

Wireless in Boston

Overview

Prepared For:

**Municipal Broadband Working Group and
Western Mass Forum**

Meetings hosted by



MASSACHUSETTS
TECHNOLOGY
COLLABORATIVE

John Adams **Innovation** Institute

Westborough, MA

August 31, 2006

Agenda

- Introduction & Background
- Boston Specific Information
- Methodology
- The Model

Introduction

– **Nicholas Vantzelfde** – Director, Altman Vilandrie & Company

- 1999 – WiFi Technology Assessment
- 2002 – WiFi in NYC
- 2004 – Muni-WiFi Economic Analysis
- 2006 – City of Boston Wireless Task Force Project Manager

– **Altman Vilandrie & Company** (www.altvil.com)

- 40 Consultants – Based in Boston
- Management/Strategy Consultancy
- Telecom Focus, including related High Tech, Media, & Entertainment

In Boston, the Wireless Task Force developed its plan across four areas. We provided direct support and facilitation across each of the following areas...

*Business Model
Selection and
Development*

*Technology Model
Selection*

Asset Inventory

*Public Interaction /
Messaging*

AV&Co Roles

- **Project Manager and Meeting Facilitator** – participate in and facilitate meetings with each group. Synthesize the results of meetings and provide updates to each group. Maintain consistent progress across multiple efforts.
- **Expert Resource** – using past experience, provide insight on business model options, best practices, and applicability
- **Researcher** – conduct primary and secondary research across the various projects and tasks. Relay findings to internal teams.
- **Modeler** – develop the business case model, including projected adoption and financials, for the various options under consideration
- **Author** – generate multiple drafts of the final report over the course of the project based on the task force's progress and findings.

Broadband matters, empirically

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

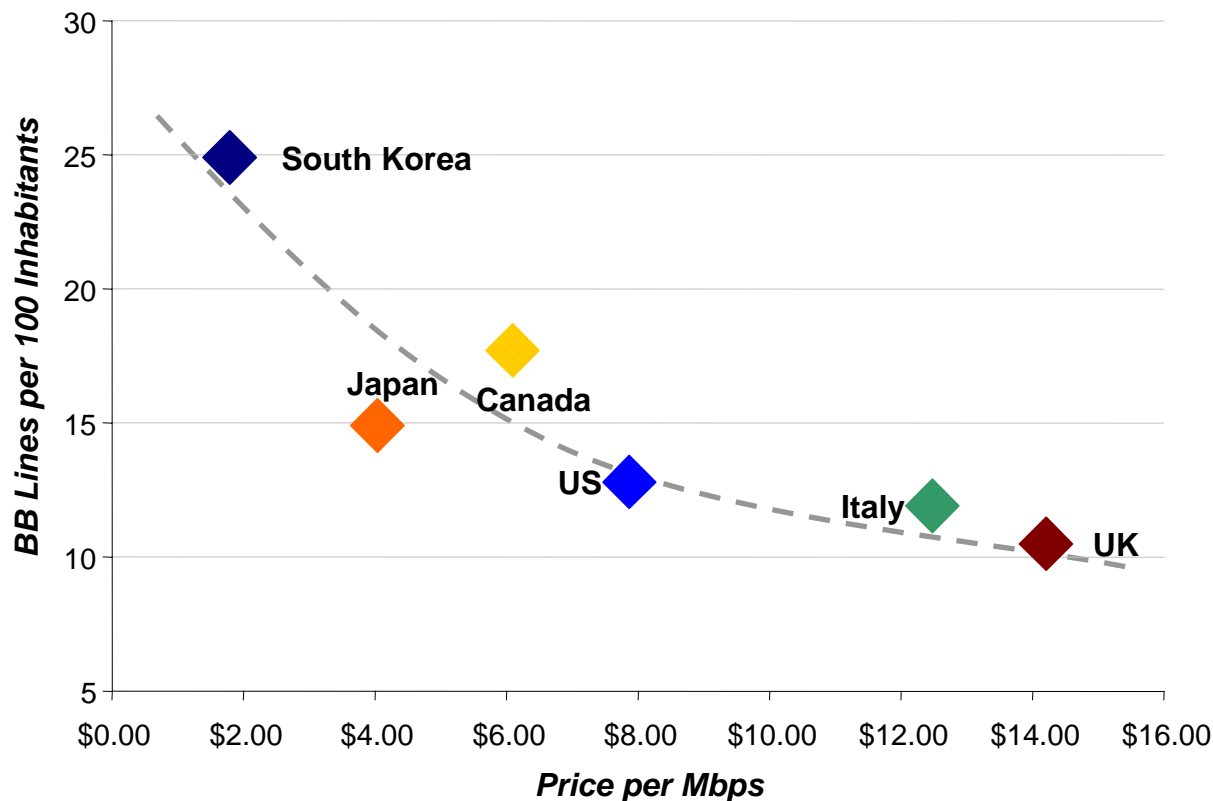
Economic Indicator	Results
Employment (Jobs)	BB added about 1% to growth rate between 1998-2002
Property Values	Housing rents more than 6% higher in 2000 where BB available by 1999
Number of Firms	BB added nearly 0.5% to growth rate in number of business establishments, 1998-2002
Industry Mix	BB added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

Study summarized in December 2005 Broadband Properties Magazine (www.broadbandproperties.com)

Broadband adoption is highly elastic...

–In Korea, which has over 2x the broadband penetration of the US, consumers can purchase an 10Mbps connection for roughly \$20US per month

Broadband Penetration vs. Price per Mbps



Implications

- Mass market demand is highly elastic
- Broadband users value speed
- ARPU is often very similar between countries with drastically different penetrations

Source: ITU, Industry Research

The Internet is simply a network that connects end-users to information. The following framework was used in our process

Internet Access Value Chain

Internet Backhaul

- National network connecting major cities around the US.
- Connects to servers of websites as well.

Metro Transport

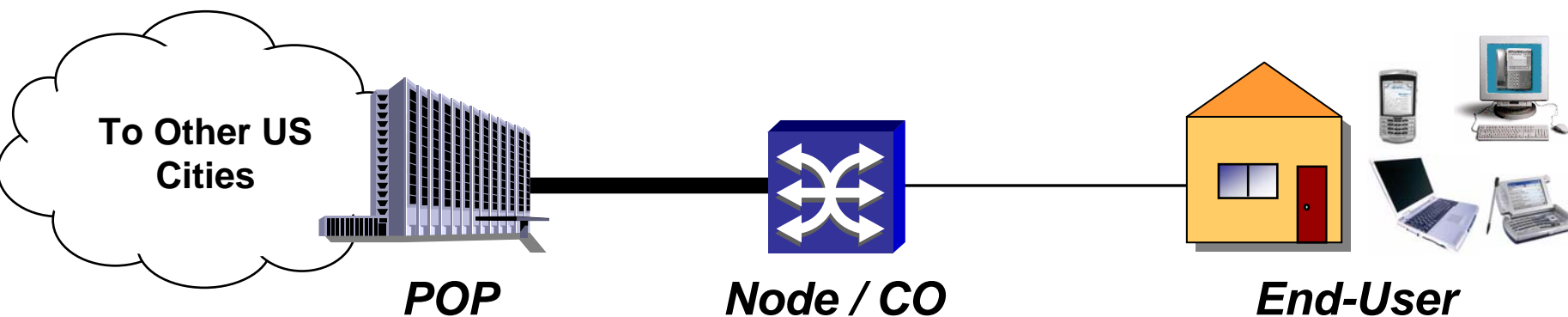
- Fiber connections running from the POP (national network interconnection point) to a Boston Neighborhood or MA Town Center

First Mile Access

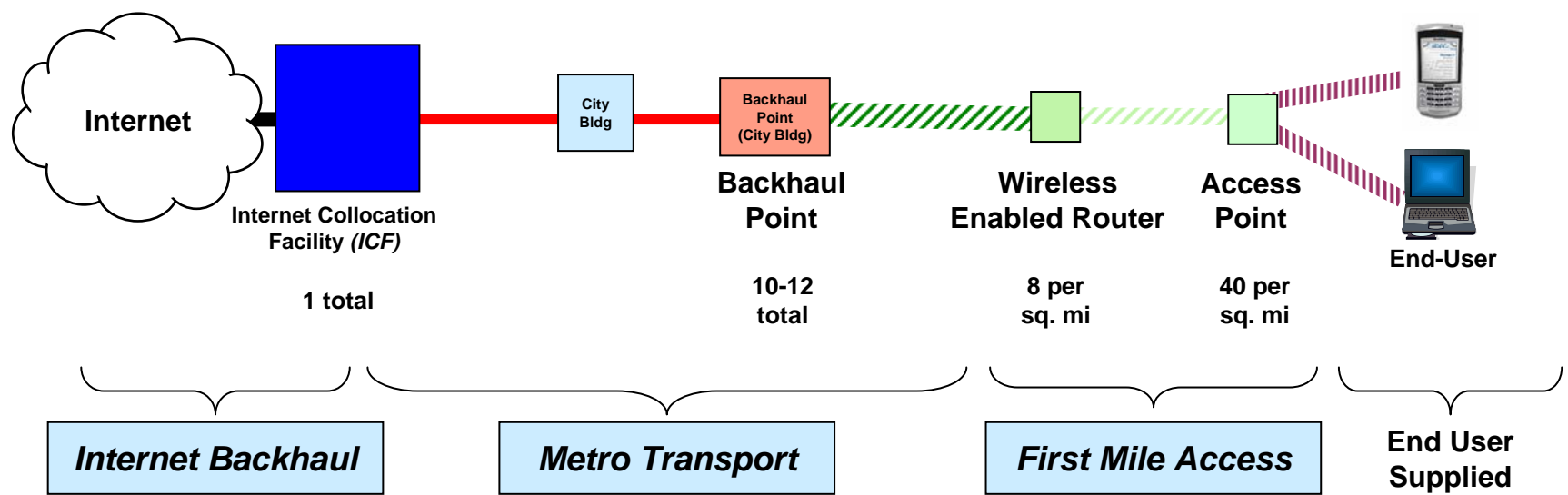
- Copper or CO-AX connections running from the Neighborhood or Town Center to each house or business
- A.K.A “Last Mile”

