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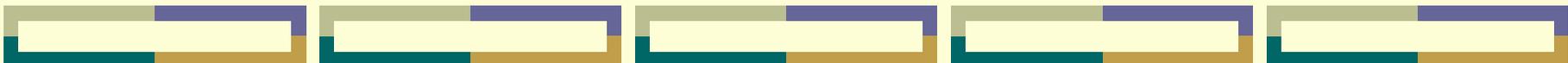
# IP versus legacy networks: what access to facilities means

Presentation to Center for Digital  
Democracy,  
May 2001, Washington, DC



# This paper deals with three Topics

1. What the Internet is versus what legacy systems are
2. How Canada regulates third party access to underlying transport facilities, and how it facilitates building your own facilities
3. What open access consists of



# The Issue

- Why is it that, in Canada, we benefit from a much more comprehensive approach to letting ISPs get access to legacy networks *in principle*, and have yet arrived at the same unsatisfactory results as in the United States?
  - Cable is considered a common carrier when it acts as a telecommunications facility in Canada, but not in the United States.
  - Access to customers through legacy networks by ISPs is the key to diversity of voices on the Internet, until customer-owned networks prevail.



# Different Regime, Same Results

In Canada, as regards third parties, there is, according to the Canadian Association of Internet Providers:

- No third party access to cable TV plant
- No third party access to DSL for the residential market;
- Some access to DSL in the business market
- Dial-up modem access everywhere.

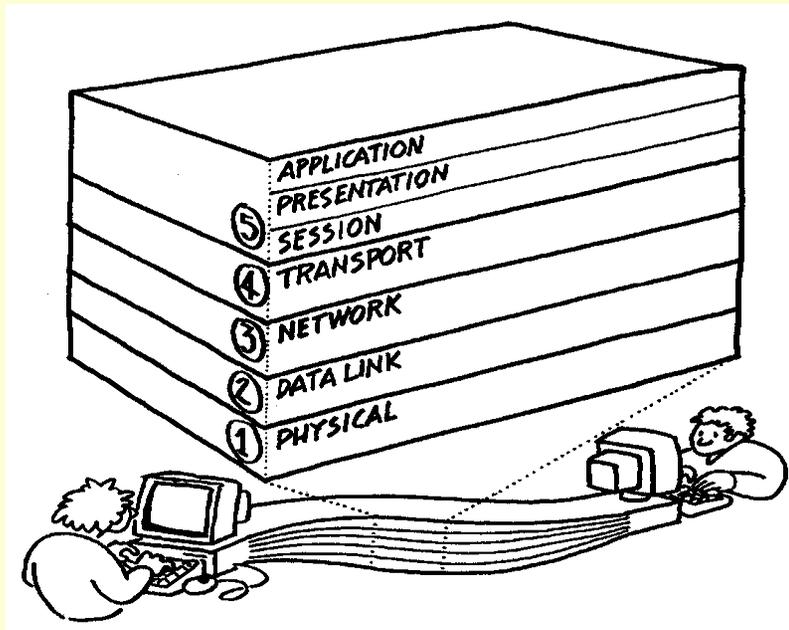
How, despite a more permissive regime, did we get here?



# End-to-end versus what went before

- The Internet is based on the engineering principle of end-to-end (Saltzer, Reed, Clark); makes fewest assumptions about the nature of the network.  
<http://web.mit.edu/Saltzer/www/publications/>
- Greatest possible functionality placed in the terminal, which lies in a competitive market.
- IP network contains as few functions as possible (packet loss is its only feedback).
- Completely contradicts telephony and cable: integration of service and transport.

