

Report to the
Governor in Council:

*Status of Competition in Canadian
Telecommunications Markets*

*Deployment/Accessibility of
Advanced Telecommunications
Infrastructure and Services*

December 2002

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20 December 2002

The Honourable Allan Rock, P.C., M.P.
Minister of Industry
235 Queen Street
11th Floor – East Tower
Ottawa, Ontario
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Dear Minister Rock:

I have the honour to present to you, in accordance with Order in Council P.C. 2000-1053, the second report of the Canadian Radio-television and Telecommunications Commission addressing the Status of Competition in Canadian Telecommunications Markets and the Deployment and Accessibility of Advanced Telecommunications Infrastructure and Services.

Sincerely,

Charles M. Dalfen
Chairman

Executive Summary

This is the second annual report to the Governor in Council with respect to the status of competition in Canadian telecommunications markets and on the deployment and accessibility of advanced telecommunications infrastructure and services.

Telecommunications services continue to play an increasingly important role in the Canadian economy. In 2001, industry revenues were approximately \$32 billion, an increase of almost 10% from the previous year. The industry's share of Canada's real gross domestic product increased to 2.6% in 2001.

However, 2001 was a difficult year for many telecommunications companies, particularly competitors. Some companies sought bankruptcy protection. Some competitors restructured their long term debt, while others ceased to exist.

In addition, the industry continued to be affected by the downturn in financial markets. This made the funding of capital expenditures more difficult for all companies, particularly competitors, since their internally generated funds were significantly lower than those of the incumbent telephone companies.

Resolution of access issues related to municipal rights-of-way, support structures and multi-unit buildings is key to facilities-based competition. Some of these issues are currently before the Courts. Local wireline competitors continued to rely heavily on the incumbents' facilities and services in order to serve their customers.

Competition did not advance substantially in 2001. In the local wireline market, competition grew at a slower pace than in previous years. As well, competitors lost market share in the long distance market.

In the local wireline market, which was the largest segment and accounted for over one third of the industry revenues, total revenues increased in 2001 by almost 8% compared to the previous year. However, competitors made little progress, as the incumbents continued to hold over 96% of total local lines and over 97% of total local revenues in 2001. Competition in this market was primarily confined to the urban business segment.

In the data and private line market, revenues in 2001 grew by approximately 15% over the previous year. However, the competitors' market share in this segment declined slightly from approximately 26% of the revenues in 2000 to 24% in 2001.

In the long distance market, total revenues in 2001 decreased by almost 6% compared to the previous year. The competitors' share of these revenues decreased from approximately 28% in 2000 to 26% in 2001. While competitors retained their share of the residential long distance market in 2001, their shares of the business and wholesale markets declined.

The mobile and Internet access markets continued to be relatively competitive. The mobile market surpassed the long distance market in 2001 as the second largest segment, in terms of revenues. Total mobile revenues increased in 2001 by over 16% compared to 2000. Four major mobile entities accounted for over 99% of the mobile market, with no entity dominating in terms of either revenues or subscribers. The Internet access market continued to be the fastest growing market in the industry, in terms of revenue percent growth (48%). The incumbent telephone companies had 39% of the retail revenues in the Internet access market in 2001, while cable incumbents had 31% and non-incumbent service providers had 30%.

Broadband deployment continued to progress, with 85% of Canadians living in communities that are served by high-speed Internet access; however, the majority of rural communities remained unserved. Initiatives were available to service providers and to users for improving broadband infrastructure, by aggregating demand through Internet exchanges, condominium fibre builds, and wireless access deployment. Public funding to help seed private-sector investment was also available, based on a variety of funding models, as discussed in this report.

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1. Introduction

1.1 Purpose of the Report

This is the second annual report of the Canadian Radio-television and Telecommunications Commission (CRTC) on the status of competition in Canadian telecommunications markets and the deployment and accessibility of broadband services and facilities across the country.¹

The report has been prepared in response to the Governor in Council's June 2000 Direction which:

(a) requires the Commission to submit, once in each year for the next five years, a report to the Governor in Council 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,

(b) requires that the report include

(i) an examination of promising means for accelerating private sector investment in rural broadband infrastructure, such as initiatives to aggregate local demand for advanced telecommunications services, and

(ii) relevant data and analyses.²

In addition, the *CRTC Action Plan 2000-2003* sets out, as one of its activities, the monitoring of the Canadian telecommunications industry in order to determine more effectively a) the state of competition, b) the effect of competition on services to consumers, and c) service providers' compliance with legal and regulatory requirements. This report, therefore, represents a key component of the CRTC's ongoing monitoring plan.

¹ The first report, *Status of Competition in Canadian Telecommunications Markets - Deployment/Accessibility of Advanced Telecommunications Infrastructure and Services*, was issued in September 2001.

² Order in Council P. C. 2000-1053, June 26, 2000 issued pursuant to Section 14 of the *Telecommunications Act*.

In addition to companies that are primarily involved in the provision of telecommunications services, the scope of this report includes broadcast distribution undertakings (e.g., cable companies) that provide telecommunications services such as Internet access or other telecommunications services, either directly or indirectly, through affiliated companies. For the purposes of this report, only telecommunications services and operations are taken into account in the case of cable companies³ as well as other companies whose primary line of business lies outside of telecommunications (e.g., as in the case of utility companies involved in the provision of telecommunications services).

1.2 Scope and Outline of the Report

This report is based in large part on the responses to the CRTC's 2002 telecommunications industry data collection forms and internal analyses (referenced as "CRTC 2002 Data Collection"), as well as on data collected from other sources, including Statistics Canada, Industry Canada, company-specific financial reports and information previously filed with the CRTC.

Firms providing one or more telecommunications products and services were required to complete the 2002 telecommunications industry data collection forms. Separate forms were required for each legal entity providing any such services on 31 December 2001. Where a legal entity in existence on 31 December 2001 was formed through a merger of predecessor companies, survey responses were provided on a consolidated basis for all predecessor companies.

The 2002 data collection forms encompassed a range of company-specific information, including financial data (e.g., income statement, balance sheet and capital expenditures) along with detailed telecommunications information focusing on product and geographic market information. Geographic markets were defined on a national, provincial/territorial, regional or (for mapping purposes) postal code basis. Data was collected for 2001 and, in many instances, for the four-year period 1998 to 2001. Certain figures for prior years have been restated to a basis consistent with 2001 figures.

In addition, each reporting entity was assigned a separate company type and sub-type classification for each of the years during the period 1998 to 2001, which reflect historical legacies (i.e., incumbent in a specific industry prior to competition) and whether the company owns facilities (i.e., facilities-based or reseller). Where operating entities are part of a larger corporate family (defined as direct or indirect ownership above 50%), the longer historical legacy supersedes other classifications.

³ The CRTC's annual *Broadcasting Policy Monitoring Report* provides more comprehensive data on broadcasting distribution undertakings as well as radio and television broadcasters, and Internet use in Canada.

The following classifications and sub-classifications have been adopted for the purpose of this report:

- i) Incumbent telephone companies
 - a) large incumbent carriers
 - b) small incumbent carriers
- ii) Competitive service providers
 - a) facilities-based competitive service providers
 - b) resellers/payphone service providers
 - c) cable service providers
 - d) utility telcos

This report is divided into the following sections.

Section 2 discusses the role of market information in monitoring progress and changes within the industry.

Section 3 provides an overview of the telecommunications industry and regulation, as well as an overall review of service providers in the market.

Section 4 provides a review of financial information, including revenue, capital expenditures and other operational data for various sectors of the industry. It also examines the status of competition in each of the major market segments, including long distance, local, Internet, mobile, and data and private line.

Section 5 reviews the status of broadband infrastructure deployment in Canada and considers the potential for the development of advanced infrastructure in rural and remote areas.

Section 6 provides the results of a consumer survey commissioned by the CRTC to assess household demand and expenditures on telecommunications services.

A glossary of terms and acronyms used in this report is found in Appendix 1.

1.3 Acknowledgements

The CRTC would like to acknowledge and thank the many companies that completed the CRTC's telecommunications industry data collection forms, which provided the majority of the information necessary to prepare much of this report. In particular, the CRTC thanks the many individuals who were responsible for completing the data forms on behalf of their respective companies.

2. *The Role of Market Information*

2.1 Overview

The CRTC is largely responsible for the implementation of the *Telecommunications Act*. Certain of the objectives of the *Telecommunications Act*, set out in Section 7 of that *Act*, are directly or indirectly tied to the notion of competition. For example, Section 7(f) of the *Telecommunications Act* explicitly states that an objective is "to foster increased reliance on market forces for the provision of telecommunications services and to ensure that regulation, where required, is efficient and effective."

This report provides an overview on the status of competition in the various telecommunications market segments in Canada. This report, as well as its ongoing monitoring of the telecommunications industry, will assist the CRTC in its regulation of the industry.

The CRTC is not alone in preparing regular monitoring reports. The use of monitoring reports has gained favour elsewhere in the world as a means of tracking ongoing industry developments to determine whether regulatory and legislative objectives are being met. This is particularly true of countries that have moved to a more competitive regulatory framework in order to achieve market results that are most beneficial to customers.

2.2 Competition and Monitoring

There are a variety of means for measuring competition; however, good quality data is critical if the monitoring process is to be accurate and useful. The CRTC has taken steps to introduce its own data collection mechanism in order to gather detailed and timely information.

Key indicators in monitoring competition include (i) various measurements of market size and market share according to criteria, such as revenues, subscribers, lines and minutes, (ii) number and description of suppliers in the market, (iii) lists of available services, pricing levels and trends, and (iv) corporate financial conditions.

As noted earlier, the use of competition monitoring reports has been growing in use throughout the world, particularly in the telecommunications fields. The Federal Communications Commission, which regulates interstate and international telecommunications in the United States (U.S.), produces annual reports and analyses of competitive market conditions in three areas: commercial mobile services, video markets and wireline telecommunications. Several state authorities also monitor telecommunications competition, including Michigan and California. Telecom regulators in the United Kingdom (U.K.), Sweden, Australia, Denmark, Hong Kong and elsewhere also produce reports that monitor telecommunications competition.

Specific elements of the monitoring exercise may need to change over time to take into account significant market developments, such as new technologies, changes in domestic or international regulations or agreements, or the introduction of new services. Adaptability ensures that monitoring reports continue to be useful tools for regulators, customers and industry players.

3. *Overview of Telecommunications Industry and Regulation*

3.1 **Regulatory Oversight of Canadian Telecommunications Markets**

The *Telecommunications Act*, enacted in 1993, gives the CRTC a broad range of powers to implement the policy objectives set out in Section 7 of the *Act*, including the powers to ensure that rates are just and reasonable and that Canadian carriers do not discriminate unjustly or accord any undue preference with respect to the provision of telecommunications services.⁴ In addition to regulating the rates, terms and conditions under which telecommunications services are provided, the CRTC has the power to forbear from the regulation of telecommunications services or classes of service where it finds, among other things, that there is sufficient competition to protect the interests of users.⁵

Industry Canada exercises powers relating to the allocation of radio spectrum under the *Radiocommunications Act*. Among other things, Industry Canada is responsible for developing spectrum allocation, spectrum utilization and service policies covering fixed and mobile terrestrial and non-terrestrial (i.e., satellite) wireless service applications. In this regard, it has the power to issue spectrum licences, either through an application process or a spectrum auction process.⁶ Industry Canada may also set the terms and conditions for any such licences as it deems appropriate.

While the CRTC is responsible for the regulation and for establishing the terms and conditions of competition in the telecommunications industry as a whole, Industry Canada effectively determines the terms and conditions of entry in the wireless segment of the industry. Consequently, there is a shared responsibility for the regulation of the wireless portion of the telecommunications industry in Canada between the CRTC and Industry Canada.

3.2 **The CRTC and Competition**

In exercising its statutory powers both under predecessor legislation and the *Telecommunications Act*, the CRTC has gradually and in an orderly manner opened up monopoly-based markets to competition over the years. The CRTC's approach to opening up various market segments to competition is to weigh the potential advantages and disadvantages, and to strike a fair and reasonable balance between the often conflicting interests of all concerned, including incumbents, competitors and customers. As well, Industry Canada has pursued spectrum licencing strategies that have increased potential entry into the various segments of the wireless market. Table 3.1 summarizes the most significant milestones in opening telecommunications markets to competition.

⁴ Sections 27(1) and 27 (2) of the *Telecommunications Act*.

⁵ Section 34 of the *Telecommunications Act*.

⁶ Section 5 of the *Radiocommunications Act*.

Table 3.1
Summary of Canadian Telecommunications
Milestones to Competition

Market	Year	Details
Data and Private Line	1979	Allowed the interconnection of private line data circuits between CNCP Telecommunications and Bell Canada.
Terminal Equipment	1982	Allowed customers to purchase their own terminal equipment (e.g., telephone sets).
Wireless	1984	A duopoly market structure was initially created in 1984; two additional national mobile wireless licences were issued by Industry Canada in 1995. The terms and conditions for wireless service providers to interconnect to the incumbent telephone companies' networks were initially established in 1984.
Long Distance (resale)	1987	Long distance resale first allowed in 1987, with the rules being liberalized in 1990. Resale of international long distance service permitted in 1991.
Long Distance (facilities-based)	1992	Facilities-based competition permitted in 1992, but full competition did not begin until 1994 when the incumbents were required to modify their networks to allow customers to make long distance calls without dialling extra digits (equal ease of access). Facilities-based competition in the provision of international services permitted in 1998.
Local	1997	Framework for facilities-based competition in the local services market was established for most large incumbents in 1997; in the following year, large incumbents were required to begin to modify their networks to allow customers to switch service providers without changing telephone numbers (i.e., implement local number portability).
Payphone	1998	Incumbents were required to put in place access tariffs and service agreements for new entrants.

Table 3.2 provides a summary of the most significant forbearance rulings since the CRTC was granted this power in 1993.

Table 3.2
Summary of Canadian Telecommunications
Markets Subject to CRTC Forbearance Rulings

Market	Year	Details
Terminal Equipment	1994	Sales and rental of terminal equipment.
Wireless	1994	Cellular, personal communications services, mobile radio and paging except in the case of incumbent in-house mobile service providers. Forbearance extended to incumbent mobile operations, starting in 1998, once competitive safeguards had been implemented.
Satellite Services	1994	Telesat's digital video compression services initially; further services offered by Telesat, such as sale/lease of earth stations and RF channels, in subsequent years.
Services Provided by Non-dominant Carriers	1995	Services, such as long distance, data, Internet and private line, provided by non-dominant competitive carriers.
Data and Private Line	1997	High-speed/DDS interexchange private line services provided by the incumbent telephone companies on a route-specific basis.
Internet services	1997	Incumbent telephone companies' retail Internet services in 1997 and those of cable providers in 1998.
Long distance	1998	Toll and toll free services.
International Services	1998	Initially excluded Teleglobe; however, certain international services provided by Teleglobe later forborne as well.

While the CRTC has forborne from the regulation of a growing number of services over time, a significant proportion of the incumbent telephone companies' telecommunications services remain subject to regulation. In the case of large incumbents belonging to the former Stentor Alliance [including Aliant Telecom Inc. (Aliant Telecom), Bell Canada, MTS Communications Inc. (MTS), Saskatchewan Telecommunications (SaskTel) and TELUS Communications Inc. (TELUS)], these services include residence basic local services, business single and multi-line local services, local options and features, payphone, digital network access, local channels and competitor services, among others. Starting in 1998, the regulation of these services changed fundamentally, shifting away from an earnings based to a price-level based form of regulation.⁷ The first price regulation regime covered the period 1998 to 2002. It was recently reviewed and modified.⁸ The new regime became effective in June of this year and extends through to 2006. It also now applies to SaskTel.

⁷ *Price Cap Regulation and Related Issues*, Telecom Decision CRTC 97-9, 1 May 1997.

⁸ *Regulatory framework for second price cap period*, Telecom Decision CRTC 2002-34, 30 May 2002.

Non-forborne telecommunications services provided by Société en commandite Télébec (Télébec) and TELUS Communications (Québec) Inc. (TELUS Québec) were made subject to price cap regulation as of August of this year.⁹ In addition, non-forborne services provided by small incumbent telephone companies were made subject to a simplified form of price regulation effective in January 2002.¹⁰

The CRTC has also issued a number of rulings recently that further support the development of competition in the Canadian telecommunications industry. The most important rulings are summarized below:

- In order to create a more competitively fair and equitable contribution regime, contribution payments, which are used to subsidize the high cost of local residential service in rural and remote areas, are now collected from most telecommunications service providers¹¹ rather than from only long distance service providers. The contribution revenue percent charge was 4.5% when the new regime came into effect in 2001; it was reduced to 1.3% for 2002.
- Rates for services purchased by competitors from the incumbents have been reduced, in some cases very significantly:
 - unbundled loop rates of incumbent local exchange carriers (ILECs) were reduced on average by up to 39% in early 2001;
 - Direct Connection (DC) per-minute rates were reduced for most incumbents by close to 60% in March 2000;¹²
 - Toll free/800 database query charges were reduced roughly 50% effective July 2000;
 - the CRTC's recent price cap decision further reduced the mark-up on many competitor services from 25% to 15%, with greater reductions in DC rates since the allowed mark-up for DC service exceeded 25%;
 - the recent price cap decision also directed the incumbents to provide Competitor Digital Network Access (CDNA) on the same basis as other competitor services (i.e., priced at cost plus a 15% mark-up), although service components to be included in this new service have yet to be finalized; and
 - Access Tandem (AT) per-minute rates were reduced on an interim basis, effective 1 June 2002, for the incumbents. Some AT rates were reduced by as much as 70%.

⁹ *Implementation of price regulation for Télébec and TELUS Québec*, Telecom Decision CRTC 2002-43, 31 July 2002.

¹⁰ *Regulatory framework for small incumbent telephone companies*, Decision CRTC 2001-756, 14 December 2001.

¹¹ Contribution payments are collected from service providers with annual revenues of \$10 million or more.

¹² This lowered the cost that long distance service providers pay to originate and terminate their long distance calls to and from the local network.

- Co-location rules have been, and continue to be, liberalized. For example, competitors can now have unsegregated space in ILECs' central offices. In addition, they are no longer required to be escorted to their facilities.
- Co-location and ILEC unbundled loops were made available in October 2000 to resellers that offer broadband and other data access services.
- The CRTC determined the terms and conditions for access by Leducor Industries and its affiliates to municipal rights-of-way in Vancouver. The matter is currently before the Federal Court of Appeal.
- The CRTC determined the terms and conditions for access by cable companies to the support structures of certain utility companies. The matter is currently before the Supreme Court of Canada.

The CRTC has put in place a range of other measures to encourage the development of competition in the remaining regulated sectors of the industry. For instance, the CRTC Interconnection Steering Committee (CISC) process provides a forum for interested parties, with the assistance of CRTC staff, to resolve local competition implementation issues of a technological, operational or administrative nature. The CISC process has also been used for other matters, such as implementation of the new contribution regime, number administration and third-party Internet access to cable company facilities.

CRTC staff also assists in resolving carrier disputes, which avoids the need for formal proceedings. In cases where a CRTC determination is required, this type of informal process enables the issues in dispute to be more narrowly defined and provides a means to obtain better information for an ultimate determination.

3.3 Overview of the Telecommunications Services Industry

The Canadian telecommunications services industry plays a significant and an increasingly important role in the Canadian economy as a whole. The industry's share of Canada's real gross domestic product (GDP) was 2.6% in 2001.¹³ The industry's share of GDP has grown sharply over the course of the last five years, increasing by roughly 45% since 1997 when telecommunications services accounted for 1.8% of GDP. Table 3.3 below illustrates this trend over the last five years.

¹³ Industry Canada, Telecommunications Service in Canada: An Industry Overview, 2001 - 2002, (Section 1, 2002 Update). Original data source: Statistics Canada.

Table 3.3
Telecommunications Services Industry
Share of Canadian Economy-wide GDP

Year	Share of Canadian Real GDP (Value Added) (Constant 1997\$)
1997	1.8%
1998	1.8%
1999	2.1%
2000	2.4%
2001	2.6%

Source: Statistics Canada

Capital expenditures for telecommunications service providers also account for a significant portion of overall capital expenditures in the Canadian economy as a whole. Telecom industry capital expenditures reached 4.6% of total economy-wide capital expenditures in 2001.¹⁴

In 2001, the number of employees in the Canadian telecommunications services industry was approximately 118,600, representing 0.9% of total employees in the Canadian economy as a whole.¹⁵ Employment in the industry increased by roughly 6.3% since 1997, when the total number employed in the industry was 111,600. However, while growing in recent years, the total number of employees in the industry in 2001 remained well below the 1991 level, which was just over 133,000. The trend in telecommunications services employee levels over the last five years is provided in Table 3.4.

Table 3.4
Telecommunications Service Employment
(000s)

Year	Employees
1997	111.6
1998	113.4
1999	113.6
2000	116.0
2001	118.6

Source: Statistics Canada

Operating revenues for all reporting entities completing the CRTC's 2002 data collection forms were \$33.5 billion in 2001. This represents an increase of approximately 30% over 1998 operating levels of \$26.1 billion for the industry. Table 3.5 provides a summary of total operating revenues for each of the four years.

¹⁴ Ibid.

¹⁵ Ibid.

Table 3.5
Canadian Telecommunications Industry
Total Operating Revenues
(\$ billions)

Year	Total Operating Revenues
1998	26.1
1999	27.4
2000	30.4
2001	33.5

Source: CRTC 2002 Data Collection

3.4 Teledensity

Teledensity provides a useful general indicator of the deployment of telecommunications networks and their usage within a country.

While a variety of alternative measures exist, teledensity is typically measured as the number of residential or business access lines per 100 inhabitants. Teledensity data for Canada, including both wireline and wireless services covering the last five years, is summarized in Table 3.6 below.¹⁶

With the wireline market well established in Canada, growth in wireline teledensity has been flat in the residential segment of the market over the last five years, at just over 41 access lines per 100 inhabitants in 2001. In contrast, business line teledensity grew almost 15% over the same period, reaching just under 24 access lines per 100 inhabitants in 2001. Growth in wireless teledensity has been much faster, however, more than doubling over the five-year period, reaching just under 35 subscribers per 100 inhabitants as of 2001.

Table 3.6
Canadian Teledensity
Wireline Access Lines and Wireless Subscribers
(per 100 population)

Year	Residential Wireline	Business Wireline	Wireless Subscribers
1997	41.5	20.8	14.2
1998	41.7	22.1	17.7
1999	41.8	23.7	22.7
2000	42.8	24.7	28.4
2001	41.2	23.9	34.9

Source: Statistics Canada

¹⁶ Industry Canada, Telecommunications Service in Canada: An Industry Overview, (Section 3, September 2002 Update). Original data source: Statistics Canada.

3.5 Market Participants

For the purposes of this report, the telecommunications services providers are divided into the following categories:

- i) *Incumbents* are the telephone companies that provided telecommunications services on a monopoly basis prior to the introduction of competition, and include the out-of-territory affiliates of the incumbents.
 - a) *Large Incumbents* are those incumbents serving relatively large serving areas, usually including both rural and urban populations, and providing local, long distance, wireless, Internet, data, private line and other services. The large incumbent companies are Aliant Telecom, Bell Canada, MTS, SaskTel and TELUS, as well as Northwestel Inc. (Northwestel), Télébec and TELUS Québec.
 - b) *Small Incumbents* are those incumbents serving relatively small serving areas (mostly municipal areas generally located in less densely populated areas) in Ontario, Quebec and, in one instance, British Columbia. Due to the limited size of their serving areas, they typically do not provide facilities-based long distance services. However, they do provide a range of local voice, data, Internet and wireless services. The small incumbents include Northern Telephone Limited and Thunder Bay Telephone.
- ii) *Competitors* are providers of telecommunications services that are not incumbent telephone companies.
 - a) *Facilities-based competitive service providers* are those competitive service providers that own physical transmission facilities (e.g., inter-city, intra-city, or local). These service providers include such companies as AT&T Canada Inc., Call-Net Enterprises Ltd., GT Group Telecom Inc., Microcell Telecommunications Inc. and Futureway Communications Inc.
 - b) *Resellers* are non-facilities-based competitive service providers. These service providers include Primus Telecommunications Canada Inc., Distributel Communications Ltd. and hundreds of others, including independent Internet service providers (ISPs).
 - c) *Payphone service providers* are competitive service providers that provide public telecommunications services by way of pay telephones. The largest competitive payphone service provider is Canada Payphone Corporation.
 - d) *Cable service providers* are the historical cable monopolies that also provide telecommunications services (e.g., Internet, wireless, voice). These cable service providers include such companies as Rogers Communications Inc., Shaw Communications Inc., Le Groupe Vidéotron ltée, Cogeco Inc. and EastLink.

- e) *Utility telcos* are service providers whose market entry into telecommunications services, or whose corporate group's market entry into telecommunications services, was preceded by a group-member company's activity in the electricity, gas or other utility business. These service providers include such companies as Hydro One Telecom Inc., Toronto Hydro Telecom Inc. and FibreWired Network.

An overview of the major players in each of these categories is provided in Appendix 2.

Each of the reporting entities that completed the CRTC's 2002 data collection forms was assigned to one of the above-noted categories for each of the four years covered by the data collection forms. Due to insufficient data on the incumbent carriers' out-of-territory competitive service activities, these activities, unless otherwise stated, have been included with the incumbent carriers' in-territory activities. The CRTC will endeavour to refine the reporting of this particular information in next year's report. As well, certain categories of competitive service providers were combined, as separate reporting would have resulted in residual disclosure of confidential information. Finally, certain figures and percentage growth calculations may not reconcile due to rounding.

A summary of total telecommunications service revenues in aggregate and by type of market participant for the four year period 1998 to 2001 is provided in Table 3.7 below. The incumbents' share of the industry's total telecommunications service revenues decreased from 83.4% in 1998 to 78.5% in 2001.

Table 3.7
Total Telecommunications Service Revenues
by Type of Market Participant
(\$ millions)

	1998	1999	2000	2001	CAGR
Incumbent Carriers					
Large	20,502.1	20,825.7	22,760.2	24,829.7	6.6%
Small	249.7	254.6	278.4	281.9	4.1%
Sub-total	20,751.8	21,080.3	23,038.6	25,111.6	6.6%
Competitors					
Facilities-based	2,652.1	2,995.4	3,562.7	3,739.8	12.1%
Resellers/Payphones	93.6	348.5	558.0	647.2	90.5%
Cable Service Providers	1,385.2	1,617.2	2,037.7	2,448.4	20.9%
Utility Telcos	0.0	0.1	5.6	31.2	-
Sub-total	4,130.9	4,961.2	6,164.0	6,866.6	18.5%
Total	24,882.7	26,041.5	29,202.6	31,978.2	8.7%

Source: CRTC 2002 Data Collection

4. Status of Competition

4.1 Financial Review of Markets

Overview

Telecommunications service revenues include local and access services, long distance, data and private line, Internet and mobile and paging services, but exclude wireline terminal sales and rentals. Total telecommunications service revenues increased from \$24.9 billion in 1998 to \$32 billion in 2001, growing on average approximately 9% annually. Wireline revenues, representing approximately 79% of industry revenues, grew on average at 7.5% per year while wireless revenues increased from \$4.6 billion in 1998 to \$6.8 billion in 2001, growing on average approximately 14% annually.

Table 4.1
Telecommunications Service Revenues
(\$ billions)

	1998	1999	2000	2001	CAGR
Wireline	20.3	21.0	23.4	25.2	7.5%
Wireless	4.6	5.0	5.8	6.8	14.1%
Total	24.9	26.0	29.2	32.0	8.7%

Source: CRTC 2002 Data Collection

As displayed in Table 4.2, all market segments, except long distance, had positive annual growth rates in 2001. Long distance revenues declined approximately 6% from 2000 to 2001. Internet continued to be the fastest growing market segment within the wireline industry with a 2001 growth rate of approximately 48%. In 2001, mobile and paging was the second largest segment, in terms of revenues.

The following table illustrates the 2000 and 2001 revenues and associated growth rates by market segments.

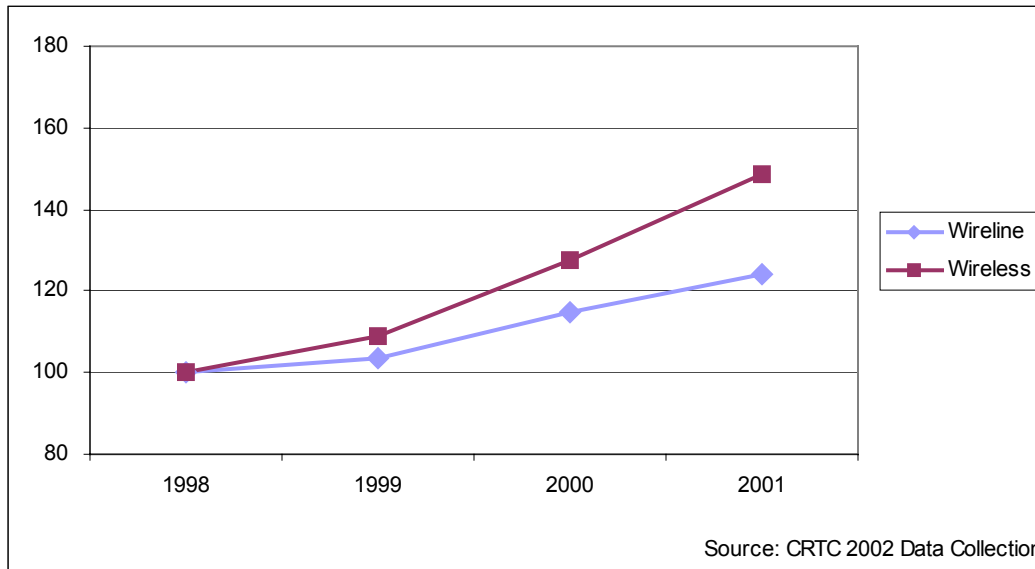
Table 4.2
Segmented Telecommunications Revenues
(\$ billions)

	2000	2001	Growth
Wireline			
Long distance	6.9	6.5	-6.2%
Local and access	10.6	11.5	7.7%
Data, private line & other	4.2	4.8	15.2%
Internet	1.7	2.5	48.4%
Total Wireline	23.4	25.2	7.9%
Mobile & Paging	5.8	6.8	16.3%
Total Industry	29.2	32.0	9.6%

Source: CRTC 2002 Data Collection

The faster revenue growth of the wireless sector as compared to the wireline sector for the period 1998 to 2001 is illustrated graphically in the following figure.

Figure 4.1
Evolution of Telecommunications Services Revenues (1998 = 100)



Operating Revenues

To measure the telecommunications industry's operating revenues and other related key financial indicators, such as earnings before interest, taxes, depreciation and amortization (EBITDA) and capital expenditures, only companies whose revenues were generated predominantly from telecommunications services are included in Table 4.3.

Table 4.3
Total Operating Revenues
(\$ billions)

	1998	1999	2000	2001	CAGR
Telecommunications ^(a)	24.7	25.7	28.7	31.3	8.2%
Terminal Equipment	1.0	0.8	0.8	1.0	0.0%
Other	0.4	0.9	0.9	1.2	46.8%
Total Operating Revenues	26.1	27.4	30.4	33.5	8.7%

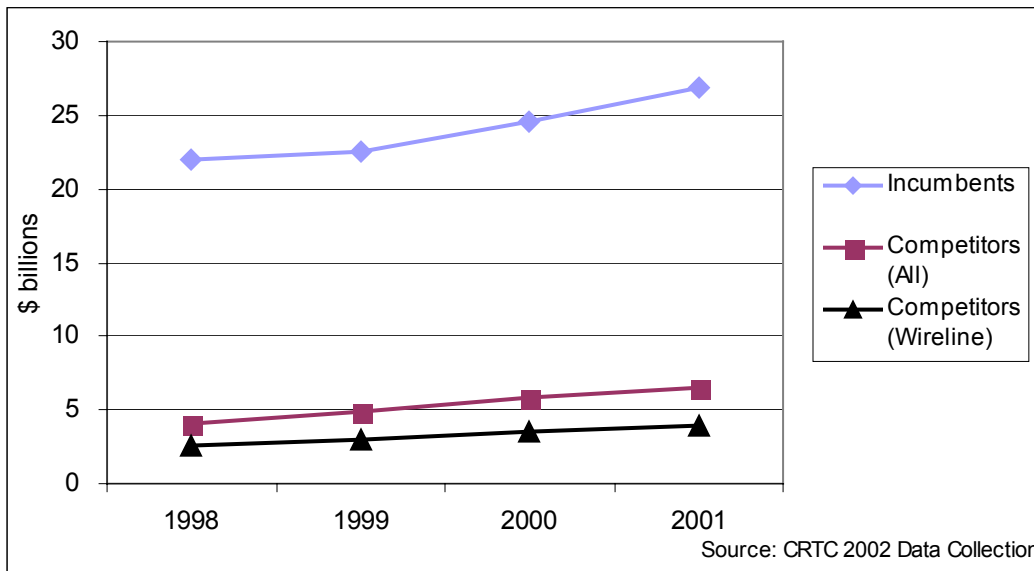
Source: CRTC 2002 Data Collection

(a) Revenues from Table 4.1 excluding revenues from smaller non-facilities-based Internet access providers and from companies whose telecommunications revenues were less than 25% of their operating revenues, such as Bell ExpressVu and Shaw Communications.