Service & Applications

- Customer care
- Billing
- Applications



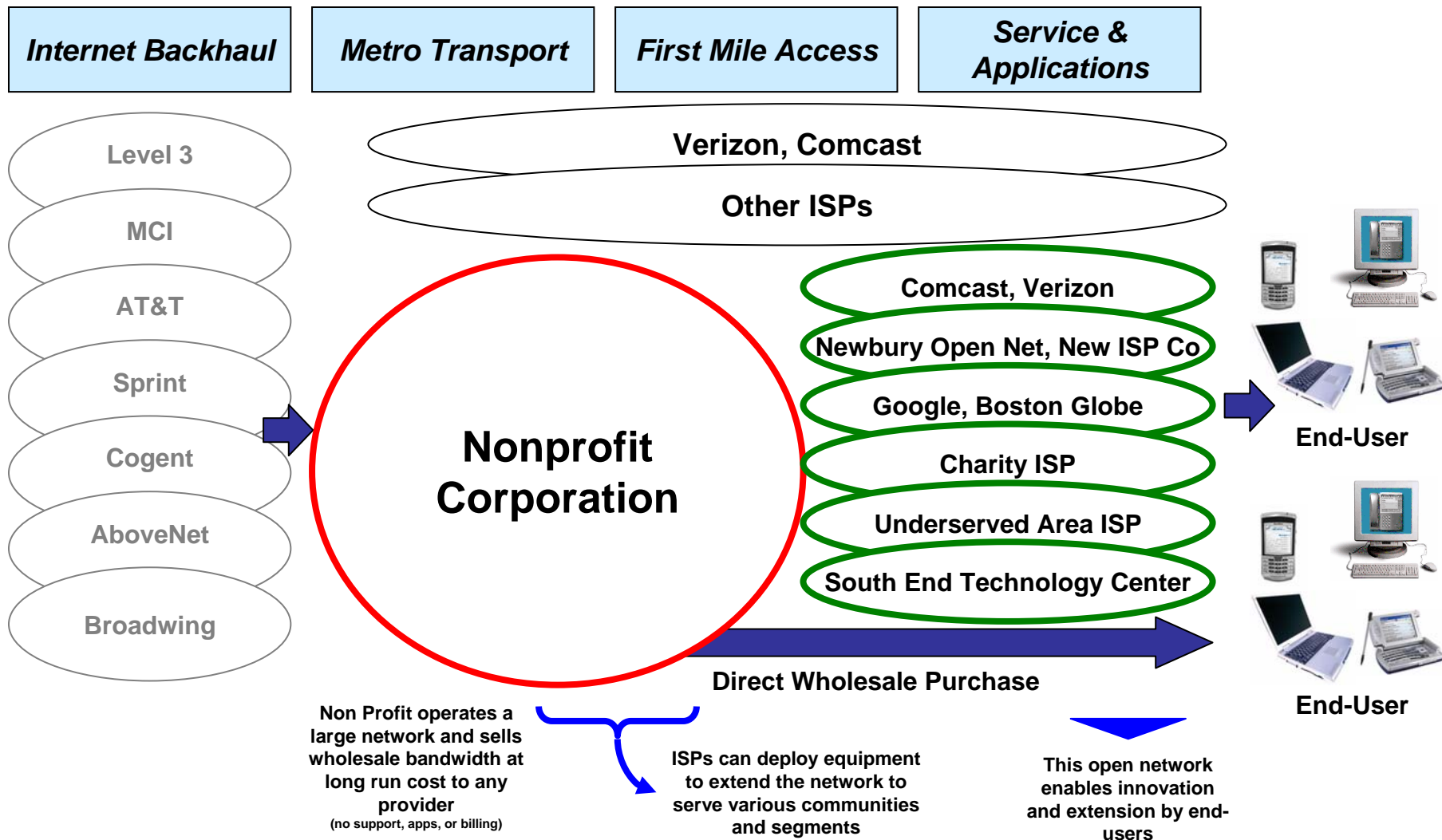
Our network design is as follows:



Transport Protocols	<ul style="list-style-type: none"> • 802.3 • 802.1P • TCP/IP 	↔	<ul style="list-style-type: none"> • 802.16 • Microwave • LMDS 	↔	<ul style="list-style-type: none"> • 802.11b/g/n • 802.11s • SIP
City Assets Used	Fiber, Conduit		Building Rooftops		Light Poles
Asset Purpose	Bit Transport		Router & Radio Locations		Radio Locations

The “Boston” Model changes the paradigm of wireless internet access

Internet Access Value Chain



The “Boston” model is the best way to achieve the City’s three goals

- Foster economic development and stimulate innovation
- Ameliorate the digital divide
- Improve access to and quality of City services

The model is extremely disruptive, innovative, and unique

- Technology is standard and very cheap to build out
- Open access network that will encourage entrepreneurs

The network will be a magnet for large companies as well as entrepreneurs

- Create a broadband ecosystem

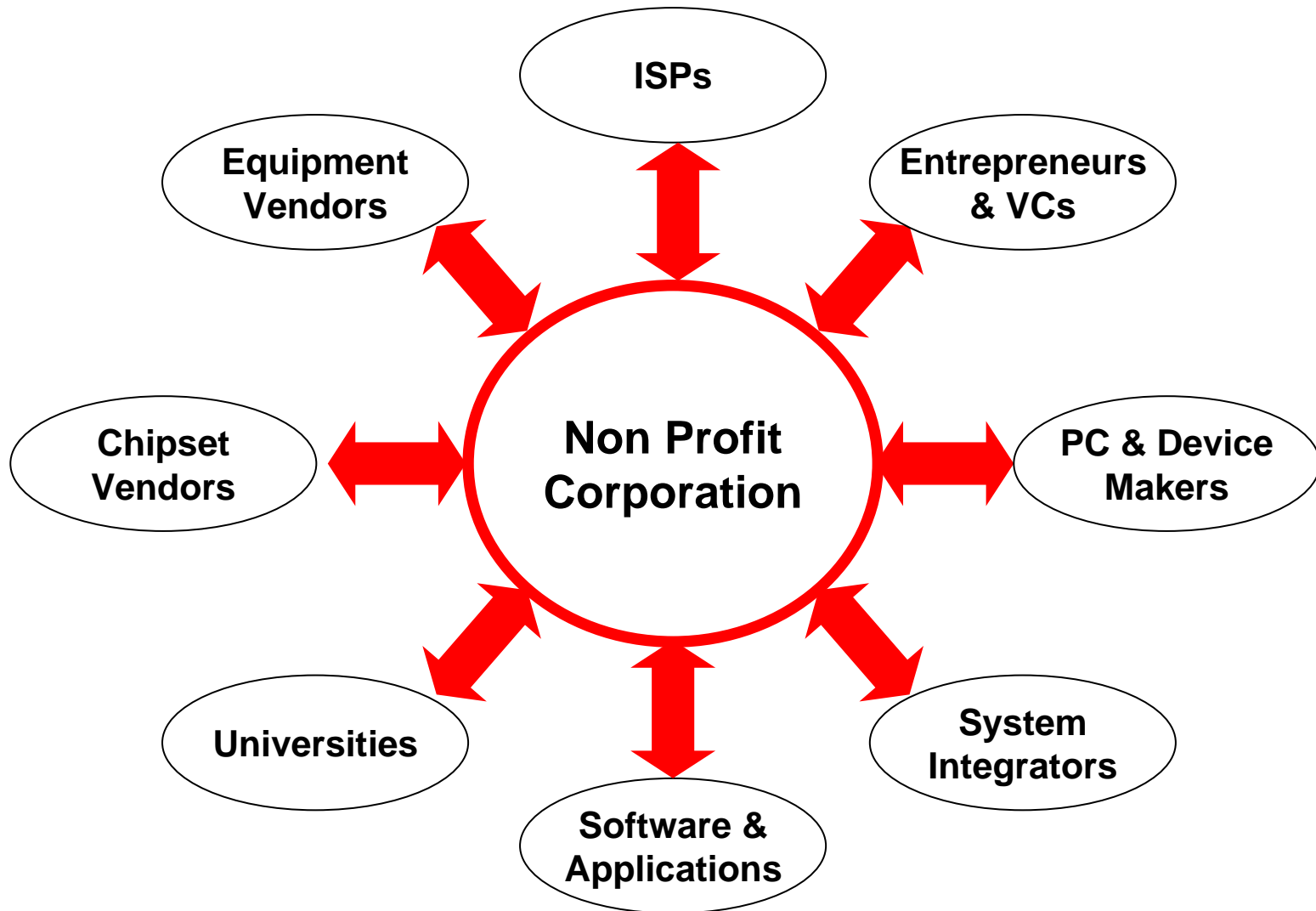
Community organizations can and will participate

