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Centre de recherches sur les communications Canada
Un organisme d'Industrie Canada

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Canada: Wireline Communications

- **One of the most developed telecommunications networks in the world:**
  - More than 99% of the lines are linked to a digital network
  - Nation-wide fibre-optic network
  - 98% of households have at least one wired telephone
- **A well developed cable distribution network:**
  - 95% of households have access to basic cable
  - 65% of these actually subscribe to basic cable
  - 86% of households have access to high speed cable internet

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Canada: Wireless Networks

- Three national wireless networks
  - available to 96% of Canadians
- National satellite communications network (Telesat)
- Competitive radio carriers and service providers
- Over the air television and radio broadcasting
- Two Direct To Home satellite broadcasting licenses
- Satellite mobile services

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Canadian Policymakers and Regulators

- **Industry Canada**
  - Telecommunications Policy
  - Spectrum Policy AND regulation
  - Standards
  - Economical development
- **Canadian Heritage**
  - Broadcasting policy
  - Canadian content (Culture)
  - Access to services and competition.
  - Production of high-quality Canadian TV programs

- **Canadian Radio-Television and Telecommunications Commission (CRTC)**
  - Regulator

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Deregulated markets

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Incumbents

Terminal Equipment
Mobile Wireless
Long Distance
International
Internet access
IX Private Line routes with 2+Facilities
Satellite
Inside Wire

Entrants

All retail services

Economic regulation is focussed on incumbents' local market activities

New and Emerging Technologies = New Challenges

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- Voice over IP
- P2P
- Integrated GPS
- WiFi
- RFID
- 3G Mobile
- Satellite Radio / DAB
- Mobile TV / IP-TV
- DTV/HDTV
- PVR
- Video on Demand
- Wi-Max
- Mesh Networks
- 3G+ Mobile
- Ultra Wide Band (UWB)
- Broadband Power Line (BPL)
- Software Defined Radio (SDR)
- Sensor Networks
- Ad Hoc Networks
- IMS
- Internet Protocol Version 6 (IPv6)
- Peer-to-Peer Internet
- User Controlled Light Paths (UCLP)
- Quantum Computing
- Bio Computing
- Semantic Web
- Grid Computing
- Nanotechnology

Access to anything, anytime, anywhere

Trends

- All-digital technologies are re-defining telecommunications and broadcasting.
- More advanced standards are in development.
- Spectrum to be used in a more efficient manner, by sharing it with unlicensed systems
- More spectrum allocation to meet for public safety needs
- New "aggregators" are enticing viewers and listeners away from mass-market, pre-programmed schedules with personalized and dynamic content menus.
- Advances in micro-billing and audience-tracking are enabling new models for advertising.

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Recent developments

- **Deregulation of access-independent VoIP (November 2006)**
- **Local Service Forbearance (March 2006)**
- **CRTC exempts mobile TV broadcasting from regulation (March 2006)**
- **Telecommunications Policy Review Panel Report (March 2006)**
  - **127 recommendations**
- **Regulation of VOIP (March 2005)**
- **Review of Broadcasting Policy 2006 / 2007**

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Telecom Policy Review Panel: Rationale

- Marketplace was being rapidly changed by technology
- Concern that regulatory framework was not keeping up, and Canada was slipping
- Canada's productivity growth was stagnant, and the relationship between ICTs and productivity needed to be understood.

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Canada's response: Convergence challenges

Telecommunications Policy Review Panel (TPRP)

- Independent panel of experts appointed by Minister of Industry April 2005 (Gerri Sinclair, Hank Intven, André Tremblay)
- Report issued March 22, 2006 provides 127 recommendations for ensuring Canada's competitiveness in the Network Economy
- Review of Canada's telecommunications policy and regulatory framework
- Recommendations on how to make it a model of 21st century regulation.
- Panel's mandate had three central themes:
  - setting the appropriate regulatory framework
  - encouraging adoption of ICTs
  - access to advanced telecomunication networks and services

www.telecomreview.ca

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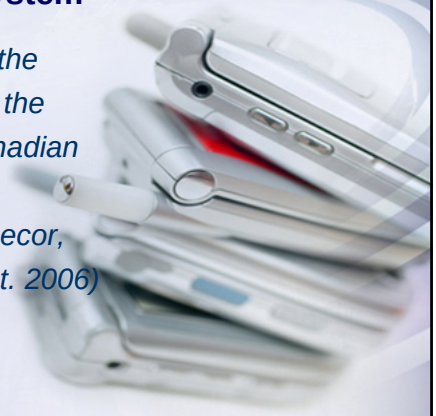
Canada's response:
Convergence challenges

