

Participation in the Higher Education and Research Networks

HEAnet/JANET

SLIGO GENERAL HOSPITAL



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**North Western
Health Board**



**Research & Education
Foundation**

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PREFACE

This policy research paper has been developed in the context of the very rapid changes that are taking place with the emergence of the Information Society, in particular the driving force of the Internet and new IT technologies and the urgent need for the Foundation to re-assess its own networking capability and options in order to adequately fulfil its mission for research and education.

At the national level the strategic need for nation-wide low-cost broadband IT infrastructure was highlighted by the Information Society Commission's First Report (www.isc.ie) and adopted by Government in its January 1999 Report *'Implementing the Information Society: An Action Plan'* (www.irlgov.ie/taoiseach/). The rollout of 'broadband' IT infrastructure and services is currently underway aided by significant EU funding. The economic and societal transformation to an Information Society has been accelerated by moves to deregulate the telecommunications sector, by several national agency programmes and by new investment initiatives in the National Development Plan 2000-2006.

The setting up of the Technology Foresight Foundation and its investment programmes (£560 m.) for world-class research in niche areas of information technologies and biotechnologies, as well as major investments within the higher education are examples of this new commitment to change and a firm acknowledgement of the vital role that research, development innovation and new skills now have in our society.

Again, the Health Research Board's current consultative document *'Making Knowledge Work for Health'* (www.hrb.ie) seeks to formulate a strategy for research and innovation in the health field itself. It adds urgency to the Foundation's challenge of identifying its research niche and capability within the national scene. The Foundation's *'Research Survey 1995 -1999'* publication is an important step in setting the framework for the development and implementation of research policy within the NWHB.

Within this dynamic national milieu the Foundation with its North West regional location, now seeks to review its IT networking needs and to develop its capacities in line with national broadband developments. This is essential if it is to fulfil its role of giving its NWHB clients access to modern networking and research capabilities. Indeed, the CAWT ERNET (Education & Research NETwork) Project jointly proposed in 1999 by the NWHB /NEHB and the Health Authorities of N. Ireland and currently under consideration for Cross Border funding, is based on having good quality electronic networking facilities. While Phase I of ERNET concentrates on narrowband tele-services in healthcare, Phase II focuses on piloting broadband tele-services.

In the light of these considerations and development needs, the aim of this research paper is to scope out the benefits and costs of the Foundation participating in the HEAnet -Irish Higher Education and Research Network (www.heanet.ie) and through it in the Joint Academic Network (JANET) of U.K. covering the similar institutions in U.K and N. Ireland (www.ja.net).

The Foundation wishes to acknowledge the valued contributions received from Mel Healy an IT expert and from Mike Norris, HEAnet towards the formulation of this document

Mr. Aleck Crichton
Chairman of the Research and Education Foundation

EXECUTIVE SUMMARY

The Research and Education Foundation has been conscious of the current trends in national development policy, which give greater recognition to the key role of research, development and innovation and to the importance of implementing an Information Society. Policy awareness is now being translated into national plans and programmes including major investment commitments in niche areas within biotechnologies and information technologies and by the national rollout of broadband infrastructure for telecommunications and Internet connectivity. The current research paper seeks to urgently re-assess the Foundation's IT networking capabilities in the light of such developments.

The paper focuses on the role that participation in the HEAnet -Ireland's higher education and research network could fulfil in furthering the Foundation's mission at this time of rapid change. The HEAnet has 37 participating members from all the universities, the Institutes of Technology and other education and research bodies. Importantly, it offers the Foundation membership and a distinct profile within the Irish research community. It interlinks the Irish research community with its counterpart Joint Academic NETWORK (JANET) in the N. Ireland & U.K. It offers similar connectivity with national networks across Europe and worldwide. Membership in HEAnet offers equal membership in JANET and the other inter-connected networks. It now offers broadband high-speed Internet access nationally and to U.K., Europe and the U.S.

The origins of the HEAnet its current not-for-profit company structure, mission, services and benefits of participation are outlined in the paper and supportive annexes. The services for client researchers include access to datasets, web hosted information, the National Information Server (NIS). The role and services of JANET / SUPERJANET are similarly outlined. These include the video-conferencing sites and bridging services within the JANET system.

The technical issues and options for connecting the HEAnet as well as the costs of membership are examined in some detail. There are different levels of connectivity with the larger members generally requiring higher connectivity. A financial model is used to determine annual fees for the different speeds of connectivity and international usage. The lowest annual subscription level is for connectivity of up to 256Kb/s.

