2007 ANNUAL REPORT

CESNET

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CESNET, zájmové sdružení právnických osob
Zikova 4, 160 00 Praha 6

association

"If I were to briefly outline CESNET, I would use the following words: Research, Development, and Science.

And there are two more that occurred to me immediately after:Erudition and Education.

Helmut Sverenyák,
Deputy Director of CESNET Association for Research and Development

In 2007 CESNET commemorated the 11th anniversary of its establishment. 2007 was also the fourth year of implementation of the research plan titled Optical National Research and Education Network and its New Applications, which is to be completed in 2010.

HISTORY

The Association was founded in 1996 by all the universities in the Czech Republic, together with the Academy of Sciences of the Czech Republic ("Akademie věd České republiky"– hereinafter referred to as AV ČR). In 1996, when the Association received a grant for the TEN-34 CZ Network Deployment project from the Ministry of Education, Youth and Sports of the Czech Republic, the Association started building the academic backbone network of the Czech Republic at an entirely new level of quality.
The Association also operated as a commercial Internet provider, with the aim to gain sufficient resources from these activities for its main activity. From 1997, the Association operated two independent networks. The first one, TEN-34 CZ (later TEN-155 CZ), served the needs of science, research and education, to which members of the Association and some other institutions complying with the Acceptable Use Policy were connected. The second network was called CESNET, for historical reasons, and connected commercial customers. After the commercial network was sold in 2000, the Association ceased to act as a commercial Internet provider. Since then, it has been engaged solely in the operation of the science, research and education backbone network (National Research and Education Network – NREN – of the Czech Republic) and other related activities.
For the period of 2004 to 2010, the Association obtained subsidies in the form of an institutional support for its research plan titled Optical National Research Network and Its New Applications, the draft of which was submitted in 2003. 2007 was therefore the fourth year of the research plan implementation.

OBJECTIVES AND THE SCOPE OF ACTIVITIES OF THE ASSOCIATION

The main goals of the Association are the operation and development of the backbone network that interconnects the networks of the Association members, research and development of advanced network technologies and applications, and the dissemination of information about them.

The main scope of activities of the Association follows:

1. To secure the research and development in the area of information and communication technologies and their applications.
2. To secure the provision of education services within research and development, using the high-speed national research and education network.
3. To secure the following for its members and the organizations they have established: the development and operation of a computer network interconnecting their networks and metropolitan networks; the creation of collectively used technical, communication and software resources and information services; testing of new applications; cooperation and complementarity of the members' activities on a level comparable with prestigious education and research networks abroad (including Internet access).
4. To secure, in cooperation with its members, the long-term development, acquisition and use of high quality communication and information technologies based on the Internet and similar modern systems.
5. To support, against the reimbursement of related expenses, propagation of erudition, culture and knowledge, cooperation with members to broaden their experience, expansion of applications of the most modern information technologies, and improvement of the quality of the network by gaining additional participants, information sources and services.

The Association ensures its activities within the scope of the institutional support gained, with subsidies and partial compensation of expenses related to these activities. The Association's objective is not to generate any profit.
In addition to its main activities, the Association also pursues economic/business activities; however, solely with the purpose of making more efficient use of its property and without any negative impact on research activities. The Association does not provide the academic backbone network services only to its members but also to selected entities complying with the Access Policy of the Next Generation National Research and Education Network ("Zásady pro přístup do sítě národního výzkumu a vzdělávání nové generace").
Any loss incurred in connection with the Association's economic/business activities is settled by the end of the fiscal year in question. Otherwise, the Association will abandon the economic/business activities in question before the beginning of the following fiscal year. After settling the obligatory reserve fund contribution, the Association uses its entire profit to support the research and development.

MEMBERSHIP IN INTERNATIONAL AND NATIONAL ORGANIZATIONS

The CESNET Association is a member of respected international and national organizations. The key organizations include:

• international organizations
CEENet (Central and Eastern European Networking Association) – organization coordinating international telecommunication activities of countries in Central and Eastern Europe.

DANTE (Delivery of Advanced Network Technology to Europe Ltd.) – non-profit organization aimed at the construction and quality improvement of the IP connectivity for academic institutions in European countries.

GLIF (Global Lambda Integrated Facility) – global experimental network activities, focusing on the development support for most demanding scientific and research applications. The main goal of this project is to construct a network that will service applications with extreme transfer rate requirements.

Internet2 – consortium led by American research and education institutions endeavoring to develop and deploy new types of network technologies, services and applications. The CESNET Association has been an associate member of the consortium since 1999.

PlanetLab – consortium of academic, commercial and governmental organizations from the entire world, collectively operating a global computer network designed for developing and testing new telecommunication applications. There are currently 780 nodes from 31 countries operating in the network.

TERENA (Trans-European Research and Education Networking Association) – established in 1994 through the merger of EARN (European Academic and Research Network) and RARE (Réseaux Associés pour la Recherche Européenne). It is engaged in the development of the telecommunication infrastructure of academic and scientific sites across Europe.

• national organizations
CZ.NIC – the Association is one of the founding members of CZ.NIC, z.s.p.o., an organization engaged in the domain registration, support of projects of general benefit and Internet-related activities. At the end of 2007, the association had 52 members.

NIX.CZ – the Association is also one of the founders of NIX.CZ, z.s.p.o. (Neutral Internet Exchange), an association of Internet service providers in the Czech Republic, offering the possibility of mutual interconnection of member networks. At the end of 2007, the association had 57 members.

ASSOCIATION MEMBERS

The following institutions were members of the Association in 2007:
Academy of Performing Arts in Prague
Academy of Sciences of the Czech Republic
Academy of Fine Arts in Prague
Czech University of Agriculture in Prague
Czech Technical University in Prague
Janáček Academy of Musical and Dramatic Arts in Brno
University of South Bohemia in České Budějovice
Masaryk University
Mendel University of Agriculture and Forestry in Brno
University of Ostrava
Silesian University in Opava
Technical University in Liberec
University of Hradec Králové
University of Jan Evangelista Purkyně in Ústí nad Labem
Charles University in Prague
University of Defence
Palacký University in Olomouc
University of Pardubice
Tomáš Baťa University in Zlín
University of Veterinary and Pharmaceutical Sciences in Brno
Technical University of Ostrava
Institute of Economics in Prague
Institute of Chemical Technology in Prague
Academy of Arts, Architecture and Design in Prague
Technical University in Brno
University of West Bohemia in Plzeň

During 2007, the Association accepted no new members.

people

"There is nothing like a flawless data network in the world. However, with CESNET2 I have the certainty that any issue will be addressed by a team of top network specialists aiming to find a solution guaranteeing maximum user satisfaction."

Jan Nejman, CESNET2 Network Administrator

CESNET has the ability to deal with demanding tasks not only due to the support from the Ministry of Education, Youth and Sports of the Czech Republic as well as all Association members but also as a result of the inventiveness and maximum commitment of all its employees and partners. This positions the Association among the top national research and education network operators.

A MESSAGE FROM THE DIRECTOR

2007 had a great importance for the Association. I had an opportunity to welcome – in my name and the name of the CESNET Association – one of the spiritual fathers of the Internet, Vint Cerf, in Prague, where he arrived for the meeting with university representatives, scientists and students. It was Vint Cerf, who introduced me in on the plans for further Internet development during my study stay in USA at the beginning of the 90's. I hold him in high esteem from then. It was pleasure for me that we could broadcast a lecture on the future of the Internet to the entire world using the CESNET2 network. The lecture was presented by Vint Cerf on 5 April in the premises of the Faculty of Electrical Engineering of the Czech Technical University in Prague. However, this was not the only reason why I consider the year 2007 successful from the perspective of the CESNET Association.

We have achieved significant progress in implementation of the seven-year research plan Optical National Research Network and Its New Applications, reaching its second half in 2007. The objective of this plan is develop and gradually change the CESNET2 network to an integrated communication and information environment. The plan involves addressing of issues connected with optical and IP networks, computing and access grids, mobility, multimedia services and End-to-End Performance problems. Details on the individual projects implemented within the research plan can be found in the following pages.

In 2007 we managed to organize a couple of important international meetings. CESNET hosted the seventh annual meeting LambdaGrid Workshop, taking place on 17 and 18 September in Prague. 116 significant experts from 17 countries arrived to this event – from Europe, Brazil, China, Canada, Japan, South Korea, USA, Australia and Taiwan. On 19 and 20 September 66 representatives of national science and research networks from 19 countries (from Europe, North and South America, Asia and Australia) met in Prague on an event we hosted to exchange their experience from the area of designing and operating Customer Empowered Fibre networks (CEF) and formulate key principles for their further research and development. CESNET provided connectivity for the 68th meeting of the open internet community IETF, taking place from 18 to 23 March in Prague. Almost 1,200 representatives of ISPs, network engineers and Internet researchers from the entire world arrived to the meeting.

Over 70 guests took part in the professional seminar Security of Networks and Services we organized on 10 May in the Blue Lecture Hall of the Charles University in Prague. The key seminar topic was the security of networks and services running in these networks, with special emphasis on the security incident issues.In addition we became one of the co-organizers of the seventh year of the Week of Science and Technology, running from 1 to 11 November throughout the Czech Republic.

First edition of the collection Networking Studies: Selected Technical Reports, containing eleven most significant technical reports elaborated by those who work on the research plan, received a great acclaim of the professional public.

An important day was 27 November when employees of the CESNET Association – Ing. Jan Radil, Ph. D., and Ing. Josef Vojtěch – together with Ing. Miroslav Karásek, DrSc., from the Institute of Photonics and Electronics of the Academy of Sciences of the Czech Republic, received a research award from the Ministry of Education, Youth and Sports for utilization of optical fibre amplifiers in the national research and education network CESNET2.

