Affordable and Equitable Access to the Information Highway

Prepared By:

John Gilbert
Ken Hepburn
Guido Henter

Affordable and Equitable Access to the Information Highway

Prepared By:

John Gilbert
Ken Hepburn
Guido Henter

AVAILABILITY

Copies of *Affordability and Equitable Access to the Information Highway* are available from:

Information Highway Advisory Council Secretariat
300 Slater Street
Ottawa, Ontario
K1A 0C8
Tel.: (613) 990-6692
Fax: (613) 941-1164
Internet: council@ic.gc.ca

This report is also available electronically via the Internet:

Gopher: info.ic.gc.ca port 70/Information Highway Advisory Council

FTP: info.ic.gc.ca/pub/info-highway

WWW: http://info.ic.gc.ca/info-highway/ih.html

or by e-mail at council@ic.gc.ca

Prepared by: John Gilbert
Ken Hepburn
Guido Henter

John A. Gilbert and Associates
714 Highland Avenue
Ottawa, Ontario
K2A 2K7

Phone: (613) 724-1266
Fax: (613) 724-3783

FINAL REPORT

MAY 26, 1995

AFFORDABLE AND EQUITABLE ACCESS TO THE INFORMATION HIGHWAY

Prepared by

John Gilbert
Ken Hepburn
Guido Henter

John A. Gilbert and Associates
714 Highland Avenue
Ottawa, Ontario
Canada K2A 2K7

TABLE OF CONTENTS

EXECUTIVE SUMMARY

INTRODUCTION

The enormous potential of the information highway has captured the world's imagination. It has led to lively debate ranging from the cybernauts' heady optimism to more pessimistic scenarios. Some people question the highway metaphor, but it is useful to describe the intent of this report. It is to offer recommendations on public policy actions concerning affordable and equitable access to the information highway. These are not easy questions, and in addressing them the rubber really hits the road...

Questions of universal access, affordability, equitable access and just and affordable rates are not new to the communications sector. But the context, captured in the single word "convergence", has set the communications world on its head. Old concepts must be rethought, and that is what we have tried to do in this document. It is not an easy read - but we hope worth the effort for the reader who already has a significant appreciation of the underlying technical, economic and market factors.

The study offers an operationalized concept of universal service and provides an analysis of the central issues for access and affordability for these services. Themes are explored, and "observations" made as the arguments unfold. Finally, a number of conclusions and recommendations with respect to public policy and regulatory matters are knitted from these observations.

UNIVERSAL SERVICE AND THE ISSUES

A family of interwoven issues are relevant to "affordable and equitable access". First, universal service concepts must be redefined and these concepts tested in today's reality. Second, the "network of networks" must be described and analyzed. Third, people and places who lack affordable or equitable access must be identified, and solutions developed to correct these inequities. Finally, the physical and institutional means of providing access, the terminals and service providers, must be assessed. Only when each of these issues has been addressed, and the inter-relationships among them explored, can coherent public policy and regulatory strategies be developed.

Universal Service

We are used to the idea of a basic service being "universal". The telephone is one such service, and national public broadcasting another. The ever expanding range of new telecommunications services, as well as new content-based services calls for a much wider concept of what constitutes a universal service. The certainty of change makes it impossible to propose a definitive and timeless listing of such services. The telegraph, a universal service of

yesterday is gone. New services emerge (facsimile, e-mail) as candidates for universal service - unplanned, but in response to a societal demand. The report suggests that societal responsiveness is the fundamental criteria for defining a universal service.

Once a service has been designated as meeting a societal need, it must, to be universal, be accessible and affordable to everyone. This suggests that two fundamental characteristics are needed. First, public networks must be immediately accessible to all users, without impediment. Second, content must be free to flow to the user wherever he or she is located. Examples of such universal services might be content of universal importance to the culture and identity of Canada. It might be content of importance to individuals relative to their relationship with government or their own well-being. For these services, public policy measures would have to be promulgated to ensure their affordability for all Canadians.

Not many services will meet the full criteria for universal service, which might call for some form of public support, but many might be required for a more limited cross section of society. Examples could be telecommunications services in support of education, for remote and rural communities or for special constituencies. These "requisite" services meet a more limited societal responsiveness. Public policy may not be able to guarantee their availability to everyone, but may be able to ensure that they are available, to those who need them, at just and reasonable rates. These rates might be ensured by competition in the market place or by the regulator.

Access and Affordability

The Report places the concepts of universal and requisite service in the context of the "network of networks", a concept that has become a cornerstone of the information highway. To permit universal access public policy must assure that interconnection and interoperability are maintained.

The traditional service-by-service approach to the definition of universal telecommunications services no longer holds. "Single party telephone service" or the provision of "dial tone" must be replaced by concepts reflecting users' ability to move content through the network of networks. The two-way transport of content between individual access points on the ensemble of public networks is a universal service. The **capacity** of the transport service becomes the distinguishing variable defining the universal service and the requisite service. The minimum capacity that must be provided at the furthermost extremity of a network to enable any user to send or receive content to any other user defines the universal service. This minimum capacity may allow for a range of enhanced telecommunications services (e.g. electronic mail, voice messaging) which are network based or use a combination of a universal telecommunications service and appropriate terminal equipment (e.g. facsimile).

However, some applications cannot be effective without a telecommunications service that provides for the transfer of greater amounts of content than that of the universal service.

Many of these applications are needed by business (e.g. videoconferencing) or by sectors such as education and health which are of vital importance to society. Telecommunications policy makers have traditionally shied away from policies, such as subsidies, which might more properly be within the purvue of these sectors. As telecommunications, driven by convergence, becomes more closely entwined with all sectors of society, there will be a need for a closer harmony between telecommunications policies and those of other sectors. A telecommunications service which provides the transport capacity needed for these types services merits designation as a requisite service.

In the case of content-based programming services, those which are licensed as broadcasting services under the Broadcasting Act should be considered as universal services in those markets for which they are licensed. Every Canadian should have access to them and be able to afford them.

Canadian programming services that are not licensed for particular markets, merit designation as requisite services for which all Canadians should have access at just and reasonable rates.

Content based information services have not yet evolved to the point where they are thought of as either universal or requisite. Nevertheless, the rapid increase in the use of on-line data bases and governments' use of electronically assisted service delivery indicate that the day is close. Criteria for the universal or requisite services above will guide the process for identifying these information services.

The reports supports competition and suggests that government policies and regulatory practices should be designed to ensure a level playing field among competing facility carriers. All carriers that provide bottleneck services to end users should be required to unbundle those services so as to provide other service providers the possibility of reaching the universe of subscribers with competitive service offerings.

The Internet, as the public's proxy of today for the information highway gets special mention. Its contribution, in terms of innovation and the development of new markets and services, promises to be a major factor in the evolution of the information society. In Canada the Internet has not been subject to regulations, but nor has it developed in isolation of government involvement. Various initiatives of governments have encouraged its development, indicating that while it might be accessible, it is not necessarily affordable. Moreover, the implications of the Internet in commercial markets is not yet clear and the evolution of financial transactions will need careful study. Other implications, such as security, privacy, and the social acceptability of some of the "fringe" activity on the Internet are issues of the day. Nevertheless, Freenets, school networks and other means of allowing "free" access to information are important and should be extended.

Special Measures: Special Constituencies

It would be ideal if all Canadians could be provided with easy and affordable access to universally available communications and information services, regardless of income, level of literacy, disability or location. However, market forces are unlikely to permit such access. There is a need for special measures to ensure that those who might otherwise be excluded can have access at just and reasonable rates.

The Report deals first with services to individuals, using persons with disabilities as an example. Another example is those whose level of literacy might constrain their access to the information highway. It then deals with services to places, locations, physical communities - particularly remote and rural areas. The problems of servicing these "special constituencies" are explored, and conclusions drawn for public policy.

Finally, providing "special constituencies" with access (to both the network and to content) involves services provided by the network or at a terminal. An exploration of the terminal issues shows that there has been an evolution from the single function terminal (the telephone, TV set etc) to a more complex environment where local networks, for example, resemble terminals. While this area is complex, the market seems to be responding the needs of "social responsiveness" and no new public policy initiatives are foreseen.

WHERE ARE WE NOW? - THE DATABASES

The study researched existing Canadian public policy and regulatory positions that have already been enunciated with respect to access and affordability. It then reviewed recommended policy principles and regulatory approaches suggested by some prior key studies. The resulting data base captures this material at the three levels of Overall Government Strategy; Policy Principles and Specific Policy/Regulatory Approaches.

The Canadian data base was used in two ways. It helped to define the areas to be studied, and it offered a framework within which to test ideas and concepts. It is concluded that the strategy, policies and regulation in place, or underway, in Canada, address the problems remarkably well. There are, however, some gaps to be filled and these are addressed in the recommendations which follow.

Other industrialized countries are addressing the issues surrounding the information highway and the recent G7 meeting in Brussels has raised the profile of access and universality issues. A short summary of the activities of other countries draws attention to international examples relevant to the Canadian context. This has proved to be a useful "checklist" in the preparation of the report. It is concluded that Canada must address its own public policies within its own context. However, the remedies being put in place by other Administrations are important and should be carefully monitored in the years ahead.

RECOMMENDATIONS

The Report makes thirty recommendations. One set is concerned with public policies to address transport requisite services. They suggest the adoption of the concepts of universal and requisite services and the establishment of criteria and processes to designate such services. They propose that one universal telecommunications service be defined in terms of the minimum capacity needed for the two-way transport of content, and mechanisms to ensure that this capacity evolves over time. They also offer criteria for identifying universal content-based services.

A second set is concerned with access and affordability with respect to telecommunications-based services. These cover the need for mechanisms to ensure interconnection among public networks and for a practical "vision" of the future information highway against which to measure access and affordability. They deal with the need for assurance that competitive provisioning can satisfy "just and reasonable" rates, or where it cannot that appropriate tariffs and subsidies be introduced. They suggest the adoption of specific mechanisms, such as a universal services affordability fund.

A third set deals with access and affordability with respect to content-based services. These reiterate the importance of competition and market forces, but suggest the need for an ombudsman function in case of malfunction in the market place. They address the need for a licensing process to achieve maximum public access to Canadian programming services and a variety of issues concerning addressable services, multimedia and video-on-demand. They suggest that public policy should provide for a competitive market for the supply of information services to ensure just and reasonable rates.

Another set of recommendations addresses special measures for individuals. Concerning persons with disabilities, specific measures, under the rubric of "accessible design" should be supported. Positive steps to overcome literacy problems should build upon the advantages of the potential services of the information highway, and support for common-user access centres is encouraged. A special role for public libraries, as the means to permit easy public access to information services, is suggested. The importance of terminals is recognized, but no special measures, other than a review of existing processes, is foreseen.

A final set of recommendations deals with special measures for remote and rural locations. These deal with the further extension of special reduced rate schedules and toll-free regional calling. They also suggest that the Department of Industry examine the potential contribution of wireless technologies to achieve the goal of universal telecommunications service in remote and rural areas.

CONCLUSION

The observations, conclusions and recommendations in the report suggest a heavy agenda for public policy and regulation concerning universal access and affordability. However, the Canadian database shows that much has been already achieved, and the international database that Canada is at the forefront among nations in dealing with the issues. Current Canadian Radio-television and Telecommunications Commission (CRTC) proceedings on convergence issues and the policy review on Direct-to-Home (DTH) satellite services will add significantly to the body of policy and regulatory approaches of direct relevance.

1.0 INTRODUCTION

We would be wiser to think of the new systems [The information highway] as an infinite collection of webs spun by thousands of spiders, many of them unaware of the existence of others.

Robert Fulford, Globe & Mail, Nov. 16, 1994

In the past eighteen months a great deal has been written on Canada's information highway beginning with *The Canadian Information Highway: Building Canada's Information and Communications Infrastructure* (Industry Canada, 1994) to the recently released Discussion Paper *Access, Affordability and Universal Service on the Canadian Information Highway* (Industry Canada, 1995). This material is all background to this study, particularly the Discussion Paper. Therefore, this report will not develop any new background material; however, to assist the reader with an easy entry into the subject matter, a few selected passages from the Discussion Paper have been reproduced at the end of this Introduction.

The study provides Industry Canada, the Working Group on Access and Social Impacts and the Information Highway Advisory Council with an operationalized concept of universal service and an analysis of the key issues that the research team have selected as central to matters of access and affordability. On the basis of observations derived from the analyses, the study develops a number of conclusions and recommendations with respect to public policy and regulatory matters. These address the questions posed in the Discussion Paper as well as other matters judged to be of importance by the researchers.

In order to identify the policy and regulatory actions that need to be considered by governments, the study also develops a data base of the current Canadian policies and regulatory approaches. The Canadian situation is placed in a global context with references to the situation in a number of selected countries.

Two comments may be appropriate to situate the reader of this report. The first deals with the matter of the terminology surrounding the subject of universal service. The second relates to the audience for whom this report is written.

The terminology used in addressing the issues of universal service and access and affordability is not consistent in the literature. Terms such as universal access, open access and equitable access abound. Services are described as being basic or essential. One of the objectives of this study was to clarify the terminology and apply it to the Canadian situation.

This is done in Section 2. It should be noted however, that when describing the approach of other countries the terminology used is that found in that country's documentation.

On the matter of the audience for this report, it was decided to write the report assuming that the reader has significant appreciation of the underlying technical, economic and market factors. Hopefully the report will be highly readable by all. However, no attempt has been made to develop some of the underlying concepts. This has been well done in other documents, including the Discussion Paper which should be read in conjunction with this report.

Selected quotations from the Discussion Paper, Access, Affordability and Universal service on the Canadian information highway.

> *"Electronic networks and services are putting the world's information and entertainment resources at our fingertips. They are transforming the ways we work and do business, the ways we study and do research, how we educate our children and retrain ourselves, and how we bank and pay our taxes. Networks and information services are vastly increasing the options available to us in education, health care, government services, and cultural and community activities.*
>
> *What does this mean? It means that producers of information services, whether voice, text, video or multimedia, have the potential to transmit information by a variety of communications networks -- telephone, cable, satellite or other wireless technologies. Coupling this potential with the interactive design of computers means rethinking and restructuring our traditional telecommunications, broadcasting and cable industries. It means a revolution in how we entertain ourselves, how we are educated, how we receive and create our news, and how we interact with each other, business and government. It means an enormous choice among entertainment and information products, new opportunities to create business, social and cultural alliances, and new possibilities to strengthen the participatory nature of our democratic heritage.*
>
> *New technologies and new media will present new opportunities and new challenges in the way we disseminate and access information and content. The information highway will enhance communications and information exchanges among Canadians, and between Canadians and the rest of the world. However, the information highway must be developed in a way that ensures Canadians have access to the services they want and need" (Industry Canada, 1995).*

2.0 ISSUE ANALYSIS AND OBSERVATIONS

2.1 Preamble

The purpose of this section is to identify the families of key issues that are relevant to the matters of access and affordability and to analyze them so as to identify policy and regulatory actions that should be considered by government.

2.2 The Issues

The research team has identified a set of key issues areas which encompass the range of issues relevant to the Canadian situation. Other groupings and nomenclatures could no doubt be used; however, it is hoped that these will serve to provide the basis for a meaningful analysis. They are:

- Universal Service: The Concept;
- Universal Service: The Reality;
- The Implications of a Network of Networks;
- Special Constituencies;
- Service to Remote and Rural Populations;
- The Terminal Environment;
- Service Providers: Changing Roles and Emerging Entities.

2.3 Analytical Framework

The analytical framework is intended to facilitate an organized and rigorous analysis of the various factors that are crucial to access and affordability. The identification of individual factors and the inter-relationships among them is important to the development of coherent public policy and regulatory strategies.

The matter of access and affordable service will be addressed from two service perspectives; the transport services and the content based services that are available over the information highway. A second set of service concepts, derived from a future network perspective, will be introduced to provide a longer term horizon to the analysis.

The framework recognizes five specific factors: technology; economic; market and industry structures; consumer requirements, and culture. In many cases these factors are quite interrelated. In others, two or three factors dominate; therefore, the analysis does not treat each of them independently. Rather, they are five threads that are interwoven throughout the analysis.

2.4 Universal Service: The Concept

2.4.1 Preamble

The concept of basic service is reasonably well understood in terms of telephony; however, it is much more vexatious when it is broadened to one that is consistent with the vision of an information highway, where it must address an ever expanding range of new telecommunications as well content-based services. This study attempts to come to grips with this expanded concept.

At the outset, it is important to recognize the limitations imposed by time. The advances of technology and the concomitant enhancement of services will always bring changes to a basket of universal services. No definitive and timeless listing of universal services can possibly emerge from a study at any point in time. A universal service of one era will disappear, only to be replaced by one which was once seen as a "luxury" service. The telegraph service would surely have been defined as a universal service a few decades ago. Today, many see facsimile as such a service. One of the objectives of the analyses that follow is to define today's absolutes where they can be found, and supplement them with processes and criteria to deal with future services which might some day qualify as universal, deserving special policy and/or regulatory treatment.

2.4.2 The Concept

The concept of "universal service" which embodies the idea of a basic service, has the fundamental characteristic that it meets societal needs. This "societal responsiveness" is the feature that distinguishes a universal service from others. It is a service that is required by all members of society.

Universal service is not a unidimensional concept. It has two key dimensions that must be considered together: One is accessibility and the other is affordability.

Observation 1 -- Universal Service is a concept describing those services that meet a societal need. It is comprised of two inter-related components: Universal Accessibility and Affordability.

The requirement that a universal service must be seen by society as meeting a need of all of its members is a rigorous test indeed. However the rigor is justified by the fact that the requirement of affordability may require that some form of cross subsidization or public funding be introduced.

The universal service designation must be used carefully and sparingly. Consequently, some services that might be very important to a special constituency or to a sector such as business or education will not meet the criteria. It is arguable, in the case of these sectors, that the service be defined as universal because the secondary effects are important for society as a whole. Others could agree that the service is important, but argue that the sector in question is well positioned to afford the services and that it should not be subsidized by others.

Without debating the merits of any given case, it is clear that public policy would be well served by two concepts: one for a universal service that meets the full criteria set out above and one that meets a criterion of a more limited societal responsiveness. In the case of this "requisite"** service the objective of public policy should be to ensure equitable access rather than universal access, and just and reasonable rates as opposed to affordability.

Observation 2 -- Requisite Service is a concept describing those services that meet the requirements of a sector or a special constituency which has itself a major impact on society as a whole. It is comprised of two inter-related concepts: equitable access and just and reasonable rates.

The twin dimensions of universal and essential service merit closer examination in order to have a good understanding of the two service concepts identified above.

2.4.3 Universal Access vs Equitable Access

In the case of a universal telecommunications or transport service, the network over which the transport service will be provided must be immediately accessible to the user. The family of networks that might lie behind the user's access point must be interconnected in such away so that there is no impediment to the user reaching any desired destination.

In the case of a universal content-based service, the above transport service must be available and of a nature that it can provide for the transfer of the content to the user. The content-based service itself must be accessible using standard, approved protocols and free of any proprietary technological or other barriers to access.

