

# **Galaxy**

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## **INTERNET SERVICES**

**Massachusetts Technology Collaborative  
Massachusetts Broadband Institute**

**Western Massachusetts**

**Response To  
Call for Solutions**

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## Solution Cover Sheet

Name of Respondent Organization Galaxy Internet Services Inc.			
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Which of the following best describes the respondent: (You must select at least one)			
<input checked="" type="checkbox"/> Broadband Service Provider <input type="checkbox"/> Government Organization <input type="checkbox"/> Equipment Manufacturer <input type="checkbox"/> Non-profit Organization <input checked="" type="checkbox"/> Equipment Vendor <input type="checkbox"/> Owner of Physical Assets (please specify Asset: _____ _____)		<input checked="" type="checkbox"/> Network or Systems Integrator <input type="checkbox"/> Interested Individual <input type="checkbox"/> Investor/Venture Capital <input checked="" type="checkbox"/> Consultant <input type="checkbox"/> Advocacy Group <input type="checkbox"/> Other (please specify Other: _____ _____)	
Brief Description of Organization (please outline previous experience with broadband deployment and/or provision of broadband services)			
<p>Galaxy Internet Services Inc. is a Massachusetts based Internet and Telecommunications Service Provider. Galaxy was founded in 1995 and is completing its 14th year providing a broad range Internet services, throughout the Commonwealth. Galaxy provides Internet access, private line, Voice over IP, hosting, software development, and general IT services. Galaxy's services are provided via dial-up, DSL, Cable Broadband, Fiber-To-The-Tome, T-1, T-3, OC-X, Switched Ethernet, Dark Fiber, Lit Fiber, Wireless Point-to-Point, Point-to-Multi-Point. In addition, Galaxy is well know for its municipal Wi-Fi networks in Brookline and Boston.</p> <p>Galaxy has worked with many State Agencies, school systems, cities, towns, public safety, and other eligible entities on a wide range of projects. Galaxy is familiar with Commonwealth procurement as it is listed on three of Massachusetts Statewide Contracts:</p> <ul style="list-style-type: none"> <li>• ITT37 – Internet Access and Hosting (listed on all Sections)</li> <li>• ITS23 – IT Services (Solution Provider)</li> <li>• ITT09 – Communications Network Services</li> </ul>			
List of anticipated partner organizations			
OpenAir Boston (OAB)			

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## 1 Introduction and Company Background

### 1.1 Introduction and Expression of Interest

Galaxy Internet Services Inc. is pleased to respond to the Massachusetts Broadband Institute's (MBI) "Call for Solutions." As an Internet and Telecommunications Service Provider servicing Massachusetts for nearly 14 years, Galaxy is well aware of that an alarming portion of the Commonwealth does still not have access to broadband Internet service. Galaxy applauds the initiative of Governor Patrick, the Legislature, the Massachusetts Technology Collaborative (MTC), the MBI, and the many other groups and individuals that contributed to the creation of the Massachusetts Broadband Incentive Fund.

Galaxy Internet Services would like to express its formal interest in assisting MBI and the Commonwealth in this worthy and formidable undertaking.

### 1.2 Introduction to Galaxy

Galaxy Internet Services was founded in 1995 and has recently entered its 14th year of business. Galaxy has grown its business to encompass a wide range of telecommunication and professional services. Galaxy provides Internet access, private line, Voice over IP, hosting, development, and general IT services. Based in Newton, Massachusetts, Galaxy is listed on three Commonwealth of Massachusetts Statewide Contracts. This includes ITT37 (Internet Access and Hosting), ITS33 (IT Services), and ITT09 (Communications Network Services). In addition, Galaxy is included on ITS33 (IT Services) as a Solution Provider, and ITT. Galaxy has worked with many State Agencies, school systems, cities, towns, and other eligible entities on a wide range of projects.

### 1.3 History

Galaxy began as a local dial-up Internet provider here in Massachusetts and has grown its operations to include a complete suite of IP and network services as well as a complete range of IT solutions. The Boston Business Journal has ranked Galaxy the number one ISP for three consecutive years and Galaxy is considered the largest independent ISP in New England. Galaxy's founders continue to manage the business, and have continued its growth throughout

the industry's tumultuous 14+ years. Galaxy hasn't changed ownership or received any outside funding. It is profitable and debt free.

