ATM CORPORATE NETWORKS WITHIN SWISS TELECOM

THE FIRST JOINT PROJECT BETWEEN THREE LABS

The information technology evolves much faster than the 'classical' telecommuniction one. The equipments used in corporate networks are born out of the information technology and very closely follow the needs of private network operators. Seen from the point of view of private network operators, a public network is only a part of a global solution. Swiss Telecom is now active in the corporate network domain and offers attractive global services (with a high added value) and influence business customer decisions.

The Asynchronous Transfer Mode (ATM) is coming up rapidly as a technology for the Local Area Networks (LAN). Although the basic technology is the same in both the LANs

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BACKGROUND

What is a corporate network?

A corporate network is the telecommunication infrastructure setup by an organization or an enterprise. This private network is located between public networks and private computers. Locally, where we find in-house LANs (Local Area Networks), it provides the fine distribution of the information flows in buildings and campuses. In the long-distance traffic domain (WAN: Wide Area Network), it concentrates the different information flows to transmit them as efficiently as possible through the various public or carriers' networks. Very often, a corporate network is essential to the business of the company it belongs to.

and the public Wide Area Networks (WAN), their implementation might differ considerably.

The project

'ATM Corporate Networks' is the first joint project of Telia Research (Sweden), KPN Research (Netherlands) and Swiss Telecom PTT Research (Switzerland). The project has been started by end of 1993 and will last until end of 1995. The project 'ATM CN' is one of the first signals that Telia, KPN and Swiss Telecom have taken the strategic decision to enter the private in-house network market.

Project targets

The main targets of the project ATM Corporate Networks are:
– to demonstrate the use and utility of ATM in corporate networks
– to gain early experience with ATM-LAN and the interconnection services provided by public ATM networks
– to study and test the integration of existing elements (e.g. routers, Ethernet LANs, PABXs) in ATM corporate networks

– to study the evolution of corporate networks, LANs and in-house networks under the influence of the ATM technology
– to provide the technical expertise for the development of ATM-based services, both in the LAN and WAN markets

ATM Corporate Networks' position

The ATM Corporate Networks platform is made of ATM-LAN islands distributed in all three countries. This platform lays between the European ATM pilot network (used for long-distance data transport) and the applications (Fig. 1).

Applications running on ATM Corporate Networks

To demonstrate the efficiency of ATM in a combined LAN and WAN environment, several applications were implemented on the top of the platform:

Figure 3.
Video retrieval
application running
over ATM.

formation related to Swiss Telecom, normally accessible through Internet, was merely copied, is used to display multimedia information at national fairs and exhibitions. A three-dimensional graphical user interface was also implemented.

- multipoint desktop videoconferencing (eight sites sessions have been tested)
- videos and high-definition picture retrieval
- worldwide web on ATM
- live TV transmission
- three-dimensional images remote handling
- multimedia mail
- network management

The four main applications are detailed below.

Collaborative work

It is based on INPERSON, a commercially available software from Silicon Graphic (SGI). It runs on SGI workstations and includes:
- multipoint desktop video conferencing
- white board (common work plane)
- common manipulation and visualization of three-dimensional objects

Using the multicast function supported by the Fore ATM LAN switches, it has been possible to set up a multipoint session between height stations.

Video and high-definition picture retrieval

This application runs on SGI workstations and servers. The commercially available software, called Cinebase, is

an object-oriented data base. It allows a simple and elementary VoD application. Beside videoclips (MPEG compression), other items like high-definition pictures (landscapes, x-ray, etc.), three-dimensional objects and slideshows can also be retrieved from the server. Any SGI workstations connected to the ATM Corporate Networks platform can access to that application. Two servers are installed in the Swiss R&D lab, one in the SGI headquarters in Neuchâtel.

World-Wide Web server on ATM

A World-Wide Web (WWW) server, exclusively connected to the ATM CN platform, is installed in the Telecom PTT's lab. Clients are any SGI or SUN workstations connected to the ATM Corporate Networks platform. This server, on which the 'public' WWW in-

Live TV transmission and distribution

Dedicated ATM/video coders and decoders allow to transport video signals (including sound) through the ATM Corporate Networks platform. Analogue input signals can be generated by any kind of videotuner, videorecorder, videocamera. The coder performs digitalization, on-line M-JPEG compression and ATM segmentation. At the receiving site, a decoder performs the reverse operation, and a standard TV set or any video projection system can be used for display. The ATM Corporate Networks platform multicasts the video stream from one coder to several decoders. These coders/decoders are commercially available products.

