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**1. Introduction**

National research and education networks (NRENs) are organizations that provide networking services to the research and education community. They are integral part of the academia where one of the major goals is to introduce and validate new services by making use of the latest technological developments in advance of their commercial exploitation. The activities behind the services of the NREN include, but are not limited to: interconnection of all the research and education institutions within the domain of the NREN and to the global Internet, development and distribution of information services, analysis and implementation of network technology, education and training, participation in peer international organizations, generation and transfer of network know-how and proactive involvement in the creation of strategies for the development and usage of ICT for the benefits of a society (the so called Information Society).

In most of the CEE countries there was a traditional awareness about the importance of academia in the society. The countries in the region had similar interests, inter alia, to leave as soon as possible the pitfalls of the old political and economic system and to join the Euro and North-Atlantic integration processes. An important part of all these transformations was to diffuse as much as possible information to all segments of the CEE societies, and ICT and the Internet were seen as the prime instruments for doing so. In some ways, the research and education communities were identified once again as pioneers that will lead the way. Since most of the problems were identical such as lack of awareness among political decision makers, difficult social and economic problems that imposed different priorities, fragmentation of the efforts among the national actors, shortage of personnel, material and infrastructure resources, and high tariffs for national and international circuits due to telecom monopolies, the networking organizations, commonly within higher education and research institutions, decided that it would be prudent to establish a forum where they could exchange information and experience, state and elaborate jointly their views and needs on the international arena. Those were some of the primary motivations behind the establishment of CEENet.

Central and Eastern European Networking Association (CEENet), a legal entity registered under the Austrian law, is an association of national organizations whose primary mission is the international co-ordination of the establishment and operation of academic, research and education networks in CEE region and in adjacent countries. The current membership of the organization includes twenty-one national research and education networks from the following countries: Albania, Armenia, Austria, Bulgaria, Croatia, Czech Republic, Estonia, Georgia, Greece, Hungary, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Macedonia, Moldavia, Poland, Romania, Russia, Slovenia, Slovakia, Tajikistan, Turkey, and Uzbekistan. The countries that used to be members such as

Belarus and Ukraine are still co-operating with CEENet and looking into ways to revive their memberships that was terminated due to some domestic problems.

The extension both logical and geographical of the CEE concept beyond Ural was behind the modification of some of the articles in the Constitution. The events in the last five years have proved CEENet right to take this step and embrace the countries of Caucuses and Central Asia.

## **2. History**

In early 1992, slightly more than two years after the fall of the Berlin wall, the avalanche of political, economic and social changes stormed through Central and Eastern Europe. and dissolved unhappy federations and put new countries on the map, several networking organizations from Bulgaria, Czechoslovakia, Hungary, and Poland along with representative from ACONet, NSF, RIPE and DFN met in Prague to sign a memorandum for co-operation. The main issues addressed in this memorandum were external connectivity, network education, training, and management, administration, and user services.

Later in December of the same year, in Vienna, with five more countries present (the new comers were Croatia, Lithuania, Romania, and Slovenia, and Slovakia and Czech Republic replaced Czechoslovakia), a project group was established with a task to set up an association of research and education networking organizations from the countries in the CEE region.

In September of 1993, the group met again in Vienna where eleven countries signed a letter of intent to form the Association. The last meeting of the Project group was in Warsaw in January of 1994. The decision was made that in order co-ordinate the international aspects of research and education networking there should be an international entity, called "Central and Eastern European Networking Association - CEENet".

The first General Assembly of CEENet was held in February 1994 in Vienna. There were thirteen members present, who passed the Constitution and elected the governing bodies. CEENet applied for RARE membership and became an international member in the same year it was formally founded. These memberships later converted to TERENA, when EARN and RARE merged. In 1999, CEENet was chartered as an international non-profit organization in Vienna, Austria.

ACONet played a special role in the establishment of CEENet. Austria was considered for a long time, depending on the perspective, as "a Gateway to the East "or a "Gateway to the West". Naturally, it had a strong geographical, historical and cultural links to the rest of the CEE countries.

ACONet was already a research network of considerable reputation, a prominent member of the European and international networking organizations and associations. The Ebone

Boundary System (EBS) in Vienna made it rather convenient to connect to. In addition, ACONet initiated network services for most of the CEE countries and a program of financial assistance and technical support.

### **3. Structure and Organization**

The Statute of CEENet defines a single representation per country. The entity representing a member should be approved by national authorities. Each country should have a single vote in the highest body of the Association. These induced the notion of equity from the very beginning. While some may argue that this has been only virtual, since there was no doubt that countries that were on a different level of development concerning networks for research and education, had, understandably so, different leverage within the organization. Nevertheless, the sense of fairness and the activities undertaken by CEENet has made the organization quite attractive for many countries.

