

# 16 SUPERJANET : MULTIMEDIA INFORMATION SERVICES OVER A GIGABIT NETWORK

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The Joint Academic Network (JANET) was established in 1983 and all UK universities and the institutes funded by the British Research Councils are connected to this optical fibre network, as are many other educational and research institutions, such as the British Library and the National Libraries of Wales and Scotland. JANET serves a population of over 50,000 terminals and personal computers, and through the world-wide Internet, millions of people are linked together in a vast global electronic village. It was used initially to provide researchers with access to remote computing resources. It was a network devoted to the 'big sciences'. However, in the past few years the network has become a vehicle for communication and for access to information resources. It is heavily used by libraries to give their users access to databases and to deliver documents between libraries.

We have now moved from the era of kilobit networks to megabit networks and are now approaching the era of Gigabit networks, with SuperJANET in the United Kingdom and the National Research and Education Network (NREN) in the United States. What will the impact be of these new Gigabit networks? Networks that will be a 1,000 times faster than JANET and allow the transmission of highly sophisticated image, video and voice communication? Networks that are being talked about in the USA, at least, as 'Information Superhighways' and have the support of the Vice-President Al Gore. As I said earlier, when we look at the example of JANET and the early networks in the US, they were created in the 1980s and were intended to be primarily research networks to link users with scarce big computers. Researchers would not need to travel to the computers with bundles of punch cards to process their research results. The use of the network as a means of communication or as an information carrier was not originally high on the agenda of the planners; for example, electronic mail was not identified as one of the uses of the network. Electronic communication between ordinary users is now the major use of the network, as well as its use for information access and delivery.

The SuperJANET network, which is an entirely new network, using the most up-to-date communications technology - synchronous digital hierarchy (SDH) - will not in the short term replace JANET. It has been planned in a number of phases. The first phase was to use the £5m provided by the British government, to install a pilot network that would link a few institutions. Further funding will connect more institutions, a further 50 during 1993, so that eventually all UK higher education and research institutions will be connected. British Telecom have been selected as the supplier of the network and Edinburgh, Cambridge and Manchester Universities, Imperial College and University College London, and the Rutherford Appleton Laboratory near Oxford, the base of the Joint

Network Team, who manage JANET, have been selected as the first six sites. They were chosen for their network and computer skills, but also for their geographic spread, to ensure that the first phase of the network covered the country.

It was recognised from the beginning that the development of SuperJANET would require close collaboration with a telecommunications carrier and with industry in general. The deregulation of the telecommunications industry in the UK and the competitive pressures that this produced led to a great upsurge of interest in high-speed networking. The initial funding for the network is for the wiring and associated equipment and no money has been made available for the development of applications to run over the new network. So it is an expectation of early connection that the initial sites would develop a range of pilot projects that could illustrate the potential of SuperJANET. The pilot network will be in place by the Spring of this year to illustrate the potential of the network to the funders and so to guarantee the release of the remaining £15m over the next three years. In addition to supporting the specific applications, the pilot network will also provide a high performance infrastructure for general use by the six sites and it is likely that the staff and students themselves at these six institutions will discover new applications not considered by the planners. The following six areas of applications have so far been identified:

- Super Computing
- Remote Consultation
- Teaching
- Group Communication
- Library
- Multimedia Information Services

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## **Supercomputing**

Supercomputers are capable of generating enormous amounts of data and in many applications the data can only be understood by the user when it is presented as an image, often using colour and animation. A range of projects will be piloted such as Global Atmospheric Modelling, where a computer model of the earth's atmosphere will be used for climate research, and Oil Reservoir Studies to look at the recovery process that may be applied to North Sea oil.

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## **Remote consultation**

In certain areas of medicine it is very expensive to have ready access to a consultant pathologist, and in the most specialised medical fields they are often only found in universities. SuperJANET could therefore be an enabling facility to allow university pathologists to look at high quality microscope images and to provide audio and visual communication between the pathologist and the operating theatre, using multimedia workstations, to advise on treatment. SuperJANET could therefore be an enabling facility to allow university pathologists to provide a consultancy service in rare pathologies for the whole country. Linked to this area of applications is the capability to allow access to remote facilities such as brain imaging. A project is being undertaken to transmit images of the brain made on a scanner in a London hospital, to be worked on cooperatively with researchers in the Department of Psychiatry in Edinburgh, over 400 miles away.

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## Teaching

There are a number of subjects that have a high visual content and SuperJANET would allow the transmission of video information between centres. The application that has been chosen is the teaching of surgery by interactive video techniques. This will be surgical operations direct from the operating theatre, clinical presentations of patients with surgical conditions from the ward or lecture theatre, and there could be discussions between surgical specialists on topics of wide interest. The teaching of surgery is heavily dependent on the transfer of visual images, which can be both still and moving and often have to be in close-up. The pool of patients is necessarily limited and the changing patterns of treatment are reducing the length of time patients stay in hospital and are therefore the time available for teaching. Such teaching is best done in an interactive way and it is necessary for students to experience the immediacy of an operation.

