Annual Report 1991-1992

Contents

1992 Executive Committee:

Standing from left:	**H. Deckers**	**M. Sommani**	**F. Greisen** **L. Csaba**
	Manager	General Secretary	President
Sitting from left:	**J.-L. Delhaye**	**A. Cohen**	**P. Bryant**
		Vice-President	Treasurer

Not shown: **S. Orphanoudakis**
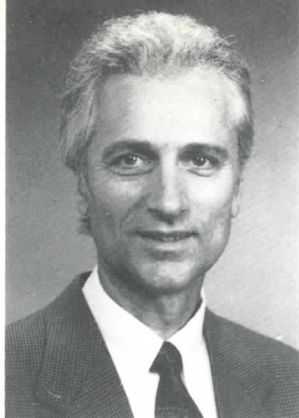
President's Report

EARN provides network services to 30 countries in Europe, the Middle East and Africa. The total number of EARN nodes is not growing significantly since we have already connected probably the majority of NJE nodes in the research and education community. However, traffic increased by 23 per cent from 1991 to 1992.

During the last year two new countries - the USSR and Bulgaria - have connected to EARN. In addition Romania, Iran and most recently Cameroon have also been accepted as member countries and plan to connect very soon.

Due to the dramatic political events in Europe, an increase in the number of member countries does not necessarily mean an increase in geographical area. The split of the USSR and Yugoslavia into several countries and the coming split of the CSFR cause difficult problems for EARN both on the organizational level and on the operational level.

Most dramatically, following the UN resolutions banning cultural and scientific cooperation with Serbia and Montenegro, the Austrian government decided to order cancellation of the EARN link from Linz to Belgrade. Thus, researchers all over former Yugoslavia were cut off, not just those in Serbia. EARN and other networking organizations therefore need to consider to what extent their computer net should be seen as cooperation and to what extent it is infrastructure.

In 1992, EARN has continued the trend to use shared international lines for connecting its countries. As described in the section on regionalization in this report, we have concluded a project where core sites in nine countries have all established virtual links to each other, vastly improving the reliability and performance of the network. One measure of this is the fact that the average number of files queued on nodes have decreased by a factor of three from early 1991 to early 1992.

The regionalization has to a large extent been made possible by the establishment of Ebone, the European IP backbone, and by the use of transatlantic links provided by the Ebone partners with support from the National Science Foundation (NSF) in the US. As a result of this, EARN and CREN have cancelled their dedicated transatlantic link and EARN has provided cash and manpower support to Ebone.

Ceasing to be primarily an operator and coordinator of international (physical) links, EARN has changed its focus towards applications. The well established Listserv/Listearn service continues to be competitive. An updated EARN end user guide has been produced and new user documentation is in preparation.

This summer EARN has performed an end user survey to assess the needs of the community. Based on the results of this survey we look forward to make networking richer, easier and more reliable to our users.

Frode Greisen
President

Technical Work in EARN

This report gives a status of the technical work in EARN. The organization of technical work in EARN is described in document BOD31 89.

EARN Permanent Groups

EARN-NOG

The EARN Network Operations Group (EARN NOG) was established in 1987.

The EARN-NOG is responsible for the operations of the EARN international backbone and has to approve all technical changes on EARN international connections. The EARN-NOG has to approve any proposed EARN directive or recommendation.

The NOG members are :

- One NCC (Network Country Coordinator - technically responsible for EARN in his/her country) per country, and possibly a NCC deputy
- The EARN manager, who chairs the EARN-NOG
- Developers of major tools
- EARN staff

The EARN-NOG meets twice a year, usually just before the BoD meetings. For each meeting minutes are produced and these are available as published electronic documents.

Almost all connected countries are represented in the EARN-NOG meetings.

EARN-INFO

In October 1989, the Board of Directors (BoD) established the EARNINFO permanent group (BOD51 89). Each EARN member country was asked to appoint a representative (INFOrep) and possibly a deputy to this new group.

This group is responsible for information and documentation about EARN and EARN services as well as information on other networks and services accessible from EARN. There are now members from 24 EARN countries, plus Canada and the USA, subscribed to its Listserv list, EARNINFO.

EARN staff (including the EARN Info Coordinator) met in Orsay in March 1992 to develop a documentation plan (EXEC26 92). Main features of the plan include: improved distribution mechanisms, modularity of the set of documents, adherence to common guidelines for content, style, layout and presentation and the setting up of an info server, to make documents publicly available. They will address the major aspects of user services provided by EARN, from a user-guide perspective. This includes user documentation on specific EARN servers across four operating systems common in EARN, and a set of more general introductory documents. Documents will be available both in plain and postscript format.

Following discussions on the various possible directions and trends for the development of the EARN network, the BoD, acting on a recommendation from the EARN Executive, decided to authorize the conducting of a USER SURVEY concentrating on network services. The survey questionnaire was developed with the cooperation of the EARNINFO and EARN-NOG groups, and it was distributed on 9 July 1992 to members of the EARNINFO list for distribution within the various member countries. Completed questionnaires were collected centrally at the EARN Office in Orsay, France, and from there they were sent to Izmir, Turkey for statistical processing. As of the end of August, the number of completed questionnaires which were returned to the EARN Office stood at approximately 1500.

The statistical processing is being carried out under the guidance of Professor Oguz Manas. The results and conclusions of the survey will be publicized at the Network Services Conference (NSC'92) which will take place in Pisa, Italy at the beginning of November 1992.