## 1.4 Current Operations

Galaxy is a facilities-based Internet Service Provider with NOC, TAC, engineering, management, and primary data center located at its Newton headquarters. Galaxy offers a unique "last mile carrier-neutral and technology-neutral" approach to providing Internet access. With dozens of carrier relationships Galaxy can assist clients in implementing the most cost effective solution for a particular location and application.

## 1.5 Offerings

- Dial-Up (Local #'s in All MA)
- ISDN
- Cable Broadband
- DSL (IDSL, SDSL, ADSL, Dry Loop)
- Fiber to The Premises (FTAS, FIOS)
- Private Line (Frame, ATM, 56k, T1, T3, OC-X, SONET, Ethernet, Gig-Ethernet, Fiber)
- MPLS (T1-OC48)
- Virtual Private Networking
- Hosting (Shared, Dedicated, Managed, Application and Colo)
- Wireless Fixed Point (256k – 1Gig)
- Wireless Point-To-Multi-Point
- Wireless Unlicensed, Licensed
- Wireless for Public Safety and First Responders
- Municipal Wi-Fi Networks & Hot Spots
- IT Services (System Integration, Security, LAN, WAN, Strategic Consulting)
- Development (Web, Database, Software)
- Equipment (Routers, Firewalls, Servers, etc)
- Voice over IP (VoIP)

Galaxy also has a robust IT Services business, with a particular emphasis on IP networking for Public Safety. Galaxy has a number of engagements involving Department of Homeland Security, as well as state and local public safety.

## 1.6 Wireless Capabilities

Galaxy has been providing a wide range of wireless services for over 5 years.

Galaxy's current wireless capabilities include:

- Design, Build, Operate
- Point-to-Point, Point-to-Multipoint, Mesh
- Unlicensed, Licensed, Optical, Millimeter wave
- Site Selection and Tower Construction
- Spectrum Analysis
- Utility Poll, Roof-Top, Water Tower, and Tower Installation
- Bucket Truck Work and Tower Climbing

## 1.7 Massachusetts Statewide Contracts

Galaxy provides the Commonwealth of Massachusetts State Agencies, Municipalities, Schools, Libraries, and other eligible entities a wide range of services under 3 distinct Statewide Contracts. Galaxy is familiar with Commonwealth procurement practices and has a long list of clients served under these contracts.

### 1.7.1 Internet Services and Hosting (ITT37)

Galaxy is the only Massachusetts based company that was selected for every section of the ITT37 Statewide Contract for Internet Services and Hosting.

### 1.7.2 IT Services (ITS33)

Galaxy is included under the coveted "Solution Provider" section of the ITS33 Statewide Contract for IT services. This allows for a broad range of IT, development, and consulting services.

### 1.7.3 Communications Network Services (ITT09)

Galaxy is included under ITT09, the Statewide contract for communication services and network connectivity.

## 1.8 USAC and SLD / E-Rate

Galaxy has provided services under the Universal Service Administrative Company (USAC) and the Schools and Libraries Division (SLD / E-Rate) for a number of years. Galaxy is familiar with the required forms, invoicing procedures, and payment schedules. Galaxy's Service Provider Identification Number (SPIN #) is 143025635.

## 1.9 Technical Resources

Galaxy operates a large network supporting literally thousands of connections and tens of thousands of end users. With its own engineering, NOC, and TAC located in Newton, Massachusetts, Galaxy supports a wide range of individual, small business, enterprise and government customers.

## 1.10 Partnerships and Certifications

Galaxy maintains a number of industry certifications and partnerships with prominent software and hardware vendors.