The goal of broadband is highlighted alongside a phased strategy of achieving this aim. The strongest feasible options for connectivity in the near term are seen as being either ISDN dial-up at 256Kb/s (for an initial cost-effective trial) or leased line connectivity as usage and costs justify. With deregulation of telecommunications and new infrastructure coming onstream the situation needs close monitoring. The HEAnet and the NWHB have allied roles in this regard. Application processing and some other issues are also discussed.

The paper recommends that the Foundation (1) adopts the goal of securing broadband Internet connectivity (2 Mb/s or greater), (2) adopts a phased approach to this goal, (3) takes up the offer of a free trial of HEAnet services (*May -Sept.2000*), (4) commits to first formal full year subscription membership of HEAnet at the entry 256K level (*Oct. 2000 -Sept. 2001*), subject to a satisfactory free trial experiences and finalising discussions and (5) evaluates the experience with the HEAnet services in mid 2001.

1. Introduction to the HEAnet

The HEAnet is Ireland's academic and research network. It has been in operation since 1983 as a collaborative endeavour between its member institutions. Since 1997 the HEAnet has been incorporated as a company limited by guarantee (HEAnet Ltd.) and its main offices and network operations centre are located at Marine House, Clanwilliam Court, Dublin 2. It has its own full-time staff and its premises houses its National Operations Centre (NOC).

Annex 1 contains more details of the HEAnet Ltd.

The HEAnet membership of 37 organisations is made up of

- (1) **The Universities**,
- (2) **The Institutes of Technology** (*through ITNET*),
- (3) **Other Third Level Colleges**
(*e.g. Royal College of Surgeons in Ireland*)
- (4) **Other Organisations**
(*e.g. Environmental Protection Agency -EPA, Royal Irish Academy -RIA*).

Annex 2 Provides a Listing of Connected Organisations.

The HEAnet Ltd. Board is representative of the participating member organisations

The **Mission** of HEAnet is -"to deliver and support national and international network infrastructure and services for the H.E. academic and research community".

In fulfilling its mission the HEAnet seeks to:

- maintain and develop a network to meet users' requirements
- provide value-added services to our community
- deliver the most cost-effective and technically advanced solutions
- gain leverage from scale and position as a national network

During the study liaison was established directly with the HEAnet Ltd. the company now charged with the responsibility of providing such a shared computing / telecommunications network service to the HEAnet and research was carried out in regard to the nature and operations of JANET.

The Foundation, as an independent body dedicated to education and research is eligible to apply for membership of the HEAnet.

2. HEAnet Services & Benefits

The **HEAnet Services** revolve around the delivery of high quality (high-speed) managed telecommunications /Internet network connectivity to its participating organisations, which have a shared purpose in education and research. Its not-for-profit model allows superior and more cost-effective communications by the shared cost approach among members. Electronic networking allows for wider access and provides easier communications, such as, email and discussion lists. Importantly, this also helps to build the sense of community among its educational and research members. It actively promotes the sharing of common problems and experiences through meetings, seminars, training workshops, joint projects and other means.

It also provides strong direct connectivity via its Dublin -Belfast link to the JANET network which covers the N. Ireland & U.K. educational and research establishments

and that is managed through an association of these organisations (UKERNA). **Annex 3** summarises the evolution of the JANET network and also outlines the SUPERJANET network programme.

Counterpart networks in other countries, as well as the wider Internet are in addition accessible through the HEAnet. The latter maintains membership in key networking bodies abroad, as for example TERENA -the Trans-European Research and Educational Networking Association comprising some 30 national networks including the HEAnet for Ireland. This ensures that it stays abreast of the many rapid developments in networking. The HEAnet operates a dedicated high-speed National Backbone network. This serves to connect the larger urban areas to its Dublin hub, (NOC), but unfortunately it does not extend to the North West region. It also has leased bandwidth to Belfast, London and the U.S.A.

An important aspect of the modern HEAnet service is that it is now a professional quality service, actively managed and monitored from the NOC with technical personnel, technical support, statistics, alert messages, security, outage reports, etc.

HEAnet services consist of (a) Client /User Services and (b) Technical Services.

(a) HEAnet Client Services

These services are primarily directed to academic staff, researchers and students in the member organisations. They include:

Irish National Information Server (NIS)

NIS is a web-based depository of information national and international information of relevance to the education and research community.

The aims of the NIS service are as follows:

- To provide a quality national repository of the most popular information resources sought after by the A&R community in Ireland and abroad
- To make possible faster and more reliable access to popular information services by reducing reliance on scarce international bandwidth by mirroring off-island archives
- To promote awareness of useful and relevant Internet-based resources among the A&R community in Ireland
- To expand the number of Internet-based national information resources available to both Irish and overseas A&R communities through close consultation with user groups.
- To provide a service which is information-driven rather than technology driven
- To deliver information directly to the user's desktop
- To offer users an attractive, easy-to-use interface

International Database Hosting

ISI Web of Science

This includes the extensive ISI Web of Science database which provides the Web interface to the Science Citation Index, the Social Sciences Citation Index and the Arts & Humanities Citation Index.