CRTC report on the future environment facing the Canadian broadcasting system

- *Order in Council requesting that the CRTC provide a factual report on the future environment facing the Canadian broadcasting system (June 2006)*
- *5O Responses: CBC, Bell, Quebecor, CAB, Rogers Cable, CRC… (Sept. 2006)*
- *CRTC Report due in Dec. 2006*



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Wireless Communications Technologies and Policy Issues

Technologies operating in the License-exempt spectrum bands

- The use of licence-exempt devices has increased significantly and will continue. With the rapid increase in data rates in unlicensed nomadic systems, progressively evolving from 802.11 b, to 802.11 a/g, and now 802.11n, the data carrying capacities of nomadic systems can surpass those of desk-top systems of today within 10 years if there is available spectrum.

Policy issues affecting license-exempt technologies

- Aggregate interference could be harmful interference to existing radio services
- Should inter-system interference be controlled? Then can license exempt spectrum continue to be on no-interference /no protection basis?"
- Should licensed and licence exempt users be operating in adjacent bands providing similar services under different regulatory frameworks: point-to-point services in the 2.4 GHz band

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Emerging Technologies and Policy Issues

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Technology		Policy issues
MIMO 	MIMO (Multiple Input Multiple Output) systems use multiple antennas at the transmitter and receiver to take advantage of reflected signals in a multipath radio environment to increase performance and reliability.	▪Need to rethink regulations on radiated power limits. Per antenna or total radiated power of all antennas?
3G 	3G (3rd generation cellular) systems offer high data rate connectivity to the mobile customer for multimedia and web surfing use.	▪Multiple worldwide standards will pose the same interoperability issues as with 2.5G ▪Spectrum costs pose a barrier to technology take-up
4G	4G (4th Generation Cellular) systems are planned to surpass 3G data rates and merge voice and data into a single high-capacity data-centric network.	▪Spectrum availability will be key to the success of 4G; today's spectrum allocations cannot support the rich multimedia services and extremely high data rates that are forecasted for 4G. ▪With the disappearance of voice-centric networks, telecom regulation will need updating (much like VoIP is forcing regulation changes for landline phones)
WiMAX 	WiMAX (Worldwide Interoperability for Microwave Access) is a wireless MAN technology that will provide broadband data connectivity to fixed and mobile clients in metro and rural areas, over much greater distances than possible with Wi-Fi.	▪As WiMAX becomes the main standard for fixed broadband access and mobile WiMAX evolves towards becoming the 4G network, more spectrum will be required to provide the level of service users require. ▪Should fixed and mobile WiMAX share spectrum? Roaming mobile users could potentially disrupt the fixed network.

Emerging Technologies and Policy Issues

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Technology		Policy issues
Ad Hoc Networks 	Ad Hoc networks are peer-to-peer networks formed by a number of clients communicating with each other without the use of a centralized control mechanism. Such networks are usually created for short periods of time and are disbanded when no longer needed.	▪Network ownership: with increasing cases of network owners being held liable for the content relayed on their network, how is the ownership of an Ad Hoc network determined?
Mesh Networks 	Mesh networks are formed by a a web of nodes with routing capabilities which also act as relays in order to permit communication between nodes that are not within radio range of each other. Mesh networks may or may not use a centralized controller.	▪Privacy issues are key: when data is relayed through a 3rd party node, can the relaying node intercept the traffic? Also, data on relaying nodes must be kept safe and separate from data being relayed through the node. ▪Spectrum issues: mesh networks currently face challenges operating in unlicensed bands because of outside interference. Dedicated licensed spectrum for mesh use would improve performance.

Emerging Technologies and Policy Issues

Technology		Policy issues
UWB 	UWB (Ultra Wideband) technologies are used for Personal Area Networks applications to communicate over a range of a few metres at extremely high data rates. They transmit over a very wide bandwidth (many GHz) at a low power level to avoid interfering with other technologies.	▪Determining appropriate maximum radiated power levels is key: UWB devices may still interfere with other existing technologies such as Wi-Fi, cellular and Bluetooth if they are in close proximity.
Position determination 	Position determination devices include technologies like GPS and radio localization to accurately determine the position of network nodes.	▪Privacy and confidentiality issues arise: regulations and mechanisms must be put in place to avoid localization information being read by unauthorized parties (i.e. the location of police vehicles in a city should not be available to the general public)

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Satellite Technologies and Policy Issues
Satcom Policy

- Convergence of ICT may force review of MSS / BSS / FSS licensing approach
  - competition with terrestrial digital services delivery technologies.
- Integration of satcom with terrestrial services for ubiquitous communications may force frequency sharing and network management (IP) techniques
- SDR implementation will impact certification process
  - Security (download authentication)
  - Piracy
- Content/Cultural issues
  - Black/Grey markets
  - Access to foreign programming
  - Internet – movies, music, video on demand