### **Partnerships:**

- Microsoft Registered Partner
- Microsoft Security Software Advisor
- Sun Microsystems Partner Program
- IBM Business Partner
- Secure Computing Partner
- Computer Associates Partner
- HP Authorized Partner
- 3Com Focus Partner
- Netgear Powershift Partner

- WatchGuard Partner
- Adaptec Connect Partner
- Netopia Partner
- Adtran Partner

**Certifications:**

- Project Management Institute (PMI)
- Microsoft Certified Systems Engineer (MSCE)
- Microsoft Certified Systems Administrator (MCSA)
- Microsoft Certified Database Administrator (MCDA)
- Microsoft Certified Professional (MCP)
- Cisco Certified Network Associate (CCNA)
- Network Security & Network Security Plus

**Carrier Relationships**

- Verizon
- MCI (Verizon Business)
- AT&T
- One Communications
- DSL.NET
- Megapath
- Level 3
- Cogent
- RCN
- Broadwing
- Covad
- Qwest
- Comcast

## 1.11 Network Management

Galaxy's 24x7 fully-staffed Network Operations Center (NOC) monitors and supports thousands of high-speed connections and tens of thousands of end users. Galaxy has adopted the ISO (International Organization for Standardization) FCAPS (Fault, Configuration, Accounting,

Performance, and Security) model and framework for network management. This framework is supported by an extensive set of tools and procedures developed over 13 years in business.

Galaxy provides event based, real-time-access, and scheduled reporting in a number of different ways.

First, Galaxy operates a fault resilient network monitoring system which can provide event-based (e.g. "circuit down") notifications via E-Mail, Pager, SMS Message, and Cell Phone. Clients can select the individuals that receive specific alarms, method of notification, time of day to be notified, etc.

Typical network monitoring includes:

- IP Level Connectivity
- Network Interface Status
- BGP Status
- Latency
- Packet Loss
- Line Errors
- Jitter
- Latency
- VPN Tunnel Status
- Trouble Ticket Status Change
- SLA Compliance

In addition, any network service can be monitored. Typical examples include:

- SMTP (Simple Mail Transport Protocol) E-Mail Services
- POP (Post Office Protocol) E-Mail Services
- Telnet (Remote Login Protocol)
- SSH (Secure Shell)
- HTTP (HyperText Transfer Protocol)
- HTTPS (Secure HyperText Transfer Protocol)
- FTP (File Transfer Protocol)
- DNS (Domain Name Service)
- RADIUS (Remote Authentication Protocol)
- LDAP (Lightweight Directory Access Protocol)
- SNMP (Simple Network Management Protocol) Variables
- Other Custom Protocols

## 2 TECHNICAL MODEL AND APPROACH

### 2.1 What technical approach is most appropriate and why?

Galaxy firmly believes that no single approach is best to cover the un-served and under-served areas of the Commonwealth. With that said, Galaxy would like to offer some thoughts on solutions that we feel should be considered. This section will be divided into the network architecture layers and technologies associated with each.

#### 2.1.1 Interstate (Long Haul)

Galaxy believes this component of the network architecture is largely in place. With significant carrier facilities in Springfield (and potentially Albany, NY) it is unlikely that any new investment is required.

#### 2.1.2 Regional Network (Backhaul)

While there are existing fiber and microwave routes that exist in the region, this area will require significant improvement to deliver services that are currently un-served.

Galaxy would recommend taking a multi-step approach:

- 1) Inventory Existing Fiber, Towers, and Microwave Routes
- 2) Obtain Recurring Costs to Use In-Place Facilities
- 3) Obtain Quotes to Build New Facilities with Fiber and Microwave
- 4) Weigh Costs of Lease vs. Build Where In-Place Facilities are Available
- 5) Lease or Build Where Appropriate

##### 2.1.2.1 Microwave vs. Fiber

Galaxy believes Microwave will generally be more cost effective than new fiber construction. The use of existing towers will significantly reduce Capital Expenditures (CapEx), but may increase Operating Expenses (OpEx).

### 2.1.3 Last Mile

It is clear that the Last Mile is the most difficult aspect of this undertaking from both a technical standpoint and financial standpoint. It is in this area that there will likely be a range of solutions that will be most cost effective for a particular location. We will outline those options that we feel should be considered.

#### 2.1.3.1 Wireless

There are a number of different wireless last mile technologies that should be considered strongly. Galaxy believes this approach will leverage the MBI's investment to serve the largest area and the greatest number of un-served citizens. In considering these approaches, it is appropriate to look at the cost per home served.