Equitable access falls short of universal access and it implies that reason and justice must be applied to seek a reasonable outcome (Bowie, 1990). It also reflects the idea of "universal reach" (Johns, 1995) which recognizes that some services cannot realistically be immediately available to all users, but that compromise solutions can be found so that users can, with a minimum of difficulty, come to the service.

2.4.4 Affordable vs Just and Reasonable

In the regulated telecommunications world, one is used to relying upon the regulator to ensure "just and reasonable" rates. Now that there is a major move toward the introduction of competition in the provision of telecommunications services, there is a concomitant lessening of the regulator's purview. Nevertheless, it can be argued that users can expect "just and reasonable rates" whether they are ensured by the market place or the regulator.

** The term requisite service has been introduced for two reasons. First, the dictionary meaning, "required, as by circumstances; necessary for some purpose", conveys the idea intended. Second, it has not been used in this context and consequently it does not evoke prior interpretations.

This does not ensure affordability. The concept of affordability embodies the idea of an user's ability to pay for the service. Consequently, this element has to be addressed separately from the determination of the tariff for a given service. In the past, cross subsidization between services or among geographical regions for a single service was generally accepted as a means for achieving affordability and this was indeed factored into the regulator's determination of justness and reasonableness. The advent of competition and the trend toward cost-based pricing is decreasing the utility of this approach and argues in favour of a clear appreciation of the distinctions made above. New approaches to achieving affordability will have to be identified, be they tax based or direct subsidies (Economist, 1994).

2.5 Universal Service: the Reality

2.5.1 Preamble

The reality of universal service has to be found in the services that are available today and those we can realistically expect within the next two or three years. This time horizon may seem somewhat limited, but it reflects the rapidity of change in the information technologies. At the same time, it is important to maintain a long range view. To do this, the analysis draws upon a future network concept and develops observations with respect to types of services that can be envisaged.

2.5.2 Current Service Concepts

The following Figure sets out a matrix of four service categories that can be used to describe the totality of services as we know them today. By reducing these to four, the study has consciously focused attention on the fundamental differences among a select few rather than the nuances among many.

Figure 1
Current Services Concepts

Telecommunications Services	Content-based services
Telecom (Transport) Services	Programming Services
Enhanced Telecom Services	Information Services

2.5.3 Telecommunications Services

Telecommunications Transport Services

The telecommunications transport services that can be provided over the physical or wireless connection to an end user are many and varied. Indeed, the practice of the industry is to design various services and to tariff and market them under different names. The objective here is just the opposite. It is to simplify the situation to enable the analysis of fundamentals. To this end, the basic concept of a transmission path, able to accommodate various amounts of content or "throughput", is used to factor out all the proprietary service designations and also to factor out the specific technology or transmission medium that underlies the service.

When viewed in this light, it is clear that an individual subscriber's fundamental need, be it private or business, is to have a service that will accommodate their requirements to send content in its many forms to addressees.

Therefore, if there is an absolute when it comes to a universal telecommunications service, it is the public services that will transport the message or data entered at one point on a network to another point, chosen by the originator, on the same or any other public network. In the light of today's technology and user expectations, this must be expressed in terms of "individual access" to the network.

Observation 1 -- The two-way transport of content between individual access points on the ensemble of public networks is a universal service.

In order to complete this very important observation, it is necessary to introduce the idea of the amount of content that this universal service must transport. If one thinks of the telecommunications path as a conduit of varying capacity and the content as flow of packages of bits carrying all the information, then the minimum capacity that is acceptable to all users can be designated as the universal telecommunications or transport service. With today's technology and carrier pricing, the idea of the volume handling capacity of the telecommunications path is expressed by a proxy which is the number of bits of information it can handle per second. This is termed bandwidth and is measured in bits/sec.

A voice conversation does not produce very many bits and hence a fairly small capacity will suffice, whereas other forms of content, such as an image, requires a much larger capacity. For example, a good quality image suitable for a business teleconference requires 1.5 Mbit/s or the equivalent of 78 telephone lines. The importance of this is clear when considering the definition of a universal service. Is it adequate to ensure that every one has a telephone connection today, or is it important to ensure that they have a service that will allow them to receive more content than just voice or its equivalent amount of data?

There is little doubt that society is ready to accept a voice telephone capability as an absolute for universal service. It is also apparent that the service providers and the policy makers cannot rest on their laurels if the vision of the highway is to be achieved.

Every effort must be made to extend the capacity of the universal telecommunications service to accommodate the more demanding applications involving content-based services and enhanced telecommunications services. It is here that the concept of a requisite service becomes useful. It allows public policy to designate the minimum acceptable to society as an universal service and establish a level for a requisite service which becomes the goal for universality.

The designation of a specific figure both universal and requisite service is a matter that will require a process of consensus building. In the case of universal telecommunications service, it could be argued that it is not yet appropriate to fix a figure and that it should be expressed in terms of a voice grade equivalency. On the other hand, some observers suggest that now is the time to fix a minimum capacity such as 8 Kbit/s. The same issue arises for the requisite telecommunications service. However, in this case there appears to be less consensus. A service providing 64 kbit/s is one possible choice while others suggest that it should be twice that figure to reflect the capabilities of the Integrated Services Digital Network (ISDN) technology. Whatever the answer, it should reflect the state of the art and should exert some pressure of the service providers to provide ever increasing amounts of capacity to meet the needs of the users of the information highway.

Observation 2 -- One universal telecommunications service should provide, at a minimum, the capacity equivalent to voice grade quality.

Observation 3 -- The provision of a transport capacity that meets the needs of key sectors of society is a requisite service.

Observation 4 -- The transport capacity for universal and requisite services will vary over time and must reflect the consensus of both users and service providers.

Enhanced Telecommunications Services

The enhanced services, with which many subscribers have become accustomed, present another situation. Here, we are speaking of that range of services that come with the power of digital switches and the terminal equipments that can now be considered as consumer items. Such network based services include call forwarding, call waiting, call answering and so on. Others derive from the marriage of the network with terminal devices such as personal computers and other information technologies to provide electronic mail, facsimile and other such services.

The fundamental question for policy makers is whether any of these services pass the rigorous test of societal responsiveness and merit a designation as either an universal services or requisite service.

At the risk of an over simplification that could elicit some protest, it can be argued that the introduction and evolution of many of these services has been primarily in response to needs of business or other special constituencies. As the combination of network evolution and terminal development result in an ever widening use and reliance upon these services, they gradually extend into the larger market place. This line of reasoning is in harmony with the concept of a requisite service advanced in this study. The evolution of the service first may bring it to the level of a requisite service and then possibly to a universal service; however, it is highly improbable that an enhanced telecommunications service will originate either as an universal service or a requisite service.

In this situation, the challenge for government is to establish the process for designating services as universal or requisite and providing the policy and regulatory environment that will result in appropriate access to these services. In the case of the latter the policy focus on competition is achieving results. New technology is assisting and a government presence in the area of standards completes a basic tool kit. One major issue requiring continued attention is the extension of requisite services into the remote and rural areas of the country where access has traditionally lagged behind that available in the urban areas. These important considerations are dealt with more fully in Section 2.8.

Observation 5 -- Enhanced telecommunications services are unlikely to qualify as universal services without a period of evolution in the market place. However, they can be of vital concern to certain sectors and may qualify as a requisite service.

2.5.4 Content-Based Services

The Idea of a Universal Content-Based Service

One of the difficult tasks for policy makers and regulators will be to apply the concept of universal service to content-based services. It is important to have some idea of the criteria that could be used to identify an universal service.

Culture is one criterion that merits close consideration. Canadian history has clearly demonstrated a willingness of governments to take measures with respect to its cultural industries to ensure Canadians have access to quality Canadian cultural products. It is reasonable to expect that this will remain the same. Consequently, content-based services that are important to the culture of Canada would be prime candidates for designation as universal services. The Vice-Chairman of the CRTC recently identified the matter of Canadian content on the information highway as the single-most important issue facing policy makers on the information highway (Globe & Mail, Feb. 10, 1995).

Observation 6 -- One criteria for designating a content-based service as a universal service could be its importance to the culture and identity of Canada.

A second line of reasoning is that those services that are the product of tax payers dollars and which are produced by the governments that collect them should be examined carefully to determine those that should be considered as universal services. The information produced by government is extremely varied. Clearly not all of it would meet the determination of a universal service; however, information that is of direct importance and relevance to individuals is a candidate for universal access and affordability.

Observation 7 -- A content-based service containing government-provided information of importance to individuals relative to their relationshipwith that government or their own well-being could be considered as an universal service.

In Section 2.7 consideration is given to special constituencies such as the handicapped, the elderly, and to sectors such as health care and education. It is quite conceivable that society would consider that certain content-services destined for these constituencies should be considered as a candidate for a requisite service.

Observation 8 -- Content-based services intended to meet the needs of special constituencies for necessary information could qualify as requisite services.

These criteria cannot be considered in isolation. They would have to be looked at in the appropriate market context. For example, if information were readily available in other media, or if there was a variety of means of accessing the same information, the imperative to designate them as universal or requisite services could diminish.

Criteria such as these should form the basis of the policy guidelines that would be used in a process established for the purpose of identifying universal and requisite content-based services. There are many possibilities for such a process, ranging from a regulatory one to a voluntary industry approach supplemented with an ombudsman like appeal process.

Programming Services

For the purpose of analysis, programming services and information services are the two basic types of content-based services that have been identified. This is not intended to suggest that programming services do not provide information or that information services cannot be entertaining. Indeed what is entertainment to one can be seen as information to another and the dividing line between the two is becoming quite blurred. As we look ahead to an era of video-on-demand and an all digital information highway, the distinction will lose much of its meaning. The purpose for the choice is to facilitate an analysis using familiar concepts where the polar extremes of a broadcast program of the Canadian Broadcasting Corporation (CBC) and a statistical data base service from Statistics Canada are quite clear.

In the matter of universal service, the regulatory approaches concerning those programming services licensed under the Broadcasting Act is quite clear. Canadian originated programming services, destined for specific markets, are universal services in those markets. To date, the Canadian market has had little experience with individual programming services outside of the broadcasting system. Single performances have been the purview of the cinemas. More recently the pay-per-view programming undertakings have simulated an on demand service, but these too have been considered as part of the broadcasting system.

Observation 9 -- Canadian programming services, licensed for specific markets, are a universal service in that market.

Observation 10 -- Canadian programming services licensed as specialty services with no specific market designation are requisite services.

Access to programming services poses some difficult policy and regulatory challenges. The emergence of multiple delivery systems for programming services means that the regulator is no longer dealing with the duality of off-air and cable. It must also consider the overlay of Direct-to-Home (DTH) satellite delivery, wireless cable and the possible entry of the telephone companies. Furthermore, it must envisage the development of on-demand systems with a one-to-one capability instead of the one-to-many broadcast model.

Given this problematique, there needs to be new ways of looking at universal programming services. If the public policy goal were to be that all Canadians had to have access to all universal programming services, regardless of the delivery system they chose to use, then all systems would have to carry all such services. This model would see the DTH systems carrying the universal services as well as the cable and any other local distribution undertakings. This could be seen as a plus in those remote and rural areas where the DTH service might be the only one available. On the other hand, a purely national model is flawed. There will be local Canadian programming services that will merit designation as universal services in that market. It is not however practical to think of the DTH systems carrying the aggregate of these services so that the users in any market who subscribed to DTH could receive all the programming services designated as universal in that market. Clearly, a compromise of the above stated policy goal would be required.

Observation 11 -- When there are multiple broadcast mode delivery systems, there will be a need to distinguish universal programming services in accordance with the nature of the systems. A differentiation will have to be made among systems that have a local vs a national/regional reach.

One approach that might be considered is to have two levels of universal service. Universal Service(s) A could be those that would have to be available on all broadcast mode delivery systems. Universal Service(s) B could be those that would have to be available, in

addition to the A services, on local, broadcast mode delivery systems in a given market. The composition of the Universal B services would, of course, vary from one market to another. In a remote or rural area of the country, where only DTH services might be available, it would mean that there could be no Universal B services available unless they were available off-air or if all such areas were considered one market and had their own group of satellite delivered Universal B services.

Information Services

Information services are now a common feature of the Canadian landscape but they are still not that well recognized by many Canadians. There is no regulatory framework around the information services similar to that for the "broadcasting system"; hence, there has been no forum for debating the issues associated with universality. The on-line data bases that generate the information services such as newspaper abstracts, stock market quotations, and library services are all provided in a competitive market place. At this point in the evolution of information services no one service or class of services is seen as universal. However, the consultative process on the information highway is producing some candidates for such a designation.

Another major change agent that has emerged is the INTERNET which has introduced a sea change in the attitude and awareness of individuals concerning access to and use of information services. This will have a profound effect on the attitude of Canadians to the concept of a network of networks and the awareness of the impact of information availability to their personal and business lives. Also, growing consumer awareness and the explosion of the information that is available in digital form for electronic distribution are contributing to change.

Observation 12 -- There are no information services provided by Canadian sources that are viewed today as either universal or requisite services.

Access and Content-Based Services

The matter of access has already emerged as an important issue for the programming services and it is just developing with respect to information services such as electronic newspapers. One way to examine the issue is to address the matter of "packaging". Canadians are already familiar with the packaging of programming services by the cable companies. It is an issue that achieved a great deal of public visibility in the controversy surrounding the introduction of the Canadian specialty channels at the beginning of 1995. The matter of how future content-based services may be packaged and distributed, as well as the roles of the commercial entities involved in the market place, all have implications for access and affordability to services that might be universal or requisite.

Packaging of content is not new. For example, magazine publishers package content. They acquire content..the magazine articles...package it with attractive covers and art work, sell advertising and then sell the finished product to readers. In another analogy, broadcasters

acquire programs, create some of their own content, assemble it in a marketable package, sell advertising and send off the package over the air waves to the waiting listeners and viewers. Finally, to compete this round of analogies, cable television licensees do something quite similar. They receive off-air signals, add satellite delivered channels, add some channels of their own locally originated programs etc. and package it all for delivery to their subscribers.

Today, an increasing number of entities play a role in the packaging and presenting of content-based services. Their service features include such things as customized user-friendly software for easy access to on-line data bases, billing services to facilitate payment, or search engines to facilitate the retrieval of desired information. It is estimated that the current 6 million US subscribers to commercial on-line services represent only 5% of the US market. The possible range of services is only limited by the creativity of the entrepreneurs (Globe & Mail, Feb. 1995).

The selection process inherent in packaging poses a fundamental question for policy makers and regulators. If universal or requisite content-based services are involved, what must be industry's responsibilities when services are not individually available?

In the foreseeable future, technology will provide a number of answers to some of the access issues associated with packaging. Specifically, the move toward interactive addressable services, including video-on-demand, by both the telephone companies and the cable companies will reduce, but not necessarily eliminate, the problem. That is the good news for universal access. However, in today's context, given today's technology, concerns center on exclusive arrangements with one carrier or distribution undertaking. For example the Stentor companies state that distribution undertakings should be precluded from entering into exclusive agreements with broadcast programming undertakings or networks (Stentor, 1995). Expressvu, the new direct-to-home satellite television company also argues that exclusivity of distribution should be prohibited (Expressvu, 1995). While these views reflect today's focus on programming services, the same concerns are applicable to the larger universe of all content-based services.

Even if a given content-based service provider can be addressed discretely by any subscriber to any network, it does not preclude that service-provider from having obtained exclusive rights to a programming or information service and having it packaged with a variety of other services, content and otherwise.

It is evident that packaging content-based services could run counter to the goals of access and affordability. Subscribers will object to having to take services they don't want in order to get services they do want. In their minds they will be paying for something they don't want. On the other hand, one does not hear many magazine subscribers arguing that they want to be able to buy a single article from one edition at a fraction of the price of the whole magazine.

Observation 13 -- A variety of content-based service providers play an important role in the packaging and presenting of content-based services in the market place. The implications of that role for access to universal or requisite services is not yet evident.

Observation 14 -- Discrete content-based services may not be available to users. This can pose a problem if services deemed to be universal or requisite are packaged with services that are not.

In summary, it would appear that public policy, in addition to having to ensure a network of networks to provide universal accessibility to universal content-based services, should also consider the ways in which universal and requisite content based services can be unbundled if required to ensure appropriate access.

Affordability and Content-Based Services

Universal content-based programming services are affordable today. In the case of public broadcasting it is financed by public funds combined, in some cases, with advertising. Private broadcasting has no public funding but the licensing process has limited entry into the broadcasting system with economic viability of the private broadcast undertakings in mind.

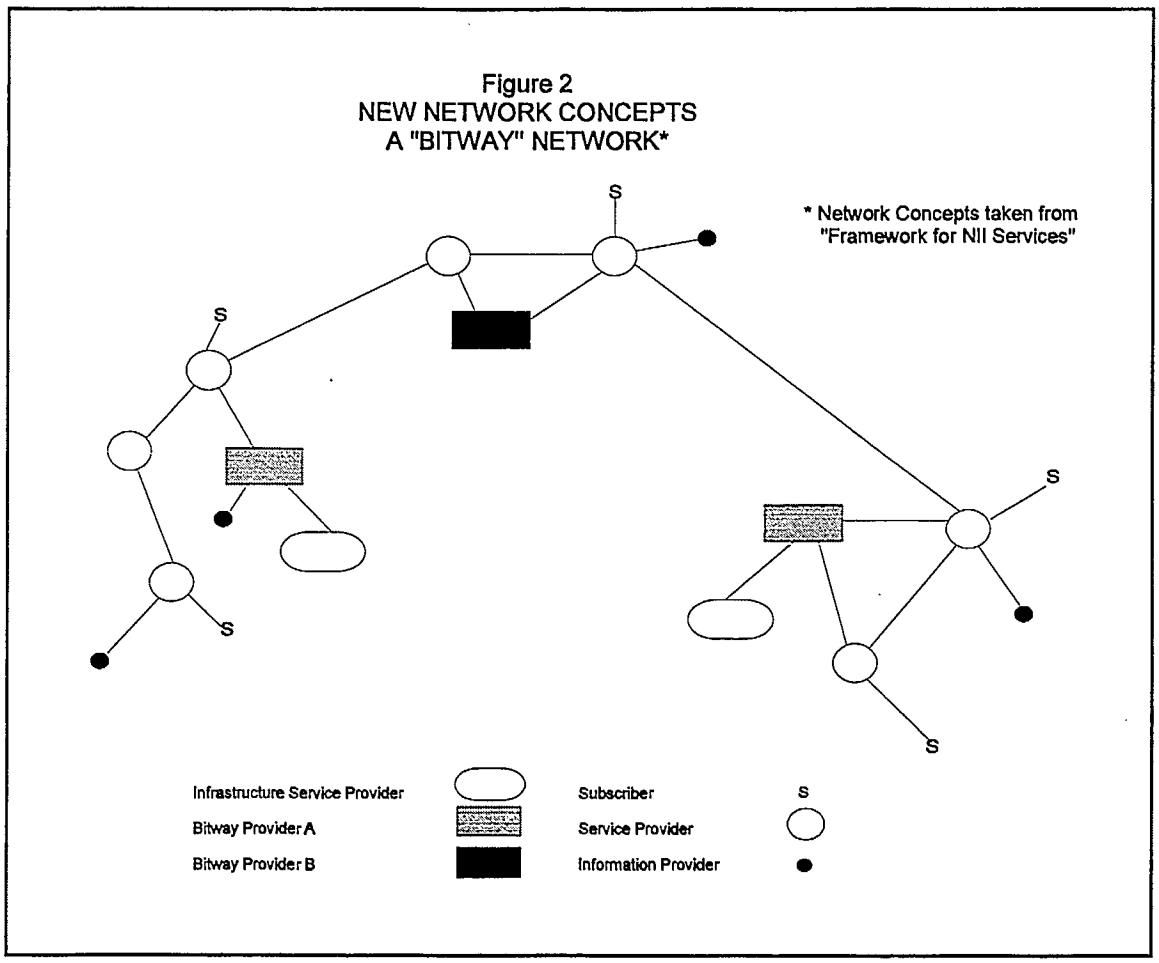
However, the model of the "broadcasting system" system is changing. The emergence of satellite-to-cable and satellite-to-home services for a fee risks a loss of the affordability of universal programming services if only one delivery systems is available. Public policy will therefore have to be responsive to these changes and ensure that, in the absence of alternative modes of delivery, universal services are not presented to subscribers in manner that impairs their current affordability.

