Community Wireless Infrastructure Research Project: www.cwirp.ca

What is this project about?

- **Public Information and Communications Technology (ICT) Infrastructure**
- Our focus is on public internet infrastructures, including wired and wireless broadband networks
- We are learning about:
  - rationales for public ownership, community benefits
  - challenges & barriers in deployment
  - best practices, policy for public ICT infrastructures

How is the research being done?

- In-depth case studies with municipal and community partners
- Extensive reviews of literature, studies of ICT deployments worldwide
- Broader thematic studies addressing cross-cutting, conceptual and policy issues
- Networking with other researchers
- Integrative knowledge distillation activities, workshops

Who is doing the research?

Investigators

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- Dr. Graham Longford, University of Toronto
- Dr. Catherine Middleton, Ryerson University
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Research Team

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Infrastructure Canada

Canada

In-Kind Contributions from:

- Ryerson University
- University of Toronto
- York University

Public Internet Infrastructures in Canada

Municipal Networks

- Municipality provides fibre and/or wireless network
  - Various models for provision, municipality may or may not own network
- Network is used for and by municipal government
  - Public safety, e.g. police communication
  - Support for mobile workers
  - Service provision, sensors, remote monitoring
- Using wireless technologies, a municipality makes its existing network infrastructure available for public use, or develops infrastructure specifically for public use
- The municipality becomes an internet service provider

Community Wireless Networks

- Local organizations, typically run by volunteers
- Connect local citizens to local resources
- May or may not focus on bridging the digital divide
- Offer free alternative to commercial internet service providers, where service exists

île sans fil

wireless Toronto

OTTAWA-GATINEAU ogWiFi

British Columbia Wireless Network *Society*
grassroots community wireless networks

Espoused Benefits of Public Internet Infrastructures

- Provision of essential service (internet access), improves access for citizens
- Encourages local economic development
- Improves efficiency of local government, facilitates improved service delivery
- Enables community engagement
- Fosters innovation

Our Research Questions

- How can these espoused benefits be realized? Are there other benefits?
- How can infrastructure development plans meet the needs of local communities?
- What models of public infrastructure are successful and why?
- What policies and supports are needed to promote public internet infrastructures?

Île Sans Fil – Montreal

WiFi Network Launch, Coverage & Use

- First free hotspot July 2003
- To date, 124 free hotspots
- Freelance workers, small businesses, community groups, students
- Spread throughout city based on requests for service
- 28,000 registered users

Technology & Infrastructure

Wifidog
A captive portal suite

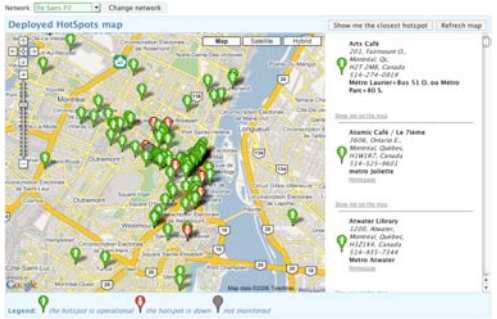
- 802.11 IEEE "WiFi" standard equipment
- 2.4 Ghz license exempt spectrum
- Developed social software, "Wifidog" and "HAL"
- Wifidog (captive portal) and HAL enable users to see who is online as well as upload sound, text and image files
- Application has been used by over 30 different groups on 4 different continents

Community/Venue-Sponsored Model

- Hotspot "hosts" pay for installation, network connection, network management provided by ISF volunteers for a fee (e.g. $140/yr for small businesses)
- Hosts agree to provide free internet to users
- ISF promotes community engagement, disseminates art, local news, community events
- Bilingual organization, operated by volunteers, 60 active members
- Funded by hosting fees, some grant support

Research Questions

- Are community WiFi networks viable?
- Are users aware of community WiFi politics informing network access?
- What impact does community WiFi have on the local ISP market?
- Does social software increase awareness and/or efficacy of users?
- What plans does this volunteer organization have in place to maintain presence and sustain its practice?