Even this brief list indicates the breadth of the current scope of CESNET activities. We can only handle all the demanding tasks with the considerable support we receive. I would like to thank for this support mainly the Ministry of Education, Youth and Sports and all Association members. My sincere thanks go to all our collaborators whose ingenuity and commitment keep the CESNET Association among the top national research and education network operators.

Ing. JAN GRUNTORÁD, CSc.
Director and the Member of the Board of Directors, CESNET, z. s. p. o.

INTERNAL ORGANIZATIONAL STRUCTURE

CESNET, z.s.p.o. has the following **bodies:**
– General Assembly
– Board of Directors
– Supervisory Board

The **Board of Directors** had the following structure in 2007:
prof. Ing. Jiří BÍLA, DrSc.
RNDr. Alexander ČERNÝ
Ing. Jan GRUNTORÁD, CSc.
Ing. Josef KUBÍČEK
doc. RNDr. Václav RAČANSKÝ, CSc.
doc. RNDr. Pavel SATRAPA, Ph. D.
prof. Ing. Miroslav TŮMA, CSc.

Ing. Josef Kubíček performed the function of the Chairman, and doc. RNDr. Václav Račanský, CSc., and prof. Ing. Miroslav Tůma, CSc., were Vice-Chairmen.

The **Supervisory Board** had the following structure to 12 July 2007:
Ing. Jiří JIRKA
RNDr. Pavel KRBEC, CSc.
Ing. Jaromír MARUŠINEC, Ph. D., MBA
Ing. Přemysl TICHÝ
doc. Ing. Zdeněk VOSPĚL, CSc.

Ing. Zdeněk Vospěl, CSc.
was the Chairman of the Supervisory Board.

For the electoral term 2007-2009, the 23rd General Assembly elected a Supervisory Board with the following members within its meeting held on 12 July 2007:
RNDr. Pavel KRBEC, CSc.
Ing. Jaromír MARUŠINEC, Ph. D., MBA
Ing. Přemysl TICHÝ
doc. Ing. Zdeněk VOSPĚL, CSc.
RNDr. František ZEDNÍK

Ing. Zdeněk Vospěl, CSc.
was elected as the Chairman of the Supervisory Board.

J. Gruntorád was the **Director** of the Association also in 2007.

Development Fund Council

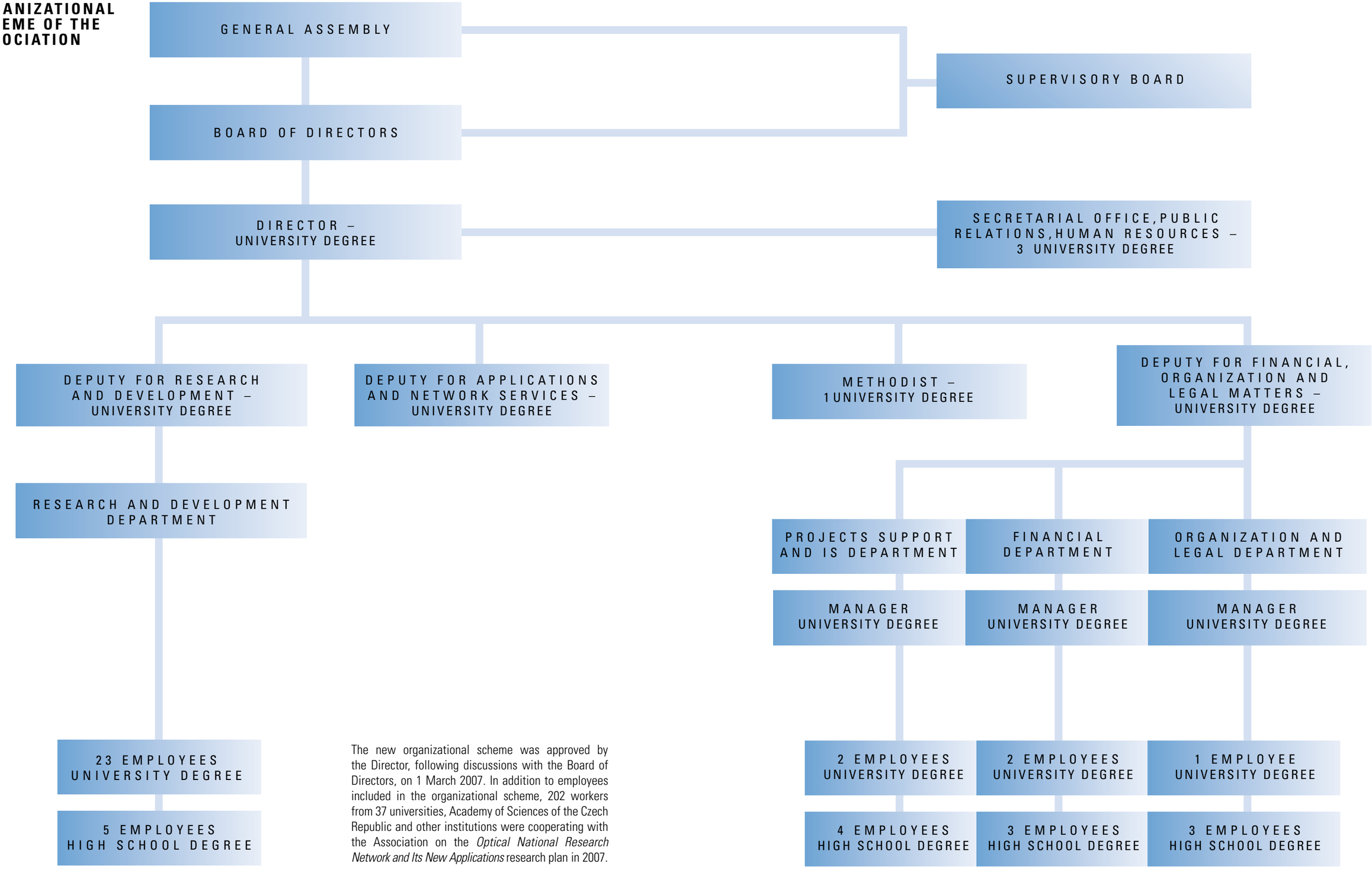
The Development Fund Council operated with the following structure to 12 July 2007:
RNDr. Igor ČERMÁK, CSc.
Ing. Miroslav INDRA, CSc.
doc. RNDr. Antonín KUČERA, CSc.
prof. Ing. Karel RAIS, CSc., MBA
Ing. Vladimír RUDOLF
prof. RNDr. Jan SLOVÁK, DrSc.
prof. Ing. Ivo VONDRÁK, CSc.

RNDr. Igor Čermák, CSc.
was the Chairman of the Development Fund Council.

For the electoral term 2007-2009, the 23rd General Assembly elected a Development Fund Council with the following members within its meeting held on 12 July 2007:
RNDr. Igor ČERMÁK, CSc.
Ing. Miroslav INDRA, CSc.
Ing. Olga KLÁPŠŤOVÁ
doc. RNDr. Antonín KUČERA, CSc.
prof. Dr. Ing. Zdeněk KŮS
prof. RNDr. Jan SLOVÁK, DrSc.
prof. Ing. Pavel TVRDÍK, CSc.

Igor Čermák, CSc.
was elected as the Chairman of the Development Fund Council.

ORGANIZATIONAL SCHEME OF THE ASSOCIATION



The new organizational scheme was approved by the Director, following discussions with the Board of Directors, on 1 March 2007. In addition to employees included in the organizational scheme, 202 workers from 37 universities, Academy of Sciences of the Czech Republic and other institutions were cooperating with the Association on the *Optical National Research Network and Its New Applications* research plan in 2007.

network

"The CESNET2 backbone network is a result of practical application of state-of-the-art communication technologies and latest trends. One of the key advantages of this network is, in our opinion, its ability to dynamically and flexibly offer and provide over the long term even the most demanding network services with the top quality to a wide community of users/ researchers, in accordance with their specific needs."

Václav Novák, CESNET2 Network Administrator

The CESNET Association builds and develops national high-speed computer network for the science, research, development and education purposes – CESNET2. The backbone network interconnects the largest university cities of the Czech Republic with circuits featuring high transfer rates. Besides universities, the Academy of Sciences of the Czech Republic and other research organizations, users of the network include several high schools, hospitals, or libraries as well.

In addition to the standard Internet connection and high transfer rates for scientific and research purposes, the CESNET2 network offers to its users also some advanced and less common services. These include for example IP telephony, video conferences, or the supercomputing MetaCentrum.

In 2007 the Association continued in the backbone network transformation to a hybrid network, capable of providing its users also with dedicated optical links between specific terminal points, in addition to the classic IP connectivity. The optical infrastructure topology of the CESNET2 network at the end of 2007 is shown in Fig.1. This topology includes those CESNET2 nodes that are connected using optical fibres and fitted with equipment of the CESNET Association.

Depending on the character of utilization of individual routes, the routes are fitted with two different technologies. The first type of the DWDM system contains devices allowing transfers with speeds of up to 10 Gbps in up to 32 channels, at the maximum distance of 1000 km. This system enables software channel configuration, bringing significant flexibility in setting up circuits matching users' needs. The system has been implemented mainly in the core of the CESNET2 backbone.

Another system is based on custom-built optical amplifiers invented by the Association within the research plan works (CzechLight Amplifier - CLA). Unlike the previous system, this system is configured statically, allowing transferring up to 8 channels with the speed of 1-10 Gbps in a single fibre, depending on the device type used. The DWDM infrastructure of the CESNET2 network was extended to České Budějovice and Liberec in 2007.

The remaining optical transfer routes currently operate in the "gray optics" mode, meaning that only one transfer channel can be implemented in one fibre.