Unique Irish Databases.

National Database of Voluntary Sector Research: Web Version

This database has been compiled by the Department of Library and Information Studies at UCD, Belfield. It is intended to serve as a valuable resource for anyone in, or dealing with, the voluntary sector in Ireland.

New Additional Irish Business Index (IBI) - Web Version

The IBI indexes articles appearing in Irish business journals and newspapers. A few UK publications are also indexed in the IBI. This database is compiled at The Library of Dundalk Institute of Technology. The web version of this database will be free for use for its first year on the web for HEAnet member institutions only. It is scheduled to be available in the near future.

Links to Datasets at Irish Higher Education Institutions (e.g. *INCBI - The Irish National Centre for Bioinformatics; Irish Opinion Poll Archive*)

Managed Network Services for Clients

This core service provides for and oversees professional day-to-day operation of the HEAnet network for members. It is actively managed by the National Operations Centre (NOC). The planning and development of the network is under a formally agreed Technical Plan: This ensures that ever increasing high-speed links are in place for the National Backbone and for international links to N. Ireland (via Belfast), London, Europe and the U.S. (via New York). In a major upgrade of service U.S. broadband connectivity has been increase over fivefold (to 34Mb/s) in the past year.

Email List hosting services

This service allows staff and researchers to run discussion lists and to disseminate information for particular groups on selected topics.

Helpdesk /Support

-Provides advise on technical problems associated with the access to and use of the HEAnet.

New client service development at the HEAnet includes the establishment of video-conferencing and video-streaming. Investments have been made in technical equipment to test video-conferencing bridging (multi-point) services and interoperability. After piloting such services will be made available to members. The Foundation could be a useful active member in piloting the service within the HEAnet.

(b) HEAnet Technical Services

These services are primarily the background technical support activities essential for the smooth delivery of client services. They include:

Network Operations Centre

-the nerve centre of the networks operations

Web Caching & Mirroring Service

-useful to improve the access /download times for frequently consulted information and software

DNS, IP registry, Domain registration

-key Internet service needs; e.g web address registration

Technical Support Services & Seminars

-useful to update technical personnel on network developments/skills

Irish Neutral Exchange (INEX)

-the 'sorting office' for Irish emails

Network Traffic Statistics

-web based: check the top 50 sites being used: graphical representation

Security and Alerts

Fault reporting, management & resolution

The **benefits** of membership include the advantages flowing from access to the above services. In addition with membership of the HEAnet, an organisation becomes one of the HEAnet research community, achieves a higher profile and is more clearly identifiable as a potential partner for participating in research projects both nationally and within the EU programmes.

Additionally, as a HEAnet member the **benefits** of the Services of **JANET** and the many other **National Research Networks** which comprise the international research community become equally available. Some details of the JANET Value Added Services (dataset holdings) are included in **Annex 4** together with the outline of their Video-Conferencing Services in **Annex 5**. JANET's video-conferencing services are already running based largely on ISDN technology. They include video-bridging services which have cost advantages to a smaller organisation such as the Foundation for whom in-house multi-link bridges would not be economic. It would be possible for the Foundation to avail of this reservation service to carry out video links from Sligo to U.K. /N. Ireland sites. Eventually, such services will be transferred to leased Internet connections. As mentioned previously, the HEAnet has recently invested in its own video-bridging equipment and this is now being used to pilot similar services in Ireland. Again, the Foundation's experience with ISDN based video-conferencing will be of keen interest to other organisations within the HEAnet community who may not yet had the benefits of such new services.

3. **Technical Connectivity: Issues and Options**

National policy for the continuous development of the telecommunications infrastructure has undergone dramatic unprecedented changes in the past three years. Deregulation of the telecommunications infrastructure, extremely rapid international developments in the Internet and IT technologies and the urgency not to be left behind in the developments of the Information Society have made major impacts on this situation. EU and national funding is being applied to the urgent realisation of national 'broadband' - that is, high-speed - connectivity to the Internet and to other telecommunication services. 'Broadband' connectivity can be generally equated to networking speeds of 2Mb/s (=2,000Kb/s) or greater.

The HEAnet under its Technical Plan now has a high speed **National Backbone** that provides for **34 Mb/s** connectivity between Dublin and the main regional nodes (POP's) at Cork, Limerick and Galway. However, the North West region is not directly serviced by this backbone. The connection to **Belfast and JANET** is currently leased at **2 Mb/s** and London is directly connected at 10 Mb/s (TEN - 155).

