

April 30, 2008

GOVERNMENT'S ROLE IN BROADBAND

**SHARON E. GILLETT
COMMISSIONER
MASSACHUSETTS DEPARTMENT OF
TELECOMMUNICATIONS AND CABLE**

About the DTC

- **Regulate telecommunications and cable industries according to federal and Massachusetts law**
 - Promote competition in telecommunications
 - Review tariff filings from carriers
 - Investigate and respond to carrier inquiries and complaints
 - Arbitrate interconnection disputes
 - Investigate service quality complaints
 - Oversee level of E911 surcharge
 - Set basic cable rates in towns without effective competition
- **Investigate consumer inquiries and complaints related to utility services**
 - Consumer hotline (**1-800-392-6066 or 617-305-3531**)
 - Consumer advisories on website (**www.mass.gov/dtc**)
 - Consumer education and outreach regarding DTV transition
 - “Slamming” complaints (unauthorized switch of telecom service)
- **Provide expert input to Administration, upon request**

How I got involved

- **Industry**

- Software engineer and development manager (1982-92)
- BBN Communications (Bolt, Beranek & Newman); Thinking Machines, Inc.

- **Academia**

- Student, researcher, advisor, program manager, lecturer, ... (1992-2007)
- Massachusetts Institute of Technology, Boston University
- Technology and Policy; Business / Management
- Research at MIT primarily focused on broadband technology and policy

- **Government**

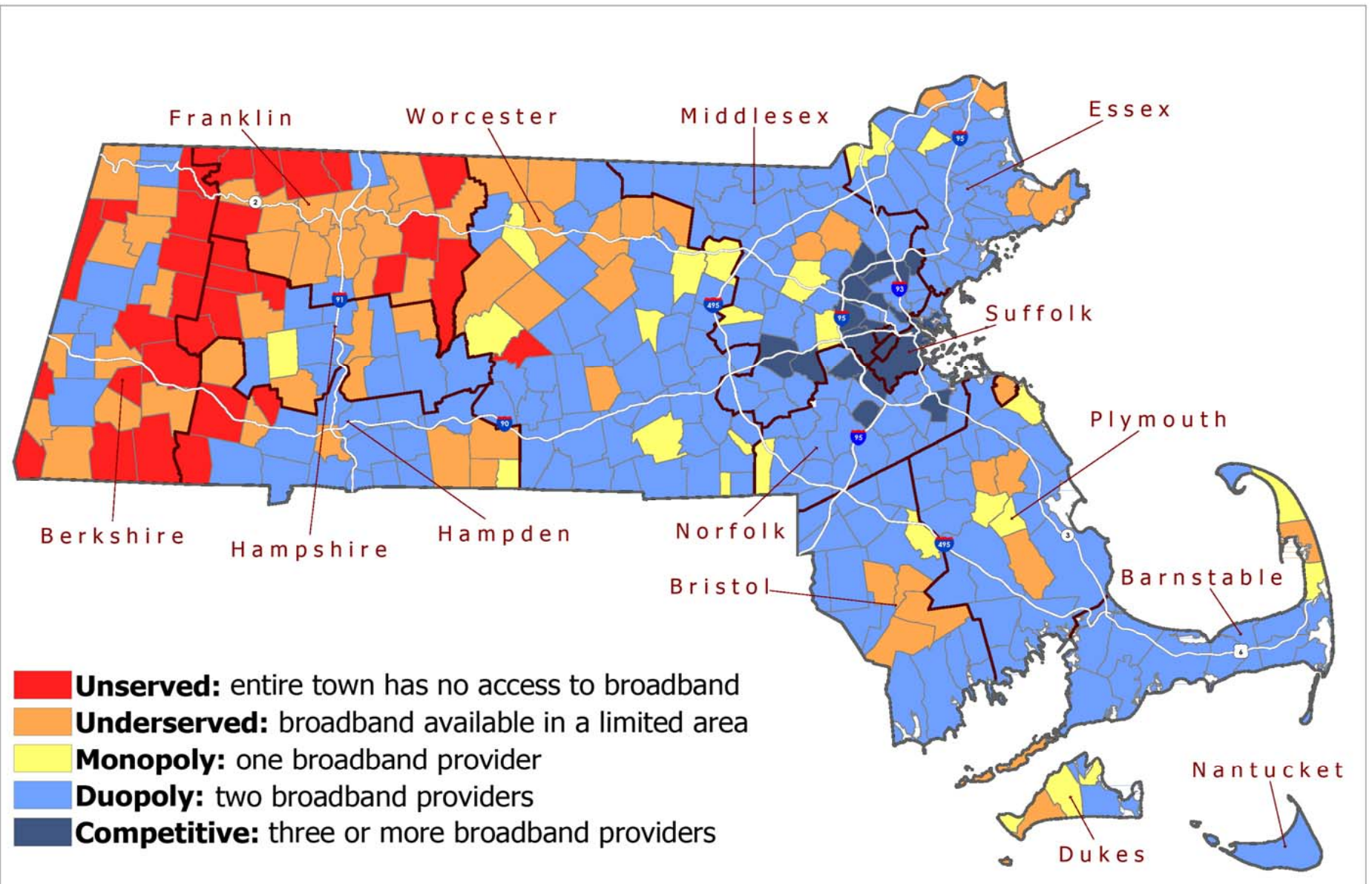
- Member of Boston Wireless Task Force (2006)
- Massachusetts Commissioner of Telecommunications and Cable (since spring 2007)

Why should government care about broadband?

