CESNET / annual report

2014

CESNET

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A Message
from the Director

Ing. Jan Gruntorád, CSc.

[Director and Member of the Board
of Directors, CESNET]

An international expert panel constituted by the Ministry of Education, Youth and Sports of the Czech Republic has awarded the national CESNET e-infrastructure with the highest rating.

You have in your hands the CESNET Association Annual Report for 2014. It was a very important year. It saw decisions on whether CESNET would continue to play a key role in developing a modern information society in the Czech Republic.

The decisive factor for further development was the assessment performed by the Ministry of Education, Youth and Sports of the Czech Republic on the national CESNET e-infrastructure as part of detailed scrutiny of large domestic research infrastructures. The objective of the analysis was to draw up a list of those infrastructures whose development and operation would be funded from public funds designated for providing support to research infrastructures in the period 2016-2022. For the CESNET association, being a non-profit organisation, the government funding support is still irreplaceable.

In its two-round assessment, the international panel examined various parameters, such as the size of the user community, the portfolio and quality of services provided, the importance of the infrastructure for research and innovation in the Czech Republic, involvement in international

structures, and the research potential. The assessment also included a comparison with similar infrastructures abroad. The information sources submitted included a framework plan for the research infrastructure development until 2022. The CESNET e-infrastructure was given the highest rating in both the rounds, which confirms its quality and cardinal importance for research, development and education in the entire country. It is excellent news for the association's staff, members and all the national academic community. The assessment results confirm that the Czech government continues to see the CESNET association as an institute that leads progressive development in network communications, and the national e-infrastructure as a strategic tool for improving the competitiveness of Czech science, research and education system. I would therefore like to thank my colleagues in the association and all our partners with whom we work on the tasks for their commitment and erudition, without which we could never play our part and expect to receive such a recognition from domestic and international experts.

The Annual Report recapitulates all the significant activities that we pursued in the last year. The majority of them were implemented as part of the CESNET Large Infrastructure strategic project, with which we have been charged by the Ministry of Education and which will be accomplished in the course

of 2015. The list of these activities is imposing and comprises the entire range of tasks, many of them absolutely unique. The important thing is that our achievements do not end up "in a drawer" but find a response domestically and abroad and, most importantly, market application.

To give just one example: In collaboration with INVEA-TECH and as part of the Alfa Programme of the Technology Agency of the Czech Republic, we launched a new generation of acceleration adapters supporting the 40G and 100G Ethernet technologies. Devices built upon these adapters efficiently handle network traffic using hardware acceleration even in the latest high-speed networks. Their advanced features for network traffic filtering, monitoring and generation offer applicability in a wide range of uses.

As you will also read, we achieved a remarkable recognition in last year's prestigious Innovation of the Year 2014 competition, organised by the Association of Innovative Entrepreneurship CR. We acquired five patents in the course of the year: one domestically, one in the European Union, and three in the United States of America. This too proves the quality and uniqueness of our solutions. We presented many of them successfully on both domestic and international forums. The international overlap of our activities is important for the retention of the European and global renown that the Association has built up.

We are involved in implementation of the key pan-European GÉANT

I would therefore like to thank my colleagues in the association and all our partners with whom we work on the tasks for their commitment and erudition.

project. In 2014, we were the only entity in the Czech Republic actively involved in the research project Future Internet – Public Private Partnership. It aims to establish a large European experimental and development infrastructure (an 'Extra Large Testbed'), which would reflect the latest networking and application trends. The infrastructure should be the primary testing element for outcomes from Future Internet projects, e.g., in the areas of smart cities, transport and logistics, agriculture, energy and mobility. The list can go on and on. I am sure that we will be able in the coming years as well to present a similarly extensive overview of achievements that benefit the country's research and development and, through them, the whole Czech society. This would not have been possible without the contributions of the association members and the funding and institutional support of the Ministry of Education, Youth and Sports of the Czech Republic.

I am very grateful to them for that.

CESNET
Association

The aim of the Association's key project
is to build a so-called large infrastructure
nnecessary for involvement of the Czech Republic
in the European Research Area

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The Association's history and current tasks

The Association was founded in 1996 by public universities and the Academy of Sciences of the Czech Republic (ASCR). Its main objectives are:

— operation and development of the backbone network that connects its members' networks
— research and development of advanced network technologies and applications and dissemination of this knowledge
— development of the CESNET e-infrastructure designed for research and education

After its establishment, the Association also operated as a commercial Internet provider, with the aim of gaining sufficient resources from these activities for its main activity. It succeeded in gaining the position of one of the most important entities on the Internet connection market in the Czech Republic. The Association discontinued that activity in 2000, chiefly for economic and legislative reasons. Since then, the Association has been engaged exclusively in the development and operation of the science, research and education backbone network (NREN, National Research and Education Network of the Czech Republic) and related activities.

In 2011, the Association received two crucial decisions of the Ministry of Education, Youth and Sports of the Czech Republic on funding for two large projects. The first of them is the **CESNET Large Infrastructure** project, with the implementation period of 2011–2015. The objective of the project is to upgrade the CESNET2 national research network to a large infrastructure that will comprise all the information and communications e-infrastructures necessary for the involvement of the Czech Republic in the European Research Area and allow, among other things, the connection to other e-infrastructures described in the ESFRI Roadmap. The other project, cardinal for the Association's work, was the Extension of the National R&D Information Infrastructure in Regions (abbreviated to **eIGeR**), the main objective of which was to build a regional foundation for the comprehensive national research and development e-infrastructure in the Czech Republic. The project was implemented between May 2011 and October 2013. In accordance with the grant decision, the Association is bound to provide sustainability of the project until at least the end of 2018.

The Association Objectives and Scope of Activities

The main scope of activities of the Association is as follows:

1. to conduct research and development in the area of information and communication technologies and their applications;

2. to provide and arrange the provision of education services of research and development type, using the high-speed national research and education network;

3. to ensure for its members and the allowance organizations that they have established the development and operation of a computer network interconnecting their networks with metropolitan networks; the creation of collectively used technical, communication and software resources and information services; the testing of new applications; the cooperation and complementarity of the members' activities at a level comparable to leading education and research networks abroad (including Internet access);

4. to secure and provide, in cooperation with its members, the long-term development, acquisition and deployment of high quality communication and information technologies based on the Internet and other advanced systems;

5. to support, against the reimbursement of related expenses, propagation of erudition, culture and knowledge, cooperation of members with industry, expansion of the latest information technologies deployment, and quality improvement of the network by recruiting additional participants, information sources and services.

The Association performs and provides its activities within the scope of received subsidies and partial compensation of expenses related to these activities. It is not the Association's objective to generate any profit on these activities.

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 services are not provided on a publicly available basis.

The Association provides CESNET e-infrastructure services not only for its members, but also for selected entities that comply with the rules for accessing the e-infrastructure.

Any loss incurred in connection with the Association's economic/business activities is settled by the end of each fiscal year; 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 research and development.

Membership
in International and National Organizations

The CESNET Association is a member of important international and national organizations.

International Organizations

TERENA (Trans-European Research and Education Networking Association) – a society established in 1994 by merging EARN (European Academic and Research Network) and RARE (Réseaux Associés pour la Recherche Européenne); served the development of telecommunications infrastructure for education and scientific institutions in Europe; ceased to exist in the autumn of 2014 in a merger with DANTE.

DANTE (Delivery of Advanced Network Technology to Europe Ltd.) – a non-profit organisation focused on building and improving IP connectivity for European countries' academic institutions; ceased to exist in the autumn of 2014 in a merger with TERENA.

