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PROMOTING BROADBAND:

THE CASE OF CANADA

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1 Introduction

In recent years, there has been a growing recognition of the importance of broadband beyond the immediate economic value of its market segment. Broadband is increasingly regarded as an enabling technology that promises wide-ranging social and economic benefits by changing the way we learn, work, use our leisure time, communicate and govern ourselves. Sharing in this view, Canada sees broadband as a key platform on which efforts to improve the quality of life of its citizens can be built. In this respect, Canada has shown itself to be an ideal country to study. The goal of promoting broadband is a common one that is shared and acted upon by all actors in the country: governments, industry, communities and civil society. The wide range of efforts that have arisen from this singularity of vision have provided us with a rich resource from which we can better understand the factors that go behind the successful promotion of broadband.

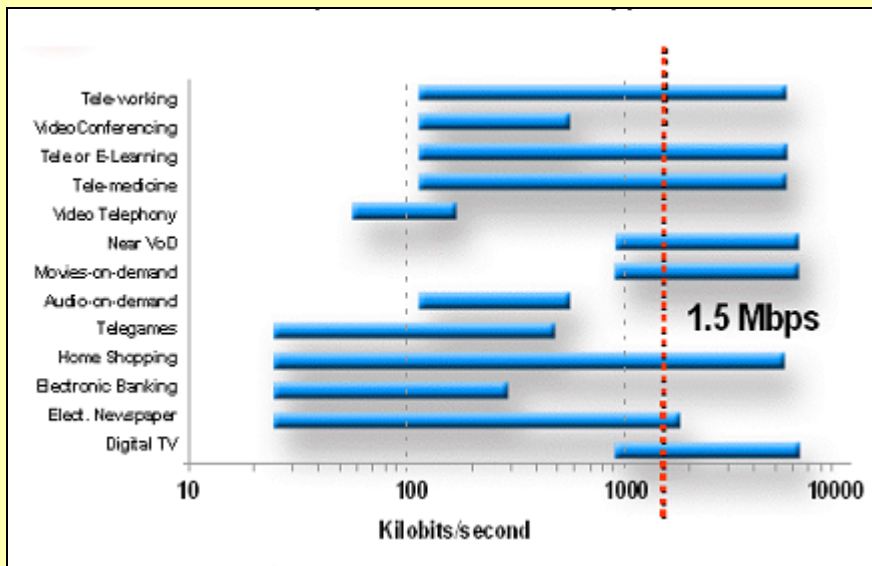
1.1 About the report

This case study is divided into seven chapters. Chapter two provides the country background against which broadband is being promoted. Chapter three then gives us an overview of the origins of the Internet in Canada, the distribution of Internet and broadband infrastructure in the country and the demographics of Internet and broadband usage. Chapter four examines the broadband market, including the strategies market players use to market their broadband services and content. Chapter five goes on to examine the regulatory context within which the market operates. Finally Chapter six sets out some of the main strategies and initiatives that have been put in place by communities and governments to promote broadband.

1.2 What is broadband?

Strictly speaking, according to the ITU standard, ITU-T Recommendation I.113, broadband means transmission capacity that is faster than primary rate ISDN at 1.5 or 2.0 Mbit/s. However, the term broadband is commonly used to describe a much wider range of transmission speeds. In considering the definition of the term “broadband”, the National Broadband Task Force observed that national definitions of the term ranged from as low as 2,000 kbit/s to high as 30 Mbit/s.

Figure 1.1: Bandwidth requirements for selected applications



Source: Report of the National Broadband Task Force.

Taking instead a more functional approach to definition, the Task Force decided not to define broadband in terms of information transmission rates. Instead it defined broadband in terms of usage, defining it as “a high capacity, two-way link between an end user and access network suppliers capable of supporting full-motion, interactive video applications, Based on the technology existing at the time, it was concluded that a minimum two-way or symmetrical transmission speed of 1.5 Mbit/s per individual user was required to meet this standard. In the future, it was foreseen by the Task Force that higher speeds up to 4 to 6 Mbit/s would be required to handle emerging applications such as peer-to-peer video file sharing and video conferencing (see Figure 1.1).

For the purposes of this study, however, we will use yet another definition of broadband in order to facilitate comparisons between the country case studies commissioned for this workshop. In this report, broadband is understood to be defined as high-speed access technologies, of which ADSL and cable modems are currently the most popular, but which would also include fixed wireless, optical fibre, satellite and wireless LANs.

2 Country background

2.1 Geography and demographics

Canada is the second largest country in the world with 6.7 per cent of the world's land area, encompassing 9.9 million square km. It spans 6 time zones and its 243,791 km of coastline is bounded by the Atlantic, Pacific and Arctic Oceans. In travel time, it takes about 9 hours to fly from the eastern-most city (St. Johns, Newfoundland) to the most westerly city (Victoria, British Columbia). And a flight from southern Ontario to Alert in the far North takes about 10 hours in a Hercules aircraft.

The total population of Canada is just over 31.4 million. Most of those people live in urban centres with the most densely populated regions being Southern Ontario and Quebec (62 per cent of the total population live in Ontario and Quebec). In 1998, 77 per cent of all Canadians lived in cities and towns with 50 per cent of the entire population living in the 10 largest urban centres. The bulk of the population is concentrated in a 5,000 km-long strip of land about 300 km deep along the Canada-US border. The country's population distribution presents a major challenge to efforts aimed at providing telecommunications and other related services, such as broadband Internet access, to rural and remote communities with small populations.

Canada's aboriginal peoples, the North American Indians, Métis and the Inuit, form a relatively small segment of the population (about 2.8 per cent of the total population).

Canada has two official languages: English, spoken as the mother tongue of about 59 per cent of Canadians; and French, spoken by around 23 per cent.

Canadians enjoy a high standard of living. In 2001, it was the twenty-sixth wealthiest economy in the world with a per capita gross national income (GNI) of US\$21,340.¹ This has allowed Canadians to have a high level of education: the adult literacy rate is above 99 per cent. Around 15 per cent have a university degree while a further 37 per cent have obtained a post-secondary certificate or diploma or have other post-secondary training.

2.2 Political system

Canada is a constitutional monarchy and a federal state with a democratic system of government based on the (British) Westminster model. The Head of State is Queen Elizabeth II of the United Kingdom. She is represented in Canada by the Governor General who is appointed by the Queen on the advice of the Prime Minister. The parliament of Canada, seated in Ottawa, consists of the House of Commons and the Senate. On average, members of parliament are elected every four years.

Canada has ten provinces and three territories (see Figure 2.1). They each have their own elected unicameral legislatures and governments.

The federal government has responsibility for national defence, foreign relations, interprovincial and international trade and commerce, the banking and monetary system, criminal law and fisheries. In addition, the courts have awarded the federal Parliament regulatory powers in areas such as aeronautics, shipping, railways, telecommunications, and atomic energy. The provincial governments are responsible, within their own jurisdictions, for education, property and civil rights, the administration of justice, health care, natural resources within their borders, social security, and municipal institutions.

Figure 2.1: Canada's Provinces and Territories



Source: Natural Resources Canada.

2.3 Economy

Canada has a modern, industrialized economy based on free market principles. Financial services and manufacturing represent the largest portions of the Canadian economy. At the end of 2002, Canada's GDP was C\$1,170.9 (US\$737.7) billion at market prices.¹ Its unemployment rate at February 2003 stood at 7.4 per cent.²

Overall trade in 2002 totalled C\$410,686.5 (US\$258,732.5) million in exports and C\$356,109.3 (US\$224,348.9) million in imports on a balance of payment basis. Exhibiting its strong economic link with the United States, 84.8 per cent of Canadian exports went to the United States in 2002, followed by 5.1 per cent to the European Union and 2.4 per cent to Japan.³ Canada is a signatory of the World Trade Organization (WTO) Agreements on Trade in Goods and Services, the 1989 Canada-U.S. Free Trade Agreement and to the 1994 North American Free Trade Agreement (NAFTA)

3 The Internet in Canada

3.1 Historical perspective⁴

Canada first officially connected to the Internet (then "ARPAnet") in 1983 through a leased line connection to the DRE laboratory in the Atlantic provinces (DREA). Unofficially, however, Canada had already been connected to ARPAnet through the international network known as Usenet that was established in 1979 and in use in Canada at the time.⁵ In 1981 Usenet made first contact with ARPAnet when the University of

¹ Figures used in this report are in Canadian dollars unless stated otherwise. As of March 2003, the Canadian dollar was worth around US\$ 0.63 or 0.88 Swiss Francs.

California at Berkeley joined the network, creating an overlap between ARPAnet and Usenet allowing ARPAnet traffic to circulate through Usenet. More gateways were then built and began to allow for two-way traffic between the networks.

In the mid-1980s, Canada's Internet infrastructure consisted primarily of several universities linked through the NetNorth network (which at the time ran at 9600 bit/s at its fastest points) In 1988, a number of universities, research institutions and federal and provincial governments began to establish a national computer communications network, called CA*net, a not-for-profit company financed by user fees from member organizations and from a subsidy from the Government of Canada. Leasing transmission lines from carriers such as Bell Canada, the network became the Internet backbone in Canada, interconnecting regional networks in the provinces and linking them to the Internet backbone in the United States. CA*Net was officially launched on 26 Oct 1990 and operated at 56 kbit/s. In 1995, it was upgraded to 10 Mbit/s and again later to 20 Mbit/s.

On 31 March 1997, responsibility for the original CA*net was transferred to Bell Advanced Communications Internet Transit Service. Until then, the structure of the Canadian Internet was well defined. Each province in Canada had a single Internet service provider (ISP). The national network, CA*net, linked these networks together and operated at 10 Mbit/s. In addition, CA*net provided three international links, all to the MCI network in the United States, from Vancouver, Toronto, and Montreal at 90 Mbit/s each.

After the Canadian backbone was transferred to Bell Advanced Communications, it was no longer officially identified as CA*net. Many of the regional networks, which were previously devoted to serve the research community, were also subsequently bought out by private companies or changed their focus towards the business sector. In the late-nineties, hundreds of commercial ISPs sprang up to provide services such as e-mail, newsgroups and World Wide Web access via dial-up connections.

3.2 Network infrastructure and service availability

There are an estimated 940 ISPs operating in Canada with a total estimated bandwidth capacity of 11,965,000 Mbit/s or about 12 terabit/s. National traffic is carried across a number of national backbone providers the 10 largest of which carry the traffic of 81 per cent of all ISPs. Bell Canada and Sprint are the market leaders, respectively serving 16 per cent and 15 per cent of all ISPs.⁶

At the end of 2001, Canadian ISPs participated in Internet exchanges in Edmonton (EIX), Ottawa (OttIX), Montréal (QIX), Toronto (TorIX,CANIX), and Vancouver (BCIX), all of which were among Canada's fifteen largest Internet transport hub cities.⁷(see Table 3.1). In its 2002 publication, TeleGeography Inc. ranked Toronto as the tenth largest international hub city in 2001 with 24,942.3 Mbit/s of total international Internet bandwidth.⁸

3.2.1 Dial-up access

Providing a rough indication of the extent to which Canada is served by ISPs, there were an estimated 7'174 points of presence (POPs) - defined as cities or locations wherein subscribers can access the Internet using a local number - distributed evenly through the country in 2002, making an average of almost one POP to 3000 Canadians.⁹

In 1999, the CRTC established as a basic service objective for wireline companies to provide "individual line local service with touch-tone dialling, provided by a digital switch with capability to connect via low speed data transmission to the Internet at local rates"¹⁰. More than 97 per cent of access lines already met this objective in 1999. By 2002, the CRTC had reviewed or approved service improvement plans for all telephone incumbents to work towards achieving this objective.

Table 3.1 Internet exchanges in Canada (2001)

Community	Exchange	Ownership
Edmonton, Alberta	EIX	Cooperative
Vancouver, British Columbia	BCIX	Academic Partnership
Ottawa, Ontario	OttIX	Cooperative
Toronto, Ontario	TorIX	Cooperative
Montréal, Quebec	QIX	Academic Partnership

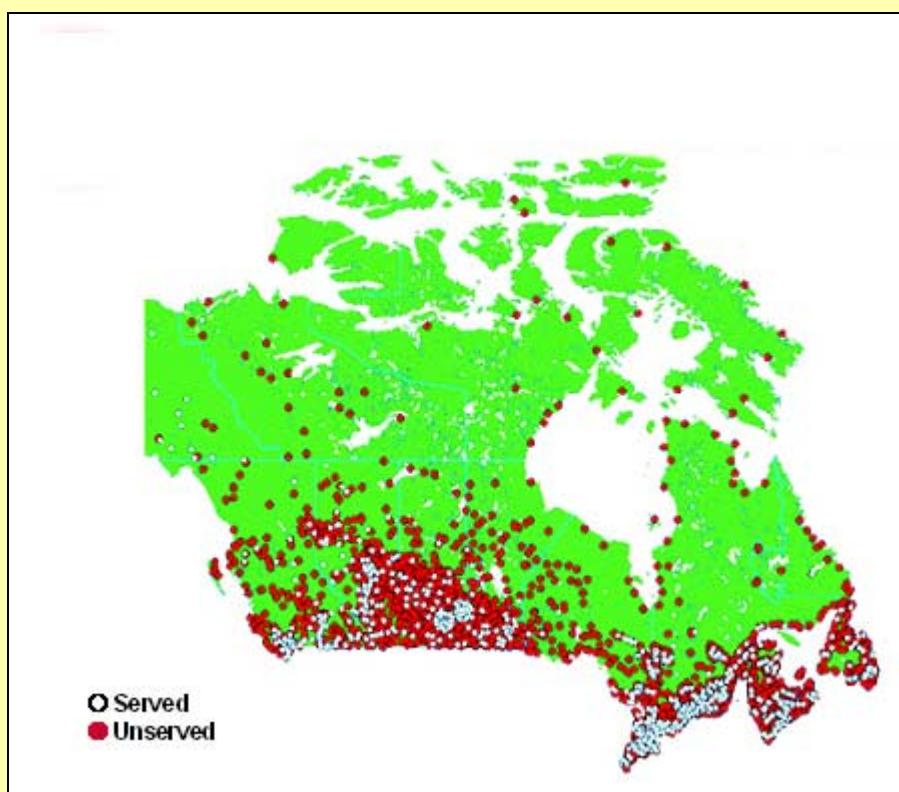
Source: CRTC 2002 Data Collection.

3.2.2 High-speed access

According to the latest data accumulated in the context of Industry Canada’s Broadband for Rural and Northern Development program, access to high-speed Internet via DSL and/or cable was available in 1,282 Canadian communities representing about 85 per cent of the Canadian population and 24 per cent of Canadian communities.¹¹

Of the communities without high-speed access, earlier data compiled by the National Broadband Task Force have shown that most are situated in outlying and remote communities see (Figure 3.1). It was also found that community size also played a role in the availability of high-speed access with communities of 10,000 inhabitants or less being less likely to have high-speed access.¹²

Figure 3.1: Geographic distribution of served and unserved communities



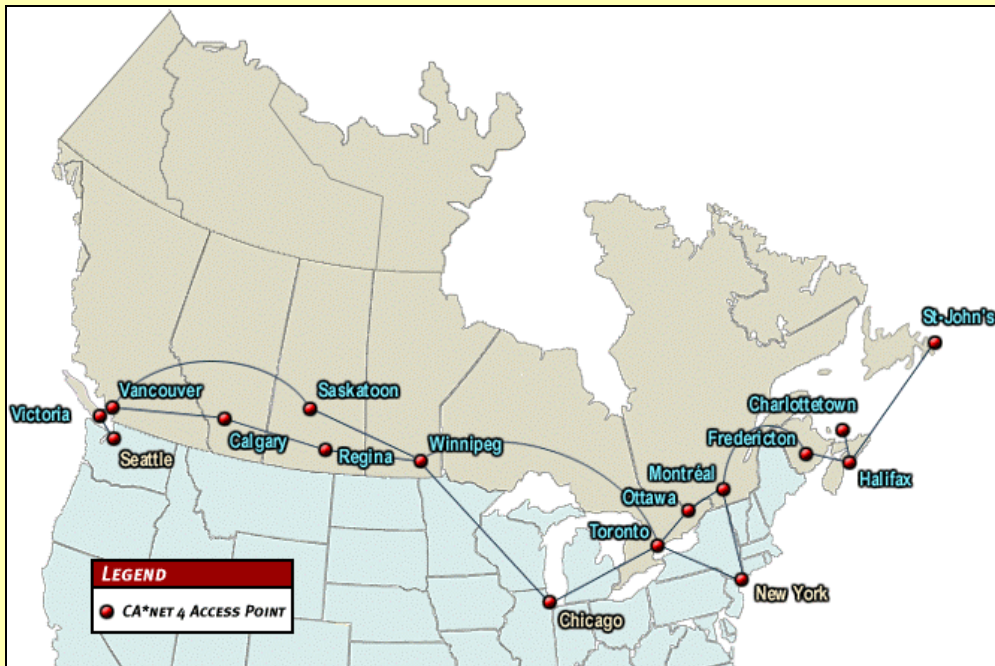
Source: Delivering on Canada’s Broadband Commitment, Broadband Pilot Program Presentation, October 2002.

Box 1: CANARIE

Founded in 1993, CANARIE Inc., Canada's advanced Internet organization is a not-for-profit corporation supported by its members, project partners, and the federal government. CANARIE's mission is to accelerate Canada's advanced Internet development and use by facilitating the widespread adoption of faster, more efficient networks and by enabling the next generation of advanced products, applications and services to run on them.

To achieve this, CANARIE supports a variety of initiatives to develop innovative applications and technologies for advanced broadband networks through its funding programmes as well as through collaborative efforts with government, industry and the research community.

Following a funding agreement with Industry Canada, CANARIE Inc. designed, developed and operates CA*net 4, Canada's National Research and Innovation Network.



Source: CANARIE at www.canarie.ca.

