Nunavut Telecommunication Needs:

Community Teleservice Centres

A Supplementary Report of the

Nunavut Implementation Commission

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Nunavut Hivumukpalianikhaagut Katimayit
Nunavut Implementation Commission
Commission détablissement du Nunavut

August 18, 1995

The Hon. Ron Irwin,
Minister,
Department of Indian Affairs and
Northern Development,
Ottawa, Ontario

The Hon. Nellie Cournoyea,
Government Leader,
Government of the Northwest Territories,
Yellowknife, NWT

Mr. Jose Kusugak,
President,
Nunavut Tunngavik Inc.,
Iqaluit, NWT

Dear Mr. Irwin, Ms. Cournoyea, and Mr. Kusugak,

On behalf of the Nunavut Implementation Commission (NIC), I am writing further to my letter of August 17, 1995, concerning a second report of the Commission in supplement to its earlier report entitled **"Footprints in New Snow"**.

At this time I am pleased to supply you with a component part of the Commission's second supplementary report, entitled **"Nunavut Telecommunication Needs: Community Teleservice Centres"**. This report is a companion report to a second report (to follow) on the same topic, entitled **"Information Technology and the Governance of Nunavut"**. Together, the two reports cover the public and private sector telecommunications needs of Nunavut.

This report examines the telecommunications infrastructure and service needs of Nunavut. It concludes that a meeting of private and public sector needs through a blended and shared use of common telecommunications infrastructure facilities and services is the only telecommunications strategy that makes sense.

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I would be pleased to discuss this report with you, or any other work of the Commission, at a convenient time.

Yours sincerely,

John Amagoalik,
Chairperson

TABLE OF CONTENTS

PART I INTRODUCTION

> **"The pathways of the past were forged by dogteam and snowmobile. The pathways of the present are travelled by air. The pathways of the future will be travelled electronically."** ("Footprints in New Snow", Nunavut Implementation Commission, March 31, 1995, page 54)

(i) Background

Chapter 7(b) of the NIC report **"Footprints in New Snow"** recommends a working group be established to undertake a variety of tasks related to the establishment of a telecommunications infrastructure for Nunavut. The chapter contemplates the establishment of a single telecommunications infrastructure of benefit and use to both public and private sectors. A letter to Simon Awa, Executive Director of NIC, from Ken Wyman, Associate Director of the Nunavut Secretariat, DIAND, May 4, 1995, requests additional information regarding: community benefits; impacts, costs and benefits to the Nunavut Government; and related transitional implications. The following report addresses these matters and explains how the establishment of a single telecommunications infrastructure may be of benefit to governments, private individuals, businesses and organizations. In doing so, it looks at the telecommunication needs of Nunavut and suggests how the needs of individuals, businesses, Inuit organizations, and other private organizations could be piggy backed at small additional cost, on a telecommunications infrastructure that the Nunavut Government requires to function.

(ii) Introduction

The **Nunavut Political Accord** (Section 8.4) provides that the federal government determine and fund **"... reasonable incremental costs arising from the creation and operation of the Government of Nunavut."** This would include the infrastructure and ongoing operation and maintenance costs associated with Nunavut Government communications needs, the funding of which is fundamental to the successful and efficient operation of a decentralized government.

It would be prudent therefore to ensure that any communications infrastructure established serve the communication needs of the Nunavut public at the same time as meeting the communication needs of the Nunavut Government. The future needs of both the Nunavut Government and Nunavut residents, businesses and private organizations lie in the installation of telecommunications infrastructure capable of delivering a full range of electronically transmitted information. Full videoconferencing, the delivery of justice, education and health services, the use of interactive data bases, CD-ROM libraries, video file servers, graphic and broadband interactive services contemplated for the information highway ---

all these things require multimedia service. Access to the information highway would allow the residents of Nunavut to cement circumpolar ties with other Arctic peoples.

(iii) Policy and Regulatory Environment

In a series of recent policy statements the federal government has clearly linked the future of economic development in Canada with Canadian participation in the field of telecommunications. Key policy objectives outlined in the January 1994 Speech from the Throne included: the creation of jobs through innovation and investment in Canada; reinforcement of Canadian sovereignty and cultural identity; and provision of universal access at reasonable cost.

Job creation and economic growth are the cornerstones of a healthy Nunavut economy capable of paying its own way within Confederation. The impediments to economic growth are enormous: remote location, population situated in 26 small communities scattered across 20% of Canada's land mass, and a limited transportation and communications infrastructure. A strong integrated regional Nunavut economy is important, not only to Nunavut, but to Canada as well, and is consistent with Federal Industry Minister John Manley's recent statement:

> **"The government believes strong regional economies are the building blocks of Canada. To be effective, economic policy must recognize the differences between regions."**
> ("Building a More Innovative Economy", 1994, page 17)

The economy of Nunavut must be revitalized. Traditionally it was based on the harvest of renewable resources. More recently, it has been based on non-renewable resource development, tourism, and employment in the public sector. Increasingly, reliance on such conventional forms of economic activity is becoming less and less sustainable. We are entering an age of economies based on "information". "Knowledge is power" it is said; without access to the information that permits the accumulation of knowledge, a Nunavut economy will remain a relic of a by-gone era. To enable the Nunavut economy to keep up and grow with the rest of Canada, its residents and businesses must enter the third millennium equipped with services and facilities that will allow them to compete effectively in the larger Canadian and global economies. With the deployment of appropriate telecommunications technologies providing easy access to global information, such participation is within grasp. Remoteness no longer has to be a major impediment to economic growth. Federal Finance Minister Paul Martin recognized this when he stated:

> **"The Information Highway promises to reduce the disadvantages of distance and remote locations in Canada. This has profound implications for the economic prospects of less-advantaged**

regions and smaller communities throughout the nation."
("A new framework for economic policy" 1994, page 63)

The "Information Highway" is a common term for the broadband transmission of voice, full motion video, and interactive data services. It will offer access to a virtually unlimited array of health care, education, social services, entertainment, business enhancement, government and consumer services and information. Its establishment will enable Canada to become a "community of communities", linking communities and regions through the exchange and pooling of knowledge and information. Just as Nunavut can benefit from access to this pool of knowledge, Canada can also benefit through the contributions of Nunavut residents and businesses.

Regional economic development achieved through the establishment of a telecommunications infrastructure is a clearly stated objective of the federal government. The **Telecommunications Act** is a key piece of federal legislation aimed at articulating and pursuing this objective. It sets a social and economic policy agenda that contemplates the development of a telecommunications infrastructure to assist in regional economic growth:

> **"...a) to facilitate the orderly development throughout Canada of a telecommunications system that serves to safeguard, enrich and strengthen the social and economic fabric of Canada and its region;**
>
> **b) to render reliable and affordable telecommunications services of high quality accessible to Canadians in both urban and rural areas in all regions of Canada;**
>
> **h) to respond to the economic and social requirements of users of telecommunications services..."**
> (Section 7)

This statutory agenda has been buttressed by a recent Canadian Radio and Television Commission (CRTC) decision which determined that, as a result of increased competition, telephone companies under its jurisdiction must be subject to a greater degree of market discipline. Any changes to the current regulatory environment must be conducive to attainment of the following objectives: universal access at affordable prices; equitable treatment of subscribers in terms of service and price; and encouragement of the development and availability of new technology and innovative services to respond to the needs of business and residence customers. (Telecom Decision CRTC 94-19).

The economic future of Nunavut will in some measure, be determined by the ability of Nunavut residents and their different levels of governments to access information and plug into the global economy. This will only be achievable through the creation

of a modern day telecommunications infrastructure giving all Nunavut residents access. The needs and circumstances of Nunavut warrant energetic pursuit of the federal policy objectives of regional economic development and growth through the development of a knowledge based society that is supported by a modern day telecommunications system.

PART II COMMUNITY TELESERVICE CENTRES (CTSCs)

(i) CTSCs: The Concept

CTSCs are also known as "telecentres", "telecottages", "televillages", and "teleoffices". They are multi-purpose centres that provide telecommunications and computer facilities and support in small villages in rural and remote areas around the globe. They function as information gateways into communities; and out to the world. They have also been described **"... as a "virtual community" composed of people, firms, government agencies, schools, libraries, health care providers and others connected through a common vision or need linked through telecommunications, information resources and shared services."** (The Rural Televillage: Creating A New Strategy for Rural Development; Kentucky Science and Technology Council Inc., 1994, page 3). The first two were established in Europe in 1985. As of 1994 well over 200 CTSCs have been established in eleven countries. They are now also found in Australia, North America, and South America.

CTSCs were initially conceived as a means of maintaining the economic and societal cohesiveness of rural communities in the face of changing economic conditions. In response to economic problems, many societies attempted to cope by investing more time and resources in obsolete development strategies. Failure to stimulate economies resulted in many people migrating to larger urban centres to seek employment and other economic opportunities. One consequence of rural/urban migration was to upset the societal, economic and political balance of communities. Another consequence was additional placed pressure on overloaded urban facilities and government assistance programs and services by unskilled and unemployable people.

Preserving the quality of life in a rural community in the face of a rapidly changing world requires solving economic problems associated with distance and remoteness. Access to telecommunications services and facilities is one means of doing so. Telecommunications can provide access to information and global markets. They can also facilitate the delivery of training, education, health care, and other public and private sector services. Unfortunately, many outlying regions cannot benefit from the potential benefits of telecommunications because of a lack of services, facilities, money and skills.

(ii) Barriers

In many rural or remote communities, people do not have access to telecommunications networks because they lack access to plain telephony, or, as in the case of Nunavut, access to more advanced telephone services. This problem is referred to as a **"network barrier"**.

A **"service barrier"** can also prevent access to telecommunications networks. As is the case in Nunavut, this situation occurs when a telephone network has been established, but the variety of services is limited.

Even if telecommunications services are available, a **"cost barrier"** can exist. For small rural families and businesses, and many Nunavut residents, the cost of computers, software, technical support, continuous upgrading, and such things, are often too high for infrequent users (i.e. small enterprises) to justify individual connection.

A **"qualification barrier"** can also exist. Skill requirements for using computers programs, telecommunication services and advanced information networks can be high. Sceptical attitudes towards the benefits of technology may be prevalent and may have to be overcome.

A **"personal financial access barrier"** may exist for some individuals. This barrier exists where people, desirous of taking advantage of CTSC facilities and services, may be unable to afford computer time charges and charges associated with long distance connections.

One way of overcoming a network barrier where individual connections are not financially viable, or where upgrading existing networks is cost prohibitive, is to provide access to telecommunications services at a single location. Overcoming the service barrier may be accomplished by providing computer and multi-media based services and training at this location in a cultural context that reflects local needs. Cost barriers may be addressed through the provision of telecommunications services and facilities on a community basis, thus reducing individual costs. The qualification barrier may be overcome by on site training and the provision of technical expertise. The personal financial access barrier might be overcome if CTSCs were to be supported as regional economic development programs.

CTSCs offer a cost effective solution to low income communities where the provision of advanced telecommunications services to individual homes and businesses is cost prohibitive.

(iii) Nunavut Needs: Connecting The North Symposium

In 1993, the Government of the Northwest Territories (GNWT) and the Inuit Broadcasting Corporation (IBC) conducted a pan Northern series of community consultations. The results of the consultations are summarized in a report entitled, **"Connecting the North: Defining Users' Needs"**. This report records Northerners recognition of the social, economic and business potential of emerging information technologies and the need for access to the information highway. As a result of these consultations, the GNWT

and IBC organized a **"Connecting The North Symposium"** (November 23-25, 1994). At the symposium representatives of federal, provincial and territorial governments, aboriginal organizations, educators, health care practitioners, economic development and business people, broadcasters, and local discussion groups in 27 communities presented their views on information and technology related issues. Their views, many of which are consistent with the purpose and function of CTSCs, are summarized in a report, entitled, **"Uqausiit Ukiuqtaqtumnit Sukajukkut Tusarutikkik: Northern Voices on the Information Highway"** (Inuit Broadcasting Corporation, 1995).

Public and private sector presenters emphasized the following concerns (page 6):

* the high human and financial cost of delivering education, health and social services, training, justice and economic development programs to remote communities;

* the lack of understanding of available technologies or applications by individuals and organizations;

* the need to upgrade the present communication infrastructure to facilitate improved East-West and North-South communication, and the attendant cost of such an upgrade;

* the absence of a pool of shared knowledge on communication initiatives, and the need for development of compatible systems by regions, government agencies, service providers and individuals;

* the growing disparity between the rate of information systems development in the South and the North; and

* the North's inability to access Southern and global information systems.

"Community discussion groups" identified six broad issues (page 22):

* access to the information highway;

* the potential impact of these new technologies on culture and language;

* the need for training to enable Northerners to participate fully in the design and use of the information highway;

* the need for a system of accountability;

* the need for Northern participation in research and development; and

* ways of funding information highway development.

Many of the issues identified in the report can be defined and categorized as network, service, cost and qualification barriers, and could, with appropriate government policy and program support, and with proper community participation, planning, funding and training, be overcome, through the establishment of a network of CTSCs throughout Nunavut.

The personal financial access barrier might be overcome if CTSCs were to be supported as regional economic development programs and residents were encouraged and supported in their use of CTSCs through subsidization of computer training and on-line time. The costs and means of providing such support need further investigation.

(iv) CTSCs: Global Survey

A paper entitled "**Community TeleService Centres: A means to social, cultural and economic development of rural communities and low-income urban settlements**" was presented in late 1993 at a **"Conference on World Telecommunication Development"** by Las Qvortrup, Vice Chairman of CTSC International. "The Paper" offered a global survey of all known CTSC associations and public authorities responsible for CTSC programming. Of the 237 CTSCs surveyed, 65 responded to "the Survey". Of the 65 CTSCs, 36 (55.4%) were privately run, and 29 (44.6%) were publicly operated. Some of the privately run centres were business driven community organized centres and had public support. The publicly supported centres were normally run by local or regional public authorities such as a school, library, or community government.

Country	**No. of CTSCs**	
Denmark	**9**	**(2 in Greenland)**
Sweden	**23**	
Norway	**5**	
Finland	**49**	
United Kingdom	**57**	**(currently 120)**
Ireland	**6**	**(currently 10)**
Germany	**47**	**(including planned)**
Austria	**5**	
Portugal	**0**	**(currently 15)**
Australia	**9**	**(currently 40)**
Brazil	**4**	**(35-40 more planned for 1994)**
Canada	**7**	
Total (November 1993)	**200**	
(Confirmed early 1994)	**237**	

(v) CTSCs Sketches

The Paper provided "thumbnail" sketches of CTSC experiences in several countries.

(a) Denmark

In late 1990 there were ten CTSCs established as the result of a national program supporting rural telecommunication development. The CTSCs focused on the delivery of education and advisory services. At the end of the program, three centres had been closed and two new ones had opened.

(b) Sweden

Since 1985, approximately 40 CTSCs have been built. In 1989, public support was threatened and the CTSC movement had to decide whether to operate as private businesses or to apply for continuous public support. As public financial support was not forthcoming, most of the CTSCs decided to try to operate as small local enterprises. At the time of the survey, 23 of the CTSCs were operating as business oriented centres, while at the same time trying to organize themselves as a cooperative network of centres. A number of other CTSCs remained non-profit centres integrated with or related to local grass-roots organizations.

(c) Norway

By late 1990, more than 10 CTSCs had been established, but as of 1993 there were only five in operation. While some CTSCs in the Southern regions have closed since then, nine more CTSCs have been proposed for the more remote Northern regions.

