council on Scientific-Technical Information under Commonwealth of Independent States;

International Center Scientific-Technical Information under Commonwealth of Independent States;

International Scientific Technical Center.

International Projects

WISTCIS significantly contributes to expansion of IST Programme on huge community of the European CIS countries. Projects covered by WISTCIS initiative in Belarus are:

"Implementation of the Satellite Technologies for Networking Infrastructure Creation", supported by NATO SC (Fig. 3);

Fig. 3. BASNET Internet Link to International R&D resources

"Telemedicine system for image analysis and consultation in radiation induced thyroid cancer" that is carried out within the framework of the project ISTC B-517 supported by the International Scientific Technical Center.

The system will provide help in interpretation of images of thyroid gland and thyroid nodules, give new opportunities to preserve, collect and evaluate unique material and data concerning medical consequences of the Chernobyl accident. TeSIAC (Telemedicine System for Image Analysis and Consultation) will contain a subsystem for analysis of three-dimensional ultrasound images. It will include new algorithms of volume interpolation from non-parallel cross-sections, semi-automatic segmentation, measurement of volume and other characteristics, texture analysis. Now the system supports teleconsultations and access to data bases. The system includes a teleconsultation server and clients developed in Java, local databases developed in Microsoft Access and a Microsoft SQL server database.

"Export of the Course of Study in Computer Engineering from the Mannheim University to Belarus" that is supported by DAAD (Germany) and includes distance education segment;

"E-courses Incubator" supported by CEENet (Austria) and devoted to distance education courses technology development;

"Development of the R&D Networking infrastructure in Belarus" supported by NATO SC (Fig. 4)

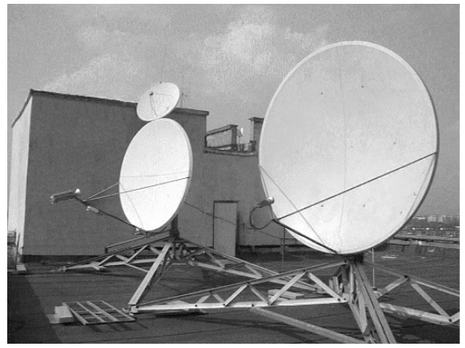


Fig. 4. Internet link to the European R&D Networks via Eutelsat and Intelsat

"Electronic repositories of scientific publications" supported by OSI in the frame of Budapest Open Archives Initiatives;

"Annual Workshops in the field of Network Technologies for Central and Eastern European Countries" supported by NATO SC, OSI, CICSO Systems, Lucent Technologies *www.ceenet.pl.*

Some of the above projects have been presented during WISTCIS workshops in partner countries.

List of selected projects executed in 2001-2002

1. To develop the technology of establishment distance-learning courses and to form on its basis a pilot information system of "virtual university".

The technology of a virtual university system developed that based on WebCT platform. It is used for teaching, testing and monitoring knowledge received by distance-learning students, as well as to use video-audio conference means, and communicating in on-line teaching process. It is envisaged to provide the users with on-line courses using Internet interface for remote access, multi-users access to the system in Windows NT, Windows 95/98, Linux and popular browsers Internet-Netscape and Explorer to extend the borders of the courses curriculum.

2. To create an automated library system to access foreign scientific publications on the basis of the Central scientific library of the National Academy of Science of Belarus.

Library information system of the Central scientific library of NASB with networking interface for remote access to over 1.5 Mio foreign scientific electronic publications (e.g. Elsevier, Springer Verlag) has been created and put into operation.

3. To create an information system of cataloging libraries.

Informational system of corporative cataloging of the publications in the libraries of the Republic of Belarus has been elaborated by means of unified cataloging of the publications collected by any library and multi-usage of the bibliography. The system provides linguistic and information compatibility of distributed databases and electronic library catalogs, possibility of bibliography information exchange between librarians and information centers.

4. To develop an electronic catalog of printed works of Belarus.

On the basis of the National book chamber of the Republic of Belarus an electronic catalog with the system of remote Internet-access to the information has been created.

5. To elaborate the system of fast reception of foreign electronic scientific publications and provide its on-line functioning.

The central node and software "system of remote Internet-ordering" for high-speed connection of the Central scientific library of NASB via satellite communication channel with guaranteed bandwidth for access to foreign electronic scientific journals have been developed.

6. To connect to the backbone of the Unified computer network of the Republic of Belarus leading scientific-educational organizations.

Over 100 major institutions were linked to the URICON backbone by high-speed channels and Radio-Ethernet links.

7. To develop a pilot implementation of the system of medical teleconsultations on the basis of image processing using internet-technologies.

The structure and basis forms of a local database and histological images of thyroid gland for pathology anatomic laboratory of Minsk city clinical oncological center have been created. A new version of medical tele-consulting server has been realized and tested. Local base for collection and storage of ultrasound images and other medical information has been worked out.

8. To create an informational networking server of software to support computational process in distributed computer media.

A large distributed pool of powerful personal computers and two supercomputers in the Republic of Belarus was connected in the Intranet network. Networking information server with applied software oriented to the solution of current scientific problems in Belarus was developed.

9. To provide for the development of Internet-resources the teaching-methodological materials for the distance-learning system.

Internet access node for the system of distance learning in sphere of education in the Republic of Belarus has been developed. Access to Internet has been provided for the center of distance learning control at the "Academy of Management under the President of the Republic Belarus".

10. To create on the basic of the main information-analytical center of Ministry of Education an access-control system of the leading scientific-educational organizations of the Ministry of Education to the Unified Research and Information Computer Network of the Republic of Belarus and to the international scientific-technical resources.

Access to the international scientific-technical resources of the leading scientific-educational organizations of the Ministry of Education of the Republic of Belarus has been provided via satellite communication channels with guaranteed bandwidth.

11. To design an operation center and high-speed channel for the exchange of the information of Scientific networks of Belarus and Russia in the framework of the joint program "Supercomputer".

High-speed channel and unified network operational center for the information exchange between scientific-educational networks of Belarus and Russia has been designed to link the participants of Russia-Belarus program of supercomputer development.

12. The creation and provision of telecommunication infrastructure of the system for the efficient monitoring of emergency, situations on the basis of distributed processing of different information and connection of the project participants by high-speed fiber optic channels is envisages. To work out methods and algorithms of discerning forestry borders on cosmic pictures taken from Russian artificial satellites of the Earth. To carry out pilot-production work on the estimation of the reliability of marking out the borders.

It allows the specialists of the Ministry for Emergency situations to receive urgent information on the territory of the Republic of Belarus from satellites NOAA (U.S.A.) and "Meteor" (Russia) to realize its distributed processing and preparation of management decision taking to liquidate emergencies.

13. To connect Brest region to the network of the state government bodies and Internet.

The main aim of the execution of this work is to create in Brest executive committee a information analytical system and to link it to the network of state management and Global Internet. The system is to provide for information-analytical support for decision taking on the region management, including monitoring and state analysis of main indices characterizing the region activities.

14. To develop Scientific-informational computer network of the National Academy of Sciences of Belarus and its information resources.

The project envisages the development of scientific-information computer network for information provision of scientific research and developments, information exchange and Internet access to information resources. High-speed networking infrastructure has been developed and put into operation to unite all (over 50) organizations of the National Academy.

15. To create on the basis of the Information Technologies Center of the National Academy of Sciences of Belarus the system of access control from Scientific-information computer network to the international Scientific-technical resources by means of a satellite channel and provide for its functioning.

A satellite system was created with asymmetric 7 Mbps link to the global Internet. The bandwidth of the system can be extended up to 100 Mbps. Access technologies of the users of the Unified Research and Informational Computer Network of the Republic of Belarus to the international scientific-technical resources via satellite communication channels Intelsat and Eutelsat have been developed. The autonomous system, which was registered in RIPE NCC, has been worked out. Route protocol BGP-4 on the bordering routes of academic network BASNET has been developed and put into operation. Guaranteed distribution of the band with of satellite communication channels between basic corporative networks of the Unified Research and Informational Computer Network of the Republic of Belarus (BASNET, BSU, UNIBEL) and the development of the technology of such distribution have been provided. The program of remote control of non-geo-stationer satellite (satellite with deviated orbit) and monitoring unexpected situations during the work of the controller has been elaborated.

The technologies of asymmetric access to the world scientific computer network via two or more simplex satellite communication channels have been developed. The technology of traffic transit of the users of base network of the Unified Research and Informational Computer Network of the Republic of Belarus through its backbone for the access to the international R&D computer networks and information resources via a group of external satellite communication channels has been developed.

16. To work out methods algorithms of discerning forestry borders on cosmic pictures taken from Russian artificial satellites of the Earth. To carry out pilot-production work on the estimation of the reliability of marking out the borders.

Testing provided of the adequacy of the results of automated forestry border marking has been done. The research was carried out on cosmic picture of regional cities forestry where test plots with forest-fall have been singled out. Search algorithms on the original image of the plots characteristics of which are close to those of the given test plots have been elaborated. The algorithms are realized in medium Matlab 52 for Windows.

List of projects (selected) executed during last 5 years

1. To develop the technology of establishing distance learning courses and to form on it basis a pilot model of information system of "virtual university". 2001-2002.

2. To create an automated library system to access foreign scientific publications on the basis of the Central scientific library of the National Academy of Science of Belarus. 2001-2002.

3. To create an information system of cataloging libraries. 2001-2002.

4. To develop an electronic catalog of printed works of Belarus. 2001-2002.

5. To elaborate the system of fast reception of foreign electronic scientific publications and provide its on-line functioning. 2001-2002.

6. To connect to the backbone of the Unified computer network of the Republic of Belarus leading scientific-educational organizations. 2001-2002.

7. To develop a pilot implementation of the system of medical teleconsultations on the basis of image processing using internet-technologies. 2001-2002.

8. To create an informational networking server of software to support computational process in distributed computer media. 2001-2002.

9. To provide for the development of Internet-resources the teaching-methodological materials for the distance-learning system. 2001-2002.

10. To develop a typical program-technical complex to analyze the functioning and to optimize the management of corporate computer network of collective us. 2001-2002.

11. To create on the basic of the main information-analytical center of Ministry of Education an access-control system of the leading scientific-educational organizations of the Ministry of Education to the Unified Research and Information Computer Network of the Republic of Belarus and to the international scientific-technical resources. 2001-2002.

12. To design an operation center and high-speed channel for the exchange of the information of Scientific networks of Belarus and Russia in the framework of the joint program “Supercomputer”. 2001-2002.