In 2001, 93% of the industry's operating revenues were generated from telecommunications services. Another 3% of these revenues were from wireline terminal equipment sales and rentals, while the remaining 4% related to other items, such as directory advertising and miscellaneous revenues of a non-telecommunications nature.

Total operating revenues increased from \$26.1 billion in 1998 to \$33.5 billion in 2001, growing on average by approximately 9% per year as displayed in Table 4.3. These revenues are broken down in Figure 4.2 between incumbents and competitors.

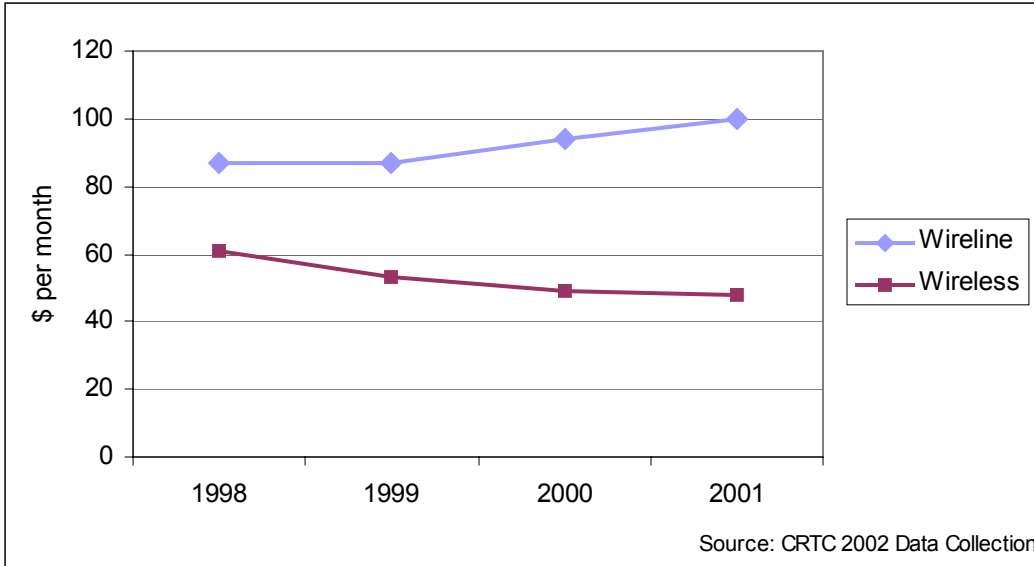
Figure 4.2
Total Operating Revenues



Over this period, incumbents' operating revenues increased from approximately \$22 billion in 1998 to \$27 billion in 2001, increasing on average approximately 7% per year, whereas competitors' revenues (both wireline and wireless) increased from \$4.1 billion to \$6.6 billion over the same period, growing on average by approximately 17% per year. Wireline competitors' revenues increased from \$2.6 billion in 1998 to \$3.9 billion in 2001, growing on average approximately 15% annually.

The average revenue per line per month for the wireline industry from 1998 to 2001 increased steadily from approximately \$87 per line per month in 1998 to \$100 in 2001, increasing on average 5% per year. During the same period, average revenue per subscriber per month for the wireless industry declined steadily from approximately \$61 per subscriber per month to \$48 per month, resulting in an average annual decrease of approximately 8%. A comparison of the average revenue per line/subscriber per month for both the wireline and wireless industry for the period 1998 to 2001 is displayed in Figure 4.3.

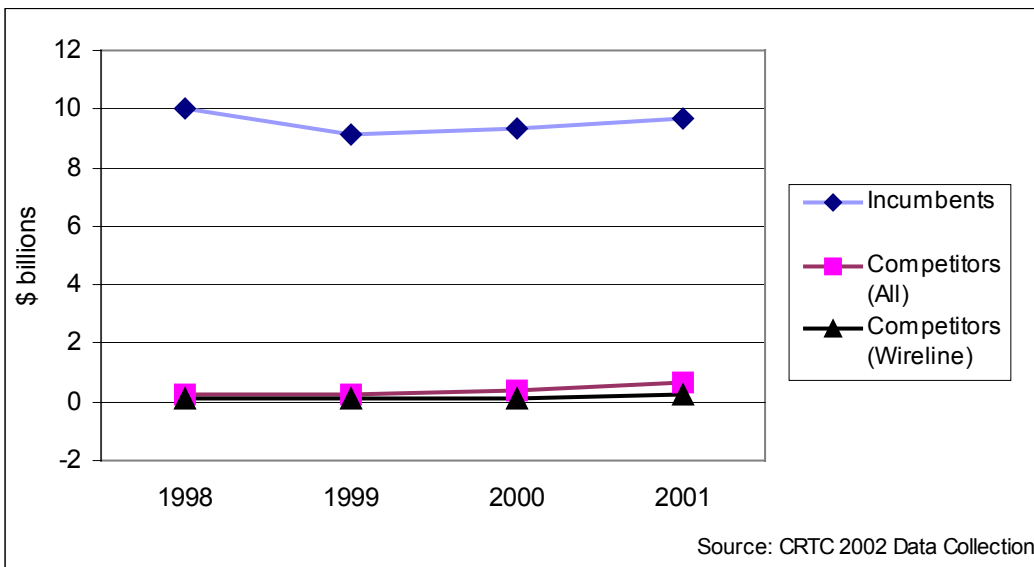
Figure 4.3
Average Revenue per Subscriber/Line



Earnings Before Interest, Taxes, Depreciation and Amortization

Earnings before interest, taxes, depreciation and amortization (EBITDA), prior to any unusual or extraordinary items, for the industry declined in 1999 and steadily increased from \$9.4 billion in 1999 to \$10.3 billion in 2001. As shown in Figure 4.4, both competitors and incumbents generated net positive growth in EBITDA, with the incumbents continuing to maintain the lion's share of the industry's EBITDA. During this period, except for 2001, the wireline competitors' EBITDA was essentially nil.

Figure 4.4
Earnings Before Interest, Taxes, Depreciation and Amortization



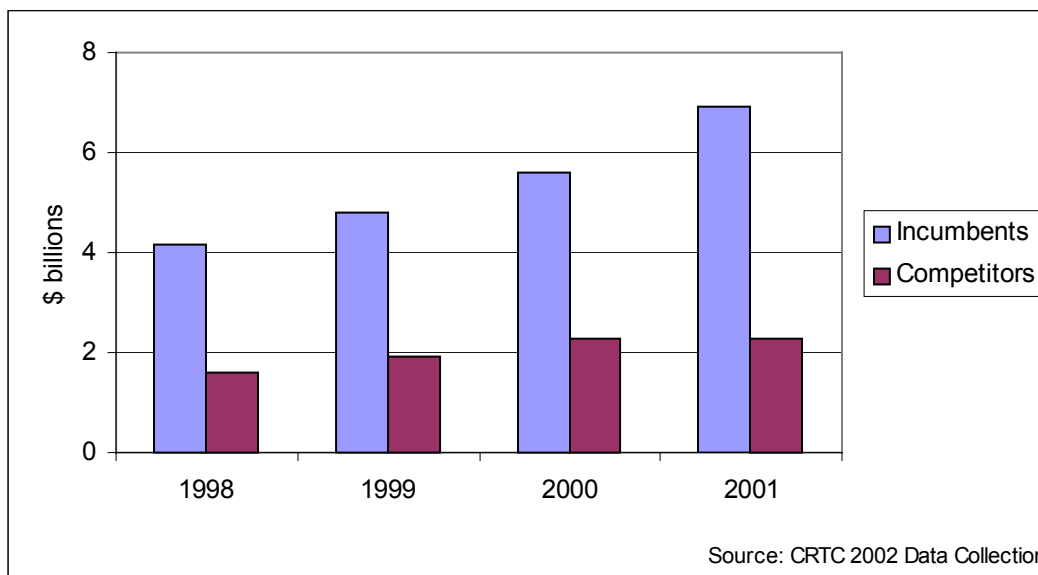
A comparison of EBITDA to operating revenues reveals that although wireline competitors accounted for 12% of the industry operating revenues in 2001, they only accounted for 2% of the industry EBITDA.

Capital Expenditures

Between 1998 and 2001, the industry spent over \$31 billion on capital expenditures. Of this amount, over 70% was spent by incumbents.

Figure 4.5 displays the industry capital expenditures for the period 1998 to 2001.¹⁷

Figure 4.5
Capital Expenditures
Total Industry (Wireline and Wireless)

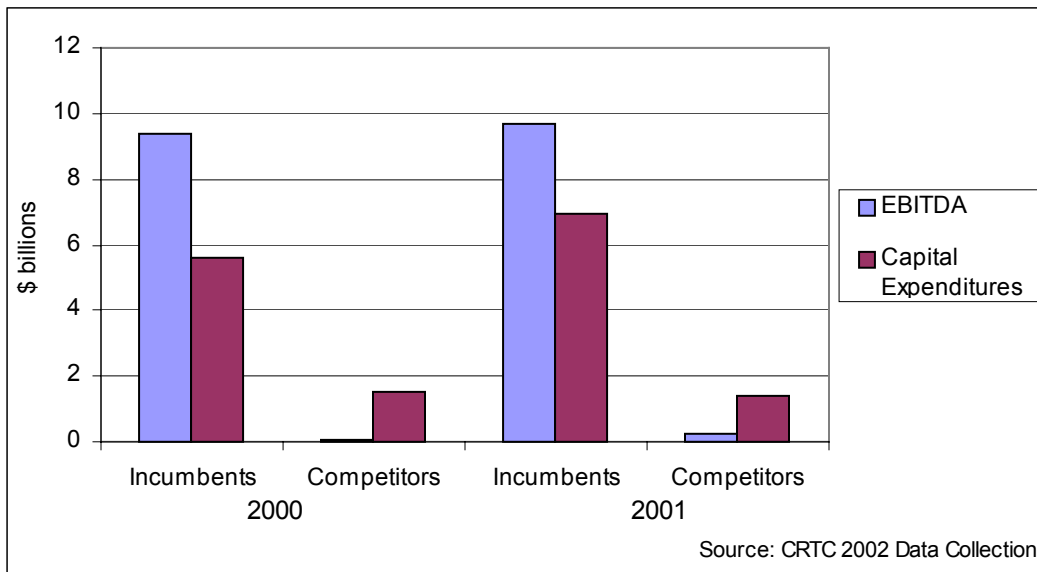


As noted above, competitors' capital expenditures in 2001 were only slightly higher than in 1998. Incumbents, however, steadily increased their capital expenditures to the point where they spent approximately one and a half times more in 2001 than in 1998.

A comparison of the wireline capital expenditures for both competitors and incumbents to EBITDA for the years 2000 and 2001 is displayed in Figure 4.6. The analysis shows that the competitors' ability to finance capital expenditures from internally generated funds was very limited as compared to the incumbents.

¹⁷ Figure 4.5 excludes the 2001 spectrum auction to acquire new licences. The wireless industry spent approximately \$1.5 billion acquiring 52 new spectrum licences from Industry Canada. Competitors spent approximately \$0.4 billion for these licences and incumbents spent approximately \$1.1 billion.

**Figure 4.6
EBITDA vs. Capital Expenditures (Wireline)**



Type of Capital Expenditures

Between 1998 and 2001, the industry spent over \$3.4 billion on fibre facilities. Of this amount, approximately 42% was spent by competitors and 58% by incumbents. During this same period, expenditures on fibre facilities were highest in 1999; however, by 2001, they had declined steadily by an average annual rate of approximately 12%. Nonetheless, capital expenditures in 2001 were still higher than in 1998.¹⁸

Expenditures on switching equipment remained relatively constant from 1998 to 2001. The industry spent over \$6.4 billion on this type of equipment during this period, with approximately 78% spent by incumbents and 22% by competitors.¹⁹

Asset Write-Downs and Restructuring Costs

Between 1998 and 2001, the industry experienced write-offs of approximately \$4.3 billion. Approximately 60% of these costs were in the years 2000 and 2001. In those years, competitors had asset write-downs of \$1.4 billion and restructuring costs of \$0.2 billion, while incumbents had asset write-downs of \$0.2 billion and restructuring costs of \$0.8 billion.²⁰

¹⁸ Source: CRTC 2002 Data Collection.

¹⁹ Ibid.

²⁰ Ibid.

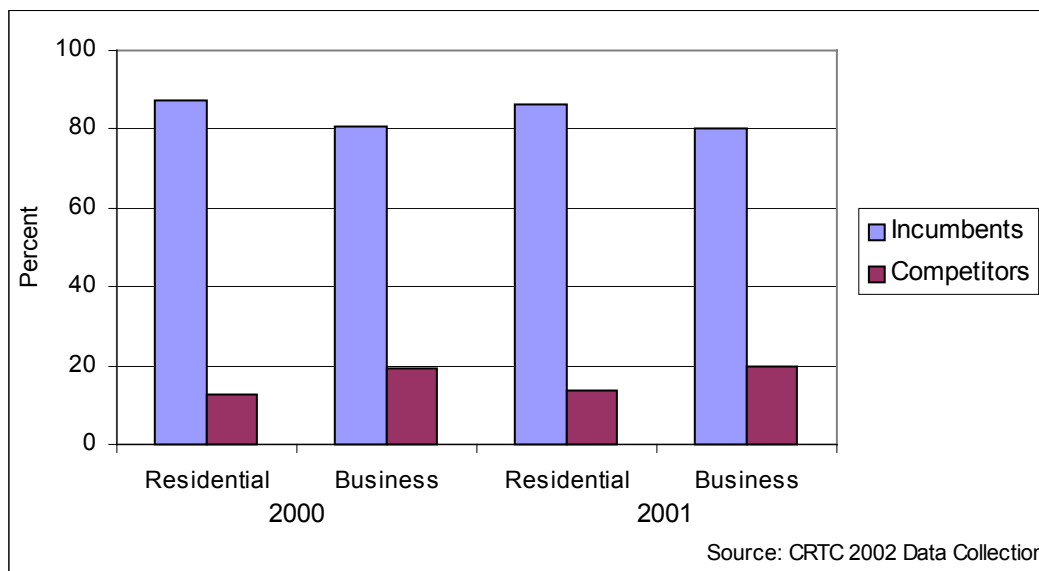
As of October 2002, some competitors, such as Call-Net, restructured their long term debt. Some companies, such as Teleglobe, 360networks and Group Telecom, were in bankruptcy protection. Several competitors, such as C1 Communications, Axxent and Norigen, have ceased to exist.

4.2 Wireline Revenues

Wireline revenues continued to be generated largely by the incumbents. In 2001, two incumbent groups accounted for almost 80% of the wireline revenues: Bell Canada, TELUS and their respective wireline affiliates. Of this amount, Bell Canada and its affiliates accounted for 72%.²¹

Two major segments of the telecommunications market are the residential and business segments. In 2001, wireline business revenues were approximately 45% of total wireline revenues.²² Competitors have taken a greater share of the business wireline market than the residential market as displayed in Figure 4.7.

Figure 4.7
Wireline Residential and Business Revenues



²¹ In 2001, Bell Canada, TELUS and their respective group of wireline affiliates accounted for approximately \$20.3 billion of \$25.2 billion in wireline revenues.

²² Source: CRTC 2002 Data Collection.

In 2001, 92% of business accounts were small business; however, the revenues generated by these accounts represented less than 14% of total business revenues. Table 4.4 summarizes the 2001 distribution of small, medium and large business accounts and revenues for incumbents and competitors.²³

**Table 4.4
Business Account and Revenue Distribution (2001)**

	Number of Business Accounts			Business Revenues		
	Small	Medium	Large	Small	Medium	Large
Incumbents	90.9%	7.2%	1.9%	13.8%	9.8%	76.4%
Competitors	95.1%	3.6%	1.3%	11.8%	11.4%	76.8%
Industry	92.0%	6.2%	1.8%	13.5%	10.0%	76.5%

Source: CRTC 2002 Data Collection

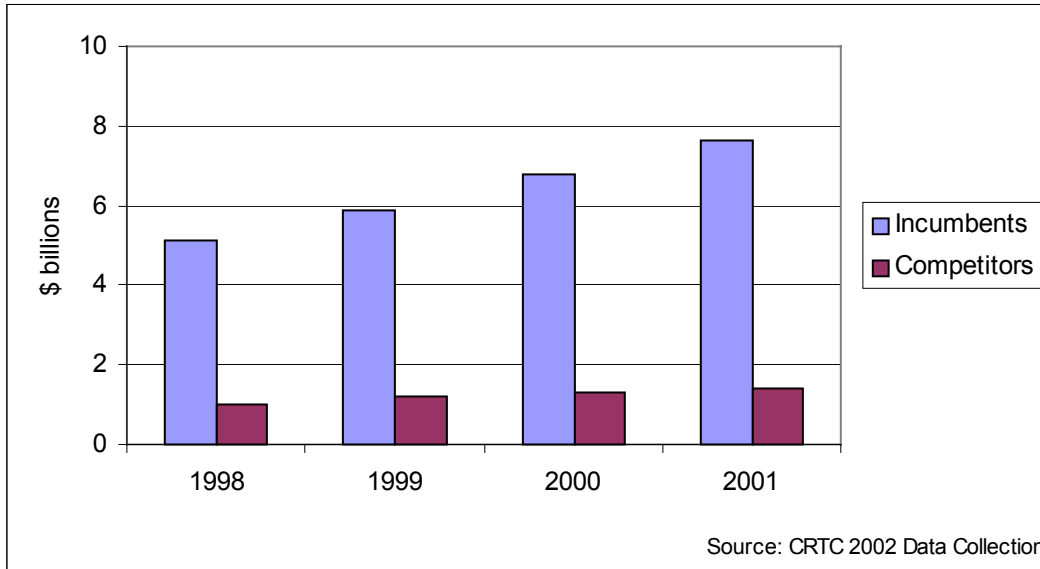
From 1998 to 2001, the number of large business accounts increased by approximately 2% and large business revenues increased by 47%. During this time, the number of large business accounts as a percent of the total business accounts remained relatively constant at approximately 2%. However, as a percent of revenues, large business revenues increased from approximately 69% of total business revenues in 1998 to approximately 77% in 2001.²⁴

For the period 1998 to 2001, competitors' large business revenues experienced an average annual growth rate of approximately 11%, while the incumbents' growth rate was 14%. During this period, the competitors' share of large business revenues declined from 17% in 1998 to 15% in 2001. Figure 4.8 displays the competitors' and incumbents' wireline large business revenues from 1998 to 2001.

²³ For the purposes of this report, wireline business customers were segmented into small, medium and large customers. A small business customer was defined as a business account that generated less than \$6,000 in annual telecommunications revenues. A medium business customer was defined as a business account that generated annual revenues between \$6,000 and \$30,000. A large business customer was defined as a business account that generated annual revenues in excess of \$30,000.

²⁴ Ibid.

Figure 4.8
Large Business Revenues (Wireline)²⁵



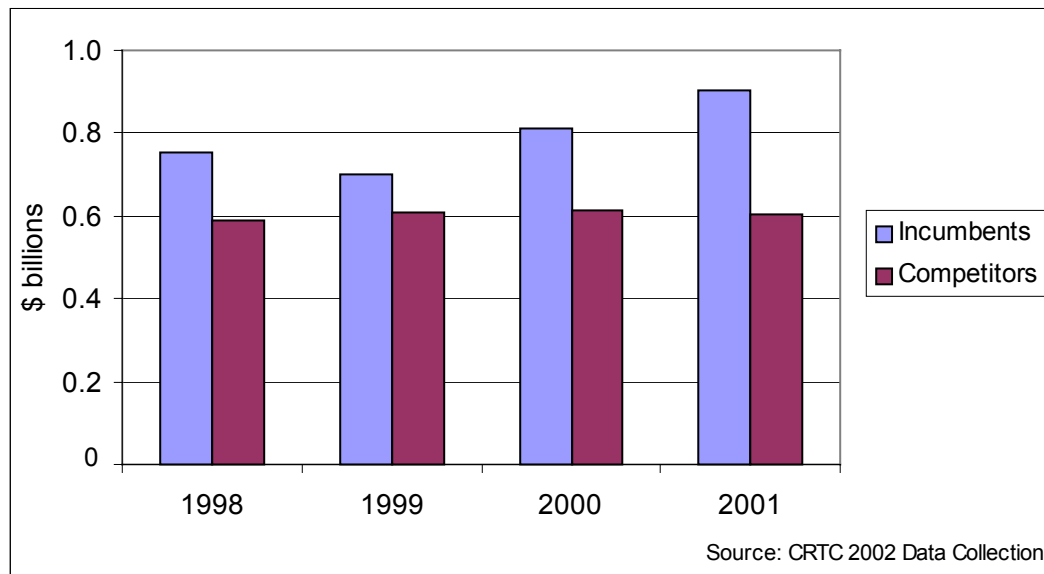
The competitors' share of the combined small and medium business revenues was approximately 15% in 2000 and 2001.²⁶

Figure 4.9 provides a comparison of the incumbents' and competitors' large business long distance revenues from 1998 to 2001. The competitors' share of large business long distance revenues was 40% in 2001, down from approximately 43% in the previous year. In 2001, long distance revenues from large business increased by approximately 11% for incumbents and declined approximately 1% for competitors over the previous year.

²⁵ Due to the limited availability of historical data prior to 2000 from TELUS and MTS, estimates were used to complete this analysis.

²⁶ Source: CRTC 2002 Data Collection.

Figure 4.9
Large Business Long Distance Revenues (Wireline)²⁷



By contrast, the competitors' share of the combined small and medium business long distance revenues was approximately 32% in 2001, down from approximately 34% in 2000.²⁸

²⁷ Due to the limited availability of historical data prior to 2000 from TELUS and MTS, estimates were used to complete this analysis.

²⁸ Source: CRTC 2002 Data Collection.

4.3 Long Distance

Overview

Resale to provide switched long distance services was permitted beginning in 1990, and facilities-based long distance entry was permitted in 1992. In 1998, pursuant to a decision issued in late 1997, the CRTC forbore from rate regulation of incumbent long distance services, although certain conditions were imposed on the incumbents, most notably price ceilings applying to each basic toll rate schedule.

Long distance services described in this section include voice wireline and voice payphone-originated Public Switched Telephone Network (PSTN) communications where any call terminates outside the local calling area in which it originated. For purposes of this report, long distance services are divided into four types according to a combination of (i) their originating and terminating locations, and (ii) whether the service is outbound or inbound in nature. The four categories are: domestic (outbound), toll-free, Canada-U.S. (outbound) and international (non-U.S. outbound). Long distance service revenues also include fixed monthly charges and other long distance service revenues. Wireless long distance services are included in the discussion of mobile and paging services in Section 4.6.

The long distance market includes residential and business services, as well as wholesale services provided by incumbents and competitors to affiliated and non-affiliated entities. As illustrated in Table 4.5, revenues for the overall market declined by \$398.9 million, or 5.8%, in 2001 in comparison to 2000. In 2001, long distance revenues for the incumbents decreased by \$148.1 million, or 3.0%, and for competitors fell by \$250.8 million, or 12.9%. The competitors' share of the total long distance market, as measured in revenues, decreased from 28.2% in 2000 to 26.0% in 2001.

Table 4.5
Total Long Distance Revenues
(\$ millions)

	2000	2001	<i>Growth</i>
Domestic			
Incumbents	2,511.6	2,357.3	-6.1%
Competitors	750.3	702.6	-6.4%
Total	3,261.8	3,059.9	-6.2%
Toll-free			
Incumbents	556.4	573.9	3.2%
Competitors	386.6	381.6	-1.3%
Total	943.0	955.5	1.3%
U.S.			
Incumbents	517.1	482.7	-6.7%
Competitors	336.6	253.0	-24.8%
Total	853.7	735.7	-13.8%
International			
Incumbents	1,212.5	1,231.6	1.6%
Competitors	468.1	322.1	-31.2%
Total	1,680.6	1,553.7	-7.5%
Other charges			
Incumbents	174.0	177.9	2.2%
Competitors	7.9	39.6	397.6%
Total	182.0	217.4	19.5%
Total			
Incumbents	4,971.6	4,823.5	-3.0%
Competitors	1,949.5	1,698.7	-12.9%
Total	6,921.1	6,522.2	-5.8%

Source: CRTC 2002 Data Collection

The long distance market, as measured in residential, business and wholesale minutes, grew by 1.7 billion minutes, representing a 3.4% increase between 2000 and 2001. This increase was caused by a 1.8 billion, or 9.3%, increase in business long distance minutes, combined with a 0.5 billion, or 2.3%, decrease in residential minutes and a 0.4 billion, or 5.6%, increase in wholesale minutes.

Both competitors and incumbents witnessed modest increases in business long distance minutes. In 2001, competitor business long distance minutes rose by 0.4 billion minutes, representing a 4.7% increase, while the incumbent business long distance minutes increased by 1.4 billion minutes, or 13.3%. With respect to the residential long distance minutes, competitor minutes decreased by 0.1 billion, or 3.5%, in 2001. Incumbent residential minutes decreased by 0.4 billion, or 2.1%, in the same year. In the wholesale market, competitor long distance minutes went down by 0.5 billion, or 7.9%, between 2000 and 2001. Over the same period, incumbent wholesale minutes increased by 0.9 billion, or 32%.

Table 4.6 provides a summary of the incumbent and competitor shares of long distance minutes, broken down between residential, business and wholesale.

Table 4.6
Total Long Distance Minutes
(billions)

	2000	2001	Growth
Residential			
Incumbents	18.4	18.0	-2.1%
Competitors	4.1	4.0	-3.5%
Total	22.5	22.0	-2.3%
Business			
Incumbents	10.1	11.4	13.3%
Competitors	8.8	9.2	4.7%
Total	18.9	20.6	9.3%
Wholesale			
Incumbents	3.0	4.0	32.0%
Competitors	6.0	5.5	-7.9%
Total	9.0	9.5	5.6%
Total			
Incumbents	31.5	33.5	6.1%
Competitors	18.9	18.7	-1.1%
Total	50.5	52.2	3.4%

Source: CRTC 2002 Data Collection

The competitor share of business market minutes decreased between 2000 and 2001 from 46.7% to 44.7%. The competitor share of residential market minutes remained essentially flat over the same period, with a marginal decrease from 18.3% to 18.1%. Competitors suffered a substantial decline in their share of wholesale market minutes, from 66.3% in 2000 to 57.9% in 2001.

Table 4.7 provides the major incumbent telephone companies' market shares, measured in terms of residential and business long distance minutes combined, in their respective operating territories.

Table 4.7
Incumbent Telephone Companies' Market Share in Long Distance (Minutes)

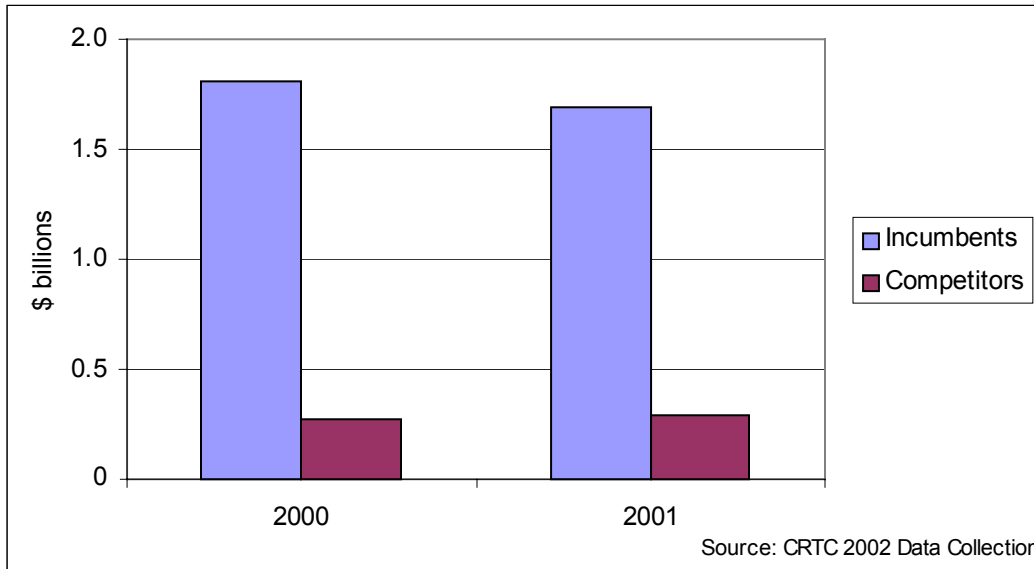
	2000	2001
Bell Canada	62%	61%
TELUS	75%	75%
MTS	80%	80%
SaskTel	84%	82%
Aliant Telecom	81%	82%

Source: CRTC 2002 Data Collection

Domestic Residential Long Distance

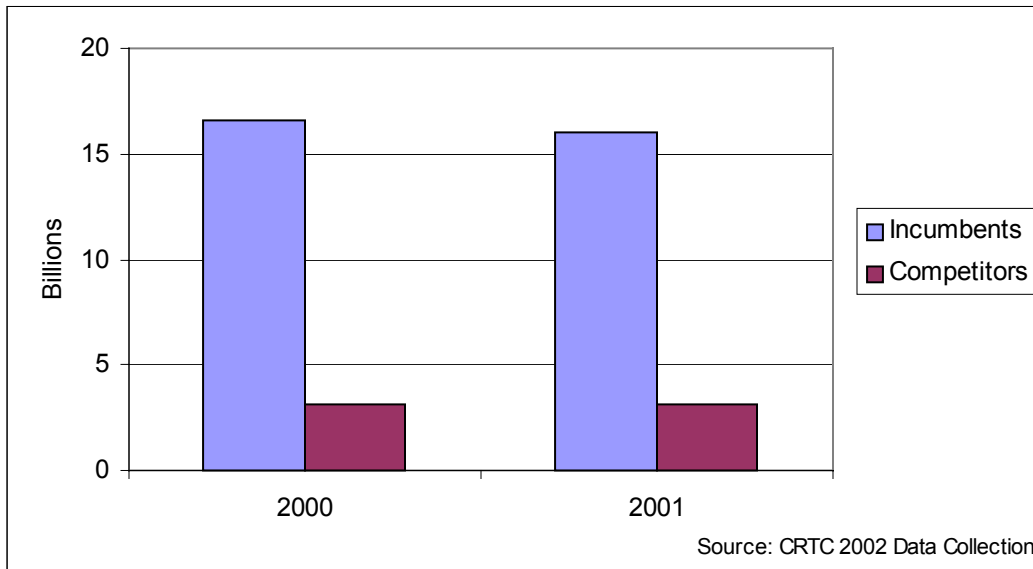
Figures 4.10 and 4.11 present the proportionate shares of domestic residential long distance revenues and minutes, respectively, achieved by each of the incumbents and competitors.

Figure 4.10
Domestic Residential Long Distance Revenues



Domestic residential long distance revenues, including revenues from fixed and other charges, were \$2.0 billion in 2001, a decrease of 5.1% from the previous year. Competitor revenues increased 6.4% to \$291.8 million, while incumbent revenues decreased by 6.8%, to \$1.7 billion, over this period. Between 2000 and 2001, the incumbents' share of domestic residential long distance revenues decreased from 86.8% to 85.3%.

Figure 4.11
Domestic Residential Long Distance Minutes

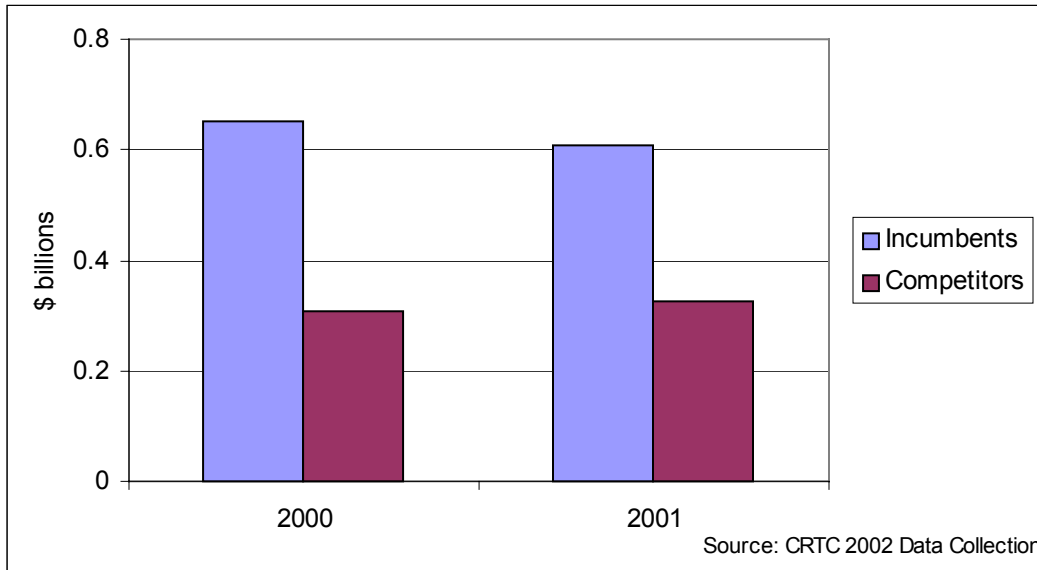


Total domestic residential long distance minutes were 19.2 billion in 2001, representing a decrease of 2.9%. Incumbent domestic residential long distance minutes decreased 3.5% to 16.0 billion, while competitor minutes increased 0.2% to 3.2 billion. The reduction in residence market minutes for certain long distance providers can be explained in part by their decision, beginning in 2000, to cap usage under previously flat-rated unlimited-usage calling plans and the eventual market reaction to this decision. Between 2000 and 2001, the incumbents' share of domestic residential long distance minutes decreased from 84.0% to 83.5%.