(d) Finland

In 1988 four CTSCs were established. This was followed in 1989 by a national initiative to support CTSCs resulting in the establishment of 70 centres. Some of these centres were part of local folk high schools and were designed to meet educational needs while others were more oriented to providing business services. Public support ended in 1991 and precipitated a short crisis. As of November 1993 there were still 49 CTSCs in operation.

(e) Scotland

Six pilot CTSCs were established in the early 1990s with support from the Highland and Island Development Board and British Telecom North Scotland District. Experience gained in operating the CTSCs revealed that community cooperatives operating as joint stock companies were the most appropriate vehicles for centre establishment, and that by linking up with existing community based organizations provided a suitable environment with which to grow.

(f) England, Wales, Northern Ireland, and Ireland

Since the late 1980s, 30 CTSC organizations have been formed. As of mid-1993, some 57 telecottages and telecentres had been established in the United Kingdom, and six in Ireland. In 1992 the British and Irish "Telecottage Association", a support organization for teleworkers, telecottages, and CTSCs, was established. Its purpose is **"... to improve opportunities and choice in employment, training and services for people who live in rural areas and the development of local economies through the use of information technology and telecommunications, including shared facilities in local centres."** (page 5).

(g) Germany and Austria

A very active CTSC movement has developed in Germany and Austria and good CTSC relations between the countries have been established. At the time of the Survey, a total of 47 CTSCs were in operation or had been planned. In 1991 and 1992, in what was formerly East Germany, nine private telecentres and 13 teleoffices had been established to compensate for poor telecommunication services. All German CTSCs are publicly supported private enterprises. Some are very large centres with up to 60 employees and 10,000 sq. meters of space. Large centres serve to transfer technologies to regional enterprises, while others are more oriented to rural community teleservice needs. As of 1994, Austria had built five CTSCs and had another one planned.

(h) Australia

In 1991, the Department of Primary Industries and Energy published a report, entitled, **"Telecottages: The Potential for Rural Australia"** which prompted the development of a telecentre program. By November of 1993, three CTSCs had been established and 17 more had received grants from the national telecentre program. In addition, six CTSCs had been established by local communities, and 20-25 were to receive program approval by 1995.

(i) Brazil

With the assistance of the **"International Association of Community TeleService Centres"**, (established in 1989), Brazil began a pilot project with a limited number of CTSCs. The first four were established by Telebras (national telephone company) in 1992 and 1993, and 35-40 were planned for 1994. Telebras has plans for eventually building some 13,000 CTSCs. The CTSCs are run by Telebras with the services being provided by independent public or private companies.

(j) Canada

In Newfoundland and Labrador it was decided in 1990 to

establish CTSCs in rural communities to take advantage of information services of the Enterprise Network and a number of open university courses based on interactive audio teleconferencing systems. The project initially followed the European approach of simply transferring technology. It evolved later to emphasizing the integration of the telecentre concept with on-line services. The difference in approach is important; whereas the European approach focuses solely on the diffusion of technology, the Newfoundland system attempts to promote both information seeking behaviour and the diffusion of technology and information.

(k) Other Initiatives

CTSCs projects are currently being considered in Benin, Greece, New Zealand, Sri Lanka and the United States of America.

(vi) CTSCs: Description

(a) Facilities

CTSCs are often located in schools, libraries, local authority buildings or converted buildings. Alternatively, they can be specific built new facilities. Generally, they contain office space, a classroom with computer and training facilities, a public area with access to computers and telecommunications services, a meeting room, a kitchen, and sometimes include a resource library and child care facilities. Child care facilities in the CTSCs (or associated with training and education program facilities) can prove to be particularly helpful to single parents seeking employment opportunities or trying to acquire or upgrade computer skills. Typically, minimum staff consists of a full time CTSC manager and a part time assistant. Together they look after the building and equipment and run computer training courses. The Survey found that many of the CTSCs are open only part of a day, or only a few days of the week.

Although equipment may vary from centre to centre the Survey found that CTSCs generally include the following equipment:

* photocopier;
* personal computers;
* printers;
* scanners;
* access to ordinary telephone network;
* modems for data communication (data bases, E-mail etc.);
* video production and editing equipment;

* sometimes facilities for broadcasting of local radio and TV;

* sometimes videoconferencing facilities; and

* ancillary equipment such as reference books and teaching aids.

The Survey found that in most centres, a wide range of software was provided, such as, word processing and desktop publishing, spreadsheets and integrated packages, graphics and computer aided design programs for educational purposes, computer games, etc. Within each centre personal computers are generally linked in a local area network. A wide area network was also sometimes established at the local and regional levels.

(b) Services

The Survey found that, while the services provided may vary, they often include:

* information services: access to regional, national and international data bases;

* telecommunications facilities: telefax, E-mail, etc.;

* data processing services: desktop publishing and word processing;

* information technology consultancy: management is undertaken by the CTSC manager who assists local businesses and organizations;

* training and education: introductory computer courses and "open university" type on-line tutorials;

* village hall facilities: rooms and facilities for meetings, municipal and county information;

* distance working facilities: some provide work stations for distance working (telecommuting);

* some hire out video-production equipment and provide access to editing facilities; and

* some provide access to local entrepreneurs who need infrequent access to computer and telecommunication equipment or who want to set up new information based businesses without too big an initial investment.

The Survey found the most popular services to be, computer training, photocopying, telefax, access to office facilities and desktop publishing (see Appendix A, Table 1). This indicated that CTSCs are typically used by private individuals and small

businesses as centres for computer training, as offices, and for communication purposes. Because the CTSCs are used as offices and for distance working, they directly support small information based enterprises.

The Survey also found that information technology services offered by private CTSCs tended to be more intensively used than similar services at public CTSCs, except for distance training and certain "other" services. Private CTSCs tended to be used for "specific" purposes, while public centres served more "general" purposes not directly associated with information technology (such as providing meeting room facilities for social services).

(c) Users

The Survey found registered users to include both individuals and private businesses, who used the training facilities and office services on both an occasional and permanent basis. The Survey also found that, while some individuals used the facilities for only short periods of time, (i.e. to use the fax machine), most tended to come either on a regular basis for computer training, or on a permanent basis to use the office facilities. Many registered users use the facility several times a week.

(vii) Geographical and Social Context

The Survey discovered 11.5% of the CTSCs to be located in towns and cities of more than 10,000 people, with 26% being located within 10 kilometres of such centres. More than 60% of the CTSCs however, are located more than 20 kilometres from towns of more than 10,000 inhabitants, with 15% being located more than 100 kilometres away. In England, experience with televillages in rural areas found that they tended to function as points of social articulation for the communities, similar to the way in which country post offices or town halls serve as local gathering points.

The Survey found a predominant proportion of the CTSCs to be located in regions dominated by resource based industries. These regions also had a heavy dependence upon public sector employment, which was often responsible for providing the second largest number of jobs. Unemployment in the areas where CTSCs have been established the Survey found, ranged from 10% to more than 40%.

(viii) Lessons Learned

The Survey found that most CTSCs were launched as a result of national public support campaigns and after three years of operation experienced some form of financial crisis. This crisis was precipitated by either a withdrawal of public funding, or because some CTSCs were established with expectations that could not be met. The most prevalent reason for closing of CTSCs appeared to be the withdrawal of public funds. Recognizing that

the short history of CTSCs supported only tentative conclusions the Paper offered the following cautionary advice:

* initial planning should be as realistic as possible to ensure that local services match local needs;

* realize that some sort of "natural selection" process will occur generally within three to four years after establishment;

* plan the public support program carefully so that the CTSCs can easily make the transition from public support to private business;

* establish CTSCs within the context of long term aid programs for regional economic development;

* combine financial support with other types of help such as training of CTSC managers, establishing relevant data bases, etc;

* provide continuous and easily accessible support to CTSCs such as setting up an electronic help-desk function;

* avoid viewing the CTSC programs as isolated activities and integrate them with telecommunications development programs as well as business, education, etc. development programs; and

* establishment of national CTSCs associations can be beneficial in stimulating CTSC development.

(ix) Financial Viability

The Survey found that, even though the majority of CTSCs were privately owned the majority were initially financed with public funds. The majority of CTSCs received income from either public sources or from a mix of private and public sources. Some CTSCs received income through the sale of services to public authorities, such as running computer training courses for departments of education.

Regarding financial viability, the Survey found that in 1992, 50% of the CTSCs balanced their books, 27.5 % made a profit, and 22.5% lost money.

(x) Impact/Contribution

The Paper acknowledged that, due to the nature of information obtained and the short duration of operation of CTSCs (since 1985), any social and economic impact assessment had to be speculative and subjective. It did however provide some general observations. Education it thought was the most important role played by both private and public CTSCs. The Paper stated that public CTSCs

assessed their role in a more positive fashion than did private CTSCs. The Paper speculated that this may have been due to private CTSCs having to run themselves as businesses. Public CTSCs respondents in the Survey did not differentiate between their economic, employment, cultural and social service impacts. Private CTSCs respondents saw themselves playing a role in the local economy and in the provision of social services, but having little impact on local employment and culture.

(xi) Newfoundland and Labrador Experience

(a) Introduction

In the late 1980s, the Government of Newfoundland and Labrador began planning a network of telecentres, to facilitate government business and operations, to stimulate regional economic development, and to provide rural residents with access to a larger world. Building on the European idea of CTSCs following the **"Bridging the Distance"** conference in 1990, several Newfoundlanders from outlying communities were sent to Finland, Sweden and Denmark for two weeks to learn about telecentres. They returned with ideas and enthusiasm that laid a basis for a telecentre network to be set up. This initiative began as a provincial effort and evolved into a federal/provincial effort with the establishment of a federal/provincial Crown corporation: ACOA/Enterprise. The Enterprise Network Inc. (ENI), as it is generally known, now operates seven rural telecentres in communities (ranging in size from 300 people to 3,0000 people) with on line services. As of March 31, 1995, it has been fully Internet inter-operable. A consultants report entitled **"Evaluation of the Canada/Newfoundland ACOA/Enterprise Network Cooperation Agreement"** prepared for "The Management Committee of the Canada/Newfoundland ACOA/Enterprise Network Cooperation Agreement" (Brian J. Hurley Horizon Consulting Limited, February 1994) provides an evaluation and overview of the operations of the ACOA/Enterprise Network.

(b) Services

The basic service mix delivered in a typical Newfoundland telecentre includes:

* on-line access to AENet information services;
* on-line access to a number of commercial database services;
* access to business planning software tools and aids, with access to business planning support and consulting;
* access to a variety of microcomputer application software products;
* on-line access to the library holdings of the Business

Resource Centre, with the ability to order books by mail;

* access to distance education and teleconferencing facilities;

* access to general office facilities (fax, phone, copier); and

* access to on-site support and consulting through the staff within the centre.

(c) Users

The provincial government is the primary user of network applications, mainly for electronic mail and file transfer.

Business development agencies use the network to create an awareness of local business and employment opportunities and to assemble information for clients for business planning and marketing purposes. They provide research information on a variety of subjects such as market trends, product suppliers, and pricing. Information accessed through the network is also used by these agencies for professional development purposes. These purposes include research to keep informed of current events, press releases, and regular contact with colleagues.

The telecentres also create an awareness of computer technology. Walk in clients use the centres to do research for resumes and business plans, and to investigate business ideas. Other private sector clients use them for electronic mail and file transfer.

Senior government officials believe that federal and provincial agencies interact more, and are more accessible, as a result of the network. Data usage on network traffic indicates that federal and provincial governments account for 33% of all E-mail and file transfers traffic (see Appendix A, Table 2 for a breakdown of users, and Table 3 for a breakdown of products used).

(d) Regional Development

Experience in Newfoundland and Labrador has found the presence of CTSCs encourages the following efficiencies in regional development:

* increased communications among and between development groups;

* networking of groups who otherwise would not have had the opportunity to do so;

* time and cost savings associated with improved communications and reduced travel;

* availability of business and related information that was

not previously accessible; and

* availability of a "one-stop shopping" concept for business information, services, and facilities.

(e) Training

The basic training package delivered to all new users consists of a one to three day workshop, depending on skill level. The package consists of:

* introduction to PCs;

* communications and electronic mail;

* database access, searching and printing; and

* file transfer.

Groups that benefited most from training were regional development associations, community futures groups, staff of business development centres (government), and womens' enterprises (see Appendix A, Table 4).

The provincial government was the largest user of the training programs.

(f) Structure

Telecentres in Newfoundland and Labrador are managed through a Cooperation Agreement. A Management Committee representing federal and provincial sponsors, is the official decision making body and it controls the project and its finances. The Steering Committee representing rural groups acts a liaison with the major user groups and the telecentre partner organizations. In addition, there is a board composed of mainly provincial public servants involved with rural economic development. A Technical Advisory Sub-Committee set up to advise on technical matters is now defunct.

Richard Fuchs, one of the three original proponents behind the drive to set up CTSCs in Newfoundland, identified three factors key to the fundamental success of the experience in Newfoundland and Labrador:

* there must be a "local champion", that is, someone who is committed to nurturing the concept and educating people at the community level;

* the people in a community must define their needs as they see them, and services adopted accordingly; infrastructure must not precede the identification of needs.

* a facility must seem to be a "familiar" part of the community; this suggests a facility should be incorporated into an existing facility.

PART III TECHNOLOGY

(i) Introduction

Telecommunications can be defined as point to point electronic transmission of voice, data and video images. Underlying infrastructure consists of cable, conduit, switching equipment, amplifiers, support systems, etc., which allow for the transmission of voice, video and data. A key infrastructural component, without which such services cannot be delivered, is the earth station (antenna), and its transmission and receiving capabilities.

(ii) Earth Stations

No electronic transmission of information via satellite into or out of Nunavut communities can occur without earth stations. An earth station in each community is required for the effective functioning of a decentralized Nunavut Government and access to the information highway. Earth stations owned and operated by government and the private sector are currently in place and an inventory of them and their capabilities should be undertaken. There may be no need to build new ones if the ones now in place could serve all future needs of government and the private sector.

Earth station antennae range in size from inexpensive Very Small Aperture Terminals (VSATs) ($3-to 15,000) to expensive ($2 million) large earth stations. Antenna size is important. Small antennas have low transmit power and low receive sensitivity. Small earth stations with low transmit power cannot communicate with another small earth station with a low receive sensitivity. Most networks use two different types of antennae. A VSAT network for example, uses a large master earth station with transmit power (and receive sensitivity if required) to communicate with small lower cost earth stations. Due to the northern geographical location of a number of Nunavut communities, and their relationship to the satellite "footprint", antennae in the 3.9 - 4.5 metre range are required.

An important aspect of a communications network is its configuration. Earth stations are designed for either "star" or "mesh" networks. Star networks require the transmission of information from one small earth station to another small earth through a larger master earth station. This transmission pattern requires a "double hop" which increases transmission time and costs, and compounds the lag time data storage requirements between each transmission burst. A mesh network allows each earth station to communicate directly with another earth station. Certain kinds of earth stations are specifically designed for mesh network applications such as high speed computer-computer links, integrated voice, data, and video conferencing applications. These networks generally use earth stations in the 2.4 - 4.5 metre range. In

Nunavut, CTSC communication needs might be more efficiently addressed through the establishment of a mesh network. This would allow for efficient point to point, and point to multipoint communication links for businesses, Inuit organizations and between different levels of governments. The costs and efficiencies of this type of network should be examined before network decisions are made.