- **MIT/CMU study of broadband's economic impact**
 - Funded by Department of Commerce and matching funds from industry sponsors of MIT's Communications Futures Program
 - Conducted by William Lehr, Marvin Sirbu, Carlos Osorio and Sharon Gillett
 - National-scale statistical study, comparing 2002 economic indicators by zip code, distinguishing communities by their BB availability in 1999 (as reported by FCC)
- **Data consistent with conclusion that broadband positively affects economic activity**
 - Even after controlling for community-level factors known to influence BB availability and economic outcomes
 - Controls: urban, income, education, growth in previous period
 - Usual academic caveats: data early and limited; potential methodological refinements

Economic Indicator	Results
Employment (Jobs)	BB added about 1% to growth rate 1998-2002
Property Values	Housing rents more than 6% higher in 2000 where BB available by 1999
Number of Firms	BB added nearly 0.5% to growth rate in number of business establishments, 1998-2002
Industry Mix	BB added over 0.5% to share of establishments in IT-intensive sectors, 1998-2002

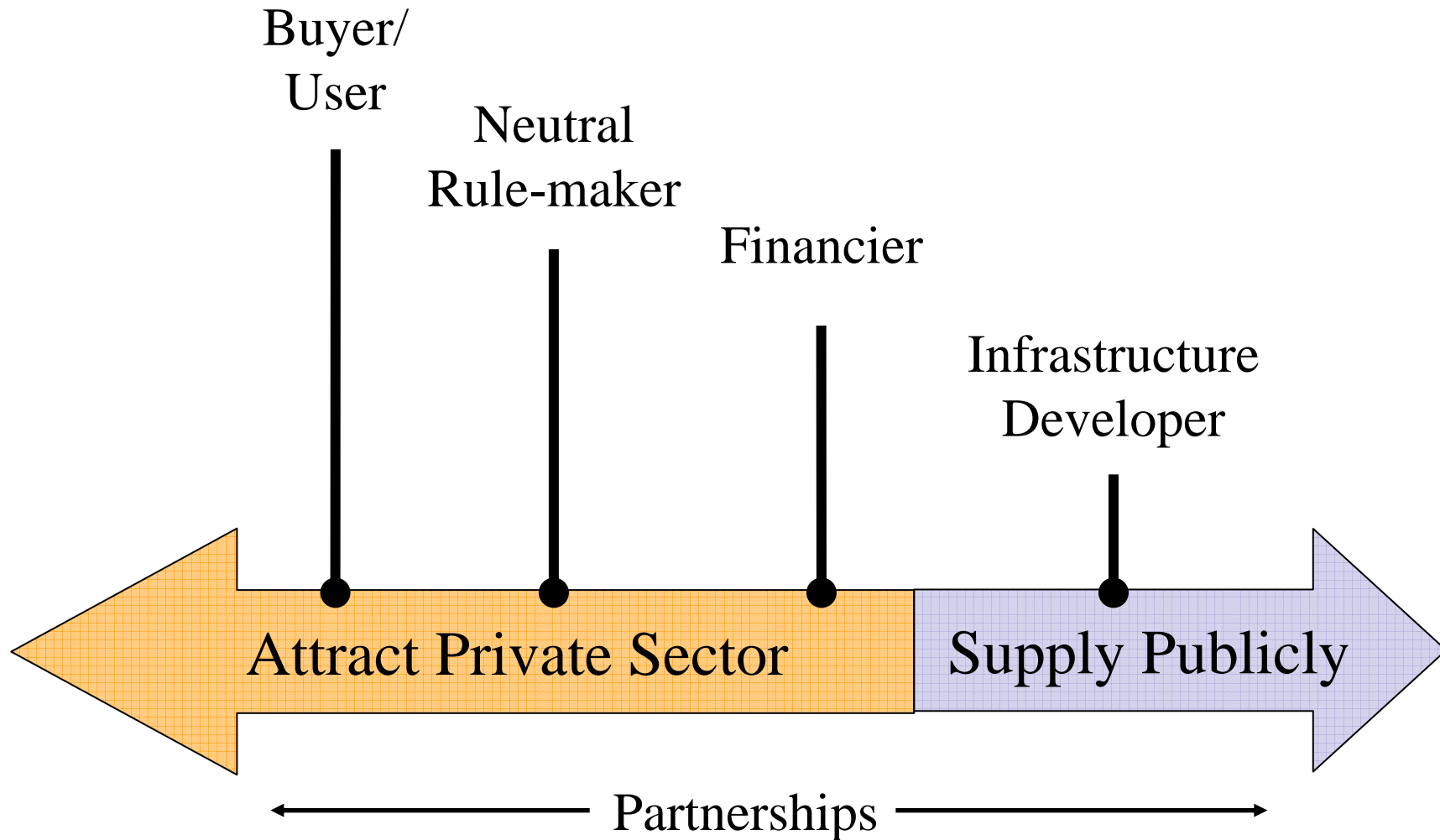
Broadband Availability in Massachusetts Municipalities June 2007