EARN Project Groups

EARN-RPG

The Routing Project Group started in 1990 after the Board of Directors instructed the EARN Executive to create a project group to study routing and networking topology. This group was then set up to implement the policy decisions made by the BoD, and to enable the use of multiple transport networks, using different protocols at the Session/Transport layer, and to incorporate additional non-EARN links in the EARN NJE network. The name of this project group is EARN-RPG and the chairman is Hans-Ulrich Giese, who is working for EARN as NJE Network Master Coordinator (NMC).

The Terms of Reference for the group are available as EXEC69 90. The group had its inaugural meeting on 13 July 1990 in Amsterdam and since then meets in conjunction with the NOG meetings. The latest minutes are available as paper EXEC52 92. The group is responsible for the EARN Regionalization Plan, which was first drafted at the Cairo meeting and has since achieved considerable success throughout its implementation. While implementing this plan, the group developed into a competent discussion forum for routing issues in EARN, as well as for interconnections with other networks.

EARN-PEG

In June 1991, the EARN Executive approved the creation of the EARN Performance Evaluation Group. The Terms of Reference of the EARN-PEG are available as EXEC51 91. The EARN-PEG took over the activities of the EARNSTAT group and, in addition, its mission included development of tools and procedures for measuring the performance of the network. The EARN-PEG is chaired by Daniele Bovio, from the EARN Office.

During its first meeting, held in Istanbul in November 1991, the EARN-PEG discussed and selected relevant data to be collected in order to better understand and evaluate the "health" of the network based on its performance. In addition, the data is used to plan improvements to the network. The main areas of interest are: traffic statistics (including details on servers); round trip time for messages, mail and files; link down times and the sizes and behavioral patterns of queues.

The EARN Office has introduced and subsequently refined a set of monitoring tools to meet the requirement expressed by the group. A relevant amount of data was in fact available at the second meeting of the EARN-PEG, held in Innsbruck in May 1992, where a further refinement of the enhanced tools and of the output format for the data was discussed. By examining the results of the monitoring activities, it was also possible to identify and correct problems on international links. Currently the results of the monitoring activities are published weekly on the relevant mailing lists. See the chapter "Statistics" in this report, for an overall review of the data collected so far.

EARN-SNA

The most recent product of the EARN-SNA working group is paper BOD36 90 (EARN SNA Directives and Recommendations). After approximately one year of inactivity, the group has been dissolved during the BoD meeting of Prague in November 1991. Reasons for the termination of the group are explained in detail in paper BOD56 91 (EARN-SNA Report for 1991).

International SNA connections dedicated to NJE transport have become financially disadvantageous as a result of the availability of the VMNET software and of the establishment of international IP connections all over Europe. As a consequence of this, NJE transport over SNA has almost disappeared from all international EARN connections, and there is no need to maintain a group for coordinating the transport of NJE over SNA across Europe. NJE over SNA is still being used on a few international links, but these are isolated cases, and do not need central coordination.

Paper BOD56 91 explicitly removes the restriction contained in BOD36 90, which limited the use of international EARN SNA connections to NJE traffic.

EARN Special Interest Groups

These groups have been started informally by the EARN technical community and are constituted by open lists of those interested in the subject. The existing groups fall mainly in the area of the EARN services and are:

- NETSERV Group

The NETSERV group works in the area of NETSERV services.

- RED

The RED group works in the area of TRICKLE services.

- LISTEARN

The LISTEARN group works in the area of development of LISTEARN, which is based on LISTSERV program developed by Eric Thomas.

EARNEST, the EARN Newsletter

The first issue of EARNEST, the EARN Newsletter, came out in May 1992. EARNEST offers a forum to discuss what happens in EARN in the technical, management and users areas. This newsletter is distributed electronically. Five issues will be published each year.

Users are invited to express their ideas in EARNEST. They are encouraged to submit articles for publication, ideas for articles, letters, etc., to Nadine Grange (grange@frors12.bitnet).

Let's quote from the Editor's corner of the first issue:

"This is the first issue of EARNEST, the EARN Newsletter. EARNEST is meant to be different things to different people. For those interested in the technical side of the network, there will be regular features on changes in network topology, reports and explanations of network, and lists of those nodes which have joined or left the network. Those of you interested in network policy issues and internetworking should enjoy the features on relations with other networking and computer groups, announcements from the EARN management, reports from the EARN Executive and the EARN BoD, and information on special EARN events. In future issues, we will have guest columns featuring the latest developments in network user services. And the lighter side of EARN is represented in this issue by a networking crossword puzzle. Much of the information in this issue can be found in official EARN documents, but we hope to present it here in a way which is accessible to all readers. Whatever your interests and whatever your level of networking knowledge and involvement, we hope that you find EARNEST edifying and enjoyable."

Newsletter information:

Those who want to receive EARNEST automatically can subscribe to it by sending the command : SUBSCRIBE EARNEST First_name Last_name to listserv@frors12.bitnet.

Visitors program

A session of the EARN visitor's program was organized from the 2nd to the 6th of March 1992 at the EARN Office, CIRCE, Orsay, France. EARN staff, reinforced by former EARN staff member Niall O'Reilly (who joined us from Ireland) prepared the program and documentation and ran a visitor's program week with tutorials, hands-on sessions and informal question and answer sessions. There were even parallel sessions when visitors interested in IBM or DEC worked separately. CIRCE contributed to the effort with two well equipped demonstration rooms. The visitors were:

Alexander Simeonov and Nikolay Avramov from Bulgaria,
Polycarpos Hadjipolycarpou from Cyprus,
Jonas Mockus and Petras Sulcas from Lithuania and
Manuela Dobre and Eugen Staicut from Romania.

EARN Staff enjoyed working with these strongly motivated and enthusiastic visitors who contributed significantly to the success of the meeting.

