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The challenges of building the pan-European Optoroute for research

Dai Davies

The research networks which connect together universities and research institutions in the various European countries are a key stimulus to the development of the European economy. These networks provide both a vehicle for researchers in the various disciplines to co-operate as well as the building blocks for research into telecommunications and information technology systems. The USA has demonstrated very convincingly through the efforts of the National Science Foundation how effective research networking can be for the benefit of industry and society as a whole. New telecommunications industry which has given rise to such firms as CISCO, Bay Networks and Netscape has resulted from NSF investment in Internet technology. Europe has very happily employed this technology and has even contributed considerable voluntary manpower to assist in its development.

In contrast Europe has been slow to build an equivalent of a pan-European facility to support research and researchers. It is only really with the fourth framework programme of the European Commission that research networking has come to be seen as an element of European industrial policy. Each country in Europe has a data communications network that interconnects its national universities. In France this is RENATER. These National Research Networks (NRNs) have had some success in building national high speed data networks to interconnect the universities. The most advanced of these networks, SuperJANET in the United Kingdom, can offer 155 Mbps interconnection to a number of sites. Developments in other countries are similarly moving towards higher speeds that will allow development and implementation of multimedia applications to support research.

The contrast between national capability and pan-European capability is quite stark. Nationally, there existed a number of networks operating at 34 Mbps and several with 155 Mbps capability. On a pan-European level, EuropaNET the pan-European research network organised by DANTE on behalf of the research community, can support connectivity at 8Mbit/s. It is to provide a matching European capability for the interconnection of national research networks that the Trans European Network Interconnect at 34 Mbps (TEN-34) project has been organised under the fourth framework programme. This will create "the pan-European Optoroute for Research"

TEN-34 is a co-operation of all of the western European research networks and today includes Hungary from central and eastern Europe. It is a major step forward in building the pan-European Optoroute for research. As the co-ordinating partner of this project, DANTE has now considerable experience of the challenges of building such a network. At one level creating the pan-European Optoroute should be easy. There is in fact no shortage of international fibre optic capacity within Europe. As part of the preparatory work for TEN-34 DANTE surveyed the capacity that was available and installed. A number of telecommunications operators were reluctant to provide information but from the partial picture that emerged it is apparent that capacity itself is not a problem. Even a relatively small country such as Austria already has giga-bits of international capacity across its land frontiers and ambitious plans to increase this capacity. The difficulty lies not in the availability of capacity rather in the willingness of the owners of that capacity to make it available at sensible prices to the market place.

There are three key challenges that the TEN-34 project has had to meet in order to implement the plans for TEN-34. These are:-

1. Availability of Service

It is apparent that European supplier are today unable to provide a ubiquitous pan-European network operating at 34 Mbps. The reasons for

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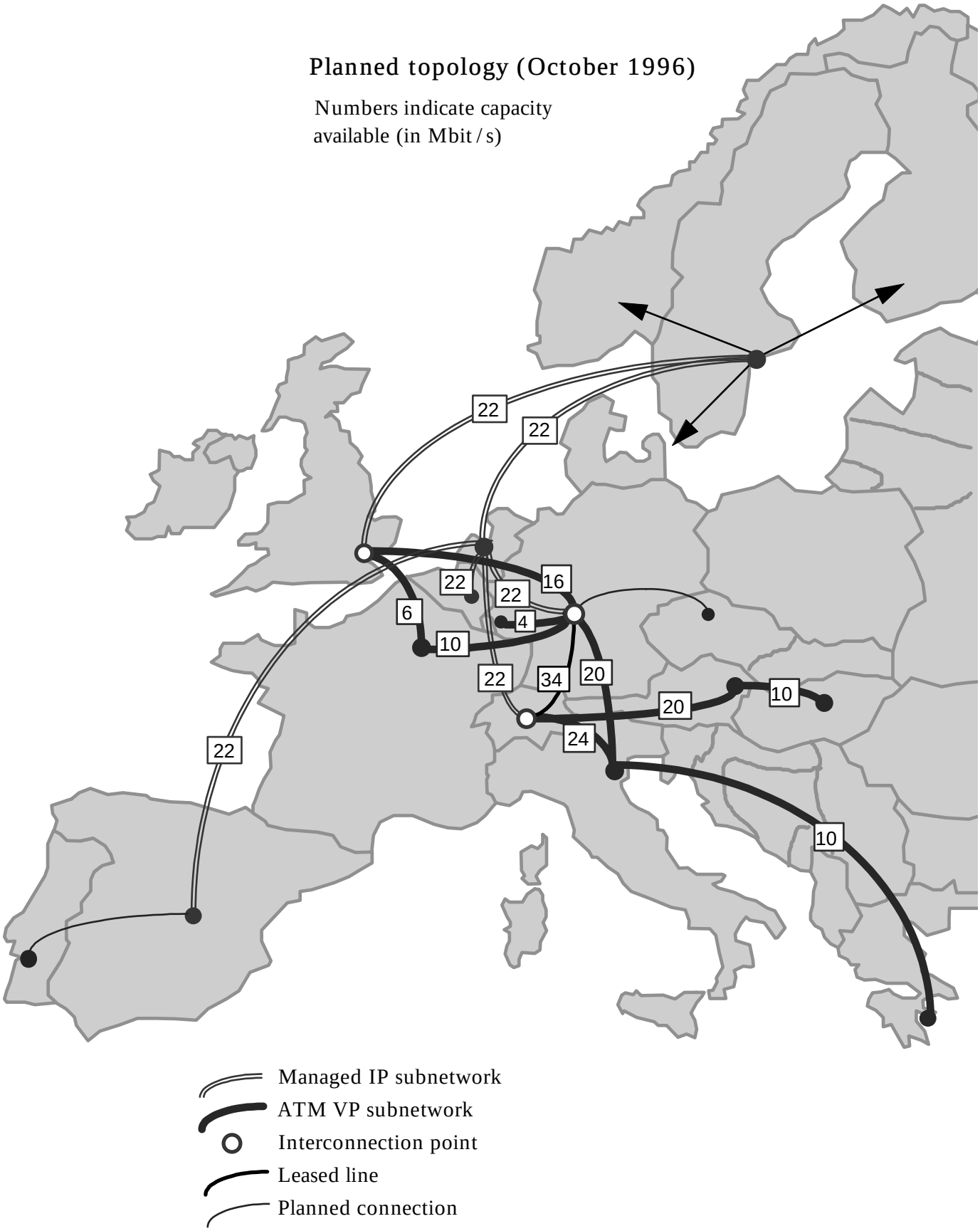
Planned topology (October 1996)
Numbers indicate capacity
available (in Mbit / s)
22
22
22
16
22
6
4
10
22
34
20
20
10
24
22
10
Managed IP subnetwork
ATM VP subnetwork
Interconnection point
Leased line
Planned connection