- Dotwell, Codman Square Health Center, Tent City, etc

The City will not own or operate this network

- No tax dollars will be used

The establishment of a non profit will create a broadband “ecosystem”



What the Boston model is:

- A network design that leverages a revolutionary new technology capable of lowering the cost of delivery of broadband, available to all ISPs
- A mechanism to increase competition for end-users
- An environment that will stimulate innovation and economic development
- A trusted partner of the City to accelerate the adoption of broadband

What the Boston model isn't:

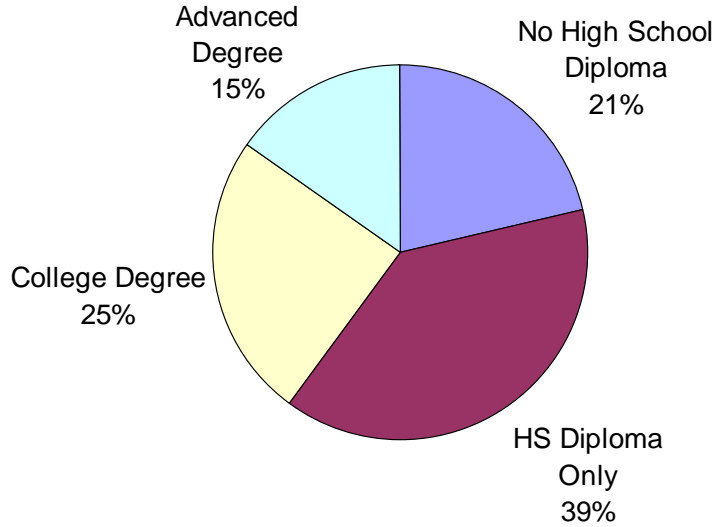
- A government agency, government affiliate, or government subsidy
- Competition for entertainment or voice services
- A model for every city in Massachusetts

Agenda

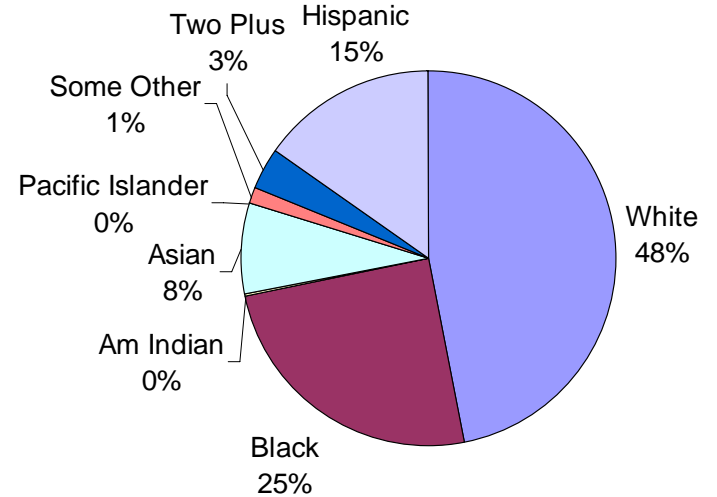
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Boston at a glance

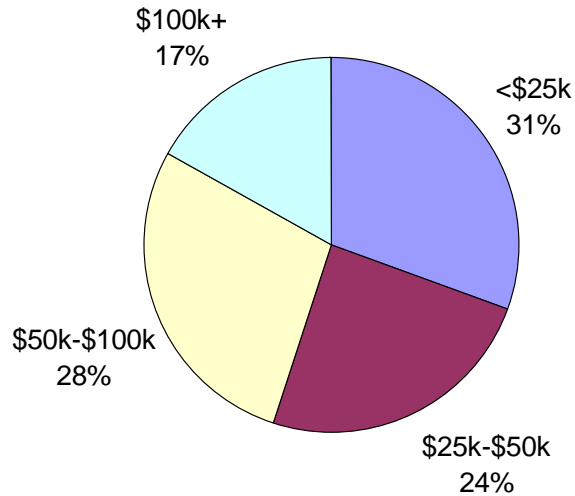
Educational Distribution of Adult Residents



