The Distribution of Signals in Cyberspace

An examination of what the Internet means for signal distribution and broadcasting

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Summary

Chapter One: Broadcasting

Chapter Two: The Internet

Chapter Three: What Does the Internet Mean for Cultural Regulation?

This work was commissioned by Susan Baldwin, the Executive Director, Broadcasting, of the CRTC, in preparation for the CRTC hearings on new media. Chapter One consists of a complete review of the history of broadcasting regulation, including especially the technological conceptions that have been frozen into it. Chapter Two concerns the Internet, and sets out the driving characteristics of the packet-switched network and its layered, open architecture. Chapter Three sets out the choices that are available for regulators and society in general. The Summary summarizes.

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TMD

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Summary

1. Cyberspace

The science-fiction writer William Gibson invented the term ‘cyberspace’ around 1984 in the book "Neuromancer". In 1990, John Perry Barlow, co-founder of the Electronic Frontier Foundation, first used term to denote the global space of signals and the artificial realities they engender. The Internet is the set of software protocols that enables this artificial world to exist.

2. Overview of this Paper

This paper looks at three different issues in three chapters: how broadcasting came to be regulated in the manner it is; how the Internet works; and what the Internet means for conventional means of cultural regulation. The chief idea is that the convergence of transmission technologies, which we see going on around us in the form of the Internet, carries with it a clash of different models of government regulation of communications. Either the legal barriers can be maintained among these three different regimes, in which technical convergence has no policy consequences, or they cannot, in which case a choice will have to be made. In the meantime, it is already certain that communications over the Internet are governed by the same laws of general application that apply to publishing.

2.1. Chapter One

In Chapter One of this paper, we look at the history of radio regulation and broadcasting from the perspective of technology and the ability of governments to control it. An exploration of the basic technical concepts of radio and broadcasting regulation is necessary because, until the Internet, there was not an effective alternative signal distribution technology that could rival it.

The basic ideas of radio broadcasting regulation were determined by the technical characteristics of analog signal propagation and reception in the 1920s and '30s of this century and have not changed since. This signal distribution system required significant government intervention to coordinate the use of frequencies. Radio signals before the computer age were analog, that is, continuous physical variables such as the frequency of the signal represent the information being conveyed. Analog signals could only be kept from interfering with one another by reserving certain frequency bands for the exclusive use of some users. This pattern was worldwide, and the only society that hesitated, if only for a short while, to impose full government regulation was the United States. Alternative systems of regulating interference, such as common law property and trespass, and the creation of a market in spectrum, were not explored at the time and are only beginning to be seriously considered.

Chapter One records how cable television, which promised signal abundance and which moved over wire, was assimilated to broadcasting in both Canada and the United States, and for similar reasons. The broadcasting paradigm rests on the exclusive jurisdiction of government to regulate the use of broadcast spectrum and its ability effectively to do so.

2.2. Chapter Two

In Chapter Two, we look at the underlying technical ideas of the Internet. The fundamental idea, in this perspective, is that layers of software coordinate the movement of signals, and that manipulation of these software protocols does not require changes to the underlying physical hardware. The existence of layers of software changes our ideas of what a distribution channel is capable of. It is shown that all previous distribution channels, in both telecommunications and broadcasting, co-mingled the service with the transport. Given the expense and therefore the scarcity of the physical means of transport, this gave to the owners of those means of transport the power to extract economic rents from them. Economic rents are a term which designates profits higher than could be earned in a competitive market. Government could then use or restrain that economic power to its own purposes, such as universal telephone service, or the bundling of Canadian with American services in cable television.

The software which constitutes the Internet dissociates the service from the means of transport, and so liberates the economics of services from the economics of signal transport. Essentially the economics of communication services are becoming the same as the economics of software creation. This is achieved by means of layers of protocols, which are logical instruction sets that govern the operation of machines and software that recognize, guide, move, coordinate and manipulate these signals.

The Internet was designed over a period of a decade, starting in about 1962, by a group of electronics engineers in the United States, working in conjunction with the Defence Advanced Research Projects Agency, for which at various times they worked as employees or on contract from their respective universities. It was designed from its conception to allow the movement of signals between and among computers independently of the computer's make, its internal operating system, or any other limiting factor. It was understood early in the process of development that the circuit-switched system of signal transport, upon which the telephone system was built, was fundamentally inadequate for this purpose.

Accordingly, these engineers devised what we now call packet-switching. From the differences between circuit-switching and packet-switching derive the major differences between the Internet and the conventional telephone system.

In a circuit-switched system, which is the public switched telephone network (PSTN), the telephone company sets up, holds open, and takes down a series of circuits, the instructions for which are the telephone number being dialled. Whether this is accomplished by a human operator putting in a plug in a switchboard, an electromechanical device physically clicking over into a position, or a microscopic gateway opening in a silicon chip, the principle is the same. The path the signal will follow is dependent upon actions taken by the telephone company. The content of the signal itself is entirely passive to the manipulations of the circuit-switched system, which, in order to work, must hold open a pathway for the signal to travel in real time. This system is admirably well-designed for the calling patterns and other demands of the human voice, around which the system was engineered.

In the PSTN, the intelligence is embedded in the system transporting the call, rather than partly in the signal itself. The advent of computers in the network did not change the fundamentals of circuit switching. The absence of machine intelligence in the signal is a determining feature of circuit-switching, from which several profound consequences flow. First is the centrality of the telephone switches to the movement of signals, and therefore the importance of the ownership of that system. Second, and not obvious except in retrospect, the telephone system is not designed to be open in the same sense in which the Internet is open. It would be impossible for someone to write a software protocol, such as created the World Wide Web, and somehow make it available to telephone users throughout the world so that they might refashion the workings of the telephone network to their convenience. The circuit-switched system is designed for end-to end voice connectivity, but not to be tampered with by people writing new software.

The consequence is that the ability to provide additional services from the intelligent network is embedded in the functions of the network; only ownership of the physical apparatus we call the telephone network qualifies one to change its operations, and this, given the size of the organizations involved, and the amount of equipment that would have to be altered, is very difficult. Relative to the Internet, the PSTN is a rigidly specified system.

The Internet is based on a concept called packet-switching. In packet-switching, the digital bit-streams which compose the signals are broken into sections called packets, and these packets are given "headers". These headers contain the instruction sets which describe the destination and origin of the message, and any other information and instructions that have been agreed upon in the Internet engineering community, as being convenient or necessary. These instruction sets are layered in what are known as "protocol stacks," and the various layers accomplish tasks that engineers have agreed will be performed at that level. New agreements upon the functions to be performed at a given layer can be introduced without necessarily upsetting the functions performed at other levels of protocol.

The Internet is therefore basically an agreement that computers will communicate in the Internet protocol, referred to as TCP/IP, or Transport Control Protocol/Internet Protocol. This and other features are systematically reviewed in Chapter Two. Two of those features are discussed here.

The Internet is fundamentally an open system. New and better software can be layered into the existing mix of protocols and utterly transform the utility of the system. The best example of this is the invention and development, around 1980, of the World Wide Web, which is a protocol for moving documents (words and pictures) through Internet Protocol networks. The Internet's popularity exploded after the World Wide Web was developed by Tim Berners-Lee, later and quite independently of the Internet. Other services and ideas are even now being developed on the basis of the layered software protocols that constitute the Internet, which will revolutionize all existing systems of moving signals.

The second important feature of packet switching is that the relationship if the message to the physical apparatus that conveys the signal is radically transformed from what it is in a circuit-switched system. In packet switching, the signal enquires of the system where the addressee can be found. The addressee is indicated in every header of every packet. The routers (not switches) of the system guide the packets towards their final destination, which is the server (or computer) whose Internet address corresponds to the address found in the packets. All servers forming part of the Internet are assigned permanent or temporary Internet addresses. A set of address books, called look-up tables, inform the routers of the location in cyberspace of the desired address. The bit-stream that was originally sent out from one computer may have been broken up and sent out on different transmissions paths, before being finally reassembled in the correct order at the destination computer. The system was designed so that lost packets are resent.

The relationship of a signal passing through the Internet to the system of routers that guide it is therefore of a fundamentally different nature than a message passing through the PSTN. The differences between highways and railways is an apt analogy, with the telephone system functioning like the railway. A strict series of procedures must be followed for trains getting on and off the lines, and traffic (the railroad cars) must conform to rigid specifications. The train moves as the series of switches permit, and not otherwise. The telephone network, in engineering terms, is highly specified in order to work at all. In the packet-switched Internet, the relationship of the signal to the system is of guidance rather than inescapable compulsion, like the relationship of a driver to highway signs. In addition, there is no control of what kind of traffic gets onto the Internet, where it gets off, or what kind of signal (vehicle) it should be. For this very reason, the Internet is less reliable and more prone to congestion and crashes than is the PSTN.

Whether they intended it or not, the architects of the Internet designed a system that has accomplished a revolution in signal distribution technologies. This revolution in how signals are moved will be applied to signals requiring greater bandwidth, such as what we now call television programming, though the moment when packet–switched video signals begins to rival the conventional television delivery system is not clear, and does not appear to be soon. Nevertheless, guessing the effect of the Internet on what is now called television broadcasting depends on many factors beyond the scope of this study.

The third major fact to be understood is that traffic on the Internet is growing exponentially. Estimates tell us that the entire traffic on the PSTN will amount to only 1% of the amount of traffic on the Internet, with the year being estimated at sometime between 2005 and 2010. This rate of change is faster even than that found in the price-performance of computer chips. Rates of change of this magnitude in the natural world would not be possible. In computer-communications, they are.

2.3. The Effect of the Internet on Cultural Regulation

In Chapter Three we try to figure out what the Internet means for the regulation of broadcasting in Canada. This is no easy or small task. We do not know even whether "broadcasting" is the appropriate term for cultural products and services made available over the Internet, nor do we know whether television programming, as we know the term, will continue in a recognizable form. But analysis is made possible by moving from what we certainly know to what we can reasonably predict, and by being as clear as possible about what we can never know.

What we know for certain is how broadcasting regulation was derived and how it has evolved, and how it differs from the other major forms of regulating communications that we know of: printing and speech, on the one hand, and common carriage responsibilities, on the other. This issue is discussed below under the title: *cyberspace is divided into three legal regimes.*

We cannot be certain how the issue of regulating signals in cyberspace for cultural purposes will present itself. The timing is equally uncertain. But we can be certain what the issues are going to be. They will concern

- the ability of the broadcasting regulator to regulate effectively – to licence, and to restrict the freedom of the regulated player in order to achieve public policy, given the technical characteristics of the distribution system;
- the relevance of doing so, in view of the nature of the goals of the Act and the amount of what looks like "Canadian content" available for distribution;
- the possibility of regulating effectively, in view of the legality and constitutionality of regulating, on the

one hand, and the actual nature of the technology, on the other;

- timing: when do the issues become unavoidable? For how long can matters continue as they are now, with a broadcast television infrastructure distinct from the telecommunications-Internet world?

3. Cyberspace is divided into three legal regimes

Cyberspace is divided into three legal regimes that govern the carriers of signals: broadcasting, telecommunications, and the Competition Act. Their territories are mutually exclusive, and are policed in different ways to different purposes.

These legal regimes embody distinctly different ideas of the responsibility of he signal carrier for the content of speech. That is the essential policy issue in convergence.

Telecommunications has generally been governed by two quite distinct ideas: the obligations of the common carrier, which derive from the common law, and, as telephone systems showed monopoly characteristics, the treatment of their economic power by government regulation.

Broadcasting has always been governed by concerns for national self-expression, culture, and broad public purposes, within assumptions of that there would always be a small number of feasible channels, or voices, that could make use of the available transmission capacity.

Finally, the signals that travel about inside one's computer and which pass over the Internet are excluded from direct economic and cultural regulation under either the Broadcasting or Telecommunications Acts. Therefore, a rapidly growing zone of society's communications take place within the boundaries of law but free direct economic and cultural regulation. This zone is governed by the *Competition Act* as regards economic structure. As regards the regulation of speech, the ordinary processes of the common law and judge-made jurisprudence apply, as do general statutes, such as the Criminal Code and Copyright Acts.

The salient characteristic of laws of general application is that there is no prior restraint of speech by government authority. No one needs a licence from the state to speak, preach, pray, or communicate in any other way, except when it is done by means of radiocommunication.

The Internet now confronts policy makers with a vital issue: is it just another transmission medium, to be captured by the *Broadcasting Act* when bandwidth, computer power, and compression techniques are sufficient for what we now call television programs to be shunted about through computer networks?

4. Technological convergence means choices among converging legal regimes

The underlying technological convergence of transmission media can be likened to colliding continents in geology. The three legal regimes are carried about on the backs of these colliding continents of technology. Convergence of underlying technologies implies choices among different legal regimes. Either new borders between the legal regimes have to be settled, in which case business continues more or less as before, and no fundamental rethinking of broadcast regulation is needed, or one regime prevails over the other, in which case, far larger interests are engaged.

Timing is a critical factor. There is reason to suppose that the broadcasting system as we have come to know it could last for many years in peaceful co-existence with the Internet, and the reasons for this co-existence are discussed in Chapter Three.

This is the statement of a problem that was long foreseen. A professor of the Massachusetts Institute of Technology, Ithiel de Sola Pool, wrote *Technologies of Freedom* in 1983, which concerns how we regulate speech when it is carried over different technical media. He predicted that technological convergence would confront us with a choice of how speech is to be regulated in electronic media.

"A convergence of modes is upsetting what was for a while a neatly trifurcated system": he wrote in 1983, referring to broadcasting, common carriage regulation, and the general rules of print publishing. He foresaw that: "The choice between them is likely to be a key policy issue in the coming decades."

As philosophy has been called a footnote to Plato, so is this paper a footnote to Pool’s pioneering work.

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Chapter One: Radiocommunication and Broadcasting

1.1 Overview of this Chapter

This chapter concerns itself with how broadcasting policy has adapted to technological change. More accurately, it tells the story of how technology was adapted to broadcasting policy. New signal distribution systems have been captured by federal jurisdiction and adapted to the purposes of the broadcasting regulatory system several times over the course of this century. It is important to see how this was done. What is of decisive importance for this report is the following:

> Radiocommunication, broadcasting, cable and other systems of signal distribution were assigned to exclusive federal jurisdiction;
>
> control over those means of signal distribution is the effective legal basis of broadcasting policy; and
>
> New signal distribution technologies raise questions about the ability of the federal government control to sustain the same level of effective control through its existing regulatory tools.

In this chapter we look at the first two of these points.

In effect, the subtext of this chapter is about the right of government to regulate. It raises no questions about the goals of Canadian broadcasting policy or the legitimacy of trying to achieve them. It asks only how signals are captured by federal regulatory jurisdiction, and by implication, how they escape it. It also looks at how these developments in Canada have been paralleled by similar events in the United States.

The problem that needs solving, according to those concerned with Canadian television broadcasting, is the scarcity of top-quality Canadian programming. It is unnecessary to rehearse the arguments about the American economic advantage in entertainment media. To respond to this problem, the Canadian government has since 1905 devised first a spectrum allocation system and then a broadcasting regulatory system that by now has the following features:

> 1) Radio spectrum is a nationalized resource, by which is meant the allocation and assignment of spectrum is made by governmental decisions, rather than by markets,
>
> 2) Coaxial cable distribution systems, and other television distribution media, such as satellites and local broadband microwave systems, are subject to the carriage requirements of the broadcasting regulator, and

3) Canadian television production is subsidized through direct expenditures on the CBC and by the creation of television production funds, paid for out of the gross revenues of the distribution systems, including cable and satellites.

All of the extensive and intensive regulation of television program delivery derives from the federal government's jurisdiction over radiocommunications and its ability to regulate for the "peace, order and good government" of the realm.

The first major purpose of this chapter is to drive home the point that federal jurisdiction over radio spectrum has been driven by quite simple technical concepts that have been used to justify intensive governmental regulation of broadcast media. These ideas about the technology have had had far-reaching consequences, long after the technical conditions that originally justified them have been overcome. The second major purpose of this chapter is to draw a clear picture the technical concepts that underlie broadcasting so that the contrast with the Internet will be as clear as possible, when it is discussed in Chapter Three.

1.2 In the beginning was licensing

The history of broadcasting regulation begins in Canada with the *Act to provide for the regulation of Wireless Telegraphy in Canada*, assented to 20th July 1905. Devices that used spectrum were to be operated only on the grant of a licence from the state. Section 3 of that Act states:

> "No person shall establish any wireless telegraph station, or install any apparatus for wireless telegraphy, in any place or on board any vessel registered in Canada except under and in accordance with a license granted in that behalf by the Minister with the consent of the Governor in Council."

Radio Acts since that time have imposed the same requirement on devices transmitting signals through electromagnetic spectrum.

The 1913 *Radiotelegraph Act*, assented to 6th June 1913, and passed in the wake of the Titanic disaster, says at section 3:

> "No person shall establish any radiotelegraph station or install or work any radiotelegraph apparatus in any place in Canada or on board any ship registered in Canada except and in accordance with a license granted in that behalf by the Minister."