International connectivity to the U.S. (New York node) has also been increased as of 1 March 2000 to 34 Mb/s. This is more than a fivefold (x5) increase in just the past 12 months. Most participating HEAnet organisations are ramping up their access capacities now that this 'super-highway' is in place. It reflects the benefits of HEAnet network investments, of deregulation and of falling prices that have occurred in the recent past.

The pace of change is not expected to slacken over the next few years. The next generation (Internet 2) is currently under development and rollout. This involves higher speeds and newer more bandwidth hungry services where quality video-casting and video-conferencing will become common practice.

The technical connectivity goal for all professional research organisations in the Information Society, including the Foundation, will be to realise 'broadband' connectivity. Already many research bodies within the HEAnet community have

achieved this position with infrastructural funding assistance. Plotting a prudent but urgent path to this goal is a key task for the Foundation.

Essentially, while more advanced networking options will emerge over time, the main technical options currently available commercially for connectivity from Sligo are (1) ISDN dial-up service (Integrated Services on a Digital Network) and (2) leased line service of the required bandwidth.

Dial-up is an intermittent requirement for service, like making a standard telephone call. Leased lines provide a permanent connection. As the Foundation does not at this time operate its own email, web site or other servers, the main determining factor will be cost. The HEAnet as part of its standard subscription, can host web services on its own servers for members who wish to avail of this option. *e.g. the National Library*. The web site can be updated remotely by the member. Similarly, domain name registration, IP addressing and any email service needs and options could be provided in consultation with the HEAnet.

The minimum HEAnet subscription level is for connectivity at 256Kb/s (=0.25Mb/s) or less. This includes a minimum guaranteed bandwidth to the U.S. The larger institutions, such as, the universities connect at several Mb/s.

The 'adequacy' or quality of any service is dependent on a mix of factors, such as, the application in-hand and also on subjective judgement. If only a single PC is in use at any particular time, then that computer has the full use of the 256K bandwidth. With an increasing number of PC's simultaneously on-line and with more intensive bandwidth demands, the quality of service deteriorates. The more advanced real-time and multi-media services generally require higher bandwidth to operate satisfactorily. Again, 256K is regarded as narrowband -as against broadband connectivity.

While the underlying aim should be to achieve broadband connectivity for Foundation's users, this can best be approached on a phased strategy so that cost-effective solutions are realised. Achieving connectivity at 256K would be a significant and urgently needed first step-up from the current level of service.

Another benefit of having this extra ISDN capability would be that it would allow the Foundation's existing video-conferencing system to be used at full capacity (384K), while the HEAnet 256K connection could be simultaneously used to display Internet based content, such as slides from a remote tutor. This would enhance the available pedagogical facilities.

4. Participation Costs and Options

The main cost elements (excluding staff/technical inputs) involved in participating in the HEAnet consist of:

- a) HEAnet annual subscription costs
- b) Network interfacing /modification costs.
- c) Telecommunication costs.

Reviewing these in turn the following observation can be made:

a) HEAnet Annual Subscription Costs:

The HEAnet has developed a complex financial model that serves as the basis for determining the cost of each member organisation's annual subscription. The model is revised as experience is gained and/or new factors emerge.

In general, the bigger users such as the universities pay more than the smaller users. Key factors are the size of the 'pipe' or the width of the electronic highway connecting each organisation to the HEAnet network itself, otherwise called the 'bandwidth' and the amount of international (as against national) traffic actually involved. Each organisation has the option of deciding the bandwidth to which it wishes to commit. In addition, each member is guaranteed a level of dedicated bandwidth to the U.S. node.

The subscription cost for 256K participation is **IR£11,125**.

This is comprised of:

Member charge (small)	£4,000
Port Charge (up to 256K)	£4,000
International charge (min. guar.)	<u>£3,125</u>
Total Annual Charge	<u>£11,125</u>

No V.A.T. is charged by the HEAnet.

The annual subscription cycle for the HEAnet is from October to the following September. Consideration is currently being given to a reformulation of this basis of charging for the year 2000/2001. This might see the breakdown altered into a once-off set-up and an annual recurring charge. This approach if approved may well see the recurring annual charge reduced for smaller entities like the Foundation.

An initial free trial period of three months is permitted in order to test the service before any final commitment is required. Ideally this should take place in advance of the 1st October start of the annual cycle.

b) Network interfacing /modification costs:

The HEAnet feed would service the Foundation PC local area network (LAN). Currently, this LAN is integrated with the hospital network so some re-patching will be involved when the final configuration is decided upon. The Foundation LAN will need to be interfaced with the HEAnet service, being delivered over the telecommunications provider's network (e.g. Eircom).