3.2.3 Advanced networking

After CA*net was transferred to Bell Advanced Communications in 1997, an existing national test network was upgraded into a “next-generation” research network called CA*net II. In 1998, however, work began on building a national optical R&D network, CA*net 3. This work was undertaken by CANARIE, Canada’s advanced Internet development organisation, following a C\$55 (US\$34.6) million commitment by the Canadian government to develop the network (see Box 1). Based on dense wave division multiplexing (DWDM) technology, the CA*net 3 network was designed to operate up to speeds of 40 Gbit/s.

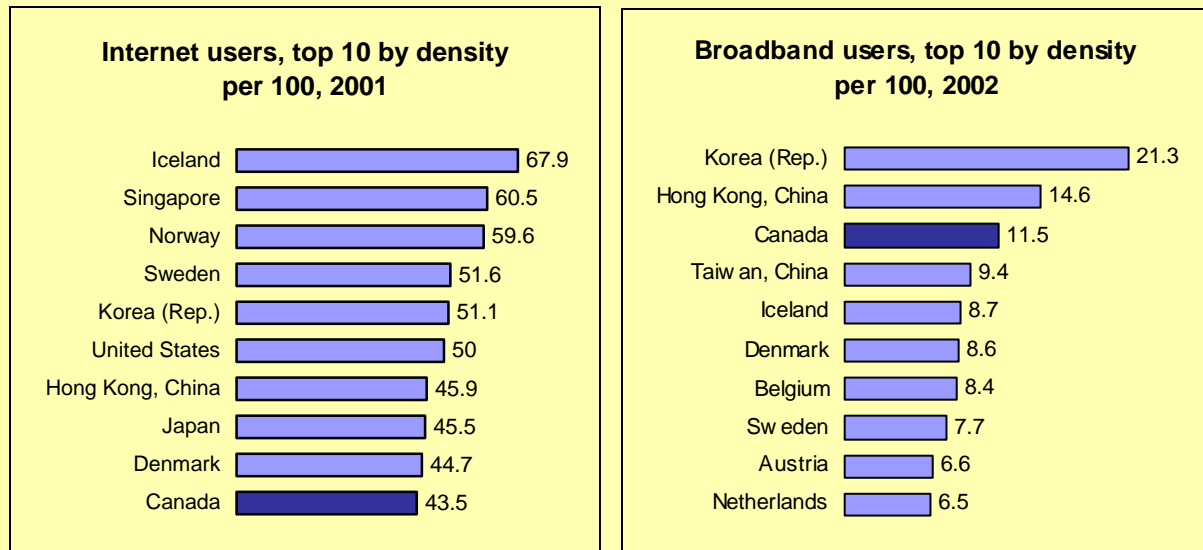
However, exponential growth in network traffic, expected growth in new high bandwidth applications, and planned extreme high bandwidth grid projects required that a new network be built to support research in Canada. To this end, the Government of Canada committed C\$110 (US\$69.3) million to CANARIE for the design, deployment, and operation of CA*net 4. Through a series of point-to-point optical wavelengths, most of which are provisioned at OC-192 (10 Gbit/s) speeds, CA*net 4 has the capacity to yield a total initial network capacity of between four and eight times that of CA*net 3.

3.3 Internet and broadband demographics

3.3.1 Internet penetration

In 2001, Canada had an Internet penetration of 43.5 Internet users per 100 inhabitants. This placed it among the top 10 countries in the world in terms of Internet penetration (see Figure 3.2).

Figure 3.2: Internet penetration and broadband penetration – Top ten



Source: ITU World Telecommunication Indicators Database.

In terms of households, more than 8 million households, or about two-thirds of the total, contained someone who had used the Internet at some time in their life from one location or another, either from home, work, school or a library. Of these households, 7.2 million had at least one member who used the Internet regularly. This group represented 60.2 per cent of the 12 million households in Canada.¹³

Canada's high Internet penetration is largely attributed to a high PC penetration rate among Canadian households, which stood at 69 per cent at the end of 2001. By comparison, PC penetration in US homes was 65 per cent in 2001.

3.3.2 Broadband penetration

Broadband penetration in Canada is well ahead of that of other industrialized economies. In 2002, it was ranked third in the world in broadband penetration (see Figure 3.2).

At the end of 2001, there were 2.5 million high-speed Internet subscribers, up from a figure of 1.2 million at the end of 2000 and 500,000 at the end of 1999. This increase represents a staggering annual subscriber growth rate of more than 100 per cent over the past three years.

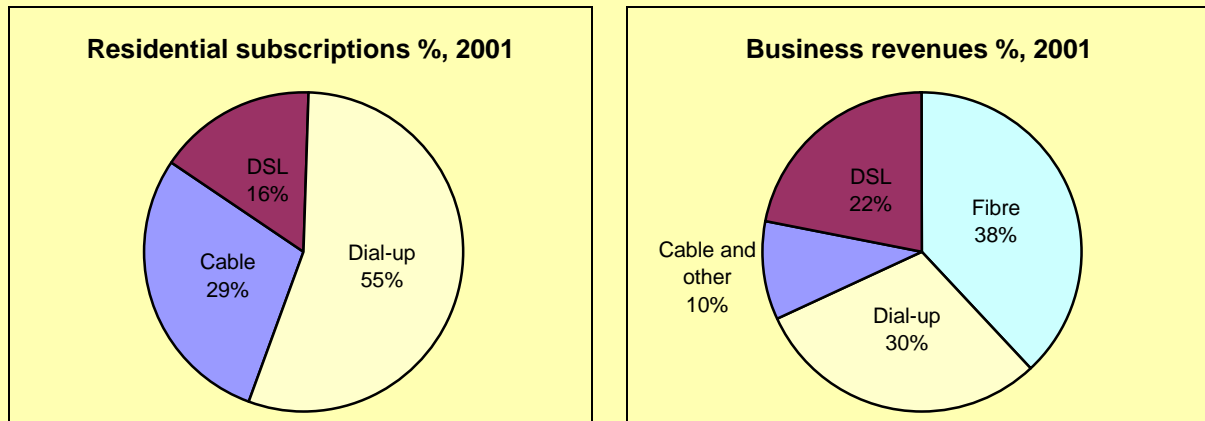
Of the 2.5 million high-speed Internet subscribers in 2001, 1.6 million Canadian households subscribed to Internet access via cable, 924,000 via DSL and another 9,000 by other means, in particular, through fixed-wireless¹⁴. Alongside these residential subscribers were nearly 200,000 small, medium and large businesses that connected mainly through fibre (54 per cent) and DSL (34 per cent).

3.3.3 From narrowband to broadband

Although subscription to dial-up access remains larger than high-speed access in the consumer segment, growth of the high-speed market continues to outstrip dial-up access. In Canada, both residential and business sectors reflect a movement toward higher-speed access. For residential, dial-up subscriptions fell from 93 per cent of residential access subscriptions in 1998 to 55 per cent in 2001¹⁵. In the case of business, dial-up revenues fell from 56 per cent of business access revenues in 1998 to 30 per cent in 2001 (see Figure 3.3).

Despite an increase in 2001 of some 180,000 (6 per cent) dial-up subscriptions over the previous year, there has been a steady migration from dial-up to high-speed access modes such as DSL or cable. The percentage of residential dial-up Internet access subscriptions to total residential subscriptions fell on average by 16 per cent annually from 1998 to 2001.

Figure 3.3 Residential subscribers and Internet access business revenues by means of access



Source: CRTC 2002 Data Collection.

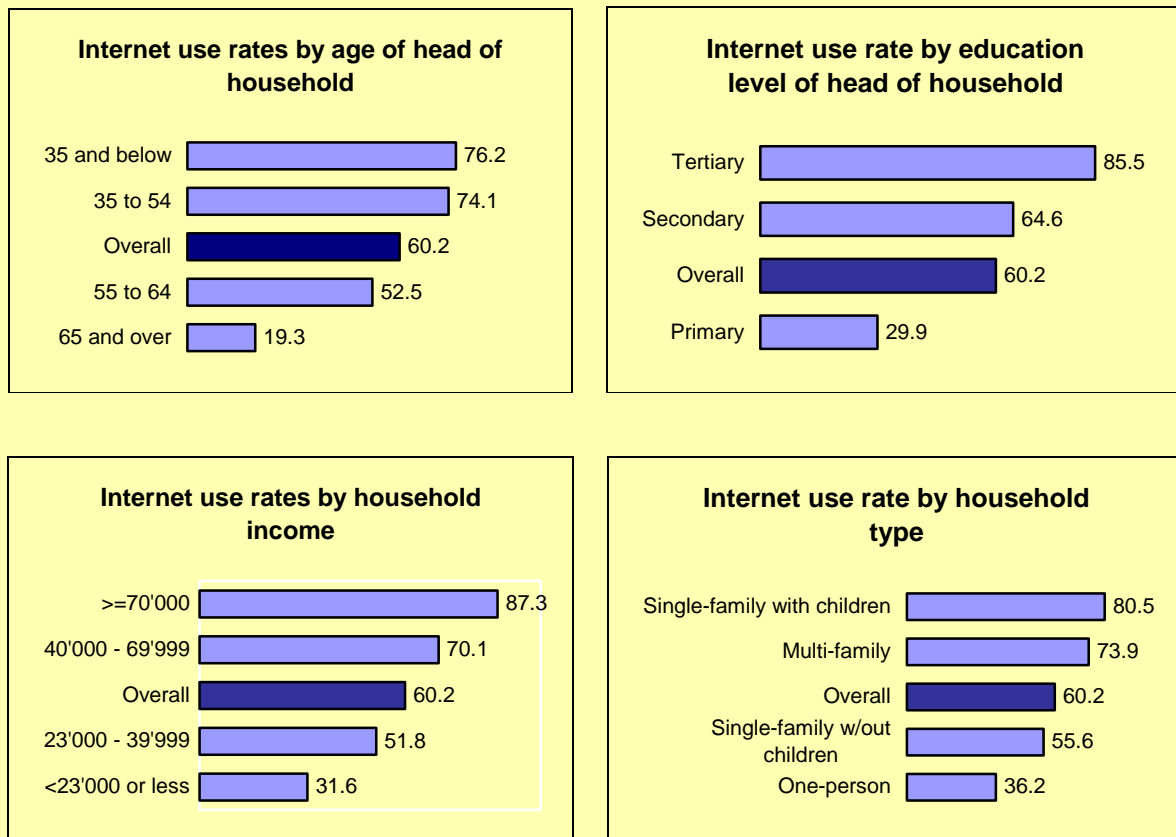
3.3.4 Internet Use

A survey conducted by Statistics Canada in 2001 found that Canadian households who use the Internet tend to be younger, to have higher incomes and education levels and to have children¹⁶ (see Figure 3.4).

In the same survey, 73 per cent of households reported that someone in the household went online from home at least once a day on average. Three out of five households reported spending 20 or more hours each month surfing the World Wide Web.

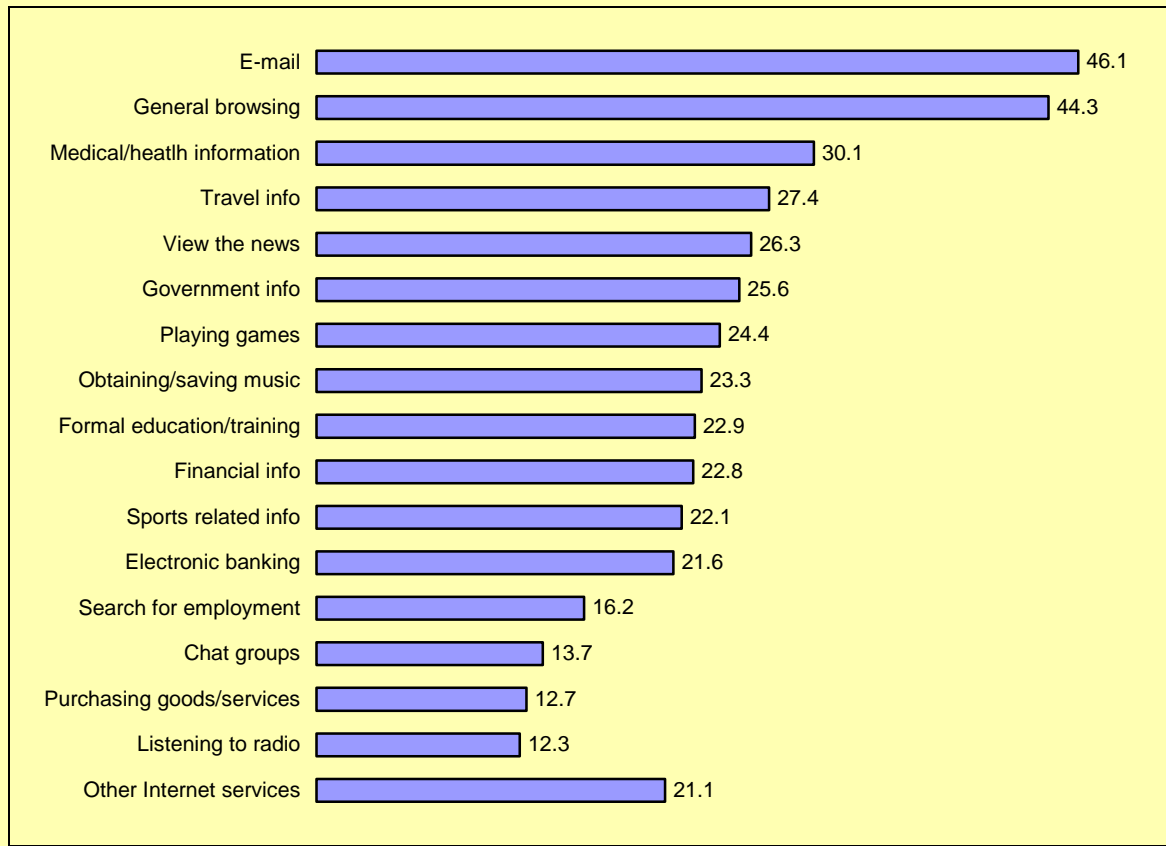
Figure 3.4: Household Internet use survey

Percentage of households, 2001



Source: Statistics Canada, Household Internet Use Survey, 2002.

Figure 3.5: Internet use by household
Percentage of households, 2001



Source: Statistics Canada, Household Internet Use Survey, 2002.

A large number of households that reported regular home use turned to the Internet as a source of information, with over half accessing news sites or searching for government information online. Three in five households used the Internet as a source for medical or health-related information (see Figure 3.5)

Internet usage patterns in Canada indicate a high degree of sophistication. Almost half of the households (about 2.75 million) reporting regular Internet usage had at least one household member in 2001 who used the Internet as a tool for formal education or training. The bulk of this group went online to do research for projects or assignments. Other educational uses included communicating with teachers and colleagues and submitting assignments, as well as communicating with administration or verifying marks. Of the households that used the Internet for formal education and training, about 12 per cent reported that at least one household member had taken an online correspondence course or used the Internet for self-directed learning.

Entertainment-wise, almost half of the regular home users had a household member who played games and who used the Internet to obtain and save music files.

About one-quarter of households (about 1.5 million) that reported regular home use indicated that at least one member used the Internet for work-related business. About 900,000 households reported that at least one household member regularly used the Internet at home for self-employment activities while almost one-fifth of regular home use in 2001 was by employees taking advantage of the Internet to work scheduled hours at home.

With the popularity of high bandwidth uses such as e-learning, working from home, online gaming and music downloads, the purposes for which Canadians use the Internet appear to be a significant driver for the take-up of broadband services in Canada.

3.4 The policy and regulatory framework

3.4.1 Legislation

The Telecommunications Act of 1993 provides the overall direction for telecommunications policy and the main framework for telecommunications regulation in Canada. It also effectively provides the broad framework within which the Government of Canada and the Canadian Radio-Television and Telecommunications Commission (CRTC) must operate.

The objectives of the Telecommunications Act are set out in Section 7. Key objectives include the facilitation of the orderly development of a telecommunications system throughout Canada which serves its social and economic fabric, the provision of reliable and affordable telecommunications services to Canadians in all areas, the fostering of an increased reliance on market forces for the provision of telecommunications services, the stimulation of research and development in telecommunications and the addressing of economic and social requirements of telecommunications users.

Consistent with this statement of policy, the Government of Canada and the CRTC have pursued a course of increasingly opening up the Canadian telecommunication service market in order to best rely on market forces to meet policy objectives. Both have recognized, however, that competition cannot be expected to develop evenly over all service sectors and in all geographic markets and that, particularly in rural and remote areas where there is less demand, the development of competition and the associated benefits it brings will tend to lag behind that in urban areas. For this reason, the Government of Canada has implemented targeted programmes aimed at addressing infrastructure and service shortfalls in these areas while the CRTC has implemented measures to improve the level of access to basic telecommunications services in high-cost serving areas.

3.4.2 Key government entities

3.4.2.1 Policy Authority: Industry Canada

Industry Canada, the Government of Canada department headed by the Minister of Industry, has responsibility for telecommunications policy under the Telecommunications Act and responsibility for spectrum policy and management under the Radiocommunication Act.

Under the Telecommunications Act, the Governor-in-Council (the federal cabinet) has the authority to issue directions of general application on broad policy matters to the CRTC (s.8), vary, rescind or refer back CRTC telecommunication decisions for reconsideration (s.12), require the CRTC to make a report on any telecommunications matter within the Commission's jurisdiction (s.14) and make regulations to implement various aspects of the Canadian ownership requirements (s.22).

In response to concerns that had been expressed about the status of competition in Canadian telecommunication markets and about the availability of advanced telecommunication services at affordable prices, in June of 2000 the Governor in Council used the power set out in section 14 to require the CRTC to submit annual reports for five years on the status of competition in Canadian telecommunications markets and on the deployment and accessibility of advanced telecommunications infrastructure and services in urban and rural areas in all regions of Canada. These reports are used to assist both the CRTC and the Government of Canada in designing regulatory, policy and program initiatives that may be needed to achieve the objectives of the Telecommunications Act.¹⁷

3.4.2.2 Regulatory Authority: Canadian Radio-television and Telecommunications Commission (CRTC)

The CRTC is an independent federal agency with quasi-judicial status. It is responsible for the regulation and supervision of telecommunications and broadcasting services in Canada. Its institutional structure and powers are outlined in the CRTC Act, the Broadcasting Act and the Telecommunications Act. Members of the CRTC (Commissioners) are appointed by the Cabinet. The CRTC Act provides for up to 13 full-time members and not more than 6 part-time members.