Conferences in 1992

As in previous years, EARN has not limited its conferences solely to EARN services and EARN users since this would today be an artificial limitation of topics as well as on attendance. We have, however, cooperated in the area of jointly sponsored conferences. In addition - as in 1990 when the Joint European Networking Conference was created by EARN and RARE and in 1991 when the INET conference was born - EARN has been a driving force behind a new event, this time the Networking Services Conference (NSC'92).

The Networking Services Conference NSC'92

NSC'92 is scheduled for Pisa, Italy, in November 1992.

NSC'92 will focus on issues in providing services to customers, with special attention paid to the recent and exciting developments in new global high-level tools such as World-Wide Web, Prospero, Archie, Alex, Gopher, and WAIS. We will address the impact of the new global tools on service development and support, the changing function of traditional tools and services (such as archives), upcoming specific services such as new databases, and the future role of the library. User support at the campus level, and the role of support in accessing global services, will be addressed.

The conference will be of greatest interest to network and automated library service providers and sophisticated users who are changing their focus from providing or obtaining bandwidth to offering, supporting, and using varied and powerful services. Talks and other conference activities will address the needs of the research, academic, educational, governmental, industrial, and commercial network communities.

NSC'92 is being organized by EARN in conjunction with EUnet/EurOpen, NORDUnet, RARE, and RIPE, with EARN having the financial responsibility.

International Networking Conference INET'92

As a sequel to INET'91 and as the first official conference of the newly established Internet Society, INET'92 was held in Kobe, Japan, in June 1992, co-sponsored by EARN among a lot of other networking organizations.

This conference drew 549 attendees from all over the world to attend a high quality program with tracks on Regional issues, Policy, Applications and Technology. The conference was preceded by tutorials on Metropolitan Area Networks, Distributed Computing/Gigabit Networks, Mobile Communications and Entry Level Technology. A number of international coordination meetings were held in conjunction with the conference.

3rd Joint European Networking Conference JENC3

JENC3 was held in Innsbruck, Austria in May, 1992.

This conference was organized by RARE in cooperation with ACOnet, ACM Sigcomm, EARN, EurOpen, IAB, NORDUnet and the Internet Society. The conference drew 352 participants from 29 countries, a lot of whom also gathered in various meetings in the European networking community.

The program featured in-depth technical sessions as well as talks on user services and on organizational and strategic topics. The proceedings will be published in "Computer Networks and ISDN Systems".

The Internet Society

At INET'91, a new professional society was announced, the Internet Society. This society has since been established.

The Internet Society is a professional membership organization whose mission is to promote the evolution and growth of the Internet as a global research and education communications infrastructure.

The first activities of the Internet Society have been the sponsorship of the annual INET conference, the publication of the quarterly Internet Society NEWS periodical and the planning an Internet Society Journal. In addition, the society will work in the "standards" area: it has been adopted as the host organization of the Internet Architecture Board (IAB) which is the authority for RFCs and it is seeking relations with the International Telecommunications Union (ITU). Other activities will be initiated as ideas arise from its membership.

The society will be governed by its individual members through an elected board of trustees. To get the society started, a board has been appointed for an interim period comprised of the following members:

Hideo Aiso, Charles Brownstein, Vint Cerf (President), Lyman Chapin, Ira Fuchs, Frode Greisen (Treasurer), Juergen Harms (Secretary), Geoff Huston, Robert E. Kahn, Tomaz Kalin, Kenneth King, Lawrence Landweber (Vice-President for conferences), Kees Neggers, Mike Roberts (Executive Director, ex. officio) and Antony Rutkowski (Vice-President for publications).

In addition to individual membership, the society provides for non-voting organizational membership. Since we found the society to be an important new body supporting EARN's mission in a way, the EARN Executive decided to become an organizational member at a cost of 5000 USD per year.

Further information on the Internet Society can be obtained from isoc@nri.reston.va.us.

Statistics

Traffic data

EARN collects traffic figures on international links. These statistics are needed to show the load on lines and to indicate the need for upgrading of lines, relocation of servers and changes in network topology.

Each international EARN node has to collect (on a monthly basis) traffic data on international links to and from all other countries. Although some countries have problems implementing this directive, we still have sufficient data due to redundancy.

In table 1, one sees the traffic for 1991 compared with that for 1990. Total traffic increased with 23 per cent, from 6.0 to 7.4 billion records.

| Summary of records sent and received between 01/91 and 12/91 (*1000)							
Country	1991	%	1990	Country	1991	%	1990
Austria	381,630	5.2	282,508	Argentina	97	0.0	276
Bulgaria	0.2	0.0	-	Belgium	351,067	4.8	243,890
Canada	43,514	0.0	47,631	Brazil	11,678	0.2	9,650
Ivory Coast	1	0.0	9	Switzerland	444,163	6.0	520,466
Colombia	500	0.0	23	Chile	2,086	0.0	2,496
CSFR	73,291	1.0	1,962	Costa Rica	277	0.0	5
Germany	1,300,392	17.7	1,170,195	Cyprus	78	0.0	0.8
Ecuador	7	0.0	0	Denmark	93,559	1.3	60,508
Spain	43,499	0.6	53,354	Egypt	17,233	0.2	6,399
France	1,097,743	14.9	669,636	Finland	97,288	1.3	128,101
Greece	91,254	1.2	92,000	Great Britain	369,880	5.0	328,897
Hungary	6,911	0.1	906	Hong Kong	4,132	0.1	1,854
Israel	331,777	4.5	291,283	Ireland	154,154	2.2	86,212
Iceland	6	0.0	4	India	17,475	0.2	5,039
Japan	8,493	0.1	7,981	Italy	484,048	6.6	270,772
Kuwait	3	0.0	119	Korea	3,184	0.0	2,039
Mexico	988	0.0	1,482	Luxembourg	6,007	0.0	5,747
Netherlands	422,947	5.7	335,916	Malaysia	18	0.0	0
Poland	26,808	0.4	1,245	Norway	75,470	1.0	92,991
Puerto Rico	10	0.0	-	Portugal	34,278	0.5	56,377
Sweden	202,397	2.7	126,470	Saudi Arabia	760	0.0	1,304
Tunesia	180	0.0	1	Singapore	2,287	0.0	3,766
Taiwan	8,078	0.1	9,727	Turkey	230,262	3.1	182,794
Yugoslavia	91,947	1.2	20,732	USA	819,535	11.1	888,748
				TOTAL	7,373,457	100	6,011,519