##### 2.1.3.1.1 Unlicensed Point-to-Multipoint

Unlicensed point-to-multipoint or simply fixed wireless has been the staple of the traditional Wireless Internet Service Provider (WISP). Typically operating at 900MHz, 2.4GHz, or 5.1 to 5.8GHz broadband services can be offered from towers to individual subscribers. While all of these unlicensed frequencies are congested in urban areas, there are likely to be significant opportunities to operate in this spectrum in un-served areas. 900 MHz is interesting in that it has good foliage penetration, but it is also congested and there is limited unlicensed spectrum in this band. 2.4 GHz is the frequency used by Wi-Fi and in very rural areas the congestion may still be low enough that this frequency can be used. The 5.GHz band (5.1 to 5.8 GHz) offers the greatest promise in that there are a large number of channels available, and the line-of sight range is significant. This band is capable of carrying high bandwidth over long distances. Unfortunately, near line-of-sight is required and generally externally mounted antennas are required to pick up the signal.

##### 2.1.3.1.2 "Whitespace"

In November the FCC started the process to make the "whitespace" frequencies in the former UHF and VHF spectrum. These frequencies will be unlicensed, and offer great promise to rural broadband deployments. The nature of the frequency (< 1Ghz) and amount of available

spectrum will be able to deliver services over a very broad area with good penetration through foliage and into buildings. Unfortunately, standards for use of this spectrum are still evolving and no equipment is certified to operate at these frequencies... There will be rapid developments in this area, and whitespace spectrum will be used in traditional fixed wireless as well as in wireless mesh.

### **2.1.3.1.3 Licensed Point-to-Multipoint**

There are a number of licensed frequencies that are being utilized for broadband deployments. These are typically characterized by WiMAX, 3G, 4G, etc. The typical spectrum used includes various frequencies the 2 GHz range and 3.65 GHz. Since these frequencies are licensed by the FCC, generally higher transmitter output is permitted, and there is little or no congestion (noise) for the signal to compete with.

In rural deployments, a single license 2.5 GHz transmission tower can cover up to 60 square miles. Terrain and foliage can impact this, but the cost models in rural deployments are very attractive.

#### **2.1.3.1.3.1 Sources of Licensed Spectrum**

While the benefits of licensed spectrum are clear, there is often a cost associated with purchasing or leasing the spectrum. Some strategies are as follows:

- 1) Galaxy holds a Nationwide FCC License for 3.65 GHz

This spectrum is not as heavily regulated as other licensed spectrum, but should be considered.

- 2) Purchasing or Leasing Spectrum may be Affordable

Spectrum is generally priced by the MHz/pop. That is to say the cost is a determined based on the value of a MHz multiplied by population in the coverage area. The low density of the underserved areas will tend to lower both the value of a MHz and the population served. This cost is worth investigating and may be surprisingly low.

- 3) 2.5 GHz Educational Broadband Service

The FCC allocated a significant amount of Spectrum to entities like Universities and the Catholic Church for Educational Broadband Service. While Sprint/Clearwire has leased much of this spectrum there is still some amount held by these entities in Massachusetts. The worthy goals of the MBI may resonate with one of the license holders and make some spectrum available at no cost or at least a cost below market value.

#### 2.1.3.1.4 Wireless Mesh

Galaxy is well known for its work with Wireless Mesh networks. These have typically been implemented to deliver Wi-Fi and public safety communication in dense suburban and urban areas. The advantage of mesh is its ability to deliver substantial bandwidth to a large number of users over a broad area. In suburban and urban deployments the cost per household served coupled with the high capacity of the network can create very attractive business models. The self-configuring, self-tuning, and self-healing nature of a well designed mesh network offers flexibility and survivability that isn't available with other last mile architectures.

In general mesh is considered less attractive in large, sparse rural deployments. There is, however a place for the technology. It is a clear fit for clusters of subscribers and downtown areas. It is also useful in the context of a "sparse mesh," where the technology can be used in the backhaul portion of the network to feed various other last mile technologies (including traditional mesh). Mesh radios operate quite well as point-to-point, point-to-multipoint, and as subscriber access points. Mesh networks can operate on a wide range of licensed and unlicensed frequencies. This versatility makes this equipment a versatile tool in handling a wide range of scenarios.

