#16

European Internet - Behind the US and moving more slowly

Dai Davies

This article was published in Europhysics News, Bulletin of the European Physical Society, No.26 - October 1995.

DANTE IN PRINT is a track record of papers and articles published by, or on behalf of DANTE. HTML and Postscript versions are available from: http://www.dante.net/pubs/dip.html

For more information about DANTE or *DANTE IN PRINT* please contact:

DANTE
Francis House
112 Hills Road
Cambridge CB2 1PQ
United Kingdom

Tel: +44 1223 302 992
Fax: +44 1223 303 005
E-mail: dante@dante.org.uk

European Internet - Behind the US and moving more slowly

Dai Davies

Dai Davies, DANTE's General Manager, reports that while the European Internet is in a relatively sorry state, initiatives to improve the situation are well-advanced.

DANTE is a not-for-profit company, set up in 1993 by a number of national university networks in Europe, to organise international network services for the European research community. EuropaNET, a pan-European backbone network which connects the national research networks to each other and to the global Internet, is DANTE's main service. DANTE also organises pan-European mail and directory services and is involved in several pan-European networking projects, one of which is TEN-34, which aims to establish a high speed pan-European backbone network for research as soon as possible.

The European Internet is currently struggling with a number of issues the North American Internet has just dealt with. On 30 April 1995 the NSFnet (National Science Foundation) backbone network ceased to exist. Last year a transition process started to replace it with a new architecture, in part restricted to research purposes and in part for commercial usage. The NSFnet backbone was set up nine years ago to interconnect six super-computer centres, and started operating at 56 kilobit/second (Kbps). Just before its 'retirement' the network operated at a speed of 45 Megabit/second (Mbps). The new architecture allows NSF to focus (again) on its primary mission of promoting scientific research and development.

US - A Neat Solution

In the US NSFnet bandwidth - which was provided to the research community under favourable commercial conditions - was increasingly being re-sold by them to commercial organisations. The big telecoms operators argued - and rightly so - that there was no way they could compete for commercial customers in a subsidised market.

The US response to this problem was twofold. For routine services (up to 45 Mbps) they shifted from paying for the network to subsidising the users at the same time encouraging the creation of a true Internet market. This was achieved by defining a technical structure for the market which favoured pan-US operators. This way competition between the large network operators will let the market do its work, and connecting networks will be able to obtain Internet access at a reasonable price and without the commercial distortions to which the Internet market is very prone. Secondly, in the new structure a very high speed Backbone Network Service (vBNS) is being established at 155 MBps the usage of which is restricted to research organisations that require high speeds for applications such as scientific computation and visualisation.

The new set-up further features four Network Access Points (NAPs), neutral interconnection points where network providers interconnect with other providers and a number of national Network Service Providers (NSPs) to carry national traffic at slower speeds. The NAPs are operated by PacBell in San Francisco, Ameritech in Chicago, Sprint in New York, and Metropolitan Fiber Systems (MFS) in Washington.Network Service Providers are not financed directly by NSF. Instead, NSF funds regional network attachments to Network Service Providers, but only to those who are present at all the NAPS. This encourages scale and favours the big operators who can exploit economies of scale. This support will decline to zero over four years. Network Access Points interconnect the vBNS and other backbone networks, both domestic and foreign. Thus the National Science Foundation has neatly solved the problem of resale and cross-subsidy, created a market of some scale for Internet services and preserved its role as the provider of advanced technology networking to the academic

Dai Davies is General Manager of DANTE, his e-mail address is: d.r.h.davies@dante.org.uk

community in the US. The key NSPs are MCI, US Sprint and the original operator of the NSFNet Backbone ANS. The major players in the US telecommunications market have emerged as the key players in the US Internet.

Europe - Some Do Better

The problem in Europe is similar, but unfortunately the US solution does not easily apply. The situation is complicated by political and regulatory issues which will come to a head in 1998 when the telecoms market in Europe is liberalised.

In Europe the Internet was also created by the research community. The national university networks in Europe have worked together since the mid-eighties to establish a rational cross-border networking infrastructure for their international traffic. Cross-border connections in Europe are very expensive, and especially high speed connections are hard to obtain from the national (monopoly) Public Network Providers. As a result of the national networks' collaboration EuropaNET was launched in 1992 - a pan-European backbone network, based on 2 Mbps links, interconnecting national research networks in 18 countries and offering interconnect with the rest of the global Internet. At the moment customers are connected at a maximum speed of 6 Mbps.

EuropaNET is managed by DANTE, a company set up by the national networks to centralise the organisation of cross-border network services for their purposes - a mandate similar to that of the National Science Foundation in the US. A major difference between DANTE and NSF is that DANTE does not channel pan-European funds like NSF does. Funding always has to be organised on an ad-hoc (and service-related) basis, which makes the setting out of a consistent, long-term strategy very difficult.