13. The creation and provision of telecommunication infrastructure of the system for the efficient monitoring of emergency, situations on the basis of distributed processing of different information and connection of the project participants by high-speed fiber optic channels is envisages. To work out methods and algorithms of discerning forestry borders on cosmic pictures taken from Russian artificial satellites of the Earth. To carry out pilot-production work on the estimation of the reliability of marking out the borders.2001-2002.

14. To connect Brest region to the network of the state government bodies and Internet. 2001-2002.

15. To develop Scientific-informational computer network of the National Academy of Sciences of Belarus and its information resources. 1997-2002.

16. To work out organizational, information-methodological and normative-legal provision of the development processes of information and Scientific-technical information system in the Republic of Belarus accounting for the problems of coordination of interaction of the ministries and other republication bodies of state government. 2001-2002.

17. To elaborate create and develop Scientific-information computer network of the National Academy of Sciences of Belarus and its information resources. 2001-2002.

18. To develop access technologies of the users of Scientific-information computer network to international scientific-technical resources via satellite communication channels. 2001-2002.

19. To work out methods algorithms of discerning forestry borders on cosmic pictures taken from Russian artificial satellites of the Earth. To carry out pilot-production work on the estimation of the reliability of marking out the borders. 2001-2002.

20. To elaborate an automated information system of the National library of the Republic of Belarus with the distance access of the users to library resources and keeping a master bibliographical catalogue. 1999-2000.

21. To connect Academy Campus to the backbone of Scientific-information computer network of the Academy. To carry out installation, adjustment of the equipment and software. To test the equipment and put it into operation. 1999-2000.

22. To develop platform-independent instrumental means to provide for distant collection, storage and visualization of biomedical information in Scientific-information computer network. 1999-2000.

23. To create program-technical means of distributed asynchronous system of computer processes automation. 1999-2000.

24. To develop a pilot specimen of asynchronous traffic node of scientific information in the structure of scientific-information computer network on the basis of the library of National Academy of Sciences of Belarus. 1999-2000.

25. To develop in the framework of Scientific-information computer network a Web-node on scientific-technical activities of the State Committee on science and technologies. 1999-2000.

26. To develop a pilot specimen of information computer system of "virtual university". 1999-2000.

27. To connect the Fund of fundamental research to the Scientific-information computer network Internet, to develop a model specimen of a WEB-node. 1999-2000.

28. To connect the Web-node of the Republican innovation fund to the network of scientific-information computer network. 1999-2000.

29. To develop type systems of automation of library activities with remote access of the users to information library resources on the basis of the National library of Belarus. To draw a sketch of the system. 1999-2000.

30. To create the national node of Internet-registry (local registry). To work out a technical project. To work out organizational- methodological provision of the local registry. 1998-1999.

31. To organize a networking operation center on the basis of the regional node. To work out a technical project. To work out organizational-methodological provision of scientific-information computer network control. 1998-1999.

32. To work out the structure of the provision of the state information-analytical system for the provision of scientific research and development. 1998-1999.

33. To elaborate the techniques and develop hardware-software monitoring system of security control for protected automated system. 1998-1999.

34. To work out documentation and create a cross station for data exchange between the departments of scientific-information computer network. To develop a test specimen of a cross station and put it into experimental operation. 1998-1999.

35. To provide for software-hardware support of the WEB-site and evaluation of the testing means on "Problem 2000". 1998-1999.

36. To elaborate the decisions on the Interstate center of electronic trade. To develop a pilot project of establishing the Interstate center of electronic trade. 1998-1999.

37. To develop a techno-working project to assemble and put into operation an automated networking system of simulation and analysis to accelerate testing for the production association "Minsk Tractor Plant". 1997-1998.

38. To create a republican information WWW-server on scientific organizations and developments in the Republic of Belarus. 1997-1998.

39. To develop (adapt) instrumental means of net systems of information provision for controlling the bases of text information and creating Web-applications.1997-1998.

40. To elaborate the structure of software of global and local nets of automated system of support for decision-taking on prevention and actions in emergency situations of nature and techno-gene character. 1997-1998.

41. To develop net infrastructure of the Academy of Sciences of the Republic of Belarus providing for the access to the global computer networks. 1997-1998.

42. To create a master electronic bibliographical catalogue on the basis of the National library and Central scientific library with the net interface of remote access. 1997-1998.

43. To develop a program-technical complex for the solution of problems of analyzing and discerning the images of complex structure on neurocomputer workstation. 1997-1998.

44. To develop instrumental-technological means for the preparation of standardized electronic documents for telecommunication exchange in officer trade management and transport. 1997-1998.

45. To elaborate normative-methodological and software provision for introducing Belarusian Bar coding. 1997-1998.

46. To develop the means of accelerated wireless access of distributing nodes of collective use network to the central server in the real time regime. 1997-1998.

WISTCIS workshop “New Methods of Work for Business and Research” in Yerevan, Armenia (November 21-22, 2002): overview and results

L. Grigoryan, T. Shulyakovskaya, A. Soloviev

WISTCIS project, as its key action, has a number of practical local workshops and conferences in CIS countries devoted to presentation and implementation of various of telematic product development in Europe by IST programme and other initiatives. The focus of this workshop is teleworking. The reported workshop in Yerevan was the forth in this line after successful kick-off conference in Kiev, Ukraine, and workshops in Kishinev (Moldova) and Baku (Azerbaijan).

In accordance with WISTCIS project work plan (see *http://www.ednes.org/wistcis/main_e.htm)*, the workshop "New Methods of Work for Business and Research" was held in Yerevan, Armenia in November 21-22, 2002.

It was the second workshop in the 4-days’ session of IST workshops in Armenia (the first, TELESOL workshop “Technical Aspects of Telework”, took place on 19-20 November). Such intensive workshops concentration highlighted their importance to the local audience and allowed to gather rich audience of Armenian experts and IST projects from Europe.

This event was funded by the Information Society Technologies Program of the European Union. The main organizers of Yerevan workshop were the project coordinator association “Earth Data Network for Education and Scientific Exchange” (EDNES, Strasbourg, France) and Company “Arminco Global Telecommunications” (Arminco LTD). National Academy of Sciences (NAS) of Armenia was the main Armenian partner of Arminco at the preparatory period and the main scientific actor and evaluator of the workshop.

Due to real serious interest of Armenian Government toward the given event many governmental institutions, agencies, business companies and universities were activity involved in the workshop "New Methods of Work for Business and Research".

By official circular of Prime Minister all state bodies were invited to take part in the workshop. Minister of transport Mr. Andranik Manoukyan took part and delivered opening remarks at the workshop opening. Quite a few of them indeed participated in the activity.

Grounds for the workshop organization and running

The National Academy of Sciences of Republic of Armenia was selected as the place for the Workshop. The invitation of NAS to cooperate within the framework of workshop was not accidental. The National Academy of Sciences is active participant of many European IST and other IT projects and has good business relations with Arminco.

The main informational support to the organization of the workshop and acceptance of applications were managed using WISTCIS national web site. The call for application which contains information about venue, Program committee, Organizing committee, themes of the meeting and EU and CIS organizations and projects invited, audience, submission of abstracts, registration procedure and registration form, deadlines, accommodations and the Workshop registration fee had been installed on the Armenian WISTCIS IDC Web site *(http://www.wistcis.arminco.com)* as well as on the WISTCIS main Web-site *(http://www.ednes.org/wistcis)* and were visible in the Internet.

Main Goals and Objectives of Yerevan WISTCIS workshop

The regional Caucasian workshop “New Methods of Work for Business and Research” was aimed at strengthening commercial, scientific and technological co-operation between the European Union and Armenia (TransCaucasian CIS countries in general) in the field of IT application to new methods of work. An emphasis was done on EU Armenia business and scientific communities’ cooperation. Following the project workplan goals of the workshop were:

- New methods of work for business regional workshop was organized to increase awareness about the experienced and newly developed telecommunication and teleworking tools for the establishing and running of fruitful business between EU and CIS countries.
- The European and CIS companies would learn about the ways of practical implementation of joint research and commercial activities in the framework of the IST programme of EC.
- Participants of the workshop would present their ideas and achievements which would be carefully documented for further development and agreement of co-operation could be signed between those participants wishing to implement possible projects.
- Participants of the workshop would try to find the solutions of co-operation in business and research through Internet and other networks.

Workshop objectives:

To collect interested audience in the field of technology suppliers, telecommunication operators, internet providers, e-commerce and e-work associations , research scientists, policy makers, business development managers, university professors , teachers in particular involved students in distant education and training.

- To demonstrate European IST projects to relevant Armenian audience.
- To organize round table to encourage establishment of cooperation agreements between EU and Armenian potential partners
- Discussion on preparation of new project proposals for FP6

One may say that workshop presented a unique opportunity for Armenian and European companies and scientific communities to

exchange successful innovative experiences to improve scientific and technological research and initiate further steps towards co-operation in IST applications.

Workshop programme overview

The venue of WISTCIS workshop " New Methods of Work for Business and Research" in Yerevan was Presidium of National Academy of Sciences of RA. The workshop was opened in the Round Conference Hall, on 21 of November 2002

The presentations were grouped in seven thematic sections. The Round Table session concluded the previous working sessions. The topics of thematic sessions were:

Session 1 **"Information Society Technologies Programme of European Union (IST) and sixth Framework Programme"**
Session 2 **"IST Projects"**
Session 3 **"Telematic Solutions for Business"**
Session 4 **"Information Technologies in Education and Training"**
Session 5 **"Information Communication Technologies (ICT) and Business"**
Session 6 **"Information Technologies in Public Management"**
Session 7 **"Telematic Application in Natural Hazard and Geophysical Research"**
Round table Discussion: New Projects for FP6

The opening session started by the welcoming remarks of vice-president of the National Academy of Sciences of Armenia Prof. Yuri Shukuryan and EDNES president Prof. Jean Bonnin. Prof. Yu. Shukuryan stressed important role of WISTCIS project in general and the workshop in Yerevan in particular for promotion of Information Society Technologies Programme to Armenian business, telematics and research communities. The speakers noted the fact that telematics products and networking technologies are actively developed in Armenia itself. That is why the WISTCIS workshop is especially timely and helpful in Armenia nowadays. The speakers pointed out significant role of IST Programme supports in dissemination of the newest achievements in the field of telematics applications and products. Special thanks were addressed to European Commission, EDNES and local organizers of the event.

Prof. J. Bonnin presented the goals and objectives of WISTCIS. He focused on its implementation by the project as far as Caucasian CIS countries are concerned. J. Bonnin also referred to WISTCIS background and history, mentioned EU TAP project that was successfully implemented in Armenia and other WISTCIS countries by UNESCO and EDNES.