In the first quarter of 2007 the IP connection to the global Internet was gradually upgraded from 800 Mbps to 1.8 Gbps as a result of the current needs. The development of the international connectivity since 2002 is illustrated in Fig. 2.

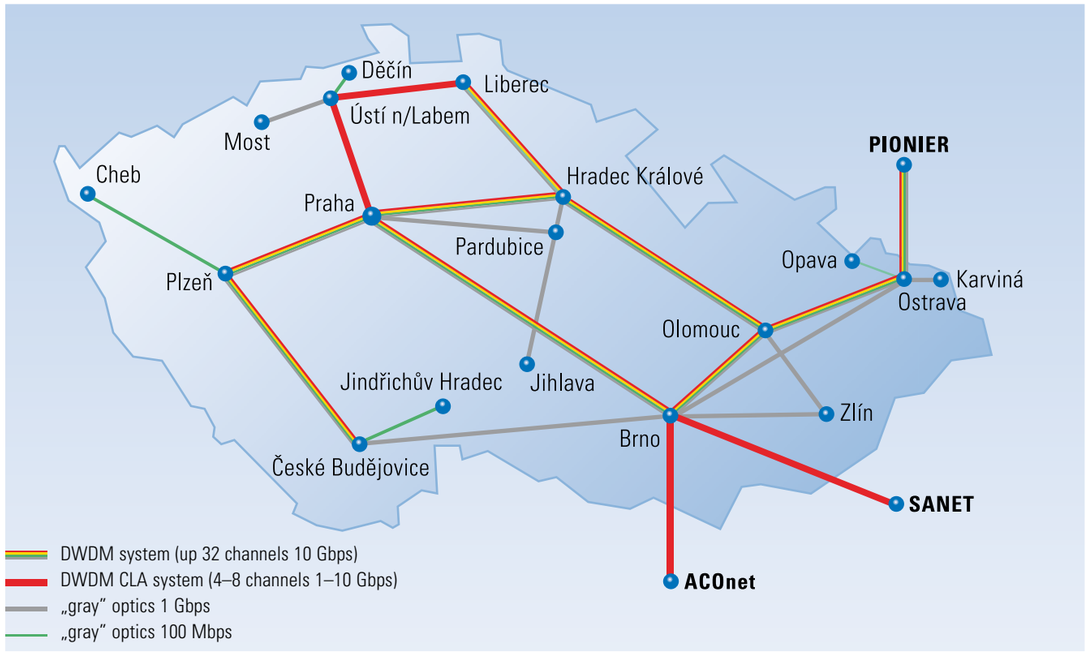


Fig. 1 CESNET2 optical infrastructure and fibre configuration at the end of 2007

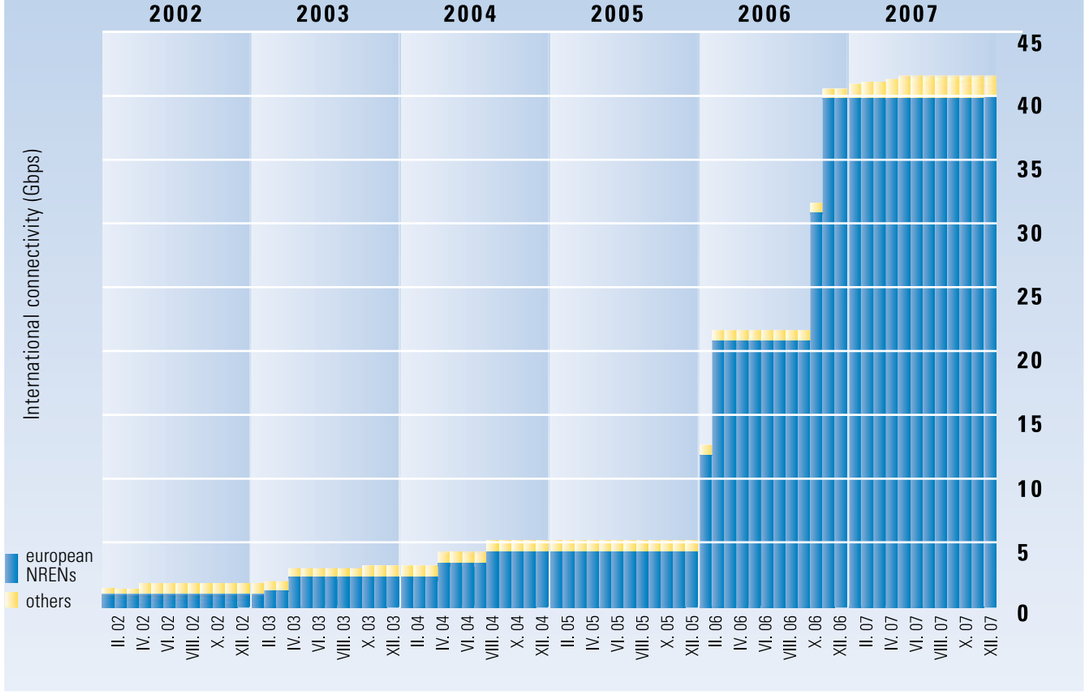


Fig. 2 International connectivity development since 2002

research

"We are transferring a demanding surgery of a unique eye defect. Ophthalmologists from any part of the planet can watch the progress of the surgery live. This gives them invaluable experience which they can use when treating their patients. This is yet another face of CESNET."

Jan Růžička, Collaborative Technology Researcher

The research activities relating to the development of the CESNET2 national research and education network are performed mainly within the implementation of the research plan *Optical National Research Network and Its New Applications*. The objective of the research plan is to design a prototype of a transparent integrated communication environment, meeting specific needs of the academic community, and to test its characteristics and viability within practical operation.

OPTICAL NATIONAL RESEARCH NETWORK AND ITS NEW APPLICATIONS RESEARCH PLAN

Considering the specific character of national research and education networks in general, it is necessary to actively participate in the research and development of advanced network technologies and applications in order to ensure continual development of the networks. This applies both to the national and the international level.

Research activities relating to the Czech NREN development are performed mainly within the implementation of the research plan *Optical National Research Network and Its New Applications.* This research plan, scheduled for 2004-2010, is to a large degree financed from the institutional support provided by the Ministry of Education, Youth and Sports of the Czech Republic.

The objective of the research plan is to design a prototype of a transparent integrated communication environment, meeting specific needs of the science and research community, and to test its characteristics and viability within practical operation.

The need to design a next-generation National Research and Education Network is based on experience with the operation of NREN, indicating that the sufficient bandwidth, considered a priority until recently, is just one of the requirements for NREN. To become a true (virtual) environment enabling cooperation of scientific teams, additional communication services need to be implemented as an extension of the high-speed infrastructure.

With respect to the great extent of the research plan – both from the professional perspective and the financial/HR perspective – –the research plan has been divided in 2007 into ten activities. Each activity has its coordinator who is responsible for defining priorities and objectives and their accomplishment. In 2007, two meetings of all entities involved in works on the research plan took place in order to give the geographically distributed teams a chance to mutually coordinate their progress, presenting results of their work.

Research Plan Activities in 2007

National Research and Education Network Development

This basic research plan activity is focused primarily on the development of the optical transfer infrastructure and its integration with the IP network layer, monitoring and provision of performance characteristics, and support for new functions and properties of this infrastructure, such as IPv6 unicast and multicast, creation of virtual private networks and private optical transfer channels. An integral part of this activity is the cooperation with the GÉANT2 network as well as other European national research networks to ensure interoperability, essential for the provision of advanced services in the international scope. Encompassing more than just the research and implementation of new technologies in the national research environment, this activity includes also all supportive activities needed to provide quality and stable services for other activities and users.

Optical Networks

The Optical Networks activity deals mainly with the research in the CEF (Customer Empowered Fibre Networks) implementation area, particularly with data transfer methods and transfer devices development. Other areas of interest include cooperation on the development of new applications utilizing GLIF (Global Lambda Integrated Facility). Research results are tested both under laboratory conditions and within extensive experimental and subsequently also production networks. For this purpose an optical laboratory is available for this activity in the Association's premises and for needs of experiments on the lowest OSI model layers that could eventually lead to a network functionality loss, there is a testbed (called CzechLight) being constructed within this activity that is connected to the worldwide experimental infrastructure GLIF.

Programmable Hardware

The objective of this activity is to develop specialized network devices based on programmable hardware, especially gate arrays. A great application potential for these devices lies in the network monitoring area, both for flow data monitoring and detecting security incidents. It is mainly the FlowMon probe for collecting statistic data on the network traffic that attracts the highest level of interest. The CESNET Association therefore decided to offer a non-exclusive license for completion, production and sale of these devices to private bodies. Based on our announcement from April 2007, two companies showed their interest and one of them eventually purchased the rights.

Network and Traffic Monitoring

The network monitoring area involves development of monitoring systems that collect, process and present information obtained primarily from active network elements (routers, switches etc.). We are trying to achieve a full-scale and continuous method of analyzing the status and trends of the network infrastructure behavior over the long term, providing not only a summary view of a set of relating quantities but also detailed information on specific parameters.

The cornerstone of the traffic monitoring is the development of tools for processing specific elementary information on the network operation (flow). Our objective is to provide information on the network as a whole. This leads to development of scalable distributed systems with rich classification and filtration mechanisms and intelligent data storage methods.

Network communication performance monitoring and optimization

Within this activity, we deal with the research the purpose of which is to find mechanisms to ensure the performance characteristics required for transferring data in large high-speed networks. We search for methods to monitor the performance characteristics of high-speed networks, aiming to acquire information on the network traffic character and the network behavior, used to identify problematic spots and bottlenecks. These activities are then followed by analyses of possibilities for ensuring the required performance parameters, including congestion management optimization proposals and testing of parallel communication potencies. To monitor the network and its characteristics we use an infrastructure of monitoring stations (illustrated in Fig. 3) providing comprehensive information about the network.