(iii) Satellites

Of the four primary types of satellite orbits, the Geosynchronous Earth Orbit (GEO) is perhaps the best suited to Nunavut communication needs because it provides good coverage of the polar regions and is effective for personal voice and data communications needs.

Of all the many technical differences among satellites, the most important are the footprint or coverage pattern, and the "frequency bands". Satellites for fixed (non-mobile) networks operate in the 6/4 Ghz band (C-Band), and the 14/12 Ghz band (Ku-band). The C-band provides good coverage of the North, while the Ku-band's coverage is poor. Anik E-1 and Anik E-2 are both GEO satellites and are effective for personal voice and data communication needs. Both provide C and Ku-band coverage. Anik E-1 is designed for message traffic such as telecommunications, voice, data and video conferencing, whereas Anik E-2 is designed for radio and TV programming.

Television Northern Canada (TVNC) is switching from Anik E-2 to Anik E-1 in November of 1995 and through the use of digital compression TVNC will free up an additional 18Mbps of space segment (bandwidth) on its transponder (channel).

(iv) Bandwidths

Bandwidth is a measure of the carrying capacity of a channel. Wide bandwidths are required for two-way high-speed signals necessary for multimedia services. Multimedia is the simultaneous presentation of multiple forms of media (audio, video, and graphics, etc.). Multimedia services in Nunavut would allow for the delivery of full video conferencing, education and justice and health services, the use of interactive data bases, CD-ROM libraries, video file servers, graphics and broadband interactive services contemplated for the information highway.

A broadband network is a network capable of transporting voice, interactive full-motion video and data services. It requires a network capable of transporting 1.5 million or more pieces of information per second (1.544Mbps).

A narrowband network carries significantly less information than a broadband network. Narrowband applications include

traditional telephone service, electronic mail, paging services and faxes and require a network capable of transporting up to 64 thousand pieces of information per second (64Kbps). A narrowband network would provide the Nunavut Government with only minimal communication capabilities.

A wideband network is capable of carrying less information than a broadband network, but more than a narrowband network. Services over a wideband network include, video conferencing, file transfer, and video telephony and require a network capable of transporting between 64 thousand and 1.5 million bits of information per second (64Kbps-1.544Mbps).

Bandwidths can be upgraded to higher (wider) bandwidths or to digital carrying capacity by replacing hardware and software components in the network. Digitization or the transformation from analog and bandwidth enhancement requires changing equipment and software to create channels in the physical media (e.g. optical cable, coaxial cable, copper wire or radio spectrum). Analog transmission employs traditional technology through which sound waves or other information are converted to electrical impulses of varying strengths. Digital transmission converts sound waves into binary computer code; it is transmitted in that format to its destination where it is converted back to its original format. Digital transmission provides sharper, clearer and faster transmission. With digital encoding and sampling and compression technology, multiple applications can travel the same medium and channel simultaneously, and bandwidth requirements are reduced.

(v) Digital Video Compression (DVC)

DVC systems compress the TV signal so that it occupies a fraction of the power and bandwidth of the original analog signal. This allows for more signals to be carried on one channel. With TV transmission, 30 frames a second are transmitted and the change from one frame to the next is slight. DVC compresses only the change from one frame to the next rather than the whole picture. This results in substantial saving in the amount of information that must be transmitted. For fast moving scenes such as sports low compression rates (4:1) must be used, but for distance education, where there is little movement high compression rates (4:1 to 8:1) can be used. TV signals distributed via satellite to cable head ends will use DVC.

Using DVC to reduce bandwidth, and Demand Assignment Multiple Access (DAMA) or similar technologies to "pool" satellite circuits for voice, data and video, will reduce space segment costs, (the greatest portion of telecommunication costs), and will result in considerable savings in transmission costs.

(vi) Wire

Earth stations are the key ground based components. From them, information either enters the community or is transmitted to another earth station located in another community. The type or range of information that can be received or transmitted within a community itself is dependent upon the type of technologies and media used to transfer information on the ground.

The transmission of information to or from an earth station within a community requires the transmission of information over a physical medium such as copper wire, coaxial cable or fibre optical cable. Wireless networks transmit information in the radio/TV spectrum through the air, or in outer space through a vacuum. Of the three "wire" media, fibre optical cable can carry the greatest amount of information. It is capable of two-way broad bandwidth transmission. Coaxial cable can carry less total information than fibre optical wire, but more information than copper wire. Copper wire is the least expensive and most widely installed communication line, but has less carrying capacity than either fibre optical or coaxial cable. Its replacement with either fibre optical or coaxial cable can be very expensive. Fibre optical cable is the most expensive medium, while coaxial cable, although less expensive, is not necessarily less expensive to install because the greater percentage of the installation costs are associated with trenching, installing poles, and building towers. The purchase cost of the medium itself is a relatively small percentage of the overall cost. Wireless networks are the easiest to install because they do not require trenching or laying cable. Costs vary according to the type of signal generated and rights of ways for transmission towers. Microwave networks are generally less expensive than fibre networks and can carry high bandwidth signals.

Telephone service in Nunavut communities is currently delivered by NorthwesTel over copper wire, but copper wire can transmit only limited amounts of information at any given time. Recent developments in standards and technology to send high speed digital signals through copper wire can significantly enhance the range of services. By using Asynchronous Transfer Mode (ATM), data can be broken up and transmitted more efficiently allowing voice, data and images to be transmitted on one line. An Asymmetrical Digital Subscriber Loop (ADSL) increases the capacity of a single copper wire more than one hundredfold, allowing for the transmission of multi-video channels, but the number of simultaneous transmissions is quite limited and high bandwidth is only possible in one direction.

The Arctic Cooperatives Ltd. (ACL) is in the process of providing cable TV services to several Nunavut communities. NorthwesTel is also interested in providing cable TV service to Northern communities. Due to the small cable TV market the two organizations have been directed by the CRTC to provide cable service in a non competitive fashion. Coaxial cable transmits

information through electrical impulses (as do telephones), and is capable of carrying broadband communications. With changes to hardware and software it can provide two-way high bandwidth transmission. The highest bandwidth currently provided to homes is provided by cable networks.

Television Northern Canada (TVNC) is proposing to provide enhanced broadband communication services to the 96 communities it currently provides television services. Its proposal envisages rewiring every site (average 100 sites per community) in each community. Doing so require cabling, head-ends, ethernet servers and routers, plus upgrading existing cable systems to two-way capability. The proposal also envisages adding telephone service to the local cable system.

(vi) Networks

The basic purpose of a network is to provide access paths between users and amongst users at different geographic locations. To operate, networks require physical media to carry such services as voice, TV signals, digital transmission services, fax, etc. Interconnection of networks at the service level requires physical and functional connection at the lower levels.

A network makes it possible for end users to be connected and to communicate in spite of errors, differences in speeds of operation, protocols, and format. Access to content (i.e. programming and messages) and services (Internet) can be provided without being tied to a particular medium or channel. This involves standardizing protocols and changing hardware and software so that the transmission of signals and services over a variety of media can occur.

The development and control of a single network in Nunavut, supported through a standardized technological infrastructure delivering integrated network services would ensure easy access to the information highway that would serve both public and private and sector interests in a cost efficient and effective manner. The opportunity to create such a network should be seized before a proliferation of incompatible technologies makes the delivery of services inefficient and more costly than it need be.

PART IV APPLICATIONS

(i) Introduction

Nunavut residents, private businesses and Inuit organizations require an up to date telecommunications infrastructure to function within and outside Nunavut. Participation in global markets, community and regional economic development, commerce, marketing, business transactions, multi-community or multi-organizational conferences, video shopping, tourism, information gathering and sharing, etc., --- today all these things require access to modern day telecommunications services and facilities in Nunavut.

The success of an effectively run and cost efficient decentralized Nunavut government will in large measure depend on the establishment of a modern day telecommunications infrastructure. The Nunavut Government must be able, quickly and reliably, to transmit and receive information within and between its own departments and with other levels of government. If the Nunavut Government is to deliver upgraded education, health care and other social services and programs, it must deliver them directly to the communities themselves. It also must be capable of exchanging information with the private sector, both within and outside the Nunavut territory.

(ii) The Information Highway: Applications and Services

Access to the information highway will open the way for the delivery of more government programs and services directly to the communities. It will also allow individuals, organizations and businesses to benefit from access to information, enabling them to effectively participate in the global economy.

The development of an telecommunications infrastructure with service levels designed to meet both public and private sector needs will open up a variety of opportunities with the potential for untold benefits for Nunavut (see Appendix C for additional examples of current telecommunication applications and benefits).

(a) Health Care

The information highway has the potential to improve the administration and quality of health care. It will enable wide dissemination of health care information and training to remote communities. Video, audio, data, and imaging services will allow remote diagnosis and consultation improving the delivery of patient care. Health care workers will be able to access remote and widely dispersed data bases. Telemedicine will help in reducing health care associated travel cost which in 1992/93 cost the Government of the Northwest Territories (GNWT) approximately $18 million (see Appendix A, Table 5).

(b) Distance Learning/Training

The provision of education programs and courses currently unavailable in communities will be made possible through access to the information highway. Videoconferencing will enable teachers and students to participate in joint learning exercises. It will also allow knowledge based information to be delivered to the South. For instance, Inuktitut language courses, could be taught in Southern universities through the use of videoconferencing facilities. Students will also have access to material stored in video libraries and access to multimedia training programs. School networks will enable students to communicate and share data and resource bases with students in other locations. Investments in distance learning services and programs will reduce the need for teaching staff in each community, as well as infrastructure costs. And if interactive education programs can be delivered simultaneously from a central location to multiple communities (as is currently being done in the North Slope Borough, Alaska), the need to move students to centralized locations for specialized education will become a thing of the past.

(c) Justice

Videoconferencing could be used in legal proceedings, interviewing witnesses, taking testimony, and even perhaps the conducting of trials for minor offenses. In many instances, court travel party costs and the costs associated with transporting witnesses for interviews might be saved. Access to federal laws and case law via the Internet is currently being developed by the Department of Justice. Internet access to this service could provide Nunavut residents and the Nunavut legal profession with the most up to date information on changes to federal legislation.

(d) Public Administration

The information highway will enable point to multipoint and point to point exchange of information, files, and data. Videoconferencing will enable distance meetings to occur. It will result in reduced travel costs and increased work efficiency as travel requirements are reduced.

By way of example, the GNWT in 1992/93 spent approximately $70 million on travel associated costs, not counting travel costs associated with boards of health and education and other government agencies. A 50/50 split in the costs between the West and Nunavut, (which would not be unreasonable due to the high costs of fire suppression attributable solely to the west and the higher costs of travel in Nunavut) would mean annual government travel costs in Nunavut of approximately $35 million (see Appendix A, Table 5).

(e) Legislative Assembly

Legislative Assembly Members (MLAs) could participate in sessions of the Legislative Assembly from remote locations through videoconferencing. Other interactive communications needs could be met by access to services provided through the information highway.

(f) Televoting

"Televoting", "teledemocracy", or voting electronically has been tried with varying degrees of success in Canada. Once the "kinks" in the system have been worked out it could be used for Nunavut wide plebiscites and territorial elections, and for voting in federal elections. Voting electronically will speed up the tallying of votes, and will reduce personnel needs and the overall costs of elections. The 1992 boundary plebiscite cost the GNWT $825,000.

(g) Public Services

People in remote communities will be able to obtain information on federal and territorial government programs and services. Information on child care benefits, old age security and employment, the filing of income tax returns, applications for drivers licences and motor vehicle registration, the issuance of hunting and fishing licences, etc., could all be handled through "one stop shopping" government kiosks located in each community. Such a concept is advocated in a Treasury Board discussion paper, entitled **"Blueprint for Renewing Government Services Using Information Technology"** (pages 14-25, no date).

(h) Telecommuting

Access to the information highway will enable residents in remote communities to do distance work. Public and private sector employees will be able to carry out work in their home communities and transfer it electronically to regional or head offices. **"According to LINK Resources Corp., 43.2 million people, or about one-third of the entire U.S. work force, telecommute in some way. Approximately 8.8 million are full time telecommunters, i.e., never in an office ..."** (The Globe and Mail, July 11, 1995, page N1). Telecommunting is also an approach to work that is advocated by the Department of Human Resources in a report, entitled, **"Working Time and the Distribution of Work"**, (December, 1994).

(i) Marketing

People in communities will be able market local products and services, such as arts and crafts, country foods, sports hunting and fishing opportunities and tourism packages throughout the world. Video files of carvings could be made so that prospective buyers could view them before they are purchased. Local hunters

and fishermen could advertise the sale of their catches. Hunters and Trappers Organizations, hotels and local businesses could market sports hunting and fishing opportunities and tourism packages world wide.

(j) Libraries/Research

The information highway will enable people in communities to have access to electronic libraries and other databases. Multimedia information sources will enable users to gather information in audio, graphic and video form.

(k) News

People in remote communities will have instant access to global news services in the form of text based news and video based news casts. Customized news services will also be available to individual subscribers.

(l) Financial Information and Banking Services

Subscribers will be able to access information on global financial markets and conduct financial transactions electronically. Access to banking services such as, bill payments, transfers between accounts, account statements, mortgage payments, etc., could be made available to residents in remote communities. Only a few Nunavut communities currently have direct access to banking facilities and services.

(m) Home Shopping

Consumers in remote locations will have access to "virtual shopping malls" with a broad range of products and services. Food and hardware and other purchases from the South could be made easier for consumers. Consumers will be able to shop around for the best prices and to view products before they are purchased.

(n) Entertainment

Games, movies, and music will be available on demand to subscribers.

(o) Travel Services

Consumers will be able to choose travel destinations by browsing through video files. They will have a choice of travel agents, travel packages, and booking services.

(p) Regional, Nunavut, National, and Circumpolar Connections

Access to the information highway would enable Nunavut residents, communities, organizations and governments to link

themselves regionally and throughout Nunavut. It would enable Nunavut Inuit to exchange information, develop economic development strategies and cement social and cultural ties with Inuit in other parts of Canada and throughout the circumpolar world.

(iii) Current Northern Initiatives

Although pan Nunavut access to the information highway remains a distant objective, a number of Northern experimental telecommunication initiatives have been or are being undertaken.

The **"Connecting the North Symposium"** employed videoconferencing to communicate with Australian aboriginals. (Australian aboriginals regularly employ videoconferencing to communicate between remote communities.) The Inuit Communications Systems Limited (ICSL), (the commercial arm of IBC), and NorthwesTel are conducting a joint venture in the area of high speed data transmission. The GNWT is providing ATM services (high speed digital signals through copper wire) for a Baffin Divisional Board of Education videoconference involving the communities of Pond Inlet, Lake Harbour and Iqaluit. A telemedicine demonstration project between Ottawa and Whitehorse in the Yukon Territory is being conducted jointly by the Communications Research Centre (CRC), NorthwesTel, and the hospital.

TVNC has applied for funding from the Canadian Network for the Advancement of Research, Industry and Education (CANARIE) for a pilot project (The Arctic Connection) to demonstrate and test the delivery of enhanced communication services to several communities. The objective of the project is to enhance the capability of Northern communities to communicate with each other in the areas of education, health care, business development, and government administration. Four to six communities will be involved.

Iqaluit residents in the near future will be able to access the Internet through the World Wide Web via two Nunavut companies, Nunanet Worldwide Communications and Nunavut Communications Ltd. Local callers will be able to access these services as local calls, and thereby save long distance charges.