The minimum equipment involved will be a network router. (*e.g. minimum a Cisco 1600 series model, preferably 2600 model or better, which has support for advanced features, such as, voice-over-IP (Internet) and which provides a base for easy plug-in modular upgrading so protecting the investment in the router itself*).

The technical support expertise at the HEAnet can be called upon to render advice and ensure a co-ordinated interfacing approach with the NWHB and Foundation. On the basis that most of the Foundation's PC's and some additional capacity is allowed for, then for HEAnet connectivity a working budget of **£2,000** should suffice.

c) Telecommunication costs:

Telecommunication costs would be those involved in linking the Foundation's location to the nearest HEAnet access Point of Presence (Galway POP) and the type /bandwidth of the link involved. As outlined above, two options are possible here; (i) ISDN dial-up and (ii) leased line (private circuit).

(i) ISDN Dial-up: (First Option)

This is the lower cost approach where the call duration is intermittent or infrequent, as in a start-up situation. It requires that two ISDN lines to be available to make the 256K connection.

It is perhaps possible that two spare ISDN circuits to the Hospital could be made available for this purpose with a minimum of delay and cost. This would allow for Internet access at 256K to the Foundation local area network.

Alternatively, two of the present ISDN lines in the Foundation could be switched over for HEAnet connectivity purposes on a test or temporary basis. No additional line rental charges would be incurred. They would be available without any installation delay. When in use for HEAnet access, they would be unavailable for normal video-conferencing purposes.

The HEAnet POP's are configured to accept ISDN, leased line and ATM connectivity. The speed of dial-up can involve either 1 or 2 ISDN lines depending on whether the full 256K bandwidth is desired. (64K and 128K are possible with 1 ISDN line). The cost of the dial-up call will be same as a single ordinary telephone call from Sligo to Galway for each 64K of connectivity. Thus, a full 256K dial-up will run at 4x cost of the ordinary telephone call to the same location.

Current Eircom Rates (<i>incl of VAT</i>): <i>Shown as per minute costs</i> <i>Charged on a per sec. basis</i> <i>Subject to a minimum of 12p /call</i>	Daytime 8am-6pm <i>per minute</i>	Evening 6pm-8am <i>per minute</i>	Weekend <i>per minute</i>
1-891 Special Internet ISP Rates For PSTN & per 64K ISDN call	1.54p	0.77p	0.77p
National telephone call & Per 64K ISDN channel call rates	10p	7p	1p
256K ISDN call costs	40p	28p	4p

The special Internet access rates during normal working hours are 6 -7 times less expensive than normal national ISDN call rates. However the HEAnet does not as yet have 1-891 numbers assigned to it. The **HEAnet** needs to acquire a **license** from the ODTR (Office of the Director of Telecommunications Regulation) to be able to offer these special rates. National calls on ISDN (Sligo -Galway POP and Sligo -Dublin POP) are at a higher tariff rate to local ISDN calls, say if a POP existed within the Sligo local call area.

ii) Leased Line: (*Second Option*)

The following cost quotations were received from Eircom to connect the Sligo Hospital location to the Galway POP site. Any one of these circuits can be delivered in 35 working days (7 weeks).

Circuit	Connection Charge (<i>once off</i>)	Annual Rental	1 st Year Cost <i>Excl VAT</i>	1 st Year Cost <i>Incl. V.A.T. (21%)</i>
64K	£1,860.00	£3,656.00	£5,516.00	£6,619.20
128K	£2,200.00	£5,281.40	£7,481.40	£9,052.94
256K	£2,800.00	£7,667.40	£10,467.40	£12,665.55

A break-even analysis can be carried out to find the point at which it becomes cheaper to switch over to a fixed cost leased line approach. It is dependent on the components of the call costs; namely, call duration, the number of 64K channels used and time of day. Obviously, if the annualised monthly ISDN telephone bills amounted

to greater than the annual leased line costs, then the leased option becomes the better economic option. Careful management of HEAnet access and monitoring of telephone bills will guide decision-making and timing in this regard.

Again, as new IT infrastructure comes on-stream in the Sligo area (ESAT, Princes Holdings,..) the cost and options will need to be kept under close review.

5. Application Process and Timeframe

The HEAnet allows for a free trial period whereby clients are allowed to connect to the service for a three-month period. This allows the new member to experience the practical benefits of the HEAnet offering before finally committing to subscribe.

The application process is straightforward and it can be expedited without any great delay. Indeed, several consultations have taken place with HEAnet personnel in the course of generating this paper and the Foundation's interest in the HEAnet is very much welcomed.