Information services are developing in a full market environment and the market place is determining the value of the services. No universal services have yet emerged to demand the attention of policy makers as to their affordability; nevertheless, it is timely for public policy to address the issue. The natural starting point is the information services provided by governments and financed by taxpayers' dollars.

Given the competitive market place, it can be expected that rates for requisite content-based services will be just and reasonable.

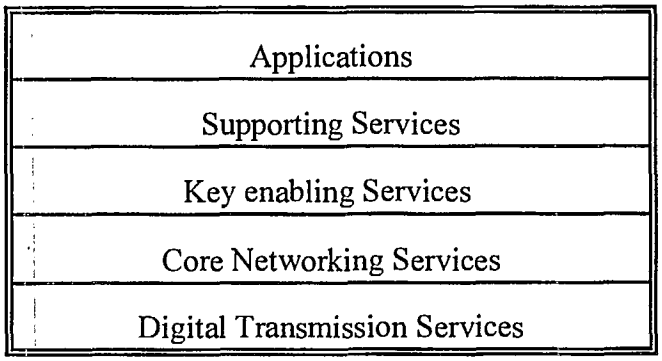
2.5.5 Future Telecommunications Service Concepts

The future network concept shown in Figure 2, offers another way of viewing the service concepts for that network (Figure 3).



The model that has been developed to facilitate this analysis is characterized by paths or "bitways" to transmit and manage digital information flowing throughout the total infrastructure. There can be a number of service providers controlling how the services are delivered and, in the case of content based services, how they are presented. At the service access point, there will be a user with his or her terminal or "information appliance". In the case of content-based services, there will also be an information service provider, who may be internal or external to the integrated network. This model is predicated on a totally interconnected family of networks with digital pathways providing scalable capacity to the full universe of users (Framework for National Information Infrastructure (NII) Services, 1994).

Figure 3
Information Highway Service Concepts



Viewed from this perspective, the digital transmission service, combined with the core networking service form the combination of services that generally qualify as the universal transport or telecommunications services. However, the separate identification of the core networking services allows for a more precise and perhaps longer lasting formulation of Observations 2 and 3.

Observation 15 -- The digital transmission service and the core networking services provided by the telecommunications service provider is a universal service.

At the other end of the service hierarchy, the application is the highest service level and can be thought of as the content, in digital form for whatever the information is which is to be passed along the highway. It is free from any of today's service concepts. It could be a voice originated message, a textual message or a still/full motion image. Importantly, it can be all of the above. In this context, the concept of a content-based service, becomes one that has to be divorced from the network.

Observation 16 -- The information highway, represented by a network of networks, is conceived as a universal transport facility for content of all kinds. Consequently, policy and regulatory policies relevant to universal content-based services should address matters related to the services themselves and not the networks that deliver them.

The Key Enabling Services and the Supporting Services are distanced from the fundamental operation of the network and are those services that can be associated with enhanced telecommunications and information services. As we have seen there is a major

enabling feature in many of these enhanced services, which could ultimately be viewed as extremely important to many users and hence qualify as a requisite service.

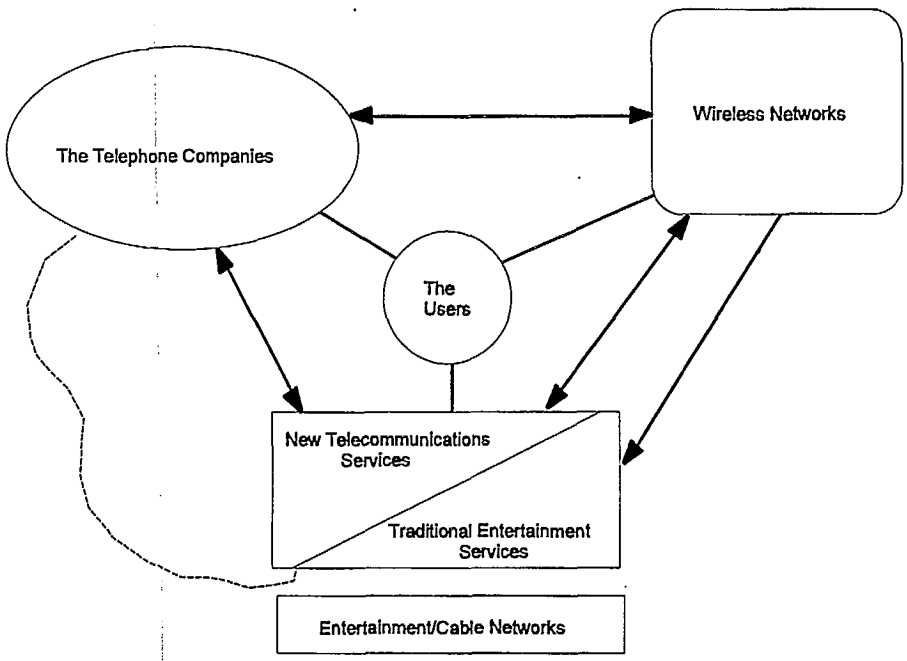
2.6 The Implications of a Network of Networks

The concept of a network of networks is a very attractive one, given the competitive environment that has developed for telecommunications and the multiplicity of facility providers that are emerging. It has become a cornerstone of the information highway concept. However, it needs to be carefully analyzed to determine exactly what it means and what route governments and industry must travel to reach this goal. If this can be done, then the necessary policy and regulatory agenda will become much clearer. The two features that are essential to the concept of a seamless web of networks, and the faultless interoperability of the services and applications that will be built upon them, are **interconnection and interoperability**. If this is not achieved, then universal accessibility to the services on the information highway can not be achieved.

The network of networks approach has gradually been taking preeminence over the debate on how to achieve a single integrated local network and the respective roles that should be played by the telephone companies and the cable companies. In the Convergence Report (Intven, Menard, Sept. 1992), the recommendations on the ownership of the local network infrastructure focused on the degree to which there should be sharing and joint use in order to achieve efficiency in the infrastructure. These considerations continue to be valid; however, the network of networks concept is more attuned to the fact that a variety of local networks are all possible, and that the attention of policy makers and regulators must focus on how these competing networks can still provide users access to the universe of other subscribers and service providers. Arguments are still being advanced for a single local network for switched broadband services. Therefore, the challenge for governments is to determine the public policies and regulatory approaches that will allow the networks to evolve in an effective and efficient manner, and still meet the broad objectives of access for all users to the highway.

In order to facilitate the analysis, the study established a base-line model for the physical telecommunications networks which reflect a contemporary perspective based upon the "stove pipes" that are associated with the industries of telecommunications, broadcasting and wireless communications (Figure 4).

Figure 4
TRADITIONAL NETWORK CONFIGURATION



2.6.1 Telecommunications Networks

In the contemporary model the telecommunications networks, which include those of the telephone companies, the new facility carriers and wireless carriers comprise a relatively cohesive and integrated network. This is not surprising, given the history and the policy and regulatory decisions of the past five years. The past monopoly for voice telephony and a single local distribution network plus the recent regulatory requirements that all new entrants must have access to this local network, has resulted in an integrated subset of networks.

Observation 1 -- The network of networks has been largely achieved for the subset of networks that have been constructed to use the telephone company local distribution facilities for the Public Switched Telephone Network (PSTN).

Nevertheless, the pattern is established and the market forces that require a provider of a public telecommunications service to provide its subscribers access to all other subscribers, will be a powerful force to achieve interconnection and interoperability. The role of government will continue to be to assure a level playing field and arbitrate disputes that are attributable to a market dominance.

Observation 2 -- Market forces will work toward achieving interconnection and interoperability for those competing networks whose subscribers have a need to communicate with the universe of subscribers on other networks.

Observation 3 -- Regulatory oversight will still be needed to ensure service providers appropriate access to the local networks of other service providers.

While trying to avoid too much technical detail in this analysis, it is important not to take an overly simplistic view of a network. Two points are worth making. First, the fact that there is a physical or a wireless connection among a universe of users, such as is provided by the PSTN, does not mean that they have access to all the services a telecommunications service provider offers. This does not mean that the goal has been achieved for all the other networks that have been built upon the PSTN such as the higher speed data networks. To have a given service, the transmission path must be appropriate for the service, the necessary electronics must have been added to the transmission path and the switching point for switched services must be appropriate for the technical characteristics of the service. Consequently, the fact that a carrier provides a particular service on part of their network does not mean that it is available to all users on the network. This is an important consideration when the matter of service to sparsely populated areas is considered. It is also a very important fact with respect to affordability. The additions to the network to provide a service to a given subscriber could be very expensive and the subscriber may be expected to contribute to the cost of those additions.

Secondly, there is the possibility of closed user groups for which access to the family of public networks may not be required by the users. For example, a network providing Electronic Data Interchange (EDI) among a large manufacturer and its suppliers could develop as a closed user group with proprietary features. This could result in the development of islands of networks which ride on top of the information highway, but which are essentially independent of it. There is nothing new in this, but it is something that needs to be monitored from a policy perspective. Circumstances can change and a service that is available only to a closed user group via a private network today could become a service which is required by the public tomorrow.

Observation 4 -- Policy does not need to select any given technology or architectural model, nor does it have to be uniform across markets or geography. But it does need to ensure that there are no impediments to the network evolution in response to market, economic and technological factors.

Observation 5 -- Affordability has to be considered both in terms of the tariffed rate for a service and the one-time charges that could apply for connection to a network.

2.6.2 Local Network Considerations

There are certain tariff issues that are crucial to the achievement of a network of networks. In particular, the full unbundling of services in the local network to allow other service providers to use those facilities to pay for what they use.

The unbundling of all the underlying services in the local access networks, or in what the CRTC has recently termed as the "bottleneck services", has been a major thrust of the Federal Communications Commission (FCC) for the past 5-8 years. It has sought to implement the plans and tariffs for Comparatively Efficient Interconnection (CEI) and Open Network Access (ONA). The FCC's primary objective was to put the telephone companies and the enhanced service providers on an equal footing and thereby foster competition in enhanced services.

The CEI obliges the telephone company to unbundle local network components, or the so-called basic underlying elements, used to provide access to their own services, and offer them to competitors on the same basis that they do for themselves. While under CEI competitors can only access service elements used by the telephone companies for their own services, under ONA, competitors could obtain access to functions whether or not used by the telephone companies. This would require telephone companies to respond to the requirements of their competitors for access components.

As described in Section 4.3.1, the CRTC has already addressed the unbundling process. Current processes are expected to move well along the road to a rational unbundling with just and reasonable tariffs. This is, however, limited to the telephone company facilities. Future proceedings will be probably be required to address the same issues for other bottleneck services provided by other facilities based carriers. It is very early days with respect to the possible provision of local telephone services by others such as the cable companies. Such a possibility has only existed since CRTC Decision 94-19. The wireless networks are also candidates for consideration. The concepts and regulatory principles are now quite clear. It will be a matter of applying them to the various networks and their bottleneck services as they evolve.

Observation 6 -- Government policies and regulatory practices should be designed to ensure a level playing field among competing facility carriers. All carriers, that provide bottleneck services to end users, should be required to unbundle those services so as to provide other service providers the possibility of reaching the universe of subscribers with competitive service offerings.

2.6.3 Cable Networks

The situation with respect to the networks that have been developed to deliver the traditional entertainment services is much less favourable to the goal of a fully integrated network of networks demanded by the information highway and the goal of universal access. The two main broadband networks of concern are those which have developed to serve the over the air broadcasters and the cable companies. To these we must now add the high powered satellite systems which will provide direct-to home television. By and large these networks are physically distinct from those discussed above and have not had the consumer requirement driving them toward a voluntary interconnection. Consequently, there is a family of issues that demand policy and regulatory attention. First, the decisions to allow competition in the provision of local telephone service allows the cable companies to use their networks to enter this market, although this is likely to be two to three years away.
(Canadian Cable Television Association, 1995). In this case it can be assumed that the same dynamic for universal user to user communications will cause cable companies, as for any other new entrant in this market, to negotiate interconnection arrangements with all other providers to provide the universal access that will be expected by subscribers for any public service.

Observation 7 -- Interconnection between the telephone company networks and the cable television networks is required for all those public services provided by both networks.

Observation 8 -- Interconnection will also be required between the cable television networks providing public services and any other provider of a like service such as the wireless personal communications service providers.

Observation 9 -- Although market forces will lead to interconnection, the regulator will have an important role to play as an arbitrator.

The issue of interconnection and interoperability for the transport facilities needed for the video and other entertainment services is another matter altogether. To date, it has never been an issue, as the cable companies basically had a monopoly for the delivery of these services. This of course is subject to change as the current regulatory hearings on convergence attest. Furthermore, video signals no longer require the bandwidth traditionally provided by the cable systems. Video compression techniques open the door to varied forms of delivery.

One important issue is the need for interconnection of the cable, telephone and other networks to achieve access to video and/or multimedia content-based services that might be available from a number of servers. Public policy and regulation will have to ensure that a subscriber of one network is able to access a content-based service on a server that might only be connected to another network. With a variety of local networks a possibility, network interconnection will be a requirement to ensure access to universal and requisite content-based services up to and including full motion video.

It would be a corollary to this that any content-based service which could be considered as a universal service, would have to be addressable by a subscriber of any network capable of delivering the service.

Observation 10 -- There is no compelling need to have interconnection of the networks of the cable companies and telephone companies in so far as the one-way distribution of content-based services is concerned unless joint or shared use is involved. Wireless networks, used for the one-way delivery of content-based services, such as over-the-air broadcasters, satellite broadcasters and Multipoint Distribution Service (MDS) networks do require the level of interconnection required for them to pass their radio delivered services to "wireline" facilities for further distribution.

Observation 11 -- As networks evolve to provide a switched Video-on-Demand (VDO) capability, all such networks must be interconnected to allow subscribers of one network to access universal content-based services, for the full range of video products, that may only be connected to another network.

2.6.4 Wireless Networks

The rapid emergence of the wireless networks has raised new considerations, given the fact that these networks can effectively become an overlay to the existing physical distribution facilities.

The services destined for end users of a wireless service could, of course, involve a totally wireless mobile connection between two users on the network. However, there is a user requirement to communicate with any other terminal access point, including those beyond the wireless network. Hence, these networks have evolved so as to provide full service through the existing local distribution networks and must continue to do so.

Other non-mobile wireless facilities and networks are common. Of particular interest are those that overlay or substitute for the traditional physical networks in remote or rural locations. In all these situations, the nature of the application ensures that they are fully interconnected with the existing networks.

Observation 12 -- The current terrestrial wireless networks providing public mobile services have been constructed so as to provide interconnection with the PSTN.

The local telephone network has now been opened to competition and new wireless Personal Communications Services (PCS) are being introduced. In all cases the wireless networks providing public telecommunications services will be driven to develop interconnection arrangements with the owner(s) of all the existing local distribution networks to ensure that its own users will be able to reach users on the "competitors'" networks.

Observation 13 -- With the advent of competition in local networks, be they wireless or wireline, all networks providing public services will have a need to enter into interconnection agreements that will enable their subscribers to communicate with the subscribers of all other public networks.

Observation 14 -- Regulatory oversight may still be required to ensure timely resolution of any disputes

2.6.5 Future Network Perspective

This analysis is made from the perspective of todays networks and the network evolution that can readily be seen from today's vantage point. However, the trend toward digitization of all information, and the digital video compression techniques that reduce the bandwidth required for the transmission of full motion video, conjures up a future family of networks that are comprised of digital paths or, as the vision for the National Information Infrastructure calls it, a network of bitways.

This network concept outlined earlier achieves all the goals of the information highway, with respect to universal access. Consequently, to the degree that it represents an ideal end state, then government policies in the 1990s, should be tested to see that they do not hinder progress toward this or similar models. Furthermore, they should be tested to see whether or not they positively contribute to progress in that direction.

With this perspective the matter of standards assumes particular importance. Many positive steps along the path to future networks will be marked by standards that will facilitate the transition from the present to the future. Government, manufacturers and service providers must play a role and government should accept a pace-setting role.

Observation 15 -- The information highway initiative should produce a vision for the future networks that will serve as a goal for the activities of the private sector and the policy and regulatory actions of government. One of the most important shared responsibility is the development of standards to facilitate interconnection and interoperability.

2.6.6 Internet: A Post-Script

Although the Internet is constructed from the networks of today and not the networks of tomorrow, it an important example of the powerful combination of telecommunications, content-based services and the ways in which many of the entities discussed in this report can all work together to produce a new world of telecommunications. It merits this special post-script.

It has been dealt with separately for the two reasons highlighted in the Keynote Address of Mr. Anthony-Michael Rutkowski, Executive Director of the Internet Society at Networld+Interop 94 in Tokyo 27-29 July 1994.

First, he describes the Internet as "...a broad "redefining paradigm" - in other words, a **fundamental transformation** that encompasses:

- building information infrastructure from the bottom-up;
- a robust global mesh for directly linking billions of computers and thousands of computer processes on whatever telecom and computer platforms that exist anywhere in the world;
- a means for open collaboration in the hyper development and evolution of new technologies and applications;
- transforming the structure, methods, and individual skills within enterprises, institutions, and professions of all kinds;
- a huge, rapidly growing market sector for Internet-related products and services."

Second, "...traditional barriers whether they are reporting hierarchies, institutions, country or geography are being obliterated". "A threshold condition (for the success of Internet) is the freedom to introduce and operate Internets without significant governmental or institutional impediments. The Internet consists almost entirely of tens of thousands of private networks all constructed and operated by largely private initiative. The Internet functions very effectively on a global scale through a number of multilateral and bilateral agreements among backbone service providers and end-user networks. The Internet is a creature of the unregulated, highly dynamic computer networking field - not the traditional regulated monopoly telecom environment.

