

IP TELEPHONY AND THE INTERNET: CANADA CASE STUDY



January 2001

This case has been prepared by Craig McTaggart, Graduate Fellow, Centre for Innovation Law & Policy, University of Toronto Faculty of Law <craig.mctaggart@utoronto.ca>. *IP Telephony and the Internet* is part of a series of country case studies produced in connection with the Third World Telecommunication Policy Forum (WTPF) on IP Telephony, Geneva, 7-9 March 2001. The WTPF case studies programme is under the direction of Dr. Ben Petrazzini, <Ben.Petrazzini@itu.int> Regulatory Affairs Advisor, Strategy and Policy Unit (SPU), ITU. Other IP Telephony cases, including China, Colombia, Republic of Korea, Peru and Thailand, can be found at <<http://www.itu.int/wtpf/casestudies/>>. The opinions expressed in this study are those of the author and do not necessarily reflect the views of the International Telecommunication Union, its membership, or the Canadian government.

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Summary

Canada has a highly competitive telecommunication services sector, supervised by a proactive regulator acting under pro-competitive government policy. Canadians enjoy some of the highest quality and lowest priced telecommunication services in the world. This has been accomplished in spite of the country's immense size, often harsh climatic conditions, and low average population density. Canadian telecommunication policy has always stressed the importance of universal service. As competition has replaced monopoly, the system employed to support that objective (known as "contribution") has become the most important remaining aspect of the regulatory regime.

Internet Protocol (IP) Telephony came to prominence worldwide *after* most telecommunication markets were already liberalized in Canada. As such, IP Telephony has almost no history of being used as a means of bypassing traditional voice telephony operators in Canada. The Internet, on the other hand, has been embraced by Canadians and the country is now home to the highest percentage of regular Internet users anywhere in the world. For telephone calls, however, the existing circuit-switched telephone network appears to serve the needs of users well enough to stifle interest in IP Telephony.

Almost no telecommunication carriers or Internet Service Providers (ISPs) in Canada offer retail IP-based voice services. It appears that the most extensive use of IP Telephony *technology* in Canada is, firstly, in closed networks, and secondly, within carriers' backbone networks—again, not as a service offered to the public. There is a very small number of Canadian IP Telephony Service Providers (IPTSPs) offering IP Telephony services to the public. However, their aggregate share of the Canadian voice telephony market (including

local, wireless, long distance, and international) *combined* with all IP Telephony public offerings from other types of carriers, while not substantiated by any statistics, is generally thought to be less than 1 per cent.

While there has been relatively little *commercial* activity in Canada relating to IP Telephony, there has been comparatively much more *regulatory* activity. The possibility that packetized speech technology, such as Voice over IP (VoIP), might be used to bypass the contribution regime has spurred the regulator explicitly to address the regulatory status of Internet and IP-based services on several occasions. Technological neutrality is a key principle of Canada's telecommunications regulatory regime. The contribution collection mechanism was very recently (1 January 2001) reformed to preserve that principle by switching from a per-minute charge on long-distance and international calls to a broad-based percentage-of-revenue charge imposed on almost all telecommunication service providers. While the end result is that both retail Internet access and small-scale IP Telephony services remain essentially unregulated in Canada, the classifications and rules employed by the regulator to reach this result will no doubt be of interest to regulators and policy-makers elsewhere in the world grappling with these same issues.

While all Internet and IP-based services are subject to the governing legislation and the authority of the regulator, only certain types of Internet and IP-based services fall under the contribution regime. What is commonly referred to as "Phone-to-Phone" IP Telephony (regardless of the nature of the underlying transmission network, be it the Internet or a private IP network) is "contribution-eligible," while plain Internet access and personal computer (PC)-based voice applications are not. Generally

speaking, where a telephone on a circuit-switched network is used to initiate a call, and that call is subsequently converted to packet-switched mode within Canada, the associated revenues fall into the contribution-eligible account of the service provider. If a call starts out in packet-switched mode, however, and is never converted to circuit-switched mode within Canada (e.g. home and enterprise computer telephony applications), the associated revenues (if any) are not contribution-eligible.

The regulatory regime for IP Telephony in Canada is premised on the assumption that true, full-featured "end-to-end" public IP Telephony systems are still several years away. This presumption is borne out in almost every sector of the Canadian telecommunication industry, where interest and investment in IP Telephony technology is very low. This is probably due to the high quality and low prices available from Canada's existing voice network, and the as-yet unclear business case for moving to all-IP, multiservice networks.

1. Country background

1.1 Geography and demographics¹

Canada is a North American country of immense size. At 9.9 million km², it is second in land mass only to the Russian Federation. Canada shares a land frontier with only one country: an 8'892 km unfortified border with the United States of America. The country spans six time zones and has 243'791 km of coastline (the world's longest).

Canada's early history was defined by the rivalries of the European powers in the 17th through 19th centuries. England ultimately defeated France for control of Canada in 1763. Canada subsequently gained its independence from England not by revolution, but by means of a series of negotiated legal steps. It became the first English colony to be a self-governing dominion in 1867, achieved full legislative independence in 1931, and finally achieved complete independence from England in 1982.

Diversity is the keynote of Canada's geography, which includes fertile plains, mountain ranges, lakes and rivers, wilderness forests and Arctic tundra. There are many climatic variations in this huge country, ranging from permanently frozen icecaps to the luxuriant vegetation of British Columbia's southwest coast. Canada's most populous regions, which lie in the country's south along the US border, enjoy four

distinct seasons. Here daytime summer temperatures can rise to 30°C and higher, while lows of -25°C and below are not uncommon in winter.

Canada has two official languages: English, the mother tongue of about 59 per cent of Canadians; and French, that of 23 per cent of the population.



Eighteen per cent of Canadians are bilingual, or have a mother tongue other than English or French, such as Chinese, Italian, German, Polish, Spanish, Portuguese, Punjabi, Ukrainian, Arabic, Dutch, Tagalog, Greek, Vietnamese, Cree, Inuktitut, or other languages. In 1996, about 3 per cent of Canadians belonged to one or more of the three aboriginal groups recognized by the Constitution Act, 1982: North American Indian, Métis, or Inuit. Of this percentage, about 69 per cent are North American Indian, 26 per cent Métis and 5 per cent Inuit. Canada's largest city (but not its capital), Toronto, is one of the most multicultural cities in the world where it is said that over 100 languages are spoken.²

Canada's population was 30.5 million in 1998, a large majority of whom (77 per cent) live in cities and towns. Canadians enjoy one of the highest standards of living in the world.³

1.2 Political system

Canada is a constitutional monarchy and federal State with a democratically elected Parliament. The Parliament of Canada, seated in Ottawa, consists of the House of Commons, whose members are elected and who in turn appoint the Senate. On average, members of Parliament are elected every four years. In the general election of November 2000, the Liberal Party was elected to its third consecutive majority government under the leadership of Prime Minister

Jean Chrétien. There are currently four other official parties in Parliament: Bloc Québécois, Canadian Alliance, New Democratic Party, and Progressive Conservative.

Canada has ten provinces and three territories, each with its own capital city (in brackets): *Alberta* (Edmonton); *British Columbia* (Victoria); *Manitoba* (Winnipeg); *New Brunswick* (Fredericton); *Newfoundland* (St. John's); *Nova Scotia* (Halifax); *Ontario* (Toronto); *Prince Edward Island* (Charlottetown); *Québec* (Québec City); *Saskatchewan* (Regina); *Nunavut* (Iqaluit); *Northwest Territories* (Yellowknife); and *Yukon Territory* (Whitehorse). Each province and territory has a democratically-elected unicameral legislature.

Table 1: Some key facts about Canada

Area	9'970'610 km ^{2(a)}	Main telephone lines (1999)	19'956'600 ^(d)
Population (July 1999)	30'491'294 ^(a)	Main telephone lines per 100 inhabitants (1999)	65.45 (rank: 11) ^(d)
Population density	3 inh./km ^{2(a)}	Mobile telephones (1999)	6'900'000 (est.) ^(d)
Average population growth rate	1.2 per cent (1980-1998) ^(b)	Mobile telephones per 100 inhabitants (1999)	22.65 (rank: 35) ^(d)
Urban population	77 per cent ^(a)	Internet Service Providers (1999)	700 (est.) ^(e)
Official languages	English and French ^(a)	Internet hosts (July 2000)	3'293'212 (est.) ^(d)
Adult literacy rate	99 per cent ^(c)	Internet hosts per 100 inhabitants (July 2000)	10.8 (rank: 10) ^(d)
Life expectancy at birth	79.1 yrs ^(c)	Internet users (1999)	11'000'000 (est.) ^(d)
Gross National Product (GNP) (PPP, 1998)	US\$ 691'000'000 ^(b)	Internet users per 100 inhabitants (1999)	36.1 (rank: 6) ^(d)
GNP per capita (PPP, 1998)	US\$ 22'814 (rank:17) ^(b)	Personal computers per 100 inhabitants (1999)	36.08 ^(d)

Sources:

- ^(a) Statistics Canada, *Canada At A Glance 2000*, <<http://www.statcan.ca/english/Pgdb/12-581-XPE.pdf>>.
- ^(b) The World Bank Group, *World Development Indicators 2000*, <<http://www.worldbank.org/data/wdi2000/index.htm>>.
- ^(c) United Nations Development Programme, *Human Development Report 2000*, <<http://www.undp.org/hdr2000/english/HDR2000.html>>.
- ^(d) ITU, *ITU Internet Reports 2001: IP Telephony*, <<http://www.itu.int/ti/publications/americas/2000/index.htm>>.
- ^(e) Industry Canada, *The Canadian Telecommunications Service Industry - An Overview, 1999-2000* (forthcoming), <<http://strategis.ic.gc.ca/SSG/sf01703e.html>>.

1.3 Economy

Canada has a modern, industrialized economy based on the free market. Until the Second World War, Canada's economy was dominated by agriculture and the extraction of natural resources, including natural gas, oil, gold, coal, copper, iron ore, nickel, potash, uranium and zinc, wood, and water. Natural resources will always be an important element of the economy. However, services, manufacturing, and processing represent major portions of the modern economy, with the leading industries being automobile manufacturing, pulp and paper (40 per cent of the world's newspapers are printed on Canadian paper), food products, iron and steel work, minerals, chemicals, machinery and equipment manufacturing.

The 1989 Canada-U.S. Free Trade Agreement (FTA) and the 1994 North American Free Trade Agreement

(NAFTA) (including Mexico) have removed almost all trade barriers between Canada and the United States. Canada's economic fortunes are thus highly dependent on those of the United States: 85.8 per cent of Canadian exports went to the United States in 1999, 5.1 per cent to the European Union, 2.6 per cent to Japan, and 6.6 per cent to other countries.⁴ Overall trade in 1999 totalled US\$ 360.6 m in exports and US\$ 326.8 m in imports (on a balance of payments basis).⁵

The unemployment rate was 6.9 per cent in November 2000.⁶ Taxation levels are relatively high, and support an extensive social security system. Total expenditure on health as a percentage of GNP was 9.1 per cent in 1997, on public education, 6.5 per cent in 1998, and on military expenditures, 1.2 per cent in 1997/98.

¹ See *Facts on Canada*, <http://www.cio-bic.gc.ca/facts/canadagen_e.html>; Statistics Canada, *Canada At A Glance 2000*, <<http://www.statcan.ca/english/Pgdb/12-581-XPE.pdf>>; The World Bank Group, *World Development Indicators 2000*, <<http://www.worldbank.org/data/wdi2000/index.htm>>; and United States, Central Intelligence Agency, *The World Factbook 2000 - Canada*, <<http://www.odci.gov/cia/publications/factbook/geos/ca.html>>. Map source: <http://www.atlas.gc.ca/english/quick_maps/quick_maps/can_gov_e.jpg>.

² City of Toronto, "Toronto key facts", <<http://www.city.toronto.on.ca/ourcity/keyfacts.htm>>.

³ United Nations Development Programme, *Human Development Report 2000*, <<http://www.undp.org/hdr2000/english/HDR2000.html>>.

⁴ Statistics Canada, *Canada At A Glance 2000*, <<http://www.statcan.ca/english/Pgdb/12-581-XPE.pdf>>, at p. 23.

⁵ *Ibid.*

⁶ Industry Canada, *Monthly Economic Indicators*, <http://strategis.ic.gc.ca/sc_ecnmy/mera/engdoc/03.html>.

2. The Canadian telecommunication sector

2.1 Historical perspective and structure⁷

Telecommunications in Canada was dominated by comprehensive territorial monopolies until 1979, when the first form of liberalization (private line and data services) began. Even well after that date, public switched telephony remained the exclusive franchise of a small number of publicly and privately-owned telephone companies. However, beginning with the introduction of long-distance competition in 1992, Canada set out on a path towards complete liberalization of all telecommunication market segments.

For the most part, the incumbent telephone companies each operated in separate provinces and implicitly agreed not to compete with each other.⁸ They exchanged long-distance traffic under the auspices of an evolving corporate relationship named, over time: the Trans-Canada Telephone System (TCTS), Telecom Canada, and ultimately Stentor. There are also a number of independent telephone companies which together represent less than 5 per cent of total telecommunication service revenues in Canada⁹ and have not been considered significant for the purposes of this study.¹⁰

Bell Canada has always been (and is now more than ever) the largest telephone company in Canada. Through its parent BCE, Bell either owns or controls all of the traditional telephone companies from Manitoba east to Newfoundland, as well as those in the northern territories, plus Teleglobe and Telesat. Bell has embraced the strategy of convergence and recently acquired national television broadcaster CTV, national newspaper *The Globe & Mail*, and assorted other interests removed from the traditional telephone business.

The telephone companies succeeded in bringing telecommunication service to 99 per cent of Canadians across the vast expanse of its populated territory (see Box 1). However, they ultimately became an anachronism when prevailing beliefs about the role of the State in industry changed in North America, and demand for competition, primarily from large business customers, translated into political commitment to liberalization. Modern Canadian telecommunication policy is premised on the belief that market competition is the most effective means of serving the public interest in access to telecommunication services. However, where competition is not viable, and even in competitive markets, sector-specific regulation is still employed to ensure that public interests are served.

2.2 Responsibility for telecommunication policy and regulation

2.2.1 Policy authority: Industry Canada

Although Canada is a federal State, jurisdiction over telecommunications lies exclusively with the federal level of government. Responsibility for telecommunication policy and spectrum policy and management rests with Industry Canada, the government department under the Minister of Industry. The relevant legislation is the Telecommunications Act (1993) (or the "Act")¹¹ and the Radiocommunication Act (1989). Under the Telecommunications Act, the Governor-in-Council (the federal cabinet) has the authority to issue directions of general application on broad policy matters to the regulator, the CRTC, and to review CRTC decisions—either on its own motion or in response to appeals from interested parties. The Governor in Council may vary, rescind or refer back CRTC decisions for reconsideration within one year after the date of the

Box 1: Telephone service in high-cost serving areas

In 1998-1999 the CRTC held public proceeding regarding access to telecommunications in rural and remote areas. In its 1999 decision, the Commission made these observations:

"The level of telecommunications service in Canada is very high. During this proceeding, the Commission heard evidence that Canada is one of the best-served countries in the world with respect to telecommunications.

"It is estimated that over 18 million telephone lines are connected to the public switched telephone network. Over 99 per cent of these lines represent 'single line' service. More than 97 per cent are connected to a digital switch, provide touch-tone telephone service, and can connect, via low speed data transmission, to the Internet without incurring long distance charges. Some telephone companies offer this level of service in 100 per cent of their lines. These figures indicate the success of Canadian telecommunications, which has grown steadily over the last century, in providing millions of Canadian residences and businesses with high quality service.

"Existing service improvement programs will enhance the level of basic telephone service to about 90,000 more Canadians. The Commission notes that when these existing programs are complete, it is estimated that only 7,700 currently served customers will not have access to single line service. As well, incumbent local carriers have identified, in total, approximately 13,000 residences and/or businesses, in over 700 locations, that will still not have any access to telephone service."

Despite these remarkably high levels of penetration, the CRTC asked the incumbent operators and the industry at large to make proposals on how to improve both the reach and quality of telecommunication services throughout Canada, including the sparsely-populated far North, where climatic conditions make it even more difficult to serve remote areas. The Commission continued as follows, and defined the "basic service objective":

"The Commission considers that the level of service now available to the vast majority of Canadians should be extended to as many Canadians as feasible in all regions of the country. Accordingly, the Commission is hereby establishing the following basic service objective for local exchange carriers:

- * *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;*
- * *Enhanced calling features, including access to emergency services, Voice Message Relay service, and privacy protection features;*
- * *Access to operator and directory assistance services;*
- * *Access to the long distance network; and*
- * *A copy of a current local telephone directory."*

Source: Telecom Decision CRTC 99-16, Telephone service to high-cost serving areas (19 October 1999), <<http://www.crtc.gc.ca/archive/Decisions/1999/DT99-16.htm>>.

decision. Broadcasting policy is the responsibility of the Minister of Canadian Heritage. Implementation of the Broadcasting Act and Telecommunications Act is carried out by the CRTC.¹²

2.2.2 Regulatory authority: CRTC

The Canadian Radio-television and Telecommunications Commission (CRTC)¹³ is an independent federal agency with quasi-judicial status. The CRTC is responsible for the supervision and, where required, regulation of both telecommunications and broadcasting in Canada. Its institutional structure

and powers are outlined in the CRTC Act, the Broadcasting Act and the Telecommunications Act. Members of the CRTC (Commissioners) are appointed by the cabinet. The Canadian Radio-television and Telecommunications Commission Act provides for up to 13 full-time members and not more than 6 part-time members, the latter of whom deal with broadcasting matters only.

The Telecommunications Act gives the CRTC a broad range of powers, including the regulation of telecommunication rates and conditions of service, approval of interconnection agreements, and quality of service

standards. Canadian telecommunication carriers that own or operate transmission facilities (facilities-based carriers) and all international carriers based in Canada or providing service between Canada and other countries are subject to CRTC regulation under the Act. The CRTC is the regulatory authority for telephone numbering.

The CRTC has a broad range of regulatory powers as an independent, quasi-judicial regulatory agency (ss. 22-71 of the Act). Under Section 47, the CRTC must exercise its powers with a view to implementing the telecommunication policy for Canada, set out in Section 7 of the Act, and any directions issued by cabinet. The CRTC must ensure that rates are just and reasonable, and that Canadian carriers do not discriminate unjustly, or accord any undue preference. As well, the Act gave the CRTC important new powers: it can use any method of regulation it considers appropriate (e.g.: alternatives to traditional rate-base, rate-of-return regulation) (s. 27(5)).¹⁴

The Act gives the CRTC other powerful pro-competitive tools. The regulator can exempt classes of carriers from the application of the Act where this is in the public interest (s. 9). It may forbear from regulating where this is in the public interest and *must* forbear where it finds that there is effective competition (s. 34). Conversely, under Section 34(3), it *must not* forbear if the Commission finds as a question of fact that to refrain would be likely to impair unduly the establishment or continuance of a competitive market for that service or class of services.

The Commission can forbear from the exercise of only certain responsibilities and obligations of the Act such as the requirement for carriers to file tariffs and agreements for approval and can impose conditions upon which forbearance is granted. In many of its forbearance determinations, the CRTC has retained certain powers under the Act to address instances of undue preference or anti-competitive behaviour, should they arise. The CRTC has held back from regulation for most of the activities of new entrants and for a

significant portion of services offered by the incumbent telephone companies, where competition has been found to be sufficient to protect the interests of users.

2.3 The transition to competition

Competition has been introduced gradually to the Canadian telecommunication service market over the last twenty years through policy and regulatory initiatives by the federal government and the regulator. This process started in 1979 with the end of the telephone companies' monopoly on private lines (facilitating the entry of CNCP Telecommunications, an arm of Canadian National Railways, later renamed Unitel, and now known as AT&T Canada); this was soon followed by similar liberalization of the market for providing customer premises equipment in 1980. In the 1980s, competition was allowed in the resale of certain telecommunication services. However, CNCP lost a 1985 application to the CRTC for permission to provide public long-distance service in competition with the telephone companies.