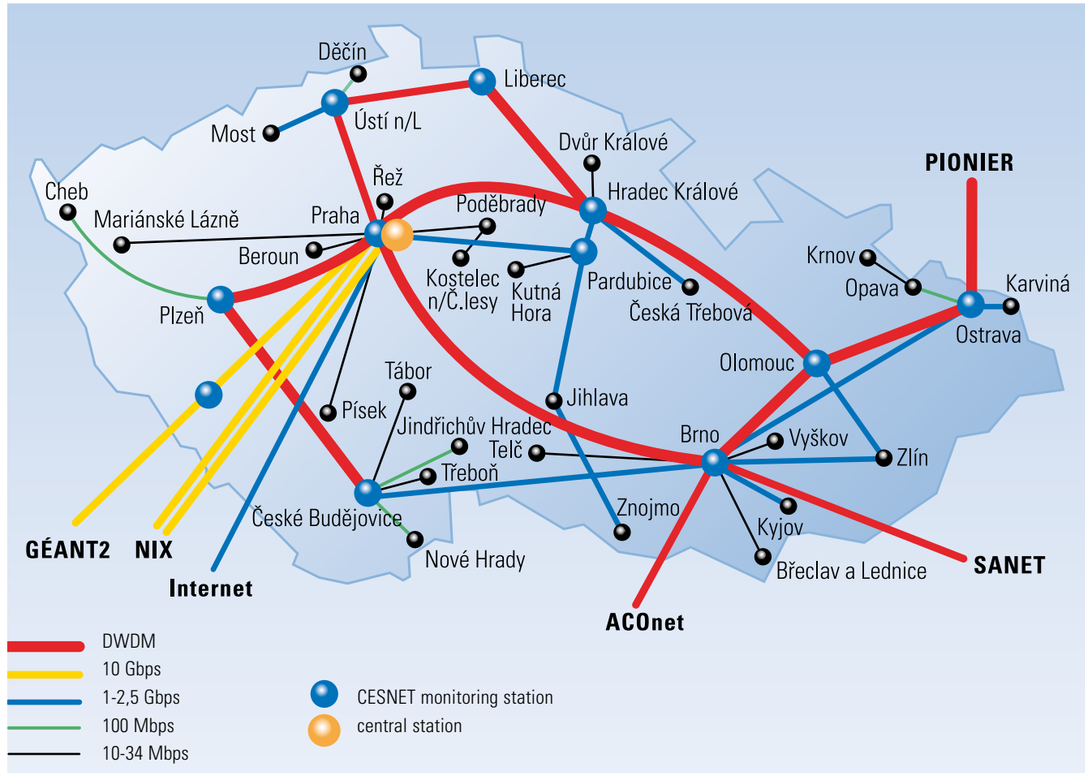


Fig. 3 Monitoring stations in the CESNET2 network

In 2007 we created two technical solutions that we decided to protect by registering a utility model or invention. These solutions are namely a connection ensuring a stable time basis in a computer and a modular programmable platform for high-speed hardware packet processing.

AAI and Mobility

The goal of the activity is the development and implementation of an "inter-domain" distributed infrastructure, providing authentication and authorization services to support cooperation of users registered in various home institutions. The basic requirement for the constructed infrastructure is its compatibility with similar solutions developed in European NRENs (TERENA, GN2) and on the worldwide level (Internet2, in particular). This activity includes implementation of roaming in computer networks within the eduroam international initiative, enabling mobility of participants also on the international level.

An important milestone of 2007 was the transfer of the eduroam academic roaming system to the standard operation mode. This system, allowing providing network connectivity within NRENs, proved to be working and useful for the academic community in the Czech Republic and abroad within its pilot stage. It is now provided as a standard service.

MetaCentrum

The task of MetaCentrum is to create a unified integrated environment for end-user applications using an intelligent interconnection of computing and data resources – a grid. Activities within MetaCentrum are closely coordinated with other activities within the research plan of the CESNET Association, mainly in the area of the security and management of access to resources, as well as international grid construction and development activities, especially the Association's intensive participation in the implementation of the pan-European EGEE II project. Research activities of MetaCentrum are focused on the distributed computing and data infrastructure monitoring area. In the last year we intensively worked on the MetaCentrum virtualization, which is the prerequisite for providing advanced services, such as interactive grid usage. The essential milestone is also the implementation of IPv6 as the basic communication protocol between MetaCentrum nodes and creation of a virtual private infrastructure on the L2 layer among these nodes. This infrastructure is shown in Fig. 4.

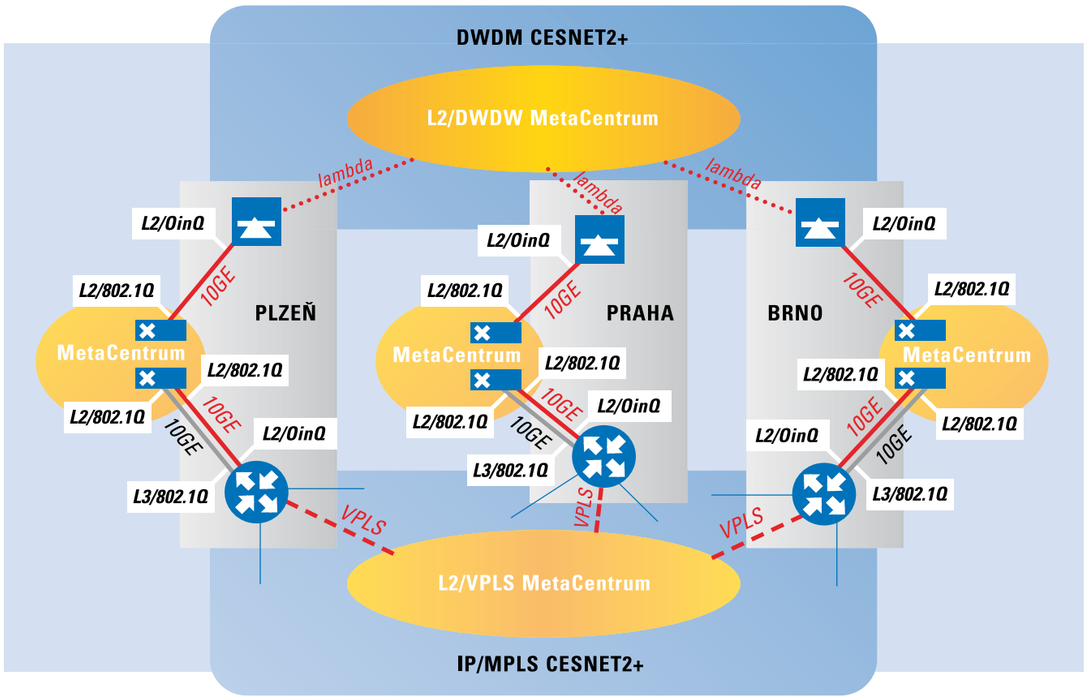


Fig. 4 VPLS MetaCentrum pilot implementation in CESNET2

Certificate of Accreditation

This certificate is granted by the Authority of the
Trusted Introducer for CSIRTs in Europe (TI) to certify that

CESNET-CERTS

has been registered as "TI Accredited CSIRT" since 27 January 2008.
Consult https://tiw.trusted-introducer.nl/ for team-specific information.

This certificate is valid from 27 January until 31 December 2008 (unless revoked).

TRUSTED Introducer

2008

TERENA

Don Stikvoort
TI Manager

Fig. 5 CESNET-CERTS accreditation

Multimedia Transmissions and Collaborative Environments

The objective of this activity is the research and development of communication technologies covering signaling protocols and relating infrastructures, transfer protocols for multimedia data, and sharing, storing and application utilization of this data type. This involves development of rich communication services (including voice, video, text and presentations) using signaling protocols (SIP, H.323, SS7) and services (MCU, ENUM) and their linkage with the surrounding environment. One of the specific goals is to provide support for implementation of communication systems at CESNET members and/or other institutions. All this with increasing security considerations. Another area is the research in the field of user-controlled elements to support multi-point synchronous communication. Development results are applied in the communication environment with Mbone tools; further development concentrates on elements supporting QoS. Concerning the video transfer, we deal with multi-point transfers of uncompressed HD and 4K video over long distances, using an infrastructure of active elements and possibly (in future) the optical multicast. We also examine psychological aspects of collaborative environments.

CESNET CSIRT

The objective of the CESNET CSIRT (Computer Security Incident Response Team) activity is to achieve a better internal organization level in the area of the security of the CESNET2 network and services running on this network. The preventive and active computer and network protection involves consistent and efficient handling of security incidents, including removal of their causes and effects. Our goal is to have the users and administrators of the CESNET2 network prepared for potential network security violations, furnished with functional procedures, rules and technical means to remove the problems that occurred as fast as possible. This area covers also the operation and development of the CESNET-CERTS team and tools used by this team. Within the process of building mutual trust between CSIRT teams the CESNET-CERTS underwent in 2007 successfully the accreditation process, which opens a way to important and useful information created and updated by member teams as well as closer cooperation with these teams.

Application Support

The objective of this activity is to search for applications requiring above-standard communication with high demands for data transfer parameters, such as unusual volume, transfer rate, response time or reliability, and/or requiring special transfer modes that cannot be achieved in the shared IP space. For these applications end-to-end routes and private and virtual networks on various levels will be created, ensuring the required parameters and the transfer quality needed. To provide an example, there are medical applications dealing with graphic data collected with modern scanning devices in hospitals (X-ray, MRI, CT) and applications from the field of physics processing data created in unique devices (electron microscopes, radiation detectors etc.). Data transfers connected with real-time 3D image modeling, virtual reality and high-resolution video are becoming more and more frequent in network applications.