Domestic Business Long Distance

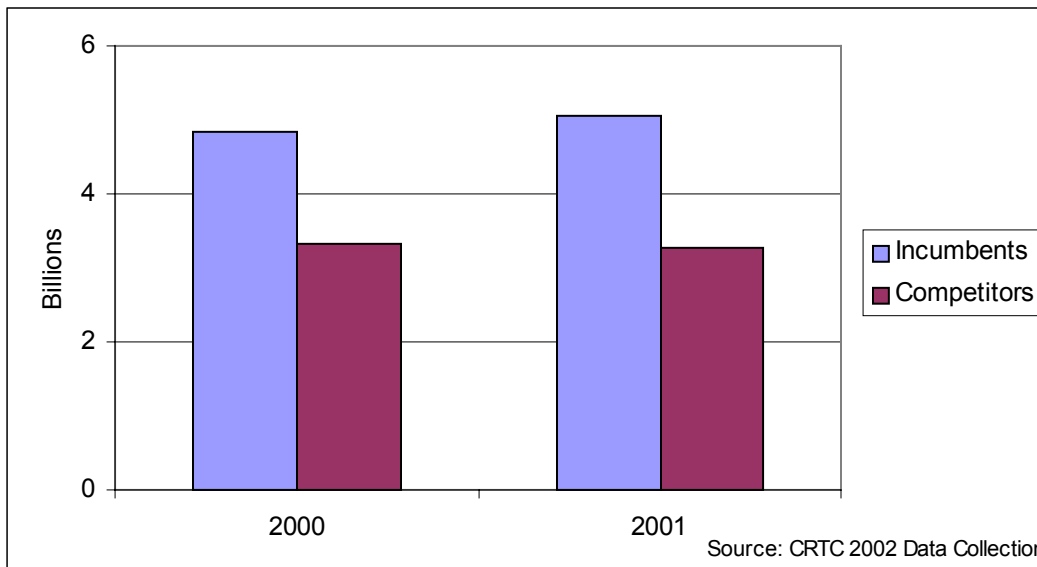
Figures 4.12 and 4.13, below, illustrate the proportionate shares of domestic business long distance revenues and minutes, respectively, achieved by each of incumbents and competitors.

Figure 4.12
Domestic Business Long Distance Revenues



Domestic business long distance revenues, including revenues from fixed and other charges, decreased by 2.6% from 2000 to 2001, totalling \$936 million in 2001. Competitor revenues increased 6.0% to \$327.5 million in 2001, and incumbent revenues fell by 6.6% to \$608.5 million in 2001. Between 2000 and 2001, the incumbents' share of domestic business long distance revenues decreased from 67.8% to 65%.

Figure 4.13
Domestic Business Long Distance Minutes



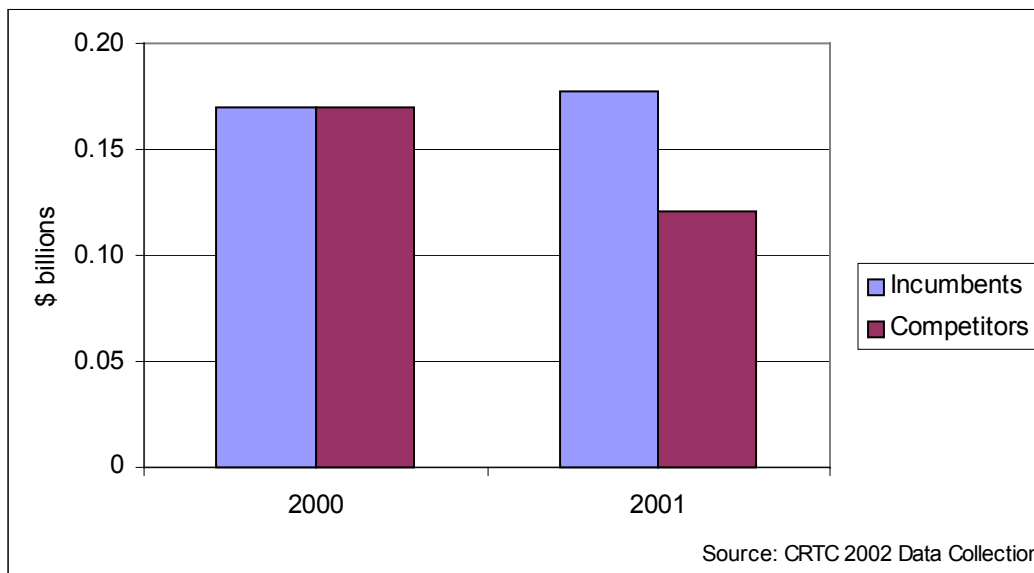
Total domestic business minutes grew by 2.1% to 8.3 billion in 2001, while competitor minutes fell by 1.3% to 3.3 billion, with their minute market share falling from 40.6% in 2000 to 39.3% in 2001. Conversely, incumbents' minutes grew by 4.4% to 5.0 billion, with the net effect being an increase in their share of domestic business minutes from 59.4% to 60.7%. While competitors' average revenue per minute (ARPM), at \$0.100 in 2001, remained well below that of incumbents, it increased from its 2000 level of \$0.093. The incumbents' ARPM in this segment decreased to \$0.120 in 2001 from its 2000 level of \$0.134.

Domestic Wholesale Long Distance

Wholesale long distance services are provided by long distance carriers to other telecommunications service providers, who in turn use them to serve the long distance traffic of their end users, sometimes in combination with their own toll network facilities.

Figures 4.14 and 4.15 provide a summary of domestic wholesale long distance revenues and minutes, respectively, related to non-affiliated entities, for competitors and incumbents.

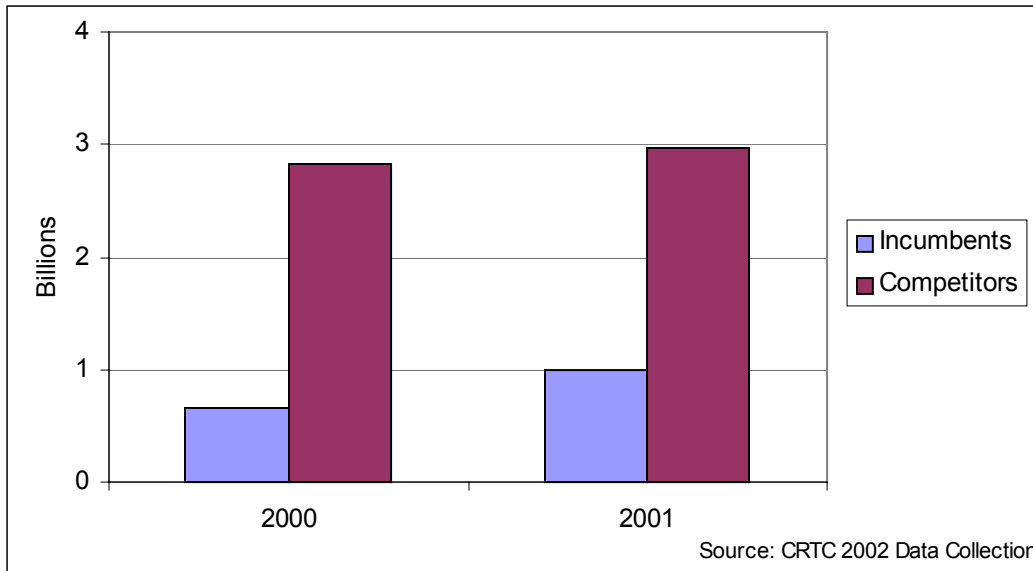
Figure 4.14
Domestic Wholesale Long Distance Revenues²⁹



Total domestic wholesale long distance revenues, including revenues from fixed and other charges, declined by 12.4% to \$297.6 million in 2001. While incumbent domestic wholesale revenues rose by 4.3% to \$177 million, competitor revenues in this segment dropped by 29.1% to \$120.6 million. The competitors' proportionate share of domestic wholesale revenues dropped significantly, from 50.1% in 2000 to 40.5% in 2001.

²⁹ Wholesale revenues include settlement revenues earned by long distance providers on terminating long distance traffic.

**Figure 4.15
Domestic Wholesale Long Distance Minutes**



Total domestic wholesale long distance minutes were 4.0 billion in 2001, an increase of 13.8% from the previous year. Incumbents experienced a 50.5% increase in domestic wholesale minutes to 1.0 billion, and competitors' minutes rose by 5.2% to 3.0 billion. As a result, the competitors' share of domestic wholesale long distance minutes decreased from 81% in 2000 to 74.9% in 2001.

International Long Distance

International long distance services, terminating outside of Canada and the United States, make up the second largest segment of the long distance market, behind the Canadian domestic long distance segment.

Total international long distance revenues declined by \$181.3 million, or 11.5%, between 2000 and 2001. Incumbent international long distance revenues decreased by 3.2% to \$1.1 billion in 2001. Competitor international long distance revenues dropped by 31.2% to \$322.1 million in the same year. As a result, the competitors' share of international long distance revenues declined from 29.8% in 2000 to 23.2% in 2001.

International long distance minutes as a whole increased by 6% between 2000 and 2001. The incumbents experienced a 13.5% increase in their international long distance minutes to 1.9 billion, while the competitors' minutes decreased by 3% to 1.4 billion. The competitors' share of international long distance minutes decreased from 45.3% to 41.4% in 2001.

International Retail Long Distance

Figures 4.16 and 4.17 illustrate the revenue and minute trends in the international retail (residential and business combined) long distance market segment.

Figure 4.16
International Retail Long Distance Revenues

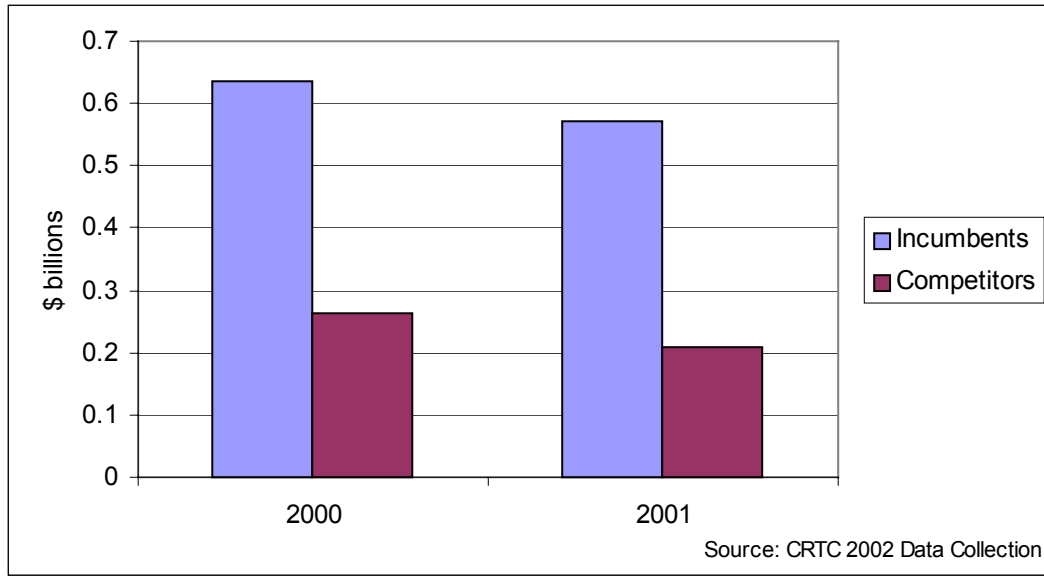
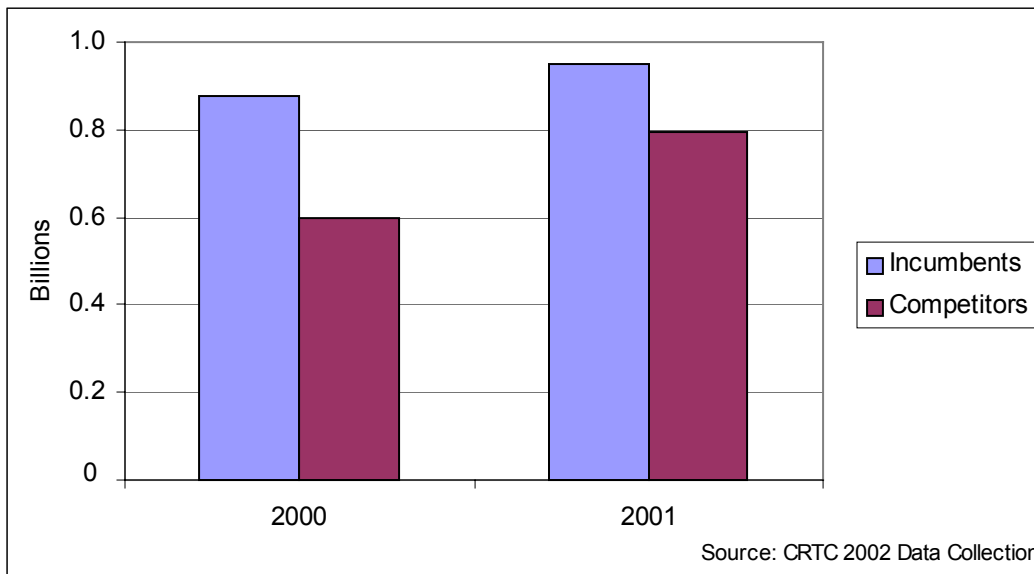


Figure 4.17
International Retail Long Distance Minutes



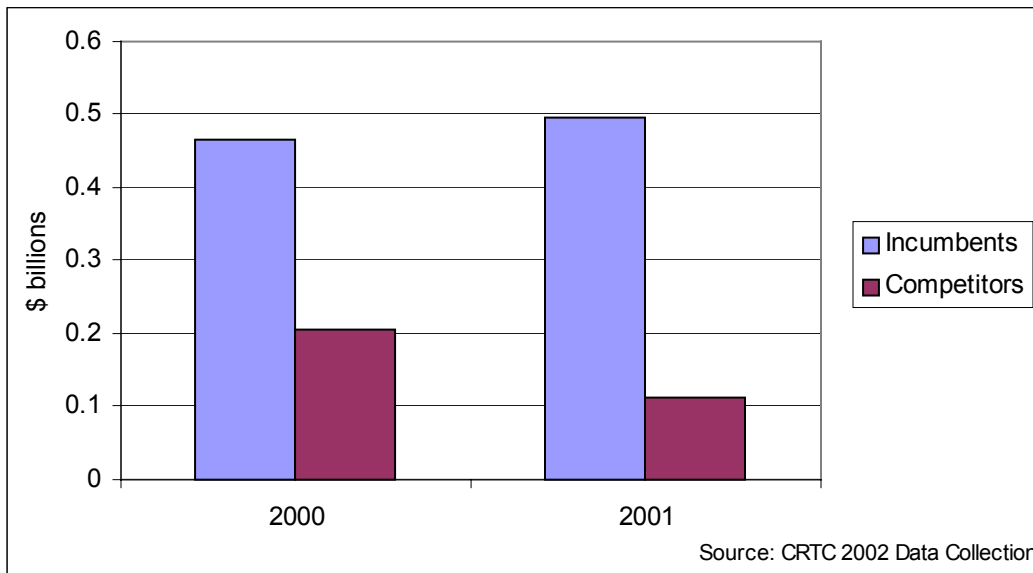
International retail long distance revenues, including revenues from fixed and other charges, decreased by 13.1% to \$781.3 million in 2001. International retail long distance revenues generated by incumbents in 2001 fell by 10.1% to \$571.6 million while competitors' revenues experienced a 20.2% decline to \$209.7 million. The competitors' share of international retail long distance revenues dropped from 29.2% in 2000 to 26.8% in 2001.

Retail minutes increased by 18.7% to 1.7 billion, with incumbents' retail minutes increasing by 8.7% in 2001 to 0.9 billion. Competitors' retail minutes grew by 33.5% to 0.8 billion over the same period, with the result that their share of retail minutes rose from 40.5% in 2000 to 45.6% in 2001.

International Wholesale Long Distance

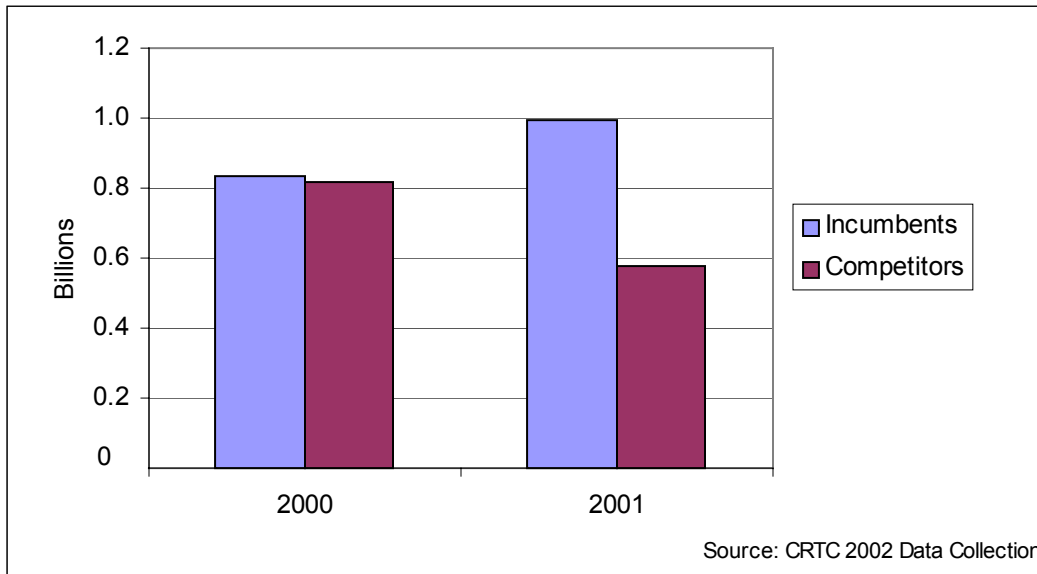
Figures 4.18 and 4.19 provide a summary of international wholesale long distance revenues and minutes, respectively, related to non-affiliated entities.

Figure 4.18
International Wholesale Long Distance Revenues³⁰



³⁰ Wholesale revenues include settlement revenues earned by long distance providers on terminating long distance traffic.

Figure 4.19
International Wholesale Long Distance Minutes



International wholesale long distance revenues, including revenues from fixed and other charges, decreased by 9.5% to \$607.3 million. The incumbents saw a 6.3% increase in these revenues between 2000 and 2001 to \$494.9 million, while competitors experienced a decrease of 45.3% to \$112.3 million over the same period. The competitors' share of international wholesale revenues fell from 30.6% in 2000 to 18.5% in 2001.

International wholesale long distance minutes provided to non-affiliated entities decreased by 5.3% to 1.6 billion in 2001. The incumbents' international wholesale long distance minutes increased by 18.6% to 1.0 billion in 2001, while the competitors' minutes dropped by 29.6% to 0.6 billion. As a result, there was a considerable shift in 2001 in the position of competitors and incumbents in international wholesale minutes, with the competitors' share of minutes dropping from 49.5% in 2000 to 36.8% in 2001.

4.4 Local and Access

Overview

The Commission established the regulatory framework for local exchange service competition in mid-1997. However, it was not until 1998 that facilities-based competitors began to provide local exchange services. By September 2002, regulatory barriers to facilities-based local competition had been removed in all parts of Canada with the exception of the serving territories of Northwestel and the small incumbents (mostly in Ontario and Quebec).

Local and access (local)³¹ service revenues are the largest component of total telecommunications service revenues. In 2001, local service revenues were \$11.5 billion, including contribution received. This accounted for approximately 36% of industry revenues. From 1998 to 2001, revenues for this segment grew at an average annual rate of 6.4%.

Table 4.8 sets out total local service revenues and lines for the years 1998 to 2001.

Table 4.8
Total Local Revenues and Lines

	1998	1999	2000	2001	CAGR
Revenues (\$ millions)	9,525	9,920	10,641	11,465	6.4%
Annual Growth (percentage)		4.2%	7.3%	7.7%	
Lines (000s)	19,609	20,390	20,895	21,141	2.5%
Annual Growth (percentage)		4.0%	2.5%	1.2%	

Source: CRTC 2002 Data Collection

Revenues in Table 4.8 include local and access monthly rates and service charges, contribution, and local payphone but exclude revenues from the sale and rental of terminal equipment. Local lines in Table 4.8 include wireline payphones as well as lines wholesaled to affiliated companies and third party providers of telecommunications services. All other tables and figures in this section, unless otherwise noted, exclude revenues from contribution, payphone lines and revenues, as well as lines and revenues wholesaled to affiliates.

³¹ The three components of local services are: 1) Local Exchange Services - access to the PSTN using direct-dial communications, regardless of whether the facility is used for voice, fax, dial-up Internet or other services; 2) Optional Local Features, such as call display and call waiting; and 3) Other, such as inside wiring.

Market Segments

The local services market can be sub-divided into residence, business and wholesale³² market segments. Revenues and lines for each market segment are set out in Tables 4.9 and 4.10 below.

Table 4.9
Local Revenues by Market Segment
(\$ millions)

	1998	1999	2000	2001	CAGR
Residential	4,270	4,421	4,833	5,245	7.1%
Business	3,770	3,801	4,060	4,369	5.0%
Wholesale	454	599	608	677	14.3%
Total	8,494	8,821	9,501	10,291	6.6%

Source: CRTC 2002 Data Collection

Table 4.10
Local Lines by Market Segment
(000s)

	1998	1999	2000	2001	CAGR
Residential	12,595	12,772	12,908	12,920	0.9%
Business	6,528	7,080	7,378	7,561	5.0%
Wholesale	276	331	401	426	15.6%
Total	19,398	20,182	20,686	20,885	2.5%

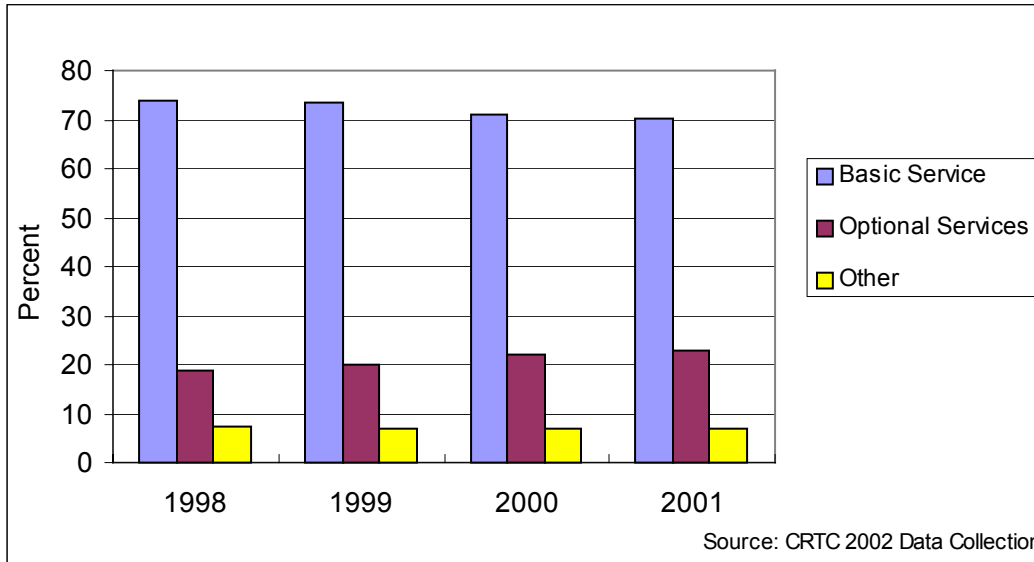
Source: CRTC 2002 Data Collection

Between 1998 and 2001, local residential lines grew at an average annual rate of 0.9% while local residential revenues grew at an average annual rate of 7.1% over the same period.

As can be seen in Figure 4.20, optional local services such as voice mail, call display and call answer represent a gradually increasing proportion of local revenues. While just over half of the 1998 to 2001 growth in local residential revenues came from basic local service, optional local services, which were less than 25% of total revenues in 2001, contributed over 40% of the growth in local residential revenues over the 1998 to 2001 time period.

³² Wholesale local services are those purchased by other telecommunications service providers and include the provision of 1) unbundled loops, 2) loop-equivalent facilities, 3) other unbundled local services and local interconnection, and 4) switching and aggregation services.

**Figure 4.20
Local Residential Revenues by Major Components**



In the local business market, revenues and lines both grew at an average annual rate of approximately 5% over the period 1998 to 2001.

The wholesale market remains a small proportion of the local market, representing approximately 5% to 7% of local revenues for the years 1998 to 2001 and approximately 2% of local lines over the same period. In 2001, wholesale revenues grew by 11% while the number of wholesale lines grew by 8%. Growth in the wholesale market has been hurt by the business failures of several competitive local exchange carriers (CLECs), including Axxent, C1 Communications, Cannect Communications Inc., and Norigen, as well as by financial market conditions which made expansion difficult.

Local Business Market

A primary focus of competitor entry plans has been, and continues to be, the business market in dense urban areas. The attractiveness of this market segment derives from its geographic concentration, the presence of large sophisticated customers and rates for local business services exceeding those in the residence market. In 2001, competitor business local lines accounted for almost 90% of total competitor retail lines. As a result, competitors' market share in the local retail market as a whole is at present determined in large part by their market share in the business market.

As shown in Table 4.11, incumbent local business revenues increased by approximately 6% in 2001 over the previous year, while competitors' revenues increased by almost 40% over the same period. In Table 4.12, the incumbents' local business lines grew 2.6% in 2001 while the competitors' lines grew 3.3%.

Competitor local business market lines in 2001, expressed as a proportion of total business lines, remained unchanged from 2000 at 8%. Competitors, however, captured a slightly higher proportion of business revenues: 4.7% in 2001, up from 3.6% in 2000.

Table 4.11
Local Business Revenues
(\$ millions)

	1998	1999	2000	2001	CAGR
Incumbents	3,830	3,822	4,035	4,264	3.6%
Competitors	24	106	150	210	105.8%
Total	3,854	3,928	4,185	4,474	5.1%

Source: CRTC 2002 Data Collection

Table 4.12
Local Business Lines
(000s)

	1998	1999	2000	2001	CAGR
Incumbents	6,408	6,679	6,806	6,970	2.8%
Competitors	120	401	572	591	70.3%
Total	6,528	7,080	7,378	7,561	5.0%

Source: CRTC 2002 Data Collection

Obstacles to meaningful market advancement in 2001 by competitors included competitor business failures, challenging financial market conditions, the uncertain financial state of most competitors, the re-evaluation of local entry business plans and falling prices in other markets in which competitors also operate.

Local Residential Market

The greater geographic dispersion of customers and lower local revenues per customer in the residence market generally result in a more difficult business case for entry than in those business markets addressed by competitors to date. While certain regional competitors, such as EastLink in the Maritimes and Futureway in the greater Toronto area, have had some success locally, the challenging economics of the residence market have prevented competitors generally from developing more than a minimal presence in the local residential market.

In 2001, the competitors' market share, expressed as a proportion of residence market lines, grew due to a renewed interest in local residential market entry. However, notwithstanding this growth in market share, the competitors' market share of local residential lines remained extremely low at 0.6% in 2001 while their percentage of residential local revenues grew marginally from 0.3% in 2000 to 0.4% in 2001.

Table 4.13
Local Residential Revenues
(\$ millions)

	1998	1999	2000	2001	CAGR
Incumbents	4,270	4,418	4,817	5,222	6.9%
Competitors	0	3	16	22	165.2% *
Total	4,270	4,421	4,833	5,245	7.1%

Source: CRTC 2002 Data Collection

* 1999 to 2001 only

Table 4.14
Local Residential Lines
(000s)

	1998	1999	2000	2001	CAGR
Incumbents	12,595	12,740	12,864	12,847	0.7%
Competitors	0	32	45	74	51.9% *
Total	12,595	12,772	12,908	12,920	0.9%

Source: CRTC 2002 Data Collection

* 1999 to 2001 only

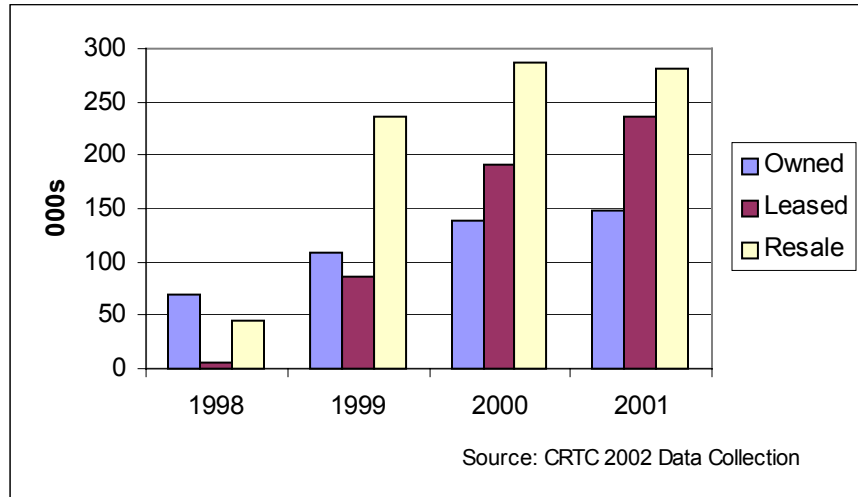
Types/Sources of Facilities and Services Used by Competitors

There are three types of facilities and/or services used by competitors:

- a) owned facilities - self-provisioned loop facilities;
- b) leased facilities - such as unbundled loops or loop-equivalent facilities leased from a facilities-based telecommunications provider; or
- c) resold services - such as Centrex or its equivalents, purchased from a local exchange provider.

Figure 4.21 illustrates the proportions of competitor retail lines made up by each of these three methods of providing local service.

**Figure 4.21
Competitor Local Retail Lines by Type of Facility**



The mix of owned, leased and resold lines used by competitors has changed over time as companies have reacted to competitive pressures in the marketplace. For instance, the establishment of final loop rates in late 1998 at levels substantially below the previous interim levels, combined with further reductions in loop service charges and monthly rates over the period 1999 to 2001, improved the economics of providing service by means of leased unbundled loops relative to resale.

Furthermore, the ability to use leased loops on a widespread basis requires a substantial investment in, and network of, co-location sites, along with other network equipment and facilities necessary to connect loops to switching facilities. The provisioning of such a network can also require a significant period of time. These factors combined to delay the proportion of competitor retail lines provisioned using leased loops which grew from 20% of total lines in 1999 to 36% in 2001, with roughly offsetting reductions in the proportion served through pure resale.

Looking at 2001 versus 2000, the share of competitor retail lines provisioned over owned and leased facilities rose in 2001 while resale lines declined. This shift is partly explained by difficult market conditions that forced some competitors that were more reliant on resold facilities out of business.

Leased and wholesale lines provisioned by facilities-based incumbents and competitors, along with associated revenues, are set out in Tables 4.15 and 4.16 below.

Table 4.15
Local Wholesale Revenues³³
(\$ millions)

	1998	1999	2000	2001	CAGR
Incumbents	363	464	452	541	14.2%
Competitors	6	8	31	31	74.3%
Total	369	472	483	572	15.7%

Source: CRTC 2002 Data Collection

Table 4.16
Local Wholesale Lines
(000s)

	1998	1999	2000	2001	CAGR
Incumbents	266	288	316	333	7.7%
Competitors	9	42	85	93	113.9%
Total	276	331	401	426	15.6%

Source: CRTC 2002 Data Collection

After growing by approximately 21% in 2000, total wholesale lines increased by over 6% in 2001 with one of the contributing factors being the competitor business failures. Notwithstanding the overall decline in wholesale lines, however, competitors increased the number of wholesale lines they provisioned by 9%, maintaining their share of total wholesale lines at 21% in 2001.

Competitor wholesale revenues remained essentially flat in 2001, resulting in a decline in competitors' share of wholesale revenues from 6.3% in 2000 to 5.4% in 2001. The 18% growth in overall wholesale market revenues in 2001 shown in Table 4.15 was driven by a number of factors, most notably interconnection revenues. Details are shown in Table 4.17 below.

Table 4.17
Local Wholesale Revenues by Major Component
(\$ millions)

	1998	1999	2000	2001	CAGR
Centrex Resale	79	105	112	160	26.2%
Service Charges	62	74	105	90	13.3%
Interconnection *	198	227	226	263	9.9%
Local Loops	30	66	40	60	26.0%
Total	369	472	483	572	15.7%

Source: CRTC 2002 Data Collection

* Includes Switching and Aggregation and other interconnection revenues.

