



Building the pan-European information superhighway for research

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What is TEN-34?

- **Trans-European Network Interconnect at 34 Mbps**
- **Consortium of all (western) European research networks**
- **with DANTE as coordinating partner**
- **Co-funded by European Commission**
- **All major telecom operators**



What is DANTE?

- **not-for-profit company established in 1993**
- **set up and owned by European national university networks**
- **to complement national network services at a European level**

Why TEN-34?

- **Network Capacity**
 - 45/155/(622) Mbit/s in US
 - 34/155 Mbit/s nationally in EU
 - 2 Mbit/s technology internationally in Europe
- **Organisation**
 - fragmentation of NRN activity



TEN-34 The diagnosis

Europe lacks a high capacity pan-European network to interconnect an increasing number of high capacity national research networks.



Telecommunications supply in Europe

- **A set of national markets**
- **Cross-border services very expensive**
- **Performance of cross-border services limited**
- **Things are improving**

TEN-34 The prognosis

- **Available capacity is not a problem**
- **Market is restricted by fears of liberalisation**
- **Commercial position of research community a key factor**



TEN-34 Two elements

- **34 Mbps network service based on proven technology as soon as possible**
- **ATM testing program with JAMES**



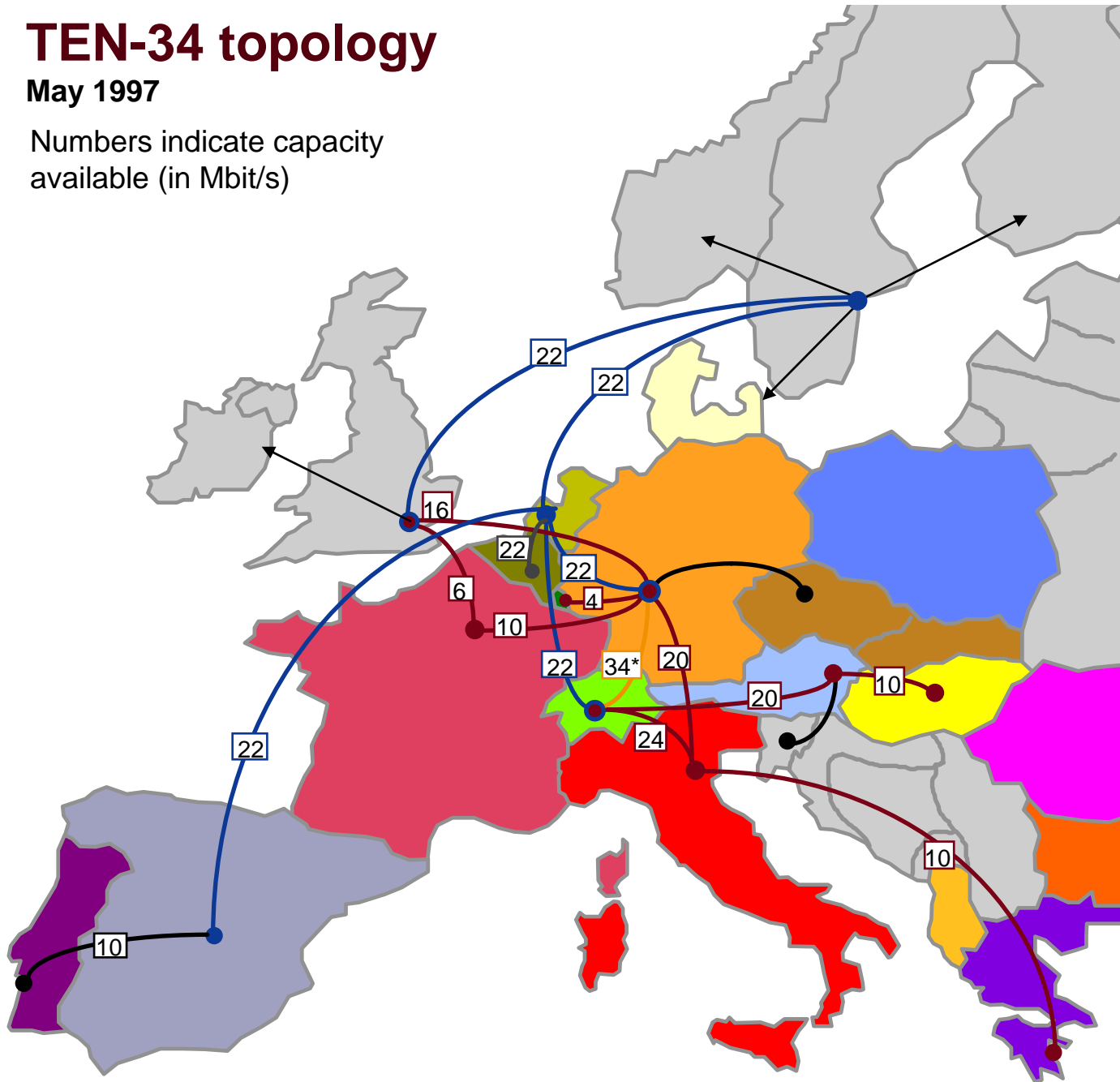
TEN-34 Technical implementation






- **Mixture of ATM and leased circuit transmission**
- **Combination of managed IP service and dedicated links**
- **Separate management service**

TEN-34 topology

May 1997

Numbers indicate capacity available (in Mbit/s)



-  IP subnetwork
-  ATM VP subnetwork
-  Interconnection point
-  Leased line
-  Planned connection



Intercontinental connectivity

- **TEN-34 work item**
- **Economics of sharing are improved by TEN-34**
- **A time of transition**



Testing program with JAMES

- **Grouping of telecom operators**
- **Pan-European pilot facility**
- **Platform for experiments**
- **Underlying ATM infrastructure**



Program of testing

- **Performance testing**
- **ATM addressing**
- **IP over ATM**
- **ATM switched services**



TEN-34 Today

- **Planning complete - August 1996**
- **Go Ahead - September 1996**
- **Contracts complete - end October 1996**
- **First bits flowed - February 1997**



TEN-34 Progress made

- **It is cheaper - 50% of old costs**
- **It is faster - access up to 45 Mbps**
- **It is actually happening**



TEN-34 A great step forward, *but...*

- **High cost - 5 times US prices**
- **Diversity of supply - more than 14 telecom operators involved**
- **Conservatism in technology - telecoms monopolies still rule**



TEN-34 Achievements

- **Service in operation**
 - traffic flowing since 06.03 (Unisource 29.04)
 - uses ATM VPs
 - smooth transition
- **Participation**
 - All Western NRNS + HU + (CZ + SI)
 - Contracts with 15 PNOs
- **Affordable Price**
 - 2M ratio



More information

- **TEN-34**
<http://www.dante.net/ten-34>
- **DANTE**
<http://www.dante.net>
- ***European research network infrastructure overview***
<http://www.dante.net/presentations/gibn>