6. Other Relevant Aspects

A Dublin teaching hospital affiliated to one of the universities had its full PC network connected to the HEAnet for a period, but now it has invested in its own ISP (Internet Service Provider) from a commercial provider. An important aspect of such connectivity is the issue of the confidentiality and security of the hospital information systems. Interconnection with the Hospital local network (LAN) is not recommended here in the first instance and without more detailed consideration of the issues and implications. The focus here is on providing the Foundation's research and education activities with adequate and acceptable connectivity.

Continuing mutual co-ordination of the Foundation and NWHB activities and plans in technical and other personnel aspects of networking with the HEAnet, will be required to gain the mutual benefits sought. With the initial level of service envisaged here no undue burden on the existing level of technical support should arise from HEAnet membership. Indeed the opportunity will exist to acquire new technical experiences from the availability of the service.

The fact that the HEAnet National Backbone itself does not extend to the North West Region may place a regional cost burden on the Foundation. The leasing of 'long distance' or trunk lines are an additional burden to leasing lines in the 'local loop'. National ISDN calls are more expensive than local calls. Any special discount benefits that the NWHB might have negotiated as a major customer of Eircom for leased lines and call costs, need to be entered into the equation.

These matters should be discussed further with the HEAnet in finalising the fee structure. Again, the benefits of telecommunications deregulation will be more apparent in the regions as new infrastructure gets commissioned, so that cost situation will need frequent review.

7. Recommendations

From a consideration of the above information, it is recommended:

- 1) That in order to assist it in delivering on its mission, the Foundation adopt the goal of securing broadband Internet connectivity (2 Mb/s or greater) to the broader national and international research and education community, as soon as is technically feasible and economically practical.
- 2) That a phased approach to achieving this goal be undertaken.
- 3) That the phased approach commences with a free trial period to the HEAnet and user activities to test the performance of the HEAnet and JANET services. *(Target: May -September 2000 using a low cost ISDN approach)*
- 4) That subject to a satisfactory free-trial experience and discussions with the HEAnet, a first full year trial of membership with the HEAnet/JANET be undertaken from October 2000 to September 2001. *(Target: 256K connectivity initially by ISDN, with costs and new leased line options monitored regularly).*
- 5) That an evaluation of the experience with the HEAnet /JANET service be carried out in mid 2001.

ANNEX 1 History of HEAnet

What is HEAnet?

HEAnet is Ireland's academic and research network. It has been in operation since 1983 as a collaborative endeavour between its member institutions. From 1993 until the end of 1997, UCD Computing Services managed the network services, under contract to HEAnet. In November 1997, HEAnet was incorporated as a company limited by guarantee, and relocated its network operations centre to Marine House, Clanwilliam Court, Dublin. It is from here that all HEAnet's services are now provided.

HEAnet Today

HEAnet provides Internet connectivity and related services to third level institutions (including the Universities and Institutes of Technology), to the HEA and to a number of other research organisations in Ireland; at present (February 2000) there are 37 subscriber institutions. These institutions are linked in a state-of-the-art wide area network (WAN) spanning the country. Significantly, HEAnet played a key role in the establishment of the Irish Neutral Exchange (INEX), a facility that enables all Irish Internet service providers (ISPs) to exchange their Internet traffic in Ireland. As a result, HEAnet members benefit from a high level of connectivity with all other major Irish networks, while customers of the commercial ISPs enjoy a high level of connectivity with the national education and research network.

HEAnet Ltd. also provides connections to networks in Europe by means of its 10Mbps link with the TEN-155 (Trans-European Network at 155 Megabits per second) backbone, and a 2 Mbps circuit links HEAnet to JANET, the UK education and research network. HEAnet is connected to UUnet via DANTE in New York, USA, with transit to all parts of the Internet, including a backup connection to the UK and Europe. The trans-Atlantic circuit was upgraded to 24 Mbps in December 1999, and commitments are in place for further upgrades to at least 34Mbps in Q1 2000. At New York, HEAnet connects to other Internet 2 networks, including the Abilene project.

HEAnet also funds and manages the National Information Server (<http://www.heanet.ie>; <ftp://ftp.heanet.ie>), which serves as an online repository of information resources of relevance to the academic and research community, both in Ireland and around the globe. HEAnet also hosts a number of major dataset services for the education and research community, including ISI's Web of Science.

Through the provision of state-of-the-art network and communications technology, and important Web-based information services, HEAnet Ltd. has and will continue to promote progress in today's Information Society.

HEAnet Board of Directors

The Board of Directors of HEAnet consists of thirteen members. These represent the Universities (seven representatives), the Institutes of Technology (three representatives), the Higher Education Authority (one representative), the Department of Trade, Enterprise and Employment (one representative), and CONUL (one representative).

