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## Evaluating Phare 1994 R&D Networking

**Tomaz Kalin**

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### Background

The Phare programme committed funds to the development of Research Networking in 1991 (the PHARE/COSINE Programme which ended in 1994) and in 1994 in the R&D Networking Programme. This programme commenced in November 1994 and will be completed in 1997. This paper looks at the benefits of the 1994 programme and will assess its influence on the developments of networking, and research networking in particular in the respective countries. The programmes covered the Phare regions as defined at the time of inception: the 1994 R&D Networking programme (Phare 94) covered 11 countries (see Annex 1) and the 1991 programme six.

In evaluating the benefits of the Phare 94 programme, one has to take into account the global trends in the developments of the Internet and the applications running over it. There is no doubt that the participating countries would have expanded their networks in any case. This document will show that Phare increased the pace of development appreciably, in particular in those countries where the Phare 1994 R&D Networking supported activities started early. Results from a survey developed to provide data for the project evaluation show that in most cases the international support helped in a major way to develop the research networks.

The development of R&D networking between the Phare countries and Western Europe and the rest of the world has been influenced by the rapid changes taking place in networking worldwide. One major influence has been the development of a high-speed infrastructure in Western Europe. The Phare 1994 programme allowed more flexibility in the way Internet services could be supplied using Phare funds than the previous PHARE/COSINE programme. This resulted in a new management structure for the programme. The countries involved had national representatives. A Programme Advisory Committee (PAC) was formed of the national representatives and the PHARE project officer from the EC. DANTE was appointed as managing contractor. The PAC had regular six-monthly meetings. External parties were also invited to the meetings as observers. The CEENet association and other non-beneficiary countries often sent observers to the PAC meetings as well.

### Current status

#### National supply

In the national part of the project the aim was to deploy a set of basic hardware and software components required by the partner countries, such as routers, modems, workstations, and network management software. Albania, Estonia, Latvia, Lithuania, Slovenia benefited from the national supply element of the project. The six other countries had already received funding for this purpose under the Phare 1991 project. The equipment was tendered according to EC rules.

#### The international network service provision

The second element of the project was to extend and/or upgrade connectivity to the rest of the European research Internet. Table 1 shows the connection(s) had been realised in December 1996.

#### Developments in network usage

Another important parameter, showing the recent developments in National Academic Networking, as well as the impact of the Phare 1994 Project is the growth of volume in the incoming and outgoing international traffic to the respective countries: Chart 1 shows the developments from 1992 till 1996:

Tomaz Kalin works as consultant for DANTE on projects in Central and Eastern Europe. His e-mail address is: Kalin@terena.nl

| Country | Link | Speed | Type | Status |
|---------|------|-------|------|--------|
| Albania | Tirana-Amsterdam | 64 kb/s | satellite | planned[1] |
| Bulgaria | Sofia-Amsterdam | 2x64 kb/s | terrestrial | planned[1] |
| CzechRep. | Prague-Amsterdam | 512 kb/s | terrestrial | operational |
| CzechRep. | Prague-Banska Bystrica | 128 kb/s | terrestrial | operational |
| Estonia | Tallin-Helsinki | 256 kb/s | terrestrial | operational |
| Estonia | Tallin-Riga | 64 kb/s | terrestrial | operational |
| Hungary | Budapest-Amsterdam | 2 Mb/s | terrestrial | operational |
| Latvia | Riga-Tallin | 64 kb/s | terrestrial | operational |
| Latvia | Riga-Stockholm | 384 kb/s | terrestrial | operational |
| Lithuania | Kaunas-Stockholm | 512 kb/s | satellite | operational |
| Poland | Warsaw-Vienna | 256 kb/s | terrestrial | operational |
| Poland | Warsaw-Stockholm | 2 Mb/s | satellite | operational |
| Romania | Bucharest-Amsterdam | 64 kb/s | satellite | terminated[2] |
| Romania | Bucharest-Budapest | 64 kb/s | terrestrial | operational |
| Romania | Bucharest-Vienna | 64 kb/s | satellite | operational |
| Slovakia | Prague-Banska Bystrica | 128 kb/s | terrestrial | operational |
| Slovenia | Ljubljana-Amsterdam | 2 Mb/s | terrestrial | operational |

Most of the circuits were established in separate projects, but funded or upgraded from the Phare 94 budget.

[1] Circuits will still be implemented; DANTE's original management contract has been extended beyond its original two year duration for this purpose
[2] The circuit was replaced in June 1996 with a 256 kb/s satellite circuit Bucharest - Stockholm which is funded independently of PHARE.