The next major law in respect of radio was *The Radio Act, 1938*, assented to 1st July 1938, which said at section 5:

> "No person shall establish any radio station or private receiving station, or install, operate or have in his possession any radio apparatus at any place in Canada or on any aircraft registered in Canada, except under and in accordance with a licence granted in that behalf by the Minister: Provided that this section shall not apply to any radio receiving set installed in any automobile or other vehicle temporarily in Canada which is owned by a bona fide tourist who resides out of Canada: Further provided that the Minister may for any reason deemed by him to be sufficient suspend from time to time the operation of the foregoing proviso either in general or as applicable to particular persons, zones or places in Canada."

The major change made in the *Radiocommunication Act* of 1985 is that receiving apparatus was deregulated, though devices transmitting through electromagnetic spectrum were still required to be licensed, as a general rule.

> "4. (1) No person shall, except under and in accordance with a radio authorization, install, operate or possess radio apparatus, other than
>
> > radio apparatus exempted under by or under regulations made under paragraph 6(1)m; or
> >
> > radio apparatus that is capable only of reception of broadcasting and that is not a distribution undertaking."

Thus the rule has been firmly established in 1905, and shows every sign of being in vigorous operation a century later, that radio apparatus treads on territory- the electromagnetic spectrum below 300 Gigahertz- owned or exclusively controlled by the state.

1.3 Why was state control of radio spectrum thought necessary?

Why is this? Why was radio spectrum treated as being incapable of private appropriation? After all, many forms of distributing scarce goods are possible. Normally markets and private property are used to allocate scarce goods – and in economic terms, all things are scarce. What made spectrum different from cement, foodstuffs, or grazing rights, such that governments in the 1920s unanimously turned to state ownership of spectrum as the only basis of allocation?

It is evident from the historical record that international coordination of the use of frequencies was required before spectrum could be exploited effectively, and that as spectrum usage grew in the 1920's, the need for the coordination of signal strength and the use of frequencies became manifest. The development of vacuum tubes in the years immediately after World War I allowed radio to be used for broadcasting as we understand the term, rather than for ship to ship and ship to shore communication, as Marconi had thought. The rapid take-off of a radio broadcasting industry followed this technological innovation.

However, we cannot answer the question about state ownership of spectrum without looking to the United States. In all other countries, spectrum was automatically and reflexively nationalized, so the possibility of a different management scheme for spectrum never materialized. In the United States, for a brief period on the 1920s, the lack of adequate statutory authority over spectrum led to the situation where the government was legally incapable of limiting the number licences or the assignment of frequencies.

The record shows that the inability of the United States federal government to control the use of spectrum with their existing 1912 radio legislation led to frequency coordination difficulties for the new radio broadcasting industry. The signal interference so generated led to strong pressure for regulation. The US Congress passed the *Radio Act of 1927*, incorporating all the features of radio spectrum allocation with which we are familiar. Spectrum was declared part of the public domain. Unlike land however, it was made incapable of being permanently appropriated, and unlike navigation rights, for instance, made subject to state permission. Market rights might exist after the spectrum was assigned, so that while radio stations might sell their licences, the purpose for which a licence was granted was unchangeable by any subsequent holder. In addition, the coordination of spectrum use was taken over by the government, so that it rather than the courts became the guarantor of the licensee's ability to use his licence free from interference.

History might have taken a different course. It is at least possible that spectrum coordination might have occurred by private contract and by private suits for wrongful interference, in an analogous manner to how property holders defend their rights against trespass, pollution, interference, copyright infringement or any other wrong or hindrance to the free enjoyment of their property. There was even a successful suit brought against a radio station for interference in the use of its spectrum, referred to as the *Oak Leaves* case.. The court had to decide "whether or not in such circumstances the fundamental or common law of the States will undertake… to protect the rights and interests of citizens." The judge had no great difficulty in finding precedents in western water rights cases and in the protection given by the common law to property rights in trade names to find that the offended station had rights to its frequency – rights which would justify a court of equity in assuming jurisdiction.

Radio spectrum law, here as well as abroad, was early frozen into certain technical concepts. In the 1920s. no one knew any different way for dealing with the signal interference problem than by dividing the spectrum into pieces according to frequency. As long as spectrum use is allocated by frequency divisions, while signals remain fully analog, interference will occur. Assigning spectrum to the exclusive use of licensee may be wasteful, but only from the perspective of the 1990s, when code division multiplexing (spread spectrum) is a feasible procedure. Dividing the spectrum into parcels was the only method available for dealing with the problem at the time that spectrum interference became an acute problem, in the late 1920s.

Today, other ways of preventing interference are available. Spread spectrum techniques have been invented and work, but they rely on computer power which was unavailable when our basic ideas of radio regulation were being put into law. The inertia of human institutions explains why states continue to assign spectrum use according to frequencies, and why courts continue to treat spectrum as a scarce public resource. Current policy assumes that interference can only be prevented by dividing spectrum into exclusive-use frequencies. Receiving equipment has been designed around these assumptions, which generates its own inertia. Some measure of coordination of radio signals will remain necessary until spread spectrum techniques replace the use of analog signals organized by frequency divisions.

The second major premise of radio regulation is that frequencies are allocated and assigned by governmental authority rather than by markets. Despite the fact that the available spectrum has expanded a millionfold since the 1920s, spectrum continues to be licensed by governments rather than sold. It was not until the 1950s, long after the die had been cast, that anyone even thought of selling spectrum, and proposals for creating markets in spectrum are still at their infant stage even now. While the sale of spectrum rights for approved purposes is now contemplated with favour, using markets to change the actual allocation to use is not yet thought possible. For instance, if a telephone company wanted to buy any part of the enormous unused spectrum for television channels 39 to 69 lying between 614 and 806 Megahertz, they could not do this, even if it would generate more money for government through the higher licence fees that can be extracted from using the spectrum for telephone calls. It is safe to assume the continuation of government control over radio spectrum assignment and allocation until a combination of spread spectrum techniques and thorough marketization of the resource has occurred. No one wants an enormous embedded investment in devices tuned to frequencies rather than IP headers to be rendered suddenly obsolete.

The purpose of this foray into the history of broadcasting and radio law is this: the courts, had they been given the opportunity, could have developed jurisprudence. The *Oak Leaves* case shows that a common law court of equity took into account both the technical factors of broadcasting, including the insensitivity of radio receivers at the time, and the failure of the then existing US federal legislation to protect the rights of spectrum users. Any system of spectrum allocation, whether regulatory or market-based, would have had to face the same set of issues.

But it was not to be. A consensus formed by the late 1920's that regulation was inevitable and desirable.

> The shortage of spectrum for broadcasting persuaded Congress, the FCC, and the courts that broadcasting was by nature different from print – that it had inevitable elements of monopoly and scarcity. For the print media, even when they became monopolies, as in one-newspaper cities, the decision as to who should be the monopolist was a non-political, evolutionary result of market processes. In broadcasting, there was no time to let this happen. The requirement to do something about radio interference seemed immediate. Political decision seemed inexorable. So people perceived or misperceived broadcasting as a new type of communication system, necessarily different from the old, in which the holder of the physical facilities was a trustee, licensed to serve the public interest and obliged to provide a responsible forum.

In Canada, the possibility of this development was precluded by the fact that the use of spectrum was brought under direct government control in Canada 1905, long before there was radio interference and therefore any spectrum scarcity to worry about. Governments have never seriously considered the possibility of fully privatizing spectrum, either here or in the United States, although it remains an issue extensively discussed by authors.

Recent policy developments in both countries have favoured the auctioning of spectrum. Nevertheless, auctions of spectrum do not constitute full privatization, since the rights assigned do not extend to changing the purposes for which the assignment was made. Thus cellular telephone companies cannot buy out television spectrum when both parties agree to the price, for instance. However, as auction policy develops, the usage rights of the licensee in the spectrum they purchase have to be defined so that a value can be put on it. Inevitably, the specification of technical characteristics – range, frequency, coding, power outputs, and so forth – leads to the possibility of an effective private market in spectrum.

Such considerations were practically inconceivable in the 1920s, when the structure of radio regulation was being laid down. In that decade Canada signed the International Radiotelegraph Convention, 1927, which treaty assigned frequencies among the various signatory states. In order to comply with this convention, Canada had to pass legislation. Canada's supreme court at the time, the Judicial Committee of the Privy Council (hereafter the Privy Council) held that the federal Parliament had the "jurisdiction to regulate and control radio communication". This jurisdiction existed by virtue of both the power over peace, order and good government of Canada, (s. 91 opening words) and the power over interprovincial undertakings (s. 92(10)a)).

When Prime Minister R.B.Bennett introduced Canada's first broadcasting legislation in 1932, he invoked the scarcity of spectrum as the rationale for state ownership and direction of this natural resource:

> The use of the air… that lies over the soil or land of Canada is a natural resource over which we have complete jurisdiction… and I cannot think that any government would be warranted in leaving the air to private exploitation and not reserving it for the development and use of the people."

In conclusion, the use of electromagnetic spectrum in Canada was subjected to the permission of the state, and that authority was found necessary to deal with the frequency coordination problems associated with sending and receiving broadcast signals with the technologies then available. The only country that vacillated, even momentarily, in full public ownership of spectrum asserted state ownership of it by 1927.

Government control of radio transmitting devices was and remains the first effective basis for broadcasting policy, to which we now turn.

1.4 Broadcasting

The first major expression of Parliamentary will in relation to Canadian broadcasting was the *Canadian Radio Broadcasting Act, 1932* which followed the Aird *Royal Commission on Radio Broadcasting* of 1928.The Aird report had found that:

> "There has, however, been unanimity on one fundamental question — Canadian radio listeners want Canadian broadcasting." ...
>
> "At present the majority of programs heard are from sources outside of Canada. It has been emphasized to us that the continued reception of these has a tendency to mould the minds of the young people in the home to ideals and opinions that are not Canadian. In a country of the vast geographical dimensions of Canada, broadcasting will undoubtedly become a great force in fostering a national spirit and interpreting national citizenship." ...
>
> "While the primary purpose of the service would be to give Canadian programs through Canadian Stations, we think that every avenue should be vigorously explored to give Canadian listeners the best programs available from sources at home and abroad." ...
>
> "We believe that broadcasting should be considered of such importance in promoting the unity of the nation that a subsidy by the Dominion Government should be regarded as an essential aid to the general advantage of Canada..." ...
>
> "As our foremost duty, we have concentrated our attention on the broader consideration of the interests of the listening public and of the nation ... we are impelled to the conclusion that these interests can be adequately served only by some form of public ownership, operation and control behind which is the national power and prestige of the whole public of the Dominion of Canada." ...
>
> "The potentialities of broadcasting as an instrument of education have been impressed upon us; education in the broadest sense, not only as it is conducted in the schools and colleges, but in providing entertainment and of informing the public on questions of national interest."
>
> "... [the] immediate objective should be, however, to provide good reception over the entire settled region of the country during daylight or dark under normal conditions on a five-tube receiving set."

As it has been noted in other papers, a Royal Commission appointed in 1951,1987 or today might have made virtually all of these statements. There is a remarkable continuity of concerns in Canadian broadcasting policy from its inception to the present and on into the future.

The 1932 *Broadcasting Act* which followed the Aird Report established a national broadcasting organization, and a regulator of broadcasting, conjoined in one organization The Act made provision for the ultimate possibility of the Canadian Radio Broadcasting Commission taking over "all broadcasting in Canada" but only after Parliament had given its specific approval.

The purposes of the broadcasting system envisaged by the Aird Report remain substantially in place today.

The *Broadcasting Act* declares: "[T]he Canadian broadcasting system . . . makes use of radio frequencies that are public property . . ."

Nor has the basic rationale of broadcasting regulation been threatened by the adoption of the *Charter of Rights and Freedoms* in 1982. The public property rationale has been held up in one of the few post-Charter broadcasting cases, Re N.B. Broadcasting Co. and CRTC. The Federal Court of Appeal has held that a regulation restricting ownership of broadcast licenses by daily newspapers did not violate s. 2(b) of the Charter. Using the Act's public property declaration as the basis for his ruling, Thurlow C.J wrote: "[The Charter] gives no right to anyone to use the radio frequencies which, before the enactment of the Charter, had been declared by Parliament to be and had become public property and subject to the licensing and other provisions of the Broadcasting Act." While the Charter adds several new layers of consideration to the scrutiny of state action by the courts, it has not so far been used to overturn any of the basic controls exerted over broadcasting, cable, and television programming.

It would be pointless to review the many iterations of government policy on broadcasting in this chapter. What concerns us is how the government and regulatory system handled the introduction of new technology. Four developments are worth considering in this context.

- The licensing of television
- Program commitments in conditions of licence
- Capturing cable television and satellites for broadcasting policy
- Defining "broadcasting" in technologically neutral ways

1.4.1 Licensing Television

The introduction of television in the early 1950s represents the most straightforward example of how a new distribution technology was captured. The basic plan for the North American Television Standard (NTSC) was laid down in the late 1940s, incorporating contemporary assumptions about the trade-offs between optimum frequency, on the one hand, and the expense of the television set, on the other.

Each television station in North America requires the exclusive use of six megahertz needed to bear a television signal. The result is that massive amounts of spectrum are used for broadcast television. The reliance upon radio spectrum meant that television was instantly captured by the regulatory system, for the same reasons as radio broadcasting. Spectrum use was enormous, and there was neither time nor desire to devise a different model. Both Japan and Europe devised different signal allocation plans for television that incorporated more signals into the same amount of spectrum, but no one at the time thought any fundamentally different model was available, practical, or desirable.

Several features of the television set should be noted here, because these features will govern the outcome of several issues whose relevance is now being understood.

> "The nature of both the vacuum tube and the radio-frequency spectrum shaped the powers and limitations of television as an information medium and a cultural force. These technologies dictated that television would be a top-down system – in electronic terms, a "master-slave" architecture. A few broadcast centres would originate programs for millions of passive receivers, or dumb terminals. Spectrum scarcity would force TV to adopt a centralized system, limited to a relatively few channels, with no two-way communication.
>
> The expense and complexity of the tubes used in television systems meant that most of the processing of signals would have to be done at the station. The TV had to be relatively simple, because designers had to keep costs down by using the lowest possible number of vacuum tubes in the sets. Storage of signals was out of the question, since a memory might require millions of vacuum tubes in a single set.
>
> With little storage or processing possible at the set, the signals transmitted by broadcasting stations would have to directly displayable waves, resembling as closely as possible the sounds and images to be presented. This meant that the TV would have to be an analog system, since analog waves directly simulate sound, brightness and colour.
>
> The advantage of analog systems is efficiency; the entire wave is used to carry, imitate and display the signal. The disadvantages are sensitivity to atmospheric interference and difficulty of manipulation and storage. Because the entire analog wave is used to carry information, and distortion in the wave results in distortion in the picture.
>
> Economic and technical constraints pushed the critical electronics out of the TV set and back into the broadcasting station. Nearly all of the system's intelligence – shaping, sequencing, and storing picture signals – would have to be located at the broadcasting centre.
>
> The television set was a bottleneck. Its processing power would limit the form of signals used, the resolution of the picture, and the number of channels. The processing power of the box was minute compared with the processing power at the station.
>
> Yet television easily triumphed over its technical flaws, and the world would come to see it as a fact of life."

1.4.2 Licence Conditions

The strategy of Canadian broadcast regulation, as it has evolved, consisted at various times of one or more of the following measures:

1) Trying to ensure the profitability of the licensee, through such means as

  a) taxation policy (non-deductibility of Canadians advertizing on US channels);

  b) limiting competition through restricting licences, including restricting or delaying the licensing of competitive forms of entertainment, such as pay-TV;

  c) subjecting cable undertakings to the purposes of Canadian broadcasting, by limiting the contractual freedom of cable owners to develop programming and to fill their capacity as they saw fit;

and

2) To use conditions of licence and other tools to cause the broadcaster to spend on Canadian programming.

The cost disadvantage of producing Canadian television shows relative to US television has been the subject of a large number of government reports. It represents the basic issue of Canadian television policy. The means used to address this problem have grown and adapted over the years.

The power to set conditions of licence is the basic tool. As the Caplan-Sauvageau Report explained:

When the CRTC issues a licence, it gives an undertaking the right to use a public resource for its own benefit, In return the licensee is committed to operate in a manner compatible with the principle defined by Parliament….

The CRTC is free to adjust its requirements for each undertaking; in other words, to take into account distinctions the regulations disregard. The use of conditions of licence thus opens the way to 'made-to-measure' regulations….

Among the conditions of licence are sometimes 'promises of performance' commitments made by a licensee in support of the licence application….

The CRTC has considerable leeway to determine the conditions of licence. The Supreme Court, in the *CRTC v. CTV* decision, even recognized the validity of a licensing condition imposed upon the CTV network requiring it to broadcast a specified number of hours of original drama programs over two seasons.

