

The Email

Maria Dimou

CERN IT

Prepared for the "**Distributed Computing - a historical perspective**"

Academic Training series

[Event Details](#)

2022-05-12

[D.Knuth - Let's drop the hyphen](#)

Contents

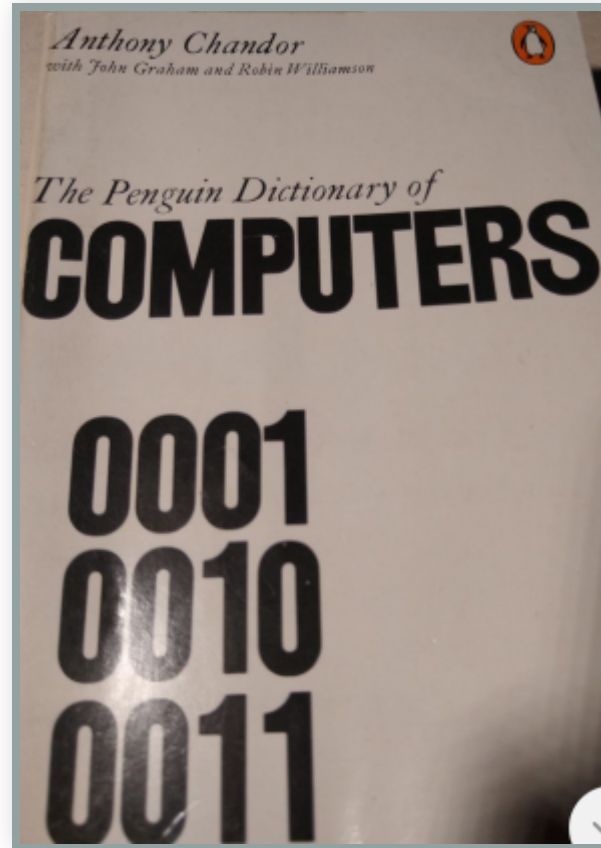
Late 1980s - early 1990s

1. Situation with the network.
 2. Creativity and liberty in the Internet world.
 3. Regulation and hierarchy in European networking.
2. The CERN Email gateway before the Microsoft contract of the late 1990s.

Why talk about the past

1. We have to know **WHY** we did what we did and **HOW** we did it.
2. This helps selecting future choices that work.
3. Required Prerequisites:
 - Agreement on *what* works, i.e. via *proof* & common *values*.
 - Willingness to accept a certain *work culture* and *ethic*.
Example: backwards compatibility and decision-making by consensus.

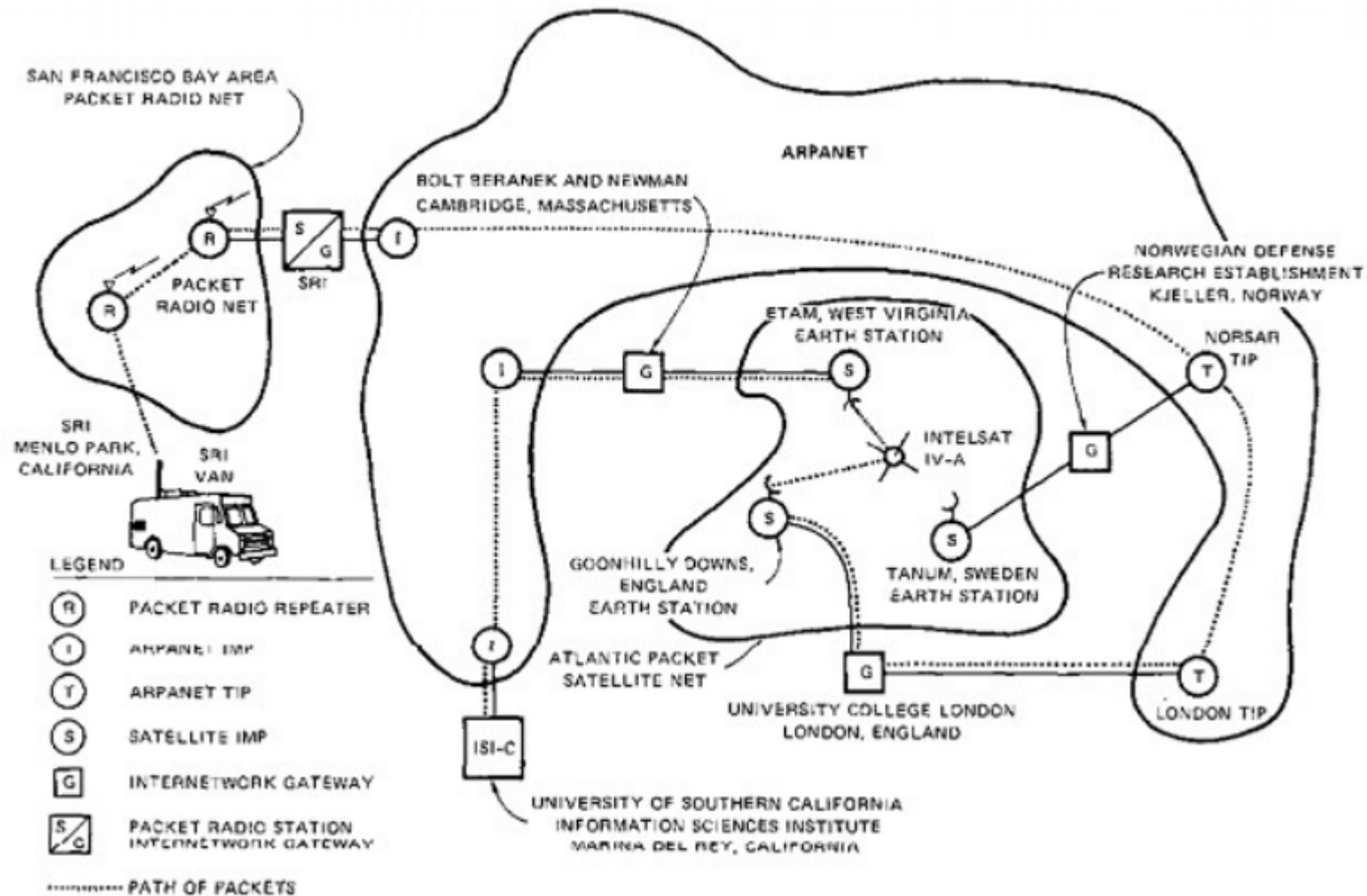
The era when a dictionary on Computing had just 500 pages



Chandor, Graham, Williamson book printed in 1970, 1981, 1986, still read today(!?)