The Telecommunications Act gives the CRTC a broad range of powers, including the regulation of telecommunications rates and conditions of service, approval of interconnection agreements, and the enforcement of quality of service standards. The CRTC must ensure that rates are just and reasonable, and that Canadian carriers do not discriminate unjustly, or accord any undue preference. Under the Act, the

CRTC must also exercise its powers with a view to implementing the telecommunications policy for Canada as set out in section 7 of the Act, and any direction issued by cabinet.

The Telecommunications Act gives the CRTC the power to forbear from regulating a service or a class of services provided by a Canadian carrier where it finds that to do so would be consistent with the Act's telecommunications policy objectives. Under the Act, the CRTC must forbear where it finds that a service or class of services is or will be subject to competition sufficient to protect the interests of users. However, the Commission can forbear from the exercise of only certain responsibilities and obligations specified under the Act. In many of its forbearance determinations, the CRTC has eliminated the requirement for carriers to file tariffs and agreements for approval, but has retained its powers to address instances of undue preference or anti-competitive behaviour. Services for which the CRTC has exercised its forbearance power include wireless services, satellite services, retail Internet services, most of the services offered by new entrants, and a significant portion of the services offered by the incumbent telephone companies.

Other examples of powers granted to the CRTC include the power to settle disputes between Canadian carriers and municipalities or other public authorities regarding the use of rights of way and the power to require any telecommunications service provider to contribute to a fund to support continuing access by Canadians to basic telecommunications services.

4 Broadband market overview

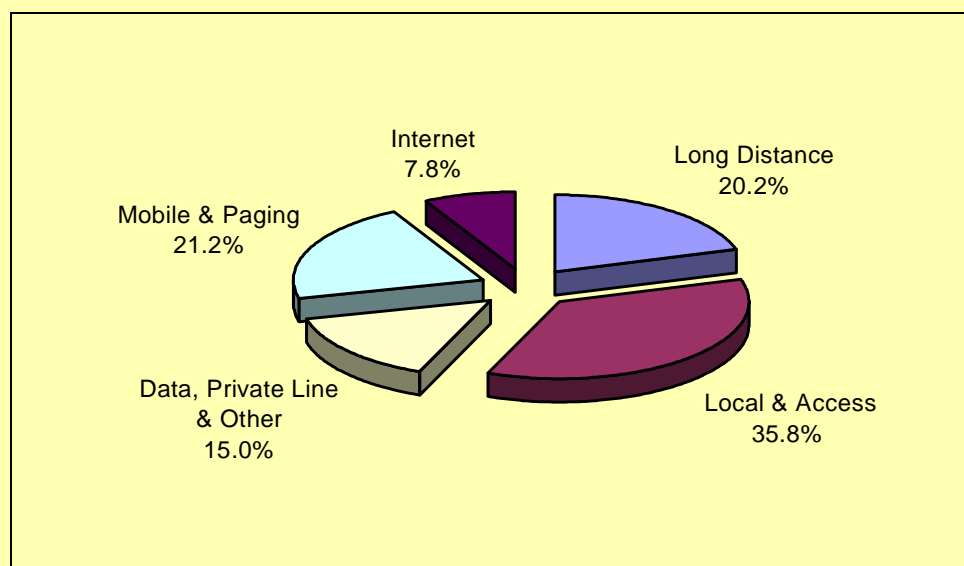
The Canadian Telecommunications services industry plays a significant role in the Canadian economy as a whole. With a total revenue of C\$32 (US\$20.2) billion, the industry's share of real gross domestic product (GDP) was 2.6 per cent in 2001¹⁸. The industry's share of GDP has grown by around 45 per cent over the last 5 years since 1997 where telecommunications services accounted for only 1.8 per cent of GDP.

Figure 4.1 gives a general picture of the different segments of the Canadian telecommunications service industry and its aggregate 2001 revenues.

At the end of 2001, retail Internet access was a C\$2 (US\$1.3) billion market in Canada, registering an average annual growth rate of 72 per cent during the 1998 to 2001 period.

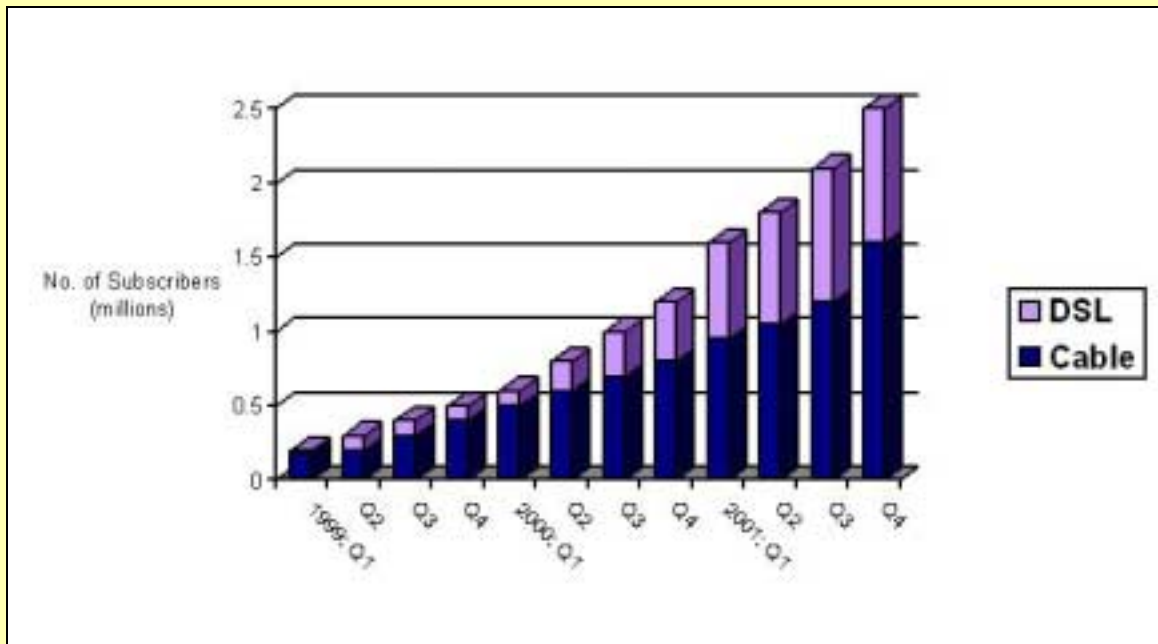
Retail high-speed Internet access revenues in 2001 were C\$1.19 (US\$0.75) billion, or 60 per cent of the overall C\$2 billion Internet access revenues. This was up from 47 per cent in 2000, which made 2001 the first year in which high-speed access revenues exceeded narrowband Internet access revenues.¹⁹

Figure 4.1: Telecommunications revenue by segment
Percentage, 2001. Total revenue: C\$32 billion



Source: CRTC 2002 Data Collections.

Figure 4.2: Growth of cable and DSL subscribers
No. of subscribers, 1999-2001



Source: Industry Canada estimates based on company annual and quarterly reports.

4.1 Market structure and competition

Without significant cross-ownership between telecom incumbents and cable incumbents, intermodal competition staged between them largely defines the competitive structure of the Canadian high-speed Internet access market. Prior investment by telco and cable incumbents in copper access infrastructure has given them a significant and continuing competitive advantage over new market entrants. Together, they controlled 84 per cent of the high-speed markets in 2001 with cable incumbents holding a 49 per cent share and telco incumbents a 35 per cent share of high-speed Internet access revenue shares.²⁰

While non-incumbents retained a noticeable proportion of high-speed Internet access revenues (16 per cent), nearly all their revenues and corresponding subscriptions fell into the business segment of the high-speed market with only 5 per cent of their revenues coming from residential subscribers. On the other hand, residential subscribers generated 95 per cent of cable incumbents' revenues and 62 per cent of telco incumbents' revenues.

Between the incumbent technologies, cable Internet subscriptions have consistently exceeded DSL subscriptions by a comfortable margin. In 2001, there were 1.6 million cable Internet subscribers to 924,000 DSL subscribers. DSL, however, which is expanding its network reach, appears to be narrowing the gap (see Figure 4.2).

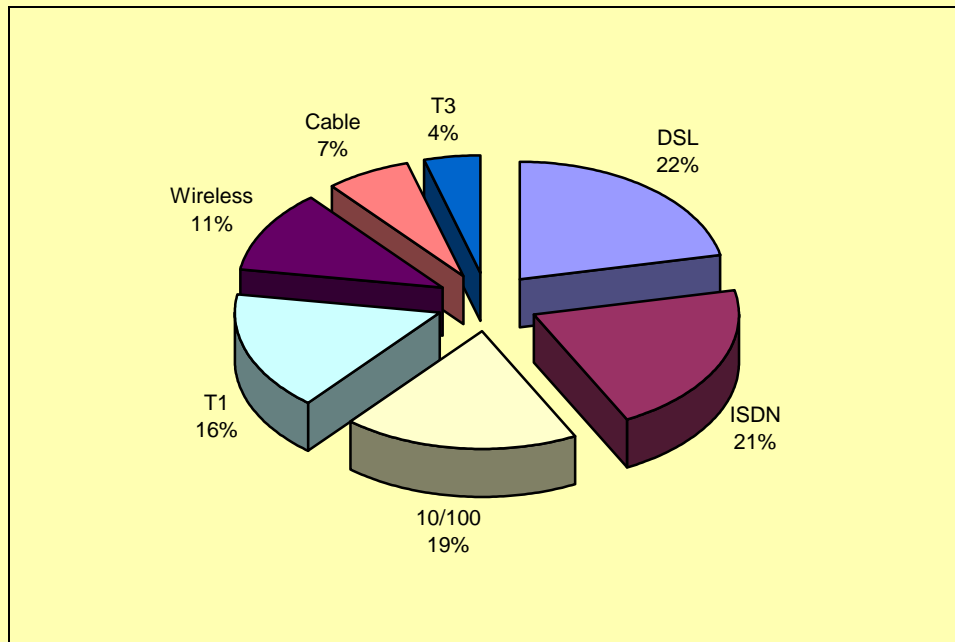
4.2 Service offerings

A private study commissioned by Industry Canada in early 2002 estimated that at the end of 2001, Canada had 940 ISPs, of which 76 per cent (740) offered dial-up and 82 per cent (771) offered high-speed Internet access through various means such as DSL, cable, ISDN and 10 or 100 Mbit/s services.²¹ Among the 940 ISPs, only around 41 per cent provided Internet access to more than 1,000 subscribers.

The most prevalent forms of high-speed access offered by ISPs were DSL (22 per cent) and ISDN (21 per cent) while cable was offered by only 7 per cent of ISPs (see Figure 4.3).

A list of major market participants in the high speed Internet access market segment can be found in Annex 1.

Figure 4.3 Types of high-speed access offered by ISPs
Percentage of ISPs, 2002



Note: Wireless access is defined as including cellular/PCS, satellite, MDS and LMCS.
 Source: Pollara Inc.

4.2.1 DSL service

In November 1996, SaskTel, the incumbent carrier in Saskatchewan became one of the world's first telecommunications carriers to offer consumer high-speed Internet services using DSL technology.

By 2001, around 70 per cent of all phone lines in Canada were provisioned for DSL services making DSL available in around 860 Canadian communities. At the end of 2001, there were 924,000 DSL subscribers in Canada compared with 455,000 the year before. This represented a growth rate of close to 100 per cent over the previous year.

Despite the size of the country and its division into 13 provinces and territories, the Canadian telecommunications industry, and consequently the DSL industry segment, is highly consolidated. A major company, BCE, controls a number of incumbent telcos that serve the great majority of the population of Canada. Its subsidiary Bell Canada provides service through most of the two biggest provinces, Ontario and Quebec, while another, Aliant, serves Nova Scotia, New Brunswick, Prince Edward Island and Newfoundland. Its subsidiary NorthWesTel provides incumbent service in the Northwest, Nunavut and Yukon territories. Bell Canada, operating under the Sympatico brand emerged as the countries largest DSL provider in the fourth quarter of 2001 with 689,000 subscribers while Aliant Telecom had 68,000 subscribers.

The other big holding company is TELUS Corporation which owns the incumbents in British Columbia and Alberta, with 215,000 DSL subscribers. The other two remaining incumbent carriers, Sasktel, the incumbent provider for Saskatchewan owned by the provincial government, and Manitoba Telecom Services Inc (MTS), the incumbent provider for Manitoba, have 33,000 and 34,000 DSL subscribers respectively.

Besides the incumbent telcos, there are a number of competing carriers providing DSL services, almost all focusing on business markets in the big cities. The biggest is AT&T Canada and others include Call-Net, GT Group and Futureway.

ADSL services are marketed primarily through the mass media. Kits are available through consumer electronic retail outlets as well as provider affiliated telecommunications equipment outlets. The monthly price of an ADSL package, including modem rental, hovers tightly around C\$45 (US\$28.35) a month (after introductory offers) for a standard 1 Mbit/s downstream and 128 kbit/s upstream connection with a 10GB download bitcap. ADSL lite packages, including modem rental, providing a 256 kbit/s downstream and 64

kbit/s upstream connection are priced around C\$30 (US\$18.90). ADSL monthly service prices typically do not include the basic monthly phone-line rental, ranging from C\$20 (US\$12.60) to C\$30 (US\$18.90), depending on location, which is payable to the telephone network operator. Installation charges can vary from around C\$25 (US\$15.75) for self-installation to C\$75 (US\$47.25) for installation by a technician.

A number of telecommunications companies providing both ADSL and voice services (local, long-distance and international call services) market various service bundles packaging these services. Depending on the number and type of services bundled, service bundles can represent substantial discounts²². It should be noted that although the CRTC regulates the provision of service bundles which include tariffed services, such as local voice services, the cost savings they sometimes represent have been cited as a considerable competitive advantage full-service telecommunications providers have over ISPs providing ADSL services only.

In marketing ADSL products, ADSL service providers have taken considerable pains to distinguish ADSL service offerings from cable Internet services that boast faster connection speeds. In particular, emphasis is placed on the guaranteed bandwidth available from an ADSL connection as a counterpoint to the often faster but non-guaranteed bandwidth available from a similar priced cable Internet connection.

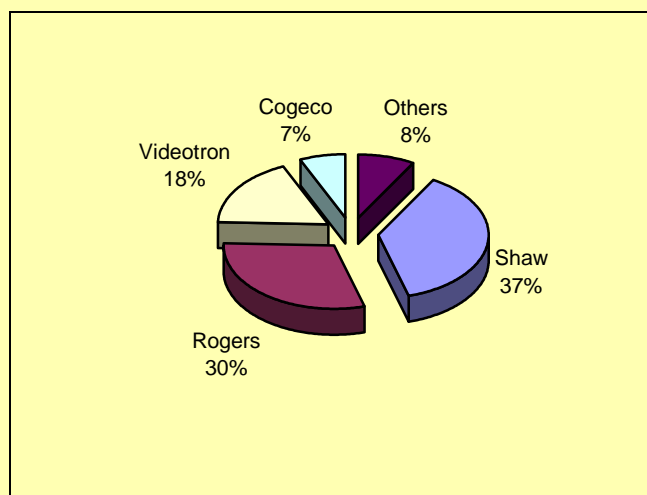
4.2.2 Cable Internet service

Rogers Communications Inc of Toronto launched the first high-speed Cable Internet consumer service in the world in November 1996. By the end of 2001, cable Internet services were available in 9.4 million homes, amounting to about 85 per cent of homes that had access to cable TV, spread over 630 communities. There were 1.6 million cable modem subscribers at the end of 2001 compared with 935,000 the year before, representing a growth of more than 70 per cent over the previous year.

Shaw Communications and Rogers are the two largest cable Internet access providers with a combined subscriber share of over 65 per cent of the cable Internet service market. Other major operators include Videotron, Cogeco and Eastlink. At the end of 2001, Shaw had 596,000 cable Internet subscribers, spread over the provinces of British Columbia, Alberta, Saskatchewan, Manitoba and Ontario, Rogers Cable 479,000 concentrated in Southern Ontario and the Atlantic provinces, Groupe Videotron 284,000, primarily in Quebec, and Cogeco Cable 108,000, located mainly in Ontario²³ (see Figure 4.4).

Figure 4.4: Cable Internet subscriptions

Percentage, 2001



Source: CRTC 2002 Data Collection. Based on individual company reports

Cable Internet services are marketed through the mass media with kits sold through company outlets and consumer electronic retail outlets. Monthly charges for cable Internet services closely resemble that of ADSL services. Currently, cable modem packages, including cable modem rental, offering 1.5 Mbit/s downstream and 192 kbit/s upstream with unlimited downloads range within a tight band around C\$45 (US\$28.35) for existing subscribers to the provider's cable TV services. Non-cable TV subscribers can expect to pay up to C\$10 (US\$6.30) more per month for their cable Internet package. Cable Internet providers have also introduced a lite package which is priced around C\$30 (US\$18.90), including modem rental. It is important to note that although cable Internet providers currently do not impose download limitations (bit cap charges), they are widely expected to be introduced sometime this year.

Installation charges, which are typically waived during promotional periods, can range from C\$80 (US\$50.40) for self-installation to C\$150 (US\$94.50) for professional installation. Providers often market Cable Internet services as part of a service bundle that includes cable TV programming.

4.2.3 Other services

According to the 2001 CRTC data collection, only 9000 households out of a total of 2.5 million households with high-speed Internet subscriptions subscribed to non-DSL or non-cable Internet high-speed services. The large majority of these households subscribed to fixed wireless.

4.2.3.1 Fixed wireless

In 2002, there were just under 100 ISPs offering fixed wireless Internet services throughout Canada, most of whom provide limited service coverage on a regional or community basis. Major fixed wireless Internet providers include Look Communications, Wiband Communications, TeraGo Networks and Storm Internet. Although the majority of these providers primarily serve the business market, the recent release of large amounts of spectrum by Industry Canada and the rapid adoption of fixed wireless solutions in rural and remote communities is expected to increase the number of residential subscribers significantly in the near future. Presently, fixed wireless services to residential customers are principally offered by non-incumbent providers.