The first plenary session of the Yerevan Workshop was focused on the European Commission Information Society Technologies Program and Sixth Framework Program, their possibilities for the creation new EU-CIS projects for IST, WISTCIS project, including background, state of the art and prospective.

The first thematic session **" IST Projects"** was devoted to the presentation of EU IST projects. Two IST related projects were introduced to the auditorium. The same day, after the lunch break the second thematic session **"Telematics Solutions for Business"** started. The session presentations were devoted to the actual problems of the establishment and utilization of business telematics tools application technology. Also current situation of Armenian telecom market was presented.

Third thematic session **"Information Technologies in Education and Training"** was entirely devoted to the application of ICT in Education and ICT teaching activities in Armenia. Also special report was addressed about Distance Education.

Thematic Session "Information Technologies in Public Management" included reports on current state of legislation and legislative activities for IT sector, some solutions for specific areas of public management and such outstanding achievement as introduction of Armenia's eVisa issuance system.

The session was followed by the last thematic session **"Telematic Application in Natural Hazard and Geophysical Research".** The third session was aimed at the discussion of results of telematics applications in natural hazard research and monitoring. Five reports were presented at the session.

The workshop was finalized by the round table discussion devoted to possible new project proposals to FP6 and other relevant EU programs. The principal goal of the discussion was to evaluate suggestions of Armenian participants and to establish their contacts with potential EU partners. The results of the discussion have been concluded in 18 preliminary agreements between EU, Armenian, Georgian, Russian, Ukrainian and Kazakh institutions, companies and individuals participated in the workshop. Then Closing Remarks followed.

Two additional meetings outside the official Workshop program were organized on 21 November and on 22 November, in which principal members of Program Committee and some invited participants were involved. During the first meeting at **President of National Academy of Sciences of RA Prof. Fadey Sarkissyan** the general results and future cooperation within the framework of EU's IST projects were discussed. Mr. President expressed his gratitude to the sponsors and organizers of WISTCIS Yerevan workshop.

The second meeting took place at on of the research institutes of NAS. The participants of the mentioned meeting initiated very interesting and informal discussion of new ideas concerning implementation of ISTs in humanitarian scientific areas.

During one of working sessions special visit for interested participants was organized to the technical premises of Arminco Global Telecommunications. There "Collaborative Browsing User Agent for EU-CIS Teamwork" was tested and some interesting features of the product were shown.

The workshop participants

WISTCIS workshop was oriented first of all at CIS countries audience and therefore numerous organizations of CIS countries, participating in WISTCIS project, were informed about the workshop in Yerevan. As the result, representatives of Armenia, Georgia, Russia and the Ukraine actively participated in the workshop. Participants from European countries have participated in the workshop. Speakers of the workshop were from France, Germany, Austria, Great Britain and The Netherlands. Different organizations and individuals of Armenia were widely represented at the workshop. The audience was formed by representatives of Armenian governmental bodies on one hand and research and educational institutions on the other hand. The group included teachers, postgraduate, undergraduate and of graduate students of Armenian universities, professors and teachers, researches, delegates from business enterprises. Numerous IST and other telematics projects international telematics projects that went on in collaboration of EU and CIS countries were presented at the workshop. Representatives of the IST projects as well as of the other EU telematics initiatives were the invited speakers.

The audience of the workshop also included some people who attended the plenary and thematic sessions of the workshop but has not registered as participants. As the result of this the total number of individuals who attended the workshop exceeded 100 persons. Professionally, the audience included:

- Policy makers and governmental administration representatives;
- Technology suppliers, Telecommunication operators, internet providers;
- E-commerce and e-work Associations;
- Tourism Organizations and Associations;
- Research scientists;
- Software vendors;
- Businessmen & Entrepreneurs;
- Service providers;
- Business development managers;
- University professors and teachers in particular involved students in distant education and training;
- Scientific and educational funds and association delegates agricultural managers librarians.

It is obvious that huge interest and appraisal toward Information Society Technologies in Armenia became stronger and more target oriented. The organization of the WISTCIS workshop in Yerevan once again has shown that the process of rapid development of information technologies, Hi Tech, networking infrastructure and telecommunications has been initiated in Armenia. In comparison to STACCIS project realization period, despite of some dramatic rivalry between national telecom operator ArmenTel and remaining actors, the situation with internal networking infrastructure, Internet connectivity, development of digital telephony and communication lines, telecommunications services provided has improved significantly. Yet the level of IST development in Armenia is less than average European and therefore the country stays behind many other states in Europe on the way to Information Society.

Several IST projects: TELEBALT, Media ISF, UsabilityNet and CoBrow, CoBrow/D, and NATO project "Seismic risk in Caucasus" were presented at the workshop. Workshop has initiated great interest toward EU's IST programs and many interested parties have shown practical interest aiming co-operation with possible European counterparts within the framework of FP6.

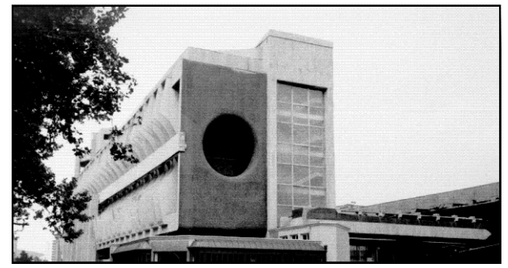
Many Expressions of Interests were signed: both bilateral and multilateral, between Armenian, CIS and European organizations and institutions. Eighteen preliminary agreements between EU, Armenian, Georgia, Russia, Ukrainian and Kazakh institutions and companies were signed.

Two project proposals "Video broadcast Distant Education System" and "Telematics in small sun based power plants design" were discussed.

The workshop promoted the formation of professional motivation of specialists in spheres of telematics products development and application for environmental and natural hazard research and monitoring, teleworking and distant education, attracted the interest of representatives of the local communities to the latest EU achievements and vice-versa.

Forthcoming WISTCIS workshop "The IST Program and e-Government" in Tbilisi, Georgia (May 29-31, 2003)

L. Chobanyan, A. Soloviev



Workshop overview

WISTCIS workshop "The IST Program and e-Government" is organized by Business Communication Centre BCC-Tbilisi and coordinated by EDNES Association (France) in cooperation with Georgian State Department of Information Technologies.

The workshop aims at strengthening commercial, scientific and technological co-operation between European Union and Georgia along with South Caucasian CIS countries in general. It will focus at IT application to new methods of work, business telematics applications, with emphasis on EU Georgia business and communities' research cooperation connected with e-government development.

"IST Program and e-Government" workshop will increase awareness about and newly developed computer telecommunication and teleworking tools for implementation and running of fruitful e-government business teleworking projects between EU and CIS countries. Special attention will be paid to Georgia, Armenia and Azerbaijan.

The European and CIS companies will learn about the ways of practical implementation of joint research and commercial activities in the framework of the European funding allocated by the European Commission (EC).

Participants of the workshop are invited to present their ideas, to negotiate and sign agreement in the areas of common interest.

Another important workshop mission is to introduce Sixth Framework Programme of the European Union and to launch new project proposals for this programme.

Participants of the workshop will also present their achievements, activities and solutions in e-government sector.

The workshop presents a unique opportunity for European and Georgian companies to exchange innovative and successful experiences and ideas to improve teleworking aspects of scientific and technological research and initiate first steps towards EU – Caucasian co-operation in IT applications.

This workshop is targeted at the user community in Caucasian countries as well as the specialists in the field of teleworking and e-government developments.

Workshop languages will be English, Georgian and Russian.

Submission of Abstracts and Registration

All abstracts must be written in English, in electronic form. Submitted abstracts must be restricted to 2 pages of A4 format and sent

via e-mail as WinWord file to the Organizing Committee (e-mail: bcc@access.sanet.ge).

Simultaneously the title of the presentation must be sent to project manager Mrs. T.Shuliakovskaya (e-mail: shu@ednes.org).

The information about the workshop is also available at the Web-sites:
http://wistcis.iatp.org.ge/wistcis/workshop/call.htm,
http://www.ednes.org/wistcis
Registration form is available at WISTCIS main Web-site:
http://www.ednes.org/wistcis/confer_e.htm

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WISTCIS outlook conference "Information Society Priorities: New Prospects for European CIS Countries" in Moscow, Russia (November 20-22, 2003)

T. Shulyakovskaya, A. Soloviev

The conference will be organised by international association EDNES in the framework of the project **WISTCIS** *("New methods of Working for Information Society Technologies Programme Promotion to Commonwealth of Independent States")*, funded by Information Society Priority of the European Union Sixth Framework Program.

The conference aims at strengthening the scientific and technological co-operation between the European Union and the European Commonwealth of Independent States (Armenia, Azerbaijan, Belarus, Georgia, Moldova, Russia, Ukraine) in the field of European ITs application to new methods of work, telematics for research, environmental monitoring and Earth sciences, teleworking in business, electronic commerce, building new EU-CIS projects for IST of FP6, applications in tourism and social integration using IT.

Participants of WISTCIS conference will have special opportunities to take part in training course on EU 6th Framework Programme.

All individuals, projects and companies involved in IT as developers and/or users are invited and encouraged to participate.

For more information:
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Register on line: *http://www.ednes.org/wistcis*

SECTION 3
Research and environmental teleworking applications

Internet-based earthquake Strong Motion Data Base – SMDB

http://perun.wdcb.ru/SMDB

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Strong Motion Database (SMDB) is one of the telematics application products of the European-Mediterranean Seismological Centre (EMSC). At the 1994 EMSC General Assembly in Rome, the development of this database was defined as the major activity of the CGDS in its capacity of the EMSC key nodal member.

This article is devoted to the overview of this project, which is coordinated by Earth Data Network for Education and Scientific Exchange (EDNES, France) since 1995.

Development of the SMDB has passed several significant stages:

- In 1995, the database was significantly extended and came on-line via telnet;
- In 1996, the client/server model with World Wide Web interface was developed;
- In 1997, scanned images of the historical Russian strong motions records were added;
- In 1999, the database was extended with new sets of strong motion records mainly from Europe, China and Taiwan;
- In 2002, the database structure and user interface have been rebuilt, and more strong motion data have been loaded.

SMDB combines 3 types of data. First comes parametric information, describing seismic events (event names, magnitudes, epicenter locations), recording stations and instruments (location, geological conditions), and digital waveforms (instrument correction, sampling and peak amplitudes). Currently MySQL database management system (DBMS) is used to store parametric metadata (the relations in the database are shown on Fig.1).