GÉANT Association – an organisation established based on the European Commission's recommendation in the autumn of 2014 by a merger of TERENA and DANTE; it continues the activities of both the former entities and coordinates the project GÉANT – GN4.

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

GLIF (Global Lambda Integrated Facility) – global experimental network activities, focusing on the support for development of the most demanding scientific and research applications; their main objective is to create a network to serve applications with extreme transmission requirements.

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

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

EGI.eu – organisation aimed at co-ordinating European computing grids used for scientific calculations and on supporting their sustainable development.

National Organizations

NIX.CZ – CESNET is one of the founding members of NIX. CZ, Association of Legal Entities (Neutral Internet Exchange), an association of Internet service providers in the Czech Republic, allowing mutual connectivity among its members'networks; the association had 70 members as of 31 December 2014

CZ.NIC – the Association is also one of the founding members of CZ.NIC, Association of Legal Entities, which administers the .cz domain, and supports publicly beneficial projects and activities related with the Internet; the association had 113 members as of 31 December 2014

Association
Members

The following institutions were members of the Association in 2014:

— Charles University in Prague

— Palacký University in Olomouc

— Czech Technical University in Prague

— VŠB – Technical University of Ostrava

— Academy of Arts, Architecture and Design in Prague

— Academy of Fine Arts in Prague

— Brno University of Technology

— University of Veterinary and Pharmaceutical Sciences in Brno

— Masaryk University

— Mendel University in Brno

— Academy of Performing Arts in Prague

— Janáček Academy of Music and Performing Arts in Brno

— University of Pardubice

— The Institute of Chemical Technology in Prague

— Czech University of Agriculture in Prague

— Technical University of Liberec

— University of Economics, Prague

— University of Hradec Králové

— University of South Bohemia in České Budějovice

— University of Ostrava

— Silesian University in Opava

— Jana Evangelista Purkyně University in Ústí nad Labem

— University of West Bohemia in Pilsen

— Academy of Sciences of the Czech Republic

— Tomáš Baťa University in Zlín

— University of Defence

— Police Academy of the Czech Republic in Prague

Internal
Organisational
Structure

CESNET has the following bodies:

— General Assembly
— Board of Directors
— Supervisory Board

General Assembly

THE BOARD OF DIRECTORS WORKED IN THE FOLLOWING COMPOSITION UNTIL 5 JUNE 2014:

— 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 held the office of the **Chairman**, and RNDr. Václav Račanský, CSc., and Prof. Ing. Miroslav Tůma, CSc., were **Vice-Chairmen**. As of 5 June 2014, the existing Chairman Ing. Josef Kubíček resigned from his office of Chairman of the Board of Directors due to being elected to the presidium of the Supreme Audit Office. Until the regular election for the new Board of Directors, held during the 37th General Assembly on 3 July 2014, the Board worked in a six-person configuration; the two Vice-Chairmen assumed the Chairman's duties.

BASED ON THE ELECTION HELD DURING THE 37TH GENERAL ASSEMBLY ON 3 JULY 2014, THE BOARD OF DIRECTORS

WORKED IN THE FOLLOWING COMPOSITION UNTIL THE END OF THE YEAR:

— RNDr. Igor Čermák, CSc.
— RNDr. Alexander Černý
— Ing. Jan Gruntorád, CSc.
— Mgr. František Potužník
— doc. RNDr. Václav Račanský, CSc.
— doc. RNDr. Pavel Satrapa, Ph.D.
— prof. Ing. Miroslav Tůma, CSc.

Prof. Ing. Miroslav Tůma, CSc., was elected by the Board of Directors as the **Chairman**; Doc. RNDr. Václav Račanský, CSc., and Mgr. František Potužník were chosen as the **Vice-Chairmen**.

Board of Directors

THE SUPERVISORY BOARD CONSISTED OF THE FOLLOWING MEMBERS UNTIL 2 JULY 2014:

—— Ing. Jaromír Marušinec, Ph. D., MBA
—— Mgr. František Potužník
—— Mgr. Eva Šmídová
—— Prof. Ing. Ivo Vondrák, CSc.
—— RNDr. František Zedník

Ing. Jaromír Marušinec, Ph.D., MBA, was the **Chairman of the Supervisory Board**.

As of 2 July 2014 Prof. Ing. Ivo Vondrák, CSc., and Mgr. František Potužník resigned from their office as members of the Supervisory Board, both because they ran for the Board of Directors. The Supervisory Board therefore continues to work in a three-person setup. Prof. Ing. Ivo Vondrák, CSc., was not elected a member of the Board of Directors, and was then co-opted as a member of the Supervisory Board in compliance with the Association Statutes on 2 October 2014. Subsequently, RNDr. Josef Milota was co-opted as a member of the Supervisory Board on 16 October 2014. The co-option of both the members was confirmed by the 38th General Assembly held on 18 December 2014.

THEREFORE, THE SUPERVISORY BOARD WORKED IN THE FOLLOWING COMPOSITION UNTIL THE END OF THE YEAR:

—— Ing. Jaromír Marušinec, Ph.D., MBA
—— RNDr. Josef Milota
—— Mgr. Eva Šmídová
—— Prof. Ing. Ivo Vondrák, CSc.
—— RNDr. František Zedník

Ing. Jaromír Marušinec, Ph.D., MBA continued to function as the **Chairman of the Supervisory Board**.

Ing. Jan Gruntorád, CSc. was the **Director** of the Association in 2014.

Supervisory Board

THE DEVELOPMENT FUND BOARD WORKED IN THE FOLLOWING COMPOSITION UNTIL 22 MAY 2014:

—— RNDr. Igor Čermák, CSc.
—— Ing. Miroslav Indra, CSc.
—— Prof. Ing. Pavel Jura, CSc.
—— Ing. Olga Klápšťová
—— doc. RNDr. Antonín Kučera, CSc.
—— Prof. Dr. Ing. Zdeněk Kůs
—— Prof. RNDr. Jan Slovák, DrSc.

RNDr. Igor Čermák, CSc., was the **Chairman of the Development Fund Board**. Ing. Olga Klápšťová was the **Vice-Chairwoman**.

RNDr. Igor ČERMÁK, CSc., resigned from his office of member of the Development Fund Board as of 22 May 2014, due to running for the Board of Directors. The Development Fund Board worked in a six-person configuration until the end of the year. The Board elected Ing. Olga Klápšťová as its new **Chairwoman**, and Ing. Michal Sláma as the **Vice-Chairman**.

Organisation chart

Following discussion with the Board of Directors, the organisational chart was approved by the Association Director on 8 April 2014 and entered into force on 1 May 2014. The Association had 134.3 converted full-time employees in 2014. The Association's basic organisational structure comprises departments, which may be aggregated into sections. Management within this structure is performed by so-called line managers.