Efforts to market fixed wireless through mass media have been modest, limited usually to local print mediums. Because of the non-standard offerings of fixed wireless broadband providers, comparisons between identical products are difficult. Monthly charges for a residential service offering performance within the range of 2.5Mbit/s to 1.5Mbit/s downstream and 2Mbit/s to 200kbit/s upstream range from C\$35 (US\$22.05) to C\$60 (US\$37.80), depending largely on location. Download caps of between 5 Gbit to 10G bit are common. Installation costs range from C\$100 (US\$63) to C\$400 (US\$252).

4.2.3.2 Satellite

Residential two-way high-speed satellite services are a relatively new entry into the high-speed market in Canada. Nevertheless, because of their near universal coverage of the country, they have filled a niche in residential market by serving homes in remote communities where broadband infrastructure of any sort has not been deployed. Major companies providing residential two-way high-speed satellite services include LinCsat, C-Com Systems and Quick Link Communications.

Marketing efforts to households through mass media are absent although local outreach through direct contacts with community groupings have been common. Prices for a 400kbit/s to 500kbit/s downstream and 56kbit/s upstream service range from C\$90 (US\$56.70) to C\$140 (US\$88.20). Equipment prices range from C\$900 (US\$567) to C\$1500 (US\$945) depending on the size of the satellite dish required. Installation of the equipment adds around a further C\$400 (US\$252) to the price.

4.2.3.3 Fibre

Fibre services to business in metropolitan areas have been a standard service offering by most telecommunications companies and ISPs operating in the business segment. Fibre to the home (FTTH), however, is presently in a nascent state of deployment in Canada with only a limited number of residential communities being connected to fibre networks. A small number of telecommunications companies, such as Futureway Communications Inc. and Telus Inc., and community-based providers deliver residential high-speed Internet services over fibre in selected areas (see Box 2).

Box 2: FibreWired Network

FibreWired is an association of community owned utilities in Ontario that provide high-speed telecommunications services over fibre optic cable to their respective home communities. The current members include: Brantford, Burlington, Guelph, Halton Hills, Hamilton, Kingston, Oakville and Ottawa River (Pembroke). At the local level, FibreWired members focus on the provision of data and Internet services to tenants of multiple occupancy buildings and to small and medium size businesses. Services provided by FibreWired members include high-speed Internet access, LAN to LAN links, Virtual Private Networks, video conferencing in real time and Voice over IP, among other services. FibreWired has partnered with AT&T Canada to provide customers with global reach to their services.

Source: Fibre Wired Network at <http://www.fibrewired.com/index.shtml>

Despite the current small footprint of residential fibre networks, it is expected that telecommunications companies seeking to upgrade their networks in order to provide more bandwidth-demanding services such as high-definition TV will progressively install fibre to the home. Largely through the outreach and advocacy efforts of CANARIE and concerted direct marketing by commercial fibre brokers, a growing number of municipalities and communities are considering the installation of fibre networks as a broadband infrastructure solution.

4.3 Marketing broadband

4.3.1 Pricing

Affordability is a major factor behind the country's high level of broadband use. According to a study by the Organisation for Economic Cooperation and Development (OECD) in 2001, Canada was the fourth cheapest OECD country for DSL and the ninth cheapest for cable.²⁴

With the robust growth of broadband subscriber numbers and with prices comparatively lower than those in other countries, ADSL and cable Internet service providers adopted price increases in mid-2002 to boost profitability. On average, prices were raised by about 10 to 15 per cent for standard high-speed Internet offerings. Nevertheless, even with increases in subscription prices high-speed services in Canada continue to remain among the most affordable in the world.

Price differences for standard residential high-speed connection offerings across ADSL, cable Internet and fixed wireless networks have been relatively small. To a certain degree, this has been supported by market research in Canada indicating that for purchases of non-essential services, there exists a psychological household consumer price barrier of around C\$50 (US\$31.50) per month beyond which the purchase is perceived as a major expense.

Table 4.1 shows a price comparison between selected high-speed Internet providers offering residential subscribers similar connection speeds over ADSL, cable Internet and fixed wireless.

4.3.2 Tiered services

As a sign of the increased commoditisation of the high-speed Internet market ADSL and cable Internet providers introduced speed and volume tiered services packages in mid-2002 to allow the targeting of different user groups with different pricing schemes as well as to more accurately model the demographics of high-speed Internet customers.²⁵ Many ADSL and cable Internet providers introduced "lite" services which offer speeds of around 128 kbit/s downstream and 64 kbit/s upstream partly in an effort to mitigate the recent price increases in their standard packages. However, not all providers have introduced "lite" services, given the still comparatively affordable pricing of standard offerings. Telus for example has said that it had no immediate plans to offer such services as it believes the cost of providing a "lite" service was identical to that of a full standard service.

Table 4.1: Price comparison: selected ADSL, cable and wireless packages

Packages offered in Canada, C\$ per month (February 2003)

	Bell Sympatico (ADSL)	Rogers Cable Internet (Cable)	Storm Internet (Fixed wireless)
High Speed Lite	C\$24.95 (US\$15.72) for the first 3 months and then C\$29.95 (US\$18.87) per month thereafter 128 kbit/s downstream 64 kbit/s upstream	C\$24.95 (US\$15.72) for the first 4 months and then C\$29.95 (US\$18.87) per month thereafter* 128 kbit/s downstream 64 kbit/s upstream	n/a
High Speed Standard	C\$24.95 (US\$15.72) for the first 3 months and then C\$44.95 (US\$28.32) thereafter 1 Mbit/s downstream 160 kbit/s upstream	C\$24.95 (US\$15.72) for the first 4 months and then C\$44.95 (US\$28.32) thereafter** 1.5 Mbit/s downstream 192 kbit/s upstream	C\$40.00 (US\$25.20) per month 2 Mbit/s downstream 2 Mbit/s upstream

* Customers not subscribed to Rogers cable TV services pay an additional C\$5 (US\$3.15) per month.

** Customers not subscribed to Rogers cable TV services pay an additional C\$10 (US\$6.30) per month.

Source: Operator information.

4.3.3 Bit cap charges

In conjunction with pricing and service changes last year, a number of ADSL providers adopted a controversial bandwidth cap, effectively imposing a download limit beyond which users would have to pay additional charges. As a bandwidth rationing tool, the introduction of bit cap charges was received with much protest by broadband users who, for the large part, felt that download limits defeated the value of having an always-on high-speed connection that allowed access to multi-media rich content.²⁶ In response however, providers introducing bit caps have highlighted the fact that that they were set well above average user downloads. Bell Canada for example has claimed that 92 per cent of its users download an average 1.5 Gbit per month, allowing plenty of room under a 10 Gbit combined upload and download bit cap under their standard package.

4.4 Commercial content

In Canada, commercial content delivered over broadband has been targeted primarily at the entertainment and mass media segment of market. Multi-media streaming (e.g. webcasts and video clips), large file downloads (e.g. music and software) and online gaming represent the most common form of content accessed by broadband users.

In the Canadian mass media and entertainment industry it is now common practice to distribute interactive multi-media content that complement traditional off-line content, such as news broadcasting, newspapers or movies. Websites featuring movie trailer downloads, live webcasts and streaming video have become an integral part of the effort to market traditional mass media and entertainment products. For example, broadcasters like Alliance Atlantis, a major Canadian broadcast entertainment producer and distributor, feature interactive content on their website properties which market its television programming. Although not specifically designed for broadband, the content provided on their websites, which include movie and television trailers, interactive games and high-quality graphics, require connection speeds in the broadband range to be fully appreciated.²⁷

On a more modest scale, Canada has also seen the introduction of subscription or fee based broadband commercial content. Websites featuring material such as streaming financial information, news or sports webcasts and software downloads are commercially offered for subscription. For example, Bell Canada affiliates offer a range of subscription based broadband content services which range from financial content

packages, which combine streaming financial information, online portfolio management and access to live financial TV footage, to computer game software downloads.

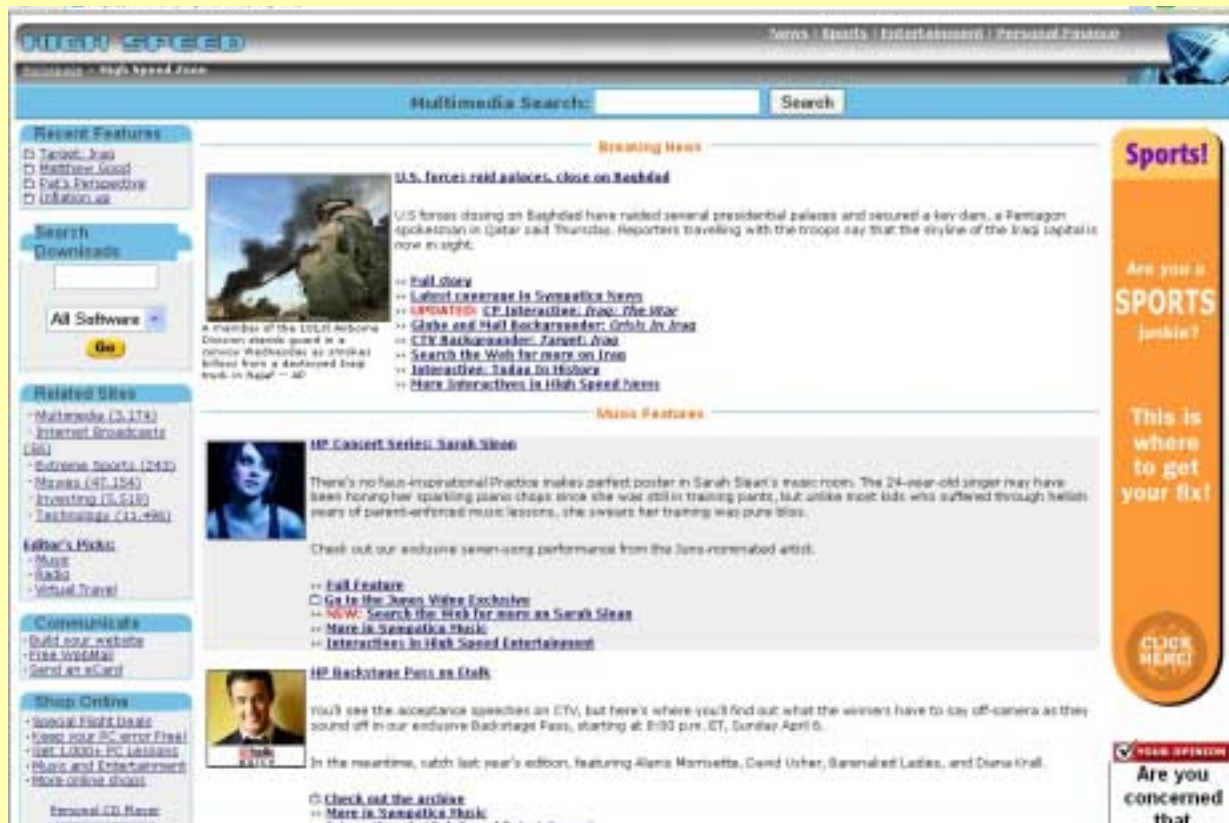
4.4.1 Packaging content and access

To a significant extent, the development of broadband content for entertainment in Canada has been driven by the support of broadband access services providers. During a brief period, the bundling of exclusive content with broadband access was widely regarded as a promising new product line. Service bundles featuring broadband access service and access to “walled-garden” sites (sites restricted to subscribers only) containing provider exclusive content were developed extensively during the 2000 to 2001 period. Over the past year, however, the popularity of bundling exclusive content with access has waned considerably, mirroring the industry’s growing disillusionment with the “convergence” business model that advocated the vertical integration of content and access providers. Broadband service providers have now largely abandoned the aggressive marketing of content and access bundles although most continue to exploit the link between access service and content in marketing (see Box 3)

Box 3: Marketing broadband access and content

Exclusive content, subscriber discounts and free trials

To encourage the take up of broadband access services, a number of broadband service providers have provided portals aggregating a wide range of free broadband content available on the Internet while others have continued to offer some form of exclusive content to their access subscribers as part of marketing strategies to differentiate their services. Increasingly however, to create new revenue streams from broadband content broadband access subscribers are enticed to subscribe to broadband content offered by their providers or provider affiliates through discounts and free trials that accompany their access subscriptions.



Source: ITU. Image taken from: <http://www1.sympatico.ca/hispeed/>.

Box 4: Dial a channel

Television over xDSL

Two different technologies support the delivery of TV over telephone lines: ADSL and VDSL. ADSL, or asymmetrical digital subscriber line, is most commonly deployed for high-speed Internet access. SaskTel currently provides television over ADSL while Telus intends to use an ADSL network to deliver its television services. The faster but more expensive alternative is VDSL, or very high rate digital subscriber line. Bell Canada uses VDSL at selected locations in Toronto and MTS has chosen VDSL to deliver its television services.

Currently, VDSL offers a downstream bandwidth of up to 56 Mbit/s and is presently capable of carrying up to four television signals. On the other hand, ADSL, with a maximum downstream bandwidth of 8 Mbit/s is only able to support a single television signal. ADSL, however, is considerably cheaper to deploy. It also allows telecommunications companies to leverage the existing ADSL systems they currently operate. Furthermore, ADSL also boasts a broader coverage range, extending as far as five kilometres to a customer's home from phone companies' individual network offices. VDSL only extends as far as one kilometre, a limitation that at present prevents mass deployment of the technology.

Nevertheless, with the advent of emerging services such as high-definition television that requires delivery over a high-capacity network, phone companies may eventually be forced to upgrade their systems to stay in the television market in the future.

Source: ITU.

4.4.2 Television over broadband

Currently, paid television programming in Canada is delivered to homes almost completely via conventional satellite and cable TV networks. Nevertheless, the recent entry of telecommunications companies into the television market by way of broadband appear to signal a dramatic change in the way television services will be delivered.

Undiscouraged by the experience of Aliant, which discontinued its television services over ADSL in June 2001 when it failed to attract subscribers, three other telecommunications companies have recently entered the market. Sasktel launched its television service over ADSL service on September 2002 while two others, Manitoba Telecom Services Inc. (MTS) and Telus, plan to launch their services this year. Because Bell Canada controls ExpressVu, a satellite direct to home TV provider, the country's largest phone company has not made a major push to deliver television over telephone lines. In Toronto, however, it currently serves four large residential buildings through VDSL following network trials in those locations (see Box 4).

Selling a suite of services has emerged as a key strategy for telecommunications companies who hope to attract new customers and keep the existing ones they have. By moving into the television market, telecommunications companies will be better able to defend their core business of voice services. In theory, customers will be less likely to switch local phone service providers if they are purchasing a wide bundle of services that includes voice, television and Internet. With cable companies being allowed to provide voice services in Canada, the entry of telecommunications companies into the television market may also be matter of competitive survival, allowing them to provide a similar bundle of services as cable competitors. Nevertheless, with only one cable company, Eastlink, currently selling telephone services in Nova Scotia, the danger that this presents is not seen as imminent in all regions.²⁸

5 Regulation and the promotion of broadband

The promotion of effective competition, in particular facilities-based competition, in high-speed Internet access markets is a key goal of the Canadian regulatory framework. To this end, a number of key regulations have been introduced to foster entry into these markets.

On the whole, the telecommunications regulatory regime in Canada has proved effective. Unlike in many other countries, there are fewer complaints by new entrants about the regulatory framework and regulatory safeguards. There are also relatively fewer complaints by new entrants about the behaviour of the incumbents. Largely, this is indicative of an efficient and transparent regulatory process as well as greater co-operation among market players.²⁹

5.1 Regulation of market entry and licensing

Canadian licensing requirements are one of the most liberal in the world. Since end-1998, Canada has had open market entry in all sectors of telecommunications services. Apart from international service providers and wireless operators who provide services over regulated spectrum, facilities based providers of telecommunications services need only register before commencing operations. The regulatory ease of facilities-based market entry into the Canadian telecommunications market has been largely credited with the growth of facilities-based competition in the high-speed Internet access segment of the market.³⁰

With its decision to forbear from the regulation of the ISP market, the CRTC does not impose any entry procedures, registration process or regulatory obligations on ISPs who are not carriers (that do not own and/or operate transmission facilities). However, companies wishing to become DSL service providers are required to inform the CRTC of their intention to do so and to submit the name of the carrier supplying the unbundled local loop and collocation. As DSL service providers, they are prohibited from using these loops to provide voice services over switched circuits unless they undertake to become Competitive Local Exchange Carriers (CLECs) who *inter alia* are subject to universal service contributions.

5.2 Foreign ownership restrictions

Foreign investment restrictions are formalised in the Canadian Telecommunications Act of 1993. In the Act, telecommunications operators that own or operate facilities must have at least 80 per cent of their voting shares owned by Canadians and not less than 80 per cent of the members of the board of directors must be Canadian. The same ownership and control requirements are applicable to radiocommunication carrier licences. However, resellers of telecommunications services who do not own or operate transmission facilities are not subject to these restrictions.

Foreign ownership restrictions have been frequently cited as an obstacle to greater foreign investment in broadband networks and increased facilities-based competition in the broadband market. In its report, the National Broadband Task Force recommended that the federal government undertake an urgent review of its foreign investment restrictions for telecommunication carriers and broadcasting distribution undertakings. A review of the legislation regulating foreign investment in the telecommunications industry was subsequently launched by the Canadian government in November 2002 and is currently ongoing.

5.3 Local loop unbundling

The Canadian Telecommunications Act of 1993 does not specifically provide for local loop unbundling (LLU). The Act, however, gives the Commission wide-ranging powers that allow it sufficient scope to interpret general clauses as it views appropriate.