Internet beginnings - the map

Slide de Vint Cerf présenté au CERN le 2009/02/26



Internet beginnings - the van

Slide de Vint Cerf présenté au CERN le 2009/02/26

Packet Radio Van

Google



Check the table on the next slide

Countries with x in the Spring 1993 Internet Society NEWS
magazine Vol.2 No.1

- They have NO international connectivity!
- Most have only Email connectivity.

International Connectivity (Version 7) by Larry Landweber lh1@cs.wisc.edu

| | | | | | |
|--|---|---|---|---|---|
| <ul style="list-style-type: none"> X Afghanistan X Albania X Algeria X American Samoa X Andorra X Angola X Anguilla ● Antarctica X Antigua & Barbuda ● Argentina ○ Armenia X Aruba ● Australia ● Austria ○ Azerbaijan X Bahamas ▶ Bahrain X Bangladesh X Barbados ○ Belarus ● Belgium X Belize X Benin X Bermuda X Bhutan ○ Bolivia X Bosnia-Herzegovina ○ Botswana X Bouvet Island ● Brazil X Br. Indian Ocean Territory X Brunei Darussalam ▶ Bulgaria ○ Burkina Faso X Burundi X Cambodia ○ Cameroon ● Canada X Cape Verde X Cayman Islands X Central African Republic X Chad ● Chile ○ China X Christmas Island | <ul style="list-style-type: none"> X Cocos (Keeling) Islands ▶ Colombia X Comoros X Congo X Cook Islands ▶ Costa Rica ○ Cote d'Ivoire ● Croatia ○ Cuba ▶ Cyprus ● Czech-Republic ● Denmark X Djibouti X Dominica ○ Dominican Republic X East Timor ● Ecuador ▶ Egypt X El Salvador X Equatorial Guinea ● Estonia ○ Ethiopia X Falkland Islands X Faroe Islands ○ Fiji ● Finland ● France ○ French Guiana ○ French Polynesia X French So. Territories X Gabon X Gambia ○ Georgia ● Germany ○ Ghana X Gibraltar ● Greece ○ Greenland ○ Grenada ▶ Guadeloupe X Guam ○ Guatemala X Guinea X Guinea-Bissau X Guyana | <ul style="list-style-type: none"> X Haiti X Heard & McDonald Is. X Honduras ● Hong Kong ● Hungary ● Iceland ● India ○ Indonesia X Iran X Iraq ● Ireland ● Israel ● Italy ○ Jamaica ● Japan X Jordan ○ Kazakhstan ○ Kenya X Kiribati X Korea (North) ● Korea (South) X Kuwait ○ Kyrgyzstan X Lao People's Republic ● Latvia X Lebanon X Lesotho X Liberia Libya X Liechtenstein ○ Lithuania ● Luxembourg ○ Macau X Madagascar X Malawi ● Malaysia X Maldives ○ Mali X Malta X Marshall Islands X Martinique X Mauritania ○ Mauritius ● Mexico X Micronesia | <ul style="list-style-type: none"> ○ Moldova X Monaco ○ Mongolia X Montserrat X Morocco ○ Mozambique X Myanmar ○ Namibia X Nauru X Nepal ● Netherlands X Netherlands Antilles X Neutral Zone ○ New Caledonia ● New Zealand ○ Nicaragua ○ Niger X Nigeria X Niue X Norfolk Island X Northern Mariana Is. ● Norway X Oman ○ Pakistan X Palau ▶ Panama ○ Papua New Guinea ○ Paraguay ○ Peru ○ Philippines X Pitcairn ● Poland ● Portugal ● Puerto Rico X Qatar ○ Re'union ▶ Romania ▶ Russia X Rwanda X Saint Helena X Saint Kitts & Nevis X Saint Lucia X Saint Pierre & Miquelon X St. Vincent & Grenadines X Samoa | <ul style="list-style-type: none"> X San Marino X Sao Tome & Principe ▶ Saudi Arabia ○ Senegal ○ Seychelles X Sierra Leone ● Singapore ● Slovakia ● Slovenia X Solomon Islands X Somalia ● South Africa ● Spain ○ Sri Lanka X Sudan ○ Suriname X Svalbard & Jan Mayen Is. X Swaziland ● Sweden ● Switzerland X Syria ● Taiwan ○ Tajikistan ○ Tanzania ● Thailand ○ Togo X Tokelau X Tonga ○ Trinidad and Tobago ● Tunisia ▶ Turkey ○ Turkmenistan X Turks & Caicos Islands X Tuvalu ○ Uganda ○ Ukraine X United Arab Emirates ● United Kingdom ● United States X U.S. Outlying Islands ○ Uruguay ○ Uzbekistan ○ Vanuatu X Vatican City State ● Venezuela | <ul style="list-style-type: none"> X Vietnam X Virgin Islands, Br. ○ Virgin Islands, U.S. X Wallis & Futuna Is. X Western Sahara X Yemen X Yugoslavia X Zaire ○ Zambia ○ Zimbabwe <p style="text-align: center;">Legend:</p> <ul style="list-style-type: none"> ● Internet ▶ BitNet but not Internet ○ EMail Only (UUCP, FidoNet, or OSI) X No Connectivity <p>Please send corrections, information and comments to: Larry Landweber Computer Sciences Dept. University of Wisconsin Madison 1210 W. Dayton St. Madison, WI 53706 lh1@cs.wisc.edu Fax 1-608-265-2635 Include details, e.g., on connections, sites, contacts, protocols, etc.</p> <p><i>Copyright © 1993 Lawrence H. Landweber and the Internet Society. Unlimited permission to copy or use is hereby granted subject to inclusion of this copyright notice.</i></p> |
|--|---|---|---|---|---|