GNWT and federal government "informatics strategy" initiatives are also in progress and it would be prudent to design them in a fashion that is compatible with private sector telecommunications capabilities and service levels, as well as each others.

PART V DISCUSSION

(i) Community Needs

Development of a modern telecommunications network in Nunavut will not be the solution for all the social and economic needs of the new territory. It will not automatically lead to stimulation of the local economy, but it will be a precondition to economic growth and job creation. Because telecommunication is two way communication it could impact detrimentally on local businesses through encroachment on local business opportunities from outside sources. It can lead as well to a centralization of jobs in larger centres resulting in the displacement of locally held jobs. Telecommunications services, therefore, must be organized and provided in such a way that maximizes local social and economic development opportunities and minimizes the ability of larger external forces to gain a competitive advantage at the expense of local interests. In the case of Nunavut with its Inuit culture and language, safeguards must be introduced so that plugging into the world at large does not lead to unplanned social and economic consequences that may be more of a detriment than a benefit. This was a concern of the "community discussion groups" participating in the **"Connecting the North Symposium"**.

The technology, types of services required locally, nature and operation of the facilities, sources of support, and training needs must be clearly identified, planned, and incorporated into the design of the telecommunications infrastructure. There is little point in designing and establishing a state of art infrastructure if its operational capacity is beyond the needs of the local people, or their desire to use it. Community input into the planning and design of the infrastructure and services has also been identified as a requirement by the community discussion groups.

The need for training and the need for participation in research and development was seen as important by the community discussion groups. Where people lack basic computer skills, are unilingual, or may be intimidated by the technology, the placement of technologically trained and culturally sensitive individuals to train and educate will be required if the qualification barrier is to be overcome. The construction of appropriate local, regional and Nunavut wide databases can only be developed once Nunavut resident needs have been identified. This can only be accomplished with local participation.

The need for funding for development of the information highway has been identified by the community discussion groups. The cost barrier can be prohibitive in Nunavut, where the network barrier and service barrier preclude the home delivery of state of the art telecommunications access without considerable infrastructural

upgrades to the telephone system. Also, a personal financial access barrier may preclude some individuals from using the information highway because of an inability to pay long distance charges.

Accountability concerning the delivery of services in a monopoly environment was also identified by community discussion groups. Participants suggested that because of the lack of cross subsidization of Northern rates, and due to the lack of competition; residents, governments, and telecommunications companies all have a responsibility to ensure the North has access to the information highway. The participants suggested that territorial and regional governments be responsible for gathering community input; the communities be responsible for providing it; the telecommunication companies be responsible for gathering community feedback; and the federal government be responsible for regulating the industry to ensure the communities have "universal access at reasonable costs" to the information highway.

(ii) Nunavut Needs

In addition to the points above, the **"Connecting the North Symposium"** summarized the main private and public sector needs at issue: the high financial and human costs of delivering government programs and services in the communities; the absence of shared knowledge of communication systems; and the need for the development of compatible systems for governments, service providers and individuals. A properly designed and shared telecommunications infrastructure and services which accommodates both private sector and public sector needs, could result in considerable cost savings to both the private and public sector. Education and health care programs could be improved and costs could be reduced through the use of distance education and telemedicine. One stop shopping government kiosks for licences, social assistance matters, etc., could reduce costs and ease the administrative burden for both government and private citizens. Centralized data banks, data warehousing, accounting and file processing could achieve savings in the form of reduced personnel requirements. The shared use of telecommunications infrastructure and systems could reduce costs associated with duplication and could promote the use of integrated private and public sector telecommunication systems and data bases.

(iii) Mutual Needs: Private and Public

Rather than establish several different infrastructures with perhaps varying telecommunication capacities and different equipment and incompatible protocols, it would be wiser and certainly more cost efficient, if public and private sector needs were combined and subsumed within a single infrastructure and service network. Doing so requires; one, identifying the telecommunication needs of both sectors; and two, determining the

technologies required to support them. If both sectors were jointly to design, plan and participate in the management of telecommunications infrastructure and services, and if both sectors were to share in the operational and maintenance costs of satellite operation and share bandwidths, and if both sectors were to share in the use and costs of the same earth station in a community, problems of service duplication, equipment and protocol incompatibility would be considerably reduced.

If telecentres with attached earth station were set up in each community; if federal and territorial government offices, schools, health centres, Inuit organizations and local businesses in each community were connected to the same earth station; the telecommunication needs of private citizens, businesses and organizations, and government program and service delivery and administrative needs could be met at reduced cost, without the need to "rewire" entire communities. Likewise, if the CTSCs were used as sites for one stop shopping kiosks currently proposed for such things as the issuance of drivers licences, motor vehicle registration, filing tax returns, etc., and perhaps as videoconferencing sites, and if the facilities and costs were shared between the federal and territorial, cost efficiencies could be achieved.

(iv) Circumpolar Needs

For many years Inuit have been trying to establish and maintain connections with Inuit in other parts of the circumpolar world. This has been particularly difficult given the need to meet and the costs of Northern and circumpolar travel. Linking the circumpolar world could be facilitated through the development of telecentres throughout Northern Canada and the rest of the circumpolar world.

Through the use of videoconferencing and the electronic exchange of voice, data, and images, Northern Canadian Inuit could be linked with other Northern peoples and circumpolar ties strengthened with considerable social, cultural, economic and political benefit. Social and cultural exchanges could occur electronically, traditional knowledge could be disseminated through the Internet, circumpolar economic development strategies could be developed and joint business ventures undertaken, and government relations facilitated. Expansion of the telecentre network in Northern Europe combined with the establishment of a telecentre network in Canada and other parts of the circumpolar world would greatly enhance the opportunities for such benefits. An appropriately designed telecommunications infrastructure in Nunavut would provide Nunavut residents with access to other circumpolar peoples at little additional cost.

PART VI INFRASTRUCTURE AND SERVICES: REQUIREMENTS AND COSTS

(i) Introduction

The transmission and receipt of a full range of information requires a sophisticated infrastructure. Because land line connected telephone systems and microwave stations are not possible means of linking Nunavut communities and the rest of the country, (although this could change with the evolution of technology), the Nunavut Government and its residents must necessarily rely on satellites and earth stations for the receipt and transfer of information between the communities. The amount of bandwidth available will determine the level of telecommunication services deliverable to the communities. As well, there must be a means of transferring information to and from earth stations located in the communities among government offices, schools, nursing stations, private businesses and organizations, etc.

(ii) TVNC Business Plan Proposal

TVNC has committed itself to providing a communications infrastructure that will guarantee Northern communities access to the information highway. TVNC is investigating setting up a "for profit subsidiary" to provide enhanced broadband communication services to the 96 communities TVNC serves across Canada's North. The cost of establishing a communications network for three different levels of service (see Appendix A, Table 6) is outlined in a consultants report for TVNC, entitled, **"TVNC Subsidiary Business Plan: Draft Final Report"** (Nordicity Group Ltd., June 6th, 1995).

(a) Service Levels Options

Service Level One would support receive-only VCR quality video, CD-quality audio or wideband services. It would also support, two-way toll-grade telephone trunking, interactive data (up to 144Kbps) and compressed videoconferencing (limited motion), plus fax machine and personal computer connection capabilities (including access to Internet). In addition, each community would be provided with a fully featured multimedia personal computer that would support "desktop" quality video conferencing for general/public use.

Service Level Two would support all level one services, but with higher speed interactive data (up to 384Kbps) and video connections, high resolution graphics, multimedia, plus a dedicated "business" quality videoconferencing terminal in each community for general/public use. This service level would support high resolution image transfer required for proposed telemedicine applications.

Service Level Three would support all level one and two

services, but with a very high speed interactive data (up to 1.544Mbps), plus full motion videoconferencing and a higher quality videoconferencing terminal in each community for general/public use.

(b) Wiring Costs

The TVNC proposal envisages rewiring every site (average 100 sites per community) in each community, at a cost of $200,000 per community (excluding earth stations for interactive services). Doing so would require cabling, head-ends, ethernet server and router plus upgrading existing cable systems to two-way capability. The proposal suggests including the addition of telephone service to the local cable system at an average cost of $35,000 per community. This would require a cable set-top box or a separate "twisted wire" distribution network.

Applying TVNC cost estimates to Nunavut needs, at an average cost of $2,000 per site, wiring the educational and health care facilities, R.C.M.P., and federal, territorial and hamlet government offices in 26 communities would cost $312,000 ($2,000 x 6 sites x 26 communities).

(c) Multimedia Computer Costs

The proposal also includes providing a fully featured multimedia personal computer that would support "desktop" quality video conferencing, plus a printer and fax, for general/public use in each of its 96 communities, at a cost of $11,200 per site, per community.

At a cost of $22,400, two fully featured multimedia computers, plus two faxes and two printers for use in each of the 26 CTSCs, could be provided at a cost of $582,400.

(d) Videoconferencing Costs

The proposal at Service Levels Two and Three envisages dedicated videoconferencing equipment in each community for each general/public usage. Such equipment could also serve Inuit organization and government videoconferencing needs. The costs of Service Level Two "business" quality videoconferencing equipment is $25,000 per site (excluding building facility costs). Service Level Three costs for full motion higher quality videoconferencing is $35,000 per site (excluding building facility costs). Possible dedicated videoconferencing sites might include, schools, Nunavut Arctic College campuses, hamlet and regional government buildings, and IBC studios. Service Level One would only support "desktop" quality video conferencing and would not require any dedicated space.

Applying TVNC cost estimates to Nunavut needs, Service Level

Two videoconferencing equipment could be provided for $650,000 (26 communities x $25,0000). Service Level Three videoconferencing equipment could be provided for $910,000 (26 communities x $35,000).

(e) Network Management Costs

All three service levels have network management system capital costs of $1.07 million. A proportional 28% Nunavut share (26 of 96 communities) for 26 communities would cost $299,600.

(f) Earth Station Costs

Service Level One, designed to maintain 144Kbps of continuous simultaneous communication links with 96 communities would require a master earth station at a cost of $150,000, plus an earth station in each community at a cost of $75,000 per site. Total earth station costs for Nunavut at this level of service would be $2,025,000, ($75,000 x 25 communities + $150,000).

Service Level Two, designed to maintain 384Kbps of continuous simultaneous communication with 96 communities would require a master earth station at a cost of $250,000, plus an earth station in each community at a cost of $95,000 per site. Total earth station costs for Nunavut at this level of service would be $2,625,000, ($95,000 x 25 communities + $250,000).

Service Level Three, designed to maintain 1.544Mbps of continuous simultaneous communication with 96 communities would require a master earth station at a cost of $250,000, plus an earth station in each community at a cost of $135,000 per site. Total earth station costs for Nunavut at this level of service would be $3,625,000, ($135,000 x 25 communities + $250,000).

(g) Satellite Space Segment Costs

It is estimated that six complete transponders could be required to support bandwidth requirements for simultaneous and continuous transmission of 1.544Mbps to 96 communities. This requirement could be reduced as digital compression technologies evolve. Space segment time for a complete transponder is approximately $2.0 million per year. TVNC estimates that its 18Mbps of extra bandwidth (75% of the transponder) could handle all additional Nunavut needs for the foreseeable future, including that of the Nunavut Government.

(h) Recurring Annual Costs

Recurring annual costs for space segment time, operations and maintenance, and local administration and maintenance for Service Level One would cost $4.84 million; Service Level Two, $8.71 million; and Service Level Three, $19.02 million. (This includes

equipment and earth station amortization and profit margin.)

A 28% proportional Nunavut share of recurring annual costs would be $1.35 million for Service Level One, $2.43 million for Service Level Two and $5.32 million for Service Level Three.

(iii) Total Nunavut Costs

Admittedly, taking a 28% share of the overall costs is a crude means of calculation, but not unreasonably so. The TVNC community costs are averaged costs which take into account the diversity inherent in the regions that it serves. Factors such as community size, current level of services, geography, distances from major centres, whether there is road access, whether land line connections or microwave stations could be used, etc., have been taken into account and the costs averaged across all 96 communities.

Although the greater costs of servicing the more northern Nunavut locations has already been averaged in, the total average Nunavut community costs would not be much outside the ball park".

Based on TVNC cost estimates, with no adjustments for economies of scale, or marginally higher Nunavut costs, earth station costs for Nunavut would be:

Capital Costs	**Level One**	**Level Two**	**Level Three**
25 Earth Stations	**1,875,000**	**2,375,000**	**3,375,000**
1 Master Station	**150,000**	**250,000**	**250,000**
Total	**2,025,000**	**2,625,000**	**3,625,000**

(It is worth noting that the cost of installing 26 Service Level Three earth stations is about 10% of the GNWT 1992/93 travel budget for Nunavut (see Appendix A, Table 5)).

To these capital costs must be added the on the ground infrastructural costs of building CTSCs or providing space in existing facilities, the provision of computers, communication equipment and training, and the linking by coaxial cable or fibre optical cable of the government sites, schools and health care facilities to the CTSC. These costs would be dependent upon community size, whether existing facilities could be used for CTSCs or new ones would be required, the number of sites that had to be wired into the CTSCs, the type of wire used, and the number of computer terminals and other equipment required in each community.

An inventory of possible CTSCs sites and an examination of the costs for the establishment of CTSCs equipped with full multimedia service capability, government one stop shopping kiosks, and child care facilities, is required before full cost estimates can be

made.

Using TVNC wiring cost information, the cost of coaxial cable wiring six government sites per community (hamlet, regional and federal government offices, R.C.M.P., school and health care facilities) into 26 community CTSCs, and the cost of providing two fully featured multimedia computer terminals with two printers and two fax machines (on average) in each of Nunavut's 26 community CTSCs, would be:

Capital Costs	**Level One**	**Level Two**	**Level Three**
Wiring 26 communities	**312,000**	**312,000**	**312,000**
2 Computers/community	**582,400**	**582,400**	**582,400**
Total	**894,400**	**894,400**	**894,400**

(Private businesses, organizations and other interested individuals if desirous of accessing the information highway from work or home could pay for their own computer terminals and the wiring costs of hooking up to the community earth station.)

The above figures of course do not include the costs of additional equipment such as photocopiers, telephones, scanners, modems, additional computers, furniture etc., nor is the cost of the building facility included. In estimating such costs, the building would likely be the greatest cost item. Outside additional costs of $500,000 for a new building, plus furniture and equipment for 26 communities would amount to $13.0 million. These costs could be considerably reduced if existing buildings were used. To do so would be in keeping with the advice of Richard Fuchs regarding the Newfoundland and Labrador experience; CTSCs must seem to be a "familiar" part of the community. Possible locations could include schools, Nunavut Arctic College campuses, hamlet and regional government offices, or commercial locations.