In 1997, the CRTC's decision on local competition (Decision 97-8) concluded that essential facilities should be subject to mandatory unbundling and mandated pricing. An essential facility was defined as a facility that: (1) is under monopoly control; (2) is required as an input to provide services; and (3) cannot be duplicated economically. In the decision, local loops in certain bands, primarily small urban and rural areas, were deemed as essential facilities. Nevertheless, the CRTC also concluded that lower cost local loop areas such as those in large urban areas, while not defined as essential, would also be subject to the same unbundling and pricing requirements as the local loops that were considered to be essential for a period of 5 years (from 1 May 1997) in order to provide new entrants the ability to build-up an initial customer base using unbundled local loops while maintaining an incentive for the eventual construction of their own facilities. A subsequent decision (Decision 98-22) set rates at "actual" incremental costs plus a 25 per cent mark-up.

Following lower than expected use of unbundled local loops to provide services, further reductions in loop service charges and monthly rates were mandated by the CRTC. In an April 2001 decision, the CRTC extended the unbundling requirements of low cost local loop areas on an indefinite basis. At the same time, the CRTC also reviewed the 25 per cent mark-up on incremental costs and issued a decision requiring incumbent local exchange carriers (ILEC)s to justify their use of a 25 per cent mark-up (or any lower mark-up above 15 per cent) failing which the CRTC would use a 15 per cent mark-up to determine final loop rates.

Monthly prices for full access to LLU in Canada vary widely from location to location ranging from C\$6.04 (US\$3.91) in low-cost bands to C\$51.81 (US\$33.54) in high-cost bands in 2002. On an average basis, Canada was placed above the OECD price average for full access LLU (see Figure 5.1).

At present, full access and shared access services are on offer in Canada while bitstream access is as yet unavailable. Nevertheless, while full access unbundling has been implemented, line sharing has not legally been mandated. A large number of CLECs, however, have voluntarily opened their above-voice bandwidth for sharing with wholesale DSL competitors. However, a large part of CLECs' lines were only for business use. At the end of 2001, 802,000 or around 4 per cent of Canada's 19,987,000 loops have been unbundled. These figures indicate that 18 per cent of competitor lines were accounted for by unbundled local loops.

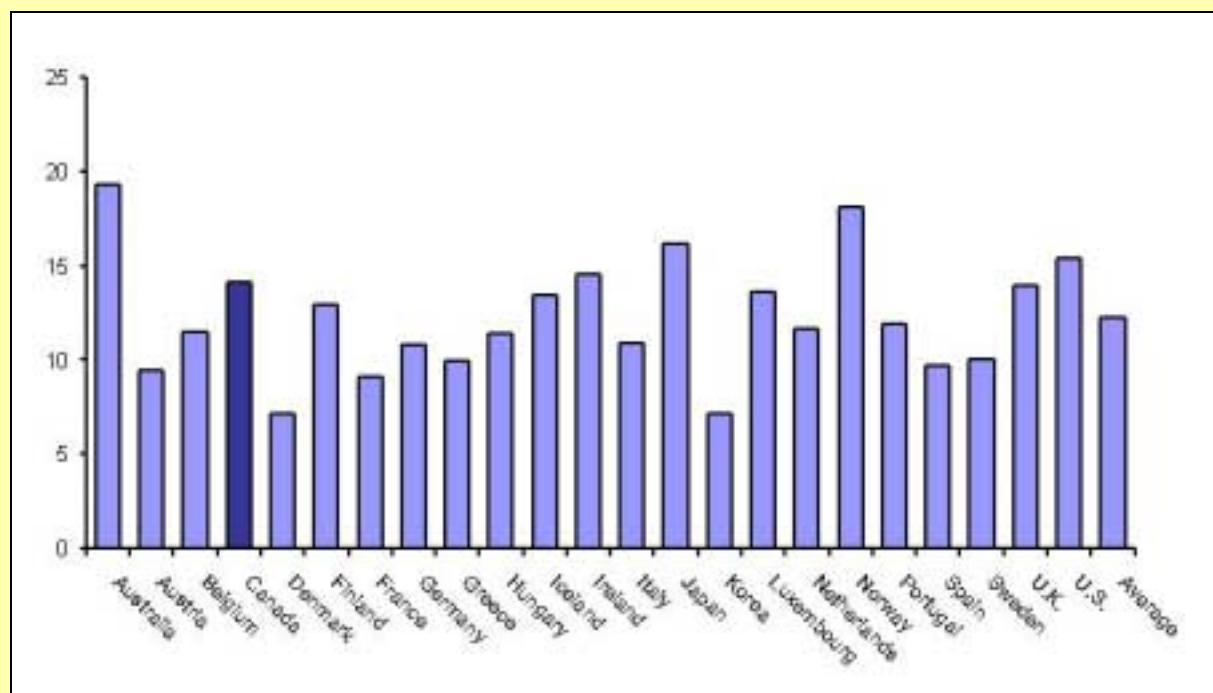
Until September 2000, CLECs had a relatively higher level of rights compared to DSL resellers as they alone could requisition local loops from ILECs and co-locate their equipment in the ILECs' company facilities. However, in a September 2000 decision, the CRTC ruled that DSL service providers who registered would be entitled to co-location and unbundled loop access at the same rates and conditions provided to CLECs provided that switched voice services were not provided. Nevertheless, despite extending unbundled loop services and co-location to DSL service providers, DSL service provider registrations proved unpopular standing at four non-incumbent-owned companies at the end of 2000 and seven by the end of 2001.

5.4 Cable open access

Canada has taken a relatively aggressive approach to "opening-up" cable broadband facilities to competing ISPs. In 1998, the CRTC ruled that it would no longer regulate the rates at which broadcast carriers (cable companies) offer retail level Internet services and certain other telecommunications services. However, the Commission required the approval of rates and terms on which incumbent cable companies provide access to their facilities to competitive providers of retail Internet services, effectively regulating access to their facilities by third party ISPs.³¹ Due in part to delays in the modification of cable networks to permit third party cable access, it was another year before wholesale rates, fixed at a 25 per cent discount off lowest retail prices, and other terms were finally approved by the Commission.³² It took another full year to finalise other remaining details.³³

Overall, the process of facilitating third-party access to cable Internet infrastructure in what is essentially a monopoly environment similar to that of telecommunications has been a difficult one. Complaints regarding the high cost of third-party access as well as other difficulties continue to surface.³⁴

Figure 5.1: Average month prices for full access LLU for DSL in selected OECD countries
US\$, April 2002



Source: OECD.

5.5 Co-location and inside wire

As part of the decision to open the local market to competition, the CRTC required incumbent local public telecommunication operators to provide co-location to new entrants at terms and conditions, including rates approved by the CRTC. The rates for co-location were set at incremental cost plus a 25 per cent mark-up for the recovery of fixed and common costs. In September 2000 the CRTC agreed to extend co-location and other rights to DSL service providers that were not CLECs.

In general, co-location regulations and the accompanying dispute resolution process, which uses an industry based committee to facilitate negotiations, have been well received by market participants.

The development of competition in the broadband market has created a demand for access by competitors to buildings and multi-residence buildings. Some concern has been expressed about the risks of access bottlenecks being created in multi-residence buildings resulting from building owners and operators entering into long-term exclusive deals which limit the scope of residents to choose their service provider. The CRTC has recently undertaken consultation on access to multi-dwelling units to examine how to ensure non-discriminatory access and customer choice.

5.6 Rights of way

The CRTC has considerable powers to arbitrate rights-of-way disputes. Although telecommunication operators need to obtain the consent of municipalities to obtain rights of way, the Commission can intervene in disputes between municipalities and carriers. Where a carrier cannot reach agreement with a municipality the Commission can grant them permission subject to any conditions that the Commission determines.

Nevertheless, the jurisdiction of the CRTC over rights-of-way disputes is in the process of being challenged with important consequences to the build-out of new broadband fibre networks (see Box 5).

Box: 5: Municipal rights of way

The jurisdiction of the CRTC

Obtaining rights of way at reasonable costs is an important requirement for facilities based broadband market entrants to deploy their networks. Unfortunately however, obstacles have arisen in situations where municipalities view the granting of access to municipal rights of way as a revenue generating activity or when municipalities own and operate competing networks.

In Decision 2001-23, January 25, 2001, the CRTC ruled on a dispute between the City of Vancouver and Leducor Industries Limited involving access to municipal rights of way in that city. In that case, the City of Vancouver wanted to impose a number of conditions on Leducor before granting it rights of way to install a fibre optic network in the municipality.

In its decision, the CRTC determined that it has full jurisdiction under the *Telecommunications Act* to deal with rights of way issues in the context of resolving disputes brought before it, subject only to the requirement that it give due regard to the use and enjoyment of those rights of way by others.

Under the terms and conditions established by the Commission, the City of Vancouver is entitled to recover all of the causal costs it incurs as a result of the construction, maintenance and operation of carrier transmission lines in its municipal rights of way. It was not, however, entitled to any compensation in the form of "market-based" or other fees charged for the use of space in rights of way. Among other things, the CRTC also found it inappropriate for municipalities to require carriers to construct spare capacity, or to require other carriers to use this capacity rather than construct their own.

On May 14, 2001, the Federation of Canadian Municipalities and the cities of Vancouver, Calgary, Toronto, Halifax and Ottawa were granted leave to appeal the CRTC's decision to the Federal Court of Appeal. The appeal argues primarily that the CRTC lacks the jurisdiction to make the type of findings regarding municipalities such as those made in Decision 2001-23. In January 2003, the Court of Appeal upheld the constitutional validity of the CRTC's jurisdiction under the *Telecommunications Act* to determine terms and conditions of access to municipal rights of way where there is a disagreement between the municipality and a telecommunications carrier. The CRTC can order that access be given and establish the terms and conditions of the access.

The municipalities concerned are currently considering a further appeal to the Supreme Court.

Source: ITU.

5.7 Universal service

As mentioned in Chapter 3, universal service in Canada has been defined to include basic telephone service with touch-tone dialling as well as the ability to access the Internet at local rates.

The CRTC, however, has decided not to include broadband as an explicit part of the universal service offering in order to allow advanced services to develop sufficiently in the market and to reach a sufficient level of ubiquitous national penetration, such as touch tone service, so that the lack of service would lead to social and economic disadvantage.

Nevertheless, the CRTC decision to require service improvement plans to meet universal service may, in some cases, facilitate the deployment of broadband services. For example, fibre optic cables or high capacity radio trunks will likely be the transmission medium used to bring improved service to a number of rural and remote communities and in most cases they will be overbuilt. Co-ordination with this activity carries the potential of accelerating broadband network deployment in the affected areas.³⁵

5.8 Spectrum management and fixed wireless broadband

The Radiocommunications Act requires that most use of radio spectrum be licensed by Industry Canada and that holders of these licences incur financial obligations of varying amounts. Over the past 10 years, Canada has made vast quantities of spectrum available for wireless broadband over a number of frequency bands and has plans to open up additional spectrum in the near future.

The 2500 MHz band is currently confirmed for the licensing of Multipoint Distribution System (MDS) broadcasting and for wireless Internet Multipoint Communication System (MCS) services. In November 2001, the Minister of Industry announced that mobile and fixed allocations would be made throughout the band. Incumbent licensees were reassured that they would not be relocated and that they could continue to deploy their networks according to their business plans.

The Department initiated a public consultation in 2001 on opening the 3500 MHz band for Fixed Wireless Access (FWA) and Wireless Communications Services (WCS) currently operating in the 2300 MHz range. The Department indicated that up to 200 MHz for FWA and 30 MHz for WCS could be opened in the 3,500 MHz band.

Other wireless broadband spectrum suitable for high capacity point-to-multipoint has also been made available. For example, 1200 MHz of spectrum in the 24 GHz and 38 GHz bands was auctioned for this purpose in 1999. Also, 1000 MHz of spectrum designated for Local Multipoint Communications Systems (LMCS) in the 28 GHz band was licensed through a comparative licensing process in 1996. That licence was recently returned to the Department; however, and plans to re-assign this spectrum are being developed.

The Department is currently undertaking a comprehensive review of the use of spectrum in the 3 to 30 GHz range. As a result of this review, additional spectrum could be designated for wireless broadband access

5.9 Competition policy

Despite the existence of a general competition authority, the Competition Bureau, the CRTC maintains jurisdiction over complaints of anti-competitive behaviour in the telecommunications sector. Recent complaints heard by the CRTC that involved high-speed Internet providers have included unfair bundling, predatory and discriminatory pricing and anti-competitive subsidisation.³⁶

6 Promoting broadband

The promotion of broadband in Canada takes place within its unique context of a vast country with a population scattered throughout its large landmass. As an overall objective, the Canadian government has focused on making a similar quality of life available to all Canadians, regardless of location. However, as was highlighted in Chapter 2, distance and size have deprived most remote, rural and first nation communities from enjoying the opportunities and benefits of advanced Information Communication Technologies (ICTs) that contribute to a wide range of economic and social activities.

With economic activity and the provision of public services becoming more dependant on high-speed delivery in recent years, there was a growing recognition by the federal government as well as provincial and territorial governments and community leaders that there was a danger that unserved remote and rural

communities would be left further behind. As a result, recent public initiatives have focused on linking these communities to the national broadband network, extending local broadband access infrastructure to serve the community at reasonable prices and developing broadband applications and content that enable the more efficient delivery of public services to remote, rural and first nation communities.

6.1 Key drivers

Given its size and the social, cultural, economic and linguistic differences that exist throughout the country, the historical development of communications networks in Canada differed widely from region to region. In some areas, the task of network building was assumed by the private sector while in others, it was considered the responsibility of the government. In some areas, networks grew and interconnected organically while in others, they were centrally planned.³⁷ In a similar way, initiatives to grow the national broadband network have also been driven by different entities with responsibility falling on communities and municipalities in some areas while on the private sector or the provincial government in others.

6.1.1 Communities and municipalities

Historically in Canada, the community or the municipality has provided an important focus to the efforts of local government, private sector companies and individuals to develop communications networks. Before the concept of natural monopoly and provincial public ownership took hold in the mid 19th century, the Canadian telephone network developed from the bottom-up. Despite the granting of a national charter to Bell Canada to serve the whole country in 1880, the expiration of key Bell patents at the end of the 19th century and public dissatisfaction fuelled an independent telephone company movement that was municipally centred.³⁸ In a similar way, the Canadian cable and satellite industry were also built from the bottom-up, beginning with community-based services aimed at delivering broadcast services to rural and remote areas.

Following in this tradition, a large number of broadband promotion initiatives have been launched throughout Canada at the community level with funding support from the provincial/territorial and federal government (see Box 6)

6.1.2 Provincial and territorial government

Provincial and territorial governments exercise considerable autonomy in areas such as local industry, education, health care and infrastructure development. With the potential of broadband to improve the economy of local communities and the delivery of education, health care and government services to these communities, provincial and territorial governments have been keen to stimulate the deployment of broadband infrastructure within their jurisdictions.

Box 6: Upper Canada Networks

Delivering community broadband access

In 1996, the South Grenville Economic Development Commission launched a Telecommunications Task Force to address connectivity issues in their four communities. It found that access to affordable, high-speed Internet service was virtually non-existent yet in demand by the public, by private sector enterprises and by the majority of residents in the predominantly rural area. In 1998 a through markets needs analysis was conducted over the entire county of Leeds and Grenville and a business case was developed for presentation to the Ontario Ministry of Energy, Science and Technology (MEST) for partial funding from their Telecommunications Access Partnership (TAP) programme.

In the first quarter of 2000, MEST awarded a grant of C\$1.8 (US\$1.13) million for the construction of a broadband network on the condition that matching funds, in cash or in kind, be raised from “stakeholder partners” who included equipment vendors, school boards and local business. In 2000, Upper Canada Networks (UCNet) was formed as a not-for-profit corporation. It currently operates a fixed-wireless broadband network that provides service to seven communities in the county and plans to eventually expand network coverage to include more than 200 communities.

Source: Upper Canada Networks at <http://www.ucnet.ca>.

Table 6.1: Selected provincial and territorial broadband related initiatives

Province	Initiative
Alberta	The C\$193 (US\$121.6) million Alberta SuperNet aims to link 422 communities in the province over two phases: a base area network, funded by Bell West, and an extended area network, funded by the province. http://www.albertasupernet.ca
Manitoba	The Canada-Manitoba Infrastructure Program has allocated C\$200 (US\$126) million to infrastructure related projects between 2000 and 2006. Among the focuses listed for the program were "Rural and Northern Telecommunications Infrastructure", and "High-Speed Internet Access for Public Institutions" http://www.infrastructure.mb.ca/e/proinfo.htm
Ontario	The government of Ontario supports the development of broadband networks through several programmes including: <ul style="list-style-type: none"> • the C\$200 (US\$126) million Rural Economic Development (RED) programme and • the C\$55 (US\$34.6) million Connect Ontario: Broadband Regional Access (COBRA) programme. http://www.ontariocanada.com/ontcan/en/rts/rts_connect-ontario.jsp
Quebec	The Villages branchés du Québec funding program launched by the Quebec government earmarks C\$75 (US\$47.2) million for the deploying of broadband network infrastructure to Quebec's schools and municipalities. http://www.meq.gouv.qc.ca/lancement/villagesbranches/
Saskatchewan	Spending a total of C\$71 (US\$44.7) million over a six-year period, the government of Saskatchewan has partnered with SaskTel to develop CommunityNet, a province-wide broadband network extending to 366 communities. http://www.communitynet.ca/intro.html
Yukon	Implemented through a cost-sharing partnership between the territorial government and the teleco incumbent, NorthWesTel, the C\$17 (US\$10.7) million Connect Yukon programme aims to make broadband Internet access available to 89 per cent of all homes in the territory. http://www.gov.yk.ca/news/2000/Nov-00/00-203.pdf

Source: Industry Canada.

The initiatives undertaken by provincial and territorial governments to promote broadband vary widely. Some of them have undertaken provincial wide broadband network build-outs, such as the Alberta SuperNet initiative, while others have adopted a more hands-off approach concentrating instead on supporting community-based initiatives through targeted funding such as the Ontario government's Connect Ontario: Broadband Regional Access (COBRA) initiative. Table 6.1 lists a number of provincial and territorial broadband infrastructure initiatives that are currently under way.