These conditions of licence have been upheld despite CTV's objection that they were infringements of the right of free speech. The Supreme Court held that the licensing power of the Commission was wide, and that as long as its regulation making power had not been exercised in relation to the same matter, it was free to impose these conditions.

The power to set broad regulations and impose conditions of licence were confirmed in the new *Broadcasting Act, 1991*.

1.4.3 Capturing Cable

How was a wire carrying over a 100 megahertz of spectrum regulated as an integral part of the wireless broadcasting system? How was something that promised abundance of spectrum regulated as if it were part of a system premised on spectrum scarcity? Until cable, TV channels in any given area could be counted in the single digits. Now there could be dozens. The story of the assimilation of cable to broadcasting shows reveals several important facets of broadcasting regulation. It also shows that, despite the fact that cable posed a somewhat different problem for Canadian broadcasting regulation than it did in the United States, the reaction by broadcasters and regulators to the emergence of the cable industry was in fact identical. As much as possible, its competitive threat to off-air broadcasting was neutralized by regulation.

The Bell system installed its first coaxial cables in New York in 1936. Bell began to use cable to distribute network programs to local television affiliates in the late 1940's. In 1948 John Walson began running coax cable from residences in Mahonay City, Pennsylvania to a large hilltop antenna that could pick up broadcast signals blocked by nearby mountains. Entrepreneurs then began installing microwave systems to beam in broadcast signals picked up from even further afield.

Cable television, or community master antenna systems, as they were then known, broke any number of taboos of broadcasting policy. They violated the idea of locality, the idea that television stations are intended to serve particular licensed areas. The idea of local television derives from the signal contour of terrestrial broadcasting stations. If early television broadcasting had had different signal diffusion characteristics, we would have had different ideas about television. Cable inherently imported distant signals, and so threatened franchise arrangements and the advertizing contracts that are the basis of broadcast television. Satellites do this even more.

The threat of cable television to broadcasting interests was infinitely compounded by two court decisions, in the United States and Canada, that totally undercut the entire economic underpinning of advertizer-supported television. In both Canada and the United States, it was decided that cable television did not offend the rights of the broadcaster when it redistributed programming.

In Canada, the cable television threatened not merely the economic interests of broadcasters, which was serious enough, but the regulatory purpose itself, since the reason for the high and early adoption of cable in this country was that it brought in US signals.

Cable television was reviewed several times by the CRTC after the passage of the 1968 *Broadcasting Act*, and two reports in 1971 and 1979 stand out. The Commission regarded cable with suspicion. This is what the 1979 report had to say about the

1971 report:

> "The commission clearly indicated that cable could only be integrated into the broadcasting system with caution and only to the extent that cable did not disrupt basic Canadian television services. It also expressed vital concerns about the growing threat of the extension of United States television signals into Canada and the necessity to harmonize the relationship between cable television and off-air television. The policy statement envisaged a guarded working accommodation between cable television and established over-the-air broadcasting.

The 1971 report said:

> The Commission repeats that its intention is to establish a policy which will permit and support the development of cable television. However, the mandate of the Commission requires it to supervise the publicly owned frequencies *so that the Canadian broadcasting system is not disrupted as a result of purely technological and marketing pressures which take no account of the social, cultural, economic and political objectives of the country*." (Italics added)

The integration of the cable distribution system into broadcasting was accomplished formally by the 1968 *Broadcasting Act*, which created the class of thing called the "broadcasting receiving undertaking", and which declared that broadcasting was a single system. By that time there were more than 300 cable television systems in Canada. The Commission declared in its "Single System" pronouncement that

> "unlimited penetration by United States stations on a wholesale north to south basis would completely destroy the licensing logic of the Canadian broadcasting system as established by the Broadcasting Act. If a solution is not found to integrate cable into the overall system, the impact, by fracturing the economic basis of private broadcasters, would also disrupt the Canadian cultural, educational and information imperatives of both the public and private sectors of the Canadian broadcasting system".

The Commission reviewed the relationship of licensed franchises, areas served, advertizing revenue, and programming commitments and concluded cable was a threat to them all. The following lines from the "Single System" report are redolent with the hubris of 1970's government in its heyday:

> In the opinion of the Commission, there is an obvious danger that the development and even the policy of broadcasting be determined by the natural tendency of hardware, tools and machines to proliferate as a result of marketing pressures. Such a proliferation can only occur if the hardware is fed with inexpensive contents…. This results in a stretching process, a "more of the same" process where, in the long run, choice is reduced rather than increased and where the medium is indeed the message.

The challenge of cable was met with regulation. While some of the regulation was particular to Canada, the response was similar on both sides of the Canada-US border.

> Detailed rules were formulated for the maximum number of US stations allowed into Canada;
>
> Cable was precluded from the television advertizing market
>
> Distant signals were not allowed to be imported by microwave
>
> Cable was restricted to programming the community channel
>
> Simultaneous program substitution was required; this had the effect of delivering Canadian viewers of US channels to Canadian advertizing on the same US programs shown simultaneously on Canadian television stations.
>
> In addition, pay TV was delayed, and its introduction made subject to the overriding objective "to maximize revenues for Canadian programming purposes."

It is important to note that the FCC imposed on cable television many of the same restrictions and for the same reasons:

protection of free advertizer-supported off-air television. Cable television was forbidden to bid on many events, feature films, sports programming and series programming. Programs, audiences and talent were not to be siphoned away from free television by either pay TV or cable.

When the anti-siphoning rules were abolished by the FCC in the latter part of 1970's, "a simple economic fact quickly became apparent: Viewers value programming more than advertisers value viewers." The ability of people to pay for programming increases the supply of it, just as revenues from subscribers, supplementing advertizer revenues, increase the amount and quality of newspapers.

Granted the broadcasting regulator had every reason to protect the television franchises they had awarded, the question remains why the courts also backed the regulator completely in assimilating and subordinating cable television to off-air broadcasting. What idea did everyone share, on both sides of the border?

The answer is clear: people conceived television, then only twenty years old, as free, advertizer-supported, and local. New technological arrangements that threatened these ideas were squashed or delayed, and the reason they could be so treated was that there was no available technological alternative that could escape regulation and still function.

In Canada, the Courts addressed the issue of provincial authority to regulate cable television in *Capital Cities Communications* and *Régie de Services Publics v. Dionne*

In the words of the then Chief Justice Mr. Laskin:

> I do not see how legislative competence ceases in respect of those signals merely because the undertaking which receives them and sends them on to its local subscribers does so through a different technology."

And further:

> "It would be incongruous, indeed, ...to deny the continuation of regulatory authority because the signals are intercepted and sent on to ultimate viewers through a different technology. Program content regulation is inseparable from regulating the undertaking through which programmes are received and sent on as part of a total enterprise."
>
> "*The fallacy of the contention... of the appellants is in their reliance on the technology of transmission as a ground for shifting constitutional competence* when the entire undertaking relates to and is dependent on extra-provincial signals which the cable system receives and sends on to subscribers."

Likewise in the *Dionne* case, where the Supreme Court had to address the constitutionality of provincial pretensions to regulate cable, the Court held strongly to the view that the cable industry should fully assimilated to television broadcasting. Per Laskin,C.J., again:

> The fundamental question is… what the service consists of. That is the very question that was faced by the Privy Council in the *Radio* case (in a different context, it is true, and which was also before that body in *Attorney General of Ontario v. Winner)* There is another element that must be noticed, and that is where television broadcasting and receiving is concerned, there can be no more be a separation for constitutional purposes between the carrier system, the physical apparatus, and the signals that are received and carried over the system than there can be between railway tracks and the transportation service provided over them or between the roads and transportation vehicles and the transportation service they provide.
>
> …the very technology employed by the cable distribution enterprises in the present case establishes clearly their reliance on television signals and on their ability to receive and transmit such signals to their subscribers. In short they rely on broadcasting stations, and their operations are merely a link in a chain which extends to subscribers who receive the programmes through their private receiving sets.

The Chief Justice was addressing the division of powers between the provinces and the federal government when he made these observations. He had a different technical system in mind than the Internet, of course. Yet the ultimate source of federal authority over cable was once again referred back to federal control of the airwaves. And once again, purely constitutional doctrines, such as the indivisibility of an undertaking, were invoked to cement the result.

In the post-Charter Supreme Court, the issues would be wider than whether the undertaking was within federal or provincial jurisdiction. Questions would be asked about the reasonableness of the restrictions of the rights of the parties imposed by the regulations, and competing social interests would be measured.

Yet the case of cable is in eloquent reminder of a technology whose competitive potential was blunted, once it was constitutionally assigned to the broadcasting system. On the other hand, the broadcasting industry is not required to satisfy the exigencies of the *Competition Act*, nor has there been until lately a conceptual alternative to the broadcasting paradigm.

1.4.4 A Conceptual Turnaround?

In the past two years, the Commission has made two major decisions that may indicate the beginning of a conceptual turnaround in the treatment of cable television and of broadcasting distribution systems generally. These developments signal a new attitude towards delivery systems: bandwidth is bandwidth. While programming signals are still privileged over others, cable undertakings do not enjoy privileges per se over other means of signal distribution.

The first such decision relates to the conditions under which cable will act as a common carrier. For instance, as technology has developed, it is becoming feasible for cable operations to offer high-speed Internet access to the home, using spare capacity not used for television. This raises the issue of how cable undertakings shall offer such services and how others, such as rival Internet service providers, might avail themselves of the same capacity, if cable were to be treated as a common carrier.

In *Regulation of Broadcasting Distribution Undertakings that Provide Non-Programming Services*, the Commission considered the conditions under which a cable undertaking provided "telecommunications services" and became "telecommunications common carriers" within the meaning of the *Telecommunications Act*. It found that they

> "are telecommunications common carriers when they provide a full channel TV service or other non-programming service to the public for compensation including the provision of access to others to use their facilities to provide these services".

After reviewing the criteria for finding these carriers within federal jurisdiction, the Commission then considered how it would regulate the carriage of signals by cable undertakings in the light of the obligations of the *Telecommunications Act.* It decided to maintain the priority of television signals over all others, allowed the continued control by broadcast carriers of the full channel TV services they distribute to their customers, and asked cable undertakings to identify themselves to the Commission if they carry non-broadcasting services. The Commission then undertook a proceeding to settle the conditions under which cable undertakings might operate as telecommunications carriers, including the extent to which they would be obliged to offer access to commercial rivals, as other common carriers are obliged The decision in this proceeding has not yet been published.

The CRTC has also embraced the concept of competition in the delivery of programming services to the home. Public Notice CRTC 1997-25 marks the complete acceptance of competitive delivery systems for television programming, including such consequential items as the customer ownership of inside wiring.

The notice and the *Broadcasting Distribution Regulations* that flowed from the CRTC's decision in the matter continue and expand the policy that distribution undertakings contribute to the development of Canadian programming by devoting 5% of their gross revenues to Canadian and independent production funds. A new class of distribution undertaking is defined – the direct-to-home distribution satellite undertaking- and regulated.

However, these decisions continue the long tradition of control that started in 1905 in the *Wireless Telegraphy Act.* State permission is at the core of broadcasting regulation, just as it is in radio emitting devices. Section 3 of the *Regulations* states:

> 3. A licensee shall not distribute programming services except as required or authorized under its licence or these Regulations.

Rules continue to prescribe which services can be carried and at what priority. Consequently, which is truer? that broadcasting regulation continues to adapt to new signal transmission media, or that new signal distribution media are adapted to the purposes of broadcasting regulation?

1.4.5 Technology-Neutral Definitions of Broadcasting

A final example of the adaptation of technology to broadcasting policy was the development, in the lead-up to the 1991 Broadcasting Act, of technology-neutral definitions of "broadcasting".

"Broadcasting" is defined in section 2 of the Broadcasting Act as follows:

> Any transmission of programs, whether or not encrypted, by radio waves or other means of telecommunication for reception by the public be means of broadcasting receiving apparatus, but does not include any such transmission of programs that is made solely for performance or display in a public place.
>
> Section 2(2) reads
>
> For the purpose of this Act, "other means of telecommunication" includes wire, visual or other electromagnetic system or any optical or technical system.

About the time the broadcasting policy was under review in the mid to late 1980's, broadcasting policy analysts became concerned that any definition of "broadcasting" that became technologically fixated would tend to be rendered obsolete by rapid changes in delivery technology. The then Minister of Communications, Flora MacDonald stated:

> "We have been driven by twenty years of technology – by the art of hat is technically possible. What we must try to ensure is in our legislative framework is that programming goals play an equally large role in shaping the broadcast system and that the appropriate technology is harnessed, or at least anticipated and controlled, as an adjunct to or facilitation of those programming objectives.

Miss MacDonald articulated the same sentiments in her statements before the Legislative Committee considering Bill C-136, the new broadcasting bill:

> Secondly, the Broadcasting Act urgently needs updating to encompass and manage new broadcasting technologies not covered by the 1968 act. The wording of the bill has therefore been technology neutral. That is, the bill addresses the activities of programming and program distribution rather than specific technologies involved. This will ensure the authority of the Canadian Radio-television and Telecommunications Commission to regulate all players in the broadcasting system while encouraging continued technological development. Both objectives are important, but programming is of primary concern, because it is the programming content of broadcast media that represents the substance of broadcasting.

These views were elaborated further in the Department of Communications' policy paper *Canadian Voices, Canadian Choices*

> Broadcasting and telecommunications, which a few decades ago seemed entirely different operations, are now converging…. Today, television signals, telephone conversations and exchanges between computers are all routinely carried by cable, fibre optics, microwave and satellite.
>
> Where does broadcasting end and telecommunications begin? What rules apply?
>
> By concentrating on the concepts of programming and distribution, a technology-neutral broadcasting act can be concerned with the content of broadcasting in the context of its cultural significance to Canada.
>
> The 1988 Broadcasting Bill is technology neutral. It distinguishes among activities as opposed to technologies. Within the broad area of radiocommunication and telecommunication, broadcasting is distinguished by its programming. Merging and overlapping technologies have been recognized and broadcasting has been defined in such a way as to keep it distinct from other activities using radio or telecommunications, even when the technologies involved are indistinguishable.

The idea of a technology-neutral Broadcasting Act survived in the next iteration of the bill under the subsequent Minister, Marcel Masse.

Technological neutrality meant, in essence, that the focus of regulation became the "program", while undertakings were of interest to the regulator insofar as they made, distributed or received "programs".

Section 2 of the Act defines the term as follows:

> "Program" means sounds or visual images, or a combination of sounds or visual images, that are intended to inform, enlighten or entertain, but does not include visual images, whether or not combined with sounds, that consist predominantly of alphanumeric text.

While the old *Cable Television Regulations, 1986* contained a definition of alphanumeric text; the new *Broadcasting Distribution Regulations* do not.

The second major feature of the new Broadcasting Act of 1991 was the subtle positioning of the future constitutional basis of authority over broadcasting in the Act. Recognizing that the days of the spectrum scarcity rationale might be numbered, the Department's chief counsel saw to it that the new language justifying regulation would allow a shift to the "peace, order and good government" clause of the *Constitution Act, 1867* as the basis of the constitutional power of the federal government.

> 3(1) b the Canadian broadcasting system, operating primarily in the English and French languages and comprising public, private and community elements, makes use of radio frequencies that are public property and provides, through its programming, *a public service essential to the maintenance and enhancement of national identity and cultural sovereignty*.

1.5 Conclusion to Chapter One

This tour of radio and broadcasting policy has necessarily emphasized technical ideas and their legal enforcement at the expense of programming and results.

Does this regulation work? It is certainly succeeding in capturing the consumer's dollar and circulating it back through television production funds and out again in the form of programming. Money spent by the consumer cannot be targeted with quite the precision of an ordinary purchase, since channels are bundled, and the feedback loop to program production is imprecise. Yet there is a domestic and world television program market, and Canada's funds play an important part in both. Despite any imperfections in the feedback loop from television subscriber through the package of channels to which he subscribes, to the program producer and scriptwriter, it is imperative to keep those channels filled with attractive programming. The much shorter feedback loop of the channel switcher to the TV set is instant death to the boring or the unwanted program. Television has enormous demand for product. It is becoming apparent that the real limitation is not channel capacity, but scripts, shows, and ideas.

The proliferation of television channels is allowing the television-watching audience some real choice in what they want to watch, and indeed, in what television can profitably consist of. Canadians are involved in script-writing and program development as never before.

It would seem that the Canadian regulatory system is correctly addressing the issue of getting money out of the paying subscriber and back into programming. The results may not compete effectively for the viewer in prime-time drama yet. On the other hand, the expansion of channel choice is leading to the emergence of new forms of television program and television channel, in which the advantages in other formats of the United States television industry are immaterial.

More important, we are beginning to see that ideas and stories are the true limitation on the amount of television the public will watch. The number of channels will keep expanding up to the limit of what cable and satellite viewers are willing to pay for. This is the behaviour of a market. The only concern, from a market point of view, is that regulation not get too much in the way of sending those signals from the viewer back to the creators.