City of Fredericton Fred-eZone

Fredericton's Municipal Broadband Network

- e-Novations ComNet Inc., a municipally owned not-for-profit corporation deployed a 22 km fibre optic ring that provides affordable, fast broadband service to the City of Fredericton and its businesses. More than 100 km of fibre are now in place.
- This broadband network provides economic benefits to the City, and enables businesses to locate in Fredericton.

Expanding Municipal Fibre with Wireless

- Started by using Motorola Canopy technology to provide wireless connectivity to the Fredericton airport, which was beyond the reach of the fibre network.
- Recognizing the importance of "Intellectual Infrastructure", a decision was made in 2003 to provide high-speed internet access to local citizens, for free, throughout Fredericton's downtown area and business corridors – the Fred-eZone.
- Fred-eZone provides WiFi service using Cisco and Motorola equipment, 200+ radios

Research Questions

- Can other municipalities duplicate Fredericton's success? What were the enabling conditions that made it possible for Fredericton to develop its own municipal fibre? What barriers did it face? Why aren't more Canadian municipalities following Fredericton's lead?
- Can the economic development benefits of investment in information and communications technology infrastructure be measured?
- What technical challenges have arisen in deploying a city-wide network? How were they overcome?
- Does the local community support investment in "intellectual infrastructure"?
- How do community members use the Fred-eZone?

Lac Seul First Nation

Lac Seul Reserve:

Lac Seul is located approximately 38 Km north west of Sioux Lookout Ontario. It is bounded to the north and east by Lac Seul Lake. The reserve is made up of three communities, Kejick Bay, Whitefish Bay, and Frenchman's Head. The on reserve population is 939.

Wireless Community Network:

- The Lac Seul community network is one of over 60 PoPs on the K-Net First Nations broadband network.
- Community owned Wifi/Licensed Spectrum radios cover Lac Seul's three communities.
- Wifi enables "free" residential access (within line of sight).
- Licensed radios enable QoS service for Telehealth, Videoconferencing, and other broadband applications.
- Community employees manage the local network infrastructure in partnership with K-Net Services, and TBay Tel (formerly Superior Wireless).
- Uptake of the network has been hampered by a harsh climate, and local human resource challenges…

Research Questions:

• What are the strengths and vulnerabilities of Lac Seul's community ownership model?

•What applications do Lac Seul's users consider essential community network services?

Wireless Nomad
Your Community Wireless Internet Provider

Wireless Nomad – Toronto

- Co-operative Internet Service Provider operating in Toronto, Ontario
- Subscription-based residential DSL broadband service
- Uses customized Wireless Nomad routers which provide shared access to Wireless Nomad account holders
- Anyone can create a free account to get WiFi access to Wireless Nomad nodes
- As of November 2006, Wireless Nomad had 127 nodes with 2510 users

Wireless Nomad Toronto WiFi Locations

Research Questions:

- Is this cooperative sharing model viable for creating a basic free service while maintaining a high quality subscription service?
- Can sharing via mesh networks improve reliably while reducing costs?
- Can this model work for a municipal scale service?