Queues and round trip times

In late 1990, the EARN Office commenced monitoring the international backbone through a centralized process hosted at CIRCE in Orsay, France. The main purpose on the monitoring activity was to inform EARN staff on the real time status of the network and in particular of the number of files queued at international sites and on the downtimes of the lines. The data collected was kept and shortly afterwards a set of postprocessing tools was developed in order to study the past behavior of the network and possibly get hints about future trends.

The historical data collected proved shortly afterwards to be a very useful and sensible parameter. The number of files queued, in fact, is indirectly a measure of the quality of the service offered. A high number of files queued means delay in the transmission and delivery of the traffic. A situation where files are queued constantly on a link means that the users will invariably receive their mail/files later that they should.

By these means, a sharp decrease in the number of files queued on the network shows a tangible improvement (service being inversely proportional to queue size). This is exactly what started happening after the implementation of the EARN Regionalization Plan, begun at the beginning of March 1991.

Graph 1 shows a breakdown by threshold of the number of files queued between January 1991 and July 1992 (on the monthly average) at all the international links at any time. The thresholds are fixed at values of greater than 50, 100, 200, 500, 1000, and 3000 files queued.
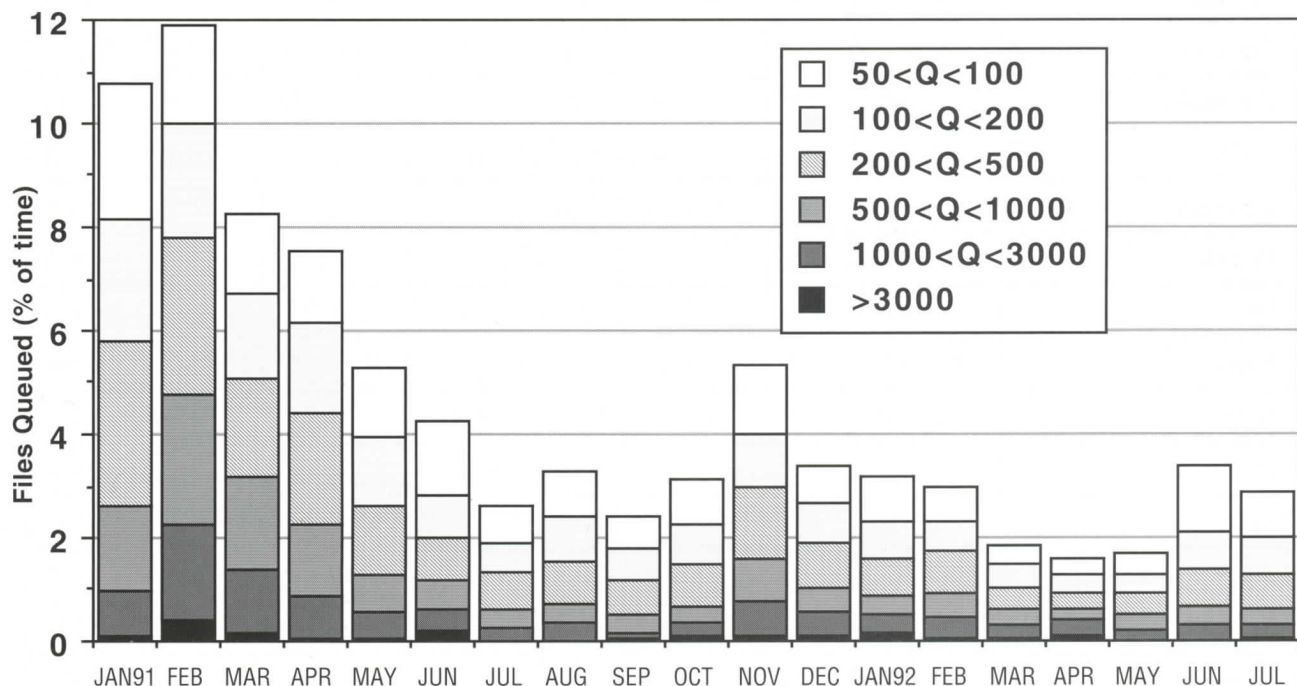
Graph 1

It is quite clear from the graph that we have experienced a sharp decrease in the size and the frequency of the queues, especially for the low thresholds (50, 100, 200, 500), this indicates an overall improvement and a change in the behavior of the network.

