THE EUROPEAN ACADEMIC AND RESEARCH NETWORK

J.L. DELHAYE

Centre National Universitaire Sud de Calcul
Montpellier

RESUME

EARN *(European Academic and Research Network) est un réseau hétérogène d'ordinateurs, utilisant une architecture simple et fiable (RSCS/NJE en mode BSC). Lancé en Février 1984, il comprend maintenant plus de 300 noeuds (IBM, VAX, CDC, BULL, etc.) installés dans des universités et centres de recherche de 18 pays d'Europe, et il est connecté à divers réseaux nationaux en Europe ainsi qu'à de grands réseaux américains (BITNET, ARPANET, etc.). Ses principaux services sont : la messagerie électronique, le transfert de fichiers, la soumission de travaux à distance.*

ACADEMIC AND RESEARCH NETWORKS : WHY ?

Researchers have always had a need to communicate :
+ Exchange of messages (electronic mail)
+ Exchange of documents, papers...
+ Data files transfer (results of experiments)
+ Software transfer
+ Remote batch use of computers
+ Remote interactive use of computers
+ Computer conferencing

WHAT IS EARN ?

European Academic and Research Network :
+ Heterogeneous network
+ Open to European Universities and Research Centers
+ Use restricted to non commercial activities

+ Open to the forthcoming OSI networks

+ Connection to BITNET

+ Gateways to national networks :

       Finland to FUNET
       Germany to DFN
       Ireland to HEANET
       Italy to INFNET
       Norway to UNINETT
       Sweden to SUNET
       U.K. to JANET
       etc.

and to American networks via BITNET :

       ARPANET
       CCNET
       CSNET
       MAILNET
       USENET
       etc.

THE EARN STORY

+ Public announcement in February 1984, at CERN (Geneva) by the users (representatives
  of the founding countries).

+ Set up thanks to the technical and financial support of IBM

+ At the launching : 9 member countries

+ By 1985 end year :

       18 member countries
       300 nodes
       2 links toward the 500 BITNET nodes

EARN TECHNOLOGY

+ "Store and forward" type of network

+ Point to point leased telephone lines (mainly 9600 b/s)

+ Simple and reliable protocols :

     - Bisynchronous

     - RSCS or NJE, BSC mode, which gives the following functions between two nodes :

                  Send messages and files
                  Send commands
                  Job submission
                  Job output

     Because of these techniques and protocols, EARN is very reliable and the operation
is cheap.

TYPES OF COMPUTERS AT NODES

+ IBM or compatibles running VM 370 or MVS

+ DEC VAXs running VMS (the JNET or Argonne NJE package is required)

+ DEC VAXs running UNIX (the UREP package is required)

+ Siemens running BS 2000 and 3000

+ CDC Cyber running NOS

+ ICL

+ BULL running MULTICS ("leaf nodes" only)

EARN MANAGEMENT

+ The Board of Directors :

- One director per country (chosen by the members of the association).

- Governs the association.

- Promulgates regulations governing the connection to, the access to and the use of EARN.

- Decides on membership

- Decides on new network services

+ The country representative :

- Coordinates the national connections

- Represents the members at the board

EARN SERVICES

+ Interactive messages between logged on users

+ Electronic mail (notes with acknowledgment of receipt...)

+ File transfer (texts, programs, data, ...)

+ Resource sharing (remote applications...)

+ Directory facilities : in each country, a "disconnected Virtual Machine" (BITSERVE or NETSERV) provides on-line facilities.

+ Technical assistance to users

In a near future :

+ Computer conferencing

+ Remote interactive access

HOW TO JOIN EARN ?

EARN is open to all European academic and research institutions (full members) and commercial research units under certain conditions (associate members).

EARN members are institutions responsible for at least one EARN node. Institutions who wish to join EARN have to make an application to the Director for their country. The Director decides on applications for membership according to the regulations established bye the EARN Board.

+ A NODE

is a computer system, able to receive, send and distribute information and to potentially support connections of additional EARN nodes.

The "NODEID" is a word identifying a node. For example : FRMOP11.

+ A USER

is any individual using a node (no application required).

The "USERID" is the user's name connected to a node.

+ The EARN user address :

USERID at NODEID

Example : DUPONT at FRMOP11

HOW TO USE EARN ?

EARN is very easy to use.