6.1.3 Federal government

At the federal level, Industry Canada has largely assumed the lead role in the promotion of the Internet and broadband in Canada. Since the mid-90s, it has progressively developed and implemented a comprehensive series of programmes aimed at helping Canadians take advantage of the Internet and at making Canada a world leader in global information based economy. In 1998, these federal initiatives programs were united and launched as an initiative called "Connecting Canadians". Organized around six pillars: Canada On-line, Smart Communities, Canadian Content On-line, Electronic Commerce, Canadian Governments On-line and Connecting Canada to the World, "Connecting Canadians" addresses a wide range of issues from

infrastructure deployment to Internet skills development. The range of initiatives covered by “Connecting Canadians” is set out in Annex 2.

With increasing recognition of the importance broadband, the federal government established the National Broadband Task Force in January 2001 to map out a strategy for achieving the goal of ensuring that broadband services will be available to business and residents in every Canadian community by 2005. The Task Force was also tasked to advise the government on the issues related to the development and deployment of broadband networks and services in Canada. In its final report, the Task Force analysed the extent of the challenge in detail and recommended that broadband facilities and services be available to all Canadian communities according to the following priorities:

- All communities should be linked to the national broadband network via links capable of supporting 1.5 Mbit/s symmetrical service to end-users.
- Access to broadband in first nation, Inuit, rural and remote communities should be available at prices comparative to that charged in more densely populated areas.
- Local broadband access infrastructure should be extended to public facilities including schools, public libraries and other designated public access points.
- Local broadband access infrastructure should also be extended to local business and residential users.

With these objectives in mind, the Task Force concluded that there were two main ways in which the priorities could be completed:

- Through an “infrastructure support model” focused on incentives to stimulate the supply of broadband infrastructure and services; and
- Through a bottom-up “community aggregator model” focused on the stimulation of demand for broadband capabilities.

Following the release of the final report of the Task Force, the federal government launched a Broadband for Rural and Northern Development Pilot Program on 5 September 2002 to provide financial support for community based demand-aggregation initiatives built on the “community-aggregator model” to develop broadband infrastructure. Results of the first round of funding were announced recently in January 2003 (see Box 7).

Box 7: Broadband for Rural and Northern Development Pilot Program

The C\$105 (US\$66.1) million Broadband for Rural and Northern Development Pilot Program was created to assist those communities that are without broadband access. Priority is given to First Nations, northern, rural and remote communities. Selected unserved communities will be given financial assistance through two separate rounds for funding, each with a competitive call by Industry Canada for the submission of applications from interested communities throughout Canada.

Under the first competitive process, up to C\$30,000 (US\$18,900) or 50 per cent of eligible costs (whichever is less) in funds will be disbursed through a competitive process, directly to “community champions,” for the development of business plans. These community champion not-for-profit organizations will act as sponsors to aggregate community demand and develop business plans on behalf of eligible communities. Once business plans are completed and submitted, communities may be eligible to receive additional funding subject to the quality of submissions and availability of funds, through a second competitive process, to assist in the implementation of their business plans. All submissions for funding components are assessed by an independent National Selection Committee.

Results of the first-round business plan development funding process were announced in January 2003 with 89 successful applicants representing around 1149 communities receiving funding. Successful applicants will use the funding for the development of business plans to be submitted in May 2003 to compete for implementation funding.

Source: Industry Canada, Broadband for Rural and Northern Development Program at <http://broadband.gc.ca>.

The broadband promotion effort led by Industry Canada at the federal level is also supported by broadband research and development (R&D) activities undertaken by the Communications Research Centre (CRC), an Industry Canada agency. As the federal government's primary laboratory for advanced communications R&D, the CRC maintains a critical mass of researchers and facilities dedicated to R&D in the telecommunications technology fields of radio, satellite, broadcasting and fibre optics. CRC facilities, such as the Broadband Applications and Demonstration Laboratory (BADLAB), allow for the development, testing and demonstration of new broadband technologies and applications.³⁹

Aside from Industry Canada, a number of other federal ministries have also initiated programmes targeting the development and use of high-speed networks in their sector. Health Canada, for example, has initiated a number of tele-health projects involving the delivery of medical services over dedicated high-speed networks.⁴⁰

The Canada Strategic Infrastructure Fund, a federal fund earmarked for large-scale infrastructure projects, has also named broadband as one of the five key areas of infrastructure it would fund from its C\$2 (US\$1.26) billion budget.⁴¹ Although no broadband projects have yet been identified, future investments from this fund may be made in large-scale projects that expand broadband networks in Canada.

6.2 Broadband infrastructure deployment

The large majority of ongoing and proposed initiatives to foster the deployment of broadband infrastructure in Canada can be roughly divided into two broad strategies: the demand aggregation model and the public infrastructure support model. The former leverages on collective arrangements that aggregate demand for broadband services on a community or wider scale in order to achieve the economies of scale required to develop and sustain a broadband network. The latter relies on direct public funding for broadband infrastructure construction.

While these models may be implemented independently, it should be noted that in many instances they frequently are combined. For example, using a public infrastructure support model to build a transport link from an existing national broadband network to a community point of presence and then to use the demand aggregation model to connect public institutions, businesses and residences within the community. In some cases, demand aggregation can also be a catalyst for the eventual construction of a public owned network. By creating sufficient economies of scale through demand aggregation, the public construction and eventual ownership of a broadband network connecting public institutions may be economically preferable to long-term leases with broadband providers.

6.2.1 Demand aggregation model

A large number of demand aggregation based initiatives have been implemented successfully throughout Canada. Common examples of such initiatives can be found the community or municipal level where "community champions", often local commissions, municipal or community councils or not-for-profit organisations, pool demand, create partnerships and make the overall business case for broadband deployment to the community.

In most cases, partnerships between public institutions, such as local government entities and public services providers, and private sector companies present in the community have been essential in creating the requisite levels of economies of scale necessary to provide and attract the necessary investment in broadband infrastructure. Where distance permits, strategic partnerships between neighbouring communities or municipalities have also boosted aggregate demand.

Demand aggregation initiatives in Canada, however, are not confined purely to the community or municipality level. In many cases, public institutions such as schools, hospitals and government offices have come together on different scales in order to aggregate demand. Through their "Community Net" initiative, the province of Saskatchewan has played an important role as anchor tenant by rolling health, education and government services into a single-customer buying group. Through this arrangement they have been able to lever around C\$50 (US\$31.5) million per year in broadband network infrastructure upgrades from SaskTel, the incumbent telecommunications carrier in the province, for a period of five years while at the same time reducing annual network operating costs by 20 per cent. Under the initiative, more than 800 schools, 310 health facilities and 256 government offices in over 366 communities will be connected.⁴²

It is important to note that in some circumstances where aggregate demand has been shown to be insufficient to generate adequate interest from commercial providers, funding in the form of subsidies, loans or grants from provincial/territorial governments or the federal government have been commonly accessed in order to make up for investment shortfalls. For example, provincial funding was granted to support network development in the cases of the Upper Canada Networks initiative (see Box 6). Similarly, the Broadband for Rural and Northern Development Pilot Program was initiated on a national scale to provide financial support for community based demand-aggregation efforts to develop broadband infrastructure.

6.2.1.1 Condominium fibre builds

Demand aggregation in Canada has been implemented in a number of different ways using different technologies. Fibre and wireless solutions in particular have proven to be conducive to collective user arrangements and have been deployed in many demand aggregation initiatives.

Because the labour and machinery involved in building a network makes the cost of laying the first fibre strand very high and the cost of subsequent fibre strands correspondingly lower, most modern cables include more fibre than is likely to be used. By leveraging off the low marginal cost of installing fibre, a group of users can aggregate their demand and form a consortium, sharing the cost of purchasing and installing a fibre optic loop with each of them owning a pre-determined number of dark fibre strands within the loop. Consortium members are generally free to light their strands and provision networks over them as they see fit.

In Canada, the condominium fibre build model has allowed institutional users, unencumbered by legacy copper plant, to provision their own facilities-based networks at rates low enough to be an alternative to long-term leases and service contracts with existing providers. Canadian research networks such as BC.NET (British Columbia), CANARIE, Netera (Alberta), and RISQ (Quebec) have attracted attention through their application of this model, as have at least 26 school boards in Quebec which had either built or examined building networks interconnecting their schools with dark fibre⁴³ (see Box 8) As a result, alongside traditional carrier competition, public sector institutions are building a handful of facilities-based networks. These networks, or the adjacent fibre, could be used in future to provide competitive market alternatives to incumbent providers, particularly in areas that are underserved.

6.2.1.2 Wireless networks

In rural and remote areas where population density prohibits the cost-effective use of wireline broadband distribution, inexpensive wireless solutions have been used to create broadband access networks of sufficient size to achieve the economies necessary to sustain the network. Being scaleable, portable, and easy to deploy, fixed wireless in particular has proven to be a popular technology choice for a number of demand aggregation community initiatives such as those in Leeds and Grenville Country, South Dundas and Simcoe County in Ontario (see Box 9).

Although still in a nascent state of deployment, cooperative solutions based on “Wi-Fi”, a short-range wireless networking protocol based on the IEEE 802.11 family of standards, present a possible avenue through which high-speed network access can be deployed at low cost.⁴⁴ Informal Internet access-sharing cooperatives, grounded in websites, at which information on participating is exchanged and provided, have already sprung up in a number of cities in Canada. Examples include cooperatives such as the Waterloo Wireless project, whose users have attempted to create a mesh of uninterrupted connectivity via a dense clustering of nodes, or “hot spots”, and the BC Wireless project which, alongside the usual node maps and do-it-yourself deployment instructions, has declared an interest in using high-gain antennae to create point-to-point intercity links that would cobble together community networks into an interconnected system⁴⁵. Current attempts in Canada to extend Wi-Fi networking to the 10 km and even 20 km range on a point-to-point basis indicate the possible extension of Wi-Fi as an alternative means for remote community-dwellers to aggregate demand and share backbone connectivity.

Box 8: Village branches du Québec

Consistent with earlier initiatives by 26 Quebec school boards to participate in condominium fibre builds, the Villages branchés du Québec funding program launched by the Quebec government in September 2002 adopts a similar condominium fibre build model. Allocated in blocks of up to 75 per cent of cost and C\$25,000 (US\$15,750) total per project, Villages branchés earmarked C\$75 (US\$47.2) million to deploying broadband network infrastructure to Quebec's schools and municipalities, and linking them with RISQ (Réseau de l'information scientifique du Québec), the province's high-speed research backbone.

The program explicitly refers to condominium fibre builds and the possible participation of private-sector companies, including telecommunications service providers. However, rather than an anchor tenant relationship in which the public sector provides the anchor tenant and the private sector provides the network, Villages branches formalizes a model in which the public sector partner acts both as anchor tenant and retains ownership of its physical network, in the form of the fibre strands it has purchased.

Source: Ministre de l'Éducation, Gouvernement du Québec at <http://www.meq.gouv.qc.ca/lancement/Villagesbranches/>.

6.2.1.3 Internet Exchanges

Internet eXchange points (IXs) are neutral meeting grounds, which facilitate on-site interconnection between ISPs. In Canada, IXs have been proposed as a relatively simple way to address a lack of local infrastructure or competition. Where multiple access ISPs depend on one to two Internet transport providers, aggregating bandwidth demand via local Internet exchanges can lower the cost of entry for Internet access providers. In addition, by encouraging network interconnection outside well-established centres, Internet exchanges can help push Internet transport hub locations closer to previously underserved areas, serving as a key element for regional development. At present, however, no IXs were located outside the main Canadian transport hub cities.

Nevertheless, in a formal Request for Proposals issued by BCNET, the British Columbia education and research network, the establishment of IXs for locations in Prince George, Vancouver, and Victoria was proposed. At each of these locations, the proposed transit exchange would gather Internet transit vendors at facilities in which ISPs may both peer with other members and purchase commodity Internet transit on a competitive basis. BCNET described one of this model's key strengths as the ability of "[m]embers outside the Vancouver metro area to obtain services from providers in their own communities. This has advantages to both the member as well as their region, as it helps to aggregate the traffic demand locally".⁴⁶

Box 9: Rat River Communications Co-operative

Affordable access at Saint Pierre-Jolys

In 2001, the tiny community of Saint Pierre-Jolys in the central Canadian province of Manitoba sought to deploy a high-speed network in spite of prohibitive costs for fibre construction from the incumbent telecommunications carrier. Led by the inter-community Rat River Communications Co-operative, the community found a way to bridge the divide using broadband fixed wireless technology. Today the town and its partners operate their own wireless ISP.

The network model involved partners from Manitoba Hydro, a telecom provider spun off from a power utility, and Wicomm Inc., a unique middle-mile wireless carrier.

The cost of constructing the network proved to be extremely low. Through extensive bargaining with Hydro and Wicomm, the co-op paid a little over C\$5,000 (US\$3,150) toward construction of the fibre connection and the point-to-point wireless links. It currently pays about C\$2,500 (US\$1,575) a month for the Internet connection to Winnipeg, the provincial capital. It also paid a total of about C\$20,000 (US\$12,600) for equipment and installation for the local fixed-wireless distributions system. Funding to build additional towers was received from the Red River School Division, which provided C\$40,000 (US\$25,200) to build two radio-towers in neighbouring communities.

The service, initially targeting business customers only, has been functioning since late 2002. Businesses pay about C\$950 (US\$598.50) for hardware and installation and C\$125 (US\$78.75) a month for bandwidth burstable to 1 Mbit/s and 5 GB downloads. A 1 Mbit/s residential service has recently been released at a starting price of C\$50 (US\$31.50) a month.

Source: ISP-Planet, Crossing the digital divide at http://www.isp-planet.com/fixed_wireless/business/2003/st.pierre.html.

6.2.2 Public infrastructure model

Most rural communities, however, lack sufficient demand on their own to obtain sufficient investment from potential users in the community to develop their own infrastructure or to entice commercial carriers to deploy broadband infrastructure. Where demand aggregation strategies fail, public funding for the development of the network is often the only recourse.

Demand-aggregation aside, some jurisdictions in Canada regard broadband infrastructure as an essential public utility and as such regard the deployment of such infrastructure as a government responsibility. Broadband deployment initiatives in these areas rely principally on public funding for the construction of broadband infrastructure and, in some cases, public ownership of the network.

6.2.2.1 Public utility model

In this model, a governmental or public sector body deploys a network for general use by end users, by service providers, or both. The public entity may or may not eventually provide commercial broadband services by operating the network.

The Alberta SuperNet project is good example of an initiative that combines commercial ownership and public ownership of a broadband network (see Box 10).

Although a number of other public-owned networks emulate the Alberta SuperNet model in providing lit fibre to ISPs, public-owned networks typically make a conscious effort to avoid moving into higher-layer offerings, offering instead dark fibre in some instances. In its decision, a public-owned provider typically examines market size and the type of likely market entrants to determine how elaborate its offering must be to function effectively as a factor in lowering barriers to market entry. For example, Fredericton's municipal corporation, e-Novations, manages a short-haul backbone provisioned over fibre, wireless, and some leased circuits. At the same time, the Fredericton network does not provide Internet access over its backbone, leaving that to competitive providers through its policy of providing non-discriminatory access to ISPs and applications service providers (ASPs).⁴⁷

6.2.2.2 Public sector network model

Adopting a similar strategy to that of condominium fibre builds, the public-sector network model typically involves a convergence of disparate public-sector networks onto a common platform, in order to maximize efficiencies of scale and of scope. In such a model, the public-sector network is used almost exclusively for public-sector applications, including intra-governmental traffic, public access points, libraries, telemedicine, distance education, and other public sector uses. As such, public-sector networks are not used to transit general Internet traffic, functioning instead as very large WAN.

Box 10: The Alberta SuperNet

Construction on the Alberta SuperNet began in 2001, with a completion date set for 2004. The SuperNet is both a physical network, constructed from fibre and from some microwave links, and a logical network, providing Internet backbone connectivity throughout the province. It will provide transport services connecting 422 communities across Alberta, including 4,700 schools, hospitals, and libraries.

The project is divided into two portions: a Base Area Network and an Extended Area Network. The project's first portion, the Base Area Network, reaches 27 larger communities where high-speed access is already present. It is owned and operated by Bell West who has undertaken to spend C\$102 (US\$64.3) million on the build-out and is contractually obligated to act as a provider of last resort to residents of any rural community in which no high-speed provider emerges in the base rate area. The second portion, the Extended Area Network, reaches 395 communities in which high-speed access is limited. Unlike the Base Area Network, it is owned by the government of Alberta, which invested C\$193 (US\$121.6) million in its deployment. Axia IP Ltd., a listed private sector company, has been awarded the contract for the network's operation on a 10-year basis.

Accompanying the Extended Area Network's deployment to less-competitive and unserved communities are several rules designed to enhance the initiative's ability to accelerate rural broadband. First, open access "Meet-Me Facilities" are placed in each of the Extended Area Network's 395 points of presence, at which Internet service providers and other bandwidth users can purchase bandwidth from SuperNet. Second, pricing of this bandwidth is "postalised" in that it is, identical throughout the province, whether in the smallest town or largest city.

Source: Alberta SuperNet at <http://www.albertasupernet.ca>.

The Region of Peel's PSN (Public-Sector Network) is an example of this model. Deployed as a condominium fibre build linking the Region of Peel, City of Brampton, and City of Mississauga as partners, the PSN has more than 14,000 route-kilometres laid along 250 kilometres, 85 per cent of it along electric utility poles. The network's Acceptable Use Policy (AUP) forbids non-public-sector traffic, allowing PSN to provide service to the various public sector organization within its jurisdiction, such as schools, hospitals, and libraries, while steering clear of the private sector. One of the advantages of this arrangement is that, by not competing with the energy utilities' commercial network businesses, they were able to use these utilities' rights of way to assemble their network. Based on 125 sites now served by PSN fibre, and compared with provisioning T-1s to every site, the estimated break-even time on the network investment was three years.⁴⁸

Other public-sector networks are less absolute with regard to prohibiting non-public-sector Internet traffic. In underserved and rural areas, public-sector networks may be able to do double duty as commodity broadband infrastructure, since no other transport network may be present in such locations, and it is uneconomic to add new facilities when existing facilities could support existing bandwidth demand. In its second report to the Premier in April 2002, for example, the British Columbia Premier's Technology Council (PTC) opined that "SPAN/BC, the provincial government's shared data and voice network, is the place to begin bridging the digital divide for more than 200 communities without broadband access", further recommending that its administrators find "ways to open up SPAN/BC to allow communities to take advantage of the government's broadband infrastructure in those communities where the private sector is unlikely to provide high-speed Internet access to citizens and businesses."⁴⁹ Following the PTC's lead, more public-sector networks may re-examine their acceptable use policies in light of the goals set for broadband deployment to all Canadians by 2005.