The pace of liberalization accelerated in the 1990s. In 1992, the market for public long-distance voice services was opened to competition.¹⁵ Through the licensing of 2G wireless spectrum in 1995, two more competitors were allowed into the mobile cellular market. On 1 May 1997, the CRTC announced the regulatory framework for competition in basic local telephone services.¹⁶ In 1998, the CRTC liberalized the public pay telephone service market. Finally, on 1 October 1998, the CRTC opened the facilities-based international telecommunication market to competition and issued a major decision setting out a new regulatory framework for all international services, pursuant to Canada's commitment in the WTO Agreement on Basic Telecommunications Services.

2.4 International competition

Facilities-based international competition was introduced on 1 October 1998, in Decision 98-17, Regulatory Regime

for the Provision of International Telecommunications Services,¹⁷ released on the scheduled date for the official termination of the Canada-overseas facilities monopoly of Teleglobe Canada Inc. (Teleglobe).

Section 2(1) of the Telecommunications Act established a new definition, that of "telecommunications service provider," and empowered the Commission to require that specified classes of basic telecommunication service providers obtain a licence in order to provide international telecommunication services within a class specified by the Commission. The new licensing power extended to resellers (while not altering other provisions applicable to resellers, such as not being obliged to file tariffs or intercarrier agreements), as well as to "Canadian carriers" within the meaning of the Act. This decision eliminated the rules prohibiting the routing of Canada-Canada calls or Canada-overseas calls through the United States.

Prior to the new contribution collection regime which came into effect on 1 January 2001 (see Section 2.5, below), service providers were required to pay contribution on a per-minute basis for international traffic, consistent with existing rules for the telephone companies and with the contribution mechanism for the domestic traffic of competing long-distance service providers. The reporting and remitting of contribution was made a condition of licence for international service providers who operate telecommunication facilities used in transporting traffic between Canada and another country.

The CRTC decided not to require proportionate return, parallel accounting or the equal division of accounting rates, absent evidence of some kind of conduct that is having an anti-competitive effect in the Canadian market. Among other things, it considered that flexible routing practices and increased competition in the major markets with which Canada exchanges traffic are reducing the need for such requirements. The Commission noted that, if conduct having an anti-competitive effect in the Canadian

market were found to have occurred, the Commission could impose proportionate return, etc., either on an individual service provider or on all service providers on a particular route.

The Commission considered a licensing regime necessary in order to deal with instances of anti-competitive conduct. The Commission prescribed a basic condition of licence prohibiting licensees from engaging in anti-competitive conduct in relation to the provision of international telecommunication services. For the purposes of this condition, anti-competitive conduct includes entering into or continuing to participate in an agreement or an arrangement that has, or is likely to have, the effect of preventing or lessening competition unduly in Canada, or otherwise providing telecommunication services in a manner that has, or is likely to have, the effect of preventing or lessening competition unduly in Canada.

2.5 Universal service support: The contribution regime

For many years the Canadian telecommunication industry consisted of companies that were regionally-based regulated monopolies. Regulators ensured that rates were just and reasonable while providing the companies with the opportunity to earn a reasonable rate of return (profit). This regulatory approach, coupled with price averaging and value of service pricing, were used to set affordable rates while, at the same time, allowing incumbent local carriers to extend, improve and maintain service.

Profitable areas (usually urban) and profitable services (long-distance, optional services) subsidized local service and areas with high operating costs (usually rural or remote). The industry was thus able to provide affordable, high quality service in a relatively consistent manner across most regions, including those areas with high operating costs.

However, this system of internal cross-subsidies and implicit subsidies had to be made explicit with the advent of multi-provider environments. The

Commission first allowed large-scale competition in long-distance, and later in local service. As well, the Commission no longer regulates certain rates. As a result, so-called "hidden" subsidies are being driven out of the system. This creates a concern that the level of service to some areas may suffer as profits in competitive markets decline, as well as a concern that some areas could remain unserved.

For this reason, when it permitted competition for toll (long-distance) service markets, the Commission created a system of explicit subsidies. Competing long-distance companies were required to pay a set amount (contribution) to the incumbent local carrier which continues to provide local service at subsidized rates. When it subsequently permitted competition for local markets, the Commission made the contribution portable. Any local exchange carrier (ILEC or CLEC) could therefore use it to subsidize local rates. The most important feature of the Canadian telecommunication regulatory scheme for the subject of IP Telephony is contribution. Therefore, contribution is discussed in detail here and its application to the Internet and finally to IP Telephony will be reviewed in Sections 3.3 and 4.2 below.

2.5.1 Contribution reform

Telecom Decision CRTC 92-12, Competition in the provision of public long-distance voice telephone services and related resale and sharing issues (12 June 1992)¹⁸ established a mechanism for long-distance competitors to contribute towards subsidizing primary exchange residential services. The Commission has made a number of changes to the contribution regime through various decisions in the years since, which have been marked by the explosion of competition in all segments of telecommunications.

On 1 March 1999, the CRTC initiated a public proceeding to review the contribution collection mechanism and to examine alternative collection mechanisms. The purpose of the proceeding was to determine whether the per-minute contribution mechanism needed to be modified or replaced in

light of current and expected technological, market and competitive conditions.

The Commission released Telecom Decision CRTC 2000-745, Changes to the contribution regime, on 30 November 2000.¹⁹ The decision brought major changes to the Canadian telecommunication regulatory environment. The new national contribution collection mechanism is based on revenues from a broad range of telecommunication service providers and will replace the existing per-minute mechanism effective 1 January 2001. On 1 January 2002, the Commission will also introduce a new subsidy requirement calculation, which relates to the amount to be collected, not the means of collection, and as such, it is not explained in detail here.²⁰

2.5.2 The old regime (until 31 December 2000)

Under the old collection mechanism, contribution was paid on long-distance minutes within an ILEC territory at rates that varied across the country. In situations where it is difficult to ascertain the actual number of minutes, proxies have been developed (for example, surcharges for wireless service providers (WSPs) and direct access lines) making the current mechanism complex to administer and difficult to understand.

The majority of parties to the high-cost serving areas public proceeding supported the policy objective of providing subsidies for affordable primary exchange residential service in high-cost serving areas. Some submitted that the old mechanism did not guarantee that sufficient revenues will be collected to attain the basic service objective. They argued that, to the extent that the mechanism was inconsistent with trends in marketing and technology, service providers or users might route traffic to avoid contribution. Further, it was argued that the ability of service providers to avoid contribution will encourage the growth of packet and IP networks, which could erode the base of contribution-eligible minutes.

Substantial evidence was provided in the proceeding indicating that the sustainability of the per-minute mechanism is questionable in the long term. As telecommunication networks are no longer easily separable into local and long-distance traffic segments, the ability to count and report long-distance minutes is becoming increasingly difficult. It was suggested that to identify long-distance traffic, service providers may have to adopt inefficient network designs which may be an impediment to technological advances. Others argued that the current per-minute mechanism could not be applied to modern converged networks, where traffic flows over packet-switched networks and such traffic cannot be measured in minutes. Some competitors specifically noted that the current contribution mechanism might fail to capture packet-switched traffic.

A major criticism of the old regime, which competitive long-distance providers claimed threatened their very financial survival, was the fact that shortly after the per-minute contribution rates were set for 1998 (going into the first price cap period) (based on projected calling (i.e., minute) patterns), the introduction of flat-rate long-distance plans (initiated by one of the leading competitive long-distance providers) caused minutes to increase dramatically, resulting, in the competitors' view, in over-collection of contribution.

The CRTC concluded that the per-minute collection mechanism no longer met the criteria outlined in Decision 92-12 because technology advances threatened its sustainability and the pricing flexibility of long-distance service providers was severely hampered. The Commission ruled that the per-minute contribution collection mechanism needed to be replaced with a mechanism that is more economically efficient, equitable for all market participants and ratepayers, and more transparent to contribution payers.

2.5.3 The new regime (from 1 January 2001)

The Commission considered industry proposals for a subscriber line charge (a flat charge levied per PSTN access

line) and a revenue charge mechanism, and chose the latter. It discarded the per-minute on long-distance collection mechanism (and along with it, eight years of regulatory tweaking and industry creativity in attempting to avoid it), and replaced it with a revenue charge mechanism, applicable to a broad range of operators, not just long-distance providers.

The Commission directed that a national revenue-based contribution collection mechanism be implemented effective 1 January 2001, using an interim 2001 revenue-percentage charge of 4.5 percent (the final 2001 revenue-percentage charge will be determined by mid-2001). That is, telecommunication service providers must pay 4.5 per cent of their 2001 gross revenues from contribution-eligible services into a national fund. Not all services provided by any given operator will be contribution-eligible, only their total "Canadian Telecommunications Service Revenues" (CTSR), less certain deductions. CTSR are revenues from "Canadian telecommunications services."

As with other areas of responsibility, the Telecommunications Act gives the CRTC wide latitude to determine what "Canadian telecommunications services" means. In this case, Section 46.5(1) of the Act states that "[t]he Commission may require any telecommunications service providers to contribute, subject to any conditions that the Commission may set, to a fund to support continuing access by Canadians to basic telecommunications services."

The Commission explained its rationale this way (at paragraph 87): "The Commission notes that applying contribution against the broadest possible range of telecommunications services would spread the contribution burden across various sectors of the marketplace. This approach would be competitively equitable, result in a lower revenue-percentage charge being applied to each service, and be more administratively efficient by eliminating the need for a detailed review and classification of all telecommunications services."

To understand how broad the range of contribution-eligible services will be, it is necessary to understand a series of interlocking definitions in Section 2 of the Act (see Box 2).

The Commission concluded that all *telecommunications service providers*, such as local exchange providers (LECs), alternative providers of long-distance services (APLDS), resellers, wireless service providers (WSPs), international licensees, satellite service providers, Internet service providers (if a telecommunication service is provided), payphone providers, data and private line service providers are required to contribute based upon their total Canadian Telecommunications Service Revenues (CTSR), less certain deductions. A minimum revenue threshold was set at CAD\$ 10 million annual total CTSR (before deductions—see below), to be determined based on the company's previous year's actual financial results.

There are some very important exceptions to this broad revenue net. The Commission ruled (at paragraph 91, emphasis added) that:

a) *retail Internet and retail paging service revenues are **not** contribution-eligible*, in consideration of the nature of these services, existing policies with respect to

their contribution exempt status and administrative complications. However, *any revenues generated by Internet and paging service providers from the provision of any other telecommunications services **will be** contribution-eligible*. In addition, any revenue generated by another telecommunications service provider supplying underlying telecommunications facilities to retail Internet and paging service providers (for example, interconnecting circuits used by Internet and paging service providers) will be contribution-eligible; and

b) revenues generated from the sale or rental of *terminal equipment* are not contribution-eligible, as it would not be competitively equitable to make telecommunications service providers contribute when terminal equipment is also provided by non-telecommunications service providers.

The significance of exemption (a) is reviewed in more detail in Sections 3.3.2 and 4.2.4 below in the course of examining the regulatory status of the Internet and IP Telephony, respectively. Where both contribution-eligible and exempt services are offered as part of the same "bundle," the revenues from the entire bundle are contribution-eligible.

Box 2: Telecommunications Act: Key definitions

"telecommunications service provider" means a person who provides *basic telecommunications services*, including by exempt transmission apparatus

"telecommunications service" means "a service provided by means of telecommunications facilities and includes the provision in whole or in part of telecommunications facilities and any related equipment, whether by sale, lease or otherwise"

"telecommunications facility" means *any facility, apparatus or other thing that is used or is capable of being used for telecommunications* or for any operation directly connected with telecommunications, and includes a transmission facility

"telecommunications" means the emission, transmission or reception of intelligence by *any wire, cable, radio, optical or other electromagnetic system*, or by any similar technical system."

Source: Telecommunications Act, <<http://www.crtc.gc.ca/ENG/LEGAL/TELECOME.HTM>>. (Note: emphasis added).

In summary, *contribution-eligible revenues* for the purpose of the new revenue-based contribution collection mechanism are defined as total Canadian Telecommunications Service Revenues (CTSR) **less**:

- contribution revenues received (to avoid double-counting);
- inter-carrier expenses to other telecommunication service providers (to net out services on which contribution will be paid by other telecommunication service providers); and
- revenues earned in Canada from retail Internet, retail paging and terminal equipment including related sales commissions.

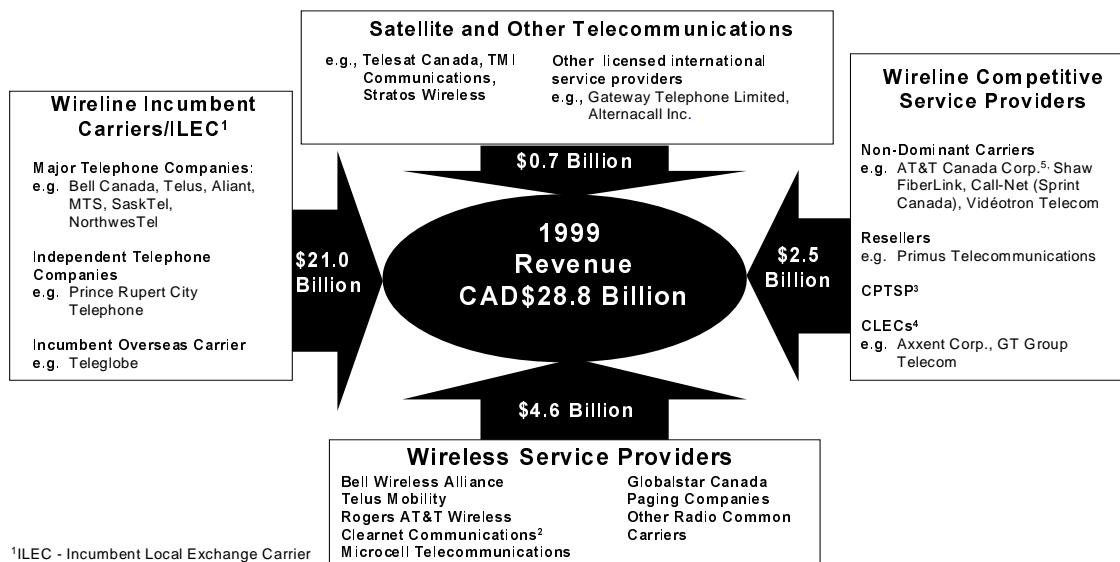
Contribution payments will be made to a central agency which is at arm's length from all parties (and the regulator) and from there will be distributed to the local exchange carriers (LECs) which are charged with meeting the basic service objective (BSO) in Canada's high-cost serving areas (most of the rural territory of Canada, where less than one-quarter of the country's population resides).

2.6 Major market segments and indicators

Figure 1 gives a general picture of the various segments of the Canadian telecommunication service industry and aggregate 1999 revenues. Figure 2 breaks down the CAD\$ 28.8 billion telecommunication services sector according to type of service.

Figure 1: Telecommunication service industry key players

Based on 1999 revenues and 1999 industry structure

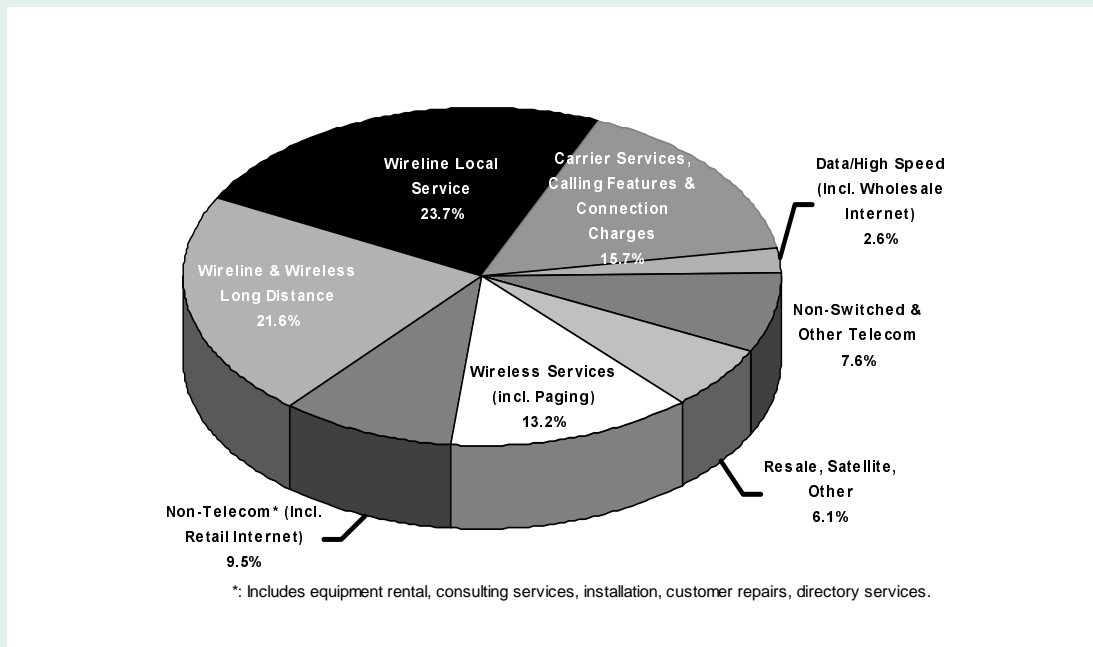


¹ILEC - Incumbent Local Exchange Carrier
²Announced merger with Telus, 2000
³CPTSP - Competitive Pay Telephone Service Providers
⁴CLEC - Competitive Local Exchange Carrier
⁵MetroNet Communications announced merger with AT&T in 1999.
 Source: CRTC, and Industry Canada estimates based on revenue figures from Statistics Canada

Source: Industry Canada, The Canadian Telecommunications Service Industry—An Overview, 1999-2000 (forthcoming). See Industry Canada, Spectrum Management and Telecommunications, Statistics and Reports, <<http://strategis.ic.gc.ca/SSG/sf01703e.html>>. Original sources: CRTC and Industry Canada estimates based on revenue figures from Statistics Canada.

Figure 2: Telecommunication services revenue by source, 1999

Total: CAD\$ 28.8 billion (US\$ 18.7 billion)



Source: Industry Canada, The Canadian Telecommunications Service Industry—An Overview, 1999-2000 (forthcoming). See Industry Canada, Spectrum Management and Telecommunications, Statistics and Reports, <<http://strategis.ic.gc.ca/SSG/sf01703e.html>>. Original sources: Industry Canada estimates based on Statistics Canada data.

2.6.1 Wireless

Figure 3 illustrates the steady increase in wireless subscribers in Canada to 9 million over the ten-year period from 1990 through 2000.

2.6.2 Long distance

Figure 4 shows who earned what proportion of domestic long-distance (including broadband, data, and private lines) services revenues from 1992 through 1999.

