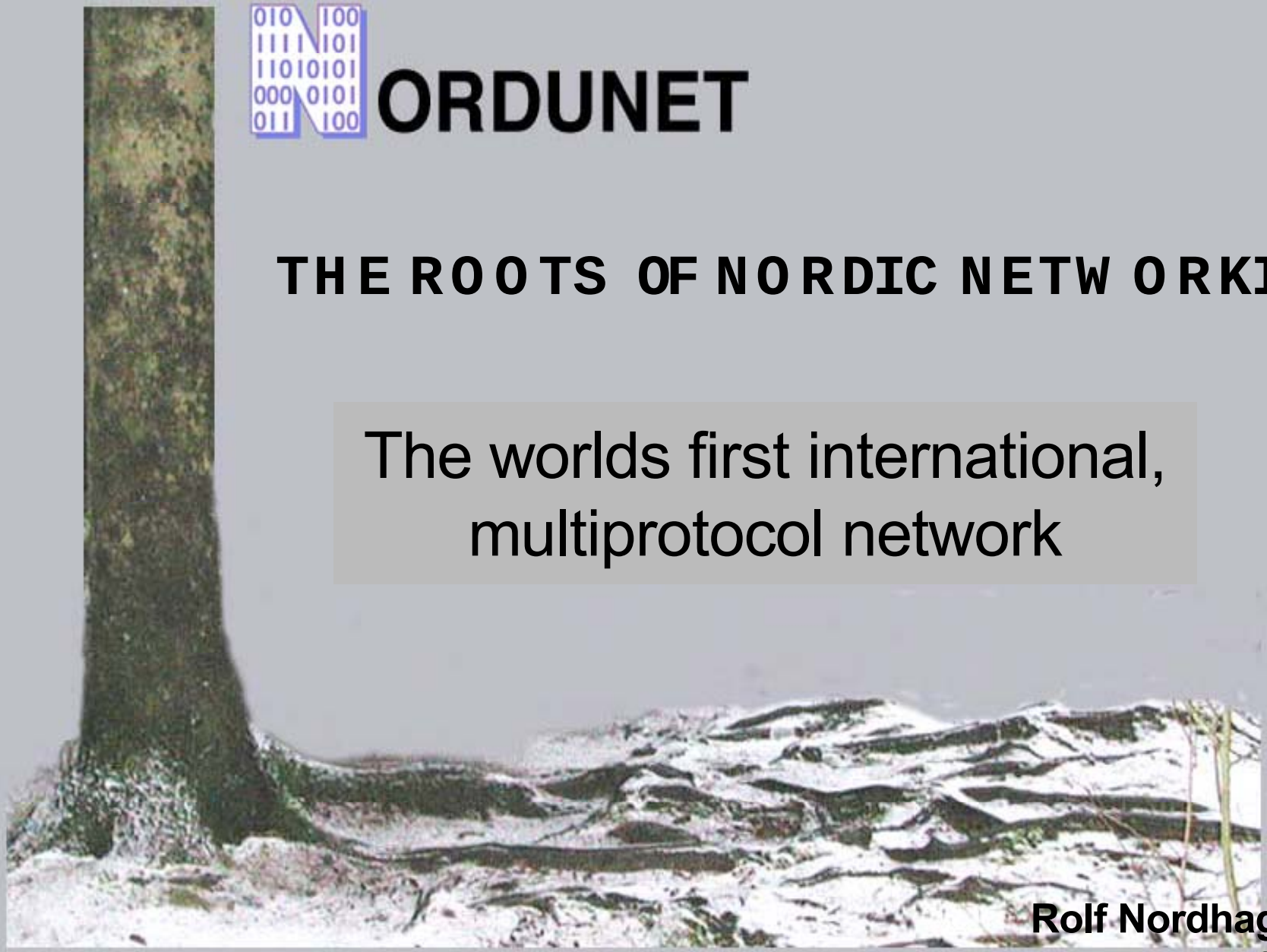


NORDUNET

THE ROOTS OF NORDIC NETWORKING

The worlds first international, multiprotocol network

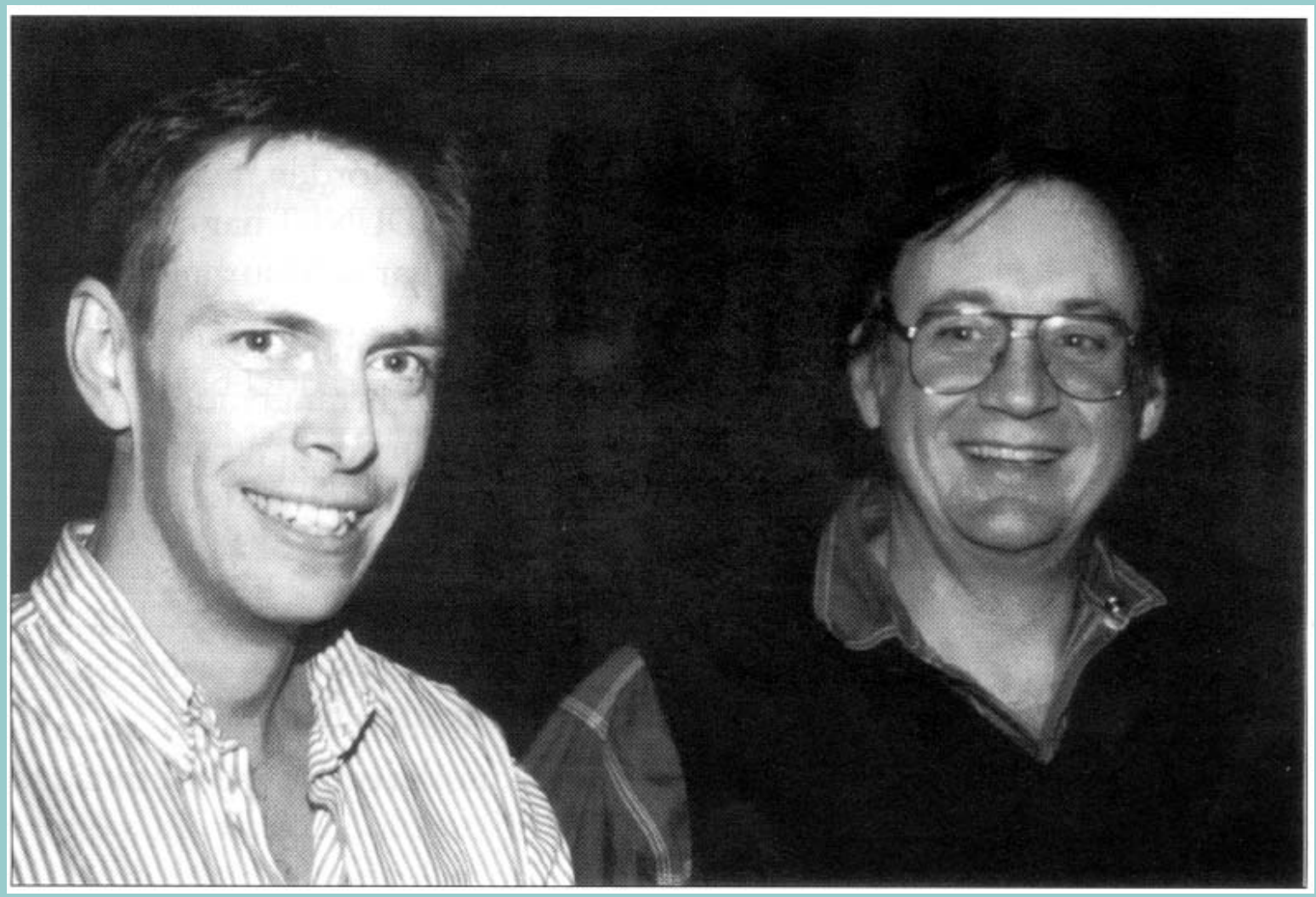
Rolf Nordhagen
University of Oslo

The beginning

- An Open network is a network that follows a common, open standard, OSI
- National academic networks, UNINETT 1978, SUNET 1980, Centernet, X25 packet switched
- ARPANET to NORSAR, Kjeller, Norway 1973
- Minicomputers, Timesharing, KOM Stockholm, Oslo
- International Dial-up

Enter NORDUNET

- Nordic Council of Ministers, NORDFORSK
  Bjørn Grønlund
- The first meeting 1980, Dalarne, Sweden
- 1983-84, the NORDUNET application
- May 1985 9.2 Mill.NOK for 4 years
- Initially NORDFORSK, then Stockholm QZ/SICS, Mats Brunell
- Technical manager Einar Løvdal, Oslo



