Today’s Agenda

1. Key findings from survey
2. Key findings from outreach meetings
3. Key findings from services inventory
4. Revisit goals
5. Key choices to make now and how they relate to future decisions
6. Next steps
Decisions Now and Later

Future Decision Examples

• Does the City want to:
  • Build broadband infrastructure?
  • Operate a broadband network?
  • Enter into a public-private partnership?
  • Provide assistance to one or more groups in the community to get better broadband?

• How will the City pay for what it wants to do?

Present Decisions

• What are our goals?
• What gaps are we trying to fill?
• What options do we want to look at in more depth?
Next Steps in the Study Process

• Scope out requirements for three levels of network solution options and provide high-level cost estimates
• Review business model options and provide guidance on potential challenges
• Analyze regulatory and public policy framework
Opinion Dynamics Telephone Survey - Key Points
Internet Service at Home & Cellular Data Plans

Internet Access at Home - *Excluding* Cellular Data Plans

- Yes: 95%
- No: 3%
- Don't Know: 2%

Internet Access - *Including* Cellular Data Plans

- Home Internet and Mobile Cellular Internet: 92%
- Only Mobile Cellular Internet: 7%
- Do not have Home-based Internet or Mobile Cellular Internet: 0.3%
Primary Internet Service Provider

- Comcast: 83%
- Verizon DSL: 6%
- Verizon FiOS: 3%
- RCN: 2%
- Don't Know: 2%
Value of Internet Service

Mean = 2.96

Percent Respondents

1 - Poor Value

5 - Excellent Value

Comcast
Verizon DSL
Verizon FiOS
RCN
# Satisfaction with Overall Quality of Internet Service by Neighborhood

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<th>Neighborhood</th>
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<th>2</th>
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Overall Quality of Internet Service at Home

Mean = 5.96
Cost of Internet Service

- Very Important: 74.2%
- Somewhat Important: 20.8%
- Not very Important: 1.2%
- Not important at all: 0.5%
- Don't Know: 3.0%
Internet Service Attributes

[Bar chart showing the percentage of respondents rating different attributes of internet service, including:
- Cost of Internet Service
- Reliability of Internet Service by ISP
- Quality of Customer Service by ISP
- Level of Technical Support Offered by ISP
- Speed of Internet Service
- ISP's ability to provide all services on one bill]
Work from Home Frequency

- Mostly: 23%
- Some: 34%
- Hardly: 22%
- Never: 21%
Internet Download Speed Estimate by Residents

- < 10 Mb/s: 4%
- 10 Mb/s > 25 Mb/s: 5%
- 25 Mb/s > 100 Mb/s: 15%
- > 100 Mb/s: 1%
- Don't Know / Not Sure: 75%
Monthly Telecom Services Estimate

Percent Respondents

- $0 - $49.99
- $50 - $74.99
- $75 - $99.99
- $100 - $124.99
- $125 - $149.99
- $150 - $174.99
- $175 - $199.99
- $200 - $249.99
- $250 - $299.99
- $300 - $349.99
- $350 - $399.99
- Over $400
- Don't Know / Not Sure
## Monthly Telecom Services & Household Income

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<th>Estimate Range</th>
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<td>Over $400</td>
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<td>0%</td>
<td>1%</td>
<td>0%</td>
</tr>
</tbody>
</table>
Willingness to Pay More for Faster Internet

Percent Respondents

- Very Willing
- Somewhat Willing
- Not Very Willing
- Not Willing At All
- Don't Know
If you were moving, how important would the **quality of home Internet service** be in your decision of which house, apartment or condominium to live in?
Frequency of Using the City’s Public Wi-Fi System

- 54% Very Frequently
- 16% Occasionally
- 22% Rarely
- 5% Never
Recommendations to Improve Overall Internet Services in the City

If you were speaking directly to the leaders of city government here in Cambridge, what are the two or three issues you would recommend to improve overall Internet services in the city?