#### 2.1.3.2 Digital Subscriber Line (DSL)

Augmenting the DSL infrastructure in the region may be a cost effective way to leverage the existing copper infrastructure. Verizon has progressed in its commitment to provide additional coverage in Western Massachusetts. A detailed understanding of their plans should be well understood, but the addition of remote terminals may prove to be a reasonable approach to servicing some areas.

### 2.1.3.3 Fiber-to-the-Home (FTTH)

While Fiber-to-the-Home offers very high capacity services, Galaxy believes the cost for deployment in sparsely populated areas makes for an untenable business model. The cost per home passed in FTTH is extraordinarily high in rural areas (principally due to outside plant costs). Television service is often touted as a component of the business model to recover costs, but Galaxy does not feel that State funds should be expended to support television services where broadcast TV and multiple, competitive Satellite TV providers are available.

### 2.1.3.4 Cable Broadband

Like FTTH, Galaxy believes that the cost to extend cable plants into sparsely populated areas is not a cost effective approach. Also like FTTH, television plays a large role in the cable business model and we believe this is not an issue that should be addressed by the Commonwealth or MBI.

## 2.2 What specific services and product offerings will be available beyond entry level, commercial Internet access (e.g. video, telephony)?

Galaxy believes that all service offerings should support Voice over IP (VoIP) telephony. This means the technology should offer sufficient bandwidth as well as controls for Quality of Service (QoS) to limit latency and jitter that would adversely affect telephony. Similarly, the ability to download low definition video streams or the ability to support basic video conferencing should be supported.

While Galaxy sees great promise in IP Television, the demands of delivering this capability (particularly in "High Definition") are not likely to be accomplished in a basic broadband IP network. While there is some potential "economic appeal" to bundling TV and Broadband data, Galaxy does not feel the Commonwealth needs to or should "subsidize" television, when there is the availability of broadcast television and multiple competitive satellite TV providers (e.g. DirecTV and Dish Network). These satellite providers compete effectively on price even in areas where there are competitive cable TV providers, and are available throughout the region.

### **2.3 What service and speed levels are achievable with your conceptual approach?**

All of the approaches outlined should support a minimum of 1 Mbps symmetrical broadband access. The wireless technologies should support higher speed connections 3-5 Mbps for some users. Wireless technology continues to improve, with more bandwidth being delivered over the same spectrum.

## **3 BUSINESS MODEL AND APPROACH**

### **3.1 What business models should be used or considered in the deployment of broadband?**

Galaxy has invested a significant amount of effort in developing sustainable business models for network deployments. These models have been developed for cost justifying our own investment (e.g. the Brookline boarder-to-boarder Wi-Fi mesh network), for responding to bids, and in consulting engagements. These models almost always include some public-private partnership.

We support the contemplated approach of investing in long term assets to enable the deployment of a commercially sustainable broadband networks.

### **3.2 What conditions and services are necessary for a sustainable business model?**

Notwithstanding our support for the overall model/approach, Galaxy has concerns regarding the short and long term sustainability of the business model. In particular, even if the CapEx was completely funded by the MBI, the subscriber density in some areas may not be sufficient to support the OpEx. This is particularly acute in the last mile component of the network. This is the ultimate challenge in deploying in sparsely populated areas and why large companies with very low cost of capital have chosen not to deploy in certain areas.

Galaxy would recommend that the MBI expend further resources to define the potential customer base, cost tolerance, demand, and deployment challenges of each underserved

community. This will help to establish a sustainability of particular business models and the appropriate technical solution for a given community.

### **3.3 What are the implications of mandating that the Broadband Institute's expenditures be used to fund a network that is in part or whole available to other commercial providers at wholesale market pricing? How should those wholesale market prices be set?**

As a regional competitive service provider, Galaxy has strongly advocated for open access to networks owned and operated by regulated monopolies. On the surface it would seem that network assets that were paid for by State funds should be open to competition. With that said, we realize that competition will dilute the opportunity for a private company to recover any additional investment (particularly in a sparsely populated area). This is a conundrum, but Galaxy would lean towards an open wholesale access approach.