# The Internet Works in Layers over a Physical Medium

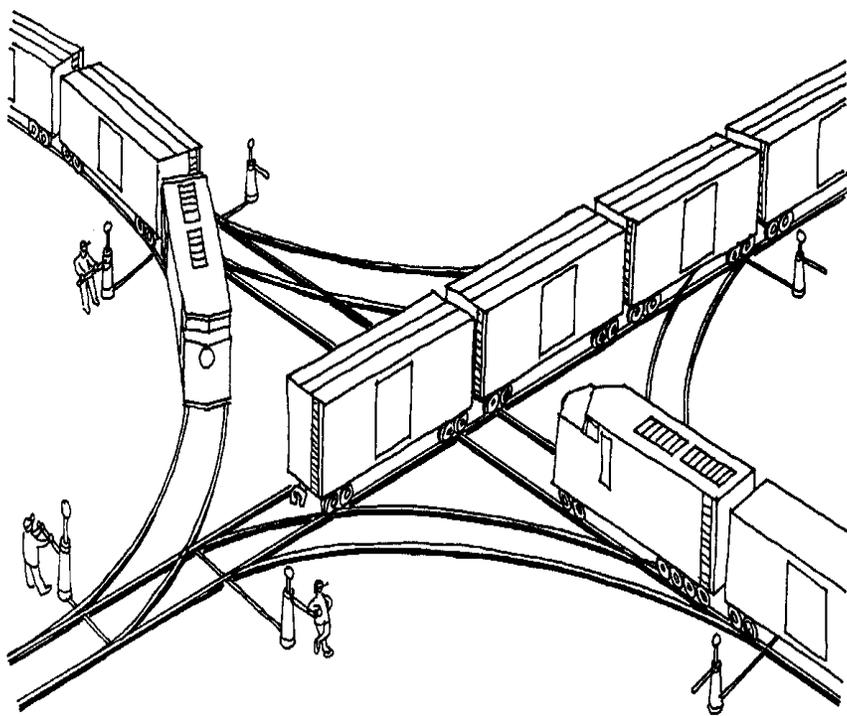


- The transport and network layers are usually “transport control protocol” – TCP – over “Internet protocol” – IP, or TCP/IP