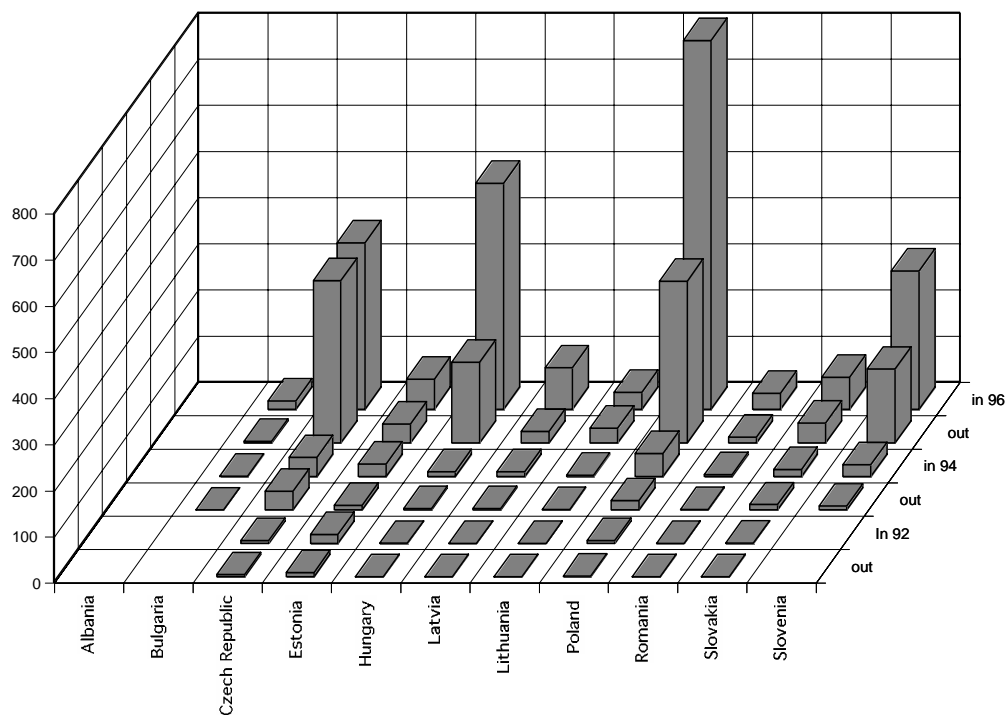*Table 1. International connectivity at the end of 1996*



*Chart 1: International Traffic in Gb/month*

Contrary to the widespread assumption that traffic with the CEE Countries will be mostly inbound, we can observe that in most cases the incoming traffic volume is only twice as large as the outgoing. In some countries the traffic flow is even more balanced. This development can be contributed to the excellent WWW sites operated by most Academic Networks and their customers, which attract attention from all over the world. Another effect that can be observed when analysing the raw data on traffic statistics is the completeness of data, as a result of measurement techniques introduced in the Phare Project.

It is obvious that the huge increase in international traffic, which, in 1996 in most cases was at least twice as large as in 1992, can only be absorbed if the national infrastructure is developing adequately as well. Chart 2 shows the number of hosts connected to the academic network. A comparison of these data to the count of all hosts as performed monthly by RIPE-NCC, shows that in most of the Phare countries by far the largest part of the hosts belongs to the academic community (see below).

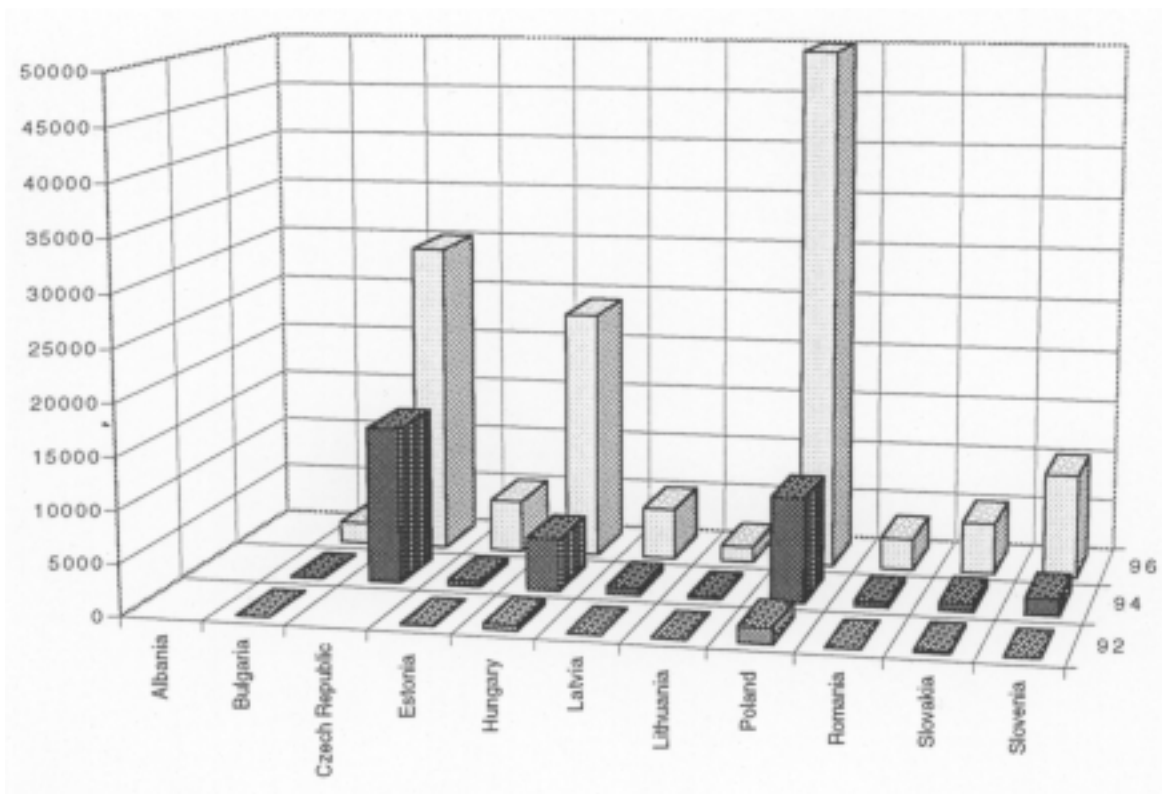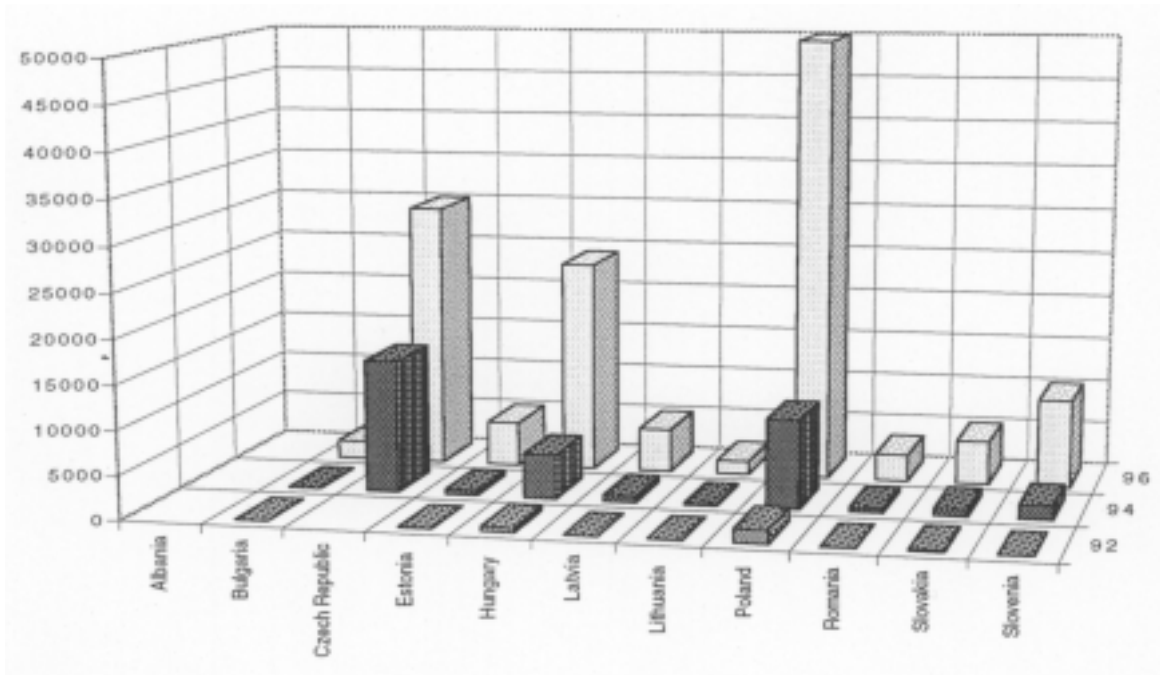| Country | Number of academic hosts/ total number of hosts - 1996 |
|---|---|
| Bulgaria | 60% |
| Czech Republic | 73% |
| Estonia | 62% |
| Hungary | 80% |
| Lithuania | 87% |
| Latvia | 84% |
| Poland | 94% |
| Romania | 38% |
| Slovakia | 62% |
| Slovenia | 72% |