The ability to regulate these activities is derived from the technical characteristics of television when it was laid down in the late 1940s. Signals had to be sent across space through the electromagnetic spectrum in certain forms by broadcasting stations for television receivers without artificial intelligence. These characteristics are: frequency division (in effect, channels) – to minimize signal interference; dumb terminals – because computers were not available when television was designed in the late 1940s; analog signals – for the same reason, so that no signal processing had to occur in the television set; and a central planning model of signal distribution, likewise to overcome the lack of processing capacity in the receiving set. None of these technical assumptions applies to the Internet.

The Distribution of Signals in Cyberspace

Chapter Two: The Internet

2.1 Overview of Chapter Two

In this chapter we examine the following topics:

- The emergence of the Internet
- The basic concepts of how the Internet works
- Why the Internet model has prevailed over other proprietary network models

We also examine the World Wide Web, and how search engines and content filters work. The purpose of this examination is to see how content controls can work, and how these compare to the basic ideas of broadcasting regulation.

2.1.1 How Important is the Internet?

This chapter has a completely different story to tell from the one preceding. In this chapter we look at an emergent phenomenon of linked computers. We are witnessing the sudden bursting forth of the power and influence of personal computers and the transformations they have been working on the economies of the world's nations. At the point of writing, this story is barely beginning.

Bill Gates thinks the Internet is as important as the development of the personal computer in 1981. Others think it will be as important as the automobile. John Sidgmore of UUNet thinks it is as important as the development of the public switched telephone network (the PSTN). Others have likened it to the development of printing in the Western world. You could raise the stakes again and liken it to the importance of the alphabet for the shaping of minds.

As a disciple of McLuhan, I believe that changed modes of communication lead to changed modes of perception. Accordingly, the Internet is not merely about new methods of communicating, the implications of which are revolutionary enough. The Internet is also important for the changes that linked computers will make in how people perceive the world. How will people view themselves when they can trade ideas, services, stories and goods on a worldwide computer network? This network will contain all available written, audio and video information, and be entirely at their disposal at a very low price. Moreover, this network will effortlessly sort people by their interests, tastes and convictions.

A Common Grammar for Machines

The first thing to be established about the Internet is that it is more than a fad in transmission technologies. It embodies the tying together of the available computer power of the world through *a common grammar for machines*. The means by which this linking has occurred is the subject of this chapter.

2.2 What is the Internet?

On October 24, 1995, the U.S. Federal Networking Council, a body of Internet architects, unanimously passed a resolution

defining the term Internet. This definition was developed in consultation with members of the Internet and intellectual property rights communities.

RESOLUTION: The Federal Networking Council (FNC) agrees that the following language reflects our definition of the term "Internet".

"Internet" refers to the global information system that –

> *is logically linked together by a globally unique address space based on the Internet Protocol (IP) or its subsequent extensions/follow-ons;*
>
> *is able to support communications using the Transmission Control Protocol/Internet Protocol (TCP/IP) suite or its subsequent extensions/follow-ons, and/or other IP-compatible protocols; and*
>
> *provides, uses or makes accessible, either publicly or privately, high level services layered on the communications and related infrastructure described herein.*

The terms of importance that will be examined in that definition are:

- Globally unique address space
- Based on the Internet protocol
- Able to support communications using the Transmission Control Protocol/Internet Protocol (TCP/IP)
- Provides services *layered* on the communications infrastructure – the operative word is ‘layered’

A term not found in this definition but which is at the core of the Internet is

- *packet switching.*

Another definition worth noting comes from Tony Rutkowski, a noted Internet authority, who defines it as

- *an autonomous, self-organizing, open, private infrastructure*

One word in that definition that deserves emphasis is "private". Although access to the Internet takes place in many cases today via the public switched telephone network, once a signal has been passed through to the Internet, it is traversing a series of privately owned networks and hosts, which are not part of the public switched telephone system or the cable distribution infrastructure of broadcasting.

These private networks number over one million. They include not only the big backbone networks like UUNet and Sympatico, but also every LAN (local area network) in every corporation, government department, and university. Any LAN that has a permanent connection with an Internet service provider (ISP) is considered an integral part of the global Internet. The Internet is an amorphous entity which includes every private and public network that has agreed to exchange communication using the TCP/IP protocol, so that things we call "backbone networks" operate on the same principles and are no different in nature from a corporate or campus LAN. The same amorphousness also makes it difficult to define with precision who is or is not an Internet service provider. Every corporate and academic LAN in the world is potentially an integral and seamless part of the Internet.

As the definition supplied by the Federal Networking Council is more or less authoritative, I propose to use it as the basis for explaining the underlying ideas that have been engineered into the basic operations of the Internet.

2.2.1. The Origins of the Internet

The purpose of this chapter is to explore the fundamental ideas incorporated into the architecture of the Internet. Accordingly it touches upon the history of the Internet only for the purpose of relating these ideas. The Internet abounds with web sites depicting the early history of the Internet. The most authoritative source is "*A Brief History of the Internet*", written by the original network architects themselves. Their version begins in 1962.

> The first recorded description of the social interactions that could be enabled through networking was a series of memos written by J.C.R. Licklider of MIT in August 1962 discussing his "Galactic Network" concept. He envisioned a globally interconnected set of computers through which everyone could quickly access data and programs from any site. In spirit, the concept was very much like the Internet of today. Licklider was the first head of the computer research program at DARPA (Defense Advanced Research Projects Agency), starting in October 1962. While at DARPA he convinced his successors at DARPA, Ivan Sutherland, Bob Taylor, and MIT researcher Lawrence G. Roberts, of the importance of this networking concept.
>
> Leonard Kleinrock at MIT published the first paper on packet switching theory in July 1961 and the first book on the subject in 1964. Kleinrock convinced Roberts of the theoretical feasibility of communications using packets rather than circuits, which was a major step along the path towards computer networking. The other key step was to make the computers talk together. To explore this, in 1965 working with Thomas Merrill, Roberts connected a computer in Massachusetts to another in California with a low speed dial-up telephone line creating the first (however small) wide-area computer network ever built. The result of this experiment was the realization that the time-shared computers could work well together, running programs and retrieving data as necessary on the remote machine, but that the circuit switched telephone system was totally inadequate for the job. Kleinrock's conviction of the need for *packet switching* was confirmed.

The basic idea of the Internet was clear from its beginning: to get computers to communicate, independently of their internal architectures or their manufacturers. Its design philosophy was open communication.

2.2.2 Packet Switching

Packet switching is the first of the major concepts introduced in our examination of the Internet. The term is like ‘horseless carriage’, or ‘wireless’; it tries to define the new thing in terms of what preceded it, and what it is not. In this case, the contradiction lies in the relationship of packets to switches. If you have packets, you do not need switches. You need something different to assist the movement of the signal to its destination, a device which has come to be called the *router*. Routers have the same relationship to telephone switches as highway direction signs have to railway switches. And indeed, the highway-railway metaphor can be extended to the characteristic differences between the Internet and telephone systems, between a packet-switched system and a circuit-switched system.

In a packet-switched system, computer power is used to break a signal down into packets. Each packet is individually addressed and routed across the network to its destination where the message is reassembled. Packets that do not arrive at their destination are automatically retransmitted. Each packet is like a car on a highway; it knows where it eventually wants to end up, but it will take direction from the highway signs. The computer address of the person is embedded in the header of each packet. Routers direct the packet towards the address shown in the header. By the same token the highway signs (the routers) can give authoritative direction to the packet to route around obstruction or congestion. Hence the origin of the phrase: "the Internet interprets censorship as obstruction and routes around it." A system designed to withstand the effects of nuclear war (that is, entire cities missing from the loop) turned out to be robust indeed.

One way of expressing the difference between a packet and a circuit-switched system is to say that, in a packet-switched system, part of the intelligence has been put into the signal itself, whereas in a circuit-switched system, the intelligence is all in the network.

The same network architecture also means that the Internet tolerates more congestion and crashes than does the circuit-switched telephone system, since the packets have more 'free will' than the data trains inside the circuit-switched phone system. An overburdened Internet slows down, just like traffic at rush hour, generally without signal loss.

Another way of expressing this concept is that the packet-switched system of the Internet uses a connectionless, adaptive routing system, which means that a dedicated end-to-end channel need not be established for each communication. Therefore, the centrality of the telephone company to telecommunications is eliminated, since no one has to set up, maintain, and take down the call. Circuit switching, no matter how electronic or modern, still relies on an intelligent network to perform these functions, just as railway cars need a switch operator to cause the train to move on to the right tracks.

Packets can be in different sizes (most normal Internet traffic) or they can be made into uniform sizes (as in ATM) for efficiency. Many different communications can use the system simultaneously, just as cars, trucks and many different types of vehicle can use a highway simultaneously. The system is *underspecified* to borrow a term from engineering. By contrast, the telephone system is completely specified.

Yet another way of saying the same thing is that Internet communications float above the physical facilities used to transport the signal. Layers of signal are disaggregated from the physical layer, be it wire, coaxial cable, or the air, over which the signal is carried. This aspect will be discussed further below in the section on *layers.*

Telephone systems have been built on switched circuits for their entire history. A call is placed, a series of circuits are opened by the interaction of the telephone number with the switching system, and the call is taken down – all the circuits are shut again – when the call is over. The telephone system was engineered on certain premises: that switching and memory were expensive, that calls would last on average a certain amount of time - the average conversation lasting about three minutes, and that only so many people in a telephone exchange would place calls at the same time. The public switched telephone network was designed around intermittence of [voice] calling and scarcity of computer memory. Data traffic of the kind generated by the Internet upsets all these assumptions around which the public voice telephone network (PSTN) was engineered.

In the opinion of those who founded the Internet, the then predominant means of conveying signals - the opening and closing circuits by means of switches - was inadequate for the job of computer communications, and they set out to devise a new method.

The importance of this discovery is now making itself felt 35 years later. Northern Telecom, one of the world's largest makers of circuit-switched telephone systems, has bought the third largest maker of equipment that links computers to the Internet, Bay Systems, and installed the President of Bay Systems as the heir apparent at Northern Telecom. Northern Telecom is buying its way into packet switched networks.

AT&T has announced its purchase of the second largest US cable television company, Tele-Communications Inc. The analysis explained the benefits of the deal as follows:

> "Yet both companies know the network future lies not in today's telephone-network or cable-system technologies but in providing consumers and businesses with high-speed network access based on Internet technology – whether for data transfers, voice conversations or, eventually, even TV-quality video. While Internet traffic can flow over phone wires or cable lines or even radio waves, the Internet employs a transmission format that is far more efficient and flexible than conventional telephone or cable systems and seems destined eventually to render those conventional systems obsolete."

2.2.3 Open Architecture based on the Internet Protocol

The next major feature of the Internet to emerge was open architecture, and with it, the idea of communication among peers.

The founders of the Internet again:

> The original ARPANET grew into the Internet….The Internet as we now know it embodies a key underlying technical idea, namely that of open architecture networking. In this approach, the choice of any individual network technology was not dictated by a particular network architecture but rather could be selected freely by a provider and made to interwork with the other networks… Up until that time there was only one general method for federating networks. This was the traditional circuit switching method where networks would interconnect at the circuit level, passing individual bits on a synchronous basis along a portion of an end-to-end circuit between a pair of end locations. Recall that Kleinrock had shown in 1961 that packet switching was a more efficient switching method. Along with packet switching, special purpose interconnection arrangements between networks were another possibility. While there were other limited ways to interconnect different networks, they required that one be used as a component of the other, rather than acting as a *peer* of the other in offering end-to-end service….
>
> The idea of open-architecture networking was first introduced by [Bob] Kahn shortly after having arrived at DARPA in 1972….
>
> Kahn decided to develop a new version of the protocol which could meet the needs of an open-architecture network environment. This protocol would eventually be called the Transmission Control Protocol/Internet Protocol (TCP/IP)….
>
> Four ground rules were critical to Kahn's early thinking:
>
>> Each distinct network would have to stand on its own and no internal changes could be required to any such network to connect it to the Internet.
>>
>> Communications would be on a best effort basis. If a packet didn't make it to the final destination, it would shortly be retransmitted from the source.
>>
>> Black boxes would be used to connect the networks; these would later be called *gateways* and *routers*. There would be no information retained by the gateways about the individual flows of packets passing through them, thereby keeping them simple and avoiding complicated adaptation and recovery from various failure modes.
>>
>> There would be no global control at the operations level.

It can be seen that the major features of the Internet were laid down from its inception. Total connectivity of networks was its goal. All vendors and all platforms are treated as equal. All operating systems are treated as equal.

The system is robust and simple. There are no records kept of what passes through the gateways, and, unlike the telephone system, there is no overall control of operations of the system.

2.2.4 Able to support communications using the Transmission Control Protocol/Internet Protocol (TCP/IP)

The goals of the architects of the Internet are achieved by the protocol by which they developed, and by means of which the Internet operates, known as Transmission Control Protocol/ Internet Protocol (TCP/IP, pronounced as the letters would be, tee see pee eye pee). Its key feature was to allow multiple networks to connect to each other. When in the 1970’s developers of the UNIX operating code at the University of California at Berkeley added TCP/IP into their software distribution kit, TCP/IP began a rapid growth spurt, especially in academic environments. In the early 1980’s, the US Secretary of Defense mandated that all computers connected to the ARPANET had to use TCP/IP. From that moment forward, the Internet was born, because TCP/IP gave to every system in which it was embedded the ability to communicate with any other network transparently. Academics and other specialized users embraced TCP/IP because it was essentially no-cost networking, from a software point of view.

A protocol is a definition or set of rules for how computers will act when talking to each other. Protocol definitions range from how bits are placed on a wire to the format of an electronic mail message. Standard protocols allow computers from different manufacturers to communicate; the computers can use completely different software, providing that the programs running on both ends agree on what the data mean.

IP. The Internet Protocol provides a unique 32-bit address for each machine connected to the Internet, and handles addressing and forwarding of packets.

TCP. The Transmission Control Protocol enables two machines to transmit data back and forth in a manner coherent to the operating system of each. It defines the handling of packets, including segmentation, reassembly, concatenation, separation, and recovery of lost packets.

While there are other protocols for the interconnection of computers, TCP/IP has become the dominant partnership.

2.2.5 "Provides services layered *on the communications infrastructure": Grammar for Machines*

Of all the features of the Internet, the one that needs the most careful explaining and which has the most revolutionary implications is the existence of layers of protocol – which are really software instruction sets in the headers of the messages transported over the networks.

The existence of layers in data communications represents a subtle and powerful method for changing how people are able to take advantage of computer networks. Layers provide agreements among people – and the machines they build and program – as to who will do what, when.

Layers are standards. They consist of agreements about the instructions that will be contained in the headers of messages. They are a form of software. Consequently they partake of the economic characteristics of software.

The importance of this point cannot be emphasized sufficiently. The Internet is an open system where new software – new protocols – may be added by a process of consensus within the industry. The effect of these protocols can be to change how the system of signal transmission works. These protocols can be introduced *without one penny being spent on changing any physical object* within the signal transmission system.

Thus understanding the function of layers helps us to understanding why the Internet is driving technological and business change so effectively.

Knowledge of the existence of layers is fundamental to understanding how the Internet works, and why it works differently from previous signal transport media.

There is an organization called the International Standards Organization (ISO, pronounced eyeso) which has developed definitions of network architecture, called Open Systems Interconnect (pronounced o, ess, eye). There are seven layers in the OSI Reference Model. The seven layer OSI cake is an agreed way for computers to communicate, and can be understood as a grammar for machines.

Layer 1: layer one is the physical layer, where the electrical signals move around.

Layer 2: the data link layer. This is the layer that splits data into packets to be sent across the connection medium. The data link layer handles electromagnetic interference. Analog broadcast signals, for example, are not sent with the benefit of a data link layer, and hence they are much more susceptible to sunspot activity and other forms of interference.

Layer 3: the network layer. This layer gets packets from layer 2 and sends them to the correct network address. If more than one possible route is available for data to travel, the network layer figures the best route. The IP (Internet Protocol) works on this layer.

Layer 4: the transport layer. This layer makes sure that packets have no errors and that all the packets arrive and are in the correct order. The Transmission Control Protocol (TCP) works in this layer.

Layer 5: the session layer. A session is the name for a connection between two computers. This layer establishes and coordinates a session. The other protocols that make up TCP/IP sit on layer 5 and above.

Layer 6: the presentation layer. The presentation layer handles different file formats, so that file transfers can be effected between computers using different file formats.

Layer 7: the application layer. This is the level where ordinary mortals do their work: e-mail, requesting a file transfer, and so forth.

While the Internet uses a layered signal architecture, the founders of the Internet decided not to conform to the ISO seven layer model. Rather TCP/IP takes the top three layers, five through seven, and combines them into one, called the application layer. Finally, it is also useful to realize that the physical and data link layers have nothing to do with TCP/IP but TCP/IP must have these layers below it in order to work. The signal must transport across *something*, even the air.