³³ Revenues include sales to affiliated and non-affiliated companies.

Market Share by Province

Some of the major incumbents have begun to compete in the traditional operating territories of other incumbents. The following table shows the major incumbents' share of local lines (including wholesale to affiliates) by province. For the purpose of this table, the incumbents' out-of-territory local operations are classified as competitors.

Table 4.18
Major Incumbent Local Market Share by Province (Lines)

	2000	2001
British Columbia	97.29%	97.20%
Alberta	97.36%	96.46%
Saskatchewan	100.00%	99.98%
Manitoba	98.67%	98.23%
Ontario	94.24%	94.39%
Quebec	97.63%	96.93%
New Brunswick	99.84%	99.81%
Nova Scotia	99.17%	94.91%
Prince Edward Island	100.00%	99.50%
Newfoundland and Labrador	98.88%	98.05%

Source: CRTC 2002 Data Collection

4.5 Internet Access

Overview

The Internet is an amalgam of more than 13,000³⁴ separately-administered networks which, by operating a common connectivity-layer networking protocol and adhering to a common addressing system, can move packets to destinations located behind any of their counterparts. To be on the Internet is therefore to connect to some network; every entity on the Internet—whether individual user, corporate customer or ISP—must access "the Internet" through another entity.

Internet access involves connecting to a provider that will move one's packets to and from other Internet destinations; the provider acts as an interface with the rest of the Internet. Although Canada first connected to the Internet in 1981,³⁵ a rudimentary market in Internet access did not develop until 1991, following the Internet's gradual conversion to a general-purpose networking platform. By the end of 2001, retail Internet access had become a \$2 billion market in Canada, registering an average annual growth rate of 72% during the 1998 to 2001 period.

Internet access is the provision of an Internet Protocol (IP) connection to an end user, allowing that user to exchange traffic with other Internet locations by means of a common addressing system. The applications deployed at the endpoints—for example, a Web browser at one end, and a Web server at the other—are, from a market standpoint, relatively transparent to the access provider. Distinct end-user markets in Internet applications have been slower to develop. In 2001, retail Internet access accounted for 82% of the retail Internet revenues realized by telecommunications providers, against less than 10% of revenues from billed Internet applications, such as e-mail services, web hosting and video-over-IP.³⁶

Table 4.19
Internet Access Revenues (Retail)
(\$ millions)

	1998	1999	2000	2001	CAGR
Residential	325.5	556.4	974.7	1,461.9	65%
Business	67.2	221.3	318.5	530.0	99%
Total Internet Access	392.7	777.6	1,293.1	1,991.9	72%
Internet Access as Proportion of End-User Telecom Revenues	2%	4%	6%	9%	

Source: CRTC 2002 Data Collection

Note:

"End-user telecom revenues" includes retail long distance, local voice, Internet access and mobile revenues.

³⁴ Approximately 12,200 individual Autonomous System Numbers (ASNs) had been assigned at the end of 2001. For additional data see Geoff Huston, *BGP Table Analyzer*, at <http://bgp.potaroo.net/as4637/>.

³⁵ CA*net Institute, *A Nation Goes Online* (Ottawa: CANARIE/Friesens, 2001).

³⁶ Source: CRTC 2002 Data Collection.

In 2001, the majority of Internet access revenues was, as in previous years, from residential subscribers. From 1999, business Internet access revenues stayed relatively constant, tending towards 25% of the Internet access market. Overall, however, the Internet access market increased as a portion of total end-user telecommunications industry revenues from 2% in 1998 to 9% in 2001.

As a network service, Internet access must be provided over some physical network facility. Because certain companies operated compatible network facilities to serve other communications markets prior to entering the Internet access market, this report distinguishes between three groups of service providers - incumbent telephone companies (telco incumbents), cable incumbents, and non-incumbents.³⁷

As shown in Table 4.20, between 1998 and 2001, cable incumbents increased their share of Internet access revenues from 14% to 31%. Telco incumbents gained 3% of the market during this period, rising to 39% of revenues, while non-incumbents' share fell from 50% to 30% of Internet access revenues.

Table 4.20
Internet Access Revenues (Retail) By Company Type
(\$ millions)

	1998	1999	2000	2001	Growth 2000-2001
Telco Incumbents	141.7	333.2	443.8	778.8	75%
Cable Incumbents	54.9	145.4	331.7	609.7	84%
Non-Incumbents	196.1	299.1	517.6	603.4	17%
Total	392.7	777.6	1,293.1	1,991.9	54%
Non-Incumbent Share	50%	38%	40%	30%	

Source: CRTC 2002 Data Collection

Residential Internet access subscriptions show a similar pattern: cable incumbents registered the strongest growth (66% between 2000 and 2001); telco incumbents lost market share but still had the largest number of subscribers (43% of all residential subscriptions at the end of 2001); and non-incumbents had fallen from 62% of residential subscribers in 1998 to 28% in 2001.³⁸ The four largest market participants had 51% of all residential Internet subscribers in Canada; the eight largest totalled 72% of the market.³⁹

³⁷ Non-incumbents may range from very large facilities-based competitors to small, non-facilities-based Internet access providers.

³⁸ Source: CRTC 2002 Data Collection.

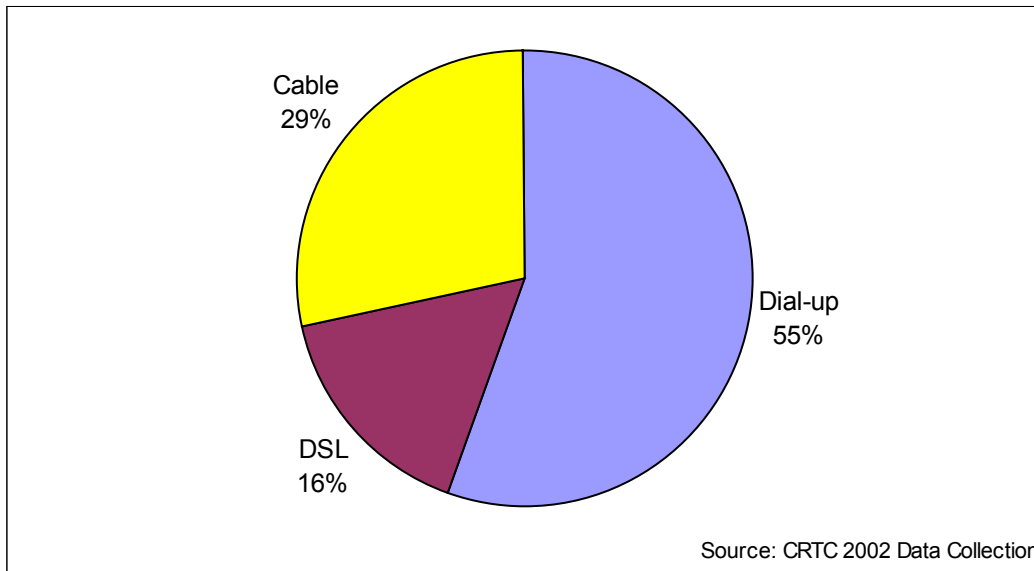
³⁹ Source: CRTC 2002 Data Collection. Excludes free subscriptions. The four largest, by retail subscriptions, were Bell Canada, Rogers, Shaw and TELUS. The eight largest also included Aliant Telecom, AOL Canada Inc., Inter.net Canada and Vidéotron.

Intermodal Competition

Competition in the Internet access market is underpinned by a form of intermodal competition staged largely between incumbent technologies. Prior investment by telco and cable incumbents in copper access infrastructure, and the resulting ease of access by consumers to this infrastructure, gave these incumbents a competitive advantage. Internet access penetration grew quickly based on installed telco and cable plant. From 2.6 million households in 1998, approximately 5.7 million Canadian households had at least one Internet subscription at the end of 2001, representing 29% average annual growth over the four year period. In sum, three in five Canadians (7.2 million households) had at least one member who used the Internet regularly, either from home, work, school, a public library, or other locations.⁴⁰

This tendency carried over to "high-speed" Internet access which, under prevailing market conditions, was defined according to access speeds above 64 Kilobits per second (Kbps).⁴¹ From late 1996, when cable and digital subscriber loop (DSL) Internet access were first offered, high-speed access had risen by the end of 2001 to 45% of residential subscriptions in Canada as shown in Figure 4.22.

Figure 4.22
Residential Subscriptions (2001)



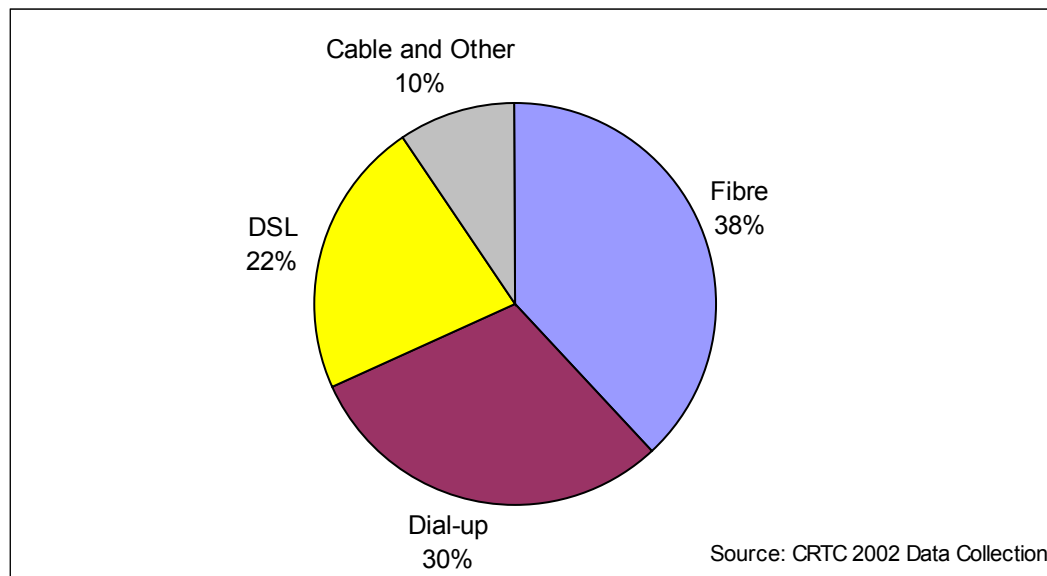
⁴⁰ Statistics Canada, "Household Internet Use Survey 2001". *The Daily*, 25 July 2002.

⁴¹ At the end of 2001, the theoretical maximum speed of most popular modems was 56 kbps; in fact, the practical maximum speed was several kbps lower.

Residential Internet access subscriptions usually consist of a single Internet address and are often associated with a household. Accordingly, the number of subscriptions provides a useful way to gauge Internet access penetration, whether on a company-by-company or technology-by-technology basis. Business Internet access subscriptions, on the other hand, often involve more complex purchases, including multiple Internet addresses, substantially higher bandwidth, and other features which facilitate Internet access for a multi-user environment. Revenues are therefore a more reliable measure for comparing business Internet access market information.

Figure 4.23 displays business Internet access subscription revenues according to the facilities over which they were carried: twisted-pair copper (dial-up and DSL), and fibre, over which dedicated Internet access is typically achieved in conjunction with ATM, Frame Relay, Ethernet, or other data link protocols. Other revenues include ISDN and cable access subscriptions.

Figure 4.23
Internet Access Business Revenues (2001)



Both residential and business sectors reflect a movement toward higher-speed access. In the case of business, dial-up revenues fell from 56% of business access revenues in 1998 to 30% in 2001. For residential, dial-up subscriptions fell from 93% of residential access subscriptions in 1998 to 55% in 2001.⁴² While residential Internet access depends almost entirely on dial-up, DSL or cable (Internet access modes based on already-existing copper plant), business access makes significant use of fibre which, regardless of whether provided by a telco or cable incumbent, represents additional investment beyond legacy copper.

⁴² Source: CRTC 2002 Data Collection.

In Table 4.21, the high proportion of incumbent-plant-dependent revenues underscores the weight of the residential segment in overall facilities investment. While the sustained movement from telco to cable plant appears to underscore this intermodal competition between incumbent plant infrastructures, a significant portion of this movement is linked to the migration toward high speed and away from telco plant dial-up access.

Table 4.21
Internet Access Revenues By Access Medium
(\$ millions)

	1998	1999	2000	2001
Dial-up	318.9	482.5	683.2	799.1
Cable	40.2	127.2	315.7	566.0
DSL	7.9	60.9	142.9	379.9
Fibre	18.3	79.2	108.1	201.9
Other	7.4	27.8	43.2	45.0
Total	392.7	777.6	1,293.1	1,991.9
Telco Plant	85%	73%	67%	61%
Cable Plant	10%	16%	24%	28%

Source: CRTC 2002 Data Collection

Narrowband

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."⁴³ More than 97% of access lines already met this objective in 1999.⁴⁴

By the end of 2001, dial-up Internet access was a \$799 million submarket (40% of the Internet access market). The non-incumbents held nearly 50% of dial-up subscriptions and telco incumbents nearly 49%. Approximately 3.1 million Canadians subscribed to the Internet using paid dial-up access, accounting for 55% of residential Internet subscriptions.⁴⁵

Table 4.22
Dial-Up Internet Subscriptions (Residential)

	1998	1999	2000	2001	CAGR
Dial-up subscriptions (millions)	2.4	2.8	3.0	3.1	9%
Percent of residential subscriptions	93%	83%	69%	55%	-16%

Source: CRTC 2002 Data Collection

⁴³ *Telephone service to high-cost serving areas*, Telecom Decision CRTC 99-16, 19 October 1999.

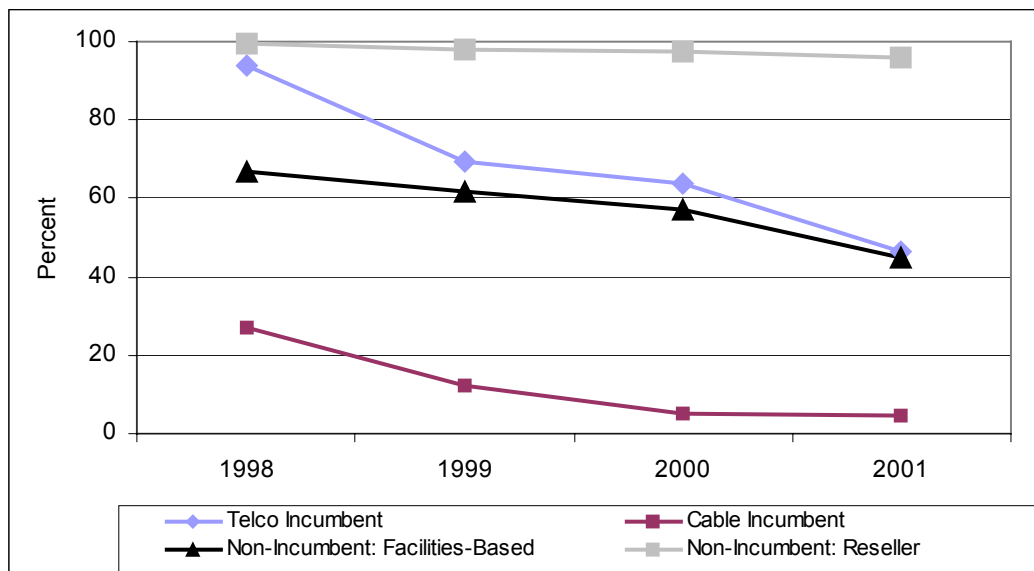
⁴⁴ By 2002, the CRTC had reviewed or approved service improvement plans for all telephone incumbents to work towards achieving this objective.

⁴⁵ Source: CRTC 2002 Data Collection.

Despite an increase in 2001 of some 180,000 (6%) dial-up subscriptions over the previous year, as previously noted, there has been a steady migration from dial-up to dedicated access modes, such as cable or DSL. The percent of residential dial-up Internet access subscriptions to total residential subscriptions fell, on average, by 16% annually from 1998 to 2001. A private study commissioned by Industry Canada in early 2002 estimated that, at the end of 2001, Canada had 940 ISPs, of which 76% (740) offered dial-up and 82% (771) offered high-speed Internet access.⁴⁶

In 1998, dial-up was the dominant mode of Internet access, representing 76% of total Internet access revenues, and the majority of Internet access providers depended heavily upon it. As shown in Figure 4.24, telco incumbents have diversified their Internet access revenue streams such that their revenues from dial-up, which were 94% of their Internet access revenues in 1998, decreased to 47% in 2001. Cable incumbents received just 5% of their revenues from dial-up in 2001, while non-incumbent facilities-based providers received only 45%. Non-incumbent resellers, on the other hand, derived 96% of their 2001 Internet access revenues from dial-up.

Figure 4.24
Dial-Up Revenues as Proportion of Total Internet Access Revenues



Source: CRTC 2002 Data Collection

The decreasing rate of growth for dial-up Internet access does not necessarily imply its disappearance. Indeed, in some ways, dial-up Internet access appeared to be taking on a new role as a secondary or back-up access method. In particular, high-speed access providers offered dial-up numbers for customers roaming with laptops when they were unable to access their fixed connections.

⁴⁶ Pollara, *Industry Framework of Internet Service Providers* (Ottawa: Pollara Inc., 2002).

At the same time, alternative means for addressing the demand for a secondary, roaming access method have been gradually introduced to the marketplace. Canadian mobile providers were among the first to market PC-card-based wireless Internet access via so-called 2.5G (GPRS, 1xRTT CDMA) protocols. In addition, plans emerged in 2002 to deploy so-called "Wi-Fi" (802.11 family) wireless network access points at locations such as cafés⁴⁷ and airports⁴⁸ as well as on a community⁴⁹ level. This indicates a growing portion of private sector resources devoted to developing technical and commercial private-sector models for wireless and roaming Internet provision.

High-Speed

At the end of 2001, 1.6 million Canadian households subscribed to Internet access via cable, 924,000 via DSL, and another 9,000 by other means, especially fixed wireless.⁵⁰ Together these 2.5 million high-speed subscriptions accounted for roughly 45% of residential Internet subscriptions, and for nearly 20% of Canadians - a rate of adoption exceeded only by South Korea, according to the Organization for Economic Co-Operation and Development (OECD).⁵¹ Alongside these residential subscribers were nearly 200,000 small, medium, and large businesses whose high-speed Internet access expenditure in 2001 was led by fibre (54% of high-speed revenues) and DSL (32% of high-speed revenues).

Table 4.23
High-Speed Internet Access Revenue Shares

	1998	1999	2000	2001	Residential (2001)
Telco Incumbent	12%	34%	26%	35%	62%
Cable Incumbent	54%	43%	52%	49%	95%
Non-Incumbent	34%	22%	22%	16%	5%

Source: CRTC 2002 Data Collection

Note: "Residential (2001)" refers to the proportion of high-speed Internet access revenues which were generated by residential subscribers.

Retail high-speed Internet service revenues in 2001 were \$1.19 billion, or 60% of overall \$2 billion Internet access revenues. This was up from 47% in 2000, which made 2001 the first year in which high-speed access revenues exceeded narrowband Internet access revenues.⁵²

⁴⁷ For example, Starbucks Co.'s relationship with T-Mobile. See Starbucks, *High-Speed Wireless Internet Access*, at www.starbucks.com/retail/wireless.asp.

⁴⁸ See, for example, "Boingo Wireless and Wayport Promote Wi-Fi Adoption in Seattle and Dallas Airports," at www.wayport.net/press/78.

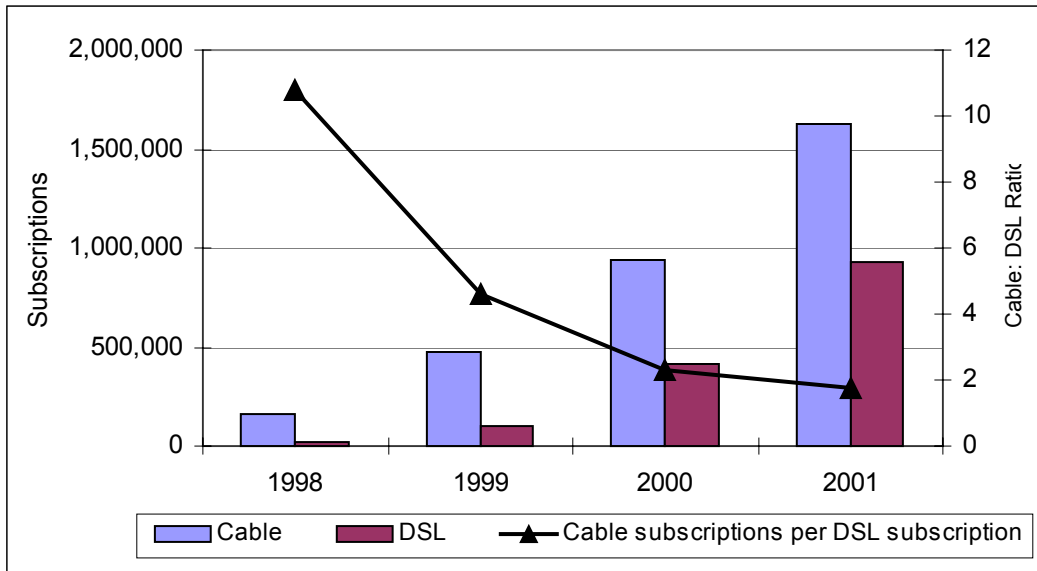
⁴⁹ See, for example, Boingo, at www.boingo.com.

⁵⁰ Source: CRTC 2002 Data Collection.

⁵¹ OECD, *The Development of Broadband Access in OECD Countries* (Paris: OECD, 2001).

⁵² Source: CRTC 2002 Data Collection.

Figure 4.25
Residential High-Speed Subscriptions, 1998-2001



Source: CRTC 2002 Data Collection

While cable subscriptions continued to exceed DSL subscriptions in 2001, DSL continued to narrow the gap (Figure 4.25). Although cable incumbents had the greater share of the high-speed subscriber base, telco incumbents continued to enjoy greater market share in terms of overall Internet access revenues. One reason for the telco incumbents' higher revenues is a substantially higher base in the dial-up sector. The other reason is the proportion of DSL business customers. Business subscribers for DSL access service accounted for 14% of all DSL subscribers in 2001 and 31% of DSL revenues. For cable incumbents, business subscribers accounted for 1% of subscriptions and 2% of revenues.

On the residential side, cable and DSL accounted for virtually all residential high-speed Internet access accounts and revenue. While non-incumbents had a noticeable proportion of high-speed Internet access revenues, as Table 4.23 shows, nearly all of these revenues, and corresponding subscriptions, fell into the business segment. While several fixed-wireless Internet access providers either entered the market or maintained ongoing activities in 2001, these providers took in less than 1% of all residential high-speed Internet access revenues.

Third-party Internet access and resale are alternative means for non-incumbent market entry. Non-incumbents and dial-up providers, attempting to extend their business models by using incumbent networks to sell higher-speed access, find themselves in a situation where the incumbents are their competitors as well as the dominant suppliers of the facilities they require in order to compete. In response to these market conditions, the CRTC mandated third-party access both to DSL and to cable facilities.

In 2001, certain aspects of third-party Internet access remained the subject of ongoing CRTC proceedings or CRTC-industry working groups. At the end of 2000, 60 providers had registered with the CRTC as resellers of high-speed Internet service, such as DSL or cable Internet; by the end of 2001, this number had increased to 81.⁵³

Registered DSL Service Providers are entitled to unbundled loop access and equipment location at the same rates and conditions provided to CLECs, so long as switched voice is not provided. DSL service provider registrations grew less quickly, standing at four non-incumbent-owned companies at the end of 2000, and seven by the end of 2001. At the end of 2001, non-incumbent resellers held just under 3% of the market share for residential DSL Internet access.⁵⁴

⁵³ Registration with the CRTC allows the Carrier Services Groups of regulated incumbents to authenticate resellers requesting confidential information for transaction purposes. Registration is therefore not a gauge of actual market activity, but rather of interest on the part of market participants.

⁵⁴ Source: CRTC 2002 Data Collection.

4.6 Mobile and Paging

Overview

The mobile industry in Canada has evolved considerably since its inception in the mid-1980s. Initially, it comprised two companies in each market (Rogers and the local incumbent telephone company) providing analog service to a small portion of their territory. Today, the coverage has expanded considerably, on both analog and digital platforms. Service is provided by four national carriers and several regional ones.

The four national carriers are Rogers Wireless, TELUS, Microcell and the Bell Wireless Alliance (BWA).⁵⁵ Regional carriers are found in the provinces of Ontario, Quebec and British Columbia. The Commission does not regulate mobile service rates since the market is sufficiently competitive.

As shown in Table 4.24, the total operating revenues for mobile and paging steadily increased from 1998 to 2001 at an average annual growth rate of 14%. Long distance revenues were approximately 8% of the total each year from 1998 to 2001.

Table 4.24
Total Mobile and Paging Operating Revenues
(\$ millions)

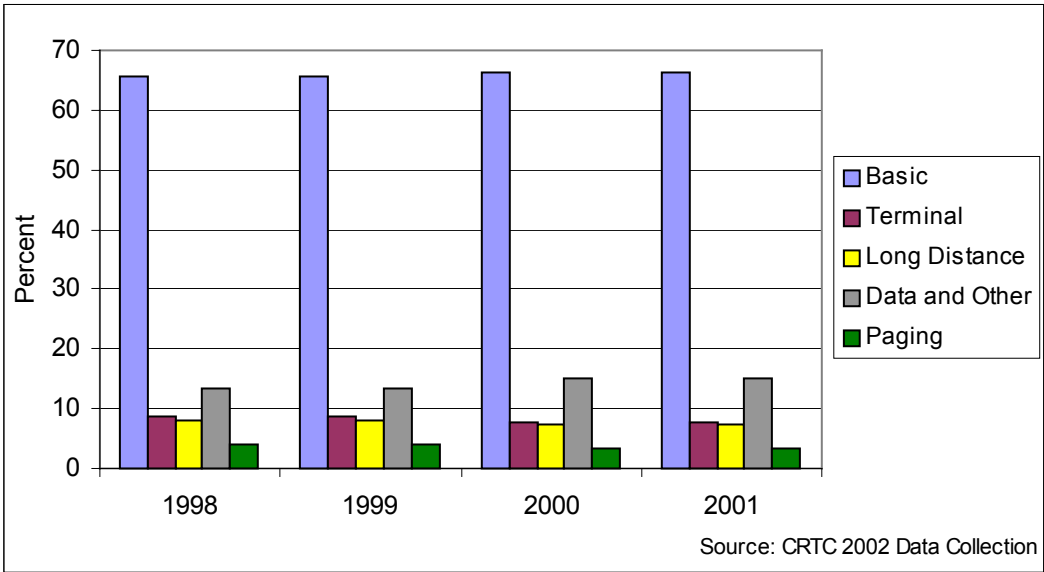
	1998	1999	2000	2001	CAGR
Local	4,199	4,579	5,366	6,278	14.3%
Long Distance	363	399	459	494	10.8%
Total	4,562	4,978	5,825	6,772	14.1%

Source: CRTC 2002 Data Collection

From 1998 to 2001, the percentage of mobile and paging revenues attributable to Basic Voice Packages remained relatively constant at just below 70% of the total. Revenues from Paging and Terminal equipment declined over the same period, while revenues generated by Mobile Data and Other increased, as illustrated in Figure 4.26.

⁵⁵ The Bell Wireless Alliance includes Bell Mobility, Aliant Telecom, SaskTel, MTS, Northwestel Mobility, Télébec Mobilité and NorTel (Northern) Mobility.

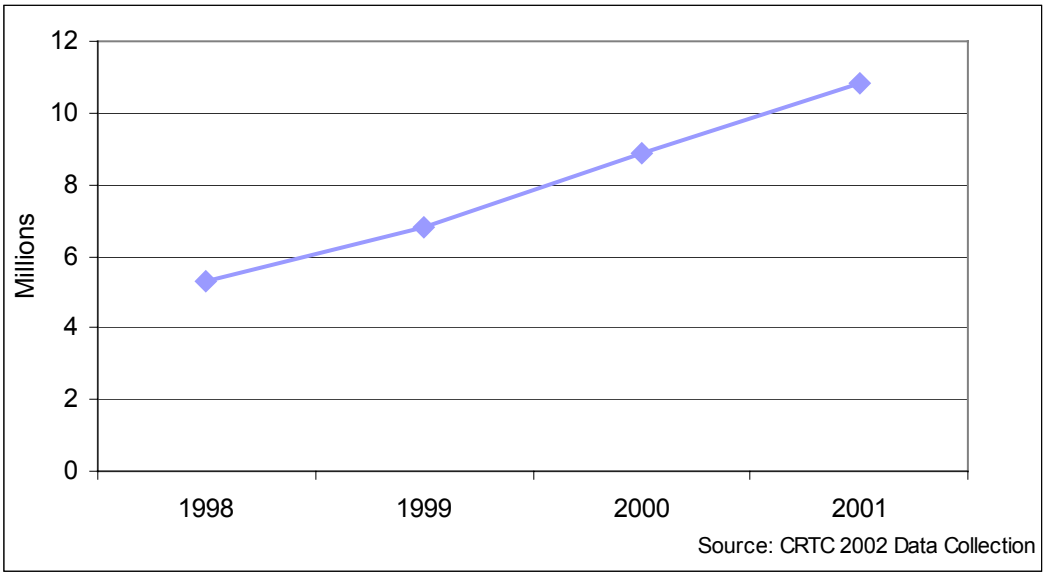
Figure 4.26
Mobile and Paging Operating Revenues
By Major Component



Mobile

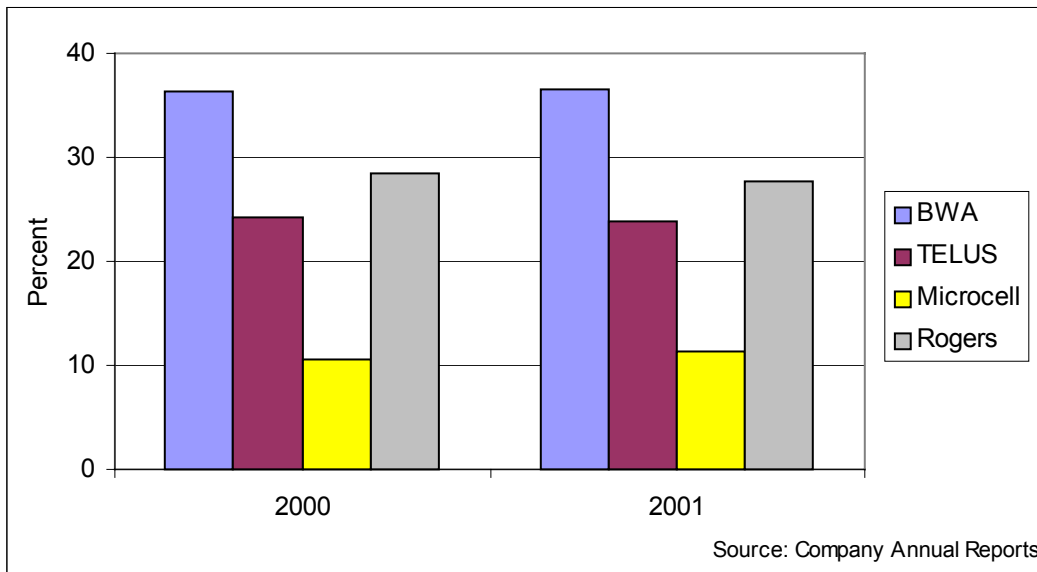
Figure 4.27 shows subscriber growth in the mobile industry. The annual average growth for the period from 1998 to 2001 was 26%.

Figure 4.27
Number of Subscribers

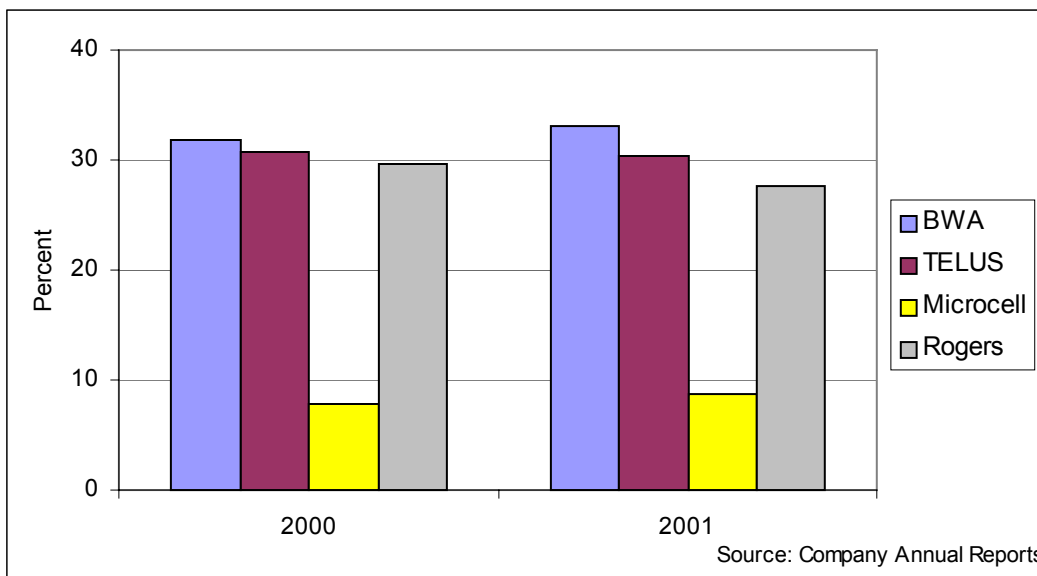


In terms of subscribers and revenues, the four major mobile entities accounted for over 99% of the market in both 2000 and 2001. As shown in Figures 4.28 and 4.29, there is no dominant mobile carrier in Canada. Because each entity offers the same basic suite of services, consumer choice is based on other considerations, such as pricing plans, service options and accessories (handsets).