Governor Patrick's Broadband Initiative

- **Funding: Up to \$25 million in long-term bond authorization**
- **Goal: Serve the Commonwealth's unserved citizens, within 3 years**
- **Approach: seed public-private partnerships by investing public funds into long-lived elements of broadband infrastructure, motivating private co-investment in remaining components of broadband service**
 - Examples of long-lived elements: conduits, fiber, wireless towers
 - Examples of “everything else:” electronics, wireless devices, billing, customer support
 - Commonwealth will not be a service provider to the public
 - Fund, partnerships to be administered by Massachusetts Technology Collaborative
- **Rationale: address fundamental market failure in low-density regions**
 - Learn from failures of loan programs in other states
 - Similar co-investment model in process in northern Vermont (North-link project)
 - Co-investment unfamiliar in telecoms, but not in other infrastructure projects familiar to economic development officials, e.g. sewer hookups

Taxonomy: Role of Gov't *vis a vis* Broadband



Key Takeaways from Muni Wireless/BB Research: Then and Now

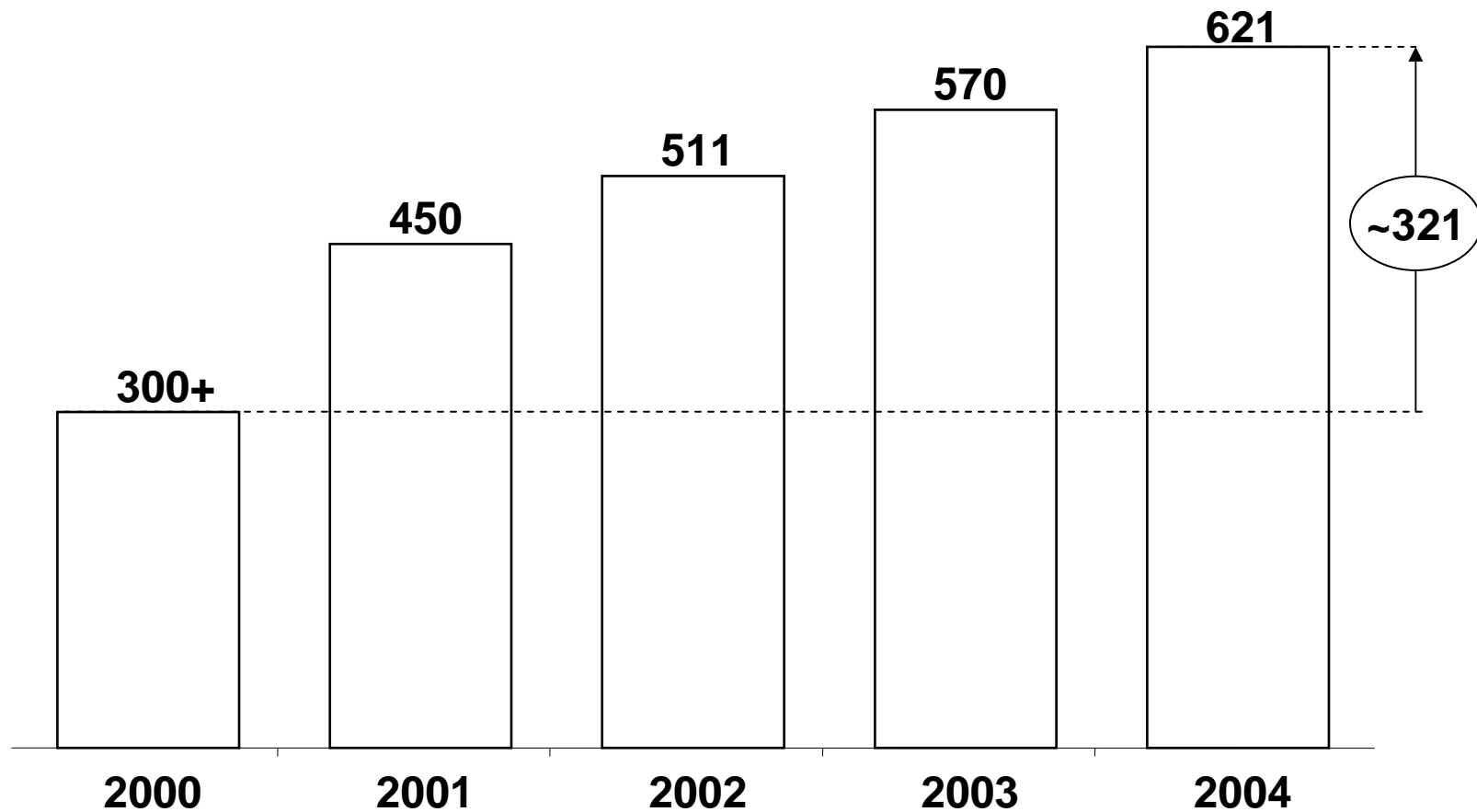
2006

- **Small but growing # of muni wireless / bb communities**
- **Cities have adopted three basic models**
- **Partnerships typically leverage existing city resources**
- **Concern about cities locking out later providers through exclusive franchises with first partner**