General Assembly

Organisational chart of the Association in 2014

Internal Audit and Controlling Department

Board of Directors

Supervisory Board

Secretariat, HR tasks

Association Director

Deputy for e-Infrastructure

Deputy for Research, Development and Innovations

R&D project managers

Deputy for Finance and Administration

Managers of CESNET LI and eIGeR infrastructure projects

Network e-Infrastructure Department

Optical Networks Department

Network Identity Department

Communication and External Relations Department

IS Department

Grid Department

Network Application Technology Department

Support Service and CSIRT Department

Finance Department

Advisor for application and network service projects

Data storage Department

Monitoring and Configuration Tool Department

Service Desk Department

Finance and Administration Unit

Multimedia Department

R&D&I Support Department

Organisational and Legal Department

e-Infrastructure Operation, Research and Development Unit

e-Infrastructure Support Service Unit

------------- Linear management

———— Project management

CESNET e-Infrastructure

The main components of the CESNET e-infrastructure are a highly permeable national communications infrastructure, a national grid infrastructure, a Data storage infrastructure, and a collaboration infrastructure

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Introduction

CESNET's fundamental activity is the development, constructing and operation of the CESNET e-infrastructure, which is part of the Roadmap for Large Research, Experimental Development and Innovation Infrastructures in the Czech Republic, approved by Government Resolution No. 208 of 15 March 2010. The purpose of the CESNET e-infrastructure within the national roadmap for large infrastructures is to provide a transparent common communication environment for the cooperation of entities dealing with research, experimental development and innovation across all sectors of the Czech Republic. Naturally, this e-infrastructure is integrated in relevant international infrastructures. The CESNET e-infrastructure is also used as a testing and development environment for new technologies and applications in the area of information and communication technologies.

Special-purpose support for developing and operating the CESNET e-infrastructure

The CESNET Large Infrastructure project defines the basic orientation and goals of the Association's work for the period 2011–2015. The special-purpose support for this project is the most important source of funding for operating and developing the services of this e-infrastructure.

The objective of the project CESNET Large Infrastructure is the gradual upgrading of the e-infrastructure to a modern comprehensive national e-infrastructure for research, experimental development and innovation. The e-infrastructure comprises all the general components that are needed to link the Czech Republic to the European Research Area and, among other things, connects with other e-infrastructures described in the ESFRI Roadmap. The chief components are a national communications infrastructure with a high throughput, national grid infrastructure (NGI), and data storage infrastructure, enhanced with tools and services for controlling access to e-infrastructure sources, tools for ensuring communication security and data protection, as well as tools for effective collaboration of distributed users and teams. The project work went in accordance with the timetable in 2014.

Communications infrastructure

Topology of the CESNET2 network at the end of 2014

The CESNET2 backbone communications infrastructure jis a necessary groundwork for the other components of the national information e-infrastructure, and it is composed as a multi-layered system connected in the various layers with both research project and user networks and international research networks, the European GÉANT network and the GLIF global experimental infrastructure. CESNET2 offers parallel support of IPv4 and IPv6 protocols, enabling advanced features and properties,

provision of reserved services in each network layer, notably lambda services, and real-time remote access to user research devices.

The foundation of the CESNET2 network is infrastructure of leased optical fibres conforming to the ITU-T G.652 standard. The core of the infrastructure comprises a complete optical transport system with a unified control system, which makes it possible to establish optical transmission channels without the need for any connection or reconfiguration of intermediate

ROADM (Reconfigurable Optical Add-Drop Multiplexer) nodes. The system also enables concurrent operation of up to 80 channels spaced at 50 GHz and designed transmission channel capacity of 1-100 Gbps.

The remaining routes are equipped with CzechLight DWDM (Dense Wavelength Division Multiplexing) technology, developed by the Association as part of its own research activity. The technology is currently based on CzechLight optical amplifiers and equipped with passive Mux/Demux or ROADM.

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National Grid
Infrastructure

MetaCentrum infrastructure
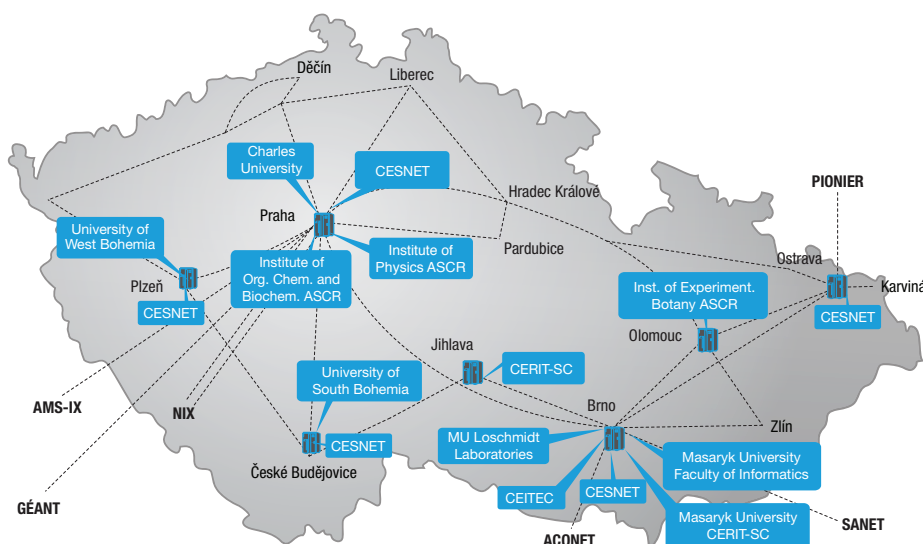
The Association's long-term objective

The Association's long-term objective in the area of distributed computing is the operation and development of the MetaCentrum national grid infrastructure (NGI) and integration of these activities in corresponding international infrastructures and projects.

The National Grid The National Grid comprises two basic types of computing clusters: conventional computing clusters with a lower number of high-performance processors, and high-performance SMP servers with more processors in shared memory. Along with these computing servers (approx. 11,000 CPU cores at the end of 2014), the MetaCentrum also operates extensive data capacities (1 PB at the end of 2014), used for storage of experimental data processed in the grid.

Within the NGI, CESNET plays the role of a national coordinator, linking the clusters acquired by other organisations or projects into a unified national grid and making available its own resources (4200 CPU cores out of the total 11,000) particularly to offset jump demands of different groups and for a faster start-up of application projects that are yet planning acquisition of their own computational resources. The integration activities include the development and management of grid middleware, coordination of procurement of application software, and user support.

As for the international activities, the Association continues supporting the international experiment **Pierre Auger Observatory** and **the virtual organisation for Central Europe** (VOCE), established for direct arrangement of computational resources for scientists and researchers in Central Europe.

At the national level, we focus on direct support of user groups in the Czech Republic interested in using the pan-European grid. Gradually, we focus on groups engaged in international collaboration, aiming to enable their direct access to know-how in the area of IT infrastructures. The priority is an orientation on specific needs of domestic expert groups and their international projects.

Shares of different institutions in the MetaCentrum computational resources

- *CESNET*
- *CERIT-SC*
- *ASCR Institute of Physics*
- *MU FSc Loschmidt Laboratories*
- *MU FSc National Centre for Biomolecular Research*
- *Others*

Data storage

Another fundamental component of the e-infrastructure is **the distributed data storage**, composed of three interconnected high-capacity data centres situated in Plzeň, Jihlava and Brno, with a combined capacity of 21 PB. From a technical point of view, the repository is organized hierarchically (HSM type – Hierarchical Storage Management). Its basic principle is that less frequently utilized data is shifted to cheaper and slower-access high-capacity media, typically tapes, which considerably reduces the operating costs. The only user limitation of this system is that the query will take somewhat longer to process once accessing long-unused data, before the data are moved from the slower storage layer.

The data storage infrastructure stored over 3300 TB of data at the end of 2014. The repositories were used via standard file-oriented interfaces by 110 user groups (virtual organisations), which translates into 2200 individual user accounts (persons and service identities). Combined, they occupied over 7500 TB of available media. However, the total impact of the repositories on the community is greater, as an individual user with an account in the repository often represents a group for which it does backup or archiving operations, without all its members necessarily having physical access to the data storage.

The data storage service also includes the very popular FileSender service for exchanging large data files among users.