Evaluation of Research Plan Results Achieved in 2007

The assessment of results of the *Optical National Research Network and its New Applications* research plan achieved in 2007 was carried out within a regular opposition procedure, prescribed by the Ministry of Education, Youth and Sports of the Czech Republic as the institutional support provider, on 6 February 2008.

According to the conclusions of the board of opponents, comprising top independent experts from the area of information and communication technologies, the research plan was implemented with a very high professional level in the assessed period, especially from the following reasons:

– the quality of the CESNET2 network achieved is excellent; many concepts applied in this environment are taken over by the international community

– the quality of other infrastructures developed or supported by the Association is very high and unique or fully competitive in the international scope; this applies mainly to computational, storage and collaborative infrastructures

– research and development results are provably taken over by the international community

– the plan implementation team is engaged in relevant international projects in the subject area, in particular the GN2 project and EGEE II project where Ing. Jan Gruntorád, CSc., CESNET Director, and doc. RNDr. Luděk Matyska, CSc., MetaCentrum team leader , are members of steering committees of those projects

– the implementation team is called to participate in preparations of new international projects and/or initiates new projects itself

– for the results achieved within the development of modular optical amplifiers CzechLight Amplifier, three members of the implementation team have been awarded a research price of the Minister of the Education, Youth and Sports.

The board of opponents found that the CESNET Association managed to maintain a high professional level of works on individual research plan tasks in 2007. For the upcoming stages the board of opponents recommends continuing in the transfer of results of various activities into practice, protecting these results with utility models and patents.

International Cooperation

GN2 Project

The CESNET Association has been actively participating in the construction of a European infrastructure interconnecting research and education networks (NREN) of individual European countries with high-speed links since 1996. From September 2004, this construction takes place within the Multi-Gigabit European Academic Network project (GN2). 32 organizations engaged in the area of high-speed research and education networks will be involved in works on the project. The goal of the project is to provide European research and education institutions with a communication environment until 2008, capable of meeting their requirements from ensuring mobility in the European Research Area (ERA) to providing reserved high-capacity connections between specific terminal devices.

Association is one of the entities participating in the formulation of objectives for the continuing project.

The basis for the aforementioned communication environment is the backbone network named GÉANT2 (see Fig.6). This network has been designed as a hybrid network since the very beginning, meaning that it supports – in addition to the basic IP communication – also creation of temporary special-purpose infrastructures (grids) or point-to-point connections, based both on virtual private networks (VPN) and reserved wavelengths (so-called lambda services).
Experts from the CESNET Association participate within this project in tasks from the following crucial areas:
– issues connected with QoS provision among end clients
– creation of tools for monitoring extensive high-capacity networks
– creation of tools and mechanisms needed to ensure security of the network
– creation of mechanisms for on-demand provision of reserved bandwidths or even reserved wavelengths (lambda services) for needs of short-term projects

ORIENT
A project for implementing a connection of the GN2 network with Chinese research and education networks (CERNET and CSTNET) named ORIENT was launched in October 2005. Besides CERNET, there are six more European NRENs involved in the project plus DANTE. The CESNET Association is investing its experience in the project, gained within monitoring of extensive networks.
More information: www.dante.net

Porta Optica Study
The aim of this project was to elaborate a study that will evaluate options for constructing networks based on dark fibres for needs of NRENs in the region of Eastern Europe, Baltic countries and South Caucasus countries. CESNET participated in particular in evaluation of information on possibilities for obtaining dark fibres needed to establish international interconnection of the target countries and preparation of draft solutions for this region. The project has been closed with a successful opposition

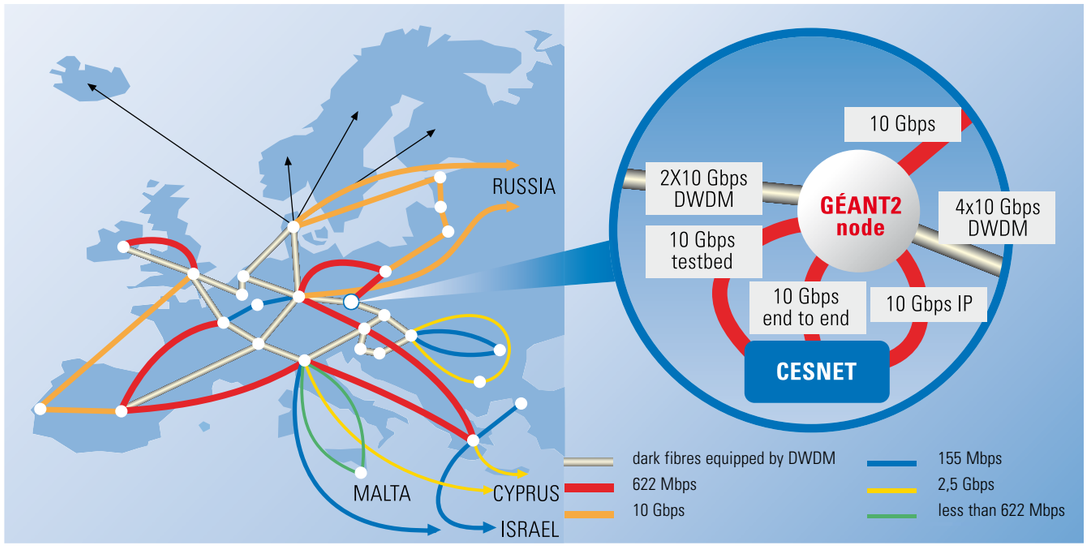


Fig. 6 GÉANT2 network topology at the end of 2007

– testing and application of the CBF (Cross-Border Fibre) concept for interconnections of neighboring NRENs via dark fibres
– development of a European video conferencing service
– development of an authentication and authorization infrastructure to support the user mobility
More information: www.geant2.net

in July 2007. The project results were used as a basis for the prepared project to implement a regional research and development network in the South Caucasus area and connect this network to GÉANT2 .
More information: www.porta-optica.org

Phosphorus
Starting with October 2006, we have been taking share in the construction of a global testbed (Europe-USA-Canada) for testing on-demand network services provision in a wide and heterogeneous (from the perspective of technologies in use and key element producers) network environment within an extensive international project named Phosphorus. The project includes development of middleware needed for smart allocation of network resources. This testbed topology is shown in Fig. 7.
More information: http://www.ist-phosphorus.eu/

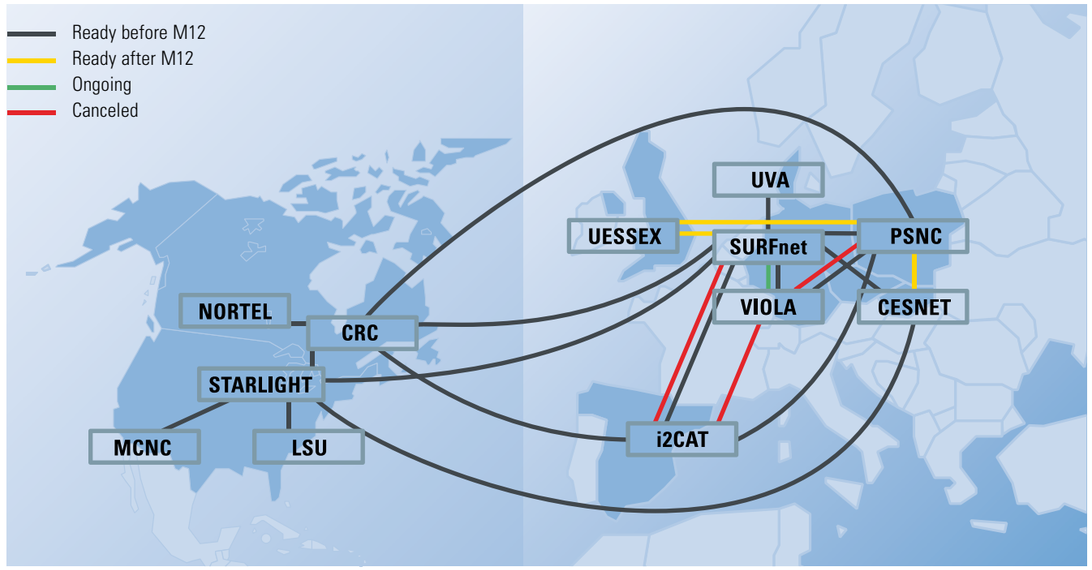


Fig. 7 Phosphorus project testbed topology

GLIF
Global Lambda Integrated Facility (GLIF) is an international research activity with participation of the most advanced institutions and consortia engaged in the network development and application in Europe, North and South America, Asia and Australia. Individual GLIF participants enable other participants to use certain resources so that collective experiments could be carried out.
This environment differs from common infrastructures by the fact that the resources of participants are used to build testbeds and perform experiments. Unlike networks, these resources are not intended for provision of permanent or long-term highly reliable services to participants but allow to perform tests creating the risk of interferences and destruction.
More information: www.glif.is

PlanetLab
The PlanetLab network plays an important role in the worldwide scope when testing new network applications with a global character. The importance of PlanetLab has a permanent nature; its virtual principles affected the development in the entire IP area and continue to be reflected in other similar projects. CESNET entered this consortium in the middle of 2006, making the PlanetLab network available for use of all its members' workplaces. CESNET currently has three nodes in this worldwide network, which are intensively used within the international cooperation. It is possible to monitor the traffic on our servers using the references available at ngi.cesnet.cz. Over 60 different applications from many foreign universities are continually processed here in a shared mode. Our servers can be seen as highly demanded nodes as their connectivity with the outer Internet is on an excellent level.