2008

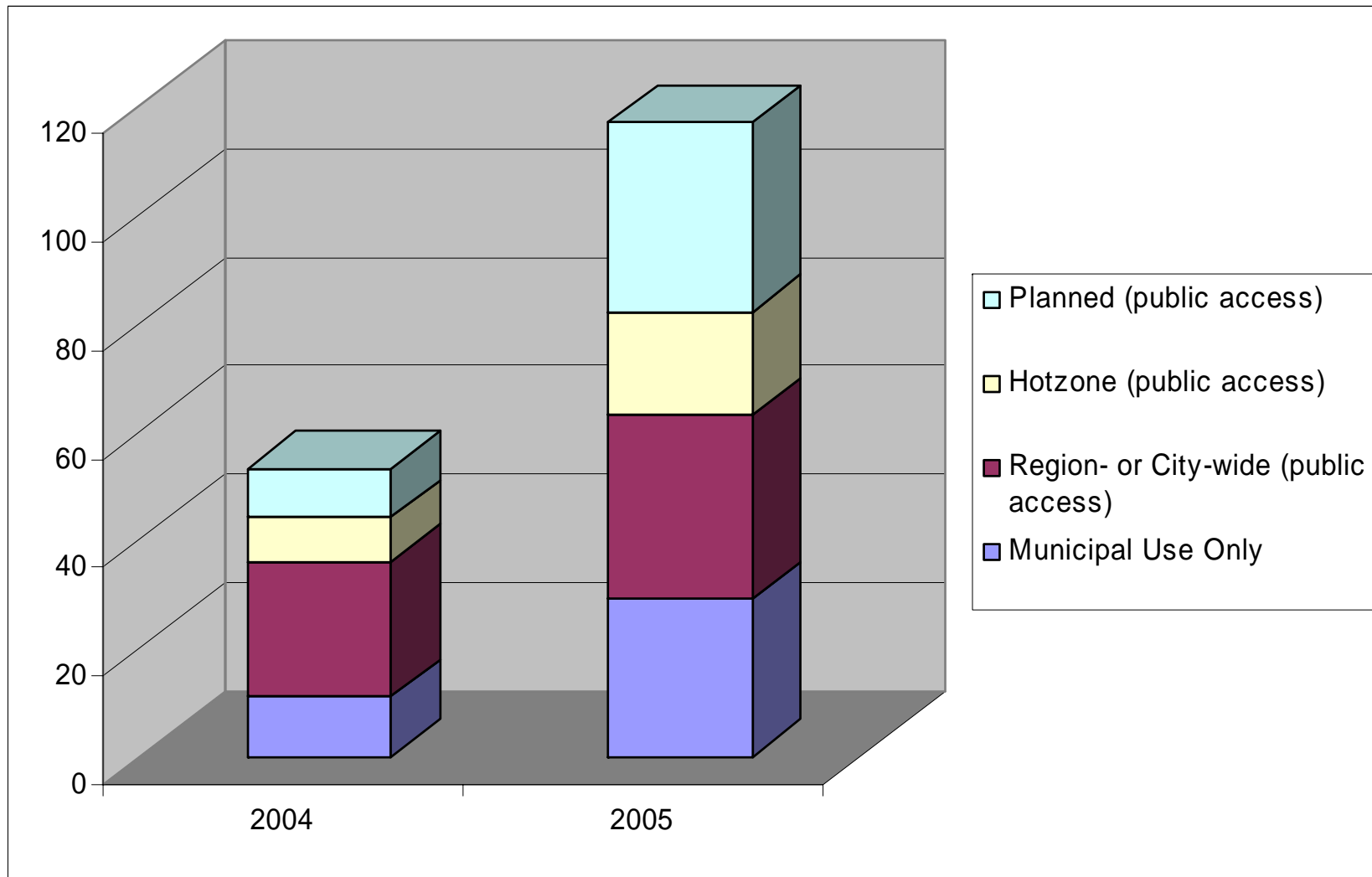
- **Shakeout, Earthlink exit**
- **Predictions borne out re self-provisioning vs. serving public directly vs. PPPs**
- **Many practical barriers to use of city assets**
- **Valid concern, but in practice few successful partnerships in the first place**