In Canada the Internet has not been subject to regulations, but it has not developed in isolation of government involvement. Various initiatives of governments have certainly encouraged the development of Internet, indicating that while it might be accessible, it is not necessarily affordable.

Readers who wish to understand the Internet need only to read the daily papers or presentations such as Mr. Rutkowski's. Clearly it is a major factor in accessing networks and content-based services. The issue to be addressed is not, however, the Internet itself, but what lessons can be learned from its short history to date. Can its successes provide models for access more generally? What are the barriers or inhibitors to its further expansion? Can government play a role in removing these barriers? Are there societal problems emerging concerning affordability and equitable access which call for public policy or regulation?

The Internet -- Inhibitors to Progress

Mr. Rutkowsi identifies three challenges:

1. The numbers of customers actually connected to the Internet or accessible through the Internet (what bandwidths or time periods are available to them) depends largely on the available underlying infrastructure and cost of service.

2. Bandwidth seems destined in the long-term to be without practical limitation within and among most metropolitan areas of the world, but the increasing complexities of managing ever larger numbers of Internet networks is going to drive operation and maintenance costs up. The result for end users may mirror the computer world where the performance just keeps on increasing at relatively constant cost.

3. Major unknowns arise at the human and institutional levels - but these also offer the greatest promise. The autonomous, heterogeneous, flat model of the Internet seems intrinsically a good one. He sees a future for Internet "filled with discovery, fulfilment and fascination for all peoples - individually and collectively."

The Canadian experience, from Freenet and other Internet access network experience, seems to show four trends:

1. Where cost is not a barrier, usage of the Internet is high;

2. Shared networks (National Capital Freenet, Government departments, universities) are a cost effective means for access by large groups of users;

3. A large percentage of commercial subscribers first accessed Internet through the local community network (e.g. Freenet), or through work, university or school;

4. While the major barrier to access to the community network is available connections, user demand and usage is still high.

Meaningful statistics are not yet available on commercial Internet providers but anecdotal information would indicate that profits have yet to be realized. The market is not yet mature, and several major service providers have indicated that they are planning to provide such services. Some telecommunications companies, such as New Brunswick Tel, have already entered the Internet access market. The current monthly rates charged by commercial Internet providers varies both as to price and services. A rough average is around $25/month which includes from 20 to 100 hours of service. As a point of interest, commercial Internet providers in the United Kingdom and Japan offer similar services at comparable costs. Large information services (e.g. Compuserve, America On-Line) also offer Internet connection of various kinds.

Observation 16 -- The underlying infrastructure of telecommunications and service providers, and the cost of access services, are significant factors in allowing access to the Internet. Universal access and affordability are inhibited by these factors.

Observation 17 -- The contribution of the Internet, in terms of innovation and the development of new markets and services, promises to be a major factor in the evolution of the information society. Regulatory measures in the further evolution of the Internet may be counterproductive, however, public policy has played a positive role in the extension of the Internet in Canada, and may be needed to play a support role in the future.

Observation 18 -- Lessons are to be learned from the Internet. However, the implications of the Internet into commercial market are not yet clear. These implications, such as security, privacy and the evolution of financial transactions will need careful study.

Observation 19 -- Freenets, school networks and other means of allowing "free" access to the wealth of information and services of the Internet are a major contributor to the acculturation of society to the Information economy. The extension of these initiatives should be extended to as wide a base of Canadian society as possible with special attention being paid to special constituencies such as persons with disabilities.

2.7 Special Constituencies

2.7.1 Preamble

One of the major considerations in developing the information highway will be to ensure that all Canadians can avail themselves of the access provided for universal and requisite services. Levels of literacy, disabilities or location (urban or rural) will frustrate that goal. Consequently, there is a need for special measures to ensure that those who might otherwise be excluded do have access.

An analysis of those who are in this potentially "excluded" category leads to two somewhat separate sets of issues. The first, which is dealt with in this Chapter, relates to services to individuals. The second, which relates to place, location or physical community, is dealt with in Chapter 2.8.

Providing "special constituencies" with access (to both the network and to content) involves services provided by the network or at a terminal. The terminal aspects of these questions are addressed in Chapter 2.9 "The Terminal Environment".

Given the large number of "special constituencies", only two will be dealt with here. These have been chosen as an illustration of the need for policy approaches which might be taken to bring to allow access to such constituencies.

2.7.2 People with Disabilities

The number of persons with disabilities in society is increasing; they account for nearly 15% of Canadians. US sources give a total of 49 million Americans (which includes seniors). Regardless of the exact figure, they can no longer be considered "exceptions" or a marginal population.

Allowing full participation of persons with disabilities is a priority in Canada. In Canada, The *National Strategy for the Integration of Persons with Disabilities* is intended to resolve issues related to employment access, training, housing, communications, transportation, integration in the community and public awareness. Other countries, such as the United States, have similar initiatives, aimed at breaking down existing barriers and accelerating progress toward the full participation of people with disabilities in society. These initiatives, and recent literature on the potential of information technology for persons with disabilities, suggest the following observation:

> **Observation 1 -- The information highway has the potential to accelerate progress toward full participation of special constituencies, including people with disabilities, in society. The design of communications services to allow greater participation of otherwise excluded members of society has the potential of enriching jobs, expanding personal horizons and creating a more information rich society.**

While much has been done to accommodate the needs of special constituencies, generally speaking customers for telecommunications services have not been able to chose the mode or form in which information is represented or communications conducted. Many people with limitations of hearing, vision or ability have been inconvenienced by, or excluded from using, existing telecommunications services.

The problems of persons with disabilities can be grouped into three areas: rehabilitation, environmental control and communications. The latter deals with three main areas: mobility and orientation, access to information and inter-communication. Consultations with experts in this field show a growing consensus around an overall concept which, if adopted, would greatly improve access (Dupuy, 1993). This concept, "accessible design", suggests that telecommunications products could be based on an architecture that is open to a variety of extensions and adaptations.

Observation 2 -- "Accessible design" features for special constituencies must be integrated from the beginning of the telecommunications services development process. If these features are incorporated in the network they would become requisite services, subject to just and reasonable rate criteria.

Observation 3 -- When features are incorporated in the terminal, and therefore subject to competitive forces in a consumer market, regulatory measures become more problematic. In this case, process oriented measures might be considered, such as the establishment of formal user, government and industry fora.

The literature indicates the potential benefit of information technology to those with disabilities. It also shows that technological solutions to the problems of the disabled can have significant positive multiplier or spinoff effects. The enormous power of intelligent networks, and of the personal computer, allow networks and terminals to be configured to meet individual requirements. Network applications such as call forwarding and voice messaging are already widespread. Terminal choices, such as volume controls on telephones and various "preferences" on computer terminals are also widely used. As the technology develops, the range of such choices can be expected to broaden. Many of the "special", and often costly, add-ons which are now used by the disabled and other special constituencies could be programmed into networks and terminals at marginal cost. The cost of "special" configurations and services is inevitably more expensive if treated as an addition to a basic design of a network or terminal. To the extent that such features can be incorporated into basic designs, they can be expected to be less costly and more easily deployed. Further, such features can be marketed internationally.

Observation 4 -- Accessibility by design, accommodating individual needs associated with disability, worker re-training, aging, and illiteracy can be regarded as a competitive advantage. Society as a whole will benefit from a strategy that encourages the deployment of applications which allow greater customer choice and convenience.

Developments in auditory or Braille modes of information have been a great help to customers who are blind. The introduction of relay operators, who convert communications between users of auditory-only devices and visual-only devices have been a great help to the deaf. Hopefully, services on the information highway can build upon these experiences and achieve the ease of use needed by the disabled. The upgrading of services inevitably creates new and unanticipated problems for them.

Observation 5 -- Technological advances already in place to serve special constituencies must form the basis for further improvements. This includes consideration of the problems associated with "upgrading" and the application of technology on a broad scale to allow access to communications services.

2.7.3 Literacy

While there is growing recognition of the need to improve access for persons with disabilities (visual, mobility, hearing and speech), there is only an initial awareness of other special constituencies. The overall literacy of the Canadian population, for example, is clearly a major area for concern as regards access to telecommunications.

Statistics Canada reports that only sixty-two percent of Canadian adults aged 16 to 69 have sufficient reading skills to deal with most everyday reading requirements. Their skills enable them to acquire further knowledge using printed material (Statistics Canada, 1991).

A further 22% of Canadian adults can use reading materials to carry out simple reading tasks within familiar contexts with materials that are clearly laid out. But the reading skills of 16% of Canada's adults are too limited to allow them to deal with the majority of written material encountered in everyday life.

A discussion of the relationship of literacy and information technology is beyond the scope of this study, but even anecdotal examples (such as the flashing 12:00 on the family VCR) indicate that this is a matter of fundamental concern for access. The Statistics Canada national survey on language literacy, quoted above, dealt with *"The information processing skills necessary to use the printed material commonly encountered at work, at home, and in the community"*. There is much talk about "computer literacy", and although this term is ill defined, it is evident that special literacy skills are required to use computer terminals which are beyond those normally measured for language literacy such as in the survey just mentioned. Given the problems with language literacy outlined above it is clear that access to information services by people with low literacy levels will require careful attention.

The Statistics Canada literacy report suggests that problems could be overcome, for some of those affected, by careful document design. Part of the problem faced by people at certain levels of literacy can be attributed to carelessly constructed documents. No doubt tens of thousands of Canadians can empathize with this situation as they struggle to operate a new software program or interpret the meaning of well intentioned "help" messages that appear on their computer screens (e.g. "...the connection came up half way and then failed"). Over time one would hope that this situation will begin to improve (as the design of VCRs has improved), and less confusing products appear in the marketplace. Meanwhile the problem of unfriendly devices and confusing instructions is likely to remain a major element in restricting access of a large part of the population.

Observation 6 -- A high percentage of the population is in danger of being excluded from the benefits of access to the information highway because of literacy difficulties.

Observation 7 -- Modern computer-based features, such as multimedia, may offer significant benefits to content providers to design and structure the content of information to meet the needs of large numbers of the public. Such techniques can be used to acculturate people in the use of information technology and support continuous lifelong learning.

It would clearly be counter-productive if government policies permitted universal access to the network, and to content-based services, only to have these efforts thwarted by the inability of large sections of the population to use the services. The problems can be overcome in part by making services readily available, in public places. Further, these services might be deliberately designed to make them easy to use. This is not a trivial task as recent studies of banking machines have shown (Globe and Mail, March 11, 1995).

Canadian governments have already responded to this challenge. SchoolNet, a joint federal, provincial and territorial initiative linking schools and libraries across Canada to the information highway is one initiative. It provides Canadian educators, librarians and students with valuable electronic learning tools and services and encourages the development of information technology skills. By the end of 1998, SchoolNet will link all of Canada's schools, libraries, colleges and universities to the information highway (SchoolNet, 1995).

Observation 8 -- Efforts should continue to be made to encourage the use of information technology services into as wide a spectrum of the public as possible through mechanisms such as community-based services.

Observation 9 -- The planned introduction of information technology based services into public institutions (schools, universities, hospitals) can assist in the adaptation of excluded members of society into the information economy.

2.8 Service to Remote and Rural Areas

2.8.1 Preamble

For many years Canadian policy makers and regulators have paid special attention to the remote and rural areas of Canada. Innovative technologies, infrastructure development, carrier obligations and other approaches have been used to deliberately reduce the difficulties of network access faced by people living in these areas. However, access to the infrastructure is not access to content. This section will therefore begin by addressing the traditional question of access to the network and infrastructure, but will then move to the emerging question of rural and remote needs for content-based services.

2.8.2 Access to Telecommunications and Content Based Services

Deliberate policy initiatives for infrastructure building for the North included the CBC Northern Service in the 60s and the launch of Anik in the 70's. This was followed by special programs such as the Guaranteed Annual Revenue scheme, the Northern Communications Assistance Program and the Northern Communications Policy of the mid-70s. The 80s and 90s have seen the strengthening of institutions, such as the Inuit Broadcasting Corporation (IBC) and companies such as CANCOM. DTH service will commence in the Fall of 1995.

From the viewpoint of the three stovepipes (Figure 4), allowing for the very real limitations of geography and the laws of physics, broadcasting and universal telecommunications services are generally technically on a par with communities in the South. New wireless technologies such as PCS, fixed cellular, DTH and mobile satellites promise to close the remaining gaps. However, both the cost of services and their affordability, continue to be a challenge.

Observation 1 -- Universal telecommunications and broadcasting services are generally available to all Canadians, including those in remote and rural areas.

Observation 2 -- Notwithstanding observation 1 there remain areas of the country where there are gaps, and universality must still be addressed.

Observation 3 -- While services may be available, and access possible, affordability will continue to be an issue for remote and rural residents and cross subsidy will remain an issue. Mechanisms such as subsidies, grants or special rates, perhaps applied differently than in the past, will continue to be needed.

2.8.3 Technology and Service

Technology has served the North well, and Canada justly deserves a high reputation internationally for companies which have used the technologies to serve remote and rural areas. The extension of fibre to rural Saskatchewan, the use of subscriber radio services (SR Telecom) and Thin Route satellite services come to mind. However, the convergence of telecommunications and computer technologies are creating opportunities which are not yet universally available or accessible.

In this connection, Industry Canada has initiated a public consultation on local wideband distribution and advanced communications satellites in certain bands above 20 GHz. Industry Canada believes that an early exploitation of this spectrum by terrestrial and satellite facilities would accelerate advanced wideband wireless access to the information highway. These proposals are of direct relevance to access and include:

- local multipoint communication systems (LMCS) to distribute a wide scope of services, such as interactive video, broadcasting, multimedia, voice, narrowband and broadband data services to Canadian households and businesses;

- local backbone fixed radio facilities to interconnect and network the traffic from various cells of future Personal Communications Services (PCS).

A number of technologies and services have the potential of improving access for remote and rural areas. One of these is Personal Communications Services (PCS). Other coverage possibilities lie in the smorgasbord of satellite services (GEO, MEO and LEO) now in the planning stages.

2.8.4 Telecommunications Infrastructure

As mentioned earlier, there have been long standing efforts in Canada aimed at bringing universal telecommunications services to remote and rural areas. It is worthwhile, at this point, to stop and take stock of precisely where these efforts have come as far as the telecommunications infrastructure is concerned.

Two basic issues need to be addressed, the extension of Individual Line Service (ILS) and service to unserved and undeserved remote areas. The CRTC has placed a high priority on both issues. Through the Construction Program Reviews, Rate Hearings and Special Proceedings, the Commission has established targets and rollout plans for ILS.

In the case of BC Tel, ILS is now the standard service offering. Similarly, there has been significant progress toward the achievement of goals concerning the extension of service to unserved/undeserved areas. BC Tel established a program including the conversion of all of its access arrangements to ILS. The company now has virtually no unserved communities with 50 dwellings or more.

Bell Canada has a high level of ILS service. By the end of 1995, Bell plans to serve all unserved (remote) communities of 30 dwellings or more and about 18 of 176 communities of less than 30 dwellings.

Observation 4 -- Service extension, i.e. individual line service (ILS) and serving remote areas is well underway. While for some companies, extension is virtually complete, for others, completion is expected in the next 3-4 years.

Observation 5 -- While the undeserved population is relatively low, the remainder is deprived from access to the information highway and service extension could be accelerated.

There are, of course, certain financing requirements in excess of that provided through new revenues. These are covered by the general body of subscribers and from the earnings of the carriers depending on their level of earnings with respect to the allowable range. Public policy and regulatory process should continue to consider this approach, perhaps in conjunction with others, such as the creation of a Universal Service Fund.

As noted above, it is unlikely that ILS and service to remote areas could become self-financing in the forseeable future. In this respect, rate rebalancing and diminishing unwarranted tariff differences between rural (remote) and urban areas would be helpful (i.e. additional financing from subscribers). However, this could put pressure on the affordability dimension.

2.8.5 Long Distance

On the other hand, rate rebalancing and increased competition will bring down the long distance communications costs which will benefit rural and remote communities considering that their use of long distance is relatively high. This particularly applies to Northern communities where the majority of the subscribers telecommunications costs are long distance calls.

The CRTC has established a separate long distance schedule for Northern communities, for one service provider, with important reductions as compared to the standard long distance rate schedule. This approach deserves ongoing consideration and possible expansion to promote universal access to and use of the information highway.

In remote and rural areas, the affordability of universal access is very much affected by the long distance component of a user's overall charge. The trend is toward less distance sensitive long distance rates with potentially beneficial effect on remote areas. The regulator should positively consider such direction.

Observation 6 -- Long distance costs are a significant portion of the cost of access for some rural and all remote areas.

Observation 7 -- Rate rebalancing and rate restructuring would reduce long distance rates, however, local rates would increase. This could put pressure on total costs of access for subscribers in many instances.

Another aspect affecting mostly the rural areas is Extended Area Service (EAS). Most rural areas now have EAS with other exchanges and most of these are with major centres affording direct access to information highway services. However, in remote areas, there may be an opportunity to expand local calling areas and ensure that these include an access node to requisite telecommunications services with greater capacity.

In both Bell and BCTel, about 90% of exchanges now have EAS. There are criteria and rollout plans in place which were approved by the CRTC. The main pressure for EAS is for regional free calling, generally clustering around major centres. Further, the concept of regional calling might be extended to certain remote exchanges. In addition, toll free access to requisite telecommunications services might be incorporated.

It should be recognized that EAS involves local rate increases which are often substantial. However, subscribers usually vote in favour of EAS flat rates to avoid long distance charges. Generally, the increased EAS rates do not cover the cost of providing EAS service. The difference is cross subsidized by the general body of subscribers. This provides a focus for the use of any subsidy to remote and rural users from a Universal Service Fund.

More recently, Bell submitted two proposals to further extend EAS (i.e. beyond the existing criteria): the Neighbourhood Calling Plan (NCP) in 1992 and the Community Calling Plan (CCP) in 1993. The CRTC rejected both plans due to their costs, much of which would have been borne by the general body of subscribers, and due to the non-voting feature. In fact there was significant opposition to the plans. Moreover, undue extension of the EAS could have negative impact on long-distance competitors. However, the CRTC indicated that it would be prepared to consider departure from existing EAS criteria to extend toll free calling provided that the incremental costs would be borne by the subscribers in the affected areas and the same subscribers were given the opportunity to vote on the proposals.

Observation 8 -- EAS is an effective means to provide toll-free access to rural communities. In Bell and BC Tel, about 90% of the exchanges have EAS, however, not always with major centres.

Observation 9 -- EAS involves substantial costs and a large portion of the incremental cost is borne by the general body of subscribers. [As well, extension of EAS could negatively impact on long distance competitors as a result of removing certain long distance support for the competitive market]. These costs could be funded in whole or in part from a USF.