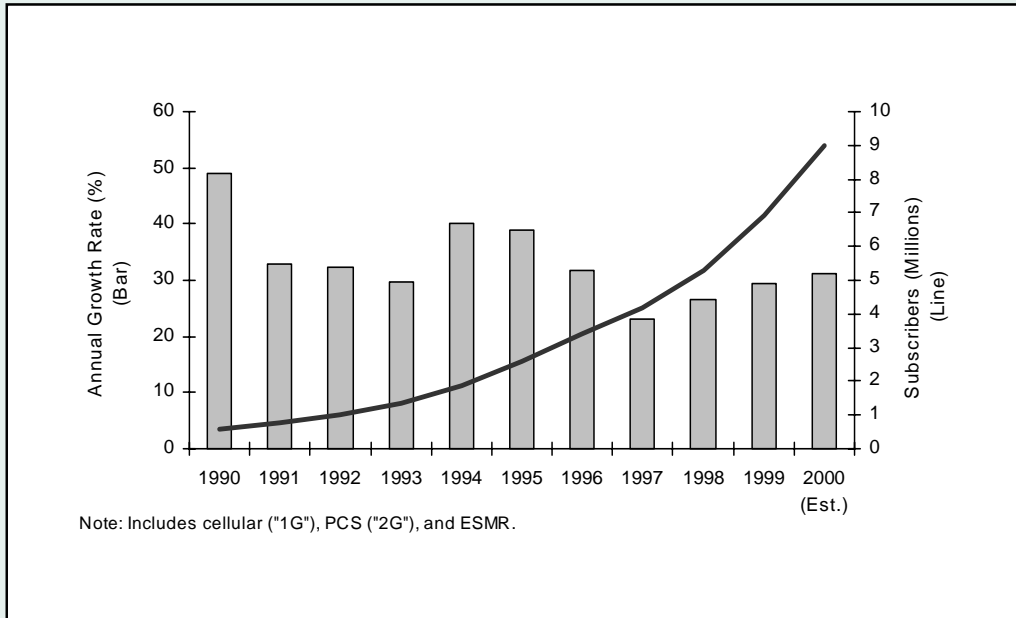
2.6.3 International

Canada’s international telecommunication traffic is dominated by traffic exchanged with the United States, as Figure 5 demonstrates.

Nearly 70 per cent of outgoing international traffic from Canada goes to the United States, with the United Kingdom a far distant second at 5.2 per cent and Hong Kong SAR in third at 1.8 per cent.²¹ For this reason, Canada-US traffic was historically treated differently as a regulatory matter from other international traffic, which was referred to as Canada-overseas traffic. Decision 98-17 (see Section 2.4 above) has made this distinction largely irrelevant, as the 1998 licensing regime for all traffic in and out of Canada does not distinguish between Canada-US and Canada-overseas traffic.²²

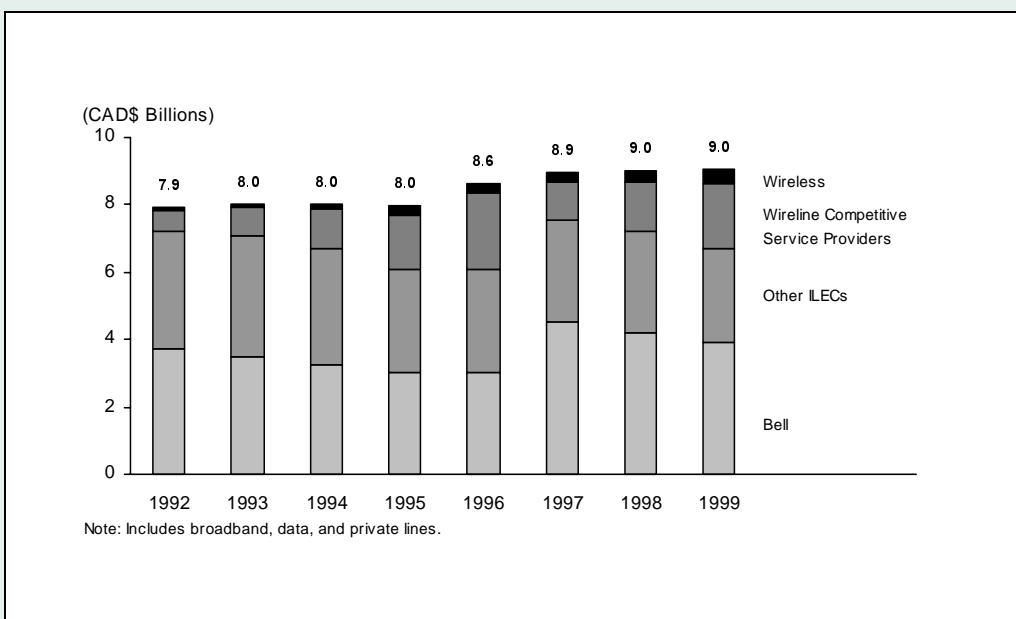
Figure 3: Wireless subscribers, 1990-2000

Estimated total: 9 million



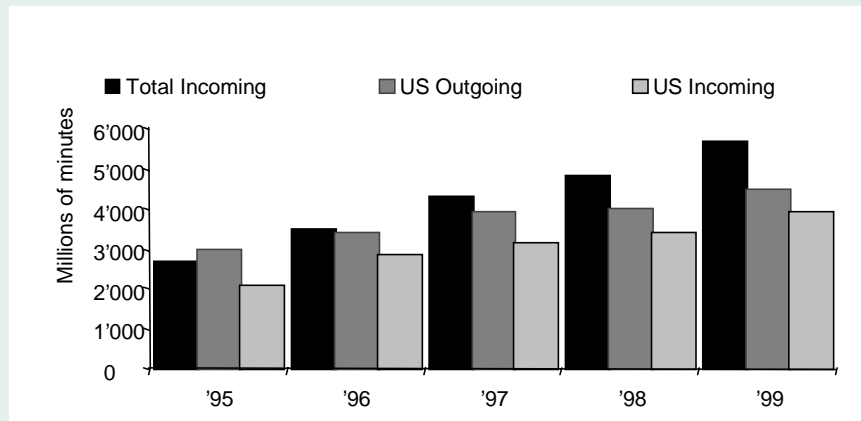
Source: Industry Canada, The Canadian Telecommunications Service Industry—An Overview, 1999-2000 (forthcoming). See Industry Canada, Spectrum Management and Telecommunications, Statistics and Reports, <<http://strategis.ic.gc.ca/SSG/sf01703e.html>>. Original sources: Industry Canada estimates based on Statistics Canada data and company annual reports.

Figure 4: Domestic long-distance services revenues, 1992-1999



Source: Industry Canada, The Canadian Telecommunications Service Industry—An Overview, 1999-2000 (forthcoming). See Industry Canada, Spectrum Management and Telecommunications, Statistics and Reports, <<http://strategis.ic.gc.ca/SSG/sf01703e.html>>. Original sources: Industry Canada estimates based on annual reports to shareholders.

Figure 5: International telecommunication traffic, 1995-1999



Source: Telegeography 1999, 2000, and 2001. <<http://www.telegeography.com/>>.

⁷ Unless otherwise indicated, data (and some text) in this Section 2 are derived from Industry Canada, *The Canadian Telecommunications Service Industry—An Overview, 1997-1998*, <<http://strategis.ic.gc.ca/SSG/sf01919e.html>> (hereinafter “*The Canadian Telecommunications Service Industry, 1997-1998*”). Note that a new edition of this publication should be available on the Industry Canada website in February 2001. See Industry Canada, Spectrum Management and Telecommunications, Statistics and Reports, <<http://strategis.ic.gc.ca/SSG/sf01703e.html>>.

⁸ The classic group of incumbent telephone companies was BC TEL (British Columbia), AGT (Alberta), SaskTel (Saskatchewan), MTS (Manitoba), Bell Canada (Ontario and Québec), MT&T (Nova Scotia), NBTel (New Brunswick), Island Tel (Prince Edward Island), and NewTel (Newfoundland). Due to subsequent name changes and corporate mergers, this list should only be considered as one of convenience.

⁹ *The Canadian Telecommunications Service Industry, 1997-1998*, Note 7 above at p. 43.

¹⁰ A current list of the independent carriers in Ontario and Québec can be found on the CRTC website at <<http://www.crtc.gc.ca/ENG/public/Iplists/ind.htm>>. The potential for full competition is only now being introduced in these small territories.

¹¹ <<http://www.crtc.gc.ca/ENG/LEGAL/TELECOM.HTM>>.

¹² For more information, see the Industry Canada website: <<http://www.ic.gc.ca/>>.

¹³ For more information, see the CRTC website: <<http://www.crtc.gc.ca/>>. A detailed historical timeline of the CRTC is available on the CRTC website at: <<http://www.crtc.gc.ca/ENG/BACKGRND/Brochures/B19903e.htm>>.

¹⁴ A power immediately put to use in Telecom Decision CRTC 94-19, *Review of the Regulatory Framework* (16 September 1994), <<http://www.crtc.gc.ca/archive/Decisions/1994/DT94-19.htm>>, which mapped out the regulatory transition from monopoly to full competition, accomplishing such major changes as: the splitting of the major incumbents’ rate bases between competitive and utility segments (such that regulation going forward would focus on the utility segment), moving from rate-of-return regulation to price cap regulation, allowing telephone companies to invest in content services, and initiating the process of rebalancing local rates in light of declining long-distance rates.

- ¹⁵ Telecom Decision CRTC 92-12, Competition in the Provision of Public Long Distance Voice Telephone Services and Related Resale and Sharing Issues (12 June 1992), <<http://www.crtc.gc.ca/archive/Decisions/1992/DT92-12e.htm>>.
- ¹⁶ Telecom Decision CRTC 97-8, Local Competition (1 May 1997), <<http://www.crtc.gc.ca/archive/Decisions/1997/DT97-8.htm>>.
- ¹⁷ Telecom Decision CRTC 98-17, Regulatory Regime for the Provision of International Telecommunications Services (1 October 1998), <<http://www.crtc.gc.ca/archive/Decisions/1998/DT98-17.htm>>. The text in this Section 2.4 is derived from the CRTC's unofficial summary of the decision.
- ¹⁸ Note 15 above.
- ¹⁹ See <<http://www.crtc.gc.ca/archive/Decisions/2000/DT2000-745e.htm>>.
- ²⁰ Some of these other portions of the decision have been appealed by the two largest incumbent telephone companies (Bell and Telus). However, those portions discussed in this study have not been appealed as of mid-January, 2001.
- ²¹ TeleGeography, Inc., *TeleGeography 2001* (October 2000), at p. 174, (<<http://www.telegeography.com/>>).
- ²² Nor could it under the Fourth Protocol to the GATS (also known as the "WTO Agreement on Basic Telecommunications"). However, the issue of the application of the Fourth Protocol to the CRTC's decision-making is unclear due to Canada's federal constitutional structure. Parliament has not specifically adopted the agreement into domestic law, and the CRTC is by definition independent of the federal government. While CRTC decisions in recent years have tended to produce results in line with the Fourth Protocol, it has never been cited as the determinative factor in a decision.

3. The Canadian Internet sector

3.1 Historical perspective and structure

3.1.1 Early institutional networking

The Internet did not begin in Canada as a commercial undertaking. The building of Canada's pre-Internet infrastructure began with the linking of several universities through NetNorth (at 19.2 kbit/s!) in the mid-1980s, the international link for which was between the University of Toronto and Cornell University in Ithaca, New York.²³ In the late 1980s, higher-capacity regional networks began to form. The largest Canadian regional network, ONet in Ontario, interconnected with the United States government's NSFNet via Cornell in 1988. In 1988, a number of universities, research institutions, and federal and provincial governments began to collaborate to establish a national computer communications network, called CA*net, which was officially launched on 26 October 1990 and operated at 56 kbit/s.²⁴

CA*net was a not-for-profit company financed by user fees from member organizations and a subsidy from the Government of Canada. The company leased transmission lines from carriers such as Bell Canada. CA*net became the Internet backbone in Canada, interconnecting regional networks in all ten provinces and linking them to the Internet backbone in the United States.

In 1993, CANARIE,²⁵ a jointly-funded programme of industry and government, was established to stimulate research into high-bandwidth network facilities and applications. In 1994 and 1995, CANARIE was responsible for the incremental upgrading of CA*net to accommodate faster speeds of data transfer and for linking the Yukon and

Northwest Territories into the national Internet backbone. In 1995, CA*net was further upgraded to 10 Mbit/s, and then later to 20 Mbit/s.

On 31 March 1997, responsibility for the original CA*net was transferred to a Bell Canada operation known as Bell Advanced Communications Internet Transit Service, and a national test network operated by CANARIE was upgraded into a "next-generation" research network, called CA*net II. Although it still operated on ATM technology, CA*net II was in fact a quasi-production Internet Protocol (IP)-based "extra-net," linking the research community within Canada and with international peer organizations. It had the dual purpose of supporting research and education and the development of next-generation Internet applications and services, especially those that demanded "quality of service" capability.

CA*net II was launched officially on 26 June 1997, and immediately set the standard for advanced, next-generation networks around the world. As with the original CA*net, CA*net II connected individual universities, government labs, and research institutes through regional networks, in this case Regional Advanced Networks, or RANs, which operated in every province (e.g. ONet in Ontario). Approved organizations could access CA*net II through fifteen Gigabit Points of Presence, or "GigaPops," operated by RANs and the three participating carriers.

By this time (1997), commercial Internet access had become the dominant means for most individuals and businesses to access the Internet, but most of the early users of the Internet in Canada got their first experience with it in the early to mid-1990s in the form of e-mail accounts at universities connected via CA*net.

As more and more of these groups of students graduated, the market opportunity for providing basic Internet accounts to them (and many others, of course) grew. In the mid-1990s, literally hundreds of small commercial Internet service providers (ISPs) sprang up, providing e-mail, newsgroups, and World Wide Web (WWW) access via 14.4 kbit/s, and then later, 28.8 kbit/s dial-up connections.

3.1.2 Commercial Internet Service Providers (ISPs)

There are no definitive data on the number of ISPs in Canada because they are not required to register with the government or report on their activities. The typical small ISP simply requisitions line-side connections from a local exchange carrier, connects its standardized Internet access servers, advertises its dial-in number, and is in business.

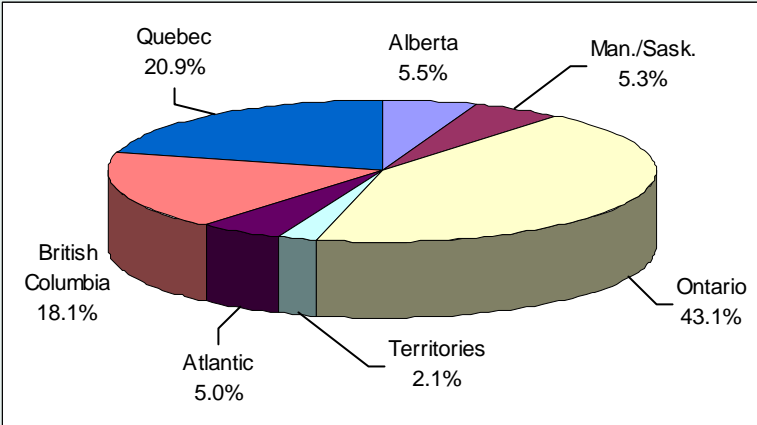
A 1999 Industry Canada report found that the Canadian ISP industry as a whole had CAD\$ 259 million in total revenues (78 per cent of which was from basic Internet access, 13 per

cent from backbone access, and the balance from other services, such as website hosting) in 1997.²⁶ ISPs have traditionally ranged from very small, residentially-oriented concerns, to large, national ones which focus on the business market, with everything in between.

Today, the Internet access services of the large, national telecommunication service providers (the incumbents, AT&T Canada, and Sprint Canada) compete with an array of local and regional providers of Internet access. Together, they were estimated to total between 700²⁷ and 800²⁸ in 1999. The industry displays very high entry and exit rates. Six per cent of the ISPs initially contacted for a 1997 Statistics Canada survey were either out of business or no longer ISPs by the time data collection started just weeks later.²⁹ This factor also makes it difficult to measure and describe the industry. The largest ISP in Canada is Bell Canada.³⁰ Figure 6 shows the geographical location of the 700 non-national ISPs estimated by Industry Canada in 1999, while Figure 7 shows subscribers and market shares.

Figure 6: Internet Service Providers, 2000

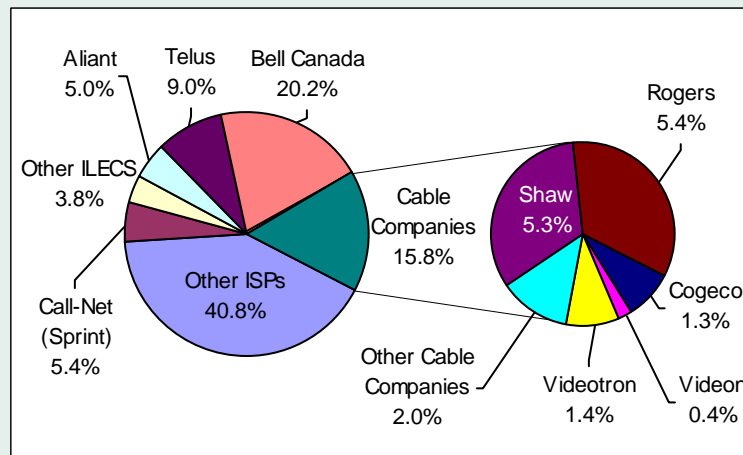
Estimated total: 700 (other than nine national ISPs)



Source: Industry Canada, The Canadian Telecommunications Service Industry—An Overview, 1999-2000 (forthcoming). See Industry Canada, Spectrum Management and Telecommunications, Statistics and Reports, <<http://strategis.ic.gc.ca/SSG/sf01703e.html>>. Original sources: Industry Canada estimates.

Figure 7: Internet subscribers, 1999

Estimated total: 3.4 million



Source: Industry Canada, *The Canadian Telecommunications Service Industry—An Overview, 1999-2000* (forthcoming). See Industry Canada, *Spectrum Management and Telecommunications, Statistics and Reports*, <<http://strategis.ic.gc.ca/SSG/sf01703e.html>>. Original sources: Industry Canada estimates.

3.1.3 The Internet at work

Using corporate networks during or after work hours remains one of the primary means by which Canadians get on the Internet. Many users got their first taste of the Internet at work, and this remains the second most common place where Canadian Internet users log on. Statistics Canada reported in November 2000 that of approximately 20 per cent of households which include at least one person who regularly uses the Internet, that use takes place at work.³¹ It is interesting to note that during the period 1997-1999, home access increased from 16 to 28.7 per cent among regular users, and school access increased from 9.4 to 14.9 per cent, however, work access remained relatively constant at 19.9 in 1996, 23.3 in 1998, and 21.9 per cent in 1999.³² High-capacity corporate local area networks (LANs) provide a much faster Internet experience and facilitate access to large multimedia files which would be impractical to use over a home dial-up connection. However, broadband access methods such as cable and DSL to the home can now rival and even exceed the performance of corporate networks.

3.1.4 Broadband/high-speed Internet

While the 56 kbit/s modem served as the high-speed alternative for home Internet users for a couple of years after its introduction, the ever-increasing richness of content on the Web made users crave speed. Cable Internet service was first off the mark in the high-speed access race in Canada in 1998,³³ but the telephone companies began to offer digital subscriber line (DSL) service in a significant way in 1999. Now, it is estimated that 22 per cent of Canadian household Internet users use high-speed connections, with cable modems at 18 per cent and DSL at 4 per cent.³⁴ The latter figure will surely rise through 2000 as cable companies, telephone companies, and their resellers are reportedly having difficulty keeping up with demand for new high-speed connections. Of Canadians recently polled who were not yet "connected" to the Internet, 24.3 per cent said they expected to hook up within a year, of which 29.2 per cent said they were considering high-speed connections.³⁵

3.1.5 "Free" ISPs

Canada has seen its share of so-called "free ISPs" come and go. While free ISPs in some European countries have taken a share of the local call revenue from the dial-up Internet session, free ISPs in Canada relied exclusively on advertising revenues, because there is no local call charge to share. AltaVista Canada operated a free dial-up service across Canada from August 1999 until 10 December 2000, when the service was abruptly cancelled for undisclosed reasons. Calgary, Alberta-based CyberSurf Corp. launched a free Internet service called 3web in August 1998, claiming to be the first in the world to do so. However, by December 2000 CyberSurf was suffering from a potentially terminal lack of revenues (from advertising and co-branding) and unhappy investors.³⁶

3.2 Internet use

Canada is home to the highest percentage of regular Internet users anywhere in the world, per capita.³⁷ Of course, the United States leads in total users, estimated to be 280 million, or 40 per cent of the total Internet users in the world at the end of 1999. Almost half of Canada's population are now said to be regular Internet users (48.2 per cent, compared to 43 per cent in the United States), and Canadians also lead the world in average hours of Internet use per week at 5.1 hours/week in 2000, up from 3.9 in 1999.³⁸ The United States saw the average hours of use per week decline from 5.3 to 4.2 hours/week over the same period.