The topology

The ATM Corporate Networks topology is made of two 'triangles': a national and an international (Fig. 2). The international connections to Telia Research and PTT Research have been established during fall 1994.
At each 'corner' of the national triangle, at Silicon Graphic in Neuchâtel, in our research lab in Bern, and on the demonstration site, an ATM-LAN switch and workstations are installed. Each ATM-LAN switch is connected to the public ATM pilot network through a 34-Mbit/s interface. All the workstations and servers are connected to the respective ATM-LAN switches through a 100-Mbit/s ATM interface. So, ATM

POSITION	
Multimedia Applications	Applications level
ATM Corporate Networks	LAN
Swiss and European ATM Pilot	WAN

Figure 1. Position of the ATM Corporate Networks platform.

to the desktop is run. The three switches as well as all the ATM boards installed in the workstations and servers are managed centrally from our lab in Bern.

Furthermore, real-time JPEG compressors and decompressors have been installed to transport TV signals.

During the first months of 1995, various existing corporate network elements (e.g. Ethernet LAN, routers, PABXs, etc.) have been integrated in the ATM environment. In order for ATM to be successful in the corporate environment, a smooth migration path, from today's situation to a future ATM, must be assured. The project ATM Corporate Networks also aims at exploring the possible migration scenario.

Demonstrations

All three partners feel that it is very important to pull a customer-oriented project such ATM Corporate Networks out of the comfortable darkness of the lab. This project is meant to be a real showcase.

Especially in Switzerland the expansion of the public ATM pilot network, the new ATM-based services Swiss WAN, and the confidence gained in ATM-LAN by Swiss Telecom R&D led to a sustained promotion campaign. At the early phase of the project, the close collaboration between Silicon Graphics (suppliers of the workstations and applications), XMIT (supplier of the Fore Systems switches), the Swiss Telecom's ATM pilot network team, and Swiss Telecom R&D allowed ATM CN demonstrations to be shown in September 1994 already. From then on, demonstrations based on the Swiss Telecom ATM pilot network and the ATM Corporate Networks platform were organized at various public events and fairs.

During all these demonstrations, the ATM Corporate Networks platform is

ATM Corporate Networks at Telecom '95

The ATM Corporate Networks platform has been chosen to be demonstrated at Telecom '95. The demonstration scenario will take the best out of the existing applications (remote multimedia collaborative work, WWW, live TV and video retrieval) that will be extended with other exciting and new ones:

– three-dimensional WWW
– remote rendering
– multimedia interactive trainer
– virtual reality

Furthermore, during Telecom '95, the ATM Corporate Networks platform will be interconnected with the Geneva MAN. Geneva MAN is an ATM-based metropolitan network, operated by Swiss Telecom in the city of Geneva. It is the first commercial realization based on Swiss WAN (the new Swiss Telecom ATM services, covering both the WAN and the LAN domain) and the experience gained through the ATM Corporate Networks project. Many ATM-based demonstrations at Telecom '95 will run through both platforms.

Figure 2. Topology of the ATM Xorporate Networks platform.

used for the local traffic and the access to the 'public' ATM-WAN pilot.

First experiences

Since the first demonstrations organized in September 1994 it was clear that signalling and VC switching is a must in an ATM-LAN environment.
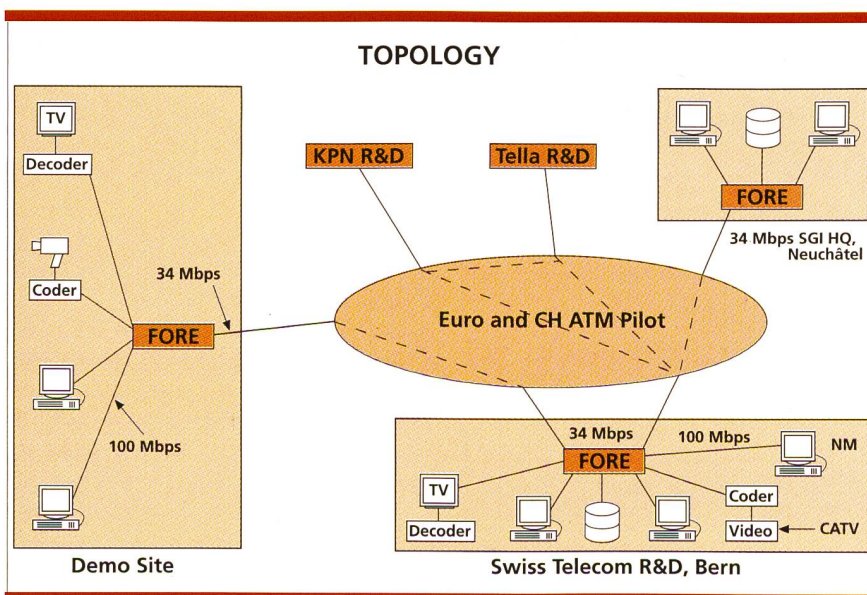
Having to set up administratively static PVCs between the workstations and servers makes the system very inflexible. Some 15 workstations and servers are presently connected to the Swiss part of the ATM Corporate Networks platform. They can all communicate among each other. Without SVC, more that 200 unidirectional PVC should have been set up! The ATM-LAN switches (Fore Systems) chosen