The complete International Connectivity table and map are available by anonymous FTP from: <ftp://ftp.cs.wisc.edu>

CERN in the 1980s

CERN was an exciting place to be for the computer scientist in the 1980s, with many information systems on different computers and on different networks, all incompatible. So the idea was to devise a means of being able to communicate and share information.

Extract from Tim Berners-Lee's talk at CERN Conference
"The role of Science in the Information Society" Dec. 2003

[See here his slides in HTML](#)

European network standards & organisations

- EUREKA COSINE project
- OSI standard
- RARE organisation

COSINE

- Stands for **C**ooperation for **O**pen **S**ystems **I**nterconnection **N**etworking in **E**urope.
- Eureka Project No. 8, is to create a computer networking infrastructure based on the use of OSI protocols which will provide services to the whole research and development community (academic and commercial) throughout Europe.
- Funded by 19 European countries and the Commission of the European Communities.
- Started in 1986.
- Composed by several Working Groups (WGs).
- In WG3 Maria Dimou represented CERN for Email and Directory Services and Tim Berners-Lee for Information Services.

OSI

- Stands for **O**pen **S**ystems **I**nterconnect.
- A set of network protocols on 7 layers.

```
7. Application layer
6. Presentation layer
5. Session layer
4. Transport layer
3. Network layer
2. Data link layer
1. Physical layer
```

- Supported by CCITT - **C**omité **C**onsultatif **I**nternational **T**éléphonique et **T**élégraphique, an organization that sets international communications standards. , now known as ITU - **I**nternational **T**elecommunication **U**nion.

Principal standards

- From the standards defined in this framework, the ones most used in Europe of 1990 were:
 - X.25: Packet-switching protocol for WANs.
 - X.29: Remote terminal access protocol.
 - X.400: The universal protocol for e-mail. X.400 defines the envelope for e-mail messages so all messages conform to a standard format.
 - X.500: An extension to X.400 that defines addressing formats so all e-mail systems can be linked together.

[Quoting weboedia for CCITT](#)

The RARE Association

- Stands for **R**éseaux **A**ssociés pour la **R**echerche **E**uropéenne.
- Formed in June 1986.
- It was a not-for-profit association of European NRENS - **N**ational **R**esearch and **E**ducation **N**etworks.
- First office was in the NIKHEF laboratory in Amsterdam.
- In October 1994 it became TERENA - **T**rans-**E**uropean **R**esearch and **E**ducation **N**etworking **A**ssociation .
- In October 2015, it again changed its name to GÉANT and at the same time acquired the shares of GEANT Limited (previously known as DANTE). [Recent lecture by GEANT CEO](#)

What all this shows

- An intense effort to create European network standards.
- Strong influence by the PTTs - Post Telephone Telegraph.
- National and regional networks (mostly X.25-based) and influential research communities, like CERN, participated in this effort, e.g. ACONET for Austria, RedIRIS for Spain, ARIADNE for Greece, NORDUnet for the Scandinavian countries.
- Companies & communities had their own networks, e.g. EARN/BITNET, DECnet, ESNET, NSFNET, HEPnet.
- HEP in particular had the HTC - HEP Technical Committee.
- HTC-Mail was one of the Working Groups.

Messaging architecture of the Clinton White House takes shape

E-mail gets high profile

Already, the American E-mail networks MCI Mail and CompuServe have started up messaging and conferencing sections that the White House is reading at least in theory. But in truth, the 500 E-mail messages they receive each day are printed out and processed along with all the postal correspondence. No doubt, the President sees well-filtered compilations of the messages, but to say that Bill Clinton is only an ADMD away is not true.

Still, such high-profile usage by a world leader's staff is bound to have its effect. The time will come soon when world leaders find store-and-forward messaging services a convenient way to exchange routine correspondence. Even sooner, heads of government will find that E-mail links to voters and reporters benefits their image. It sure didn't hurt Clinton's campaign - nor did his choice of data networking advocate Al Gore to be his Vice President.

As it turns out, Al Gore will not be the telecom tsar that some thought he would be. And his advocacy of government spending on information superhighways has run into opposition from powerful businessmen such as AT&T Chairman Robert Allen.

Nobody is against government policies that expand the messaging market. But many are opposed to government ownership or subsidy. It's a difference we see often between Europe and America: on this end private industry is wary of governments that offer to help

The White House even has a public E-mail address. MCI Mail subscribers can address a message to the user name White House or the account number 589-5485. Internet users may send a message to 5895485@mcimail.com and X.400 users can send to C=US; A=MCI; S=White House.

In each segment of the messaging industry, the Clinton administration will have an impact. In many areas, the effects will be indirect and slight. But in no case will they be accidental. The White House staff is simply too familiar with the technology to be surprised by it. As prominent users themselves, they will cheerlead adoption of the technology by business. They may experiment with e-mail "town meetings" and press conferences, further spurring usage.

Eric Arnun is editor of Electronic Mail and Micro Systems, the fortnightly US newsletter.