The significance of a layers becomes evident when we see what it enables people to do with computer networks, and it becomes even clear when we contrast what users can do with a computer network running on open protocols versus what cannot be done on proprietary systems.

2.2.6 What is the significance of layers?

The existence of this common grammar for communication between machines allows for people at the periphery of the network – and we are all at the periphery when it comes to machines – to modify how the network will work.

The significance of layers can be summarized in the following points:

- Layers are composed of protocols, which are of their nature software, in all layers above the physical transport layer.
- They are therefore not physical objects but instructions and information embedded in the headers of signals and in the machines that read the headers and route them to their destinations.
- Layers are developed in a collaborative and open process of commentary upon papers by technical experts. Their acceptance by a consensus among experts turns them into an industry standard.
- Changes in one layer will not necessarily affect other layers, unless this is designed into the software.
- The economics of changing protocols are therefore like the economics of software, the more people use it, the more other it becomes a standard, and once a standard, other software can be designed to run on it, in the same way that programs run on Microsoft Windows.
- The economics of telecommunications, and therefore the players in the game, can now be radically transformed.

For example, suppose you had the technical skill to write programs that would address a consumer’s needs. You write a program that solves the problem, say, of knowing whether your friends are on the Internet or not. If you think other people will buy it, you put up a web site and sell it. If enough people buy it, you have created any of the following: a new network standard, a new business, or a new way of communicating. The grammar of machines, TCP/IP, has not changed. But all owners of computers have the ability to buy your product and run it. A common grammar for machines has the effect of creating a common market for all who use those machines. The advantage of the layered model, and a common protocol, is precisely this: no has had to change a single physical device to get a product to work.

The significance of layers can be understood better by seeing the process by which they are created. As was indicated above, layers allow for fundamental improvements in the technical characteristics of the signal transport system because, by segregating various functions from one another, various changes can be made in the protocols of one layer, which will not necessarily affect the operation of others.

The standards that cause the Internet to work are devised by a collaborative group of experts gathered under the title of the Internet Engineering Task Force. The Internet Engineering Task Force (IETF) is a large open international community of network designers, operators, vendors, and researchers concerned with the evolution of the Internet architecture and the smooth operation of the Internet. It is open to any interested individual. The actual technical work of the IETF is done in its working groups, which are organized by topic into several areas (e.g., routing, transport, security, etc.). The creation of new protocols within the session layer proceeds by way of papers put up for comment on email lists. Those with the technical capacity to comment do so.

Currently work is being conducted on the *session layer* within the IETF communities concerned with internet telephony. I have in my possession a recent paper by Professor Henning Schulzrinne, Department of Computer Science, Columbia University, and Jonathan Rosenberg, Bell Laboratories, Lucent Technologies, dated July 2, 1998, titled "Internet Telephony: Architecture and Protocols, an IETF Perspective". Let the authors describe the significance of their work.

> "Internet telephony, also known as voice over IP or IP Telephony, is the real-time delivery of voice (and possibly other multi-media data types) between two or more parties, across networks using Internet protocols, and the exchange of information required to control this delivery. Internet telephony offers the opportunity *to design a global multimedia communications system that may eventually displace the existing telephony infrastructure*, without being encumbered by the legacy of a century-old technology." (emphasis added)

In short, engineers are specifying the protocols by which the signals of the twenty-first century will move about. The exercise of creating protocols is a logical process of specifying what information and functions are to be carried or performed in the headers of the digitized bit streams that constitute data traffic. Below an illustration of the alphabet soup of protocols, called a *protocol stack*, the authors comment:

> "Even though the term Internet telephony is often associated with point-to-point service, none of the protocols described here are restricted to a single media type or unicast delivery. Indeed, one of the largest advantages of Internet telephony compared to the Plain Old Telephone System (POTS) is the transparency of the network to the media carried, so that adding new media type requires no changes to the network infrastructure."

Layering changes the relationship of users to the network

The effect of layers then translates further into economic power for those who can take advantage of the change. The Internet distinguishes different service layers in a parsimonious way, so that each layer can be applied in the widest possible variety of contexts. Clean functional differentiation among service layers, however, means that simple data transport threatens to become a commodity business.

A particularly insightful observer, David Isenberg, a former employee of AT&T Research, has called this "the rise of the stupid network". Contrasting this with the telephone company paradigm of the "Intelligent Network", Isenberg writes:

> "The Intelligent Network is a straight-line extension of …four assumptions … -- scarcity, voice, circuit switching, and control. Its primary design impetus was not customer service. Rather, the Intelligent Network was a telephone company attempt to engineer vendor independence, more automatic operation, and some "intelligent" new services into existing network architecture. However, even as it rolls out and matures, the Intelligent Network is being superseded by a *Stupid Network*, with nothing but dumb transport in the middle, and intelligent user-controlled endpoints, whose design is guided by plenty, not scarcity, where transport is guided by the needs of the data, not the design assumptions of the network."

And further:

> "The {telephone} network works as long as engineering assumptions (e.g., the length of a call, the number of call attempts, etc.) do not change. But let the assumptions change episodically (e.g., Rolling Stones tickets go on sale), or structurally (calls to Internet service providers last several times longer than voice calls), and the network hits its design limits - completing a call becomes a matter of try, try again.
>
> "What if network design were based on another assumption - that computation and bandwidth were cheap and plentiful?"

The layered architecture of the Internet allows totally new players and forces to participate in the evolution of the network, rather than restricting them to the existing telephone companies. Somewhere out there the next Bill Gates of Internet Telephony may be devising software to revolutionize how the network works. In the July 1998 *Cook Report on the Internet,* an interview with François Ménard of Mediatrix Ltd. of Sherbrooke, Quebec, quotes him as saying:

> "So here I am, a 24 year old guy, starting with a clean sheet of paper and saying that I have this idea that Internet telephony can take down the telephone network."

The technical challenge of Internet telephony derives from the layered architecture of Internet protocols. Layering increases the power of users to configure the network to their purposes. Layers detach the manipulation of the software from the underlying transport facilities. One does not have to build one's own transmission system, nor does one have to modify equipment within it, to change how the system will work. If someone builds a better product or service, including a product or service that changes the way the network operates, then all they have to do is to offer it to the public, over the Internet or however they please. Innovators are not obliged to get into the system and change every black box within the telecommunications network in order to make their idea work. The effect of layers is to allow developers to create new businesses and even new standards if enough people adopt the product or service.

The division of communication protocols into layers means that businesses cannot extract revenue from the mere possession of transport facilities. Layers allow for open entry by those who do not own transmission facilities into markets potentially as vast as the number of connected computers.

The Stupid Network

Isenberg again:

> "A new network "philosophy and architecture" is replacing the vision of an Intelligent Network. The vision is one in which the public communications network would be engineered for "always-on" use, not intermittence and scarcity. It would be engineered for intelligence at the end-user's device, not in the network. And the network would be engineered simply to "Deliver the Bits, Stupid," not for fancy network routing or "smart" number translation.

"Fundamentally, it would be a Stupid Network.

> "In the Stupid Network, the data would tell the network where it needs to go. (In contrast, in a circuit network, the network tells the data where to go.) In a Stupid Network, the data on it would be the boss….
>
> "End user devices would be free to behave flexibly because, in the Stupid Network the data is boss, bits are essentially free, and there is no assumption that the data is of a single data rate or data type."

In short, the aspect of the Internet that may have the most subtle and pervasive effect is the breaking down of the communications system into layers. What this accomplishes is to prevent anyone from gaining revenue out of the exclusive possession of distribution channels, be they in "Intelligent Networks" or any other proprietary system. This has dramatic implications for what John Sidgmore, Prsident of UUNet, calls the "central planning models" of telephony and broadcasting.

Telecommunications networks and computer operating systems show both exhibit two important economic phenomena: network effects -- the benefit of using a given system increases as other people use it -- and economies of scale -- the price of the software can decrease rapidly as more people use it. This combination dramatically favors whichever system has the most users. But this creates the need to get to the market first with as cheap a product as possible, and then gradually add to it. In this model, a business can only make money when the services they supply are so good that no one wants to bypass them.

Effects on Pricing

A further implication of the packet switched model is a change in how services are priced. Telecommunications services are priced on circuit-switched assumptions: a call is set up, circuits are opened, a "call" is made, the longer the call, the more is charged; the more bandwidth is asked for, the higher the price. Services differ in price depending on the nature of the customer – business or residential. In a packet-switched environment, the transport layer is always 'on', there is no such thing as a continuous bit stream recognizable as a "call", resources are not consumed by the duration of any particular packet's travel, and customers cannot be distinguished by opening up the header and finding if they are business or residential IP numbers.

Also implied in the packet-switched model is that no one can open up the header of your message and determine what is being carried: voice, video, or sound. There is therefore no basis for price discriminations based on the nature of the signal traffic, only on the quality of service requested out of the network.

Business strategies are in trouble that make access to higher-level services dependent on the exclusive possession of underlying transport facilities. The Internet blows that business model away. It is only a question of time.

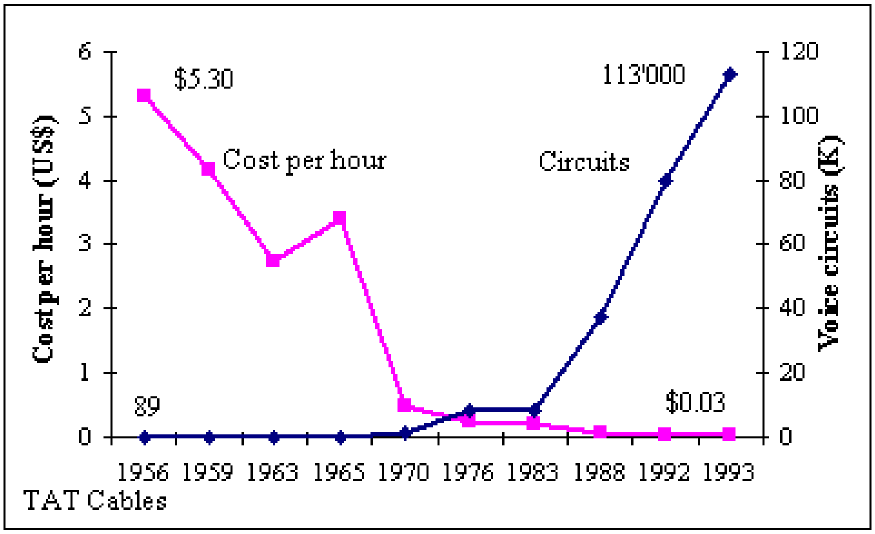
22.2.7 Bandwidth x Computations = Exponential Growth

The cost of computations and bandwidth are dropping like a stone Moore's Law ensures that computations continue to decrease in cost, and the rate of increase of bandwidth and comparable decrease in cost is now overtaking even the astounding improvements in computations. Things are getting cheaper, very, very fast.

A couple of illustrations may be helpful.

Graph 1: Drop in Price of Transatlantic Circuits

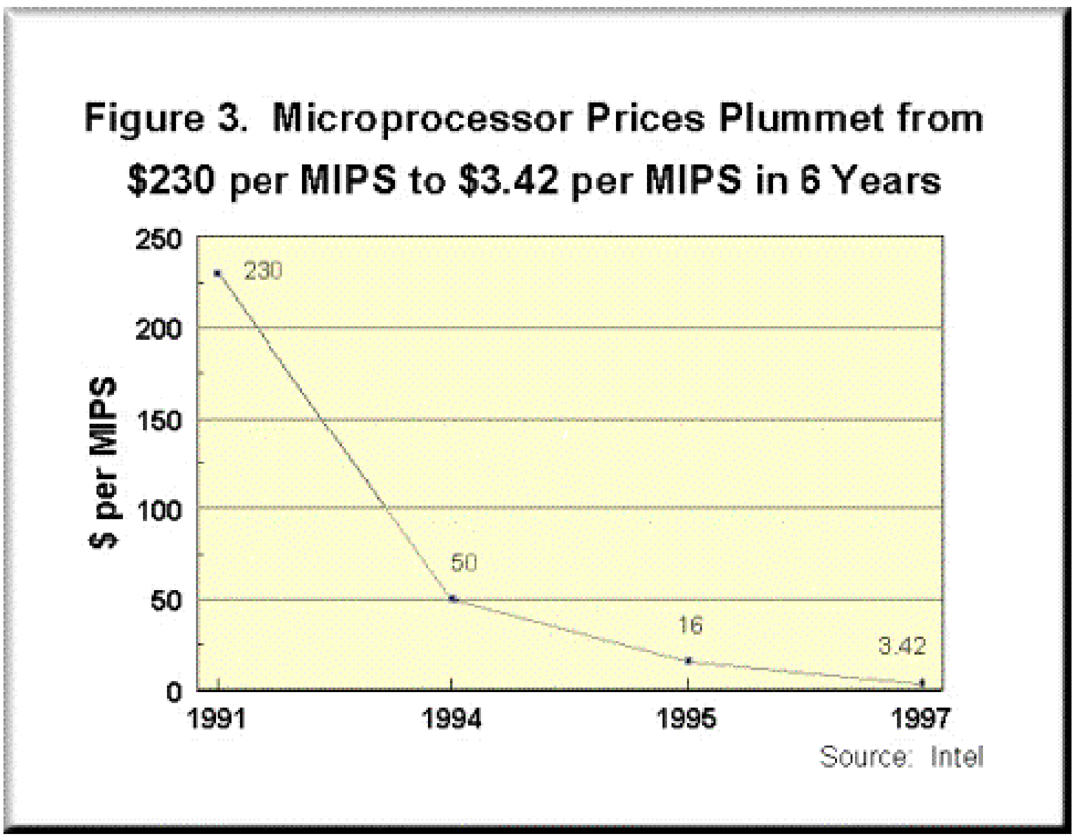
Rise in Capacity, 1956-1993



Source: ITU World Telecommunication Development Report 1995
http://www.itu.int/ti/wtdr95/graphics/ov6.gif

Graph 2: Drop in Price of Computer Power

Measured in Millions of Instructions Per Second (MIPS)



Source: Intel at <http://developer.intel.com/solutions/archive/issue2/focus.htm>

Thus the Internet is designed to take advantage of how the technology is going: faster and cheaper computation, vastly more plentiful bandwidth. This in turn allows entire nationwide telecommunications companies to be built from scratch for ten billion, as opposed to a hundred billion, dollars.

The growth of available bandwidth tells an important story. Generally, increases in voice telecommunications traffic are generally consistent with the growth of the population and economy, in a developed economy. Rates of 5-10% a year are normal. Voice traffic is currently growing around 8% per year. With the Internet, rates of growth are of a different order of magnitude. John Sidgmore, President of UUNet, one of the largest and oldest providers of Internet service, says that his company must double its bandwidth every 3 ½ months to stay abreast of the explosive demand that computer traffic is generating. Doubling every three and a half months is a tenfold increase per year. This is far faster than the operation of Moore’s Law on computing power.

The effects will not take long to be seen. No matter how measured, the Internet is growing like crazy. The point of acceleration of Internet growth starts from 1994, from the invention of the World Wide Web, which permitted the transfer of graphics and text on the same file. By the year 2000, the Internet will be half of all bandwith used in the world. By the year 2003, if that rate of growth continues, that figure will be more than 90% and by 2008 more than 99%. "In a way, we won’t even know that voice is in there. It will become completely irrelevant", says Sidgmore. Provisioning a network growing tenfold a year is an enormous challenge. Sidgmore says that his engineers tell him that, "if you are not scared by this, you just don’t understand."

A somewhat smaller rate of change is predicted by John MacDonald, Chief Operating Officer of Bell Canada. Speaking at the Net98/BCIA Conference at Whistler BC, Mr. MacDonald said that, by his calculations

- Internet traffic is increasing at 10% per month, or 120% a year;
- By 2005, voice traffic will be less than 20% of network traffic; and
- Bell will migrate or evolve into a "network-centric application and platform developer".

The fate of the telephone company’s traditional line of business was represented in the Mr. MacDonald’s slide show as the extraction of revenue from the existing plant as its value drops towards zero. Accordingly, it is safe to assume that, while the senior management of telephone companies may not share Mr. Sidgmore’s enthusiasm for the Internet, they apprehend it to be a fundamental challenge to their "network-centric" business model.

2.2.78 A Globally Unique Address Space

The definition of the Internet made by the Federal Networking Council stated that it was a global information system that

> *is logically linked together by a globally unique address space based on the Internet Protocol (IP) or its subsequent extensions/follow-ons;*

Addresses were central to making computers communicate with each other. In this subsection of chapter two, we look at how the Internet routes traffic to IP addresses.

Internet Protocol assigns an IP number to every device on the net. If you have no IP number, you are not on the Internet. Every resource on the Internet has a unique IP address.

> Every computer (host) on the Internet is identified by an **IP number**
>
> Every IP number is **different** - if two computers had the same IP number, the network would not know which one to deliver data to.
>
> An IP number is a **32-bit binary number**, that is, a string of 32 ones and zeros.