CONCLUSION

The ATM Corporate Networks project is ambitious. To reduce as much as possible the time between the research and the commercialization of services, four as pects are treated (almost) in parallel by the ATM CN team:

– the theoretical studies
– the practical experiments
– the demonstrations (promotion of the ATM-based Swiss WAN services)
– the support for the realization of the first customer projects

The theoretical activities are focused on interoperability and evolution aspects; the practical activities are focused on system integration.
The ATM Corporate Networks project provides outstanding practical and theoretical expertise to the partners. This competitive advantage allows them to penetrate quickly and efficiently both the corporate and the public ATM market.
The Swiss WAN CNS (Corporate Network Services), offering global and integrated ATM-LAN and -WAN solutions to customers after August 1995, represent the commercial achievement of the ATM Corporate Networks project.
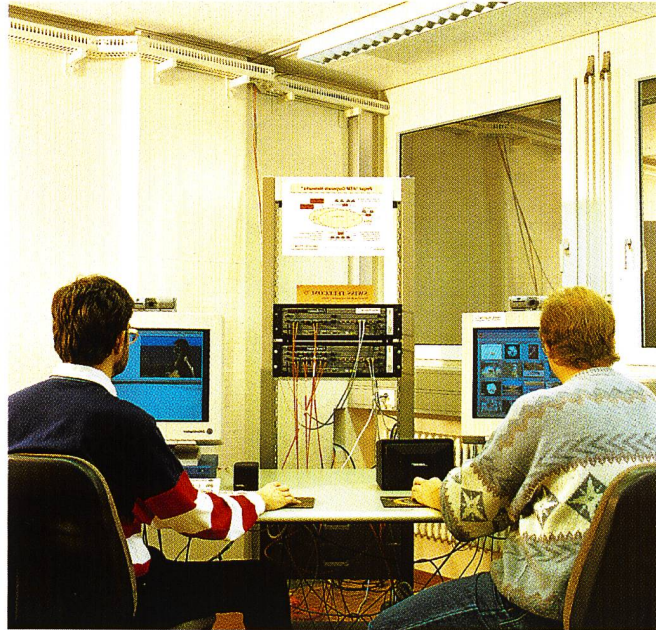

Figure 4.
Partial view of the ATM Corporate Network Lab.

for the Swiss part of the project support SVC.
Interconnecting ATM LANs with 100- or 155-Mbit/s interfaces on the LAN side through 'narrow' ATM-WAN VPs, typically 5 to 10 Mbit/s, is a common configuration. In such a situation, traffic-shaping and congestion-management mechanisms have still to be enhanced to provide manageable end-to-end quality of services. ABR (available bit rate) services, implementing feedback mechanisms between the ATM LAN and ATM WAN, will improve the congestion management aspects.

Future activities

The following topics will be studied and be tested more in detail in the near future:
– interoperability between legacy LANs and ATM LANs
– interoperability between ATM-LAN switches from different suppliers

– LAN emulation, IP over ATM
– standard signalling (Q.2931)
– traffic management and shaping, ABR services
– PABX interconnection through ATM Corporate Networks

A second ATM Corporate Networks project might be launched in 1996/97 to validate the SVC and ABR functionalities offered by a possible second-generation European ATM pilot network.

Daniel Forchelet received his B.S. in 1983 and his M.S. in 1987 from the Swiss Federal Institute of Technology in Lausanne (Switzerland). He joined the Swiss Telecom R&D lab in 1989. He was then in charge of the development of LAN interconnect services. He is now responsible for the Corporate Network Services domain within Swiss Telecom R&D.