LOBSTER
The objective of the LOBSTER (Large Scale Monitoring of Broadband Internet Infrastructure) project was to create a distributed European infrastructure for passive Internet traffic monitoring. This project included development of applications to process data produced by the system, including data anonymization. This monitoring infrastructure enriched with suitable applications should contribute considerably to the increase in reliability and security of the Internet. The project was closed in June 2007; its results were successfully defended in October.
More information: www.ist-lobster.org

International Grid Projects
The international cooperation in the grid area is represented particularly by the Association's participation in the **EGEE II** project. The objective of the project, launched in 2006, is to create a stable grid infrastructure in Europe, with significant global impact. The grid is primarily build for the community of particle physicists. However, the EGEE II project also attempts to support other user communities, such as bioinformatics, medicine, computational chemistry, astronomy, astrophysics and more. The project consortium unites over 90 partners from Europe as well as Russia, USA, Korea or Taiwan, being coordinated by the European research center CERN. CESNET is one of the few partners that participate in research activities, in particular the middleware development for Logging and Bookkeeping and Job Provenance services. CESNET has a significant share also in the grid operation, managing the Central-European virtual organization. In addition, CESNET is responsible for the Grid Incident Response Team for the Central Europe.
More information: www.eu-egee.org and egee.cesnet.cz

Since the EGEE II project will be completed in 2008, 2007 was the year of intensive preparations of the draft of this project's successor – the **EGEE III** project. The expected implementation time of the EGEE III project is two years. The objective of the project is to extend, optimize and simplify (from the usage perspective) the existing grid infrastructure and keep it operational, while supporting users from various scientific communities. An essential step will be the shift from the grid management model based on individual research projects to a federative infrastructure the basis of which will be the national grid initiatives.
It is the need to better define the future development and operation of the European grid infrastructure that led to creation of the **EGI_DS** (European Grid Initiative Design Study) project, the task of which is to design a mutual cooperation concept for grid activities in individual countries, both on the organizational and the technical level, develop means to implement the cooperation and verify these means in practical operation.
More information: www.eu-egi.org

International Projects in the Medical Field
From April 2006, we are a part of a consortium of two projects from the human medicine area supported by the European Union – **EuroCareCF** and **Ithanet**. The goal of both projects is to create a virtual environment for cooperation and coordination of medical research teams within a large geographic area (the basis is the Mediterranean region), performing research in this area relating to the cystic fibrosis and thalassemia, respectively. We offer for these projects our videoconferencing and multimedia data sharing experience. Another project was added to this group in 2007 – **MedGeNet**, where we provide support for video information sharing again, this time for tele-consultations in genetics.
More information: www.eurocarecf.eu a www.ithanet.eu

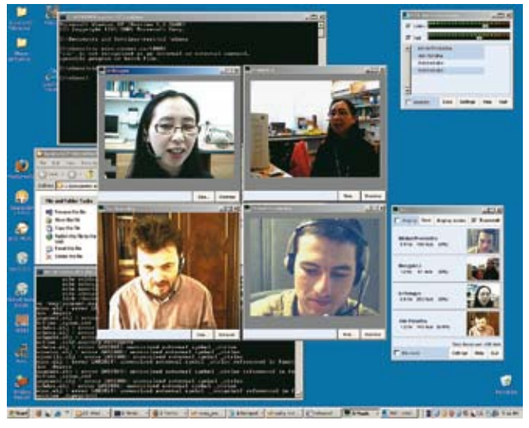


Fig. 8 Ithanet consortium video conference

Workgroups within the TERENA Association
In addition to international projects supported by EU, experts from the CESNET Association also actively participate in works of professional workgroups (Task Forces) organized by TERENA, an association of European NRENs (where CESNET is also a member). The following groups are concerned:
TF-CSIRT – coordination of network security incident handling
TF-ECS – issues bound to deployment of advanced remote cooperation technologies, especially voice and video transfers
TF-EMC² – middleware development platform
TF-LCPM – issues relating to management of the service portfolio provided by NRENs
TF-mobility – development of the *eduroam* roaming system
TF-PR – exchange of information relating to the presentation of national research networks
TF-VSS – works on resolution of the question whether it is purposeful to create a unified European videoconferencing infrastructure

National Research Projects
Within the project of **Efficient Processing of Medical Image Information**, the CESNET Association together with the Masaryk University and the Masaryk Institute for Oncology in Brno deal with:
– design, development and implementation of resources for integration in the area of acquisition, storage, transfers, and sharing of medical image information
– design of solutions to legislation issues relating to the topics in question
– security of sensitive patient data

The objective of the **MediGrid – Methods and Tools for Utilizing Grid Networks in the Biomedicine**, project, implemented collectively by the University Hospital in Motol, Masaryk Hospital in Ústí nad Labem and CESNET, is to create a pilot implementation of MediGrid – an environment and modular system of applications for distributed processing of data and computing tasks in the healthcare area.
The goal of the collective **Raman Fibre Amplifiers with Time-Multiplex Pumping** project of the CESNET Association and the Institute of Radio Engineering and Electronics of the Academy of Sciences of the Czech Republic is the theoretical analysis and experimental verification of properties of wide-band Raman fibre amplifiers with time multiplexing of pumping sources.

The CESNET Association is also an important partner in the project supported by the Ministry of Interior of the Czech Republic–**Cybernetic Threat Issues from the Perspective of Czech Security Interests.** Works on this project were initiated in the middle of 2007, with the objective to develop a model national CSIRT (Computer Security Incident Response Team) of the Czech Republic. Other partners of this project are the Faculty of Mathematics and Physics of the Charles University, Faculty of Philosophy of the Charles University and Faculty of Science of the Charles University, Faculty of Electrical Engineering of the Czech Technical University, Institute of Sociology of the Academy of Sciences of the Czech Republic and NESS Czech, s. r. o.

Development Fund
In 2007 the Fund Development Council announced two calls for new projects. For the first call, the following thematic groups were specified:
• Education support for Association member employees with the objective to obtain a globally recognized certificate in the IS/IT area
• Work and study stays of Association member employees at world's leading workplaces from the scope of activities of the Association

6 projects were submitted in total. All of them were accepted for co-financing, 2 of which needed some revision before.

Project Number	Project Executor	Project Title
214/2007	AV ČR	Oracle database training – Administrator Certified Associate
215/2007	VUT	Increase in professional qualification in the network security and IP telephony area
216/2007	ČVUT	Increase in qualification of the workers of the Computing and Information Center of ČVUT
217/2007	UK	Increase in qualification of the workers of the network department of the CIT PřF UK
218R1/2007	ZČU	Handling of security incidents in the computer network of the ZČU in Plzeň
219R1/2007	OU	Work stay focusing on efficient use of information and communication technologies in education

For the second call, the following thematic groups were specified in 2007:
• Utilization of services of the CESNET2 network and modern information and communication technologies within the tuition and education process, creative and scientific/research activities and management of public universities and the Academy of Sciences of the Czech Republic
• Advanced applications using the high-speed backbone network; development of new network protocols
• Support for utilization of the CESNET2 infrastructure for mutual cooperation of members using video conferencing tools
• Support for convergence of voice and data services
• Completion of wireless networks in connection with the *eduroam* project

12 of 40 projects submitted in this call were accepted for co-financing; 7 of them needed some revision before. 5 were accepted for implementation on the condition of lower financial resources.

Project Number	Project Executor	Project Title
220R1/2007	ČVUT	Video conferencing technology implementation in the internal and external communication of the managing units of the FEL ČVUT in Prague
222/2007	VUT	Securing the access of a 10Gbps computer network of the Technical University to the CESNET2 network
229/2007	UJEP	Staff video conferencing room UJEP
230/2007	ZČU	Development of intrusion detection systems for WEBnet
232/2007	ZČU	Integration of a video conferencing system to the routine operation of the university
234R1/2007	ZČU	Extension of the ConTextCZ application as a tool of support for education and research at the ZČU in Plzeň
236R1/2007	VŠB	Anomalous network traffic detection and security incident announcement
244/2007	AMU	SIP IP telephony development at AMU
251R1/2007	MU	IPv6 infrastructure at the MU (MUv6)
252/2007	MU	Support of communication among virtual work teams in the area of medical image data processing
253R1/2007	MU	Common Access Toolkit for Federations
254/2007	MU	Development of user-oriented collaborative environments

Note: Projects submitted in the thematic group E (eduroam) were not considered due to high overall financial requirements. A decision was made to announce a separate call with limiting conditions.

In 2007 two rounds of opposition for closed projects took place. 24 projects were successfully completed in total, of which 5 projects were presented by their implementers within the opposition procedure. Final reports for projects implemented within the CESNET Development Fund are available at the Association's website. Results of some projects were presented within the community of entities working on the CESNET's research plan, at professional seminars for CESNET members as well as at international conferences. The presentation of results included publication is specialized press.

forum

“I’m truly delighted that we could offer the top parameters of the CESNET2 network to perform the transfer of a lecture presented by such a prominent figure as Vint Cerf.”

Jan Gruntorád, Director of the CESNET Association, in connection with Vint Cerf’s lecture on the future of the Internet, presented at the Faculty of Electrical Engineering at the Czech Technical University in Prague.

At the beginning of the 1970s, Vint Cerf was one of the leaders of the team that developed TCP/IP protocol. This protocol is still the technological basis of the Internet, determining the format and method of data transfer through computer networks.

In 2007 the CESNET Association hosted several representative meetings of leading network experts from the entire world. In September, for instance, the Association organized the seventh year of the GLIF meeting – 7th Annual Global LambdaGrid Workshop; in April the Association participated in organization of the Prague visit of one of the spiritual fathers of the Internet – Vint Cerf.