Two additional important aspects should be noted:

In the case of Bell and BCTel, the main EAS criterion is at least 60% Community of Interest followed by the vote. (Other telcos have different criterion and generally include societal considerations, e.g. the COI). COI of 60% means that 60% of the subscribers in that exchange make at least one call per month to the other exchange in question. In the case of Bell EAS candidate exchanges, the distance between them should not exceed 40 miles. It is important to note that communities generally vote in favour of EAS despite the often substantial local rate increases without any noticeable disconnects. i.e. it is deemed to be affordable for the value.

In the event significant rate rebalancing is proceeded with and the rate schedules are compressed (i.e. larger increases for smaller rural exchanges as compared to larger urban exchanges), then the EAS regime will need to be reviewed in this context.

The regulator should review on an ongoing basis the cost of access and the tariff implications (including sources of financing/cross subsidies) to provide universal and requisite services, and a blueprint to achieve them. This should include consideration to achieve two-way access as technologies and services develop.

Considerations should include the implications of:

- Competition;
- Reduction in long distance rates (including less distance sensitive rates);
- Special long distance rate schedules for remote communities;
- Rate rebalancing and rate restructuring;
- EAS implications;
- Technological and service developments and associated costs;
- Sources of financing (e.g. Universal Service Fund).

2.8.6 Content-Based Services

Access to content based services is a particular problem for remote and rural areas. In urban areas, people have other options for obtaining information of importance to them, and which may be designated as a requisite service. Access to business tax information, for example, may be a local phone or fax call away for an urban resident, but a long distance call for those in non-urban areas. This situation is, of course, ameliorated by the use of 1-800 numbers or reduced rate schedules, but the urban advantage still prevails. Similarly, with DTH, content-based entertainment services are readily available to both urban and rural consumers, but the rural consumer is again somewhat at a disadvantage compared with the urban consumer who has a wider range of choices. However, the gap between the remote/rural or urban dweller can be greatly reduced by wise public policy, and the gap virtually removed.

Observation 10 - Concerning requisite content services, rural and remote consumers may still be at a slight disadvantage compared to urban dwellers. Positive measures (DTH, 1-800, reduced long-distance rates, etc.) to alleviate this situation may remove much of the inequality of access, but urban dwellers will continue to have a greater choice of options.

Observation 11 -- Certain services may be designated requisite to rural consumers which are available universally to urban consumers by alternative means. In such cases, policies may be needed to ensure access to certain content based services by those in rural and remote areas. Such policies may derive from government mandates in the health and educational sectors.

2.9 The Terminal Environment

2.9.1 Preamble

Access, whether to the telecommunications network or to a content-based service, requires the use of a terminal device (a handset, computer, television set). It might be a terminal in the home (such as a set-top box) or office, or a public terminal, such as a kiosk or other public point of access. There have been various examples of these, such as Minitel in France or Alex in Canada. However, the idea of a single technology terminal is too limited for the information highway. In the new environment a "terminal" might well be a complex of equipment, a local area network (LAN) or wide-area network. This section will address some considerations with respect to this emerging environment.

2.9.2 The Traditional Terminal

The three stovepipe model in Figure 4 has, until now, allowed the development of separate terminals which are universally recognized. Everyone knows that a terminal with certain characteristics is used on the telecommunications network and, with some minor adjustments, a customer used to using a telephone set in Albania would have little problem with the telephone in Zimbabwe - or any place in between. These same characteristics have carried over into cellular telephony and into existing personal communications services -with minor additions which can be easily learned.

Television, VRCs and radio sets are, again, universally recognized. Most people have adapted to the various features offered in these terminals, although many people have trouble with some features (the flashing 12:00 phenomena).

Computers are becoming a mass consumer item, but while most people can use a familiar keyboard, these are largely language/cultural specific. Further, an individual using an unfamiliar computer may have difficultly using the features (programs) available without training or at least re-orientation. While computers (or component parts of a system) can be used to interface with the telecommunications and broadcasting networks, such uses are either packaged into the "computer" itself or are limited to people with a reasonably sophisticated knowledge of the technology.

Because consumers interface with various networks through an appropriate terminal unit, an individual seldom has reason to be concerned with the functioning of the network itself. It should be, and usually is, transparent.

Mandatory regulation of terminals is limited to safety features (Canadian Standards Association CSA approval), the Terminal Attachment Program Advisory Committee APAC process and to regulations governing the radio frequency spectrum. Otherwise the terminal environment is left to market forces.

Observation 1 -- Except for standards, terminals are essentially unregulated and subject to market forces. In the current environment they have become a consumer item.

2.9.3 An Emerging (and Converging) Terminal Environment

Terminals are the direct means by which people gain access to the services of the information highway and thus are the "key to the door" to universal access. As the Network of Networks evolves, and convergence becomes a reality, the terminal environment will change too. The 1994 ITU *World Telecommunication Development Report*, gives an interesting example:

> "...the modern telecommunications network is more and more hungry for computer-based applications. However, it is also true that the modern personal computer needs even greater access to external information sources to function effectively. Thus the development of *Personal Digital Assistants*, represents an attempt to add telecommunication functions such as mobile, voice, data communications and fax, to a palmtop computer" (ITU, 1994).

The same report also mentions the use of

> "...*Application Programme Interfaces (APIs)* which offer software developers the opportunity to build software control functions for Private Branch Exchanges (PBXs) on standard personnal computers rather than having to use special terminals, thus promising considerable price reductions. The application of easy-to-use software would also allow non-expert users more freedom to configure PBXs and to apply network management software which has traditionally remained in the domain of telecommunication specialists".

Among other possibilities offered by these opportunities is

> "...routing of outgoing calls according to private networks, other leased circuits, preferred carriers etc. and regular updating of information on prevailing tariffs offered by different carriers and call options".

A user perspective is given in *Technology Forecast: Communications and Information Technologies.* This report notes a broadly based consensus on the requirements for terminals used in electronic information and transaction services. They would need to contain a user interface to promote user-friendliness, standardized software and a standardized operating system (NGL, 1993). The same report, concerning terminals used for media services at home and work, notes the need for reliability, variable bandwidth, low cost and ease of use.

Advanced wireless techniques, such as the wireless local loop replacement mentioned in 2.8 may add another perspective to the traditional definition of a "terminal". A small isolated

community may chose to provide its own telecommunications services using an access link to the information highway. From the network provider's point of view this would look like a "terminal", although the customers in the community might have distinct network access using their own terminal devices.

Observation 2 -- The terminal environment is likely to evolve dramatically as the information highway develops. Single function terminals will become multifunctional and multimedia. Clusters of terminals and terminal systems may be viewed as terminal nodes.

2.9.4 Standards

The environment described above gives some idea of the complexity of the terminal environment. The evolution of this market seems likely to continue to be market driven, but subject to certain mandatory and voluntary standards. Industry Canada has suggested two essential sets of standards that will be required for terminal access to the information highway.

These are:

- Terminal (user) interfaces and signalling protocols which permit terminal portability and vendor independent equipment; and

- Numbering, naming and addressing conventions and standards which will let users be identified regardless of their network of origin (Connexions, 1994).

The roles of the various standards bodies in Canada have been closely examined over the past four years. Most of these bodies are represented on the Telecommunications Standards Advisory Council of Canada (TSACC) which was established because of the demands that the rapid pace of technology evolution has placed on the standardization process. One of its purposes is to develop and recommend strategies for the development of Canadian standards (Standards, 1993).

Observation 3 -- Standards will be an integral element in the emerging terminal environment, and an important factor in ensuring easy access to services on the information highway. TSACC should be asked to provide advice on the effectiveness of current Canadian standards processes to address the emerging terminal environment.

2.10 Service Providers: Changing Roles and Emerging Entities.

2.10.1 Preamble

The digital language of the computer has gradually become the Esperanto of the Information Society and the previously different worlds of telecommunications services, business information systems, broadcasting , news media, book publishing and film can now all speak the same language and communicate with one another. The result is that separate institutions within well defined industry boundaries are disappearing, to be replaced by old institutions with new roles and entities reflecting new unexpected strategic alliances. This is another of the many faces of convergence.

The purpose of this section is to analyze some features of these changes and examine the implications for universal access and affordability.

2.10.2 Telecommunications Towards Content?

Historically the telecommunications carriers have had to maintain their distance from the message they were transmitting. Clearly, the role of a carrier was to take the users message and deliver it faithfully and without change to its destination. This heritage has persisted, and there have been good reasons over the decades to ensure that there was no mixing of roles concerning the message and the carriage. This however, merits renewed analysis in the era of an information highway.

The carriage/content division has proven to be an excellent reference point; however, care needs to be taken to apply the concept in such a way that it contributes to the achievement the of goals of access and affordability. Examples exist where the role of the carrier has been modestly extended beyond pure carriage and it has had a positive impact on the universality and affordability of the service. Perhaps the most cited example is the Minitel Service in France, where France Telecom provided the terminals at no direct charge to the subscribers. This resulted in a roll-out of the service that would not otherwise have been achieved. Closer to home, the CRTC allowed Bell Canada to cross-subsidize the terminals for the Alex service, while ensuring that the overall service offering was not subsidized from other services. This type of policy and regulatory flexibility may contribute to affordability of content-based services.

Observation 1 -- The concept of content/carriage separation, and the highly legitimate principle of carrier non-interference with messages, does not preclude a role for a carrier in the provision of content-based services that would contribute to universal access and affordability for universal services.

The issue of the full entry of telecommunications carriers into the provision of content-based services is complicated by the nature of programming services. These services have been provided by the broadcasting industry which has been regulated in accordance with the Broadcasting Act. All this is subject to the forces of change. The advent of content-based services, which are in a video or multimedia format, and the digitization and compression of these services which will allow them to be delivered over the facilities of the telecommunications carriers, suggest that the line of demarcation between a content-based service that falls within or without the purview of the Broadcasting Act will be difficult to discern.

This does raise a number of public policy issues but simply from the point of view of universal access and affordability, these developments augur well. The existence of options for access to content-based services and the existence of sustainable competition in the market place should increase the access to the services and their affordability.

Observation 2 -- The key factor, excluding the telecommunication carriers from the provision of content-based services has been the special circumstances surrounding broadcasting services. These circumstances do not exist to the same degree with information services.

Observation 3 -- Technological change will make the differentiation between broadcasting services and other video or multimedia, content-based services extremely difficult. This in turn will make it difficult to delimit the role of telecommunications carriers in terms of programming services that fall within the purview of the Broadcasting Act and information services.

The CRTC has now allowed the telephone companies to take part in Video-on-demand (VOD) trials. The important issue concerning the respective roles of the carriers and the telephone companies in the provision of broadcasting services is now under review as a result of the government's reference to the CRTC. That process is underway, and the subsequent report and government policy decisions will set the context for the next few years.

2.10.3 Cable Television: Cross Ownership and Access

Unlike the telecommunications carriers, the broadcasters have been in the content business since day one. It is true that the cable companies began as "community antenna television services", which were essentially carriers of distant TV signals; however, they have evolved into broadcasting undertakings that originate and acquire a variety of content for distribution to their subscribers. Over the years, they came to play a central role in Canadian broadcasting policy (Towards a New Broadcasting Policy, 1983).

In the case of broadcasting, and more specifically cable, it is not so much the extension of its role in the direction of telecommunications that merits attention here, it is the expansion of the ownership and strategic alliances to encompass the content-providers in other industries, particularly those that provide information services.

The implications for universal access are linked to the fact that, with current technologies, the cable companies still only have limited capacity. Hence, any cross ownership, strategic alliance or other arrangement that would place a service provider in a preferential position could compromise access to content-based services from other service providers. The policy goals appear quite clear. The regulatory principles to ensure the achievement of the goals may need further elaboration.

The significance of the issue will diminish as the cable companies move to the provision of interactive addressable services and, in this role, provide non-discriminatory delivery services to content-providers. In the meantime it will be important for the regulator to ensure that the access policy of the cable companies responds fully to the public policy objectives of access by the service providers to the cable distribution facilities and universal access and affordability of those services deemed to be universal or requisite.

Observation 4 -- Regulatory oversight is required to ensure that the cable companies provide non discriminatory access to their networks. Where there are capacity limitations that prevent such access, then universal and requisite services will have to have priority.

2.10.4 Wireless Delivery of Programming Services

The over-the-air television broadcasting industry now serves a decreasing number of viewers via direct reception. It is however an important service from the point of view of universality and affordability for the Canadian signals. This being said, the majority of the broadcast signals now reach their viewers via cable networks and, with the recent licensing of the last round of Canadian specialty services, the cable networks are the sole delivery mechanism for the Canadian content-based, video channels that do not have an over-the-air origin. This introduces a limiting factor, particularly to equitable access for requisite programming services.

This is about to change. One of the class of new entities to emerge in the second half of the decade is direct-to-home satellite television. A service is to be introduced in the Fall of 1995 which will essentially provide full Canada coverage of television services approved by the CRTC for satellite delivery. This will be particularly important in those areas, remote, rural or just plain unserved by a cable system. In those areas also served by cable, it will introduce a competitive alternative which should maintain some pressures on prices toward ensuring the affordability of the services to the users. This will be particularly true if additional direct-to-home services enter the market place. This possibility exists; however, the most likely entrant is one that would be using services derived from an existing US service. Hence it raises a number of policy issues beyond those of accessibility and affordability. The matter is currently the subject of a policy review and the submissions from interested parties number over 370. This suggests the importance of the issues to Canadians.

2.10.5 Public Libraries: A Role as an Access Provider?

As governments turn their attention to the role of information services in our society, it is timely to think how universal or equitable access can be achieved. This study has expressed the view that no current information service has yet emerged as one that cries out for an universal designation. However, government's rapidly increasing use of electronic delivery for its services and the use of on-line data bases to store public information, clearly indicates that at least requisite content-based services demanding equitable access are on the horizon.

The issue of equitable access demands that public policy focus on the realities of what is required for that access. Two factors are important. One is the terminal device that will be needed and the second is the ease with which that terminal can be used by an extremely heterogeneous public. There are limits to what can be achieved with the telephone, today's ubiquitous terminal. Access will require more sophisticated terminals such as a personal computer and, even with the accelerating diffusion of personal computers (PCs) into the homes of Canadians, it is realistic to expect that requisite information services will emerge before many of them have computers.

This fact suggests that public policy must recognize the need to foster an infrastructure of public access points, equipped with the necessary terminals to allow Canadians to access the information services that are important to them as individuals. Positive developments are taking place. Initiatives such as the Community Information Access Centers and the Community and school networks with their own access points, all add up to a developing infrastructure. Particular attention should be made to the role of public libraries. These institutions are readily associated with the access to information and their physical locations are suited to meeting their publics "half-way".

> **Observation 5 -- Public Libraries could be a very important part of the infrastructure required to provide locations for the public to access requisite information services.**

There is also a need for public policy to recognize the threshold that many members of the public will have to overcome when they attempt to use one or other of the information technologies to access the services. Even if an individual has a home computer, experience suggests that he or she will require assistance, or at least a very user-friendly interface through an access provider, to navigate the information highway to the services they need. Again, the public libraries are an institution that could play a key role. As a publicly funded organization, they could act as a non-exclusive access provider for all universal and requisite information services in their area. The Canadian system of government leads to a possible hierarchy of information services that will differ from one region/ province to the other. The public library would be able to provide a "Home Page" that reflect this situation for those clients that can communicate electronically with it as well as the necessary network connections to the appropriate information sources (servers). It could also "educate" those who come to the library to become autonomous in the use of the public access facility.

Furthermore, if libraries played such a role, they would be an excellent source of advice for the public policy process with respect to the information people consider important and the criteria that should be used to designate universal or requisite information services.

Observation 6 -- Public Libraries, which have a long heritage of assisting their publics to find and retrieve information, could become a public non-exclusive access provider for universal and requisite information services.

3.0 RESULTS AND RECOMMENDATIONS

3.1 Universal and Requisite Services

A universal service should be thought of as a service, that meets a test of societal responsiveness, for which government policy and regulation should seek to ensure universal access and affordability. It is a finely tuned concept and, because it can trigger the use of public funding, it should be applied carefully and sparingly. A requisite service is a companion and more forgiving concept. It includes those services that are vital to a sector which is itself important to society. In this case government policies should seek to ensure the lesser criteria of equitable access and just and reasonable rates, while striving to minimize the difference with universal service.

<u>Recommendation 1.</u> The government should adopt a set of well defined concepts for universal and requisite service, along the line of those set out in this report, and define them for use in public policy.

<u>Recommendation 2.</u> Public Policy should identify, as far as possible, those services that are considered to be universal and requisite services today.

<u>Recommendation 3.</u> The government should establish a process and criteria for the designation of future universal and requisite services.

It should also identify the special considerations that will be accorded these services.

The public processes of the CRTC should be used to determine whether or not a given service should be designated as universal or requisite and hence qualify for the special considerations that public policy would afford it.

There is a need to depart from the traditional service by service approach to the definition of universal telecommunications services. "Single party telephone service" or the provision of "dial tone" no longer reflects the technological and service realities of 1995 nor the future offered by a digital information highway. It is more appropriate to think of the needs of users to move content through the network of networks. Therefore, in the case of telecommunications services

the two-way transport of content between individual access points on the network of networks constitutes a universal service. The capacity of the transport service is the distinguishing variable defining the universal service and the requisite service. The minimum capacity that must be provided at the furthermost extremity of a network to enable any user to send or receive content to any other will define the universal service. This does not preclude other telecommunications services, with particular network provided features, also being defined as universal services.

Recommendation 4. One Universal telecommunications service should provide, at a minimum, the capacity equivalent to voice grade quality for the two way transport of content among all individual access points on all public networks.

Many enhanced telecommunications services can be network based or can be the result of the combination of a universal telecommunications service and appropriate terminal equipment. Electronic mail, facsimile or voice messaging can be achieved from such a combination. However, there are services that could not be effectively provided without a telecommunications service that provides for the transfer of greater amounts of content than that provided by the universal service. Many of these services are those that are needed by business or applications needed by sectors of critical importance to society. Consequently, a telecommunications service which provides the transport capacity needed for these types of services should be a requisite service.

Recommendation 5. One requisite telecommunications service is the provision of capacity, that meets the needs of key sectors, for the two way transport of content among access points on public networks.

Recommendation 6. This transport capacity will vary over time and must reflect the consensus of both users and service providers. Therefore, public policy should identify the process that will be used to establish this

consensus and to modify it as technical, economic and social factors change.

In the case of content-based programming services, those which are licensed as broadcasting services under the Broadcasting Act should be considered as universal services in those markets for which they are licensed. Every Canadian should have access to them and be able to afford them.

Canadian programming services that are not licensed for particular markets, cannot be considered as universal services, but they do merit designation as requisite services for which all Canadians should have equitable access.

Content based information services have not yet evolved to the point where they are thought of as either universal or requisite. Nevertheless, the rapid increase in the use of on-line data bases and governments' use of electronically assisted service delivery indicate that the day is

just around the corner. Now is the time to identify the criteria for universal or requisite information services. These criteria can then guide the process recommended above.

> **Recommendation 7. The criteria for universal content-based services should include:**
>
> - **importance to Canadian culture and identity;**
> - **importance to individuals re their relationship with government and their own well-being.**

3.2 Access - Telecommunications Services

Universal access cannot be achieved without the interconnection of all public networks and the interoperability of all public telecommunications services designated as universal.