These numbers are converted out of binary notation according a formula that need not concern us.

IP numbers include four address blocks of numbers consisting of numbers between 0 and 256, separated by periods. For an example of IP numbers, go into your Windows system: Start button, to Accessories, to Dial-up Networking. Click on your server, if you have one, and right click on "properties." The first box to click on is "server type", and embedded within that pop-up window will be "server settings". That set of numbers is the IP address of the domain name servers used by your Internet Service Provider. Your own IP number is dynamically assigned by the ISP for the duration of your hook-up from its bank of IP numbers.

The address blocks are separate bytes of a 32-bit address. The growth of the Internet has raised concerns that this number space will eventually be exhausted. As a result, the next version of the Internet's underlying protocol, referred to as IP version 6 or IPv6, includes a much larger 128-bit address space.

The current version of IP gives 256^4 addresses, or more than 4,294, 967,200 addresses.

The next version will accommodate enough IP addresses that the world population will be able to wear or own many devices, each with an IP address.

Domain Names

If the system of IP numbers could be remembered by human beings, we would not have to superimpose on the IP numbering system the system of *domain names* by which products, services, firms and other websites are being called up.

The Domain Name System (DNS) was invented in 1987 by Paul Mockapetris, and stems from work defined by Zaw-Sing Su at the Menlo Park Stanford Research Institute (SRI) and Jon Postel at the Information Sciences Institute (ISI) at the University of Southern California. Jon Postel had been keeping track of "well known numbers" used on the then ArpaNet since 1972 under a US Department of Defense contract.

In March 1992 the US National Science Foundation solicited bids for a five-year contract to run various network registration services. In January 1993 the NSF awarded a contract to a cooperative of Network Solutions, AT&T and a third party which has since become Network Solutions Inc. The contract was set to expire in September 1998.

In May 1994, Joshua Quittner published an article in Wired magazine and described how he registered *mcdonalds.com* and tried to sell it to Burger King. That month, domain registration requests shot up from 2000 a month to 8000 a month and the "great domain name gold rush" began and has not stopped since.

An enormous amount of controversy has arisen inside Internet circles concerning the future of the domain name system. The future management of the Internet is at stake. In legal terms, the issue concerns how the United States government will privatize the remaining functions, including especially domain name management, that have until now been within the jurisdiction of the National Science Foundation. While these debates are of great importance, their outcome will not affect the fundamental technical nature of how the Internet works. They will help to sort out how much international influence will play in the management of domain name administration.

Basically, there are six top level domains: .com, .net, .org, .mil, .gov, and .edu, of which .mil and .gov are reserved for the United States government. There are also 144 national level domains, such as .ca, .uk, and so forth.

The operation of the domain name system complicates but does not change the basic features of the Internet. A request for a website – for example, the Commission's own: http://www.gc.ca.crtc - is sent out from one's computer to one of a very few central computers, most of which are in the United States. These computers return a message to one's server indicating where the website can be found. For example, the top level directory (the *root server*) tells one's server that the supreme *.ca* directory is found at such and such location. One's server then directs its inquiry to the .ca directory. The *.ca* supreme directory then informs one's server that such and such as site, such as *crtc.gc.ca* is found at another server located at an IP address. The connection finally made, the website downloads onto one's screen.

It can be seen that this method ensures that there is plenty of long distance traffic on the Internet – not the PSTN – in the search for any given website. Indeed, more than 90% of Internet traffic transits through the United States because of several factors, one of the most important of which is that most domain name servers are located there.

Internet service providers can sometimes deal with the problem of frequently asked-for websites by storing them at sites closer to the customer. This is referred to as *caching.* An Internet Service Provider automatically will cache websites that customers have browsed on their servers for some period of time before they are deleted. Thus the *Globe and Mail* for instance will be cached locally because of high demands upon that set of web pages. Internet service providers or their customers can also decide to take the entire contents of a website and store it on their own servers. For instance, popular websites from the United States can be stored in the entirety in Australia, China or Europe, thus avoiding the transoceanic download of data from North America, where most Internet material still originates. This practice of copying a complete website onto a local server and changing its IP address is called *mirroring.*

2.3 The World Wide Web

So far this discussion has not mentioned the World Wide Web, the application that has succeeded in making the Internet a household name and a business phenomenon. The omission has been deliberate. All the basic features of the Internet existed before the development of the World Wide Web – the *www* in domain names. But the World Wide Web is a protocol that has greatly added to the power of the Internet – the *killer application* that makes the Internet worth having for millions of people outside university research labs.

The web was originally developed to allow information sharing within internationally dispersed teams, and the dissemination of information by support groups. Tim Berners-Lee, an English physicist working at CERN in Geneva, developed it. It is currently the most advanced information system deployed on the Internet, and embraces within its data model most information in previous networked information systems.

In fact, the web is an architecture which will also embrace any future advances in technology, including new networks, protocols, object types and data formats.

The WWW world consists of documents, and links. Indexes are special documents which, rather than being read, may be searched. The result of such a search is another ("virtual") document containing links to the documents found. A simple protocol ("HTTP", or hypertext transfer protocol) is used to allow a browser program to request a keyword search by a remote information server.

The web contains documents in many formats. Those documents which are hypertext, (real or virtual) contain links to other documents, or places within documents. All documents, whether real, virtual or indexes, look similar to the reader and are contained within the same addressing scheme.

To follow a link, a reader clicks with a mouse (or types in a number if he or she has no mouse). To search and index, a reader gives keywords (or other search criteria). These are the only operations necessary to access the entire world of data.

The WWW model gets over the frustrating incompatibilities of data format between suppliers and readers by allowing negotiation of format between a smart browser and a smart server.

The development of the World Wide Web, starting about 1989, some fifteen years after the basic protocols of the Internet were devised, illustrates as nothing else could the points made earlier about the fundamental openness of the Internet to new services. The entire hypertext system for locating information from arbitrary nodes via browsers was developed independently of the TCP/IP protocols. The reason most of us we know of the existence of the Internet is through the Web, and yet the two have nothing in common save that one rides upon the other.

2.4 Web Searches, Content Filters, and Censorship

Go to any page on the Internet with any web browser. Open up the drop-down menu under "view". Go to "source". A page of hypertext mark-up language appears – the source of the abbreviation ‘html’. Below the visible level of screen text lies the hypertext mark-up language, which tells the computer what functions to perform with the text and graphics presented on a website. Before the development of convenient *html* editors, web pages had to be coded by hand in a tedious process, which has now been automated.

Near the top of the lines in a web page, encoded in *html*, will be found the key words that enable a search engine to search the web. Let us take the example of the Recreational Software Advisory Council for example.

The html code reads as follows:

```
<META name="keywords" content="Recreational, Software, Advisory, Council, RSAC, RSACi, Ratings, Games, Site,Web, Violence, Nudity, Sex, Language">
```

The RSAC is concerned with developing a process whereby search engines and net filters can be made to operate so that parents can control the amount of violence or nudity that their children are able to see on the Internet.

The success of this system lies in the cooperation of website developers to embed *meta* labels in the headers of the html coding of webpages pages.

The meta headers in the Department of Justice pages of the government of Canada contain only the following:

```
<meta http-equiv="Content-Type"

content="text/html; charset=iso-8859-1">

<meta name="GENERATOR" content="Microsoft FrontPage 2.0">

<title>Department of Justice Canada</title>
```

Thus the federal Department of Justice ages would be searched for or filtered according to its title, but not other descriptions. The keywords in the *meta* labels for the World Intellectual Property Association read as follows:

```
<META NAME="keywords" CONTENT="WIPO, industrial property, intellectual property, copyright, neighboring rights, treaties">
```

Likewise the source code for Shealagh Rogers' *Take Five* CBC radio program reads as follows:

```
<meta name="DESCRIPTION" content= "TAKE FIVE with Shelagh Rogers, a classical music program on CBC radio Two, with concerts, music requests, interviews and more.">

<meta name="KEYWORDS" content= "Shelagh Rogers,CBC Radio Two,Playlists, Composers,Canadian Performers,RealAudio,Music Resource links">

<meta name="AUTHOR" content="James Reid:jrlinks@istar.ca">
```

These embedded codes tell search engines how to look for materials on the web. They can also tell content filters what pages it will not transmit back to a person's computer, by the same device. Content filters can block sites according to certain IP addresses, and obvious website titles as well, but the main mechanism by which sites will be blocked are the meta tags in the html code.

One of the key issues for the possibility of control of the contents of the World Wide Web is the use of content filters to block obnoxious web pages from being received. The question might also arise whether content filters might be applied by third parties to restrict the range of sites that others might reach. Could government restrict the range of sites available by technical specifications embedded in html, for instance?

To answer this question we turn to the World Wide Web Consortium (W3C), a group of universities that, founded in October 1994, has as its mandate to lead the World Wide Web to its full potential by developing common protocols that promote its evolution and ensure its interoperability. The creator of the hyper-text mark-up language (html) and founder of the World Wide Web, Tim Berners-Lee, is its head. PICS (the Platfom for Internet Content Selection) is a system of labelling and filtering that was developed under the auspices of the W3C, which maintains an extensive website dealing with content selection issues. PICS explains what it is about:

> "The **PICS** specification enables labels (metadata) to be associated with Internet content. It was originally designed to help parents and teachers control what children access on the Internet, but it also facilitates other uses for labels, including code signing and privacy. The PICS platform is one on which other rating services and filtering software have been built."
>
> "PICS is a set of technical specifications that facilitate recipient-centered controls on Internet content, rather than sender-centered controls.
>
> "The PICS Rules specification provides a common format for expressing filtering criteria, which makes it easy for one entity to set filtering criteria which are then installed and run by someone else. For example, a parent might, with one mouse click install filtering criteria suggested by some trusted organization, say a local church group, even though that organization provides neither rating labels nor the filtering software."
>
> The system has two obvious features.
>
> First, the system relies upon the embedding in the meta files of *html* of appropriate words that allow a search engine or content filter to block out the page.
>
> Second, each person in charge of his or her own computer has to take affirmative steps to block sites.

How does this system lend itself to the cultural control of signals in cyberspace? The PICS site answers in the following manner.

> There are six roles that could all be filled by different entities:
>
> - Set labeling vocabulary and criteria for assigning labels
> - Assign labels
> - Distribute labels
> - Write filtering software
> - Set filtering criteria
> - Install/run filtering software
>
> PICS itself actually fills none of the six roles listed above! PICS is a set of technical specifications that makes it possible for these roles to be played by independent entities.

Could the responsibility for making decisions about which web sites could or could not be accessed be taken out of the hands of individuals and placed in the hands of government? How practical would a system of control of distribution channels be? The question is not absurd; we live in an environment where the control of distribution channels has been practiced since the *Broadcasting Act* of 1932, or the *Wireless Telegraphy Act* of 1905, and comparable levels of regulatory control of broadcasting is almost universal. In its response to issues of political control through labelling, the W3C states:

> **Could governments encourage or impose receiver-based controls? Does PICS make it easier or harder for governments to do so?**
>
> Yes. A government could try to assume any or all of the six roles described above, although some controls might be harder than others to enforce. As described below, governments could assume some of these roles even without PICS, while other roles would be harder to assume if PICS had not been introduced. It's important to note that W3C does not endorse any particular government policy. The purpose of this FAQ is to explain the range of potential policies and to explore some of the impacts of those policies on both the climate of intellectual freedom and the technical infrastructure of the World Wide Web. Potential government policies:
>
> **Set labeling vocabulary and criteria.** A government could impose a labeling vocabulary and require all publishers (in the government's jurisdiction) to label their own materials according to that vocabulary. Alternatively, a government might try to achieve the same effect by encouraging an

industry self-policing organization to choose a vocabulary and require subscribers to label their own materials....

Assign labels. A government could assign labels to materials that are illegal or harmful. This option is most likely to be combined with government requirements that such materials be filtered but it need not be; a government could merely provide such labels as an advisory service to consumers, who would be free to set their own rules, or ignore the labels entirely. If a government merely wants to label, and not impose any filtering criteria, then PICS again provides some assistance because it enables a separation of labeling from filtering. On the other hand, a government that wishes to require filtering of items it labels as illegal gets little benefit from PICS as compared to prior technologies, as discussed below in the question about national firewalls.

Distribute labels. A government could operate or finance operation of a Web server to distribute labels (a PICS label bureau); the labels themselves might be provided by authors or independent third parties. Taken on its own, this would actually contribute to freedom of expression, since it would make it easier for independent organizations to express their opinions (in the form of labels) and make those opinions heard. Consumers would be free to ignore any labels they disagreed with. Again, since PICS separates labeling from filtering, it enables a government to assist in label distribution without necessarily imposing filters. If combined with mandatory filtering, however, a government-operated or financed label bureau could contribute to restrictions on intellectual freedom.

Write filtering software. It's unlikely that a government would write filtering software rather than buying it; the supplier of filtering software probably has little impact on intellectual freedom.

Set filtering criteria. A government could try to impose filtering criteria in several ways, including government-operated proxy servers (a national intranet), mandatory filtering by service providers or public institutions (e.g., schools and libraries), or liability for possession of materials that have been labeled a particular way. In some ways, by enabling independent entities to take on all the other roles, PICS highlights this as the primary political battleground. Each national and local jurisdiction will rely on its political and legal process to answer difficult policy questions: Should there be any government-imposed controls on what can be received in private or public spaces? If so, what should those controls be? Most kinds of mandatory filters could be implemented without PICS. A government could express its required filtering criteria in the form of a PICS Rule that everyone would be required to install and run, but without PICS Rules a government could express its requirements in less technical form. One potential policy, however, mandatory filtering based on labels provided by non-government sources, would have been difficult to impose without PICS.

Install/run filters. A Government could require that filtering software be made available to consumers, without mandating any filtering rules. For example, a government could require that all Internet Service Providers make filtering software available to its customers, or that all PC browsers or operating systems include such software. Absent PICS, governments could have imposed such requirements anyway, since proprietary products such as SurfWatch and NetNanny are available.

Since PICS makes it easier to implement various kinds of controls, should we expect there to be more such controls overall?

Yes; all other things being equal, when the price of something drops, more of it will be consumed.

Does PICS encourage individual controls rather than government controls?

Yes; for example, a national proxy-server/firewall combination that blocks access to a government-provided list of prohibited sites does not depend on interoperability of labels and filters provided by different organizations. While such a setup could use PICS-compatible technology, a proprietary technology provided by a single vendor would be just as effective. Other controls, based on individual or local choices, benefit more from mixing and matching filtering software and labels that come from different sources, which PICS enables. Thus, there should be some substitution of individual or local controls for centralized controls, although it is not obvious how strong this substitution effect will be. In both Europe and Australia initial calls for centralized controls gave way to government reports calling for greater reliance on individual recipient controls; the end results of these political processes, however, are yet to be determined.

The answer seems to be that, in order to control the distribution channels in the same fashion as broadcasting distribution channels are controlled, something like a national firewall would have to be constructed.

An effective national firewall would make it possible for a government to impose filtering rules on its citizens. A firewall partitions a network into two components and imposes rules about what information flow between the two components. The goal of a national firewall is to put all the computers in the country into one component, and all computers outside the country into the other component. This is difficult to do, especially if people deliberately try to find out connections (e.g., telephone lines) between computers inside the country and those outside the country. Given a successful partition, however, PICS could be used to implement the filtering rules for a firewall. In particular, the government could identify prohibited sites outside the country that people inside the country could not access; such a filtering could be implemented based on PICS-formatted labels or, without relying on PICS-compatible technology, with a simple list of prohibited URLs (Universal Resource Locators, or website addresses).

Given the integrated nature of the North American telephone system, it is impossible to police the ability of people to connect computers through the telephone system. Consequently, the ability to set up a firewall of the type mentioned above is effectively nil. On the other hand, the ability of states to set standards through content labelling and filtering systems appears to be a quite real possibility. For instance, Canada, alone or in concert with other nations, could establish a PICS vocabulary. Since 85-90% of Internet traffic comes from outside the country, a purely national PICS vocabulary would be of little use or effect.

Nevertheless, a scheme of content rating and filtering has little in common with the regulation of a broadcast distribution medium as it has been practiced until now in Canada and elsewhere. Labelling and filtering may assist the enforcement of laws of general application, such as those dealing with pornography or other criminal infractions. To that extent, they have faced opposition from civil liberties groups. However, laws of general application can apply to the Internet, such as packaging laws apply to all physical products. Schemes for labelling and filtering do not appear to have equivalent technical results of broadcasting distribution regulations, unless of course the entire telephone system were somehow to be brought under very tight control, which for technical reasons would be impossible and which would most likely be considered unconstitutional.

Consequently, when we look at the cultural regulation of signals in cyberspace, we are required to start from fundamentally different premises of how regulation would work. The supply of signals cannot be constricted by the nature of the then prevalent technology, as was the case in broadcasting, or by efficient technical means. Filtering and labelling systems promise only that, if applied, people will be empowered to limit their access to the potentially infinite amount of stuff on the Internet. No one can efficiently or inevitably limit it for them.