# Various Layers perform different functions

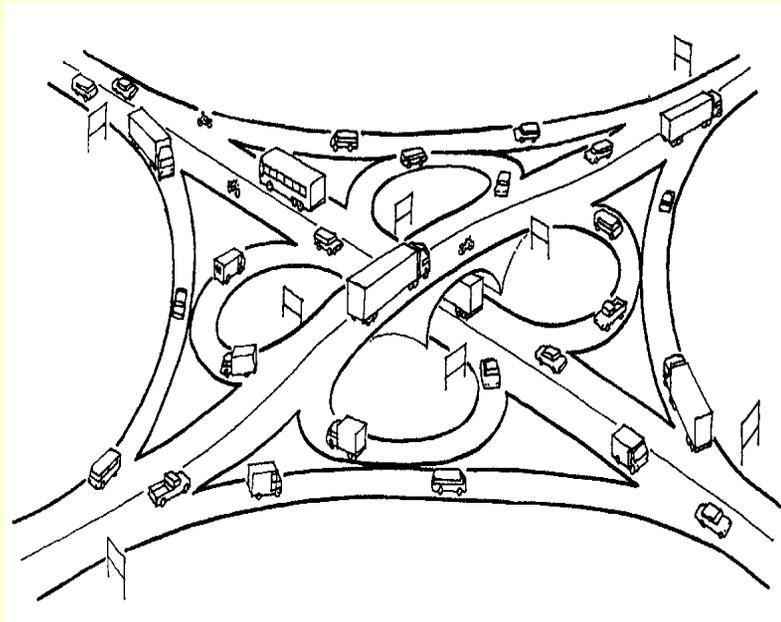


# Circuit Switching is like a railway



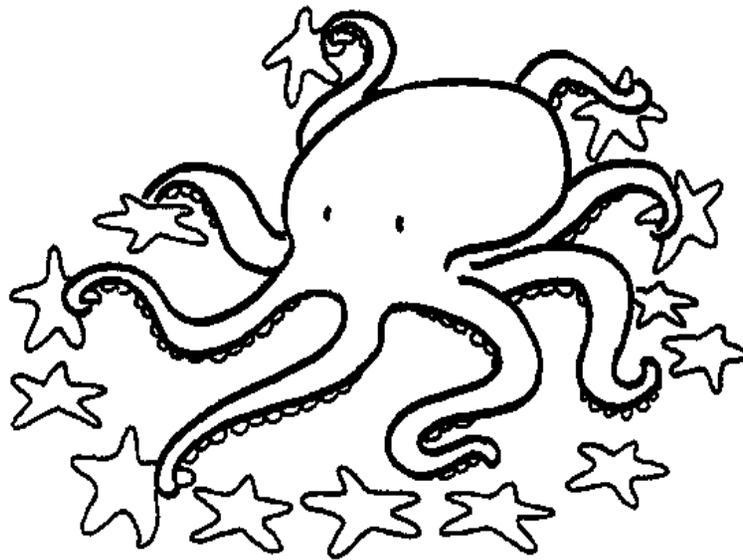
- Highly specified results
- Controlled access to the network
- Need for central command of timing, loads, vehicle types
- Owner of railbed owns the railroad cars (services integrated with transport).

# Packet-Routing is like a highway



- No specification of results
- No central command
- No schedules for travel
- No common ownership of roadbed and vehicles
- Privately owned toll roads interconnecting – this is peering

# The two systems place the intelligence in different locations



*INTELLIGENCE AT CENTRE*



*INTELLIGENCE AT PERIPHERY*



# End-to-end principle = stupid network

- The “stupid network” encapsulates in telephone terms what the Internet is – minimum specification of results (see [www.isen.com](http://www.isen.com)).
- A purely stupid network uses too much bandwidth, so caching and other devices seek to lower bandwidth demand.
- The domain name system adds complications
- Overall, the Internet remains an open platform based on a common protocol, TCP/IP



# But the Internet does not reach your home yet

- To get there, you need access through one of the two legacy systems, cable or telephony.
- The least amount of intelligence in the chokepoint can act to prevent the end-to-end principle.
- The last monopoly is not over this and that service, but *to define what a service is and can be.*



# There are four ways to reach the customer

- Phone lines
- Cable television
- Build your own microwave
- Build your own fiber

In this presentation, I will outline the situation in Canada as regards cable TV and building your own facilities.



## Telecom Decision 96-1 said cable was a common carrier when it offered telecom services

Statutory definitions of “telecommunications” and “broadcasting” were essential to the decision:

The definition of "telecommunications" in the Telecommunications Act encompasses "broadcasting" as that term is defined in the Broadcasting Act, as well as, among other things, any other transmission of intelligence by any wire or other electromagnetic or similar technical system.



# Access to Cable: Logic of 96-1

1. The services proposed were not “programs” within the meaning of the Broadcasting Act.
2. To the extent that the activities of an undertaking do not involve “broadcasting,” that undertaking does not operate as a “broadcasting undertaking” with respect to those activities. (thus out of the Broadcasting Act)
3. Was the entity in question a “Canadian carrier” in the Telecommunications Act?



# Logic of 96-1, continued

- Was it a “telecommunications common carrier” and “subject to the authority of Parliament”?
- The Telecommunications Act defines a “telecommunications common carrier” as a person who owns or operates a transmission facility (first criterion) used by that person or another person to provide telecommunications services (second criterion) to the public for compensation (third criterion).



# Decision 96-1, continued

- The commission found that cable owns “transmission facilities”
- They were offering “services”, and
- “Given the all-encompassing definition of telecommunications”, their facilities were capable of being used for telecommunications, by themselves or by third parties, and accordingly
- They were telecommunications common carriers when offering non-programming services.



# What happened since

- Cable and ISPs “negotiated” but no one met for a year and a half.
- Cable insisted and ISPs agreed that interconnection would take place at the network layer rather than the physical, because of the cost of equipment in 1997, which
- involved waiting for the DOCSIS standard, which means that cable and AOL are still talking in committee of the CRTC.



# On DSL

- ISPs petition CRTC for better terms
- CRTC finds low speed market adequately competitive;
- CRTC fails to see high-speed market as sufficiently different to worry about (TD-98-9).
- Now, only competitive offerings of DSL are in the commercial market; residential DSL tied up by incumbents.