The second SMDB data type is digital waveforms (time series) of the three-component strong motion records. They are stored in external direct access binary files. A component of a seismic record is shown on Fig.2.

The last SMDB data type is scanned photo-images (jpeg files) of the historical strong motion records from archive of Central Experimental Methodical Expedition of Geophysical Service RAS. The catalog contains 320 records for a period of 29/01/1968-18/12/1970 registered with the following stations: Andizhan, Kurilsk, N.-Kurilsk, S.-Kurilsk, Petropavlovsk, Sheekotan. Users can download from the catalog high-resolution images (Fig.3) and digitizing program to convert the analog strong motion data into digital waveforms.

Table of records

Region	Date	Time	EvLat	EvLon	EvDepth	Mag	InstrType	nSamp	SmpRate	Distance	Station Code	...
Turkmenistan	01.04.1984	9:47:00 AM	40,55	62,91	13	4,9	ASZ-2	383	0,01	44,7497	HYG	
Turkmenistan	01.04.1984	9:47:00 AM	40,55	62,91	13	4,9	ASZ-2	382	0,01	44,7497	HYG	
Turkmenistan	01.04.1984	9:47:00 AM	40,55	62,91	13	4,9	ASZ-2	383	0,01	44,7497	HYG	
Turkmenistan	11.04.1984	11:30:00 PM	40,335	63,147	7,5	4,7	ASZ-2	395	0,01	14,0589	HYG	

Table of stations

Name	Latitude	Longtitude	Code
31-KM	40,317	63,239	STD
31-KM	40,317	63,239	STD
31-KM	40,317	63,239	STD
OZERO-2	40,414	63,246	OBS
OZERO-2	40,414	63,246	OBS
OZERO-2	40,414	63,246	OBS
31-KM	40,317	63,239	STD

Station code

Figure 1. Table relations in the database

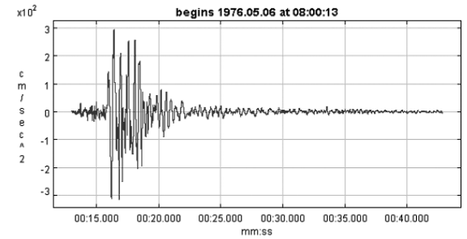

Figure 2. A digital accelerogram (Italy, Friuli, Mag: 6.2ML)

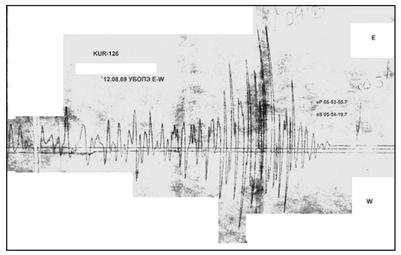

Figure 3. An analog accelerogram (Sheekotan, Aug 12, 1969)

Besides the historical data SMDB includes link to the earthquake rapid determination system that supplies us with brief description of events just in a few hours after it.

The Fig.4 shows these three basic divisions of SMDB from user's point of view.

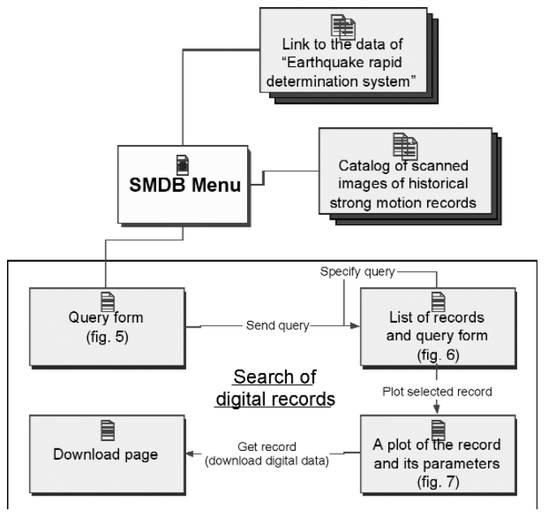

Figure 4. Three basic divisions of SMDB

The new web interface to search digital data supplies users with information of data availability and allows selection of seismic events on the map. Now it works faster and simplifies data mining by specifying possible search variants. A screenshot of the SMDB query form is shown at Fig.5.

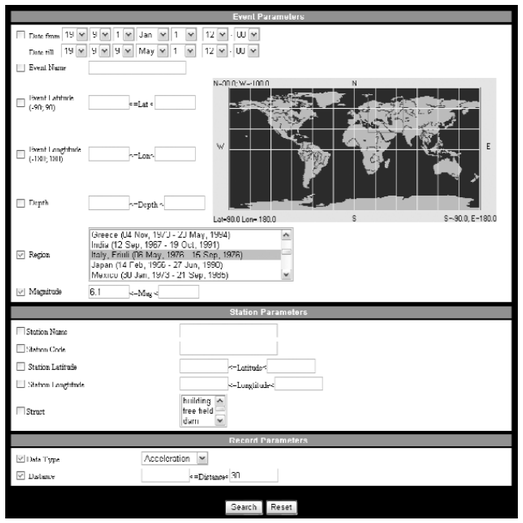

Figure 5. SMDB query form

The query form returns a list of found strong motion records (including parameters of the corresponding seismic events) and after that the user can select any digital record to be plotted or downloaded to the client workstation. The result of the query is shown at Fig.6. Here user can correct the query to truncate or expand a set of available records.

The Fig.7 shows how a selected record is displayed in web-browser. The page contains image of the records and a set of parameters to describe it (time, location, station, power, etc).

The new version of SMDB is bases on JSP-technique (Java Server Pages). The technique merges the power of Java and simplicity of HTML by embedding code snippets in a web document. The servlet container Tomcat is used to translate jsp-pages (pages contain both Java and HTML code) into servlet sources and than compile the servlets into Java-classes which create html-pages. The Fig.8 illustrates the control flow when JSP is invoked.

The JSP pages SMDB based on, dynamically form html-pages using information from the database connected with JDBC interface. The JSP pages translate requests of SMDB users to SQL queries, pass them to the database, process response from it and pass received values into html-pages.

At the moment, SMDB contains 77682 strong motion records world wide. The Table 1 shows the data distribution by regions.

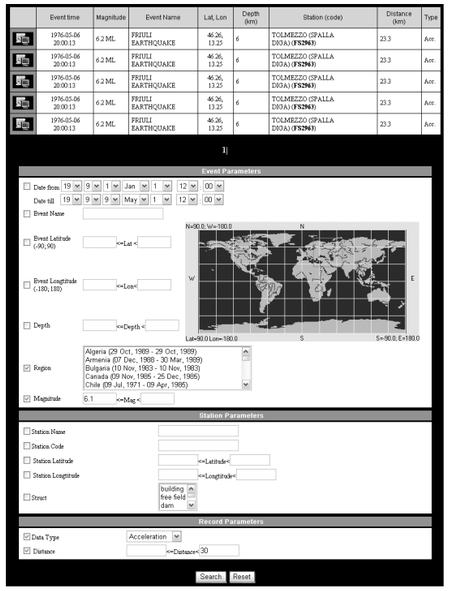

Figure 6. Query result

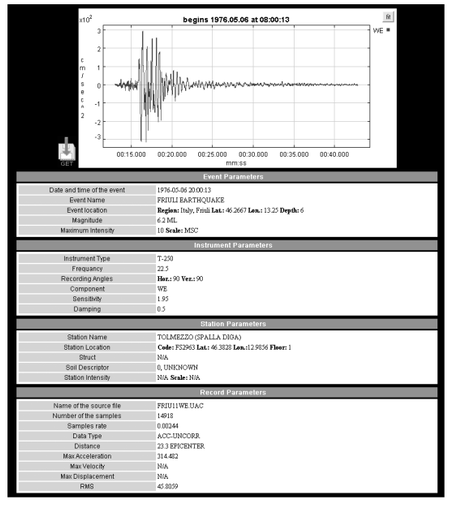

Figure 7. A plot of selected event

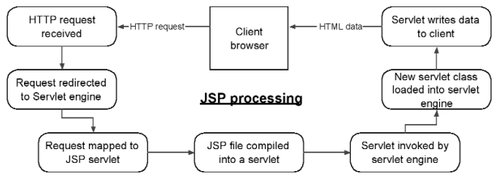

Figure 8. Processing of jsp-pages by Tomcat

Table 1

SMDB contents summary

Region	Records	Events	Stations	Date	Magnitude	Distance, km
countries of former USSR	832	68	45	17/05/76-01/11/91	2.8-7.2	1.83-126.92
Europe	7700	263	376	14/02/71-31/12/99	3.3-7.2	0-205
Asia	51048	9568	1016	14/02/56-20/09/99	1.3-7.9	0-910
USA	16548	418	864	11/03/33-17/01/94	1.7-7.7	0-1006
North America, except USA	354	12	29	30/01/73-25/12/85	4.8-8.1	6-465
Central America	90	9	4	18/11/67-31/03/73	4-6.2	3-30
South America	444	12	36	31/01/51-09/04/85	5.3-7.9	12-373
Africa	18	1	2	29/10/89-29/10/89		
Australia and Pacific Islands	648	19	49	05/10/80-08/09/91	2.7-7.7	1-270
Total	**77682**	**10370**	**2421**	**11/03/33-31/12/99**	**1.3-8.1**	**0-1006**

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Space Physics Interactive Data Resource (SPIDR) in Russia

http://spidr.ngdc.noaa.gov
http://clust1.wdcb.ru/spidr

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Introduction

This article is devoted to the overview of the SPIDR telematics product, which is promoted to World Data Centers in CIS countries by WISTCIS. At the same time, WISTCIS prepares SPIDR system for detailed demonstration and training course at environmental session of the project outlook conference in Moscow. It is also expected that SPIDR will be implemented in Ukrainian WISTCIS IDC, which is much involved in environmental and Earth science activities.