*Chart 2: Number of Hosts Connected to the Academic networks*

*Chart 3: Number of organisations served*

Comparison of Chart 2 (Number of Hosts Connected to the Academic networks) with Chart 3 (No. of organisations served) and Chart 4 (Number of users of the Academic network) supports the view that some countries (e.g. Poland) provide network access to a large number of students through large scale mainframes. In many other countries the principal means of access to the network seem s to be personal computers.
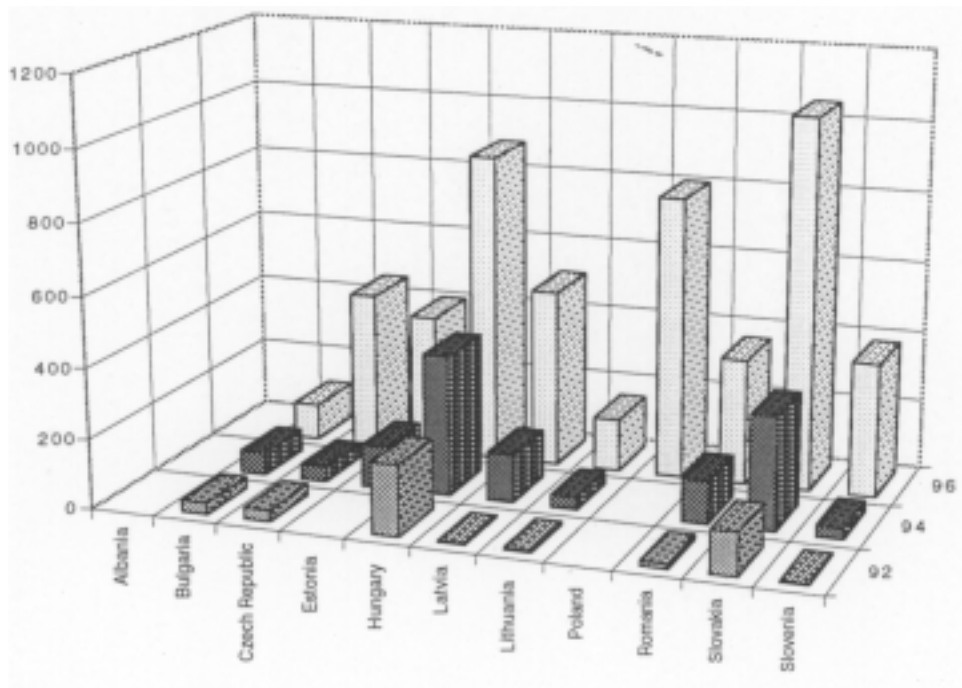