Mats Brunell and Einar Løvdal

The requirements

- A stable, operating computer network, connecting Nordic Education and Research
- Build on existing university networks
- Use the Nordic telecommunication networks and international standards for tele- and data-communication.
- Make a common use of data-resources, programs and databases available througout the Nordic area. Users shall be given access to Nordic and international networks and information services
- Give the same opportunities for collaboration and information exchange as in European countries and the North American research communities

Cooperation

- Establish a common Nordic infrastructure for the NR&E community by connecting the national nets.
- New competence and services be created for the smaller communities.
- The resources to be found in the national network organisations, with the local, university services operating the net.
- A computer network would greatly increase bridging the large geographical distances caracteristic in the Nordic countries. Thus opportunities for research in remote communities would be greatly improved.

Interim services

- In 1984, IBM donated machines and leased lines for EARN, European Academic Research Network (modelled on Bitnet)
- Local Ethernets, private networks X.25, PAD services - chaos
- Make popular services Nordic wide, X.400 mail EAN
- EARN to Europe, DECnet/HEPNET for physics
- Work to local groups, EARN in UNI-C, EAN in UNINETT etc.

Difficult challenges

- Firm belief and political pressure for CO OSI-protocols.
- Standards slow in coming from ISO and CCIT
- Slow development of common services.
- Independent development of services in NORDUNET regarded as unrealistic
- Reorientation of original goals

Reorientation strategy

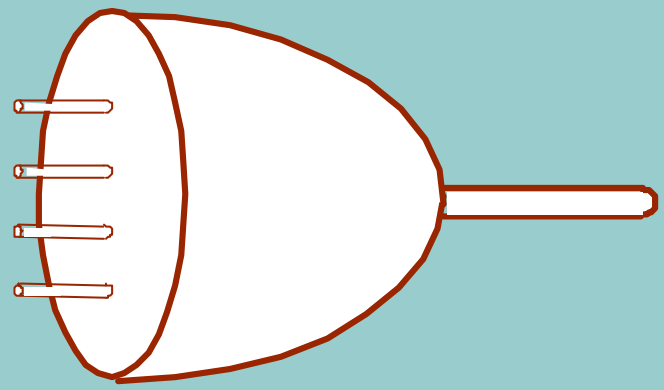
- Continued support of interim solutions, but prepare for OSI migration (!)
- Interim solutions to connect to international networks, EARN, UUCP, DECnet and Internet
- Active participation in European OSI-efforts in RARE and COSINE, to build competence
- Migration pilots, file transfer, base for further work, JANET coloured books, ISODE (X.25 over IP) ?
- Reliable standards and services still regarded as 10 years off (JANET)

In 1987 new possibilities

- No continuation of support for the EARN leased lines. NORDUNET urged to connect the main Nordic nodes.
- A major technological breakthrough, bridges to run Ethernet over slow lines, Vitalink bridges.
- Sudden realisation of a possible Nordic Ethernet connecting the major nodes
- National Ethernets based on the same technology connect to a clean Nordic net.
- Institutional Ethernets on national nets connect users.
- The X.EARN project quickly adopted early 1988