The service has gained popularity quickly: in 2014, it handled more than 17,000 files totalling about 25 TB of data.
In 2014, we launched a new service, the ownCloud cloud repository, directly accessible to members of the eduID.cz national federation of identities. The number of users of this service at the end of 2014 was almost 2500; they stored 14 TB of data in approx. 12 million files.

Infrastructure
for cooperation and user support

IP telephony, video and web conferencing and multimedia streaming

The IP telephony network interconnects more than forty gateways linked to institution exchanges, and several IP telephone exchanges of various brands. In the course of 2014, the Association attended to 686,000 calls with a total length of 34,000 hours. The video conferencing infrastructure, linked to the IP telephony, offers primarily client registration, use of virtual rooms, recording and airing of programmes. The infrastructure registers almost 110 hardware units, resulting in an easier availability of both units and services by means of telephone numbers allocated by the Association.

Via our multi-conferencing units (MCU), 4800 hours of meetings in dozens of virtual rooms took place in 2014. Over a hundred hardware units were registered, and dozens of users used the software client provided by the Association.

The Association operates a web conferencing system built on the Adobe Connect platform, employing Adobe Flash technology. The system registers more than 1500 users authenticated by the **eduID.cz** federation of identities, who, together with visitors, make use of 180 virtual rooms. Users of the Adobe Connect system attended more than 4600 hours of meetings in 2014.

The collaboration infrastructure also includes devices for live transmission (streaming) and broadcast from recording in the Windows Media, Adobe Flash and MPEG-4 formats. The infrastructure is used by more than ten institutions, which store over 14 TB of multimedia data in the repository. The Association demonstrated its technologies for high-quality low-latency transmission at six events abroad. We also organised transmission for around ten mostly medical congresses and events organised by institutions connected to the CESNET infrastructure.

Since August 2014, the Association has provided its expertise in the area of work with multimedia data for the National Film Archive as

a national partner in a Czech-Norwegian project entitled Digital Restoration of Czech Film Heritage, co-funded from programme CZ 06 Cultural Heritage and Contemporary Art, supported by countries of the European Economic Area (EEA) – Norway, Iceland and Liechtenstein. The project focuses on preserving and making accessible Czech film heritage under new technological circumstances.

Network identity

A system for user management and access control for services provided under the e-infrastructure is an integral component of the comprehensive e-infrastructure.

The user management is based on the **eduID.cz** distributed federation of identities, where the initial user registration and authentication services are provided by the home organizations while the authorization information is managed at the level of the services and their administrative domains. At present, the federation comprises 61 identity providers (IdP) and 174 service providers (SP). The **eduID.cz** federation has been a member of the European eduGAIN academic inter-federation since 2011; the Association's users can thus make use of the services operated by the partnership federations in Europe. The special **eduID.cz** IdP known as **Hostel** is designed for users without an account with an identity

provider integrated in **eduID.cz.** It permits normal self-service registration based on an e-mail address authentication. Users registered in this way are provided with a limited scope of the large infrastructure services. For full access to all services, the user has to be fully registered by an **eduID.cz Hostel** official based on submission of personal data. Fully registered users' identity is equivalent to the identities provided by **eduID.cz** member IdPs.

eduroam.cz is the federated service still most accepted by users; it enables users of all the participating institutions to connect to the (typically wireless) network of any other collaborating institution,

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thus gaining access to the Internet, as well as other services provided by the host network. Users are always authenticated by the home institution. This academic roaming system was established as a European initiative under the TERENA Association (GÉANT Association nowadays) and has since spread all over the world.

To ensure safe and trustworthy communication, the Association operates a public key infrastructure, based on the CESNET CA certification authority, issuing various types of certificates: for individuals, servers and other certification authorities, and also certificates for signing SW codes since 2014. The Association develops its own system Perun for controlling access to the e-infrastructure resources;

it enables administration of the entire ecosystem, including user identities, user groups, resources and services.

Security of the e-infrastructure

The CESNET-CERTS security team is the basic element ensuring the e-infrastructure security. The core of its activity is incident handling – the receipt of security incident notifications occurring in the CESNET2 network, its solving and related coordination. The team closely cooperates with other security teams and relevant organisations at the national and international levels, including as part of the TF-CSIRT activity, headed by the GÉANT Association.

As part of activities related to network security, the Association runs its own detection systems, thus obtaining information about attacks in progress. Since 2013, we have run the FLAB forensic laboratory, which provides services such as analysis of cybernetic security incidents or penetration and loading tests for preventive verification of integrity, credibility and availability of systems tested. The laboratory services are available not only to CESNET e-infrastructure members but to other clients as well. The Association pays great attention to awareness raising among users and administrators of the connected computer networks. It organises training, presents itself at numerous events and publishes papers focusing on security.

The CESNET association is one of the founding members of the Fenix project. The Fenix project led by the Czech peering centre NIX.CZ and its aim is to ensure that the Internet services are available to the entities involved even during a DoS attack. It is aimed at the institutions that provide access to significant services and need to secure their operation even under the most critical circumstances.

Cooperation with national research and development infrastructures

The Association continuously deals with representatives of other large infrastructures, listed in the Roadmap for Large Research, Experimental Development and Innovation Infrastructures in the Czech Republic and other infrastructure projects. It strives to identify their needs from the point of view of the services provided by the Association and to start cooperation in the area.

Besides providing technical support to large infrastructure projects, mutual coordination of activities of the infrastructures CERIT-SC, CESNET and IT4Innovations continued in 2014.
The Association is also actively involved, in fact as one of the members of the ELIXIR.CZ consortium, in the building of the national node of the ELIXIR European bioinformatics infrastructure, to provide an advanced computational environment, data resources and unique tools for the bioinformatics scientific community in the Czech Republic and Europe. The support to this user community includes also provision of a pilot computational node for bioinformatics calculations.

International
Infrastructure
Projects

The Association's experts have contributed to implementation of important international research projects: GÉANT, EGI-Inspire, CHAIN-REDS, GLIF, PlanetLab, XIFI, and more

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International Infrastructure Projects

GÉANT

VInterconnection of European national research and education networks and their connection to similar communications projects outside Europe, such as the Internet2 and ESnet networks in the USA, CANARIE in Canada, and networks on other continents, are provided by the pan-European GÉANT infrastructure. At present, it makes network services available to approx. 40 million users in more than 3500 institutions in 38 European countries. The funding of this infrastructure and related activities at the European level is ensured by support of the project GN3plus (Multi-

gigabit European Research and Education Network and Associated Services). In addition to the GÉANT Association, the project consortium comprises 34 NREN operators, including CESNET. In this project, we are involved in handling tasks associated with network operation, development of new services, security, network identity, end network issues, and provision of cloud services. The Association is the task leader of Hardware and Systems Engineering as part of the sub-activity Testbed as a Service. The GN3plus project also includes so-called open call projects, focusing on demonstrations of infrastructural use for demanding

and innovative applications. Within this group of projects, the Association coordinates the eMusic project. The project objective is a pilot verification of practicability of the Bandwidth on Demand service in the GÉANT network for improving real-time collaboration among music schools. The project engages six partners in the Czech Republic, Italy and the United Kingdom.
The Association was also a member of the project consortium for connecting European networks (via the GÉANT) and Chinese national research networks (CSNET and CERNET) titled ORIENTplus (Linking European and Chinese Research Infrastructures and Communities).

