



## ***European Research Networking Moves into the Fast Lane***

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"We have started to shed the dead weight of monopoly pricing of international bandwidth which has been holding back European research networking. We can now concentrate more on exploiting European imagination and ideas for delivering Quality of Service to the research community", Howard Davies, General Manager, DANTE.

DANTE, together with the national research networks of 16 European countries and with the support of the European Commission, will replace the current TEN-34 pan-European research network with the new TEN-155 network which will have access capacities of 155 Mbps in eight European countries. TEN-155 will be the largest pan-European operational network. For the first time bandwidth for international connectivity will equal bandwidth available on the national services used by the academic and research community.

The increasing dependence on networking for collaborative research at institutions and universities across Europe leads to ever increasing demands for pan-European network bandwidth. By the summer of 1998, the consistent growth of traffic in the current TEN-34 network has led to a gradual erosion of the good network performance. Additionally, more and more co-operative development activities in Europe are based on the use of multi-media services, which are only effective if they can rely on high Quality of Service levels which cannot be provided on a fully loaded 'best efforts' IP network.

The TEN-155 network will be co-funded under a joint initiative by DGXIII (Telematics for Applications and ACTS) and DGIII (Esprit) of the European Commission. The TEN-155 network is a direct result of the QUANTUM project. In addition to providing for TEN-155, the QUANTUM project also entails a Test Programme (QTP) for advanced testing on ATM and IP technology. The participating national research networks, DANTE and Telebit Communications A/S will be the active members of the QTP group and will co-operate in this Wide Area and International Testing Programme.

### **TEN-155: the topology**

TEN-155 will provide European researchers with a core transmission network of 155 Mbps circuits and nodes in Austria, France, Germany, Italy, the Netherlands, Sweden (as the connection point for the Nordic regional network services), Switzerland and the UK. Belgium, the Czech Republic, Greece, Hungary, Slovenia and Spain will be connected to the core at 34/45 Mbps. There will be 10 Mbps links to Luxembourg and Portugal and an extension to service to Ireland is currently planned. The design of the TEN-155 network also provides for extension of the service to the USA other Continents. In this way the TEN-155 network meets the requirement of the European research

community for more bandwidth to facilitate international communication.

The main supplier of the TEN-155 network is KPN/Unisource Belgium who will provide connectivity in Belgium, France, Germany, Italy, the Netherlands, Spain, Sweden, Switzerland and the UK. Contracts for connectivity of the remaining research networks are being negotiated with the Telecom Operators serving the respective countries.

## **TEN-155: the technology**

The TEN-155 network will combine the best of both IP and ATM technology. TEN-155 will be based on SDH (Synchronous Digital Hierarchy) circuits with an ATM (Asynchronous Transfer Mode) overlay which allows for bandwidth management for optimal loading of the SDH capacity. Much of the capacity will be devoted to a continuation of a 'best efforts' IP service, but the ATM overlay of the TEN-155 network also provides for a Managed Bandwidth Service to be offered to specific groups of users and for the temporary setup of virtual paths with guaranteed bandwidth between national research networks. The participating national research networks have the choice of ATM or SDH-over-IP access to the TEN-155 network.

## **TEN-155 Network Operations**

The TEN-155 Network Operations Service will serve the entire TEN-155 community. As was the case for the TEN-34 network, day-to-day operation of the best efforts IP service has been subcontracted to UKERNA (the organisation responsible for the development and operation of the UK national research network), who will use their existing facility at the University of London Computer Centre. The responsibilities of the Network Operations Centre include monitoring of the network infrastructure and applications, software and hardware maintenance, operating a trouble ticket system and the provision of service reports.

The ATM Managed Bandwidth Service provided to all national research networks participating in TEN-155 will directly be managed by KPN/Unisource Belgium. It is planned that the Managed Bandwidth Service will initially serve pilot users and will over time be extended to all national research networks and a wider group of users.

## **QTP: The Quantum Test Programme**

In addition to the operational TEN-155 network, the Quantum project will implement a testing programme (QTP) which has the objective of testing and validating new technologies, products and services with a view to introducing them into the operational TEN-155 service at some future date. The Quantum Test Programme is managed by DANTE as the Co-ordinating Partner in the Quantum project and will be carried out in a Joint Task Force together with TERENA.

Much of the effort to carry out the QTP is expected to come from the national research networks as the Partners in the Quantum project and from Telebit Communications A/S. Telebit is Associated Partner in the Quantum project and will provide technical support including laboratory testing

facilities when appropriate.

## After TEN-155

Compared to the TEN-34 network, TEN-155 represents a major breakthrough. For the first time a pan-European network benefits from the liberalisation of the European telecommunications market. TEN-155 has broken the monopolistic price barrier and the bandwidth rationing that existed in pre-liberalised Europe. However, liberalisation has not yet taken place in all European countries.

The contract with Unisource Belgium for the supply of the bulk of the capacity has been signed for a period of 3 years, with the roll-out of the network starting in December 1998. It is anticipated in the contract that the network will be upgraded to 622 Mbps by the year 2001!

## The Role of DANTE

DANTE (Delivery of Advanced Networking Technology to Europe Ltd.) is the Co-ordinating Partner of the Quantum Consortium and is responsible for the management of the project. DANTE is a not-for-profit company with research association status based in Cambridge (UK). DANTE is owned and was set up by a number of European national research networks to organise and manage the provision of advanced networking services to the European research community.

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## The TEN-155 Partners

### Who is TEN-155 ?

DANTE (Co-ordinating Partner)      United Kingdom

And the following national research networks:

ACONET	Austria
ARNES	Slovenia
BELNET	Belgium
CESNET	Czech Republic
DFN	Germany
FCCN	Portugal
GRnet	Greece
HEAnet	Ireland
HUNGARNET	Hungary
INFN	Italy
	Denmark
	Finland
NORDUnet	{ Iceland
	Norway

Sweden

RedIRIS	Spain
RENATER	France
RESTENA	Luxembourg
SURFnet	Netherlands
SWITCH	Switzerland
UKERNA	United Kingdom

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