Public Relations

The most significant event, as well as the most demanding one in terms of organization, hosted by the Association in 2007 was the seventh year of the meeting of the GLIF international organization – 7th Annual Global LambdaGrid Workshop, taking place on 17 and 18 September in premises of the Charles University in Prague. This event attracted 116 leading experts from 17 countries: in addition to guests from Europe, participants arrived also from Brazil, China, Canada, Japan, South Korea, USA, Australia and Taiwan. Within the two-day meeting participants could watch several demonstrations of the GLIF infrastructure utilization. Attractive demos included transfer of high-quality video in the 4K format with more than four times the resolution of HDTV and quality matching the 35mm film. The first demo showed that the GLIF infrastructure will allow to transfer such video from many parts of the world. Transfer to two localities in Prague (Karolinum and Barrandov) was carried out from Seattle, Chicago and San Diego in USA, Tokyo in Japan, and Amsterdam in Netherlands.

In 2007 the Association hosted four meetings of work groups of the TERENA international organization. The work groups meeting in Prague were the work group acting as a platform for cooperation and mutual coordination in the middleware area (TF-EMC^2), work group dealing with voice services and video conferencing issues (TF-ECS), work group coordinating unified procedures for reporting and handling security incidents (TF-CSIRT), and the group whose members are responsible for the area of external relations within individual European NRENs (TF-PR). This was the fourth time when the Association organized a meeting of representatives of research networks from the entire world at the CEF (Customer Empowered Fibre) Networks Workshop, giving them a chance to exchange experience with CEF design and operation. For the first time, however, Prague hosted a workshop of the REFEDS (Research and Education FEDerationS) group, where 30 top experts in the authentication sphere from 23 countries of the world met. The key topic of this workshop were issues of policies applied within federations and among federations. In the conclusion of the year the Association hosted the work group of the NA2 EGEE II activity, the primary objective of which is to spread information on the EGEE II international project.

The Association kept on its tradition of seminars intended for the domestic professional public in 2007 – seminars revolving around the topics of IP telephony and network and services security.

The public were informed about the events with press releases and news at the Association's website.

From the perspective of the external presentation of the Association, those events where Association's experts appear in mass media are important. In connection with the visit of Vint Cerf in Prague the Association Director was interviewed by Česká televize (Czech Television) on the channel ČT24. The interview video record is available at the website of the Association, along with records of Association's experts appearing on the channels ČT1, Nova and ČT24 in relation with the 15th anniversary of the Internet in the Czech Republic.

In 2007 the Association became a partner of two important events. For the 68th international IETF (Internet Engineering Task Force) meeting the Association provided a gigabit Internet connection and for the nation-wide academic Week of Science and Technology the Association took care of transfer and recording of selected lectures, including lectures of the Association's own experts.

The Association continued releasing its internal newsletter Datagram in 2007. In addition, this was the first year when a collection of selected technical reports was published under the name Networking Studies 2007. Datagram as well as the collection were distributed in printing; however, both materials are available also as .pdf at the Association's website.

The Association takes advantage of feedback in the form of regular media monitoring. Monthly analyses focusing mainly on articles in the public press confirm stable richness of media outputs, including the biggest mass medium – TV – in 2007, again.

awards

"In discussions with conference participants, even abroad, I find more and more frequently that among the professional public the research and education networking as well as optical networking in the Czech Republic is connected with the name CESNET."

Josef Vojtěch, Optical Networking Researcher

The high reputation CESNET built with its research and scientific results is evidenced by the fact that Association's representatives are appointed to management positions of the current most advanced international networking projects or awarded by prominent institutions.

Association Director in the GN2 Project Steering Committee

The Director of the CESNET Association, Ing. Jan Gruntorád, CSc., was elected in October 2007 for another three-year function period to the steering committee of the most important European networking project – GN2. The task of the five-member steering committee is to ensure operation management of the entire project, the objective of which is to build a pan-European scientific and research network of the next generation. This network enables researchers to transfer high data volumes in short time intervals, take advantage of advanced network applications such as computing grids or end-to-end services, and cooperate on shared projects in the real time. 34 countries are involved in works on the project and the GN2 network interconnects 30 NRENs from the entire Europe.

MetaCentrum Project Leader the Chairman of the EGEE II Steering Committee

The leader of MetaCentrum Project which represents grid activities of the CESNET Association, doc. RNDr. Luděk Matyska, CSc. from the Institute of Computing Equipment and the Faculty of Informatics of the Masaryk University in Brno performed the function of the chairman of the steering committee (Project Management Board) of the international project of the pan-European grid infrastructure, EGEE II. Luděk Matyska operates in the committee as a representative of the Central-European Federation, uniting in addition to the Czech Republic also Austria, Poland, Slovakia, Hungary, Slovenia and from the middle of the year also Croatia. He has been performing the function until February 2007 when the post was taken over by prof. Manuel Delfino from Spain.

Research Award of the Ministry of Education for Association's Experts

In November 2007 representatives of the CESNET Association – Ing. Jan Radil, Ph. D. and Ing. Josef Vojtěch – together with Ing. Miroslav Karásek, DrSc. from the Institute of Photonics and Electronics of the Academy of Sciences of the Czech Republic received a research award of the Ministry of Education, Youth and Sports. They were awarded for utilizing optical fibre amplifiers in the Czech national research and education network. The nomination came from the Director of the Institute of Photonics and Electronics of the Academy of Sciences of the Czech Republic, Ing. Vlastimil Matějec, CSc.

Ing. Miroslav Karásek, DrSc., Ing. Jan Radil, Ph. D., and Ing. Josef Vojtěch developed a unique modular construction kit of an optical amplifier – CzechLight Amplifier (CLA) – removing drawbacks of active opto-electronic elements used in optical transfer networks, such as optical fibre amplifiers or Raman amplifiers. Several foreign partners of the Association have already demonstrated their interest in CLA devices.

finance

Economic Results

2007 Economic Results

Activities of the CESNET Association are divided into two categories – Main Activities and Economic Activities, in compliance with the Association's statutes.

Main Activities

The most important share of the Main Activities in 2007 was the implementation of the *Optical National Research Network and Its New Applications* research plan, launched on 1 January 2004. The Ministry of Education, Youth and Sports of the Czech Republic provided its institutional support (operation subsidies) for this research plan, amounting to 57 % of all yields from the Main Activities in 2007. This support was fully utilized.

Within its Main Activities, the Association continued in developing the CESNET2 national research and education network, providing services to the Association members utilizing the CESNET2 network, and providing services to other entities meeting conditions required to be connected to this network. In addition the Association cooperated on implementation of international research projects of the 6th EU Framework Program and 7th EU Framework Program, grants of the Academy of Sciences of the Czech Republic, Ministry of Interior, and projects of the Development Fund Council.

The Main Activities of the Association ended in 2007 with a book loss of 10,655,000 CZK. Yields from the Main Activities of the Association in 2007 amounted to 318,313,000 CZK; costs for the Main Activities reached 328,968,000 CZK.

The basis of the income tax from the yields of Economic Activities of the Association in 2007 was positive, amounting to 8,643,000 CZK.

Economic Activities

The Economic Activities of the Association in 2007 involved mainly management of the largely bond-based portfolio of the Development Fund comprising financial resources obtained by sale of the commercial part of the CESNET network in 2000 and management of financial resources in other funds.

The Economic Activities of the Association ended in 2007 with a book loss of 10,998,000 CZK. The Economic Activities of the Association yielded 301,048,000 CZK in 2007; costs for the Economic Activities reached 290,050,000 CZK.

The basis of the income tax from the yields of Economic Activities of the Association in 2007 was positive, amounting to 11,323,000 CZK.

Total Book and Tax Economic Result

The total book economic result of the CESNET Association reported in 2007 was the profit amounting to 343,000 CZK.

The basis of the income tax after deducting the loss from previous years amounts to zero; the Association will not pay any income tax in 2007.

Conclusion

The Association properly managed the entrusted resources in 2007, meeting all its obligations resulting from the legislation, decisions of the Ministry of Education, Youth and Sports of the Czech Republic and concluded contracts. The financial statement for 2007 was verified by the auditor without any remarks.