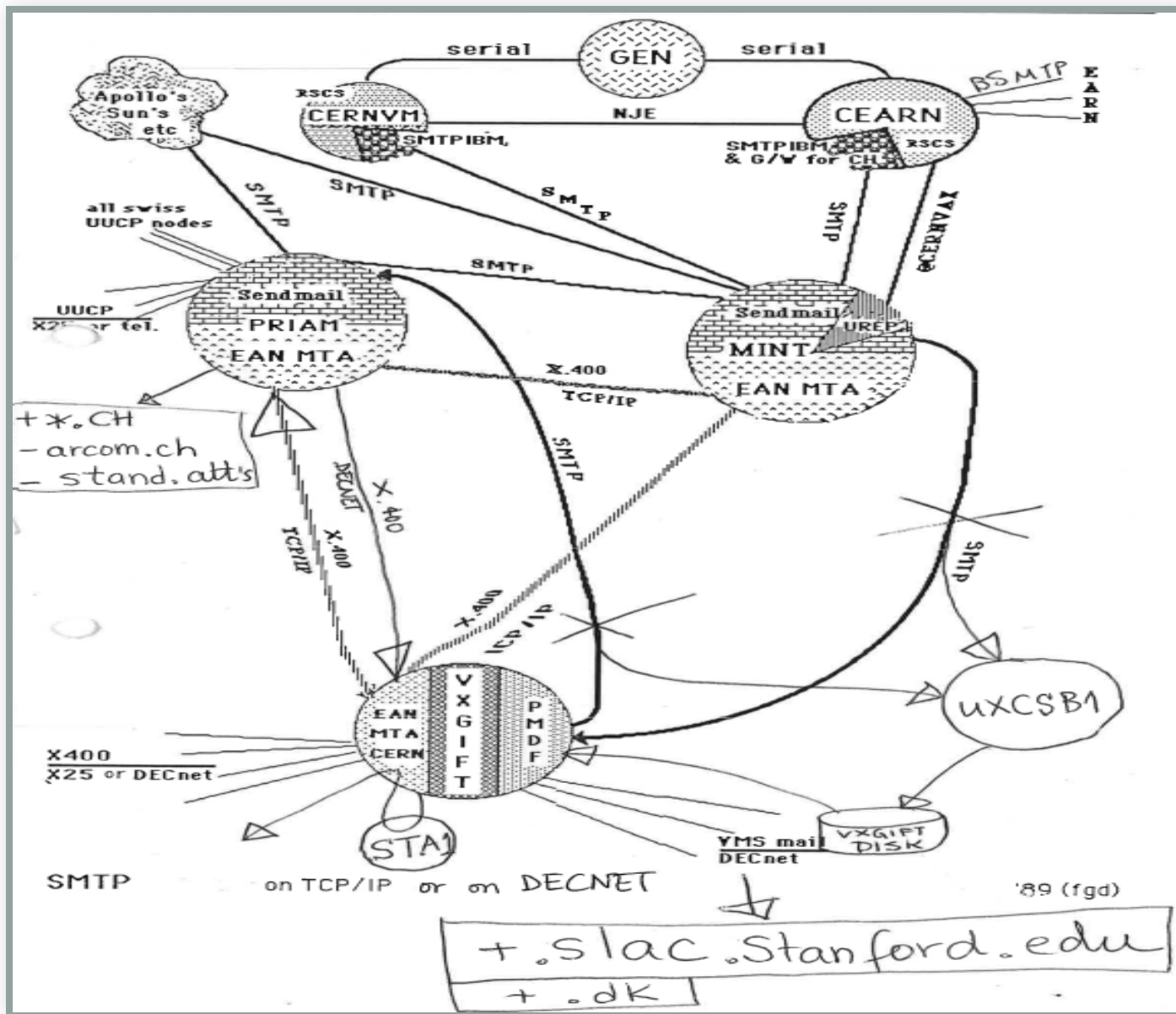
© EEMA

European Electronic Messaging Association - EEMA BRIEFING April
1993

How did this resolve?