Statistics Canada has found the following numbers and trends in Canadian Internet use:³⁹

- The proportion of households that regularly use the Internet (where at least one person uses it regularly from any location) has jumped from 29.4 per cent in 1997, to 35.9 per cent in 1998, and most recently to 41.8 per cent in 1999 (an estimated 4.9 million people).

- The percentage of Canadians using the Internet from home increased from 16 per cent in 1997 to 28.7 per cent in 1999.
- Only 4.5 per cent of respondents used the Internet primarily from a public library.
- 65.4 per cent of home-use households access the Internet every day, and home use of the Internet is a daily part of the lives of almost one in five Canadian households, doubling from 9.8 per cent in 1997 to 18.8 per cent in 1999.

Its long history in networking and early commercial availability of e-mail and Internet access have made Canada one of the most Internet-connected countries in the world. While many claim that the Internet has been so successful because it has been free of government regulation, the advantages which the Internet has enjoyed under Canadian telecommunications policy should not be underestimated as drivers of its extensive adoption in the country.

3.3 Regulatory status of Internet services

In general, Internet services are not regulated in Canada. ISPs which are not carriers (do not own and/or operate transmission facilities), online service providers, and bulletin board operators are not directly regulated by the CRTC. While the operations of the classic ISP are not regulated, those of the carriers which provide the telecommunication services by which they are connected to Internet backbones are. The retail ISP services provided by carriers, however, are not regulated either. The CRTC found in 1997 that the Internet access market was sufficiently competitive that it could forbear from regulating certain carriers' retail ISP businesses completely.⁴⁰ The Commission found again in 1999 that the Internet service market in Canada was very competitive and forbore from regulating retail Internet services (but not underlying access facilities) provided by any carrier that did not already enjoy forbearance.⁴¹

There is no doubt that part of the early and continuing success of dial-up Internet access in Canada is the historical fact that local telephone use has not been metered. Rather, subscribers pay a flat monthly rate for basic telephone service, plus per-minute charges for long-distance calls only. Since dial-up Internet sessions are usually local calls, once the connection is made, there is no extra cost for staying connected as long as one likes. This is in sharp contrast to many countries where local telephone calls are metered, but is similar to the situation in the United States.

3.3.1 Contribution exemption for Internet services

The place of ISPs in Canada's contribution regime was a hotly-debated subject in the mid-1990s, but in September 1998, the CRTC created a contribution exemption for what it called "IP Data" service provided over an "Internet access line".⁴² The Commission set out several important definitions in this decision, including the following:

- **Internet Service Provider (ISP)** is a service provider who provides dial access capability to connect customers to the Internet via an Internet gateway or server.
- **Internet Access Line (IAL)** refers to an access service provided by a Local Exchange Carrier (LEC) to an ISP which allows calls to be originated from or terminated to the Public Switched Telephone Network (PSTN). IALs typically connect to a "gateway" or server which provides the functionality to connect a caller to the Internet.
- **Internet or Internet Protocol (IP)** refers to the manner of carriage of Internet services between Internet gateways, servers or routers, but not to carriage on access lines to or from the PSTN.
- The Commission defined "**PC Voice**" and "**PSTN Voice**," declaring PSTN Voice to be contribution-eligible and PC Voice not. These definitions are examined in Section 4.2.2.3 below in relation to the legal status of IP Telephony.

- **IP Data traffic** includes all other usage on the Internet.

Under the old contribution regime, ISPs which do not offer any contribution-eligible services (i.e., PSTN Voice) over their facilities were not required to register with the CRTC, nor pay any explicit contribution charges (although there may be implicit contribution built in to the prices of the IALs they order from LECs).

3.3.2 Impact of contribution reform on Internet services

The regulatory status of ISPs appears not to have changed with the introduction of the new contribution regime effective 1 January 2001. In Telecom Decision CRTC 2000-745,⁴³ the CRTC specifically carved revenues from "retail Internet" services out of the range of telecommunication service revenues which are contribution-eligible, thus maintaining their contribution-exempt status (see Section 2.5.3 above). The precise definition of the somewhat vague term "retail Internet" is expected to be developed by the industry-regulator group known as the CRTC Interconnection Steering Committee (CISC),⁴⁴ which has been asked to help with some implementation details.

3.3.3 Access to broadband facilities

Canada has taken a very aggressive approach to "opening up" broadband network facilities to independent ISPs, so that they can resell these "higher speed Internet services" and thus compete with the incumbent telephone and cable TV companies which own the infrastructure that reaches into homes and businesses.

With respect to cable TV companies, the CRTC ruled in July 1998 that it would not regulate the rates at which broadcast carriers (cable companies) offer retail level Internet services, and certain other telecommunication services (e.g. security services) to their customers. However, the Commission

has required the approval of the rates and terms on which incumbent cable and telephone companies provide access to their telecommunication facilities to competitive providers of retail level Internet services.⁴⁵

Due in part to the Canadian cable industry's having to develop the ability to allow third-party access at a time when their American counterparts did not (and when the latter arguably wanted to maintain the appearance that such arrangements were technically impossible), it was another year before these wholesale rates and terms were finally approved by the Commission.⁴⁶ Even then, it took another full year for most of the details to be worked out.⁴⁷ The process of facilitating third-party access to cable Internet infrastructure has grown in many ways to resemble the local competition process, with a great deal of industry and regulatory effort being put into creating a multi-provider environment out of a monopoly environment.⁴⁸

With respect to digital subscriber line (DSL) service, independent ISPs can purchase the underlying high-speed Internet service facilities which they need to provide DSL service at wholesale rates, and thus compete with the telephone companies in that market. In the early days of DSL, though, the Canadian Association of Internet Providers (CAIP) asked the CRTC to prevent Bell Canada's unregulated affiliates from allegedly selling these same services below cost to drive such competitors out of the market. However, the CRTC ruled in June 1999 that the market was competitive enough that such action was unnecessary.⁴⁹ There are now dozens of registered resellers of high-speed Internet access services in Canada.⁵⁰

CLECs had a higher level of rights compared to DSL resellers until September 2000, as they alone were able to requisition DSL-ready circuits from ILECs and co-locate their equipment in telephone company facilities (as part of their rights of access to the unbundled facilities of the tele-

phone companies granted in the CRTC's Local Competition decision).⁵¹ DSL service providers have enjoyed these same rights since a September 2000 decision granting the request of Covad Canada Communications Inc., the Canadian subsidiary of the largest independent provider of wholesale DSL services in the United States.⁵²

3.3.4 Internet content

In May 1999 the CRTC became the first national regulatory telecommunications and broadcasting regulatory agency to ask the public the simple question: "should we regulate the Internet?".⁵³ As might be expected, this question elicited a flood of written comments from just about every stakeholder in Canadian communications. After extensive written and oral consultations, the CRTC issued its response (in the form of another public notice—there was no decision to render because there was no issue to be decided) in May 1999.⁵⁴

In its New Media decision, the Commission repeated back the overwhelming consensus that came out of the consultations: no, regulation was not necessary. The Commission's summary, excerpted in Box 3, gives an indication of the range of issues explored and the findings of the consultation. While the proceeding was primarily one concerning the CRTC's mandate under the Broadcasting Act with respect to content regulation, there were also important telecommunication issues involved. The Commission took the opportunity to confirm its commitment to open access to broadband Internet facilities and to indicate to the cable TV industry that it was serious about requiring it to figure out how to comply with Decision 98-9 (see above).

3.3.5 Internet technical infrastructure—The .ca domain

The governance of Canada's country code top-level Internet domain, ".ca", is an important element of Canada's Internet policy. Management of the .ca domain was traditionally performed

Box 3: CRTC "New Media" decision

The Commission's approach to new media

The Commission considers that the majority of services now available on the Internet consist predominantly of alphanumeric text, and, therefore, do not fall within the scope of the Broadcasting Act and are thus outside the Commission's jurisdiction.

Among the services that also do not fall within the scope of the definition of broadcasting are those where the potential for user customization is significant, i.e., services where end-users have an individual, or one-on-one, experience and where they create their own uniquely tailored content. The Commission considers that these types of services do not involve the transmission of programs for reception by the public and are, therefore, not broadcasting.

For those undertakings that offer new media services that do fall under the definition of broadcasting, the Commission has concluded that regulation is not necessary to achieve the objectives of the Broadcasting Act. It will issue, by 30 June 1999, a proposed exemption order without terms or conditions in respect of all undertakings that are providing broadcasting services over the Internet, in whole or in part, in Canada.

Accordingly, the Commission will not regulate new media activities on the Internet under the Broadcasting Act.

A Canadian presence in new media

In the Commission's view, there is no apparent shortage of Canadian content on the Internet today. Rather, market forces are providing a Canadian Internet presence that is also supported by a strong demand for Canadian product.

The Commission notes that a number of initiatives and funds have been developed in both the public and private sectors to help finance and support Canadian new media product.

For these reasons, the Commission concurs with the majority of participants that there is no reason for it to impose regulatory measures to stimulate the production and development of Canadian new media content.

How conventional broadcasting is affected by new media

The Commission considers that new media have not had any detrimental impact on conventional radio and television audiences. The Commission is of the view that the effect of new media on television audience size will be limited at least until such time as high-quality video programming can be distributed on the Internet.

The Commission also agrees with most participants in the proceeding that there is no evidence that the Internet has had any negative financial impact on the advertising revenues of traditional broadcasters. In fact, radio advertising revenues have increased since 1993, and television advertising revenues have grown steadily over the past twenty years.

Illegal and offensive content

The Commission acknowledges the views of the majority of parties to the proceeding that generally-applicable Canadian laws, coupled with self-regulatory initiatives, rather than the Broadcasting Act are more appropriate means for dealing with offensive material in new media.

Source: Extracted from Telecom Public Notice CRTC 99-14, New Media (17 May 1999), <<http://www.crtc.gc.ca/archive/Notices/1999/PT99-14.htm>> at "Summary."

voluntarily by a computer systems operator at the University of British Columbia, but in 1997 the Canadian Internet industry and the federal government began to develop a plan for the creation of a non-profit body to manage the domain in the public interest.⁵⁵ The culmination of this lengthy process was the creation of the Canadian Internet Registration Authority (CIRA) in December 1998.⁵⁶ Two years later, and after extensive industry-government negotiations, official authority for the .ca domain, which was described as "a key public resource," was transferred to CIRA on 1 December 2000.

The redelegation of the .ca domain to CIRA was the first such redelegation since the United States government delegated limited responsibility for the Internet's domain name space to the Internet Corporation for Assigned Names and Numbers (ICANN), a California non-profit corporation created at the direction of the US Department of Commerce in 1998. The process was carried out in accordance with the "Principles for the Delegation and Administration of Country Code Top Level Domains" promulgated by ICANN's Governmental Advisory Committee (GAC).⁵⁷

3.4 National Internet connectivity

Internet traffic within Canada flows over the backbone networks of a number of competitive network providers, including AT&T Canada, Sprint Canada, UUNet Canada, and PSINet Canada. However, the majority of traffic is carried on the facilities of the Bell Canada group of companies, predominantly Bell Nexxia. This is partly due to Bell's having taken over the original CA*Net backbone in the late 1990s (see Section 3.1.1 above).

3.5 International Internet connectivity

Canada is not only one of the most "connected" nations domestically, but also enjoys some of the highest capacity links to the Internet of any country. According to TeleGeography, Inc. Toronto was the ninth-largest inter-

national Internet hub city in 2000, with 16.4 Gbit/s of total international Internet bandwidth, one of five Canadian cities ranking in the top fifty in the world.⁵⁸ Four of the top twenty international Internet routes in 2000 originated or terminated in Canada.⁵⁹

3.6 Public networking

Canada has a strong tradition of public networking, beginning with the CA*net initiative, and currently embodied in the aspirations of certain provinces to wire their communities together via very high speed Internet links. The Western province of Alberta, normally known for its energy exports and distaste for State interference in the market, recently contracted with a consortium of networking service and equipment companies led by Bell Canada to build a CAD\$ 300 million high-speed, broadband Internet network that will connect the province's communities, learning institutions, hospital facilities and libraries.⁶⁰

These excerpts from Bell's news release announcing the project demonstrate the Alberta government's motivation for making such a large investment in public networking:

"The project will link any community in Alberta that has a school, hospital, library or provincial government office to other communities via high-speed telecommunication lines. A fully wired province will offer Albertans in all regions direct access to information and services not locally available.

The project is part of a government strategy that envisions Information and Communications Technology (ICT) as a means to improve quality of life and build sustainable prosperity for Albertans. The strategy encompasses four priorities, including development of the fibre-optic infrastructure, investment in education, growth in ICT research and development and expansion of ICT-based industry.

"At its heart, our strategy offers a way to provide everyone, both in rural and urban areas, with equal access at equal cost to the best information and services available, while at

the same time, fostering economic diversification,” said the Honourable Lorne Taylor, Alberta’s Minister of Innovation and Science. “The Bell consortium offers us the most cost-effective and technologically advanced approach to achieving this strategy.”

“This innovative network will put Alberta on the global map as the most desirable place for e-business, e-learning, e-government and e-health,” said Art Price, CEO of Axia [one of the vendors]. “It will further enhance Alberta’s position as an attractive place to live, work and invest.”

The province of Alberta’s “SuperNet” initiative demonstrates that even in competitive market environments, there may still be a need for public investment in information infrastructure to meet development goals, particularly where populations are spread out over large areas. There are other examples in Canada—Saskatchewan has its “Community-Net.” In Québec, school board-led “condominium partnerships” are building innovative, customer-owned dark fibre networks.⁶¹ In the province of Ontario, by contrast, the government has thus far insisted that broadband infrastructure is a private sector concern.

At the federal level, the Government of Canada’s “Connecting Canadians” initiative aims to make Canada “the most connected country in the world” by ensuring that broadband Internet connections are available to all Canadians by 2004 (see Box 4).⁶² It is interesting to note that despite having one of the most competitive telecommunication markets in the world, including Internet access, there is still strong interest in public initiatives to push Canada’s communications infrastructure even further, at the highest speeds possible.

3.7 Advanced networking

CANARIE, Canada’s advanced Internet development organization, has been at the forefront of advanced networking research for several years. Picking up from CA*net II (described in Section 3.1.1 above), in February 1998, the Canadian government announced

a CAD\$ 55 million commitment to CANARIE to build a national optical R&D Internet network, CA*net 3. In March 1998, CANARIE issued a Request for Information relating to the building of the core optical network and to the conducting of related R&D. A consortium led by Bell Canada was selected as the provider of the core network.

The CA*net 3 network was initially designed to operate at up to 40 Gbit/s or 250 times the speed of the then-current CA*net II backbone, and roughly 750 000 times the speed of the original CA*net. It is based on Dense Wave Division Multiplexing (DWDM) technology, which expands the information carrying capacity of individual optical fibres by multiplexing a number of wavelengths of laser light. The wavelengths are connected directly to high performance network routers, which are the only electrical switching devices on the network.

This direct connection between the DWDM equipment and the routers leads to the definition of the network as an “optical Internet.” While other advanced optical networks are still based on SONET technology, which is basically designed to carry voice traffic first, and Internet traffic second, CA*net 3 was built from the ground up to carry Internet traffic. CA*net 3 was the world’s first national optical fibre Internet R&D network.

CANARIE states that its “end objective” is “to ensure that Canadians in general continue to have access to the best information infrastructure possible, and that Canadian businesses learn to use that infrastructure to their advantage, and ultimately to the advantage of the Canadian economy. Only on such a foundation can Canada’s future in a global information society be assured.”⁶³

CANARIE represents a unique public-private partnership in networking research and development. It is no surprise that service and equipment vendors like Bell Canada and Nortel Networks are eager to contribute money and expertise to its projects, given the valuable R&D experience they get, which can later be used to their commercial advantage.

Box 4: Industry Canada news release: "Connecting Canadians"

Government of Canada Announces Commitment to Bringing High-Speed Broadband Internet Services to all Canadian Communities

HALIFAX, October 16, 2000—On behalf of the Prime Minister, John Manley, Minister of Industry, announced today at Softworld 2000 the Government of Canada's commitment to achieving the goal of high-speed broadband access to all communities by 2004.

The Minister announced that a National Broadband Task Force will be established to advise the Government of Canada on how best make high-speed broadband Internet services available to businesses and residents in all Canadian communities by the year 2004.

As a first step, the Task Force, to be chaired by Dr. David Johnston, President of the University of Waterloo, will map out a strategy and advise the Government, by March 31, 2001, on best approaches for achieving this commitment.

"Through the Connecting Canadians initiative, and a dynamic private sector, more and more Canadians are realizing the benefits of the Internet and information and communications technologies," said Minister Manley. "With today's announcement, the Government is taking the first step to expand on maximizing these benefits by providing access to the necessary tools—highspeed broadband networks—which will allow all Canadian communities to reap the rewards of the 21st Century economy."

The Task Force's mandate will include consideration of, and advice on:

- the needs and characteristics of communities which without government involvement will not likely gain access to private sector-delivered high-speed services by 2004;
- the technical, institutional and financial barriers which could delay provision of such services by the private sector;
- the roles governments might play in overcoming these barriers; and
- the carriers and other organizations who may be receptive to deploying these services in such communities and what the Government of Canada would need to engage them.

Canada must ensure it has a high-speed, high-growth economy and an improved quality of life. Access to high speed broadband networks will translate into strong investments across Canada and opportunities for all Canadians.

It will address the digital divide in this country that separates urban from rural and remote communities. These small communities which stand to benefit the most from high-speed broadband services may be the last to have these services available to them without government involvement. Access to high-speed broadband will provide the foundation for improved services such as distance learning and telehealth as well as provide small business with access to broader markets.

Source: Excerpted from Industry Canada, news release, "Government of Canada Announces Commitment to Bringing High-speed Broadband Internet Services to all Canadian Communities" (16 October 2000), <<http://connect.gc.ca/en/ne/1530-e.htm>>.