U.S. Muni Electric Utilities Doing Communications



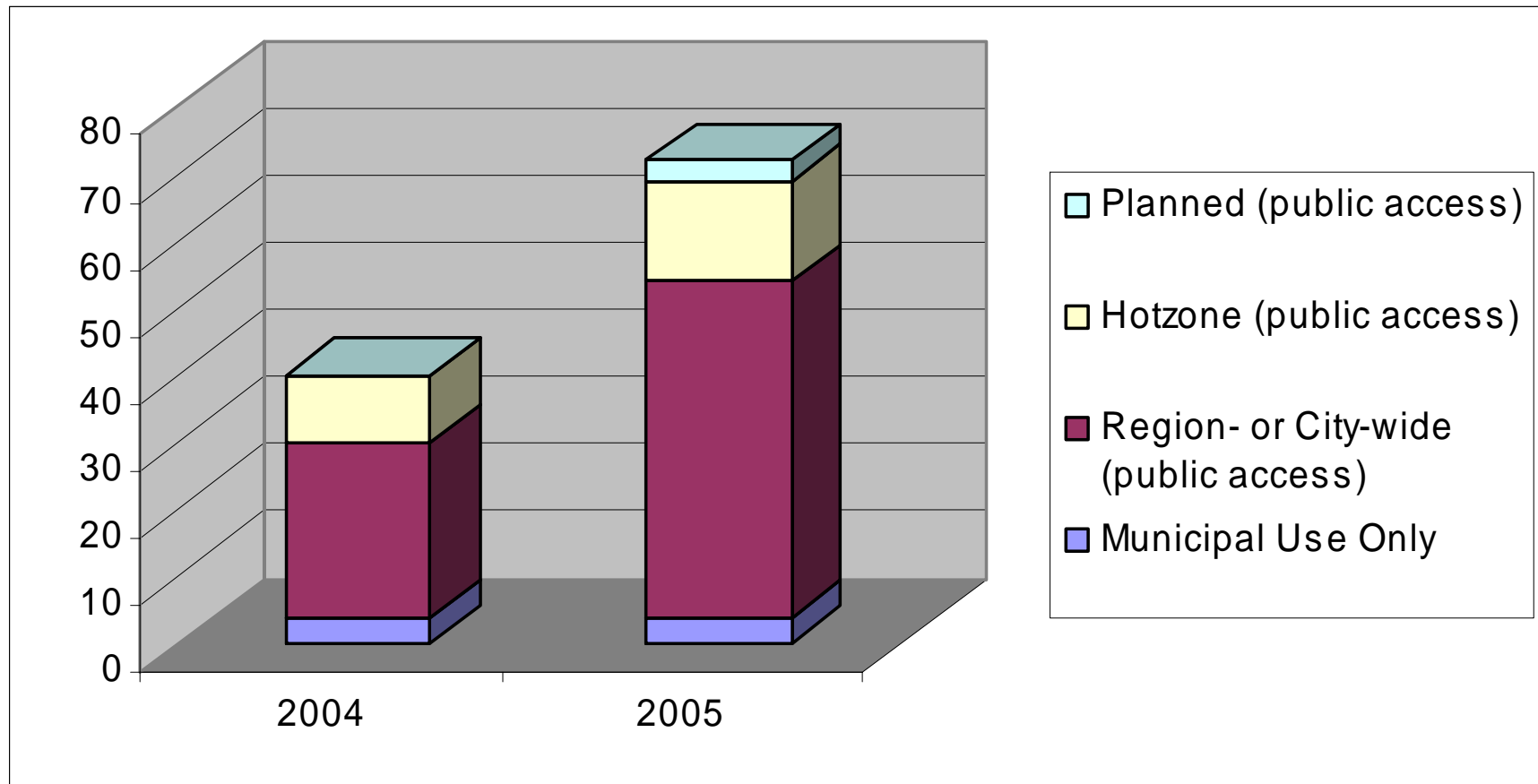
Of about 2,000 MEUs in U.S.
Source: American Public Power Association

U.S. Muni Wireless Deployments



Source: MuniWireless.com Anniversary Reports (Esme Vos)

Non-U.S. Muni Wireless Deployments



Source: MuniWireless.com Anniversary Reports (Esme Vos)

Model 1: Self-provision Wireless to Meet City's Own Needs

- **Part of broader “Customer-owned Network” trend (fiber and wireless)**
- **Enabled by unlicensed wireless spectrum**
- **Motivation: More bandwidth and/or more ubiquitous coverage => more efficient city services for less money**
- **Dominated by public safety today, but future possibilities limited only by imagination**
 - Homeland security and emergency preparedness in addition to day-to-day policing
 - Other mobile city workforce (inspectors, meter readers, ...)
 - Sensor (RFID)-based applications (parking meters, traffic lights, rubbish bins...)
 - Urban traffic and parking management (e.g. Denver, CO)
 - Road maintenance (potholes)

City's Own Use: Customer-Owned Network in San Mateo, CA

- **Public Safety Network**

- Wi-Fi mesh network, on city-owned light poles
- All HQ broadband applications now mobile
 - Mug shots, fingerprints , Amber alerts, GIS data, HazMat data
- New applications easily enabled
 - Real-time video surveillance, VoIP
 - Mobile, tactical broadband networks