If dedicated videoconferencing equipment were to be provided in each community, excluding facility costs, the costs would be:

Videoconferencing Costs	**Level One**	**Level Two**	**Level Three**
26 Communities	**-------**	**650,000**	**910,000**

The total infrastructure costs for a telecommunications network for the entire Nunavut Territory that would provide public access to the information highway while at the same time servicing all Nunavut and federal government requirements, (except for the costs of one stop shopping government kiosk equipment), would be:

Total Start up Costs	Level One	Level Two	Level Three
25 Earth Stations	1,875,000	2,375,000	3,375,000
1 Master Station	150,000	250,000	250,000
Wiring 26 communities	312,000	312,000	312,000
2 Computers/community	582,400	582,400	582,400
Network Management	299,600	299,600	299,600
26 Videoconference Sites	-------	610,000	910,000
26 CTSC Facilities	13,000,000	13,000,000	13,000,000
Total	16,219,000	17,469,000	18,726,000

A 28% proportional Nunavut share of annual recurring annual costs for space segment time, operations and maintenance, and local administration and maintenance would be:

Annual Costs	Level One	Level Two	Level Three
Recurring	1,350,000	2,430,000	5,320,000

Earth station equipment and terminal equipment amortization rates and a 10% cumulative profit margin are included in the annual recurring cost totals. But other CTSC costs, such as the costs of CTSC staff salaries, costs of training courses for CTSC users, program costs to assist user time costs, etc., have not, and will have to be developed if the full cost picture for Nunavut is to emerge. This responsibility should be that of officials in charge of regional economic development.

If complete start up costs appear excessive a graduated approach could be taken. Initial telecommunications infrastructure costs could be spread out by first linking the capital and the two regional centres. This would allow experimentation, training, and for the bugs to be worked out before linking other communities (eight) with decentralized government headquarters functions. As both financial and human resources became available, the remaining 15 communities could be linked into the network.

(iv) TVNC Consortium Proposal

Service Level Two is recommended by TVNC as the appropriate infrastructure level for the initial construction of the Northern Canadian information highway (see Appendix B, Figure 1). Service Level Two is preferred over Service Level One because telemedicine applications can be provided. While Service Level Three provides increased service in the areas of data transmission speed and improvement in video conferencing quality, it is 34% more expensive to implement and more than double the cost of Service Level Two to maintain and operate. Thus Service Level Two is preferred. The proposal recognizes that although the use of higher bandwidths may be required in the future, doing so will be possible because of TVNC's use of digital transmission which will free up 18Mbps of

bandwidth. Using DVC will reduce TVNC bandwidth requirements for broadcasting to 25%, freeing up the remaining 75% for sale or use for interactive communications.

To use the excess bandwidth in the provision of interactive communication services in Nunavut, upgrading and restructuring the telecommunication infrastructure and services is required. TVNC proposes involving other communication companies to do this. This would require establishing an owner/operator consortium of companies. A consortium of communication companies would eliminate the need for the Nunavut Government to establish a dedicated government telecommunications infrastructure. The Nunavut Government could, (as could the federal government), simply purchase or lease bandwidth and/or telecommunication services from the consortium, an approach that is in keeping with NICs recommendations regarding government leasing of private sector services and facilities. This though would not preclude the need for a Nunavut Government management role in the consortium or the need for the Nunavut Government to design its own "informatics strategy".

Roles and responsibilities for existing Northern companies that could provide various elements of the infrastructure and services have been tentatively outlined in the TVNC report, **"TVNC Subsidiary Business Plan Draft Final Report"**. They are as follows (pages 39-40:

* TVNC could be the network catalyst, systems integrator, possibly the franchiser of the earth stations, and it could be the broker of satellite airtime based on leasing arrangements with Telesat Canada;

* Telesat Canada could provide space segment time; establish the DVC standards and leadership in decoder equipment; and help plan and assist in network development;

* NorthwesTel could provide for inter-operability between the TVNC and NorthwesTel networks;

* ACL could provide the provision of cable services at the community level, and the operation of earth station maintenance and user terminals; and

* IBC and other TVNC shareholders could provide content and services and act as systems integrators for major users in the communities.

By organizing existing communication companies in the above fashion, community wiring and equipment, earth stations and telecommunication infrastructure requirements could be met. This would ensure that the Nunavut, federal and community governments, community residents, businesses, and organizations would have

access to broadband interactive communication services.

The only element of such an infrastructure missing is the provision of CTSCs facilities and services. (The TVNC proposal suggests permanent videoconferencing facility locations could be found in hamlet council or economic development organization buildings.) CTSCs could be provided by the federal government as a one time cost associated with setting up the Nunavut Government. The operation and maintenance of earth stations and other technical equipment associated with CTSCs could be provided through a service contract with ACL or IBC.

IBC, informally, has offered to play the role of local champion. This may make sense given the services it currently provides, and the fact that it already has technical staff and facilities located in many Nunavut communities.

(v) Operation/Service Options

An alternative to the TVNC approach would be for the federal government to pay for the wiring of main sites in the communities and the costs of the telecentres as a one time cost, and for the Nunavut Government to establish a Crown corporation, (with partial private ownership to reduce costs) to deal with the telecommunications needs (earth stations and satellite time). The latter could be handled through the purchasing or leasing of earth stations, bandwidths or satellite time. The main telecommunication infrastructure costs are associated with earth stations purchase and installation, and satellite time and maintenance.

These costs, plus the need for a network control centre staffed 24 hours a day, seven days a week with uninterrupted power supply etc., lead some earth stations users to lease capacity. For the Nunavut Government, it might be preferable to use standard satellite services or it may be simpler and less expensive to buy "pre-packaged" services from a carrier.

There are two types of carriers. A Type I carrier is a carrier that owns the basic facilities for the provision of services. Type II is a carrier that leases the basic transmission capability from a Type I carrier and sells a service to the end user.

As a general rule, satellite networks in Canada must operate with a Canadian satellite. For domestic applications, users are permitted to own and operate earth stations for any type of communications application.

A user has four earth station ownership options for a fixed satellite network (Satellite Communications in Canada; Telesat Canada, 1993, page 151):

(a) lease a complete service from a satellite provider including

all the earth stations, the satellite capacity required for the network, installation, maintenance, licensing, etc;

(b) purchase all earth stations, lease the space capacity and operate its own network - this would require the user to find an organization to install, licence and maintain the earth stations;

(c) combine options a) and b): purchase the earth stations and lease the master earth station and services from a service provider; or

(d) form a group to operate a complete satellite network.

The trend today is towards options (a) or (c). Most users prefer a total solution and use a carrier for any of the following:

* sale/lease of dedicated earth stations;

* shared use of a large, expensive earth station;

* shared use of space segment;

* installation and testing;

* network management;

* maintenance;

* licensing.

(vi) Licensing for Earth Stations

All transmit earth stations in Canada require a Department of Communications Radio Licence except for receive-only earth stations. An applicant for a licence must be either a Canadian corporation or a Canadian individual. This means that any company incorporated provincially of federally in Canada may apply for a licence. Municipal licences are sometimes required as well.

The licensing procedure requires frequency coordination to accommodate possible interference problems. C-bands are shared with terrestrial systems and require coordination, whereas the Ku band is dedicated to satellite communications and does not require frequency coordination.

(vii) Training Requirements

A body of technically trained Nunavut residents will be necessary to provide on site servicing and repair of telecommunications equipment in each community. Appropriately trained people could operate and maintain the community earth

stations and other equipment required for the operation of CTSCs, and also that of government. A lack of trained on site technicians involves costly service and repair visits to remote communities. A technical school in Nunavut offering a two/three year technical assistant course would provide individuals with adequate training to service most community telecommunication needs. Twenty-six trained telecommunication technicians would be required for each community to have local technician on site. A local technician in each community would save on expensive service and repair visits, and it would provide employment as well.

PART VII RECOMMENDATIONS

(i) Introduction

The needs of both private citizens and business, and governments are similar - both require access to a modern day telecommunications infrastructure. Whether it is a private citizen "surfing the net" or conducting banking electronically, a regional Inuit organization conducting a videoconference on economic development opportunities, or a regional government employee transferring files electronically to the capital, all such actions require access to a telecommunications infrastructure and services to conduct their business.

Therefore, infrastructure should be designed to accommodate the needs of individuals and the private sector as well as those of governments. CTSCs are a means of doing so that do not require heavy infrastructure investments such as rewiring entire communities throughout the Nunavut Territory (see Appendix A, Table 7). Infrastructure costs may be viewed as being made up of three parts: the on ground wiring costs of linking main government sites by either coaxial or fibre optical cable to earth stations, and the cost of earth stations; the provision of public access to telecommunication services through establishment of CTSCs attached to earth stations; and the establishment of a telecommunications network that links all Nunavut earth stations via satellite connection.

(ii) Two Approaches

Two approaches to providing the infrastructure may be taken.

(a) Option One: Private Sector Provides

The TVNC proposal appears to be a workable approach. It provides multimedia interactive wideband services to 96 communities that will give them access to the information highway. Its extra 18Mbps bandwidth could accommodate all federal and Nunavut government needs. It envisages implementing Service Level Two with a view to upgrading transmission speed when required.

The consortium proposal is a cooperative rather than a competitive approach to providing telecommunication services. This is in keeping with the wishes of the CRTC regarding services to Northern markets. It involves Northern communication companies many of which are aboriginally owned and operated. Some of the required infrastructure is owned by these companies and is already in place. These companies also have technically trained individuals on staff.

By supporting such a proposal, governments would be relieved of much of the financial burden of ensuring Nunavut residents,

businesses and organizations have access to the information highway. The main costs to governments would be the costs of developing and implementing their internal informatics strategies and establishing one stop shopping kiosks, and setting up and maintaining CTSCs. The costs of the CTSCs could be subsumed under a regional economic development strategy or, alternatively, could be provided by private sector business agencies associated with Inuit economic development organizations, or by IBC. Earth station services and satellite transmission time, in keeping with NIC's recommendations to use private sector services and facilities where ever possible, could be leased from the private sector. A management role or position on a private sector telecommunications consortium board of directors would ensure that government telecommunication needs are met.

(b) Option two: Governments Provide

This option would require wiring the main government sites in each community into the community earth station. Earth stations with broadband communication capability would have to be established. If public access to the information highway is also to be provided without expensive rewiring of entire communities, CTSCs will be required. Such costs could be subsumed under federal government one time costs associated with the Nunavut infrastructure.

Regardless of whether CTSCs are established, the wiring of main government sites and the installation of earth stations are necessary costs associated with the efficient functioning of a decentralized Nunavut Government. CTSCs, if existing facilities are used, can be piggy backed for little additional cost on an infrastructure that has to be established anyway. Satellite services could be handled by a Crown corporation established for that purpose with partial private ownership to assist in sharing the costs and giving the private sector a role in management.

(iii) Recommendations

1. NIC recommends that private sector telecommunications services and facilities be used.

2. The NIC recommends that the GNWT, the federal government, the Nunavut Tunngavik and NIC form the basis of a working group to undertake the responsibilities identified in recommendation # 7-7 in the NIC report, "Footprints in New Snow". The NIC further recommends that other levels of government and selected private sector organizations, as may be identified by the main parties to the working group, be invited to participate in the working group when thought appropriate, or when required. The working group shall:

(i) review the current state of public and private sector

communications systems capabilities, including technologies, facilities, and human resources;

(ii) identify public and private sector communication needs, potential users and investors;

(iii) determine public and private sector communication infrastructure needs and training requirements;

(iv) develop a corporate model and a financing plan for a Nunavut-wide communications network to serve the public sector, the private sector, and individuals; and

(v) prepare a comprehensive telecommunications strategy for Nunavut which will define what should be considered "basic services" and other services, and consider who might be partners that can provide the infrastructure.

3. The NIC recommends that the working group begin an inventory of existing facilities, equipment, antennas, satellite space segment needs and availability, etc. Care should be taken to identify any duplication of infrastructure, and recommendations should ensure compatibility of equipment and the standardization of protocols. Earth station power supply requirements should also be addressed.

4. The NIC recommends the working group develop plans for a single Nunavut wide network supported by standardized protocols.

5. The NIC recommends that a pilot project involving the three regional centres of Cambridge Bay, Iqaluit and Rankin Inlet be undertaken to demonstrate and test an appropriate telecommunications infrastructure and level of services with a view and timetable to linking the other eight communities with decentralized Nunavut Government headquarters functions to the Nunavut capital and regional centres by April 1, 1999, with the remaining communities to follow within two years. Guidance regarding community needs should be sought from the "Connecting the North Symposium" report.

6. The NIC recommends that the working group provide advice on training needs and the design of an appropriate training program. The NIC further recommends that GNWT provide and implement the training program in time to have a body of trained community based technicians in place for all communities with decentralized headquarters functions by April 1, 1999.

7. The NIC recommends that the GNWT and federal government, with Nunavut community participation, develop a regional economic development strategy to support the establishment and use of CTSCs for use by individuals, businesses and organizations, based on the issues and needs identified in the "Connecting the North Symposium"

report.

8. The NIC recommends that the federal government and the GNWT government collaborate on the design, use and costs of incorporating one stop shopping government service kiosks into CTSCs.

9. The NIC recommends that GNWT and federal government informatics strategies be designed to be compatible with public sector telecommunications capabilities, and if possible, with each other.

(iv) Concluding Remarks

Given the small population base and the vastness of the Nunavut Territory, a meeting of private and public sector needs through a blended and shared use of common telecommunications infrastructure, facilities and services is the only telecommunications strategy that makes sense. A network of CTSCs should be considered as a means of meeting the telecommunications needs of individuals, businesses, and organizations in the private and public sectors.

APPENDIX A

TABLES 1-7

TABLE 1
DISTRIBUTION OF TECHNICAL EQUIPMENT

Equipment	Number (in percentage)
Access to ordinary telephone network	100%[2]
Personal computers	100%
Printers	98.5%
Scanners	96.9%
Telefax	87.7%
Photocopier	83.1%
Access to databases	66.2%
Electronic mail	61.5%
Access to data network	47.7%
Access to satellite services	41.5%
Access to ISDN	20%
Videoconferencing facilities	9.2%
CD-rom	6.2%
Others (teleconferencing, videotex)	3.1%

Source: "Community Teleservice Centres: A means to social, cultural, and economic development of rural communities and low-income urban settlements". A paper presented to a "Conference on World Telecommunication Development" by Las Qvortrup, 1993, Table 2, page 7.

TABLE 2
NUMBER OF BUSINESS AND ECONOMIC DEVELOPMENT AGENCIES
SUPPORTED THROUGH THE NETWORK

Organization Type	Number of Organizations	Percentage of Total Organizations
Federal Government	4	1.6%
Provincial Government (includes ENL offices)	45	17.8%
Municipal Government	9	3.6%
Rural Development Associations	42	16.6%
Community Futures Committees	15	5.9%
Business Development Centres	11	4.3%
Other Core AENet Users (eg. W.E.B.)	26	10.3%
Private Sector	65	25.7%
Industry Associations	8	3.2%
Enterprise Education	17	6.7%
Out of Province	11	4.3%
Total	253	100.0%

Source: "Evaluation of the Canada/Newfoundland ACOA/Enterprise Network Cooperation Agreement" prepared for The Management Committee of the Canada/Newfoundland ACOA/Enterprise Network Cooperation Agreement (Brian J. Hurley Horizon Consulting Limited, February 1994, Table 3.1, page 23).