- ²³ See "History of the Internet in New Brunswick," <<http://personal.nbnnet.nb.ca/laurie/internet.html>>.
- ²⁴ See CANARIE Inc., "Canadian Advanced Networking History" (10 May 2000), <<http://www.canarie.ca/advnet/history.html>>.
- ²⁵ <<http://www.canarie.ca/>>. The name, which originally stood for "The Canadian Network for the Advancement of Research, Industry and Education," is pronounced "canary" in English. CANARIE is a not-for-profit corporation supported by its members (predominantly universities), project partners (telecommunication equipment and service vendors), and the federal government. Its 26-member board represents the public and private sectors equally.
- ²⁶ Industry Canada, "1997 Survey of Internet Service Providers," <<http://strategis.ic.gc.ca/SSG/sf05190e.html>> at slide 15.
- ²⁷ Industry Canada, *The Canadian Telecommunications Service Industry—An Overview, 1999-2000* (forthcoming). See Industry Canada, Spectrum Management and Telecommunications, Statistics and Reports, <<http://strategis.ic.gc.ca/SSG/sf01703e.html>>.
- ²⁸ ITU, *ITU Internet Reports 2001: IP Telephony*, <<http://www.itu.int/ti/publications/americas/2000/index.htm>> at p. A-18.
- ²⁹ N. Hillary & G. Baldwin, "Challenges facing Canada's Internet service providers; A snapshot from a survey of ISPs" (December 1999), Statistics Canada, Analytical Paper Series No. 28, <<http://www.statcan.ca/english/IPS/Data/63F0002XIB99028.htm>> at p. 12.
- ³⁰ Bell Canada, news release, "Sympatico now connects more than 1 million Canadians to the Internet" (14 November 2000), <http://www.bell.ca/en/about/news/releas/2000/pr_20001114.asp>. Of those 1 million customers, approximately 800,000 were dial-up, and 200,000 were high-speed (DSL) customers.
- ³¹ Statistics Canada, "Plugging in: The increase in household Internet use continues in 1999" (4 December 2000), <<http://www.statcan.ca/english/research/56F0004MIE/56F0004MIE00001.pdf>> at p. 5.
- ³² *Ibid.*
- ³³ Canada has the highest cable television penetration rate in the world. Ninety-three per cent of households had access to a cable network in 1999, and 73 per cent were subscribers. D. April, "Internet by Cable" (January 2001), Statistics Canada, Connectedness Series No. 2, <<http://www.statcan.ca/english/research/56F0004MIE/56F0004MIE01002.pdf>> at p. 1. The deployment of cable modem service is significantly ahead in Canada compared to the United States, both in terms of supply and demand for the service (*Ibid.* at p. 5).
- ³⁴ PriceWaterhouseCoopers, news release, "Canadians lead the world in Internet use—Subscription to high-speed access grows" (16 November 2000), <<http://www.pwcglobal.com/extweb/ncpressrelease.nsf/docid/0FBB779D0438216585256999004D6439>>.
- ³⁵ *Ibid.*
- ³⁶ See <<http://www.cybersurf.ca/>>.
- ³⁷ PriceWaterhouseCoopers news release, at Note 34 above; and Computer Industry Almanac Inc., news release, "15 Leading Countries in Internet Users Per Capita" (25 October 2000), <<http://www.c-i-a.com/200010iuc.htm>>. According to the latter report, second through fifth are Sweden, Finland, the United States, and Iceland.
- ³⁸ PriceWaterhouseCoopers news release, at Note 34 above.
- ³⁹ These and many more statistics regarding Canadian Internet use can be found in Statistics Canada, "Plugging in: The increase in household Internet use continues in 1999", Note 31 above.
- ⁴⁰ Telecom Order CRTC 97-471 (8 April 1997), <<http://www.crtc.gc.ca/archive/Orders/1997/O97-471.htm>>.
- ⁴¹ Telecom Order CRTC 99-592, *Forbearance from retail Internet services* (25 June 1999), <<http://www.crtc.gc.ca/archive/Orders/1999/O99-592.htm>>.
- ⁴² Telecom Order 98-929, *In the matter of Proposed New Contribution Exemption Regime for Internet Service Providers* (17 September 1998), <<http://www.crtc.gc.ca/archive/Orders/1998/O98-929.htm>>.
- ⁴³ Note 19 above.
- ⁴⁴ See <http://www.crtc.gc.ca/cisc_e.htm>. The CISC was originally struck to assist in developing the practical aspects of local number portability, and later its mandate was expanded to cover many technical aspects of the transition to local competition. CISC is sometimes referred to by the Commission as the "Industry Steering Committee" and is a good example of the kind of collaborative, alternative dispute resolution measures which can be used in the telecommunications industry to implement complex details of industry transitions.

- ⁴⁵Telecom Decision CRTC 98-9, Regulation Under the Telecommunications Act of Certain Telecommunications Services Offered by "Broadcast Carriers" (9 July 1998), <<http://www.crtc.gc.ca/archive/Decisions/1999/DT99-8.htm>>.
- ⁴⁶Telecom Decision CRTC 99-8, Regulation Under the Telecommunications Act of Cable Carriers' Access Services, (6 July 1999), <<http://www.crtc.gc.ca/archive/Decisions/1998/DT98-9.htm>>.
- ⁴⁷See Telecom Order CRTC 2000-798, Terms and rates approved for large cable carriers' higher speed access service (21 August 2000), <<http://www.crtc.gc.ca/archive/Orders/2000/O2000-789.htm>>.
- ⁴⁸For a list of the many CRTC proceedings related to third-party cable Internet access, see the website of the Canadian Association of Internet Providers (CAIP) at: <<http://www.caip.ca/issues/infrastr/subset.htm>>.
- ⁴⁹Telecom Order CRTC 99-591, Application by Canadian Association of Internet Providers regarding ADSL-based Internet services (25 June 1999), <<http://www.crtc.gc.ca/archive/Orders/1999/O99-591.htm>>. CAIP's original application and the record of the proceeding is available at: <http://www.crtc.gc.ca/ENG/Proc_rep/TELECOM/1998/8646/c51-01.html>.
- ⁵⁰See the list of "Registered Resellers Of High Speed Retail Internet Service" on the CRTC's website at: <<http://www.crtc.gc.ca/ENG/public/Iplists/Internet.htm>>. This list does not distinguish between cable and DSL resellers.
- ⁵¹See Note 16 above.
- ⁵²Telecom Order CRTC 2000-983, Digital subscriber line service providers' access approved for unbundled loops and co-location (27 October 2000), <<http://www.crtc.gc.ca/archive/Orders/2000/O2000-983.htm>> (letter decision originally released 21 September 2000).
- ⁵³See Telecom Public Notice CRTC 98-20, New Media—Call for Comments (31 July 1998), <<http://www.crtc.gc.ca/archive/Notices/1998/PT98-20.htm>>.
- ⁵⁴See Telecom Public Notice CRTC 99-14, New Media (17 May 1999), <<http://www.crtc.gc.ca/archive/Notices/1999/PT99-14.htm>>.
- ⁵⁵For more information about CIRA and the .ca reform process, see T. Denton, "Canadian Domain Name Governance: The Twice Delegated CIRA," (29 November 2000), <<http://www.tmdenton.com/Canadian%20Domain%20NameGovernance.PDF>>.
- ⁵⁶See <<http://www.cira.ca/>>.
- ⁵⁷See <<http://www.noie.gov.au/projects/international/DNS/gac/library/ccdocs/cctld.txt>>.
- ⁵⁸TeleGeography, Inc., *TeleGeography 2001* (October 2000), at p. 107, <<http://www.telegeography.com/>>.
- ⁵⁹*Ibid.*, at p. 106. #7 being Montreal-New York, #12: Toronto-Chicago, #15: New York-Toronto; #16: Seattle-Vancouver.
- ⁶⁰Bell Nexxia, news release, "Bell Intrigna and Bell Nexxia to build a \$300 million network in Alberta" (6 November 2000), <<http://www.bellnexxia.ca/en/newsroom/releases/2000/2000.11.06/>>.
- ⁶¹For interesting information on this emerging concept in Internetworking, see the CA*net3 Ardnoc Library at: <<http://www.canet3.net/library/papers.html>>.
- ⁶²The "Connecting Canadians" website is at: <<http://connect.gc.ca/en/100-e.htm>>.
- ⁶³Note 24 above.

4 IP Telephony in Canada

4.1 Introduction

Canada was the first country in the world explicitly to address the place of IP Telephony in its regulatory scheme, yet ironically IP Telephony still has a very low profile in the Canadian telecommunication environment. While most telecommunication operators are *talking* about IP Telephony, very few are actually using it in their networks, and even fewer are offering specific retail services on IP platforms. The general view in the industry appears to be that IP Telephony technology is simply not advanced enough yet for widespread implementation, and even if it were, it would face an uphill battle because circuit-switched telephony is ubiquitous and cheap throughout Canada. However, the prevailing belief is also that IP represents the future and that eventually all telecommunication networks will run IP at some levels, with end-to-end IP Telephony being the final stage of this evolution.

4.2 Regulatory status of IP Telephony in Canada

While the advent of IP Telephony in many countries has challenged monopolies in long-distance and international calling, in Canada these markets were liberalized before even the first generation of PC-to-PC IP Telephony technologies became available. However, the advent of Internet services, and subsequently IP Telephony, forced a series of CRTC proceedings on how these new services fit into Canada's contribution regime (see Section 2.5 above). The idea of banning IP Telephony was thus never considered—it was only a matter of making sure that it did not bypass existing structures designed to support universal service.

4.2.1 General

Canada's regulatory approach to IP Telephony is well summarized by the following question-and-answer exchange with then-CRTC Chairperson Françoise Bertrand in May 1999:⁶⁴

"Q: Does the CRTC regulate Internet telephony?"

A: No, the CRTC views it as another type of telephone service and we encourage it. It is an emerging phenomenon."

Of course, viewing IP Telephony as "another type of telephone service" implies a regulatory choice which some might, in fact, call "regulating Internet telephony," but Madame Bertrand's response demonstrates the general sense of the word "regulation" in Canada. While Canada has a comprehensive telecommunications regulatory regime, that does not mean that matters such as entry and pricing are always regulated, only that a general framework exists which imposes certain rights and obligations on service providers of many types, some more burdensome than others. However, this framework is based on the principle that market competition is the preferred means of delivering quality services at the lowest prices to all types of users.

While the regime has changed since IP Telephony was first incorporated into Canada's regulatory structure in 1997 (as described below), the current state of affairs is that international IP Telephony service providers require a licence from the CRTC (like any other international service provider) to offer service to the public. If they have gross contribution-eligible revenues of at least CAD\$ 10 million per year, they must also pay contribution based on a prescribed percentage of their total annual revenues from such services. These would include Phone-to-Phone packet-switched voice telephony, but not PC-to-PC or PC-to-Phone (unless the terminating telephone is located in Canada) or retail Internet access services.

The series of CRTC decisions on IP Telephony is instructive because it demonstrates a technology-neutral

regulatory response to a new technology which threatened to undermine the important public goals behind the telecommunications regulatory framework.

4.2.2 CRTC decisions on IP Telephony

Contribution exemption for Internet traffic, but not voice

Internet access services were first explicitly dealt with in the context of the contribution regime in May 1997, when the line-side data connections which ISPs use to connect their customers' dial-up calls to the Internet were exempted from contribution-related charges otherwise payable on such circuits.⁶⁵ However, even in late 1996, it was clear that IP circuits could potentially be used to carry interexchange (IX) voice traffic, and that this presented the opportunity to avoid contribution. In response to this scenario, the CRTC ruled that "where the Internet network is used as the underlying transmission facility by a service provider to provide public switched IX voice or data services, the service provider is to register as a reseller and to pay contribution."⁶⁶ In early 1997, few regulatory agencies in other countries were even aware of what IP Telephony was.

The ShadowTel Application

Later in 1997, a company which offered IX service to the public over a voice-over-frame-relay network applied to the CRTC for a contribution exemption for its traffic.⁶⁷ ShadowTel Communications argued that it was just like an ISP, and therefore eligible for the contribution exemption with respect to all traffic on its network. ShadowTel stated that toll quality on its network was "distinct and different from toll quality found on the networks of other resellers," and therefore should not be subject to the same rules. It is important to note that although ShadowTel used frame relay and not strictly IP technology, the rhetoric of the proceeding was about "phone calls over the Internet."⁶⁸

Excited about the possibilities which packetization and compression offered even at that time, ShadowTel stated that the benefits to consumers of the

unique application of its technology were "arguably unprecedented in the industry," and that the unique application of its technology would benefit the consumer by bringing greater overall market efficiencies, as well as the growth of a new emerging market.

Bell Canada replied with the following arguments, most of which the CRTC accepted:⁶⁹

- the description provided by ShadowTel clearly establishes that ShadowTel's service is intended to provide voice communication between regular PSTN connections using normal telephone equipment;
- no specific quality criteria or standards apply to the interexchange services of resellers or other toll service providers, and contribution charges are not based on the quality of service provided;
- the digitization and compression of voice communications is not a new or innovative technology and that such techniques are commonly employed by carriers and long-distance resellers when provisioning their networks, accordingly, ShadowTel's service quality argument has no bearing on the applicability of contribution to ShadowTel's service;
- the requirement to pay contribution is not based on the size or scope of the operations of an individual firm;
- contribution applies equally to all service providers who offer long-distance voice or data services to the public, and ShadowTel's service is clearly intended to do exactly that.

The Commission concluded (at paragraph 17) as follows: "[b]ased on the evidence of this proceeding, the Commission considers that ShadowTel is providing public switched interexchange voice services, albeit over the Internet and that, consistent with Order 97-590, ShadowTel is clearly required to register as a reseller and pay contribution."

To the extent that there was a decisive “battle” over the regulatory status of IP Telephony in Canada, the ShadowTel application was it. The resulting message was clear: long-distance telephone service provided to the public by means of any technology, including frame relay or the Internet, even if used by a company which otherwise styles itself an ISP, is contribution-eligible.

Contribution exemption for Internet Service Providers

The most important CRTC decision with respect to the legal status of IP Telephony is Order 98-929, released on 17 September 1998.⁷⁰ In this decision the CRTC confirmed the view which it gave in the ShadowTel decision, and set out a comprehensive regime for IP communications under the Telecommunications Act. It is important to note that these rules were made under the old contribution regime (see Section 2.5.2 above), which was replaced on 1 January 2001. However, important elements of the rules remain relevant under the new contribution regime (Section 2.5.3).

At issue in the proceeding leading up to this order was how to make the contribution regime simpler for ISPs, given the policy decision to exempt them from the obligation to pay contribution. However, the Commission was concerned not to allow IP voice to avoid the existing regime, under which contribution was required to be paid in relation to each minute of IX traffic, no matter who provided it to the public, or over what type of circuit. The difficulty was figuring out how to separately identify those packetized minutes in otherwise undifferentiated IP data streams.

Recognizing that it did not provide definitions in Order 97-590 (see Section 4.2.2.1 above), the CRTC adopted a series of important definitions proposed by the Stentor group of incumbent telephone companies (see the other definitions in Section 3.3.1 above), including these two, which likely remain valid under the new contribution regime:

- **PC Voice** is “real-time” voice communication via the Internet using a personal computer (PC) or other terminal equipment which is equipped with a modem, and the hardware and software required to perform voice compression and conversion to a form which can be transmitted to or from an ISP over IALs. At the IAL, PC Voice communication is effectively indistinguishable from other forms of communication between a modem-equipped PC and an ISP.
- **PSTN Voice** refers to “real-time” voice communication via the Internet to or from a telephone set or other equipment where the conversion for carriage on the Internet is performed at the service provider’s (i.e., the ISP’s) equipment. Unlike PC Voice, such communication can be accommodated using a normal telephone set, without requiring the user to be equipped with a modem or a computer with special hardware or software at the terminal location.

The Commission then made these key determinations (at paragraphs 20 and 21):

The Commission disagrees with AOL Canada’s submission that PSTN Voice should be contribution-exempt. The Commission has already ruled twice on this subject in Order 97-590 (re Scope of IX Contribution Paying Services) and Telecom Order CRTC 98-28 dated 23 January 1998 (re ShadowTel Communications (Ontario) Inc.). The Commission remains of the view that PSTN Voice using the Internet as the transmission facility should be contribution-eligible.

The Commission agrees with Stentor’s characterization of the type of services that are contribution-eligible and contribution-exempt. Accordingly, the Commission finds that: (i) only IALs carrying PSTN Voice traffic are subject to contribution charges; and (ii) if an IAL is used to carry any local or inter-exchange PSTN Voice traffic, then all traffic carried on that IAL is subject

to contribution. The Commission agrees with Stentor that IP Data should be contribution exempt.

The difficulty with this scheme remained the task of identifying PSTN Voice traffic on IALs, which otherwise carry WWW and e-mail traffic, which are not contribution-eligible. The “lighter contribution exemption regime for ISPs” which the CRTC devised to address this difficulty is set out in Box 5.

In its prophetic second-last paragraph, the Commission noted that “Call-Net [parent of Sprint Canada] proposed that the Commission re-examine the entire contribution regime and replace it with a system that requires telecommunications service providers to contribute on the basis of a percentage of revenues.” The Commission denied the request at the time, but just over two years later, did precisely that. Before getting to that decision, it is worth briefly considering the international licensing regime which was developed under the old contribution

policy, and specifically how the issue of packetized voice was dealt with under it.

4.2.3 International licensing regime

As discussed in Section 2.4 above, a new international licensing regime was introduced in October 1998. Anyone offering originating or terminating international telecommunication services (including voice and fax) to the public⁷¹ is required to hold a licence of one of two different classes (see below). Further, licensees were required to pay contribution on a per-minute basis on international traffic, just like the domestic and international traffic of other telecommunication companies in Canada.

The Commission defined two classes of licences (Class A and Class B) in this way:⁷²

- a) those who operate telecommunication facilities, whether owned by them or leased from a separate

Box 5: Regulatory rules for ISPs under the old contribution regime

Situation 1: If an ISP offers exempt ISP services only and no other service provider offers PSTN Voice or any other contribution-eligible telecommunications services from the same service locations, no registration is required. The Local Exchange Carrier (LEC) is to maintain records of services provided to ISPs for possible audit requirements. The ISP should make available a no-charge, five-hour per-month, low-speed access account to its serving LEC. The exemption is assumed automatically by the LEC unless the ISP advises it offers PSTN Voice or other telecommunication services. The exemption is effective the date of service installation. Disputes are to be referred to the Commission.

Situation 2: If an ISP offers PSTN Voice or other telecommunications services in addition to ISP services and no PSTN Voice or other contribution-eligible telecommunications services are offered by the ISP or any other service provider from the same service locations, the ISP is to register with the Commission, but no exemption application for contribution-exempt services is required. The ISP should make available a no-charge, five-hour per-month, low-speed access account to its serving LEC. An affidavit is to be served on serving LEC(s) only. When the LEC is offering the ISP service, a senior officer should swear an affidavit which should be available in case of a dispute. The exemption is effective the date of service installation. Disputes are to be referred to the Commission.

Situation 3: If an ISP offers PSTN Voice or other contribution-eligible telecommunications services from the same service locations in addition to ISP services or another service provider offers PSTN Voice or other contribution-eligible telecommunications services from the same service locations, registration and an exemption application is required (for contribution-exempt services) with the Commission and serving LEC(s). The ISP should make available a no-charge, five-hour per-month, low-speed access account to its serving LEC. Appropriate technical evidence is required (carrier verification or technical audit). Commission approval is required—no interim approval is assumed by the LEC. The exemption is effective the date of application or the date of installation, whichever is later, absent special circumstances.

Source: Extracted from Telecom Order CRTC 98-929, *In the matter of Proposed New Contribution Exemption Regime for Internet Service Providers* (17 September 1998), <<http://www.crtc.gc.ca/archive/Orders/1998/O98-929.htm>>, at paragraphs 31-33.

facilities provider, used in transporting basic telecommunication service traffic between Canada and another country (Class A licensees); and

- b) those who do not operate telecommunications facilities owned by them or leased from a separate facilities provider used in transporting basic telecommunication service traffic between Canada and another country (Class B licensees).

The Commission notes that telecommunications facilities include exempt transmission apparatus as defined in the *Telecommunications Act*. For greater clarity, Class B licensees include service providers who only resell the switched services of other service providers or who hand off all of their international traffic to another service provider in Canada for termination in another country.

While this dichotomy worked well for circuit-switched traffic, it had difficulty with packet-switched due to the question of who should be responsible for contribution when a call is originated on the PSTN, but leaves Canada in packet form. IP Telephony service providers neither resold the switched services of other service providers, nor handed off switched traffic for termination in another country, since their output was in the form of IP packets.

A joint industry-regulator consultative body⁷³ initiated by the CRTC grappled with this issue of packet-switched services and decided upon the following definition of "international contribution-eligible minutes":⁷⁴

The Commission accepts the updated definition of international contribution eligible minutes as proposed by the task force. The task force consensus position defined international contribution eligible minutes as voice conversation minutes that originate or terminate in Canada which are transported between Canada and another country, except: 1) minutes carried on international facilities that are physically or virtually dedicated to the sole use of a single end-user customer; 2) minutes carried on international facilities that are used

solely to carry domestic traffic, on a dedicated basis, through a second country; and 3) minutes that originate or terminate in Canada via Internet PC voice services.

Among other things, the task force proposed creating a third class of licence, described below (at p. 7):

Under the task force proposal, a Class C licensee would be "a telecommunications service provider, other than a Class A licensee, who operates telecommunications equipment in Canada which converts circuit-switched international contribution eligible minutes originating in Canada to a non-circuit switched transmission protocol; or which converts non-circuit switched international traffic to circuit switched international contribution eligible minutes terminating in Canada." These licensees would be obliged, by condition of licence, to report the converted minutes and associated contribution to the relevant LEC.