Data constitute the raw material of scientific understanding. The World Data Center system works to guarantee access to solar, geophysical and related environmental data. It serves the whole scientific community by assembling, scrutinizing, organizing and disseminating data and information. Scientific data gathering has a long history, but mechanisms for data distribution and exchange are more recent. The first large-scale international scientific enterprises were the International Polar Years of 1882-1883, which eventually led to the International Geophysical Year of 1957-1958. Planning of the IGY was coordinated by CSAGI, the Special Committee for the IGY set up by the **International Council for Science.** CSAGI established the **World Data Center system** to serve the IGY, and developed data management plans for each IGY scientific discipline. Because of its success, the WDC system was made permanent and used for post-IGY data. Over the years the tally of WDCs has changed. A comprehensive set of WDCs was established in China in 1988. The WDC in the U.S.A. has expanded and WDC in Russia is now operated by three different organizations. Some of the WDC centers in Europe and Asia have moved or have closed, but new centers have opened. In 1999, the method of naming WDCs was modified to remove the -A, -B, -C, and -D references. World Data Centers are now referenced by the type of center without reference to the country operating the center, i.e. WDC for Glaciology. If there is more than one WDC for a discipline, the name of the city where the WDC resides is appended, i.e. WDC for Glaciology, Boulder. All centers now have computer facilities and most use electronic networks to meet requests, exchange catalog information and transfer data. Today the WDC system is healthy and viable. Most centers are maintaining their funding, though not without struggle. Data acquisition, storage and distribution are expensive, WDCs cost money, but they are cost-effective in transferring data to users, and their operational costs represent a tiny fraction of worldwide scientific activity.

The Space Physics Interactive Data Resource (SPIDR) is a distributed network of synchronous databases and application servers designed to allow a modeling and prediction customer to intelligently access and manage historical space physics data for integration with virtual environment models and real-time space weather forecasts. Eliminating the network bottlenecks associated with transcontinental links, the distributed system architecture is a key factor for low latency in multimedia data visualization and fast data delivery.

The SPIDR is a set of 100% Java platform independent middleware servers accessed via World Wide Web. Each server resides at a parallel computer cluster and provides fuzzy logic based searching on a relational database of space weather parameters. The system is designed to allow the user to specify desired spatial, temporal, and parameter conditions in fuzzy linguistic and/or numeric terms and to receive a ranked list of events best matching the desired conditions in the historical archive. Once discovered, the client can request dynamical temporal and spatial visualization using a set of communicating Java applets, browse the archive of Sun and Earth satellite images, and request delivery of the data formatted for inclusion in model runs. Each SPIDR server has a database management interface, which allows data updates performed either by a local user or by another SPIDR server from the Net. The servers communicate to each other for scheduled mirroring of the data and software.

SPIDR has the following important features:

- Open source: server side including Java Server Pages, servlets and applets, HTML and JavaScript forms;
- Portability: may be installed on Unix (Linux, BSD, Solaris) and Windows 9x/NT/2000/XP operating systems;
- Scalability: full-featured versions available for a parallel computer cluster and for a notebook;
- Unified data model: similar access to various “pluggable” relational databases in the space weather historical archive;
- Dynamic time-series, maps and imagery data visualization;
- AI-based data mining and forecast;
- Web-based data-basket interface initiated by e-commerce concept;
- Automatic database and software mirroring using SOAP and asynchronous Web Services.

Figure 1. A screenshot from a SPIDR-II title page at location *http://clust1.wdcb.ru/spidr*

Algorithmic and programming patterns developed and utilized in SPIDR are general enough to be used in other Internet-based scientific data mining and visualization systems.

Geography of the distributed system

The development of SPIDR project is coordinated by *Earth Data Network for Education and Scientific Exchange* (EDNES), an international non-commercial association based in Strasbourg, which is a WISTCIS project partner. The project has two key development centers: one at *National Geophysics Data Center* (NGDC) in Boulder, CO, USA; another in *Center of Geophysical Data Studies and Telematics Applications* IPE Russian Acad. Sci. (CGDS) in Moscow. The international bodies, which take part in the data exchange for SPIDR development, are *World Data Centers for Solar-Terrestrial Physics.* These organizations also are hosting SPIDR network nodes, which are accessible at the following URLs: *http://spidr.ngdc.noaa.gov* and *http://clust1.wdcb.ru/spidr.* Homepage of a SPIDR node is shown at Fig.1.

Ionosphere Prediction Service (IPS) in Sidney, Australia, has applied in 1999 for SPIDR node status and installed SPIDR server and databases software at *http://spidr2.ips.gov.au.* In 2000 a SPIDR node was installed in the Solar-Terrestrial Environment Lab of the Nagoya University in Japan, at *http://gedas22.stelab.nagoya-u.ac.jp/spidr.* In 2001 Rhodes University in South Africa has installed a SPIDR node at *http://spidr.ru.ac.za/spidr.* In the nearest future it is planned to install a SPIDR node in China. A map of all SPIDR nodes is shown at Fig.2. In Russia, SPIDR is an important component of WISTCIS Information Dissemination Center at the CGDS IPE RAS. Installation of the SPIDR node in France at the Paris Institute of physics of the Earth is under discussion.

Figure 2. Map of synchronous SPIDR nodes

SPIDR network nodes

Fig. 3 shows the principal scheme of interoperation between the components of SPIDR. On each network node Relational Database Management System (RDBMS) is interfaced with server-side and client-side applications ("servlets" and "applets" respectively). When a client using web browser connects to the SPIDR web-server, several Java applets are transferred to the client machine and run there. They help almost all following operations and queries to take place. When the user makes a database query, he has to specify a date interval and to select a set of space weather parameters and possibly stations or satellites. Then the query form is being sent to the Java servlet running on the server machine under the Tomcat application server. In its turn the servlet executes a JDBC query on the MySQL database and after receiving a result sends it back to the client machine. Then the user can interact with the received data in the browser using JavaScript DHTML and Java applets.

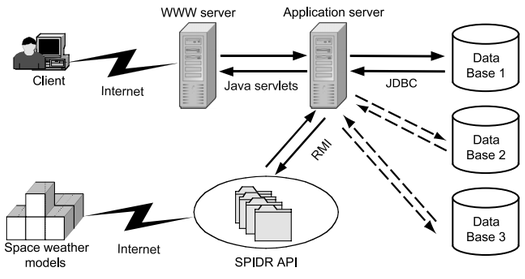


Figure 3. SPIDR client- and server-side applications

Numerical space weather models may automatically request historical data from SPIDR. The external computer services interact with SPIDR using Application Program Interface (API). The first version of API was based on Java network technique called Remote Method Invocation (RMI). This part of SPIDR is rapidly evolving following the global IT trend into the Web Services.

SPIDR software (both server-side and client-side) was tested to work under Linux (RedHat 7.2-8.0, Mandrake 9.0), Solaris, FreeBSD and Windows 98/NT4.0/2000/XP. For the optimum performance the minimum hardware requirements are: Pentium 1GHz, 512 Mb RAM, ~300Gb HDD, 100 Mbit TCP/IP network with relatively fast (~1 Mbit) connection to the Internet. SPIDR nodes in Boulder and Moscow run 12-box parallel Linux clusters (Fig.4).

Figure 4. Computer cluster for SPIDR node at CGDS in Moscow

The so-called "pluggability" of the SPIDR databases refers to the fact that additional database can be added to the SPIDR existing data holdings to become available through the standard interface with the search/visualization/delivery functions. To add a new database to SPIDR, one has to: 1) write access method creating SPIDR data model objects (one day of observations per variable per station); 2) prepare HTML data request form and create visualization and delivery servlets aware of the new data type; 3) add database metadata (units, log/linear scales, axis labels, etc.).

Data holdings

SPIDR database combines several thematically linked sets (relations) sets for different branches of solar-terrestrial physics. It also contains a few supplementary tables for system administration purposes. The SPIDR data holdings include:

- SSN – sunspot numbers daily, from 1700
- Geomagnetic field variations on stations minute and hourly, from 1901
- Geomagnetic and solar indices Kp, Ap, Cp, C9, DST hourly and daily, from 1932
- Ionospheric stations observations hourly, from 1954
- IMF – interplanetary magnetic field and solar wind (minute and hourly), from 1973
- GOES – geostationary NOAA satellites particles and magnetic field telemetry, from 1986
- DMSP – defense meteorological satellites visible and infrared images and SSJ4 sensor telemetry, from 1991
- Solar images, the following bands: X-rays, alpha-particles, radio band, magnetograms from 1992
- Cosmic rays, from 1951

System architecture

Key blocks in the SPIDR architecture are login module, data retrieval and export modules, data basket, visualization module, fuzzy search engine, and new user registration module.

The login module controls access levels to the system: anonymous, registered user, and system administrator. The user may brows data at any access level. The registrered user may download data to his workstation. The system administrator may load new data into SPIDR databases, change the metadata, and update the SPIDR software.

It is important to introduce the term "data basket". This is a special object, associated with a particular username, which tracks all the SPIDR data sets selected by user for alanysis and which is processed by SPIDR as a single entity, e.g. it can be plotted, printed out or downloaded to the client computer. Information in this object is persistent (saved from session to session) for each registered user, so that whenever the user logs in next time, the system "remembers" his data set selection and search constraints from the previous session.

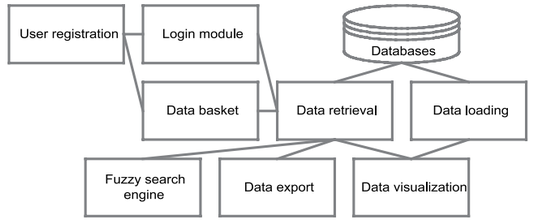


Figure 5. System architecture

The data basket concept helps to retrieve, visualize, and compare cross-disciplinary data from different SPIDR databases. For example, having in the data basket solar activity indices and heights of ionospheric layers (different request forms and databases in SPIDR), the user can plot all the time series on the same page with the same time scale.

Data visualization in SPIDR

Graphical representation of unified data model in SPIDR is mainly based on embedded applets technology. After the web-server receives a request to plot data (coming from a thematic data request form or a data basket form), the specialized SPIDR II servlet connects to the STP database (Fig.6), retrieves the data needed for plot, stores it in a new STPDataSet object implementing the unified data model, serializes the object into a FTP accessible directory, and sends back to the client a dynamically built HTML-formatted page with embedded links to the plotting applets (possibly several applet-plots on one page) together with formatting parameters and URLs to the serialized datasets to be plotted (Fig.7).

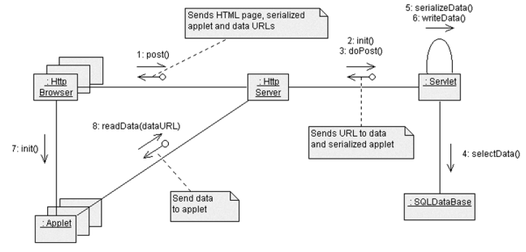


Figure 6. SPIDR time series visualization scenario

If there is more than one applet on a page, the applets start to negotiate a synchronous time scale for all the plots, and in case a user wants to zoom into a space weather event on one of the applet-plots, all the remaining plots on this page are automatically rescaled to the same time window.