TABLE 3
PERCENTAGE OF USES BY ORGANIZATIONS

Product Type		Fed	Prov	Muni	RDA	CFC	BDC	Oth	Priv	Assoc	Ent Ed	Out	Total
Directories	6.3%	10.4%	8.2%	18.1%	8.3%	14.3%	8.4%	7.2%	5.9%	5.9%	16.7%	5.6%	7.9%
Opportunity ID	10.0%	16.8%	12.8%	9.3%	9.3%	9.7%	15.8%	13.7%	22.2%	4.4%	13.3%	7.4%	12.3%
Market & Finance Info	2.9%	10.0%	3.5%	3.1%	2.6%	4.6%	5.1%	5.7%	6.5%	3.2%	6.7%	1.9%	3.9%
Library/Research	18.3%	47.9%	22.8%	18.9%	7.4%	13.7%	15.8%	11.7%	11.3%	7.1%	36.7%	7.4%	17.6%
Communication Tools	36.1%	10.7%	34.6%	48.9%	70.8%	56.4%	54.9%	60.1%	52.4%	78.9%	26.7%	72.2%	45.8%
About AENet	0.6%	4.3%	0.9%	1.8%	1.7%	1.3%	0.0%	1.6%	1.7%	0.5%	0.0%	5.6%	1.2%
Other	25.9%	0.0%	17.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	11.3%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100.0%

Percentage of uses by product

Product Type		Fed	Prov	Muni	RDA	CFC	BDC	Oth	Priv	Assoc	Ent Ed	Out	Total
Directories	11.8%	2.0%	44.6%	2.9%	13.8%	4.6%	1.3%	12.7%	4.1%	1.7%	0.4%	0.2%	100.0%
Opportunity ID	12.1%	2.1%	44.9%	1.0%	9.9%	2.0%	1.5%	15.4%	9.8%	0.8%	0.2%	0.2%	100.0%
Market & Finance Info	11.2%	4.0%	38.6%	1.0%	8.9%	3.0%	1.6%	20.5%	9.0%	1.9%	0.3%	0.1%	100.0%
Library/Research	15.5%	4.3%	56.1%	1.4%	5.6%	2.0%	1.1%	9.2%	3.5%	0.9%	0.3%	0.1%	100.0%
Communication Tools	11.8%	0.4%	32.6%	1.4%	20.4%	3.1%	1.4%	18.3%	6.2%	3.9%	0.1%	0.5%	100.0%
About AENet	7.6%	5.7%	34.3%	1.9%	18.6%	2.9%	0.0%	18.6%	8.1%	1.0%	0.0%	1.4%	100.0%
Other	34.3%	0.0%	65.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Total	14.9%	1.6%	43.2%	1.3%	13.2%	2.5%	1.2%	13.9%	5.5%	2.3%	0.2%	0.3%	100.0%

Column Legend:
Fed - Federal Government
Prov - Provincial Government
Muni - Municipal Government
RDA - Rural Development Associations
CFC - Community Futures Committees
BDC - Business Development Centres
Oth - Other Core Users (eg. WEB)
Priv - Private Sector
Assoc - Industry Associations
Ent Ed - Enterprise Education
Out - Out of Province

Source: "Evaluation of the Canada/Newfoundland ACOA/Enterprise Network Cooperation Agreement" prepared for The Management Committee of the Canada/Newfoundland ACOA/Enterprise Network Cooperation Agreement (Brian J. Hurley Horizon Consulting Limited, February 1994, Table 5.2, page 32).

TABLE 4
NUMBER OF USERS TRAINED BY ORGANIZATIONAL TYPE

Organization Type	Number of Users Trained	Total Number of Users	Percentage of Users Trained
Federal Government	23	41	56.10%
Provincial Government (includes ENL offices)	161	233	69.10%
Municipal Government	7	13	53.8%
Rural Development Associations	62	73	84.93%
Community Futures Committees	22	26	84.62%
Business Development Centres	26	26	100.00%
Other Core AENet Users (eg. W.E.B.)	62	79	78.48%
Private Sector	41	80	51.25%
Industry Associations	11	17	64.71%
Enterprise Education	14	18	77.78%
Out of Province	8	18	44.44%
Other	20	41	48.78%
Total	457	665	68.72%

Source: "Evaluation of the Canada/Newfoundland ACOA/Enterprise Network Cooperation Agreement" prepared for The Management Committee of the Canada/Newfoundland ACOA/Enterprise Network Cooperation Agreement (Brian J. Hurley Horizon Consulting Limited, February 1994, Table 8.1, page 45).

TABLE 5
FIS TRAVEL EXPENDITURES BY DEPARTMENT AND TYPE (1992/93)

Department	TYPE OF TRAVEL EXPENDITURE								
	Airfare	Fire Suppression	Annual Assistance	Meals & Accomm.	Other Charters	Ambulance	Ground Transport.	Other Types	TOTALS
Health	16,891	0	0	143	19	3,209	11	(1,372)	18,901
Personnel	8,060	0	8,023	231	84	0	246	1,757	18,401
Renewable Resources	734	9,399	0	700	2,213	0	71	217	13,334
Education	1,733	0	0	327	136	0	666	227	3,089
Social Services	1,742	0	2	653	106	11	101	240	2,855
Justice	805	0	0	609	1,101	4	53	134	2,606
Gov't Serv./Public Works	739	0	15	706	410	0	23	7	1,900
MACA	783	1	0	868	110	0	15	32	1,819
Transportation	488	0	0	657	210	0	18	33	1,406
Economic Development	540	0	0	483	142	1	68	103	1,337
Executive	566	0	0	327	160	0	32	127	1,212
Legislative Assembly	675	0	0	217	101	0	33	4	1,030
Safety & Public Services	301	0	2	223	19	0	14	2	561
EM&PR	109	0	3	64	92	0	1	54	323
Culture & Commun.	152	0	0	116	4	0	4	3	278
Finance	84	0	0	71	2	0	0	2	159
Other Programs	551	0	34	220	64	0	6	224	1,099
TOTALS	34,963	9,400	8,079	6,514	4,973	3,225	1,362	1,794	70,310

Source: Government of the Northwest Territories: Travel Management Project, 1994, page 6.

TABLE 6
TOTAL SYSTEM COSTS

	Capital Costs ($ million)				Recurring Costs ($ million/yr)					
					Satellite		Local	Amort.	Provider	Total
	Hub + Earth Stations	Terminal Equipment	Network Management System	Total System Capital Cost for 96 Communities	Space Segment	Oper. & Maint.	Admin. & Maint.	multiple classes (5 & 10 years)	Margin @ 10%	
Service Level Offering:										
1- receive high quality video & originate/receive data (incl. Internet), voice, highly-compressed video/image, multimedia @ 144Kbps	7.35	1.08	1.07	9.50	1.50	0.60	1.20	1.06	0.48	4.84
2- receive high quality video & originate data (incl. Internet), voice, good-quality video/image, multimedia @ 384Kbps	9.37	3.48	1.07	13.92	3.50	0.80	1.80	1.74	0.87	8.71
3- fully interactive (originate/receive), high-quality video & multimedia, data (incl. Internet), voice @ 1.544Mbps	13.21	4.44	1.07	18.72	12.00	1.00	1.80	2.32	1.90	19.02

Source: "TVNC Subsidiary Business Plan Draft Final Report", Nordicity Group Ltd., June 6, 1995, Exhibit 3-4, page 27.

TABLE 7
IMPACTS AND APPLICATION OF CTSCs
ACCOMMODATION, TECHNOLOGY, COSTS AND STAKEHOLDER CONSIDERATIONS

Impact	Description	Accommodation requirements	Technology	Other Issues/ Cost Implications	Stakeholders
Government - GN - Federal - Community	• Information centre • Distance "government – i.e. taxation, social services, grants, drivers license renewal • Contracting	• Office facilities • walk-up computer desks • Kiosk space • Resource materials	• Computers • video-con • kiosk • networks • modems • satellite link • Internet • Fax	• Coordinating different levels of government • Appropriate connections to service delivery • Co-location • Sharing FTEs • Training • Technology Costs	• Nunavut Gov't • Federal OGD's • Communities
Inter-community Networking	• Gathering place for community • inter-community networking • Daycare	• Meeting space for large and small groups • Kitchen facilities • Lounge areas • Daycare facilities • Accessible	• Computers • Video-con • E-Mail • LAN/WAN • ISDN • Databases • Internet	• Should be fully accessible • Braille, audio services, etc...	• NIC • NTI • Interim Comm. • Communities
Education and Training	• Distance education from Arctic college/Southern universities • On-sight computer training	• Training rooms • Video-con. room • Resource centre	• Video-con. • BTV • Desk-top computers • Various software/ hardware	• Partnerships with education institutions • Technology Costs	• Arctic College • Other Universitie • NIC • Training Council • Communities
Tele-Medicine	• Medical delivery via. telecom., • Diagnoses possible on video-con., electronic x-rays, vital signs, etc. • Health care prof. on-sight	• Health room • Private room • Accessibility	• X-Ray • Video-con. • Telecon. • Other medical	• Technology costs (travel avoidance) • Training • Partnerships	• Medical prof. • Hospitals • Community • NIC/NTI
Economic Development	• Pooling resources for computers/ technology • Training • Support services (i.e. business consulting, admin. support) • Distance employment • Access to other markets through Internet • Provides office space	• Office space - closed and open • Meeting facilities • Video-con. • Training space • Resource Centre • Process space • Storage • Kitchen facilities	• Fax • Databases • Video-con. • Internet • Computers • LAN/WAN • Telephone/ Modem	• Form partnerships with local enterprises • What are their needs? • Cost Recovery	• NTI • NIC • Communities • Practitioners • CIO

Source: Community TeleService Centres for Nunavut: Linking Information Technology and Facilities. Draft Discussion Paper. Prepared by Deborah Doane. PWGSC. June 6, 1995. Table 1.

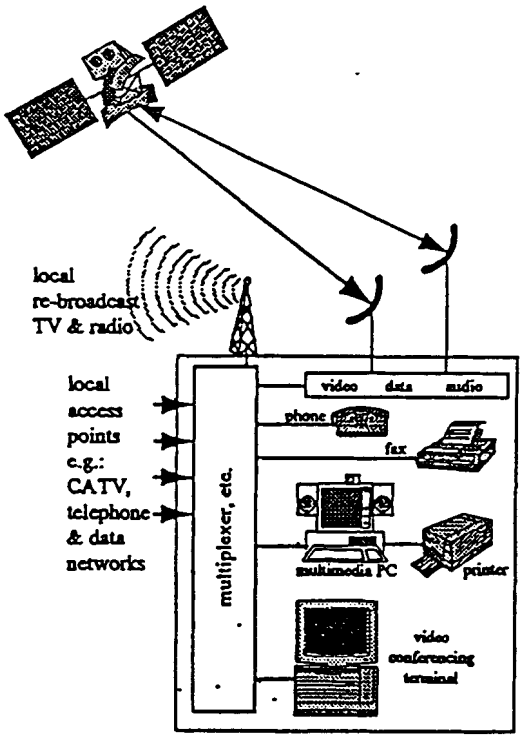
APPENDIX B

FIGURE 1

FIGURE 1 Service Level Two

FIGURE 1
SERVICE LEVEL TWO

Bidirectional 384 Kbps Transmission
+
Point-Multipoint Broadcast



Supports:

Simultaneous Two-Way (send & receive)		One-Way (shared receive only)
- toll-grade voice (telephone quality) - packet data (shared screen/GUI)) - circuit-mode data (G4 Fax, image) - video conference-quality video - high resolution graphics - multimedia	+	- CD-quality audio - VCR quality video - wideband data (~<500Kbps) - combination of above (w/reduced BW)

Source: TVNC Subsidiary Business Plan Draft Final Report: Prepared for Television Northern Canada by Nordicity Group Ltd. July 6, 1995, Exhibit 3-2, page 23.

APPENDIX C
CURRENT EXAMPLES OF TELECOMMUNICATIONS APPLICATIONS AND BENEFITS

British Columbia

Alberta

Saskatchewan

Manitoba

Ontario

Quebec

New Brunswick

Nova Scotia and
Prince Edward Island

Newfoundland

Stentor

MediaLinx Interactive Inc.

Information Highway Networks

Source: "The Beacon Report: Telcos and the Emerging Multimedia Market in Canada; summary of trials, applications and networks". (Stentor, July, 1995.)

British Columbia

UBIQUITY

ATM services in Canada were pioneered by MPR Teltech Ltd., the research & development (R&D) subsidiary of BC TELECOM Inc. Its affiliate company, BC TEL Advanced Communications, introduced the world's first commercially available ATM service —*The Ubiquity Network* — in 1992. Now extending around the province — from the Lower Mainland to the interior and to Vancouver Island — Ubiquity links most of the major urban areas in British Columbia. Services are delivered through a combination of fibre-optic, optical interface electronics and ATM switching technology, at speeds 10,000 times faster than with a modem link over an ordinary telephone line. To date, more than $35 million has been invested in the province-wide fibre optic network using ATM technology.

Business

Among the groups benefitting from Ubiquity are stock brokerage houses. Since February 1995, the Vancouver Stock Exchange and stock brokerage houses in the Lower Mainland have been connected through this high speed network, making the fast exchange of data and information possible.

Pacific Coast Savings Union has established a disaster recovery plan that is unparalleled in Canada, with the assistance of BC TEL Advanced Communications' high-speed fibre optic network. The disaster recovery plan employs two data centres, at two separate locations, connected by fibre optics, which can update each other simultaneously. If something happens to the primary data centre, all records and information are preserved by the second data centre.

Health care

In November 1994, B.C. InfoHealth (BCIH) and BC TEL Advanced Communications announced a memorandum of understanding to form a joint venture that will deliver computerized, information-related services to the health care industry under a separate company. The new company will provide payroll and related information services to existing BCIH customers, and use new development tools and advanced telecommunications to enhance services to both new and existing customers.

Education

In distance learning, the Ubiquity network enables teleconferencing, remote access to seminars and lectures, and professional consultation among educators across a range of curricula at a number of locations. The service includes applications such as high-resolution video conferencing for training seminars, and video imaging and transmission for simultaneous observation and discussion. Through the Coast Hotel chain, videoconferencing services are available to groups throughout the province.

Research

Rnet BC has launched a broadband, fibre-optic network that can carry voice, data and video at 100 megabits -- or 100 million bits of information -- per second to the desktop. Rnet was implemented in late summer 1994, and joins three major Vancouver hospitals, Simon Fraser University, University of British Columbia, MPR Teltech, B.C. Systems Corp., BC TEL and several other technology companies that want to connect to test broadband applications. BC TEL Advanced Communications helped Rnet become operational by providing the connection to its province-wide ATM fibre-optic network.

Discovery Learning Services

Discovery Learning Services, part of BC TEL Advanced Communications, offers the Community Connections Network (CCN). CCN is a two-way, fibre-optic interactive multimedia learning network which will electronically link a number of schools, colleges and universities to remote learning centres, including the Royal British Columbia Museum and Science World.

Internet

Full Internet access for schools will soon also be available via CCN. The first phase involves an investment of $5 million. In the future, virtually all educational centres, homes, businesses and community centres will be linked as part of BC TELECOM's $1.2 billion investment in The Beacon Initiative.

Financial services

In 1994, BC TEL Advanced Communications conducted a trial of interactive home banking, in partnership with Vancouver City Savings Credit Union (VanCity). The Teleview trial allowed 100 credit union members to pay their bills, access account information, transfer funds between accounts, make RRSP contributions and get credit union product and service information. Customers found Teleview easy to use and beneficial. This service was launched publically in June, 1995. Ten to twenty thousand customers are expected to be actively using the service by the end of 1996.

Concord Pacific Place

Concord Pacific Place introduces visionary concepts in urban living on Vancouver's waterfront. Within the enclosed real-estate development, using Northern Telecom's *FiberWorld* technology, BC TELECOM has joined with Concord's developers in Pacific Place Developments to create North America's first fibre-optic community. Residents of this community are being offered the ultimate in personal communications, information, entertainment, security and environment control. In addition, Pacific Place Communications provides one of the most comprehensive television line-ups using SMATV. The Concord Pacific site also offers video conference capabilities, placing it among an increasing number of centres around the province and across North America which offer this convenient service.