Wholesale prices should be set based on a combination of real cost and market demand. This needs to be determined based on a fully developed business model as mentioned above.

## **4 SERVICE AREA**

### **4.1 Can your conceptual approach reach all un-served citizens in western Massachusetts?**

Yes.

### **4.2 If your conceptual approach can not reach all un-served citizens of western Massachusetts, in what towns and areas would you expect to deploy a broadband network, and what percentage of households would you anticipate serving?**

N/A

## 5 PARTNERSHIPS

### 5.1 Could your organization provide end-to-end services or would it partner with other organizations?

Galaxy is capable of providing end-to-end solutions (design, build, operate, maintain, and support end-users). With that said, Galaxy would entertain mutually beneficial private and public-private partnerships.

### 5.2 How would you envision and arrange such partnerships?

Partnerships could be made privately or through the efforts of the MBI.

### 5.3 What role should the Broadband Institute play with regard to inducing or enabling the formation of partnerships?

As in the Commonwealth of Massachusetts online procurement system ([www.comm-pass.com](http://www.comm-pass.com)) we may suggest that MBI could allow companies to formally list an expression of interest in a particular project or area. These companies could meet privately or at events hosted by the MBI.

## 6 FINANCING

### 6.1 What long-lived assets would it be appropriate for the state to invest in, and which privately-owned assets will complement that state investment?

Galaxy would suggest the following areas for the state to invest:

- Regional collocation facilities and long-haul network connections.
- Purchase and/or long-term lease of pre-existing fiber routes

- Towers (site acquisition, construction or long-term lease)
- Purchase of point-to-point microwave links for backhaul network
- Purchase and/or long-term lease of licensed spectrum (e.g. 2.5 GHz)
- Purchase of last mile wireless transmission equipment
- Purchase of general networking equipment (routers, switches, servers, etc.)

Privately owned assets may include any of the above, but would more likely focus on last mile solutions to directly support broadband connections to the citizens of the Commonwealth. Even with the state focus on the long-haul and backhaul portions of the network, state investment in the last mile may be required to create a sustainable business model in some areas.

## **6.2 What investment structure is appropriate and why?**

## **6.3 How and on what terms should the Broadband Institute structure the deployment of the publicly owned assets for use by participants?**

While it is clear that the MBI should invest in the long term infrastructure assets to enable the delivery of broadband services to un-served areas, it is less clear how that infrastructure will be maintained.

## **6.4 What is your perception of the Broadband Institute's financing structure for investing in and owning assets required to serve un-served areas of the Commonwealth?**

Galaxy's perception of the MBI's financing structure is that it will provide a significant stimulus to create broadband infrastructure in areas where private investment would not see a viable return. All would agree that access to broadband Internet is an essential service, and there are many examples of State and Federal programs that were designed to assist in un-served areas. With that said, Galaxy cautions the MBI to finance business models that are sustainable. As

previously mentioned, private sector companies with very low cost of capital have chosen not to invest in these un-served areas.

## **6.5 What other sources of capital are available to support your conceptual model? How much capital is required to implement the proposed conceptual approach?**

While Galaxy may choose to invest its own capital where it deems appropriate, we encourage the MBI to seek or facilitate additional funding via the following means:

- 1) Federal rural broadband initiatives – Includes Rural Utilities Service’s Rural Broadband Access Loan and Loan Guarantee Program and other Federal programs.
- 2) Universal Service Fund for Schools and Libraries (a.k.a. Erate) – Telecommunications and Internet access for schools and libraries in the region are eligible for federal contribution, offsetting some costs.
- 3) Possible new “stimulus” programs under the Obama administration – Indications are that additional federal funding for these types of initiatives may be a priority for the new administration
- 4) Additional state funding

Galaxy strongly recommends that MBI encourage Governor Patrick and Massachusetts Congressional and Senate legislators to aggressively seek additional federal funding through “stimulus” programs. The MBI should prepare and package “shovel ready” projects so that they can be funded as soon as the programs are made available.

## **6.6 What experience do you have in raising capital from these alternative sources?**

Galaxy has extensive experience with the Universal Service Fund for Schools and Libraries. We also have some experience with federal grant programs.