**Figure 4.28
Market Share (Subscribers)**



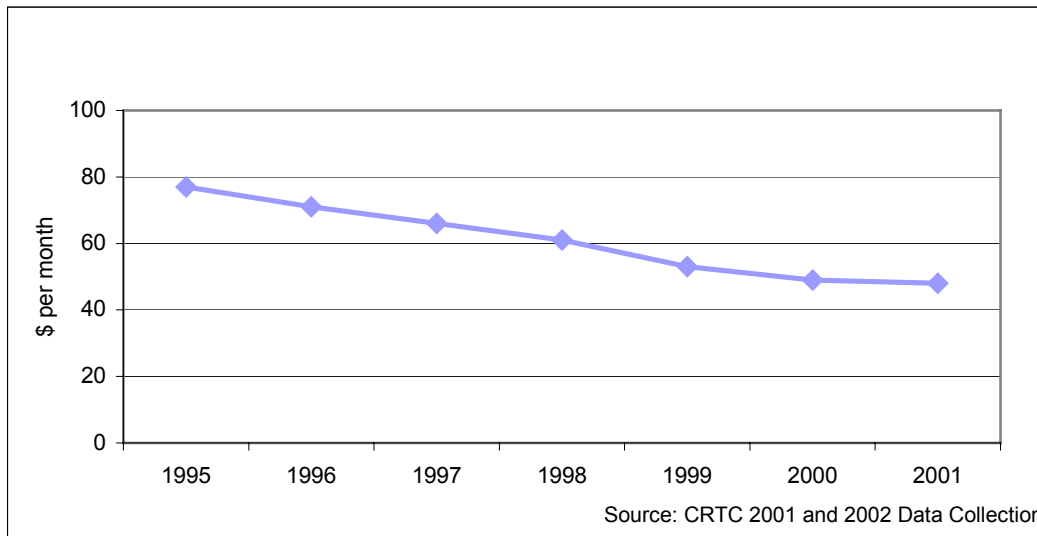
**Figure 4.29
Market Share (Revenues)**



Pricing Plans

Although average revenue per subscriber (ARPU) is not a pure measure of price, it can be used as a reasonably reliable proxy. As indicated in Figure 4.30, the industry ARPU has declined over the last several years. This decline is due to the introduction and growth in the use of pre-paid plans, and the overall reduction in prices.

Figure 4.30
Average Revenue Per Unit (Subscribers)



A wide variety of pricing plans can be found in the industry. These plans can include any or all of the following: anytime minute packages, packages with evenings and/or weekend options, calling features, long distance plans, plans with or without a handset, and shared multi-phone packages.

Each service provider offers both pre-paid and post-paid plans. The percent of pre-paid subscribers has increased from 6% of total subscribers in 1998 to 26% in 2001.⁵⁶ Figure 4.31 shows the wide variance in the portion of pre-paid and post-paid subscribers amongst the major service providers in 2001.⁵⁷

⁵⁶ Source: CRTC 2002 Data Collection.

⁵⁷ Bell Mobility figures used instead of BWA.

Figure 4.31
Percent of Pre-paid and Post-paid Subscribers by Company (2001)

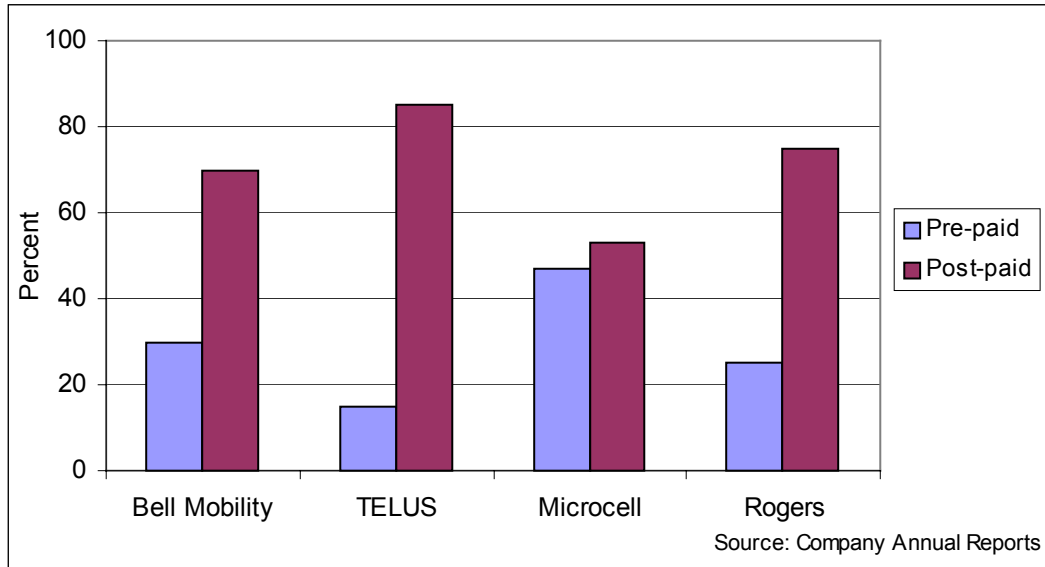
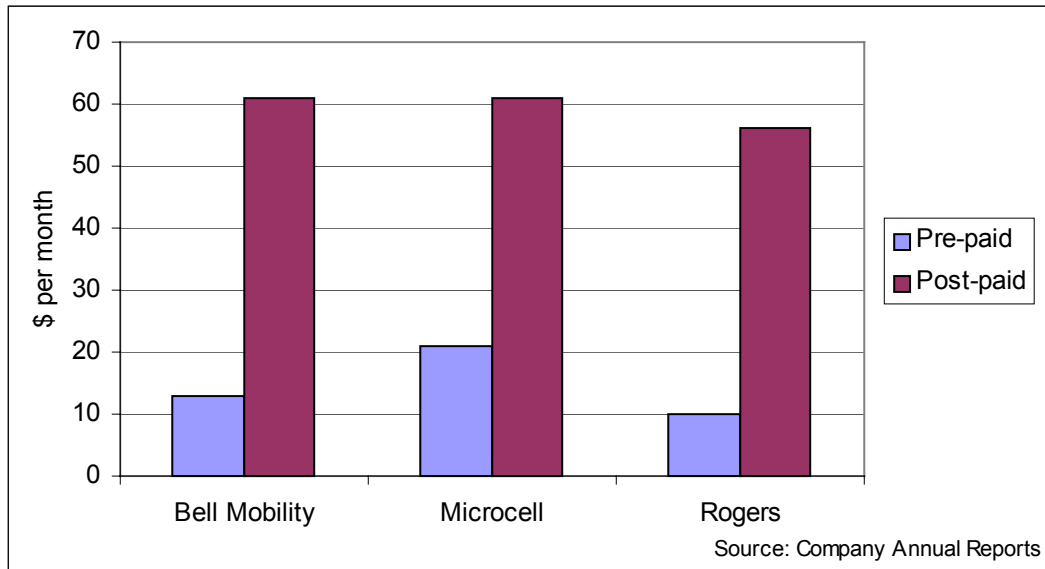


Figure 4.32 provides the ARPU on a pre-paid and post-paid basis for 2001 for three of the major service providers.⁵⁸ This graph shows the significant difference in ARPU between the two types of plans.

Figure 4.32
Pre-paid and Post-paid ARPU (2001)



⁵⁸ TELUS provided only a blended ARPU. Bell Mobility figures used instead of BWA.

Each national service provider initially offered only a post-paid service, under which subscribers entered into contracts for various services. The level of subscribers switching from one supplier to another (churn) was limited due to factors such as contract length and the lack of compatibility of platforms between suppliers. The introduction of pre-paid service in 1998, where contracts are not required, has increased the churn as indicated in the following table. In comparison to major U.S. companies, churn rates in Canada are generally lower.⁵⁹

**Table 4.25
Churn Rate (1998 to 2001)**

	1998	1999	2000	2001
Bell Mobility	1.4%	1.7%	1.5%	1.5%
Microcell	2.1%	2.1%	2.2%	2.6%
Rogers	1.9%	1.9%	2.4%	2.3%
TELUS	1.3%	1.6%	2.0%	2.0%

Source: Company Annual Reports.

Paging

The paging market has not experienced the same growth as the mobile market. The number of paging subscribers dropped by 2% from 2000 to 2001. Paging revenues also declined by 3.8% in 2001 over 2000. Total revenues at the end of 2001 were \$215 million, while total subscribers were 1.8 million.⁶⁰

Although many companies provided paging services, Bell Mobility, Rogers Wireless and TELUS dominated the market. Together, these three service providers accounted for approximately 90% of the paging revenues in both 2000 and 2001.

Mobile Coverage

By the end of 2001, mobile services covered approximately 95% of the Canadian population, through a combination of analog and digital technology.⁶¹ Personal Communications Services (PCS) coverage was not as widespread as analog, although the major carriers have plans to increase PCS coverage.

In October 2001, Bell Mobility, Aliant Telecom and TELUS agreed to expand their existing roaming and resale agreements. The expanded agreements cover services in the 1.9 GHz and 800 MHz (digital PCS) bands. As a result of the expanded agreements, the companies increased access to their advanced digital voice and data services, resulting in greater competition in rural areas.

⁵⁹ Source: DBRS – North American Wireless Industry Study (July 02), page 5. Churn rates for Q4 2001 for major U.S. wireless companies: Sprint PCS 3.0%, Cingular Wireless 3.1%, Verizon Wireless 2.7% and AT&T Wireless 2.7%.

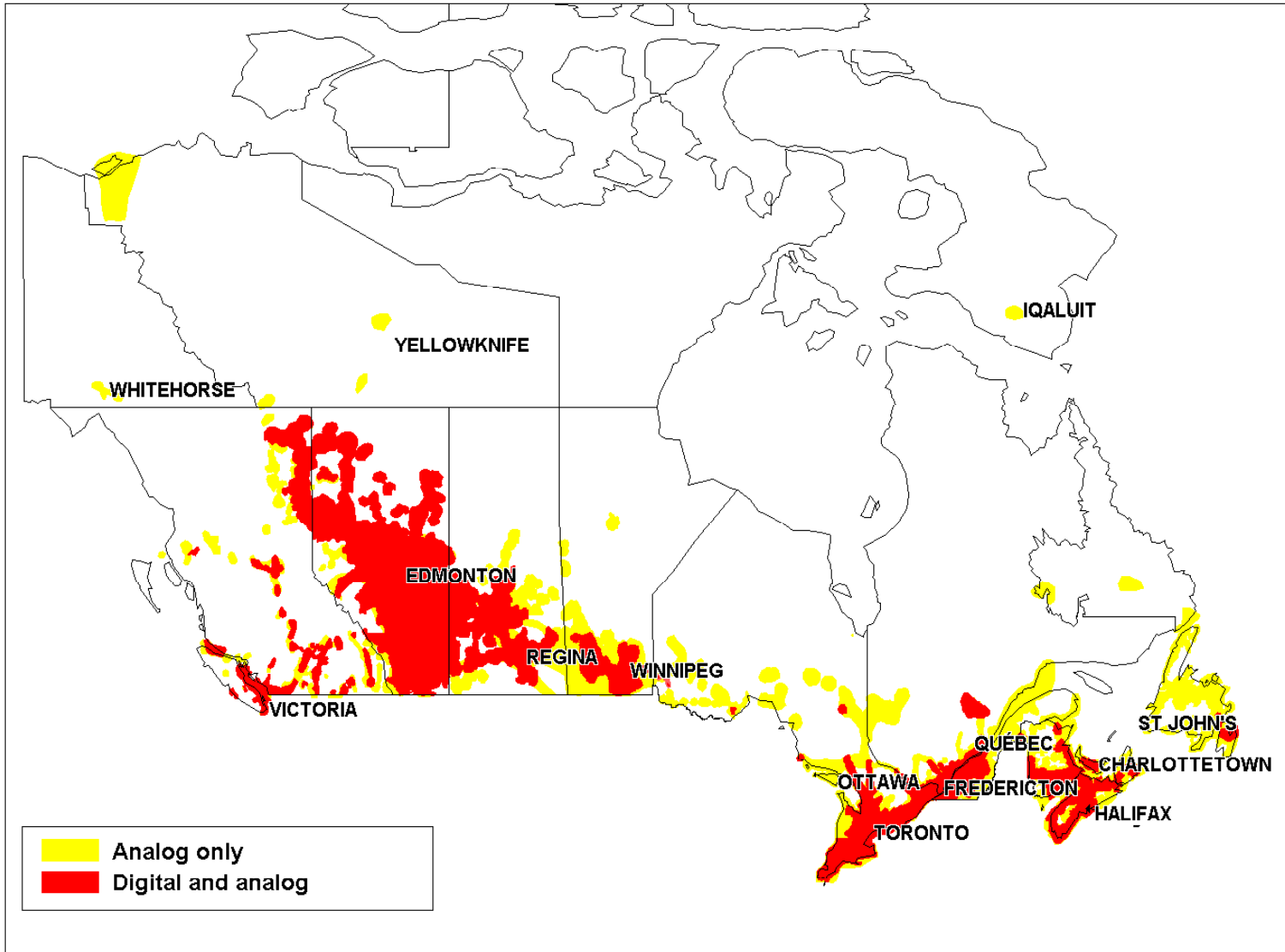
⁶⁰ Source: CRTC 2002 Data Collection.

⁶¹ OECD Reviews of Regulatory Reform, Canada (2002), page 103.

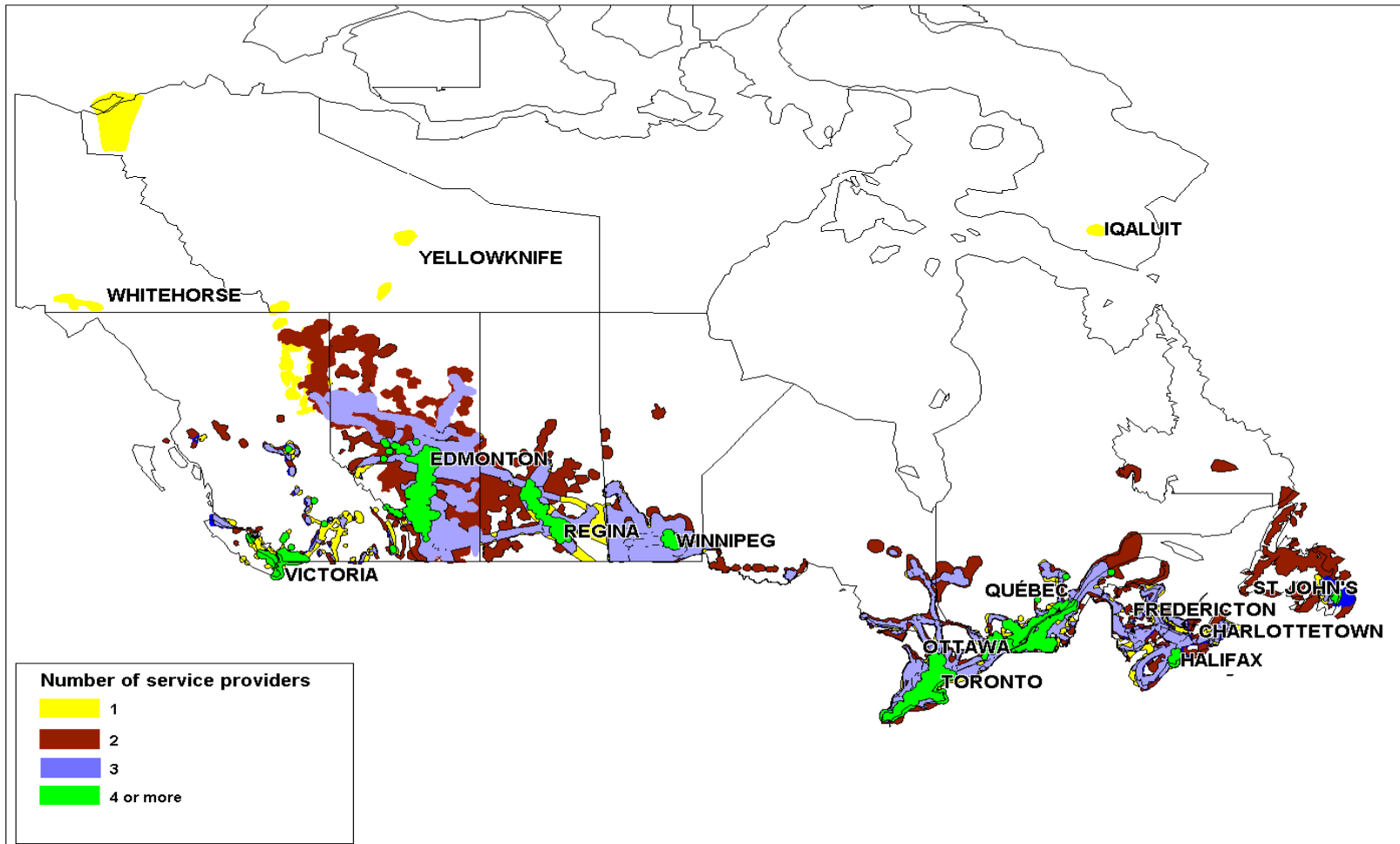
The following maps show mobile coverage across the country first by type of technology (digital/analog) and then by the number of service providers.⁶²

⁶² Source: CRTC 2002 Data Collection and information obtained from company websites.

National mobile coverage (digital and analog service)



Presence of mobile service providers



4.7 Data and Private Line

Overview

Competition was first permitted in the interconnected interexchange private line data market in 1979. The CRTC has since forborne from the regulation of much of the data services market as well as the private line services market on many interexchange routes.

Data and private line services combined represent one of the fastest growing segments of the telecommunications industry. With the rapid rate of technological developments in this segment of the industry, legacy data and analog services are being displaced by high-growth advanced data and private line services.

Data and private line services are provided by a growing number of players in the market. These include the large incumbent carriers, that account for over 75% of the market, as well as competitive service providers, both facilities and resale based, cable companies and, most recently, utility telcos. Data and private line services are marketed to end-customers in the retail market, as well as to other service providers as wholesale services.

Data services are used to provide access to, and connectivity between, local area data, video and voice networks to establish dedicated or virtual private networks (VPNs) within a metropolitan area or on a broader national or international scale, providing customers with managed local area network and wide area network services. Data services include X.25 (packet switched network), Frame Relay, Asynchronous Transfer Mode (ATM), IP-enabled Frame Relay (or IP-VPN) and Gigabit Ethernet.

This segment of the industry also includes intra-city and inter-city private line services, which provide the capability to link two or more locations over dedicated facilities for the purpose of transporting data, voice or video traffic. Private line services include high-capacity digital transmission services (at speeds ranging from 56/64 Kbps to gigabit speeds over fibre) and digital data systems, as well as voice grade and other analog services.

Table 4.26 provides an overall summary of incumbents' and competitors' annual data and private line revenues (including both retail and wholesale revenues) for the years 2000 and 2001. In 2001, industry data revenues reached close to \$1.2 billion, an increase of approximately 11% over last year. Private line revenues reached roughly \$2.7 billion in 2001, an increase of approximately 18% over the previous year.

**Table 4.26
Data and Private Line Revenues
(\$ millions)**

	2000	2001	Growth
Data			
Incumbents	694	762	9.7%
Competitors	363	406	11.9%
Total	1,057	1,167	10.5%
Private Line			
Incumbents	1,795	2,165	20.6%
Competitors	504	541	7.4%
Total	2,299	2,706	17.7%
Total			
Incumbents	2,489	2,926	17.6%
Competitors	867	947	9.3%
Total	3,356	3,873	15.4%

Source: CRTC 2002 Data Collection

Overall, competitors' data and private line revenues have grown more slowly than those of the incumbents, decreasing their share of industry data and private line revenues from 26% in 2000 to 24% as of 2001. In 2001, competitors accounted for 35% of the industry data revenues and 20% of private line revenues.

Data Services

For the purpose of this report, data services have been disaggregated into four categories: X.25, Frame Relay, ATM, and Other (including IP-VPN, Ethernet and other data services). A summary of industry-wide data service revenues for the years 2000 and 2001 for each of these four categories and in total is provided in Table 4.27. Data service revenues shown in the table below include both intra-city and inter-city services.

Table 4.27
Data Service Retail and Wholesale Revenues by
Service Category
(\$ millions)

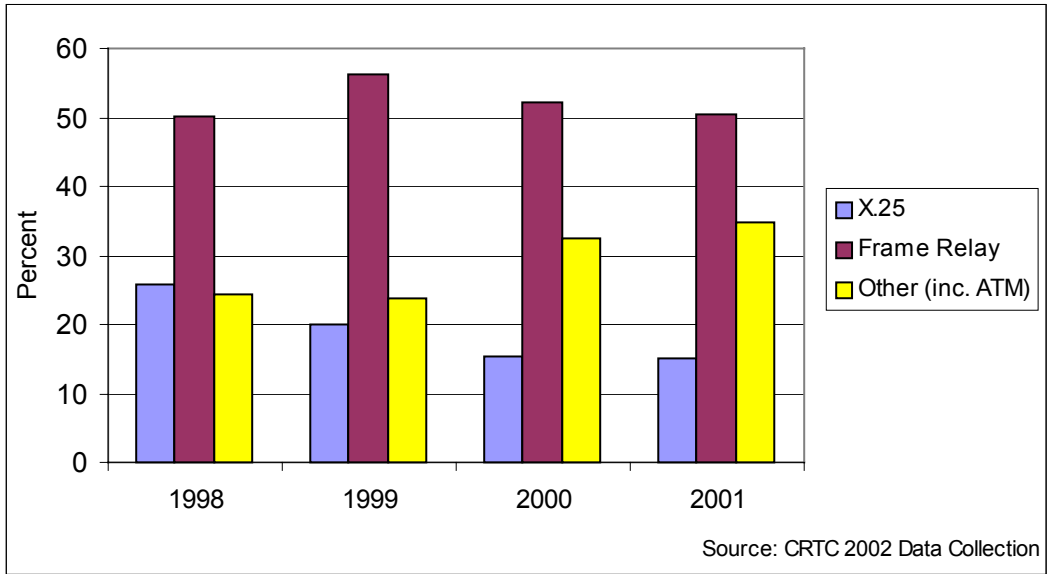
	2000	2001	<i>Growth</i>
X.25			
Retail	144	155	8.1%
Wholesale	18	19	5.0%
Total	162	175	7.8%
Frame Relay			
Retail	489	510	4.2%
Wholesale	63	78	24.0%
Total	552	588	6.5%
ATM			
Retail	65	94	45.6%
Wholesale	8	9	7.8%
Total	73	103	41.4%
Other			
Retail	140	200	43.1%
Wholesale	131	103	-21.5%
Total	271	303	11.9%
TOTAL			
Retail	837	959	14.6%
Wholesale	220	208	-5.2%
Total	1,057	1,167	10.5%

Source: CRTC 2002 Data Collection

As Table 4.27 illustrates, in 2001, total retail and wholesale data services revenues reached almost \$1.2 billion, representing an increase of approximately 11% over 2000. However, the growth rates of individual data service categories vary considerably.

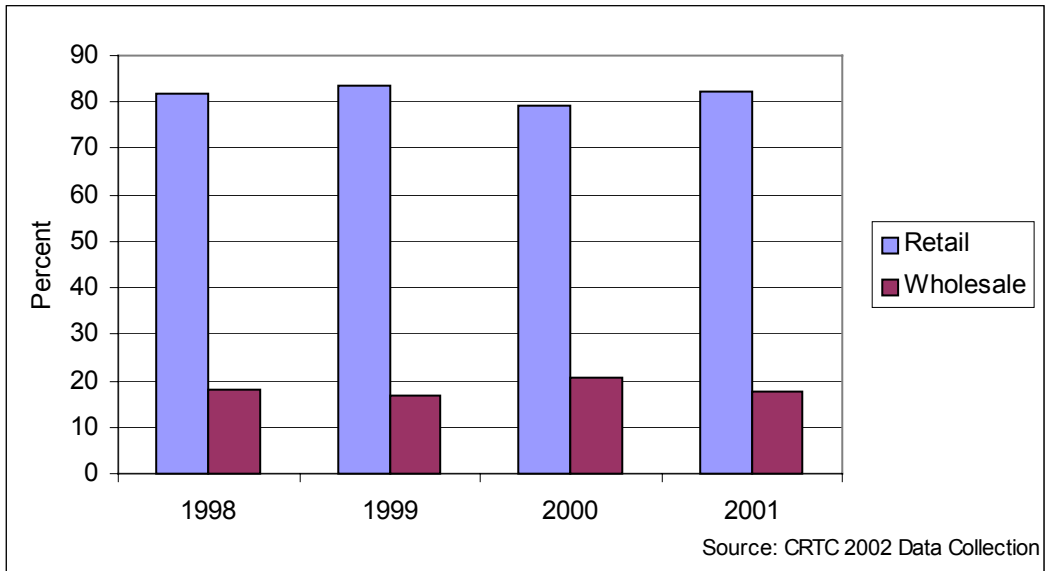
Due to the varying growth rates in specific data service revenues, the distribution of service revenues within the sector changed significantly between 1998 and 2001. As shown in Figure 4.33 below, the shares of revenues attributable to X.25 service declined, the share of Frame Relay revenues held relatively constant at approximately 50%, while the share of other data service revenues, including ATM, grew from roughly 25% in 1998 to 35% as of 2001.

Figure 4.33
Data Services
Revenue Distribution by Service Category



For all data services combined, wholesale revenues, as a percentage of overall revenues, remained relatively constant at about 20% from 1998 to 2001, as shown in Figure 4.34 below.

Figure 4.34
Retail and Wholesale Revenues
As a Percentage of Total Data Services Revenues



In terms of market share, incumbents account for about 65% of overall data service revenues in 2001, although there are cases in which competitors account for a significant market share of service-specific data revenues. Table 4.28 below provides a summary of the market shares of incumbents and competitors for each of the data services categories and data service in aggregate over the period 1998 to 2001.

Table 4.28
Market Shares by Data Service Category

	1998	1999	2000	2001
X.25				
Incumbents	93%	98%	100%	100%
Competitors	7%	2%	0%	0%
Frame Relay				
Incumbents	49%	50%	53%	54%
Competitors	51%	50%	47%	46%
Other (inc. ATM)				
Incumbents	68%	80%	70%	67%
Competitors	32%	20%	30%	33%
Total				
Incumbents	65%	67%	66%	65%
Competitors	35%	33%	34%	35%

Source: CRTC 2002 Data Collection

As Table 4.28 indicates, the incumbents account for virtually all of industry revenues associated with X.25 service. By contrast, competitors had a significant share of the revenues associated with the faster growing Frame Relay service market. They accounted for just under 50% of the Frame Relay market in 2001, although their share of this market has been declining slowly since 1998. On the other hand, the competitors' share of other data services (including ATM) has grown considerably over the last three years. Overall, competitors' share of the total data services market was 35% in 2001.

Figure 4.35 illustrates the trends in competitors' revenue shares of each segment of the data services market.

Figure 4.35
Competitor Revenue-based Market Shares
by Data Service Category

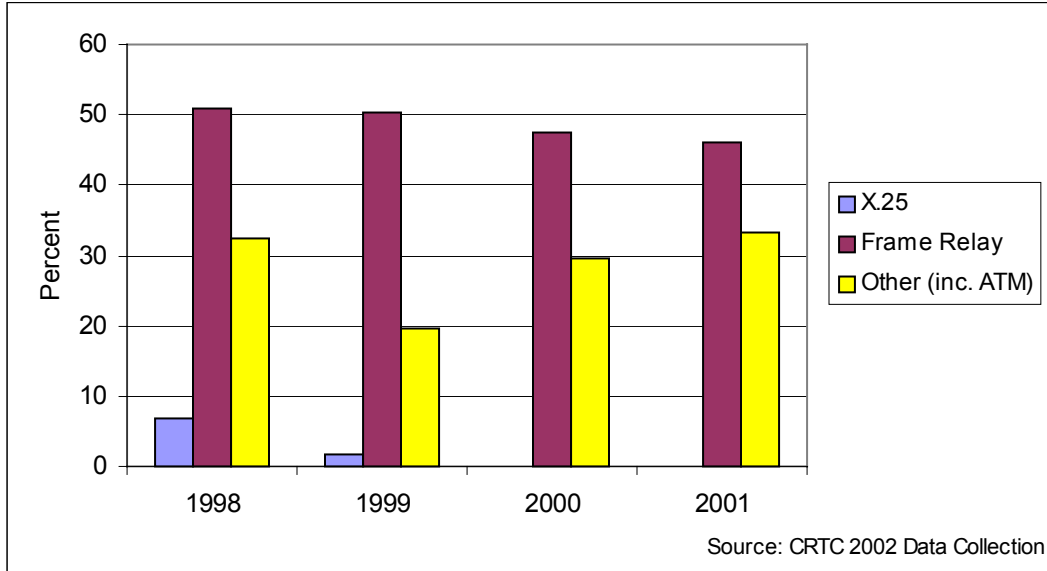
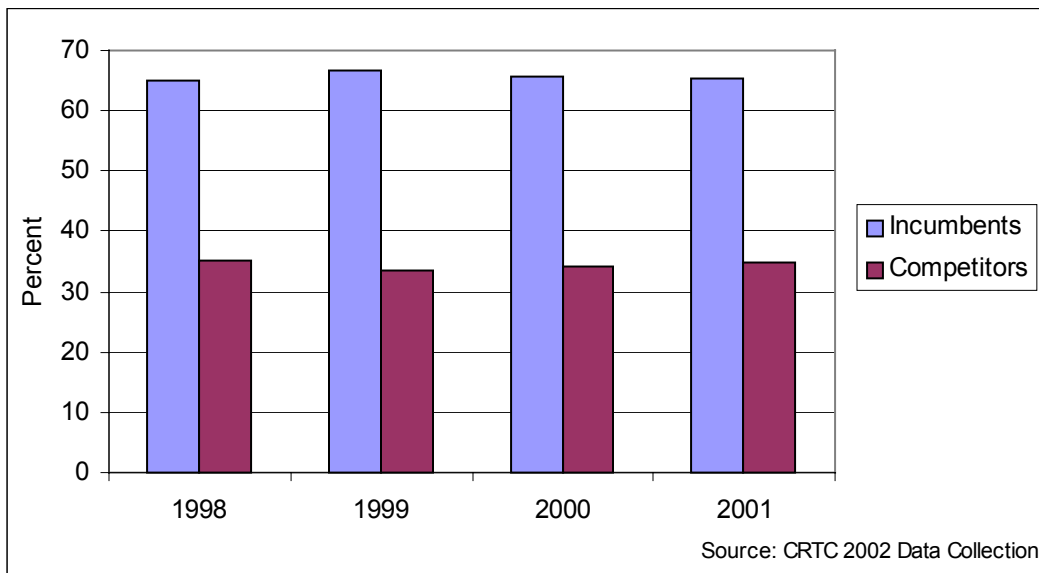


Figure 4.36 below illustrates the relative revenue shares of the overall data services market held by the incumbents and competitors.

Figure 4.36
Data Services
Revenue-based Market Shares



Private Line Services

Private line services have been disaggregated into two main categories: intra-city and inter-city private lines. A further breakdown of inter-city services into those provided over terrestrial facilities and satellite is also provided later in this section.

Table 4.29 provides a summary of industry-wide private line service revenues for the years 2000 and 2001 for intra-city, inter-city and total private line services.