Travel kiosk

The Information Highway is speeding tourist information to Whistler guests, with the launch of Discover Whistler. Interactive information kiosks and specialized hotel guest channels are part of a joint tourism initiative by BC TEL Advanced Communications and Nexus Display Systems, in conjunction with the Whistler Resort Association.

The first phase of Discover Whistler brings touch-activated video kiosks to the lobbies of a number of the larger hotels in Whistler. The kiosks will allow tourists to access tourism information and to make restaurant and activity reservations. Key hotels include the Crystal Lodge, the Delta Whistler Resort, the Fairways Hotel & Resort, the Westbrook Whistler, Radisson Blackcomb Suites and the Tantalus Lodge.

In addition to information kiosks, guests at Discover Whistler partner hotels will be able to obtain information geared specifically for them on special guest channels on their hotel room television sets. The Discover Whistler Guest Channel includes hotel information, weather and mountain updates, information about the Whistler Resort area, as well as where to go and what to see in Whistler Village. Without getting out of bed, guests can choose where to ski, shop and dine. Later, on their way out of the hotel, they can make dinner reservations at the kiosk before hitting the slopes.

Cellular Digital Packet Data (CDPD)

MPR Teltech is a leading expert in the cellular industry and is refining the transmission of digital data and video over existing cellular networks. Cellular Digital Packet Data (CDPD) enables users to exchange data quickly and efficiently at relatively low cost. Applications are virtually limitless:

- a vending machine reports to a central computer that it is out-of change;
- a rural doctor monitors changes in a patient's medical chart via a laptop computer with a real-time link to a hospital 200 miles away; and
- an executive receives a beep from her laptop as she drives to her next presentation alerting her to a message from her president indicating he will be joining her.

Alberta

Remote Consultative Network

AGT Limited, a subsidiary of TELUS, is a partner in two leading health networks. The Remote Consultative Network allows interactive consultation services between rural health care providers and specialists at the University of Calgary. The network enables physicians, technicians, nurses and residents to use audio, video, imaging and data transmission services to respond to queries. Real-time transmission of ultrasound, x-ray, and other test results facilitates diagnosis by specialists in larger urban facilities and reduces time for diagnosis and treatments. As well, it has enormous potential in terms of bringing cost savings in patient transportation. AGT donated a telecommunications link to trial the technology at street level during the Stampede parade. Another street trial is planned to take place during the World Police and Fire Games in June 1997.

Alberta Health Knowledge Network

The Alberta Health Knowledge Network provides health care professionals throughout the province with on-line access to medical databases. The network links the University of Alberta and the University of Calgary to databases such as *Medline*, which contains seven million records from 3,500 journals. The program's top priority is linking the universities with local hospitals and later making it available over provincial networks.

Alberta Educational Technology Research Foundation

The Alberta Educational Technology Research Foundation (AETRF) is conducting research on using information technologies to improve the delivery of education in the kindergarten to Grade 12 (K-12) segment. There are four focus areas: improving the link between home and school; special needs, including disabled as well as gifted students; development of an information management system for K-12, and the use of video and screen-sharing technology between classrooms.

Lacombe School District

Since 1993, the Lacombe School District has been employing Visual Interactive Technology (VISIT) for teachers with special training requirements (such as Japanese and advanced mathematics) to instruct students remotely in schools throughout the district. VISIT, launched two years ago, is a desktop multimedia system, developed by Northern Telecom, a subsidiary of BCE Inc., that integrates desktop video conferencing, screen sharing, high-speed file transfer, electronic voice mail access and voice call management on a desktop PC.

Saskatchewan

Community Fibre System

Three years ago, SaskTel completed the installation of a community fibre system between a Regina high school, a local elementary school, and 172 homes. It allows students to use the multimedia network to supplement their classroom activities and obtain remote access to video material.

Hollywood-to-the-Home

Two years ago, approximately 200 households in Regina participated in a near video-on-demand trial—a first in the world— in which current movies are available to participants via their television sets and a special remote control device. With *Hollywood-to-the-Home*, a viewer's rental request is transmitted to Acme Video, a video-rental chain, and in less than five minutes the selection appears on the home screen. Viewers enjoy the added benefit of being able to fast forward, reverse, or pause the movie selection.

Hospitality Network Canada Inc. and Nintendo

In cooperation with Hospitality Network Canada Inc. and Nintendo, SaskTel will soon be operating a closed circuit movie service in a limited number of hotels/motels in Saskatchewan. This service combines the use of fibre/coax cable with regular telephone lines, to allow for video game functionality in a hotel room. This leading edge technology is a pre-cursor of expanded interactive in-room services for the hotel/motel industry and has caught the interest of hoteliers in international venues in North and Central America. This service is fully interactive. The video game itself is not down-loaded to a game player. Rather, the player communicates directly with the central computer via the phone line and watches the interaction remotely on the closed circuit television.

Eston-Elrose School Division

In distance learning, video conferencing has been in use in Saskatchewan's Eston-Elrose School Division since 1991, enabling teachers to conduct a class from one location for students in two separate communities.

Special Needs trial

With the support of computer-based video/audio conferencing, a Special Needs trial was conducted last year for students and their teachers in six Saskatoon schools to communicate in real-time with counterparts at four Mississauga schools, as well as with mentors across North America.

Manitoba

Provincial Backbone Network

On February 15, 1995 MTS and the Government of Manitoba announced the development of a new provincial backbone network, the platform for Manitoba's information highway. The network, consisting of fibre optics, digital switching, and leading edge ATM technology, is being deployed through most of Manitoba. The network will increase access to government, medical, and distance education services, the Internet, and many future services such as home shopping and telebanking, as well as entertainment options. Also, the network, in combination with toll free calling areas, has allowed MTS to provide local Internet Access to many communities in Manitoba.

Evergreen School Division

Interactive television is currently being used by teachers in Manitoba's Evergreen School Division to send courses to students in rural schools. Prior to 1993, students had to travel at least an hour to larger urban schools to take these courses. Evergreen's technological push was born to address declining enrollments and the rejection of a proposed merger of area high schools. The fibre-optic network now links high schools in the communities of Gimli, Arbor, Riverton and Fisher Branch. The Evergreen division now foresees rural students taking university or college level courses without leaving home.

Interactive Video Courses

Brandon University and the Swan River Regional Secondary School are using MTS' ATM technology to conduct interactive courses for their distance education program.

Manitoba Network

Another distance education application in Manitoba links northern communities to the south. It is planning to migrate the narrowband two-way video service to ATM which would allow for multi-channel, point-to-point switched video conferencing and future expansion into applications for government services and the business sector.

Birds Hill School Division / VISIT

Birds Hill School Division is using VISIT to connect with schools; universities and businesses. For example, they connected a classroom to Spar Aerospace in Toronto via computer, enabling an engineer to explain Canada's role in the Space Station.

Ontario

VISIT

In September, 1993, Bell Canada, NB Tel and Northern Telecom announced plans to deliver a wide range of multimedia applications based on Northern Telecom's VISIT (Visual Interactive Technology) family of products. VISIT products permit users to share computer screens, transfer files and conduct videoconferences from their computers, at home, in the office or on the road. The partners unveiled seven new multimedia applications, including:

- VISIT Home Office, multimedia videoconferencing for home-based telecommuters;
- Private 9-1-1, emergency assistance for university campuses and office complexes, linked to the public 9-1-1 emergency service;
- Multimedia Transaction, multimedia kiosks;
- Portable VISIT, providing the features of the VISIT Home Office anywhere, via public telephone networks or cellular networks;
- Bill 2000/VISIT Post, a high-speed electronic courier and PC-based application that allows businesses to analyze their telephone usage and billing data; and
- VISIT Bridge, videoconferencing from a desktop computer to multiple locations worldwide simultaneously.

LARGnet

LARGnet is a three year project to develop a high-speed ATM / fibre optic linkage of five institutions in London, Ontario, including two hospitals and the University of Western Ontario. Now beginning its second year, the trial is testing ATM technology with medical, educational and administrative applications.

LARG*health

A spin-off of LARGnet, LARG*health is a computer based information network linking health care givers and institutions. It is designed to provide seamless service, eliminate duplication and delay and ultimately help patients become more involved in their own health care. London's three hospitals are key players. Others include nursing homes, family doctors, specialists and other care-givers. The system is expected to aid in hospital policy planning, management and clinical research. The service will provide video conferencing, two-way education and exchange of diagnostic information. Emergency room staff in hospitals will have records of diagnosed conditions, medication, and previous visits to medical facilities. Bell Canada provides the fibre optics hardware for the information exchange.

HealthLink

HealthLink is a trial project planned to begin in late 1995. It will interconnect seven Toronto hospitals with a network for sharing medical information, such as medical records and images. Technology partners include Digital Equipment Corp., the Ontario government, and CMR. Long term plans include linking to LARGnet in London, Ontario and other medical facilities in the Toronto area. The project will guarantee patient confidentiality and ensure that only medical personnel with security clearance have access to patient records.

Connecting Yukon

Northwestel, in partnership with the Communications Research Centre (CRC), the University of Ottawa Heart Institute (OHI) and Yukon College, will be using multimedia broadband communications over satellite to demonstrate medical and educational applications that may one day become standard features of the information highway.

In the first demonstration, which took place on July 6 1995, the OHI staged a 30 minute demo for Whitehorse doctors who could remotely monitor a prototype artificial heart. The doctors could consult with one another in real time through the full motion video capabilities of the multimedia workstations.

Centennial College

Bell Canada, in partnership with Centennial College, began a six month trial in May 1995 to offer dial-up Internet access on a trial basis to customers in the 416 area code, for six months beginning May 1, 1995. This trial will determine customer demand for this type of access, and how best to serve customer needs.

Ease of use will be paramount to the trial. Billing and tracking of the service will be handled by Bell, with the charges appearing on the customer's monthly telephone bill. For customers wishing to receive this service, they simply have to call one unique seven-digit number to make arrangements from anywhere in the 416 area code. The cost of this service will be approximately $30 per month.

Intercom Ontario

Intercom Ontario is a consortium of public and private organizations that includes Bell Canada, governments, broadcasters, computer companies, real estate developers, universities, museums, educators, retailers, and members of the health industry. The consortium is building a 'smart city' or 'city of the future' in Newmarket, Ontario. During the course of the four year trial, 300 homes in Newmarket will link their computers, televisions and wireless communicators to libraries, museums, government offices, to access video, music, pictures, computer files, games, transactions, etc.

Orangeville / River Oaks Project

The River Oaks development company is working with Bell and Shaw Cable to interconnect 70-80 new homes in the Montgomery housing development with the local high school using an Ethernet Local Area Network (LAN). The Orangeville switching centre has full ISDN capability, making Orangeville the first community in Canada to have such capability.

Queens University Distance Learning

Bell and Queens University are jointly operating a distance learning program involving 79 students from across Canada. The students are using multi-point videoconferencing facilities in their home locations to participate in MBA lectures given in Ottawa. This is a customer solution already in service, not a trial.

Bell is also in the process of organizing a research project with Queens University to develop generic models for distance learning using new applications of information technology. Bell is providing telecommunication support for the project, as well as financial and personnel assistance. If an application for additional funding from the Ontario University Research Incentive Fund is successful, the project will begin in December 1995 and conclude in mid 1996.

Baynet Project

The North Bay community initiated the Baynet project to develop a broadband network connecting local government, hospitals, local college and businesses to help reduce costs and create jobs. Bell is working with the local economic development team to finalize a business plan and obtain a financial commitment from the municipality. Similar projects in less advanced stages are being explored with the municipalities of London and Kitchener/Waterloo.

George Brown College

In July 1995, the Bell Canada Centre for Distance Education at George Brown College in Toronto opens for classes. A joint venture between the College and Bell, the Centre will help instructors and students benefit from interactive technology. It will use curriculum developed at the Teletraining Institute at Oklahoma State University -- a world leader in distance education -- to teach people how to design and deliver distance education courses using Video Conferencing and related technology. The Centre will be a living laboratory comprised of two learning labs, two electronic classrooms, presentation studios, edit suites and a multimedia lab. For more information about the Bell Centre for Distance Education at George Brown College, call the information hotline at: 1 800 413-2588.

Highway 407 Electronic Toll System

Bell and Bell Sygma have recently bid to build a fully electronic tolling system for the new Highway 407 which spans metropolitan Toronto. Bell is proposing a SONET and ATM network circling the highway to collect video records of automobiles that do not have the appropriate on-board electronics indicating they have paid their tolls. There are two aspect to the proposal -- first, the provisioning of equipment, and second, the operation and billing of the system. Bell's partner in this venture is Hughes Aircraft from California.

Real Estate

For some time, MPR Teltech Ltd., the research & development (R&D) subsidiary of BC TELECOM Inc., has been working in the area of video and multimedia on demand, developing custom applications for various markets. In an Ottawa trial in 1992, **Royal LePage**, the national real estate brokerage chain, used an MPR-developed system to help home buyers narrow the search for their dream home without leaving the real estate office.

The service is currently operational in Royal LePage offices in Ottawa and Toronto, plus two shopping malls. Using ***Infohome 2000***, prospective buyers can scan coloured photographs of available homes, photographs of adjacent homes, and regional maps depicting the location of the home and its proximity to schools, shopping and other amenities. Plans call for the evolution of this system into a national network, allowing interested buyers to use the system to view available listings in any community in the country. The company is also exploring with MPR Teltech the possibility of giving real estate agents access from their cars over a wireless network.

Quebec

Hôtel Dieu (Montreal) and Centre hospitalier Cochin de Paris

On Wednesday, November 23, 1994 a test was successfully performed between the Hôtel Dieu in Montreal and Paris to transmit X-rays. Doctors in both countries were able to share information and consult by seeing the same X-rays at the same time. This new technology permitted the team of doctors to exchange expertise in the area of research and treatment of hormonal illnesses. Bell provided six microlink lines and the test was conducted on Bell's network. Doctors in Chicoutimi and Trois-Rivières used Bell's video-conferencing services to view the event.

In February 1995, surgery was performed at the Hôtel Dieu in Montreal with the assistance of doctors in Paris. This surgery was filmed and presented at the G7 Conference held in Brussels at the end of February, 1995.

Quebec Hospital Trial

In Quebec, a three phase trial using ATM and fibre optic technology is underway that reduces the time and improves the quality of transmitting X-ray, mammography and Magnetic Resonance Imaging (MRI) images between various institutions in the hospital community. The trial began in Montreal with the Montreal Cardiology Institute and St. Luc Hospital with plans to expand to the rest of Quebec, and later to hospitals in Toronto. Other hospitals involved in Quebec include CHRR Rimouski, CHUL in Quebec, Maisonneuve-Rosemont, and Joliette. This is a joint venture between Bell Canada and Québec-Téléphone.

VISIT (Université de Québec)

The VISIT system for video conferencing has been installed in the offices of Université de Québec executives in Montreal, Chicoutimi and Trois-Rivieres. Bell is also proposing the installation of broadband technology at the Université de Québec to support the introduction of "tele-education" between campuses. A co-writing trial will be held between a literature professor and a publisher during 1995.

Provincial Courts service

Lawyers, their clients, and judges are now able to use Québec-Téléphone and Bell's public videoconference facilities and phone lines for remote trial appearances. They are being used on a regular basis and response has been very positive. The service has also been used by the Québec Court of appeal.