By comparing the overall monthly average of the queued files and the traffic data (graph 2), it is also clear that the reduction of the queues is not bound to a corresponding reduction of the traffic volume. The two curves are, in fact, following a very different path: the traffic is increasing (except the traditional lower values for the Summer and over Christmas) while the average of the queued files is decreasing.
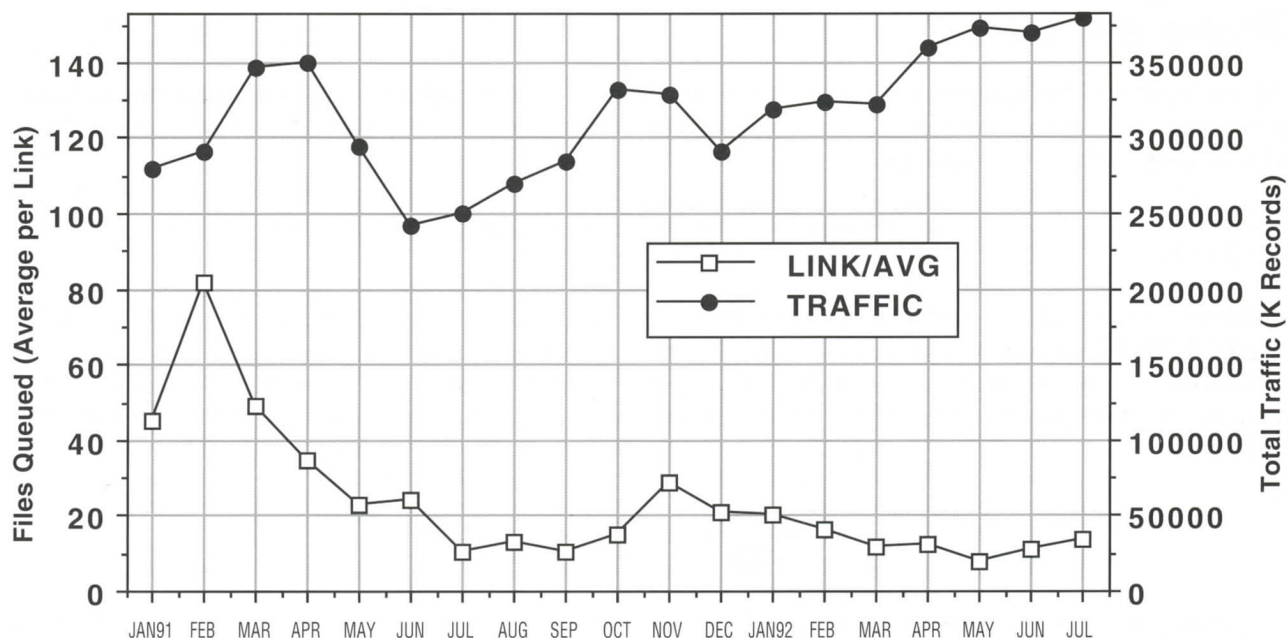
Graph 2

Given the relevance and the usefulness of the information obtained through the monitoring activities, the EARN Performance Evaluation Group enhanced and enlarged, during the first half of 1992, the scope and the locations of the monitor, which are today installed at each core site. These monitors are autonomous service machines, colloquially known as the EARN or HIMON monitors. This new set of tools allows for the collection of more reliable data since the data is now stored locally and the frequency of the queries has been augmented by a factor 3. The new set of tools have been put fully in production at the beginning of June 1992, and the increased sensibility is reflected in the slightly (but clearly) higher values in both charts for June and July 1992.

Since June 1992, round trip time were also extensively measured between each pair of core sites in Europe and between each European core site and Princeton University (PUCC is the only US site running the HIMON monitor). Every hour two files of 50 and 1001 records are transmitted over the links, simulating respectively a mail item and a medium size file. Interactive messages (NMR) delays are also measured, each 10 minutes. Chart 3 shows the monthly average values for June and July 1992 for all the EARN core links.

For 1001 and 50 record files both the minimum value (Min) observed and the average (Avg) are shown. For the interactive messages (NMR) only the averages are shown (no sensible difference has been detected between minimum and averages values for NMRs). All values are expressed in seconds.

	1001 Rec Files		50 Rec Files		NMR
	Min	Avg	Min	Avg	Avg
June 1992	20	526	8.5	423	4.5
July 1992	15.5	573.5	7.5	457	4.5

Chart 3

Trickle statistics

Trickle is a server that mirrors software archives accessible via FTP and caches recently requested files for faster delivery. It has advanced features such as automatic "new files listing" report generation and automatic delivery of selected new files to subscribers.

In Europe, the Trickle servers are in Belgium, Denmark, France, Germany, Israel, Italy, the Netherlands, Poland and Turkey.