For example, on a node running VM 370 /

+ TELL address message

    To send a message to a networked user

+ NOTE address

    To prepare and to send a note

+ SENDFILE filename TO address

    To send a file to a user

+ RECEIVE and RDRLIST

    To receive files and notes

+ NETLOG

    To compile the exchanges (sent and received)

EARN TODAY

Active nodes (01/10/85) are located in :

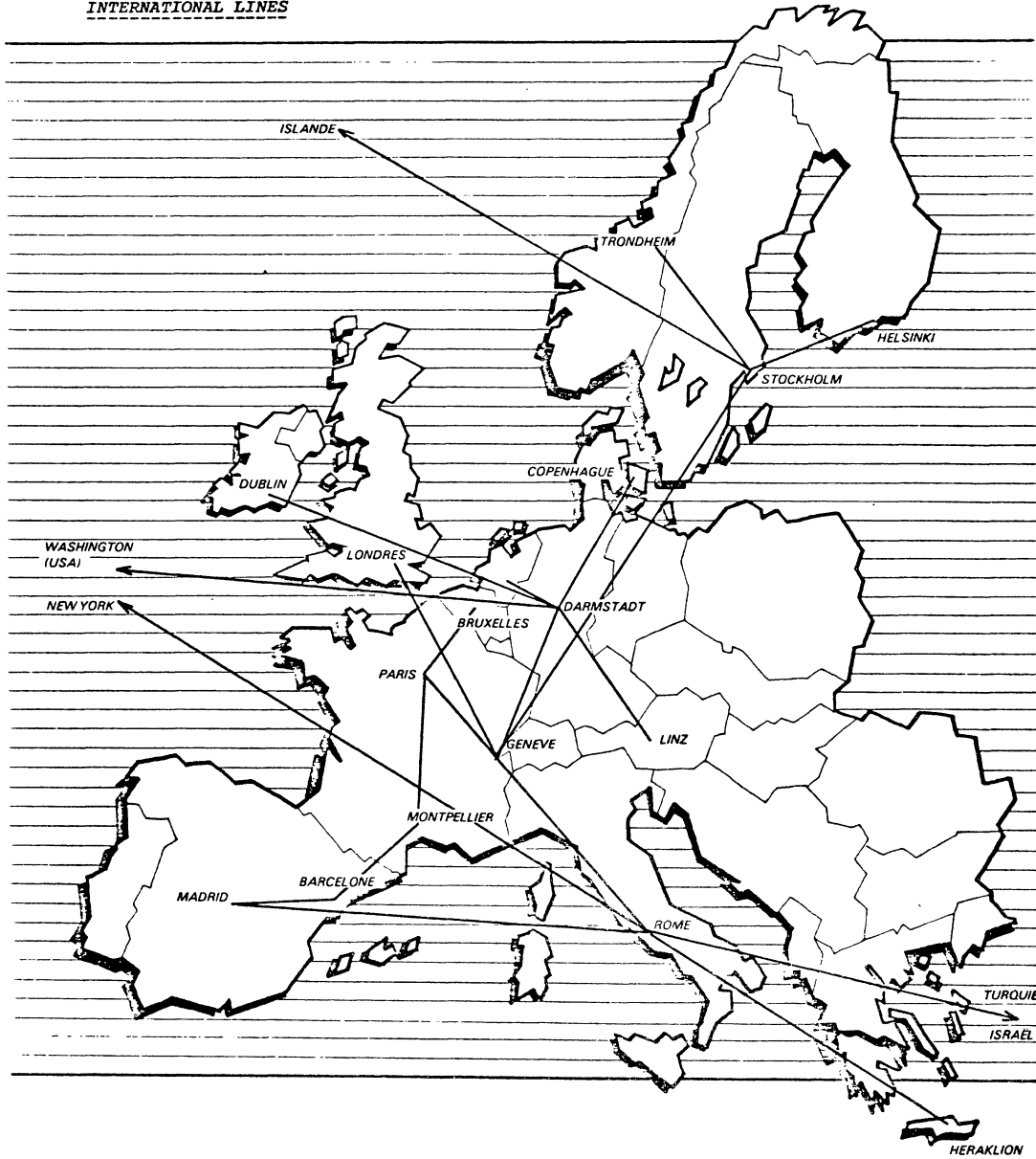| Country	Nodes	Notes
Austria	2	(5 more planned)
Denmark	8	(3 more planned)
Finland	2	(3 more planned)
France	13	(37 more planned)
Germany	92	
Greece	1	
Ireland	4	(1 more planned)
Israel	24	
Italy	24	
Netherland	30	
Norway	1	
Spain	5	(2 more planned)
Switzerland	8	(5 more planned)
U.K.	1	(gateway to JANET)
CERN	8	(1 more planned)

BITNET   483

SOME PROBLEMS :

+ As no multi-streaming a large file being transferred can block a link for long periods

+ No facilities for alternate routing, in case of a link failure or to off-load traffic on busy routes.