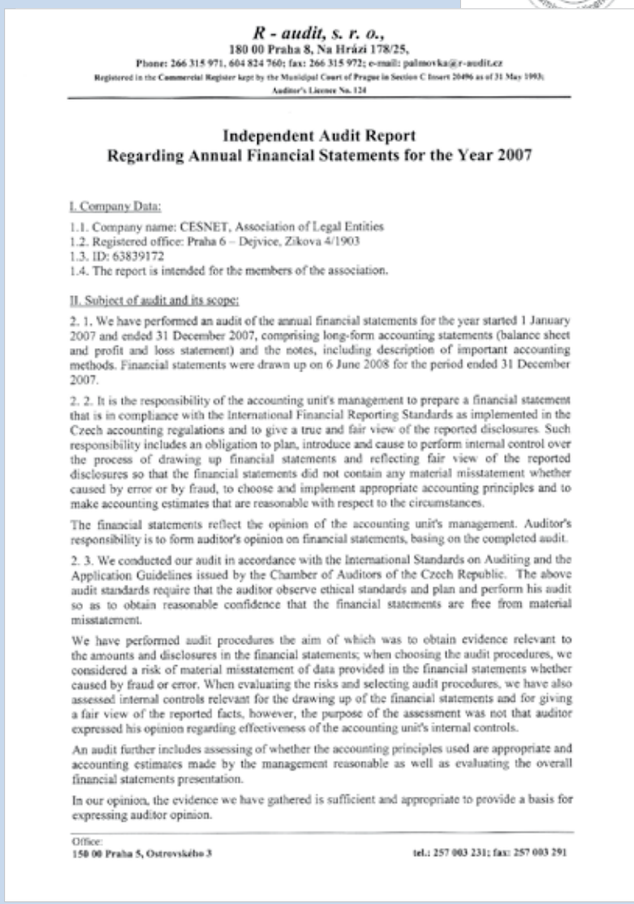
Balance Sheet in Thousands of CZK

Index	2007	2006	2005	2004
Assets total	**734 438**	**741 539**	**711 008**	**683 135**
Fixed assets	535 043	410 531	386 821	370 877
Intangible fixed assets	3949	4952	6045	6613
Tangible fixed assets	220 715	217 591	200 907	170 529
Financial investments	310 379	187 988	179 869	193 735
Current assets	199 395	331 008	324 187	312 258
Supplies	504	0	0	0
Receivables	35 139	32 115	43 746	54 550
Current liquid assets	128 070	264 249	251 854	230 966
Other assets	35 682	34 644	28 587	26 742
Liabilities total	**734 438**	**741 539**	**711 008**	**683 135**
Own resources	686 467	699 578	665 219	652 920
Funds	524 413	660 115	587 091	574 006
Economic result	343	-25 704	13 982	-24 104
Undivided profit from last years	161 711	65 167	64 146	103 018
External resources	47 971	41 961	45 789	30 215
Obligations	46 315	38 884	45 274	30 109
Loans	0	0	0	0
Other liabilities	1656	3077	515	106

Profit and Loss Statement in Thousands of CZK

Index	2007	2006	2005	2004
Earnings for the sale of goods	23	730	36	113
Earnings of own products and services	99 567	101 611	104 568	106 585
Current liquid assets revenues	16 988	16 915	9937	27 986
Other revenue	319 955	54 125	52 196	33 736
Received membership fees	0	0	0	0
Operation subsides	182 828	195 963	229 897	200 524
Revenue total	**619 361**	**369 344**	**396 634**	**368 944**
Purchase price of sold goods	19	711	38	104
Material and energy consumption	15 244	23 545	25 384	13 753
Purchased services	171 417	184 016	209 900	187 972
Personnel costs	93 038	89 016	74 950	61 567
Depreciation and amortization of intangible and tangible fixed assets	46 065	54 297	44 929	50 855
Other costs	293 235	43 463	27 451	78 797
Income tax – assessment for the current year	0	0	0	0
Costs total	**619 018**	**395 048**	**382 652**	**393 048**
Economic result (revenue – costs)	**343**	**-25 704**	**13 982**	**-24 104**

AUDITOR'S REPORT



R - audit, s. r. o.,
180 00 Praha 8, Na Hrázi 178/25,
Phone: 266 315 971, 604 824 760; fax: 266 315 972; e-mail: palmovka@r-audit.cz
Registered in the Commercial Register kept by the Municipal Court of Prague in Section C Insert 20496 as of 31 May 1993;
Auditor's Licence No. 124

Independent Audit Report
Regarding Annual Financial Statements for the Year 2007

I. Company Data:

1.1. Company name: CESNET, Association of Legal Entities
1.2. Registered office: Praha 6 – Dejvice, Zikova 4/1903
1.3. ID: 63839172
1.4. The report is intended for the members of the association.

II. Subject of audit and its scope:

2. 1. We have performed an audit of the annual financial statements for the year started 1 January 2007 and ended 31 December 2007, comprising long-form accounting statements (balance sheet and profit and loss statement) and the notes, including description of important accounting methods. Financial statements were drawn up on 6 June 2008 for the period ended 31 December 2007.

2. 2. It is the responsibility of the accounting unit's management to prepare a financial statement that is in compliance with the International Financial Reporting Standards as implemented in the Czech accounting regulations and to give a true and fair view of the reported disclosures. Such responsibility includes an obligation to plan, introduce and cause to perform internal control over the process of drawing up financial statements and reflecting fair view of the reported disclosures so that the financial statements did not contain any material misstatement whether caused by error or by fraud, to choose and implement appropriate accounting principles and to make accounting estimates that are reasonable with respect to the circumstances.

The financial statements reflect the opinion of the accounting unit's management. Auditor's responsibility is to form auditor's opinion on financial statements, basing on the completed audit.

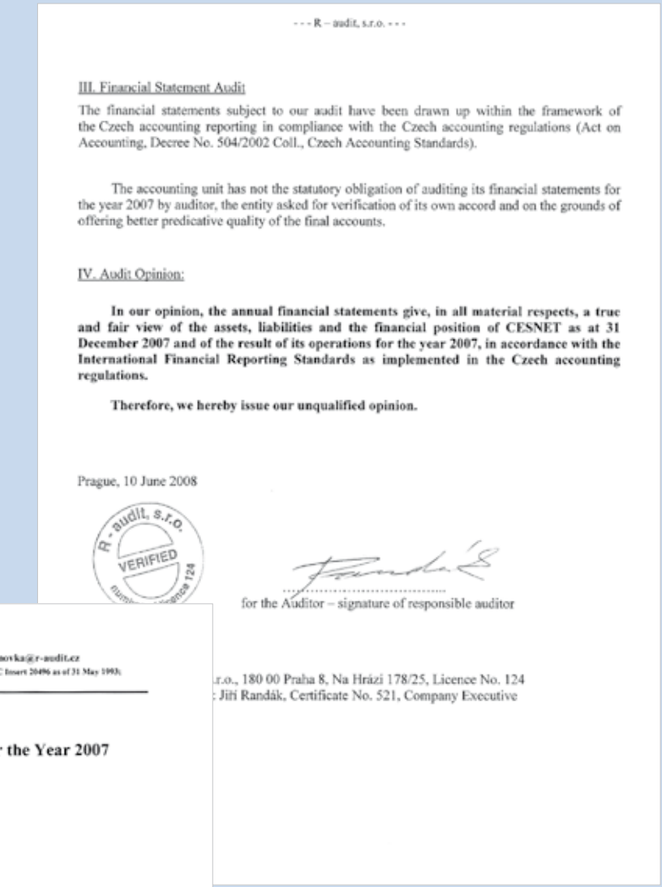
2. 3. We conducted our audit in accordance with the International Standards on Auditing and the Application Guidelines issued by the Chamber of Auditors of the Czech Republic. The above audit standards require that the auditor observe ethical standards and plan and perform his audit so as to obtain reasonable confidence that the financial statements are free from material misstatement.

We have performed audit procedures the aim of which was to obtain evidence relevant to the amounts and disclosures in the financial statements; when choosing the audit procedures, we considered a risk of material misstatement of data provided in the financial statements whether caused by fraud or error. When evaluating the risks and selecting audit procedures, we have also assessed internal controls relevant for the drawing up of the financial statements and for giving a fair view of the reported facts, however, the purpose of the assessment was not that auditor expressed his opinion regarding effectiveness of the accounting unit's internal controls.

An audit further includes assessing of whether the accounting principles used are appropriate and accounting estimates made by the management reasonable as well as evaluating the overall financial statements presentation.

In our opinion, the evidence we have gathered is sufficient and appropriate to provide a basis for expressing auditor opinion.

Office:
150 00 Praha 5, Ostrovského 3 **tel.: 257 003 231; fax: 257 003 291**



– R – audit, s.r.o. –

III. Financial Statement Audit

The financial statements subject to our audit have been drawn up within the framework of the Czech accounting reporting in compliance with the Czech accounting regulations (Act on Accounting, Decree No. 504/2002 Coll., Czech Accounting Standards).

The accounting unit has not the statutory obligation of auditing its financial statements for the year 2007 by auditor, the entity asked for verification of its own accord and on the grounds of offering better predicative quality of the final accounts.

IV. Audit Opinion:

In our opinion, the annual financial statements give, in all material respects, a true and fair view of the assets, liabilities and the financial position of CESNET as at 31 December 2007 and of the result of its operations for the year 2007, in accordance with the International Financial Reporting Standards as implemented in the Czech accounting regulations.

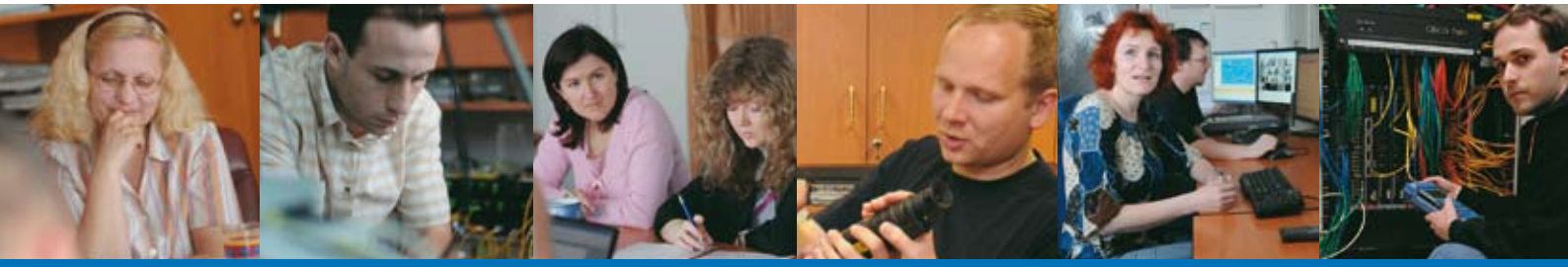
Therefore, we hereby issue our unqualified opinion.

Prague, 10 June 2008

R - audit, s.r.o. VERIFIED

for the Auditor – signature of responsible auditor

...r.o., 180 00 Praha 8, Na Hrázi 178/25, Licence No. 124
...: Jiří Randák, Certificate No. 521, Company Executive



WWW.CESNET.CZ