Cooperation Under the TERENA Association Activities

GÉANT Task Forces (TF), informal expert working groups, are a very important European collaboration platform, set up based on current common needs of the European academic infrastructures and bringing together experts from NRENs interested in the issues. In 2014, CESNET was involved in the work of the following task forces:

— **TF-CSIRT (Computer Security Incident Response Team):** coordinating network security incident resolution and prevention;

— **TF-EMC2 (European Middleware Coordination and Collaboration):** coordination and collaboration in identity management and development of middleware for applications and services;

— **TF-Mobility and Network Middleware:** development and deployment of mobile technologies and utilization of network middleware for supporting interoperable roaming services within academic networks

— **TF-CPR (Communications and Public Relations):** exchange of information and coordination of procedures associated with presenting national research network activities and results to the public;

— **TF-Storage:** issues of implementation of data storage in the academic network environment;

— **TF-NOC (Network Operation Centre):** issues of supervision centres of national research and education networks.

EGI

The European Grid Infrastructure (EGI) is a tool for coordinating national activities in implementation of grid technologies at the European level. The primary goals of the EGI include:

— provision of long-term sustainability of the European grid infrastructure;

— its operation, including connections among national grid infrastructures;

— coordination of middleware development

Collaboration within the EGI is supported by the EGI-Inspire project, which further elaborates on the concept of multi-disciplinary pan-European grid infrastructure. In this project, the Association is engaged in all the primary operating activities, ensures operation of the national EGI grid node, and provides computational resources, comprising both its own computational capacities and those of the ASCR Institute of Physics. The capacities involved are also part of the MetaCentrum and use its virtualised infrastructure.

Another project associated with advancement of international grid infrastructures in which the Association staff is involved is the CHAIN-REDS (Coordination and Harmonisation of Advanced e-Infrastructures for Research and Education Data Sharing), dealing with coordination of cooperation of European grid infrastructures with similar infrastructures in other regions.

Global Lambda Integrated Facility – GLIF

Global Lambda Integrated Facility (GLIF) is a global research activity involving the most advanced institutions and consortia engaged in network research and application in Europe, North and South America, Asia and Australia. Individual GLIF participants enable other participants to use part of their resources so that collective experiments can be carried out. GLIF refers to a virtual organization composed of involved institutions as well as a research environment (facility), consisting of lambdas and nodes known as GOLE (GLIF Open Lightpath Exchanges), set up by this organisation. Such an environment also enables experiments and demonstrations that pose a risk of interference and destruction.

PlanetLab and Related Projects

Since 2006, CESNET has been a member of the PlanetLab consortia and maintains four machines permanently in the PlanetLab networks (.org and .eu). The popularity of PlanetLab among university users has maintained a stable level. The Association is responsible for the operation of local infrastructure, that is, the operation of the server and registration of domestic users, authentication of their affiliation with the organisation, and basic support activity in the area of using the system. It registers about thirty permanent users from several universities, but their numbers increase substantially temporarily during semestral teaching. For these users, the Association has established and operates twenty active virtual networks with various configurations as specified by the users themselves. In total, all the virtual networks used by the CESNET users contain about 400 foreign nodes. This gives the users an unusual opportunity to test their applications in a global context.

XIFI

In April 2014, the Association joined the consortium of XIFI project (eXperimental Infrastructures for the Future Internet), implemented as part of the EU programme Public-Private Partnership on Future Internet, whose objective is to build and operate a unified platform of a European dimension for extensive experiments in the areas of Future Internet and Smart Cities.

The Association's Research Activities

CESNET's unique solutions have been awarded five patents: one in the Czech Republic, one in the European Union, and three in the United States of America

04

The Association's Research Activities

Development of e-infrastructure for R&D requires an innovative approach, which is why CESNET, in addition to building and operating e-infrastructure, also deals with research and development in the area of information and communications technologies, notably in the following areas:

E-infrastructure security

CESNET has dedicated long-term care to network security. In addition to developing tools for providing user privacy protection and security for their data and tools for sharing information on security incidents, we have been intensively developing tools for network monitoring and detection of operating anomalies as potential sources of attack. One of the activities in the area of monitoring is the development of specialised hardware equipment based on programmable gate arrays for monitoring data flows. Part of this development is funded under a joint project of CESNET and INVEA-TECH, a.s., titled the Distributed System for Comprehensive Monitoring of High-speed Networks (DMON100), supported by the Technology Agency of the Czech Republic under its ALFA programme. The project's objective is to complete the development of a HW probe enabling traffic monitoring on lines with a capacity of up to 100 Gbps. The probe has a great potential for the area of high-speed data network security.
Another project supported by the Technology Agency, this time under the ALFA 4 programme, is Technology for Processing and Analysis of Large-Scale Network Data (SecurityCloud), launched in November 2014. Additional participants in the project are the Masaryk University and the company INVEA-TECH, a. s. The

objective is to develop an innovative technological solution for modern services and infrastructure that will enable both providers and users of network infrastructures and centralised services to reveal security problems.

Grid middleware

Within the activities related to the running of the grid environment, the Association is also intensely involved, particularly as part of the EGI.eu activities, in developing grid middleware related to task scheduling, as well as some components related to grid infrastructure operational security.

Optical transmission systems

CESNET has long been researching and developing optical technologies. We have developed the CzechLight series of original fully optical transmission systems, the openness of which is their greatest advantage. This means that any software adjustments can be done by the device owner or administrator directly without requesting CESNET or the manufacturer. This makes them independent in terms of decisions on the further network development. The CzechLight series components have found practical application: specialist companies manufacture and market them under a CESNET licence.

Accurate time transmission via optical network

An interesting application is the accurate time (deviation up to 100 ps) and frequency (accuracy to 10-17) transmission via optical networks. These issues are the subject of the international research project NEAT-FT pursued as part of the EMRP (European Metrology Research Programme). CESNET is the only partner to this project representing national research and education networks; the other nine partners represent national laboratories dealing with time and frequency metrology.

Research and Development Outcomes

Five patents were registered in 2014:

— Device For Receiving Of High-Definition Video Signal With Low-Latency Transmission Over An Asynchronous Packet Network, No. US8792484, issued by the United States Department of Commerce United States Patent and Trademark Office (USPTO)

— Modular Set Of Devices For Optical Amplification Of Signal By Raman Fiber Amplifier, No. 8630035B2, issued by the United States Department of Commerce United States Patent and Trademark Office (USPTO)

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— Device For Reception Of Video Signals Transmitted Through Packet Computer Network, No. 304388, issued by the Czech Republic Industrial Property Office
— Device For Multicast Of Optical Signals In The Internet And Other Networks, No. EP2227911, issued by the EPO (European Patent Office)
— Connection For The Fast Analysis Of Packet Headers Transferred Via Data Bus, No. 8923300, issued by the United States Department of Commerce United States Patent and Trademark Office (USPTO)

Moreover, our research activity in 2014 resulted in the publication of three articles in professional journals and 36 articles in conference anthologies.

CESNET Development Fund

In late 2013, the Development Fund Board in cooperation with the Association selected topics for new project tenders. The topics focused on providing support to projects of Association members using data storage and services developed as part of the OP R&DfI eIGeR project and infrastructure as part of the CESNET Large Infrastructure project.

The following topic areas were announced for the first round:
— Pilot applications and services
— Access to e-infrastructure
— High-resolution multimedia
— Security

Out of the 29 project applications submitted in the first round, 17 were admitted for co-funding, including eight after reworking. The contributions requested by three projects were reduced compared to the amounts requested. One of the project applicants withdrew due to personnel changes in the institution.
In the latter half of the year, the Development Fund Board prepared and announced the second round of the tender. For this round, too, it chose topics that fit the focus on supporting projects of Association members using the data storage and services developed as part of the OP R&DfI eIGeR project and infrastructure as part of the CESNET Large Infrastructure project.