During the past two years heated debates have taken place between small commercial Internet providers and the research networks, in particular DANTE representing EuropaNET. Some commercial Internet providers in Europe insist that all Internet networks should inter-connect to each other without charge for the sake of the 'spirit of the Internet'. DANTE, having invested significant amounts of money in the establishment, maintenance and continuous upgrading of EuropaNET, argues that whoever uses the network should pay a price for it. It is hardly fair that a network like NORDUnet, which itself interconnects 5 national research networks in Scandinavia, should pay for a connection while a much smaller, commercial network operating within one country, would get a free connection. More importantly the acceptance of that point of view would make the whole collaborative model, and as a result the European backbone, collapse, as each network could claim to be offering connectivity to itself in return for a connection to the backbone. While the spirit of the Internet may have some real substance in the US, under the European commercial circumstances it is no more than an easy and opportunistic argument which serves (the economic interests of) some better than others.

A Proposed High Speed Network

In October 1994 the Acceptable Use Policy on EuropaNET was removed and from October 1995 on the network will become fully open for commercial organisations. This way Europe's research community has created a high-quality infrastructure which can now be 'handed over' for general commercial exploitation. The difference between Europe and the States is only...43 Mbps ....

European researchers also need a high speed network infrastructure. Since 1993 the university networks have set up a series of collaborations in an effort to speed up the creation of a pan-European high speed network. Six of them have already set up their national high speed backbone and are now urgently seeking ways of getting a complementary European backbone in place as well.

Their latest initiative is TEN-34, a proposal backed by a consortium. The proposal was formulated in reaction to the Call for Proposals of the EC Fourth Framework Programme, which was launched in December 1994. In the Consortium 18 networks work together with DANTE as co-ordinating partner. The TEN-34 proposal consists of two elements: a detailed implementation plan for the speedy setting up of a 34 Mbps IP backbone in combination with the development of an international high speed ATM test network. Like the vBNS this network will be restricted to academic use. The difference between Europe and the States is only...121 Mbps.

ATM - The Future?

ATM offers two potential benefits over current switching and transmission technology. Firstly it is capable of providing a more flexible division of bandwidth enabling both synchronous and asynchronous connections to be provided on the same link. Secondly, as the switching technology develops it will allow dynamic allocation of bandwidth to meet the requirements of individual applications thereby permitting greater flexibility and more efficient use of network capacity.

There are three great challenges to ATM. In the first place there is the commercial challenge. A great success of Internet is fixed access pricing. It encourages some less than optimum usage of network resources and actually imposes Quality of Service by rationing rather than by price. But predictable bills are popular with users. If ATM services are expensive, never mind the fact that they can be managed economically, they will not prove popular. ATM represents a potential for future telecommunications services but will only succeed if the real cost reductions in technology are actually made available to the user. The market for ATM needs to be driven by increasing supply through low prices rather than by rationing demand through high prices. Users will stick to the simple Internet if demand is to be rationed.

The second major issue is the lack of maturity in the technology. Although the basic ideas of cell relay are well understood, the control mechanisms that take a technology to the point where it can be used as a real service still require development effort. This lack of maturity is reflected in the European PNO ATM pilot where the facsimile machine was used as the signalling system. Facsimile is one of the few success stories of PNO standardisation efforts, but it was not really specified as a signalling system for advanced network technology. It is a measure of DANTE's belief in the need for this process to succeed that we are investing effort in defining an ATM test network. It is also a measure of our scepticism that it will succeed that we need to invest such effort.

Thirdly there is the standardisation challenge. Large scale international standardisation efforts do not have a good track record of success in creating international products. By contrast, where the market has been dominated initially by a single supplier who has been able to impose a de-facto solution, standardisation has proceeded quite quickly. The standardisation process for ATM has cut some corners. It will remain to be seen whether the standardisation process will produce reliable products from a variety of vendors.

ATM represents a major new technology. It has the potential to meet the emerging requirements of the generation of multi-media applications that are under development. Within the networking research community there is considerable interest in its usage. However, ATM will only succeed if it learns the hard lessons demonstrated by earlier networking technologies.

The Future of the European Internet

Compared to the US the European Internet is in a rather sad state. The good news is that initiatives to improve the situation are well- advanced. Some serious obstacles remain though: telecoms operators unwilling to deliver, commercial unmanageability of the Internet, the non-existence of a pan-European funding body dedicated to the long- term development of an advanced network infrastructure and technical and commercial uncertainties with respect to ATM. The next two years will be decisive for the future of European networking; as a central organisation set up to centralise all European networking efforts for the research community DANTE is in an ideal position to make the most of it.