The General Assembly (GA) is the highest governing body of the Association. The Management Committee (MC), which consists of six members, executes the decisions of the GA and is headed by a chairman. The GA elects the MC for a two-year term. The Secretary General of the Association is in charge of the administrative matters and takes care of the daily duties as defined by the MC.

The meeting of General Assembly takes place once a year and is usually associated with one of the education events organized by the Association.

### **4. Activities**

In the early days of CEENet, it was evident that the widespread usage and acceptance of the Internet and networking technology in general, was clearly dependent on well-trained and educated individuals that would be involved in building the infrastructure, the services, the administration and the education on the network. Hence, the Association based on the previous experience by ACONet and the ISOC workshops on networking for the developing countries, decided to establish a series of educational workshops. The awards and grants by the Public Diplomacy Division and its Security through Science Programme (formerly NATO Scientific Affairs Division) and the Soros Foundation (Open Society Institute) provided a sound financial basis for the education and training of almost a thousand individuals from the CEE countries.

Throughout the years, the institute of workshop has proved to be a powerful vehicle to introduce and promote new paradigms related to both in the areas of network technology, network management and policies. In a way we followed a similar path established by the NATO Science Policy Committee concerning networking, to have two types of events related to training and policy.

#### **4.1 Technology**

At all CEENet educational activities, the attendees learn through lectures, labs, tour de

table discussions, and group assignments advanced networking concepts, to meet the network leaders from the West including the representatives from the major CIT companies, and to identify possible venues of co-operation, common problems, and admissible solutions. The support and the assistance of many world renown vendors and corporations of computing and communication technology such as Cisco, Sun, GlobeComm (NetSat Express), 3Com, Silicon Graphics, Newbridge Networks, Hewlett Packard, Oracle, and O'Reilly enabled the attendees to experience the state of the art equipment and laboratories. Since 1995, there have been nine network technology workshops in Warsaw, Budapest, Zagreb and Bratislava, with the next five revisiting Budapest. The Tenth CEENet workshop will take place by the end of June 2005 in Ohrid.

The international team of CEENet lecturers, consisting of distinguished scholars and experts in network technology and its applications, covered an extensive set of topics into two parallel tracks, Engineering the Network and Network Knowledge Systems, respectively. The curricula included, but was not limited to the following subjects: network addressing and topology, DNS, authentication and authorization, routing, congestion and flow control, dial-up networking, virtual private networks, security, ATM, management of a network infrastructure, Web technology, the structure and the architecture of network and Internet information systems and data-bases, e-commerce, caching, mirroring and replication .

In 1998, a third track was added and became an integral part of the workshops, which addresses the issues of distance and open learning. In the true spirit of networking and the Internet, during the 1999, there was a pre-workshop distance learning course on the basics of distance education and course design. For the Network technology workshop in the year 2000, the design of pre-workshop courses for the engineering and content tracks was another innovation. . The pre-workshop courses have had, among others, two main objectives (1) to assist in the selection process of the best possible candidates, and (2) to provide them with a fundamental knowledge in one of the tracks, so that the actual attendance to the workshop is devoted to more advanced topics.

The last workshop with three tracks was held in Budapest in 2001. With the advances made by the beneficiary member countries, somehow the need for such large scale training with respect to the range of topics and the number of participants was fading. The workshops from 2002 had, for the first time, a single track with a much focused topics such as Internet over Satellite Links, Wireless Networking in 2004, and in 2005 on Network Security. In 2004 for the first time we had participants from Afghanistan. In fact, the last three technology workshops have been with reference to the topic, content and the participation somehow tailored towards the countries who are beneficiaries of the Virtual Silk Highway, a major NATO project to provide IP connectivity via satellite technology to the countries of the Caucuses and Central Asia.

CEENet also run a special distance education course and a workshop in Russian. It took place in 2002, in Tver, Russia, and it was a spin-off from the Wired Education (WirEd) track.