The following topic areas were announced for the second round of the tender:
— Pilot applications and services
— Access to the e-infrastructure
— Security
— Support of training for Association members' employees aiming to acquire a globally recognised IS/IT certificate

The assessment of the project applications took place in early 2015. Two rounds of opposition proceedings for completed projects took place in 2014: nineteen projects were completed successfully; one was presented by the researcher as part of an opposition proceeding. Completion of final documentation was requested for two projects. Final project reports within the CESNET Development Fund are available on the Association's website. In order to improve accessibility of results of the projects, the final reports are always converted to a browsable PDF format.
Participants of seminars for the Association research project researchers and participants of the VIC Director Club sessions are periodically informed about the activities of the Development Fund and the projects implemented under the Development Fund. Results of some projects were presented at workshops for researchers working on the research plan, at professional seminars for the Association members, as well as at international conferences. Results of the project implemented were also presented by means of publishing in expert journals.

Project No.	Project executor	Project Name
503/2014	ASCR	Implementation of access to CESNET e-infrastructure services for the ASCR Institute of Molecular Genetics – BIOCEV project
504/2014	University of West Bohemia in Plzeň	Legislative aspects of external data storage
505R1/2014	University of West Bohemia in Plzeň	Integration of CESNET DR infrastructure in the user data backup process
509R1/2014	VŠB-TUO	Sharing of virtual infrastructures in the university data centre environment
510/2014	ASCR	Utilisation of the CESNET data storage to backup and archive data of the ASCR Centre of Administration and Operations
511/2014	Czech University of Technology	Agency Technology Centre data backup and archiving, allowing expansion to other similar institutions
513R1/2014	Czech University of Technology	Integration of scientific-education group data services
514/2014	VŠB-TUO	Design of an embedded system for data collection and security incident detection in computer networks
516R1/2014	MU	Pilot project for low-barrier access to digital content protection (LTP pilot)
517R1/2014	University of Hradec Králové	Use of intelligent solutions for acquisition and processing of information on incidents in the UHK network
518R1/2014	University of Pardubice	Integration of the University of Pardubice network in the Warden project
519/2014	VŠB-TUO	Pilot project of use of CESNET infrastructure for an academic experimental mobile network
520R1/2014	VŠB-TUO	Directory information and name services for Internet of Things applications and their pilot deployment in CESNET academic network in the CR
524/2014	Academy of Performing Arts in Prague	Access control and security for the APA computer network
526/2014	Czech University of Technology	Children Usability Lab monitored using split displays (SAGE)
527/2014	Czech University of Technology	Detection of phishing attacks in the CESNET network
529R1/2014	Silesian University	Establishment of a software-defined repository for data storage and sharing within the institution and its backup in CESNET data storage

Public
Relations

The Association achieved a remarkable recognition
in the prestigious Innovation of the Year 2014
competition, organised by the Association
of Innovative Entrepreneurship CR

05

Public
Relations

In 2014, the Association continued shaping itself as the national e-infrastructure for research, development and education, and intensely communicated the services included in its portfolio and their specific benefits for users.

One of the main presentation tools was the web site, which is constantly updated and optimised based on detailed analyses. A unified design and a navigation bar for the central web presentation were implemented on the web sites of the component services (eduroam, eduID.cz, MetaCentrum, CERTS, etc.).
The Association informed representatives of member and user institutions, as well as numerous individual users about events and news relating to its services by means of an e-mail newsletter. Seven newsletters were sent out to a long list of verified contact addresses in 2014. Moreover, we expanded our communication via the social networks Facebook and Twitter, which have now become a full-fledged communication channel for the Association with interactive reader response.
The Association put a great emphasis on direct communication and personal meetings with users. We organised two CESNET Community Forums in 2014: one dealing with New Types

of Transmission Services and Their Applications in the spring, and Large Data Processing and Storage in the autumn. Both the forums featured speeches by representatives of organisations connected to the CESNET e-infrastructure, who were thus able to share their user experience of its services and strengthen the community principle of the Association's functioning.
The seminar Secure Network and Service Operation was met with great interest. The Grid Computing Seminar was intended for all those interested in demanding calculations and MetaCentrum users.
The CESNET Days, a series of informal meetings of the Association experts with users from member organisations focused on specific areas for specific institutions, continued with a positive response at the Jan Evangelista Purkyně University in Ústí nad Labem and the Academy of Sciences of the Czech Republic. The Association organised and was involved in numerous smaller and professionally focused seminars and training courses.

The objective of the autumn user meeting with CESNET professionals was to learn about innovations being developed in the area of e-infrastructure services. This time, a large part of the agenda focused on the issue of big data, their processing, backup, archiving and sharing.

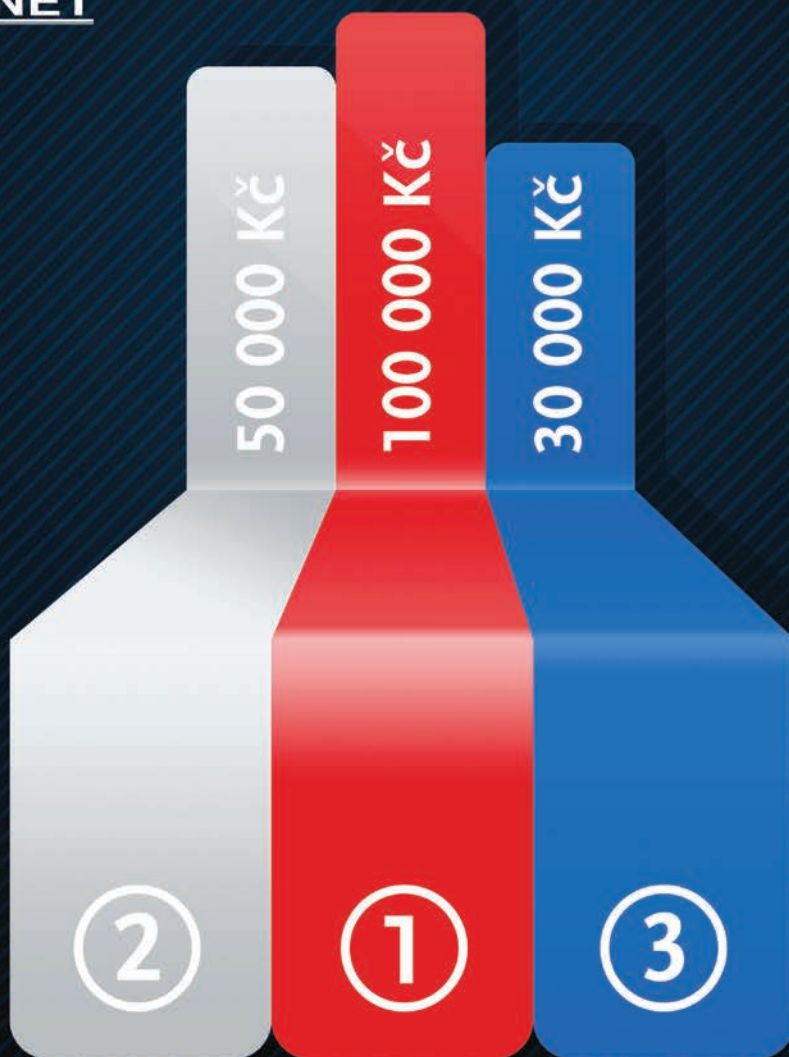*Safe Network and Service Operation Seminar*
[4 February]

Network and service administrators and members of security teams among user institutions again showed great interest in the "Safe Network and Service Operation" seminar, with an emphasis on the most important aspects of security as a continuous process.