Table 4.29
Private Line Service Retail and Wholesale Revenues
By Market Segment
(\$ millions)

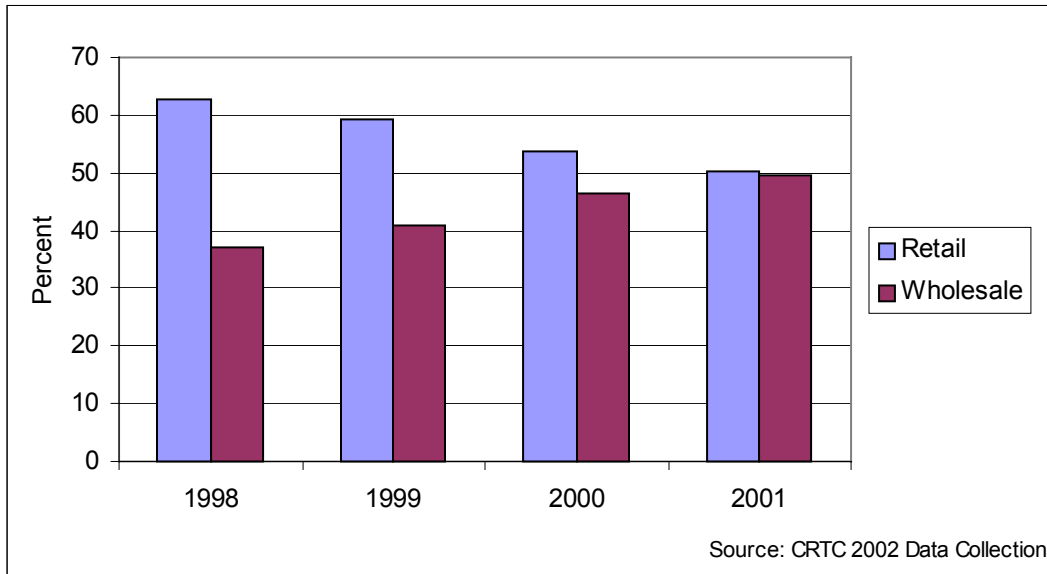
	2000	2001	<i>Growth</i>
Intra-city			
Retail	313	394	<i>25.9%</i>
Wholesale	352	486	<i>38.1%</i>
Total	665	880	<i>32.3%</i>
Inter-city			
Retail	922	971	<i>5.3%</i>
Wholesale	712	856	<i>20.2%</i>
Total	1,634	1,826	<i>11.8%</i>
Total			
Retail	1,235	1,364	<i>10.5%</i>
Wholesale	1,064	1,342	<i>26.1%</i>
Total	2,299	2,706	<i>17.7%</i>

Source: CRTC 2002 Data Collection

As shown in Table 4.29, total private line revenues reached \$2.7 billion in 2001, representing an increase of close to 18% over the previous year. The intra-city segment of the market grew faster than the inter-city market segment. The relative share of the private line revenues attributable to the intra-city market segment rose from under 29% to roughly 33% as of 2001.

The growth in wholesale private line service revenues, both in the intra-city and inter-city market segments, has been much faster than in the retail market segments. As shown in Table 4.29 above, intra-city private line service sales to other telecommunications service providers exceeded sales to end-customers, whereas wholesale inter-city sales revenues were less than retail inter-city sales revenues. Overall, as of 2001, total private line revenues are roughly equally split between the wholesale and retail market segments, as illustrated in Figure 4.37.

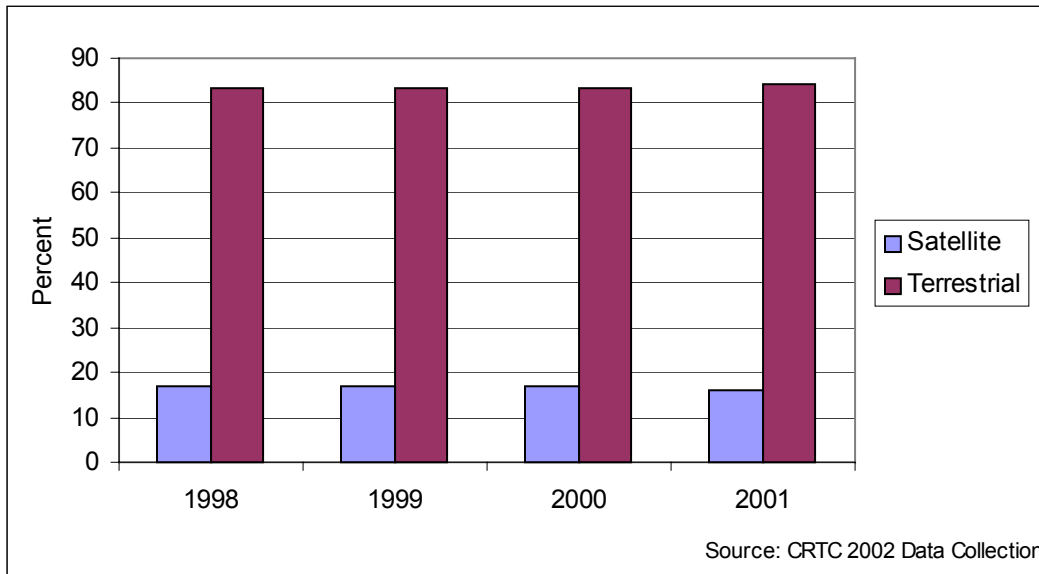
Figure 4.37
Private Line Service Revenue Distribution
Retail versus Wholesale



Inter-city private line services are provided over terrestrial facilities as well as via satellite (e.g., by Telesat).⁶³ The share of the total retail and wholesale private line services market provided via satellite has remained relatively constant at roughly 17% over the four-year period 1998 to 2001, as illustrated in Figure 4.38 below.

⁶³ Satellite-based private line services are primarily provided to retail customers, only a relatively small percentage of satellite-based private lines are provided to wholesale customers.

Figure 4.38
Inter-city Private Lines Services
Satellite versus Terrestrial Facilities



As in the case of data services, the incumbents account for approximately 80% of revenues in the private line market, as illustrated in Table 4.30, which provides a breakdown of incumbent and competitor revenue-based market shares in the private line market for the years 1998 to 2001.

Table 4.30
Private Line Service Revenues
Intra and Inter-city Market Shares

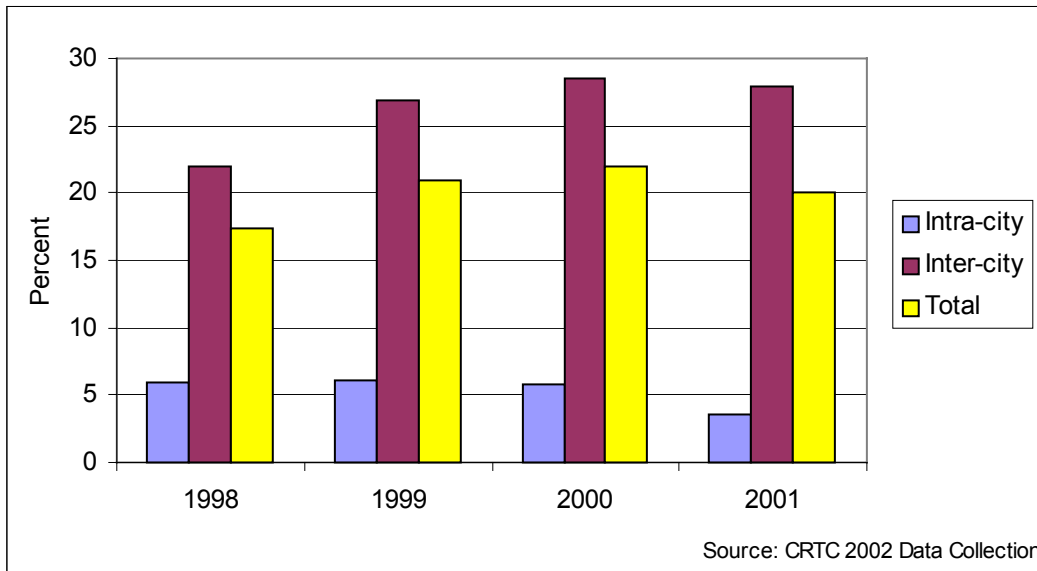
	1998	1999	2000	2001
Intra-city				
Incumbents	94%	94%	94%	96%
Competitors	6%	6%	6%	4%
Inter-city				
Incumbents	78%	73%	72%	72%
Competitors	22%	27%	28%	28%
Total				
Incumbents	83%	79%	78%	80%
Competitors	17%	21%	22%	20%

Source: CRTC 2002 Data Collection

As of 2001, competitors accounted for 20% of the total private line revenues. Competitors' share of intra-city private line revenues is much smaller at 4%, whereas their share of the inter-city market segment is higher at 28%. Overall, competitors' share of the market dipped slightly in 2001, but remains slightly higher than in 1998.

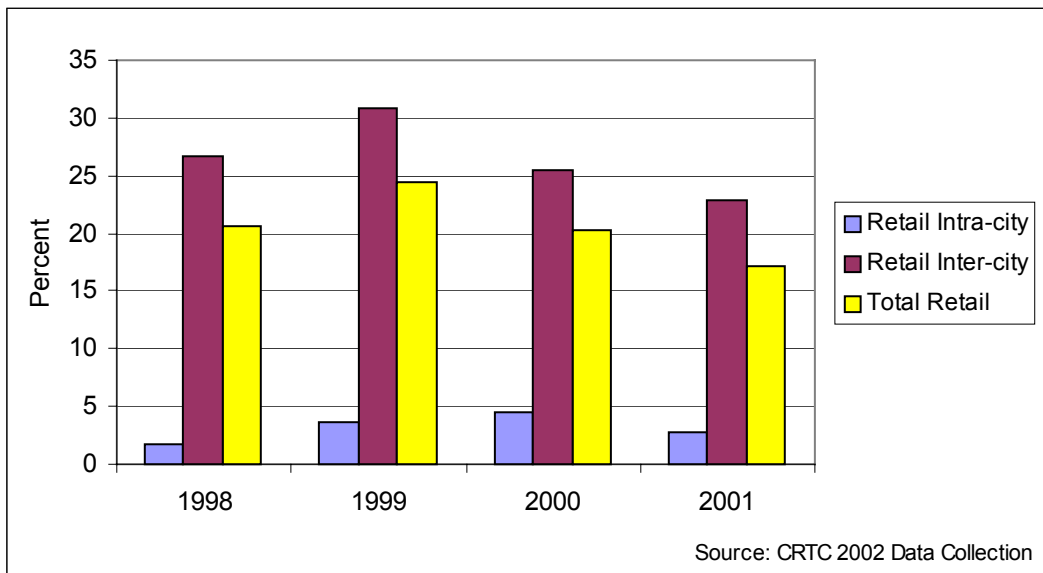
Figure 4.39 illustrates the trend in competitors' private line market share, by market segment and in total, over the period 1998 to 2001.

Figure 4.39
Private Line Service Revenues
Competitor Market Share by Segment



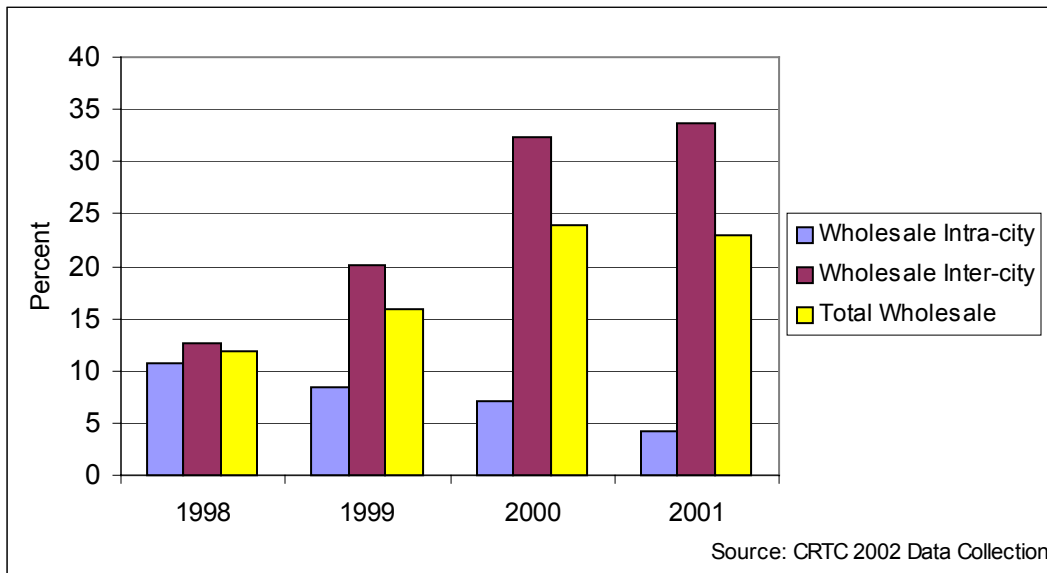
Over the last three years, competitors' share of the retail segment of the private line market has generally declined. The decline has been most pronounced in the inter-city segment of the private line retail market, where competitors' share of revenues fell from over 30% in 1999 to roughly 23% as of 2001. Competitors' share of the retail intra-city private line market was limited throughout the four-year period, consistently below 5%. In aggregate, competitors' share of retail private line revenues fell from 24% in 1999 to 17% as of 2001. Figure 4.40 illustrates the trend in competitors' retail private line market shares over the period 1998 to 2001.

Figure 4.40
Retail Private Line Service Revenues
Competitor Market Share



In contrast to the retail market segment, competitors' share of the wholesale private line services market generally increased over the last four years. Competitors' share of wholesale inter-city private line revenues increased sharply from 13% in 1998 to 34% in 2001. On the other hand, their market share of the intra-city market dropped off to less than 5% as of 2001. In aggregate, competitors' share of wholesale revenues trended upwards from 12% in 1998 to 23% as of 2001. Figure 4.41 illustrates the trend in competitors' wholesale private line market shares over the period 1998 to 2001.

Figure 4.41
Wholesale Private Line Service Revenues
Competitor Market Share



4.8 Payphones

In June 1998, the Commission allowed competition in the provision of payphone service, while at the same time establishing related consumer safeguards. The Commission refrained from regulating the payphone rates of new entrants, but retained rate regulation of pay telephone services offered by the incumbents. In addition, the incumbents are required to provide billing and collection agreements for the new entrants.

Payphones are public telephone terminals that provide coin or card-based billing on a per-transaction basis and can be located indoors, outdoors, or in transportation vehicles such as airplanes and trains. Location types can include semi-public phones available on a restricted basis owing to their location (for example, payphones on private premises such as restaurants). More sophisticated payphone offerings now include such services as PSTN data jack, PSTN fax, Internet Web, Internet e-mail, and Short Messaging Services (SMS).

Currently, over 350 potential payphone service providers have registered with the Commission. Of these, two companies have developed a national presence with others offering service in specific geographic locations.

The following table provides an overview of incumbents' payphones and their usage since the inception of competition. For the period 1998 to 2001, the number of incumbent pay telephones declined at an average annual rate of 1.0% and the related revenues declined at an average annual rate of 10.6%. The decrease in the total number of payphones and revenues is also reflected in an average annual decrease of 7.0% in the overall number of calls. However, minute usage actually increased by an annual average of 0.9% over the same period and the average holding times (AHT) increased by 8.5% annually.

Table 4.31
Incumbent Payphone Summary Statistics⁶⁴

	1998	1999	2000	2001	CAGR
Total payphones (thousands)	185.1	188.3	181.8	179.8	-1.0%
Revenues (\$ millions)	466.7	424.0	374.8	333.8	-10.6%
Number of calls (millions)	826.8	786.2	713.9	665.1	-7.0%
Number of minutes (millions)	522.7	504.6	530.6	537.0	0.9%
AHT per call (seconds)	37.9	38.5	44.6	48.5	8.5%
Average revenue per call (\$)	0.56	0.54	0.52	0.50	-3.8%
Average revenue per minute (\$)	0.89	0.84	0.71	0.62	-11.4%

Source: CRTC 2002 Data Collection

⁶⁴ Includes wholesale pay telephones. If wholesale figures were excluded, the total number of payphones would have declined in each year since 1998.

5. *Broadband Infrastructure Deployment*

Broadband Accessibility

Broadband access is a key enabler for a wide range of communications services and applications. As such, it is usually defined in terms of the minimum amount of Internet bandwidth to which the end-user has access. Current definitions fix this threshold at 1.5 Mbps; Internet access links between 0.64 and 1.5 Mbps, faster than narrowband dial-up but slower than broadband, are referred to as wideband connections. At the same time, it is recognized that this scale is likely to increase as new applications become widely deployed; indeed, broadband access is intended to facilitate the wide deployment of new and innovative applications. For this reason, other broadband definitions have usefully emphasized broadband's always-on (dedicated access) character, the user's ability to upgrade his or her access bandwidth as the need arises, and the consideration that the local link be neither a limiting factor in deploying existing applications nor a bottleneck in encouraging new ones.⁶⁵ This section examines wideband as well as broadband Internet access. Together, these will be referred to as high-speed Internet, since both are dedicated modes and substantially faster than dial-up, which remains the most common form of residential Internet access.

Federal and provincial governments in Canada have encouraged the deployment of broadband infrastructure and services. Initiatives have included (a) contracting for government institutes or personnel, (b) providing seed funding to community projects, (c) providing capital funding for infrastructure projects, (d) providing research and development tax credits to equipment manufacturers, (e) funding trials for broadband applications, and (f) developing and supporting online content. In addition, Industry Canada has made available and licenced the use of spectrum for fixed wireless services, allocated orbital position for advanced satellite services, and funded a range of broadband initiatives.

As this wide range suggests, the challenge of high-speed and broadband Internet accessibility is not a matter of the Internet access link alone. Rather, broadband infrastructure issues play out across two axes, one geographic and the other technical. Along the geographic axis, broadband infrastructure involves the following three items—(a) the local access link, which connects the end user's premises to the provider's point of presence; (b) the community (intracity), or short-haul network; and (c) the inter-community (intercity), or long-haul network.⁶⁶ On the technical axis, physical infrastructure such as fibre optic cable or radio spectrum must be distinguished from the network connectivity layer, including data link services like ATM and network services like Internet. The network connectivity layer depends upon the physical infrastructure

⁶⁵ See, in particular, U.S. Computer Science and Telecommunications Board, National Research Council, *Broadband: Bringing Home the Bits* (Washington, DC: National Academy Press, 2002), at www.nap.edu.

⁶⁶ The short-haul and long-haul segments are sometimes referred to together as the transport portion.

layer. In particular, the distinction between physical capacity and network connectivity demarcates the difference between facilities-based competition, in the first instance, and network-layer competition between networks that are provisioned over the same physical plant, in the second instance.

High-Speed Access Deployment

The Minister of Industry convened a National Broadband Task Force in 2001 to map out a strategy for making broadband access widely available to citizens, businesses, public institutions, and to all communities in Canada. In addition, the Task Force was asked to advise the federal government on issues related to the development and deployment of broadband networks and services in Canada.

Data reported in the context of that exercise found that high-speed Internet via DSL and/or cable was offered in communities that accounted for 75% of the population. Since then, Industry Canada has continued to monitor the deployment of high-speed Internet access in Canada on a community-by-community basis. The most recent data available, using a more finely-grained definition of "community", indicated that high-speed Internet access via DSL, cable, or fixed wireless access was present in 1,282 Canadian communities, representing about 24% of communities and 85% of the Canadian population.⁶⁷ Nearly all residential high-speed Internet access was via cable and DSL, of which many subscriptions operated at wideband rather than broadband speeds.⁶⁸ While some residential Internet subscriptions were provided over fibre, these represented well below 1% of the total; all residential fibre subscribers were based in urban and suburban households.

In establishing the state of high-speed Internet access availability, it is useful to distinguish between communities according to the availability of alternative Internet access providers. Four types of competitive environment are typical.⁶⁹ The first, Type 0, describes the unserved communities where no high-speed Internet is publicly available to meet the community's needs. Type 1 and Type 2 competition both involve incumbent cable and DSL providers, where either one of them is present, as a local high-speed monopoly (Type 1), or both are present, as competitors (Type 2). Type 3 competition, in which a new entrant provides an alternative high-speed service over non-incumbent facilities, tends to be restricted to densely-populated areas. While direct satellite-based Internet access is available to nearly all Canadian communities at speeds faster than narrowband, some residential offerings provide only one-way satellite access, taking

⁶⁷ Detailed province-level maps as well as disaggregated community-by-community data for this deployment are published in the context of Industry Canada's Broadband for Rural and Northern Development program, at www.broadband.gc.ca/maps/maps_e.asp. Prior Industry Canada statistics were based on 1996 census population data and communities defined as Census Subdivisions (CSD); current Industry Statistics are based on 2001 census data and communities defined as Dissemination Areas (DA) aggregated by Canada Post naming conventions. As a result, year-over-year comparison of this data is approximate at best.

⁶⁸ Source: CRTC 2002 Data Collection.

⁶⁹ See National Research Council, *Bringing Home the Bits*, *supra* note 1.

return signals through a dial-up connection, while others were very recent market entrants, often at relatively high price points.⁷⁰ Starting in late 2001, mobile providers began to provide Internet access via their 2.5G mobile networks, but these did not offer speeds substantially faster than narrowband access.

Figure 5.1
High-Speed Access by Canadian Communities⁷¹

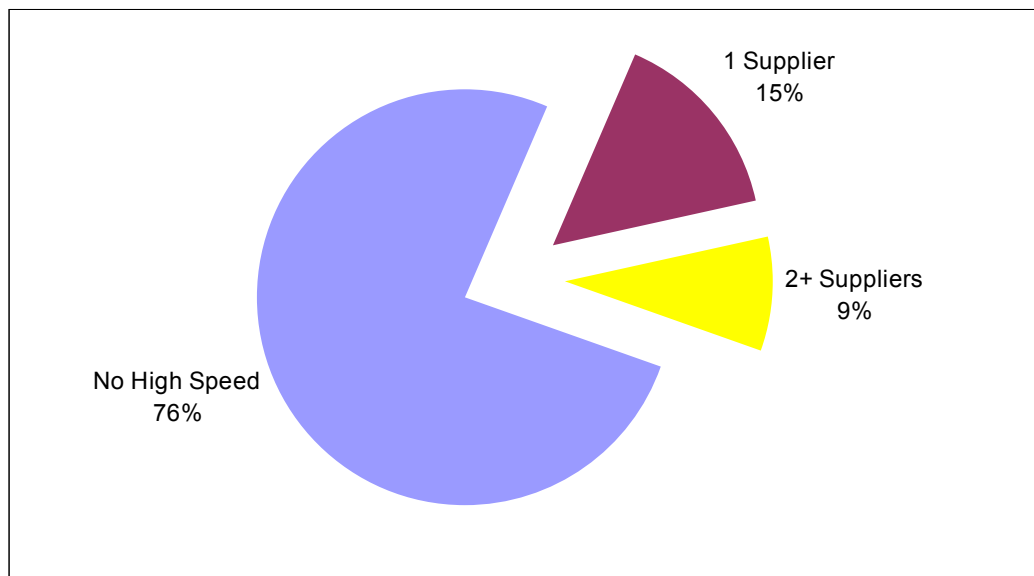


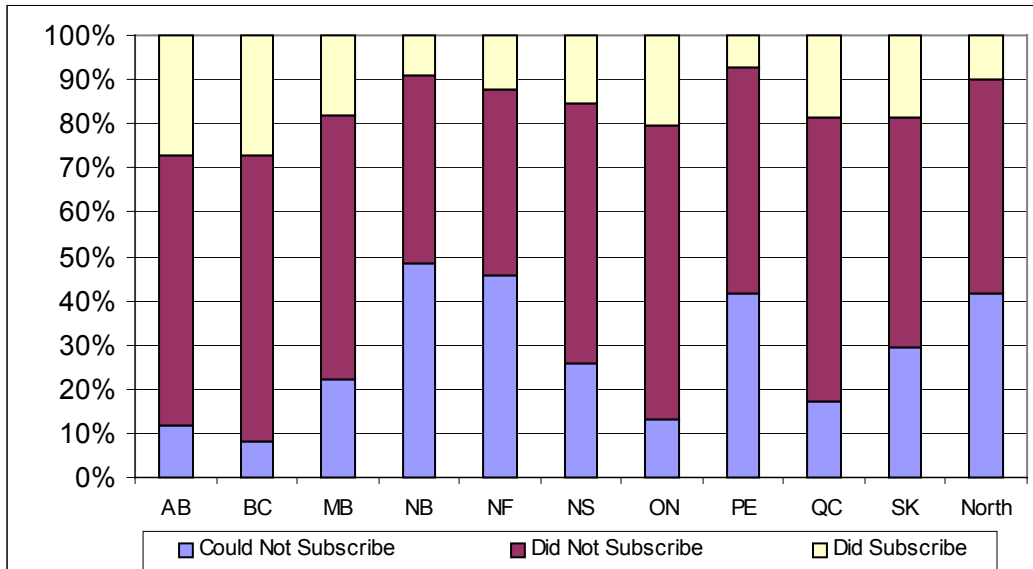
Figure 5.1 indicates that most communities in Canada were unserved. While these unserved communities represented a minority of the Canadian population, each community is a distinct undertaking with regard to access and short-haul and long-haul networks. In particular, different challenges are faced by unserved communities than by *underserved* communities, in which access is available to some households but not to all. Underserved communities face access issues, but the presence of a high-speed Internet access provider in these communities indicates that sufficient transport bandwidth is probably available to connect the community to the rest of the Internet, and suggests the possibility of competition at the data and network layers, if not necessarily facilities-based competition. On the other hand, unserved communities may, in addition to access issues, face particular challenges with regard to Internet transport in and out of the community at speeds high enough to support broadband Internet use.

Figure 5.2 compares the proportions of the provincial and territorial populations which could not subscribe to high-speed Internet to the proportions which did not subscribe to the service available to them.

⁷⁰ Commercial satellite offerings are available as well, but the cost of commercial-grade service and customer-premise equipment make them unsuitable for residential markets.

⁷¹ Source: "Canada in the network age: building an infrastructure for innovation and inclusion" (Toronto: Presentation to EXPO COMM Canada, Michael Binder, Industry Canada, 5 November 2002).

Figure 5.2
High-Speed Access
Households by Province and Territories



Source: CRTC 2002 Data Collection, Industry Canada.

Notes:

"Could not subscribe" refers to dwellings in unserved communities.

"Did not subscribe" refers to dwellings in served communities but which were not high-speed Internet subscribers. Because most served communities do not have high-speed Internet available in 100% of their territory, some of these dwellings may not have had terrestrial high-speed Internet access available.

"Did subscribe" refers to high-speed Internet subscriptions.

"North" includes Northwest Territories, Nunavut and Yukon.

Internet Transport Deployment

Whereas Internet access is generally an end-user service provided to households, businesses and mobile devices, Internet transport is usually procured by Internet access providers. By combining multiple paths to the rest of the Internet, network providers assemble an Internet transport service in order to provide relatively robust Internet access to end-users and to resellers.

The Internet transport segment is composed of a series of point-to-point Internet Protocol links; each link joins two pieces of service-provider-owned equipment, such as Internet routers. Internet transport is thus distinguished from the Internet access segment, which links service provider and end user. Outside competitive Internet hub cities, the Internet transport and access segments are operated by the same provider; this is particularly the case for DSL and, to a lesser extent, cable Internet access. But the Internet is a series of interconnected networks, and so every network must interconnect with at least one other network at some location.

This interconnection relationship is generally structured in one of two ways. Most commonly, a clear vendor-customer relationship exists, for example between a very large backbone operator, and a small access provider which operates no backbone at all. Where this is the case, the seller provides the buyer with *transit* to the rest of the Internet, agreeing both to pass on traffic destined to the ISP, and to forward ISP-originated traffic onward to Internet correspondents. In buying transit from the larger backbone provider, the ISP gains access both to the point-to-point backbone routes that the larger provider manages internally, and to the connections that the larger provider has procured to other Internet providers, which include downstream customers and upstream suppliers. That, in turn, helps improve the network connectivity of the buyers who, having decided to buy transit from several large providers, may decide that their Internet backbone is now attractive enough to market to other ISPs.

Sometimes, however, a pair of ISPs may decide that the value they gain from connecting to one another's network is either relatively even or not worth pricing. Known as *peering*, this unpaid relationship allows Internet providers to improve network connectivity at minimal cost. It also allows the ISP to better position itself in the market, since its better-connected network may be able to sustain more transit customers. Where a peered ISP improves its network connectivity substantially, it may therefore come to regard long-established peering agreements as foregone revenue, reasoning that it gives away more than it receives.

This makes Internet transport procurement a highly strategic activity. In communities where only one Internet transport provider is present, it is, by definition, impossible to procure diverse Internet transport links. ISPs in these communities therefore have only two options—to act as reseller of that provider's network, or to pay for a data link and, possibly, physical capacity into an Internet transport hub where more competitive conditions prevail. If, however, they choose to extend their network into such a hub community, and thus act as an independent Internet network rather than as reseller of another provider's network, then network quality can be improved, and Internet transport expense can be mitigated through peering. Given sufficient interconnection in such an arrangement, revenue may even be generated to offset expense.

As a result, Internet transport is at once a competitive arena in itself, and an essential input into providing high-quality access services. At the end of 2001, there were forty-six competitive Internet transport routes in Canada.⁷² These were city-to-city routes served by at least two competitors whose aggregate bandwidth, added together, linked the route's two endpoints with at least 155 Mbps of total Internet capacity—the equivalent of an OC-3 link.

⁷² Source: CRTC 2002 Data Collection and internal estimates.

At the end of 2001, competitive routes represented 87% of Canada's intercity Internet capacity, and linked communities accounting for 65% of Canada's population. As shown in Table 5.1, five routes accounted for more than half of all competitive Internet transport bandwidth. Of these, three (ranked first, third, and fifth) provided out-of-country links with the U.S., accounting for 33% of the market. The two other routes bound Canada's most populous province-pairs (Ontario-Quebec and Alberta-British Columbia).

The U.S. links play a prominent role in Canada's Internet transport market. At the end of 2001, they composed 41% of competitive intercity Internet bandwidth, compared with approximately 7% of Canada's intercity voice bandwidth. Indeed, Canada relied on the U.S. for more than 99% of its international Internet bandwidth, placing it in exclusive company—only Ireland's tight integration with the U.K. Internet⁷³ was comparable—and, as a result, a significant amount of Canada-Canada traffic as well as most Canada-overseas traffic was routed through the U.S.

Table 5.1
Internet Transport
Fifteen Largest Competitive Intercity Routes (2001)

	City	City	Gbps	Route Weight	Intercity Hub Index
1	Montréal, QC	New York, NY	25.5	15%	-
2	Montréal, QC	Toronto, ON	20.1	12%	1.1
3	Toronto, ON	Chicago, IL	16.6	10%	-
4	Calgary, AB	Vancouver, BC	15.6	9%	2.2
5	Vancouver, BC	Seattle, WA	13.9	8%	-
6	Toronto, ON	Vancouver, BC	9.5	5%	0.5
7	Toronto, ON	Washington, DC	7.5	4%	-
8	Calgary, AB	Chicago, IL	6.4	4%	-
9	Vancouver, BC	Victoria, BC	5.5	3%	3.2
10	Montréal, QC	Québec City, QC	4.7	3%	0.7
11	Ottawa, ON	Toronto, ON	4.6	3%	0.3
12	Calgary, AB	Edmonton, AB	3.9	2%	0.5
13	Toronto, ON	New York, NY	3.9	2%	-
14	Montréal, QC	Ottawa, ON	3.8	2%	0.4
15	Edmonton, AB	Vancouver, BC	3.4	2%	0.5

Source: CRTC 2002 Data Collection and internal estimates.

Notes:

- 1) Domestic city pairs shown in alphabetic order. International city pairs show the Canadian city followed by the foreign city.
- 2) "Route Weight": a route's share of the total bandwidth deployed across all competitive Internet transport routes.
- 3) "Intercity Hub Index": Route Weight divided by population weight (the city pair's proportion of the Canadian population).

⁷³ Sources: CRTC 2002 Data Collection, and TeleGeography, *Global Internet Geography 2002* (Washington, DC: TeleGeography, Inc.).

A given route's proportion of overall transport bandwidth provides a measure of its centrality. City-to-city transport routes have two purposes, however: they carry Internet traffic to a final destination, and they transit it to an intermediate destination from which it is hubbed. Destination centrality is driven primarily by end-user demand, for example where an Internet transaction originates with an end-user in one of the route's two cities, and terminates at an end-user in the other. Hubbing centrality, on the other hand, is influenced by a wider range of supply and demand factors, including (a) the availability and pricing of physical capacity, (b) availability of adequate switching and related facilities, and (c) the network effects that accrue from the design choices taken by large networks.

Hubbing centrality provides a measure of Internet infrastructure deployment patterns. To quantify it, a Hub Index was calculated by dividing Route Weight (the route's proportion of bandwidth in the market) by population weight (the city pair's proportion of the Canadian population). An index score above one indicated that the route's proportion of competitive Internet transport bandwidth is greater than its proportion of the Canadian population and was, therefore, more likely to be used for Internet transactions whose siting was market-based rather than demand-based at the route's endpoints. Internet transactions of this type include accessing content servers, traffic interconnection with other ISPs, and transit interconnection on to a third location.

Intercity Hub Index scores suggest that, of the fifteen largest intercity routes, the Montréal-Toronto, Calgary-Vancouver, and Vancouver-Victoria routes served as demand aggregators of this type. When Route Weight is factored in, the Montréal-Toronto and Calgary-Vancouver routes are identified as having played particularly critical roles in Canadian Internet infrastructure deployment.

Route-based hubbing indices can be misleading, however. By constituting each city pair as a separate submarket, the indices fail to take into account the Internet's proficiency at transiting traffic across long series of router-to-router and place-to-place hops before moving this traffic to its final destination—which, where preexisting alternatives are in place, can render expansion into otherwise important routes redundant. At the same time, route-based hubbing indices also ignore cities whose centrality is due, not to their role as endpoint on a handful of very large routes, but as node in a larger number of smaller routes. To mitigate the impact of these factors, the Hub Index was recast in Table 5.2 at the city level, by assigning City Weight according to the proportion of competitive Internet transport bandwidth to which a city was connected. Examined from this standpoint, hubbing centrality is seen to be more widespread, factoring into each of the fifteen largest hubs' competitive location.

