The Public Sector's Role in Broadband Internet Development

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with research assistance from Carlos Osorio
Motivation

- What’s Broadband?
  - “Fast enough” and always-on Internet connectivity

- Why is it important?
  - Fundamental enabler of eBusiness
  - Especially for SMEs and consumers

- But isn’t Internet infrastructure a solved problem?
  - Unfortunately, not
Why Local Governments?

- U.S. zip codes with high-speed subscribers
  - 78% nationwide (FCC, July 2001 data), but
    - 97% of most densely populated
    - 49% of least densely populated

- “Eventually” is a long time to wait to cross the digital divide
  - Economic development (attract & retain business)
  - Quality of life (attract & retain residents)
  - Improved education, health care, govt. services
Why Public Sector?

- Infrastructure
  - High fixed & sunk costs – a lot is shared
- Question is typically not whether, but what form of public intervention.
  - In the bad old days, PTTs.
  - Today, dominant model is private sector operates, public sector regulates.
  - Governments also buy services.
  - Some governments also provide some services.
Research Objectives

- Generate data about public sector approaches to stimulating broadband.
  - Lots of anecdotes, but little data suitable for consistent comparisons.
  - Focus on local and regional (sub-state) initiatives.
  - Stimulate demand, supply, or both.

- Understand effectiveness of different approaches in different situations.
  - Understand what hasn’t worked.
Today’s Talk

- Types and examples of initiatives
- Municipal networking data
  - Preliminary model, analysis
- Theoretical context of public-sector involvement in communications infrastructure
  - How does edge-based wireless fit?
Local Initiatives: Four Classes

**Stimulate/Aggregate Demand**
- Surveys, Registrations
- Buying Coops
- Anchor Tenants
- Sectoral Pilots
- Training, Tech Centers etc.

**Reform Policies/Rules**
- Rights of way
- Pole attachments
- Antenna, tower siting
- Zoning
- Cable franchising

**Distribute Funds**
- Loans, grants, tax incentives
- Subsidize users
- Subsidize providers
- Community planning

**Develop Infrastructure**
- Build, operate, finance
- Wholesale, retail
- Ducts/conduit, first mile, interconnection, middle mile
- Wireless, fiber, etc.
WHAT'S HAPPENING WITH BROADBAND WHERE I LIVE?
Click on where you live on the map or select a region from the pull-down menu to see what's happening locally with Broadband.

LOCAL CAMPAIGNS
BT also supports the efforts of groups of local consumers campaigning to generate sufficient interest in broadband services to justify enabling their local exchanges for ADSL. More than 200 exchanges are already being enabled as a result of the registration scheme.

You may wish to add your weight to an existing campaign or to set up a new group to bring broadband services to your town or neighbourhood more quickly.

BROADBAND WHERE YOU LIVE
BT is committed to delivering its broadband services across the UK and works in close partnership with national, regional and local authorities to drive the rollout of broadband networks and services across the community and across the potential digital divide.

By clicking on your county or region on the UK map, you can see:
- an overview of what is happening in your part of the country
- a map of local broadband coverage
- which local exchanges are seeking registrations of interest
- broadband suppliers who will register your interest
- contact details for local campaigns
- details of how to set up a new local campaign group
- the resources BT can provide to support your local campaign

Please select a region...
Berkshire Connect

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>Discussions begin</td>
</tr>
<tr>
<td></td>
<td>Task Force organized</td>
</tr>
<tr>
<td></td>
<td>Business plan developed</td>
</tr>
<tr>
<td></td>
<td>RFP: 7 bids</td>
</tr>
<tr>
<td>1999</td>
<td>Contracts signed with GC/EAN</td>
</tr>
<tr>
<td></td>
<td>Network construction begins</td>
</tr>
<tr>
<td></td>
<td>1st service</td>
</tr>
<tr>
<td>2000</td>
<td>Global Crossing Chapter 11</td>
</tr>
<tr>
<td>2001</td>
<td>3-year contract expires</td>
</tr>
</tbody>
</table>

Key choices:
- Focus: T1-class business connectivity
- Strategy: New facilities, demand aggregation
Demand Aggregation

The Connect…
“Guarantees” demand, in essence serving as a reseller/affinity group marketer

The Provider…
Makes service available to any business in the county at a uniform, distance-insensitive price

Key Success Factors:
1. Region must be large and heterogeneous enough for cost-averaging to work
2. Civic engagement – “doing well by doing good”
BC Results, 2002

- **Pricing**
  - 50-70% discount from ILEC
  - Internet access: $550-750/month (128 Kbps – 1.5 Mbps)
  - No install charge, minimal membership fee

- **Customers**
  - 55 businesses in 15/32 towns

- **Revenue**
  - Est. $350k/month (on est. $3m investment)
Keystone Communications Project (Pennsylvania)