CESNET Community Forum
[26 November]

The "Big Data" topic attracted not only users from institutions connected to the CESNET e-infrastructure to the National Technical Library lecture hall.

The Association informed about the most important events via 31 press releases, selectively distributed among both general and professional media, both online and print. Based on consistent monitoring, it can be concluded that these releases elicited responses and were frequently adopted by the media.

A major communication event with a desired target group in 2014 was the nationwide competition for students and graduates of doctoral studies (Ph.D.) up to 35 years of age, aimed at supporting young scientists and students as well as popularising among the community the latest IT services and their use for scientific and research work. The competition gained a broad response among member institutions, whose proactive collaboration succeeded in greatly increasing awareness of the CESNET e-infrastructure and its services.

In 2014 too, the CESNET Association presented itself in television broadcasting, being involved in filming the show How to Connect the World as part of the Czech Television science and technology series Lovci záhad (Mystery Hunters). More detailed information about the latest news on the CESNET e-infrastructure were published in the Datagram bulletin, targeted at those interested within the user community. Three issues were published in 2014.

A successful campaign aimed at providing more visibility for the Data Repository Department's

new ownCloud service took place in May and June. The campaign, targeted largely at end users in member institutions, resulted in a jump increase in the service user numbers. In the course of October and November, a series of PR articles was published drawing attention to the unique role of the national research and development e-infrastructure in the Czech Republic based on examples of achievements by e-infrastructure service users in various disciplines.

In addition, the Association presented itself at numerous other events, including the conferences InstallFest, Year of Informatics, LinuxDays and Internet and Technologies. Others included the Night of the Scientists at the CTU Faculty of Information Technologies and the Biological Research Methodology Days. Traditionally, the Association presented itself at the biggest science "festival" in the Czech Republic: the Week of Science and Technology. Another form of the Association's presentation was the provision of transmissions for medical operations at major conferences at home and abroad and demonstrations of the ability to arrange special transmissions by way of joint transcontinental music and dance performances, with various artists located in different parts of the world.

The Association hosted several international professional events in 2014: the CEF Networks Workshop, the Campus Network Monitoring and Security Workshop,

and supported the organisation of the Coreboot Hackathon workshop. The Association expert and research staff presented the results of their work at numerous major international events and conferences, such as the Networkshop42 in Leeds, UK, and the conference of APAN, an organisation uniting national research and education networks in Asia, Australia and New Zealand.

Major recognition and visibility was provided by the honourable mention for the CESNET e-infrastructure in the prestigious Innovation of the Year 2014 contest, organised by the Association of Innovative Entrepreneurship CR. The ranking of the 302 innovative technical solutions registered was decided by a board representing, among others, the Academy of Sciences of the CR, ministries and the Research, Development and Innovation Council. The results were ceremonially announced in the Senate of the Parliament of the CR.

In the international dimensions, the active cooperation of the Communications and External Relations Department under the working group of the GÉANT Association (Special Interest Group – Communication and Public Relations) continued, exchanging information and working in synergy on popularising national research networks at the national level.

CESNET Communiy Forum
 [26 November]

The autumn forum included
a demonstration of use of the SAGE
large-area visualisation device.
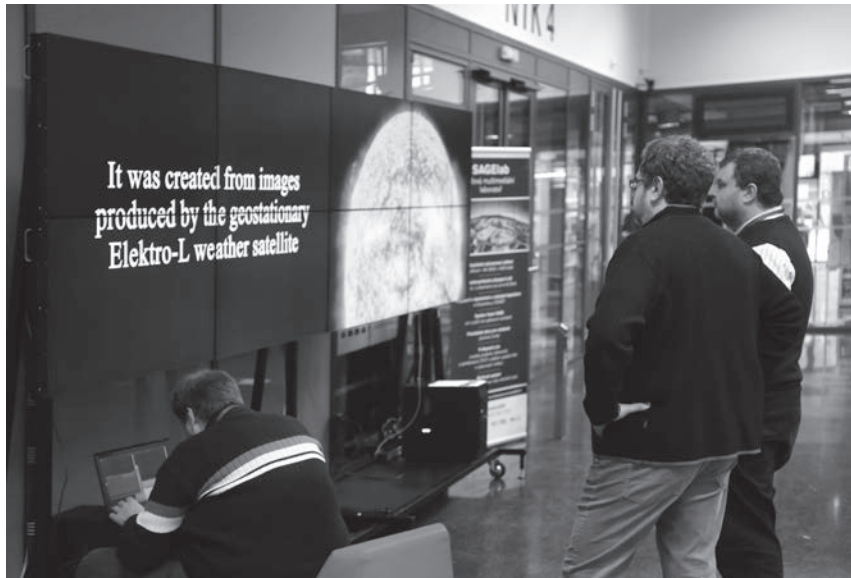
Grid Computing Seminar
 [2 December]

The seminar, dealing with information
and innovations in the Czech national
and cloud environments MetaCentrum
and CERIT-SC, took place at the
Masaryk Dormitory in Prague.

Grid Computing Seminar
 [2 December]

The topics included an overview
of capacities for scientific and research
uses of the MATLAB tool and the efficient
running of calculations using MATLAB
in the environment of our infrastructure.

CESNET Day
[18 March]

The series of informal meetings of CESNET professionals with representatives of member organisations dealing with specific areas and issues continued at the Jan Evangelista Purkyně University in Ústí nad Labem.

CESNET Day
[8 October]

CESNET Day at the Academy of Sciences of the CR in the formal spaces of the ASCR's Villa Lanna.

Filming the Czech Television Mystery Hunters show
[21 October]

CESNET was involved in filming the Czech Television show Lovci záhad (Mystery Hunters). In the episode titled How to Connect the World, the authors focused on the Internet phenomenon. They asked about how it really works and its history.

Music performance transmission
[12 August]

Transmission of a unique cultural event
from Prague HAMU at 4K to a conference
of the APAN, association of national
research and education networks in
Asia and Oceania, hosted in South Korea.

Transmission of an operation intervention
[10 October]

Live transmission of an operation intervention
to the 2nd Prague Ophthalmological Casuistic
Festival 2014 at the Spanish Hall of Prague
Castle, which is part of the prestigious
Videocatarattarefrattiva conference
in Milan, Italy.

8th CEF Networks Workshop
[15–16 September]

Professionals from all over the world
attended the international Customer
Empowered Fibre Networks Workshop,
organised by CESNET at the CTU Faculty
of Information Technology. The topic was
experience of designing and managing
customer fibre networks, necessary for
providing demanding services to the
research and education community.

Coreboot Hackathon
[17 October]

Along with the CTU FIT, CESNET supported
the organisation of the international
Coreboot Hackathon workshop, at which
specialists from various countries
cooperate on an open source project
to replace proprietary BIOS.