Graph 4 shows a breakdown by received bytes and sent bytes of the Trickle traffic between January 1991 and August 1992. The incoming traffic are the commands from the users, the directory updates and the software to be distributed. The outgoing traffic are the replies to the commands and the software requested by the users. Because the software is cached on Trickle's disk, it is usually obtained once and sent out several times to recipients.
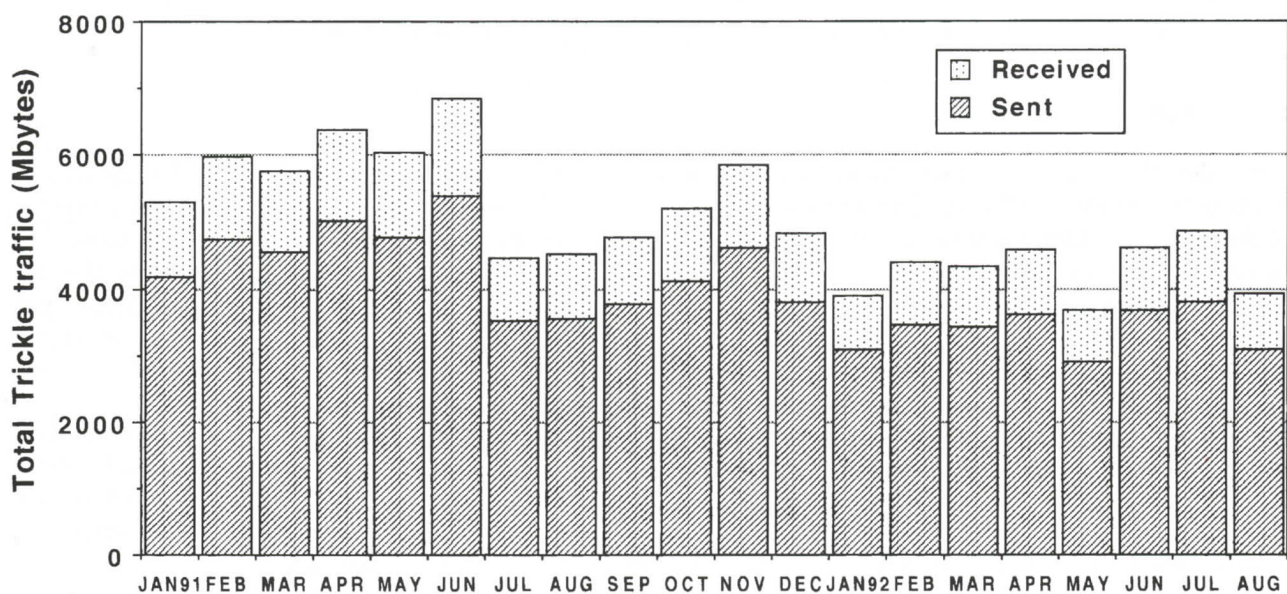
Graph 4

HIMON - A new EARN tool for monitoring the network

Introduction to the HIMON monitor

The impetus to produce a monitor to measure various aspects of network performance came primarily from the growing desire among EARN member countries to have a more professionally managed and stable network structure. The aspects of network performance that the HIMON monitor measures are the availability of network links, the behaviour of queues on those links, file transfer times and interactive message times. All of these areas are crucial when considering the performance of the EARN network as perceived by those that utilize it in the course of their everyday work. Taking all these points into consideration, this monitor was written and then subsequently distributed to all EARN core sites. The monitor has been in production since early February 1992 but only reached full monitoring status during May 1992 when the current version was distributed with all of the above features implemented. In addition to producing the HIMON monitor, a complete set of data storage and report generator routines have had to be designed and implemented.

The HIMON monitor has evolved from a set of more rudimentary tools already developed by the EARN Office. The monitor presented an opportunity to consolidate these tools and add the new features desired by EARN country members. It also enabled a data collection and report generation standard to be defined, pulling together and building on all the work that had previously been completed in this area.

Basic operation of the HIMON monitor

The monitor operates at each EARN core node as a service machine continuously monitoring the network's status. Each monitor concerns itself with that physical area of the network serviced by that EARN core node and that node's interconnection with all the other EARN core nodes. The basic function of the monitor is to query a set of configurable link names and process the information about each link as it is returned. From this information, link availability, queue behaviour and interactive message round trip time statistics are collected. This is done on a cycle of ten minutes and therefore provides good granularity within the data collected.

In addition to the above functions, the monitor will send out two differently sized files to measure file transfer times across the EARN backbone every hour. These files emulate a typical item of electronic mail (50 records) and a large file requested from a remote server (1001 records). These two files are treated differently by the network communication protocols and therefore measure different aspects of the networks performance. These files are sent to another HIMON monitor on another EARN core node which immediately returns the file to the source HIMON monitor. The final time taken to complete this loop is called the FILE round trip time.

Post processing of the HIMON data

Every Monday morning, each HIMON monitor assembles its collected data and delivers it to a central site. From this point, it is accepted into data bases and is then used to produce a range of reports. These include weekly reports on all the above mentioned aspects of network performance which may then be utilized in identifying problem areas and potential solutions. In a more managerial context, monthly and quarterly reports can also be extracted yielding trends and giving a platform for long term planning.

The future for the HIMON monitor

The global area of networking is dynamic and ever evolving. New or popular communication protocols place new demands on monitoring tools and the HIMON monitor is no exception to this. At present, the monitor addresses itself primarily to the application level of the NJE network protocol. There are two basic fields into which the monitor may be developed: these are to increase the amount information about network performance by monitoring its lower (physical) layers and extending the monitor's functionality to include the surveillance of network gateways. A further field of development concerns the post processing of the data gathered on the network. Finally, as the network itself evolves, new protocols may be employed to better meet its changing needs prompting a complete update of any monitoring tools. Nevertheless, as the demand for stable and fast networking services increases world-wide, there will always be the potential to develop monitors such as HIMON to provide networks with a necessary performance and management tool.

Regionalization of EARN

In 1991 EARN decided to reorganize its NJE routing following a plan formulated by the EARN Routing Project Group.

The new routing plan is based on the segmentation of the network into regions, mainly following the model already adopted by BITNET for the definition of the BITNET II network. The criteria followed for the division is based on the density of nodes, traffic, and need of services in the area. The regions are connected through a set of EARN sites (called "core sites") located at strategic positions from the point of view of traffic patterns and connectivity, with the capability to have virtual NJE links amongst themselves and also with selected partners on the BITNET II core.

The main goal of the regionalization was to improve the performance of the whole network by reducing the load on key backbone sites in Europe and exploiting several existing IP lines between the USA and European network organizations like NORDUnet, JANET and others.