*Chart 4: Number of Users Connected to the Academic Network*

A very interesting picture gives the analysis of the type of users served by the Academic Networks in the Phare 1994 partner countries. In Chart 5 one can see that the first users connected in 1992 were universities and governmental research organisations. As a consequence of increased contacts with the colleagues elsewhere and growing awareness of the benefits of networking, the members of the universities were the first ones to demand international connectivity. The same holds for the governmental research organisations that show a moderate, if still impressive, growth in connections. The most remarkable is the increase in the number of secondary schools that currently have access to the Internet. But none of them surpasses the growth of the commercial organisations that are connected to some National Academic Networks.
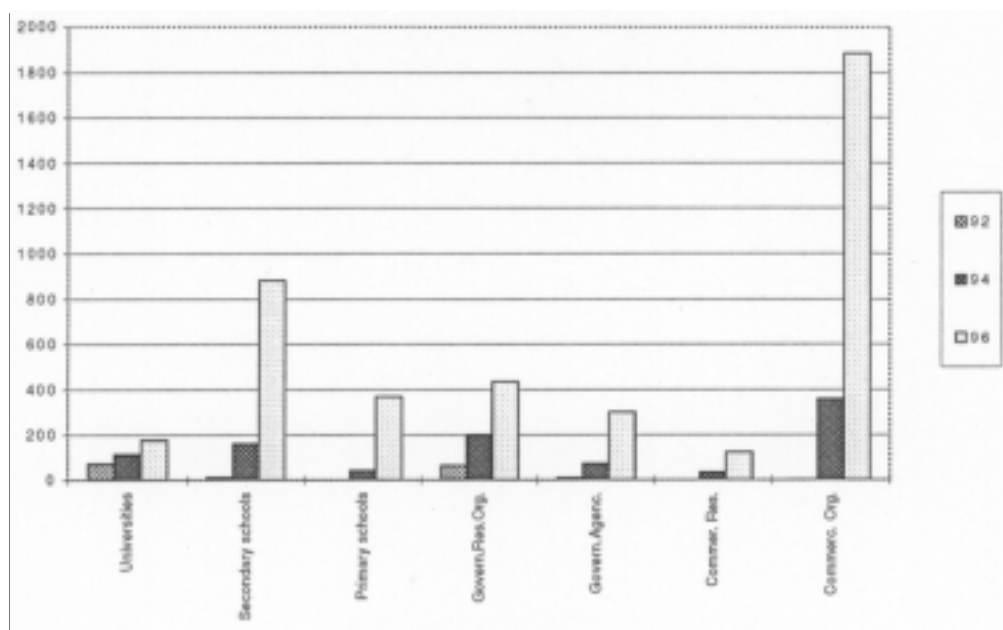


*Chart 5: Community served*

A detailed look at the data for 1996 (Table 2) shows that around half of the Phare 94 Academic Networks have a very strong Acceptable Use Policy and therefore connect no commercial customers at all. In those countries a satisfactory coverage by the commercial ISP's was established as a rule. In the rest, the Academic Networks are either the only substantial Internet providers and they have to accept interested parties, or they have to serve commercial customers, to share the cost of the network infrastructure.

At this point in the evolution of the Academic Networks in the CEE Countries, one should consider this developments as positive, since they contribute to the 'informatisation' of the respective countries.

|  | Universities | Secondary School | Primary School | Government Research | Government Agency | Commercial Research. | Comm. Org. |
|---|---|---|---|---|---|---|---|
| Bulgaria | 17 | 5 | 0 | 62 | 22 | 0 | 0 |
| Czech Rep. | 27 | 200 | 5 | 46 | 40 | 5 | 150 |
| Estonia | 9 | 180 | 60 | 10 | 0 | 1 | 1 |
| Hungary | Yes | Yes | 0 | Yes | Yes | Yes | 0 |
| Latvia | 12 | 43 | 43 | 28 | 21 | 8 | 783 |
| Lithuania | 10 | 7 | 190 | 18 | 126 | 3 | 0 |
| Poland | 80 | 150 | 20 | 200 | 50 | 0 | 300 |
| Romania | 40 | 200 | 0 | 34 | 3 | 60 | 21 |
| Slovakia | 19 | 90 | 25 | 40 | 20 | 45 | 650 |
| Slovenia | 3 | 206 | 25 | 30 | 20 | 60 | 0 |

*Dial-up access*

Larger institutions can afford to connect to the National network using leased lines, metronets or other high speed method. To provide access to a large number of individual users an infrastructure was set up consisting of distributed Points of Presence (PoPs) in the form of sets of terminal servers connected to the network, using an appropriate higher speed link, and providing a bankof dial-up modems for the users to log in through the public telephone system. The following two Charts show the total number of PoPs and the number of dial-up ports in the Phare 94 countries.
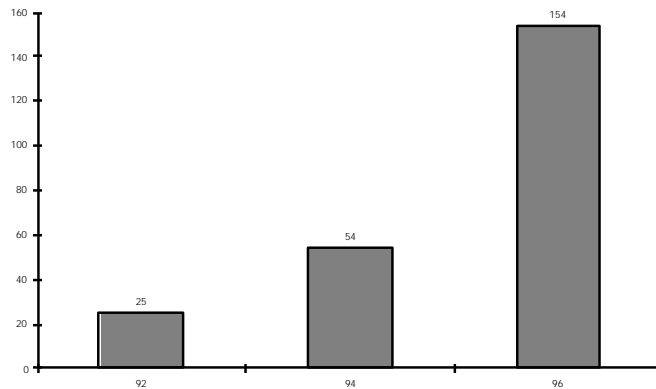