# Build your own

- In Telecom Decision CRTC 95-13, the CRTC established a uniform national regime favouring access to telephone company support structures at reasonable prices.
- In TD 95-19, the CRTC found that it should not regulate services offered by competitive carriers other than local voice services.
- Entering the market as a “non-dominant” carrier became a matter of registration with the CRTC, and no more.



# Non-dominant carriers

- Are not price-regulated
- May build facilities without municipal permission (only if CRTC supports them on appeal)
- Have a right to access to telephone company support structures;
- May sublet space to third parties without having to prove to the carrier that the lessor satisfies Canadian ownership rules (Cable-Axion Digitel, 8 Oct. 99)



# Customer Owned IP networks

- Many institutions are now finding it cheaper to build their own facilities, on a completely IP basis, using available dark fiber.
- A relaxed regime permits entrepreneurs to organize school boards, hospitals, municipalities.
- These can provide interconnection hubs for later use by businesses and homes.



# Paradigm shift needed

- We are moving from an era when services were integrated into the transport functions, to one where applications are separated from transport.
- Most politicians and many experts fail to understand this.
- Pre-internet networks are the purest embodiment of central planning.
- This issue is not left versus right, but future versus past.



# Open networks versus central planning

- Telephony means: central planning, state-sanctioned profit levels, resistance to innovation, we define what you will get, proprietary software, closed networks.
- Open networks are the way of the future: no central planning, competitive markets, no ability to thwart innovation, open code.
- It is ironic that politicians propose a duopoly of cable and telephone companies as “competition”. The Internet provides an alternative model.



# What would open access look like?

## Necessary conditions

- It is possible to freely choose, on a per application basis, dynamically, which service provider is to be used;
- Non-affiliated service providers are capable of providing services, which are comparable in all aspects to the services made available by service providers affiliated with the telecommunications carriers.



# Open Access, 2

Telecommunications carriers are required to provide, in a non-discriminatory fashion, at published rates with no volume discounts:

- standardized interconnections interfaces at the last bottleneck facility and optional non-blocking back-haul to the bottleneck facility;
- standardized equipment, which can be sourced from multiple competing manufacturers;



# Open Access, 3

- interconnection interfaces for which there is demand for all layers of the protocol stack and of the physical infrastructure;

They would not knowingly

- plan for a limitation in the number of competing service providers through the selection of a particular brand or model of equipment with a certain interface density or size.
- attempt to define the nature of the applications, by means of the mandatory bundling of interfaces across different layers or limitation of protocols to certain versions.



# Open Access, 4

- Telecommunications carriers are required to provide all necessary interconnections to ensure that service provided by competitors is equal in all aspects, including reliability and redundancy, while not requiring that competitors duplicate any portion of the infrastructure of the carrier;
- All network capacity is made available to all applications and to all users at all times, and allocated dynamically on a non-discriminatory basis.;



# Open Access, 5

- Equal access is provided to all shared mechanisms for self-provisioning and network management.
- It is possible to choose which equipment is attached to the network at any point in time;
- Disputes surrounding carriers' compliance with Open Access requirements, are dealt with expeditiously, so as not to allow any opportunity for temporary market dominance



# Why do these look revolutionary?

- As we pass from the closed command and control architectures of legacy systems, to an Internet based system, we move to a separation of *transport* from *applications*.
- Legacy systems integrate transport and applications, contrary to the Internet model.
- The only legal model that works is common carriage, where the carrier cannot discriminate among packets. This is the new implication of IP-based networks.



# Acknowledgements

- Saltzer, Reed and Clark, “End-to-End Arguments in System Design”, <http://web.mit.edu/Saltzer/www/publications>
- David Clark and Marjory Blumenthal “Rethinking the design of the Internet: the end-to-end arguments versus the brave new world” TPRC, August 10, 2000  
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<http://cyber.law.harvard.edu/lessigbio.html>
- François Ménard, <http://people.debian.org/~fmenard> on conditions for open access
- Andrew Bjerring & Bill St. Arnaud, “The coming revolution in Dark Fibre Networks”,  
<http://www.canarie.ca/advnet/canet3/fibre.html>