- **Low cost**

- \$50k grant funding
- Lower cost than the 19.2Kbps data radio system it replaced
- “Edge” investments replace recurring costs
- Same user equipment works in car and at HQ

**Significant Productivity and
Efficiency Improvement**



Sources: Ron Sege, Tropos;
Muniwireless.com

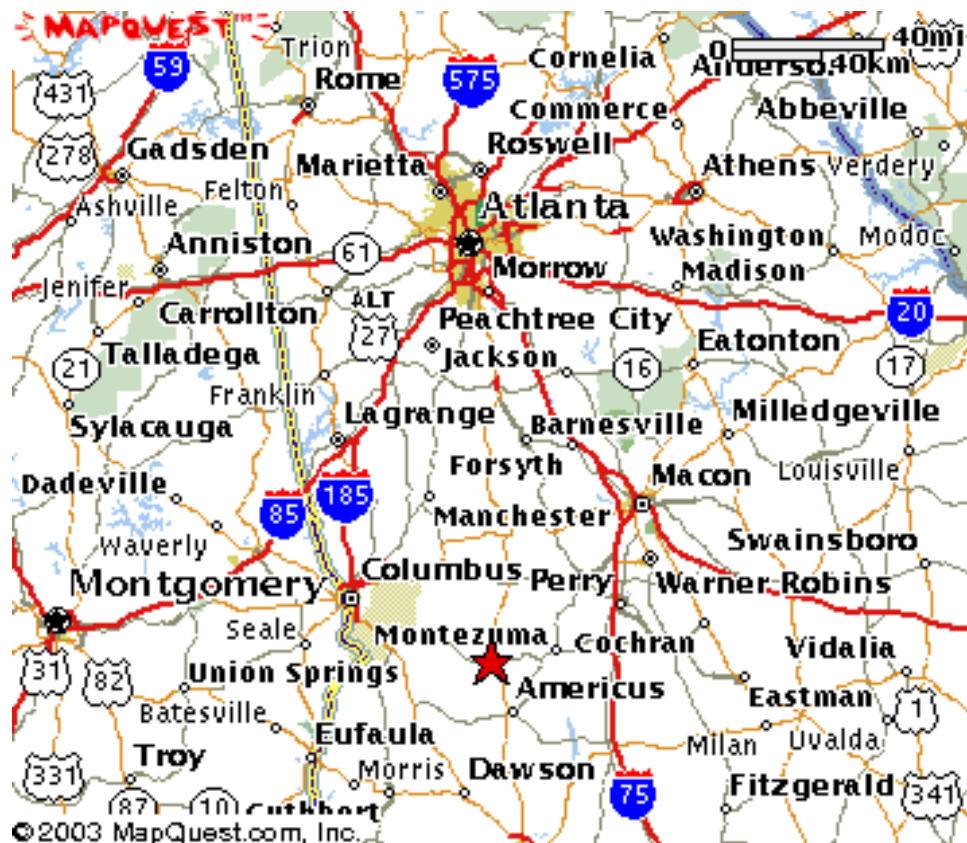
The view from 2008

- **Use of wireless for city's own needs is a powerful motivator**
 - Example of success in Brookline where this was the main driver of the project
- **But, deploying new municipal IT systems, reliably, at scale, is not the same as experimenting in a university lab**
 - Tight budgets push emphasis to cost savings rather than quality improvements
 - Technical expertise less plentiful, with more reliance on vendors
 - Security, reliability concerns paramount
 - Anchor tenant strategies make sense but require standardization across city departments
 - Success more likely in mid-size cities?

Model 2: Serve the Public Directly

- **Hotspots, businesses, or homes**
- **Motivation: digital divide, economic development**
- **Dominated by communities with publicly owned electric utilities**
 - E.g. Chaska, MN and Scottsburg, IN
 - Already have all the customer-service staff and infrastructure in place
 - Can often build on a municipally owned fiber ring already in place
- **These communities are “special” and not particularly good templates for larger, non-MEU communities like Boston**
 - 2006 conclusion, remains true in 2008

Serving the Public Directly: Ellaville, Georgia Municipal Electric Utility



- Population <2,000
- 3 antennas on City's main water tank
 - 2.4 GHz LOS (Alvarion) + 900 MHz N-LOS (WaveRider) – trees!
- \$200,000 upfront cost
- Users pay for service (~1 Mbps @ \$30-45/mo), modem (\$200) + antenna (\$100-150)
- 1.5 Mbps backhaul (ouch)

Small Cities Serve Their Own

http://www.isp-planet.com/fixed_wireless/business/2002/municipal.html

June 25, 2002

www.epride.net

©Gillett 2006 16

Model 3: Public Private Partnerships (PPP)

- **Hybrid approaches typically addressing needs of both city and community**
- **Motivation: “Economies of scope”**
 - Leverage city resources to reduce cost, improve quality of city services *and* facilitate entry by non-muni actors (private sector and non-profits)
- **Dominant model among planned initiatives in major cities**