Table 1:

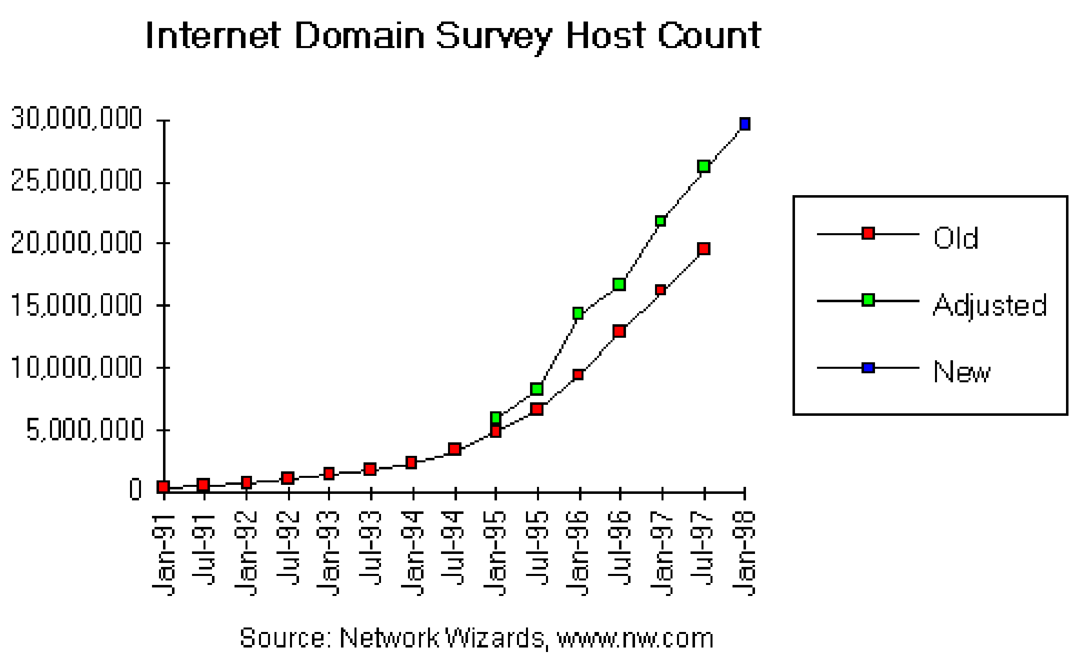
Growth in Number of Internet hosts

Date	Hosts
Aug 81	213
May 82	235
Aug 83	562
Oct 84	1,024
Oct 85	1,961
Nov 86	5,089

Dec 87	28,174
Oct 88	56,000
Oct 89	159,000
Oct 90	313,000
Oct 91	617,000
Oct 92	1,136,000
Oct 93	2,056,000
Oct 94	3,864,000
Jan 96	9,472,000
Jan 97	16,146,000
Jan 98	29,670,000

Source: Network Wizards <http://nw.com

Graph 3



The Distribution of Signals in Cyberspace

Chapter Three: What does the Internet mean for Cultural Regulation?

3.1 Purpose of this Chapter

The purpose of this chapter is to look at some of the basic legal ideas we have about cyberspace, to see how it might be possible to continue some form of cultural regulation there. In so doing we shall look at various approaches to law and regulation in other spheres of activity as possible models for cyberspace.

3.2 What has been shown

The first chapter showed that television has been informed by certain capacities on the part of government to exclude signals and control distribution channels. The second chapter showed that the Internet has been deliberately constructed in such a way that distribution channels have as little effect as possible on the signal made available by a sender and received by the person requesting the signal. Thus the Internet changes our received ideas about the relevance of distribution channels for regulation of any kind. In both television and telephone systems - each in different degrees and each by different means - the distribution channel plays an important role in determining the capacities of the system. With the arrival of the Internet, the notion of a distribution channel combining both content and transport becomes an artifact of previous technologies. The division of the signal transport system into severable layers of protocol and physical media was designed to make the system indifferent to the limitations of the physical media of transport and transparent to the end users. The separation of the signalling system into layers causes a parsimonious assignment of different tasks to the various layers of protocol, with the result that different economic actors can specialize in the various layers. Therefore, if the concern is the content of the message - the programming - then policy in relation to the content has to account for the decoupling of ownership of the transport medium from influence over the signal.

3.2.1 Review of Chapter One

The first chapter showed that cultural regulation, as practised by the federal government over airwaves, relied on its having ultimate control over spectrum assignment and over radio transmitting devices. This control has been justified in terms of the scarcity of spectrum, and also for a somewhat different reason, that radiocommunication relies on the coordination, by governments or international agreements, of the uses to which radio spectrum can be put. Absent this coordination, frequencies become unusable, as long as people use signal propagation techniques where interference is possible, such as the analog frequency division system we are used to.

Whatever the justifications, use of the radio spectrum has always been conditional on the possession of a licence from the state. Making broadcasting conditional on the possession of a licence means that broadcast programming is subject to an authority that printing has escaped. The subordination of cable to broadcasting followed in both Canada and the United States. Coaxial cable was captured by the broadcasting industry through judicial decisions. The carriage of programs on cable was subordinated to the then prevailing ideas about television: that it was to be free (advertizer-supported) and local. The regulator was assigned the task of making the cable industry conform to the requirements of broadcasting policy.

Though the policies in the two countries differed on the issue of Canadian content, in many other respects they were identical. What a cable company could carry was subjected to rules that favoured the carriage of local television stations. The freedom of the cable operator to buy programs and show them was suppressed, in favour of the television licencee. The introduction of pay television was delayed for many years in both countries because of concerns for the health of the advertizer-supported local television licencee. Gradually, television has become less local. "Distant" signals were allowed - where distant meant further away than the broadcast range of a TV transmitter on a nearby hill. More programming is available because regulators permitted cable specialty channels, which are financed through viewer subscription more than by advertizing. The subscription model has allowed the development of many more specialty channels than television advertizing alone would support. It has now reached the point, with roughly fifty channels available, that the real limit on television as we know it may be the capacity of the industry to find interesting scripts and story ideas, capable of being financed, rather than a shortage of channels per se.

Though our ideas of television have evolved, and regulation has kept pace, our notion of television is culturally static. We watch it for the same reasons we watched in the 1950's: entertainment. Today we enjoy much more choice, but we still lean back to watch television, rather than lean forward into the computer screen. At 98% household penetration, people believe that television is good value for the money. Though many have not been able to successfully program a VCR, the interface device between the TV set and the user - the channel changer - is understood by all. TV is user-friendly.

There is not enough capacity for everyone that wants to be a television station to be one. From that fact flows a series of features of the television programming universe. The primary feature of broadcasting is the one-to-many model. Unlike the computer-enabled Internet model, communication is not from peer to peer, but from the entity having the signal to a dumb receiving terminal. The few continue to broadcast to the many. The technology that delivers the signal makes "appointment television" an inescapable reality. The technology embedded in the television set of the 1990s still reflects the assumptions of cost, bandwidth, and available machine intelligence of its origins in the early 1950s.

The same limitations on how many people can distribute television programs have had the effect on ensuring that television would be considered part of the public space of society. Both critics and fans of television assume that it serves public goals. Judicial decisions regarding the right of the state to intervene for the public good in radio and television broadcasting have been predicated on the belief that it was in some fashion already in a public space, pervasive, using scarce public resources, or partook of some quality that justified a degree of regulation to which print and pulpit were not subject.

The means whereby the government has achieved these goals depend on certain technical features of broadcasting transmitting and receiving technologies. These technical features are not shared by computer networks linked by the Internet protocol.

3.2.2 Review of Chapter Two

In Chapter Two we examined the newer computer-driven packet-switching technologies that constitute the Internet. These features can be summarized as follows:

- communication is from peer to peer, not from client to server or master-slave; intelligence is embedded in the signal itself;
- the signal travels on a software-dependent path through various physical media but independently of them;
- layers in the signalling protocol ensure that signals are not dependent upon an intermediary setting up, switching and taking down a circuit;

- layers also ensure that innovation can be introduced from the edge of the system - enormous costs of re-engineering the transport system are avoided because it does not have to be changed to allow for new products and services;
- this further implies that innovation can be introduced by people who do not own the physical transport facilities, since all that is being changed is software, and only on the consent of the person agreeing to use the innovation in his computer;
- access to this series of privately-owned computer networks now takes place principally through the public switched telephone system, but this is not a necessary feature of the Internet so much as an accident of history;
- programming languages, such as HTML and XTML, will allow for content rating systems, but these cannot be used to prevent access to websites unless the user agrees that they should;
- since the further effect of layers is to segregate the signal's content from the physical medium of transport, revenue cannot be extracted from a customer by the mere ownership of a transportation medium;
- services, once decoupled from the transport medium, can be created, bought, and sold from any point on the globe, and partake of the same economics of production as does software;
- every point on the Internet has a permanent or temporary IP address, so that no signal can be received without one.

Thus IP-based computer networks are very unlike broadcasting in almost every single technical respect. They are also very unlike the circuit-switched telephone system. Both broadcasting and telephony have this in common, that the end user is essentially powerless to affect its technical characteristics. The possibility of changing how people use the Internet, and how the Internet actually functions, is a reality based in the layered signalling architecture, which enabled, for instance, Tim Berners-Lee to invent the World Wide Web, which turned the Internet from an academic specialty into the phenomenon it is today. Whether or not the original architects of the Internet understood the full implications of what they designed, they nevertheless have accomplished a technical revolution.

3.3 A Word about Other Program Distribution Technologies

A question implicit in this paper is the timing of when the Internet will start to affect, and then transform, television.

Prophecy is dangerous and difficult in the field of communications and computers. The principal difficulty is in determining the timing: the moments when a phenomenon transforms from something anticipated by visionaries, then known only to specialists, to something introduced at the office, then the stuff of conversation in check-out lines at the market. Computers and email have gone through these phases since the introduction of the personal computer back in the mid-seventies. Grandmothers now talk of keeping in touch with their children through e-mail. By the same token, the Internet and the World Wide Web are on their way to becoming commonplaces. Convergence, the blurring of frontiers between telecommunications, computer, audio-visual and publishing technologies, services and industries, is moving through these phases of public understanding now.

The telephone system constitutes one of the world's largest social, economic and engineering artifacts, rivalled only be the world's postal systems in size and importance. Any change to something so vast may take decades to play out. Broadcasting will be equally slow to change. It is a salutary reminder, to those who think change would have come faster, for how many years competition in long distance service was anticipated before it became a reality. Likewise liberalization of telecommunications services is only just beginning in most places in the world, and billions of people on this planet have never placed a telephone call. Despite much effort local telephone competition is only beginning and is still not significant. Spectrum auctions are only recently being tried.

The slow pace of apparent change always justifies those who doubt its importance or reality. There are always those who doubt that $e=mc^2$ until they see the bomb go off. But the farsighted understand that rapid change is possible, and plan for it as best they can.

On the other hand, there are plenty of reasons why the Internet is only a distant threat to Canadian sovereignty over broadcasting. Existing bandwidth available to the home is either inadequate or scarcely adequate for full-motion video delivery of a kind that would rival the functionality and bandwidth available from the television and from cable.

However, improvements in compression technology, coupled with the development of protocols for multi-media, and the ability of the cable system to offer IP-based signals, could change this situation very rapidly. In addition, it can be argued that existing technologies, such as high-powered direct broadcast satellites, may pose a more immediate threat to the continuance of effective cultural regulation of television and radio.

These two facts suggest that the Internet will not have a significant direct role in the distribution of what we could call television programming to a significant number of Canadian homes within the next five years. Improved satellite receiving technologies may be a much more immediate threat to the cultural objectives of the Broadcasting Act. But this speculation could be as wrong as Lord Kelvin's prediction that nothing heavier than air could fly, or Thomas Watson's 1945 prediction that the world would only need about five computers.

As technology forecasting is outside the boundaries of this paper, it is not appropriate to guess when the Internet will make itself felt in broadcasting. Clearly, people are spending more time in front of computer screens working or amusing themselves, and this must inevitably cut down on time available for television. Advertizing dollars are being shifted towards the Internet, though this amount is relatively trivial compared to the billions poured into broadcast television.

More than this, the huge installed base of television sets, sitting in more than 98% of Canadian homes, indicates that, as long as they remain, and as long as computers remain such relatively difficult devices to use, television as we have come to know it has several decades of life left. This would tend to suggest that broadcasting regulation will survive at least as long as people wish to watch "appointment" television.

But when people come to watch something called ‘television’ which is actually a device slaved to a computer receiving signals from the Internet, all bets are off. It should be noted that the protocols discussed in Chapter Two are not limited in their application to voice communications but are inherently capable of moving ‘television’ signals through IP networks to their destinations.

3.4 Is it Broadcasting?

The question whether what we now call television programming will become "broadcasting" when delivered over an IP network is beyond the scope of this paper to answer. The question can only be authoritatively resolved by the courts. In the case of *ACLU v.Reno*, the US federal Court of Appeals, affirmed by the US Supreme Court, ruled that the Internet was not broadcasting on several grounds. It was distinguished from broadcasting by the deliberate searching out of sites that must be engaged in before a website could be accessed. It was also found to be characterized by low entry barriers, that the number of voices available were not limited by spectrum scarcity, and that it deserved the constitutional protections afforded to speech and printing, rather than the more narrowly construed protections afforded to broadcasters.

A Canadian court might weigh the factors differently, or feel more concern for cultural identity issues, than the US courts have done.

If Canadian courts determine that "programming", as defined in the Broadcasting Act, is still "broadcasting" when delivered by the means afforded by the Internet, the problem of cultural regulation of cyberspace does not exist as a legal and constitutional issue, although for other reasons it may be practically impossible to use the regulatory tools available in the Broadcasting Act. The analysis that follows assumes for the purposes of this paper that the Internet will be found not to be "broadcasting" by Canadian courts, as that term is defined in law. *This is not a legal opinion but a postulate.*

3.5 Various Possible Legal Regimes

Cyberspace is divided into three parts: broadcasting, telecommunications, and the rest, principally computers and data networks. Broadcasting and telecommunications each have their statutes and specialized agencies to implement them. These sectors are subject to significant measures of economic regulation.

The rest principally consists of what we would now call computer communications, and it is the domain of free economic competition. This portion of cyberspace is governed by the Competition Act in Canada and by the Sherman Anti-Trust Act in the United States. It is from this zone of competition that computers and the Internet have emerged. It is a fact that the Internet received significant government investment in its early days, and that the US government still has residual functions in relation to domain names and IP numbering assignments. Nevertheless, the Internet is governed by the same laws as govern the manufacture of toothpaste, cement, newspaper publishing and all the other myriad products and services of modern society. The basic rule of the free market is that competition prevails. In this sector, the relevant issue is whether anti-trust action is justified in relation to Microsoft.

Broadcasting, telecommunications, and electronic publishing can also be looked at from a slightly different perspective – the degree to which they are subject to cultural regulation. Computer-based communications have generally been dealt with as another form of publishing, and subject to the same broad rules as apply to written communication or speech. Broadcasting as we know has been the object of intense cultural regulation.

Regulation and the Rule of Law

In order to discuss legal regimes it is necessary to clarify terms. Generally speaking, speech and broadcasting may be said to be regulated, though the words are used in an equivocal sense. Broadcasting is licensed activity. Printing, publishing and speech are not. "Regulation" in this context will be taken to mean "subject to the licensing authority of the state". Printing, publishing and speech will be described as "subject to laws of general application."

The difference is obvious but may be illustrated better by an example. A speed limit is an example of a law of general application. If you do not exceed the speed limit, you will never be stopped by a policeman for speeding. Obedience to a law of general application means freedom within that law. Your driver's licence, however, is a legal privilege issued by the state according to certain criteria. Once in your possession, you do not need anyone's permission to drive anywhere. Penalty points for traffic infractions are legal criteria for limiting one's right to drive a car, up to the point where enough infractions eliminate the right to hold a licence. The distinction between a law of general application and regulation, in this sense, is the absence of anyone in authority having to make a judgment about one's right to do a thing. As much as possible in the discussion that follows, I shall try to use the word "regulation" in the sense that something is subject to the discretion of an authority, whereas "subject to a law of general application" implies that no one has to make a judgment about one's fitness to do a thing. In that sense, "regulated" has a different connotation than "subject to the rule of law". Unfortunately the English language does not possess a short word for the concept.

Though the Internet operates on different technical principles than previous communications media, it is, at various points, within the jurisdiction of states to affect or influence. For instance, no one has questioned the right of the police to prosecute child-pornography offences simply because the means of transmission was the Internet. Nor has commentary on the Internet been found immune to actions in defamation. Accordingly, John Perry Barlow's "Declaration of the Independence of Cyberspace" is premature, if not merely wrong. Speech continues to be regulated by laws of general application even though no one needs pre-clearance of government to speak, preach or publish. Likewise, domestic laws governing printing and publishing apply to materials published from Canada to the Internet. Jurisdiction may be more difficult to assert where it is unclear where a thing has been published, or where multiple jurisdictions are involved. However, merely legal difficulties of determining appropriate jurisdiction for prosecution do not overturn the principle at issue.