These two aims were achieved through the second half of 1991, even though only part of the planned virtual links were established. Therefore better services were then already available for EARN users. The statistical data collected by the EARN office showed in fact a drastic reduction of the load on key backbone sites and a general sharp improvement of the network performance (in the graphs, shown in the Statistics chapter, a reduction by more than two thirds in the number of files queued can be seen).

During the first half of 1992 the consolidation of the European IP infrastructure, known as EBONE'92, allowed EARN to implement the BITNET approach of full connectivity among the core sites. A full mesh configuration was in fact finally achieved in September, when the last missing link between UK and CERN was put into production. The full mesh structure makes network management at the routing level possible for both inside Europe and for the connections to BITNET. This approach is now being applied to gateways into other cooperating networks.

With the completion of the full mesh structure, the Regionalization Plan can be considered as complete and regarded as a bright success since it has resulted in a major improvement of services for the EARN users.

EARN countries and their virtual links
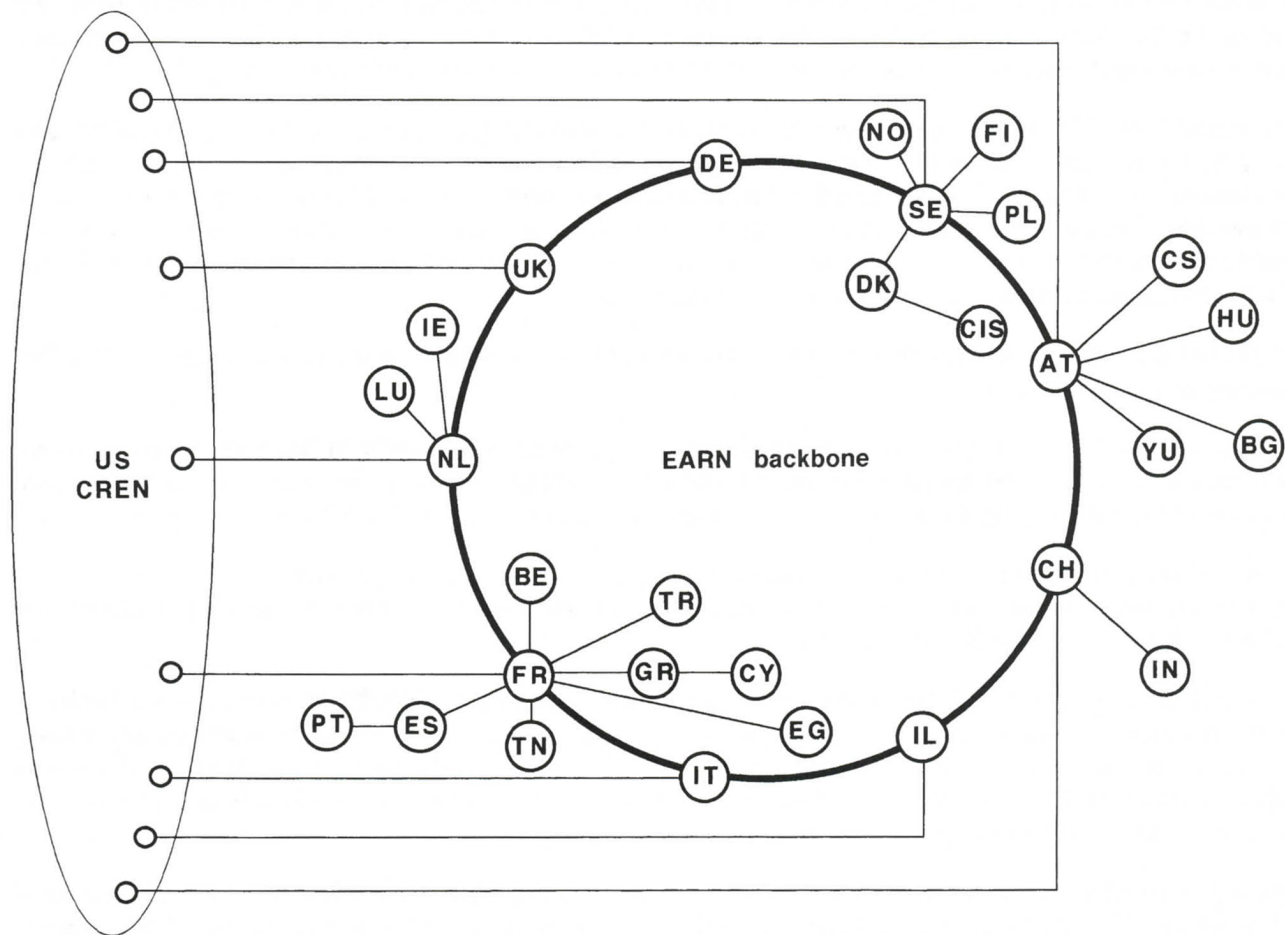
In addition, each country on the circle (or EARN backbone) has complete connectivity with every other country on the circle. This configuration of network links (also called a full mesh) is comprised almost exclusively of "virtual" NJE over IP links. Most of these links run over the IP backbone for Research and Education (Ebone). The transatlantic links run over IP links provided by Ebone partners and NSFnet.

Countries are denoted by their two letter ISO code.

Countries to be connected in 1992/1993: Algeria, Cameroon, Iran, Jordan, Lithuania, Morocco, Pakistan, Romania, Slovenia, Syria.

Treasurer's report

For the 1991 accounts EARN appointed new auditors, KPMG, operating in Paris rather than Montpellier. This allowed a far closer relationship during the drawing up of the accounts. We were therefore able to provide a much more satisfactory set of accounts which we will now use as a model for future years.