Before concluding this section, it is important to note that infrastructure deployment initiatives involving public ownership and service provision of broadband networks, at the community level or otherwise, have been greeted with some concern by some commercial broadband providers. In particular, concerns have been voiced over the numerous advantages enjoyed by public owned networks over commercial networks and their effect of on fair competition. In addition to advantages in terms of land ownership, access to and control of rights of way, public-owned networks also have access to public financial resources and have less financial performance requirements imposed on them. The entry and operation of public-networks on such advantageous terms run the risk of excluding any further commercial entry into the market.

To some extent, some of these concerns have been mitigated by government efforts to clearly highlight the necessity and benefits of government intervention and to ensure transparency in the decision-making process and implementation of public-owned network models. At the same time, actions by the CRTC, such as its decisions concerning municipal rights of way, have reassured the market of its determination to ensure regulatory parity between all market entrants.

6.3 Broadband applications and content

The Canadian government promotes the development of online content and applications through a number of initiatives under "Connecting Canadians" (see Annex 2). These have focused, *inter alia*, on the creation and on-line distribution of Canadian specific content (e.g. Aboriginal Digital Collections, Canada's Digital Collections, etc.), the development of applications and content for e-learning purposes (e.g. SchoolNet, LibraryNet, etc), and the provision of government services online (e.g. Canada Business Service Centres, Canada Patent Database, etc).

The promotion of e-commerce has also been a high priority of the Canadian Government with the development of policies and legislation on key issues such as cryptography, consumer protection, tax neutrality, privacy, e-signatures and public key infrastructure and standards. Government e-business services have also been launched to provide resources to guide commercial organisations through the implementation of e-business strategies (ebiz.enable) and to establish an e-marketplace to expose Canadian businesses with domestic and global e-market opportunities (sourceCAN).

Table 6.2: Selected CANARIE funding programmes

Programme	Total funding	Time frame	Programme goal
Advanced Network Applications, Services and Technologies (ANAST) Program	C\$8 (US\$5) Million	29 Jun 1999 – 31 Mar 2002	To develop innovative applications for high performance networks. To use high performance networks to evaluate and test new modalities of instruction, E-business and health delivery.
E-business	C\$28 (US\$17.6) Million	1999-2004	To encourage projects that will accelerate the development of advanced E-business applications and services.
E-content	C\$6 (US\$3.8) Million	2001-2004	To support research and applications development in the area of interactive media, and stimulate the development of advanced networked content.
E-health	C\$5 (US\$3.2) Million	1999-2004	To encourage research and development projects that will accelerate the adoption and implementation of advanced tele-health applications and services assisted by advanced networks.
E-learning	C\$28 (US\$17.6) Million	1999-2004	To encourage the development and use of broadband networks in education and training.

Note: For a complete list of CANARIE funded R&D projects, see <http://www.canarie.ca/funding/index.html>.

Source: CANARIE.

In the area of tele-health, the Office of Health and the Information Highway (OHIH) was created in 1997 as Health Canada's focal point for all matters concerning the use of ICTs in the health sector. Apart from its policy responsibility, the OHIH also manages the Canada Health Infostructure Partnerships Program (CHIPP), a two-year, C\$80 (US\$50.4) million, shared-cost incentive programme, aimed at supporting collaboration, innovation, and renewal in health care delivery through the use of information and communication technologies. Investing in model implementation projects in two strategic areas: telehealth and electronic health records model projects, CHIPP projects have included remote screening for diabetic complications for first nations in Alberta, telemedicine services for 47 Northern Ontario communities and access to psychiatric care using video-conferencing technology for rural and remote communities in Ontario and British Columbia.⁵⁰

Beyond general online applications and content, the Canadian government also actively supports and initiates broadband specific application and content development through several avenues.⁵¹ Principally, these include direct government involvement in R&D, often in partnership with the private sector (e.g. CRC partnership projects), and indirect government support of R&D through the funding of private sector development activities (e.g. CANARIE R&D Funding Programmes).

In its mission to accelerate Canada's advanced Internet development and use, CANARIE in particular has occupied a central role alongside the CRC in the national effort to promote broadband application and content development. Its numerous funding programmes have supported broadband application and content development in the many areas including e-learning, e-health, e-business and e-health (see Table 6.2).

In the area of broadband applications and content development, government supported efforts have focused on improving the delivery of public services such as health and education to communities, especially those in rural and remote areas. Although high-speed connections have already been in use to deliver a number of public services to some of these communities for a number of years (see Box 11), further programmes have been initiated to expand the range of public services applications that would benefit from delivery over broadband networks.

Box 11: High-speed satellite-based community services in Newfoundland and Labrador

Since 1998, a satellite-based, high-speed, fully meshed communication infrastructure has been deployed in Newfoundland and Labrador to serve nine communities under the Remote Community Services Telecentre (RCST) project. This multimedia communication infrastructure is used for medical consultations between nurses in remote sites and medical staff at Memorial University in St. John's, for high-speed access to Internet and government services, for bail hearings and for meetings by representatives of government and commercial organizations who are separated by great distances. Use of these facilities has grown from 50 hours a month in the early days of the service to over 1,400 hours a month today.

Source: National Broadband Task Force Report at <http://broadband.gc.ca/Broadband-document/broadband.pdf>.

6.3.1 e-Learning

Bolstered by the success of its established SchoolNet programme, the federal government has pursued the development of e-Learning broadband applications in a continuing effort to promote ICT as a learning tool. The following lists a selection of e-learning projects that have been supported by the Canadian government through the CRC:

- Focusing on the professional development of Canadian educators, LearnCanada is a holistic initiative aimed at developing and evaluating broadband infrastructure, multi-media tools and middleware for adult learning through virtual peer-learning communities and advanced tele-mentoring. The project brings together diverse project partners that include school boards, the CRC and private companies.⁵²
- Bringing together universities, music schools, private companies and the CRC, MusicGrid's educational goal is to enable, expand and enrich music education programs in Canadian communities, especially those in remote and rural areas. Collaborations are initiated through planned clinics, masterclasses, and performances and small group video conferences which are shared with all interested partners via live webcast and asynchronous repository/server access to webcast streams.⁵³
- Managed by the CRC the objective of the VirtualClassroom project is to research, influence and manage the migration from a traditional pedagogical learning environment to new collaborative models of learning using multi-point collaborative work tools that provide learners with the opportunity to debate issues and participate in desktop collaborative work in near real-time.⁵⁴

6.3.2 e-Health

Supported by the CANARIE R&D funding programme, the OHIH CHIPP and various other provincial and territorial government initiatives, some of the broadband e-health projects that have been launched recently include the following:

- Supported by CHIPP funding and led by the Pembroke General Hospital, the Eastern Ontario Tele-health Network will link 16 rural and community hospitals in Eastern Ontario with three advanced medical institutions in Ottawa. Medical imaging and clinical devices integrated in the high-speed interactive network will permit specialist treatment to be brought to the community level.
- A cooperative effort by Aliant Telecom, CANARIE and private health care providers, the Home Tele-health Service Pilot Project will implement and evaluate a web-enabled home tele-health service that allows remote nursing visits and vital sign monitoring using interactive video, audio and data transmission over high speed broadband, IP networks.
- The Tele-health Saskatchewan project plans to upgrade and expand existing tele-health infrastructure and services through the eventual use of Saskatchewan's CommunityNet in order to deliver advanced tele-health services such as the quick transmission of X-ray images from isolated health centres to specialists at major Saskatoon hospitals and remote consulting between rural and remote care providers with distant medical specialists. Rural health providers will also be able to use the network to pursue continuing education opportunities. The project brings together, among others, the provincial health ministry, six health districts, hospitals as well as the telecommunications carrier Sasktel.⁵⁵

6.3.3 Others

A significant number of broadband specific content initiatives have also been launched in the area of e-commerce and e-content. For example, to encourage the delivery of Canadian Content and Culture in a Broadband environment, CANARIE and the Department of Canadian Heritage have jointly launched the Applied Research in Interactive Media (ARIM) Program. Funding amounting to C\$6 (US\$3.8) million from this program will support projects consisting of research and development of broadband technologies and tools that facilitate the creation and use of broadband content, or projects that perform research to address existing barriers to accessing broadband content.⁵⁶

Although initiatives to spur broadband application and content development are concentrated at the federal and provincial government level, it is nevertheless worthwhile to highlight the fact that development activities have also been pursued by other jurisdictions, especially at the community and municipal level. Community websites and tourism portals employing interactive elements and substantial graphics have consistently been developed alongside the deployment of broadband infrastructure in their communities.

7 Conclusion

To a certain extent, the factors that have contributed to Canada's high ranking in broadband penetration are very similar to those of other countries in the top ranks. It is a wealthy country with a highly educated population and, despite its vastness, the main bulk of its population is concentrated in large metropolitan cities located within a 5,000 km-long strip of land about 300 km deep along the Canada-US border. Beyond these factors, however, Canada benefits from a unique combination of strengths that have allowed it to push past countries in similar circumstances. These include in particular, its competitive and innovative broadband market and its wide diversity of broadband promotion activities that leverage off all segments of Canadian society: the government, industry, academic institutions, communities and civil society.

In the broadband marketplace, competition is keen with lower prices and wider service offerings to show for it. A strong history of innovation in a liberalised market that is effectively regulated have made the Canadian broadband market one of the most advanced and competitive in the world. However, the broadband market continues to be heavily dominated by telco and cable incumbents using mainly copper plant to deliver their services. In the long run, a self-serving continued reliance on such legacy infrastructure might act as a brake on the adoption of higher capacity applications and content that will arise in the future. Nevertheless, promise can still be seen in market with the emergence of higher-speed broadband access technology in the form of fibre and fixed wireless. Although relatively new in the residential broadband market, their deployment is increasing in areas where legacy infrastructure has never been deployed.

Canada's regulatory framework has been vaunted as a model regime particularly conducive to the growth of facilities-based competition in broadband access. Liberal market entry requirements, regulatory forbearance and mandatory open access have been highlighted as key factors behind the high level of competition in broadband markets. Nevertheless, certain concerns still remain: Canada's foreign investment restrictions are currently undergoing review while the CRTC's efforts in maintaining a level playing field have been challenged by the entry of public-sector broadband providers into the market and their accompanying advantages.

Canada's largest challenge, however, is its effort to connect the large number of unserved communities located in rural and remote areas. Here, the initiatives taken to extend broadband to these communities have been profoundly influenced by the country's social diversity which has resulted in the introduction of a wide range of initiatives involving, to different degrees, governments at all levels, communities, public-private partnerships and not-for-profit organisations. In particular, Canada has leveraged off the high level of grassroots based activism in many communities to pull together the resources to deploy broadband infrastructure. Although it may be too early to tell, the growing number of success stories surrounding community-based initiatives may indicate that for some, this could be an ideal model to follow

Annex 1: Major market participants

1 Telecommunications Carriers

BCE Group of Companies

BCE Inc. (BCE) is the largest telecommunications holding company in Canada. BCE is organized around several core operating segments, the most significant of which is the Bell Canada segment or Bell Canada Holdings Inc. (BCH). BCH owns Bell Canada, the largest incumbent carrier in Canada. Bell Canada's subsidiaries include Bell Mobility and Bell Nexxia Inc., among others, as well as two additional large incumbent carriers, Northwestel and Télébec. BCH also holds an interest in Manitoba Telecom Services Inc. (MTS) as well as a joint interest with MTS in Bell West Inc. (formerly Bell Intrigna). Also included within the Bell Canada segment is Aliant Inc., in which BCE holds a controlling interest, and Bell ExpressVu (a direct to home satellite service provider).

In addition to Bell Canada, BCE also includes four other major business segments: BCE Emergis (a business-to-business e-commerce infrastructure provider), BCE Ventures (which includes satellite service provider, Telesat Canada, along with other subsidiaries involved in international communications and information technology services), BCE Teleglobe (which includes global communications and e-commerce service provider Teleglobe Inc.) and Bell Globemedia (which includes the television operations of CTV Inc. and the Globe and Mail newspaper).

BCH, including Bell Canada and its subsidiaries, accounts for the vast majority of BCE's telecommunications activities. Those companies provide a wide range of telecommunications services, including wireline local and long distance voice and data services, high-speed Internet access, IP-broadband services and e-business solutions. In addition, through Bell Mobility, Bell Canada provides wireless voice, data and Internet access services. Bell Canada provides services primarily in Ontario and Quebec and, through its wholly-owned subsidiaries or affiliates, in most other parts of the country as well. Bell Canada also provides a range of wireline and wireless telecommunications services "out-of-territory" in Alberta and British Columbia through Bell West (formerly through Bell Nexxia and Bell Intrigna) and Bell Mobility.

TELUS Group of Companies (TELUS)

TELUS is the second largest telecommunications company in Canada. TELUS is the incumbent carrier in the provinces of Alberta, British Columbia and a portion of Quebec. TELUS was formed in 1999 through the merger of BC TELECOM Inc. and TELUS Corporation, two western-based incumbent carriers. TELUS subsequently acquired eastern Quebec-based large incumbent carrier TELUS Québec (formerly Québec-Téléphone) and national wireless service provider Clearnet Communications Inc. (Clearnet).

TELUS provides a full range of local, long distance, data, Internet and other services to residence and business customers in Alberta, British Columbia and eastern Quebec. In addition, TELUS offers voice, data and IP services to business customers outside of its home operating territory. With the acquisition of Clearnet and roaming/resale agreements in place with eastern Bell Wireless Alliance companies, TELUS provides wireless services on a national basis. TELUS also expanded its data and IP capabilities and coverage through the acquisition of PSINet Canada in 2001.

Aliant Telecom Inc. (Aliant Telecom)

Aliant Telecom is the incumbent carrier serving the provinces of New Brunswick, Prince Edward Island, Nova Scotia and Newfoundland. In early 2001, Aliant Telecom was formed through the amalgamation of the four formerly separate incumbent carriers serving the Atlantic provinces. BCE Inc. owns a controlling interest in Aliant Inc., Aliant Telecom's parent company. Aliant Telecom provides wireline local, long distance, data and Internet services as well as wireless voice and data services throughout the Atlantic provinces. Within the same operating territory, a number of affiliates provide information technology, remote communications and advanced communications services.

Manitoba Telecom Services Inc. (MTS)

MTS is the incumbent carrier in the province of Manitoba. It provides a full range of wireline local access, long distance and data services as well as wireless, e-commerce and broadband services such as high-speed

Internet access. MTS also provides local and long distance voice, data and IP services to business customers in Alberta and British Columbia jointly with Bell Canada through Bell West (formerly Bell Intrigna).

Saskatchewan Telecommunications (SaskTel)

SaskTel is the incumbent carrier in the province of Saskatchewan. Unlike the other large incumbents, SaskTel is a crown corporation of the province of Saskatchewan. SaskTel provides local, long distance, data and Internet services as the incumbent carrier in the province of Saskatchewan. SaskTel also provides wireless services in its territory.

AT&T Canada Inc. (AT&T Canada)

In 2001, AT&T Canada was the largest competitive wireline carrier in Canada. Its operating subsidiaries included AT&T Canada Corp. and AT&T Canada Corp.'s wholly-owned subsidiary, AT&T Canada Telecom Services Company. AT&T Canada provides business customers with local, long distance, data, Internet and other telecom services throughout most of Canada. The company is capable of serving roughly 85 per cent of the Canadian business telecommunications market. While AT&T Canada is a facilities-based carrier, it still relies heavily on carrier services purchased from the large incumbent carriers.

Call-Net Enterprises Ltd. (Call-Net)

In 2001, Call-Net was the second largest competitive wireline carrier in Canada. Call-Net provides telecommunications services primarily through its wholly-owned subsidiary, Sprint Canada Inc. Call-Net provides local, long distance, data and Internet services to businesses, residential customers, governments and other telecommunications carriers. Call-Net provides local service to residence customers in a number of metropolitan areas across the country through the use of unbundled local loops purchased from large incumbent carriers.

GT Group Telecom Inc. (Group Telecom)

In 2001, Group Telecom was the third largest national facilities-based wireline competitor in Canada. Group Telecom provides business customers with voice, data, Internet and other telecommunications services. It also provides wholesale services to other telecommunications service providers.

Microcell Telecommunications Inc. (Microcell)

Microcell is a national wireless carrier that provides PCS and wireless Internet services. Microcell's Internet business segment consisted of two additional subsidiaries Inukshuk Internet Inc., which is licensed to deploy a cross-Canada high-speed fixed wireless IP-based access network, and Microcell i5 Inc., which develops wireless Internet services.

Look Communications Inc. (Look)

Look owns and operates a wireless Multipoint Distribution System (MDS) network. Its network reach covers areas in Ontario and Quebec, including the major metropolitan markets of Toronto, Montreal, Hamilton, Quebec City and Ottawa. Significant shareholders in the company include Telesystem Ltd. and BCE Inc.. Look provides a range of communications services, including wireless digital television distribution, dial-up and high-speed Internet access and Web-related services including Web hosting to residential and business customers. Look provides dial-up Internet access services in western Canada using leased facilities.

Futureway Communications Inc. (Futureway)

Futureway is a facilities-based provider of voice, data, video and high-speed Internet services to business and residential customers in the Greater Toronto Area (GTA). In the residential market, it has focused on new housing developments and the installation of high-speed fibre links to customers' homes. In 2001, Futureway acquired the Toronto area high-speed Internet access infrastructure and broadband digital network of Mississauga-based C1 Communications.