Publishing and speech have been governed by different approaches than broadcasting, on the one hand, or telecommunications common carriage, on the other. The issue for cultural regulators is what to do when the tools available to broadcast regulation can no longer be effective, owing to changes in delivery technologies.(Again it must be emphasized that the actual legal questions regarding the application of the Broadcasting Act to the Internet are assumed away in this analysis.)

Accordingly there are several orders of question:

1. Can public purposes be asserted over the Internet?
2. Can certain forms of speech or cultural expression be favoured?
3. Can certain forms of speech or cultural expression be excluded?

4. What are the prospects for cultural regulation of the Internet?

3.5.1. Can public purposes be asserted over the Internet?

Yes. Expression on the Internet is already subject to laws of general application governing speech and printing. The question whether such speech may be subject to the licensing authority of government is excluded from this discussion.

3.5.2. Can certain forms of speech or cultural expression be favoured?

Yes. Subsidies to producers, by lowering their perceived costs of production, encourage the production of more of what is subsidized.

3.5.3. Can certain forms of speech or cultural expression be excluded?

Legally, the Criminal Code is already being used to prosecute certain obnoxious forms of self-expression on the Internet. In addition, Internet service providers follow a `notice and take-down policy', whereby after an opportunity to respond, Internet service providers will remove certain sites that offend the Criminal Code.

For technical reasons explained in Chapter Two, it would be exceedingly difficult to remove all offensive sites from the Internet, as the addressing system is inherently global. Consequently, international standards and agreements, coupled with appropriate labelling and filtering software - which is still being developed - may serve to control the access of minors to particular sites. However, the ability of any national authority to exclude the reception of a foreign site from its territory is virtually nil in a country with an advanced telecommunications system.

3.5.4. What are the prospects for cultural regulation of the Internet?

The Internet is subject in principle to laws of general application within a national jurisdiction, and can be made subject to international treaties regarding rating systems, and to some degree, to technical operating standards.

For various reasons that have been advanced in the course of this paper, it is doubtful that the kind of licensing system that has applied to broadcasting could work in regard to IP-based computer networks. An IP number might lead to a source of "programming" or it might monitor a refrigerator or a thermostat. Moreover, the tools that will shortly be available to everyone will allow people to create their own "television". Every IP number is a potential source of programming, as it is of almost any other kind of signal. Any kind of central planning model is irrelevant to this technical scheme. This does not mean that cultural regulation is impossible, on the contrary, it means only that society will have a much larger role to play in formulating and agreeing to abide by whatever rules are found suitable.

3.6 Enterprise Regulation and Transaction Regulation

The remainder of this chapter looks at various models for how the law conceives of a topic and deals with it. Are there other possibilities for coping with cultural regulation in cyberspace?

Regulation, or laws of general application, could apply either to the enterprise, or to the transaction. An example of enterprise regulation is the Broadcasting Act. An example of regulation of the transaction would be the Copyright Act, where the object itself carries rights.

3.6.1 Enterprise Regulation

In order to proceed with the analysis, we have to come back to the three basic divisions of law regarding communications: broadcasting, telecommunications common carriage, and publishing.

If cultural regulation is to apply to certain kinds of communication in cyberspace, these three models are available to regulate or provide the legal framework for the enterprise engaged in the production and dissemination of signals. This is not to say these models will actually fit without further modification.

For the sake of this analysis only, we have assumed away the applicability of the *Broadcasting Act*. The purpose of doing so is to see whether in either the common carrier model or the printing and publishing model there is scope for some form of effective cultural regulation.

The issues were set forth with elegance and prescience in the classic book, *Technologies of Freedom*, as far back as 1983. Pool foresaw that, given these three different models for regulation of speech, convergence of technologies into a computer-driven publishing system would confront policy makers with choices among conflicting legal ideas that underlay the then different delivery technologies. For him the fear was that the licensing and other constrictions appropriate at one time to broadcasting would continue to be applied to signals in cyberspace, rather than the unlicensed system of publishing that applies to older media like printing and speech.

These three domains of law are ways of regulating (there is no short term for "subjecting to the rule of law") the enterprise that carries on the activity in question.

3.6.2 Transaction Regulation

The second possibility is that, rather than regulate the enterprise, the actual transaction will be the subject of regulation or laws of general application. In that case, defining the nature of the transaction becomes the relevant issue. The current Broadcasting Act focuses on "programming", which essentially means `full-motion video' when the legalities are stripped away. What is it about television programming, for instance, that would make it conceptually different from downloading an interactive computer game? or doing one's banking?

It may be helpful to illustrate how the law might look at an enterprise or a transaction by the following table. The examples chosen are illustrations, and no significance should be attributed items found in the same rows. Several other categorizations might be as helpful.

A Scheme Illustrating how the Law Might Categorize the World

Regulation of the Enterprise		Regulation of the Transaction		
Relatively unregulated framework approach	industry specific regulation	Rights determined by the nature of the thing	Ways of forming rights in things	Human rights and civil status
Competition Act	Broadcasting	Copyright	Laws of contract	Charter Rights
The common law (jurisprudence)	Radiocommuni-cations (radio spectrum)	Real estate	Consumer protection acts	Criminal Law - Pornography and hate speech
	Telecommuni- cations	moveable goods	Civil liability - torts	Defamation and libel actions
		Other rights in intangibles	Professional liabilities	Privacy codes and human rights codes

More coherence and finality should not be ascribed to this illustration than it deserves. It merely sets out an example of how enterprises and transactions could be categorized, and the means available to treat them.

The table treats human interactions as non-monetary exchanges involving human rights, so that they are classified under "transactions".

The question for us is how the Internet, and how transactions on the Internet, could be treated, if it were desired to favour certain forms of Canadian cultural expression.

Let us begin with regulation of the enterprise.

3.7 Regulation of the Enterprise

3.7.1 General Frameworks

Regulation of the enterprise refers to laws and actions that govern the enterprise by rules. These rules can apply to all economic actors in society, or can apply to particular kinds of enterprise. Framework legislation is the term for rules applying to all economic actors.

Competition Policy

Under this category, the Competition Act provides the model for all economic actors to follow. It proscribes a series of offences, some criminal, some civil, that actors in the economy might take against open competitive markets. It assumes that economic competition is the normal process for sorting out the viability of players, products and technological processes. It favours competition, not competitors, so that the fate of individual competitors is not the concern of the Act or the people who manage competition policy. Industry-specific regulation, such as applies to telecommunications, brewing, broadcasting, railways and parts of agriculture, is treated as a defence to the application of the Competition Act. Accordingly, in spirit and practice, the Competition Act is antithetical to measures that would favour certain kinds of cultural enterprise.

The Common Law

Another general framework that needs to be more fully considered in times of rapid technological change is the common law.

The common law is not so much a category of law as an approach to law-making itself. It is contrasted to statute law, which is the normal means employed by government to deal with complex issues such as telecommunications or copyright. Common law emphasizes a particular style of making decisions: narrowly, on the facts of the case, one at a time, subject to review by higher courts, subject to being distinguished on different facts. It appears to take longer to evolve, since it involves adjudication of the rights of private parties, rather than the mediation of the state among organized interest groups. If a ruling provides the right balance between the claims of the parties, or produces a sensible and enforceable rule, it tends to be adopted, rather than distinguished, by other courts. As judges face new and unfamiliar issues, conflicting judgments are issued. But as knowledge of the issues grows and the implications of rulings become clearer, rules evolve into a sensible balance among conflicting interests.

Statutory law is created by government working in conjunction with organized interest groups, in a process of public hearings, private consultations, and lobbying. Statute law tends to provide a comprehensive view of the issues and embodies the policies that government and Parliament think are required at the time of the passage of the bill. Statute law also tends to give rise to specialized agencies of government. It is significant that each of the major pieces of federal statutory law: copyright, telecommunications, broadcasting, and competition, have separate agencies for the enforcement of rights and obligations created by those statutes.

A common law approach to the major issues of cyberspace would mark a significant departure from the statute-and-agency approach that has prevailed in Canada and the United States up to this point. The major issues would include freedom of speech, privacy, and copyright. A common law or jurisprudential approach would rely more on private litigation to vindicate rights and to establish the appropriate boundaries of behaviour and private property in cyberspace. Adopting this approach would be consistent with the emergence of a spontaneous, coherent, and rational order, deriving from the interests of many different players in society.

Relying more on private players to litigate their rights in cyberspace may be an appropriate response when the rate of technical evolution is too fast, and the conceptual models too rapidly obsolete, for a statute-and-agency approach to rule-making.

A further reason for considering the common-law approach to cyberspace is that it is the one that already applies to publishing. Moreover, as the Internet increasingly becomes used for transactions, such as sale of goods or services, it will be seen that what is at issue is the behaviour of people towards one another and not the medium through which they are conducting their business. Commercial and other transactions are judged in law by their inherent qualities rather than by the media through which they are effected.

Whether such an approach would have any relevance to the protection of rights in and promotion of Canadian cultural content in cyberspace is difficult to say. But relying more on common law would mark a departure from the statute-and-agency model we adopted in the 1930's. It also has the merits of allowing time to pass, for issues to become clearer, for errors to be made without fixing them in place for decades, and for relieving us of the necessity of coming up with a coherent set of balanced ideas at one time and place, that will allocate rights and responsibilities appropriately throughout cyberspace.

Of the three models for regulating speech in cyberspace, broadcasting, common carriage, and printing, only the latter is currently subject to laws of general application, such as the Competition Act, free from state licensing, and subject to the rules of law as regards publications. The recent legal analysis conducted for the Department of Industry, "*The Cyberspace is not a No-Law Land*", described the legal obligations and penalties governing published materials in close to 300 pages of well-researched text. However, the obligations and penalties that apply to newspaper publishers nowhere include seeking prior permission of anyone to publish, neither are they required to show balance in their treatment of issues, or subject to revocation of their right to publish by public authorities.

If the enterprise model of regulation should fail for any reason to apply to content producers on the Internet, we have at our disposal a well-understood and in some cases centuries-old tradition of law and precedent to rely upon. This tradition has favoured publications through postal and other subsidies and tax breaks that have assisted reading, while at the same time avoiding licensing. The ability to subsidize certain forms of cultural consumption in the future, having regard for Canada's trade commitments, is beyond the scope of this study, but is an issue that should be studied.

3.7.2 Industry-Specific Regulation

Common Carrier Regulation and the Telecommunications Act

The Telecommunications Act provides a framework for dealing with the market power of certain carriers. It imposes obligations on telecommunications common carriers to interconnect to other carriers, and provides the Commission authority both to exclude from economic regulation those services thought to be subject to a sufficient degree of competition to protect consumers, and to forbear from regulating as the Commission deems advisable. The motives of regulation have differed over the course of time. For many years the goal of regulation was to use the ability of a monopoly to price some services lower than cost so as to assure universal household penetration of telephone service. Long distance competition was delayed for many years because of this concern. More recently the goal of constraining monopoly power has predominated, and competition policy analysis has prevailed.

Common carriers exchange the right to discriminate among potential clients, serving some and not others, for limitations on their liability. Common carriers are not liable for the contents of the communications which traverse their networks. It is worth noting that the exclusion of liability in common law predates the statutory exclusions of liability found in successive statutes regarding telephone companies.

Non-discrimination among signals does not appear to be a likely legal basis for favouring certain kinds of communication over others. In fact, a special exception to the common carriage requirement was introduced in the Telecommunications Act in order to allow for discriminatory rates and access in favour of Canadian broadcast signals.

The Telecommunications Act might potentially have applied to the Internet and other forms of computer-mediated transaction, but for decisions made in the United States and Canada to exclude "enhanced services" from telecommunications price regulation. The challenge was to adopt quite different policies for (then) monopolistic physical networks, on the one hand, from generally competitive value-added networks, on the other.

> In the 1960s and 1970s remote time-sharing became an important part of the competitive unregulated computing industry. Computing networks using the phone lines were established. These had the incidental ability to move messages in competition with posts and telegraphs. This capacity created a regulatory issue. Should time-sharing systems be banned, as they are in many countries, from providing a useful new message service? Or should they be allowed to operate in competition with common carriers without bearing any of the obligations and regulations of common carriers? Or should they be forced into a generally undesired regulatory mode, even though they have none of the monopoly characteristics that justify common carrier regulation, simply because they compete with a previously regulated industry? In its Computer Inquiry II the FCC found no way to distinguish computing on a time sharing network from communicating over it. They therefore had to achieve their purpose of not regulating computing by exempting it as a category of enhanced communication service.

The Commission followed the reasoning of the FCC and accepted essentially the same division between regulated basic services and unregulated enhanced services.

One of the major borders in the tri-partite division of cyberspace, between computing and telecommunications, is therefore not a matter of legal definition that excludes CRTC regulation, but an ongoing regulatory decision not to advance the boundary into what are called "enhanced services". The border between unregulated communications over the Internet, for instance, and regulated telecommunications carriers, could be changed without reference to Parliament, at the Commission's discretion.

For a variety of sound economic reasons, the Commission chooses not to adjust this border. However, even if the agency did, the result would be of no particular use for promoting Canadian programming, for reasons discussed in Chapter Two.

3.78.3 Regulation of the Transaction

Another way of thinking about cultural protection in cyberspace is to think about the transaction. What is being bought, viewed, shared, downloaded? Instead of trying to regulate the carrier or the producer or the consumer, this approach would invest the thing in question with certain legal properties. These might create rights in the thing, such as an obligation to pay for the right to consume it.

Copyright is a good example. Copyright grants the creator or creators of a cultural product the right to receive payments or other forms of recognition, such as moral rights, for the future use of that product. The extraction of royalties (copyright payments) depend on the mode of transmission or conveyance. A compact disc bought in the store generates royalties in the sale price. In that case, the buyer is identified. Where the consumer cannot be identified, as in the case of music played in elevators, restaurants or on the radio or television, the intermediary pays the copyright holders.

The law assists the collection of payments by authorizing the existence of various copyright collectives, a tribunal before which they can plead, and a right to charge money (set tariffs) for the use of copyright products.

In the case of television programming, the ability to favour it by special laws governing its consumption would have to answer some important questions:

> How is the product or thing to be identified? How is it to be distinguished from other products or things of a similar nature? What is it that policy is trying to protect or promote?

Unless the thing we are seeking to protect can be defined somehow, no further measures are conceivable. While we have a culturally understood idea of the television program, we do not know what forms IP-delivered entertainment will take as bandwidth expands, compression increases, and costs decline. Even without any reference to constitutional division-of-power questions, we would still want to know what it that we are protecting or promoting. Since IP-delivered "programming" is still in its very early stages, we have no idea what formats, concepts, or packages will prove out, let alone whether Canadian sources of such material will need promotion.

> As consumption of a product or thing is largely determined by cost, how is revenue to be extracted from consumption of a product or thing when it competes freely against all other like forms of entertainment, which may not be subject to similar price conditions?

Canadian cultural product will compete against all other like products on a world market based on global IP-addresses. Policies which raise the cost of the thing being protected will normally reduce its consumption.

The passage of time will be needed before we can see adequately the scope of the problem and the nature of the issues that need resolution.

Other forums than the CRTC may play an important role in advancing the interests of cultural producers. It is worth noting, for instance, that one of the musical rights collectives, SOCAN, is pursuing the suppliers of Internet services in Canada for up to 3.5% of their gross revenues, for the transmission of music across their systems. This is an instance where action is being taken to advance the interests of creators by copyright holders in a different forum than the Commission. The point of this observation is that the interests of producers of cultural product may be satisfied by other means than those available to broadcast regulators. As transmission systems change, other forums may be used to satisfy the needs of cultural producers. Copyright law provides for no particular protection of Canadians above any other kind of cultural producer, however.

3.96 Conclusion to Chapter Three

Cyberspace is already within the jurisdiction of the government of Canada in all ways allowed by the division of powers in the constitution, and within the jurisdiction of provinces in a similar way. Consequently, many laws apply to transactions in cyberspace without any further action being taken. The default position, as it were, is that the laws and liabilities appropriate to publishing will continue to apply, just as they do to other forms of publishing. Transactions in cyberspace, like transactions handled through the mails, are still subject to the laws pertinent to the nature of the transaction, rather than the communications medium.

The extension of the Broadcasting Act or the Telecommunications Act to new areas in cyberspace would depend on many factors, technical, political, and constitutional. Some of them have been discussed in this paper. Nevertheless, one reason that cannot be cited is that somehow there is a vacuum of law that justifies the extension. The relations of people through these new media are governed by existing laws, civil and criminal, federal and provincial, that apply to like transactions and relations outside of cyberspace.