This interconnection and interoperability has largely been achieved for those networks relying upon the Public Switched Telephone Network (PSTN) of the telephone companies to reach their subscribers.

This interconnection has not been achieved for those networks that have developed as one-way distribution facilities for video; however, this only becomes crucial to the information highway when those networks begin to provide public telecommunications services.

> **Recommendation 8. Public policy should clearly state that all public networks providing addressable services must be interconnected so as to enable subscribers on any network to communicate with any other subscriber of the same service on any other network.**

Market forces will serve to ensure that service providers will themselves seek network interconnection and service interoperability. This will be required by all providers of public services to ensure that their subscribers can communicate with all other subscribers.

There is an ongoing need for regulatory oversight to ensure a level-playing field, to ensure appropriate responses from the owners/operators of bottleneck facilities and to provide for dispute resolution on matters of the terms and conditions of access to those facilities.

> **Recommendation 9. The CRTC should order network interconnection and arbitrate disputes if the market forces do not result in agreements.**

The same market pressures are at play with respect to the interoperability of services. In this instance, the matter of competitive services with proprietary features must be accommodated within the envelope of interoperability. Consequently, the role of public policy and regulation is to ensure a standards setting process and appropriate mechanisms are in place. Government should be prepared to intervene if it is required in the public interest or in the case of ensuring adherence to international agreements.

A vision of the nature of future networks is required to provide governments, service providers and users alike a point of reference against which each can test their own strategies and present actions.

> **Recommendation 10. In its report to the Ministers, the information highway Advisory Council should provide a vision of a future network to provide a template against which public policy and regulatory practices can be tested to determine their future impact on access and affordability.**
>
> **The concept of a network of networks comprised of bitways, providing users with scalable capacity on demand, is one such vision that deserves consideration along with the related concepts set out in this report.**

3.3 Affordability: Telecommunications Services

One of the key elements of affordability for an universal telecommunications service is the underlying justness and reasonableness of the rate. This can be achieved through regulation or through competition. The competitive approach is now possible due to advances in technology and, given the concomitant stimulus for new services and service features, it is becoming the preferred approach for public policy.

In the past, the use of competition has had very limited application in remote and rural areas. The advent of new wireless technologies and the allowed entry of cable companies into the provision of local telephone services may change this situation.

> **Recommendation 11. To the maximum degree possible, public policy should rely upon competitive provision of telecommunications services to achieve just and reasonable rates.**

Just and reasonable rates based on costs do not necessarily equate to affordability. Consequently, public policy must address the means by which it can be achieved for universal telecommunications services.

Recommendation 12. The government should request the CRTC to establish a public proceeding on the special tariff considerations that should be accorded universal telecommunications service. Approaches that should be considered are:

a) **The use of cross subsidy, within the public networks, to achieve the universal telecommunications service identified in this report.**

b) **The introduction of new tariff principles for remote and rural areas (See Recommendations 30 & 31).**

c) **Affordability for special constituencies could be achieved through the use of direct subsidies to users. The subsidy could come from a universal services affordability fund, established from a levy on all public telecommunications services; and/or, special non-discriminatory tariffs for limited services.**

3.4 Access: Content Based Services

If a universal telecommunications service, as defined in the report, is in place, then the information highway will give all users, regardless of their geographical location, access to all information services that can be delivered using the universal transport capacity. This would include most text based services.

The market place largely ensures that content providers, telecommunications providers and terminal equipment manufacturers achieve technical compatibility and access to the information services.

Recommendation 13. Public policy continue to support competition and choice in the provision of all the elements affecting access to information services.

Recommendation 14. Public policy should rely upon the market place in the provision of information services. In the case of the technical and other arrangements among multiple parties that could affect universal or requisite information services, government should have an ombudsman function in case of malfunctions in the market place.

Access to programming services poses some difficult policy and regulatory challenges. The emergence of multiple delivery systems for programming services means that the regulator is no longer dealing with the duality of off-air and cable. It must also consider the overlay of direct-to-home satellite delivery, wireless cable and the possible entry of the telephone companies. Furthermore, it must envisage the development of on-demand systems with a one-to-one capability instead of the one-to-many broadcast model.

Recommendation 15. The CRTC should explore through a public process the issue of Universal Services in an environment of multiple, broadcast mode, distribution systems to develop a licensing process that achieves maximum public access to Canadian programming services.

Other access issues center on institutional and market related factors. The market place is evolving and new entities are emerging with different roles in the provision, marketing and presentation of content-based services. This evolution augurs well for variety and diversity of services; however, access to universal and requisite services could be impaired if they are packaged with other services and presented to users in a way that prevents distinct access.

Recommendation 16. Public policy should not constrain the evolution of the industry nor the roles of it members in the provision, marketing, presentation and delivery of content based services, other than in the matter of the public's access to universal and requisite services.

Recommendation 17. Public policy should require that all universal and requisite information services are distinctly addressable.

A telecommunications service that will give access to multimedia content-based services combining voice, text and video is not yet an universal service. It is likely however, that any determination of the capacity provided by a requisite telecommunications service will accommodate such services. The potential of multimedia information services for special constituencies, including education and the handicapped, would support such a decision.

Recommendation 18. Public policy should set objectives for the establishment of a requisite telecommunications service capable of providing the capacity needed to transport multi-media content.

Recommendation 19. Public policy and regulatory practice should recognize the positive contribution to access that will be provided by Video-on-Demand.

3.5 Affordability: Content Based Services

Affordability for universal programming services has already been achieved through the regulation of the broadcasting system and direct government funding of public broadcasting.

Recommendation 20. Public policy and regulation of programming services should ensure that future evolution of the current system for the delivery of programming services to one including the addressable services does not compromise the affordability of universal services found in today's broadcasting system.

Similarly, the regulation of the broadcasting system and the use of advertising supported services has resulted in fees for requisite programming services that can be considered just and reasonable.

Information services are developing in a full market environment and the market place is determining the value of the services. No universal services have yet emerged to demand the attention of policy makers as to their affordability. Given the competitive market place, it can be concluded that all rates will be just and reasonable and hence this criteria will be met for any service deemed to be requisite.

Recommendation 21. Public policy should provide for a competitive market for the supply of information services to ensure just and reasonable rates.

3.6 Special Measures for the Individual

It is readily recognized that all Canadians do not possess the same capabilities and that special measures may be required to minimize differences among individuals in the ease of using the access that is provided for universal or requisite services.

This difference is particularly acute for individuals with disabilities. In order to address this issue, it is important that every opportunity be used to sensitize service providers and terminal equipment manufactures to the potential benefits of planning special feature into new services and equipments. The cost and difficulty of focusing on these issues after the roll-out of a service and the appearance of the terminals may render the cost of adaptations prohibitive; whereas, if considered at the beginning of the process, they can be entirely feasible.

Recommendation 22. Public policy should strongly support "accessible design " of telecommunications and content-based services.

To provide focus and momentum, government should establish a formal user-industry forum for the on-going identification and resolution of issues.

The emergence and importance of content based information services will put further stresses on those individuals with literacy problems. Fortunately, the information technologies that will create these new stresses have the capability of ameliorating them.

Recommendation 23. Providers of universal and requisite information services should consider multi media formats to assist people with literacy problems.

Access to information services via the information highway is not only a function of the access to the telecommunications network and the server on which the information is stored. It is also a function of the availability of terminal devices and the software that will assist the user to locate, retrieve and use the information. There is an accelerating diffusion of these elements;

however, special measures will be required for some time if all segments of Canadian society are to benefit from the availability of information services. The public funding that supports shared networks such as community and school networks and common-user access centers will be an important feature for some time to come. Public funding in public libraries could also be levered to assist users to capitalize on the access provided to universal and requisite information services.

> **Recommendation 24. Governments should continue to provide financial support for shared networks and common-user access centers to help Canadians use the access to information services that the information highway provides.**

> **Recommendation 25. Public Libraries should be used to provide public access to electronic information services and they should be mandated to become a public, non-exclusive access provider for universal and requisite information services.**

Terminal equipments are, of course, required to achieve access to all networks and the telecommunications and content based services they provide. This market has become highly competitive and operates in a totally unregulated environment. In effect, many terminals such as telephones, computers and television sets are consumer items. The challenge for public policy centers on the identification of standards that are required and the processes to set them.

> **Recommendation 26. TSACC should be invited to provide advice on the effectiveness of existing Canadian standards processes to address the issues surrounding the emerging terminal environment.**

3.7 Special Measures for Remote and Rural Locations

Telecommunications service extension, individual line service (ILS) and service to remote areas is well underway. In the case of some service providers extension is virtually complete, in others, completion is expected in the next 3-4 years. Service extension should be accelerated.

New wireless technologies such as PCS, fixed cellular and mobile satellite services may offer technological options to facilitate this acceleration. In general, with the technologies that are now available, or are in the immediate future, universal access to telecommunications service will be within the reach of all Canadians. Affordability will continue to be the problem; therefore, new tariff principles and the possible entry of second service providers should be contemplated.

Universal or equitable access to content based information services depend on the availability of both universal and requisite telecommunications services. If this is achieved, then access to information services in remote and rural areas of Canada will approach that enjoyed by other Canadians.

Recommendation 27. The CRTC should further focus on the costs and tariff implications, taking into account developments in technology and services, to provide universal and requisite services to rural and remote areas on an accelerated basis.

Long distance costs are a significant portion of the cost of access for some rural and all remote areas even though, in some cases, separate reduced long distance rates apply to northern exchanges. For this reason, it is imperative that new tariff principles are considered in conjunction with the matter of subsidization of access charges as outlined in Recommendation 12.

Recommendation 28. Further extension of special reduced rate schedules for remote exchanges should be considered, particularly in the event of negative overall impact as a result of rate rebalancing and/or rate restructuring.

Extended Area Service (EAS) is an effective means to provide toll-free access to rural communities. In Bell and BC Tel, about 90% of exchanges do have EAS, however, they do not always encompass a major center. EAS can involve substantial costs. To achieve affordability it would require a balance between self financing and some form of subsidization.

The extension of EAS could, of course, have a negative impact on long distance competitors. This would have to be considered.

Recommendation 29. The CRTC should seek alternative EAS plans to provide toll-free regional calling for remote and rural areas. The EAS area should contain an access node to a requisite telecommunications service.

Recommendation 30. The Department of Industry should examine how the use of the wireless technologies could contribute to the goal of universal telecommunications service in rural and remote areas. It should take this matter into consideration when licensing new service providers.

3.8 The State of the Nation

The observations, conclusions and recommendations in this report suggest that there is a very heavy agenda ahead for public policy and regulation concerning universal access and affordability. This is true, but it must also be recognized that major progress has been made in the last two to three years. The data base contained in this report clearly indicates just how much has been achieved, and there is no slowing down. Current CRTC proceedings on convergence issues and the policy review on Direct-to-Home (DTH) satellite services will add significantly to the body of policy and regulatory approaches of direct relevance to the subject of this report.

4.0 WHERE ARE WE NOW? THE DATA BASE - CANADA

The data base for this study consists of two major components:

- The current public policy and regulatory positions that have already been enunciated with respect to these issues;
- Some recommended policy principles and regulatory approaches suggested by prior studies.

The data base concept that has been chosen for the public policy and regulatory approaches is one that is hierarchical in structure. The definition of public policy is itself somewhat elusive and has many levels. The study deals with policy at three levels:

Level I: Overall Government Strategy;
Level II: Policy Principles;
Level III: Specific Policy/Regulatory Approaches.

4.1 The Point of Departure

While the concentration on the Information Highway is quite recent, a considerable amount of study of public policy and regulatory issues concerned with its development and use has already been accomplished. This work constituted the point of departure for this study and is a key element of the data base.

A complete bibliography for this study is annexed. Two reports are of particular importance. They are recent, each was based on a consultative approach and was commissioned by the government to provide it input into the policy making process. This report builds upon that work and seeks to refine and expand upon the policy recommendations already put forward.

Given their importance to the work, they merit specific mention here. "Canada's information highway; Service, Access and Affordability", May, 1994 was prepared for Industry Canada by Elisabeth Angus; Angus TeleManagement Group and Duncan McKie; Decima Research. The recommendations of the report were based upon interviews and contributions from some 30 opinion leaders with organizations that have a stake in the information highway. These were supplemented by focus groups involving another 150 persons.

An earlier report, "Convergence: Competition and Cooperation", September, 1992 was prepared for the then Minister of Communications and was based upon the work of a Local Networks Convergence Committee chaired by Hank Intven and Robert Menard. A number of the recommendations from their work are of relevance to the matter of universal access and affordability.

The government's preparation for the establishment of the Information Highway Advisory Council also constitutes an important element. The constituting documents give a good indication of the high level policy of the government and provide the basic directions on which this study has concentrated in its more detailed analysis of access and affordability.

On October 8, 1994 the Governor in Council (GIC) requested the CRTC to report on a number of matters touching upon the development of the information highway and access thereto. In the details of the referral the government sets out a number of broad policy positions that are germane to the work. This proceeding is rich in material of relevance to this study. Unfortunately, it is still in process at the moment of finalizing this report.

A number of other processes have been launched since the commencement of this study that will have direct relevance to it and which will add to, or otherwise change, this data base. Specific mention should be made of the policy review on the matter of direct-to home satellite television (Canada Gazette, Nov. 26, 1994); the reconsideration, by the CRTC, of its decision with respect to the de-averaged per-minute contribution mechanism (Telecom Public Notice CRTC 94-59, Dec. 29, 1994); and the Governor in Council's decision to refer back the part of the CRTC Decision 95-19, concerning the matter of rate rebalancing.

4.2 Announced Policy Principles: Facilities and Content

4.2.1 Facilities

The analysis of the above issues and the derivation of policy/regulatory recommendations must take into account the existing policy positions. It is popular to insist that the government and the regulator must address the issues raised by the information highway. This is true. It is also true that a great deal of progress has been made.

The fundamental expression of public policy is found, of course, in the telecommunications policy set out in the telecommunications legislation. Section 7 sets out the telecommunications policy for Canada. The objectives of particular relevance to this study are:

(b) to render reliable and affordable telecommunications services of high quality accessible to Canadians in both urban and rural ares in all regions of Canada.

(e) to promote the use of Canadian transmission facilities for telecommunications within Canada and between Canada and points outside of Canada.

(f) to foster increased reliance on market forces for the provision of telecommunications services...

In the Speech from the Throne, January 1994, the government highlighted the information highway as a key priority. It subsequently identified three broad strategies central to the development of the highway. One of these was:

- Universal Access at reasonable cost

This pronouncement sets the key overall government strategy that is the point of departure for this study.

At the same time the government committed itself to a number of policy principles. The two that are of primary importance to universal access and affordability are:

- An interconnected and interoperable network of networks ; and,

- Competition in facilities, products and services

In the October 1994 GIC referral to the CRTC, the government set forth a number of policy positions which are also very germane to this study. On the matter of facilities, the government stated that it was its policy that:

- Cooperation or sharing between cable licensees and telecommunications carriers should be permitted,

- The facilities and capacity of telecommunications carriers under federal jurisdiction, including the facilities of cable licensees beyond that used by the licensee for the carriage of broadcasting services to the extent practicable, be made available for the lease, resale and sharing by service providers and other carriers on a non-discriminatory basis, and

- Facilities and capacity, including support structures, should, to the extent practicable, be provided in a manner that allows users to use and pay for only those parts of the network infrastructure that they require.

These operating principles are subject to some qualification but they nevertheless set forth for the first time clear elements of the overall government strategy for facilities of the information highway. The process that has now been started will presumably lead to a number of specific policy/regulatory approaches that will be necessary to meet the overall government strategy of universal access and affordability.

On the matter of content the government policy was stated to be:

- Participants in the information highway make equitable and appropriate contributions to the production and distribution of and access to Canadian cultural-content products and services.

As noted above, the matter of competition in the provision of facilities and services has long been a major issue affecting both access and affordability. When announcing the referral to the CRTC, Minister Manley stated, " Competition will be the key to the information highway". In the text of the GIC Schedule, the government stipulated a number of policy principles, including the following:

- Foster fair competition and an increased reliance on market forces in the provision of facilities, products and services;

- Encourage the regrouping and interconnection of cable licensees' systems on a national basis in order to maximize their efficiency as long as this does not impede access.

The role of Industry Canada in establishing the policy principles for the use of the radio spectrum, for which the Minister is also the regulator, opens another window on a family of policies that have particular importance for universal access and affordability, given the rapidly expanding role of wireless services on the information highway.

The Minister's statutory responsibility for the licensing of radio facilities, gives him/her effective control over entry into the market place for those entities which intend to provide services primarily by means of radio based telecommunications. One of the guiding policies over the years has been the use of Canadian facilities for Canadian traffic. This policy has had particular relevance for the regulatory approaches of the government in the matter of radio licensing.

Canadian Facilities for Canadian Traffic

The advent of Regional and Global Satellite systems, fully capable of providing mobile services to subscribers anywhere in the world, including the remotest parts of the country, caused a review of Canada's policies with respect to mobile satellite services from regional and global satellite systems. As a result of that review, the government announced a new policy on Nov. 5, 1994. This policy continues to place a high priority on Canadian ownership and control of transmission facilities used for the carriage of Canadian traffic. However, it uses a proportional approach similar to that used for Canada's participation in other global systems, such as INMARSAT and INTELSAT. This policy is of particular importance to the matter of universal service, given the technological potential of the mobile satellite systems to provide service where no other facilities exist.

- Mobile Satellite services from a global or regional system could be licensed in Canada if:

    - It provides demonstrable benefits to Canadians;
    - Canadians hold a share of equity in the system that is proportional to Canadian usage.

4.2.2 Content

As in the case of telecommunications facilities, the highest expression of government strategy with respect to content can be found in the objectives of the relevant Act...the Broadcasting Act. Those of particular relevance to this study are:

- the Canadian broadcasting system, ...makes use of radio frequencies that are public property and provides, through its programming, a public service that is essential to the maintenance and enhancement of national identity and sovereignty;

- The Canadian broadcasting system should:

  i) serve to safeguard, enrich, and strengthen cultural, political, social and economic fabric of Canada,

  ii) encourage the development of Canadian expression...

- Each broadcasting undertaking shall make maximum use, and in no case less than predominant use, of Canadian resources in the creation and presentation of programming, unless...

- Programming accessible by disabled persons should be provided within the Canadian broadcasting system as resources become available for the purpose.

- Distribution undertakings:

  i) should give priority to the carriage of Canadian programming services and, in particular, to the carriage of local Canadian stations;

  ii) should provide efficient delivery of programming at affordable rates, using the most effective technologies available at reasonable costs.

In addition to the above statutory objectives it is interesting to note that the Act makes the following " further declaration":

- It is further declared that the Canadian broadcasting system constitutes a single system and that the objectives of the broadcasting policy set out in subsection (1) can best be achieved by providing for the regulation and supervision of the Canadian broadcasting system by a single independent public authority.