Instead of creating a Class C licence, the Commission opted to reformulate the definitions of the existing Class A and B licences to deal specifically with the conversion of circuit-switched traffic to "non-circuit-switched traffic," and *vice versa*. These new definitions are found in Box 6.

These new licence definitions addressed a type of service provider which was not explicitly contemplated a year earlier, in Decision 98-17—the operator of the gateways which convert packet-switched calls to circuit-switched for the purpose of carrying international calls out of Canada, and *vice versa*—gateways which receive calls from the Internet or any other type of packet-switched network, and convert the calls to circuit-switched mode, for termination in Canada. This was likely necessary to address again the difficulty of distinguishing between voice and fax traffic in packetized form running over a circuit dedicated to data traffic.

There are presently dozens of Class A and Class B licensees registered with the CRTC.⁷⁵ Some of the most well-known international and "next

Box 6: Revised Class A and B Basic International Telecommunications Services (BITS) licences

[P]ursuant to section 16.1 of the Telecommunications Act, and subject to the exclusions noted in Decision 98-17, the Commission revises the definition of Class A licensee as follows, effective immediately:

A Class A licensee is a telecommunications service provider who:

- (a) operates telecommunications facilities used in transporting basic international traffic between Canada and another country, whether those facilities are owned by the licensee or leased from a separate facilities provider;
- (b) operates telecommunications equipment that converts basic international traffic from circuit-switched minutes originating in Canada to non-circuit switched traffic, or from non-circuit switched traffic to circuit-switched minutes terminating in Canada, regardless of whether the licensee is responsible for the international transport; or
- (c) performs both of the functions described in (a) and (b), above.

Pursuant to section 16.1 of the Telecommunications Act, and subject to the exclusions noted in Decision 98-17, the definition of a Class B licensee is also revised effective immediately to read as follows:

A Class B licensee is a telecommunications service provider who neither:

- (a) operates telecommunications facilities used in transporting basic international traffic between Canada and another country; nor
- (b) operates telecommunications equipment that converts basic international traffic from circuit-switched minutes originating in Canada to non-circuit switched traffic, or from non-circuit switched traffic to circuit-switched minutes terminating in Canada.

In addition, the Commission hereby amends paragraphs 2 and 3 of the licence conditions of [existing] Class A licensees.

Source: Extracted from CRTC Letter, "Industry Task Force on International Contribution Issues – Final Consensus Report" (17 December 1999), <<http://www.crtc.gc.ca/INTERNET/1999/8695/14/01/crtc/991217e.doc>>, at pp. 8-9.

generation" telecommunication carriers in the world are Class A licensees, including: Cable & Wireless, Concert Global Networks, Deutsche Telekom, Equant, Global One, iBasis, Net2Phone, RSL COM, as well as most major Canadian carriers. Many of these same carriers plus many more hold Class B licences, including: Ameritech, BT, Global Crossing, and Korea Telecom.

This regime turned on there being a point of conversion of circuit-switched into packet-switched calls, and *vice versa*, to identify the operator which is responsible for paying per-minute contribution. The Commission had earlier expressed the following views about the state of what it called "Internet telephony" (that is, where IP calls start out in IP form and leave Canada in that form) at that time:⁷⁶

"The Commission has also determined that it would not be appropriate to subject certain ISPs to a licensing regime at this time, as described below. The Commission considers Internet telephony to be in the

development stage. At present, Internet telephony does not afford a mechanism to manipulate international settlements on a significant scale. The Commission notes that this situation may change in the future."

"In Telecom Order CRTC 98-929, 17 September 1998, the Commission is providing for automatic exemptions from contribution charges for certain ISPs, generally consistent with Stentor's submissions in the proceeding. In particular, subject to certain requirements, the Commission concluded that ISPs should be exempt from contribution, and not be required to register with the Commission, if the ISP offers only contribution-exempt ISP services and no other service provider offers PSTN voice or any other contribution-eligible telecommunication services from the same location. The Commission considers that such ISPs should similarly be excluded from any licensing requirement. However, the Commission puts ISPs on notice that this may change in the future as Internet telephony develops."

Thus the CRTC reserved the right to subject PC Voice-type services to regulation in the future, but to date has opted not to. This position was confirmed in the recent contribution reform decision, discussed next.

4.2.4 IP Telephony under the new contribution regime

In Order 98-929 in September 1998, the CRTC made these comments immediately after deciding that PSTN Voice traffic was contribution-eligible, but PC Voice traffic was not:⁷⁷

"The Commission also notes that technological innovation will likely lead to a situation where services such as PSTN Voice will increasingly be able to be offered in a manner similar to PC Voice. Given that this will likely lead to a potentially significant reduction in contribution payments, the Commission is of the view that the contribution-exempt status of Internet services may need to be revisited in the future."

Ironically, it was not this outcome that drove the CRTC to revisit the suitability of its existing contribution collection regime, but rather the fact that the existing "per-minute on IX" system was proving inequitable and unsustainable among existing telecommunication companies. The contribution-exempt status of Internet services was in fact not revisited. Rather, the Commission confirmed that ISPs are not subject to contribution for their retail Internet services, but also that any "other telecommunications services" which they might provide, by which is almost certainly meant PSTN Voice, would be contribution-eligible.

However, the trend towards packet-switching clearly played a role in the CRTC's decision to move from a per-minute mechanism to a revenue charge mechanism. The Commission noted (at paragraph 13), that "parties argued that the ability of service providers to avoid contribution will encourage the growth of packet and Internet protocol networks, which could erode the base of contribution-eligible minutes." Many parties had told the Commission that traditional concepts used in measuring and selling telecommunication traffic were losing

relevance in the IP age, and that this led to administrative problems and ultimately competitive inequities among operators. Call-Net Enterprises Inc., parent of Sprint Canada, made these arguments:⁷⁸

"[D]evelopments such as the growth in Internet data traffic make issues regarding measurement of packet-switched traffic on a per-minute basis, as well as the difficulty of discerning local traffic from interexchange traffic, particularly acute. Efforts required to measure packet-switched communications and to distinguish between Internet and other data applications, as well as between local and long-distance traffic carried over the Internet, will be rendered increasingly futile with the inevitable growth of packet-switched networks. It should also be emphasized that consumers will not want these distinctions maintained. Seamless services, which simply provide the customer with what they want and when they want it, should become the competitive standard. Any contribution collection mechanism that is based on artificial distinctions to which consumers object should be avoided."

As discussed in more detail in Section 2.5.3 above, in Decision 2000-745, released on 30 November 2000, the Commission discarded the per-minute mechanism and directed that a national revenue-based contribution collection mechanism be implemented effective 1 January 2001, using an interim 2001 revenue-percentage charge of 4.5 percent (the final 2001 revenue-percentage charge is to be determined by mid-2001). Not all services provided by any given operator will be contribution-eligible, only its total "Canadian Telecommunications Service Revenues" (CTSR), less certain deductions. CTSR are revenues from "Canadian telecommunications services."

The Commission concluded that all telecommunications service providers, such as local exchange carriers (LECs), alternative providers of long-distance services (APLDS), resellers, wireless service providers (WSPs), international licensees, satellite

service providers, Internet service providers (if another telecommunication service is provided—e.g. PSTN Voice), payphone providers, data and private line service providers are required to contribute based upon their total CTSR, less deductions for contribution revenues received, inter-carrier expenses to other telecommunication service providers, and revenues earned in Canada from retail Internet, retail paging and terminal equipment including related sales commissions. Operators whose CTSR is below CAD\$ 10 million, however, are not required to make any revenue charge payments.

Referring specifically to ISPs, the Commission stated (at paragraph 91(a)) that:

"retail Internet and retail paging service revenues are not contribution-eligible, in consideration of the nature of these services, existing policies with respect to their contribution exempt status and administrative complications. However, any revenues generated by Internet and paging service providers from the provision of any other telecommunication services will be contribution-eligible. In addition, any revenue generated by another telecommunication service provider supplying underlying telecommunication facilities to retail Internet and paging service providers (for example, interconnecting circuits used by Internet and paging service providers) will be contribution-eligible[.]"

The "other telecommunications services" referred to are most likely voice services, and revenues for PSTN Voice services, regardless of who earns them, are included in the calculation of CTSRs. However, PC Voice services, which include both Web-based "free long-distance" services such as Dialpad.com⁷⁹ and Yahoo! Instant Messenger,⁸⁰ as well as calls on the internal network of closed user groups such as corporations, are not.

Under the new collection mechanism, all Class A international services licensees (including operators such as Equant, iBasis, and Net2Phone, for

example) with CTSRs of at least CAD\$ 10 million will be required to pay a charge equal to 4.5 per cent of those portions of their 2000 gross Canadian revenues which are CTSRs—which excludes revenues from "retail Internet" and "PC Voice" services, but includes revenues from the origination or termination of PSTN Voice services (domestic or international, voice or fax), whether they bring the calls into Canada in packet-switched or circuit-switched form. Where both contribution-eligible and exempt services are offered as part of the same "bundle," the revenues from the entire bundle are contribution-eligible.

4.3 The IP telephony services market

4.3.1 Indicators

There are very few statistics available about IP Telephony in Canada, partly because what specific IP Telephony operations there are have a very low profile, and partly because those operators which are required to report matters such as traffic and revenues are not required to break down their reports according to technology. While there are a number of IP Telephony service providers (IPTSPs) based in the United States which are publicly-traded companies (and thus report publicly on their activities), the Canadian IPTSPs which this research has identified are very small, privately-owned affairs. It is possible, in fact, that very few or no standalone IPTSPs in Canada would have annual CTSRs of over CAD\$ 10 million, effectively leaving them unregulated, from the point of view of the contribution regime, which is the most significant aspect of Canada's telecommunication regulatory regime for IPTSPs.

Large telecommunication carriers either do not offer retail IP-based voice services, or are unwilling to disclose such matters as minutes or revenues derived from it. It appears that the most extensive use of IP Telephony technology in Canada is in closed, enterprise networks. Likely the next-largest instance of IP voice technology use in Canada is within public carriers'

backbones—again, not as a service offered to the public, and not very extensively. Finally, while IPTSPs appear to be the only operators offering IP Telephony services to the public as a retail proposition, their aggregate share of international minutes and revenues, while not substantiated by any statistics, are generally thought within the industry to be less than 1 per cent. Since good indicators simply are not available, the sections below discuss projections for several market segments where IP Telephony technology may be applied, based on the activities and views of various actors in the Canadian telecommunication and Internet industry.

4.3.2 General views

In the recent contribution collection reform proceeding before the CRTC, one party attempted to elicit information which would have been very useful for the present study, but no other company was either able or willing to provide it. During the “interrogatory” phase of the proceeding which resulted in Decision 2000-745, Call-Net Enterprises Inc. (parent of Sprint Canada) asked the other major parties: “For the years 1995-1999 and the Company’s forecast for 2000, provide the traffic volume associated with packet-switched services and circuit-switched voice services that are carried on the Company’s network. Where actual data is not available, provide the Company’s best estimate.”⁸¹ AT&T Canada responded: “[t]he Company is unable to provide traffic volumes associated with its packet-switched services.”⁸² Both the Bell Canada companies and RSL COM Canada replied that the information was irrelevant and unnecessary for the proceeding.⁸³

In response to a series of questions relating to migration to IP Telephony posed by the CRTC, Bell Canada (on behalf of itself and its related telephone companies, collectively referred to as “the Companies”) gave an extended response which gives insight into how Bell views IP Telephony technology. It is interesting to note that while Bell is a traditional telephone company, it is also a new entrant in territories where it and its affiliates are not incumbents, such as in Western Canada, where it has

aggressively rolled out a massive data network, and is presumably exploring opportunities for carrying voice over that network. The Commission’s questions and Bell’s responses are excerpted in Box 7.

4.3.3 Local

While competitive local exchange carriers (CLECs) are free to choose IP Telephony as the chief protocol for their local networks, they face a CRTC-imposed (and informal industry consensus) requirement to be able to interconnect with local networks by means of standard interfaces. As a practical matter, this means that a new entrant would have to build an IP infrastructure, including all of the compression, conversion, routing, and other facilities necessary to carry voice on a data network, *plus* develop the capability to interface seamlessly with the local switches, databases, and signalling systems of all other local exchange carriers (LECs) in each area where it plans to provide service. Not surprisingly, few companies entering the local telephone market have followed this route, including cable companies and DSL service providers. The views of GT Group Telecom (Box 8) are typical.

Several registered and proposed CLECs see DSL facilities as the primary reason to become a CLEC, because the technology allows them to provide both Internet services and multiple voice-grade phone lines over the same single copper loop. These types of bundled services might be particularly attractive to small and medium-sized businesses which are not necessarily large enough to have dedicated high-capacity Internet links or a private branch exchange (PBX). Voice-over-DSL using IP Telephony technology may represent a future opportunity for these CLECs, but at present (and it is not difficult to see why), the voice services such firms offer are circuit-switched because DSL lines can not only support voice, they are designed for it. Thus it does not make sense to transmit voice or fax calls over DSL links in packetized form, only to have to convert them back to circuit-switchable form at the DSL access multiplexer (DSLAM).

Box 7: Bell Canada's views on migration of voice traffic to packet-switched networksCRTC Questions:

- a) Provide the best estimate of the percentage of contribution-eligible minutes that will migrate to voice telephony on packet-switched networks by year for the period 2001 to 2005. Indicate what amount, if any, of the migrated traffic would be packetized end-to-end.
- b) Comment on whether and how the migration of contribution-eligible voice minutes to packet-switched networks can be policed for contribution reporting purposes.

Bell Canada's responses to (a) and (b) combined:

"In addition to IP networks, there are several types of other packet networks that are widely used today. Some of these networks, such as X.25 and X.75 networks, are not used to carry voice traffic. Other networks that may carry voice traffic, i.e., ATM and frame relay networks, do not carry contribution-eligible traffic on an end-to-end basis. They are primarily used in the following instances:

- (i) to carry contribution-exempt private interexchange intra-corporate data and voice traffic; and
- (ii) as backbone networks interconnected with circuit-switched networks which provide access to the PSTN. In such cases, contribution is already collected, if required, at the PSTN access point.

With regard to IP networks, the Companies have no data on which to base an estimate of the percentage of contribution-eligible minutes that will migrate to IP networks for the period of 2001 to 2005. This market is in the very early stages of development and is still challenged by significant technical, service quality and economic issues. Accordingly, the Companies expect that the migration to voice telephony on IP networks is small at this time.

There has been some migration of international traffic to IP networks where there is potential for arbitrage as a result of high international accounting rates. However, if the Commission decides to remove international contribution from the contribution mechanism, this arbitrage would no longer be a concern from a contribution recovery perspective.

Evidence of the low usage of IP networks for voice telephony can be found in recent reports from studies conducted with end-users and enterprises. For example, in a recent study reported by Canadian Telecom & IT Review it was confirmed that among Canadian Internet users:

"Internet telephony remains low in usage, possibly indicating that this technology is still a bit before its time. Currently, only 12 per cent of Internet users have ever used the Internet to place telephone calls. Since Q1 '98, the usage of this technology has steadily declined from 14 per cent to 10 per cent in Q2 '99." (Source: "Internet Services," Canadian Telecom & IT Review, Angus Reid Group, Inc., October 1999)

A similar study of primarily US consumers performed by the Yankee Group found that 93 per cent of consumers had never heard of Internet calling, or had heard of it but never used it. (Source: The Yankee Group, 1998 Technologically Advanced Family Survey). Of these consumers, few (20 per cent) expressed an interest in using Internet calling, while 58 per cent indicated that they had no interest in using it.

Similarly, with respect to enterprises in Canada, a recent article published in Telemanagement states:

"Everybody's talking about Voice over IP (VoIP) these days. However that is all they're doing—talking. I am not aware of any major customer that has abandoned their traditional voice infrastructure in favor of VoIP."

and

"There are many systemic technical issues that need to be resolved before VoIP solutions achieve near-PSTN quality." (Source: "Delay Still Bars Road to VoIP," Telemanagement, January 2000, Al Lounsbury—EDS Systemhouse)

Further, another study on this subject reported by Forrester Research, Inc. concluded as a result of interviews with 2,500 managers of corporations that:

"Users are overwhelmingly satisfied with the price and performance of current voice services.

With a poor economic case and user concerns about reliability, VoIP is not a viable alternative to existing voice services." (Source: "Enterprise Voice Over IP (VoIP): Still Dead," The Forrester Brief, Forrester Research, Inc., 11 May 1999)

In other cases, consultants and industry participants have been reluctant to develop forecasts of the growth of VoIP, because the market has been slow to develop and there are so many technical and operational issues yet to be resolved. The Strategis Group, for instance concludes:

"It would be foolish to predict the destination or end-state of the IP Telephony market. To the degree that, like all markets, it is constantly evolving, such a prediction would be inherently futile and meaningless. It is relatively easy, however, to chart where the market has been and where it stands today. As an extension of this, it is likewise simple to predict near term market development. While it is impossible to state exactly how IP Telephony will be used 2-5 years from now, it will obviously be more convenient and accessible than today. Current trends point the direction to future use."

(Source: "Long Distance Competition: IP Telephony, RBOCs, IXCs and Fiber," The Strategis Group, May 1999)

Notwithstanding the current situation of slow growth and the reluctance by some to attempt to predict the future, other industry consultants have made predictions of the impact of voice traffic migrating to IP networks: [estimates of global packetized networks of 11 per cent by 2002, 15 per cent by 2005, and 33 per cent by 2010 not reproduced]

The migration of contribution-eligible traffic to IP networks does not necessarily mean that such traffic will no longer be subject to contribution. Much of the forecasted traffic that could migrate may be utilizing an IP backbone network, but still interface with circuit-switched networks and legacy PSTN access arrangements where contribution-eligible traffic would be captured.

At the same time, the continuation of pricing models which include a minutes-of-use based component will generally be prevalent for the short to medium term, even where a service provider may also offer a pricing package without a per-minute component. As long as minutes-of-use can be tracked for billing, account detail and dispute purposes, it should continue to be possible to monitor such usage for the purpose of reporting contribution payments.

The Companies have no data on which to forecast what percentage of migrated traffic would be carried on IP networks on an end-to-end basis, thereby having the potential to escape contribution. To the extent that there could be migration of contribution-eligible traffic to IP networks where carriage is packetized on an end-to-end basis, this may present challenges with respect to policing such traffic for contribution purposes. It is known that where an IP dedicated gateway is used for voice traffic, the minutes-of-use can be measured at the gateway point."

Source: Extracted from The Companies, "Response to Interrogatory – The Companies(CRTC)14Jan00-802 RCM" (25 February 2000), <http://www.crtc.gc.ca/ENG/Proc_rep/TELECOM/1999/8695/PN99-06/Bell/99-6.zip>.

4.3.4 Wireless

IP Telephony technology has an even lower profile in Canada's wireless telecommunication industry. Carriers are still trying to pay off their second generation ("2G") digital wireless networks and turn a profit, and it is estimated that building 3G networks will cost about as much as it did to build the first generation networks fifteen years ago. While it is expected that IP technology will be used in 3G networks, it is unclear whether such networks will use IP exclusively for voice, and it is unlikely that if they did, they would be able to exchange traffic with other types of carriers in packet form.

It is worth recalling that while Canada was ranked 11th in the world in number of main (wireline) telephone lines per 100 inhabitants in 1999, it was only 35th in number of mobile telephones per 100 inhabitants (see Table 1 above). Canada is not, therefore, likely to be at the leading edge of 3G wireless roll-outs in the near future.

4.3.5 Long distance/international

In other countries, the market segment where IP Telephony has been the most relevant is in international calling. In fact, the primary global business opportunity relating to IP Telephony has been the business of price arbitrage on certain international routes where prices remain high. However, Canada already enjoys some of the lowest prices for long-distance and international calling in the world, and termination of calls in Canada is available on a competitive basis at similarly low rates. Further, the quality of telecommunication services in Canada has always been very high, and this has conditioned most Canadians to expect near-perfect sound quality, rates of successful dialling, and stable connections—all measures where IP Telephony has traditionally lagged behind. That being said, there are certain examples of IP Telephony being used to provide international (but certainly not domestic long-distance) services, and they are set out below.