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## Group communication

The ability of SuperJANET to transmit sound and moving pictures to and from workstations on the desk, means that groups of researchers could work together in real time, sharing white boards on which they could write and interact as if they were all in one room. The development of sophisticated workstations, which can support multimedia communication, means that video conferencing and distance learning can take place over the network directly from the desk, rather than from specially equipped studios. This project will be using a workstation developed by Olivetti in Cambridge and already in use within their laboratories in Cambridge and the University of Cambridge.

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## Library

There are a number of projects being developed by the library and information community, including document delivery of the full text of journal articles between libraries, including colour images and graphics; the development of new types of electronic journals, incorporating colour, images, graphics, mathematical formulae and with the potential for interactive working are being explored. There have been significant contributions from commercial publishers and from the learned societies. The potential for network delivery of such material is being explored. In addition, a pilot project has also been set up to explore remote access to a collection of manuscript fragments, which are being scanned to provide researchers with access to a high quality image over the network. Using pattern-recognition software, it will be possible to bring the manuscript fragments together, without handling them and to attempt to create the whole again.

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## Multimedia information services

Although none of the pilot applications that I have detailed are direct museum applications, I am sure that you can see the potential of such high speed networks as SuperJANET for this area. We are now seeing a fusion of media and there is the ability to create multimedia packages, which bring together images, text, animation and video, as well as sound. Through high-speed networks there can be links to massive information banks. Until now multimedia has been confined to the individual workstation because networks could not cope with the transfer of multimedia information in real time and allow the necessary immediate interaction. The SuperJANET Project Team, who are responsible for implementing the network, have recently met with a group of Museum Documentation Specialists to see if there are any projects that could benefit from the

potential of SuperJANET. The Project Team considered that the collections of national museums represent a rich, yet often under-utilised, resource. For example, the Cook Collection in the Natural History Museum comprises watercolour drawings, engravings, manuscripts and plant and animal specimens collected by those who travelled with Captain Cook on the Endeavour in the late eighteenth century. If some of the material was digitised, and enhanced with sound and video, it could be accessed remotely as a 'virtual collection' over the network and could be linked to related material in other collections, such as the National Maritime Museum. This would enable researchers to compare objects which are housed in different locations without needing to travel or handle the objects. It would be possible for visitors, such as school parties, to access the collections remotely over the network, as a substitute or preparation for a visit, and there is the potential to link the network into the home or into schools via cable-TV.

In the same way that SuperJANET will allow access to archives, illustrated manuscripts and rare books, which could be consulted by groups of researchers, located in different institutions, but working in real time, it will also allow access to objects. SuperJANET will provide for the transmission of high quality images, so rare or unique material could be scanned to create an image that is as good as the original. Software could be used to examine the object, to dissect it and rotate it and even to compare it with similar objects from a national databank of material. No longer will researchers have to travel to examine rare material, no longer will rare material have to be handled and possibly damaged. It will be possible to compare and manipulate the documents on screen, as if one was handling the originals. These type of applications will move us closer to the reality of the 'virtual museum', where the user no longer needs to come to the museum, because the user's workstation has become the museum, providing them with instant access to the information and objects that they want.

The applications that I have outlined are all pilot and experimental projects and if they were to turn into real services, then a number of significant issues will have to be addressed. These are not just the technical ones, but the economic, social, cultural, legal and some would say, ethical ones. There are a whole range of issues based around standards. The effective use of network information resources, particularly multimedia resources, will depend on a combination of factors: the ability to identify resources of interest; the ability to interact with, and consolidate results from, diverse resources; the ability to request and if necessary to pay for services; the ability to share data between applications. We will also need appropriate tools that provide users with the ability to discover what is available on the network, to obtain it and to effectively use it by integrating it into other applications. There is a lot of work going on in the area of Network Resource Guides by librarians and computing specialists to allow us to discover what information is available on the network. There are already a number of such tools available like WAIS and Gopher, which enable us to access the information and will allow access to multimedia information resources. There will have to be further exploration into the description of resources, if users are to be presented with lists of the material that is available on the network. Users will, of course, need to be aware of the new ways in which networks can deliver information to them. They will need training in the use of the technology and of the network and together with training, we will need to address the wider cultural issues and how to change the user's perceptions of obtaining information.

The strength of high-speed networks such as SuperJANET and the NREN will be in their ability to abolish distance, space and time. Instead of information being confined to a fixed location, only available at fixed times, it will be possible to gain access to the information to suit the user at their time and location. We are not yet in the world of virtual reality where, for example, architects are guiding clients around buildings which have not yet been started, nor are we in the world of cyberspace, the vast 'global village' network of information accessible from the desktop via networks. However, the networks can begin

to change the way that people can reach the cultural richness of museums and art galleries, which because of distance are inaccessible to many, though images are, of course, no substitute for the uniqueness of an object or a work of art.