*Chart 6: Total Number of PoP in all Members*
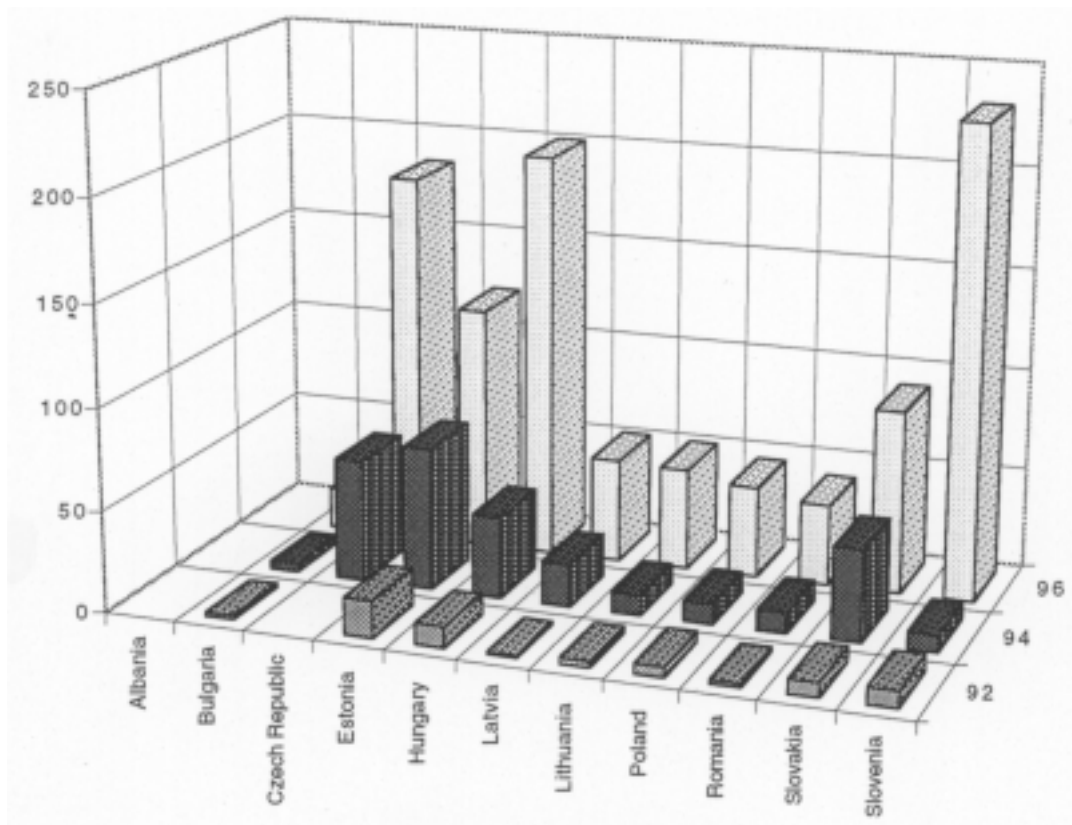


*Chart 7: Number of Dial-up Ports*

## Applications

In the previous chapters the emphasis was on the development of the network infrastructure, such as information flow and access to the network. The applications that are running were not analysed, with the exception of the influence of the WWW on the international traffic load. Particularly in the area of WWW servers, an astonishing progress was made in the CEE Countries. Chart 8 depicts the growth in the number of the WWW servers. This can partly be ascribed to the general trends in the Internet world, but some elements like occurrence of the large number of WWW caches operating in the CEE Countries (Chart 9) can without doubt be credited to the COPERNICUS project INSIGHT running for the last two years in the same countries. Present density of cache servers is much higher than in most of the Western European countries. Use of the cache technology has reduced the bandwidth requirements for the incoming WWW traffic considerably. In the case of Estonia bandwidth savings up to 30% were measured.
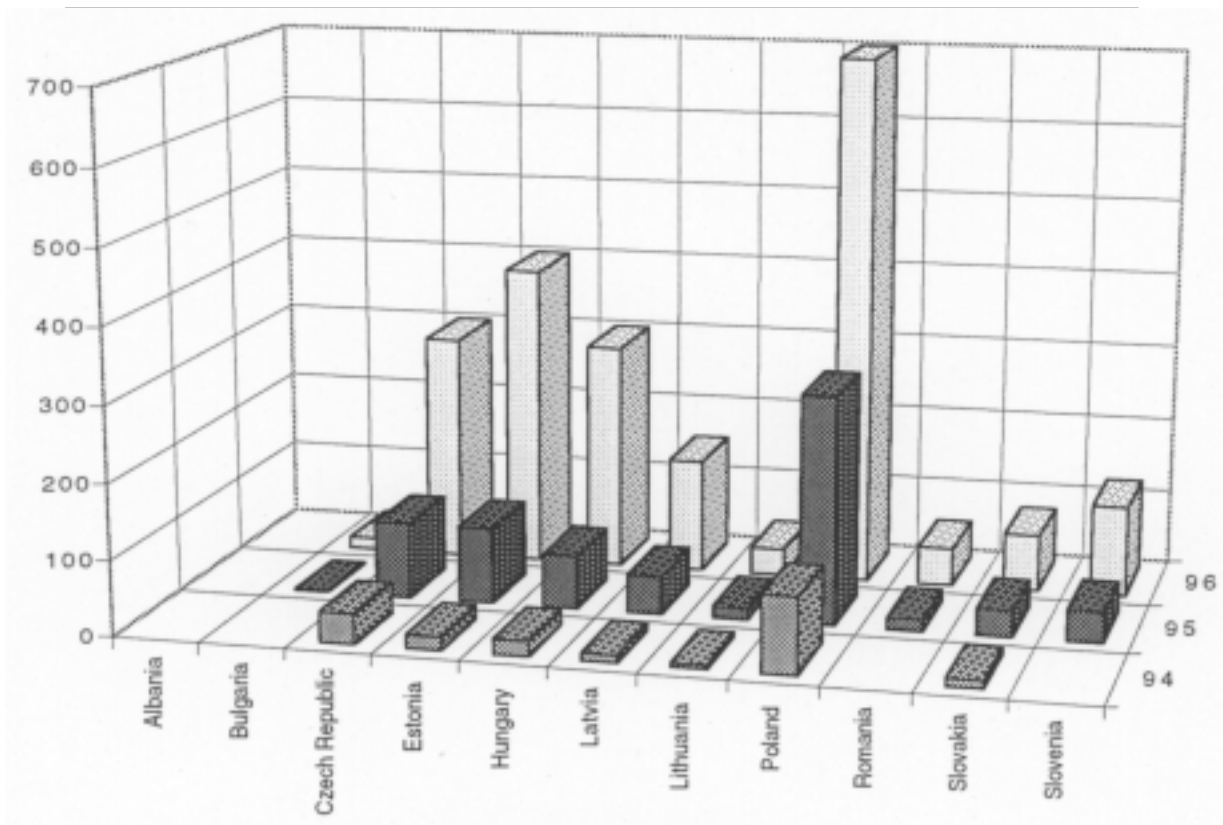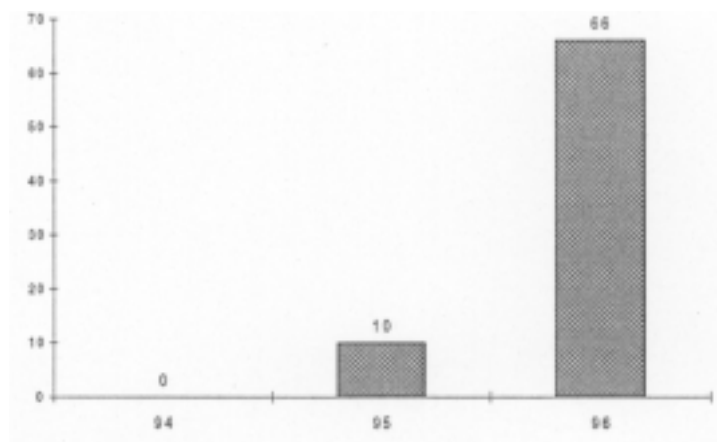