## **7 PUBLIC ROLE**

### **7.1 How should the performance of the Broadband Institute's investments be monitored?**

The investment should be monitored closely, with a particular emphasis on the goals set forth by the MBI. Service providers granted funds by the MBI should adhere to rules similar to those required under the Commonwealth's contracting system.

### **7.2 What reporting requirements are appropriate for service providers?**

Service providers that make use of publically funded infrastructure should be required to report on how the use of the infrastructure and how it has impacted the problem in for which MBI was funded to reduce. In particular the number, location, and type of subscribers serviced would be some metric of internets. Areas served and overall bandwidth available would also be of value.

### **7.3 What public sector demand evaluation and stimulation efforts are appropriate?**

Demand will be the overwhelming factor to the construction and success of any business model. Galaxy strongly suggests that the MBI undertake a demand evaluation to assist vendors in building business models and directing both public and private investment to where it will benefit the most people. One suggestion is to produce a questionnaire to be distributed and collected by municipalities that would like to benefit from the MBI initiative.

Notwithstanding the evaluation of any pre-existing demand, Galaxy's work in the inner-city environment via the OAB initiative demonstrates that even when service is available and affordable, a citizenry that is not familiar with the benefits of the Internet are unlikely to embrace it. Demand stimulation through education is an important initiative that is appropriate for State investment.

## **8 OTHER**

### **8.1 What provisions should be included in the agreements to build the necessary infrastructure?**

While sometimes constraining, the Commonwealth has a well established procurement practice utilizing the State Contract system managed by the Operational Services Division (OSD) as well as Chapter 30B procurement rules enforced by the Office of the Inspector General (IG). While private vendors are often discouraged by the rules and protections under these practices, they are well established protocols to protect the Commonwealth.

### **8.2 What provisions should be included in the agreements governing the use of the infrastructure?**

As previously mentioned, Galaxy generally supports an open access model, but acknowledges the difficulty in attracting private contributions to open access networks in sparsely populated areas.

### **8.3 What are the essential questions that must be resolved for the respondent so as to better inform them on the applicability of various solutions?**

Galaxy believes that further State funded efforts need to be undertaken to understand the current availability of broadband access (an update to the June 2007 report), demand, population density, and clustering. In addition, the availability of existing assets such as towers, fiber and microwave routes, telco facilities, etc. should be gathered. Much of this data is best organized in GIS (Geographic Information System) formats. Overlaying available resources, demand, topography, etc. will be essential to directing the MBI's investment to where it can produce the greatest results and the construction of a sustainable business model.

#### **8.4 What are the non-financial constraints to network deployment?**

Since Galaxy is principally supporting the deployment of wireless solutions, the availability of towers and tower sites is essential. While there are a number of pre-existing tower assets that can be leveraged, additional sites may be required. Local planning a zoning has often been an impediment to tower construction and may present an obstacle to deployment. With proper

#### **8.5 What information can you provide to give the Institute a better understanding of where specifically broadband is currently available and where it is soon-to-be available?**

Galaxy believes that the fast changing landscape of broadband deployment has made the June, 2007 study by the Massachusetts Broadband Initiative somewhat dated. It should be noted that T-1 service (the staple product for business and municipal use) is available throughout the Commonwealth. DS-3 and Switched Ethernet services (for larger applications) are also becoming more widely available and affordable. While these services are more costly in remote areas the increased costs of these services in the area is frequently exaggerated.

While the problem for consumer and low cost broadband is still acute, there have been some improvements by private industry. In particular low cost ADSL is available in additional central offices and remote terminals. There have also been improvements in broadband cable and some Wireless Internet Services (regional WISPs). While Galaxy has access to much of this information, we did not have an opportunity to compile data for this response. We do strongly recommend that a new survey be conducted prior to expenditure of any state funds.

#### **8.6 Are there other deployments or models used in other areas of the country or globe that could be applicable to the situation and challenges in western MA?**

Virtually all of the technologies outlined in the “Technical Model and Approach” section are widely deployed. The one exception is the use of “whitespace” spectrum which has yet to be deployed in a commercial product.