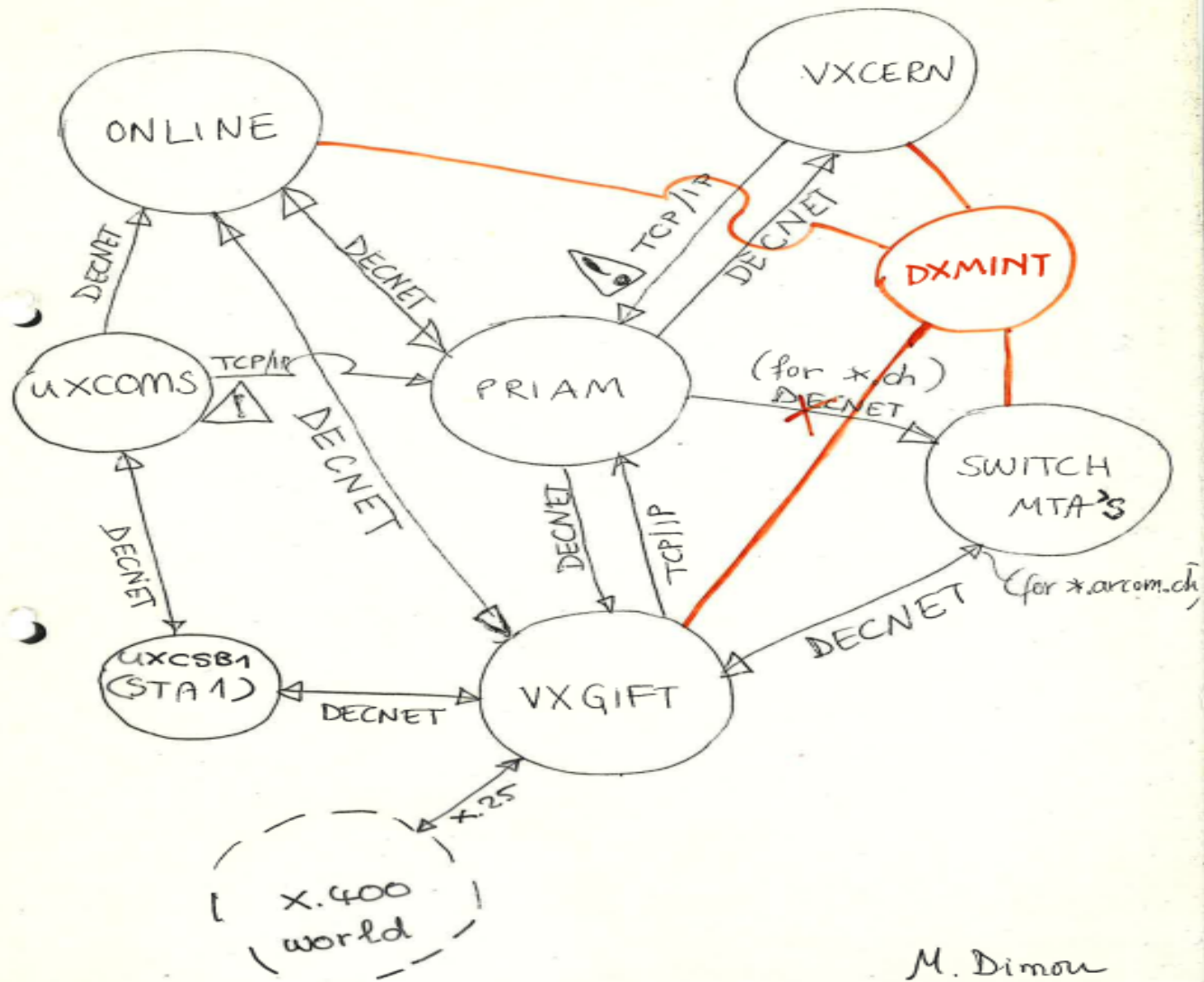
- The OSI transport protocol was not as efficient as TCP/IP.
- OSI would need many years to become mature.
- Performance and functionality requirements were pressing.
- One could say that the OSI ambition was relevant to today's anti-GAFAM (Google Apple Facebook Amazon Microsoft) efforts; even if the ambition were fulfilled, the GAFAM progress would not have slowed down, of course.
- The wind started to change in 1989. TCP/IP and Internet applications were *Open* **AND** *existing* **AND** *performant* **AND** *easy to use*.