- Aggregate statewide buying power
- Geographic cost-averaging
- Contract with Adelphia Business Services
- Three classes of user arrangement
  - State Compulsory
  - State Optional
  - “Ceiling” rate pre-negotiated for local governments
- Public-private partnership e.g. for backhaul
- Too early to judge results
Reforming Policies: Michigan

- Then-Governor Engler: "Fast Lane to Future is Now Open" Governor Signs Bills to Speed Broadband Deployment

www.michigan.gov, March 14, 2002

- **SB 880** “creates a statewide right-of-way authority, eliminating excessive fees and permit delays and leveling the field for all service providers.”
- **SB 881** “creates a broadband finance authority that will provide low interest loans to expand broadband access in areas across the state that are underserved.”
- **SB 999** “provides tax credits to telecommunications providers who invest in new broadband infrastructure, and provides, upon certification of the state Public Service Commission, for a dollar-for-dollar tax credit for right-of-way fees paid under SB 880.”
Sample Funding Programs

- **U.S. Rural Utilities Service**
  - $1.4B, FY2003
  - Loans and guarantees for providers of rural broadband, FY2003

- **Michigan**
  - $50m initial capitalization, April 2002
  - Loans & tax credits

- **Texas Infrastructure Fund**
  - $1.5B to be disbursed 1996-2005

- Internationally, e.g. World Bank
Develop Infrastructure

- Build, operate, finance
- Wholesale, retail
- Ducts/conduit, first mile, interconnection, middle mile
- Wireless, fiber, etc.

A key issue: Where is the boundary between public and private-sector responsibility?
Public Network Example: Algona, Iowa

Population 5,741
Algona Municipal Utilities

- Water and electricity (100 years)
- 74% voted for move into communications, 11/97
- Constructed HFC network starting 2000
- Now offering cable TV and broadband Internet
- Plans for phone service
- [http://www.netamu.com](http://www.netamu.com)
On the other hand...

- Batavia, St. Charles and Geneva, Illinois (Kane County Tri-Cities)
- Municipal fiber network voted down, April 1, 2003
  - SBC, Comcast fought
  - “Take an unfamiliar concept, put six zeros behind it, and watch voters punch ‘No’” – Greg Rivara, Kane County Chronicle
## Public-Private Partnerships

<table>
<thead>
<tr>
<th>Aberdeen, Scotland</th>
<th>Los Angeles, CA</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISP (Internet for Business), City Council, Police</td>
<td>Dept of Water &amp; Power operates optical network as wholesale carriers’ carrier</td>
</tr>
<tr>
<td>Combine city fiber, CCTV cameras, WiFi cells</td>
<td>Leases dark fiber, wireless sites, backhaul, etc.</td>
</tr>
<tr>
<td>In progress</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pittsburgh, PA</th>
<th>LaGrange, GA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial WiFi “hotzone”</td>
<td>Bought private cable system, invested in broadband upgrade and leased video capacity back to Charter Communications</td>
</tr>
<tr>
<td>Local civic group (3 Rivers Connect) and wireless integrator (Grok Technology)</td>
<td></td>
</tr>
<tr>
<td>$18.95/month</td>
<td></td>
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</tbody>
</table>
Today’s Talk

- Types and examples of initiatives
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- Theoretical context of public-sector involvement in communications infrastructure
  - How does edge-based wireless fit?
APPDA Data

- Out of about 25,000 communities in U.S.
  - 2,020 have municipal electric utility
  - 511 of them do some form of telecom, whether internally, or externally as wholesaler or retailer
    - SCADA, AMR, Inets, etc.
    - Private (leased) lines
    - CATV, Telephony
    - Broadband Internet access (<200?)

- How applicable is municipal networking to:
  - Remaining 1,500 APPA communities?
  - Remaining 23,000 communities in U.S?
### Community Size Distribution