Innovation of the Year Awards
[5 December]

CESNET Director Ing. Jan Gruntorád, CSc.
at the Senate of the Parliament of the CR
at the announcement ceremony for
the prestigious Innovation of the Year award
by the Association of Innovative
Entrepreneurship CR, where the CESNET
e-infrastructure won an honourable mention.
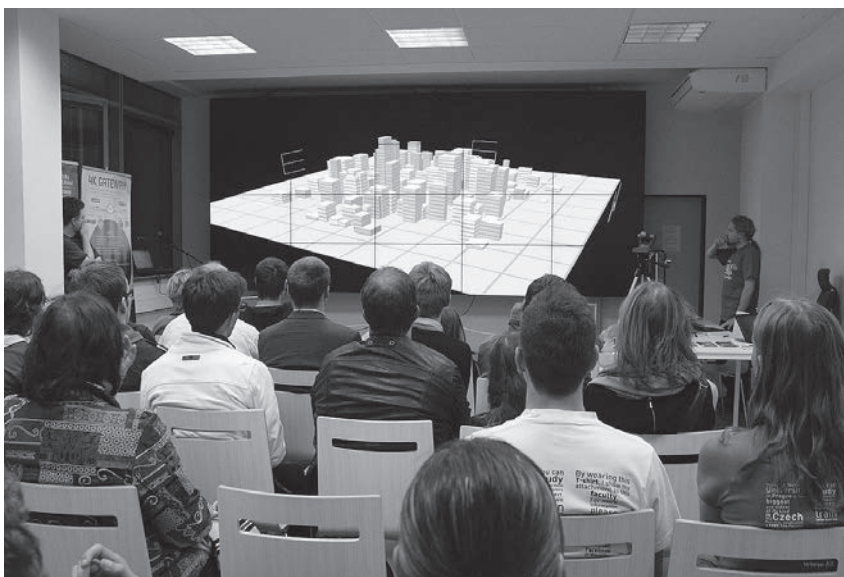
Night of the Scientists
[26 September]

During the Night of the Scientists,
those interested could learn about
modern technologies and their
applications at the joint multimedia
laboratory of CESNET and the CTU Faculty
of Information Technology.

Economic
Results

In 2014, the Association properly managed the entrusted financial resources and fulfilled all its obligations resulting from legislation, decisions of the Ministry of Education and concluded contracts

06

Economic Results

2014 Economic Results

Activities of the CESNET Association are divided into two categories in accordance with its statutes: Principal Activity and Economic Activity.

Principal Activity

The five-year project CESNET Large Infrastructure continued in 2014. As part of its principal activity, the Association continued building an e-infrastructure of a new quality to provide Association members and other entities eligible for connection to the CESNET2 network with a comprehensive set of services. In addition, the Association was involved in executing international research projects under the EU's 7th Framework Programme, grants from the Technology Agency of the Czech Republic, and projects of the Development Fund Board. The Association's principal activity in 2014 was concluded with a book loss of CZK 15,204,000 . Revenues from the Association's principal activity

amounted to CZK 602,955,000; the expenditures were CZK 618,159,000. The income tax base for the Association's principal activity in 2014 was negative, amounting to minus CZK 11,019,000.

Economic activity

The Association's economic activity in 2014 mainly involved 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 Association's economic activity ended 2014 with a book profit of CZK 19,344,000. Revenues from the Association's economic activity in 2014 amounted to CZK 70,445,000; expenditures on the economic activity were CZK 51,101,000. The income tax base from the yields of the Association's economic activity in 2014 was positive, amounting to CZK 19,810,000.

Total Book and Tax Economic Result

The total book economic result of the CESNET Association prior to taxation reported in 2014 was a profit amounting to CZK 4,140,000.
The total income tax base after deducting tax base-reducing items was CZK 18,810 thousand. The Association paid income tax of CZK 3,722,000 for the year 2014, resulting in a net profit of CZK 418,000.

Conclusion

The Association properly managed the entrusted resources in 2014, meeting all its obligations resulting from the legislation, decisions of the Ministry of Youth, Education and Sport of the Czech Republic and concluded contracts. The financial statement for 2014 was verified by the auditor without any remarks.

BALANCE SHEET IN THOUSANDS OF CZK				
	2014	**2013**	**2012**	**2011**
Assets total	**834,034**	**1,020,221**	**1,145,473**	**973,454**
Fixed Assets	648,300	814,654	676,126	627,664
Intangible fixed assets	9,277	10,044	7,800	3,615
Tangible fixed assets	304,242	475,675	345,263	306,765
Financial Investments	334,781	328,935	323,063	317,284
Current assets	185,734	205,567	469,347	345,790
Supplies	92	92	1,406	243
Receivables	38,628	46,879	52,862	70,176
Current liquid assets	130,761	135,918	397,617	252,428
Other assets	16,253	22,678	17,462	22,943
Liabilities total	**834,034**	**1,020,221**	**1,145,473**	**973,454**
Own resources	717,133	907,022	985,784	797,542
Funds	589,923	768,320	839,660	665,136
Economic result	418	16	21,686	9,125
Undivided profit from last years	126,792	138,686	124,438	123,281
External resources	116,901	113,199	159,689	175,912
Obligations	112,014	109,676	157,015	173,658
Loans	0	0	0	0
Other liabilities	4,887	3,523	2,674	2,254

PROFIT AND LOSS STATEMENT IN THOUSANDS OF CZK				
INDICATOR	**2014**	**2013**	**2012**	**2011**
Earnings for the sale of goods	5	193	748	21
Earnings of own product and services	101,565	99,276	98,697	100,933
Current liquid assets revenues	54,746	151,325	89,755	26,039
Other revenues	279,950	229,200	187,818	107,775
Received membership fees	0	0	0	0
Operation subsides	237,135	237,810	248,233	229,675
Revenue total	673,401	717,804	625,251	464,443
Purchase price of sold goods	2	4	263	16
Material and energy consumption	17,475	22,473	19,656	21,958
Purchased services	198,033	222,073	230,517	197,130
Personnel costs	134,699	137,480	133,844	129,133
Depreciation and amortization of intangible and tangible fixed assets	256,126	181,783	132,057	74,905
Other costs	62,926	153,135	82,550	27,810
Income tax – assesment for the current year	3,722	840	4,678	4,366
Costs total	672,983	717,788	603,565	455,318
Economic result (revenue – costs)	418	16	21,686	9,125

R – audit, s. r. o.

150 00 Praha 5, Ostrovského 253/3

Tel.: 266 315 971, 604 824 760; fax: 257 003 291; e-mail: info@r-audit.cz

entered in the Commercial Register kept at the Municipal Court in Prague under Section C, Entry 20496 from 31 May 1993, auditor's certificate number 124

REPORT OF THE INDEPENDENT AUDITOR

Auditor's report for the members of the association of CESNET, Association of Legal Entities with its registered office at: Praha 6 – Dejvice, Zikova 4, Company Registration Number: 63 83 91 72

We have audited the accompanying financial statements of association CESNET, Association of Legal Entities which comprise the balance sheet as at 31 December 2014, a profit and loss statement and the appendix to these financial statements, including a description of the significant accounting policies used. Information about CESNET, Association of Legal Entities is specified in point 1 of the appendix to these financial statements.

Statutory Body's Responsibility for the Financial Statements

The statutory body of CESNET, Association of Legal Entities is responsible for the preparation of financial statements that give a true and fair view in accordance with Czech accounting regulations and for such internal control as statutory body determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditor's Responsibility

Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with Act No. 93/2009 Coll., the Act on Auditors and International Standards on Auditing and the related application guidelines issued by the Chamber of Auditors of the Czech Republic. Those laws and regulations require that we comply with ethical requirements and plan and perform the audit to obtain reasonable assurance whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation of the financial statements that give a true and fair view in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Opinion

In our opinion, the financial statements give a true and fair view of the financial position of CESNET, Association of Legal Entities as of 31 December 2014, and of its financial performance for the year then ended in accordance with Czech accounting regulations.

Date of issue of report:
In Prague on 29 May 2015

Auditing company: **R – audit, s. r. o.**   Responsible auditor: **Ing. Radmila Špíšková**
Chamber of Auditors of the Czech Republic certificate number 124   Chamber of Auditors of the Czech Republic certificate number 1326
Company head office: Praha 5, Ostrovského 253/3

Thank you
for reading