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Broadcasting Technologies and Policy Issues

Digital TV: Situation in Canada

- Canada decides to let the market forces dictate the transition
  - 24 out of 723 analog TV stations in Canada (3%) have been authorized to broadcast digital. 11 are in operation
  - Canada does not have a fixed date for DTV roll-out
  - Canada has not issued a cut-off date for licensing analog TV
  - Broadcasters have claimed that no new revenue stream would result from conversion to DTV. No market incentives to change.
  - Spectrum may be encumbered for a long period beyond the U.S. 2009 cut-off date, delaying introduction of new services.
  - IC is consulting with broadcasters to finalize the allotment plan for DTV below channel 52, similar to the U.S.
- Consumer uptake of DTV equipment and services (Digital cable and satellite) identical to the US
- HD program-hours on Canadian networks lagging behind the US
  - Weekly over-the-air of HD program hours: 35.5 on the Canadian networks versus 185.5 on the US networks

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Broadcasting Technologies and Policy Issues

Emerging interests for the TV Broadcast Spectrum

- Wireless Industry
- Public Safety and National Security
- Wireless Broadband in Remote and Rural Areas
- New Advanced Broadcast Services such as Mobile Multimedia Broadcasting

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Broadcasting Technologies and Policy Issues

Mobile TV, internet TV, DTV

- Since many **Mobile TV** programs can be transmitted over a single 6 MHz DTV channel, regulation could allow several program providers to share a single TV channel.
- ***Different regulations for Mobile TV on cellular and for broadcasting networks***?
- Technical limitations mean the present internet network is not well-suited for real-time television broadcasting. Internet TV is likely to remain a delivery method that complements regular broadcasting rather than replacing it.
- **If some forms of IPTV are implemented without regulations, the consumer could then get unregulated access to new content from anywhere in the world**.
- The decisions concerning the phasing out or termination of the analog broadcast services should take into consideration the impact this will have on the governments' ability to reach citizens and alert them of emergencies.
- The new digital broadcasting system should be implemented so that it can take over from the analog systems and play its critical role in emergency situations.

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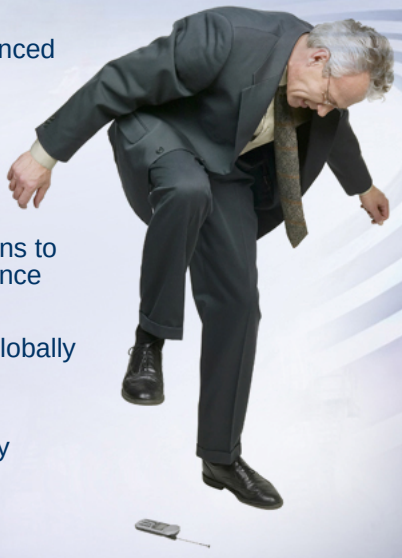
Summary

New challenges for spectrum management

- **Demand for spectrum**
  - Challenge: Preparations for Advanced Wireless Services (AWS) auction
- **Satellite services**
  - Challenge: Building on success of Ka band multimedia satellite
- **Cognitive Radio**
  - Challenge: develop new regulations to accommodate cognitive performance
- **WiMAX**
  - Challenge: Identify regionally or globally harmonized bands for WiMAX
- **UWB**
  - Challenge: Develop internationally harmonized rules addressing potential interference



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Summary of Issues

- Platform neutral regulation or need to differentitaion between delivery of information through Cellular Telephone Networks, Broadband Wireless or Broadcasting ?
- Impact of Cognitive and software defined Radio on regulations?
- New spectrum allocations for RFID, Digital Multimedia Broadband Wireless, Mobile TV…
- Unlicenced Devices operation in allocated Band
- Improvements to Standards.
- Compatibility and legacy issues.
- Transition to Digital Broadcasting
  - Mandatory Turn-off date for analog TV services
  - Spectrum Auction
  - Incentives to speed it up ?
- Consumer protection
- Transborders Rights Managements.
- Cultural Sovereignty.

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Summing up…

" Structures and formulas that worked in the past, and are the glue that holds much of the systems in place, are being challenged by the brutal and unrelenting force of technological change."

- Convergence of technologies is re-shaping the future
- Rapid pace of technological changes
- An increasingly inter-connected world requires:
  - Governments to be flexible & adaptable
  - Business & government(s) working together
  - Continuous improvement in policy & regulation
  - Strong focus on ICT development
- Policy makers must understand the technologies to make the apropriate changes in policies and regulations.

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