The CERN Email gateway in 1989



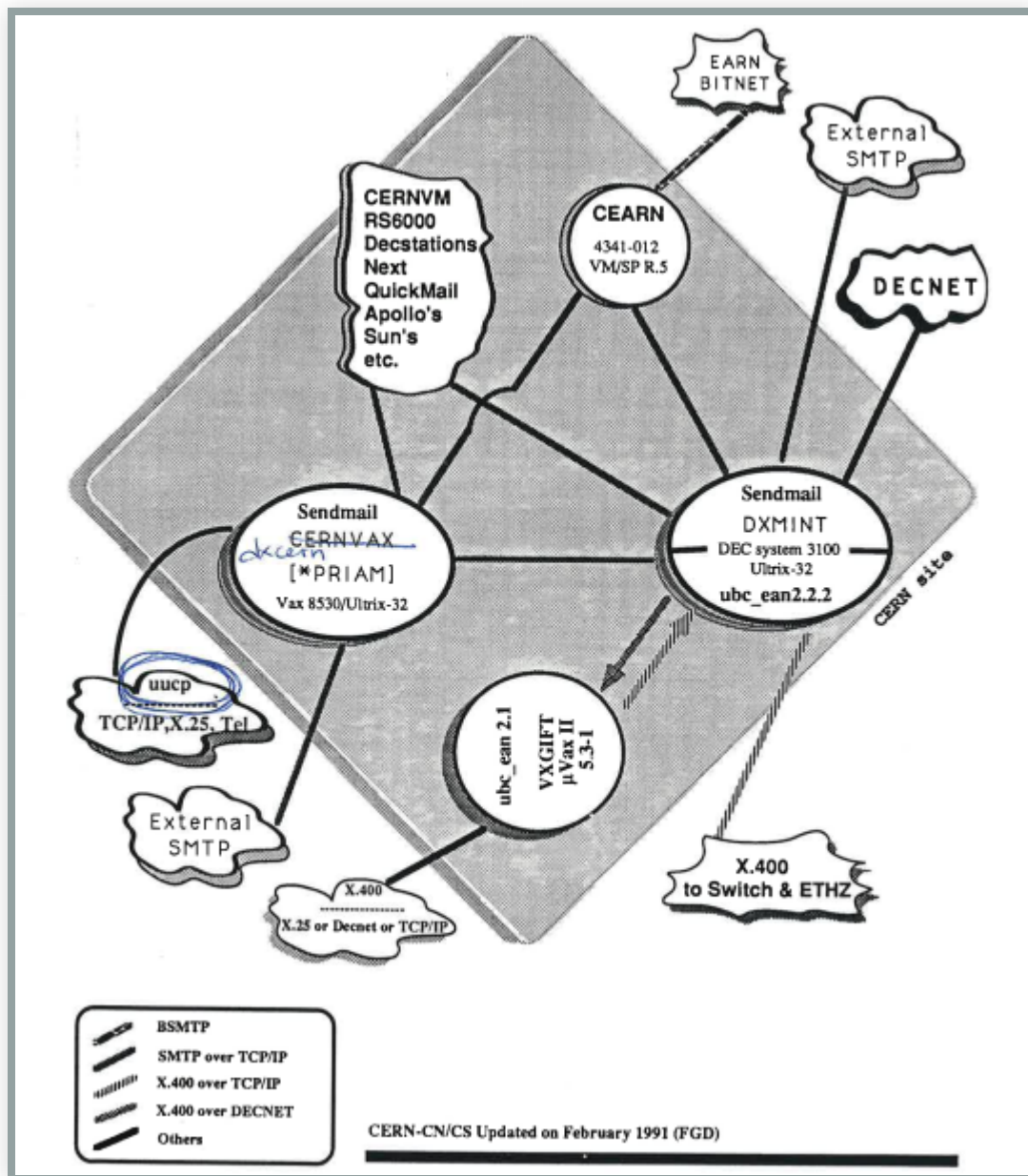
The CERN Email gateway in 1990

EAN as of May 1990

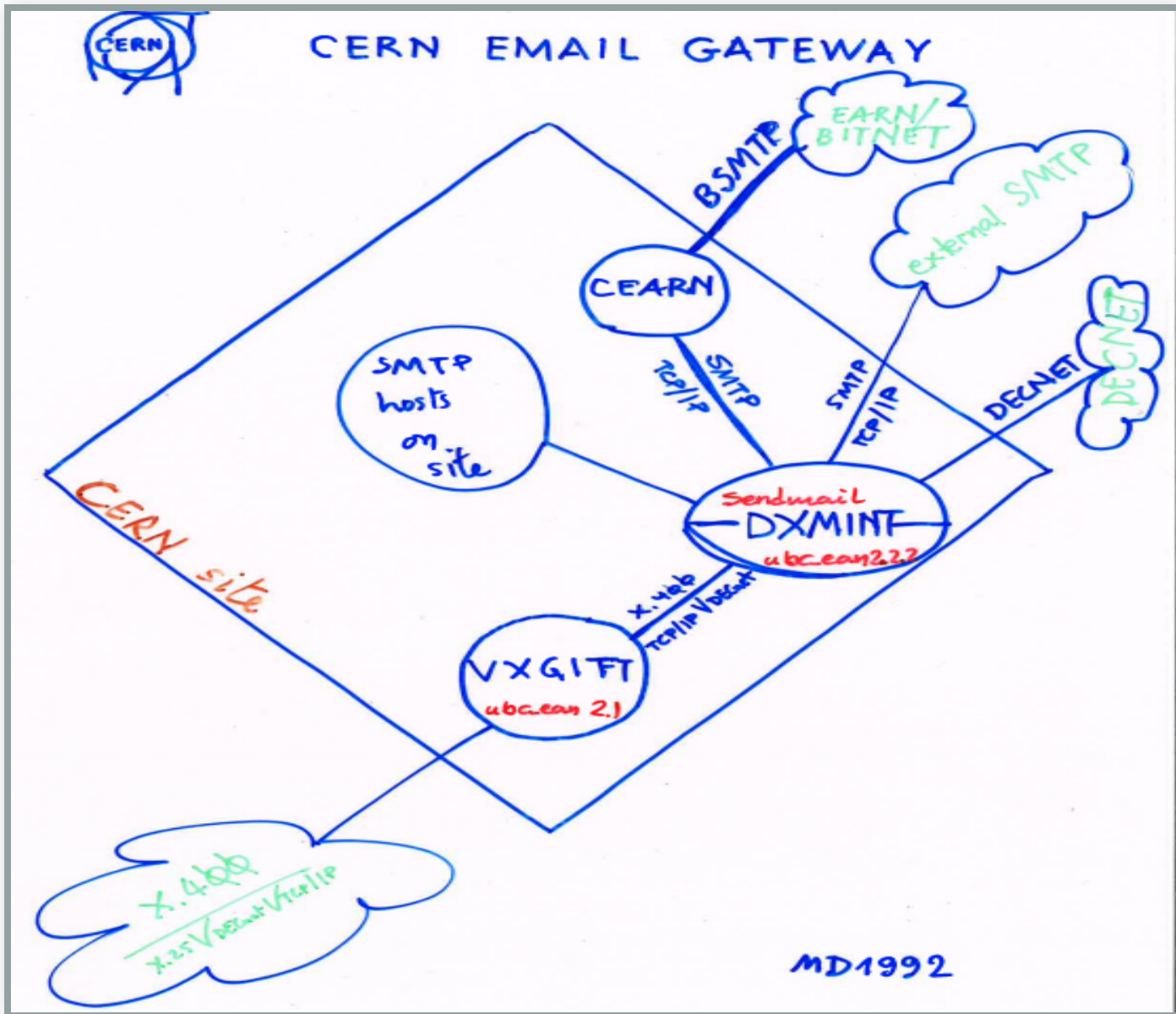


M. Dimou

The CERN Email gateway in 1991



The CERN Email gateway in 1992



How the addresses looked

DECnet *host::user* - No hierarchy, at least in DECnet phase IV, host had to be unique.

EARN/BITnet *user@host* (from within) *user@host.bitnet*

X.400 *C=ch;ADMD=arcom;PRMD=cern;O=cern;OU=host;S=user;*

UUCP *user@host.uucp* **OR** *host1!host2!..hostn!user*

RFC822 (GEM - PEM) *name@domain* - *user@host.domain*

PSImail - *PSI%DTEnumber::user* **OR** *PSI%host::user*

GMAIL - **General Mail** *user@host.domain* - A SLAC development, not used at CERN, for sending Email from VAX/VMS machines to BITNET or other networks. [See section 5 of this paper.](#)

NB! From JANET (the UK network) address was *user@ch.cern.host*

Work with X.500 in the RARE Working Group WG3

*V. CERF 10/26/88
(comments throughout)*

CERN DD – CS – EN
Naming structures for directory services

Maria Dimou
July 27, 1988

Naming structures for directory services

Abstract

The purpose of this note is to give:

- A summary of the paper: 'A proposal for a naming, data structures and name data distribution in RARE' (Revision:1.5, Date:31 May 1988), written by Chr. Huitema,
- A personal view on the compatibility of X.500, in general, and the RARE paper, in particular, with the CERN needs for directory services. This second part is a **call for comments**, contributing to the development of a common CERN position on X.500 directories.