**Table 5.2
Internet Transport Hub Cities (2001)**

	City	Mbps	City Weight	Hub Index	Intraprov'l	Internat'l
1	Toronto, ON	79.7	41%	2.7	44%	20%
2	Montréal, QC	58.9	31%	2.7	32%	18%
3	Vancouver, BC	53.8	28%	4.2	44%	13%
4	Calgary, AB	31.2	16%	5.1	21%	11%
5	New York, NY	29.3	15%	-	-	100%
6	Chicago, IL	23.0	12%	-	-	100%
7	Seattle, WA	18.9	10%	-	-	100%
8	Edmonton, AB	13.4	7%	2.2	42%	1%
9	Winnipeg, MB	11.3	6%	2.6	48%	1%
10	Victoria, BC	10.5	5%	5.2	80%	20%
11	Saskatoon, SK	8.6	4%	6.0	40%	0%
12	Ottawa, ON	8.5	4%	1.2	56%	1%
13	Washington, DC	7.5	4%	-	-	100%
14	Québec City, QC	6.2	3%	1.4	86%	1%
15	Regina, SK	4.9	3%	4.0	45%	1%

Source: CRTC 2002 Data Collection and internal estimates.

Notes:

- 1) Because Internet networking is bi-directional, connections between Canadian and non-Canadian cities allow foreign locations to act as Canadian Internet hubs. Non-Canadian locations were therefore considered.
- 2) "City Weight": the proportion of competitive Internet transport bandwidth to which a city was connected.
- 3) "City Hub Index": City Weight divided by population weight (the proportion of the Canadian population living in the city's census metropolitan area).
- 4) Intraprov'l, Internat'l: of the competitive Internet transport bandwidth to which a city is connected, the proportion which connected to other cities within the same province (intraprovincial) or to other cities outside Canada (international).

Demand Aggregation

Introduction

Broadband deployment represents particular challenges to rural, remote, and underserved communities, which may be distant from Internet hubs and fibre routes. Nonetheless, a wide variety of initiatives are underway to provide improved access to high-speed infrastructure. These include promising means that have been put forward for accelerating private sector investment in broadband infrastructure through demand aggregation as well as the dissemination of information on alternatives ways to respond to that demand. The following discussion outlines some of these demand aggregation and information dissemination initiatives.

Internet Exchanges

Internet exchange points are neutral meeting grounds, which facilitate on-site interconnection between ISPs. Their role in Internet deployment is not uniform: whereas in the U.S. they serve largely to interconnect relatively small providers and have a reputation for congestion, Internet exchanges in Europe play a more prominent role, with the London Internet Exchange (LINX) handling more than 15 gigabits each second (Gbps), and the Amsterdam Internet Exchange (AMS-IX) taking in another 5 Gbps.⁷⁴

Internet exchanges can help increase networking efficiencies, aggregate local supply, and accelerate private sector investment. They have been proposed as a relatively simple way to address a lack of local infrastructure, or of local competition, or both. At some locations, in particular, two or more networks may connect to the Internet via intercity links but not to each other locally. As a result, they "trombone" traffic originated and destined locally through long-haul, often expensive, links. The cooperatively-run Ottawa Internet Exchange, for example, identified this problem as a key impetus for creating an exchange facility.⁷⁵

Aside from freeing up intercity bandwidth for true intercity traffic, Internet exchanges help reduce ISP dependency on upstream networks, helping disperse market power—particularly where a competitive market for Internet transport supply does not exist. Internet service providers reported that, at the end of 2001, they 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.⁷⁶ No Internet exchanges were reported in lesser-served areas. Particularly where multiple access ISPs depend on one to two Internet transport providers, however, 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.

⁷⁴ As at mid-2002. LINX, *Public LINX Statistics* (www.linx.net/tools/stats/index.shtml), and AMS-IX, *Live Statistics Showing Total Aggregate Volume of All Members Connected to AMS-IX* (www.ams-ix.net/hugegraph.html).

⁷⁵ "Currently, nearly all Internet traffic in Ottawa is back-hauled through Toronto. In such a situation, Ottawa-Toronto bandwidth is too valuable a resource to needlessly waste on same-city Internet traffic. Finally, however, we can avoid this senseless waste of resources by having networks in Ottawa peer directly with each other." Ottawa Internet Exchange, at www.ottix.net.

⁷⁶ Source: CRTC 2002 Data Collection.

Table 5.3
Internet Exchanges in Canada (2001)

Community	Exchange	Ownership
Edmonton, AB	EIX	Cooperative
Vancouver, BC	BCIX	Academic Partnership
Ottawa, ON	OttIX	Cooperative
Toronto, ON	TorIX	Cooperative
Montréal, QC	QIX	Academic Partnership

Source: CRTC 2002 Data Collection

Internet exchange ownership models vary. As Table 5.3 shows, Internet exchange points are either autonomous co-operatives, or partnerships with academic networking bodies such as British Columbia's BCNET (BCIX) and Quebec's RISQ (QIX). Other models include operator-run initiatives, such as WorldCom's MAEs in the U.S. and Europe, and for-profit businesses, such as U.K. operator XchangePoint and U.S. operator Equinix. Their common characteristic is a focus on peering—bilateral or multilateral exchange of traffic in order to reduce costs for all concerned.

More recently, some exchange operators have begun to incorporate transit, or paid Internet routing, into their models.⁷⁷ Although chiefly practiced by stand-alone for-profit Internet exchanges, the model has begun to be put forward as a promising means for encouraging private-sector Internet access provider market entry. This so-called "transit exchange" model attempts to create "one-stop-shopping" aggregation points that are closer to rural and remote communities than existing hubs.⁷⁸ The model is outlined in a formal Request for Proposals issued by BCNET, the British Columbia education and research network, for locations in Prince George, Vancouver, and Victoria. At each of these locations, the proposed transit exchange was to 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."⁷⁹

⁷⁷ Bill Woodcock, Are "Transit Exchanges" and "Peering Exchanges" Self-Differentiating? (Richmond Hill, Ont.: Presentation to the North American Network Operators Group, June 2002), at <http://www.pch.net/resources/papers/peering-exch-transit-exch/NANOG-02.06-peering-trans.html>.

⁷⁸ PSTN architecture also uses the term "transit exchange", as distinguished from a local exchange switch. The two are not linked.

⁷⁹ BCNET, RFP20020501, "Subject: Provision of Internet Transit Services for BCNET" (Vancouver: BCNET, 2002), at www.bc.net/transit%20exchange.htm. See also Dan Hoffman and Michael Hrybyk, "The transit exchange: an ISP mall for the next generation Internet", *Focus* (Summer 2002), at www.sfu.ca/acs/focus/01-3/transitxchg.htm.

Scottish Enterprise, the Scottish regional development agency, rolled out a similar facility through its Project ATLAS (Accessing Telecom Links Across Scotland). Project ATLAS' first initiative was announced in February 2002, and involved setting up what Project ATLAS calls Telecom Trading Exchange (TTEs) in Aberdeen, Edinburgh, and Glasgow, each linked to a larger transit exchange in London. The TTEs take the transit exchange a step further by adding to the Internet transit buying and selling process a Web-based intermediation interface. The interface provides ISPs with real-time bandwidth price and quality information and facilitates re-provisioning based on these indicators. Lack of information and difficulty in changing supplier are identified by Scottish Enterprise as two key issues affecting the Scottish telecoms market, which the TTEs are to address by building upon the transit exchange model.⁸⁰

Condominium Fibre Builds

In some instances, demand aggregation on the part of users has extended into direct or indirect involvement of these users on the broadband supply side, making municipalities or schools into market entrants. By leveraging the technical improvements and corresponding falling prices of network components, for example, the condominium fibre build model has allowed education and research networks such as CANARIE's to provision customer-owned facilities-based long-haul networks as an alternative to long-term leases and service contracts with existing providers.⁸¹

Dark fibre is optical fibre that is not in use and, therefore, has not been "lit" by lasers or other network equipment. 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, particularly given technological advances in the amount of information that can be transmitted over a single strand of fibre. A condominium build is one which brings several partners together to form a consortium, each member of which is assigned a certain number of fibre strands inside the cable being laid. Consortium members are free to light their strands and provision networks over them as they see fit.

The existence of new, relatively inexpensive networking equipment, and the possibility of piggybacking on a condominium build involving larger network providers, allows institutional users, unencumbered by legacy equipment, to provision their own facilities-based networks at rates low enough to reverse the traditional proposition by making building less expensive than buying. In particular, Canadian research networks such as BC.NET (British Columbia), CANARIE (national backbone), Netera (Alberta), and RISQ (Québec) 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

⁸⁰ See Project ATLAS, www.ecommerce-scotland.org/atlas/atlas_intro.htm.

⁸¹ See related material at www.canarie.ca/canet4/library/canet4design.html.

networks interconnecting their schools with dark fibre.⁸² Alongside traditional carrier competition, then, a handful of facilities-based networks are being built by public sector institutions, and these networks, or the adjacent fibre which they enable, could well be used to provide competitive market alternatives to incumbent plant—particularly in areas that are underserved.

Two professional service categories factor into the fibre condominium build. One is the cable's physical construction and ongoing maintenance, typically undertaken by a contractor on the consortium's behalf. The other role is that of the fibre "broker", who helps bring partners together to join the consortium, to take advantage of already-existing rights of way or infrastructure, and related tasks. As a de facto demand aggregation agent, the fibre broker is in a position not only to facilitate, but also to promote broadband infrastructure investment of this type by disseminating material on costing and feasibility, providing electronic collaboration tools to enable partners to locate one another, and pro-actively approaching possible participants. Such information dissemination activities are also ways to promote private sector investment.

Wireless Access

Popularly known as "Wi-Fi", short-range wireless networking protocol based on the IEEE 802.11 family of standards uses unregulated spectrum in the 2.4 GHz range to exchange data at approximately 11 Mbps, well into the range defined as broadband speeds.⁸³ Sometimes referred to as "wireless Ethernet", Wi-Fi can be used to distribute network access at low costs both to the distributor and to the users. This has led users in several cities to form informal Internet access-sharing cooperatives, grounded in Web sites at which information on participating is exchanged and provided. Variations on this theme 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 the community networks into an interconnected system.⁸⁴ Some Internet and telecom providers have begun to develop urban-focused commercial Internet-over-Wi-Fi models (e.g., Boingo, T-Online). U.K.-based Invisible Networks, on the other hand, offers a rural broadband focus, provisioning clusters of Wi-Fi nodes linked to central leased-line hubs in rural English villages as an inexpensive mode of entry into a market in which Invisible Networks hopes to build demand for even faster access, via wireline facilities.⁸⁵

⁸² Leo J. Deveau, "Building Your Own Fibre Optic Networks" (Sydney, NS: Presentation to the Atlantic Canada Organization for Research Networks, July 2001), at www.itic.uccb.ca/Technology_Report.htm. See also IMS Experts, www.ims-experts.com/en/B01B_Telecom/index2.php, and 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.

⁸³ See IEEE Wireless LAN Working Group, grouper.ieee.org/groups/802/11/.

⁸⁴ See Waterloo Wireless, at www.waterloowireless.org, and BC Wireless, at bcwireless.net.

⁸⁵ See Invisible Networks, www.invisible.uk.net.

Attempts to extend Wi-Fi networking to the 10 km and even 20 km range on a point-to-point basis indicate the extension of Wi-Fi to use the technology as an alternative means for remote community-dwellers to aggregate demand and share backbone connectivity. If so, this user-controlled alternative takes its place alongside other wireless options, such as frequency hopping, spread spectrum, and Orthogonal Frequency Division Multiplexing (OFDM).

Indeed, in rural and remote areas where population density prohibits the cost-effective use of incumbent plant for broadband distribution, wireless, and particularly fixed wireless, access is scaleable, portable, and can be deployed relatively quickly.⁸⁶ For communities distant from wireline transport infrastructure, fixed wireless can be usefully combined with satellite access, which, in the backbone portion, has many of fixed wireless' strengths with regard to flexibility and time to deployment. Access of this type has been rolled out by providers including Quick Link Communications, to First Nations communities in the Northwest Territories and Nunavut; and RAMTelecom, to Inuvik, Nunavut, and Fermont, Quebec.

In April 2002, a National C-Band Public Benefit Working Group was convened to review the opportunity provided by Industry Canada's allocation of a "satellite benefit channel" aboard one of the Anik E-2 satellite's C-Band transponders.⁸⁷ K-Net, the Keewaytinook Okimakanak Computer Services group which had earlier been designated Industry Canada's Aboriginal Smart Demonstration project, took the lead in convening this group and developing this channel. These responsibilities included providing direct bandwidth to several remote communities and assisting other communities in remote areas across Canada to use this capacity for public benefit applications through to 2004.

Public Sector Initiatives

In addition to the privately funded and partnership initiatives noted above, a number of models exist for private and public sector initiatives to accelerate the deployment of broadband infrastructure.

Public Utility Model

In this model, a governmental or public sector body provisions a network for general use by end users, by service providers, or both, with the primary goal of increasing broadband accessibility and deployment in the wider community. Construction on the Alberta SuperNet began in 2001, with a completion date set for 2004.⁸⁸ 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 connect 422 communities across Alberta, including 4,700 schools, hospitals, and libraries, but is divided into two portions.⁸⁹

⁸⁶ Vic Allen, "Communities at the Crossroads" (Fredericton, NB: Presentation to the Community Connect Conference, April 2002), at www.connectconference.com/presentations.html

⁸⁷ See smart.knet.ca/satellite/.

⁸⁸ SuperNet Rollout Schedule, www.albertasupernet.ca/progress/rollout+schedule/default.htm.

⁸⁹ SuperNet Network Description, www.albertasupernet.ca/the+project/the+network/default.htm.

The SuperNet's first portion, the Base Area Network, reaches 27 communities in which competition was already present, and is owned and operated by Bell West. This Bell Canada affiliate spent \$102 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 prior competition was limited. Unlike the Base Area Network, it is owned by the government of Alberta, which invested \$193 million in the extended area network. Axia IP Ltd., an affiliate of Alberta's Axia NetMedia Corp., holds the contract for the network's operation.

Accompanying the Extended Area Network's deployment to less-competitive and unserved Internet access communities are several rules designed to enhance the initiative's ability to accelerate rural broadband. First, so-called "Meet-Me Facilities" are placed in each of the SuperNet 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 "postalized"—that is, identical throughout the province, whether in the smallest town or largest city.⁹⁰

In Stockholm, Sweden, a similar model was put into place via Stokab, a municipally owned dark fibre utility. Like SuperNet, Stokab's position in the overall broadband infrastructure is well specified: whereas SuperNet operates in the long-haul (intercity) portion of the network, Stokab operates in the short-haul (intracity) portion. Also, like SuperNet, Stokab operates based on an open access model, allowing any provider to use the network without discrimination in return for a fee.⁹¹

Unlike SuperNet, however, Stokab provides only dark fibre, leaving basic fibre lighting, data networking, and other network services to competitive telecommunications providers who buy Stokab's dark fibre. Although few Canadian municipal community networks emulate this model, a conscious effort is typically made by these Canadian networks, too, to avoid moving into higher-layer offerings, examining market size and likely entrants to determine how elaborate its offering must be to function effectively as a factor in lowering barriers to market entry. Fredericton's municipal corporation, e-Novations, manages a short-haul backbone provisioned over fibre, wireless, and some leased circuits, and does provide Ethernet and Wi-Fi data access over these facilities. At the same time, the Fredericton network does not provide Internet access over its backbone, leaving that to competitive providers, and does provide non-discriminatory access to ISPs and Applications Service Providers (ASPs).⁹²

⁹⁰ See www.albertasupernet.ca/faq/progress+faq/default.htm.

⁹¹ See www.stokab.se/templates/Page.asp?id=2034.

⁹² See www.e-novations.ca/uhsn.html.

A variation on the broadband public utility model involves subsidizing an existing network provider to increase broadband accessibility and deployment. This implies folding funded infrastructure upgrades into the incumbent's own network inventory. For example, Saskatchewan's CommunityNet (\$21 million) will have reached schools, health facilities, libraries, and government offices in all of Saskatchewan's communities by 2004. At the same time, this initiative has enabled SaskTel to expand its high-speed service to 65% of these communities.⁹³ Connect Yukon (\$17 million), a cost-shared joint initiative between the Yukon government and Northwestel, had increased the number of Yukon communities reached by eleven when the project was completed in August 2001.⁹⁴

Anchor Tenant

The anchor tenant model typically involves the public sector aggregating its bandwidth usage by converging to a single network. This allows the aggregated public sector presence to help justify the cost of building the infrastructure.

Some anchor tenant network projects operate as public/private partnerships. In the U.S., for instance, Colorado's Multi-Use Network (MNT) backbone will, when completed in 2003, be owned, managed, and monitored by Qwest but, as the MNT notes, the "State of Colorado is the anchor tenant partner and as such, uses the significant aggregated telecommunications requirements of state government agencies as the leverage investment for extension of telecommunication capabilities and advanced services into all geographic areas of the state."⁹⁵

The Villages branchés du Québec funding program launched by the Quebec government in September 2002 provides a facilities-based variation on the anchor tenant model, consistent with earlier initiatives by 26 Quebec school boards to participate in condominium fibre builds. Allocated in blocks of up to 75% of cost and \$25,000 total per project, Villages branchés earmarked \$75 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. Rather than an anchor tenant relationship in which the public sector provides the anchor tenant and the private sector provides the network, Villages branchés 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.⁹⁶

⁹³ CommunityNet, Frequently Asked Questions, www.communitynet.ca/faqs.html.

⁹⁴ "Connect Yukon wraps up right on schedule". Press release, Yukon Government, www.gov.yk.ca/news/2001/Aug-01/01-201.pdf.

⁹⁵ State Multi-Use Network (MNT) Fact Sheet, at www.state.co.us/mnt.

⁹⁶ See www.meq.gouv.qc.ca/drd/tic/villages.html.

Public-Sector Network Model

Like the anchor tenant model, the public-sector network broadband model typically involves a convergence of disparate public-sector networks onto a common platform, in order to maximize efficiencies of scale and of scope. Unlike the anchor tenant model, however, the public-sector network is used almost exclusively for public-sector applications, including intragovernmental 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, distributed, end-users, similar to corporate Internet access rather than to broadband Internet transport networks.

The Region of Peel's PSN (Public-Sector Network) is an example of this model, and it is useful to observe the interplay between usage policy, scope, and cost. 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% of it along Hydro 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 purvey—schools, hospitals, and libraries, for example—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 served, and compared with provisioning T-1s to each site now linked to PSN fibre, estimated break-even time on the network investment was three years.⁹⁷

Other public-sector networks are less absolute with regard to prohibiting non-public-sector, commodity 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." Indeed, following the PTC's lead, it may in some cases be appropriate to re-examine public-sector networks' Acceptable Use Policies in light of the goals set for broadband deployment to all Canadians by 2005.⁹⁸

⁹⁷ 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

⁹⁸ B.C. Premier's Technology Council, *Second Quarterly Report*, at www.gov.bc.ca/prem/popt/technology_council.

Public Funding Model

In addition to the network models described above, government funding can be used to stimulate private-sector investment in rural broadband infrastructure. In September 2002, Industry Canada launched its Broadband for Rural and Northern Development program, soliciting project proposals, which aimed specifically at addressing those communities that were without high-speed Internet access.⁹⁹ Similar programs existed within other government branches. The Canada-Manitoba Infrastructure Program, for example, had allocated \$200 million to its activities between 2000 and 2006. Among the secondary focuses listed for the program were "Rural and Northern Telecommunications Infrastructure", and "High-Speed Internet Access for Public Institutions".¹⁰⁰ Finally, the Canada Strategic Infrastructure Fund named broadband as one of the five key areas of infrastructure it would fund from its \$2 billion budget.¹⁰¹

⁹⁹ "Allan Rock and Andy Mitchell Launch Broadband for Rural and Northern Development Pilot Program". Press release, Industry Canada, www.ic.gc.ca/cmb/welcomeic.nsf/cdd9dc973c4bf6bc852564ca006418a0/85256a220056c2a485256c2b0048c376!OpenDocument.

¹⁰⁰ Canada-Manitoba Infrastructure Program, www.infrastructure.mb.ca/e/proinfo.html.

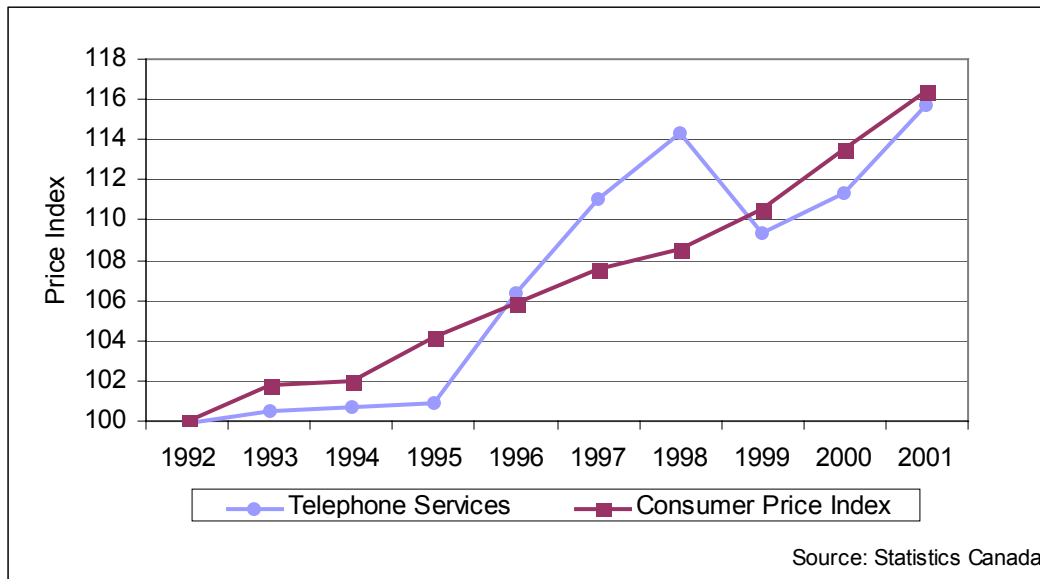
¹⁰¹ "Investment Categories", Canada Strategic Infrastructure Fund, at www.infrastructurecanada.gc.ca/csif/investmentcategories_e.shtml.

6. Information on Consumers

Trends in Expenditures on Telecommunications Services

In Figure 6.1, an index reflecting price changes experienced by a householder for a basket of telephone services is compared to the consumer price index (CPI) for the period 1992 to 2002. The telephone service price changes reflect a weighted average of consumer expenditures on basic local charges, other local charges (such as options and features), long distance charges, installation and repairs. They do not include cellular or Internet service expenditures.

Figure 6.1
Telephone Services Price Change as Compared to Inflation



The telephone services price index increases from 1996 to 1998 are a result of rate increases approved by the CRTC, which were implemented to ensure that the price of basic residential local service better reflected the cost of providing this service. The reduction in this index in 1998 is predominantly due to the decline in long distance service prices resulting from the introduction of flat rate pricing plans. The increases in this index from 1999 to 2001 are due to rate increases approved by the CRTC consistent with the price cap regime established in 1997.

Less than 1.5% of total residential household expenditures are allocated to traditional telephone services (not including spending on wireless and Internet services). This percentage has not changed significantly in recent years.¹⁰²

¹⁰² Statistics Canada *Survey of Household Spending* data for 1997, 1998, 1999, 2000.

Over the last five years, shifts in the pricing of telephone services have taken place, in conjunction with growing competition in the telephone industry. For example, in 1996, long distance services and local services represented 54%, and 38%, respectively, of a household's average telephone bill,¹⁰³ while in 2001 these proportions were essentially reversed.¹⁰⁴

Residential Users

In 2001, the large incumbents' rates for basic local service increased, except in Saskatchewan, in most urban and rural areas. SaskTel's local rates did not increase in 2001 pursuant to the Commission's 2000 decision dealing with the company's transition to federal regulation. Except in Manitoba, the increases in monthly rates ranged from \$0.11 in urban Alberta and rural British Columbia to \$2.00 in both urban and rural regions in the Atlantic provinces. In Manitoba, urban and rural monthly rates increased by \$2.98 and \$2.76, respectively, in part due to the Commission decisions in 2000 and 2001 to allow MTS to increase its rates to recover certain income tax expenses. These increases were consistent with the regime established by the Commission's 1997 price cap decision, which applied to the large incumbent telephone companies except for SaskTel.

Residential consumer spending on optional local services (including calling features such as voice mail, call display and call waiting) has also increased in recent years. In 1998, calling features generated approximately 20% of residential local voice services revenues; in 2001, this proportion had increased to 24%.¹⁰⁵

Competitive Alternatives

Residential consumers now have a range of alternatives to the incumbent telephone companies available to them for long distance calling, Internet access, and mobile telephony. With respect to residential local service, choice of suppliers has been limited to certain major centres in Canada. In 2001, a small number of CLECs offered residential customers basic local phone service as part of bundles that included optional features and long distance service plans. For example, in 2001, Sprint Canada offered local service with a choice of one or more calling features to its long distance subscribers. In the Atlantic provinces, EastLink offered telecom service bundles of basic and long distance services. However, in 2001, CLECs continued to largely focus their attention on providing bundled services to business users.

¹⁰³ Statistics Canada 62-555-XPB, *Family Expenditure in Canada, 1996*.

¹⁰⁴ Statistics Canada 56-002-XIE, *Quarterly Telecommunications Statistics, 4th quarter 2001*.

¹⁰⁵ Source: CRTC 2002 Data Collection.

As competition evolves, service providers continue to experiment with a variety of bundled service offerings and pricing plans. Bundles generally offer consumers a price incentive compared to purchasing the same products and services individually, and offer the convenience of a single bill. However, as new services are developed, price is not necessarily the primary marketing tool for attracting subscribers, particularly as new services are developed and introduced into the marketplace. Affinity partnerships with other companies can be developed as a means of broadening the base of services which providers can offer their customers. Providers continue to cater to a wide spectrum of customer needs, and frequently design different service packages with a view to meeting the needs of diverse customer groups.

Competition has brought about a variety of billing and payment options readily available to consumers, including credit card billing, pre-payment options, direct withdrawal, debit card, and Internet payment, to name a few. Access to banking and other financial services via telephone and the Internet lowers transaction costs of the service provider and reduces the need for some consumers to perform many of these transactions in person. However, such options are not available to all consumers and some may find it more difficult to make cash payments for bills, as companies centralize their customer care facilities in an effort to cut costs in an increasingly competitive environment.

Residential Consumer Survey

A recent poll¹⁰⁶ by Ipsos-Reid indicated that while almost half of residential consumers surveyed stated that their telecommunications spending over the last four years on local service plus optional features and long distance had increased, an equal number considered that their spending had remained at about the same level.¹⁰⁷ At the same time, subscribership for some service offerings, such as Internet access and cellular service, has increased over the years, representing an increase in expenditures for those customers taking up these new services. Of the households surveyed, 52% indicated they currently have a cell phone, and 63% have Internet access at home.

The results of the Ipsos-Reid survey showed that 60% of consumers considered that they have benefited from the availability of competition in telecommunications markets. When these consumers were asked what they considered to be the best outcome resulting from telecommunications competition, most cited lower prices. More choice of service providers and new or better service offerings were cited by some as benefits resulting from competition. Although 9% of the customers considered improved responsiveness by telecommunications service providers as the best outcome, almost as many cited responsiveness as an area where providers in general could do a better job.

¹⁰⁶ Source: September 2002 Ipsos-Reid survey commissioned by the CRTC.

¹⁰⁷ In the Ipsos-Reid survey, 46% stated that spending had increased, 45% stated that it was the same, 7% stated it had decreased. 2% did not know/refused to answer.

There is some evidence to indicate that consumers are giving thought to choosing mobile telephone service as a substitute for additional lines in their home – and in some cases as a replacement for their primary wireline service. In the consumer survey, 13% of the respondents said they would consider disconnecting their traditional telephone service in favour of exclusive use of wireless phone service. Of the respondents that were not ready to relinquish landline service, most cited cost (wireless is generally more expensive than the same service delivered via a wired line), reliability or a certain comfort level with their existing service as the main reasons for not changing.

Glossary of Terms and Acronyms¹

Analog Service: Transmission of a set of audible frequencies enabling telephony voice conversations or dial-up Internet access via a regular telephone line. Virtually all residential telephones are analog devices. Analog signals are typically converted to a digital format.

Broadband Services: For the purposes of this report, a service enabling the two-way transmission of voice, data or multimedia communications with speed in one direction in excess of 1.544 Mbps.

Cable Internet Service: A bi-directional high-speed digital communication service, enabling Internet access through the use of cable TV coaxial network.

Central Office: Facility containing telephone equipment where customers' calls are switched and transmitted.

Centrex Resale: The purchase and resale of bulk Centrex service to retail customers.

Centrex Service: A telephone company supplied local service with associated sets of features (e.g., call display, call forwarding).

Co-Location: An arrangement whereby competitors of an ILEC can locate facilities at or near the ILEC's Central Office.

Competitive Local Exchange Carrier (CLEC): A facilities-based provider of local exchange service, other than an ILEC.

CRTC Interconnection Steering Committee (CISC): A forum for parties, with CRTC assistance, to resolve local competition implementation issues of a technological, operational or administrative nature and to resolve other telecommunications issues.

Digital Service: The transmission of binary data signals (a continuous string of zeros and ones). Such service is used for computer-to-computer communications or for transmission of digitally-encoded analog signals in telephone and digital cellular networks.

Digital Subscriber Loop (DSL): A local loop equipped to allow high-speed data transmission.

¹ A complete glossary of telecommunications terms can be found at <http://www.crtc.gc.ca/PartVII/eng/monitor/glossary.htm>.

Exchange: A basic geographical area for the administration and provision of telephone service by an ILEC, which normally encompasses a city, town or village and adjacent areas.

Facilities-based Carrier: A carrier that provides telecommunications services, using, in part, their own switching and transmission facilities.

Fibre Optics: A broadband transmission facility which uses a beam of light to transmit a digital signal through a glass strand.

Fixed wireless: Point-to-point transmission through the air between stationary devices.

Incumbent Local Exchange Carrier (ILEC): A company that, prior to the introduction of competition, provided monopoly local telephone service.

Internet Service Providers (ISPs): Companies that provide customers with Internet access.

Interexchange Private Line (IXPL): A dedicated communications channel provided at flat rates between points in different exchanges.

Local Loop: Typically called the "last mile", the physical connection between the customer premise and the Central Office.

Long Distance Resale: The purchase and resale of bulk private line and other interexchange services for the provision of long distance services to retail customers.

Mobile Services: Wireless services including analog and digital cellular (e.g. Personal Communications Services or PCS).

Narrowband Services: For the purposes of this report, a service enabling the two-way transmission of voice or data communications with speed in either direction not exceeding 64 kbps.

Private Line Service: A clear dedicated communications channel between two points.

Stentor: The former national alliance of large incumbent carriers.

Support Structure: Structures, such as poles and conduit, that support transmission facilities (copper cable and/or fibre optics).

Terminal Equipment: Equipment located at the customer's premises, used for voice or data communications (e.g., telephone set).

Wideband: For the purposes of this report, a service enabling the two-way transmission of voice or data communications with speed in either direction of greater than 64Kbps up to and including 1.544 Mbps.

Wireless Services: Telecommunications services via the airwaves using radio, cellular, satellite, microwave and other wireless transmission systems including fixed wireless.

Wireline Service: Telecommunications services offered over wires.

Major Market Participants¹

Incumbent Carriers

Incumbent carriers can be divided into two categories: large and small. The most significant large incumbents are Aliant Telecom, Bell Canada, MTS, SaskTel and TELUS. The other large incumbents are Northwestel, which provides services in the Yukon, the Northwest Territories, Nunavut and parts of British Columbia, and Télébec and TELUS Québec, which provide services in Quebec. Many small incumbent carriers operate primarily in the provinces of Ontario and Quebec and, in one case, British Columbia.

The advent of competition has significantly changed the role of the incumbents. The incumbents now provide not only retail services, but also a range of wholesale services to competitors under terms and conditions mandated by the CRTC. These wholesale services include long distance switching and aggregation services, local transit and transport services, co-location and unbundled local loops. Incumbent carriers also provide a range of other services to retail customers and competitors such as Digital Network Access and Centrex services.

Since the break-up of the former Stentor Alliance in 1998, the large incumbent carriers have begun to compete against one another by providing telecommunications services outside of their traditional home serving territories. These services include data and IP services targeted at business customers, wireless services and, increasingly, business local exchange services. At the same time, there has been an increasing trend toward consolidation among large incumbents.

Large Incumbent 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,² as well as two additional large incumbent carriers, Northwestel and Télébec. BCH also holds a 22% interest in MTS as well as a joint interest with MTS in Bell West Inc. (formerly Bell Intrigna). Bell West is 60% owned by Bell Canada and 40% owned by MTS.³ Also included within the Bell Canada segment is

¹ This Appendix does not reflect any events that have place after 1 November 2002.