+ Depending on the type of computer at a node, some functions and services may not be available.

+ Loss of function at the gateways to other networks.

+ Pressure to use the public X25 networks.

+ In general, all copies of messages being sent to a distribution list must be transmitted individually from the source node. Various MAILERS have been developed but only exist on specific types of machines, i.e. again no standard.

TOMORROW :

+ X25

+ OSI

+ RNIS

+ Satellites

EARN

ISLANDE

TRONDHEIM

HELSINKI

STOCKHOLM

DUBLIN

COPENHAGUE

WASHINGTON
(USA)

LONDRES

DARMSTADT

NEW YORK

BRUXELLES

PARIS

GENEVE

LINZ

MONTPELLIER

BARCELONE

MADRID

ROME

TURQUIE

ISRAEL

HERAKLION

European Academic & Research Network

EARN REPRESENTATIVES

AUSTRIA
A. SCHULTZ
University Linz - A-4040 Linz -
tel. (43) 732.232381

BELGIUM
L. NUYENS
ULB - 50, avenue F.D. Roosevelt -
1050 Brussels - tel. (32) 2 - 647.94.82

DENMARK
F. GREISEN
NEUCC, Technical University - Bygn 305,
DTH - DK 2800 Lyngby - tél. (45) 2 - 881277

FINLAND
M. IHAMUOTILA
Finish State Comp. Centre - University
Support Div. - P.O. Box 40 - 02101 Espoo -
tél. (358) 0 - 7571

FRANCE
J.-C. IPPOLITO - J.-L. DELHAYE
CNUSC - 950, rue de Saint-Priest - B.P. 7229 -
34083 Montpellier - tel. (33) 67 - 54.41.33

GERMANY
H. HULTZSCH
GSI - Planckstr. 1 - Postfach 11 05 41 - D -
6100 Darmstadt 11 - tel. (49) 6151 - 359528

GREECE
S. ORPHANOUDAKIS
Institute of Computer Sciences - P.O. Box 527 -
Heraklion - Crete - tel. (30) 81-281727

ICELAND
P. JENSSON
Computer Centre - University of Iceland -
Reykjavik - tel. (354) 1-250188 ext. 289

IRELAND
D. JENNINGS
National Science Foundation - Washington
D.C. - U.S.A - tel. (1) 202-3579776

ISRAEL
A. COHEN
Tel-Aviv University - Computation Center -
Ramort Aviv - Tel-Aviv - tel. (972) 3 - 420.610

ITALY
S. TRUMPY
CNUCE - 36 via S. Maria - 57100 Pisa -
tel. (39) 50 - 59.31.11

NETHERLANDS
C.M. NEGGERS
Univ. Comp. Center - Geert Grooteplein
Zuid 41 - P.O. Box 9101 - 6500 HB,
Nijmegen - tel. (31) 80 - 51.59.49

NORWAY
O. MELAND
The Norwegian Institute of Technology -
Strindveien 2 - 7034 TRONDHEIM - NTH -
tel. (47) 7 - 59.31.00

PORTUGAL
A. SERNADAS
Faculdade de Ciencias de Lisboa -
Avenida 24 de Julho, 134 - 1300 Lisboa -
tel. (351) 1-609822

SPAIN
M.A. CAMPOS
Universidad de Barcelona - Diagonal 645 -
08028 Barcelona - tel. (34) 3 - 3303108

SWEDEN
B. CARLSON
Stockholm University - Computing Centre,
QZ - Box 27322 - S - 10254 Stockholm -
tel. (46) 8 - 679280

SWITZERLAND
K. BAUKNECHT
Institut fuer Informatik - University of
Zurich - Irchel - Winterhurerstrasse 190 -
CH - 8057 Zurich - tel. (41) 1 - 257.43.11

U.K.
P. BRYANT
Rutherford Computing Division - Appleton
Lab., Chilton, Didcot, OX1 0QX -
tel. (44) 235 - 445.267

CERN
D. LORD
CERN - D.D. Division - Genève 23, Suisse -
tel. (41) 22.83.39.67

Conception : BÉLINE

Author's address :

Jean-Loïc DELHAYE
Centre National Universitaire Sud de Calcul
950, Rue de Saint-Priest
B.P. 7229
34083 MONTPELLIER Cedex
France