The TEN-34 Networks

Technical set-up

The TEN-34 network is an interconnect facility between the national research networks (NRNs) in Europe, co-funded by the European Commission. It offers a high speed pan-European backbone to complement an increasing number of high speed national backbones.

Technically, the TEN-34 network consists of two subnetworks, connected at three points in Europe. One subnetwork is based on ATM Virtual Paths/leased lines and the other subnetwork is a managed IP network, provided by Unisource. TEN-34 has become operational in April 1997.

The ATM VP subnetwork

This subnetwork connects the following national research networks:		The telecom operators involved are:
Renater	(France)	France Telecom
JANET	(UK)	BT (Worldwide) Ltd (Belgium)
DFN	(Germany)	Deutsche Telekom AG
GARR	(Italy)	Telecom Italia
Switch/CERN	(Switzerland)	Telecom PTT
GRnet	(Greece)	OTE
ACOnet	(Austria)	Post and Telecom Austria
RESTENA	(Luxembourg)	Enterprise des P et T Luxembourg
HUNGARNET	(Hungary)	MATAV
ARNES	(Slovenia)	Telekom Slovenije
CESnet	(Czech Republic)	Global One

The services delivered to the TEN-34 partners by the telecom operators are based on either ATM or leased lines. In order to provide an IP service to their customers, the individual NRNs will arrange for an IP service to be mounted over the services provided by the telecom operators.

Two modes of operation are available from the telecom operators - Constant Bit Rate (CBR) and Variable Bit Rate (VBR). The former is aimed at services in which timing is important, such as video-conferencing, while the latter is geared to less time sensitive, bursty applications such as data. Given that the performance criteria are more stringent in the case of CBR, the service is normally more expensive than a VBR service of the same average capacity. TEN-34 uses VBR with Peak Cell Rate (PCR) = Sustainable Cell Rate (SCR) where this mode of operation is offered by the telecom operators, and CBR for the remaining links. This provides the most cost effective solution for the interconnection of the NRNs, whose international traffic is not bursty since it is the aggregated traffic of thousands of users.

The IP Service is mounted using Cisco 7500 series routers, connected to the telecom operators' ATM switches or leased line via an appropriate interface. These routers have the ability to control the flow of data into the ATM network to match the contracted ATM parameters, so there should be little loss of ATM cells due to the NRN networks exceeding their agreed ATM contracts with the telecom operators.

The managed IP subnetwork

The service delivered by Unisource is an IP network service with advanced features such as native IP multicast. The Unisource routers are on Unisource PoPs (Points of Presence), from where local loops would extend the network to the National Research Network sites. This is the normal network set-up as used in most backbones today.

The Unisource subnetwork connects the following national research networks/organisations:

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NORDUnet  (Nordic countries)
SURFnet   (Netherlands)
SWITCH    (Switzerland)
RedIRIS   (Spain)
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The Unisource network service offered will not be a static network. Unisource will move the network over to an ATM platform. The first step foreseen in progressing the network to an ATM platform is to move the 'trunk' part of the Unisource network to an ATM-based platform. In order to avoid a degradation of the initially offered service, the trunk connections in the ATM network will be implemented using STM-1 (approx. 155 Mbit/s) circuits. This phase of the ATM transition of this network will be transparent to the connected networks, as the setup at the customer site will remain unchanged. Only in later stages will it be possible to extend the ATM network service to the customer's premises, and in that case Unisource provide both an IP network service and an ATM service. In general, the setup between the trunk router and the ATM switch installed in the Unisource PoPs will be implemented using STM-1/ATM.

IP routers from both subnetworks interconnect at three locations in Europe: London (UK), Frankfurt (Germany) and Geneva (CH).

Management of the TEN-34 network

UKERNA has been awarded the contract for the Network Management Service, which covers the entire TEN-34 community.

DANTE produced a blueprint for TEN-34 in the EuroCAIRN report in 1995.
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