² Other subsidiaries include Bell Actimedia Inc., Bell Distribution Inc., Certen Inc. and Expertech Network Installations Inc.

³ Bell Canada, News Release, 11 April 2002.

Aliant Inc., in which BCE holds a controlling interest (39% through BCH and 14% through BCE, or 53% in total), and wholly-owned subsidiary, Bell ExpressVu.⁴

In 2001, BCE held an 80% interest in BCH. U.S.-based SBC Communications Inc. (SBC) held the remaining 20%.⁵

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. Bell Canada's out-of-territory activities are discussed further below.

On a consolidated basis, Bell Canada⁶ generated total operating revenues of \$14.2 billion in 2001. Of this total, \$5.7 billion (or 40%) was due to the provision of local and access services, \$2.3 billion (or 16%) long distance services, \$3.2 billion (or 23%) data services, \$1.6 billion (or 11%) wireless services and the balance, \$1.4 billion (or 10%), terminal equipment sales, directory advertising and other services. Bell Canada's year-end 2001 total assets were \$24.7 billion.⁷

Bell Canada served 11.8 million network access lines as of year-end 2001, of which 7.6 million were residence lines and 4.1 million were business lines. In addition, Bell Mobility, which operates in Ontario, Quebec and through resale agreements in Alberta and British Columbia, served 3.0 million wireless customers as of year-end 2001, of which roughly 70% were post-paid customers. Bell Canada also served roughly

⁴ BCE, 2001 Annual Report and BCE, News Release, 5 February 2001.

⁵ BCE recently announced, however, that it planned to regain full ownership of Bell Canada by re-purchasing SBC's 20% interest in the company. (Source: BCE, News Release, 28 June 2002)

⁶ Including Bell Mobility and Bell Nexxia, among other subsidiaries.

⁷ All information in this paragraph obtained from Bell Canada's Financial Information report for 2001.

1.5 million Internet customers as of year-end 2001, of whom roughly 689,000 or 46% were high-speed customers and 825,000 or 54% were dial-up customers.⁸

Direct-to Home (DTH) satellite service provider, Bell ExpressVu, which is also included within BCE's Bell Canada business segment, served 1.1 million customers as of year-end 2001 and generated revenues of \$474 million in 2001.

As noted above, in 2001, BCE's wholly-owned international service provider, Teleglobe, was placed into a separate business segment within BCE. Teleglobe provides international telecommunications services, including voice services, Internet connectivity, high-speed data transmission, broadband and other services on a retail and wholesale basis. Teleglobe's 2001 revenues were \$2.1 billion.⁹

While Telesat is currently wholly-owned by BCE, in late 2001, BCE indicated that it was considering selling a minority in Telesat to a strategic partner. Telesat provides satellite transmission capacity and related earth segment (uplink and downlink) services and sells satellite equipment. It currently owns and operates three fixed satellite service satellites and a direct broadcast satellite, and it operates four other satellites for various customers. It provides satellite services to both North and South American customers. In 2001, Telesat's consolidated revenues were \$321 million and its year-end 2001 total assets were \$1.3 billion.¹⁰

On a consolidated basis, including all of BCE's business segments and related subsidiaries, BCE's 2001 revenues were \$21.7 billion and its year-end 2001 total assets were \$54.3 billion.¹¹

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).

⁸ Ibid.

⁹ With the significant and continuing downturn in the data and long-haul marketplace, BCE announced that it was discontinuing the long-term financing of Teleglobe and that it planned to write down Teleglobe's carrying value. Teleglobe has since filed for protection under the *Companies' Creditors Arrangement Act* and is currently undertaking restructuring initiatives that, if successfully implemented, will likely scale back the scope of its operations considerably. (Source: Teleglobe, News Release, 15 May 2002)

¹⁰ Telesat, 2001 Annual Report.

¹¹ BCE, 2001 Annual Report.

U.S.-based Verizon Communications Inc. holds a 24% interest in TELUS Corporation. As well, Motorola Inc. holds a 3% interest in the company. During 2001, TELUS purchased the remaining 30% interest in TELUS Québec that had been held by Verizon Communications.

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.

In 2001, TELUS' consolidated revenues were \$7.2 billion and its year-end 2001 total assets were \$19.3 billion.¹² TELUS served roughly 5.0 million wireline and 2.6 million wireless customers, and 670,000 Internet access service customers (of which 215,000 or 32% were high-speed customers) as of year-end 2001.¹³

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 -- i.e., NBTel Inc., Island Telecom Inc., Maritime Tel & Tel Limited and NewTel Communications Inc. 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.

In 2001, Aliant Telecom's total revenues were \$2.6 billion and its total assets as of year-end 2001 were \$3.7 billion.¹⁴ In addition, as of year-end 2001, Aliant Telecom served roughly 1.6 million wireline and 0.5 million wireless customers, and 263,000 Internet access service customers (of which 68,000 or 26% were high-speed customers).¹⁵

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

¹² TELUS, 2001 Annual Report.

¹³ Ibid.

¹⁴ Aliant, 2001 Annual Report.

¹⁵ Ibid.

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).

On a consolidated basis (i.e., including Bell Intrigna), MTS' 2001 total operating revenues were \$1.0 billion last year and its year-end 2001 total assets were \$1.7 billion.¹⁶ MTS served roughly 700,000 wireline and 200,000 wireless customers, and 97,000 Internet access service customers (of which 34,000 or 35% were high-speed customers) as of year-end 2001.¹⁷

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. In August 2001, SaskTel purchased Vancouver-based RSL COM Canada Inc., which has since been renamed Navigata Communications Inc. (Navigata). Navigata provides competitive local, long distance, wireless, data and Internet services in British Columbia, Alberta, Ontario and Quebec.

In 2001, SaskTel's consolidated revenues, including wireline, wireless, international and directory services, were \$853 million and its year-end 2001 total assets were \$1.25 billion.¹⁸ SaskTel served roughly 600,000 wireline customers and 106,000 Internet access service customers as of year-end 2001.¹⁹

Incumbent Out-of-Territory Service Providers

There are three active players in this category -- i.e., (i) Bell Canada and MTS through Bell West, (ii) TELUS, and (iii) SaskTel through Navigata.

Bell West provides voice and data communications services, including local exchange service, targeted at business and government customers in Alberta and British Columbia. Bell West, which was formed earlier this year, combines the operations of Bell Intrigna and Bell Nexxia in western Canada. Bell Canada's ownership interest in the new company is 60% and MTS' interest is 40%.²⁰

¹⁶ MTS, 2001 Annual Report.

¹⁷ Ibid.

¹⁸ SaskTel, 2001 Annual Report.

¹⁹ Ibid.

²⁰ Bell Canada, News Release, 11 April 2002. Formerly MTS held a 2/3 and Bell Canada a 1/3 interest in Bell Intrigna.

While financial results for Bell West are not available for last year, Bell Intrigna's 2001 revenues were \$182 million, more than triple the level of its 2000 revenues of \$58 million, and its year-end 2001 total assets were \$410 million. As of year-end 2001, Bell Intrigna had approximately 1,500 customers.²¹

In addition, through roaming/resale agreements in Alberta and British Columbia and the purchase of PCS spectrum in Industry Canada's 2001 spectrum auction, Bell Mobility, together with its Bell Wireless Alliance partners,²² provide a range of mobile wireless services in western Canada.

While TELUS also provides a range of wireline services out-of-territory in eastern Canada, at this time it does not have a separate subsidiary established for this purpose. In terms of wireless services, with the acquisition of Clearnet, TELUS became a nationally based wireless service provider. As well, in January 2002, TELUS signed a reciprocal agreement to provide roaming/resale agreements with eastern Mobility wireless service providers, further extending TELUS' coverage in the eastern half of the country.

SaskTel's subsidiary, Navigata, provides competitive local, long distance, wireless, data and Internet services in British Columbia, Alberta, Ontario and Quebec.

Small Incumbent Carriers

There are 39 small incumbent telephone companies in Canada. With the exception of municipally-owned Prince Rupert City Telephones (CityTel) in British Columbia, these carriers are dispersed throughout the provinces of Ontario and Quebec. Small incumbent carriers are municipally owned or independently owned, either privately or publicly. Like the large incumbents, they have enjoyed historical monopolies in their respective operating territories. Most serve mainly rural areas and almost all have less than 25,000 subscribers, with several having fewer than 1,000 subscribers. Overall, small incumbent carriers serve less than 2% of the total population of Canada.

Given their limited serving areas, small incumbent carriers typically do not provide facilities-based long distance services. However, they do provide a range of local voice, data, Internet and wireless services. One exception is O.N.Telcom that operates in a relatively large territory in Northern Ontario and primarily provides long distance services as well as local services. As well, branching out from the provision of local, data, wireless and terminal equipment services, Northern Telephone Limited entered the long distance market in north-eastern Ontario in January of this year.

²¹ MTS, 2001 Annual Report.

²² The Aliant Telecom companies, MTS and SaskTel. Bell Mobility, News Release, 1 February 2001.

Nineteen small incumbents are members of the Ontario Telecommunications Association (OTA), which as a group serve roughly 95,000 access lines. Thirteen other small incumbents are members of the Association des Compagnies de Téléphone du Québec (ACTQ), which as a group service roughly 50,000 lines, mainly in rural areas in the province of Quebec. Lastly, five municipally-owned small incumbent carriers, such as Thunder Bay Telephone which serves 79,000 access lines, belong to the Canadian Alliance of Publicly-owned Telecommunications Systems (CAPTS).

Competitive Service Providers

Competitive service providers in the Canadian telecommunications market provide telecommunications services on a facilities or resale basis, as well as on a combined facilities/resale (or hybrid) basis. Cable companies and utility companies that provide telecommunications services primarily on a facilities basis are discussed in the next two sections.

Overviews of a number of the major competitors in the Canadian telecommunications service markets in 2001 are provided below. The service providers covered were selected primarily on the basis of their relative size, the technology they employ or market segment they serve.

Facilities-Based Competitive Service Providers

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. (formerly AT&T Canada Long Distance Services Company, which also included former long distance service provider, ACC TelEnterprises Company) and AT&T Canada Corp.'s wholly-owned subsidiary, AT&T Canada Telecom Services Company (formerly MetroNet Communications Group Inc., acquired in 1999).

U.S.-based AT&T Corp. (AT&T) held a 31% equity interest and 23% voting interest in AT&T Canada in 2001. In 2001, British Telecommunications plc ("BT") held approximately a 30% share of AT&T's equity and voting interest in AT&T Canada.²³

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% of the Canadian business telecommunications market. With its relationship and interconnection agreements with international service providers, such as AT&T Corp., AT&T Canada provides global voice, data, Internet and e-business solutions to Canadian business customers.

In 2001, AT&T Canada's total operating revenues were \$1.5 billion. Of this, \$658 million (or 43%) was derived from long distance services, \$485 million (or 31%) from data services, \$209 million (or 14%) from local services and the balance, \$193 million (or 12%), from Internet, e-business and other services. AT&T Canada's year-end 2001 total assets were \$4.7 billion.²⁴

As of year-end 2001, AT&T Canada served roughly 549,000 business local access lines - 50% of these lines were either "on-net" (i.e., served using AT&T Canada's own facilities) or "on-switch" (i.e., served using leased loops).²⁵ The remaining balance was served on a resale basis. The company had 96 co-locations in incumbent wire centres at the end of 2001.²⁶ 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.

²³ In April 2002, AT&T acquired BT's indirect investment in AT&T Canada. In addition, in 1999, AT&T conditionally agreed to purchase or arrange for another party to purchase all of the outstanding voting and equity securities in AT&T Canada, to the extent permitted assuming the full or partial removal of existing Canadian foreign ownership restrictions, on or before July 2003 at pre-specified per share prices. With changes in the foreign ownership restrictions not being imminent, AT&T recently identified two Canadian parties (Brascan Financial Corporation and CIBC Capital Partners) to facilitate the completion of the 1999 share purchase agreement. The transaction was completed in October 2002 and maintained AT&T's existing equity and voting interest in AT&T Canada. (Source: AT&T Canada, News Release, 8 October 2002).

Subsequently, AT&T Canada announced that it had reached an agreement in principle with its bondholders on a proposed capital restructuring plan that would see the company's bondholders receiving 100% of its new equity in exchange for AT&T Canada's outstanding public debt. AT&T Canada has received a court order under the Companies' Creditors Arrangement Act to implement the proposal. (Source: AT&T Canada, Press Releases, 15 October 2002).

²⁴ AT&T Canada, 2001 Annual Report.

²⁵ AT&T Canada, News Release, Fourth Quarter Financial and Operating Results, 6 February 2002.

²⁶ AT&T Canada, Annual Information Form for 2001.

Call-Net formed an alliance with U.S.-based Sprint Corporation (Sprint) in October 1993 through which it received exclusive Canadian rights to Sprint's technology, products and trademarks. In exchange, Call-Net provided Sprint with a 25% non-voting equity interest in the company.

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. Sprint Canada owns and operates an extensive transcontinental fibre network, and maintains network facilities in the United States and the United Kingdom.

In 2001, Call-Net's total operating revenues were \$928 million, of which roughly \$625 million (or 67%) was derived from long distance services, \$278 million (or 30%) from data services and \$26 million (or 3%) from local services. Call-Net's year-end 2001 total assets were \$1.6 billion.²⁷

By year-end 2001, Call-Net served roughly 54,000 residential local access lines²⁸ and had 100 co-locations in incumbent carrier wire centres in nine major urban centres across the country.²⁹

GT Group Telecom Inc. (Group Telecom)

In 2001, Group Telecom was the third largest national facilities-based wireline competitor in Canada. Its operations were expanded in 2000 through the acquisitions of cable company telecom affiliates Shaw FibreLink, Videon FibreLink and Cable Atlantic. Calgary-based cable service provider, Shaw Communications Inc., held a significant interest in the company.³⁰

Group Telecom provides business customers with voice, data, Internet and other telecommunications services. It also provides wholesale services to other telecommunications service providers.

In its fiscal year 2001 (i.e., the year ended 30 September 2001), Group Telecom's total operating revenues were \$209 million. Of this, roughly \$160 million (or 76%) was derived from data services, \$39 million (or 19%) from local and long distance services,

²⁷ Call-Net, 2001 Annual Report.

²⁸ Ibid.

²⁹ Call-Net, Annual Information Form for 2001.

³⁰ Early in 2002, Group Telecom announced that it was undertaking a corporate restructuring plan involving, among other things, reductions in its workforce and reductions in planned capital expenditures. Subsequently, the company sought and obtained protection under the Companies' Creditors Arrangement Act. As of October 2002, it remained in discussion with its creditors regarding the potential restructuring of its debt and operations.

and the remaining share, \$10 million (or 5%), from the sale of dark fibre and provision of other services. Group Telecom's year-end fiscal 2001 total assets were \$2.2 billion.³¹

As of fiscal year-end 2001, Group Telecom served approximately 90,000 access lines; 80% of these lines were provisioned "on-net". At the same time, Group Telecom had 80 co-locations established in incumbent carrier wire centres.

Microcell Telecommunications Inc. (Microcell)

Microcell is a national wireless carrier that provides PCS and wireless Internet services. Microcell was awarded a national PCS licence in 1995. It competes directly with the Bell Wireless Alliance companies, TELUS Mobility and Rogers AT&T Wireless.

U.S.-based VoiceStream Wireless Corporation holds a 15% equity investment in Microcell.

In 2001, Microcell provided a range of wireless communications products and services primarily through its wireless network operator and wholesale PCS service provider, Microcell Connexions Inc.,³² and its retail PCS service provider, Microcell Solutions Inc., which markets PCS services under the Fido brand name. Microcell's Internet business segment consisted of two additional subsidiaries Inukshuk Internet Inc.,³³ 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.³⁴

On a consolidated basis, Microcell's 2001 revenues were \$561 million and its year-end 2001 total assets were \$1.4 billion.³⁵

As of year-end 2001, Microcell served 1.2 million subscribers, roughly 638,000 (or 53%) of which were post-paid customers. Microcell also provided digital PCS wireless service to an additional 21,000 customers on a wholesale basis.³⁶

³¹ Group Telecom, 2001 Annual Report.

³² In 2000, Microcell Connexions Inc. received approval from the CRTC to become a competitive local exchange carrier (CLEC).

³³ In 2001, Microcell acquired 100% ownership of Inukshuk by purchasing Look Communications Inc.'s 50% interest in the company.

³⁴ Earlier this year, Microcell announced that it was consolidating Microcell Connexions and Microcell Solutions into a single corporate entity, Microcell PCS. In addition, Microcell integrated the activities of Microcell i5 Inc. into its PCS division. Microcell has also been seeking a partner to share the financing of Inukshuk Internet Inc. Given the uncertainties involved and increasing financing costs, it recently wrote down the value of the subsidiaries' spectrum licenses to nil. (Sources: Microcell, News Releases, 26 March 2002, 17 April 2002, and 9 August 2002).

³⁵ Microcell, 2001 Annual Report.

³⁶ Microcell, News Release, 14 January 2002.

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.³⁷

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.

Look's 2001 revenues were \$74 million and its 2001 year-end total assets were \$55 million. As of year-end 2001, Look served approximately 113,000 residential dial-up Internet customers and 5,000 high-speed access customers.³⁸

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.

Futureway is privately owned. Metrus Property Development Inc., a developer of residential neighbourhoods in the GTA, and Rogers Communications Inc. hold interests in the company.

Novus Communications Inc. (Novus)

Novus provides integrated telephone, high-speed Internet access and television services to residents of multiple dwelling units in Vancouver. Novus currently provides television and high-speed Internet services to approximately 3,700 subscribers in 60 buildings in Vancouver.³⁹

³⁷ Under financial pressure in late 2001, Look filed for protection under the *Companies' Creditors Arrangement Act*. The company's restructuring plan was later approved in early 2002.

³⁸ Look, Annual Information Form for 2001.

³⁹ <http://www.novus-tele.com/frame/vancouver/about.html>.

Resellers

Resellers began to first enter the long distance market in the late 1980s. To provide long distance services, they resell the facilities and services of incumbent and/or competitive carriers. Since resellers do not own transmission facilities, they are not Canadian carriers and, therefore, are not subject to foreign ownership restrictions. In addition, resellers are not subject to rate regulation by the CRTC.

Resellers provide business customers with local, long distance and other services on a resale basis, and they provide residential customers with long distance and Internet access services. Examples covered below include Primus Telecommunications Canada Inc., Distributel Communications Limited and YAK Communications (Canada) Inc.

Primus Telecommunications Canada Inc. (Primus Canada)

Primus Canada is a wholly-owned subsidiary of U.S.-based Primus Telecommunications Group Inc.

Primus Canada provides voice, data, e-commerce, Web hosting and Internet services. Primus Canada also offers local services to businesses, bundling them with its long distance and Internet services. The company has a nation-wide network, extending from Quebec City to Victoria, which is leased on a 20-year indefeasible rights of use (IRU) basis. Primus Canada provides international connectivity through its parent company's global network.⁴⁰

In March 1999, Primus Canada acquired the customer base and assets of long distance and Internet access services provider London Telecom Group (including London Telecom Network and Win-Tel Communications). In May 1999, Primus Canada acquired the residential long distance customer base of AT&T Canada and ACC TelEnterprises. In addition, in June 1999, Primus Canada acquired Telephone Savings Network, a provider of local services through resold Centrex services, permitting Primus Canada to enter the local services market as a reseller.

As of early 2002, Primus Canada served over 800,000 retail customers and about 60,000 dedicated and dial-up Internet access subscribers.⁴¹ Primus Canada's 2001 net revenues were US\$173 million and its total assets as of year-end 2001 were US\$112 million.⁴²

Distributel Communications Ltd. (Distributel)

Distributel is Canadian owned and controlled. It provides long distance service in Ontario and Quebec. Distributel offers a variety of residential and commercial long distance plans generally based on fixed monthly fees for long distance calls within a particular

⁴⁰ Primus Canada, News Release, 6 May 2002.

⁴¹ Ibid.

⁴² Primus Telecommunications Group Inc., Form 10-K, fiscal year ended 31 Dec 2001.

geographical area. It currently services roughly 250,000 customers in Ontario and Quebec.⁴³

YAK Communications (Canada) Inc. (YAK Canada)

YAK Canada, a wholly-owned subsidiary of YAK Communications (USA) Inc., is a reseller which utilizes its own switching system together with alternate carrier networks that supply national and international voice and data traffic termination over a variety of different, least-cost routes.⁴⁴

YAK Canada specializes in offering long distance services to residential and small-to-medium business customers by way of "dial-around" platform (also known as 10-XXX or casual calling). YAK Canada provides service in Alberta, British Columbia, Manitoba, Ontario and Quebec. It currently has over 300,000 monthly recurring customers.⁴⁵

Resale-based Internet Service Providers (ISPs)

While incumbent carriers and cable companies account for the majority of the Internet access market, there are also hundreds of other independent ISPs operating across the country today.⁴⁶ Similar to resellers, these companies are not carriers and, therefore, are not subject to foreign ownership limitations. They provide business and residential customers with Internet access services, as well as web hosting, e-commerce and other services.

A recent study conducted for Industry Canada by Pollara Inc. found that there are 940 ISPs operating in the country, including incumbent carriers, cable providers and independent ISPs. Most independent ISPs are small operations, with 60% reporting annual revenues of less than \$1 million and only 8% reporting annual revenues in excess of \$3.5 million.⁴⁷

Most independent ISPs provide service on a local basis, although some service providers, such as AOL Canada and Inter.net Canada, provide service on a national basis.

Initially, independent ISPs offered primarily dial-up Internet access to their customers. When the incumbent carriers introduced high-speed or DSL Internet access service, ISPs sought access to the incumbent carriers' networks so they could provide a high-speed Internet access service alternative themselves. In 2000, the CRTC mandated access by independent DSL providers to the required incumbent facilities.⁴⁸ A number of

⁴³ <http://www.distributel.com/wwwpages.e/profile.php3>.

⁴⁴ Earlier this year, the company signed a five-year deal with TELUS who will provide YAK Canada with long distance, private line and clearing house services. (Source: YAK, News Release, 14 May 2002)

⁴⁵ Ibid.

⁴⁶ Independent ISPs in this context includes ISPs that are not affiliated with either incumbent carriers, cable providers or other facilities-based carriers (such as AT&T Canada or Call-Net).

⁴⁷ Network Letter, Vol. 22, Issue 12, 18 June 2002. (Original source: Pollara Inc.)

⁴⁸ Order CRTC 2000-983, 27 October 2000.

independent ISPs now provide DSL Internet access services to their customers on the basis of Bell Nexxia's wholesale service.⁴⁹ However, there have been failures in the industry where entrants have focused largely on this approach, as in the case of now bankrupt C1 Communications Inc.

No independent ISP has formally requested the CRTC to interconnect to the cable providers' infrastructure to provide high-speed Internet access. In the meantime, the relevant tariffs setting out the rates, terms and conditions for interconnection to the infrastructure of the four largest cable providers are being finalized.

Payphone Service Providers

The payphone market was opened to competition in 1998. At that time, the CRTC set access rates to be charged to entrants wishing to connect their payphones to the incumbents' networks. Since that time, numerous parties have registered as Competitive Pay Telephone Service Providers (CPTSPs), with the intent of providing competitive alternatives to the incumbent carriers.⁵⁰ The vast majority of these new entrants are either inactive or very small. A significant player to enter the market, however, is Canada Payphone Corporation.

Canada Payphone Corporation (Canada Payphone)

Canada Payphone provides public telecommunications services and sells advertising delivered by way of pay telephones and other public access products. By the end of 1999, Canada Payphone had installed approximately 2,000 payphones in most of the major and secondary markets across Canada. Canada Payphone's installed base of phones reached a high of approximately 3,000; due to financial pressures, this amount was reduced to roughly 2,300 as of year-end 2001.⁵¹

Canada Payphone has an agreement with AT&T Canada under which AT&T Canada is the default carrier for all long distance calls originated from Canada Payphone's payphones in Canada. The AT&T Canada brand name appears on all of Canada Payphone's payphones and related products. AT&T Canada owns roughly a 15% interest in Canada Payphone.

Canada Payphone's revenues for the fiscal year ended September 30, 2001 were \$3.5 million and its fiscal year-end 2001 total assets were \$14.2 million.⁵²

⁴⁹ Bell Nexxia purchases Bell Canada's wholesale DSL service.

⁵⁰ A list of current CPTSPs is available on the CRTC's website:
<http://www.crtc.gc.ca/ENG/public/lplists/cptsp.htm>.

⁵¹ Canada Payphone Corporation, Annual Information Form for 2001.

⁵² Ibid.

Cable Providers

As of September 2001, roughly 99% of Canadian homes had televisions, and close to 92% of those homes were passed by cable. Of the homes passed, roughly 72% subscribed to cable, representing roughly 7.6 million households.⁵³ In total, Canadian cable providers served 8.2 million residential and commercial customers in 2001.⁵⁴

Cable modem service first became available in Canada in 1997 and, as of August 2001, there were roughly 1.4 million cable modem subscribers.⁵⁵ As of the same time, roughly 85% of Canadian homes with access to cable also had access to cable modem service; however, access to cable modem service is generally much more limited in small-size communities compared to medium and large-size communities. Overall, approximately 15% of all homes with access to cable modem service subscribed to the service as of August 2001.⁵⁶

Overviews of the four largest cable providers are provided below, illustrating the diverse range of services they provide, which in addition to cable modem service includes a variety of other wireless and wireline telecommunications services. EastLink is also included since it is the only Canadian cable provider to provide cable telephony services to date.

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 2.3 million 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. Rogers Cable's 2001 total operating revenues were \$1.4 billion and, as of year-end 2001, it served approximately 479,000 high-speed Internet customers.⁵⁷

Rogers holds a majority interest in Rogers Wireless Inc. (Rogers Wireless, which operates under the co-brand Rogers AT&T Wireless) and, as part of its strategic alliance with U.S.-based AT&T, AT&T holds a one-third interest in Rogers Wireless.

Rogers Wireless is a national provider of cellular, digital PCS, paging and two-way messaging and wireless data services. In 2001, it served more than 3.4 million customers across the country, including 2.3 million post-paid wireless voice service subscribers,

⁵³ Canadian Cable Television Association, 2001 Cable Industry Statistics.

⁵⁴ Ibid.

⁵⁵ Statistics Canada, High-speed Internet by cable, 2001, The Daily, 3 September 2002.

⁵⁶ Ibid.

⁵⁷ Rogers, 2001 Annual Report.

735,000 prepaid wireless voice service subscribers and 427,000 wireless data and messaging subscribers. Rogers Wireless' 2001 revenues were \$1.8 billion.⁵⁸

In early 2001, Rogers Wireless acquired 23 of the 62 regional PCS licenses available in Canada through the auction organized by Industry Canada, at a cost of \$397 million.

On a consolidated basis, Rogers' 2001 total operating revenues were \$3.9 billion and its year-end 2001 total assets were \$9.0 billion.⁵⁹

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. In 2001, Shaw served approximately 2.1 million cable television customers in five provinces (British Columbia, Alberta, Saskatchewan, Manitoba and Ontario), representing approximately 25% of the Canadian cable television market.⁶⁰

Shaw provides high-speed Internet access services to residential and small business subscribers. As of year-end 2001, Shaw's Internet access service subscribers were approximately 596,000, representing a penetration rate of approximately 24%. Shaw's Internet service revenues in 2001 were \$191 million.⁶¹

Shaw also provides telecommunications services through its wholly-owned Big Pipe subsidiaries (one operating in Canada and the other in the U.S.). In 2000, Shaw established Big Pipe to develop and operate the fibre network that serves as the primary Internet backbone for Shaw's broadband Internet customers and to provide Internet services to large businesses and other organizations requiring end-to-end connectivity to the Internet. Big Pipe established a strategic relationship with 360networks Inc. ("360"),⁶² through which it entered into a fibre capacity lease arrangement, purchased a national fibre optic network, and entered into an IRU with respect to a portion of 360's U.S. fibre network. Big Pipe's 2001 revenues, (excluding intra-company payments) were \$11 million.⁶³

⁵⁸ Ibid.

⁵⁹ Rogers, 2001 Annual Report.

⁶⁰ Shaw, 2001 Annual Report.

⁶¹ Ibid.

⁶² In 2001, 360 filed for protection under the *Companies' Creditors Arrangement Act* in Canada and Chapter 11 of the Bankruptcy Code in the U.S. 360 recently received approval of its plan of reorganization in both Canada and the U.S.

⁶³ Shaw, 2001 Annual Report.

Shaw sold the assets and operations of Shaw FibreLink to Group Telecom in February 2000. It currently retains a significant interest in Group Telecom.

On a consolidated basis, Shaw's 2001 total revenues were roughly \$1.6 billion and its year-end 2001 total assets were \$8.9 billion.⁶⁴

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

In 2001, Quebecor acquired Vidéotron.⁶⁵ 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., which accounts for the bulk of Quebecor's revenues, 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 provided analog and interactive digital cable television service to approximately 1.5 million customers in 2001. It also provides both high-speed and dial-up Internet access services. In 2001, it served 284,000 Internet access customers of which roughly 80%, or 227,000, were high-speed Internet access customers. Vidéotron's total revenues in 2001 were \$710 million and its year-end 2001 total assets were \$6.1 billion.⁶⁶

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 ltée (VTL), provides business telecommunications services in Québec. It has a regional network of more than 8,600 km, covering 90% of Québec's potential market for business telecommunications. 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. VTL's 2001 total revenues were \$97 million and its year-end 2001 total assets were \$589 million.⁶⁷

On a consolidated basis, including Quebecor World Inc. and Quebecor Media Inc., Quebecor's 2001 total revenues were \$11.6 billion and its year-end 2001 total assets were \$19.5 billion.⁶⁸

⁶⁴ Ibid.

⁶⁵ In alliance with the Caisse de dépôt et placement de Québec.

⁶⁶ Quebecor Inc., 2001 Annual Report; pro forma results, incorporating Vidéotron on a 12-month basis into Quebecor's 2001 financial results.

⁶⁷ Ibid.

⁶⁸ Ibid.

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.⁶⁹ 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.

As of fiscal year end 2001 (i.e., the year ended August 31, 2001), Cogeco Cable had roughly 879,000 cable customers in Ontario and Quebec, the majority of whom (i.e., 71%) were located in Ontario.⁷⁰ Cogeco Cable offers high-speed cable modem Internet service on its larger systems in Ontario and Quebec and also offers conventional speed telephone modem service. Cogeco served roughly 108,000 high-speed Internet service customers in 2001.⁷¹

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.

On a consolidated basis, Cogeco's fiscal 2001 total revenues were \$479 million and its year-end fiscal 2001 total assets were \$1.8 billion.⁷²

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. Following the purchase of Shaw's Nova Scotia systems in 2001, it served more than 240,000 customers.⁷³ 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

⁶⁹ Cogeco Inc. holds an 86.6% interest in Cogeco Cable Inc. Cogeco, Annual Information report for fiscal 2001.

⁷⁰ Cogeco, Annual Information report for fiscal 2001.

⁷¹ Cogeco, Fiscal 2001 Annual Report.

⁷² Ibid.

⁷³ EastLink, Press Release, 30 July 2001.

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.

Utility Telcos

Historically, many utility companies (e.g., in the electricity, energy, gas or other utility businesses) have managed their own telecommunications facilities to meet internal service requirements for administrative data, voice and power system protection and operation. These requirements have typically been met through the use of a range of owned facilities and services acquired from other telecommunications service providers. For instance, electric utilities rely on telecommunications services for protection and operation of their electric transmission systems. As a result, they own facilities that include microwave radio, fibre-optic cable, power line carrier and mobile radio systems, although microwave radio systems have been or are in the process of being replaced by fibre-optic systems.

Electrical utilities, for example, possess a range of assets that can directly assist their entry into the telecommunications market. These include extensive rights-of-way (both intra and inter-city), access to numerous buildings in urban centres, an extensive number of transmission and communications towers, significant existing fibre-optic network capacity and reach as well as experience in managing telecommunications networks. In addition, utility telcos can leverage not only the physical assets of their parent electric utilities, but also their financial assets. For example, in terms of total revenues and assets, many provincial crown corporation power utilities are comparable, if not larger, in scale than many incumbent carriers and cable providers.

Entry into the telecommunications market by utility telcos has been relatively limited to date, but appears to be increasing. Examples include the creation of Hydro One Telecom Inc., which provides service on a provincial basis, as well as members of the Ontario-based FibreWired Network who provide telecommunications services in the metropolitan areas served by their respective parent electric utility companies. As well, Hydro Ottawa announced in December 2001 that it had received approval to launch a competitive utility telco carrier subsidiary.⁷⁴ The company, Telecom Ottawa Limited, is expected to begin operations this year.

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. The Hydro One family of companies emerged from the restructuring of Ontario

⁷⁴ Telecom Ottawa, News Release, 31 December 2001.

Hydro. 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. Toronto Hydro Telecom provides its customers access to its network of more than 700 route-kilometres of fibre optic cable, connecting approximately 400 office buildings in Toronto. The company also offers private line services, metro LAN (Ethernet access), dedicated Internet access and data centre co-location solutions.

FibreWired Network

FibreWired is an association of community-owned utilities in Ontario that provide high-speed telecommunications services 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.