PC Voice

Using the CRTC's definitions in Order 98-929 (see Section 4.2.2.3, above), the first segment is PC Voice, which has two important sub-groups: calls originating on home computers (also referred to as PC-to-PC and PC-to-Phone), and calls originating on enterprise networks which are never converted from circuit-switched to packet-switched form before they leave Canada. The latter, which is not a service provided to the public, is discussed in the next section.

It is very difficult to estimate the impact of PC-based software applications and associated Internet services such as iConnectHere.com (formerly Delta Three)⁸⁴ or Yahoo! Messenger in Canada, but it is generally thought to be extremely small. Purely anecdotal evidence suggests that typical users are computer-savvy recent immigrants to Canada who use PC-based Internet

telephony software to communicate with a small number of regular correspondents (usually family) who are equipped with similar equipment in their home country.

This research did not reveal any Canadian-based PC Voice services, likely because the required software and service can already be obtained for free on the Internet from American companies.⁸⁵ Yapalot Communications (profiled in Box 10 below) states that it intends to offer a PC-based service in the future, however.

PSTN Voice—Prepaid phone card-based services

All over the world, by far the most popular means of providing discount international calling services is by means of prepaid phone cards. Of course, there is no particular reason for the product to be called a "card" at all, since usually what is provided is two

Box 8: GT Group Telecom - VoIP: not ready for "prime time"

The views of a representative of Competitive Local Exchange Carrier (CLEC) GT Group Telecom in the following excerpts from *Communications & Networking* magazine are common in the Canadian telecommunications industry:

"No one is predicting the demise of the public switched telephone network (PSTN). And while Canadian carriers are gradually incorporating packetized voice into their networks, there are no signs of convergence on a massive scale.

Group Telecom (GT) Inc., for example, uses voice-over-Internet Protocol (VoIP) gateways for its unified messaging service.

The Toronto-based competitive local exchange carrier (CLEC) doesn't actually have any service offerings known as VoIP or voice over digital subscriber line (VoDSL), said Steven Koles, the carrier's senior vice-president of marketing. But when you leave a voice mail for someone using GT's unified messaging service, the voice traffic is converted to IP at the receiver's end. The company is also considering voice over IP for its trunk network, meaning that some long-distance voice traffic would be converted to IP.

"The service they're purchasing is a long-distance phone call," Koles said. "They don't know that it happens to be transiting over IP somewhere on the network."

[...]

GT has concerns about VoIP quality of service, Koles said.

"In the trials that we've done with voice over IP, it starts sounding a lot like a cell phone call," he said. "Our mind is, it's not quite ready for prime time."

Source: G. Meckbach, "Packetized voice creeps into telecom," *Communications & Networking* (September 2000), Vol. 3, No. 9, <<http://www.plesman.com/Archives/cn/2000/Sep/0309/cn030917a.html>>.

numbers: a local and/or toll-free access number to call on the PSTN, and an account number. In practice, though, this information is generally printed on credit-card sized plastic cards.

These cards are certainly available in Canada, but they have a relatively low profile. Not all calling cards available in stores (primarily newsstands and convenience stores) are necessarily examples of IP Telephony because wholesale circuit-switched international minutes are available so cheaply from so many carriers. Established circuit-switched telephone companies often sell discount services under different brand names,

such as the "Smartel" prepaid phone cards available from AT&T PrePaid Card Company, a Class B international licensee affiliated with AT&T Corp. of the United States. The size of this market is also very difficult to estimate.⁸⁶

Box 9 profiles the calling card company which claims to be the largest licensed calling card company in Canada. This company's marketing is targeted towards Toronto's many large ethnic populations. It is interesting to note that, while such an enterprise would most likely take advantage of VoIP technology in most other countries, Gold Line resells circuit-switched capacity instead.

Box 9: Gold Line Telemangement – Discount circuit-switched services

Gold Line Telemangement⁸⁷ markets prepaid long-distance and international phone cards across Canada. Their cards are given different names—such as "Gold," "Silver," "Wow," "CiCi," and "Lily." Each offers different combinations of per-minute rates and connection charges (the lower the per-minute rate, the higher the connection charge). Gold Line's cards are advertised by means of posters in convenience stores, particularly in communities with large populations of recent immigrants to Canada. On its posters, Gold Line claims to be "the largest Canadian phone card provider with a CRTC licence," and even used to display the CRTC's logo (without permission, incidentally).

Gold Line holds a Class B international telecommunications services licence, and, by the terms of licence, neither (a) operates telecommunications facilities used in transporting basic telecommunications service traffic between Canada and another country; nor (b) operates telecommunications equipment that converts basic international traffic from circuit-switched minutes originating in Canada to non-circuit-switched traffic, nor from non-circuit-switched traffic to circuit-switched minutes terminating in Canada.

Gold Line cards generally offer lower prices than wireline residential long-distance companies, but the myriad different plans and permutations of charges makes direct comparison difficult. The table below looks at certain per-minute rates for direct-dialled calls from Canada to Greece:

	Gold Line "Gold" prepaid card (no connection fee)	Gold Line "Silver" prepaid card (\$1.97 connection fee per call)	Yak 10-15-945 dial-around service (no connection fee)	Sprint Canada "OnePlan" residential plan (\$3.95 monthly fee)	Bell "First Rate Overseas" residential plan (\$4.95 monthly fee)
Greece-Athens	9.9 ¢/min.	5.35 ¢/min.	29 ¢/min.	55 ¢/min.	66 ¢/min.
Greece	18.5 ¢/min.	6.42 ¢/min.	29 ¢/min.	55 ¢/min.	66 ¢/min.

These Gold Line rates assume that the caller is located in a major metropolitan centre, where Gold Line can be reached by means of a local call. Extra charges apply for toll-free access from outside such centres.

Note: There are 100 cents (¢) in a Canadian Dollar (CAD\$). One Canadian Dollar = US\$ 0.65

Sources: Gold Line Telemangement Inc. CRTC licence (CRTC File # 8190-G15-01/00), Gold Line advertising posters, and <<http://www.goldline.net/>>. Yak Communications (Canada) Inc., Sprint Canada, and Bell rates as advertised at <<http://www.yak.ca/>>, <<http://www.sprintcanada.ca/>>, and <<http://www.bell.ca/>> respectively on 15 January 2001.

PSTN Voice—Preselected long-distance services

In Canada, telephone customers can choose to have a particular long-distance (and therefore international) service provider 'preselected' as their carrier of choice for such calls (known in North America as "1+" calls). However, generally only facilities-based carriers (wireline and wireless) can offer this service. A new Toronto company

called YapAlot Communications offers a new kind of preselected long distance which allows the user to register with the service from a particular telephone number, and then enjoy flat rate pricing to one designated country. YapAlot is profiled in Box 10.

Companies like Yapalot are very rare in Canada, but very common elsewhere in the world. Due to the very low cost of circuit-switched long-distance and

Box 10: Yapalot Communications – Discount VoIP services

Yapalot Communications⁸⁸ is a Canadian subsidiary of a Delaware, U.S.A. holding company which qualifies as a reporting issuer under U.S. securities laws. By virtue of its obligation to make regular disclosure filings to the US Securities and Exchange Commission (SEC), detailed public information is available about the company. This information describes what is perhaps a prototypical start-up VoIP company.

Yapalot entered the international VoIP business in July 2000 from its head office in Toronto, Canada. Its initial product offering is a flat-rate international calling plan whereby the customer chooses one country to which he or she will be entitled to make unlimited calls for CAD\$ 50 per month. As of January 2001, subscribers (who must designate the telephone number with which the service is to be associated) could choose from 20 (predominantly liberalized) countries. PC-based calling services and value-added services such as videoconferencing and unified messaging are also planned for the future.

Yapalot described itself as follows in a December 2000 SEC filing:

"We specialize in voice communication solutions over an Internet Protocol (IP) network[.] [O]ur network of computers around the world allows for voice telecommunications over the Internet. We do this by moving packets of information from one place to another over our IP network that we have deployed and now manage. Voice traffic travels into our network from our customer's telephones, we 'packetize' (digitize the sound into small data packets) them, send them over our IP network to the destination that the customer dialed, and then we 'unpacketize' them when they reach the destination. The final result is a telephone call over an IP network or Voice over IP (VoIP)."

While Yapalot says that it uses the Internet to transmit its calls, this statement is contradicted later in the document. Describing its VoIP network, the company says: "[w]e purchased Internet bandwidth from UUNet that can carry all data between our gateways to avoid data being carried over public Internet service." Yapalot perhaps describes its service as "the Internet" nonetheless to take advantage of the lighter regulatory regime which generally applies to it. In fact, the company explicitly acknowledges as much in this further excerpt: "[t]his VoIP network is intended to bypass Bell [the incumbent] and any regulatory body by accessing the unregulated Internet IP network, hence Voice over IP." The filing goes on to acknowledge that the US Congress may pass legislation to regulate data transfer of this type in the future, and that any such taxation would be passed on to its customers.

While purportedly aware of regulatory requirements in the U.S., Yapalot appears to have neglected to date to apply for the licence which it is required to hold in its home country. The company says in the SEC filing: "[o]ur VoIP network is Internet based and, therefore, does not require government approval or licensing." However, because Yapalot offers basic international telecommunications services to the Canadian public, it is required under Decision 98-17 to apply for an international services licence. Yapalot receives calls in circuit-switched form and than 'packetizes' them into non-circuit-switched form, and thus falls into the category of international service providers required to hold a Class A licence. These licences are normally issued as a matter of course.

While Yapalot's activities are in fact regulated in Canada, as a practical matter this should not have a financial impact on the company until its annual gross revenues from Phone-to-Phone telecommunications services reach CAD\$ 10 million per year, the minimum threshold established under the new contribution collection regime. As Yapalot has only recently begun operations, this may not be the case for some time. As of 30 September 2000, the company had only recorded revenue of USD\$ 17'523 for 2000.

Sources: Yapalot Communications Holdings Inc., Amendment No.3 to Form 10-SB, filed with the U.S. Securities and Exchange Commission (SEC) on 28 December 2000 (Commission file No. 000-31183), <http://www.edgar-online.com/auth/verity/display.asp?query=yapalot&filename=0000950136per_cent2D00percent2D001881&cik=1120323>.

international capacity, they are far outnumbered in Canada by circuit-switched resellers like Gold Line Telemanagement.

Among facilities-based (or traditional) long-distance carriers, the use of packetized voice appears to be quite rare. Primus Canada,⁸⁹ which purchased the residential long-distance customer base of AT&T Canada in May 1999, stated in the course of the contribution reform proceeding that "the only packet-switched services that it currently offers to its customers are Internet services."⁹⁰ Similarly, Bell Canada stated that: "long distance contribution-eligible voice services are currently carried only over interexchange circuit-switched networks."⁹¹

PSTN Voice—Carrier's carriers

Teleglobe⁹² began life as Canada's state-owned monopoly provider of Canada-overseas services, but on 1 October 1998, its monopoly was terminated in accordance with Canada's obligations under the Fourth Protocol to the World Trade Organization's

General Agreement on Trade in Services (GATS), and on 1 November 2000, it became a wholly-owned subsidiary of Bell Canada's parent company, BCE. It is now one of the world's largest international carriers of telecommunication traffic, and operates primarily as a "carrier's carrier," although it merged with a retail operator based in the United States named Excel Communications in 1998. Far from content with its position in the circuit-switched telecommunication world, Teleglobe is embarking on an ambitious programme of converting its facilities to IP.

Indeed, Teleglobe's answers to the CRTC's questions about migration to packet-switching in the contribution reform proceeding, set out in Box 11, demonstrate that it is the Canadian company which is the most committed to IP Telephony in the near term. Its views of the potential for end-to-end packetized voice are clearly different to those of parent BCE, or at least to those of the Bell Canada regulatory department (see Box 7 above).

Box 11: Teleglobe's views on migration of voice traffic to packet-switched networks

CRTC Questions:

- a) Provide the best estimate of the percentage of contribution-eligible minutes that will migrate to voice telephony on packet-switched networks by year for the period 2001 to 2005. Indicate what amount, if any, of the migrated traffic would be packetized end-to-end.
- b) Comment on whether and how the migration of contribution-eligible voice minutes to packet-switched networks can be policed for contribution reporting purposes.

Teleglobe's responses:

- (a) Teleglobe has made no specific forecasts related to the speed of implementation of conversion of voice-switched traffic to packet-switched networks. Teleglobe has no basis to estimate the speed of conversion in the domestic traffic area. With respect to international traffic, Teleglobe is in the process of converting circuit-switched voice to packet mode between Teleglobe's international gateway switches and the international transmission facilities. Teleglobe broadly estimates that by 2001, about 10 per cent of its traffic will be converted, and that this will rise gradually to 50 per cent by 2005. With respect to international traffic that is packetized end-to-end, Teleglobe again broadly estimates that it would reach some 30 to 40 per cent by 2005.
- (b) Teleglobe currently transports less than 1 per cent of its long distance telephone traffic on packet-switched networks. When Teleglobe does convert the traffic, the circuit-switched voice traffic is carried in ISDN format to the IP conversion platform where it is converted into H.323 voice over IP protocol.

Source: Extracted from Teleglobe Inc., "Response to Interrogatory—Teleglobe(CRTC)14Jan00-802" (25 February 2000), <http://www.crtc.gc.ca/ENG/Proc_rep/TELECOM/1999/8695/PN99-06/Teleglobe/CRTC.doc>.

4.3.6 Enterprise networks

Large enterprises appear to be slowly buying into the idea of unified communications networks—having one enterprise-wide data network which carries both voice and data on the same facilities. The market leader in this business appears to be Bell Nexxia, which announced large contracts with Algonquin College in Ottawa, Ontario, and CIBC, one of Canada's largest chartered banks, in late 2000. The excerpts from the joint Bell/Cisco news release relating to the Algonquin College implementation demonstrates the marketing points which are being used to try to encourage large users to go IP (see Box 12).

While any calls destined for numbers outside of the university are converted to circuit-switched traffic before they leave the university buildings, this implementation demonstrates the potential of IP Telephony for voice/data integration within the enterprise. The nearly continuous series of problems with the network reported on the college's "information services news" Web page in the first few months of operation suggest that the technology is still somewhat unproven, but that surely can be expected with any new technology.⁹³

A Canadian network analyst recently estimated that about 100 organizations in Canada have either purchased or are in pilot programs with VoIP systems in a local area network.⁹⁴ This, of course, is a very small number. It appears that most large enterprises remain comfortable with their existing parallel networks, one for circuit-switched voice, and one for IP data. Given the very low rates on circuit-switched calls which the many competing long-distance firms are offering to potential corporate clients currently, it is unlikely that such clients would make a decision to adopt IP Telephony out of a desire to save long-distance costs, particularly since packetized calls have to be converted to circuit-switched to travel anywhere outside of the internal network.

4.3.7 Carrier backbones

Finally, another in-road for IP Telephony is in carriers' internal backbones. However, ATM (another packet-oriented method) remains very strong in Canadian networks. In fact, many carriers layer IP on top of ATM to try to improve quality of service when transporting IP datagrams. There is no public information available about the extent to which IP is used for voice transmission in Canadian carriers' backbones, although Teleglobe's plans certainly indicate that it can be attractive in certain circumstances (see Box 11 above).

Ironically, the main driver of most of the CRTC's IP Telephony-related regulatory activity has not been retail IP Telephony services, but rather the spectre of some carriers using IP links in their internal networks to lower their costs—not necessarily out of technical efficiency—but rather out of a desire to avoid contribution by turning contribution-eligible voice traffic into contribution-exempt data traffic.

4.4 Impact of IP Telephony on existing telecommunication environment

In sum, IP Telephony appears to have had little impact on the Canadian telecommunication environment to date. There is little to no concern about IP technology being used to bypass international settlements for traffic terminating in Canada, and there is no regulatory restriction on the use of the technology in any sector. Canada already had a very competitive telecommunication environment when IP Telephony came along, and as such, the potential cost savings from VoIP bypass were negligible. The attractive prospect of operating just one multi-service network in the future appears to be the main motive force for IP Telephony in Canada, as opposed to consumer demand or bypass.

The current view of most people in the Canadian telecommunication industry is expressed by Bell Canada in the excerpts from its November 1999 submission to the CRTC found in Box 13. Bell makes a point similar to that made by Ian Angus, a well-known

telecommunication industry consultant and author, who is of the view that the switch from circuit-switching to packet-switching will be very much like the transition from analogue to digital switching several years ago—customers will not notice the difference, and they need not. Networks are going to change from the inside out, not as a result of customer demand. However, at present, most operators and analysts believe that IP voice technology is simply not ready for widespread implementation in the public network.

As has been stated above, there is general consensus around the industry that if packetized voice is having an impact on any segment of the Canadian telecommunication market, then it would be on the circuit-

switched international market (for both origination and termination), and that impact would be less than 1 per cent of the total market.

Further, the general belief is that true end-to-end IP Telephony remains several years away in North America, and that standing in the way are the immense sunken investment in circuit-switched networks and the lack of a complete set of standards and directories. Another business issue which the industry must confront is that, while data traffic is certainly growing faster than voice traffic, it is not translating into revenue growth. Rather, revenues from voice, while getting thinner, still produce greater overall profits than those from data, and specifically Internet services.

Box 12: Algonquin College VoIP network

Bell Canada and Cisco Systems Canada partner to deliver advanced IP Telephony solution to Algonquin College

Bell Canada becomes first Service Provider in Canada to receive IP/Telephony Specialization from Cisco Systems - Toronto, Ontario (29 November 2000)

Bell Canada today announced the launch of one of Canada's largest IP Telephony networks at Algonquin College, an initiative made possible as a result of recent approval Bell received from Cisco Systems to sell, design, deploy and support Cisco IP Telephony services in Canada.

The next generation network developed by Cisco Systems Canada and jointly supported by Bell Canada recently went live at Algonquin College's new student residence, its Police and Public Safety Institute, and its Pembroke campus. The state-of-the-art network showcases the next evolution in the convergence of voice and data communications.

Sprawled across five sites in Ottawa, Perth and Pembroke Ontario, Algonquin College has over 10' 000 full time and close to 50'000 part time students and is one of the first educational institutions to seize upon the opportunities inherent in Voice over Internet Protocol (VoIP) technology. As of today, there are 550 IP phones on the campus with plans to increase that number to 3'000 over the next three years, eventually making IP phones standard issue for faculty and students. The new unified, IP-based network handles approximately 190,000 calls per week and can deliver increased efficiencies and reduce costs over a range of applications.

"After discussions with Cisco and Bell, we realized IP Telephony would offer us the opportunity to take advantage of Internet technology and networking services by increasing capacity and reliability while minimizing operating costs," said Barry Brock, Director, Information Technology Services, Algonquin College. "By introducing both voice and data on one network, we are now able to provide an incredible wealth of new applications such as phone-based Web browsing, improved customer service, and Webcasting for our staff and students."

Bell Canada began work on the new IP Telephony system in May 2000, after becoming the first service provider in Canada to receive the specialization designation that enables it to sell, design, deploy and support Cisco IP Telephony solutions. The converged infrastructure is based on Cisco's AVVID (Architecture for Voice, Video and Integrated Data) and provides significant benefits, including lower phone call costs, simpler network administration and support and increased flexibility to meet expanding telephone and computer network needs well into the future. AVVID also includes IP/TV for streaming high-quality end-to-end communications over IP networks, and IP/VC for video conferencing application deployment.

[...] Within the next year, the college hopes to add several new applications including interactive services over the Web. For example, when a student or potential student goes online, a customer service agent in the college's registrar's office will be able to interact with the visitor in real-time to assist with course selection.