See [full paper here](#)

Attributes

A lot of work was devoted on

- *which* attribute names to adopt.
- *which* is the authority that gives values (at the time .gb vs .uk was still discussed)
- *how deep* and *how flexible* should the hierarchy of attributes be. Reason: They were used by X.400 Email, so there were matching requirements for the routing.
- Work done in the X.500 WG was very important for the definition of LDAP and X.509, used by today's certificates.

Information Services work in the same WG

From: timbl@nxoc01.cern.ch
Subject: Comments on P2.2 Functional Spec v2
To: rare-wg3@SURFNET.NL
Date: Mon, 22 Apr 91 09:57:36 GMT+0100

Here are comments on version 2 of the P2.2 functional specification (D10), for what they are worth.

The comments marked * are looking ahead to when one might want to use the data as part of a hypertext system, and I would encourage their inclusion out of foresight.

GENERAL:

The philosophy that the P2.2 server should be "central" is suspicious. No facility should regard itself as central, or it will have big problems fitting in with other facilities which do the same. That which is "central" is very subjective.

* There should be provision for a non-interactive fast enquiry. This probably just means turning off any paging of the output, for example, and formatting the result with (SGML preferably) tags for parsing.

The Web made that work much easier

- While Tim Berners-Lee was writing the Web code, this WG was making available catalogues of services.
- We were all discussing the contents and the conventions for these catalogues.
- There was a lot of maintenance in this work.
- It took a few years for the community to switch to the new mode of Information Services - alias The Web.
- Imagine the quality of life improvement, when publishing updates on paper became obsolete!

Improvements - Utilities - Challenges

- All forwarding done by hand in a the DEC Ultrix DXMINT [sendmail.cf](#) file with regular expressions.
- When SMTP - **S**imple **M**ail **T**ransfer **P**rotocol and RFC822, i.e. username@domain were adopted, traffic increased and performance improved.
- Frédéric Hemmer wrote EMDIR - **E**lectronic **M**ail **DIR**ectory, which could be queried via Email.
- 1993 Summer Student George Melissargos wrote the *autorouter* in C, a programme that turned the username@host.domain Email to [firstname.]surname@cern.ch.

Communicating with the users

Mostly via the CNL - **C**omputer **N**ews**L**etter and the Userguides (on paper). Example:

Online, Spring 1994

EMDIR inquiry via Email

by Maria Dimou-Zacharova (CERN-CN/GS) 31-3-027, 3356,
dimou@dxcoms.cern.ch

Note that this information is also included in the new CERN Electronic Mail User Guide, available from UCO on paper and also online via XFIND and WWW.

You can send an Email message to cerndir@cern.ch or cerndir@dxmint.cern.ch and in the "Subject:" field and/or in the body enter the names of persons you are looking for separated by a semicolon (;) or carriage return. You will receive a reply with the retrieved EMDIR entries that match exactly or (in case of no exact match) approximately your query.

The service has the capability of searching for approximate matches, up to two mistakes and accepts the use of two wildcards, '?' for any one character and '*' for any number of characters. If just one string is

entered, e.g. *{\it dupond}*, it will be treated as a surname, if you want to specify firstnames as well, the syntax *firstname.surname* should be used e.g. *herve.dupond* if you want to retrieve all entries of a certain *firstname*, you have to terminate it with a dot and leave a blank before the separator e.g. *herve.*

The allowed separators within parts of the *firstname(s)* and/or *surname(s)* are the dot, hyphen,

underscore, whitespace and single quote. E.g. sending mail to cerndir@cern.ch with 'Subject: Alcibiades. ; and no message body, you will receive a message as shown in the box, below.

EMAIL PROBLEMS
For information or problems related to EMDIR contact emdir@cern.ch. For information or problems related to the inquiry via Email contact mail.support@cern.ch.

Please remember that your preferred Email address in EMDIR should always be in the format user@HOST.DOMAIN, i.e. it MUST contain a host.

```
From CERNDIR Tue Feb 8 15:57:25 1994
Date: Tue, 8 Feb 1994 15:57:24 +0100
From: CERNDIR
Subject: Re: Your query to CERN DIRectory
Apparently-To: dimou

***** CERN DIRectory Lookup Mail Service *****

The following records match exactly your requested query: Alcibiades.

1.  First name(s): ALCIBIADES *****Last name(s): APOSTOLAKIS
    Cern phone number:6039 *****Beep number:
    Division:PPE/LR ***** Office:20/R-030
    E-mail address: APOST@CERNVM.CERN.CH
```