*Chart 8: Number of WWW Servers*



*Chart 9: Number of Caches in the CEEC*

**Financial aspects**

Everybody is aware that the high cost of international telecommunications circuits in Europe makes Internet networking a costly affair. This is even more true in the CEE Countries, where the national and international links can be twice as expensive as in Western Europe. This prohibits timely upgrading of the internal and international connections to the required level of throughput. Therefore, the support of international connectivity by the Phare 1994 R&D Networking Programme was the right type of help in the right place at the right time. More about the opinions on this subject of the national project coordinators at the end of this document. Chart 10 shows the size of the budgets of the respective National Academic Networks from 92 till 96 in ECU.

A normalisation of the amounts per e.g. million inhabitants would show (Chart 11) that a few of the small countries in the CEE region are applying a huge effort, in terms of their economic potential, to catch up with the rest of the developed world.
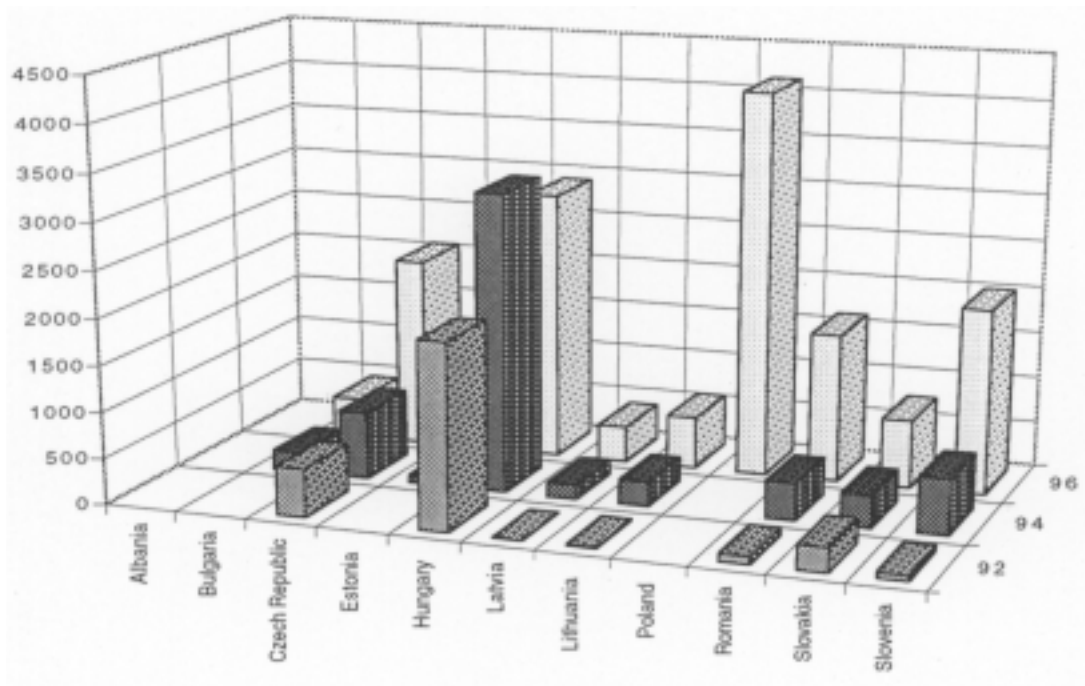