"This is an opportunity to move our student service capability well into the future," added Brock. "Right now we provide basic phone service. With the new network, one agent can handle everything—voice, video, interactive voice response, e-mail and the Web, guaranteeing much better service all around."

Source: Extracted from Bell Canada, news release, "Bell Canada and Cisco Systems Canada partner to deliver advanced IP Telephony solution to Algonquin College" (29 November 2000), <http://www.bell.ca/en/about/news/releas/2000/pr_20001129.asp?&ref=s>.

Box 13: Bell Canada's views on IP Telephony in the Canadian telecommunications environment

The public switched telephone network (PSTN) and packet-switched data networks have been developed to meet different customer needs. The PSTN is a circuit-switched network, with its own signalling protocols, which is used to provide local and long distance voice services and optional services (for example, call waiting and calling line identification) to meet customers' voice telecommunications needs. On the other hand, packet-switched networks have been designed to meet the data needs of business customers. Initially, the X.25 standard network was used to provide a variety of data services, including the Companies' Datapac™ services. As business customers' data requirements grew, and technology evolved, other packet network standards (such as asynchronous transfer mode (ATM) and frame relay) have been used to provide services such as the Companies' HyperStream™ service and Bell Nexxia's Bell Nexxia.Frame Relay™ service. In recent years, growth of data communications over the Internet, a packet-switched network using Internet protocol (IP), has been phenomenal.

Data traffic has been growing very rapidly due to growth in business applications in general and due to growth of communications on the Internet, in particular. Growth of the Internet has been largely driven by web communications and e-commerce. Internet applications include e-mail, web browsing, on-line retail sales, on-line financial services (for example, on-line trading), auction houses (for example, eBay) and on-line downloading of text, audio and video files.

The rapid growth in the volume of data traffic does not mean that the volume of voice traffic is declining, or that significant bypass of the PSTN using IP-based or other packet-switched networks is imminent. The vast transport capacity available on packet-switched networks creates a potential opportunity to use this capacity to deliver voice, data and multimedia services on a single network. However, the mere existence of this capacity is not sufficient to lead to the conclusion that there will no longer be the capability to measure voice traffic for assessing contribution.

Before significant migration of voice traffic to IP networks can occur, certain technical, service quality and economic issues need to be resolved, including the following:

- Standards are required for the equipment, gateways and connections which will provide reliable inter-operability of legacy networks—including the PSTN, and frame relay and ATM networks—with IP networks. While work on these standards is ongoing, for example, in the International Telecommunications Union [sic], universally accepted standards are not yet available. Even once the standards are in place, service providers will need to test the inter-operability of equipment from different vendors.
- At this time, real-time voice communication via the Internet, or "voice over IP" (VoIP) as it is sometimes termed, is not transparent to the customer. It does not provide the level of service quality that is expected by the industry and customers from voice telephony (for example, VoIP is subject to packet loss and latency). Also, it does not provide optional services such as call waiting and calling line identification, which many customers have come to rely on as integral to their voice telephone service. IP networks will also have to prove they can meet the rigorous survivability requirements of voice customers. Resolving service quality and functionality issues on IP-based networks in a cost effective manner is expected to take some time.
- Operations support systems, such as billing systems and network management systems, must be developed to handle the carriage of significant volumes of voice traffic over IP networks. These systems are in the early stages of development.
- The business case for the provision of voice telephony on IP networks needs to be considered. At this time, there is an attractive business case for VoIP in some niche markets. VoIP is predominantly used, but still only on a limited basis, for international telecommunications where there is the potential for arbitrage available as a result of a combination of high international accounting rates and lower sensitivity to service quality on certain international routes. Bypass of the PSTN resulting from VoIP is expected to remain low, particularly for domestic and North American traffic, because of low long distance rates, the costs of high capacity facilities to get adequate transmission over data networks, and generally unacceptable service quality.
- VoIP applications are also being developed on private intra-corporate networks to replace existing private line arrangements. In this case, since the enterprise has end-to-end control of traffic, inter-operability is less of a concern and service quality can be controlled to some degree. These applications are generally replacing private lines rather than PSTN voice traffic.

- Due to the very high demand for new data and Internet applications, IP network service providers appear to be concentrating on data-based business opportunities. Most service providers will use voice to add value to these data-based applications in circumstances where service quality is of less concern (for example, to provide customers with the option of “click to chat” with a service representative during an e-commerce transaction). This is already happening to some degree. Since these opportunities currently appear to be more attractive than offering mainstream voice long distance service, most service providers are expected to concentrate their development efforts on these opportunities, before addressing the myriad of issues surrounding the convergence of legacy networks with IP-based networks and the provision of mainstream voice communications.

Notwithstanding the above, over the longer term, an IP-based network capable of handling end-to-end mainstream voice traffic will likely evolve. However, because IP telephony is in its infancy and much uncertainty exists as to the technology to be used and the deployment plans of carriers, it is very difficult to predict the exact timing of any material degree of migration of voice traffic to IP networks.

The migration to next generation networks will likely result from a gradual convergence with IP networks, followed by an evolution into IP networks. The new networks that will evolve must first accommodate the inter-operability and interconnection of legacy networks—such as the PSTN, and frame relay and ATM networks—with IP networks. The process will reflect the need to develop IP networks to be more reliable and suitable for voice telephony. Voice telephony is currently accomplished using legacy telephone sets, multi-line equipment, switches, networks and support systems which represent a huge investment by customers and service providers on a global basis. It is unlikely that the vast majority of this investment will be replaced in the near term. There will, at a minimum, be a need to accommodate the existing end-user telephony structure for many years to come.

Source: Extracted from Bell Canada, Island Telecom Inc., Maritime Tel & Tel Limited, MTS Communications Inc., NBTel Inc. and NewTel Communications Inc., “Review of Contribution Collection Mechanism and Related Issues – Submission” (30 November 1999), <http://www.crtc.gc.ca/ENG/Proc_rep/TELECOM/1999/8695/PN99-06/Bell/991130.doc>.

- ⁶⁴ CRTC, "Did You Know?" (17 May 1999), <<http://www.crtc.gc.ca/eng/news/releases/1999/i990517e3.htm>>.
- ⁶⁵ See Telecom Order CRTC 97-590 (1 May 1997), <<http://www.crtc.gc.ca/archive/Orders/1997/O97-590.htm>>.
- ⁶⁶ *Ibid.* at para. 82.
- ⁶⁷ Telecom Order CRTC 98-28 (23 January 1998), <http://www.crtc.gc.ca/ENG/TELECOM/ORDER/1998/O9828_0.TXT>.
- ⁶⁸ For instance, see the report of the decision in Angus Telemanagement, *Telecom Update*, number 117 (January 26, 1998), <<http://www.angustel.ca/update/up117.html#SHADOWTEL%20MUST%20PAY%20LD%20CONTRIBUTION>>: "On January 23, the CRTC ruled that long distance service providers which use the Internet to carry customers' calls must register as resellers and pay the same fees as other LD carriers." Similarly, the report in Evert Communications Limited, *Canadian Communications Network Letter*, vol. 18, number 4 (9 February 1998), <http://www.evert.com/sub_aces/net_le~1/1998/nl9804.htm#b13> (subscription required) said: "The CRTC had told ShadowTel Communications Inc to pay contribution to carriers if it intends to offer voice over the Internet."
- ⁶⁹ Arguments of Bell Canada in *Ibid.*, at paras. 11-15, paraphrased.
- ⁷⁰ Telecom Order CRTC 98-929, *In the matter of Proposed New Contribution Exemption Regime for Internet Service Providers* (September 17, 1998), <<http://www.crtc.gc.ca/archive/Orders/1998/O98-929.htm>>.
- ⁷¹ The Commission defined "international telecommunications service" by starting with the definition of 'telecommunications service' in the *Telecommunications Act* (see Section 2.5.3 above) and added that: "an international telecommunications service involves traffic that originates in Canada and terminates in another country, or vice versa." See Telecom Decision CRTC 98-17, Note 17 above, at para. 273.
- ⁷² *Ibid.*, at para. 351. The Commission's rationale for requiring licensing in the first place is set out in paragraphs 264 and 265. One of the primary concerns was the potential for anti-competitive behaviour involving a foreign monopolist acting in conjunction with a resale affiliate based in Canada.
- ⁷³ Under the aegis of the CRTC Interconnection Steering Committee (CISC), see Note 44 above.
- ⁷⁴ See CRTC Letter, "Industry Task Force on International Contribution Issues—Final Consensus Report" (17 December 1999), <<http://www.crtc.gc.ca/INTERNET/1999/8695/l4/01/crtc/991217e.doc>>, at p. 2. When the CRTC accepts a consensus report from the CISC, the report takes on the weight of a CRTC order.
- ⁷⁵ See current lists of licensees and applicants on the CRTC website at: <<http://www.crtc.gc.ca/ENG/public/8190.htm>>.
- ⁷⁶ Note 17 above, at paragraphs 301-302.
- ¹⁴ Note 70 above, at para. 23.
- ⁷⁸ See "Telecom Public Notice CRTC 99-6 - Review of Contribution Collection Mechanism and Related Issues—Comments of Call-Net Enterprises Inc." (30 November 1999), <http://www.crtc.gc.ca/ENG/Proc_rep/TELECOM/1999/8695/PN99-06/Call-Net/99-6sub.doc>, at para. 60. The author worked as Regulatory Counsel at Call-Net Enterprises during the period when these submissions were prepared.
- ⁷⁹ <<http://www.dialpad.com/>>.
- ⁸⁰ <<http://messenger.yahoo.com/>>.
- ⁸¹ See, for example, Call-Net Enterprises Inc., "Interrogatory—AT&T Canada(Call-Net)14Jan00-101" (14 January 2000), <http://www.crtc.gc.ca/ENG/Proc_rep/TELECOM/1999/8695/PN99-06/Call-Net/Si0331.zip>.
- ⁸² AT&T Canada, "Response to Interrogatories - AT&T Canada(Call-Net)14Jan00-101 PN 99-6" (25 February 2000), <http://www.crtc.gc.ca/ENG/Proc_rep/TELECOM/1999/8695/PN99-06/AT&T/CallNet.doc>.
- ⁸³ The Companies, "Response to Interrogatory - The Companies(Call-Net)14Jan00-101 RCM" (25 February 2000), <http://www.crtc.gc.ca/ENG/Proc_rep/TELECOM/1999/8695/PN99-06/Bell/99-6.zip> and RSL COM Canada Inc., "Response to Interrogatory - RSL(Call-Net)14Jan00-101 RCCM" (11 February 2000), <http://www.crtc.gc.ca/ENG/Proc_rep/TELECOM/1999/8695/PN99-06/RSLCom/PN99-6.zip>.
- ⁸⁴ <<http://www.deltathree.com/>>.

- ⁸⁵The extensive list of “free” long-distance operators on Jeff Pulver’s “Free World Dial-up” page does not list any companies based in Canada. See: pulver.com, “FWD III: free world dial-up”, <<http://pulver.com/fwd/>>.
- ⁸⁶Evert Communications Limited, *Canadian Communications Network Letter*, “Canadian calling card market flourishes, but size and scope remains a mystery” (7 July 1997), <http://www.evert.com/sub_aces/net_le~1/1997/nl9721m2.htm> (subscription required).
- ⁸⁷<<http://www.goldline.net/>>.
- ⁸⁸<<http://www.yapalot.com/>>.
- ⁸⁹<<http://www.primus.ca/>>.
- ⁹⁰Primus Canada, “Response to Interrogatory – Primus(Call-Net)24Jan00-101 PN 99-6” (25 February 2000), <http://www.crtc.gc.ca/ENG/Proc_rep/TELECOM/1999/8695/PN99-06/Primus/28feb00.zip>.
- ⁹¹The Companies, “Response to Interrogatory – The Companies(CRTC)14Jan00-802 RCM” (25 February 2000), <http://www.crtc.gc.ca/ENG/Proc_rep/TELECOM/1999/8695/PN99-06/Bell/99-6.zip>
- ⁹²<<http://www.teleglobe.ca/>>.
- ⁹³See Algonquin College, Information Technology Services, “News”, <<http://www.algonquincollege.com/its/news/history.html>>.
- ⁹⁴S. Chu, “Bell unveils Internet telephones” *The [Toronto] Globe & Mail* (30 November 2000), <<http://www.globeandmail.com/>>, citing Albert Daoust, network analyst, Evans Research Corp.

5. Conclusion

Canada's recently-revised regulatory regime assumes that full end-to-end IP Telephony is not going to happen for several years, and currently exempts, from the universal service support system, calls which begin as IP Telephony and leave Canada in that form (or *vice versa*), and thus are never converted from circuit-switched to packet-switched form (or *vice versa*) in Canada. The regulatory distinction turns on there being such a conversion somewhere in Canada. The CRTC has reserved the right to find in the future that the volume of "unconverted" traffic is significant, and could incorporate it at that time into the contribution regime without need for any additional legislative authority. However, the regulator is clearly of the view today that such a response will not be necessary in the near future because full-featured, commercially-viable, end-to-end IP Telephony is not perceived to be possible in public networks at this time.

Despite having certainly made the most inquiries into the impact of IP Telephony on telecommunication regulation of any regulator in the world, the CRTC recently indicated that in the near future it plans to go even further by soliciting the industry's views on the all-IP world which is so often predicted as the future of telecommunications (see Box 14).

The CRTC clearly intends to continue its tradition of proactively assessing new technologies and their impact

on Canada's telecommunication regulatory regime. It has recently moved the burden of contribution from one specific market segment to a much wider spectrum of actors in the telecommunication services industry which will bear smaller portions of the universal service support obligation. One of the regulator's consistent goals has been to maintain the technological neutrality of its regulatory framework, and for this reason the CRTC has wisely chosen to focus on services, and not technologies. As such, operators are free to choose whatever technology they find the most attractive, and this usually means the most economically efficient.

The lack of embrace of IP Telephony technology in Canada to date suggests that, at least at the present time, IP Telephony does not offer convincing economic or technological advantages over the existing voice and data infrastructures. Canada has ironically been the site of far more IP Telephony regulatory activity than commercial activity in recent years. While telecommunication operators in Canada are free to embrace IP networking technology for voice, very few have. This is likely due to the high quality and low prices available from Canada's existing voice network, and the as-yet unclear business case for moving to all-IP, multiservice networks.

Box 14: CRTC announces that it will look at emerging technologies once more pressing issues are settled

On 7 December 2000, the CRTC produced its report on an industry-regulator meeting which took place in June 2000 to consider an innovative proposal by a coalition of competitive telecommunication service providers referred to as the "Network of Networks" proposal. According to the CRTC, the purpose of the Workshop was to assist Commission staff to develop recommendations to the Commission regarding the most appropriate means to address various issues with respect to the interconnection and interoperation of telecommunication networks in Canada.

The three main topics discussed were: co-location, interconnection, and emerging technologies. Demonstrating the most pressing concerns of the competitive service providers, the first two issues dominated the discussion and the Commission's report. The latter was considered to be of the lowest priority. In acknowledging this point, the Commission made these remarks about the need to address IP Telephony issues:

"There appears to be general agreement that emerging technologies issues are not as pressing and can be handled on a lower priority basis. The main concern at this time is the interoperation of Internet Protocol (IP) based networks and predominately circuit switched legacy networks. Since there is a decreasing distinction between voice and data networks, several parties suggested that minimum obligations and quality of service be considered for networks that are used to carry data as well as voice traffic. There is a need to examine the impact of these next generation networks on the definition of basic service, universal access and affordability of such services as well as the interconnection and interoperation of these networks. Few parties argued that the emerging technologies issue required immediate attention; the Commission is of the view that it should be addressed as soon as possible.

"While a number of implementation issues related to interconnection of IP networks to existing networks were identified by the Interconnection Workshop group, in the Commission's view, these should be addressed once the more fundamental interconnection methodology and general framework are established. In addition, the standards for IP based networks are under active consideration by standard bodies such as the International Telecommunications Union (ITU) [sic] and Internet Engineering Task Force (IETF).

The Commission intends to issue a Public Notice on emerging technology issues once the current interconnection issues have been addressed."

Source: CRTC Letter Re: Follow-up to the Network of Networks Workshop (7 December 2000), <<http://www.crtc.gc.ca/archive/Letters/2000/LT001207E.HTM>>.

ANNEX I: LIST OF PEOPLE INTERVIEWED

Regulator

Mr. Scott Hutton	Director, Efficiency & Expenditure Analysis, Telecommunications	Canadian Radio-television and Telecommunications Commission (CRTC) Hull, Québec
Mr. David McKendry	Commissioner	CRTC Hull, Québec
Ms. Carolyn Pinsky	Senior Counsel	CRTC Vancouver, British Columbia
Mr. Michel L. Spencer	Manager, International Telecommunications	CRTC Hull, Québec
Ms. Cynthia Stockley	Manager, Rights-of-way, Convergence and Infrastructure Access (formerly Manager, International Policy, Telecommunications)	CRTC Hull, Québec

Policy-maker

Dr. Bruce Gracie	Senior Advisor, International Organizations Telecommunications Policy Branch	Industry Canada Ottawa, Ontario
Mr. Allan MacGillivray	Director, Industry Framework Telecommunications Policy Branch	Industry Canada Ottawa, Ontario
Mr. Len St. Aubin	Senior Director, Business and Regulatory Analysis Telecommunications Policy Branch	Industry Canada Ottawa, Ontario

Operators

Mr. Jonathan Daniels	Vice President, Regulatory Affairs and Carrier Relations	C1 Communications Inc. Mississauga, Ontario
Ms. Aviva Klein	Product Manager	GT Group Telecom Toronto, Ontario
Mr. Dieter Rambacher	General Manager - Sales	BCE Nexxia Inc. Toronto, Ontario

Equipment Manufacturers

Mr. Oscar Avellaneda	Advisor, International Standards	Nortel Networks Ottawa, Ontario
Mr. Colman Ho	Senior Advisor, Succession Architecture	Nortel Networks Ottawa, Ontario
Dr. Bruce Pettitt	Advisor, Performance & QoS Standards	Nortel Networks Ottawa, Ontario

Research Agencies

Mr. Bill St. Arnaud	Senior Director, Advanced Networks	CANARIE Inc. Ottawa, Ontario
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Consultants and Experts

Mr. Bram Dov Abramson	Senior Research Analyst	TeleGeography, Inc. Washington, D.C., USA
Mr. Ian Angus	President	Angus TeleManagement Group Inc. Ajax, Ontario
Dr. David Ellis	President	Omnia Communications Inc. Toronto, Ontario
Professor Hudson N. Janisch	Professor of Law	Faculty of Law, University of Toronto Toronto, Ontario
Mr. Lawrence Surtees	Senior Analyst, Telecom & Internet Research	IDC Canada Toronto, Ontario

ANNEX II: LIST OF ACRONYMS

2G	Second-generation (wireless)
3G	Third-generation (wireless)
APLDS	Alternative Provider of Long Distance Services
ATM	Asynchronous Transfer Mode
BITS	Basic International Telecommunications Service
BSO	Basic Service Objective
CAD	Canadian Dollar
CIRA	Canadian Internet Registration Authority
CISC	CRTC Interconnection Steering Committee
CLEC	Competitive Local Exchange Carrier
CPTSP	Competitive Pay Telephone Service Provider
CRTC	Canadian Radio-television and Telecommunications Commission
CTSR	Canadian Telecommunications Service Revenues
DSL	Digital Subscriber Line
DSLAM	DSL Access Multiplexer
DSLSP	DSL Service Provider
IAL	Internet Access Line
IETF	Internet Engineering Task Force
ILEC	Incumbent Local Exchange Carrier
IP	Internet Protocol
IPTSP	IP Telephony Service Provider
ISP	Internet Service Provider
ITU	International Telecommunication Union
IX	Interexchange
LEC	Local Exchange Carrier
PBX	Private Branch Exchange
PSTN	Public Switched Telephone Network
RAN	Regional Access Network
USD	United States Dollar
VoIP	Voice over Internet Protocol