2 Cable Providers

Rogers Communications Inc. (Rogers)

The Rogers group of companies covers a diverse range of interests. It includes wholly owned subsidiary Rogers Cable, the country's largest cable provider, which serves cable customers concentrated primarily in

Southern Ontario and the Atlantic provinces. Rogers Cable provides cable television, digital TV, high-speed Internet access and, through Rogers Video, operates the country's largest domestically owned chain of video stores.

Shaw Communications Inc. (Shaw)

Shaw is a diversified company with its primary activity being the provision of cable services. In addition, it provides high-speed Internet, DTH, satellite and business telecommunications services and, through its subsidiary, Corus Entertainment, it either owns or holds interests in specialty television, radio and television broadcasting services. Shaw is currently the second largest cable television company in Canada. Shaw provides high-speed Internet access services to residential and small business subscribers.

Quebecor Inc. (Quebecor)/Le Groupe Vidéotron Itée (Vidéotron)

Vidéotron is now a subsidiary of Quebecor Media Inc., a diversified company involved in cable television; Internet access; newspaper, magazine and book publishing; broadcasting; business telecommunications; Internet portals and content; Web integration and technology; and the distribution and retailing of cultural products. Quebecor's largest subsidiary, Quebecor World Inc, is involved in Canadian and world-wide commercial printing activities. Vidéotron is the largest cable operator in Quebec and the third-largest in Canada. It provides analog and interactive digital cable television service and both high-speed and dial-up Internet access services.

While Vidéotron had conducted cable telephony trials in the past, following the acquisition of Vidéotron by Quebecor, a number of rationalization measures were implemented, including cancellation of Vidéotron's IP telephony project. Another subsidiary of the Vidéotron group of companies, Vidéotron Télécom Itée (VTL), provides business telecommunications services in Québec. In early 2001, VTL management carried out a major restructuring plan that re-focused the company on offering high-speed telecommunications services, voice services, Internet access services and Web hosting-based services to large business users and telecommunications carriers.

Cogeco Inc. (Cogeco)

Cogeco provides cable television as well as high-speed Internet access services in Ontario and Quebec through its majority-owned subsidiary, Cogeco Cable. In addition, it either owns or has interests in radio and television broadcasting and digital specialty channels, primarily through its wholly-owned subsidiary, Cogeco Radio-Télévision Inc. service on its larger systems in Ontario and Quebec and also offers conventional speed telephone modem service. Cogeco Cable also provides customized high-speed Internet access to business customers, as well as other telecommunications services, such as dedicated Internet access gateway services, dedicated transmission circuits for data and voice traffic and high capacity fibre-optic links, to business and institutional customers.

EastLink

Bragg Communications Incorporated (Bragg) is a Halifax-based holding company whose primary business is cable television. EastLink, operated by Bragg, serves communities in Nova Scotia, New Brunswick and Prince Edward Island. In addition to cable television services, EastLink also provides high-speed Internet access and cable telephony services, among other services.

EastLink is the first cable service provider in Canada to provide local telephone service over its cable network. It launched the service in late 1999 in Nova Scotia. To provide the service, EastLink has deployed an end-to-end "circuit-switched" rather than IP-based cable telephony network platform. While service coverage area is still expanding, telephone service is currently available in the Halifax, Bridgewater, New Glasgow, Liverpool, Truro and Charlottetown areas, among others. As a result, EastLink is able to offer customers, in areas where the service is available, a bundled package of local and long distance voice, optional calling features, basic cable, digital cable and high-speed Internet access. In addition, EastLink provides bundled and stand-alone voice and Internet solutions to home offices and small-to-medium size businesses over a fully digital network.

3 Utility Telcos

Hydro One Telecom Inc. (Hydro One Telecom)

Hydro One Telecom is one of six wholly-owned subsidiaries of Hydro One Inc. (Hydro One), whose principal activity is the transmission and distribution of electricity in Ontario. Hydro One owns and operates the electrical transmission and distribution network that was formerly part of the provincially-owned electrical utility, Ontario Hydro. Hydro One Telecom provides dark and lit fibre-optic capacity to telecommunications carriers and commercial customers with broadband network requirements. It also provides co-location space on its microwave towers to wireless service providers. Its primary business, therefore, is one of a "carrier's carrier", utilizing existing assets of Hydro One Networks as well as newly constructed facilities.

Hydro One Telecom also provides local transport, optical telecommunications (dark fibre and optical wavelength services), local area network (LAN) extension, private line, tower leasing, bulk Internet connectivity and managed network services. It offers services to business customers, interested in leasing fibre or purchasing fibre (e.g., IRUs), as well as to competitive carriers, ISPs, government and large private network owners. Hydro One Telecom also partners with local utilities to provide telecommunications services.

Toronto Hydro Telecom Inc. (Toronto Hydro Telecom)

In July 1999, Toronto Hydro Corporation was incorporated with the City of Toronto as its sole shareholder. Toronto Hydro Corporation operates four wholly owned affiliates that carry on the businesses of electricity distribution, retail energy sales and services, telecommunications and street lighting.

One of these affiliates, Toronto Hydro Telecom, is a provider of dark fibre and a comprehensive suite of data communication services to telecom carriers and large businesses and institutions located in the City of Toronto. The company also offers private line services, metro LAN (Ethernet access), dedicated Internet access and data centre co-location solutions.

Annex 2: Connecting Canadians

Launched in 1998, Connecting Canadians is the federal government's vision and plan to make Canada the most connected country in the world. The following lists some of the key initiatives that make up its six pillars:

1 Canada On-line

Community Access Programme (CAP)

Established in 1995, CAP is a key component of the federal government's Connecting Canadians initiative, providing the residents of rural, remote, and urban communities across Canada affordable access to the Internet through community access points like schools, libraries and community centres which also provide computer support and training. The Community Access Program is a partnership between governments, the private sector, and community organizations. At present, 8,800 affordable Internet access sites have been established or approved.

Canada's SchoolNet

Canada's SchoolNet encourages the integration of information technology in learning to help students acquire skills in Internet research and communication. Originally aimed at connecting all of Canada's schools to the Internet, it has now shifted its focus to extend connectivity to the classrooms. As of May 2000, there were half a million connected computers in Canadian schools. The SchoolNet Web site offers users more than 1000 learning services and resources, including training and research tools.

CanConnect

CanConnect is a national partnership movement to encourage individuals and organizations to work to ensure that Canada's youth are given adequate opportunity to acquire and demonstrate information and communications technology (ICT) skills. The CanConnect national Web site provides access to an on-line inventory of ICT activities, "how-to" materials and networking opportunities allowing businesses to donate surplus computers, parents to help teachers with technology skills development and classroom activities, etc.

Computers for Schools

As part of Canada's SchoolNet, Computers for Schools (CFS) provides Canada's schools and libraries with surplus computers and software donated by governments and the private sector.

LibraryNet

LibraryNet promotes Canada's libraries as public access sites and encourages the use of the Internet in public libraries for community development, distance education and the delivery of information and government services.

SkillNet.ca

SkillNet.ca is a one-stop shopping site for jobs and career-related information,

2 Smart Communities

Smart Communities Demonstration Projects are the central focus of the Smart Communities program. Selected through a nationwide competition, exemplary communities (one in each province, one in the North and one in an Aboriginal community) are selected to become centres of expertise in the integration of information and communication technologies. They will also act as "learning laboratories" in which the innovative use of these technologies in community life and enterprise will be tested.

The Smart Communities Tool Kit and Skills Development Program will build on the proven experiences of the Demonstration Projects by providing on-line and in-person training, as well as educational and business development tools designed to help other communities plan, manage and monitor their initiative over time.

3 Canadian Content On-line

Aboriginal Digital Collections

ADC will provides financial contributions to Aboriginal Canadian individuals, associations, businesses, partnerships and institutions to hire teams of Aboriginal youth, aged 15 to 30, to digitize text, images, and audio and video material for display on the Internet. The material will range from information on Aboriginal business opportunities to contemporary issues, such as the preservation of languages and culture.

Canada's Digital Collections

Canada's Digital Collections awards contracts to Canadian firms, associations, institutions, museums, libraries, archives, educational institutions and other organizations to hire teams of young people to digitise text, images, and audio and video material, and incorporate it in attractive Web sites for display on SchoolNet.

Francommunautés virtuelles

The program supports projects by Canada's Francophone and Acadian communities such as creating applications, services and content in French on the Internet, promoting networking among Francophone communities in Canada, and stimulating the growth of the French-Canadian multimedia industry.

SchoolNet Multimedia Learnware and Public Access Applications Program

The program is an initiative of Canada's SchoolNet that matches the investments of partners who produce commercial online learnware and public access applications. One-half of these funds is directed at enhancing product development by small and medium-sized enterprises.

4 Electronic Commerce

In collaboration with the provinces, territories, private sector and other stakeholders, the federal government released Canada's Electronic Commerce Strategy in September 1998. This framework focuses on building trust, clarifying rules and providing access to the Internet. The Government of Canada is delivering on a policy framework of seven "firsts": a technology-neutral taxation regime, a policy on cryptography, legislation governing the protection of personal information, a legal framework for digital signatures and electronic documents, guidelines for consumer protection, a Canadian electronic commerce standards roadmap, and a policy framework for the Government of Canada's public key infrastructure.

5 Government On-line

Canadian Customer Information Gateway

The Canadian Consumer Information Gateway provides Canadians with a single reliable source of consumer information from the federal government and its agencies. It is an online portal that gives convenient access to comprehensive consumer information on topics such as health, housing, food and money, as well as details on product warnings, recalls and scams.

Canadian Technology Network

The Canadian Technology Network (CTN) provides integrated access to information and services relevant to small and medium-sized enterprises using technology. It delivers its services through a cross-country network of member organizations and advisors who are known for their technology and business competence. These advisors are linked together to deliver advice or expertise to meet the needs of small and medium-sized enterprises (SMEs).

ExportSource

ExportSource is a virtual export office that allows to companies harness trade information within a single Web site which contains information on items such as government procedures, foreign markets, trade statistics, export financing and the logistics of product delivery.

GeoConnections

GeoConnections is a national initiative to provide Canadians with geospatial information over the Internet.

Service Canada

Service Canada is an integrated, government-wide approach to delivering Government of Canada services to Canadians. It offers one-stop access to government services through in-person access centres, telephone service centres, and over the Internet.

6 Connecting Canada to the World

NetCorps Canada International

NetCorps offers young Canadians between the ages of 19 and 30 the opportunity to participate in exciting information and communications technology internships in developing countries, placing over 1,000 young people in Latin America, Asia, Central and Eastern Europe, and Africa by March.

The Office of International Partnerships (OIP)

OIP provides a single point of access to showcase the best of Canada's information and communications technology skills and products for any country or foreign organization seeking to build their own electronic learning network.

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- ¹ World Bank at <http://www.worldbank.org/data/databytopic/GNIPC.pdf>.
- ² Statistics Canada, Canada at a Glance 2002 at <http://www.statcan.ca/english/Pgdb/>.
- ³ Statistics Canada.
- ⁴ CA*net Institute, A Nation Goes Online at <http://www.canet-inst.ca/english/history.html>.
- ⁵ Usenet is actually the software application that runs (mostly) on top of the UUCP network, but “Usenet” is commonly used to refer to the network as well. UUCP stands for Unix-to-Unix CoPy which, as the name suggests, copies data from one UNIX machine to another over regular phone lines with a computer modem. Although called “the poor man’s ARPAnet,” Usenet did not employ packet-switching or networking protocols, operating instead as a store-and-forward system with dial-up phone lines. The network also used manually updated lookup tables rather than fully automated computer updates to guide data to its destination.
- ⁶ Pollara, Industry Framework of Internet Service Providers, 2002 available at <http://www.caip.ca/issues/ISPReport.pdf>.
- ⁷ CRTC 2002 Data Collection.
- ⁸ Telegeography 2002.
- ⁹ Pollara Inc, Industry Framework of internet Service Providers, 2002.
- ¹⁰ Telephone service to high-cost serving areas, Telecom Decision CRTC 99-16, 19 October 1999 available at <http://www.crtc.gc.ca>.
- ¹¹ Detailed province level maps as well as disaggregated community-by-community data for this deployment are published by Industry Canada at www.broadband.gc.ca/maps/maps_e.asp.
- ¹² Report of the National Broadband Task Force available at http://www.broadband.gc.ca/Broadband-document/report_e.asp.
- ¹³ Statistics Canada, “Household Internet Use Survey 2001”, The Daily, 25 July 2002 at <http://www.statcan.ca/Daily/English/020725/d020725a.htm>.
- ¹⁴ CRTC 2002 Data Collection.
- ¹⁵ CRTC 2002 Data Collection.
- ¹⁶ Statistics Canada, Household Internet Use Survey 2001.
- ¹⁷ See CRTC, Report to the Governor-in-Council: Status of Competition in Canadian Telecommunications Markets, December 2002 available at <http://www.crtc.gc.ca/ENG/publications/reports/PolicyMonitoring/2002/gic2002.htm>.
- ¹⁸ Statistics Canada.
- ¹⁹ CTRC 2002 Data Collection.
- ²⁰ CRTC 2002 Data collection
- ²¹ Pollara, Industry Framework of Internet Service Providers, 2002.
- ²² For example, see <http://www.bell.ca> and <http://www.telus.ca>.
- ²³ CRTC estimates based on individual company reports.
- ²⁴ OECD, The Development of Broadband Access in OECD Countries, 2001 available at <http://www.oecd.org>.
- ²⁵ TelecomWeb Broadband, Can Cable keep its Broadband Lead? June 18, 2002 at http://www.rbua.org/TelecomWeb_Broadband-06-18-2002.html.
- ²⁶ Globe and mail, June 14 2002, Download limits draw protests at http://www.globeandmail.com/servlet/RTGAMArticleHTMLTemplate?tf=RT/fullstory_print.html&cf=RT/config-neutral&slug=wxband&date=20020614&archive=RTGAM&site=Technology.
- ²⁷ See <http://www.allianceatlantis.ca/>.
- ²⁸ EastLink is the first domestic cable company in Canada to sell telephone service. Since 1999, it is estimated that about 80,000 of EastLink’s 240,000 cable subscribers in Nova Scotia have signed up to also buy local and long-distance phone service.
- ²⁹ OECD, Regulatory Reform in Telecommunications: Canada at <http://www.oecd.org>.

- ³⁰ Andy Oram, The Hard Questions in Broadband Policy at http://www.webreview.com/pi/2001/03_23_01.shtml.
- ³¹ CRTC, Telecom Decision 98-9, Regulation under the Telecommunications Act of Certain Telecommunications Services Offered by Broadcast carriers, 9 July 1998.
- ³² CRTC, Telecom Decision 99-8, Regulation under the Telecommunications Act of Cable Carrier's Access Service, 6 July 1999.
- ³³ CRTC, Telecom Order 2000-798, Terms and rates approved for large cable carriers' higher speed access, 21 August 2000.
- ³⁴ For a list of the many CRTC proceeding related to third-party cable Internet access, see the website of the Canadian Association of Internet Providers (CAIP) at <http://www.caip.ca/issues/infrastr/main.htm#cable>.
- ³⁵ Legislative and Regulatory Considerations Affecting Broadband Deployment, paper prepared for the national Broadband Task Force by Industry Canada, March 2001 at http://broadband.gc.ca/english/resources/considerations_mar01.pdf.
- ³⁶ See for example CRTC decision 2003-3 at <http://www.crtc.gc.ca/archive/ENG/Decisions/2003/dt2003-3.htm>.
- ³⁷ Report of the National Broadband Task Force.
- ³⁸ Dwayne Winseck, A Social History of Canadian Telecommunications, Canadian Journal of Communications at <http://www.wlu.ca/~wwwpress/jrls/cjc/BackIssues/20.2/winseck.html>.
- ³⁹ See <http://www.crc.ca>.
- ⁴⁰ See http://www.hc-sc.gc.ca/ohih-bis/about_apropos/index_e.html.
- ⁴¹ Canada Strategic Infrastructure Fund, Investment Categories, at http://www.infrastructurecanada.gc.ca/csif/investmentcategories_e.shtml.
- ⁴² See <http://www.communitynet.ca/intro.html>.
- ⁴³ Leo J. Deveau, "Building Your Own Fibre Optic Networks" (Sydney, NS: Presentation to the Atlantic Canada Organization for Research Networks, July 2001), at http://www.itic.uccb.ca/Technology_Report.htm. See also SECOR, "Canadian School Board Investments in Private Fibre Optic Networks" (Montreal: SECOR, Inc. for Industry Canada, March 2001, at www.canarie.ca/canet4/library/customer/secorreport.pdf).
- ⁴⁴ See IEEE Wireless LAN Working Group, group at <http://grouper.ieee.org/groups/802/11/index.html>.
- ⁴⁵ See Waterloo Wireless, at <http://www.waterloowireless.org>, and BC Wireless, at <http://www.bewireless.net>.
- ⁴⁶ BCNET, RFP20020501, "Subject: Provision of Internet Transit Services for BCNET" (Vancouver: BCNET, 2002), at <http://www.bc.net/transit%20exchange.htm>.
- ⁴⁷ See www.e-novations.ca/uhsn.html.
- ⁴⁸ Roy Wiseman, "Inside the Biggest Community Network in North America" (Fredericton, NB: Presentation to the Community Connect Conference, April 2002), at www.connectconference.com/presentations.html.
- ⁴⁹ B.C. Premier's Technology Council, *Second Quarterly Report*, at http://www.gov.bc.ca/prem/popt/technology_council.
- ⁵⁰ See http://www.hc-sc.gc.ca/ohih-bis/about_apropos/index_e.html.
- ⁵¹ Broadband applications and content is understood here to refer to applications and content that are interactive, that requires a broadband infrastructure for effective use, and that is integrated in its structure and functionality across media.
- ⁵² See <http://www.learncanada.ca>.
- ⁵³ See <http://www.musicgrid.ca>.
- ⁵⁴ See <http://www.crc.ca/en/html/virtualclassroom/home/home>.
- ⁵⁵ See http://www.health.gov.sk.ca/ps_telehealthsask.html.
- ⁵⁶ See <http://www.canarie.ca/funding/econtent/index.html>.