BRAIN-IBER Networks and Applications for RACE Summer School 94

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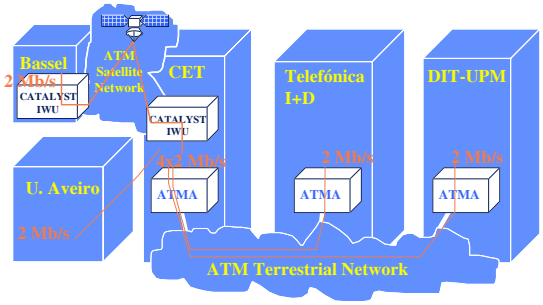
The RACE Summer School 94 has demonstrated, over a five day period, a complex interconnection of new technologies. The Summer School has been supported by advanced networks and applications from the IBER and BRAIN projects, requiring digital transmission of compressed video and audio and international ATM terrestrial and satellite networks. The Summer School was held in a distributed manner across five sites, and was also digitally broadcasted to several sites in Spain by means of the HISPASAT satellite and the ETSIT project infrastructure. The RSS 94 sites were the University of Aveiro (UA) in Portugal, the Department of Telematics of the Polytechnical University of Madrid (DIT-UPM) in Spain, ASCOM-Tech in Switzerland, Telefonica I+D (TID) in Spain and Centro de Etudos de Telecomunicacoes (CET) in Portugal.

The interconnection of the five sites was performed by an ATM backbone network that supported all the required services. The ATM network was formed by a terrestrial network and a satellite network using EUTELSAT. The terrestrial ATM network interconnected UA, CET, TID and DIT-UPM while the satellite ATM network interconnected CET and ASCOM.

Over the ATM network two logical networks were built. The first one was a point to point circuit network, and the second one was a TCP/IP network. The logical point to point circuits were used to support a commercial H.261 videoconferencing system, while the TCP/IP logical network was used to support an advanced CSCW application. Both the videoconferencing and CSCW application were used, at interleaved sessions, to transmit the digital video, audio and data (slides) of the Summer School between the five sites.

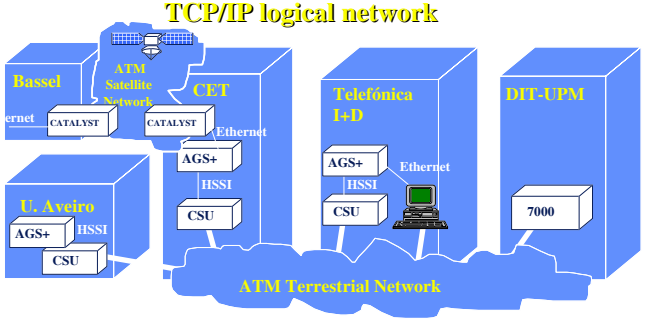
Point to point circuit logical network



The point to point circuit network was built making advantage of the circuit emulation capabilities of ATM. ATM adapters manufactured by TID were placed at CET, TID and DIT-UPM. These ATM adapters provided a G.703 interface supported by AAL 1 over ATM circuits. Therefore, there was a point to point G.703 logical circuit from DIT-UPM to CET and another one from TID to CET. CATALYST project provided IWU units that were placed at ASCOM and CET. The CATALYST IWUs provided a point to point G.703 logical circuit from ASCOM to CET supported by the ATM satellite network. The connection from UA to CET was performed using a conventional G.703 point to point circuit.

The TCP/IP logical network was built using several different devices. The connection between ASCOM and CET was done using a CATALYST IWU that provides an Ethernet interface over ATM. By placing one such IWU at CET and at ASCOM, a virtual LAN spanning from Switerland to Portugal was formed. The connection between UA, CET and TID was done using CSU/DSU units that provide an SMDS/DXI service over HSSI converting to/from AAL 3/4 to an ATM port. Each CSU/DSU was connected to the ATM network and to a router placed at each of the sites. The connection between TID and DIT-UPM was done using a router with an ATM
interface using AAL5 at each of the two sites. Notice that the routers equipped with ATM cards cannot interwork with the CSU/DSU because of their incompatible adaptation layeres. Therefore, the logical network is formed by three isolated IP subnets, built over ATM, that are interconnected by the routers at CET and TID.

TCP/IP logical network



Therefore, the ATM core network supported simultaneously isochronous 2 Mbit/s traffic transporting compressed video and audio from the H.261 codecs and asynchronous IP traffic transporting compressed video and audio, plus data, from M-JPEG compression cards in the CSCW workstations.

The CSCW application runs over a UNIX worstation equipped with a M-JPEG compression card. The application supports the presentation of several remote digital video signals with different quality, plus data presentation. The application allows the treatment of video windows as ordinary windows, includign scaling and moving with the mouse buttons. Digital audio signals are handled sepparately, allowing for the independent usage.
Two configurations were mainly used during the Summer School. For presentations, a large slide covering the whole screen was presented together with a small (1/6 screen) video window of the speaker. For questions or distributed panels, two video windows were presented.