Ethnic Distribution of Residents

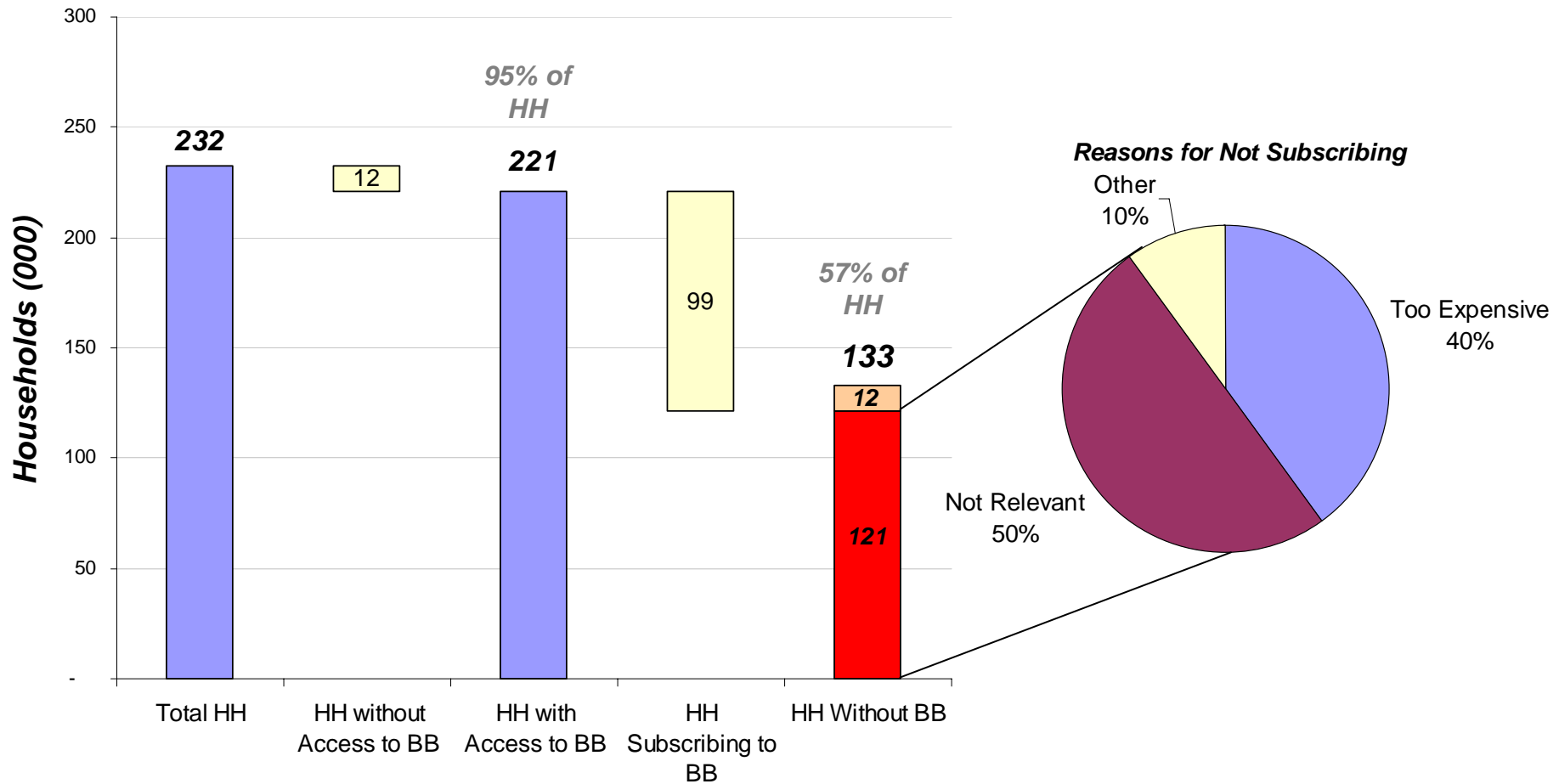


HH Income Distribution of Residents



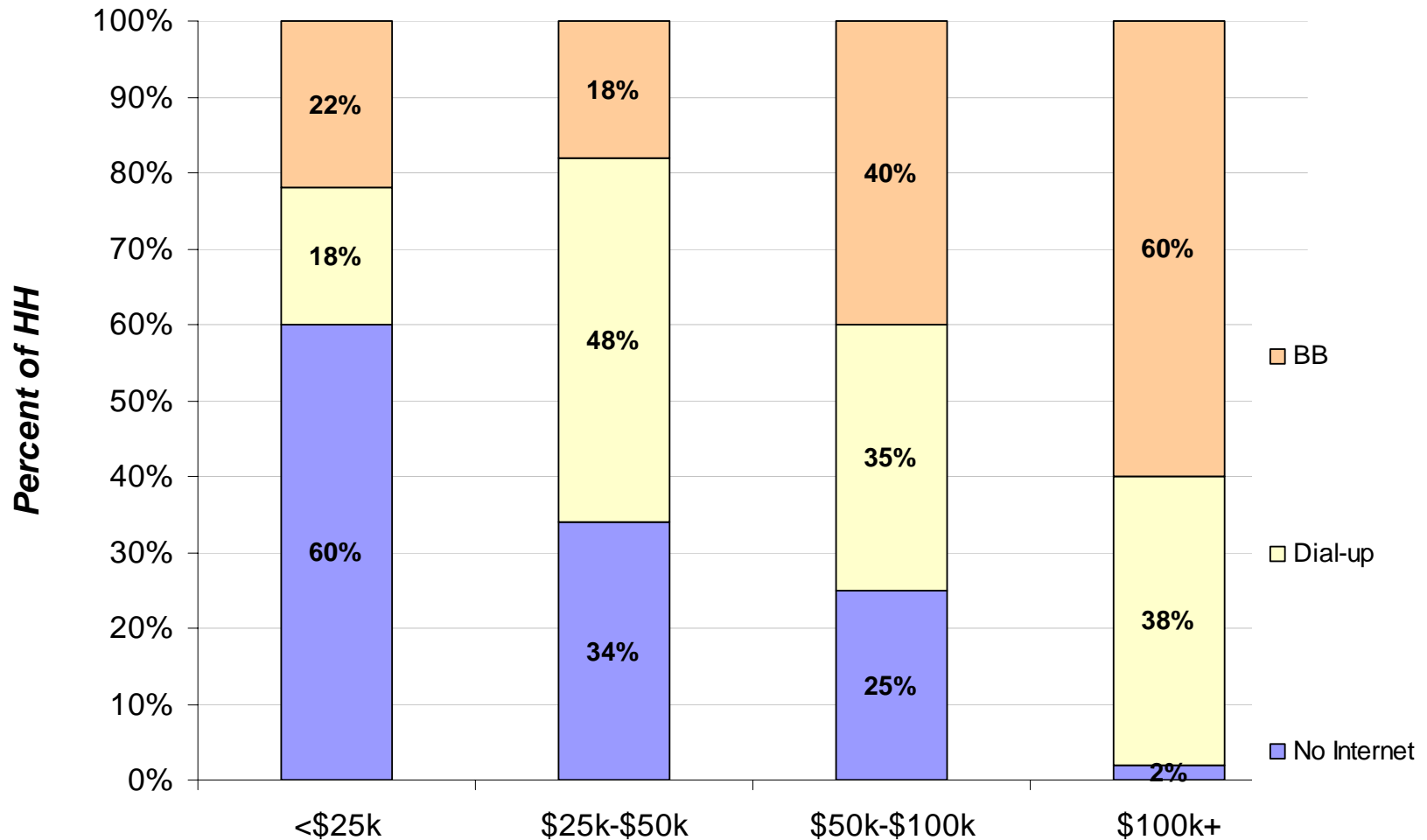
Boston Broadband Adoption

Broadband Adoption in Boston

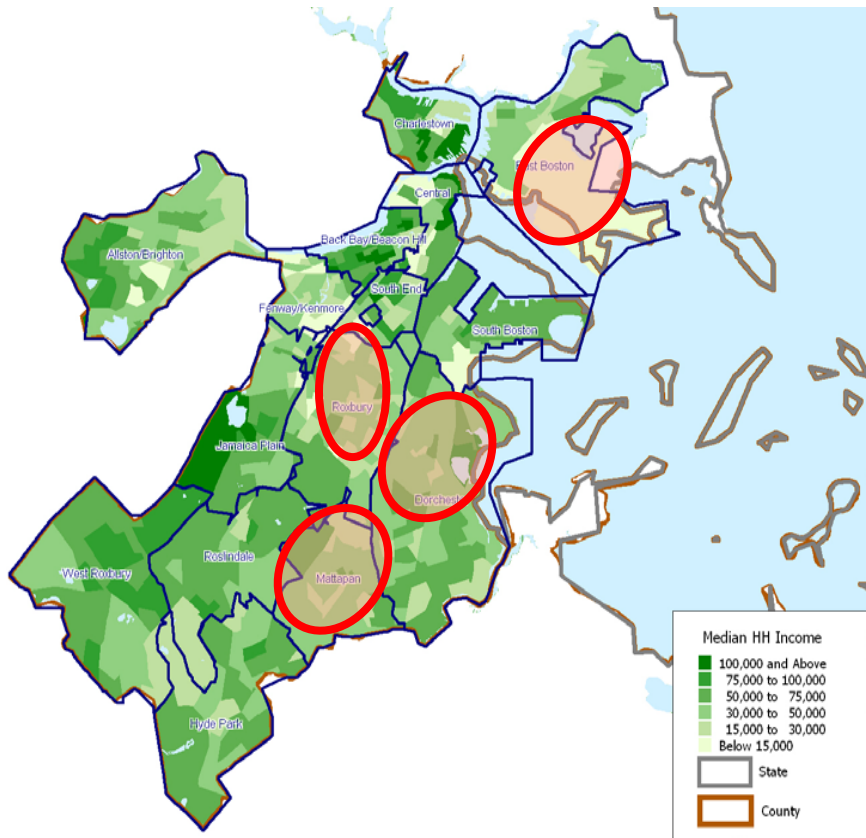


Income distribution drives the disparity between the “haves” and the “have nots”...

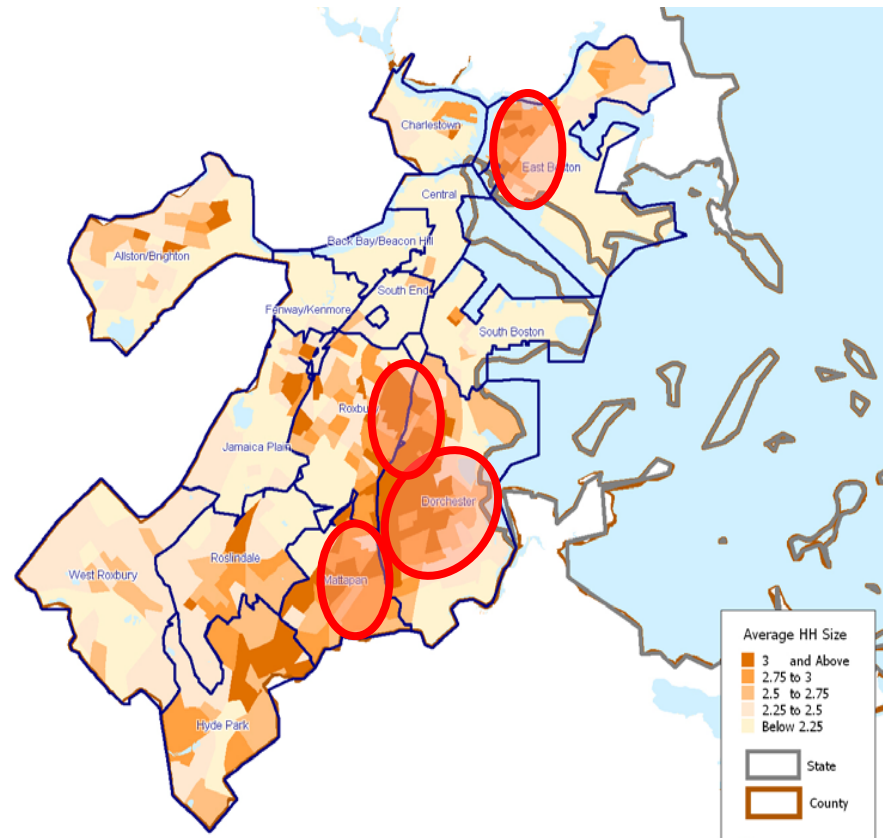
Internet Adoption by Income



Income













HH Size









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Typical Problems

	Applicable to Boston	Applicable to Other Places
① <i>Access is not available</i>		
② <i>Access is too expensive</i>		
③ <i>Access is not customizable</i>		
④ <i>Devices are too expensive</i>		
⑤ <i>Need more efficient City services</i>		

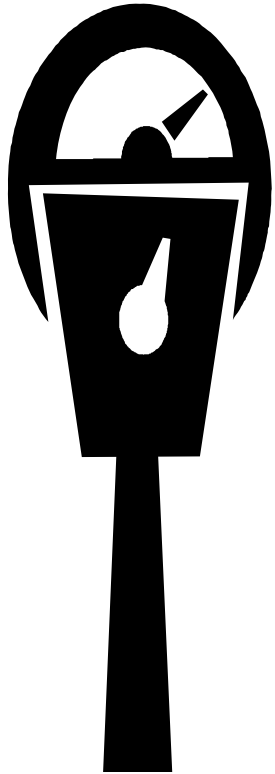
The City has several existing competitors

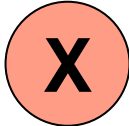
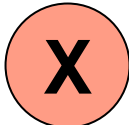

	Offering	Price Points	Estimated Customers	Target Market
	BB, Voice	<ul style="list-style-type: none"> \$18 786k DSL (w/ voice package) \$30 3M DSL (w/ voice) \$35 1.5M naked DSL 	180k voice ~34k BB	<div style="border: 1px solid black; padding: 10px; text-align: center;"> In-Home, High Capacity Broadband + Entertainment </div>
	Video, BB, Voice	<ul style="list-style-type: none"> \$43 3M Cable Modem (w/ Video) \$55 3M Cable Modem 	145k video ~65k BB	
	Video, BB, Voice	<ul style="list-style-type: none"> \$19.95 1.5M Cable Modem \$38.99 5M Cable Modem \$35 1.5M naked DSL 	19k wireless ~5k BB	
	Wireless, BB	<ul style="list-style-type: none"> \$45 unlimited data plan \$200 one-time card purchase 	120k wireless ~2k BB	<div style="border: 1px solid black; padding: 10px; text-align: center;"> Traveling Business Customers (price insensitive, need coverage everywhere) </div>
	Wireless, BB	<ul style="list-style-type: none"> \$70 unlimited data plan \$150 one-time card purchase 	120k wireless ~8k BB	
	Wireless, BB	<ul style="list-style-type: none"> \$80 unlimited data plan \$100 one-time card purchase 	90k wireless ~5k BB	

The wireless parking meter problem...