<table>
<thead>
<tr>
<th>Type of Town by Population (Inhabitants)</th>
<th>US Total (25,503 towns)</th>
<th>M.E. (1898 Towns)</th>
<th>M.E. with Telecom (490 towns)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 999</td>
<td>43.5%</td>
<td>32.8%</td>
<td>10.7%</td>
</tr>
<tr>
<td>1,000 to 4,999</td>
<td>19.8%</td>
<td>22.0%</td>
<td>21.8%</td>
</tr>
<tr>
<td>5,000 to 10,999</td>
<td>11.0%</td>
<td>17.7%</td>
<td>12.1%</td>
</tr>
<tr>
<td>11,000 to 24,999</td>
<td>5.0%</td>
<td>5.0%</td>
<td>6.6%</td>
</tr>
<tr>
<td>25,000 to 99,999</td>
<td>18.4%</td>
<td>0.9%</td>
<td>2.5%</td>
</tr>
<tr>
<td>100,000 to 499,999</td>
<td>6.9%</td>
<td>0.1%</td>
<td>0.6%</td>
</tr>
<tr>
<td>More than 500,000</td>
<td>1.6%</td>
<td>1.6%</td>
<td></td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>No. Cities / Towns</th>
<th>US Total (25,503 towns)</th>
<th>M.E. (1898 Towns)</th>
<th>M.E. with Telecom (490 towns)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000 to 4,999</td>
<td>2,183 in US, 229 in M.E., 118 with Telecom</td>
<td>1803 in US, 229 in M.E., 118 with Telecom</td>
<td>1266 in US, 125 in M.E., 90 with Telecom</td>
</tr>
<tr>
<td>5,000 to 10,999</td>
<td>1,593 in US, 48 in M.E., 34 with Telecom</td>
<td>1,218 in US, 48 in M.E., 34 with Telecom</td>
<td>220 in US, 48 in M.E., 34 with Telecom</td>
</tr>
<tr>
<td>11,000 to 24,999</td>
<td>577 in US, 11 in M.E., 8 with Telecom</td>
<td>577 in US, 11 in M.E., 8 with Telecom</td>
<td>577 in US, 11 in M.E., 8 with Telecom</td>
</tr>
</tbody>
</table>

Explaining the Differences

- Refining a regression model
- Pr[MuniTelecom] = f(Cost, Demand, Alternatives, Political process)
  - Cost = f(Density, Remoteness)
  - Demand = f(Community size, Income, Knowledge industry employment, Growth)
  - Alternatives = f(Cable/modem availability, DSL availability)
  - Political Process = f(Political structure of local government, State proxy, Social capital)
Comparing Average Income

Comparing Average Density

Where We’re Headed

- Seeking/gathering remaining data
  - Non muni-electric municipal networks
    - Those that launched, and those that didn’t.
  - Other classes of locally based initiatives
    - Demand stimulation and aggregation.
    - Policy rule changes.
    - Funding programs.

- Understand what gets broadband out there.
  - Define performance metrics.
  - Measure effectiveness of different interventions, in different local contexts.
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Public / Private: A Swinging Pendulum

- 1980’s-90’s - Privatization
  - Reaction to inefficient and capital-starved government monopolies
- Today – Publicization? Reaction to
  - Perceived importance of communications for SMEs/economic development and quality of life
  - Decreased acceptance of rural lag
  - Capital-starved private sector
  - Availability of edge-based solutions
Public Wireless Anecdote:
City of Ellaville, Georgia

- Population <2,000
- www.epride.net
- 3 antennas on City’s main water tank
  - 2.4 GHz LOS (Alvarion) +
  - 900 MHz N-LOS (WaveRider) – trees!
- $200,000 upfront cost
- T-1 backhaul (ouch)
- Live in July, congested by December; over 100 users now, aim for 200

Small Cities Serve Their Own
June 25, 2002
Glendale School District, Flinton, Pennsylvania

- $457,000 “digital divide” grant - GAIN
- Extend wireless bb Internet access from school to nearby communities, schools
- Mobilize community support for “100 laptops” – tech and job skills training
Theoretical Rationales For and Against Govt. Involvement

- Lower-cost access to longer-term capital as town’s “unfair advantage.”
  - OK, if this gets bb where otherwise none?
  - OK for taxpayers to bear risk?

- Inherent conflicts of interest
  - Setting right-of-way rules for others while using for self.
  - Depends on specifics (e.g. may be no others).
Rationales, cont.

- Public sector generally less efficient.
  - Efficiency not always supreme: Consider TSA.
  - Operations often through private partners.
  - But, political decision making. Structure matters.

- How to evaluate performance?
  - Operated as non-profit.
  - Difficult to measure spillovers (e.g. health).
Crowding Out

- OK, if get bb faster?
  - Muni electric experience.

- In many cases, opposite effect.
  - Public announcement stimulates private deployment.

- Potential pendulum swing as a form of contestability over time?
  - FDR: local government utility as “the birch rod in the cupboard”
Voluntarism

- “Public” not just “government”
  - OurConcord.net
  - WiFi-based “freenets”
    - You can exclude with WiFi, but it’s more work.
    - Not the natural “affordance” out of the box.
A Framework for Understanding Freenets

<table>
<thead>
<tr>
<th>Consumption Type</th>
<th>Easy to exclude</th>
<th>Difficult to exclude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual consumption</td>
<td>Individual goods (e.g. food, clothing, shelter)</td>
<td>Common-pool goods (e.g. fish in the sea)</td>
</tr>
<tr>
<td>Joint (non-rival) consumption</td>
<td>Toll goods (e.g. cable TV, telephone, electric power)</td>
<td>Collective goods (e.g. national defense)</td>
</tr>
</tbody>
</table>

Question of Sustainability

- Depends on actual costs.
  - Capital (known to be low).
  - Backhaul, maintenance, operations, upgrade (open questions).
  - Excludability (authentication, billing, roaming etc.)

- Amenable to study.