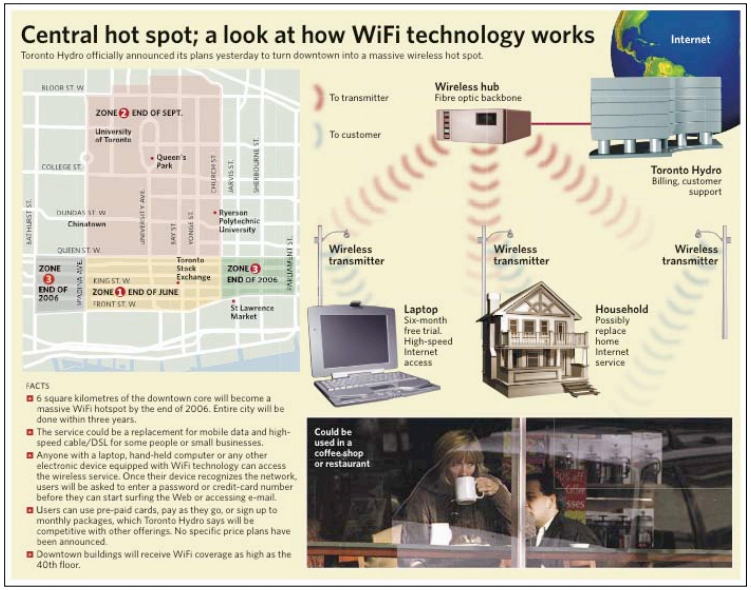
Toronto Hydro Telecom Municipal WiFi Network

WiFi Network Coverage & Use

- Phase 1 launched Sept, 2006 - financial district
- Phase 2, December 2006 - downtown core 6km^2
- Business, tourists, hotel/restaurant patrons, students
- City-wide, 630km^2 - 2009?
- Streets, public spaces, indoors to 30m from curb
- 7Mbps (bidirectional) high speed internet access
- 20,000 registered users, average 260 simultaneous

Technology & Infrastructure

- 802.11 IEEE "WiFi" standard equipment
- 2.4 Ghz license exempt spectrum
- Multi-radio mesh network (vendors: Bel Air & Siemens)
- 20,000 access points on Toronto Hydro street light poles
- existing 450 km Toronto Hydro fibre network for backhaul



Source: *Toronto Star*, March, 2006

* Content reflects original launch dates, which were postponed in June 2006

Public/Private Subscriber Model

Business Case

- Provincially mandated wireless metering by 2011
- Combined data/internet services market of $1billion
- Seamless access vs. 200 fragmented 'hotspots
- Can offer cheaper service than Bell, Rogers etc
- Potential cost-saving municipal applications (e.g. parking tags)

Network & Service Costs

- Capex - $2M for Phase 1, $56M full coverage
- Pricing (6 month free trial) $29/mo ($10/day, $5/hour)
  - competitors (Bell, Rogers) are up to 30% more
- Positive return on investment within 1 year with 1% mkt share

Ownership & Governance

- Wholly–owned subsidiary of Toronto Hydro Corporation (THC)
- THC shareholder: City of Toronto
- THC pays annual dividend to City of Toronto (2005 = $68M)

Research Questions

- Is the THT business model a viable one?
- To what extent will 'One Zone' be adopted for domestic and business use?
- How can 'One Zone' be used to benefit low income neighbourhoods?
- What changes in Internet use, communication, work practices, and social relations are associated with ubiquitous connectivity?
- How can 'One Zone' be harnessed to increase civic engagement?
- What is the rationale and business case for offering wireless broadband service as a low cost or free public utility, as some municipalities do?
- What are the potential benefits of doing so?

From Research to Action…

Progress and Activities to Date

- Understanding the terrain of public broadband infrastructure in Canada: community and municipal providers, working with case study partners to learn what they are providing
- Articulating benefits of public broadband infrastructure, desiderata for public wireless infrastructure, review of literature and international experiences
- Investigating policy aspects of deploying public broadband infrastructure

Longer Term Goals

- Documentation of successes and failures in Canadian public broadband deployments, documentation of best practices
- Theorizing about public aspects of infrastructure
- Understanding parallels between public broadband and earlier instances of public ICT infrastructures
- Developing policy recommendations for deployment of public wireless broadband infrastructures

Key Findings

- Local context is key: what works in one community may not work elsewhere
- Purpose and importance of infrastructure varies with geography and organizational characteristics of the sponsoring entities
- High quality “backhaul” connection (e.g. fibre) is of strategic importance for the deployment model, business case, and to deliver Quality of Service via wireless infrastructure