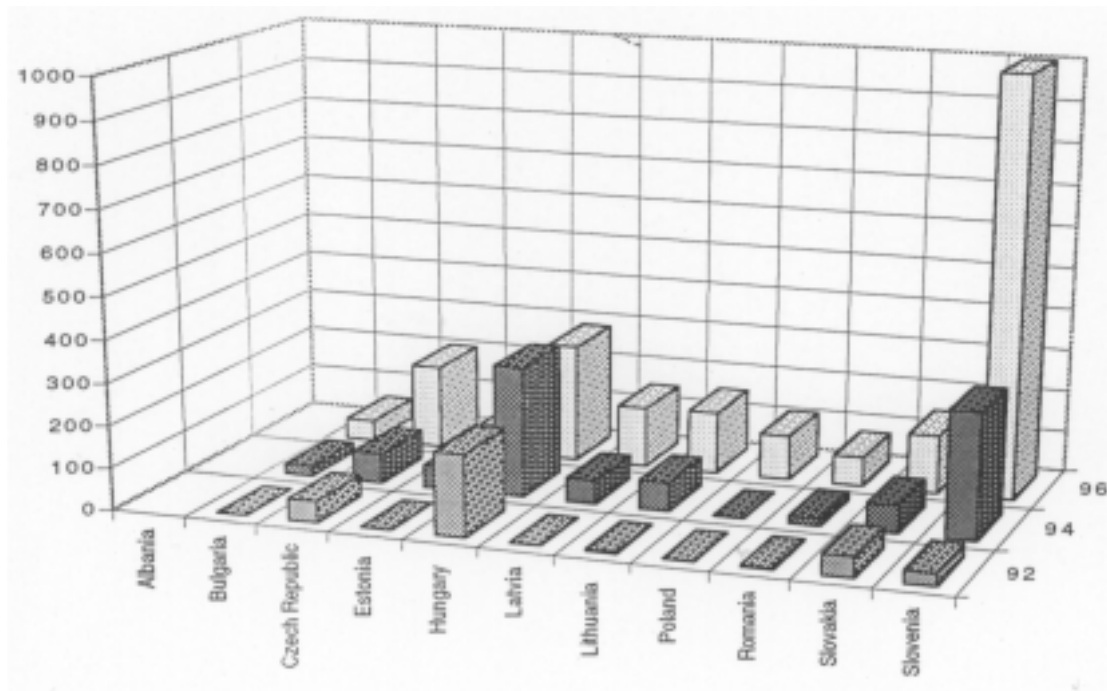
*Chart 10: Yearly Budgets (in kECU)*

*Chart 11: National Academic Network budget in kECU/million population*

Another no less important piece of information is the average percentage of the operational budget of the National Academic Network that was covered by international contributions in the last 4 years. One can observe (Chart 12) that in 1994, on average, an extremely high proportion of the budgets was externally funded. In 1996, with the rising costs for ever increasing demand the average percentage was cut by half, but for some of the smaller countries it still remains on the level of above 40%, which seriously questions the capability of those countries to maintain the present level of network services in the future.
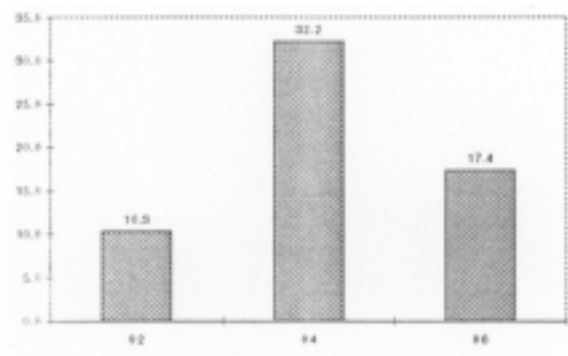


*Chart 12: Percentage of the networking budgets covered by international funding*

## Was it worthwhile?

This is of course the question that everybody involved in a project like Phare 1994 asks at the end of the work: the provider of the funds, the Project Officer, the organisation managing the project, the staff involved, and last but not least, the beneficiaries. To be able to answer this question a survey was held under the partner countries. In addition to questions dealing with quantitative aspects of the developments of the respective National Academic Network, the survey asked the opinion from the representatives of the partner countries on the most important benefits of the project and more general comments on the results. The findings are listed below.

### 1. Name the three most important contributions of PHARE 94

As the most important benefit the participants listed the financial support of the international connectivity. Some answers were quite descriptive:

*"PHARE project helped LATNET to survive covering the expenses of the international connectivity."* [Latvia]

*"Setting up the line Prague-Amsterdam (512 kb/s) in June 1994 before the INET 94 and keeping the line for CESNET's use after INET'94"* [Czech Republic]

*"PHARE funded about 70% of all LITNET international traffic in 1996."* [Lithuania]

*"The PHARE programme has helped to increase the international connectivity significantly for Hungarnet".* [Hungary]

Secondary effects in relation to the national part of the programme were deemed important as well:

*"A major step ahead in bandwidth and as a result of this improved quality of service for more academic users."* [Bulgaria]

*"PHARE project gave possibility to set up Internet services for students and staff at 6 new Universities, which could not themselves get the funds for buying computers for information servers".* [Lithuania]

*"The national PHARE project has provided funds for the equipment to allow the increase of the number of ports, both for leased and dial-up connections".* [Romania]

It is interesting that a Project management requirement that the networks operate a network monitoring system and provide monthly statistics on the usage of the international connections, received full approval. Quite high on the list of the benefits one can find:

*"The help in starting the continual collection of data about international connections."* [Estonia]

*"Installation of the NMS monitoring system".* [Czech Republic]

*"Very needed and useful proxy servers were installed on 4 computers from PHARE project. It helped to improve load on communication line".* [Lithuania]

*"PHARE project funds allowed to install a Network Management and Administration System, which is very useful for operating and monitoring of the network".* [Lithuania]

In second and third position in the list of benefits the technology and knowledge transfer elements are listed:

*"The participating in an cooperation project, financed by EC, has given knowledge needed for such cooperation schemes".* [Estonia]

*"Valuable information and know-how about Internet provision to the academic society".* [Bulgaria]

*"During the regular contacts with the colleagues from EC and CEE countries new information and knowledge were obtained".* [Latvia]

*"The PHARE programme improved the WEB culture in the country with new sets of standards and services".* [Hungary]

*"Several research cooperations come to exist through using the network".* [Hungary]