Ref. <http://www.heanet.ie>

ANNEX 2 Irish Establishments Connected Through HEAnet

By Categories of:

- * Universities
 - * Institutes of Technology
 - * Other Third Level Colleges
 - * Other Organisations
-

Universities

University College Cork
Dublin City University
Trinity College Dublin
University College Dublin (including Michael Smurfit Graduate School of Business)
The National University Of Ireland (NUI)
National University of Ireland, Galway
National University of Ireland, Maynooth
University of Limerick

Institutes of Technology (through IT Net)

Institute of Technology, Carlow
Cork Institute of Technology
Institute of Technology, Blanchardstown
Dublin Institute of Technology
Institute of Technology, Tallaght
Institute of Art, Design and Technology, Dun Laoghaire
Letterkenny Institute of Technology
Galway-Mayo Institute of Technology
Institute of Technology Tralee
Limerick Institute of Technology
Dundalk Institute of Technology
Institute of Technology, Sligo
Waterford Institute of Technology
Athlone Institute of Technology

Other Third-level Colleges

Mary Immaculate College Limerick (a college of UL)
National College of Art and Design
National College of Ireland (formerly NCIR)
Royal College of Surgeons in Ireland
St. Patrick's College, Drumcondra (a college of DCU)

Other Organisations

CAO/CAS

- responsible for processing centrally applications for admission to the first year of undergraduate courses in institutions.

Centre for Management and Organisation Development (CMOD) -

-a section of the Department of Finance.

Dublin Institute for Advanced Studies

-a publicly-funded independent centre for research in specific disciplines. It has three constituent schools which include the School of Celtic Studies, the School of Theoretical Physics, and the School of Cosmic Physics

Environmental Protection Agency

-established with the purpose of protecting Ireland's natural environment. The EPA's mission is "to promote and implement the highest practicable standards of environmental protection and management which embrace the principles of sustainable and balanced development".

Enterprise Ireland

delivers a range of State supports for marketing, technology, enterprise development and business training. Its focus is on helping Irish industry build competitive advantage and grow profitable sales, exports and employment. This includes administering national and EU supports for building innovation capability and co-operation between industry and higher educational institutions.

Higher Education Authority -

-A statutory body which assesses the needs of Irish Higher Education and allocates public funds to university institutions.

National Council for Educational Awards (NCEA)

-validates and confers awards for National Certificates, National Diplomas, Degrees and post-Graduate Degrees. The NCEA have no website at present.

National Library of Ireland

-aims to collect, preserve and make accessible materials on or relating to Ireland, and to provide an accurate record of Ireland's output in manuscript, print and other media. The library collection is a record of the history and culture of Ireland.

Royal Irish Academy-

-the principal learned society in Ireland, founded in 1785 as a society "for promoting the study of science, polite literature, and antiquities".

Tipperary Rural and Business Development Institute (TRBDI)

Europe's only Institute integrating third level education with rural and business development programmes. TRBDI offers courses in the areas of business, rural development and information technology. The Institute will develop and extend its range and levels of courses in Phase II of its development by offering new courses in emerging fields of economic and social activity such as alternative energy, the environment, multi-media studies etc.

Teagasc

Ireland's national Agriculture and Food Development Authority. It is responsible for providing research, advisory and training services for Ireland's agriculture and food industry.

ANNEX 3 A Brief History of JANET

THE EARLY YEARS - JANET

In the late 1970s academic networking activities were fragmented: universities had developed several regional networks, the national computer centres had developed separate star networks, and the NERC and SRC had developed a national X.25 network.

The first Joint Academic NETWORK (JANET) was created in April 1984 - essentially by expanding and enhancing the NERC/SRC X.25 network. Initially, JANET served around 50 sites with line speeds of 9.6 kbit/s. By the mid-1980s JANET comprised a 2 Mbit/s backbone with 64 kbit/s access. JANET's expansion started and by the late 1980s there were around 200 sites which included research and higher education interests outside the academic community along with polytechnics and colleges.

Services such as e-mail, job and file transfer were provided by the Coloured Book protocols, developed by the community where OSI standards were lacking. The intention was to migrate to full OSI standards when these were available.

A further upgrade in the early 1990s provided 2 Mbit/s access and an 8 Mbit/s backbone making JANET the highest performance X.25 network in the world.

THE JANET IP SERVICE

In January 1991, JANET started a pilot IP service over its X.25 infrastructure. This became a full service in November 1991. Interest was high and within ten months the IP traffic had overtaken the X.25 traffic. With the connectivity to the global internet secured, the IP service kicked off the exponential growth in traffic that we see today in JANET.

SUPERJANET

SuperJANET was proposed in 1989 and the contract signed in November 1992. It was an initiative to develop a high performance wide-area network based on optical fibres.

The first step was to implement two pilot networks (achieved in early 1993): a 34 Mbit/s data network and a 34 Mbit/s ATM network used for video traffic amongst 14 sites.