Plotting of geomagnetic and ionospheric station maps in SPIDR is also performed by a configurable Java applet. It receives from the server a list of stations with coordinates, names, and URL to the background map (possibly with several layers) and map formatting options. User click into

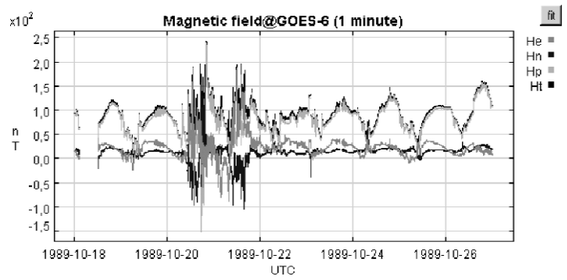


Figure 7. Example of the applet window plotting GOES magnetic field data

vicinity of a particular station tells the applet to request the station parameters hidden in the map HTML form and to select the station in the station list on the request form (Fig.8) using JavaScript.

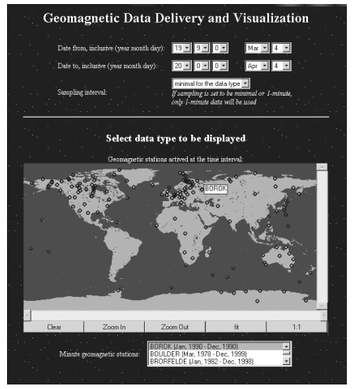


Figure 8. Mapping applet used to select a geomagnetic station for data visualization request

Visualization of solar images in SPIDR is performed by periodically refreshing static HTML pages (HTTP push technique). Pushing HTTP servlet is used for the standard access to the solar imagery database, when the image sequence length is not known in advance (Fig.9).

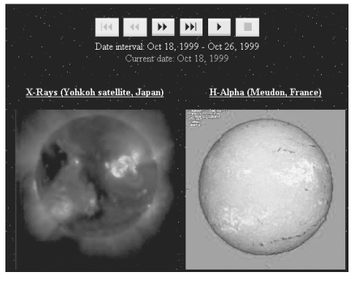


Figure 9. Visualization of solar images using the HTTP push technique

Similar approach is used for visualization of sequences of satellite images from the Defence Meteorological Satellite Program (DMSP). The infrared and visible images from the DMSP satellites is used for aurora detection.

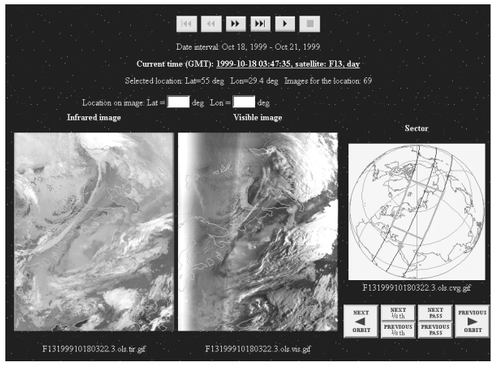


Figure 10. Animated visualization of images from DMSP satellites

Fuzzy search engine for space weather data mining

Intelligent parallel data mining of the STP database thematic table sets is performed within the SPIDR *fuzzy search engine* [3-5]. The search conditions may be specified in a number of ways depending on the user's familiarity with the themes and the space weather event of interest. An expert user can specify exact thresholds and/or limitations that must be maintained on certain parameters. Conditions can also be specified via abstract natural language definitions for each parameter.

For example, geomagnetic field disturbance index Kp values can be specified as "storm", "disturbed", or "quiet". Thus, a user may specify the following fuzzy search request for geomagnetic storm:

Fuzzy constrains: *(VERY HIGH "Kp index") AND (VERY LOW "DST index")*
Time constrains: *FROM (1/1/97) TO (30/6/98) DURING (24 hours)*

The form of query actually looks like a table with the column of the searchable parameters on the left with the rows with fuzzy search terms and relative values of these parameters (Fig. 11).

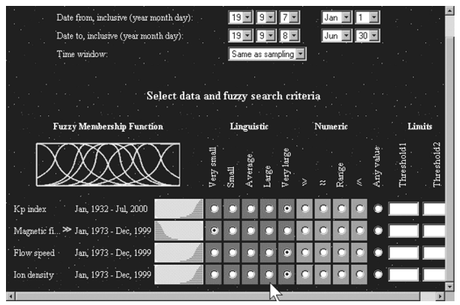
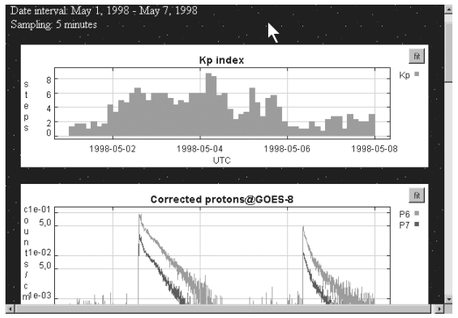


Figure 11. Fuzzy search query form

The result of such a request reported by the fuzzy search module is always a list of the "most likely" space weather event dates. The list is sorted by the match quality, i.e. values of the aggregated multidimensional fuzzy membership function (MF). In the current version of fuzzy engine, multidimensional database fuzzy search patterns are specified as logical AND aggregations of one-dimensional MFs. Optional temporal moving average smoothing (from 5 minutes to 1 day) of all variables can be performed prior to the aggregated MF calculation.

Action buttons in the last two columns of the fuzzy search report table call time series and solar imagery (Fig. 12) visualization servlets for the corresponding event dates and parameters listed in the fuzzy request.



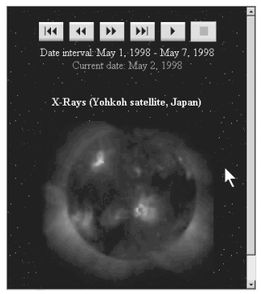


Figure 12. Time series plots for Kp and DST indices history (left) and Sun X-rays daily image (right) of the first "geomagnetic storm" event listed in fuzzy search report

Data dissemination and mirroring

All nodes of the SPIDR network are equal partners in data dissemination. Each node exercises full control of both loading and exporting of local data and decide which data sets are loaded locally and which nodes receive data. Automatic transfer from local to remote node is available if the data is not mirrored locally.

The mirroring technology is vital to the goal of synchronization of the data sets at all SPIDR locations. Dealing with low bandwidth and transient network connections the developers had to create a robust and simple mechanism of replication and synchronization of data at remotely located nodes. Two strategies are available for this purpose: passive and active. Passive strategy is implemented through a mechanism, when local data loading routine sends e-mail with the compressed data and loading instructions to the subscribed participants. Active strategy implies scheduled web-grabbers that search for new data (imagery) and download it to its location.

References

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Near real-time Internet interactive access to strong earthquake data

D. Mishin

This telematics system provides automatic processing of data from the latest earthquake warning messages sent by a rapid earthquake determination service and loading to the relational database. To the end user the system displays epicentral maps and list of parameters for the series of the recent seismic events. It provides comfortable browsing of maps with epicentric data and parameters of seismic events series and enables real-time browsing of seismic roes evolution and aftershock activity in the epicentral zone of strong earthquakes. Internet access to the system is provided by any Java-enabled Web-browser.

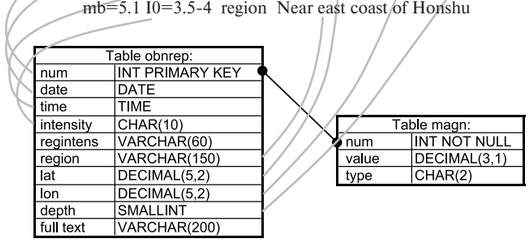
Data loading and processing

Messages about strongest earthquakes are sent by email from Urgent reports service of Central experimental methodical observatory, Geophysical service RAS (Obninsk town), EMSC and NEIC. Using these data system processes quick determination of earthquake parameters including event time, epicenter coordinates, depth, magnitude and seismic region. If magnitude exeeds the threshold for seismic region then information on the event is immediately sent out.

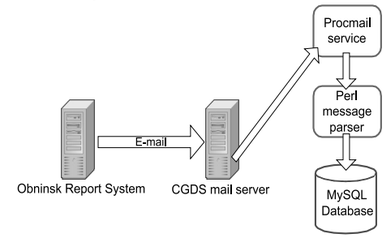
Earthquake warning messages come to subscribers less than in 15 minutes after it was registered. The average amount of messages per day is 10.

The text of one email message is below:

Obninsk, Early Alert Service
1545.Preliminary hypocenter for earthquake of 2002
DEC04 O=15h53m00.5s(utc) 38.73n 142.11e H=33.
mb=5.1 I0=3.5-4 region Near east coast of Honshu



We can find in the free-format text of the message all the parameters: time, coordinates, depth, magnitude, seismic region, maximum and local macroseismic intensity.

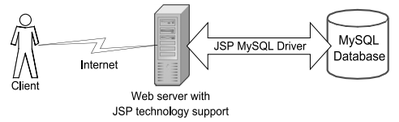


Received messages are transferred to the Linux mail filter procmail. It determines whether the message is Obninsk report using address and sender fields of the message, parses it and adds one to the database.

Procmail service enables user to browse messages immediately when it has reached the mailbox. When the message is received, its text is transmitted by procmail service to the Perl-script, which puts information from the message into the database. DBI module is used in Perl-script for communicating with MySQL database.

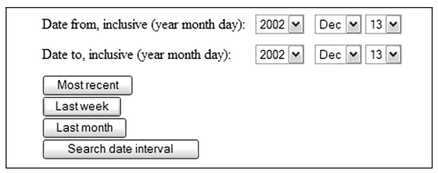
Data visualization

Users access to the rapid earthquake messages service is possible via Internet at *http://clust1.wdcb.ru/obnrep*



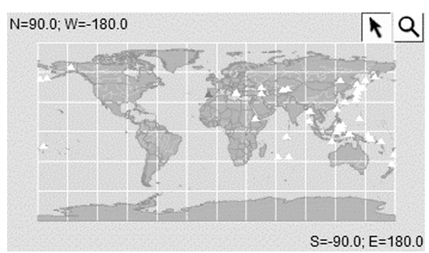
Pages being sent to the user are built dynamically by the server. Server-side dynamics is provided by JSP (Java Server Pages) technology, provided by Tomcat application server and Apache webserver.

Replying to the initial user request, server shows all messages for current day. Also using request form it is posible to select messages date interval like last week, last month or select any other required interval.



Messages in selected interval of dates are shown in the lower part of the window as the table, sorted by message number.

There is a Java-applet on the page. It shows location of epicenters of all events, selected by current query from archive, on world map.