To simplify our accounts we have now aligned the EARN accounting codes used in the budget with the ones used by the auditors which makes cross referencing a trivial exercise - this reduces the risk of errors and aids understanding. We now work exclusively in French Francs and only use the ECU in the budget process and for illustrative purposes. This has eliminated various conversion problems which made accurate calculations difficult. This means that when subscriptions are paid it is the amount in French Francs arriving in the EARN bank account which determines any under or over payments.

A further innovation is to carry forward any minor under or over payments to the subsequent year rather then issuing an invoice for a trivial amount.

Financially, EARN had a satisfactory year as budgeted expenditure was broadly in line with budgeted income although many items show modest underspends. There was a healthy surplus of 144 KECU which was, in part, caused by the USA paying for part of the transatlantic line and income from the Killarney conference.

A disturbing trend has been the late payment of subscriptions from several large countries which became over a year overdue. Various ways to encourage early payment have been examined but nothing workable and effective has met with the Board's approval.

In the light of the concern shown by several countries, the subscription mechanisms have been overhauled to provide a means for reducing the subscriptions of countries with few nodes. No subscription mechanism is going to suit every country but the compromise currently arrived at appears satisfactory. Undoubtedly with the very fluid situation, with a possible RARE Operational Unit and a changing role for EARN, further changes may well be needed in the subscription structure.

Also as a result of subscription concerns, the 1993 proposed budget has some substantial cuts in the order of 25% which will undoubtedly restrict EARN activities. It is too early to predict the exact effect of this change.

Financial Data

The two next tables reflect the official documents by EARN's auditors, KPMG Audit at Neuilly-sur-Seine, France.

<table>
<tr><td colspan="5" align="center">Balance Sheet
December 31, 1991
(Expressed in French Francs)</td></tr>
<tr><td></td><td colspan="2">December 31, 1991</td><td colspan="2">December 31, 1990</td></tr>
<tr><td>Fixed assets</td><td></td><td>130,780</td><td></td><td>957,771</td></tr>
<tr><td>Current asset</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Debtors</td><td>2,343,458</td><td></td><td>1,486,291</td><td></td></tr>
<tr><td>Marketable securities</td><td>4,463,163</td><td></td><td>4,778,905</td><td></td></tr>
<tr><td>Cash at bank and in hand</td><td>399,933</td><td></td><td>470,632</td><td></td></tr>
<tr><td></td><td>7,206,554</td><td></td><td>6,735,828</td><td></td></tr>
<tr><td>Current liabilities</td><td>1,632,277</td><td></td><td>1,963,073</td><td></td></tr>
<tr><td>Net current assets</td><td></td><td>5,547,277</td><td></td><td>4,772,755</td></tr>
<tr><td></td><td></td><td>5,705,057</td><td></td><td>5,730,526</td></tr>
<tr><td>Funds</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Net capital</td><td></td><td>5,730,526</td><td></td><td>9,316,496</td></tr>
<tr><td>Income less expenditure</td><td></td><td>(25,469)</td><td></td><td>(3,585,970)</td></tr>
<tr><td></td><td></td><td>5,705,057</td><td></td><td>5,730,526</td></tr>
</table>

<div align="center">

Income and Expenditure Account
December 31, 1991
(Expressed in 000 French Francs)

</div>

		1991 (Actual)	1991 (Budget)	1990 (Actual)
Income				
- Contries contributions		5,491	5,516	5,836
- Other income		2,058	1,638	648
	Total	7,549	7,154	6,484
Budgeted expenditures				
- President office		254	294	235
- EARN office		1,213	1,218	974
- EARN staff		1,886	2,128	1,152
- Other expenses		602	784	651
- Intercontinental line		611	560	540
- Other development expenses		934	2,170	836
	Total	5,500	7,154	4,388
Income less budgeted expenditures		2,048	-	2,096
Unbudgeted expenditures		2,074	-	5,682

- For 1990 unbudgeted expenditures include depreciation and write off of equipment transfered to countries.
- For 1991, this includes depreciation and other expenses balanced by items under "other income".

Income less total expenditures		(26)	-	(3,586)

Accounts 1990 and 1991 and budget for 1992 (KECU)						
	Accounts 90		Accounts 91		Budget 92	
	Expenses	Income	Expenses	Income	Expenses	Income
President's Office	33		36		43	
EARN Office	140		175		201	
EARN Staff	165		274		316	
Other expenses	91		86		95	
EARN transatlantic connectivity	77		88		85	
Development	117		134		181	
Contribution to contingency fund	150		0			
Total budgeted expenses	773		793		921	
Unbudgeted expenditures			299			
Net surplus	153		-4			
Countries contributions		833		791		799
Contribution from contingency fund		0		0		31
Other income		93		297		
TOTAL	926	926	1,088	1,088	921	921

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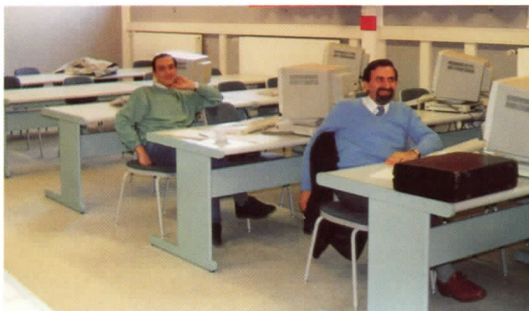   Fax: +33.1.69285273
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1. The visitors and the EARN staff:
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Front row, from left: M. Jhagarou, N. O'Reilly, N. Grange, T. Kalfaoglu, D. Bovio
2. G. Lloyd (EARN staff)
3. and 6. During the VMS parallel session
4. and 5. During the IBM parallel session