*"...cooperation with other networks organizations"* [Slovak Republic]

*"...be involved in the progress in the new Information technologies"* [Slovak Republic]

But not only the educational value to the network operators; as an important result of the Project the increased awareness of the authorities is mentioned as well:

*"Involvement of the State with the problems of the academic computer networking and especially with its funding."* [Bulgaria]

*"Support for the governmental decision bodies to understand the importance of the academic and research networks and the need to approve the necessary funds for running such a network".* [Romania]

*"Support for increasing awareness of the research networking".*

### 2. General comments partly repeated the statements about the main benefits, but showed some new angles as well:

Some criticisms:

*"Very useful, but slow and somehow too bureaucratic". [Estonia]*

*"Very useful project but the official procedures are to slow, especially the equipment's tender (more than 1.5 years)". [Latvia]*

Moving closer to European networking, scientific and cultural circles:

*"This PHARE R&D Networking 1994 program enables the still underfinanced academic communities in CEE countries to use in their educational and research work the modern means of data networking and collaborate with their colleagues from other states" [Slovak Republic]*

*"The PHARE program was the best way to help new democratic countries (CEE countries) start in networking activities, help to have connection to information resources, to bring new possibilities in R&D cooperation in Europe and also help to create academic network which has to be fully compatible with the European Academic Networks". [Estonia]*

*"Without PHARE projects, the Research and Academic Network in Romania would not be so developed as it is now, that means that there would be less contact between Romanian and foreigner scientists without PHARE funds". [Romania]*

*"The PHARE programme helps bridging the gap between Eastern and Western research networks, consequently the isolation era has been replaced by the collaboration era". [Hungary]*

The early part of the project was identified as the most helpful period in the lifetime of the project, particularly in the case of the larger countries. This opinion is based on the diminishing proportion of the PHARE contribution in time, compared with the total networking budget (see Chart 12):

*"It was valuable at early stages of computer networking in some countries, but it could not be effective in the case of fast growing network, as in Poland".*

*"The PHARE program helped us to improve our infrastructure (both international and domestic), mainly in first years (1993, 1994)" [Czech Republic]*

And expectations for the future:

*"Expectations for future if it will be extended: to trigger European high speed international backbone". [Poland]*

### 3. The final question was: "To what extent has PHARE contributed to the present development level of your Academic Network?"

The results are presented below:

| | |
|---|---|
| Not at all | - |
| To a small extent | 1 |
| In a major way | 8 |
| Impossible without it | 2[1] |

*Table 3. Contribution of PHARE*

[1] Of the two answers indicating that the present level of the networking would be impossible without PHARE 94 support, one [Slovak Republic] had a qualification "in the starting phase" and listed the "in a major way" for the rest of the duration.

### Conclusion

Looking at the results of the Phare 1994 R&D Networking contribution to the development of Academic and Research networking in Central and Eastern Europe, it is justified to say that the Project has been a success. Relatively modest funds helped to make a big change in a large part of Europe. In some cases the contribution represented a major part of the networking budget in a country, while in others it had more of a catalytic effect. In any case, participation in the Project made substantial knowledge transfer possible and helped to make the national authorities aware of the importance of networking activities.

It is also fair to say that the Phare project has contributed substantially to the fact that three countries, Hungary, the Czech Republic and Slovenia have become partners in the TEN-34 Consortium, Hungary as a Member and Slovenia and the Czech Republic as observers. TEN-34 is a new high speed pan-European interconnect facility between the national research networks and will be launched in the first quarter of 1997. A TEN-34 node in Hungary is part of the first phase of the implementation plan.

For the future it will be important to find a form to continue the collaboration with the Academic Networks in the CEE region and to help them to follow the technological developments in the other European countries.

### Annex 1: The partner organisations in the Phare 1994 R&D Networking Project

**CSTID**
Centre for Scientific and Technical Information and Documentation
Rr. "Leke Dukagjini" 5.
Tirana
Albania
*Contact person:*
Serzh Qesteri

**HUNGARNET** *
H-1132 Budapest XIII.
Victor Hugo u. 18/22.
HUNGARY
*Contact person:*
Miklós NAGY

**RNC** *
Research Institute for Informatics
Bd. Averescu 8-10
Bucharest 71316
Sector 1
Romania
*Contact person:*
Eugeni Staicut

**UNICOM-B** *
Bulgarian Academic and Research Network
Centre of Informatics and Computing
Technology
Acad. G. Bonchev Str.
Bl. 25-A
BG-1113 Sofia
Bulgaria
*Contact person:*
Martin Bankov

**LATNET**
LATNET Laboratory
Institute of Mathematics and Computer Science
Raina bulv. 29
Riga, LV-1459
Latvia
*Contact person:*
Janus Kikuts

**SANET** *
UAKOM UMB
Kyjevske nam. 6
Banska Bystrica 97401
Slovakia
*Contact person:*
Jaroslav Bobovsky

**CESNET** *
VC CVUT
Zikova 4
166 35 Praha
The Czech Republic
*Contact person:*
Jan Gruntorad

**LITNET**
Network Operating Center
Studentu 48a,
3028 Kaunas,
Lithuania
*Contact person:*
Laimutis Telksnys

**ARNES**
Jamova 39
1000 Ljubljana
Slovenia
*Contact person:*
Marko Bonac

**EEnet**
Estonian Educational
and Research Network Tahetorn Toomel
EE2400 Tartu
Republic of Estonia
*Contact person:*
Enok Sein

**NASK** *
Research and Academic Network in Poland
Bartycka 18
00-716 Warszawa
Poland
*Contact person :*
Tomasz Hofmokl

More information and contact details available from: http://www.dante.net/phare

**\*Partners in the 1991 Programme as well**