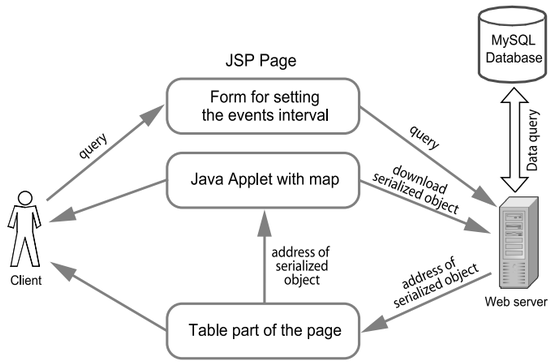


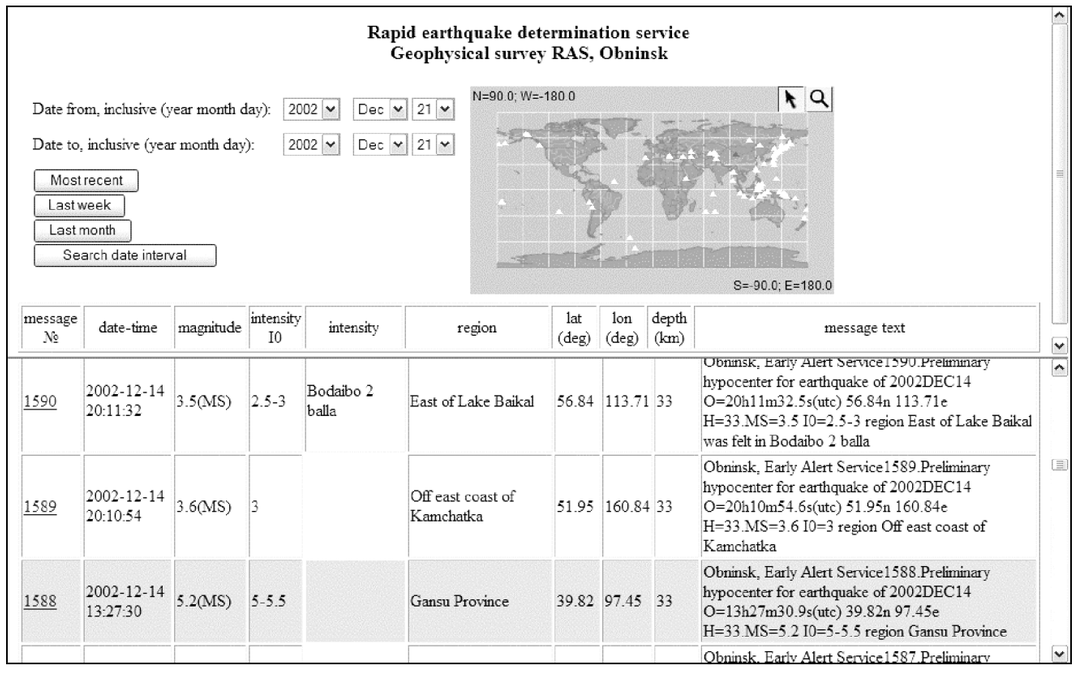
Dynamical table part and Java-applet communication is done at a client-side by Java-script that helps to avoid page reloading.

When mouse button was clicked at the map one event is selected at the map. Table part of the page scrolls to the selected event and corresponding line of the table is selected.

User may select table line by clicking mouse button at it. Then selected event (earthquake) is displayed in the applet.

The Java-object serialization mechanism is used for messages transmission from database to the applet. While data is requested from the database by JSP page, besides generating page content, the Java-object is created, which contains information on events. After the data is received, the object is serialized to server disk into the dicertory, which is accessible from network. The applet receives the link to the object. When reloaded page is received by the client, the applet loads the file which contains serialized object, unpacks it and shows received events at the map.





During initial client request the server selects the last day, which contains events, as events date interval. If necessary, a user may select another interval. Then the table part of the page is reloaded and the server fills the table with data over the selected interval. When query is processed new object is created. It is saved at the server and new link is sent to the applet when new table part is loaded.

The page, which contains query form, received data and Java-applet with epicenters map is shown on the picture above.

In the near future the system enhancement is expected for operative regional catalogues processing.

Telematics and artificial intelligence tools in monitoring of volcanoes

J. Zlotnicki, S. Agayan, A. Gvishiani, Sh. Bogoutdinov

Introduction

The analysis of huge amount of local geophysical data, in particular, interpretation on a global level or an integral combination, on the one hand demands expert's qualification, but on the other hand is not subjected to him due to physical reasons. The work at a good expert's level can rarely be led to some algorithmic process, but such activity nevertheless comes under computerization. So the necessity of the new stage in the geophysics arises – the creation of the intellectual systems oriented at the modeling of the specialist's activity in the spheres of seismology, gravi-, magnetometry *etc*. Besides the mathematical geophysics these systems include artificial intelligence (AI) and fuzzy mathematics. AI because it's a study on knowledge, on how to get it, to present it in the intellectual systems, to process it within the systems and to use for achieving the goals. The originality of each geophysical task, in general, necessarily brings with it the originality of the method of it's resolving, making impossible blind imitation. As a result, two problems take on supreme significance: the problem of the most adequate presentation the experts' data, knowledge and opinions on the geophysical task and the problem of the optimal utilization of the previous experience for its resolving. They can be overcome in the framework of two directions of AI: "the presentation of the knowledge and working with them" and "the images' recognition and training". Then, it follows from additional geophysical specificity that mathematics in such tasks has to be fuzzy due to initial fuzziness of the geophysics itself.

The task setting

5 stations MAF, BAF, CSV и DON, DOS fulfill the measuring of the anomalies of the natural electrical potential at Piton de la Fournaise active volcano (Reunion island, France) along EW and NS directions.

The schemes of stations' dislocation at Piton de la Fournaise volcano

It's necessary to create a system on 10 arising records, which resolves the following tasks:

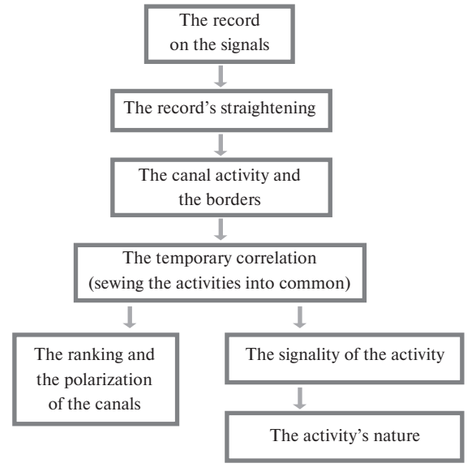
1. The recognition of the active sites on each record (≡ canal activities).
2. The determination of the beginning and the end of every active site on each canal record (≡ canal activities borders).
3. The temporary correlation of the active sites on different canals for sewing them into common activity.
4. The ranking and the polarization of the stations and canals regarding to found activity.
5. The activities' classification as for noise and signal.
6. In case of signality of such activity, the determination of its nature.

The principles of the solution

The intellectual system construction on the interpreter logics' fuzzy modeling basis during the analysis of each record.

It lies in the following: the interpreter is sliding on the record, locally evaluating its small fragments from different sites, keeps in mind these assessments and aggregates them into this or that final solution depending on above formed tasks.

So, two levels are supposed to be in the system - local and global, the first of which carries auxiliary-preliminary nature – the work in the point, and the second – decisive-concluding nature.

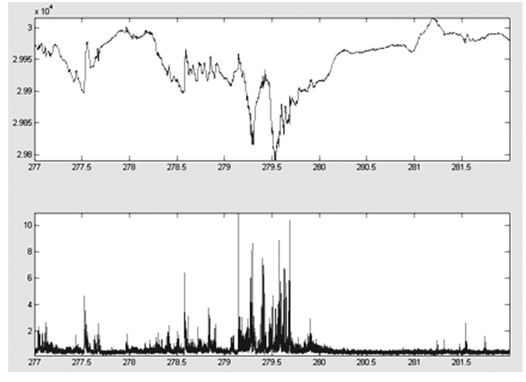


Block scheme of the system

Here is the short description of all system blocks.

Straightening

Modelling the *y(t)* record's amorphous-multivalued "activity" idea on the basis of so called quality functional (≡ this or another limited (private), but definitely it's (activity) mathematical interpretation: energy, length, irregularity etc.). Φ functionals are definite on the centered fragments and have "straightening" property, *i.e.* they transfer the activity on the *y(t)* record into the $\Phi_y(t) = \Phi\ (\Delta^t y)$ function graphics' height.



The example of *y(t)* function and it's $\Phi_y(t)$ straightening functional

The canal activity and the borders

The given block directly works with the $y(t)$ function's straightening. For searching the activities on $y(t)$ it's necessary to find heights on $\Phi_y(t)$. In the course of block's working, the straightening is analyzed in every point – the activity of its fragments is evaluated from different sides. Then the evaluation data are being analyzed and integrated into the common final solution that helps to judge on signal's presence or absence in the given point.

We should notice that the one height level is not enough because the signals in general case don't have permanently high intensity, so their straightening are not permanently higher than that level. In this work more delicate logic is needed, which is based on $\mu(\Phi_y(t)) \in [-1,1]$ background's mark-changing measure: $\mu(\Phi_y(t)) \equiv$ the Φ_y relief's minimality level in t point. So, t point is anomalous on relief ($\equiv$ record y in point t), if $\mu(\Phi_y(t))<0$.

The temporary correlation

This implements $(A_i)|_1^{10}$ activities sewing into common activity. First, the horizontal sewing on canal is implemented (internal sewing), then the vertical between the canals (external sewing). There are different ways to do it and they are the essence of this block. In particular, during external sewing for arbitrary segments B and C fuzzy measure $\mu(B,C)$ of their mutual belonging is created. If $(A_i)|_1^{10}$ activities totality on K_i different canals, as the measure of their $\mu(A)$ coordination we choose the $\mu(A)=\wedge_{i,j=1,\dots,10;i\neq j}\mu(A_i,A_j)$ general conjunction of their paired concordances. Then the totality with the most level of concordances will be the needed sewing of canal activities into the common activity.