City Internet Service / Public Utility
Faster Internet Speed
Fiber Optic Internet
Lower Internet Prices
Free Internet / Public Wi-Fi
Competition / Multiple ISPs
Better Internet Service
Themes

• Comcast dominates the market
• On average, people are only marginally satisfied with their Internet
• Reliability and speed are very important to most people, but most people don’t know what their speed is
• The cost of internet is very important to \( \frac{3}{4} \) of respondents, and a majority estimate they spend \$150 \) or more per month on telecom services
  • But a majority say they would be somewhat or very likely to pay more to get better internet service
• A large proportion of respondents recommended that the City address “Better internet service,” “Fiber optic internet” and/or “Faster internet speed”
Community Outreach Meetings - Key Points
Outreach Meeting #1

- Several dozen people
- Most participants identified as residents, very few as businesses or providers of public service
- Process:
  - Brainstorming issues
  - Discussion and clustering of similar issues in breakout groups
  - Multi-voting by all participants on most important issues
Outreach Meeting # 1: Most Important Issues

1. “To address equity and autonomy issues, the City should own and manage its own broadband system.” (22 votes)
2. Excellence—Speed (gigabit+)/Reliability/Customer Service—“Go Big” (16 votes)
3. Providing affordable access for certain groups of lower-income residents (13 votes)
   - Students
   - Seniors
   - Public housing residents
   - Other low-income residents
4. Providing access and equity, including price, availability, wireless availability, and a free tier of service (12 votes)
5. Need for a choice of providers (9 votes)
Outreach Meeting #2

• Approx. 15 people
• Representatives from:
  • Lesley College
  • Novartis
  • Microsoft
  • Cambridge Innovation Center
  • Other local entrepreneurs and educators.
• Questions asked in two small groups:
  • How does better broadband across Cambridge support my organization?
  • What is/isn’t the problem
  • “Blog post from the future”
Examples of How Better Broadband Supports Organizations

- Supporting economic development and City’s leadership in the tech economy
- Opportunities to collaborate with K12 schools
- Addresses digital divides (economic & geographic)
- Colleges are more attractive to students
- Supports quality of life
- Makes properties more marketable

- Access to great infrastructure without multiple digs
- Addresses City’s affordability issues for residents
- More affordable options for bus. & institutions
- Applications—cloud apps, smart buildings, sensors, video, “homework at home”
What is the problem summary

With Broadband to my Organization

• Inconsistent levels of access to best service
• Access to conduit between locations in the City
• Upload ability
• Number and diversity of devices
• 1 Summer St. vulnerability

With Broadband in the City

• Poor competitive choices
• Lost opportunities when digging up streets
• The Wi-Fi in many public spaces
• Planning for fiber and conduit in new construction
What isn’t the problem

summary

With Broadband to my Organization

• Metro A Loop connectivity to Summer Street
• Good fiber options in some locations
• Working with the City
• Basic broadband access

With Broadband in the City

• Kendall & Harvard Sq. Wi-Fi Collaborations
• Comcast raising speeds w/out raising prices
• Use of city conduit (if available)
Sample Reports from the Blog
Post from the Future

Process
• “City talked to carriers and business partners to find out what they wouldn’t do regarding broadband offerings.”
• “A comprehensive plan was made.”
• “Collaboration amongst public schools, private universities, providers, and local businesses (small, medium and large).”
• “Presented a compelling business case to carriers / business partners.”
• “Spent time talking to residents and businesses alike regarding digital divide.”

Outcomes
• “Public utility: City-owned conduit”
• “Decided that this was infrastructure with limited private business case.”
• Services that are “more reliable,” “high quality,” “lower quality”
• “Broadband regardless of ability to pay”
• “Students have better, more equal opportunity”
• “Better employee recruitment”
Carrier Offerings Analysis
Broadband Service Offerings

- Residential and Small Business
  - Comcast
  - Verizon
  - NetBlazr
- Small Business
  - MegaPath
  - RCN
  - XO
  - Wicked Broadband
- Enterprise/Institutional/Wholesale
  - Numerous
Residential Internet – Highest Download Speed Offered

<table>
<thead>
<tr>
<th>Internet Service Provider</th>
<th>Speed (Mb/s Download)</th>
<th>Price/Mo.</th>
</tr>
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<tbody>
<tr>
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Residential Internet – Lowest Price Offered