In the area of content, there have been a variety of other notable strategies and policy and regulatory approaches of the government with respect to Canada's cultural industries other than broadcasting. There is no specific legislation in these area, such as the Broadcasting Act, with

its own objectives. Nevertheless, the strategies that have found their expression in specific policy initiatives are of value in establishing the traditional approach of Canadian governments to matters of "content".

One important family of strategies have been directed toward maintaining Canadian ownership of the publishing industry and the protection of magazine publishers from US competition. (Direct regulatory interventions have used the governments taxation powers to implement such regulatory approaches as the disallowance of advertising expenditures in US published magazines for tax purposes).

- Canadian governments have promoted Canadian ownership of the publishing industry.

These strategies have been complemented by financial support programs to assist Canadian cultural industries. In the area of film and video creation, the strategy has been to ensure that quality Canadian cinema and television programming was available to Canadians. The policy approaches have centered on direct government support to film makers through various programs and through institutions such as Telefilm Canada.

All of the above strategies culminated in a common focus when Canada fought for, and won, a "cultural exemption" in the Free Trade Agreement between Canada and the US.

4.3 Regulatory Approaches of the CRTC

4.3.1 Facilities

A variety of regulatory decisions, both by the CRTC and Industry Canada (as the regulator of the radio frequency spectrum) have also been made in the past two or three years which have direct relevance to access and affordability.

Several CRTC Decisions have featured regulatory approaches that have been important building blocks; an integral part of the policy environment for the information highway. Because of the recent progress made in these areas, only those decisions post-1991 are included here. By and large other regulatory approaches are subsumed in decisions of the last three years.

Decision 1992-12, the so-called Interconnection Decision, is of particular relevance. It was the landmark decision that redefined the telecommunications marketplace in Canada. In previous decisions the CRTC had gradually increased competition in local and long distance voice telephone service through sharing and resale as well as allowing virtually full competition in voice private line, data and enhanced services. With Decision 92-12, the CRTC permitted full scale competition in public long distance telecommunications and allowed free entry for facilities based carriers along with interconnection of their networks with those of the then federally regulated telephone companies, with the exception of NorthWestel. Sharing and resale rules were revised and the resale of Wide Area Telephone Service (WATS) was permitted. In summary:

- Long distance voice competition was permitted;

- Free entry of facility based carriers was allowed with interconnection rights to the major federally regulated carriers.

All previous decisions respecting long distance telecommunications were subsumed in this decision. It essentially represents the point of departure for the subsequent decisions opening up the market place to competition.

The decision also specified the terms and conditions under which facilities based carriers and resellers could interconnect with the telephone companies and prescribed the tariff components to be filed. The decision required the telephone companies to provide equal access to competitors services and established rules to safeguard against any anti-competitive actions.

One of the concepts and associated regulatory principles in the decision, that of the unbundling of the "bottleneck services", is of particular importance to the matter of open access and affordability. Consequently, they merit specific identification here.

In decision CRTC 94-19, the CRTC required the telephone companies to provide unbundled utility service components so that their competitors could have access to them on the same basis as the telephone company itself. This requires the splitting of the ratebase into the utility and the competitive components for regulatory purposes.

Unbundling has already been achieved to some degree, pursuant to Decision CRTC 92-12, which saw a number of tariffs filed and approved to implement long distance competition. In the proceeding leading to CRTC 94-19, all parties agreed to the need for unbundling. However, there were differences as to the approach that should be used. The telephone companies wanted to base their tariffs for unbundled services primarily on the negotiations with their competitors. On the other hand, the competitors sought a more proactive approach by the Commission although none of the parties had formulated a precise requirement for unbundled services.

Consequently, in its decision the CRTC allowed the telephone companies 180 days to file their initial tariffs for unbundled services. The competitors were required to make their needs know within 90 days. In the future all new services to be filed by the telephone companies are to include a description of any underlying service elements and, if they are untarriffed, propose tariffs along with the related rational.

Unbundling does have a cost associated with it and the Commission has recognized that it should not be pursued beyond a point where the benefits outweigh the costs. Furthermore, there is recognition conditions can vary from one telephone company to another across the country. While the final outcome of the current process is not yet known, the regulatory approach of the CRTC is now well entrenched

- Telephone companies are required to unbundle the basic underlying elements of their access services and make them available to their competitors on the same basis as they are available to themselves.

A related issue is co-location. Currently, all transmission facility terminals, located in a telephone company's central office, must be provided by that company. As a result, competitors must incur extra costs in connecting their networks to those of the telephone company. The telephone companies do nor oppose co-location in principal; however, their concerns would have a limiting effect on the possibilities of co-location. The CRTC has set forth a general requirement that co-location be provided unless there are good reasons against it. It has required the telephone companies to submit tariffs for virtual co-location or, if this is deemed physically impossible, then tariffs that would reflect the same access to their local switches for competitors facilities that the company is prepared to offer to its own long distance operations.

- Telephone companies must, in principle, allow competitors reasonable access to their local switches for the co-location of their interconnection facilities.

Technical matters related to interconnection and interworking were also dealt with.

- Telephone companies are required to provide equal access to competitors;

- New entrants are required to pay contributions to the telephone companies for access to the local networks.

The second landmark decisions of the CRTC was Decision 94-19, dated September 16, 1994, in which the Commission set forth a new regulatory framework for Canada, after a long and thorough public process. This decision extended the competitive market place to local telephone service. The key features of that decision constitute specific regulatory approaches that operationalize the policy principles of the government. The salient features are:

- Competition is now permitted in the local telephone market.

Telephone companies, cable companies, wireless service providers, resellers and specialized service providers will <u>all</u> be permitted to offer a range of voice/data/video telecommunications services to local subscribers.

- Support for the removal of barriers to telephone company entry into the information services markets.

This decision did not address the matter of carriers holding a broadcasting license; however, they have been allowed to participate in video-on demand trials.

- An approach of promoting open and reciprocal access among telecommunications service providers to facilitate competition and user choice.

The matter of open access to the local networks of the telephone companies was addressed in another major CRTC Decision, 92-12. In that decision the Commission ruled that the telephone companies must provide equal access to their networks for other facility-based long distance carriers. That decision was fundamental to a user friendly access for non-telephone company subscribers and is an important part of this data base. More detail of Decision 94-19 is mentioned below.

- Rate rebalancing with increases in local rates to be offset by decreases in long-distance rates, effective January 1995 (under review). Also replacement of rate-of-return regulation with incentive regulation focused on price caps in 1998.

These regulatory approaches will be important to the matter of affordability, as it relates to the telecommunications/transport services.

With the convergence of telecommunications and broadcasting, one has also to examine the CRTC's broadcasting decisions to determine the exact nature of its regulatory approaches to facilities. The two decisions that merit attention are in the matter of the take over of Maclean Hunter limited by Rogers Communications Inc. (RCI), December 19, 1994, and Public Notices CRTC 1993-74, 75, 76,and 77, June 3, 1993.

In the Rogers Communications decision the CRTC commented directly on the issues related to the respective roles of the telephone companies and the cable companies. It the matter of local networks it referred to Public Notice 1993-74 and cited " Accordingly, the Commission encourages the cable and telephone carriers to explore opportunities for cooperative ventures for the shared use of network infrastructure..". and it further referred to its Telecom Decision 94-19 and, while noting that it had stopped short of a determination that telephone companies should be allowed to hold broadcasting licences, it quoted " subject to the licensing of service providers where required, broadcasting or content-based services may be distributed over telephone company facilities...".

- Telephone companies and cable companies are encouraged to find ways to share network infrastructure and the telephone companies will not be prohibited from distributing broadcasting signals.

The Rogers Communications decision also addressed access and interconnection issues. Intervenors expressed concerns that the merger could result in impediments to other parties seeking access to RCI's cable facilities for distribution their own services. While the decision does give a good indication of the regulators priorities on the access issue, it is not a definitive decision and the process of determining a fully acceptable access policy is continuing, However, for the purposes of this data base it is worth observing that the regulator's noted that " the proposed policy does not ensure fair end equitable access among exempt programming services that have not been assigned a carriage priority, but which are nonetheless "broadcasting"...and... " the Commission considers that...cable television undertakings must offer program suppliers access to their distribution facilities on a fair and equitable basis, and without any discrimination on any basis whatever."

4.3.2 Content

In the past, the CRTC Decisions which have set out the regulatory approaches of most significance to universal access and affordability of content-based services are those made under the Broadcasting Act, particularly those relating to the delivery of US programming via Broadcast Receiving Undertakings and other distribution systems such as direct-to-home broadcasting satellites.

Broadcast Receiving Undertakings

The regulatory approaches that have evolved over the years have been primarily directed toward an achievement of the cultural objectives of the Broadcasting Act. These have been oriented toward the broad protection of the Canadian broadcasting system and its broadcasters through the limiting of the competition to Canadian programming from foreign programs. These are, of course, primarily US programs available to Canadians via US signals receivable in Canada.

The regulatory approaches that merit particular mention are the "3 +1" rule and the linkage rules. The so-called 3+1 rule limited the US channels that could be carried on cable systems to the three US networks plus a non commercial channel. This rule was given some flexibility in a 1994 decision which allowed cable systems to offer a fourth conventional US network, but on a discretionary tier. The Commission's Linkage rules define how cable companies are permitted to package foreign satellite services such as Cable News Network (CNN), Arts & Entertainment etc. These rules were first introduced to give Canadian subscribers access to popular foreign services and to ensure they assisted in the success of Canadian specialty and Pay-TV services by having them packaged with Canadian services.

Apart from these historical approaches of the CRTC which have appeared in a variety of their decisions, there is only one decision that offers much guidance on the regulatory approach of the CRTC in matters of content that is particularly enlightening with respect to the information highway. That is the decision concerning the take over of Maclean Hunter Ltd. by Rogers Communications Incorporated. In Decision CRTC 94-923, the Commission sought to ensure a clear separation between editorial voices in markets where RCI will operate both newspaper and over-the-air broadcasting outlets.

- Common ownership of content based services must not hinder an expression of a diversity of views.

On the issue of concentration, the Commission noted RCI's plans to position itself as an industry leader in the push to compete with non-Canadian companies and accepted its arguments that ownership of Maclean Hunter's magazines was an important part of its plan to develop new electronic information and multimedia services for the new communications environment.

- Ownership that crosses various media boundaries can position Canadian companies to compete with foreign companies in the production of content based services.

Direct-to-Home (DTH) Satellite Television

In September 1994, the Commission issued an Exemption Order which allowed direct to home satellite distribution of authorized television programs, subject to certain criteria such as the use of Canadian satellites. The importance of this decision to the longer term direction of access to the content on the information highway prompted the government to launch a review of Direct-to-Home satellite policies following the decision. It can be expected that at the end of this process, which involves a review of the policy by three eminent individuals, new policy principles will be put forward by the government which may
or may not result in changes to the now established regulatory approach. However, as it stand the features of the regulatory approach relevant to this part of the highway are:

- Direct-to-Home (DTH) Satellite Distribution Undertakings may deliver television programs directly to individual satellite receivers or indirectly through distribution undertakings provided they meet certain criteria such as:

- Industry Canada technical requirements;

- Distribute only Canadian signals licensed or exempted by the Commission;

- Use Canadian satellites.

4.4 Regulatory Approaches: Industry Canada

Industry Canada, has regulatory responsibility for the management of the radio frequency spectrum. Widely diverse services as radio astronomy, television broadcast and microwave transmissions rely on the availability of spectrum, and its allocation and use is a vital consideration in Canada's ability to compete internationally. The eventual result of Industry Canada's activities in the management of the spectum is the granting of a license (or an exemption from licensing). A number of steps lead to this result, including the negotiation multilaterally and bilaterally of "bands" of frequencies, the adoption of a national "Table of Frequency Allocations" and the promulgation of plans and regulations governing the technical and operational use of the spectrum. This may involve the opening up of "new" spectrum, or the reallocation of existing spectrum in a process analogous to that of the zoning or rezoning of land. The allocation of a block of spectrum to a "service", and the granting of a licence to use that spectrum can be of great commercial value. In 1992 the then Department of Communications (prior to these functions being moved to Industry Canada) issued a *Spectrum Policy Framework for Canada* which stated that:

> "...the frequency spectrum is a public resource which needs to be allocated and planned to advance public policy objectives. .....access to the spectrum [will] be adapted to meet the changing user requirements and facilitate new and innovative services" (Framework, 1992).

Canada has, in recent years, benefitted from a series of balanced spectrum policies which have contributed to the success of its communications networks. Examples include the allocation and licensing of the microwave bands, which allowed for the orderly evolution of the telecommunications networks but permitted reasonable access to other users of microwave (such as the cable companies and power utilities). The balanced re-allocation of valuable spectrum from television broadcasting to cellular service permitted the establishment and growth of the burgeoning cellular industry. Canada has seen, over the past few years, the establishment and development of "...a number of competitive and complementary mobile and personal communications services, including cellular radiotelephony, radio paging, mobile satellite data transmission and telephony, dispatch mobile radio, digital public cordless telephony and air-to-ground telephony" (2 GHz, 1994).

From the viewpoint of access and affordability three major application areas are experiencing dramatic evolution in the market-place and can be expected to exercise a significant influence. These are satellite systems, mobile radio systems and personal communications services.

4.4.1 Satellite Systems

In 3.2.2, above, the policy of the Government of Canada on the question of Canadian facilities for Canadian traffic has been covered. The same policy statement, dated November 5, 1994, states that:

> "Through ... mobile satellite systems, Canadians could have a greater choice of communications services, and users in remote and rural areas of Canada would, in particular, benefit from access to better and more affordable communications services and
>
> ...satellite communications are likely to play a key role in providing an increasingly mobile population with continuous access to the information highway. Satellites might also prove to be instrumental in giving more Canadians access to the information infrastructure sooner, since the delay and costs of laying cable can be avoided if satellite coverage is available"
> (DGTP-001-94).

A number of allocations have been made in the *Revisions to the Canadian Table of Frequency Allocations (1994)* reflecting the importance of satellites . These include allocations to the Mobile Satellite Service as well as to Broadcasting and Broadcasting Satellite Services to support digital radio broadcasting (Allocations, 1994). In this connection, it should be noted that digital radio broadcasting will greatly improve radio coverage for all Canadians, particularly those on the move.

The Department has also carried out public consultation on local wideband distribution and advanced communications satellites in certain bands above 20 GHz. Industry Canada believes that an early exploitation of this spectrum by terrestrial and satellite facilities would accelerate advanced wideband wireless access to the information highway. These proposals are of direct relevance to access and have been specifically referenced in 2.8 "Service to Remote and Rural Communities". They include:

- local multipoint communication systems (LMCS) to distribute a wide scope of services, such as interactive video, broadcasting, multimedia, voice, narrowband and broadband data services to Canadian households and businesses;

- local backbone fixed radio facilities to interconnect and network the traffic from various cells of future personal communications systems (PCS);

- future advanced communication satellites for multipurpose mobile or fixed service applications to portable earth stations (DGTP-013-94).

4.4.2 Mobile Radio (Cellular)

Cellular mobile service was introduced in Canada by Gazette Notice DGTN-006-82 which limited cellular service to applications providing a public mobile service with some form of interconnection with the public switched telephone network. In the interest of avoiding any limitation to competition, the Department of Industry has initiated a consultation process to clarify the definition of cellular services which would make it explicit that:

> "...cellular service providers can ... provide dispatch, paging, mobile data and like services in addition to public mobile telephone" (DGTP-008-94).

4.4.3 Personal Communications Services (PCS)

The Department defines **personal communications services** as comprising a family of (integrated) radiocommunications services provided through personal user radio terminals operating primarily in a mobile or portable mode. The Department expects wireless technologies in general, and PCS in particular, to play key roles in the development of the Canadian information highway. Accordingly, policy formulation in this area is being carried out with regard to the objectives of the information highway strategy which includes

> "....the provision of universal access at reasonable cost."

Further, these policies are consistent with the principles guiding the development and implementation of the information highway strategy and with the objectives of Section 7 of the Telecommunications Act and with the Radiocommunications Act.

The Department has recognized the need to implement PCS in Canada and is proceeding with implementation in the 2 GHz range leading to a call for licenses in the second quarter of 1995 and the awarding of licenses later in 1995. To this end the Department has initiated a process to:

> "...designate suitable frequency spectrum in the 2 GHz range for both licensed and licence exempt PCS applications".
>
> A public process (2 GHz, 1994) is now underway to develop appropriate policies. One of the goals of this process is:
>
> "...to foster the introduction of state-of-the-art voice, text/data, and image services for Canadians....to garner the benefits available from advanced technology...and [to permit] Canadian industry [to] maintain its leadership in the provision of mobile and personal communications equipment and services".
>
> Comments were sought from the industry on measures which would:
>
> "....best foster ...innovation, encourage market flexibility, promote consumer choices, and ensure full and open competition".

The Department has proposed a *spectrum transition policy* which would recognize on the one hand the potential benefits of PCS, yet on the other hand would provide reasonable transitional measures for users who will be displaced by the new policy.

The Department has also addressed the implementation of narrowband personal communications services in the 900 MHz range. The current interest in the 2 GHz Range has been largely in voice communications. But narrowband personal communications in the 900

MHz sub-bands would open up additional possibilities including two-way messaging for text, data, voice and other communications (900 MHz, 1994).

4.5 Existing Recommendations for Policy Principles and Policy/Regulatory Approaches

In Section 3.1 Point of Departure, it was noted that the Report "Canada's information highway; Service, Access and Affordability", was of particular importance to this study. Given that importance, Appendix A reproduces a number of the "policy guidelines" recommended in that Report which are of first order importance to access and affordability.

The second reference which contains recommendations that are of prime importance is "Convergence: Competition and Cooperation" the essential thrust of which follow. The full text of the recommendations can be found in Chapter 9 of the Report.

Efficiency of the Infrastructure

Full integration of the local network need not be promoted, but policy should be flexible and not prevent sharing and integration of elements that make sense. Regulatory supervision should also ensure that anti-competitive strategies do not prevent integration when that cold improve efficiency.

Ownership of the Local Network Infrastructure

Sharing and integration should be particularly pursued in less populated areas. In all areas, the sharing of support structures should be promoted and consideration given, with suitable safe-guards, to the joint use of rights-of-way and subscriber drops. Requirements that cable companies own their own amplifiers should be abolished and the sharing of head-ends among cable operators should be allowed.

Developing Advanced Local Broadband Networks

Government policy and regulation should permit the upgrading of cable and telephone companies' networks and any sharing of network elements should maintain a competitive environment. Industry should lead activities for the development of standards facilitating the integration and interconnection of networks. These should be consistent with the Open Systems Architecture concept.

Telephone/Cable Cross-Ownership

Telephone companies should not be permitted to own or control cable systems in their service territories, with any ownership limited to 30%. An exception should be made in remote and unserved areas. Subject to the above there should be no cable ownership

restrictions for telephone companies and policy should not prevent joint ownership of separate entities that would provide elements of a local network.