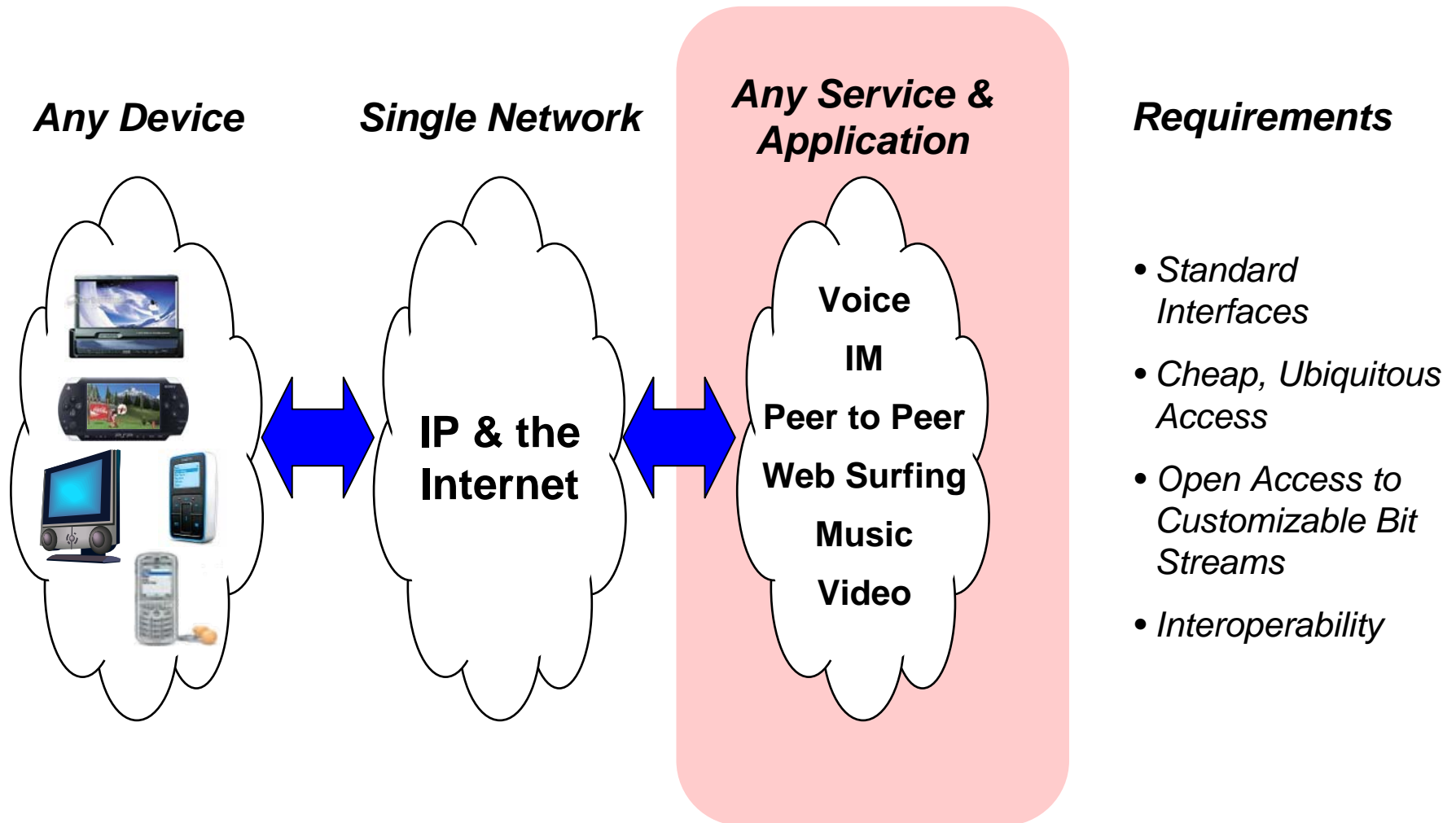
How do we enable a parking meter to accept credit cards?

- Non real-time authentication charge = 25%
- Real-time = <5%



	Wireless Device Cost <i>Per Meter</i>	Monthly Access Fee <i>Per Meter</i>	Economical?
CDMA (cellular)	\$150	\$40	
DSL	\$2,500	\$35	
WiFi	\$15	\$1-2	

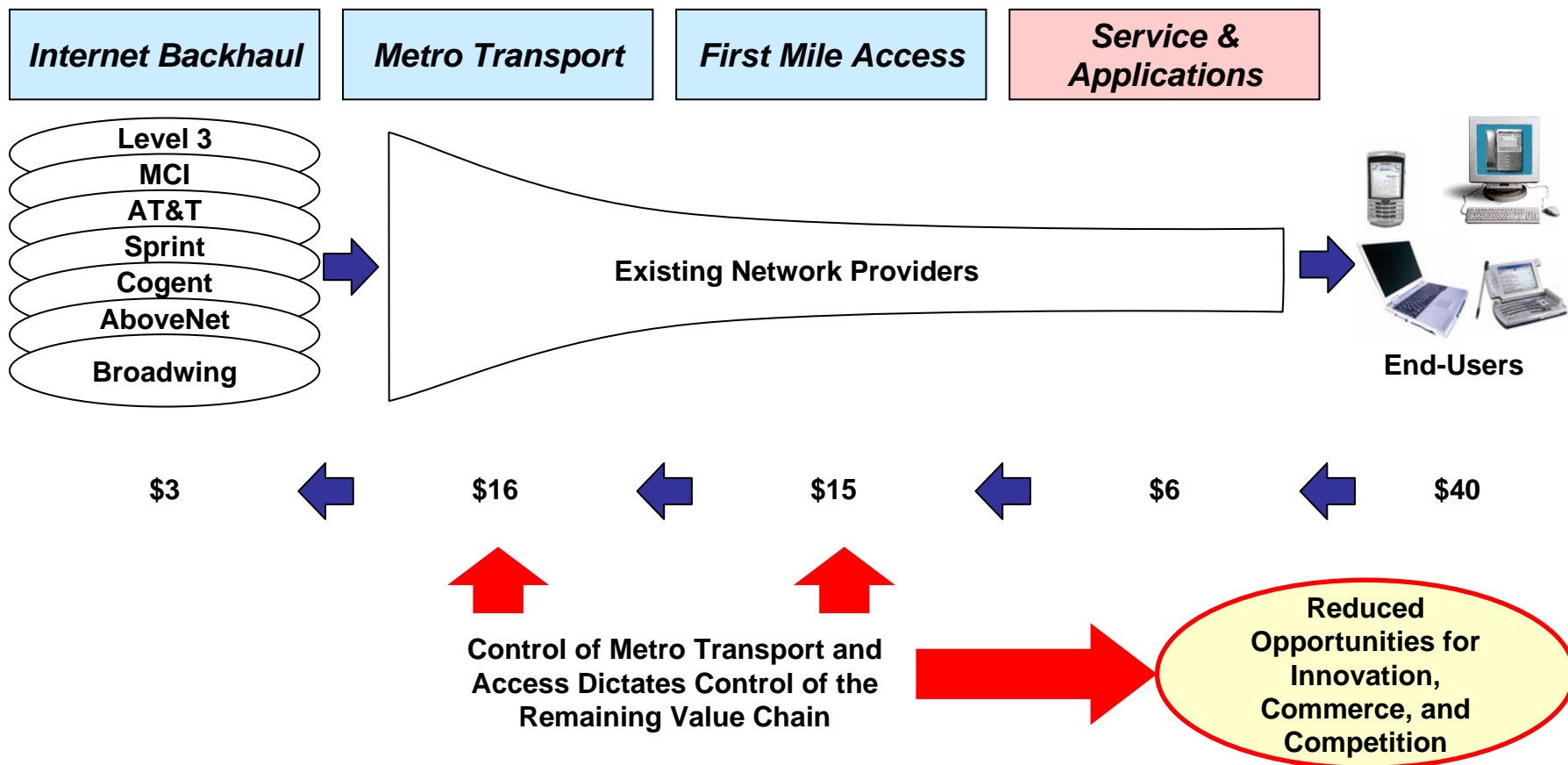
Nirvana



Today, existing ISPs control the metro area transport and first mile access...

–Non-profits are building networks to support Digital Divide initiatives...