CallMall

Six hundred Bell Canada customers in Sherbrooke have taken a first step on the information highway as part of a pilot project to provide home access to information and transactional services. The services are available through a new telephone set equipped with a display screen (Nortel's Vista 350). During the pilot project called CallMall, which ran from April 10 to July 31, 1995, Bell collaborated with four partners -- Northern Telecom, New North Media, Tele-Direct and CentreSource.

Participating customers had access to the products and services of some 15 businesses operating in diverse sectors such as: banking, lotteries, retail sales, postal services, legal services, and travel. As a result, customers participating in the project had direct access, through their home phone, to such things as banking services, lottery results, listings of movies and cultural events in Sherbrooke and elsewhere in Quebec, local and national news, and personalized or prerecorded legal advice, depending on their individual needs. Approximately 150 Sherbrooke businesses also participated as advertisers.

L'Université du Québec à Rimouski Distance Learning

Québec-Téléphone has established partnerships with l'Université du Québec à Rimouski and regional school boards to deliver distance learning programs at the university, technical and K-12 level in remote areas.

New Brunswick

NBTel, along with the Province of New Brunswick, Northern Telecom and other partners are positioning New Brunswick as a leader in the telecommunications industry. New Brunswick leads in a range of services, from universally available residence voice mail services, to elementary schools all connected to the Internet, to approximately 20 call centres bringing jobs and investment to the province.

Electronic delivery of public services

NBTel is working closely with the government in the delivery of electronic applications of public services. Digital on-line property mapping allows businesses to scan deeds province-wide through a service developed by NBTel for the provincial government. Plans are to link NBTel's *TalkMail* to a new service called *NBAlert* which would disseminate evacuation messages in the event of a disaster. NBTel and Anderson Consulting, with the provincial government, have developed a database and support system for a province-wide, Emergency 911 service, to become fully operational by the end of 1996.

Electronic Kiosk

NBTel, in conjunction with North Communications (Canada) Ltd. and the Province of New Brunswick, also launched the first ever multi-tenant electronic kiosk service in Canada. The Info/New Brunswick kiosks -- located in malls, grocery stores and gas stations -- are equipped with a full-motion video screen, graphics and english and french audio. Kiosks enable the general public to renew vehicle registrations, purchase hunting and fishing licenses, access government information, review their telephone bills and activate a wide range of calling features on their telephone lines.

Health care distance education program

Sixty-one hospitals in eight regions of the province are using a health network. Hospitals within the same region share one centralized data base for financial, purchasing and patient care information. In addition, a health care distance education program is using advanced communications applications to train ambulance drivers and other health care professionals.

PharmaPhone

Rural residents no longer have to travel miles to the nearest pharmacy for prescription drugs. *PharmaPhone*, a kiosk system that incorporates video and telephone connections, enables an urban pharmacist to see-and talk to a remote customer. Using VISIT, the system was developed by Northern Telecom for MEDITrust (a mail-order pharmacy company based in Ontario). A pharmacist can scan the customer's prescription and offer advice. Transactions are completed through a standard "credit card swipe" device. Orders are then delivered directly to customers via courier.

Broadband multimedia network

In June 1995, NBTel and Northern Telecom unveiled plans for the next era of telecommunications services. The two companies signed a $300 million memorandum of understanding to develop a broadband multimedia network to serve the province. By late 1996, more than 26,000 homes and 10,000 businesses in New Brunswick will have access to broadband communications. This will expand to over 60 per cent of the province's homes and businesses by 1999.

Customers will use a set-top box or multimedia controller to access such services as: educational multimedia-on-demand; home-shopping; on-screen telephone features; display-based marketing; government services; health biling; multimedia *TalkMail*; telecommuting and work-at-home; videoconferencing; on-line information access, and business data networking.

As system integrator, Northern Telecom will provide project management for the development of the broadband network. The development will involve the construction of a fibre/coaxial network to allow two-way interactive broadband communication. NBTel will be the first carrier to use the Magellan Concorde, the latest and largest capacity member in the Northern Telecom Magellan family of ATM switches.

CallMall

CallMall, by New North Media, is a joint venture of Bruncor and Northern Telecom. *CallMall* uses an advanced screen telephone, the Vista 350, which was developed and made in Canada by Northern Telecom. The eight-line display screen is used to deliver a variety of services to customer's homes including home banking, electronic shopping and community messages. New North Media officials are working with governments to enable citizens to access public information services from home.

CallMall is also a new advertising and information channel that allows customers to request and receive only the information they want, giving them full control and choice. Currently more than 75 service providers and partners are using CallMall to market their products and services such as Canada Trust and Tele-Direct (Services Inc.) and international companies such The Body Shop and CentreSource Inc. that brings with it suppliers such as Lands' End, Sears Canada Inc. and Regal Greetings and Gifts.

Nova Scotia & Prince Edward Island

Izaak Walton Killam Hospital for Children

At the Izaak Walton Killam Hospital for Children in Halifax, medical practitioners use MT&T's remote diagnostics system to examine young patients in their own community hospital. The system incorporates video depicting full-motion images of the heart and a speaker phone for the doctors and technicians. The telecommunications link saves the health care system the cost of transporting the patients for diagnosis, while extending the benefit of the Halifax-based cardiac unit to hospitals throughout the Maritimes. The families benefit as well by not having the stress of traveling with an ill child.

College L'Acadie

In September, 1992, MT&T provided the technology for french-language distance education to Acadian and Francophone regions of Nova Scotia. MT&T developed a digital audio network that also combines personal computers and real-time video conferencing. College L'Acadie links six small learning centres around the province, making French-language learning a reality that would not otherwise be affordable for those communities.

Nantucket trial

A multimedia market trial is taking place in Dartmouth, Nova Scotia. In the Nantucket trial, residents of a 200-home subdivision have access to VOD, audio jukeboxes, home delivery and messaging services. Applications in home banking, government sales, lotteries and ticket sales will also become available in 1995.

Teledemocracy™

MT&T Technologies, a wholly owned subsidiary of MT&T, is the first company in the world to offer Teledemocracy™ services. Teledemocracy enables citizens or members of an organization to vote in an election using the telephone. In 1994, MT&T conducted the first election of a national party leader as well as the first electronic referendum in a federal constituency. The National Party of Canada elected both its leader and president using the televoting system. Liberal MP Ted White conducted an electronic referendum on the federal *Young Offenders Act*, querying constituents in his North Vancouver riding. The Progressive Conservative Party in Saskatchewan elected its new leader through the telephone system as did members of the Alberta Liberal Party. The Liberal Party of British Columbia also chose the system to elect its new leader in September 1993 following upon the Nova Scotia Liberal Party leadership televote in June 1992.

Newfoundland

Memorial University

Newfoundland Telephone and Memorial University have combined efforts on several communications projects, driven in many cases by the geographic challenges. Memorial University, in concert with Newfoundland Telephone, has developed its own teleconference centre that has grown into one of the most sophisticated systems in North America.

Another recent joint project linked the university campuses and two tertiary care hospitals in St. John's and Corner Brook. Multiple voice and data signals sent at high speeds over long distances permit the use of compressed video in educational settings, teleconsulting, and the transmission of complex medical diagnostic images.

Newfoundland Telephone is providing technical and marketing support to Memorial University which introduced a special topics course within its MBA program, to evaluate distance technology. It has also teamed up with Northern Telecom to test educational applications associated with the use of VISIT. Two VISIT systems in remote locations are connected through communications lines, permitting educators to trouble shoot, collaborate on projects, and design programs, saving time and travel costs.

Telemedicine Network

The Telemedicine Network operates in approximately 207 sites located in health centres, community colleges, high schools, university campuses and government buildings, and links approximately 120 communities within the province. Telewriters enable the exchange of freehand writing and computer graphics via personal computers and special modems which allow simultaneous transmission of voice and data on the same telephone line, a feature mainly used in teaching courses.

Integrated Rural Delivery Network

The Integrated Rural Delivery Network (IRDN), a consortium of Telecommunications In Health and Learning Inc., Newfoundland Telephone, Compusult Ltd., the Telemedicine and Educational Technology Resources Agency, and the Enterprise Network Inc., is a field technology trial to provide solutions customized to rural clients' needs for integration of varied network models. The technology is unique in its application to rural environments where bandwidth availability is more limited than in metropolitan areas.

Stentor

National Aviation Museum Kiosk Trial

The National Aviation Museum—with the assistance of Stentor, the Canadian Heritage Information Network, MPR Teltech, Digital Renaissance and Kodak, launched the *Silver Dart Project*—an on-line multimedia electronic aviation encyclopedia for museum patrons. For the first time in any Canadian museum, an electronic encyclopedia provides users with an easily accessible database containing sound, moving images, information on aircraft, and famous aviators. The kiosk uses telephone lines to provide access to multimedia programs from a central server. The project provides a remote access link using ATM technology to a kiosk located at the Ontario Science Center in Toronto. Because of the success of the trial, a major consortium of museums and libraries, are looking at duplicating the trial across the country.

Mentor Networks Trial

An interactive multimedia-on-demand trial involving five players, including the Ottawa Civic Hospital, the Royal College of Physicians and Surgeons, and Stentor, provided continuing medical education services for doctors in Ontario. This phase of the trial ended in August 1994. The trial was conducted in a Local Area Network (LAN) environment as well as a telephone network environment using Bell Canada's telephone lines and ADSL technology to transmit interactive multimedia to PCs. Users of the application could choose from a module representing patient care scenarios for chest pain. Its interactive nature allowed choices to be made on diagnostics and procedures, leading to more cost-efficient medical decisions. In a related trial, Bell and Mentor will interconnect members of the Ontario Medical Association in the Halton region with e-mail and conferencing facilities. Mentor eventually hopes to link physicians across Canada.

Global Library

Members of the Stentor Alliance are participating in the international project aimed at ultimately bringing material from such institutions as the National Library of Canada, the U.S. Library of Congress, the Bibliothèque Nationale in Paris, the Lenin State Library in Moscow and the British Library in London to classrooms and homes around the world via cable TV and the Internet.

VOD at Carleton University / University of Ottawa

Students at two Ottawa-based universities broke ground in the field of electronic information in a video-on-demand (VOD) trial launched in January of 1994. Stentor joined with the University of Ottawa and Carleton University to deploy the first fully digital VOD trial in Canada. Phase I of the trial began in January and ended in May, 1994. Using personal computers located on campus, students accessed taped lectures and lecture support material, such as films, from a video library. Multiple viewers had simultaneous access to the video material and could pause, rewind, fast forward and scan through video information carried over existing telephone lines. Phase II, started in October 1994, extended the project to include other business customers in a multi-office environment. Customers included eight Ottawa schools and three RCMP locations. The technology platform was developed by Bell-Northern Research, the R & D arm of Northern Telecom.

MediaLinx Interactive Inc.

Founded in 1994 as part of the $8+ billion promise of The Beacon Initiative, MediaLinx Interactive Inc. is funded by BCE and a number of other Canadian telephone holding companies. Through partnerships, MediaLinx develops content for Canada's full-service fibre optic information highway. Its mandate is to form joint ventures with companies and organizations in seven alliance pools: News & Information, Education & Learning, Financial Services, Health, Entertainment, Shopping, and Government Services. MediaLinx will acquire no less than 20% of a venture but no more than 49%. The ideal arrangement is three partners, each owning 33%. MediaLinx is a collaborator not a competitor, a catalyst not a controller, a gateway not a gatekeeper.

MediaLinx offers its partners content packaging and marketing, service bureau support and media labs, on-screen consumer product and service directories, "smart" searchers, advertising and sponsorship, standards development, and ultimately, a network of linked digital video servers soon to exist across Canada.

MediaLinx plans to distribute its first services from stand-alone consumer kiosks in strategic locations across Canada in1995. Network services and programming are slated to begin in 1996. These will include entertainment-on-demand, home shopping, home banking, and personalized news searches delivered to subscribers. These first services can be delivered over conventional twisted-pair copper cable. But, as more Canadian communities are wired with fibre optic / coaxial networks under the Beacon Initiative, capacity will increase dramatically, greatly heightening the ability to deliver programming and services, including two-way video.

Consumer Kiosks

MediaLinx's first consumer kiosks will be installed by the end of 1995. Located in high-traffic sites such as shopping malls or office towers, each kiosk is equipped with a touch-screen, keyboard, telephone, fax machine, printer, and credit card swipe. In a few minutes, a kiosk can pay several bills, order flowers, book concert tickets, and check a credit card account balance.

The system will be linked nationally and regionally, first to existing high-speed connections and eventually to the broadband fibre-optic network now being installed across the country.

Information Highway Networks

CANARIE

Formed in 1993, the Canadian Network for the Advancement of Research, Industry and Education or CANARIE is a public-private partnership to build a Canadian Information Highway. At a cost of $22.5 million, CANARIE links regional computer networks around the country, enabling universities, businesses, research institutions and hospitals to test the latest information highway products and services.

A non-profit corporation, CANARIE has evolved from the work of more than 200 people form 56 organizations representing Canada's research, university, business and government communities. Their efforts, over a four year period, developed the seven year multi-phase Business Plan which defined a program to improve Canada's overall competitiveness in the Information Age. CANARIE has over 140 private and public sector, fee-paying members. It has a seventeen member Board, with eight members representing the private sector and eight representing institutions, with the seventeenth being jointly appointed.

In addition, CANARIE provides funding for the Internet backbone network in Canada called CA*net; development of applications and products for the information highway; and deployment of a high speed test network called the CANARIE National Test Network.

OCRInet

OCRInet is an ATM / fibre optic network linking twelve research centres in the Ottawa-Carleton region, with satellite links to remote areas of Canada. University, government and industry R&D centres are using the network for field trials of new equipment, services and applications of multimedia broadband networks.

SchoolNet

SchoolNet is a Federal / Provincial / Territorial and Industry initiative developed to introduce elementary and secondary school students and teachers to the Internet, and to enhance educational opportunities by making national and international resources available. This trial involves an electronic network linking students and teachers across Canada to national and international databases and a wide variety of learning applications. About 4,500 schools are currently on-line.

The project is a cooperative endeavour of Industry Canada and participating schools, provincial ministries of education, Canadian universities and colleges, and the private sector, including Stentor.

Telesat

The satellite company, wholly owned by the Stentor owners' holding companies and Spar Aerospace Limited, is embarking on new technology developments and customer applications that will enable universal access and maintain Canadian leadership in the "skyway" portion of the Information Highway. In conjunction with the Broadband Applications and Demonstration (BAD) lab at Industry Canada's Communication Research Centre (CRC), Telesat is believed to be the first satellite operator to successfully trial commercial ATM multimedia at T1 rates. Satellite ATM will allow new, interactive multimedia technologies to be delivered to locations that cannot be accessed economically by terrestrial ATM technology.

WurcNet

Launched in July 1994, WurcNet is a not-for-profit organization based in Western Canada that manages the provision of a high-speed ATM testbed network for research and development into high-speed networks and the development of applications that require connectivity at high speeds. Membership includes several universities and Stentor owner companies based in the West. The network, which spans B.C., Alberta, Saskatchewan and Manitoba, allows university research institutions and research departments of major industrial members to access supercomputer facilities at the University of Calgary. Consistent with WurcNet 's objective to encourage the development of commercial products and related background technologies, network projects are also being explored in business, education, media and entertainment applications.