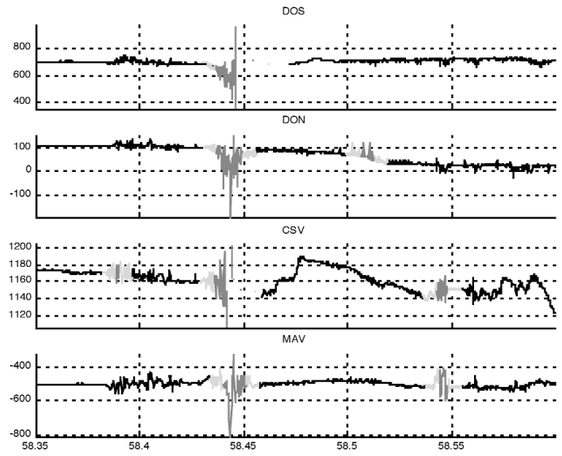
The ranking

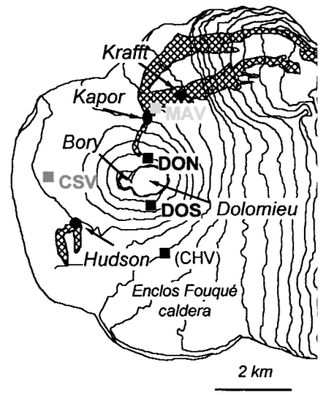
We should notice that the stations are on different distances from the volcano. So the events around it in their absolute expression will be seen stronger on the nearer stations which makes incorrect the ranking of the stations regarding the $A=(A_i)|_1^{10}$ event through the direct comparison of A_i and A_j. So we need to compare the A_i activity with the other activities on that canal, *i.e.* we must build the measure of A_i relative activity. In this block we can use the measures built in "The canal activity and the borders" block.

The remaining blocks are based on the recognition with training. The recognition features are the morphologic-geometrical characteristics of the record's straightening. If BS is the training base in the signality block, then its $BS=\vee BS_j$ fragmentation (where BS_j is the signals' totality in j nature) is the training base for the signality's nature block.

The monitoring

All above mentioned works are conducted in teleworking regime. The stations in Piton de la Fournaise volcano zone implement continuous automatic measurement of anomalies of the natural electrical potential. The measured data are transferred through connection channels to Clermont-Ferrand (France) and Moscow (JIPE RAS), where the processing of received data is conducted. The processing results are the allotted areas of the anomaly and are reflected in one of the following forms:





Presence Awareness Service: collaborative browsing at "WISTCIS on the Web" system

A. Soloviev (EDNES Moscow branch, Russia), H. Christein (University of Ulm, Germany)

Introduction

Presence Awareness Service (former title "VPS - Virtual Presence System") was applied to an objective of collaborative browsing in the framework of the project WISTCIS. It was implemented in collaboration between Centre of Geophysical Data Studies and Telematics Applications (Moscow, Russia), University of Ulm (Germany) and EDNES Association (Strasbourg, France).

In the Web context Presence Awareness allows people to 'see' each other while they are browsing the same Web-page or Web-site. This fundamental property of Presence Awareness enables more fruitful communication of people since people with similar interests meet on the same Web locations.

Within the project WISTCIS it eases the getting in touch between people from EU and CIS working in research and education.

Basing on Presence Awareness Service we've implemented a multilingual Collaborative Browsing User Agent, which supports Russian language so that it is well fitting for use within the CIS countries. To allow EU-CIS team work in areas such as research and education it also supports English language.

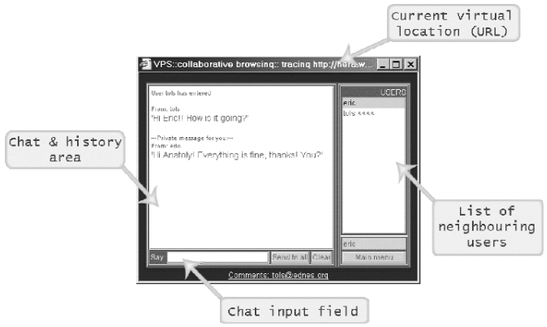


Figure 1. The *user agent* main window

For detailed system overview and technical information please refer to WISTCIS Newsletter vol.2, English edition (H.Christein, A.Soloviev "Multilingual Collaborative Browsing User Agent as an extension of the CoBrow concept", pp.22-25), TELEBALT Newsletter vol.1 (A.Soloviev, E.Kedrov "Collaborative browsing toolkit (CoBrow) and Virtual Presence System (VPS)", pp.11-14) and TELEBALT Newsletter vol.2 (H.Christein, A.Soloviev "Implementation of multilingual Collaborative Browsing User Agent as an extension of the CoBrow concept", pp.14-16).

Collaborative Browsing User Agent (CBUA) installation at WISTCIS main Web-site at EDNES

Testing of Collaborative Browsing User Agent at VPS demonstation Web-site has shown that the whole system works properly. The system was applied to WISTCIS main Web-site and from that moment the Web-site supports collaborative browsing.

To enable collaborative browsing mechanism at the Web-site it is necessary to click the corresponding button *("Start collaborative browsing")* at the index Web-page *(http://www.ednes.org/wistcis)*. The required software for it is the following:

- *Internet Explorer 5 or Netscape 6;*
- *Java Plug-in 1.4.*

If a user doesn't have one of these components, he is able to download it from the same Web-page.

After a user has clicked "Start collaborative browsing" button, he will be offered to choose preferred language of a graphical user's interface (English or Russian). Then a user logs on to the system and starts browsing the Web-site.

While a user is browsing the Web-site, an additional window of the *user agent* is always visible. While a user browses different Web-pages within the Web-site, his *user agent* reacts upon that and updates a list of neighboring users in a corresponding way. As soon as a user leaves the Web-site, his *user agent* stops reacting upon his Web-browsing.

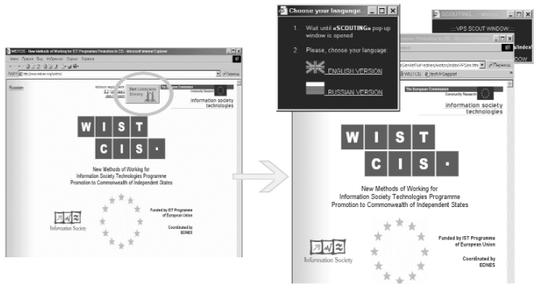


Figure 2. Enabling collaborative browsing at WISTCIS main Web-site

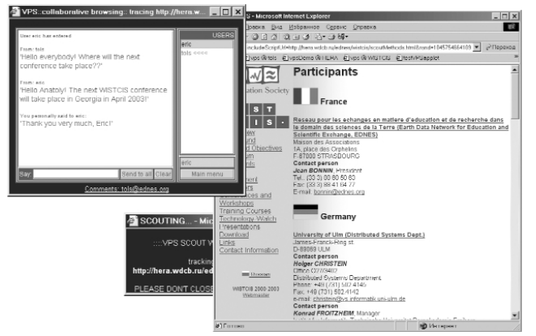


Figure 3. Collaborative browsing at WISTCIS main Web-site

Virtual meetings held at WISTCIS main Web-site

Several virtual meetings were held at the Web-site by means of Collaborative Browsing User Agent, in particular, in the framework of CBUA live-demonstration performed by Mr. Holger Christein (University of Ulm, Germany) in collaboration with Mr. Anatoly Soloviev (EDNES Moscow branch, Russia), Mr. Ernest Kedrov (EDNES Moscow branch, Russia) and Marco Rocha Reynoso (colleague from University of Ulm) at WISTCIS workshop "New Methods of Work for Business and Research" held in Yerevan, Armenia (November 21-22, 2002).

Several virtual working meetings in the framework of the project TELEBALT were also held at WISTCIS main Web-site:

- date/time: December 10, 2002, 15:00-16:00 CET; topic "Technical aspects of CBUA and PAIB"; number of participants: 4
- date/time: December 20, 2002, 14:00-15:00 CET; topic "TELEBALT project progress (1)"; number of participants: 5
- date/time: January 23, 2003, 09:00-10:15 CET; topic "TELEBALT project progress (2)"; number of participants: 4
- date/time: January 31, 2003, 14:00-14:30 CET; topic "TELEBALT project progress (3)"; number of participants: 2

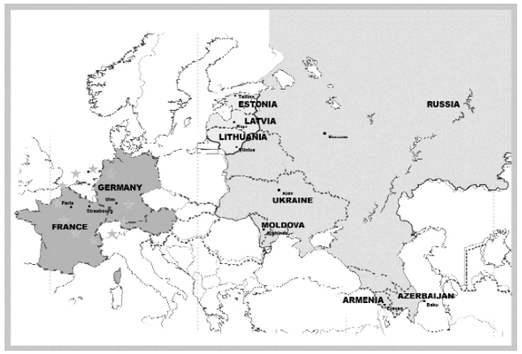


Figure 4. Countries participated at virtual meetings

Presence Awareness Service application to 4 IDC Web-sites

Belarus IDC and Moldova IDC were provided with all the necessary instructions (including special html-files) for collaborative browsing support at the corresponding Web-sites so the *user agent* could be enabled at these Web-sites. During an attempt of the system application to Moldova IDC Web-site some problems occurred. It took about one month to adapt the Web-site for that. With Belarus IDC Web-site everything went off smoothly. It suited perfectly for that purpose, so it took least time for it's adaptation for collaborative browsing ability.

Russian IDC Web-site was also prepared and adapted for collaborative browsing ability with minimum time expenses.

Ukrainian IDC was provided with the same instructions as Belarus IDC and Moldova IDC. Work still goes on at Ukrainian side for preparing their IDC Web-site for collaborative browsing support. Almost 85% of work is done, including the Web-site modification.

At the moment, there are three Web-sites considered to be fully operational in the context of collaborative browsing – Russian IDC Web-site, Belarus IDC Web-site and Moldova IDC Web-site.

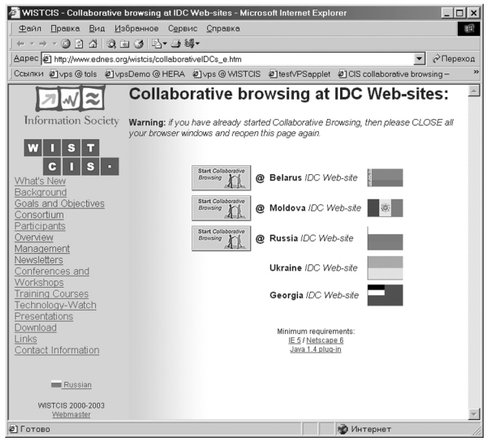


Figure 5. Web-page at WISTCIS main Web-site: starting of collaborative browsing at IDC Web-sites

Launching of collaborative browsing enabled Belarus IDC Web-site, Moldova IDC Web-site and Russian IDC Web-site is executed at WISTCIS main Web-site at EDNES. The corresponding Web-page is not yet available from the outside, because remaining Ukrainian IDC Web-site is not yet completely adapted for collaborative browsing.

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