Public-Private Partnership: Cerritos, CA Dual-Use WiFi Mesh Network

- **Fast and simple**
 - Commodity 802.11b clients
 - Less than 1 month to install
- **True metro-scale**
 - 9 sq. miles
 - 17,000 homes passed
 - 50,000 residents
- **Low cost to own and to operate:**
 - <\$600k total CAPEX
 - One wired backhaul link for the network
 - POP to Internet
 - No special CPE; no truck rolls
 - \$15 opex/sub @15% penetration
- **Bands used: 2.4 GHz**



City takes fast track to high-speed access

Town got tired of waiting for DSL, so Wi-Fi did trick quickly, cheaply

By Michelle Kessler USA TODAY



New TV ensures cords are out of sight, out of mind. Edward C. Baig, Personal Technology, 5B



Plan	Connection Speed Downlink/Uplink	Price/ Month
Aiirmesh Home		
Monthly	512 Kbps/256 Kbps	\$29.99*
Aiirmesh In-Town		
Hourly	512 Kbps/256 Kbps	\$4.99
Daily	512 Kbps/256 Kbps	\$8.99
Weekly	512 Kbps/256 Kbps	\$17.99
Monthly	512 Kbps/256 Kbps	\$29.99*
Aiirmesh BusinessPro		
Monthly	1 Mbps/1 Mbps	\$249.99*

*Annual contract agreement required.

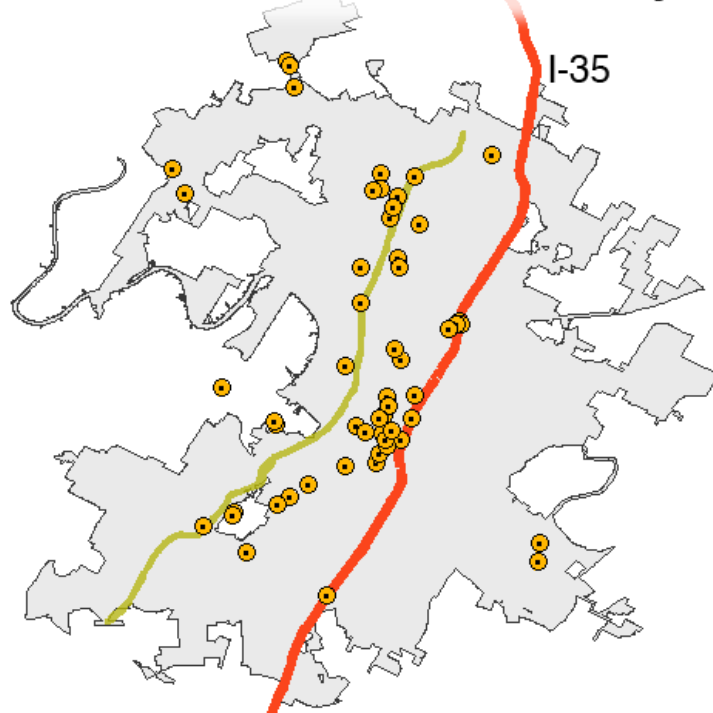
Source: Ron Sege, Tropos

Diverse PPP approaches

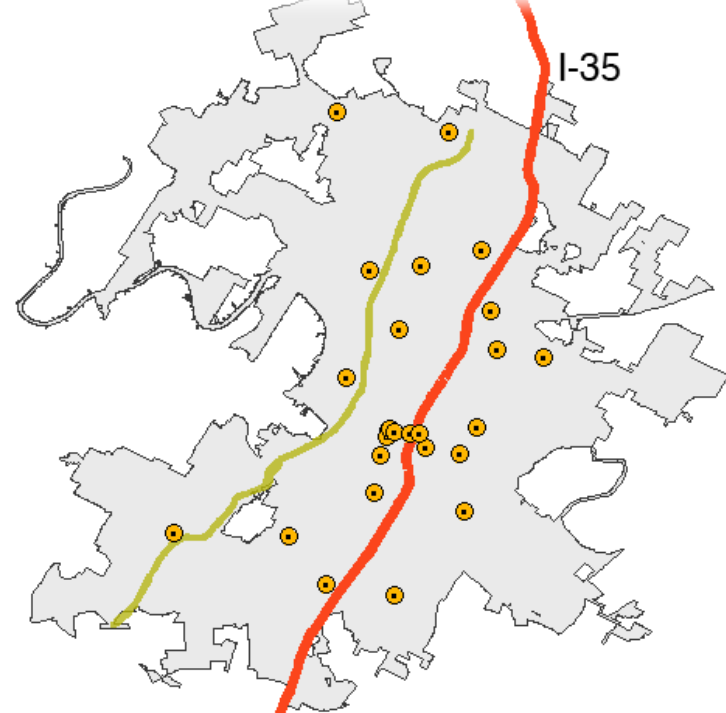
- **Philadelphia, PA**
 - City leases to Earthlink access to city fixtures for wireless antenna placement
 - City requires “open access” i.e. wholesale access for other ISPs on resulting Earthlink network
 - Earthlink agrees to invest \$10-15m and charge “low” wholesale rates
 - Wholesale profits feed into digital divide funds (taxation by another name)
 - Analogous to cable franchise, but many details still not clear / public
- **Anaheim, CA**
 - Exclusive deal with Earthlink, but “open access”
- **Tempe and Chandler, AZ**
 - Non-exclusive deal with NeoReach
- **San Francisco, CA**
 - Six proposals
 - Google and SF Metro Connect both proposing free-to-end-user access + advertising support + options for paid service tiers