In addition to the pilot networks, the service comprised 10 Mbit/s SMDS access to around 50 sites with interconnects to the 34 Mbit/s network. SuperJANET cemented the move from X.25 protocols to IP.

SUPERJANET II

SuperJANET II started during 1995. It was aimed at significantly increasing the spread of SuperJANET and helped to create a number of Metropolitan Area Networks (MANs) - aimed at geographically close institutions, mainly centred on existing SuperJANET sites.

From early 1995 a successful trial was carried out of IP over ATM using a combination of 155 Mbit/s and 34 Mbit/s circuits. Later in 1995 an IP trunk service was provided over the 34 Mbit/s SDH network. In a collaborative technical trial with BT in 1995, five ATM sites used 155 Mbit/s SDH lines to create an IP interconnect to European PNO networks.

A further 27 institutions were connected to either SMDS or to 8 Mbit/s access lines. Over the next few years, around 12 MANs were created.

SUPERJANET III

SuperJANET III was aimed at consolidating the pioneering work of SuperJANET and SuperJANET II. A 155 Mbit/s ATM backbone was installed between a central ring of switches at London, Bristol, Manchester and Leeds. The network was extended using 34 Mbit/s and 155 Mbit/s links to "Backbone Edge Nodes" from which connections to MANs and other sites were made.

Ref. <http://www.ja.net>

ANNEX 4 JANET Value Added Services

A number of nationally organised and funded services are available over the JANET network. The following is not a complete list but illustrates the type of facility that JANET makes available to its users. These services provide information storage and distribution capabilities in a number of specialist areas and an enhanced electronic mail distribution service.



BIDS - Bath Information and Data Services - provides the higher education community with network access to a range of commercially supplied bibliographic databases, and a range of electronically published journals.

<http://www.bids.ac.uk/>



BUBL - The BUBL Information Service - offers an Internet resources current awareness service, together with organised, user-friendly, access to Internet resources and services, with the combined Gopher/WWW Subject Tree being a particular feature.

<http://bubl.ac.uk/>



EDINA - at Edinburgh University Data Library provides national on-line services for the UK higher education and research community, giving access to bibliographic databases and digital map data.

<http://edina.ed.ac.uk/>



ESRC Data Archive - is a national resource centre for computer-readable data in the social sciences and humanities.

<http://dawwww.essex.ac.uk/>



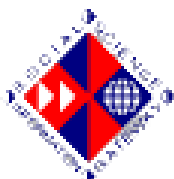
Mailbase - is the UK's major electronic mailing list service, enabling researchers and academics to manage discussions and to share information regardless of geographical distance.

<http://www.mailbase.ac.uk/>



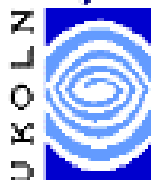
NISS - National Information Services and Systems - provides comprehensive, professionally maintained information services designed to meet the needs of staff and students in Higher Education.

<http://www.niss.ac.uk/>



SOSIG - Social Science Information Gateway - provides value-added access to quality networked resources in the social sciences throughout the world; also training and support in using these resources.

<http://sosig.ac.uk/>



UKOLN - The UK Office for Library and Information Networking - supports the UK library and information communities through research, network services, and co-ordination in the areas of networking and bibliographic management.

<http://ukoln.bath.ac.uk/>

ANNEX 5 JANET Videoconferencing Services

- **JANET Videoconferencing Service (JVCS) Booking System**

The Booking System provides a web interface to request a JANET videoconferencing booking. It also provides details of videoconferencing facilities at each registered institution and a summary of existing bookings. In order to request a booking it is necessary to have a user ID and password. The existing bookings may however be browsed without the need for a user ID and password. The appropriate instructions within the booking system pages provide further information on how to request a booking.

- **JANET Videoconferencing Service (JVCS) Operational Cover**

The JVCS Management Centre provide cover Mon-Fri 0900-1700. Details are provided for conferences which require to be held Out of Hours.

A comprehensive list of all venues registered to use the service including details of each venue is available providing contact and facility information.

You may also comment/complain about a videoconference you have participated in to ensure that the high quality of the service is maintained.

- **JANET Videoconferencing Switching Service (JVCSS)**

Use of the switching service is strictly controlled and institutions must first register their details using the on-line registration form. Documentation provides:

- the JVCSS Overview, supplying general information and details of how to register.
- Local Service Managers guide

- **Scottish MAN Videoconferencing Network**

- the Users Guide, supplying general information and venue contacts details.
- The Scottish Local Service Managers Guide gives a more thorough guide which includes Quality Assurance tests and studio set-up procedures.

Ref. <http://www.jvcs.video.ja.net>