## 4.2 Policy and Management

The necessity to address and if possible to define a common set of problems and their resolutions beyond the technology level (organization, administration, funding, and co-operation) have induced the need for another type of a workshop. Running a National Research and Education Network requires not only networking technology skills, but also a deep understanding of managerial and policy issues. The need for this type of workshops is also a recognition that communication and information technology is one of the conditions for an economic growth and general progress of each society. Due to the complexity and the global implications of the effort, there is a need for policy recommendations and implementations on each level. This way the public and social awareness could create the necessity of realization. There have been eight workshops on network management and policies, the first one in Tartu 1997, followed by Yaroslavl 1998, Tbilisi 1999, Bishkek 2001, Zagreb 2002, Baku 2003, and Chisinau 2004. There were somehow linked to the already established sequence of NATO Advanced Networking Workshops held previously in Budapest 1993, Moscow 1994, and Almaty in 1995. The Workshop in Yaroslavl and another one in Varna 2003 were organized jointly with TERENA.

The Tartu and the Yaroslavl policy and management workshops respectively, established the model of these types of events in the years to come. They set up the context, the scope and the range of the topics, as well as the profile of the participants and the spirit of interaction. Hence, we shall examine these two workshops in a slightly more detail.

The first CEENet Workshop on Network Policy was held in May of 1997, in Tartu, Estonia. There were sixty-three participants, from twenty-three countries, who presented forty-four papers. The profile of the participants included directors of the CEE NRENs, the high representatives from the government (such as ministries and agencies responsible for national research and education networking), and delegates from institutions of higher education. The objective was to confront the ideas of the three different players in the research and education networking, namely to identify major problems and issues, recognize the main characteristics of NRENs, enumerate the list of goals and priorities, as well as define a set of strategies, and finally provide a common set of guidelines useful for all the NRENs in their respective countries.

Three major topics were discussed in Tartu

- Network organization and administration
- Financing and funding
- Network in National and International Context

The result of the conference in Estonia was the CEENet Tartu Declaration which is a series of statements about the state of the affairs with respect to the research and education networking in each member country, and a set of recommendations to the governments, the national networks, international agencies and organizations.

There are seven parts in the Declaration: the preamble, the challenges, the current situation, the goals and the objectives to be reached, the means to achieve the objectives, the list of problems, and a set of recommendations for the governments, the national networks, and the international organizations and agencies. One of the recommendations to the governments is that they must acknowledge the inevitability of science, education and technology, and thus provide a fruitful and stimulating environment by enacting precise and non-monopolistic telecommunication laws, protect the intellectual rights and freedoms, as well as the security and the integrity of the data. On the other side, national networks should observe the international standards with respect to the infrastructure, the quality of the services, and the right to access. An intensive effort should be allocated to the primary and secondary education since they play an important and lasting role in the dissemination of the Internet and network/information literacy. While the Declaration is an aggregation of recommendations, rather than binding resolutions, it profoundly and strongly posits the objectives and the principles how to converge and integrate into the Global Information Society.

The next workshop on the management issues in running a national network was done jointly with TERENA in Yaroslavl, Russian federation. Now, the top officials responsible for running the national networks in the CEENet member countries became students, while the lectures were the managers and the directors of the most advanced research and academic networks in Europe, and both TERENA and DANTE officials.

The objectives of the Yaroslavl Workshop were to identify the necessary structures required to provide networking services to the research and education community, to define the principles that should be observed in order to achieve and maintain utility of services, technical excellence and financial stability, and to understand the funding mechanism and the possible ways of their implementation, naturally according to the characteristics of the country and its policies.

The first two sessions of the Workshop consisted of the TERENA and DANTE presentations with respect to their role in the European research and education networking, and the enumeration of the Workshop programme and the explication of the expectations of the participants. The workshop continued with an excellent statement of what a science policy is, and an overview of its attributes relative to networking. Then the identification of new user communities and groups followed, which usually fall in the realm of research and education networking, such as schools, museums, municipal centers, and libraries.

The fourth session dealt with the basic services that NREN network should offer connectivity, services, licenses, discounts, training, education, research and development. The very important issues with respect to the telecommunication laws and regulations, the emerging technologies and how they affect the communication market were in the focus of the next two sessions. The last four session were devoted to the management of the NREN, illustrated with case studies, the relations with the government and funding mechanisms, the possibility to achieve some degree of independence and where actually policies should be made.

In turn, these two workshops were quite different in content and format. The first one in Tartu gather the top managers of the NRENs, the high level representatives of the ministries and government agencies responsible for national research and education networking, and the delegates of the institutions of higher education that are dominant in the use of networking and the Internet. The objective was to confront the ideas of the three different players in the research networking and to provide a common set of guidelines useful for the national networks in their respective countries.

In July 2002, CEENet organized a unique educational event, which in a way looked like a logistic nightmare. It was called “A Flying Workshop” and in only a week, it moved the participants of the workshop through three different NRENs, in three different cities and naturally in three different countries. The hosts were CESNet (Prague, Czech Republic), NASK (Warsaw, Poland), and EENet (Tartu, Estonia). For the purpose of the Flying Workshop a book was written in Russian under the title “NREN Creation Cookbook”.