Internet Access Value Chain



Cities are executing various strategies for their municipal wireless strategy

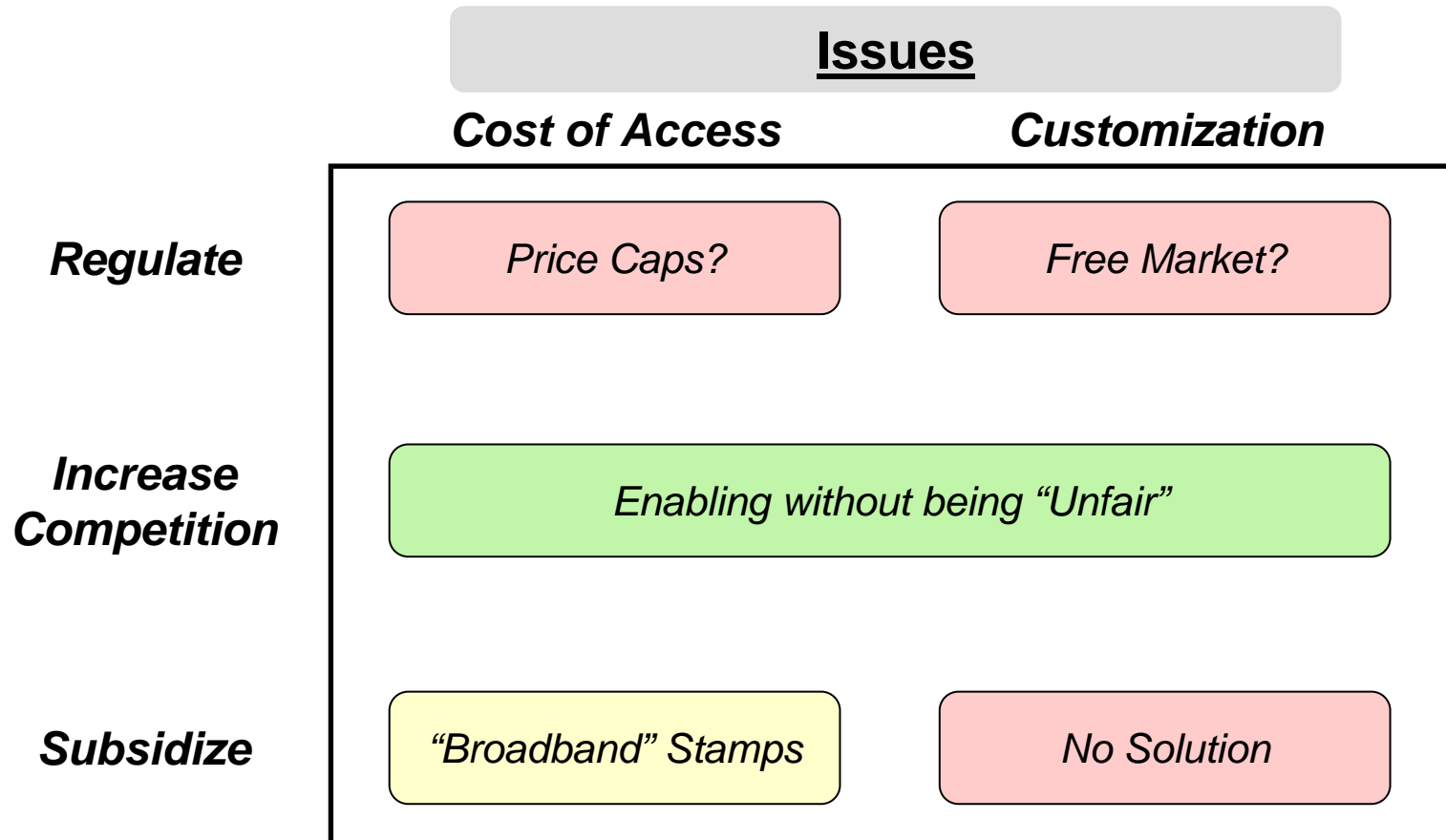
Internet Access Value Chain

City	Major Driver of Model	Assets Involved	Operating?	Metro Transport and Access	Service & Apps
San Francisco	Free Access	Light Poles Buildings	No	Private	Private
Philadelphia	Digital Divide				
Anaheim	Competition				
Portland, OR	City Services	Light Poles Buildings	No	Private	Private + Open Access
Brookline, MA					
Aurora, IL					
Corpus Christi, TX	BB Availability	Fiber Light Poles Conduit Buildings	Yes	City Owned	Open Access
St. Cloud, FL	Keeping \$\$ Local				
Chaska, MN	Competitiveness / Cost				
Nevada, MO	BB Availability				

Compared to other cities, Boston's objectives are more oriented to public purposes

<u>Agreed-on Objectives</u>	<u>Detailed Requirements:</u> <i>What Boston Wants</i>	<u>Examples:</u>
<i>Promote Economic Development & Stimulate Innovation</i>	<ul style="list-style-type: none"> • Minimal barriers for entry by ISPs or entrepreneurs • Unique “bit” plans that can be customized to the specific application (low speed for parking meters, or very high speed for video) • Ubiquity • Interoperability • Security / Trust 	<ul style="list-style-type: none"> • Allow local businesses and entrepreneurs to create new business models by eliminating obstacles embedded in the current telecom system <ul style="list-style-type: none"> – Village Books in Roslindale Square can compete against Amazon.com by using the wireless network to advertise competitive offerings – Internet-based phones coupled with wireless can offer toll-free communication to anyone, anywhere in the world
<i>Support Efforts to Eliminate Digital Divide</i>	<ul style="list-style-type: none"> • Affordability • Accessibility • Resources <ul style="list-style-type: none"> – Computers – Training – Support 	<ul style="list-style-type: none"> • Underserved areas receive broadband capabilities at affordable rates, not private sector market rates • Technology Goes Home to every BPS family • BPL resources and BPS content available to every resident at home • Current Non-Profits groups can focus their efforts on training and support instead of just access
<i>Incidental Benefits</i> <i>(Enhanced Constituent Quality of Life)</i>	<ul style="list-style-type: none"> • Mobility • Ubiquity • Speed 	<ul style="list-style-type: none"> • Police cars with high bandwidth capability for real-time information • Fire trucks able to download blueprints, photos and maps of buildings while driving to an alarmed site • Enhancing Boston's attractiveness as a center for technology advancement

Possible solutions for local governments



Model Options

Model

Details

Issues

Government Funded

- Government funds network construction through savings on existing applications
- Other non-city end-users can access network for free or small fee
- Upfront budget or bond must be developed to fund construction

- Sustainability subject to city budget, economy, political regimes
- Non-city end-users can be crowded out as network traffic increases
- No implied price or cost for use of network by any end-user

Private Model

- Government issues RFP for private entity to design, build, and operate network
- Contract is created to allow access to government assets and enforce rules
- Government “liaison” is created to oversee process
- Private market absorbs all risk

- Franchise negotiation problem – divergent interests, successors, etc
- Government must enforce rules
- Private interests may be counter to public interests (e.g. digital divide areas)

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Two Major Business Model Options:

For Profit - Model

“RFP” or “Franchise”

Details:

- Multi-vendor relationship with a city agency or non-profit – “Liaison”
- Private companies operate all parts of the value chain (with possible exception of digital divide)
- RFP or Franchise arrangement
- “Liaison” develops requirements, metrics, penalties

Risks:

- City or “Liaison” does not receive attractive bids
- Any vendor does not perform to requirements
- Limited innovation opportunities

Opportunities:

- Private market absorbs all market, technology, demand, and funding risks
- Low political / legal risk if vendor performs
- Faster time to market

Non Profit Model

Some Non-Profit Role in the Value Chain

Details:

- Non-profit participation in the value chain
 - Backhaul / transport at minimum
- Non-profit entity established with board and funding
- Private companies serve other value chain elements
- Non Profit conducts RFP to find private partners
- City has process to select non profit and establish asset grant

Risks:

- Non-profit must assume some market, technology, demand, and funding risks
- Significant political, legal, and execution risk
- Partner does not perform to requirements
- Non-attractive bids

Opportunities:

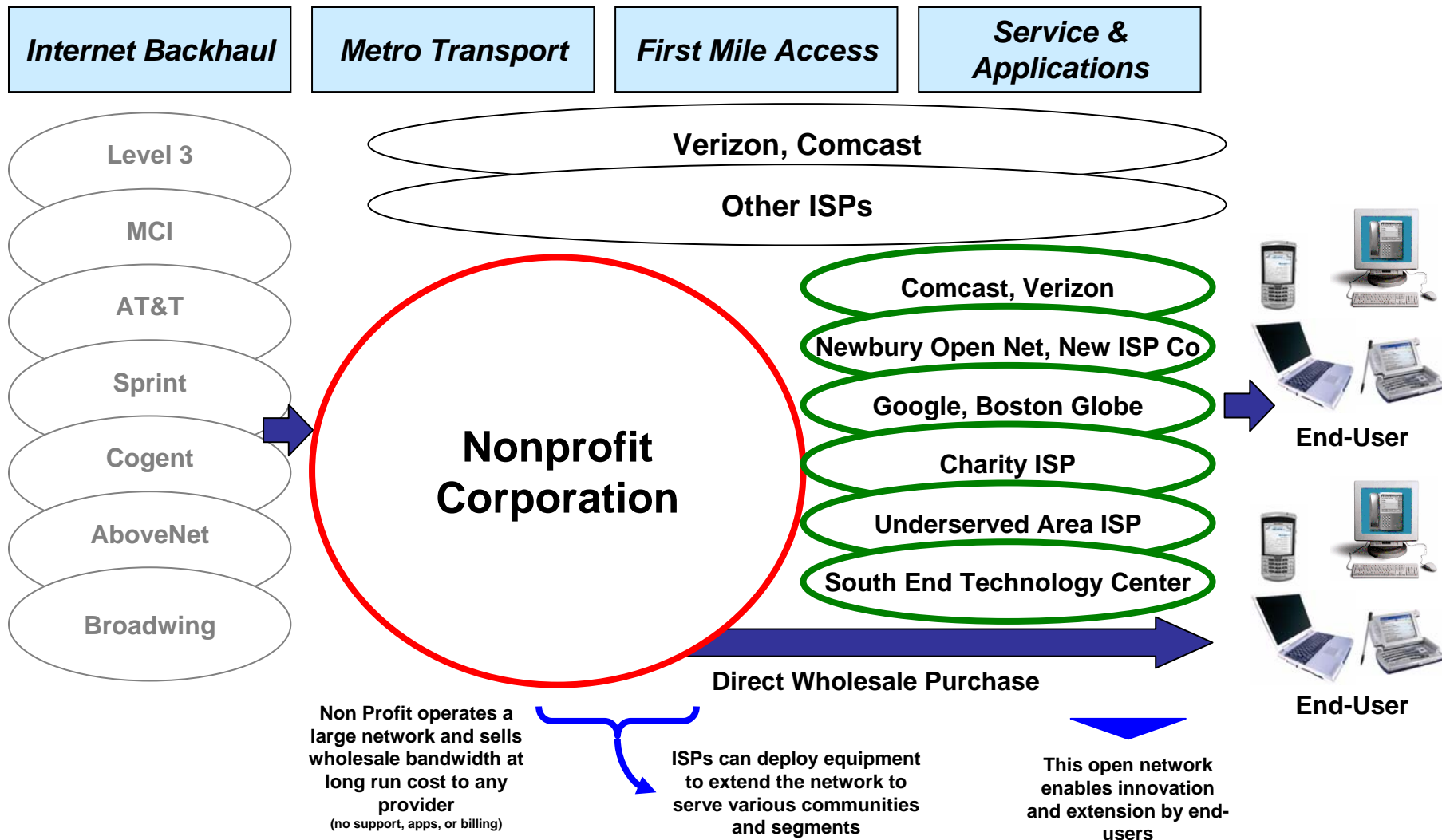
- Provides a unique platform for innovation
- Platform for state-wide expansion
- Universal digital divide support
- Control over execution, management, operations, partnerships, etc

Models

		<i>For Profit</i>	<i>Non Profit</i>
Network	Transport Provider	Yes	Yes
	Mesh Provider	Yes	Outsource
	Retail Provider	Yes	No
	Digital Divide Provider	Yes	Possibly or Partner
	City Services Provider	Yes	Partner
Objective	City Services	Very High	Very High
	Digital Divide	Moderate	Very High
	Innovation	Very Low	Very High
Risks	Technology Risk to NP/City	Very Low	Very Low
	Need to Leverage City Assets	Moderate	Very high – especially fiber
	Demand Risk to NP/City	Very Low	Low
	Coverage Risk	Moderate	Low
	Political Risk	Moderate	Moderate
	Management Requirement	Very Low	Moderate
	Funding Requirement	~\$0M	\$10M-\$25M

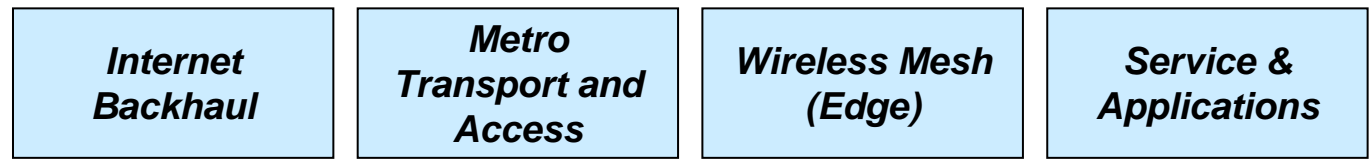
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Internet Access Value Chain



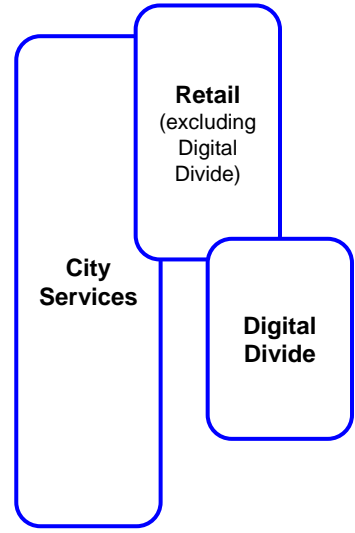
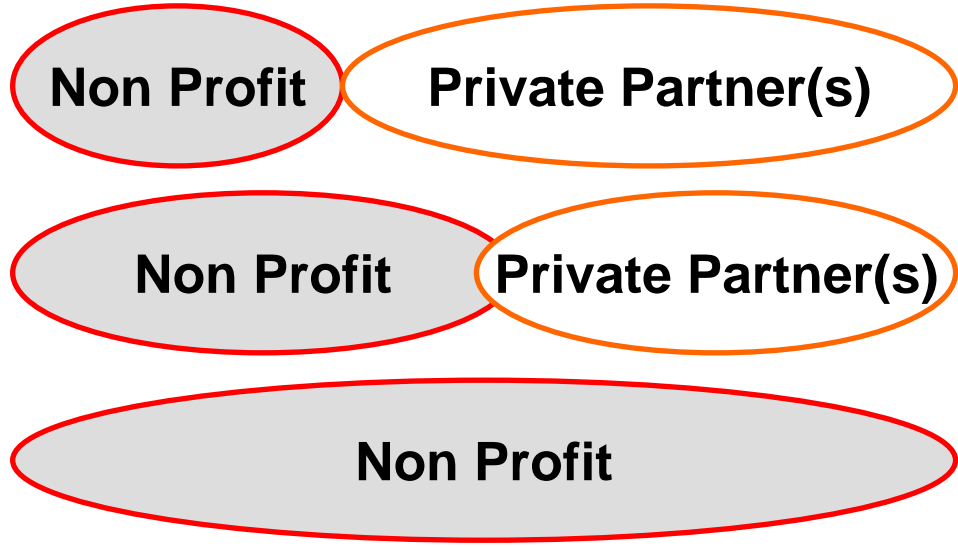
The Non Profit will likely play in several different areas of the value chain, depending on the target customer