this seem to lie in the current liberalisation of the telecommunications market in Europe. European PNOs rely disproportionately on international voice services for a significant part of their profitability. This is based on the monopoly prices that they are in a position to charge for such services. High capacity links of 34 Mbps or 155 Mbps would allow competitive bypass networks to make serious inroads into this profit stream.

As a consequence the market, collectively, has been reluctant to make available high capacity circuits on an international basis within Europe. Paradoxically liberalisation is in fact delaying its own process. The consequences of this for the TEN-34 project are that we will deal with fourteen service suppliers in order to create a pan-European network. For the past five years EuropaNET has been provided by a single telecommunications supplier. The price of progress is diversity of supply.

2. Cost

International telecommunications in Europe is expensive. A compelling proof of this is to look at the cost of transatlantic capacity in comparison with equivalent international capacity within Europe. It is a harsh fact today that the same capacity provided over 5,000 km of sea cable costs slightly less than for equivalent capacity on 500 km of terrestrial fibre within Europe. A price differential between Europe and USA of 10 is not unrealistic. This is not because Europe has less capacity. This is not because Europe has inferior optical technology. It is because of the development of the pan-European market place for telecommunications. By judicious negotiation TEN-34 has managed to reduce the overall cost per Mbit by up to 50% of its current level. Nevertheless the development of the Optoroute is constrained by price. The price of progress is the high cost of international telecommunications in Europe.

3. Availability of Technology

TEN-34 will use a mixture of leased circuits and ATM transmission capacity. ATM has a number of benefits over IP technology. In particular ATM offers the potential much improved management facilities and control of quality of service which are the Achilles heel of Internet. In practice TEN-34 will not be able to utilise these capabilities. Through co-operation with the JAMES project, a consortium of the existing European PNO's, a testing programme for ATM will be implemented. In general it is disappointing that more advanced ATM services can not be available as part of an integrated European service. The price of progress is conservatism in technology.

Summary and Conclusions

TEN-34 represents a major step forward for pan-European research networking. It will mean that the gap between the national telecommunications facilities available to European researchers and those available Europe-wide will be at least reduced. Nevertheless European research networking continues to be restrained by lack of capacity, by the cost of current capacity and the limited availability of ATM technology. The 'Ancien Régime' of European telecommunications continues to live despite the intention to create a liberal market within Europe. The challenges of building the pan-European Optoroute are essentially political and remain. If Europe is to emulate the success which the US has had in the use of telecommunications for economic and scientific success it has to address two major challenges.

1. Stimulation of a true European Market

Infrastructure is not a problem within Europe but access to it at sensible prices is. The de-regulation of telecommunications alone is not enough. To date de-regulation has had the effect of encouraging the existing operators to man the barricades against progress. There needs to be proactive regulation to dismantle these to ensure that a liberal and competitive market exists on a pan-European basis.

2. Research Networking as an element of Industrial Policy.

Europe needs to exploit the resource which research networks represent for the development of new technology and services. Too much effort is still focused on the traditional market players whose conservatism has been a bar to European economic success in telecommunications. The US example of using the research community to develop new and innovative products and services in telecommunications and information services has created the concept of the Information Superhighway and is providing the building blocks. Le défi américain est toujours là... Europe should learn from it and meet the challenge.