In order to document its activities and to disseminate its results and accomplishments in an efficient and lasting manner, CEENet has established a series of publications. The books from the CEENet Edition, which primarily contain the material presented and lectured at the workshops and the conferences, are distributed to the member countries, corporations, international organizations and governments.

### **4.3. Projects**

Throughout the years CEENet has been involved in a number of projects. In the very beginning they were limited to the activities of its sponsors, NATO and OSI. Namely, CEENet helped some countries in the Network Infrastructure Grants (NIGs), and has helped the proliferation of Cisco Networking Academy Programme in the CEE countries.

The need for diversification, the aforementioned transformation of educational objectives, and to extend to another domain areas related to ICT, made CEENet look into other sources of funding, in addition to the old ones, such as the EU, SIDA and the Internet Society.

One of the first projects was the ALARI, with University of Lugarno and other EU partners. This project finished by the end of 2004, and here CEENet was key in recruiting students from CEE countries for the international graduate programme in embedded engineering at the University of Lugarno.

Three years ago, based on its expertise, CEENet along with seven other EU countries carried a project termed as @DULINE. It was dedicated to the design and tutoring of distance education courses, using distance learning technology. A pure instance of learning about a technology via the technology itself.

Both CEENet and the projects partners are trying to find the best way for a provision of

follow-ups.

Another project that started in December of 2004, and will end in May 2005, with a workshop at Lund University was financed by SIDA (Swedish Agency for International Cooperation) through the SPIDER (Swedish Programme for ICT in Developing Regions) Centre. The coordinator of the project, named ICT4ICT or ICT Knowledge for ICT Diffusion, is Mid Sweden University. In addition to CEENet, participants are Yerevan State University, Saint Cyril and Methodius University, National and University Library of Macedonia, and the Macedonian Academy of Sciences and Arts.

The main goal of the project is to explore and study ICT diffusion in the CEE countries create an open model comprising the factors that influence the overall conditions for ICT development. Some ramifications of the model and preliminary verification are done via three pilot projects, one in Armenia and two in Macedonia. The project related to e-learning module with content relevant to the professionals within Armenian political institutions

The second project builds a Web system for searchable terminology material from several scientific fields in Macedonian and four other languages. It is well-tailored to young scholars and students, and makes the content creators aware about the potential of the ICT technology. It has the possibility for upgrading to complete terminology dictionary. Another project in Macedonia is the propagation of community networks benefits via know-how of wireless technology deployment module published in four different languages and a tele-center for demonstrating the power of wireless networking in the NULM that will be later used also in Armenia.

Currently, there are several more project proposals in the pipeline waiting for their evaluation by the funding bodies they have been submitted to.

## **5. The Future of CEENet**

What about the future? Well organizations are dynamic entities, so is networking. Since the inception of CEENet, many things have changed both in CEE region and in the science and the technology of networking.

Most of the countries have firmly established multiparty democracy, free market economy, some have completed and others have started the process of European and North-Atlantic integration. Four years ago, Poland, Czech Republic and Hungary became members of NATO. The same will be true is true for seven more members of CEENet. When the organization was formed, there was no a single member that is part of EU, today there are two full members and ten more that have been invited to join in May of 2004.

Academic networks such as ARNES, CESNET, NASK, HUNGARNET and ACONet were members of the TEN-34 projects that spilled over in Quantum, and later into GEANT. By now, more than half of the CEENet members are in the GEANT2

consortium.

How to balance the reasonable membership fees, the low overhead costs and better quality and wider range of services for its members, is one of most serious tasks that is ahead of the Association. Another one is to increase the number of projects, both bilateral and multilateral, which could be done in co-operation with EU, NATO and other international organizations.

CEENet is a heterogeneous association, comprised of countries, which were and are at the different levels of economic and social development. Nevertheless, in each one of them, at least within the academic communities, there is unqualified determination for democracy and free market economy. The ability to globally communicate and network is actually a part of that determination.

There is a lot of discussion in CEENet about the justification of the existence of the Association, and the need for change and transformations. CEENet has never been, in any way, about Gigabits and quality of service, as much as about establishing connectivity and raising public and political awareness that the Internet and networking are indeed the necessary conditions for progress and sustainability. It is about educating people both on technological as well as on managerial and political level how to become a part of the Net. Indeed, CEENet has been a factor of integration, changing even the semantics of what a CEE country is.