Telephone Company Entry into Local Broadband Markets

Telephone companies should be permitted to develop local networks capable of delivering broadband services and regulatory oversight should prevent any abuse of a dominant market position subsidize competitive broadband services. Service providers, using these facilities, that would impinge on the objectives of the Broadcasting Act, should be regulated under this Act.

The Carrier/Content Distinction

Both telephone companies and cable companies should be allowed to participate in the provision of content-based services on their networks. This should generally be done through separate affiliate, with some exceptions for cable companies. In the case of telephone companies, investment information services affiliates should be limited to a minority position for the first five years. This would not apply to enhanced telecommunications services.

5.0 THE DATA BASE - OTHER COUNTRIES

5.1 Preamble

Most industrialized countries are addressing the issues surrounding the information highway. A major consultation process is now underway in the United States, a report dealing with the situation in Europe has been prepared for the European Community, Australia has its Broadband Services Expert Group and Japan's Ministry of Posts and Telecommunications (MPT) is addressing similar issues across a broad base of applications-based services. Singapore, with its *Intelligent Island IT2000* initiative, has undertaken an extensive study to bring advanced information infrastructure to every home, office, school and factory in the country. The recent G7 meeting in Brussels has placed the "information highway" issues on the agenda of the world's most industrialized countries.

Out of the enormous volume of papers generated by other countries in recent months a few deal with access and affordability. Many deal with issues of only peripheral interest to Canada (e.g. the creation of a Europe-wide market). This chapter draws attention to international examples **relevant to the Canadian context**. Some international references, such as descriptions of basic services, may not fit the Canadian situation, but the approach used might still be of interest (e.g. Singapore).

The chapter deals first with the global context, a set of regulatory principles suggested by the Secretary General of the International Telecommunication Union. It then addresses selected points of interest.

5.2 A Global Context

The Secretary General of the International Telecommunication Union (ITU, March 94) has suggested a set of regulatory principles which would

"...create the right environment to encourage investment and to achieve certain public interest goals, but at the same time....avoid pre-judging those decisions which should rightly be taken by the marketplace...".

These include:

(i) The Principle of Internationalism

Given the process of globalisation, policy-makers should strive to ensure that national initiatives are harmonised and coordinated at the regional and international level;

(ii) The Principle of Universalism

Universal service implies uniform geographical coverage, service quality and pricing, and service provision offered on a non-discriminatory basis. *It also implies a cross-subsidy between different classes of users, between urban and rural areas, and between business and residential subscribers.* It required the [development] of mechanisms whereby the cost of providing network access to non-commercial or uneconomic users is shared between the different firms competing in the market.

(iii) The Principle of Regulatory Symmetry

Historically there have been at least three regulatory traditions in the information industry: publishing, common carriage and broadcasting. For the most part, regulatory barriers between these industries are largely artificial and can be dismantled. Thus, barriers which prevent cable TV companies and telephone operators from entering each others markets should be reviewed. Regulators should take every step to ensure that mobile communications companies are able to compete with, as well as interconnect with, fixed-link operators.

(iv) The Principle of Regulatory Independence

This principles deals with the independence of the regulator (funding and "regulatory capture"). "In order to avoid regulatory capture, it is important the regulator be properly funded. Ironically this probably means that the industry itself, rather than the State, should pay for the regulatory process. But this should be done in an open, transparent and shared way, not by hidden transactions".

(v) The Principle of Open Access

In a democratic and pluralistic society, the value of open and non-discriminatory access to public networks should be cherished. "In the coming era of high capacity networks, it will be possible for multiple service providers to share the same network in much the same way that multiple television channels are provided over the same cable. In traditional telephone networks, the network and the service have been virtually indivisible. But technological change is permitting the "unbundling" of the network from the service it supports. While the virtually infinite capacity of today's fibre-based networks may make dual network provision uneconomic, it will make multiple service provision by multiple service providers highly attractive".

5.3 National Policy Principles

As in Canada, many governments have responded to the challenges raised by the information highway as a matter of urgency. A comprehensive assessment of these responses would soon be out of date. For example the United States' Communications Act of 1994, a bill to revise the Communications Act of 1934, was inevitably affected by the political changes of late 1994 and the outcome is uncertain. In Europe, the influential Bangemann Report, approved by the European Council in July, 1994, has since been the subject of further scrutiny by national government. Regardless of political considerations, the ideas, concepts and suggestions contained in these responses remain of interest.

The Communications Act of 1994 was intended to foster the further development of the telecommunications infrastructure of the USA, and to protect the public interest. Public interest objectives included:

- To ensure that every person has access to reasonably evolving telecommunications services at just, reasonable, and affordable rates taking into account advances in telecommunications and information technology.

On the same subject, the National Information Infrastructure (NII) Progress Report of September, 1994 identified nine principles and goals for government action including:

- Extend the "universal service" concept to ensure that information resources are available to all at affordable prices;

The Report of the Japanese Telecommunications Council of 20 June, 1994 *Reforms toward the Intellectually Creative Society of the 21st Century*, identifies a range of issues relevant to establishing a "high-performance info-communications infrastructure" and recommends that government:

- develop leading applications in public fields, such as education, medical care, and welfare services;

- re-examine universal service and tariff issues; and

- prepare the environment for the intellectually creative society, through addressing intellectual property rights, developing standards, and promoting international cooperation to build global networks.

The Japanese report also recommends reforming the regulatory regime to accommodate the convergence of telecommunications and broadcasting.

Australia's Broadband Services Working Group (BSEG) takes the view that the "information highway" metaphor is misleading. "Instead of a vast network of superhighways, what we are really looking at is more like a complex web or network of connections - some broad, some perhaps very narrow". "The Information Superhighway term emphasises the infrastructure instead of the more important services it delivers to people".

The BSEG notes that:

"...ensuring access for all Australians at affordable prices will be a key challenge for the implementation of broadband networks".

The Australian Report also defines a number of key principles for broadband services in a converging environment covering:

inclusiveness...to avoid creating or adding to inequalities;

access to the network should be open to content providers regardless of size;

...a flexible regulatory framework which supports openness of access and keeps pace with change.

The Bangemann Report (26 May, 1994) deals with Europe and the Global Information Society. With respect to access, affordability and basic services, the Report states:

Private investment will be the driving force. "Monopolistic, anticompetitive environments are the real roadblock..." and recommends that

"..the Council support the implementation of the European broadband infrastructure and secure its interconnectivity with the whole of the European telecom, cable tv and satellite networks;

5.4 Universal Service

Universality is clearly a major principle in these industrialized countries, and there have been many attempts to define the meaning of **Universal Service.** In the United States, the Administration held public hearings on how to ensure open access and defined *universal service* as follows:

"...an evolving package of services which includes any telecommunications and information services, which the [FCC]....determines should be provided at just, reasonable, and affordable rates to all Americans, including those in rural and high-cost areas and those with disabilities, to enable them to participate effectively in the economic, academic, medical and democratic processes of the Nation.

These public hearings were to address:

- Whether Universal Service works now and how the goal should evolve;
- who currently has network access and what policies will improve access for information providers and users;
- how to pay for Universal Service in a competitive environment, and
- What basic pricing principles should be adopted with respect to implementing modern Universal Service and Open Access policies.

The Communications Act of 1994 had proposed remedies to advance universal service including a Universal Service Fund...established by the FCC which [would] have ...mechanisms to provide adequate and sustainable support for maintaining and advancing universal service.."

5.5 Basic Services

As in Canada, other countries are struggling with the definition of a set of "basic services". Some have suggested a set of specific services. **The Bangemann Report,** for example suggests these might include e-mail, file transfer and interactive multimedia.

Australia takes a different approach. The BSEG suggests that:

"...demand for services [in Australia] rather than availability of technology should determine the pace at which networks and applications are introduced;

There will be a range of residential services available, starting with video services and evolving to interactive and switched broadband services;

The first manifestation of...broadband services to the home will be....a range of subscription television services;

Content [services] including education, training, entertainment, government services, business and manufacturing (e.g. telecommuting) will emerge over time.

The approach in **Singapore,** is different again. Basic services are built into that country's NII architecture. It contains four main components which define the basic services (Hiong, 1994). These are

(i) The **Principal and Roles** system - the mechanism for users to be identified by the NII. This identity is required by virtually all applications that offers users services at a personal level;

(ii) The **Electronic Commerce** system which provides the mechanism for commercial transactions to be carried out via the electronic medium;

(iii) The **Electronic Mail** system which provides a mechanism for users to exchange messages with each other, making full use of the speed and reliability of the electronic world, and

(iv) The **Directory Service** which offers the users a standard mechanism for naming as well as providing a central source of information regarding the other users and services available through the NII.

5.6 Recommendations and Proposals for Policy/Regulatory Approaches

Other countries have different regulatory structures to Canada, but many proposals currently being considered are relevant. For example, The Communications Act of 1994 contained the following provisions:

(a) Universal Service, requiring the FCC to adopt rules to protect and advance universal service within 18 months after enactment;

(c) Competition

1. Preempting almost all State and local barriers to competitive entry after 1 year;

2. Permitting telephone entry into cable, and cable entry into telephone.

(d) Special Protections for Rural Markets (and the creation of a universal service fund).

(f) Miscellaneous

1. Telecommunications rights of the disabled; including consideration of the needs of persons with disabilities in the definition of "universal service";

2. Public Access

a. advances the ability of schools, health-care facilities, libraries, museums, and other public institutions to obtain access to telecommunications at "preferential rates".

With respect to this last point, other countries also see a specific role for governments in the provision of services. For example, **The NII Report** reference to the need to **"Provide access to government information...."** and Australia's BSEG forsees an important role for governments to...

> provide greater access to government information for all members of the community; and
>
> to improve access to and lower the costs of health and education services.

The United States' Federal Communications Commission (FCC) also addresses the question of universal availability at affordable rates for PCS/universal wireless service:

"Licensees must serve with a signal level sufficient to provide adequate service to at least one-third of the population in their license area within five years of being licensed, two-thirds of the population in their licensed area within seven years of being licensed, and 90 percent of the population in their licensed area within ten years of being licensed".

Robinson notes that it is precisely the ten percent most likely to be left out of this service requirement that may have the greatest need for mobile services and suggests that remedies to this situation are to be found in the 1993 Omnibus Budget Reconciliation Act. This Act enables State public utility commissions to impose requirements on commercial service providers to "ensure the universal availability of telecommunications service at affordable rates" where "such services are a substitute for land line telephone exchange service for a substantial portion of the communications" within their states (Robinson, 1994).

5.7 Impending Problems

Some of the potential problems with the future information highway have been mentioned earlier. Other countries have also mentioned these problem areas. For example, the Bangemann Report notes potential difficulties with lack of social contact and the impact on labour legislation and social security.

5.8 Implications for Canada

This brief review of the activities of other countries has provided a useful "checklist" in the preparation of this report. It can be concluded that Canada must address its own public policies within its own context. However, the remedies being put in place by other Administrations are important and should be carefully monitored in the years ahead.

References

Americans with Disabilities Act

Angus, Elisabeth and McKie, Duncan. *Canada's Information Highway: Services, Access and Affordability*, May 1994.

Australia. *Networking Australia's Future*, BSEG, 1994. Interim Report, Summer 1994.

Bangemann Group. *Europe and the Global Information Society, Recommendations of the high-level group on the information highway to the Corfu European Council*, June 1994.

Borrows, John D. *Universal Service in the United States: Dimensions of the Debate*, The National Regulatory Research Institute, June 1994.

Bowie, Nolan. *Equity and Access to Information Technology*, The Annual Review, 1990.

Communications and Information Technologies and Persons with Disabilities, March 1993.

Communications Canada. *A Spectrum Policy Framework for Canada*, September 1992.

Cowhey, Peter and McKeown, M. Margaret. *The Promise of a New World Order, The Knowledge Economy*, Institute for Information Studies, 1993-1994.

Framework for NII Services, *Executive Summary*, Internet, http://dsys.ncsl.gov/pub/sawg/niifrmO.html

Gillett, Sharon. *Technological Change, Market Structure, and Universal Service*, MIT, Twenty-Second Annual Telecommunications Policy Research Conference, October 1994.

Gooderham, Mary. "*Bank Machines attract young but not seniors, studies show*", The Globe and Mail, March 11, 1995, p. A5.

Hiong, Goh Seow and Tan Jin Ho. *Some Basic Services of the NII, in Information Technology*: Journal of the Singapore Computer Society, September 1994, Vol 6, No 1, p. 51.

How to send a letter to your remotest rural friend without giving your post office a perpetual monopoly, Economist, January 7, 1995.

Industry Canada. *Connexions*, Standards Program Office, Vol 2, No 1, Summer 1994.

Industry Canada. *Policy Discussion and Proposals Respecting the Future Provision of Personal Communications Services and Frequency Spectrum in Canada in the 2 GHz Range*, Canada Gazette Notice DGTP-006-94, October 28, 1994.

Industry Canada. *Policy Framework for the Provision of Mobile Satellite Services Via Regional and Global Satellite Systems in the Canadian Market*, Canada Gazette Notice DGTP-001-94, November 5, 1994.

Industry Canada. *Proposal for Implementation of narrowband personal communications services in the 900 MHz Range*, Canada Gazette Notice DGTP-007-94, November 17, 1994.

Industry Canada. *Proposal concerning the Radio Systems Policy (RP-005) for dispatch type mobile radio interconnection with the Public switched telephpone network and also clarifying the provision of service applications by cellular providers*, Canada Gazette Notice DGTP-008-94, November 16, 1994.

Industry Canada. *Revisions to the Canadian Table of Frequency Allocations (1994)*, Telecommunications Policy Branch, 1994.

Industry Canada. *Proposed Spectrum Policy to Accommodate Microwave Radio Systems, including Local Wideband Distribution and Advanced Communication Satellites in Certain Bands Above 20 GHz*, Canada Gazette Notice DGTP-013-94, December 15, 1994.

Industry Canada. *SchoolNet: Community Access Project*, Brochure, 1995.

Intven, Hank and Menard, Robert. *Convergence: Competition and Cooperation*, Report of the Co-chairs of the Local Networks Convergence Committee, September 1992.

ITU, *World Telecommunication Development Report*, Geneva, March 1994.

Martin, Lawrence. *Speaking Notes: Presentation to the Information Highway Working Group on Access and Social Impacts*, Wawatay Native Communications Society, November 1994.

Melody, William H., *The Overlooked Opportunity: Rural and Remote Area Telecoms*, Pacific Telecommunications Review, Vol 15, No 2, December 1993.

Mere, Rein. *Convergence, Universal Service and Public Policy*, KPMG Peat Marwick Mangement Consultants, Canberra, Australia.

Minges, Michael. *Rural Telecommunications in Asia-Pacific*, ITU, 1994.

National Association of Development Organizations Research Foundation, *Telecommunications and Its Impact on Rural America*, Washington, 1994.

NGL Consulting Ltd. *Technology Forecast: Communications and Information Technologies*, Ottawa, 1993.

NGL Nordicity Group Ltd. *A Study of the Effect of Standards and Regulations on Technology Diffusion: Communications and Information Technology Sector*, April 1993.

NII Progress Report, September 1993-94, Information Infrastructure Task Force.

Robinson, Deanna Campbell. *United States PCS Policy and Rural Development*, in Proceedings, Pacific Telecommunications Conference, Honolulu, January 1994.

Rutkowski, Anthony-Michael. *The Present and the Future of the Internet: Five Faces*, Networld+Interop 94, Tokyo, 27-29 July 1994.

Sirbu, Marvin. *Telecommunications Technology and Infrastructure*, A National Information Network, Institute for Information Studies, 1992.

Soramaki, Martti. *Yes but....some cautionary tales about VOD and the information superhighway*, Intermedia, Vol 22, No 4, August/September 1994.

Statistics Canada. *Reading Skills of Adults in Canada*, 1993.

Syfret, Toby. *Move Over, PPV and VOD: free television will retain the dominant audience share*, InterMedia, Vol 22, No 2, April/May 1994.

Tagalik, Abraham. *Hi-8 in the High Arctic, in Proceedings*, Pacific Telecommunications Conference, Honolulu, January 1994.

Tarjanne, Dr. Pekka. *Regulating the International Information Infrastructure*, ITU, Speech given at the Networked Economy Conference, Paris, March 10, 1994.

APPENDIX A

Relevant Extracts from *"Canada's Information Highway: Service, Access and Affordability"*

- Access to services can be ubiquitous, without being dependent on a providers choice of medium. Therefore, government policy should focus on ensuring open access to new network services, whether or not a given physical medium Is available in every location (Page 25).

- Replacement of 2-party and multi-party lines with single party lines should be a priority in all parts of Canada (Page 32).

- Existing legislation and regulation ensures that carriers controlling bottleneck local access facilities may not accord themselves special privileges based upon this control, or on their special relationships with subscribers. this principle should be extended to all access providers in an open interconnected network environment, to the extent that bottlenecks still exist (Page 33).

- The Canadian public agenda should include the development of common North American and global standards for

    - functional interconnection between physical networks, including cable and television networks;
    - feature and service interoperability across different physical networks and overlay networks, using non-proprietary connecting devices (Page 41).

- The information highway should operate functionally as a single network infrastructure, but no single industry or entity should own or control the entire network. The government and the CRTC have the necessary powers to require the interconnection of the various networks. However, the manner of co-operation between suppliers and the ways in which services are offered, should be left open so that Canadians may benefit from the ingenuity of competitive providers (Page 40, 41).

- To prevent increased monopolization of local access networks, Canadian telephone companies should not to be permitted to control cable companies in their own serving areas, or vice-versa. For Stentor member Telephone companies, this restriction would apply to the serving area of any other Stentor telephone company as well (Page 45).

- Canadians should have a choice of access networks, and pay only for those services that they choose to use (Page 45).

- Since consumers will use interactive services which require high bandwidth in the local loop:
  - preference should be given to local loop technologies which allow bi-directional high bandwidth access.
  - service providers should be permitted to offer access to their services through the use of either-or both-the local telephone and cable infrastructures (Page 51).

- Canadian cultural policy should address:
  - digitization of Canadian cultural products
  - support to databases of Canadian material
  - market mechanisms for electronic distribution of Canadian content (Page 54).

- Since access to public information is essential for a democratic society, all Canadians should have the basic capability to access government information in electronic form (subject to appropriate protection of individuals' privacy, Page 59).

- All Canadians should have electronic access to government services and information sources, either from home or from an easily reached community location (Page 63).

- Government policy should ensure that all affiliated and unaffiliated service and content providers have access, on a non-discriminatory bass, to all the delivery options available in the interconnected "networks-of-networks" (Page 64).

- Government and regulators should strongly encourage carriers to develop strategies to make access to (and use of) high-bandwidth digital networks universally affordable (Page 83).

- Government and regulators should mandate local access providers to provide digital access throughout their serving areas (Page 84).

- Government should encourage additional competition in the provision of high-banddwidth lines, and other services which may provide similar functionality (Page 85).

- Competition in local access provision should be encouraged (Page 118).

- The government should mandate the CRTC to encourage and promote resale and sharing of network facilities, including cable network facilities, to enable maximum interconnection and interoperability between networks and services (Page 119).