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Small Business Internet – Highest Speed Offered City-wide

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<th>Internet Service Provider</th>
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Small Business Internet – Lowest Price Offered City-wide

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<td>50</td>
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Other Small Business Offers

- **Megapath**
  - DSL and Ethernet-based services, speeds top out at 15Mbps
- **RCN**
  - Similar speed tiers to Comcast, approx. $35-45/mo less in price
- **XO**
  - Lowest tier 1.5 Mbps/768 kbps @$447/mo
  - Highest tier 100 Mbps/100 Mbps @$2,128
- **Wicked Bandwidth**
  - 10 Mbps/10Mbps @$450/mo through
  - 1Gbps/1Gbps @ $2,000/mo
Overview of Metro Networks

Metro Networks
- Bay Ring Communications
- FirstLight - Leased
- Genesis
- Hibernia
- Independent Optical Netw.
- Last Mile Solutions
- Level3 Metro
- Lightower
- Lightower Leased
- Oxford Networks
- RCN
- Sunesys
- Verizon Business - Field P.
- Wicked Bandwidth
- Wicked Bandwidth - Leas...
- Windstream
- XO Communications
- Zayo Metro
Fiber-Based Networks with Small Business Offers
Selected Enterprise Metro Fiber Networks
Enterprise Fiber:
Not for the average small user

Common Characteristics
- Low/no oversubscription
  - Dedicated capacity or facilities
- Prices often quoted on an individual case basis
- Sold to large businesses, institutions, wholesale customers
- May be sold as dark fiber, waves, Ethernet transport, Dedicated Internet Access

Sample Pricing: Zayo
- Dedicated Internet Access (DIA) - 10M $956-1,593
- DIA - 100 Mb $1,051-1,753
- DIA - 200 Mb $1,396-2,326
- DIA - 500 Mb $2,830-4,717
- DIA - 1Gb $3,937-6,562
- DIA - 10Gb $18,731-31,218
- Dark Fiber (Point to Point)* $2,855-6,684
- Dark Fiber (Ring)* $3,996-9,078
Takeaways

- Mass-market services are available widely only from a handful of providers.
- Many metro fiber providers are present in Cambridge, but are concentrated in the eastern and central parts of the City, and to a lesser extent in the north.
Goals, Key Choices and Decisions on Next Steps
Evidence Supporting Goal Themes

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<td><strong>Local control</strong></td>
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Does anything we’ve learned make us want to add, remove, or change goals in these areas?
Ways to Think About City’s Possible Broadband Activity

• Delivering a *program*
• Building a *platform*
• Providing a *utility*
Delivering a Program

• Focuses on a targeted problem or issue with a discrete initiative focused on that problem or issue
• Likely to be an expense supported or subsidized by taxes

Example: Delivering improved, low-cost broadband services to lower-income households in Housing Authority buildings
Providing a Utility

- Provides a common service broadly across the community
- Typically a service that everyone pays for through user fees

Example: Gigabit internet access delivered to every home and business location in the City
Building a Platform

• Creates a common set of infrastructure that can be used in a variety of ways by entities other than the City to deliver services
• May be associated with user fees or provided as a “commons” supported by taxes

*Examples: Shared conduit system or dark fiber*
Levels of a Platform--Example

- Internet Access and Network Applications
- Lit Transport Services
- Dark Fiber
- Conduit
Network Solutions We Will Examine

- “Small”: Fiber build-out to CHA buildings (a Program)
- “Large”: City-wide Fiber-to-the-premise network (a Utility)
- “Medium”: to be determined
  - A Platform?
  - Another Program?
  - A Smaller Utility?
Platform Options for Consideration

• Option 1: Dark Fiber with frequent points of access for laterals or drops to individual users
• Option 2: Conduit (or underground dark fiber in conduit with spare innerduct)
• Targeted geographic focus (pick one or more)
  • Extended ring(s) around city
  • Neighborhoods with lower concentrations of metro fiber
  • Between key business or institutional locations not adequately served by existing conduit or dark fiber networks