The NORDUNET multiprotocol plug

- the basic X.25 service
- EARN and RSCS
- DECnet
- TCP/IP



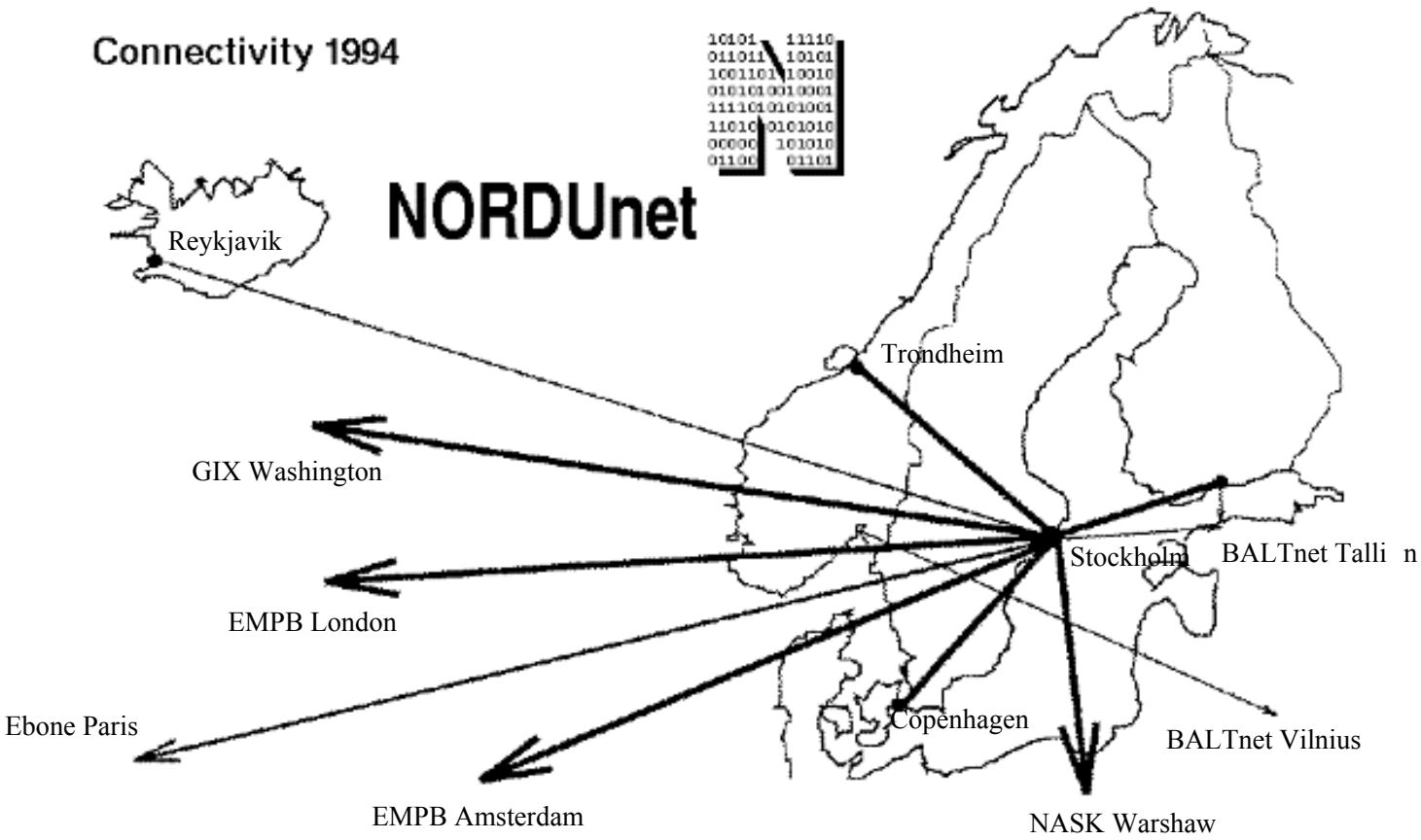
The challenge not technolgy but organisation

The distributed service concept

An international, multiprotocol network

NORDUnet,
the operational net

- One stop shop for lines, Scantele
- 64 kb/s Copenhagen, Helsinki, Stockholm, Trondheim, 9.2 Reykjavik
- Central node KTH, Stockholm
- US NSFnet to Princeton via satellite, 56 kb/s
- KTH connected Europe, EARN, HEPnet
- Peering with EUnet
- European interchange, GIX
- Operating late 1988, official opening Oct.89


Connectivity 1994
NORDUnet
Reykjavik
Trondheim
GIX Washington
Stockholm
BALTnet Talli n
EMPB London
Ebone Paris
Copenhagen
BALTnet Vilnius
EMPB Amsterdam
NASK Warshaw

Not only a network

- Inter-Nordic work-groups created competence on many levels
- Catalytic effect on national networks early commercial introduction
- Joint activities creating international recognition and status in international bodies

International recognition

- The first DNS root-server outside US
- RIPE as European Internet coordinator
- Participating and forming IEPG and IETF Operation WG, other IETF work, MIME
- In RARE WG8-management introducing open support of protocols and services, including TCP/IP as well as ISO OSI work

(controversial!)

Europe and TCP/IP

- Work on service harmonisation and OSI migration continued
- Einar Løvdals urge for TCP/IP migration met with mixed reactions (Trieste 1989)
- Support from research communities collaborating US and Canada
- RIPE formed 1989, RIPE NCC in 1992
- Large European communities forged ahead with OSI based services

- and fell behind -