#17

Roadblocks on the Superhighway

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Roadblocks on the Superhighway - meeting the challenges of setting up a high speed backbone in Europe

Dai Davies

Introduction

DANTE is a not-for-profit company which was set up in 1993 by a number of national university networks in Europe to organise and manage international advanced network services for the European research community. DANTE's main service is EuropaNET, a backbone network which links up research networks in more than 15 European countries and provides access to the global Internet. EuropaNET constitutes by far the largest part of the European research Internet.

Three years ago EuropaNET was launched. The network operated at a maximum speed of 8 Mbps. Three years later we have just completed a similar procurement exercise. The resulting network also operates at 8 Mbps since this is the fastest speed that the international telecommunications market in Europe provides. This is despite record traffic growth of up to 700 % per year. So much for the development of the market for data services in Europe.

The EC Fourth Framework Development Program has given a significant budget to enhance the existing pan-European research networking infrastructure to 34 Mbps and higher speeds. Although in a global context this is not particularly advanced technology-wise, nevertheless from an operational perspective such high speeds are not used by commercial customers. There is much practical operational experience to be gained from implementing a high speed service in advance of such a service commercially being available. This fits in with one of DANTE's overall strategic goals of introducing advanced operational services at a quality near to services provided by the market place.

There are currently technology developments in telecommunications and an accompanying liberalisation of infrastructure in Europe that could significantly change the provision of telecommunication services to allow access to a far ranging set of information sources.

The technological challenge

A major issue is the choice of technology to be used in developing the next generation, high speed service which will constitute a real 'Superhighway'. There are two basic elements of telecommunications technology: transmission and switching. Transmission is about moving the bits of data around. Switching is about the connection together of the different parties that wish to communicate. The choice of technology for switching and transmission can be independent, but this is not necessarily the case. Thus, the technology that underlies the Internet (IP) is purely a switching technology which can use a variety of underlying transmission technologies, whereas the newer and more advanced Asynchronous Transfer Mode technology (ATM) is both a switching and transmission technology. The key technology choice to be made in telecommunications technology today is between IP and ATM.

IP is the favourite of the technically literate research networking community. There is very little intelligence in IP switches themselves. Because of this a very high level of technical expertise is required to operate IP networks. IP does have a major advantage in as much as it is simple to connect. It is also very robust. It was designed to withstand a nuclear explosion and is literally bombproof. It has however two major disadvantages.

Firstly it cannot guarantee a level of performance to a given user. All users compete for the network and as the network becomes more heavily loaded its performance degrades and rationing sets in. This makes it unsuitable for real time applications such as voice and video where a guaranteed level of performance is needed.

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Secondly, the lack of inherent manageability in the technology makes it difficult to control traffic allowing free rides and creating commercial distortions. There is highway robbery as well as road kill on this part of the information highway.

In contrast ATM is a technology which allows much higher levels of management control, unlike IP, which is sometimes described as a best endeavours approach. ATM will allocate network resources for the duration of a communication. ATM offers much higher levels of inherent manageability than IP and therefore requires fewer 'hands on technical staff' to operate it. ATM includes both transmission and switching elements in the technology. They are however at different stages of development. The much simpler transmission elements are relatively well defined and implemented by a number of manufacturers. In contrast, the more complicated switching elements, in particular the switching control and management elements are still being developed and are unlikely to mature into reliable technology for several years.

DANTE has a simple strategy in terms of networking. It consists of two elements. Firstly to operate advanced network services at acceptable quality to technically literate users before these become available in the market place. Secondly to pilot the next generation of technology in a pre-production environment, thereby giving early experience of its use. This strategy can roll forward as technology matures. We are therefore planning an 'acceptable quality' IP service at 34 Mbps and the piloting of ATM technology.

There is little argument that ATM is the next generation of switching technology although there is real debate as to whether it will succeed. Piloting is also useful in as much as it employs technicians in testing out new technology rather than managing existing technology. There is some suspicion of ATM since it is a managed technology and a lot of the direct involvement which IP allows will be missing in an ATM environment which will be much more like the telephone network from which many of the principles behind ATM derive.

The commercial challenge

The commercial challenge in Europe is to persuade the European Public Network operators (PNO's) to remove the roadblocks to the creation of high speed networking by making available large quantities of bandwidth at reasonable prices. This is never going to be easy since the PNO's have been used to monopoly national markets and their pricing structures bear little practical relationship to cost. It is also a real problem for the PNO's that if they offer service to one customer at a certain price it is very difficult to prevent it being demanded by another customer at the same price.

In practice the PNO's can offer access to the transmission capability of ATM. It is the new technology. It enables them to organise this offer as a technology trial (which it is) and at the same time avoid creating a price in the market place. Although the transmission elements of ATM are relatively mature, it nevertheless will be a challenge to create a multi-vendor ATM transmission platform which can be used to support an Internet service. The challenge is however one of detail and it is possible to say now that it will be solved.

There is another reason why the PNO's should be interested in high speed networks. This is because it relates to the great Information Superhighway. The PNO's, and to an extent the media barons see a significant future for entertainment sent down cable systems to people's homes. This requires the high bandwidth and control that ATM technology promises to deliver. With such large sums of money involved they will not put up with the commercial anarchy of the Internet.

The liberalisation of the telecommunications market promised for 1998 will make it easier to create high speed networks. Nevertheless it is direct access to millions of homes that will create the Superhighway. The battle is likely to be between cable television operators and traditional telephone companies. 1998 will represent the start of the process. Until the PNO's can adapt commercially to the new competitive market place they will put informal roadblocks in the way of liberalisation.

Of course these big predictions do not always work out and the success stories in telecommunications in the last thirty years have been facsimile and mobile and not ISDN and Videotex as the pundits predicted. There is an important and strong motivator. Entertainment is a huge market with as many potential customers as there are telephone users. This is however a very far cry from the 'techno enthusiastic' market which appears to be a focus of the current Internet. If the technology

can be delivered, and the price of PNO services drops to cost based levels then Europe could see the development of a real Superhighway. The research networks are about to trial this technology. It will be apparent in two to three years whether it will fulfil its promise.

Conclusion

Technology developments in telecommunications are creating the building blocks for the Information superhighway. The next few years will determine whether the technology will fulfil its promise and pilot projects carried out by the European research community will give early answers. Technology however is not enough. There needs to be significant reduction in telecommunications infrastructure costs in Europe if the Superhighway is to be built. Liberalisation of telecommunications will assist this process. It is by no means obvious however that the Superhighway will be more than a pipe dream.