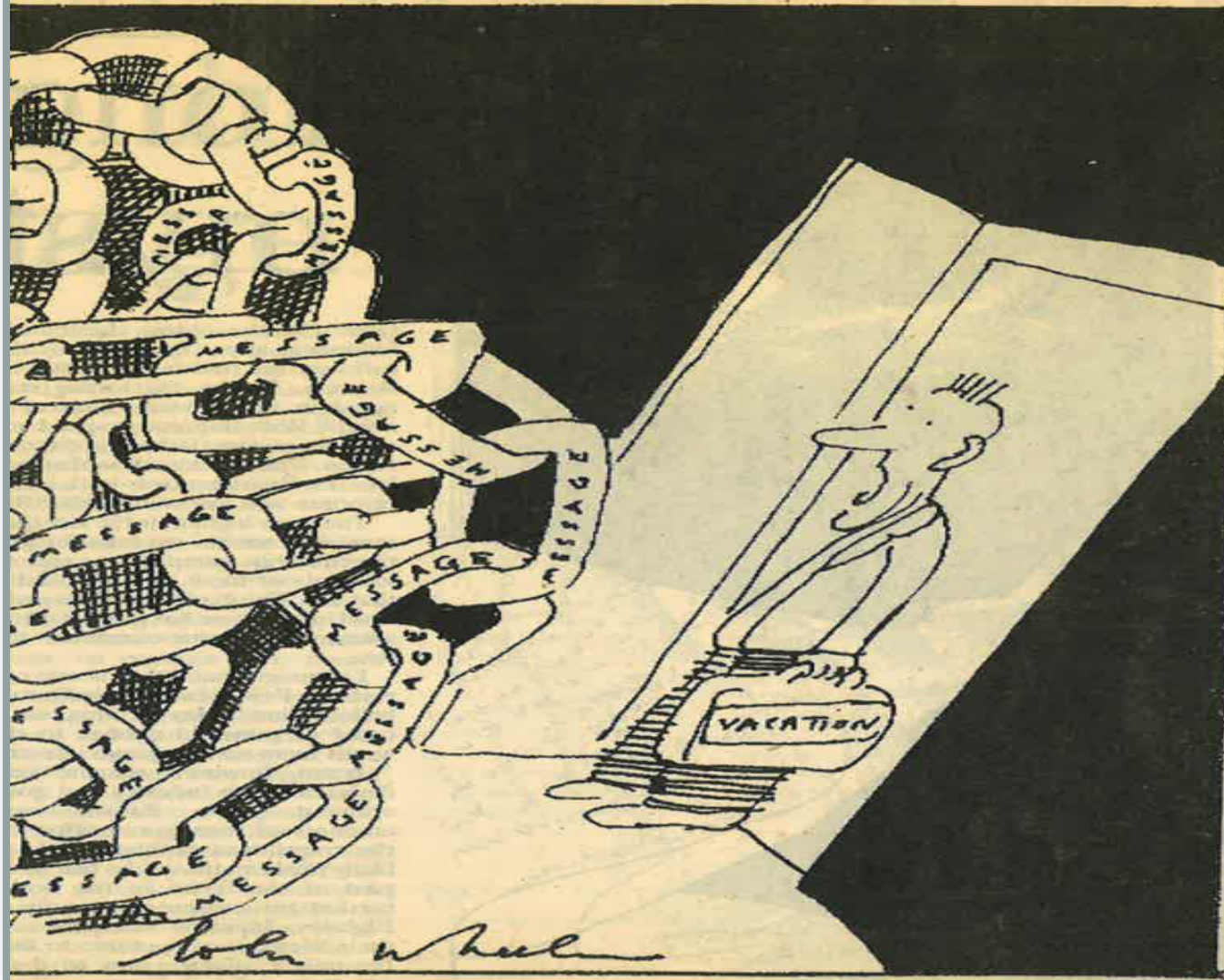

Challenges

- The team was always very small: Denise Heagerty handed over responsibility to Maria Dimou in 1988. Fellow Tor Bothner and a few collaborators were periodically joining.
- Bottlenecks = store & forward - were causing performance problems.
- Loops - the greatest and most frequent issue! Dietrich Wiegandt was The Email logs' Magus, he was reading core dumps like mystery novels.
- Incompatibility of network solutions and address syntax.

On the contrary **spam**, phishing and other security issues were not yet a concern.

The first large-scale commercial Email spam on the Internet appeared in 1994. (source: "Terena Celebrating 20 years" brochure)³³

Monday 25 February 1991



The Loop!

From newspaper THE INDEPENDENT Science column with title

“Short cut to chaos” and subtitle

“Darrel Ince writes on the chain reactions that are creating havoc in
computer networks”

Some pros of all this variety

So there was a lot of heterogeneity. Now, heterogeneity is a Good Thing. Diversity is a Good Thing. It is good to have a variety of types of computer and operating systems in a large organization like CERN where there are many visitors from a large number of different home institutes: you don't want to tell everybody to buy the same computer system or use the same mail-reading software.

In a way CERN in the 1980s was interesting as a microcosm of the world. It was also a good substrate for the growth of the Web. Almost everybody had some sort of workstation on his office desk, which was unusual at the time. Also, those workstations were networked. So CERN staff were potential Web users.

Extract from Tim Berners-Lee's talk at CERN Conference
"The role of Science in the Information Society" Dec. 2003

[Page 5 on my browser](#)

Science and Society - LBL Computing Newsletter December 1990

MESSAGE

I have been trying to connect to a computer in the soviet union. I was given the following address, which does not seem to work. Could you comment if possible:

psi%025021705::cmain::sovname (dubna)

At Dallas, I was informed that I should add vxcern:: in front of the above. I'm a little lost, so please be patient with me. Thank you.

RESPONSE

Try the address

vxcern::psi%025021705::cmain::sovname

This is a VMS Mail (MAIL>) address. VMS Mail addresses are read from left to right, so this mail will go to VXCERN which presumably knows how to call PSI and then to CMAIN to SOVNAME.

Introducing Nathaniel Borenstein and MIME

In October 1990, Nathaniel presented “Why Do People Prefer FAX to Email?”, to the IFIP WG 6.5 International Symposium on Message Handling Systems, Zurich, October 1990.

Maria presented [The Email Gateway Manager Reminiscent of Sisyphus](#)

Enjoy the history of **M**ultipurpose **I**nternet **M**ail **E**xtensions!