Internet Access Value Chain



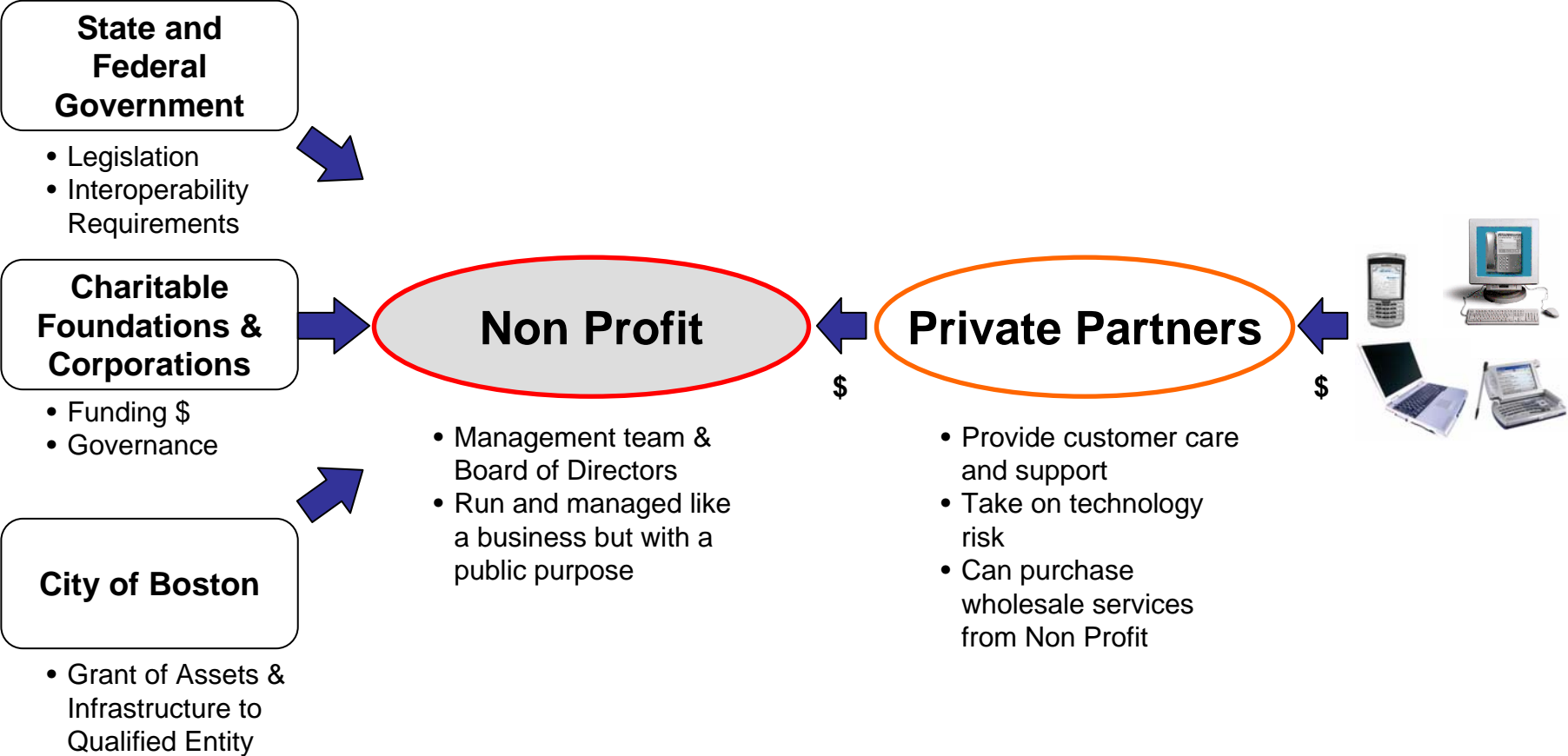
End-Users

Many Options

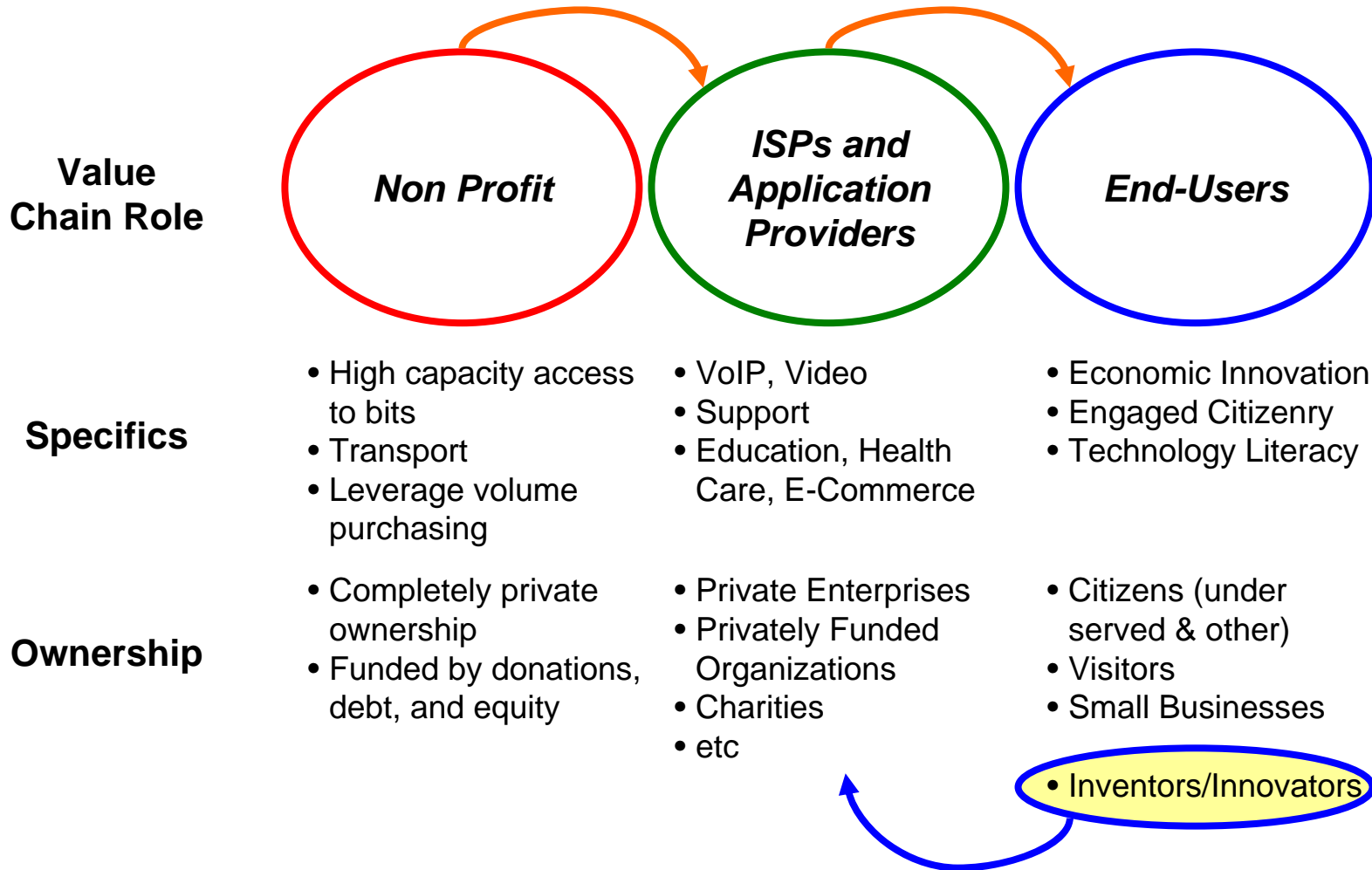


All three of these models for the Non Profit will co-exist simultaneously

The Non Profit will be structured in such a way that the City has influence on the Board, but no direct control

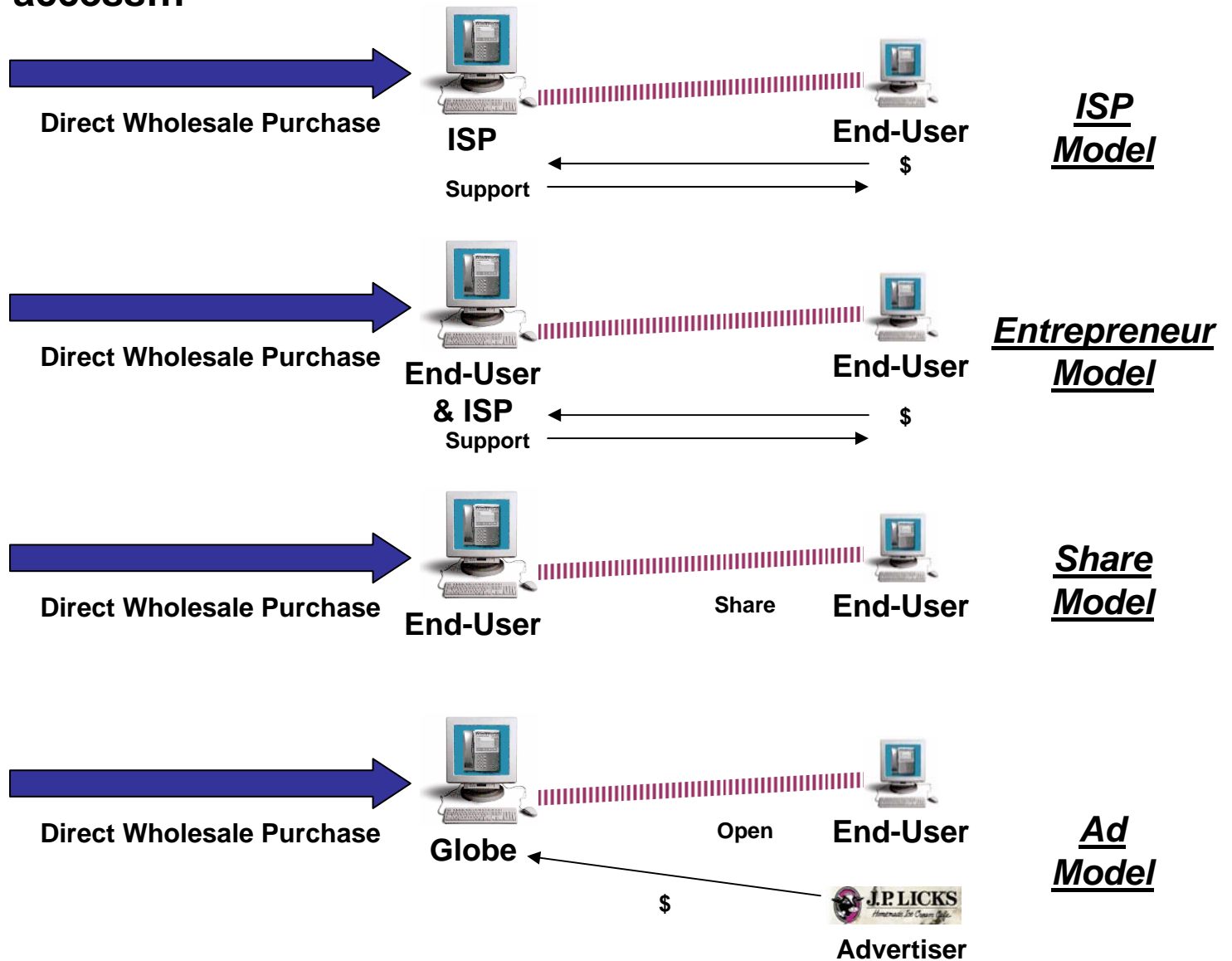


The Non Profit is simply the enabler. It does not develop applications or provide service to end-users



In this model, anyone can be ISP and use any means to support the purchase of access...

Non Profit Network



So who does what?

Value Chain	<i>Metro Transport</i>	<i>First Mile Access</i>	<i>Service & Applications</i>
Name	Transport Co	Mesh Co	ISP Co
<u>Structure Decisions</u>			
Ownership	Non-Profit	Non-Profit	Private
Construction	Contractors	Contractors	None Required
Operation	Partner	Partner	Private