City's Role in Narrowing Digital Divide: Public-Private Hotzones in Austin, Texas

Public Wi-Fi venues - AWCP only



Public Wi-Fi venues - City gov't



AWCP=Austin Wireless City Project

Source: Martha Fuentes-Bautista and Nobuya Inagaki, "Wi-Fi's Promise and Broadband Divides: Reconfiguring Public Internet Access in Austin, Texas," Telecommunications Policy Research Conference, September 2005, www.tprc.org

Leveraging City Resources

- **Infrastructure-based resources**
 - Traffic and street light poles
 - Underground conduits
 - Rooftops of municipal buildings (antenna placement / real-estate model)
 - Towers (water, fire, etc.)
 - Fiber rings/backhaul connections
 - Essentially, any right-of-way or city property that facilitates wireless networking
- **City's buying power is also an important resource**
 - Demand aggregation / anchor tenant strategies
- ***Inventory* of these resources is a critical first step**
- **Can Boston non-profit institutions be leveraged in analogous ways?**
 - Health, education, arts, housing, historical, community, etc.
 - Existing wireless networks (Boston Foundation report)
 - May be especially relevant to digital divide issues (San Francisco model)

The view from 2008: Use of City Assets in Boston

- **Light poles**
 - Powering issues (e.g. bank-switching)
 - Not all of poles owned by city
 - No systematic inventory / GIS
- **Rooftops**
 - Access to electric power
 - Controlled by city departments
 - If public building not available, private landlords may hold out
- **Fiber / backhaul**
 - In many cities this is provided as part of cable I-Net, not available for dual use purposes
 - Another reason why MEU communities are more successful at muni wireless
- **Partnerships with non-profits**
 - Many good intentions, but lots of meetings – hard to move quickly
- **In short: devil (and lots of time) lies in the details!**

Best Practice Partnerships Avoid Exclusivity

- **In the process of facilitating the first wireless entrant, don't accidentally hinder the next one**
 - There can and will be many wireless networks, services, business models, etc.
 - Not all will look like traditional service providers (e.g. organic mesh networks)
- **How to manage multi-party access to city facilities?**
 - Consider treating like rights-of-way
- **“Open Access” Model Proving Popular**
 - Generally, means multiple competitors use a common shared network infrastructure, and customers can elect services from alternative suppliers
 - But requires clarification along many dimensions

The view from 2008

- **Avoiding exclusivity is important to think about for the future, but practically speaking is not yet the real problem**
 - Getting ANY partner is more of the issue, given uncertain returns
- **Municipal wireless as testing ground for innovative technology and business models**
 - In this context, many “failures” are to be expected
 - Example casualties: Earthlink’s municipal division; proprietary mesh networking
 - The new new thing: participatory networking, e.g. Meraki
- **TANSTAAFL!**
 - Can’t get something for nothing
 - If the problem is lack of infrastructure, can’t be solved without investment by someone
 - Problems of affordability and access (absorptive capacity) are different and admit a different set of solutions
 - In both cases, government has started where the need is greatest

Selected Publications on Municipal Broadband

William H. Lehr, Marvin A. Sirbu, and Sharon E. Gillett, "[Wireless is Changing the Policy Calculus for Municipal Broadband](#)" Government Information Quarterly, forthcoming.

Marvin A. Sirbu, William H. Lehr, and Sharon E. Gillett, "[Evolving Wireless Access Technologies for Municipal Broadband](#)" Government Information Quarterly, forthcoming.

Sharon E. Gillett, William H. Lehr, and Carlos Osorio, "[Municipal Electric Utilities' Role in Telecommunications Services](#)," Telecommunications Policy, forthcoming.

Sharon E. Gillett, William H. Lehr & Carlos A. Osorio. "[Municipal Trends](#)," Broadband Properties Magazine, September 2004. Excerpted from "[The Municipal Role in U.S. FTTH Market Growth](#)," FTTH Council's 3rd Annual FTTH Conference & Expo, October 3-6, 2004, Orlando, FL.

Marvin Sirbu, William Lehr, and Sharon E. Gillett. "[Broadband Open Access: Lessons from Municipal Network Case Studies](#)," 32nd Annual Telecommunications Policy Research Conference, October 1-3, 2004, Arlington, VA. Also see [Case Study Appendix](#).

Sharon E. Gillett, William H. Lehr, and Carlos Osorio, "[Local Government Broadband Initiatives](#)," Telecommunications Policy 28, August/September 2004, pp. 537-558.

Carlos A. Osorio, "[Bits of Power: The Involvement of Municipal Electric Utilities in Broadband Services](#)," MIT MS Thesis, June 2004.